EXHIBIT 5
[Filed Under Seal]

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA
OAKLAND DIVISION

THE APPLE IPOD ITUNES ANTITRUST LITIGATION	)	Case No. C 05 00037 YRG Case No. C 06 04457 YRG
	)	HIGHLY CONFIDENTIAL

EXPERT REPORT OF KEVIN M. MURPHY
August 19, 2013
(Amended)

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I. INTRODUCTION

1. My name is Kevin M. Murphy. I am the George J. Stigler Professor of Economics in the Booth School of Business and the Department of Economics at The University of Chicago, where I have taught since 1983. I have been retained by counsel for Apple Inc. ("Apple") to serve as an expert in economics in the above-captioned case.

A. Qualifications

2. I received my bachelor's degree in economics from University of California, Los Angeles, in 1981 and my doctorate degree in economics from The University of Chicago in 1986. I am a member of the faculty in both the Booth School of Business and the Department of Economics at The University of Chicago, where I teach graduate-level courses in microeconomics, price theory, empirical labor economics, and the economics of public policy issues. In these courses, I cover a wide range of topics, including the incentives that motivate firms and individuals, the operation of markets, the determinants of market prices, and the impacts of regulation and the legal system. In my teaching, I generally focus on two things: how to use the tools of economics to understand the behavior of individuals, firms, and markets and how to apply economic analysis to data. In both my research and my teaching, I emphasize the integration of economic principles with empirical analysis.

3. I have authored or co-authored more than sixty-five articles in a variety of areas in economics. Those articles have been published in leading scholarly and professional journals, including the *American Economic Review*, the *Journal of Law and Economics*, and the *Journal of Political Economy*. Many of my articles analyze economic issues related to industrial organization and antitrust.[1] A list of the works I have published over the last ten years is included in my curriculum vitae, which is attached to this report as Appendix A.

[1] See "A Competitive Perspective on Internet Explorer" (with Steven J. Davis), American Economic Review 90 (May 2000): 184-187; "Critical Loss Analysis in the Whole Foods Case" with Robert H. Topel, 3 (2) GCP Magazine (March 2008); "Competition in Two-Sided Markets: The Antitrust Economics of Payment Card Interchange Fees" (with Benjamin Klein, Kevin Green, and Lacey Place), Antitrust Law Journal 73 - 3: 571-626 (2006); "The Economics of Copyright 'Fair Use' In a Networked World" (with Benjamin Klein and Andres Lerner), American Economic Review 92 (May 2002): 205-208; "Vertical Integration as a Self-Enforcing Contractual Arrangement" (with Benjamin Klein), American Economic Review 87 (May 1997): 415-420; "Vertical Restraints as Contract Enforcement" (with Benjamin Klein), Journal of Law and Economics 31 (October 1988): 265-297; "Entry, Pricing and Product Design in an Initially Monopolized Market" (with Steven J. Davis and Robert H. Topel), Journal of Political Economy 112 (Feb. 2004): S188–S225; "Economic

4. I am a Fellow of the Econometric Society and a member of the American Academy of Arts and Sciences. In 1997, I was awarded the John Bates Clark Medal, which the American Economic Association was then awarding once every two years to an outstanding American economist under the age of forty.[2] In 2005, I was named a MacArthur Fellow, an award that provides a five-year fellowship to individuals who show exceptional merit and promise for continued and enhanced creative work.

5. In addition to my position at The University of Chicago, I am also a Senior Consultant at Charles River Associates ("CRA"), an international consulting firm that specializes in the application of economics to legal and regulatory matters. I have consulted on a variety of antitrust, intellectual property and other matters involving economic and legal issues such as mergers, class certification, damages, labor practices, joint ventures, and allegations of anticompetitive exclusionary access, tying, price fixing, and price discrimination. I have submitted testimony in Federal Court, the U.S. Senate and to state regulatory bodies, and I have submitted expert reports in numerous cases. I have testified on behalf of the U.S. Federal Trade Commission, and I have consulted for the U.S. Department of Justice. A list of the reports I have filed and testimony I have given over the past four years is contained in my curriculum vitae.

6. In analyzing the economics in this case, I have consulted with my colleague Professor Robert Topel. My analyses have been supported by both Professor Topel and my colleagues at CRA. CRA is being compensated at my standard rate of $1250 for my work on this matter. I receive compensation from CRA based upon its billings in this matter. Neither my compensation nor that of CRA depends upon either the content of my testimony or the outcome of this litigation.

7. This report sets forth my opinions and describes the bases for those opinions as well as the data and analyses that underlie them. My opinions are based upon my analysis of documents and data produced in this matter; discovery responses; deposition transcripts;

Perspectives on Software Design: PC Operating Systems and Platforms" (with Steven J. Davis and Jack MacCrisken), Microsoft, Antitrust and the New Economy: Selected Essays (2002); and "Exclusive Dealing Intensifies Competition for Distribution" (with Benjamin Klein), Antitrust Law Journal 75 (Nov. 2008): 433-466.

[2] Until 2009, the John Bates Clark Medal was awarded biennially. It is now awarded annually. *See*,"John Bates Clark Medal," American Economic Association, http://www.aeaweb.org/honors_awards/clark_medal.php (accessed December 19, 2012).

declarations, pleadings, and other filings; declarations previously submitted by Professor Noll, Dr. Burtis, Dr. Martin, and Dr. Kelly; reports of Professor Noll, Dr. Martin, and Dr. Kelly and materials cited therein; data provided by both parties, and information from public sources. My opinions are also based upon my general expertise in economics. During the course of my work, I have had access to an electronic database that contains all the documents and data produced in this case. The materials and information upon which I specifically rely in forming my opinions are listed in Appendix B to this report.

8. My opinions are based on the information available to me as of the date of this report. My work is ongoing, and I will continue to collect facts, data, and information relevant to the issues and opinions discussed herein. I will review, evaluate, and analyze any relevant material that becomes available including new opinions and analysis provided by plaintiffs' experts, and I will supplement my report as necessary to reflect this information.

B. Assignment and Summary of Opinions

9. Plaintiffs claim that the implementation of an update to FairPlay released at the same time as iTunes 7 (one of many updates to Apple's iTunes software), which had the effect of disabling or blocking RealNetworks' Harmony software, was anticompetitive because it allegedly raised the price of iPods during the class period. I have been asked by counsel for Apple to examine whether the conduct Plaintiffs challenge in this case was anticompetitive - that is, whether it allowed Apple to acquire or maintain monopoly power in any relevant market and allowed Apple to, and whether Apple did, charge higher prices for iPods than it otherwise could have. I have also been asked to evaluate Plaintiffs' and Professor Noll's theories and opinions. Based on the analysis described below, I have formed the following main opinions in addition to the opinions set forth in the remainder of this report:

10. Opinion 1: Apple's integrated iTunes/iPod/iTunes Music Store (iTMS) platform for managing, delivering, and playing digital media is pro-competitive and beneficial to consumers.

a) Apple's integrated platform competed successfully against many other proprietary and non-proprietary platforms for accessing and playing digital media.

b) Requiring iPod owners to use iTunes to add content to the iPod and thereby preventing the use of unsupported applications preserved the simplicity, reliability

and ease of use of the iTunes/iPod/iTMS platform. This was procompetitive and beneficial to consumers.

11. Opinion 2: Professor Noll's economic analysis is flawed and unreliable.

a) Professor Noll ignores the pro-competitive reasons for the implementation of iTunes 7, particularly the substantial consumer benefits inherent in the integrated iTunes/iPod/iTMS platform.

b) Professor Noll fails to examine whether iPod owners actually used RealPlayer with Harmony and/or purchased music from the RMS. He simply assumes they did. Thus, he fails to provide evidence of the critical factual basis for the existence of the harm he hypothesizes. His purported regression analysis cannot substitute for such evidence.

c) Professor Noll's analysis is at odds with both the undisputed facts and the Plaintiffs' theory. Any incremental "lock-in" resulting from iTunes 7 could only apply to the small fraction of iPod owners who might otherwise have used RealPlayer with Harmony and the RMS in the future, and even then could only impact purchasing decisions in a vaguely defined "long run." If iTunes 7 had any impact at all (and Professor Noll has not shown that it did), that impact would have been to make alternative music players more attractive to existing users of the RMS by reducing the proportion of their existing music library that could be played on the affected iPods while leaving the amount of that music that could be played on other MP3 players unchanged. But this would have led, if anything, to a reduction in iPod prices – the exact opposite of what Plaintiffs contend.

12. Opinion 3: Professor Noll's regression analysis of iPod prices — which he claims demonstrates both anticompetitive impact and damages — is fatally flawed and highly speculative.

a) Professor Noll's regression analysis cannot identify the impact (if any) of the [redacted] as distinct from other contemporaneous factors that may have influenced iPod prices. Among other things, his model cannot separate the alleged impact of the [redacted] from

the other changes that occurred at precisely the same time and, by the logic of his own model, would have affected Apple's pricing.

b) Professor Noll's regression analysis is inconsistent with the timing implications of Plaintiffs' theory of harm. He admits that iPod prices ***might*** be higher in the "long run," but his regression is based on an assumption that the alleged overcharge began on the day on which iTunes 7.0 was released. As a matter of both economic theory and the evidence in this case, that is not possible.

c) Professor Noll vastly overstates the precision of his model and its results. By ignoring the way his data are constructed and the pricing practices at issue in this case, he purports to estimate the "effects" of the [redacted] with an astonishing degree of precision and statistical significance. But his claims are demonstrably wrong. Properly analyzed, even his (otherwise incorrect) estimates of impact and damage are not statistically significant. In other words, even using Professor Noll's flawed regression one cannot conclude that the "impact" of iTunes 7 (to say nothing of the challenged [redacted]) was materially different from zero.

d) Professor Noll's model misrepresents the "but-for" world that would have existed in the absence of the challenged conduct. I understand that the relevant FairPlay technology in iTunes versions 4.7, 5 and 6 has been found legal. Despite this, Professor Noll's regression model assumes that this legal technology would not have existed in the but-for world. This error alone doubles the magnitude of his otherwise flawed estimate of the "impact" on resellers, and it raises his claimed impact on direct purchasers by a factor of six.

e) Professor Noll excludes from his model many other observable features of iTunes and iPods that, by his own "hedonic" theory, would affect the value and prices of iPods. Among these were features considered by Apple's pricing committee in deciding how to price iPods. Correcting these errors and omissions undermines his claimed results — there is no evidence that iTunes 7 or the [redacted] caused prices of iPods to be higher than they otherwise would have been.

f) Professor Noll errs in using the logarithm of time instead of time measured in units to account for "Moore's Law" of technical progress. This error also causes him to overstate damages.

13. Opinion 4: Professor Noll's analysis of relevant markets and market power is misguided and does not address the economic issues in this case.

a) On the music side, Professor Noll defines a separate antitrust market for digital music downloads. But this is a "market" without meaning. The central question in this case is whether iPod owners could be locked in through their purchases of music from the iTMS, and what matters in answering that question is where those owners get the music on their iPods and especially the relative importance of music from the RealNetworks Music Store. Since music from the RMS is a very small share of any music on the iPod, the effect of blocking Harmony will be negligible, regardless of whether digital music downloads are a separate market or they compete more broadly with other sources of music.

b) Professor Noll's analysis of market power in music players is similarly flawed. Professor Noll claims that Apple is able to charge a premium price and still maintain a large share of the market because it able to lock in customers and exercise market power. However, Apple was successful long before it was established as a market leader, and it has continued to be successful in selling to new customers entering the market. The overall history of this market shows that consumers bought their iPods not because of any alleged lock in or market power but because the iPod was a product they wanted.

14. The remainder of my report explains the basis for these opinions.

II. BACKGROUND

15. The issues in this case center on Apple's highly successful platform for managing, playing and acquiring digital media files. From an economic standpoint, the iPod is not simply a portable device for playing music and video files. Rather it is part of an integrated platform including software for managing and acquiring media files (iTunes), a portable device for playing those files (the iPod), and an online store from which such files may be purchased (the

iTunes store). Exhibit 1 is a timeline of significant events in the development and enhancement of the iTunes/iPod/iTMS platform, as described below. Exhibit 2 is a similar timeline that describes significant events in the evolution of portable consumer devices for playing music.

A. iTunes

16. Apple introduced iTunes in January 2001. On October 16, 2003 Apple introduced iTunes for Windows, which allowed owners of personal computers based on the Windows operating system to use the iTunes/iPod/iTMS platform. This exported the revolutionary software beyond Apple's operating system for the first time. By moving beyond the relatively small Apple PC universe to include owners of the vastly larger number of "Wintel" based PCs, this greatly expanded the potential market for Apple's integrated music platform.

17. In its original form iTunes was a software program that allowed users to import music digitally from CD (i.e., "rip" the CD) and other sources onto their computers. Once imported, iTunes could manage the music, play it using the computer's speakers, or copy it back to a CD (i.e., "burn" it). iTunes was, and continues to be, offered as a free program for download aimed at streamlining the process by which users upload their entire digital music collection and making it easy to organize and play.[3] The early version of iTunes could also write music files to various portable MP3 players that were available at the time. But Apple executives had low regard for those devices: "Every single one of them [stunk]."[4]

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[3] At the time, other computers already had software that enabled them to download music (from the internet or from CDs) and play it on the computer. Although two independent companies (Audion and SoundJam) had been working on the issue, there was nothing like it yet for Apple's Macintosh computer. When Steve Jobs realized the potential importance of this for the Mac, he purchased SoundJam. It has been reported that, at the time, he was concerned that Apple had missed its chance. "I felt like a dope," he later told Fortune magazine, noting that "millions of kids were using computers and CD burners to make audio CDs and to download digital songs called MP3s from illegal online services like Napster." "I thought we had missed it. We had to work hard to catch up." Brent Schlender, "How Big can Apple Get?" Fortune Magazine, February 21, 2005. Four months later, iTunes debuted. The new iTunes was "stripped down, cleaner, and many times friendlier than anything that had come before. It gave people the ability to search for their songs at lightning speed, a task performed without forcing you to go into some clumsy mode of specifying whether you were looking for the title, the artist, or the album. 'iTunes was of course brilliant,' concluded a stunned and disheartened Sasser of Audion. 'It was a way to take a complicated digital music collection and make it easy. Sure, it was limited, but man, it was easy.'" Audion tried to compete, but eventually it was shut down. As Sasser wrote in his farewell, "iTunes is, you know, actually pretty awesome." Levy, Steven *The Perfect Thing: How the iPod Shuffles Commerce, Culture, and Coolness*, New York, NY: Simon & Schuster (2006), hereinafter "The Perfect Thing", p. 52.

[4] The Perfect Thing, p. 53.

> 'Everybody had the same story,' says Greg Joswiak, who was then a Macintosh marketing manager. 'I got it, it was cute, and now it's in the drawer.' And that means no second-time purchase. That means no telling your friends how cool it is. Because it isn't cool.[5]

18. Since iTunes was first introduced, there have been ten major (version) updates, or just under one per year. In general, the new version updates enhanced the operation of the music player; added or supported new features in iPods, such as photo and/or video; and supported new content from the iTMS (e.g., movies, TV shows, and games). There have also been numerous smaller updates that added features, supported new iPods, or addressed technical issues. All told, there have been 88 different updates, the most recent of which was released on June 5, 2013.[6] (See Exhibit 3 for a history of the various versions of iTunes and the major updates to those versions through March 2012.)

B. The iPod

19. Apple introduced the iPod on October 23, 2001. The iPod became one of the most recognizable products in the United States, if not the world. By 2006 it was described as "the most familiar, and certainly the most desirable, new object of the twenty-first century."[7] There were many glowing reviews in magazines and newspapers,[8] and musicians offered effusive

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5 The Perfect Thing, p. 53.

6 This number includes 10 versions after version 1, 26 sub-version updates, and 52 more minor updates. iTunes 4.7 is not counted as a separate version, but rather as one of the sub-version updates. See "iTunes version history," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/ITunes_version_history (accessed 6/25/2013 - last checked 7/18/2013).

7 The Perfect Thing, p. 1.

8 "When we ran our First Take of the Apple iPod, we were convinced that it was the best MP3 player we had ever seen. After testing a final production unit, we still think that it beats the pants off of anything else out there." CNET Staff, "New & Noteworthy: CNET Reviews," November 28, 2001, http://reviews.cnet.com/8301-13727_7-1036303-263 html (accessed 9/25/2102).

"Leave it to Apple to come out with the world's coolest – and dare we say best – MP3 player, the Apple iPod ($399 list). Its usefulness and simplicity make it a standout product, even for the price" … "The Apple iPod's pricing is at the high end for an MP3 player, but this is a tremendously good product. We hope to see a Windows-compatible version in the near future." From "iPod: Not just iCandy," PCMAG.com, November 7, 2001, http://www.pcmag.com/article2/0,2817,19362,00.asp (accessed 5/28/2013).

"Susan Kervorkian, a digital music industry analyst with IDC, praised the new iPod design, saying the combination of its ease of use, portability and big storage space would influence competitors. 'This raises the bar,' she said." Richtel, Matt, "TECHNOLOGY; Apple Introduces What It Calls an Easier to Use Portable Music Player," NY Times, October 24, 2001, http://www nytimes.com/2001/10/24/business/technology-apple-introduces-what-it-calls-an-easier-to-use-portable-music-player html (accessed 9/25/2012).

praise.[9] As soul singer Seal put it: *"Everyone's* going to want to have one of these."[10] Steven Levy described the iPod in his book *The Perfect Thing:*

> The triumph of the iPod is such that the word 'success' falls far short of describing it. Its massive sales don't begin to tell the story… No one thought the iPod would change the music business, not only the means of distribution but even the strategies people would use to buy songs. … No one expected that there would be magazine covers and front-page newspaper stories proclaiming this an 'iPod Nation.' No one predicted that listening to the iPod would dethrone quaffing beer as the most popular activity for undergraduate college students. And certainly no one thought that the name of this tiny computer cum music player would become an appellation to describe an entire generation or a metaphor evoking any number of meanings: the future, great design, short attention span, or just plain coolness. [11]

But that's what happened.[12]

1. iPod Classic

20. The first iPod was smaller and lighter than other devices then on the market; with 5GB of memory it could put "a thousand songs in your pocket."[13] Designed to be used in conjunction with iTunes and Apple's Macintosh computer, the new iPod could play music from a variety of sources, including a CD collection copied or ripped to the user's computer and then synced or loaded to an iPod, music obtained online without DRM, music that originally had DRM but was copied to a CD and then copied back to a computer (burned and ripped), and later

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[9] Techno-deejay Moby, who at the time was on top of the music industry with an album that not only sold millions but provided sound tracks for movies and commercials, said: "I'm having a hard time getting my head around the fact that you can transfer an album onto this in ten seconds." He went on to say: "The design is really cool. I don't know who your [Apple's] product designers are, but, boy, you're not paying them enough. … I might have to steal your prototype." (The Perfect Thing, pp. 10-11.)

Smash Mouth singer Steve Harwell commented on the ease of use: "It doesn't take a rocket scientist to figure this out. … Super simple – five buttons and a scroll pad. You've got the whole record store in this … thing. This kicks every other product's …!" (The Perfect Thing, p. 11.)

Soul singer Seal was similarly enamored: "Do you remember what it was like to get your first Walkman? Do you know that feeling? … I haven't picked up any MP3 player [yet] that has made me go, 'Wow, okay, I want to carry this everywhere I go. OK.' *Everyone's* going to want to have one of these." (The Perfect Thing, p. 11.)

[10] The Perfect Thing, p. 11.

[11] The Perfect Thing, pp. 2-3.

[12] In 2005, technology journalist and author Leander Kahney compared the iPod to other inventions and concluded, "gadgets don't come more iconic than Apple's digital music player." Kahney summarizes the historical significance of the iPod, stating "[t]he iPod is to the 21st century what the big band was to the '20s, the radio to the '40s, or the jukebox to the '50s—the signature technology that defines the musical culture of an era." Kahney, Leander "*The Cult of iPod*," San Francisco, CA: No Starch Press, Inc. (2005), p. 3.

[13] Apple Press Release, "Apple Presents iPod; Ultra-Portable MP3 Music Player Puts 1,000 Songs in Your Pocket." October 23, 2001 (Apple_AIIA0097 4636). See also http://www.vaughanpl.info/vortex/?p=5261.

music purchased from iTMS. Less than a year after its release, the iPod had already been updated twice and was capable of storing 2,000 songs.[14] (Exhibit 4 describes the evolution of iPod features and models over time.) By September 2006 the iPod was available with 80GB memory,[15] and a year later, it was available with 160GB, which allowed users to store the equivalent of 40,000 songs.[16] (See Exhibit 5 for a summary of enhancements to iPod memory.)

21. In addition to adding memory, Apple continued to add features and to bring out new models that were smaller and lighter and had longer battery life and a variety of other features. Even with this technological innovation, Apple generally sold the newer models at prices equal to or lower than the models they replaced. For example, by 2003, the iPod was thinner and lighter than two CDs and contained twice the storage capacity of its predecessor.[17] Further, Apple improved the hardware components available on the iPod. The second-generation iPod replaced the first-generation's mechanical scroll wheel with the industry's first solid-state touch wheel.[18] By 2004, the iPod utilized a touch sensitive Click Wheel that contained mechanical switches beneath the wheel itself.[19] To use any of the four included buttons, the user physically pushed the edge of the wheel inward over one of the four labels. Apple also added new features, including full-color screens, and the ability to view slideshows of photos and watch high resolution HD video.[20] Each succeeding generation featured color screens with higher resolution than its predecessor. For example, when Apple introduced the fifth-generation iPod Classic in September 2006, it upgraded the display to a 2.5 inch full-resolution screen that was 60% brighter than the fourth-generation, capable of displaying TV shows and Hollywood movies

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[14] Apple Press Release, "Apple Introduces 10GB iPod-2,000 Songs in Your Pocket," March 21, 2002 (Apple_AIIA00974574).

[15] Apple Press Release, "Apple Introduces the New iPod," September 12, 2006 (Apple_AIIA00974904).

[16] Apple Press Release, "Apple Introduces the New iPod classic," September 5, 2007 (Apple_AIIA00974713).

[17] Apple Press Release, "Apple Introduces New iPods," April 28, 2003 (Apple_AIIA00974667).

[18] Id.

[19] Apple Press Release, "Apple Introduces the New iPod," July 19, 2004 (Apple_AIIA00974596).

[20] *See, e.g.*, Apple Press Release, "Apple Introduces iPod Photo," October 26, 2004 (Apple_AIIA00974749); Apple Press Release, "Apple Merges iPod-iPod Photo Lines," June 28, 2005 (Apple_AIIA0097 4463); Apple Press Release, Apple Press Release, "Apple Unveils the New iPod," October 12, 2005 (Apple_AIIA0097 4546).

from the palm of a user's hand.[21] (For a summary of the history of the iPod Classic, see Exhibit 6a.)

2. iPod Mini and iPod Nano

22. The iPod Mini was introduced in January 2004. At the time, the iPod Mini was the smallest portable digital music player that could hold 1,000 songs.[22] It featured the same user interface as the traditional iPod and was one of the most popular electronic products of its time.[23] A year after it first released the Mini Apple upgraded it, making it smaller and lighter, while increasing its storage capacity by 50 percent and increasing its battery life to 18 hours.[24] (For a summary of the history of the iPod Mini, see Exhibit 6b.)

23. In September 2005, Apple replaced the Mini with the iPod Nano, a full-featured iPod that was slimmer than a standard No. 2 pencil and that featured a redesigned color screen.[25] The following year, Apple introduced a completely redesigned Nano with a new aluminum body, twice the storage capacity of the original Nano, and 24 hours of battery life at the same price as the previous generation.[26] (See Exhibit 6c.) In September 2008, Apple introduced the Nano 4th Generation with a screen large enough to support playback of widescreen videos; a built-in accelerometer, which allowed users to shake the Nano to "shuffle" their playlists; and 16 GB of storage.[27] A year later, the Nano was updated again with an FM radio tuner and a built-in video

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[21] Apple Press Release, "Apple Introduces the New iPod," September 12, 2006 (Apple_AIIA00974904).

[22] The new Mini was half the size of the original iPod. Apple Press Release, "Apple Introduces iPod mini; Smallest 1,000 Song Music Player Ever Comes in Five Colors." January 6, 2004 (Apple_AIIA00974840).

[23] "iPod Mini," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/wiki/IPod_Mini (accessed July 16, 2013).

[24] The 2nd Generation iPod Mini was also available in a 4GB model with improved features at $199. Apple Press Release, "Apple Unveils New iPod mini Starting at Just $199." February 23, 2005 (Apple_AIIA0097 4588).

[25] Apple Press Release, "Apple Introduces iPod nano," September 7, 2005 (Apple_AIIA00974603).

PC World named it one five ground-breaking products in the audio category in its 2006 World Innovations Awards. "2006 PC World Innovations Awards," PR Newswire, January 4, 2006, http://www.prnewswire.com/news-releases/2006-pc-world-innovations-awards-winners-unveiled-53127872.html (accessed July 16, 2013).

[26] Apple Press Release, "Apple Introduces the New iPod nano; World's Most Popular Digital Music Player Features New Aluminum Design in Five Colors & 24 Hour Battery Life," September 12, 2006 (Apple_AIIA00974838).

[27] Apple Press Release, "Apple Introduces New iPod nano," September 9, 2008, http://www.apple.com/pr/library/2008/09/09Apple-Introduces-New-iPod-nano html (accessed July 16, 2013).

camera and microphone. Apple was able to incorporate these new features and still offer the iPod Nano to consumers at the same price.[28]

3. iPod Shuffle

24. On January 11, 2005, Apple introduced the iPod Shuffle, a digital music player based on iPod's popular shuffle feature, which randomly selected songs from the user's library for placement on the iPod, which "shuffled" the music to prevent playback of repeated tracks. The Shuffle was smaller and lighter than a pack of gum, and was available for less than $100.[29] (See Exhibit 6d.) The Shuffle 2nd Generation was introduced in September 2006. It had twice the storage capacity of the original version, had shrunk to just a half cubic inch in volume, and weighed only half an ounce.[30]

4. iPod Touch

25. Apple introduced the iPod Touch in September 2007. The Touch featured the same Multi-Touch interface as the iPhone and introduced new features to the portable music player industry, including widescreen display and Internet access via built-in Wi-Fi wireless networking, which allowed browsing and wireless viewing of internet videos. Users could now browse the Internet and even preview music and other digital media directly through the device.[31] A year later, Apple introduced the iPod Touch 2nd Generation. Smaller and lighter than the original, it featured a 3.5 inch widescreen glass display, 802.11 b/g Wi-Fi wireless networking, integrated volume control buttons, a built-in speaker, a built-in accelerometer, and other advanced sensors. At the same time Apple introduced the App Store, which allowed users to "download and play hundreds of great games on their iPods."[32] (For a summary of the history of the iPod Touch, see Exhibit 6e.)

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[28] Apple Press Release, "Apple Introduces New iPod nano With Built-in Video Camera," September 9, 2009, http://www.apple.com/pr/library/2009/09/09Apple-Introduces-New-iPod-nano-With-Built-in-Video-Camera.html (accessed July 16, 2013).

[29] Apple Press Release, "Apple Introduces iPod shuffle; First iPod Under $100." January 11, 2005 (Apple_AIIA00974708).

[30] Apple Press Release, "Apple Unveils the New iPod shuffle," September 12, 2006 (Apple_AIIA00974519).

[31] Apple Press Release, "Apple Unveils iPod Touch," September 5, 2007 (Apple_AIIA00974641).

[32] Apple Press Release, "Apple Introduces New iPod touch," September 9, 2008 (Apple_AIIA00974932).

5. The iPod/iTunes Interface

26. The iPod family of products can only play songs and videos that are formatted and organized in a compatible manner. iTunes software achieves this by, among other things, verifying that the file is the proper format (e.g., MP3, AAC, etc.). When loading, iTunes writes a music database (music index) that is used by the iPod to locate music and video files. Customers can use iTunes to manage and organize music and video files on iPods (e.g., create playlists) and to manage, organize and play music on their computers. By designing iTunes and iPods to work together, Apple offered customers an integrated platform designed to work seamlessly and reliably. From the time the iPod was introduced and by design, Apple's iPod/iTunes platform was essentially a "walled garden" – an essentially closed platform that would compete with other approaches to satisfying consumers' demands.[33]

27. Over the relevant time period, others also offered applications that could be used to manage music on portable media devices — e.g., RealNetwork's RealPlayer, Microsoft's Windows Media Player, Dell's Jukebox by Musicmatch, Winamp, Anapod, GNupod, Ephpod, etc.[34] I understand that some of the third-party applications could be used to manage music and video files on iPods with varying degrees of success (e.g., RealPlayer, Winamp, Anapod, Gnupod, and Ephpod).[35] To load and manage music so that it could actually play on an iPod, these third-party programs had to mimic the way in which iTunes loaded and managed music,

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[33] "Walled garden" and "closed platform" are terms often used to describe technology in which the entire system is integrated, i.e., technology in which one entity provides the hardware, the software (applications) and the content and restricts access to non-approved applications or content. This is also referred to as a "closed ecosystem." See, e.g., "Closed Platform," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/Closed_platform (accessed 7/17/2013).

[34] See, e.g., Bloomberg Businessweek, "RealPlayer: Master Music Manager," May 25, 2005, http://www.businessweek.com/stories/2005-05-25/realplayer-master-music-manager (accessed 5/28/2013); "Managing Music with Windows Media Player," PCUG, http://www.pcug.org.au/pcug/training/upcd02dm01/dmLesson01Media%20Player.pdf, January 17, 2004 (accessed May 28, 2013); Ku, Andrew, "Dell's Digital Jukebox 20 - Music, the Dell Way," AnandTech, June 20, 2004, http://www.anandtech.com/show/1354/9 (accessed 6/4/2013).

[35] See, e.g., Boswell, Wendy, "Manage your music with Winamp," Lifehacker, July 8, 2007, http://lifehacker.com/276000/manage-your-music-with-winamp (accessed May 28, 2013); Sauners, Gareth J M, "Anapod - transfer files to your iPod via Explorer," November 19, 2007, http://blog.garethjmsaunders.co.uk/archives/2007/11/19/anapod-transfer-files-to-your-ipod-via-explorer/ (accessed May 28, 2013); Ulrich, Adrian, "Gnupod; Manage your iPod," GNU, last updated September 20, 2007, http://www.gnu.org/software/gnupod/gnupod html (accessed 5/28/2013); "How to Use the EphPod IPod Manager," eHow, http://www.ehow.com/how_2145859_use-ephpod-ipod-manager.html (accessed 5/28/2013).

including writing a properly formatted internal database.[36] Apple did not support these applications.

C. The iTunes Store (iTMS)

28. In recounting events following the introduction of the iPod, Apple's late CEO Steve Jobs reported that he soon realized that "the whole iPod 'platform' was missing something, namely an online way for consumers to buy downloadable songs."[37] To provide this third leg, Apple would need to create an online store that could "automatically both serve up the songs and take care of billing and accounting for conceivably millions of purchases. Plus they would have to construct a 'storefront,' either as a website or preferably by modifying iTunes yet again so that the store was incorporated right into its screen."[38]

29. At the time, most digital music came from peer-to-peer file sharing sites such as Napster and Kazaa.[39] There were also some independent sites that sold licensed music (e.g., eMusic and Listen.com) and two sites (PressPlay and MusicNet) that were operated by the five major record labels.[40] None of these lawful sites enjoyed much commercial success – they generally imposed recurring monthly subscription fees, had limited catalogues, and imposed tight restrictions on usage.[41] Because of these limitations, PC World named Pressplay and MusicNet as Number 9 on their list of the worst tech products of all time.[42]

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[36] Kelly declaration, ¶¶33-37. See also See Expert Report of Dr. John P. J. Kelly, July 19, 2013 ("Kelly report").

[37] Schlender, Brent, "How Big can Apple Get?" Fortune Magazine, February 21, 2005.

[38] Schlender, Brent, "How Big can Apple Get?" Fortune Magazine, February 21, 2005.

[39] "Napster," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/Napster (accessed July 16, 2013); Kravitz, David, "Dec. 7, 1999: RIAA Sues Napster," Wired, December 7, 2009, http://www.wired.com/thisdayintech/2009/12/1207riaa-sues-napster/ (accessed July 16, 2013).

[40] Listen.com debuted its paid service in October 2001 under the name Rhapsody. (The company was later acquired by RealNetworks.) Mariano, Gwendolyn, "Listen.com to tune in new music service," CNET News, December 2, 2001, http://news.cnet.com/Listen.com-to-tune-in-new-music-service/2100-1023_3-276476.html (accessed July 16, 2013); Evangelista, Benny, "Industry starting to endorse Net music / Listen.com to offer songs from all five major labels," Listen.com, July 1, 2002, http://www.sfgate.com/business/article/Industry-starting-to-endorse-Net-music-2801248.php (accessed July 16, 2013). These two sites were essentially identical – each had non-exclusive licenses to the same recordings. The main difference was that MusicNet used the RealNetworks DRM format while PressPlay used the Microsoft WMA DRM format.

[41] Tyson, Dan, "The 25 Worst Tech Products of all Time," PCWorld, May 26, 2006, http://www.pcworld.com/article/125772/worst_products_ever html (accessed July 16, 2013).

[42] Id. In describing the two services, PCWorld said:

30. By 2002, Jobs felt that Apple was in a position to build an online music store that could succeed where existing stores had not.[43] But to do so he would need the co-operation of the five major record labels: Universal, Warner, EMI, BMG, and Sony.[44] In the fall of 2002, Jobs began to negotiate with the labels. During the negotiations, the labels expressed concern over piracy and the ability to protect their copyrights. Ultimately, they required, as a condition of agreeing to license Apple to distribute their music, that Apple use some sort of encryption to limit use, including the number of computers that could be used to play music that had been purchased from Apple.[45] Jobs said later:

> When Apple approached these companies to license their music to distribute legally over the Internet, they were extremely cautious and required Apple to protect their music from being illegally copied. The solution was to create a DRM system, which envelopes each song purchased from the iTunes store in special and secret software so that it cannot be played on unauthorized devices.
>
> Apple was able to negotiate landmark usage rights at the time, which include allowing users to play their DRM protected music on up to 5 computers and on an unlimited number of iPods. Obtaining such rights from the music companies was unprecedented at the time, and even today is unmatched by most other digital music services. However, a key provision of our agreements with the music companies is that if our DRM system is compromised and their music becomes playable on unauthorized devices, we have only a small number of weeks to fix the problem or they can withdraw their entire music catalog from our iTunes store.[46]

> Digital music is such a great idea that even record companies finally, begrudgingly accepted it after years of implacable opposition. In 2002, two online services backed by music industry giants proposed giving consumers a legitimate alternative to illegal file sharing. But the services' stunningly brain-dead features showed that the record companies still didn't get it.
>
> PressPlay charged $15 per month for the right to listen to 500 low-quality audio streams, download 50 audio tracks, and burn 10 tracks to CD. It didn't sound like an awful deal, until you found out that not every song could be downloaded, and that you couldn't burn more than two tracks from the same artist. MusicNet cost $10 per month for 100 streamed songs and 100 downloads, but each downloaded audio file expired after only 30 days, and every time you renewed the song it counted against your allotment.
>
> Neither service's paltry music selections could compete against the virtual feast available through illicit means. Several billion illegal downloads later, an outside company-Apple, with its iTunes Music Service-showed the record companies the right way to market digital music.

[43] The Perfect Thing, p. 147.

[44] "The kind of store that Jobs envisioned would require virtually any song that anyone could imagine, and lacking even one of the big players would mean that users would face a second-rate selection." (The Perfect Thing, pp. 147-148). Sony later merged with BMG, and the "big five" became the "big four." The Perfect Thing, p. 149.

[45] See Robbin deposition, pp. 32:16-40:13.

[46] Jobs, Steve, "Thoughts on Music", February 6, 2007 (AIIA00093477).

31. Apple completed its integrated platform in April 2003 with the opening of the iTunes Music Store (iTMS).[47] Like the iPod before it, the iTMS was an immediate success. Just a week after it opened, Apple announced that it had already sold over one million songs.[48] Roger Ames, chairman and CEO of Warner Music Group said:

> Hitting one million songs in less than a week was totally unexpected. Apple has shown music fans, artists and the music industry as a whole that there really is a successful and easy way of legally distributing music over the Internet.[49]

His sentiments were echoed by Doug Morris, CEO of Universal Music Group:

> Our internal measure of success was having the iTunes Music Store sell one million songs in the first month. To do this in one week is an over-the-top success. Apple definitely got it right with the iTunes Music Store.[50]

Fortune Magazine named the iTunes Store its 2003 "product of the year."[51] Even the Assistant Attorney General for the Antitrust Division of the United States Department of Justice weighed in:

> [Apple] solved a problem that some observers, less than five years ago, predicted might never be solved: how to create a consumer friendly, yet legal and profitable, system for downloading music and other entertainment from the internet.[52]

32. The iTMS grew rapidly. When it first opened in April 2003, it offered 200,000 songs.[53] By March 2004, there were more than 500,000 songs available, and in August, Apple

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47 The store was originally called the iTunes Music Store. Apple later changed its name to the iTunes Store. See "iTunes Store," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/ITunes_Store (accessed July 16, 2013).

48 Apple Press Release, "iTunes Music Store Sells Over One Million Songs in First Week," May 5, 2003 (Apple_AIIA00974824).

49 Id.

50 Id. See also Leonard, Devin, "Songs In The Key Of Steve Steve Jobs may have just created the first great legal online music service. That's got the record biz singing his praises." Fortune Magazine, downloaded from CNNMoney.com, May 12, 2003, http://money.cnn.com/magazines/fortune/fortune_archive/2003/05/12/342289/ (accessed 5/28/2013).

51 Lewis, Peter, "Product of The Year Apple iTunes Music Store," Fortune Magazine (downloaded from CNN Money), December 22, 2003, http://money.cnn.com/magazines/fortune/fortune_archive/2003/12/22/356108/ (accessed July 16, 2013).

52 See, U.S. Department of Justice, Interoperability Between Antitrust and Intellectual Property, Thomas O. Barnett Presentation to the George Mason School of Law Symposium Managing Antitrust Issues In a Global Marketplace, Washington, D.C., September 13, 2006, http://www.usdoj.gov/atr/public/speeches/218316 htm (accessed July 16, 2013).

53 Apple Press Release, "Apple Launches the iTunes Music Store" April 28, 2003 (Apple_AIIA00974776).

announced that its catalogue topped one million songs.[54] By the time the iTMS began to offer DRM-free downloads in January 2009, the store offered nearly 10 million songs, and today there are more than 26 million songs available.[55] In July 2008, Apple launched the App Store.[56] By May 2013, consumers had downloaded more than 50 billion apps from a library of over 850,000 available.[57]

D. FairPlay

33. [redacted], Apple decided to develop its own proprietary DRM technology, which it called FairPlay.[58] Other online music stores also developed proprietary DRM technologies, such as Real's Helix and Microsoft's WMA. Each of these technologies was different, and the result was that DRM-protected music purchased from a vendor using one of these methods could only be loaded and played on MP3 players that supported that particular method.[59] This meant that digital music downloads

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54 Apple Press Releases, "iTunes Music Store Downloads Top 50 Million Songs," March 15, 2004 (Apple_AIIA00974577); "iTunes Music Store Catalog Tops One Million Songs," August 10, 2004 (Apple_AIIA00974782).

55 Apple Press Release, "Changes Coming to the iTunes Store," January 6, 2009, http://www.apple.com/pr/library/2009/01/06Changes-Coming-to-the-iTunes-Store html (accessed July 16, 2013); "Apple Unveils New iTunes; Featuring Dramatically Simplified Design & Seamless iCloud Integration," September 12, 2012, http://www.apple.com/pr/library/2012/09/12Apple-Unveils-New-iTunes.html (accessed July 16, 2013).

56 Apple launched the App Store; officially introducing third-party application development and distribution to the platform. "Application Store," The Free Encyclopedia, http://en.wikipedia.org/wiki/Application_store (accessed 7/16/2013) ; Apple Press Release, "iPhone 3G on Sale Tomorrow; Over 500 Native Applications for iPhone & iPod touch Available at Launch." July 10, 2008, http://www.apple.com/pr/library/2008/07/10iPhone-3G-on-Sale-Tomorrow.html (accessed July 17, 2013).

57 Apple Press Release, "Apple's App Store Marks Historic 50 Billionth Download." May 16, 2013, http://www.apple.com/pr/library/2013/05/16Apples-App-Store-Marks-Historic-50-Billionth-Download.html (accessed July 17, 2013).

58 The Perfect Thing, pp. 152-153.

59 FairPlay developed a reputation for being unobtrusive and easy to use:

"FairPlay also appeals to content providers because of its ease of use. Apple's DRM is considered to be one of the less obtrusive forms of DRM on the market." Jupiter Research analyst Joe Wilcox said: "FairPlay is a highly unobtrusive DRM. Consumers only see that FairPlay is there when they are trying to violate rights privileges. I can't say the same about WMA DRM, for which, in testing, I've had trouble on nearly all stores and devices." From Dalrymple, Jim, "iPod DRM faces another reverse-engineering challenge," PCWorld, November 22, 2005, http://www.macworld.com/article/1048070/ipoddrm html (accessed 6/17/2013).

obtained from online music stores that used Microsoft's WMA DRM or downloads protected by RealNetworks' Helix DRM could not be played directly on iPods.[60] Similarly, music files obtained from the iTMS could not be played directly on MP3 devices that used WMA or Helix.

34. The use of DRM benefited consumers. It allowed Apple to create the iTMS and offer a wide range of music by providing a level of security that induced the record labels to participate. Ultimately it allowed Apple to do what many thought was impossible: to encourage consumers (through the iTMS) to pay for music they had previously been getting for free.[61] As Professor Noll previously admitted, the iTMS was "procompetitive" and a "huge benefit" to consumers.[62] Plaintiffs have likewise admitted that the iTMS provided "enormous advantages" for consumers.[63]

35. I understand that the Court in this case has ruled that Apple's decision to use its proprietary DRM system, FairPlay, rather than adopt a competing system such as WMA, was lawful under the antitrust laws.[64] Apple's use of proprietary DRM was also procompetitive. It furthered Apple's business interest in developing and maintaining its own system to ensure that it complies with its agreements with the record labels that require Apple to maintain the security of the DRM and to promptly repair any breaches. As Jobs put it: "Apple has concluded that, if it licenses FairPlay to others, it can no longer guarantee to protect the music it licenses from the big four music companies."[65]

36. The use of a proprietary system also furthered Apple's procompetitive interest in ensuring that the system was reliable so that customers could continue to download music from the iTMS and listen to it without problems. If there was a problem – if, for example, a

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60 Although the RMS did not debut until July 2004, RealNetworks had been selling digital downloads through its subscription service Rhapsody since 2001. Evangelista, Benny, "Music firms open online services, but will fans pay?" SFGate.com, December 3, 2001, http://www.sfgate.com/business/article/Music-firms-open-online-services-but-will-fans-2845907.php (accessed 7/17/2013).

61 The Perfect Thing, pp. 152, 157.

62 Noll Dep. Trans (Sep. 19, 2008) at 105-8-20.

63 Amended Consolidated Complaint for Violations of Sherman Antitrust Act, Clayton Act, Cartwright Act, California Unfair Competition Law, Consumers Legal Remedies Act, and California Common Law of Monopolization, (filed Jan. 26, 2010), ¶¶ 14-15, 40.

64 Order Granting In Part and Denying In Part Defendant's Motion For Summary Judgment; Denying As Premature Plaintiffs' Motion For Class Certification (hereinafter, "Summary Judgment"), p. 6.

65 Jobs, Steve, "Thoughts on Music," February 6, 2007 (AIIA00093477).

downloaded song does not play properly – Apple knew that the problem had come from something within the Apple system and not from elsewhere. Experience has shown that competing systems, including Microsoft's PlaysForSure, lacked the reliability of the Apple system:

> Plays for sure didn't live up to its moniker, and the portable services were plagued by glitches. Songs wouldn't transfer, players would freeze, tracks would stop playing inexplicably, software would have to be uninstalled and reinstalled repeatedly – stuff like that. Critics said it was just too difficult for Microsoft's software to work with so many different services and players.[66]

III. APPLE'S INTEGRATED SYSTEM IS PROCOMPETITVE

37. As detailed in the following paragraphs, Apple's proprietary model of software (iTunes), hardware (the iPod), and content (the iTMS) is procompetitive. The seamless manner in which the products work together reflects Apple's overall business strategy and contributed to the success of the integrated platform. Nothing prevented others from developing their own competing players and music systems. Indeed, other companies have adopted different models. At the time Apple entered the marketplace, there were already at least two dozen other companies that offered MP3 players, most, if not all, of which followed open models. Later, other companies (notably Sony and Microsoft) began to offer their own competing closed systems. Proprietary models compete with "open" models on the other end of the spectrum and with hybrid models, which are somewhere in between. One model is not necessarily better than the other, and only time (and competition) will tell which one (if any) consumers will prefer. Consumers are well-served when alternative models compete – even though one model may win out in the end. Apple provided a product that consumers valued for its reliability, ease of use, and seamless operation.

A. Apple's Initial Adoption of its Integrated System was Procompetitive.

38. Industry analysts have recognized the value to consumers of Apple's integrated approach. The day after Apple launched iTunes for Windows, Forrester Research reviewed the success of the iTunes/iPod/iTMS platform on the Macintosh and its prospects for more general growth among Wintel PC owners. Under the title "Apple iTunes Jump-Starts Windows Digital

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[66] Los Angeles Times Blog, available at http://opinion.latimes.com/bitplayer/2006/09.

Music," Forrester emphasized the benefits of Apple's integrated "walled garden" model and its advantages against the competition:

> Apple announced the Windows version of iTunes yesterday. iTunes is both a free music application and an online music store with 400,000 downloadable and burnable songs for $0.99 a track. iTunes for Windows features two strengths:
>
> - **Peerless ease of use.** In porting its iTunes application to Windows, Apple has maintained all the features that made it popular on the Macintosh. iTunes' interface makes it easy to: 1) organize and find digital music files; 2) rip songs from CDs with great sound quality; 3) make playlists; 4) burn CDs and DVDs; 5) copy files to Apple's iPod portable players; and 6) buy music from Apple's iTunes store. The strength here is the integration—everything here from iPod support to the store is part of one logically organized application. [Emphasis added]
> - **Broad awareness.** iPod users are a natural iTunes audience; Apple leads in portable player sales — with 1 million iPod users already — and continues to advertise heavily.[67]

The Forrester review went on to predict that success in digital music will depend on "the very two elements Apple has focused on", including "Ease of use and integration." Under the headline "OTHER MUSIC SERVICES MUST NOW BEAT APPLE", the Forrester Review concludes that "Apple should get out to an early lead in music downloads, based on its strength in both distribution and ease of use."

39. At the time of this review in October of 2003, Apple's integrated iTunes/iPod/iTMS platform had successfully served the narrow niche of Macintosh PC users, which at the time made up around five percent of PC owners.[68] Apple had no appreciable "market power" in any market relevant to this case, to say nothing of "monopoly power." It did not control access to digital music played on portable devices, the vast majority of which had been acquired from CDs and online peer-to-peer file sharing services. It was a new entrant into music downloads, with existing competitors and other competing business models, such as subscription services.[69] And while the iPod was popular and growing more so, other brands of MP3 players outsold it by roughly two to one. (See Exhibit 7a).

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[67] Bernoff, Josh, "Apple iTunes Jump-Starts Windows Digital Music," Forrester Research, Inc., October 17, 2003 (Apple_AIIA00331431).

[68] The Perfect Thing, p. 157.

[69] In fact, Fortune magazine said: "Apple's competitors dismiss the iTunes Music Store as a niche product. How, they ask, can Apple have any impact on the music industry when its share of the global computer market is a minuscule 3%? 'It's a very positive thing for their community,' says Kevin Brangan, a marketing director at SonicBlue, which makes Rio MP3 players. 'But their community is a very small percentage of the overall market.'"

40. What Apple did have was a successful product, bolstered by a "walled garden" business model and platform. The pro-competitive benefits of that model to consumers were clearly stated by Forrester — "the strength here is the integration — everything here from iPod support to the store is part of one logically organized application."[70] [redacted] [71]

41. In addition to providing reliability and ease of use, Apple's integrated approach gave Apple the incentive to price both its players and its music more aggressively than it would have with a less integrated platform. In the language of economics, the iPod and the iTMS are complements. Because the two are used together, lower prices for one will encourage consumers to buy more and thus stimulate greater sales of the other. In other words, lower prices for iPods will stimulate sales of music from the iTMS, and lower prices for music from the iTMS will stimulate sales of iPods. Thus prices for both will tend to be lower than they would have been with less integrated platforms. This represents a second procompetitive benefit of preserving the integrated model. Consistent with this incentive to lower prices, comparison of iTMS prices to those charged by other online music stores indicates that Apple has priced music from the iTMS competitively.

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[70] Other commentators and industry analysts agreed. Literature that examined Apple's walled garden business plan for consumer electronics concluded that Apple's closed, integrated systems have been more stable and secure and have provided a better user experience than the myriad of open systems with which Apple's products compete. *See* John Berra, Walled Garden or Open Field?, Automation World, Feb. 2, 2012 (stating walled gardens are easier to use, safer, and more secure); *see also* Hee-Yeon Cho, Choon-Sung Nam, Dong-Ryeol Shin, 2010 International Conference on Electronics and Information Engineering (ICEIE 2010), pg. V2-141 (explaining that walled gardens are more secure, stable and robust as compared to open platforms); Roland M. Müller, A Comparison of Inter-Organizational Business Models of Mobile App Stores: There is More than Open vs. Closed, Journal of Theoretical and Applied Electronic Commerce Research, Vol. 6, Issue 2 (Aug. 2011), p. 72 (noting that walled garden approach helps to create an exceptional user experience and increased quality focus).

[71] [redacted]

42. This does not mean that Apple's "closed" model was necessarily the best, or that it would compete successfully against other alternatives going forward. Indeed, Apple had historically followed a similar "integrated platform" strategy in personal computers, producing proprietary hardware (computers, processors, screens, keyboards and so on) and software (the operating system and many applications that ran on it). This integrated model was not as successful as the more open "Wintel" platform, in which one company (Intel) was the main producer of processors, another (Microsoft) produced the operating system and some applications, dozens of OEMs produced computers, and thousands of software developers produced applications written to the APIs exposed by the Windows operating system. By the end of the 1990s, Apple was a niche player in personal computers, with a small, albeit dedicated, following. Whether Apple's commitment to the integrated iTunes/iPod/iTMS platform was the "right" strategy or not would be determined by competition on its merits.[72]

43. Apple has always faced competition on the merits. Its integrated model has competed, and continues to compete, with other methods of managing, distributing and playing music and video files, including solutions offered by major companies such as Sony and Microsoft and many vendors of music player software, music and devices. As noted above, just looking only at digital music players, portable MP3 players were already common at the time the iPod was introduced in late 2001, and during the time periods relevant to this case consumers could purchase players from literally dozens of competing manufacturers, including Sony, Samsung, Microsoft, Creative, SanDisk and Rio — see Exhibit 8. In some cases a competing brand of portable device was, like the iPod, part of an integrated platform offered by a single

[72] Walled gardens or closed ecosystems are common for digital products. Video game consoles have a long history of walled gardens – developers were required to purchase licenses to develop games for the platform, and in some cases, they were also required to get editorial approval from the console manufacturer before they could publish their games. The Kindle, Amazon's well-known e-reader, is also a walled garden. As an October 2011 article in *Business Insider* observed: "Amazon's Kindle is no longer just a product: It's a whole ecosystem." Gobry, Pascal-Emmanuel, "How Amazon Makes Money From The Kindle," Business Insider, October 18, 2011, http://www.businessinsider.com/kindle-economics-2011-10 (accessed July 16, 2013). Michael Gartenberg of the Gartner Group has said: "The new version of the Kindle shows that digital ecosystems are more important than devices." Akasie, Jay, "With New Kindle, Bezos Proves Ecosystems Matter More Than Hardware," September 7, 2012, http://www minyanville.com/sectors/technology/articles/amazon-new-kindle-amazon-kindle-family/9/7/2012/id/43794 (accessed July 16, 2013). In December 2011, Barnes and Noble began to follow a similar strategy with respect to its NOOK. See, generally, "Closed Platform," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/Closed_platform (accessed July 17, 2013).

company. For example, Sony operated the CONNECT Music Store which used Sony's proprietary method of DRM protection, which could be transferred to a Sony portable music player.[73] Microsoft later pursued a similar approach with its Zune integrated platform.[74] Other device manufacturers such as Dell, Creative and Diamond Rio followed a less integrated approach offering players designed to work with a range of software and one DRM technology or another. For example, Creative's relationship with RealNetworks resulted in certain Creative players that interoperated with Real's Helix DRM technology, while other Creative players interoperated with Microsoft's WMA technology.[75]

44. Similarly, as discussed above, there were alternative approaches to DRM protection, the sales of digital downloads, and software programs for managing digital music. Thus there was a range of solutions that competed for consumers' attention — Apple's integrated platform or "walled garden" was just one of them. Today, consumers still have a wide variety of options with many choices of software to manage digital files, portable devices on which to play those files, and stores from which to purchase music in digital and physical formats.[76]

45. In effect, Plaintiffs argue that Apple should have designed its platform differently. There is no economic basis for such a claim. First, there is no guarantee that Apple could have accomplished the same thing – seamless, reliable, integrated ease of use — with an open system in which it was continually forced to integrate someone else's products into its own. And, even if it could have, it is highly likely that such a system would have been more costly, less secure, and inefficient to maintain. Allowing RealNetworks or others to provide software or content for the iPod may have made it easier for hackers to breach the system. And, if Apple started to work

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[73] Apple_AIIA00093477.

[74] Apple_AIIA00093477.

[75] McGuire, Mike, "U.S. Online Music Market to Show Steady Growth," Gartner Industry Research, July 26, 2005 (Apple_AIIA00995575 at -86, -87).

[76] In addition to iTunes, current choices of digital management software include: Media Monkey, Winamp, jetAudio, J. River Media Center, Blaze Media Pro, and ZenPoint Digital Center. See "MP3 Software Review", 10TopTenReviews, http://mp3-software-review.toptenreviews.com/ (accessed June 10, 2013) and "Music Management software," CNET, http://download.cnet.com/windows/music-management-software/ (accessed June 10, 2013). See also, Exhibits 8 and 9 for lists of some of the available players and sources of digital music, respectively.

with others and then got hacked again, correcting the problem would have been more complicated.[77]

46. Plaintiffs forget that the world Apple entered was a world in which virtually all, if not all, of the participants were competing with open models. Apple entered that world with a completely new "product." Apple started small, offering something new and untested. There was no guarantee it would succeed, but succeed it did – because it offered something that people valued: an integrated platform designed to be foolproof. It was a good way to buy, manage, and play music no matter how large or small the user. And, having a single seller with a strong reputation gave consumers confidence that the system would work. In short, Apple entered a world that was lacking certain things consumers valued, and the iTunes/iPod/iTMS platform filled that void. Had Apple been required to enter with an open model, consumers would have been deprived of the substantial benefits that came with Apple's integrated system. Requiring Apple (or any other company that is using a closed system) to prove in the aftermath that they could not have achieved the same benefits with an open system would unnecessarily push companies towards open systems for fear of later being found to have violated the antitrust laws. The result would be that companies would tend to default to open systems thereby depriving consumers of the benefits of innovation and platform competition.

47. [redacted]

[77] Kelly report, Section VII.

[redacted]

48. The rapid growth of the market implies that there were many new users entering. The entry of those users, who had no prior investment in Apple's platform, created the opportunity for competing products and platforms to take share away from Apple if they offered a superior product and/or better pricing than that offered by Apple, even if we ignore the ability of those suppliers to compete for the existing base of iPod users. [redacted].[78]

B. Apple's Actions to Protect the Integrity of its Integrated Platform were Procompetitive

49. Almost immediately after the iTMS was launched, hackers attempted to bypass Apple's FairPlay encryption.[79] Some hackers would decrypt the code until they could wipe out the DRM and would then publish programs on the internet that would allow users to strip off the DRM and produce digital files that could be shared and played on virtually any computer or MP3 player.[80] Some of the most well-known of these were developed by Jon Johansen, who was commonly known as DVD Jon. His earliest program was called QTFairUse. Released in November 2003, its purpose was to convert iTunes music into DRM-free files that would play, but not without manipulation, on other devices.[81] Shortly thereafter, Johansen reverse

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78 iPod Buyer Survey- Wave 3, p. 85.

79 "FairPlay – QTFairUse," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/FairPlay (accessed May 28, 2013).

80 See Deposition of Apple Inc., Designee: Jeffrey L. Robbin, December 3, 2010 ("Robbin deposition"), pp. 20:25-21:24.

81 This program was somewhat limited because the raw files could not be played on most computers or devices without further processing. "FairPlay – QTFairUse", Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/FairPlay (accessed June 6, 2013).

engineered the FairPlay encryption and created an algorithm that would remove the DRM in a way that would allow the songs to play directly on other devices.[82]

50. RealNetworks' (Real) approach was different. Real introduced the Real Music Store (RMS) in January 2004.[83] Like Apple's iTMS, Real's RMS was an online store that sold downloadable digital music files. And, like Apple's iTunes, Real's proprietary software program RealPlayer could be used to manage digital files on a computer, to acquire DRM-protected music files from the RMS, and to load digital files onto a portable music player. As noted above, files purchased from the RMS were encrypted using Real's proprietary Helix DRM technology, which initially could not be loaded or played on iPods or on other portable devices that used different proprietary DRM technologies and thus did not support the Helix DRM technology. Unlike Apple's integrated platform in which the software, the device, and the music store were integrated by a single firm (Apple), Real relied on agreements with hardware vendors to market players that supported its Helix DRM technology.[84]

51. In July 2004, RealNetworks introduced RealPlayer 10.5 with Harmony. Like some other third-party applications mentioned above (e.g., Winamp), RealPlayer 10.5 tried to mimic the way in which iTunes loaded music to iPods, including writing the internal database on the iPod. RealPlayer 10.5 with Harmony then mimicked FairPlay's encryption/decryption methodology to allow music purchased from the RMS to be loaded onto an iPod. When music from the RMS was written to an iPod using Harmony, the iPod "saw" that music as iTMS music protected by FairPlay.[85] Harmony not only mimicked FairPlay, it mimicked WMA as well. Using Harmony, an owner of a WMA-based device could purchase Helix-protected music from

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[82] Levine, Robert, "Unlocking the iPod; Jon Johansen became a geek hero by breaking the DVD code. Now he's liberating iTunes - whether Apple likes it or not." Fortune Magazine, downloaded from CNNMoney.com, October 23, 2006, http://money.cnn.com/magazines/fortune/fortune_archive/2006/10/30/8391726/ (accessed May 28, 2013).

[83] Demery, Paul, "RealNetworks launches digital music store with latest RealPlayer," Internet Retailer, January 7, 2004, http://www.internetretailer.com/2004/01/07/realnetworks-launches-digital-music-store-with-latest-realplayer (accessed July 18, 2013).

[84] "RealNetworks lacks a digital music player of its own — the company relies on licensing partnerships with device manufacturers, and has struck deals with the manufacturers of hardware devices including Creative and Palm." Cohen, Peter, "RealNetworks' Harmony Promises iPod Compatibility", PCWorld, 7/26/2004, http://www macworld.com/article/1035237/harmony html (accessed May 28, 2013).

[85] Robbin deposition, pp. 83:8-84.2.

the RMS and play it on a WMA-based MP3 player. In announcing the new technology, Real touted the number of devices on which it would work:

> With Harmony Technology, RealPlayer Music Store supports more than 70 secure portable media devices, including all 4 generations of the iPod and iPod mini, 14 products from Creative, 14 from Rio, 7 from RCA, 9 from palmOne, 18 from iRiver, and products from Dell, Gateway, and Samsung. Generally speaking, Harmony supports any device that uses the Apple FairPlay DRM, the Microsoft Windows Media Audio DRM, or the RealNetworks Helix DRM, giving RealPlayer Music Store support for more secure devices than any other music store on the Internet.[86]

52. As Dr. Kelly explained, third-party programs (like RealPlayer, Winamp and others) that attempted to add and manage songs on iPods without support from Apple

> interfered with the proper operation of the iPod and/or iTunes. The documentation for some of these programs listed known or fixed problems. Users of these programs posted bug reports and sought help in forums on the program's web site or elsewhere. For example, there are reports of music disappearing from the iPod, playlists disappearing from the iPod, songs not playing or skipping, iTunes not recognizing the iTunes database, duplicate files, and artwork not displaying.[87]

[redacted][88]

53. The initial hacks in which hackers stripped the DRM from FairPlay-encrypted music created an immediate problem. According to its contracts with the record labels, Apple was required to maintain the security of the music it sold through the iTMS or face the loss of the right to offer that music.[89] Apple released iTunes 4.7 on October 26, 2004. iTunes 4.7 changed the way FairPlay operated and thus allowed Apple (at least for a time) to prevent the removal of FairPlay from protected songs. [redacted]

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[86] Bell, Ian , "RealNetworks Snaps Apple's iPod Exclusivity", Digital Trends, July 26, 2004, http://www.digitaltrends.com/gadgets/realnetworks-snaps-apples-ipod-exclusivity/ (accessed May 28, 2013).

[87] Kelly report, ¶90.

[88] Kelly report, ¶92.

[89] See, e.g., Jobs, Steve, "Thoughts on Music", February 6, 2007 (AIIA00093477 at -78).

[redacted][90]

54. In early 2005, Johansen released a new hack, called PyMusique. This was an iTMS "client" developed to allow the user to download songs from the iTMS before the DRM was even applied.[91] The labels, Sony in particular, complained to Apple about this breach.[92] On March 21, 2005, Apple began to require that all users upgrade to iTunes 4.7 if they wished to purchase music from the iTMS.[93] [redacted]

55. [redacted] the original version of Harmony ([redacted]) could no longer convert Helix-protected files so that they would play on iPods. Put differently, because [redacted] changed the way in which FairPlay-protected files were encrypted and decrypted, Harmony no longer mimicked the iTunes/FairPlay system. Thus, it could no longer convert files purchased from the RMS and protected by Helix into a format that could be played on iPods that had been updated with [redacted][94] I understand that the Court has ruled that the iTunes 4.7 update was not anticompetitive, and thus the fact that this update effectively blocked Harmony so that it could no longer interoperate with the iPod was not anticompetitive either.

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90 Declaration of Jeffrey Robbin in Support of Defendant's Renewed Motion for Summary Judgement, January 18, 2011, ¶44.

91 "SharpMusique," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/PyMusique (accessed May 28, 2013).There was another group of hacks, called Playfair, Hymn, and JHymn, that were initially based on source code that had been written by Johansen and operated in a similar fashion. "FairPlay," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/FairPlay (accessed May 28, 2013).

92 See Deposition of Eddy Cue on Behalf of Apple, Inc., December 17, 2010, pp. 128:16-129:11, discussing Cue Exhibit 61. See also AIIA00090546.

93 See, e.g., Borland, John, "iTunes hack disabled by Apple." CNET News. March 21, 2005, http://news.cnet.com/Apple-disables-iTunes-hack/2100-1027_3-5628616.html#addcomm (accessed May 30, 2013).; Smith, Tony, "Apple plugs PyMusique iTunes 'hole.'" The Register. March 22, 2005, http://www.theregister.co.uk/2005/03/22/apple_blocks_pymusique/ (accessed May 30, 2013).

94 Note that when iTunes 4.7 was first released, iPod users were not required to update their software in order to buy from the iTunes store. As mentioned above, that changed in March 2005 when Apple made the update mandatory in order to block a particular hack called PyMusique. "Apple plugs PyMusique iTunes 'hole.'" The Register. March 22, 2005, http://www.theregister.co.uk/2005/03/22/apple_blocks_pymusique.

56. On April 26, 2005, RealNetworks announced that it had updated its Harmony software so that it could once again interoperate with iPods.[95] I understand that Harmony continued to interoperate with all new iPod models until September 12, 2006. This began to change in September 2006 - some seventeen months later - when Apple released iTunes 7.0, the update that is at issue in this case.[96] [redacted][97]

57. [redacted] Any owner that had used one of these applications to load music onto the iPod would have to reload that music using iTunes in order for the music to play properly.[99] Both of these changes reestablished the integrity of the iTunes/iPod/iTMS platform by preventing Harmony and other unsupported applications from adding files to the affected iPod.

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95 Borland, John, "RealNetworks rekindles iPod Tech Tussle," CNETNews, April 26, 2005, http://news.cnet.com/2100-1027_3-5685286 html (accessed May 28, 2013).

96 Expert report of David M. Martin Jr., Ph. D., April 8, 2003 (hereinafter "Martin report"), ¶74.

97 As I discuss in detail below, the [redacted] and [redacted] applied only to selected new iPod models, which I call the "affected iPods."

98 Martin report, ¶¶75-76. See also Kelly report.

99 Declaration of Augustin Farrugia in Support of Defendant's Renewed Motion for Summary Judgement, (hereinafter "Farrugia Declaration"), ¶¶29-30; Martin report, ¶¶75-76.

58. [redacted][102]

59. [redacted][103]

60. Apple had procompetitive reasons to protect its platform by making efforts to prevent third parties from writing outside content to iPods, as this could affect performance and undermine the value of its products. Just as it was procompetitive to adopt the walled garden at the outset, it was also procompetitive to update the system to keep it walled. The same considerations apply: The use of the closed system allowed Apple to maintain the very features consumers valued — reliability, ease of use and integration – by allowing it to control the risk of

[100] This number has been calculated based on the assumption that iPod owners replace iPods every two years on average. See Declaration of Roger G. Noll on Liabilities and Damages, April 3, 2013, hereinafter "Noll declaration.", p. 4 and NOLL 4095-96. Assuming that iPod owners replaced their iPods every 18 months on average, there would have been approximately 28 million iPods in use as of September 2006; however, assuming that owners replace their iPods every 36 months, there would have been approximately 36 million iPods in use as of that date.

[101] Farrugia declaration, ¶¶29-32; Martin report, ¶92; Supplemental declaration of Augustin Farrugia, July 2, 2013, ¶¶2-3.

[102] Farrugia Declaration, pp. 7,8. Martin report, p. 34. Supplemental declaration of Augustin Farrugia, July 2, 2013, ¶¶2-3.

[103] Supplemental Declaration of Augustin Farrugia, July 2, 2013, ¶3.

bugs and other problems that would disrupt the user experience. It also spared Apple the time and expense of working with other companies (some of which were its competitors) to try to ensure that their products would work properly on Apple's system without creating problems that would impair the user experience of Apple's customers.[104] When Apple first entered the market, it did not adopt an open system and wait for problems to develop; instead, it made an independent determination that the walled garden was the best way to offer a quality product that met the demands of both consumers and the record labels.[105] Having adopted the walled garden, it had every reason to prevent any efforts by others to compromise the system, without waiting for problems to develop.[106]

61. At the end of the day, Apple's closed system competes with a variety of other systems, both open and closed. When Apple adopted the walled garden, it was a new entrant with a new approach. There was nothing like the iTunes/iPod/iTMS platform in the market, and there was no way to know whether it would be successful. As it turns out, the product has been a great success, driven by the fact that it has been able to offer a high-quality user experience. In fact a recent article attributes Apple's overall success in consumer products like the iPod and the iPhone specifically to its walled garden business model:

> The fundamental difference between Apple and its competitors lies not at the margins but in the totality of sterling hardware, comprehensive and ongoing support, usability assurances, unequaled product integration and unmatched reliability. . . .
>
> I am the buyer. I am the user. I am prepared to switch. Neither my apps, my downloads, nor my music collection is holding me back. Apple's competitors have simply failed to offer me equivalent or better value.[107]

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[104] Professor Noll argues that Apple would not be forced to cooperate with RealNetworks because "RealNetworks managed to produce Harmony and to keep it operating during two periods, one lasting more than a year, without cooperation from Apple." Noll declaration, p. 65. Professor Noll ignores substantial evidence of incompatibilities, bugs, and other issues relating to using RealPlayer with Harmony to manage iPods. I understand that Apple's technical expert, Dr. Kelly, has conducted several experiments that illustrate RealPlayer with Harmony's incompatibility, including: (1) inconsistent iTunes database contents; (2) corrupted playlists; (3) deletion of On-The-Go playlists; (4) incorrect database lengths; (5) crashes causing music to disappear; (6) incorrect display of certain song tags; and (7) improper management of orphan files.

[105] See Jobs, Steve, "Thoughts on Music," February 6, 2007 (AIIA00093477).

[106] And, of course, in this case, problems had developed, which provides even stronger support for Apple's updates to maintain the integrity of its systems. See Kelly report.

[107] Brian S. Hall, "The Apple Walled Garden is Grounded in Old Fashioned Product Superiority," techpinions.com, March 4th, 2013

It would produce no economic benefit to conclude that, having produced significant consumer benefits through its walled garden approach, Apple must abandon that approach now that its products have proven successful in the marketplace.

IV. PROFESSOR NOLL'S STUDY OF IMPACT AND DAMAGES IS BASED ON UNSUPPORTED ASSUMPTIONS AND IS INCONSISTENT WITH THE ECONOMICS OF PLAINTIFFS' THEORY

62. Plaintiffs claim that, because music from the RMS could no longer play on affected iPods after Apple released the [redacted] (and later the [redacted]), the owners of these iPods who would otherwise have used Harmony would now be "forced" to stop buying music downloads from the RMS and buy them from the iTMS instead.[108] The argument is that, over time, the music libraries of these allegedly affected owners would contain more FairPlay-protected music than they would have had Harmony not been blocked. Unlike the music they would have purchased from the RMS, plaintiffs assert that this FairPlay-protected music could not be easily transferred to another brand of portable music player.[109] Thus, when owners of these affected iPods

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See also an article from Time.com which attributes Apple's success to its integrated product, including the Apple Store: "Apple builds great hardware, owns the core software experience, optimizes its software for that hardware, equips it with web services (iTunes and iCloud), and finally controls the selling experience through its own retail stores."

"In fact, if we take a hard look at the consumer and personal electronics landscape, we would be hard pressed to find a better hardware, software, services, and retail combination in the marketplace."

Bajarin, Ben, "Why Competing with Apple Is So Difficult," Time.com, July 1, 2011, http://techland.time.com/2011/07/01/why-competing-with-apple-is-so-difficult/#ixzz2ZN8itJ6i (accessed July 16, 2013).)

[108] Professor Noll offers no evidence whatsoever on how many iPod owners might have been affected in this way; in fact, he doesn't even offer evidence that any owners were affected.

[109] Plaintiffs' assertion about the ease of transferring ignores the fact that FairPlay-protected music is readily transferrable to competing players by copying the music to a CD (i.e. "burning") and then importing the music (i.e. "ripping") to whatever computer is used to load songs onto the user's player. *See* Apple Knowledge Base Support Article, "iTunes: About Third-Party Music Player and AAC File Support," http://support.apple.com/kb/HT2698 (accessed 6/18/2013). Professor Noll asserts that this process is "costly and time consuming." But he cites no evidence in support of that assertion. Moreover, Professor Noll admitted at his deposition to not having analyzed how long it takes to burn a music CD and could not recall how costly burning was. Noll deposition, 151:21 – 152:11; also 151:12-16 (Professor Noll has never burned a music CD). More importantly, Professor Noll's assertion is contrary to the evidence. Once users have identified the songs they wish to burn and created a playlist of those songs, they can burn a CD with three mouse clicks. Apple Knowledge Base Support Article, "iTunes: How to Create CDs from Audible Content," http://support.apple.com/kb/HT2955 (accessed July 18, 2013). Or users can "virtually burn" their entire music

eventually wanted to replace their devices, they would be "locked in" - meaning they would be more likely to purchase another iPod rather than some alternate brand of portable music player. This eventual "lock-in" of iPod owners who, in the absence of the [redacted], would have used Harmony and ultimately purchased a non-iPod music player might, according to Plaintiffs and Professor Noll, have allowed Apple to charge higher prices for iPods in the "long run," which is an undefined point in time sometime after September 12, 2006. The possibility of this "long-run" increase in price is the alleged anticompetitive impact of the [redacted].

63. Professor Noll acknowledges that Plaintiffs' "lock-in" theory need not raise the prices of affected iPods.[110] He asserts that whether the [redacted] raised iPod prices, lowered them or left them unchanged is "an empirical question."[111] Based on a "hedonic regression" model of iPod prices that he claims is capable of identifying the impact of Apple's challenged conduct, Professor Noll concludes that the challenged conduct caused Apple to raise the prices of all new iPods purchased on or after September 12, 2006 through March 31, 2009. However, Professor Noll's analysis does not support this claim. In particular, as I explain in detail in the following paragraphs:

a) Professor Noll presents no evidence that the RMS was actually selling enough music to iPod owners (and would have continued to do so in the "but-for" world) that there could have been any material effect on iPod demand.

b) Professor Noll presents no evidence that, to the extent RMS sales were reduced to iPod owners by the [redacted], those owners later purchased a replacement iPod as a result of lock-in as opposed to choosing the iPod because it was a superior product.

c) Professor Noll's theory implies that, if anything, prices for at least the [redacted] would have been expected to fall, not rise as a result of iTunes 7.0.

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collection by copying their iTunes library to their hard drive (negating the need for a CD) and then directly import the music to the alternative player's jukebox and play the music on the alternative player.

[110] See Noll declaration, pp. 15-17.

[111] Noll declaration, pp. 57-58

A. Professor Noll Has Not Shown that the RMS Had Any Effect on iPod Owners

64. For Professor Noll's theory and study of impact/damages to be valid, he must show, as a threshold matter that iPod owners actually used RealPlayer with Harmony to purchase RMS music and load it on their iPods.[112] Professor Noll offers no evidence on this point: He does not tell us how many iPod owners were using Harmony, how many were buying from the RMS, how much music they had bought that way, or how important that music was in their pre-[redacted] music libraries. And, even more important, he does not tell us how many owners of affected iPods might have bought music from the RMS in the absence of the [redacted], how much music they might have bought, or how important that music would have been in their post-[redacted] libraries. When asked in his deposition: "Do you have any information or any estimate on how many iPod users bought music from RealNetworks?" Professor Noll answered: "No."[113]

65. Professor Noll makes much of RealNetwork's claim that during a late August, 2004 three-week "half-price" sale that offered digital downloads for $0.49 instead of the $0.99 the RMS and the iTMS generally charged, Real sold 3 million additional downloads, which allegedly "doubled" its market share.[114] But he offers no evidence that any of these sales were to iPod users. And, he offers no evidence that there was any effect on RMS sales beyond the initial three-week period. On this latter point, contemporaneous accounts are skeptical. As *The Register* said in its 2004 review of the digital music industry: "It's [Harmony] arguably made little difference in any case. There's no indication that Harmony has increased adoption of Rhapsody. Real had more luck by slashing song prices for a time."[115] More pointedly, *The Register* commented on Real's claim of selling 3 million songs:

> What the company doesn't say is how many songs it sold in the three-week period to the $0.49-a-track promo kick-off, or in the period since the offer ended.

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[112] While there might be some technical argument that iPod owners who had not been buying music from the RMS in the months prior to September 2006 would suddenly have started to do so if only iTunes 7.0 had not been released, this seems highly unlikely, and in any event would certainly require economic evidence, and Professor Noll offers none.

[113] Videotaped Deposition of Roger G. Noll, May 16, 2013, hereinafter "Noll deposition,", p. 116:18-23.

[114] Noll declaration, p. 53, note 93.

[115] Smith, Tony, "Downloading digital music: Majors and minors, players and platforms, lawsuits and licences," The Register. December 24, 2004, http://www.theregister.co.uk/2004/12/24/digital_music_in_2004/print html (accessed June 4, 2013).

> Almost certainly sales went up during the promo. It's clear from other low price offers Real and other digital music companies have run in the past—not to mention common sense—that punters prefer lower prices. But when Real's prices went back to $0.99, sales are likely to have fallen. Had sales momentum been maintained, Real surely would have boasted about it. What company wouldn't?[116]

66. Exhibit 10 shows quarterly iTMS downloads from 2003 to 2010. The RMS half-price sale, which allegedly doubled its market share, occurred in the third quarter of 2004. But there is no apparent decline in iTMS sales in that quarter, or even a noticeable slowdown in growth. RMS may have sold a lot more music, but those sales were evidently made to owners of other portable devices, not to owners of iPods or users of the iTMS - or at least they did not displace iTMS sales. This finding is consistent with the view that users of the iTunes/iPod/iTMS platform valued its integrated design and ease of use. To play DRM-protected music purchased from the RMS on an iPod, iPod owners would have had to commit to using Harmony instead of iTunes to manage their music libraries and load music onto their iPods.[117] That prospect was evidently unattractive, even if the music they might have acquired in this way would have been portable to some other, non-Apple, device in the future. And it wasn't as if the RMS was generally offering music at a lower price than the iTMS — the vast majority of music from both stores sold for $0.99 per song, which was evidently the competitive price.[118] There simply wasn't much economic incentive for satisfied users of Apple's integrated platform to switch to Harmony and the RMS.

67. Even more fundamentally, knowing what RMS sales were in 2004 does not tell me how many songs the RMS was selling in September 2006 when the [redacted] was implemented, or what the RMS's sales would have been after September 2006 and in the "but-for" world. On that question, Professor Noll offers no evidence at all. Indeed, he has previously stated that he suspected consumers were not taking advantage of Harmony after it relaunched in 2005 because

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[116] Smith, Tony, "Real '49c a song' promo pushes downloads to 3m," The Register, September 9, 2004, http://www.theregister.co.uk/2004/09/09/real_promo_results/ (accessed June 4, 2013).

[117] Apple-AIIA0093860, Real Customer Support, "How do I install the iPod to work with RealPlayer", http://service.real.com/musicstore/support.html?section=iPodRPinstall (accessed April 27, 2010).

[118] Following the promotion, RealNetworks continued to sell top-10 singles as "49-cent loss leaders." "Real says digital song sale doubled market share," USA Today, September 09, 2004, http://usatoday30.usatoday.com/tech/techinvestor/corporatenews/2004-09-08-real_x.htm (accessed July 2, 2013).

they had already experienced Harmony being disabled.[119] The available data support this latter view. [redacted]

68. [redacted]

[119] Noll Dep. Trans. (Apr. 7, 2011), 147:20-148:5.

[120] By comparison, iTunes music accounted for 60-65 percent of digital downloads during this period.

[121] AIIA009845746 and AIIA0096463.

[122] [redacted]

[redacted]

69. The basic conclusion is simple—once one accounts for the actual market importance of downloads from the RMS, whether the [redacted] was included in iTunes 7 or not would have no material impact on the amount of RMS music on affected iPods, on competition or on iPod prices. This is because the [redacted] had essentially no impact on the amount of iTunes music that iPod users accumulated and hence no impact on the degree of "lock-in." Without this, Plaintiffs' theory has no economic content. Nor do Professor Noll's regression results. Whatever he is measuring with his itunes7_0 variable (if anything), it cannot be the impact of the [redacted] on iPod prices.

B. Professor Noll has done nothing to show that iPod owners were actually "locked-in" as opposed to choosing the iPod because it was a superior product.

70. Even if the RMS had been selling Harmony music to iPod owners and would have continued to do so absent the [redacted], that would still not establish that disabling Harmony increased demand for iPods. To show such increased demand, Professor Noll would also need to show, among other things, that (1) the additional amount of iTMS music that iPod owners purchased as a result of Harmony being disabled was enough to lock them in when they would not otherwise have been locked in under Plaintiffs' theory by their existing iTMS library, (2) that those same owners purchased an additional iPod at some point within the class period, and (3) that, absent the challenged conduct, they would have elected to purchase a competing player rather than an iPod.

71. Professor Noll offers no evidence of any of these critical predicate facts. He does not cite any evidence to indicate how much iTMS music was on the iPods of any iPod owners who might have purchased from the RMS. Nor does he offer any reason to believe that any

additional music such consumers might have bought from the iTMS as a result of the [redacted] would have been enough to create lock-in if it did not otherwise already exist. He likewise offers no evidence as to the number of consumers who [redacted] on it (and who would have purchased from the RMS absent the [redacted]) who then purchased an additional iPod during the class period. And, finally, Professor Noll does not present any evidence to show that any such additional iPod purchases were because the purchaser was locked-in as opposed to being simply because the consumer was happy with the performance of the existing iPod and believed iPods were superior to competitive products.

C. Professor Noll's Claims of the Possible Impact of the Challenged Conduct are not Supported by Economics

72. In addition to the lack of evidence to support its central factual predicates, Professor Noll's hypothesis of increased iPod prices is also contrary to basic economics. The economic evidence suggests that, if anything, the prices of affected iPods would have been lower, not higher with the introduction of the [redacted]. The [redacted] reduced the types of music that could be played [redacted], but it had no effect on the types of music that could be played on other players. Thus, the introduction of the [redacted] would have made [redacted] attractive relative to other competing players. To the extent that hypothetical iPod owners with substantial libraries of music they had purchased from the RMS might have been considering the [redacted] iPod prior to the introduction of the [redacted], these individuals would have been ***less*** likely to buy the [redacted] and ***more*** likely to buy some other device. As a result, if Plaintiffs' theory was otherwise correct, consumers would have been willing to pay ***less*** for a [redacted], not more. In other words, they would have been locked ***out***, not ***in*** - which is exactly the opposite of what Plaintiffs' theory would predict. To the extent that these hypothetical "intensive" RMS customers would have preferred to use Harmony going forward, their valuation of affected iPod models would have been reduced even further.

73. The same is true for RMS users who owned other portable devices but might have considered [redacted] With the introduction of the [redacted], their RMS music would no longer load, and thus under Plaintiffs' theory [redacted] would be less attractive, not more. Similarly, those potential iPod buyers - whether current iPod owners or not - who would have preferred the option of using Harmony in the future would also find [redacted]

[redacted] to be less attractive. Under Plaintiffs' theory, all of this indicates that the effect of the introduction of the [redacted] on buyers' willingness to pay for [redacted]-compatible iPods would have been negative. Thus, if anything, the direct effect of introducing the [redacted] must have been that Apple would charge less for affected models, not more.

74. All of this can be summarized by considering those consumers who already owned iPods at the time iTunes 7.0 was introduced. They can be roughly categorized by the amount and type of music they had on their iPods and their likely reaction to the introduction of the [redacted]:

a) All music on their iPods is DRM-free: For these owners, the value of an affected iPod will not change;

b) All music is from the iTMS, and they have no desire to buy from another online store: For these owners, the value of an affected iPod will not change;

c) All music is from the iTMS, but they might want music from the RMS in the future: For these owners, the affected iPod will now be less valuable;

d) Some music is from the iTMS and some is from the RMS: For these owners, the value of the iPod will change as follows:

   i. If the majority of their music is from the iTMS, the affected iPod will be less valuable, but only a little less so;

   ii. If majority of their music is from the RMS, the affected iPod will be much less valuable than for owners in the previous category;

   iii. And, if their music comes from both stores in roughly equal parts, the value of the affected iPod will be somewhere in between;

e) And, finally, if virtually all of their music is from the RMS, the affected iPod will likely be much less valuable.

In short, with respect to those consumers who already own an iPod, the overall value of affected iPods will go down, and the effect on price will either be neutral or negative. Consumers who have never owned an iPod, but might consider buying one, fall into one of three categories: 1) This is their first MP3 player; 2) They already own a non-Apple MP3 player; and 3) They are

adding to a "collection" of non-Apple MP3 players. For these potential buyers, the situation is similar: In each case, either they care about the ability to buy from the RMS, in which case the other players will be relatively more attractive, or they do not care about the flexibility, in which case, there will be no change in the relative attractiveness. Once again, the overall value of affected iPods will go down, and the effect on price will either be neutral or negative.

V. PROFESSOR NOLL'S "HEDONIC REGRESSION" AND HIS CLAIMS OF ANTICOMPETITIVE IMPACT

75. Professor Noll attempts to avoid confronting the implications of his theory by claiming that whether the [redacted] caused iPod prices to be higher, lower or unchanged is an "empirical question."[123] He then claims that his "hedonic regression" analysis of iPod prices proves both anticompetitive impact and damages.[124] [redacted] As I show below, Professor Noll's regressions are fundamentally flawed, lack statistical significance, and do not (and cannot) reliably determine impact or measure damages.

A. Hedonic Models of Prices for Products with Changing Quality and the Facts of This Case

1. Impact and Damages Would not Be Immediate or Constant

76. Under Professor Noll's theory, iTunes 7 created lock-in by preventing owners of iPods with [redacted] from accumulating music from RMS. He concedes that any lock-in and impact would necessarily occur in the long run. Whether lock-in actually occurs, and when, depends upon a number of factors, including the amount of iTMS music an owner has relative to other music that could be played directly on other devices (e.g., music from the RSM, DRM-free music, etc.) An iPod owner can become locked in as a result of iTunes 7 only ***after*** she has purchased an iPod with [redacted] and has built a library of iTMS music (which creates switching costs), and then only when she seeks to purchase a new MP3 player. Although he does not make the connection, Professor Noll cites evidence that consumers replace

[123] Noll declaration, pp. 57-58.

[124] Noll declaration, p. 71.

their portable music players every 18 to 24 months.[125] Taken together, this means that lock-in cannot occur until sometime in the long run after the consumer has purchased an [redacted], and the impact will occur even later when the consumer considers purchasing a replacement player, which would, on average, be a year and a half to two years after the iPod [redacted] had been purchased. For consumers who purchased [redacted], lock-in wouldn't occur until long after the introduction of iTunes 7 in September 2006, and the impact would, on average, not be felt until 18 to 24 months after that. By then, the iTMS was already DRM-free, and the class period was over.

77. Professor Noll also posits that lock-in has a greater effect in later periods as the number of replacement purchases grows relative to new purchases, saying: "lock-in normally has a greater effect on price as the fraction of sales that are accounted for by replacement purchases grows."[126] In other words, the impact on demand and prices, if any, would not be constant, but instead would increase over time. Despite this clear implication of his theory, Professor Noll restricts his regression model to estimate that iTunes 7 impacted prices of all iPod models immediately and that the impact on prices was constant throughout the entire class period — *i.e.*, it never increased. This is directly contrary to his theory of impact, and demonstrates that there is no connection between his theory of "lock-in" or the underlying economics and the impact and damages he claims to have measured.

[125] Noll declaration, p. 18, note 20 (citing Jemima Kiss, "How Big Is the iPod Installed Base?" Guardian, September 9, 2009 (reporting discussion with executive at Forrester Research); Larry Dignan, "Tablet Replacement Rates: More Like an MP3 Player than PC," ZDNet January 4, 2011 (reporting a Forrester Research study); "Mobile Phone Lifecycles," GSM Association, 2006 (reporting that about half of phone sales are replacements and that the replacement rate is about 18 months); "The Life Cycle of a Cell Phone," U.S. Environmental Protection Agency, 2005 (reporting cell phone replacement rate of 18 months); John Paczkowski, "I Got a Fever, and the Only Prescription is… More iPhone!" All Things Digital, June 25, 1010 (reporting that the replacement cycle for iPhones is 14.7 months); Victor H., "Americans Replace Their Cell Phones Every 2 Years, Finns – Every Six, a Study Claims," Phonearena.com, July 11, 2011 (reporting a study by Recon Analytics finding that the replacement rate for mobile phones was 18.7 months in 2007, 19.6 in 2008, and 21.1 in 2009).

[126] Noll declaration, p. 18.

2. Professor Noll's Regression Predicts But-For Prices That are Inconsistent the Way in Which Apple Prices iPods

78. [redacted][128]

B. Professor Noll's Regression Analysis Cannot Isolate the Effects of the Challenged Conduct

79. The stated goal of Professor Noll's analysis is to estimate the impact of the challenged conduct, i.e., the introduction of the KVC, on iPod prices. To do this, it is critical that Professor Noll's two regressions (reseller sales and direct sales) separate the impact of the challenged conduct from the impact of other factors that influence iPod prices. Failure to account for factors that affect iPod prices that are correlated with iTunes 7 will overstate any estimated impact of the challenged conduct. In other words, if Professor Noll's regressions fail to include variables for factors that impact prices or otherwise fail to account for them, the effect of those causes will be improperly and misleadingly attributed to the challenged conduct causing the regression to produce an overcharge where none exists.[130] As shown below, Professor Noll

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127 Donnelly Dep. (Dec. 20, 2010), 20:5-23, 46:1-47:2, 49:21-50:12, 72:5-74:7.]

128 Noll Dep. (May 16, 2013), p. 96:6-16; Noll Declaration Exhibit 15.2]

129 [redacted]

130 "The omission of relevant variables can bias the results. If, for example, costs were high during those periods of alleged wrongful behavior because of the influence of variables not included in the regression model, or if demand grew more inelastic during that period in ways not captured by the included demand-side variables, then a dummy variable reflecting the likely effect of wrongful behavior might have a large positive coefficient

cherry-picked certain product attributes and variables to include, leaving out significant ones that would be expected to affect iPod prices. These omissions bias his results in favor of finding an overcharge, even if there was no overcharge. In addition, some of the events that may have affected iPod prices occurred simultaneously with the updates about which plaintiffs complain, and he has provided no way to separate their effects from any effect from the challenged updates.

80. Professor Noll uses a form of "before and after" analysis in which he uses a "dummy variable" (itunes7_0) to separate the period before the release of iTunes 7.0 from the period after. He then claims that the coefficient on this dummy variable measures the impact of the challenged conduct. Indeed, the coefficient on this variable is the entire content of his claim to have demonstrated impact and damages. Putting aside his model's other flaws, this indicator is incapable of identifying the impact of the challenged conduct, for two related reasons. First, the challenged [redacted] was only one feature of iTunes 7. Other enhancements of iTunes occurred at the same time, and by their very nature as product improvements they can be expected to affect consumers' valuation of iPods and hence prices. Professor Noll does not control for these changes, and so his regression cannot identify the effect of the challenged [redacted] element of iTunes 7. Second, the features and functionalities of iPods themselves were different after September 2006 than before. Like the features and functionalities of iTunes, these were product improvements that enhanced the value of iPods. Unless these changes are also controlled for — and they were not — their omission from Professor Noll's regression will cause him to estimate an effect of iTunes 7 even if the true effect of the [redacted] feature is zero.

81. Many things changed on September 12, 2006, only one of which was the implementation of the [redacted]. For example, at the same time the [redacted] was implemented Apple introduced new iPods, including the iPod Nano 2nd Generation (2GB, 4GB, and 8GB) and the iPod Shuffle (N98 Best 1 GB), all of which included upgraded features compared to their predecessors. Although it did not introduce a new model of the iPod Classic 5th Generation, it did enhance the existing model with improved video and additional capacity (30GB and 80GB). iTunes 7 itself — which contained the [redacted] — was a major version update that included upgrades to the previous version of iTunes software with enhanced video, support for the movie

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for reasons unrelated to the existence of the alleged conspiracy." Daniel L. Rubinfeld, Quantitative Methods in Antitrust, in 1 Issues in Competition Law and Policy 723 (ABA Section of Antitrust Law 2008), p. 726.

downloads available for the first time from the iTMS, new Cover Flow, and a redesigned layout. (See also Exhibit 11.) These improvements would be expected to enhance the value of new iPod models to consumers. Professor Noll's model does nothing to account for them, and thus, his estimated "overcharge" is biased upward, which means that he would estimate a positive effect of iTunes 7 on prices even if the true effect had been zero.

82. These criticisms are not speculation—they can be clearly and convincingly demonstrated. As detailed below, when I include other valuable product features in Professor Noll's model and correct other obvious flaws, Professor Noll's estimates of "overcharge" vanish.

C. A High Adjusted R-squared and Small Standard Errors do not Show that the Model is Reliable

83. Professor Noll's regression results — reported in Exhibits 13.1 and 13.2 of his declaration — record "high" adjusted R-squared values. Professor Noll also reports the standard errors of his coefficient estimates, which are astoundingly small because Professor Noll has committed a fundamental error in estimating them. According to Professor Noll, the combination of a "high" regression R-squared and small standard errors reflects the "overall power of the regression[s]."[131] He claims that the high R-squared (roughly .98) on each regression "means that virtually all of the variation in prices across models of iPods and among time periods is explained" by the regressions and that the low standard errors imply that all of his key coefficient estimates are highly statistically significant.[132] It is well established that a high adjusted R-squared and small standard errors — whether they occur individually or together — do not indicate that the regression results establish the true relationship between the variables of interest.[133]

84. A regression can generate a high R-squared even when it is of little actual value in explaining the hypothesis of interest. The R-square of a regression is simply the proportion of the total variance in the dependent variable — here price — that is accounted for (correlated with) the estimated linear combination of included explanatory variables. In this case, for

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[131] Noll declaration, p. 80.

[132] Noll declaration, p. 89.

[133] A Guide to Econometrics, Peter Kennedy, Second Ed. p 185.

example, quality-adjusted iPod prices fell dramatically over time, and Professor Noll includes time-varying factors such as storage capacity (which increased dramatically over the period) in his model. So long as the chosen explanatory variables (which include a time trend) are able to track the overall decline in prices fairly closely, the R-squared of his regression can be quite high. But that has nothing to do with whether the regression is reliable for measuring the impact of the challenged conduct in the case, which is the impact of the [redacted] on iPod prices.

85. Similarly, relying on low estimated standard errors can be misleading, and it will be misleading when, as here, they have been calculated incorrectly. As discussed more fully in the next section, Professor Noll's standard errors are incorrectly estimated because he wrongly pretends that the millions of price "observations" he used in his model are statistically independent outcomes. They are not independent, and this causes him to grossly underestimate the standard errors of his regression and therefore to grossly exaggerate the statistical significance of his findings.

86. As an example of the fact that high R-squared and small standard errors do not signal the reliability of a regression model, consider the alternative models that Professor Noll estimated but chose not to use for his overcharge and damage calculations. Professor Noll rejected several regressions he ran that also had adjusted R-squared values of .98 and low standard errors. In addition to his "preferred logarithmic regressions," on which he ultimately relies, Professor Noll also ran regressions with "linear specifications" — in which price was measured in dollars — to estimate impact and damages. Significantly, the two linear regressions have nearly identical adjusted R-squared values (the linear reseller regression has adjusted R-squared of .98 and the linear direct reseller regression has an adjusted R-squared of .9713) and both have very low standard errors, which means that in Professor Noll's analysis, every estimated coefficient is highly statistically significant.

87. Despite the high R-squared and extremely low standard errors, he rejected his linear regressions, finding them "less reliable."[134] At deposition he explained that the results of those regressions did not fit reality, in part the regressions predicted "but for" prices for some models that would have been below cost. [redacted]

[134] Noll declaration, pp. 76-7.

[redacted]

88. Professor Noll vastly overstates the precision of his model and thus he overstates the significance of his claimed results. By ignoring the way his data are constructed and the very pricing practices at issue in this case, he purports to estimate "effects" with a high degree of precision and statistical significance. This is demonstrably wrong. Properly analyzed, even his (otherwise incorrect) estimates of impact and damage are not statistically significant. In other words, even using Professor Noll's flawed regression one cannot conclude that the "impact" of iTunes 7.0 (to say nothing of the challenged [redacted]) was materially different than zero.

D. Professor Noll Makes a Critical Methodological Error and Thus Dramatically Overstates the Precision of His Estimates

89. Two of the key outputs of a regression analysis are the estimates of the coefficients on each of the variables and the estimates of the precision with which each of these coefficients is estimated. Economists generally report these coefficients in terms of their estimated values and the standard error of those estimated values. The estimated standard error is intended to measure the precision with which the model has estimated the associated coefficient. When the standard error is very small, the estimate is similarly very precise. Economists are also typically interested in expressing the degree of confidence they have that the estimated value of the coefficient did not arise by chance when the true effect of the variable in question is actually zero. This can be measured by taking the ratio of a coefficient estimate to its standard error, which is called the "t-ratio" or "t-statistic" for that estimate. Intuitively, the t-statistic measures the distance between the estimated value of the parameter in question and zero, measured in standard deviations. When the t-statistic is large, the estimated coefficient is "far" from (many standard deviations away from) zero, which increases our confidence that the true effect of that variable is not zero.

90. When sample sizes are sufficiently large, as they are in this case, a common rule of thumb for saying that an estimated coefficient is "statistically significant" is that its associated t-

statistic is 2.0 or larger. This corresponds to approximately a five-percent probability that an estimated coefficient as large as the one obtained could have occurred by chance if the true effect of the variable in question is zero.[135] [redacted]

91. Professor Noll has made a fundamental error in constructing his data and in interpreting his regression. He incorrectly assumes that literally millions of identical price "observations" are statistically independent. But they are not independent — they are highly correlated with each other — and this error causes Professor Noll to grossly exaggerate the amount of information in his data. As a result of this very basic error, he totally misrepresents both the statistical precision and the significance of his estimates. Properly analyzed, even his otherwise flawed estimates of "overcharges" are not statistically significant. That is, they are not statistically distinguishable from zero.

1. The Way in Which Professor Noll Constructs and Interprets His Data Causes Him to Vastly Overstate the Significance of His Results

92. Professor Noll committed critical and serious errors in constructing and interpreting the observations in his data. Because of these errors, he vastly overstates the precision of his model and the statistical significance of his results. He reports extremely low standard errors, by

[135] A t-statistic of 2.0 corresponds to approximately a five percent (*p = .05)* probability that a coefficient estimate as large as the one obtained could have arisen by chance if the true value of that coefficient is zero. This would sometimes be referred to as "statistical significance at the 5 percent level." Larger values of the t-statistic correspond to rapidly declining probabilities that the true effect of the variable in question is zero. For example, a t-statistic of t = 2.58 corresponds to a 1-in-100 (*p=.01)* probability of arising by chance—"statistical significance at the 1 percent level." A t-statistic of t = 4.9 corresponds to a one-in-one million chance (*p = .000001*.

which he measures the precision with which the regression has estimated the value of the coefficients in his model. He obtains such small standard errors because he committed an extreme econometric error in calculating them. Properly computed, his estimates of impact and damages have no statistical significance, which means the estimates cannot be statistically distinguished from zero.

93. Calculating accurate standard errors is critical if one is to draw proper statistical inferences. Professor Noll's estimates of the parameters of his model and their associated standard errors are based on the assumption that the residuals in his model are statistically independent — that is, that they are not correlated with each other. Professor Noll's error is fundamental — by assuming that his observations are independent, he grossly exaggerates the amount of price information in his data, and as a result, he misrepresents the statistical precision and significance of his estimates.

94. Specifically, Professor Noll wrongly assumes that the price of each individual iPod sold to either a reseller or a direct purchaser represents a statistically independent draw from an underlying distribution. But the structure of his data should have alerted him that this cannot be the case. [redacted] Because Professor Noll treated each unit in a multi-unit transaction as a separate price observation, he calculates his standard errors as if he had approximately 113 million independent

observations on iPod prices.[136] His data do not contain anywhere near that amount of independent information.

95. The prices paid by purchasers (either individual customers or resellers) have a fundamental common element: they were all set by Apple according to its pricing policy. In the case of individuals who purchase directly from Apple, the vast majority of the prices for the same model in the same time period were identical. The same is true for resellers. [redacted] This fundamental fact should have caused Professor Noll to examine whether the prices paid were in fact independent. [redacted] In the presence of clustering, an analyst who wrongly assumes that his data are independent may calculate grossly inaccurate standard errors. That is exactly the error that Professor Noll committed.

2. Professor Noll did not Cluster his Observations and Thus His Results are Unreliable and not Scientifically Valid

96. Based on even a superficial review of the data, Professor Noll should have examined whether there was a clustering problem. Observations are said to be "clustered" when they are not independent, but instead are correlated within a group or "cluster." [redacted] Knowing the price of

[136] Professor Noll also asserted that the standard errors reported in his Exhibits 13.1 and 13.2 are "robust" standard errors, which had been adjusted to account for heteroskedasticity. (Noll deposition at 196:16-17.) They are not. They are ordinary least squares standard errors calculated under the assumptions of equal variance across observations and independence.

[137] [redacted]

one tells you the price of the remaining ones. When observations are not independent, the regression "must control for clustering, as failure to do so can lead to massively underestimated standard errors and consequent over rejection using standard hypothesis tests."[138] At deposition, Professor Noll explained that he refused to examine whether there was a clustering problem because he knew it wasn't appropriate to do so. He either doesn't understand statistical independence or doesn't understand the data in this case.

97. There are standard tests one can perform to determine whether there is a clustering problem. As noted, if the regression residuals are positively correlated, the observations are not independent and there is a clustering problem. To test this, I disaggregated the observations used in his regression into family-by-quarter categories (i.e. an individual category might be the iPod Nano 1st Generation in the first quarter of 2006). I then split the units sold in each group randomly into two halves and calculated the average residual (which represents the statistical error in professor Noll's model) for each of these two groups. If the observations were truly independent as Professor Noll assumes, there would be no systematic relationship between the errors in the two halves. As Exhibit 13a demonstrates, there is simply no way that Professor Noll's assumption of independence can be correct. In fact, it is fair to say that his assumption could not be farther from the truth. The exhibit shows a scatter plot of the average residual in the second half of each family-quarter group against the average residual in the first half. The exhibit shows that these residuals lie almost entirely along a 45-degree line, which means that the two averages are almost exactly equal. In other words, the figure shows that the residuals are almost perfectly correlated — exactly the opposite of what Professor Noll assumed. Thus his assumption that his observations are independent is completely rejected by the very data he himself used.[139] For comparison, Exhibit 14a illustrates what Exhibit 13a would have looked like had Professor Noll's assumption been correct.[140]

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[138] Colin Cameron and Douglas L. Miller, "Robust Inference with Clustered Data," in *Handbook of Empirical Economics and Finance*, edited by Aman Ullah and David E. A. Giles, CRC Press 2011, p at 2.

[139] Exhibit 13a shows the scatter plot of the average residuals from Professor Noll's Reseller Sales regression. Exhibit 13b presents the same information for the average residuals from Professor Noll's Direct Sales regression. Note that the two exhibits are nearly identical.

[140] For this exercise, the regression residuals are first reallocated randomly across categories before dividing each category residuals in two groups. Similar to above, Exhibit 14b illustrates what Exhibit 13b would look like for the Direct Sales regression if Professor Noll's assumptions were correct.

98. There are standard techniques that allow for clustering in the calculation of regression standard errors. If it were the case that clustering is unimportant, as assumed by Professor Noll, he could have employed these techniques to demonstrate that accounting for clusters does not affect his results. He simply refused to do so. The most common method, widely used in modern empirical economics, is to allow for arbitrary non-independence within empirically designated groups, or "clusters," which allows the regression package to calculate the degree of correlation.[141] In the current context, this method allows for the fact that the prices of iPods, particularly those in multi-unit transactions, are not independent, but rather are highly correlated.

99. The consequences of Professor Noll's mistake in calculating standard errors are shown in column (2) of Exhibits 15a and 15b. Consider the reseller sales regression in Exhibit 15a. Using the standard and well-accepted methods mentioned above, I have calculated the standard errors of Professor Noll's model allowing for "clusters" of non-independent price observations within product family and quarter. The only thing that changes here is the information about the precision of these estimates. As the exhibits show, once I correct for the (obvious) high correlation among the residuals, Professor Noll's estimated "overcharges" (and his other estimates as well) are not statistically significant. [redacted] Both of these values are well below any conventional or accepted threshold for statistical significance. Properly interpreted, and even ignoring its many other flaws, Professor Noll's hedonic regression model provides no reliable evidence that the iTunes 7 update had any material effect on the prices of iPods.

E. Once some of Professor Noll's Critical Errors and Omissions are Corrected, His Regression Model Cannot be used in Any Way to Support a Claim that the [redacted] caused iPod Prices to Increase

100. Exhibits 15a and 15b also summarize certain modifications of Professor Noll's regression models that show the impact of correcting just some of his other critical errors and

[141] See William H. Greene, *Econometric Analysis,* 7th Edition, Prentice Hall, 2012, Chapter 11. See also Joshua Angrist and Jorn-Steffan Pischke, *Mostly Harmless Econometrics,* Princeton University Press, 2009, Chapter 8, "Clustering and Serial Correlation in Panels."

omissions. Exhibit 15a presents the impact of the modifications to Professor Noll's reseller sales model, and Exhibit 15b presents the same impacts for Professor Noll's direct sales model. I present the results of the modifications sequentially in order to illustrate the individual and cumulative impact of those corrections. As noted above, the first column in each table simply reproduces Professor Noll's model. The only difference is that instead of reporting the coefficient estimate and the standard error for each explanatory variable, I report the coefficient estimate and the t-statistic for that estimate. The second column makes the essential correction to Professor Noll's method of statistical inference, recognizing that pricing decisions are not independent within product family clusters. The remaining columns in Exhibits 15a and 15b show the effect of correcting some of Professor Noll's other errors and omissions.

1. Professor Noll Does Not Properly Model the True But-for World, Which Included iTunes 4.7

101. Professor Noll includes an indicator variable for the issuance of iTunes 4.7 in October 2004. By doing so, he recognizes that, if plaintiffs' theory were correct, iTunes 4.7 would be expected to have an effect on iPod prices by disabling Harmony. Professor Noll's regression includes several other variables that are similarly intended to capture the effect on iPod prices of other events, such as the launch of the iTMS in April 2003 and the launch of Harmony in 2004. For each of these other variables, Professor leaves them turned on from the time of the event until the end of the data, so as to capture any continuing effect of that event.

102. In contrast to his treatment of those other variables, however, Professor Noll turns off the variable for iTunes 4.7 at the time he turns on the variable for iTunes 7. The effect of doing so is to treat iTunes 4.7 as having no independent continuing effect from September 12, 2006 onward—the date iTunes 7 was introduced. It is also to treat the but-for world Professor Noll is attempting to model as not including any effect from iTunes 4.7. By constructing his model in this way, he is comparing the prices of iPods after iTunes 7 with prices of iPods between July 2004 (the launch of Harmony) and October 2004 (the launch of 4.7). The effect is that his iTunes 7 variable picks up any effects of iTunes 7 ***and*** any effects from iTunes 4.7

103. This is incorrect. As noted above, I understand that the Court in this case has ruled that iTunes 4.7 was lawful, which means that iTunes 4.7 would have existed in any but-for world and that any effect it had on prices was not anticompetitive and cannot be included in determining impact and damages. Thus, to measure any incremental impact of iTunes 7 on

prices, he must compare prices of iPods after iTunes 7 to prices of iPods just before iTunes 7 (not before iTunes 4.7). Moreover, Professor Noll offers no evidence, or reason to believe, that any effect on iPod prices from iTunes 4.7 would cease to exist as of the date iTunes 7 was issued. To the contrary, he admitted at his deposition that he suspected that iTunes 4.7 discouraged consumers from going back to Harmony even after Harmony was re-launched in April 2005.[142] If that is true, that effect would likewise have continued even after iTunes 7 was issued. His treatment of iTunes 4.7 also ignores that iTunes 7 was included on only the [redacted]. It was not included on the millions of existing iPods, [redacted].

104. To capture any continuing effect from iTunes 4.7, Professor Noll should have left the iTunes 4.7 variable turned on throughout the relevant time period. The result of turning it off on the same day as he turns on the iTunes 7 variable is to cause the iTunes 7 variable to capture the continuing effect from iTunes 4.7. In the case of Professor Noll's reseller regression, the effect of turning off iTunes 4.7 is to increase the alleged overcharge from 1.6 to 3.2 percent. In the case of the direct sales regression, turning off iTunes 4.7 increases the overcharge from 1 to 6 percent.

2. Professor Noll's Confusion about the "Log of Time"

105. According to Professor Noll, the electronics in MP3 players are semiconductors that follow "Moore's Law" of technical progress, i.e., "the amount of functionality that can be placed on a semiconductor of a given size doubles every 18 months."[143] This is one reason that "prices for consumer electronics generally fall through time."[144] In an attempt to control for this, Professor Noll includes in his regressions a variable that he calls "the log [or logarithm] of time" instead of measuring time in natural units such as weeks, months, or years. It is common to include a time trend (measured in natural units such as months) in regressions in which the dependent variable is measured as a logarithm (here, the natural logarithm of price). This treatment allows for unmeasured technical progress that changes the dependent variable at a

[142] Noll deposition (May 13, 2013), pp. 65:21-70:16.

[143] Noll declaration, p. 18.

[144] Noll declaration, p. 80.

constant rate, such as 10 percent per year. Here, it would allow for constant progress that reduces prices at a constant percentage rate.

106. Based on his declaration and deposition testimony, Professor Noll clearly believes that "the log of time", instead of time measured in natural units, has the properties mentioned in the previous paragraph.[145] But in fact it does not. Because changes in logarithms of a variable are approximately equal to percentage changes, using "the log of time" yields nonsense results as a control for technical progress. For example, advancing time from the 100th month to the 101st month of a dataset is a change of one month, but it is a percentage change of just one percent. Changing time from the 10th month of the data to the 11th month is also a change of one month, but it is a percentage change of 10 percent — ten times greater than the same one-month change from 100 to 101. This implies two things for Professor Noll's regression. First, his control for "technical progress" will be forced to have a large effect at the beginning of the data (when percentage changes in time are large) and almost none at the end (when percentage changes are small). This is exactly the opposite of what Professor Noll claims he intended the variable to do. Second, the effect of the log of time will depend crucially on the starting value for time—if time is measured in months since 2001, the regression will give an entirely different result than if time is measured in months since 1981 or 1843. Again, this is exactly the opposite of what Professor Noll claimed his control should do.

107. One can only conclude that Professor Noll did not understand the properties of his "log of time" control for technical progress and Moore's law. If he had, he would have controlled for these phenomena using a time trend measured in natural units, which allows for a constant *rate* of price change over time. Had he done so, however, his (otherwise flawed) regression would have yielded much smaller estimates of "overcharge" and consequent damages, as I show below.

3. Additional Features and the "Quality" of Professor Noll's Regression

108. Similarly, by even the most charitable interpretation of his "empirical" analysis, Professor Noll can only claim to have identified an increase in all iPod prices related to the introduction of iTunes 7 and its upgrades, not the impact of the [redacted] or a hypothetical induced

[145] Noll deposition, pp. 24-25

reduction in usage of Harmony and the RMS.[146] Professor Noll agreed that factors that would explain or impact price, including significant product attributes, must be included in his model to avoid biasing his results. Professor Noll's report says that he controlled for significant product attributes that explain price. At deposition, Professor Noll retreated from that position, admitting that there may be other product attributes that impacted iPod prices and correlated with the challenged conduct.

109. As Professor Noll recognizes, iPods evolved rapidly over the period he is measuring. Compared with earlier models, later iPods differ dramatically in their attributes, technologies and features. The original iPod line was larger, thicker, had less capacity, etc. Just a few years later, iPods had color screens, were thinner, had greater capacity and battery life, and could display album art, play television shows and movies. And the iPod Touch once against revolutionized the device market with its multi-touch interface and ability to play video, watch movies and television shows on a larger screen, send and receive emails, play video games, download and use apps from Apple's iTMS, and access the internet.

110. [redacted]

[146] This ignores the fact that there were three new or enhanced iPods introduced at the same time. Professor Noll would claim that the "value" of the new features in these iPods is accounted for by the characteristics in his regressions. However, as I show later, this is not the case.

[147] Professor Noll apparently was aware of the fact that he had failed to consider a number of characteristics. See Expert Report of Dr. Michelle M. Burtis in Apple Inc.'s Opposition to Plaintiffs' Motion to Exclude, May 2, 2011, ¶¶16-17; Noll January 18, 2011 declaration, pp. 39, 76-78, 81-82, and Exhibits 1-6; Noll April 7, 2011 deposition, pp. 87:18-88:1.

111. [redacted].[149] [redacted]

112. [redacted].

113. Professor Noll also makes no effort to separate the impact of [redacted] from the other features of iTunes 7 that enhanced iPods. As shown in Exhibits 11 and 16, both the initial and upgraded versions of iTunes 7 contained a number of features and enhancements that improved iPod performance and quality, including new album covers views of music, TV shows, movies with better browsing capability and videos with "near DVD" quality. Without controlling for these features it is impossible to claim that any price-elevating impact of iTunes 7 — assuming there even was one — was due to the [redacted] as opposed to other value-enhancing features of iTunes 7 and the new and improved iPod models it supported. As just one example, the enhanced video functionality of iTunes 7 improved the video playback quality of the already

[148] In order to choose the characteristics I used in my model, I started with a list of all iPod models (by MPN) that Apple had introduced between 2001 and December 2010 (the latest date for which I have usable price data). (Note: MPN stands for "Marketing Part Number." "Marketing Part Number," Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/Marketing_part_number (accessed June 14, 2013).) I then asked my staff to collect information on the characteristics of each of these models. They searched both Apple.com and Everymac.com, and they reviewed Apple press releases and Apple price committee documents that were produced as part of the discovery in this case. In some cases they could not find the needed information on these websites. In such instances, they searched a variety of other websites. (For a list of the websites used and a description of the process by which the search was conducted, see Appendix C.)

[149] I have tested to see whether the variables I have included in this exercise are jointly significant, and I find that they are.

[redacted], a model that could not invoke the [redacted] because it did not have the requisite firmware. At deposition, he admitted that these enhancements to the iPod [redacted] could present a multi-collinearity issue, biasing his results. His only response was that he believes, without any empirical support, that owners of the iPod with video didn't actually use the video function. That assumption is not only unsupported, but is also contrary to logic (Apple enhanced the video quality through iTunes 7 presumably because it determined that customers wanted that feature) and to the specification of his own model, which includes a variable for video feature of iPods.

114. In addition, his regression does not include any controls for influence that other versions of iTunes may have had on iPods or enhancements to iTMS. With respect to iTMS, under plaintiffs' lock-in theory, any increase in iTMS demand as a result of new features and content would ultimately lead to increased demand for iPods and thus prices. If plaintiffs' theory were correct, as customers were drawn to purchase more iTMS content that could be played only on iPods, they would become more locked in to purchasing iPods in the future, thus increasing demand and prices. Professor Noll recognizes this by including a variable for introduction of iTMS, the number of music downloads available, and when the iTMS offered all music without DRM. But he has no variables to account for other significant changes to the iTMS (e.g., ability to rent or purchase movies and television programs). Any impact from such changes will be mistakenly attributed to other variables.

4. The [redacted] Did Not Apply to All Models and in Any Event, Would Not have Affected All Models Equally

115. Because of the way he constructed his regression, Professor Noll estimates a single average percentage overcharge that he applies across all models over the entire class period. First, this is inconsistent with his theory that any price impact would increase over time. But, second, it assumes that iTunes 7 would have exactly the same impact on every iPod that was sold. There is no basis for his assumption. Though "iPods," different models were different from one another and were affected differently by iTunes7. Under Professor Noll's theory, whether lock-in occurs is peculiar to the consumer's behavior — what iPod she purchases and when, how much iTMS music she purchases relative to other music, when she would consider purchasing a new device, whether she would consider a non-iPod but for her iTMS library, etc.

There is no reason to expect that the number of consumers who meet all of these conditions is relatively the same for each iPod.

116. [redacted]

117. These facts indicate that, to the extent the challenged feature of iTunes 7 had any impact on iPod prices, that impact would vary across models. Even if it might raise the price of some model or models, Plaintiffs' theory indicates that it may not affect others at all and that it may in fact reduce prices of some or all models. During the class certification phase, Professor Noll recognized that estimating an average impact across models could mask variation of impact, with the result that buyers of some models might appear to be harmed when in fact they were not. Although during that phase he indicated that he could fix the problem by estimating separate effects of his iTunes 7 indicator for each iPod model, he has done nothing in this phase to address this issue.

118. At deposition, Professor Noll again claimed that he could fix the problem by turning an indicator variable on for models that had iTunes 7 and turning it off for models that didn't [redacted]. This method cannot provide a meaningful answer because it implicitly assumes that the effect of iTunes 7 on non-affected iPods was zero. However, as I have shown above, just because a particular iPod could not invoke the [redacted] feature of iTunes 7 does not mean that its price could not have been impacted.

119. Column (6) of Exhibits 15a takes this additional step of allowing for separate effects of iTunes 7 on each iPod model. For all three models the estimated "effect" of iTunes 7 is

negative - which is inconsistent with Plaintiffs' claim that these class members were damaged - and one of these (for the Classic) is statistically significant. Similarly for direct purchasers, column (6) of Exhibit 15b shows that three of four model-specific coefficients for iTunes 7 are negative, and the lone positive estimate is virtually zero. Not one of these findings is consistent with Plaintiffs' theory.

5. Professor Noll's Models Overstate Damages

120. As discussed above, Professor Noll's regressions do not and cannot determine impact or provide any reliable measure of damages. Even accepting the regressions on their own flawed terms, he has specified his model in such a way as to bias his results upward. For example, among other things, he estimates damages on all iPods starting on September 12, 2006 even though he admits that any impact on price would occur in the long run and on average 18 to 24 months after September, 12, 2006; he uses the wrong before period to nearly double the damages; he uses a time trend that is contrary to his own theory and admissions at deposition; he cherry picks what features to control for and excludes others without any justification; and he estimates a single percentage overcharge across all models, including models that did not include iTunes 7.

121. In addition to the errors discussed above, Professor Noll also biased his results in the way he handled the variable for accounting for the impact of the availability of DRM-free music on iPod demand and prices. Professor Noll's regressions include dummy variables to capture any impact of online stores that competed with iTMS offered their collections without DRM and any impact from iTMS offering its entire collection without DRM on March 31, 2009. Under his theory, which he later clarified at deposition, it is the availability of substantial amounts of DRM-free music that he believes would impact iPod prices. Indeed, at deposition he agreed that the date on which Apple offered 80% of its collection DRM-free would "of course" impact prices. On January 6, 2009, Apple offered 80% of its iTMS collection (8 million of the 10 million tracks) available without DRM. It also announced that all ten million would be available without DRM by the end of March, 2009. The announcement was widely covered in the popular press. Professor Noll knew this when he specified his model; among other things, he refers to documents that establish this fact. And according to iTMS data Professor Noll cites to, approximately 24 percent of all DRM-free upgrades sold during the first 21 and a half months

were sold during the month of January 2009 and 45 percent were sold between January and March 2009, the three months before Noll's dummy variable was "turned on."

122. All these errors result in greatly overstated damage calculations. In Exhibits 15a and 15b, I have rerun his models correcting for some of these errors. The results show that, even correcting a few, has a substantial impact on his damages calculations. (See Exhibit 15c.) Indeed, his models properly interpreted predict that there are no damages.

VI. MARKET DEFINITION AND MARKET POWER

123. Professor Noll asserts that Apple has monopoly power in two markets: A market for digital music downloads and a market for portable digital music players.[150] The analyses he presents to support his conclusions have no meaningful economic implications for this case. Monopoly (or market) power is the ability of a firm to restrict output and thereby increase market price above the competitive level. Economists (and courts) often attempt to measure this ability by defining the relevant market and calculating the firm's share in that market.[151] The usefulness of this approach depends critically upon asking the appropriate question. Professor Noll fails in this regard.

124. This case is about the impact of the [redacted], a particular update to Apple's iTunes 7.0 software that, in conjunction with the firmware on certain iPods (in particular the [redacted] disabled Harmony's ability to load RMS music onto those iPods. What matters in assessing the magnitude of that impact, if any, is how important downloads of RMS music would have been to users of iPods absent the introduction of the [redacted]. This depends, in turn, upon where users get the music they load onto their iPods and how much of that music is accounted for by music purchased from the RMS. If music from the RMS is a small share of the music iPods owners have on their iPods (and it is), then the effect, if any, of blocking Harmony will also be small, regardless of whether music downloads are a separate market or they compete more broadly with streaming services, physical copies, or other sources of music.

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[150] Noll declaration, pp. 4-5.

[151] Professor Noll says: "The purpose of relevant market analysis is to identify products that are close substitutes." See Noll declaration, p. 23. This statement misses the mark. Even if one identifies the close substitutes, one may still not be able to draw meaningful conclusions, particularly in markets that are growing and in which there are no barriers to entry. See, e.g., Landes, William and Richard Posner, "Market Power in Antitrust Cases," *Harvard Law Review*, Vol. 94, No. 5. (Mar. 1981), pp. 947-950.

125. Second, even if the market in which Apple sells music were relevant, Professor Noll presents no coherent analysis to suggest that it is as limited as he asserts. He does not meaningfully analyze, for example, whether prices for paid downloads are constrained by the availability of free downloads from peer-to-peer file sharing sites. Early in his report he suggests otherwise when he describes how the record labels and later Apple had to make their sites for paid downloads attractive enough to lure consumers away from obtaining music for free from the file-sharing sites.[152] Both Steve Jobs and the then-head of the Department of Justice Antitrust Division similarly cited to downloads from file sharing sites as a significant challenge to the success of outlets such as the iTMS.[153]

126. Professor Noll's exclusion of other sources of music is likewise unsupported. It is beyond dispute that, at the time Apple launched the iTMS and set its prices that prevailed throughout the class periods, it had to design its sites to compete against not just the file sharing sites, but also on-line subscription services,, online CD sales, and brick-and-mortal CD sales. Professor Noll argues that physical CDs do not compete with digital downloads. [redacted] [redacted]"[154] He acknowledges that the available evidence supports the conclusion that on-demand streaming services are in the same market with digital downloads, but he dismisses them on the ground that they could not support access by mobile telephones during the class period.[155] Support for mobile devices, however, is not relevant to iTMS consumers who purchased music to listen to on other devices – and Professor Noll presents no analysis as to the amount of iTMS sales for use on such other devices. Nor does Professor Noll address the fact that Apple does not own the music but is dependent on licenses from the record labels, which could and did put restrictions on Apple's ability to sell or could revoke the licenses.

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152 Noll Declaration, pp. 7-9.

153 See Jobs, Steve, "Thoughts on Music", February 6, 2007 (AIIA00093477); U.S. Department of Justice, Interoperability Between Antitrust and Intellectual Property, Thomas O. Barnett Presentation to the George Mason School of Law Symposium Managing Antitrust Issues In a Global Marketplace, Washington, D.C., September 13, 2006, http://www.usdoj.gov/atr/public/speeches/218316 htm (accessed 7/17/2013).

154 Apple_AIIA00105851 - Apple_AIIA00105861.

155 Noll Declaration, pp. 33-35.

127. Professor Noll presents an analysis of market definition and market power to support his conclusion that there is a separate antitrust market for digital downloads and that Apple has market power in that market. This analysis is misguided and sheds no light on any of the issues in this case. Market power in digital downloads is related only to the question of whether Apple has the ability to raise prices of digital downloads above the competitive level. But this case is not about raising prices in a hypothetical market for digital downloads, it is about the ability of customers to substitute across music players. Since Apple does not sell music for other players, it cannot reduce the attractiveness of other players by increasing the price of iTunes music. Indeed, any attempt by Apple to increase the price of iTunes music would only make other players ***more*** attractive and encourage consumers to switch away from iPods and towards those other players. Moreover, Plaintiffs have not alleged that Apple attempted to increase prices for digital downloads above the competitive level – and, in fact, this apparently is not something Apple ever did (or even attempted to do.) This makes Professor Noll's analysis of market power in digital downloads essentially irrelevant.

128. Professor Noll's analysis of market power in music players is also flawed. Professor Noll attributes Apple's ability to sell iPods at higher prices and still maintain a large share of the market to Apple's alleged ability to "lock in" customers and exercise monopoly power.[156] However, the fact that a firm has a large market share does not mean it has market power. As I showed in Exhibit 7a and the accompanying discussion, Apple achieved great success and was able to charge a price premium even ***before*** it was established as the market leader. Moreover, as I show in Exhibit 7a, the market for digital music players has expanded enormously. By all accounts Apple has been very successful selling to new customers entering the market even though, as I explain below, there are literally dozens of companies, many of which offer well-established brands of consumer electronics that also sell MP3 players and competing products.

[redacted]

[156] Noll declaration, p. 57.

[redacted].[160] This evidence directly contradicts Professor Noll's claim that Apple's success was due to its market power created by lock-in.

129. Professor Noll's claims regarding market power do not explain how Apple's alleged market power would lead new customers to pay higher prices for iPods when lower-priced, allegedly comparable products are available in the marketplace. From the time the iPod was first introduced at least through 2009 (the latest year for which I have data), there have been literally dozens of alternative players available in the market. (See Exhibit 8.) Consumers were always free to purchase any one of these. If Apple's prices had been set above the competitive level, presumably consumers would have done so. The more logical explanation is that the iPod provides value to consumers commensurate with the price it commands.[161] Contrary to Professor Noll's assertions, better products can command a price premium even in the absence of monopoly power. His inference that Apple has monopoly power in portable music players based on the pricing and success of Apple's iPod is unjustified and incorrect.

130. The market has been characterized by innovation. Over this period, the development of substitutes such as the smartphone and later the tablet computer, have given

157 [redacted].

158 [redacted]

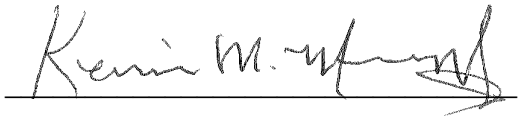
159 [redacted]

160 [redacted]

161 See, e.g., Apple_AIIA00455825 at -39; Apple_AIIA00493743.

consumers additional options to the iPod. While these were a relatively small factor in 2006, they have increased in importance and are now an important force in the market. Given the widespread success of these products in recent years, such alternatives need to be considered in any analysis of the relevant market. Professor Noll admits that smartphones were a plausible substitute for iPods.[162] But he says that they did not compete initially because they were not capable of quickly downloading music over the wireless carriers' networks. But he ignores the fact that iPods have never had that capability. Even the iPod touch could download music only over a Wi-Fi connection, not a mobile telephone network. Thus, from day one smartphones had the same ability to load music as iPods - by connecting them to a computer and syncing them through iTunes or by connecting to a Wi-Fi network. Evidencing this substitutability, Apple's iPods sales declined as iPhone sales grew. (See Exhibit 17.)

131. While these alternative products should be considered in such analysis, my conclusions do not depend upon whether these products are included in some hypothetical relevant market or not. It is the impact of the [redacted] on iPod owners that matters.



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[162] Noll Declaration, p. 27, note 35.

Exhibit 1
Apple Timeline

Date	Events
January 9, 2001	iTunes introduced for Mac
October 23, 2001	Original iPod: 5GB Memory; holds 1000 songs
July 17, 2002	Second-generation iPod (touch-sensitive scroll wheel) PC-based iPods
April 28, 2003	Third-generation iPod, 30GB model holds up to 7500 songs iTunes Music Store opens for Mac users; downloads cost 99 cents
October 16, 2003	iTunes and iTunes Music Store introduced for PC users
January 6, 2004	iPod Mini; in five colors
July 17, 2004	Fourth-generation iPod introduced
July 25, 2004	RealNetworks announces that Harmony software is compatible with the iPod
October 27, 2004	iTunes 4.7 released; update is optional
January 11, 2005	iPod Shuffle introduced; no screen or wheel
March 21, 2005	iTunes 4.7 update is now mandatory for all users who want to buy from iTMS
April 26, 2005	RealNetworks announces that Harmony software is once again compatible with the iPod
September 7, 2005	iPod Nano replaces Mini
October 12, 2005	Fifth-generation "video" iPod Classic iTunes store to sell music videos and TV shows iTunes 6.0 released
September 12, 2006	Second-generation iPod Nano released: smaller with color and aluminum skin iTunes store begins to sell movies Enhanced video capabilities available as update to iPod Classic 5th Generation Second-generation Shuffle: size of a postage stamp [redacted]
March 21, 2007	Apple TV: connects iTunes and Internet to television
April 2, 2007	iTunes store begins to sell music from EMI without DRM
June 29, 2007	iPhone introduced: touch-screen iPod, Internet navigator, and phone all in one
September 6, 2007	iPod Nano 3rd Generation Released, iPod Classic 6th Generation, and iPod Touch 1st Generation released iTunes 7.4 released, [redacted]
January 6, 2009	Apple announces that 80% of music at the iTMS is now DRM-free
March 31, 2009	iTunes store begins to sell all music without DRM
September 9, 2009	iTunes 9.0 released; adds GeniusMixes, HomeSharing, iTunes LPs and iTunes
March 30, 2010	iTunes 9.1 released; adds support for iPad
April 3, 2010	iPad released
September 1, 2010	iTunes 10 released; adds support for iPod Shuffle 4G, iPod Nano 6G, iPod Touch 4G, and Apple TV
June 6, 2011	iTunes 10.3 released; adds support for iCloud (Beta)
October 12, 2011	iCloud released

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http://www.apple.com/pr/library/2002/07/17Apple-Unveils-New-iPods.html
http://www.apple.com/pr/library/2003/04/28Apple-Introduces-New-iPods.html
http://www.apple.com/pr/library/2003/04/28Apple-Launches-the-iTunes-Music-Store.html
http://www.apple.com/pr/library/2003/10/16Apple-Launches-iTunes-for-Windows.html
http://www.apple.com/pr/library/2003/10/16Apple-Updates-iPod.html
http://www.apple.com/pr/library/2004/01/06Apple-Introduces-iPod-mini.html
http://www.apple.com/pr/library/2004/07/19Apple-Introduces-the-New-iPod.html
http://www.apple.com/pr/library/2005/09/07Apple-Introduces-iPod-nano.html
http://www.apple.com/pr/library/2005/10/12Apple-Unveils-the-New-iPod.html
http://www.apple.com/pr/library/2005/10/12Apple-Announces-iTunes-6-With-2-000-Music-Videos-Pixar-Short-Films-Hit-TV-Shows.html
http://www.apple.com/pr/library/2006/09/12Apple-Announces-iTunes-7-with-Amazing-New-Features.html
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Exhibit 1

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Exhibit 2
Industry Timeline

Date	Events
October 18, 1954	First ever portable transistor radio (Regency TR-1) introduced
July 1, 1979	Sony introduces the Walkman
November 1984	Sony introduces the Discman (portable CD player)
Summer 1998	The first commercially released digital music player in MP3 format is introduced
September 2000	Siemens SL45 launches as first mobile phone with memory expansion and an MP3 player
January 9, 2001	iTunes introduced for Mac
October 23, 2001	Original iPod
July 17, 2002	Second-generation iPod (touch-sensitive scroll wheel) PC-based iPods
April 28, 2003	Third-generation iPod, with four buttons above wheel iTunes Music Store opens for Mac users; downloads cost 99 cents
October 16, 2003	iTunes and iTunes Music Store introduced for PC users
January 6, 2004	iPod Mini; in five colors
May 5, 2004	Sony Connect is launched as a music store similar to iTunes
July 17, 2004	Fourth-generation iPod introduced
July 25, 2004	RealNetworks announces that its Harmony software will work with iPods
October 27, 2004	iTunes 4.7 released; Update is optional
January 11, 2005	iPod Shuffle introduced; no screen or wheel
March 21, 2005	iTunes 4.7 update is now mandatory for all users who want to buy from iTMS
March 23, 2005	PyMusique announced
April 26, 2005	RealNetworks announces that its Harmony software will work with iPods
July 21, 2005	Pandora Radio enters and begins streaming music
September 7, 2005	iPod Nano replaces Mini Motorola ROKR Released as First Mobile Phone with iTunes
October 12, 2005	Fifth-generation "video" iPod iTunes store to sell music videos and TV show iTunes 6.0 released
September 12, 2006	Second-generation iPod Nano released: smaller with color and aluminum skin iTunes store begins to sell movies Enhanced video capabilities available as update to iPod Classic 5th Generation Second-generation Shuffle: size of a postage stamp [redacted]
November 14, 2006	Microsoft introduces Zune
March 21, 2007	Apple TV: connects iTunes and Internet to television
April 2, 2007	iTunes store begins to sell music from EMI without DRM; cost: $1.29 per song
June 29, 2007	iPhone introduced: touch-screen iPod, Internet navigator, and phone all in one
September 6, 2007	iPod Nano 3rd Genereation Released, iPod Classic 6th Generation, and iPod Touch 1st Generation released [redacted]
September 25, 2007	Amazon launches public beta of Amazon MP3
January 11, 2008	Amazon MP3 is first online music store selling DRM-free music from all four major labels
January 6, 2009	Apple announces that 80% of music at the iTMS is now DRM-free
March 31, 2009	iTunes store begins to sell all music without DRM; cost: $1.29 per song
September 9, 2009	iTunes 9.0 released; adds GeniusMixes, HomeSharing, iTunes LPs and iTunes
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June 6, 2011	iTunes 10.3 released; adds support for iCloud (Beta)
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Exhibit 2

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http://en.wikipedia.org/wiki/IPad
http://en.wikipedia.org/wiki/Icloud

Exhibit 3
iTunes Update History

iTunes Version Update	Release Date	Major changes
1.0	1/9/2001	Original release based on SoundJam MP code
1.1	2/22/2001	External burners, improved visual effects, more supported CD burners
2.0	10/23/2001	Adds support for newly introduced iPod, CD burning improvements, equalizer/cross-fader/sound enhancer added
3.0	7/17/2002	Smart playlists, more song list categories (including the My Rating column)
4.0	4/28/2003	Adds support for new iTunes Music Store, AAC audio codec, DVD burning, music sharing, GUI improvements
4.1	10/16/2003	Music store/CD burning improvements, Windows support added, voice notes, on-the-go playlists.
4.2	12/18/2003	AOL accounts with music store, GUI, and performance improvements
4.5	4/28/2004	iMix, party shuffle, CD insert printing, music store improvements, WMA to AAC conversion (Windows only), Apple Lossless audio codec
4.6	6/9/2004	AirTunes support, minor improvements.
4.7	10/27/2004	Copying photos to iPod Photo, GUI/performance improvements, Windows taskbar minimizing, updated FairPlay in effort to block hacking of music from the iTMS
4.8	5/9/2005	Video support, international music stores supported, security enhancements
4.9	6/28/2005	Podcasting, Motorola ROKR E1 mobile phone support added
5.0	9/7/2005	GUI refined, search bar improvements, parental controls, smart shuffle, iPod Nano support
6.0	10/12/2005	GUI/music store changes, blocks DRM remover utilities, transfer videos to 5th generation iPod classic, included a complete redesign of FairPlay
7.0	9/12/2006	Video playback/purchasing improvements, iPod games, Major GUI changes, gapless playback and album, sync purchased content from iPod to computer, Cover Flow added, [redacted].
7.1	3/4/2007	Apple TV support, additional 2G shuffle support, GUI improvements, fixes Windows Vista issues, enhanced sorting options, full-screen Cover Flow
7.2	5/29/2007	Fully supports Vista, iTunes Plus introduced with 256 kbit/s DRM-free music tracks, iTunes U introduced which offers free content from some of the top universities around the United States. Also included GUI Update for Windows Vista
7.3	6/29/2007	Support for iPhone activation/synching, GUI changes/fixes. Changes sorting pattern
7.4	9/6/2007	Support for iPod Touch, Classic (6G), Nano (3G), and adds interface art for new iPod Shuffle colors. GUI improvements; [redacted]
7.5	11/5/2007	Allows activation of iPhones outside of the United States wherever activation is available, (e.g. United Kingdom and Germany) as well as security and stability fixes. Also included is a GUI update for Leopard, and the ability to add custom ringtones for free. Includes support for iPod game Phase. Shows iPod battery level in source list (iPod Nano 3G, iPod Classic, iPod Touch, and iPhone with 1.1.2 software)
7.6	1/15/2008	Rent movies from the iTunes Store. Transfer Apple TV purchases to your computer. Allows manual management of music on iPhones. Added support for Windows Vista 64-bit
7.7	7/10/2008	Support for iPhone 3G, iOS 2.0 and the new App Store which features application downloads for the iPhone and iPod Touch as well as enabling the two products to act as remotes for wireless iTunes control
8.0	9/9/2008	Genius Sidebar and playlists, Grid View, HD TV shows, Shows capacity of Apps on iPhone/iPod Touch on device summary tab, new default visualizer, more flexible podcast options and support for second generation iPod Touch and 4th generation iPod Nano

Exhibit 3

iTunes Version Update	Release Date	Major changes
8.1	3/11/2009	Support for the third generation iPod Shuffle, speed improvements for browsing large libraries and the iTunes Store, as well as 'preparing to sync' and 'optimizing photos' for syncing to iPods and iPhones, Party Shuffle has been replaced by iTunes DJ which now has the ability to receive requests for songs, the ability to import/convert files and CDs to iTunes Plus format, better performance when downloading iTunes Plus songs, accessibility improvements, Genius has been expanded to cover TV shows and movies, refined parental controls and refined auto-fill options. Supports Multi-touch gestures
8.2	6/1/2009	Supports iPhone 3GS and iOS 3.0 Software Update for the iPhone and iPod Touch. Includes many accessibility improvements and bug fixes
9.0	9/9/2009	New UI and redevelopment of the iTunes Store using WebKit. Genius Mixes were added, as were Home Sharing, iTunes LPs and iTunes Extras. Support for activation/syncing of iPod touch (late 2009). Music is automatically added to the library from a watched folder. 1-Click purchases.
9.1	3/30/2010	Adds support for iPad, adds the ability to sync and organize downloaded books between iPad and the iTunes library, and Genius Mixes can now be renamed, rearranged, or removed. "Applications" are renamed "Apps"
9.2	6/16/2010	Added ability to sync with iPhone 4. Also added ability to sync and read books with iPhone or iPod touch with iOS 4 and iBooks 1.1. Added ability to organize and sync PDF documents as books, and to read PDFs with iBooks 1.1 on iPad and any iPhone or iPod touch with iOS 4. Added option to organize your apps on iOS 4 home screens into folders using iTunes. Speed up back-ups while syncing an iPhone or iPod touch with iOS 4. Album artwork improvements make artwork appear more quickly when exploring your library
10.0	9/1/2010	Adds new social networking layer named "Ping". Adds support for iPod shuffle 4G, iPod nano 6G, iPod touch 4G, and Apple TV (late 2010). Renamed AirTunes to AirPlay. Adds visual improvements to list view. Improves performance. Adds additional support for VoiceOver Kit for iPod. New application icon.
10.1	11/12/2010	Bug fixes. Streaming to AirTunes speakers working again. Adds Twitter connectivity to Ping. Adds printing support and support for devices running iOS 4.2
10.2	4/18/2011	Adds support for iPad 2, and iOS 4.3. Improves Home Sharing, allowing browsing and playback of entire iTunes libraries on devices running iOS 4.3, and brings back the colored icons in the Preferences window
10.3	6/6/2011	Adds support for iTunes in the Cloud (beta), allowing automatic downloading of purchased content between iTunes and iOS devices, and downloading previously purchased music. Adds support for iBookstore on the iTunes Store
10.4	7/20/2011	Adds support for Mac OS X Lion. It now allows users to take advantage of the Full-Screen App capability. GUI slightly improved. Better integration with Windows Vista and Windows 7 (Aero effects support).
10.5	10/11/2011	Adds support for iPhone 4S, iCloud, iTunes in the Cloud, Wi-Fi Syncing, and iOS 5.
10.6	3/7/2012	Adds support for iPad (3rd generation). Adds the ability to play 1080p HD movies and TV shows from the iTunes Store. Higher bit rate songs can be converted to 128, 196, or 256 kbit/s when syncing to iOS devices or iPods. Improvements for iTunes Match. Bug fixes

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Exhibit 3

Sources (cont.):

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http://www.apple.com/pr/library/2005/10/12Apple-Announces-iTunes-6-With-2-000-Music-Videos-Pixar-Short-Films-Hit-TV-Shows.html
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Exhibit 4
Evolution of iPod Features

Model Update	Release Date	Major Changes
iPod Classic: Original iPod introduced October 23, 2001		
iPod P68 Oct01	10/23/2001	First iPod introduced; portable device design; large capacity; featured Auto-Sync technology Available capacity: 5GB
iPod P95 Mar02	3/21/2002	Added 10 GB model to the family; users now can personalize their iPods with the laser engraving Available capacity: 5GB, 10GB
iPod P68A/97 Jul02	7/17/2002	Introduced 20 GB model; compatible with Windows; 10GB model is physically smaller than the previous comparable models Available capacity: 10GB, 20GB
iPod Q14 Apr03	4/28/2003	Introduced 15 GB and 30 GB models; smaller and lighter than earlier iPods; prices are lower than previous comparable models Available capacity: 10GB, 15GB, 30GB
iPod Q14A Sep03	9/8/2003	Upgraded 15 GB and 30 GB models to 20 GB and 40 GB, respectively, while keeping the same introduction prices Available capacity: 10GB, 20GB, 40GB
iPod Q14A Sep03	1/6/2004	Added 15 GB back to the family; 15 GB model is smaller, lighter, and costs less than previous comparable models Available capacity: 10GB, 15GB, 20GB, 40GB
iPod Q21 Jul04	7/19/2004	New 20 GB and 40 GB models have longer battery life and are in smaller sizes than the previous comparable models Available capacity: 20GB, 40GB
iPod Photo P98 Oct04	10/26/2004	Allow photo browsing on the high-resolution color screeen; have more memory Available capacity: 40GB, 60GB
iPod Photo P98A Feb05	2/23/2005	Replaced the 40 GB model with the 30 GB model; longer battery life Available capacity: 30GB, 60GB
iPod Photo P98A Feb05	6/28/2005	Merged iPod and iPod photo lines; all iPods now equiped with color display Available capacity: 20GB, 60GB
iPod Video M25 Oct05	10/12/2005	Enhanced color display with larger screen and higher resolution; smaller and lighter; faster battery recharge; introduced at lower prices Available capacity: 30GB, 60GB
iPod Video M25B Sep06	9/12/2006	Upgraded 60 GB model to 80 GB while maintaining the same size; enhanced color display with larger screen and higher resolution; supported video playback; increased game support; longer battery life for the 30 GB model than the previous comparable models; lower introduction price Available capacity: 30GB, 80GB
iPod Classic N25 Sep07	9/5/2007	Introduced the 160 GB model; longer battery life for music, photo, and video playback while keeping the same introduction prices Available capacity: 80GB, 160GB
iPod Classic N25B Sep08	9/9/2008	Introduction at same price as 80 GB model of iPod Video M25B in Sep07 Available capacity: 120GB
iPod Classic N25C Sep09	9/9/2009	Greater capacity while keeping the introduction price the same as the 120 GB model of iPod Classic N25B Sep08 Available capacity: 160GB

Exhibit 4

Model Update	Release Date	Major Changes
iPod Mini: Introduced January 6, 2004		
iPod Mini Q22 Jan04	1/6/2004	Introduced iPod mini, smallest portable music player available; lightweight; new design in various colors; touch-sensitive click wheel controller; large capacity Available capacity: 4GB
iPod Mini Q22B Feb05	2/23/2005	Added 6GB model; lower introduction prices; longer battery life Available capacity: 4GB, 6GB
iPod Nano: Introduced September 7, 2005 to replace iPod Mini		
iPod Nano M26 Sep05	9/7/2005	Available in black and white for both Mac and Windows users; held 1000 songs; thinner than a standard #2 pencil; supported photo playback Available capacity: 2GB, 4GB
iPod Nano M26 Sep05	2/7/2006	Introduced the 1 GB model Available capacity: 1GB, 2GB, 4GB
iPod Nano N36 Sep06	9/12/2006	Introduced 8 GB model at same price as 4 GB model from the first generation Nano; longer battery life; improved screen resolution; aluminum body with click wheel; smaller and lighter; additional colors; lower prices for 2 GB and 4 GB models Available capacity: 2GB, 4GB, 8GB
iPod Nano N46 Sep07	9/5/2007	New design; enhanced video user interface; larger screen with higher resolution; supported video playback Available capacity: 4GB, 8GB
iPod Nano N58 Sep08	9/9/2008	Additional colors; new design with a curved aluminum and glass enclosure; incorporate "Genius" technology; lower introduction prices than previous comparable models Available capacity: 8GB, 16GB
iPod Nano N33 Sep09	9/9/2009	New design; built-in video camera; larger screen with higher resolution; lower introduction prices than previous comparable models Available capacity: 8GB, 16GB
iPod Nano N20 Sep10	9/1/2010	New design; multi-touch interface; smaller and lighter than previous comparable models at same introduction prices Available capacity: 8GB, 16GB
iPod Shuffle: Introduced January 11, 2005		
iPod Shuffle Q98 Jan05	1/11/2005	smaller and lighter than any other iPods; 512 MB model for under $100. Available capacity: 512MB, 1GB
iPod Shuffle N98 Sep06	9/12/2006	Built-in clip; smaller, lighter, and more affordable than previous comparable model Available capacity: 1GB
iPod Shuffle N98A Jan07	1/30/2007	Additional colors; built-in clip; smaller, lighter, and more affordable than the previous comparable model Available capacity: 1GB
iPod Shuffle N98C Sep07	9/5/2007	New colors Available capacity: 1GB
iPod Shuffle N98E Feb08	2/19/2008	New colors; higher capacity while maintaining the same size and weight at a lower introduction price than the 1 GB model of iPod Shuffle N98C Sep07; reduced price of 1 GB model Available capacity: 2GB
iPod Shuffle N98F Sep08	9/9/2008	New colors; lower prices Available capacity: 1GB, 2GB
iPod Shuffle D98 Mar09	3/11/2009	Greater capacity; smaller and lighter; faster battery recharge Available capacity: 4GB

Exhibit 4

Model Update	Release Date	Major Changes
iPod Shuffle D55 Sep09/ iPod Shuffle D98A Sep09	9/9/2009	Lower price; button controller with voice over; in-ear headphones with remote Available capacity: 2GB, 4GB
iPod Shuffle N12 Sep10	9/1/2010	New design Available capacity: 2GB
iPod Touch: Introduced September 5, 2007		
iPod Touch N45 Sep07	9/5/2007	Multi-touch interface; built-in wifi wireless networking; 3.5-inch display; longer battery life for audio and video playback Available capacity: 8GB, 16GB
iPod Touch N45 Sep07	2/5/2008	Introduced 32 GB model Available capacity: 8GB, 16GB, 32GB
iPod Touch N72 Sep08	9/9/2008	New design; longer battery life for audio and video playback; lighter than previous comparable models Available capacity: 8GB, 16GB, 32GB
iPod Touch N18 Sep09/ iPod Touch N72B Sep09	9/9/2009	Introduced 64 GB model; new design; longer battery life for audio and video playback; lighter and lower introduction prices than the previous comparable models; greater memory and onboard RAM capacity for 32 GB and 64 GB models Available capacity: 8GB, 32GB, 64GB
iPod Touch N81 Sep10	9/1/2010	Higher screen resolution; included front-facing camera for FaceTime; longer battery life for audio and video playback; lighter and smaller than previous comparable models Available capacity: 8GB, 32GB, 64GB

Sources: iPod characteristics data in Murphy/Topel reports, Wikipedia and Apple press releases, including:

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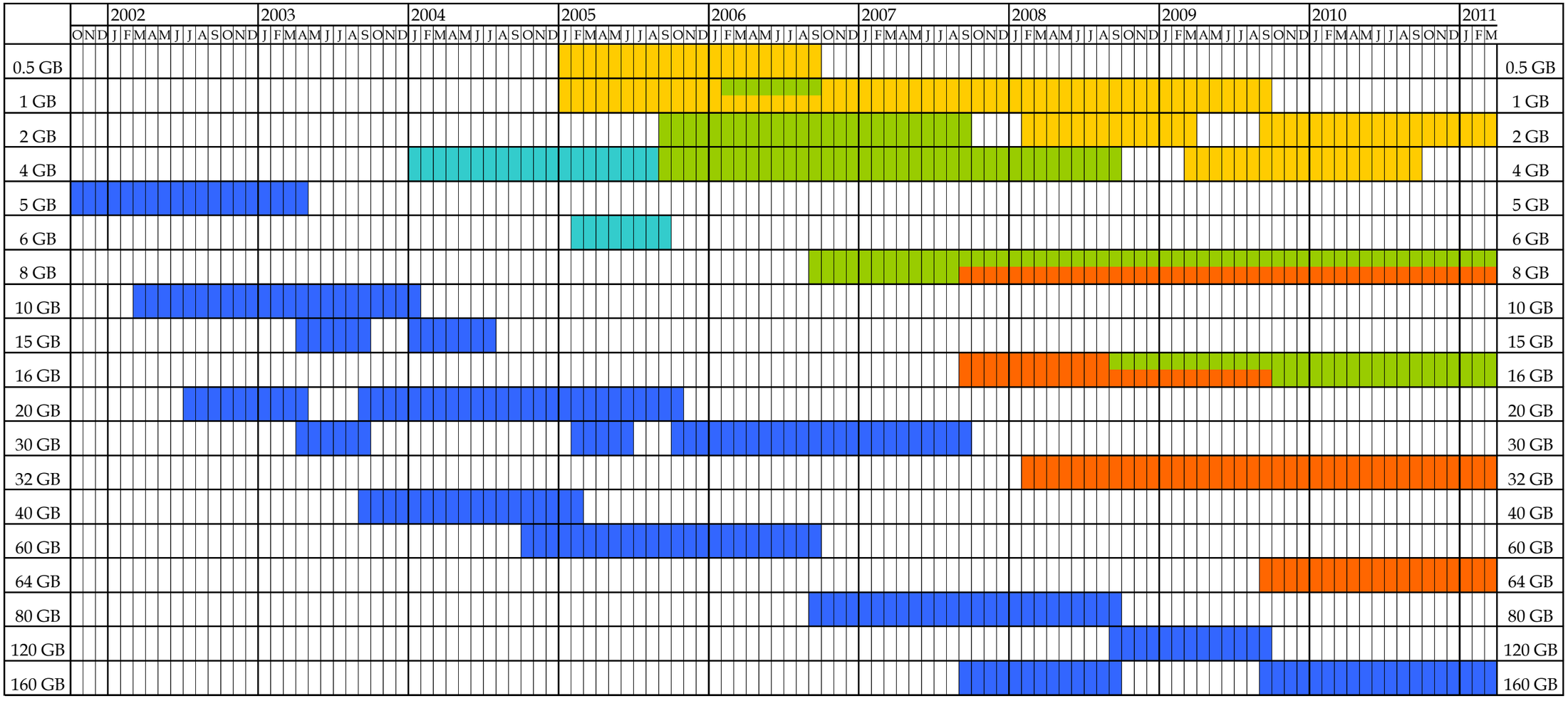
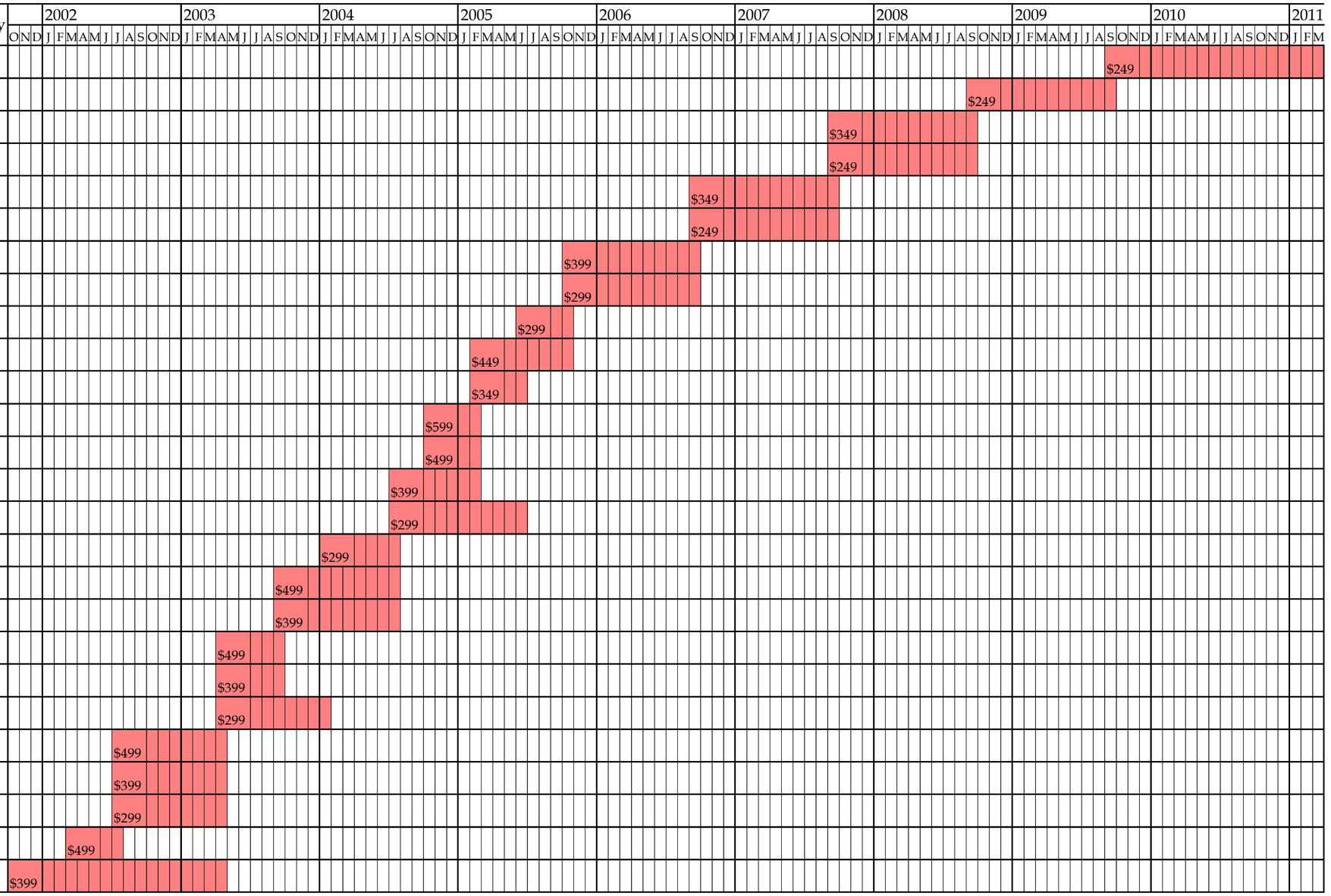
Exhibit 5
iPod Timeline by Memory Size



Note: Special editions of U2, Harry Potter, and Product Red are excluded from this exhibit.
Source: Price change data, Price Committee Documents, Apple Press Release, Direct Sales Data, Everymac.com.

Exhibit 6a
iPod Timeline of iPod Classic

Family	Start Date	Memory
IPOD CLASSIC N25C GOOD	9/9/2009	160
IPOD CLASSIC N25B GOOD	9/9/2008	120
IPOD CLASSIC N25 BETTER	9/5/2007	160
IPOD CLASSIC N25 GOOD	9/5/2007	80
IPOD VIDEO M25B BEST	9/12/2006	80
IPOD VIDEO M25B BETTER	9/12/2006	30
IPOD VIDEO M25 BEST	10/12/2005	60
IPOD VIDEO M25 BETTER	10/12/2005	30
IPOD PHOTO P98A GOOD	6/28/2005	20
IPOD PHOTO P98A BEST	2/23/2005	60
IPOD PHOTO P98A BETTER	2/23/2005	30
IPOD PHOTO P98 BEST	10/26/2004	60
IPOD PHOTO P98 BETTER	10/26/2004	40
IPOD Q21 BEST	7/19/2004	40
IPOD Q21 BETTER	7/19/2004	20
IPOD Q14B GOOD	1/6/2004	15
IPOD Q14A BEST	9/8/2003	40
IPOD Q14A BETTER	9/8/2003	20
IPOD Q14 BEST	4/28/2003	30
IPOD Q14 BETTER	4/28/2003	15
IPOD Q14 GOOD	4/28/2003	10
IPOD P97 BEST	7/17/2002	20
IPOD P97 BETTER	7/17/2002	10
IPOD P68A GOOD	7/17/2002	5
IPOD P95 BETTER	3/21/2002	10
IPOD P68 GOOD	10/23/2001	5



Note: Special editions of U2, Harry Potter, and Product Red are excluded from this exhibit.
Source: Price change data, Price Committee Documents, Apple Press Release, Direct Sales Data, Everymac.com.

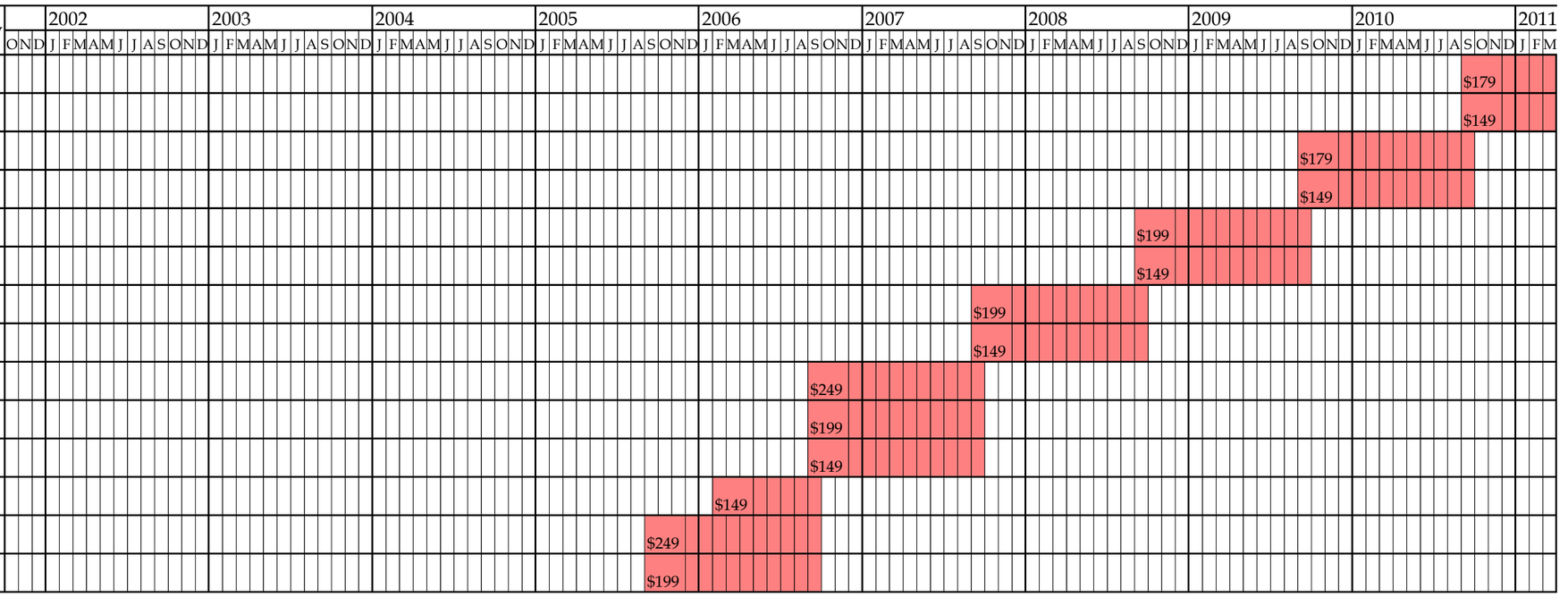
Exhibit 6b
iPod Timeline of iPod Mini

Family	Start Date	Memory	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
			O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M
IPOD MINI Q22B BEST	2/23/2005	6				$249						
IPOD MINI Q22B BETTER	2/23/2005	4				$199						
IPOD MINI Q22 BEST	1/6/2004	4			$249							

Note: Special editions of U2, Harry Potter, and Product Red are excluded from this exhibit.
Source: Price change data, Price Committee Documents, Apple Press Release, Direct Sales Data, Everymac.com.

Exhibit 6c
iPod Timeline of iPod Nano

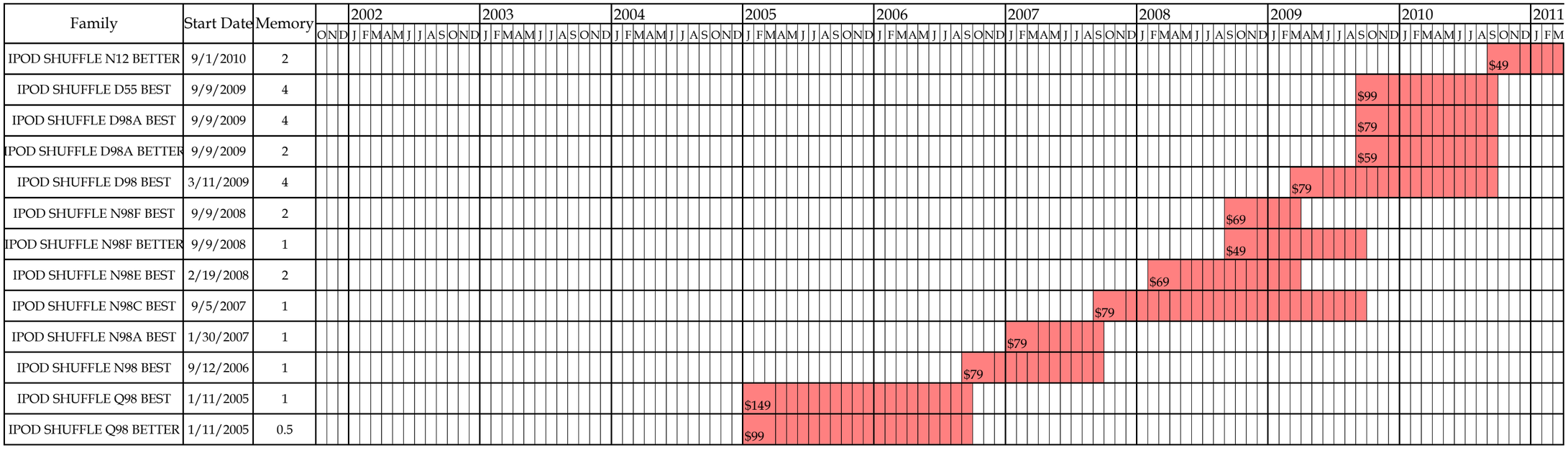
Family	Start Date	Memory
IPOD NANO N20 BEST	9/1/2010	16
IPOD NANO N20 BETTER	9/1/2010	8
IPOD NANO N33 BETTER	9/9/2009	16
IPOD NANO N33 GOOD	9/9/2009	8
IPOD NANO N58 ULTIMATE	9/9/2008	16
IPOD NANO N58 BEST	9/9/2008	8
IPOD NANO N46 BEST	9/5/2007	8
IPOD NANO N46 BETTER	9/5/2007	4
IPOD NANO N36 BEST	9/12/2006	8
IPOD NANO N36 BETTER	9/12/2006	4
IPOD NANO N36 GOOD	9/12/2006	2
IPOD NANO M26C GOOD	2/7/2006	1
IPOD NANO M26 BEST	9/7/2005	4
IPOD NANO M26 BETTER	9/7/2005	2



Note: Special editions of U2, Harry Potter, and Product Red are excluded from this exhibit.
Source: Price change data, Price Committee Documents, Apple Press Release, Direct Sales Data, Everymac.com.

Exhibit 6d
iPod Timeline of iPod Shuffle

Family	Start Date	Memory
IPOD SHUFFLE N12 BETTER	9/1/2010	2
IPOD SHUFFLE D55 BEST	9/9/2009	4
IPOD SHUFFLE D98A BEST	9/9/2009	4
IPOD SHUFFLE D98A BETTER	9/9/2009	2
IPOD SHUFFLE D98 BEST	3/11/2009	4
IPOD SHUFFLE N98F BEST	9/9/2008	2
IPOD SHUFFLE N98F BETTER	9/9/2008	1
IPOD SHUFFLE N98E BEST	2/19/2008	2
IPOD SHUFFLE N98C BEST	9/5/2007	1
IPOD SHUFFLE N98A BEST	1/30/2007	1
IPOD SHUFFLE N98 BEST	9/12/2006	1
IPOD SHUFFLE Q98 BEST	1/11/2005	1
IPOD SHUFFLE Q98 BETTER	1/11/2005	0.5



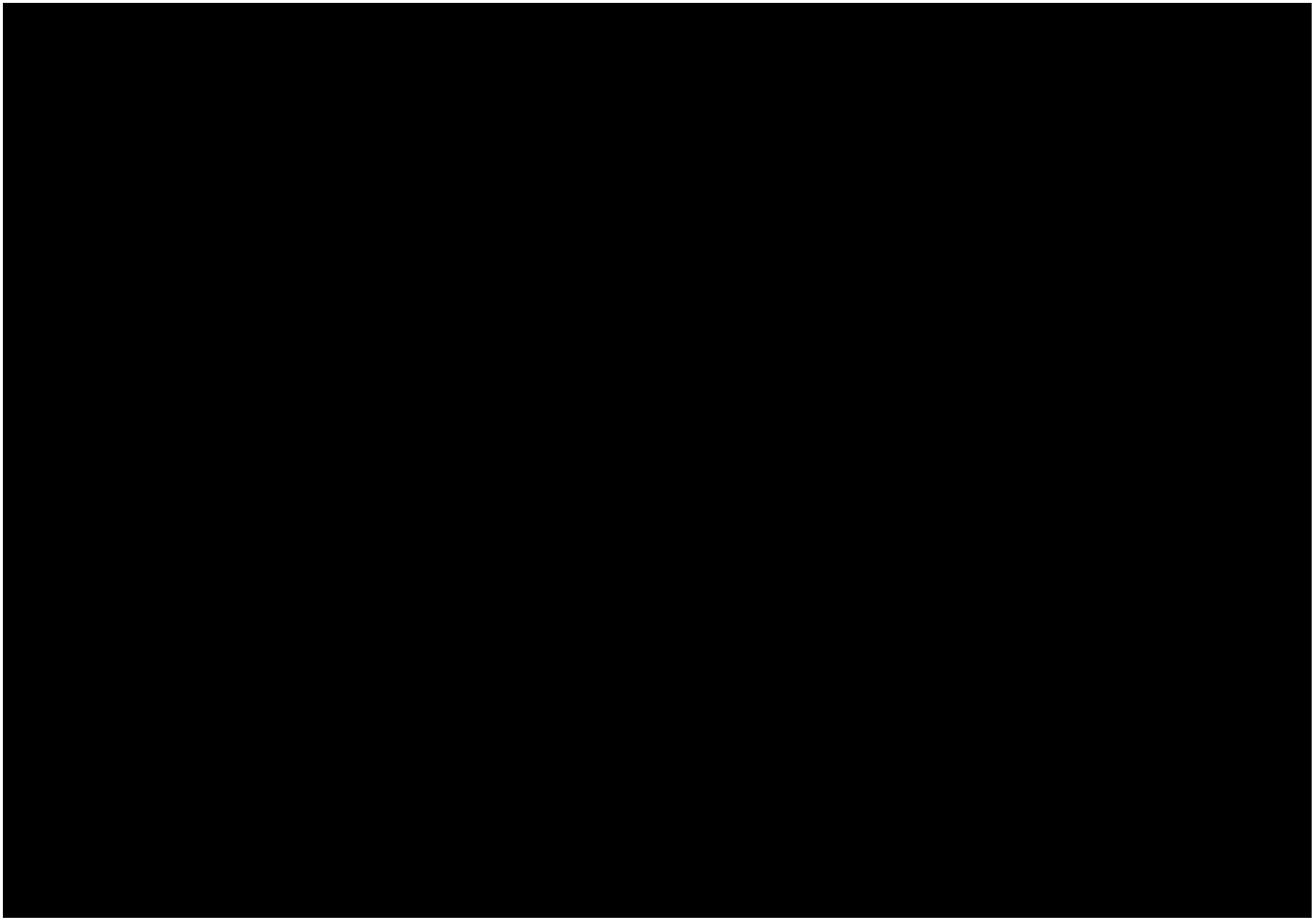
Note: Special editions of U2, Harry Potter, and Product Red are excluded from this exhibit.
Source: Price change data, Price Committee Documents, Apple Press Release, Direct Sales Data, Everymac.com.

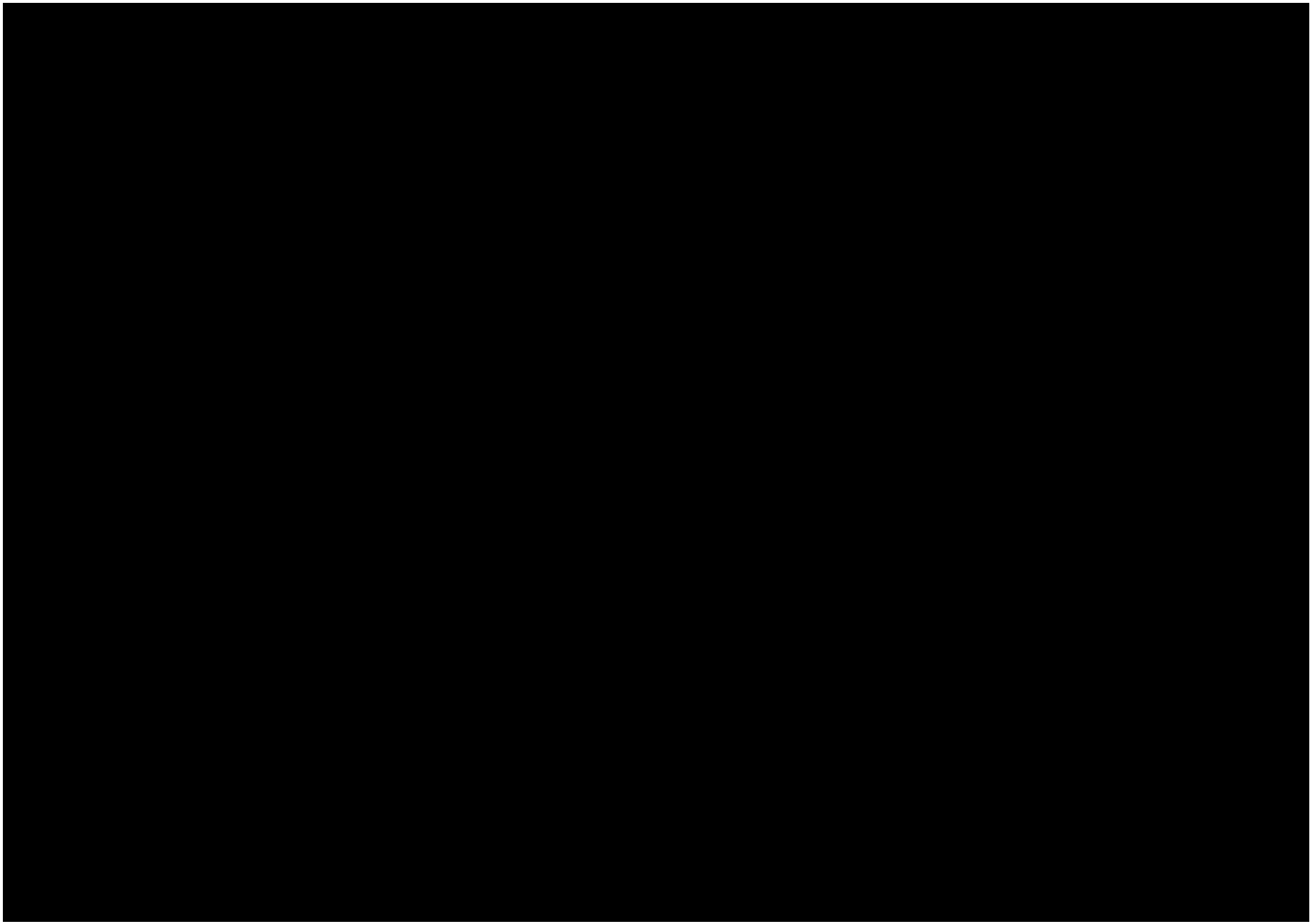
Exhibit 6e
iPod Timeline of iPod Touch

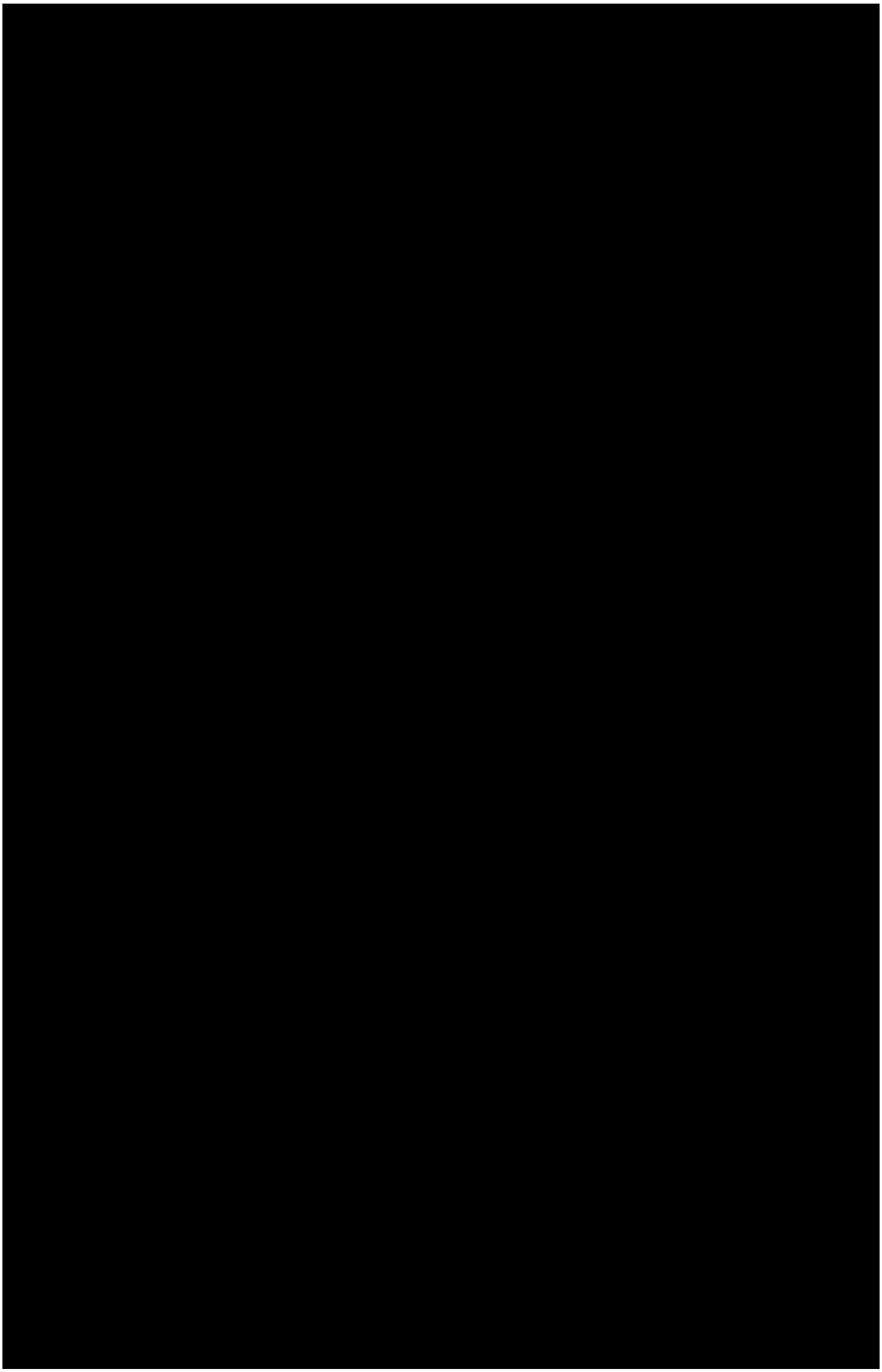
Family	Start Date	Memory	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
			O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M
IPOD TOUCH N81 BEST	9/1/2010	64									$399	
IPOD TOUCH N81 BETTER	9/1/2010	32									$299	
IPOD TOUCH N81 GOOD	9/1/2010	8									$229	
IPOD TOUCH N18 BEST	9/9/2009	64								$399		
IPOD TOUCH N18 BETTER	9/9/2009	32								$299		
IPOD TOUCH N72B GOOD	9/9/2009	8								$199		
IPOD TOUCH N72 BEST	9/9/2008	32							$399			
IPOD TOUCH N72 BETTER	9/9/2008	16							$299			
IPOD TOUCH N72 GOOD	9/9/2008	8							$229			
IPOD TOUCH N45A BEST	2/5/2008	32							$499			
IPOD TOUCH N45 BETTER	9/5/2007	16						$399				
IPOD TOUCH N45 GOOD	9/5/2007	8						$299				

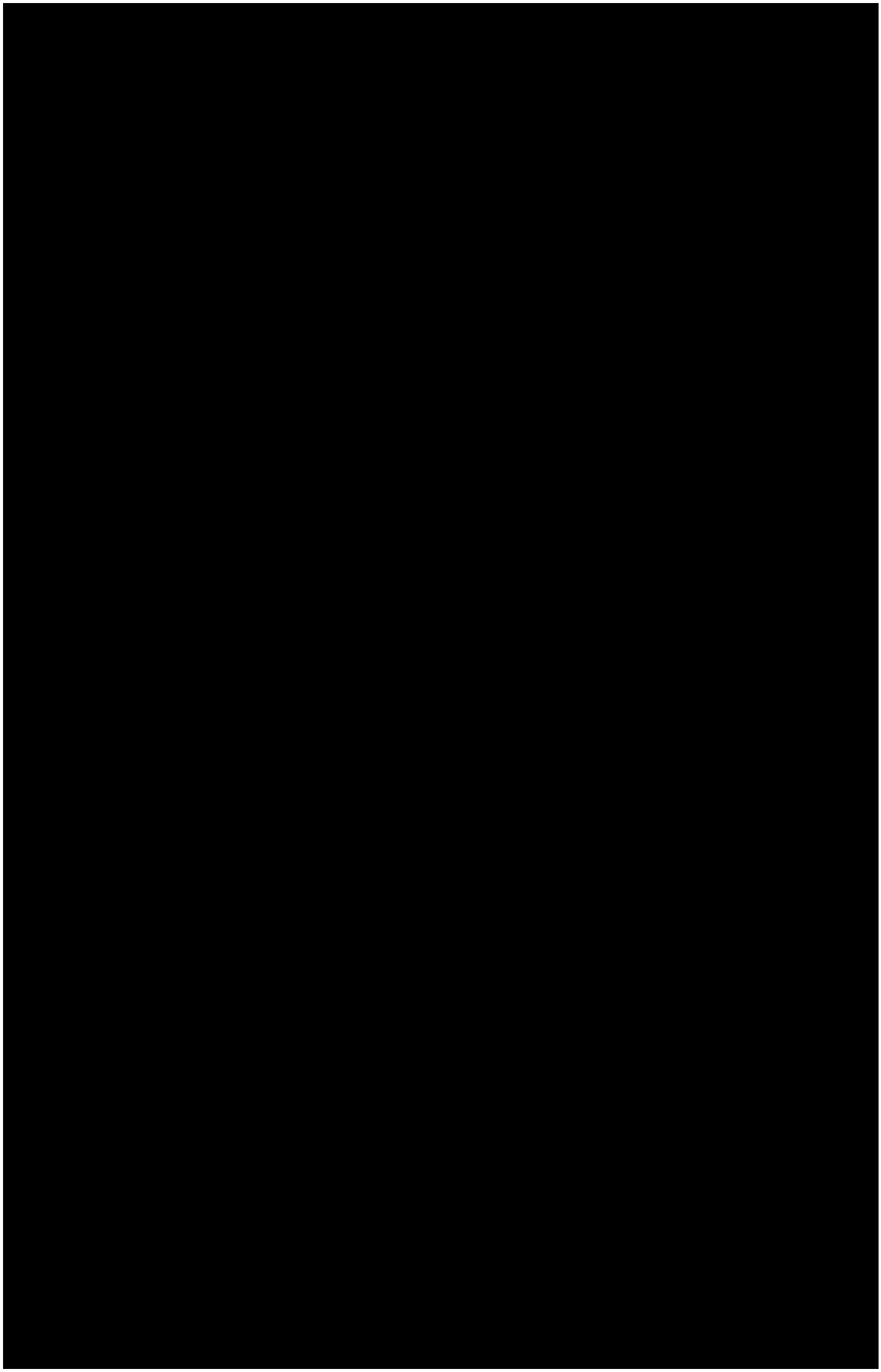
Note: Special editions of U2, Harry Potter, and Product Red are excluded from this exhibit.

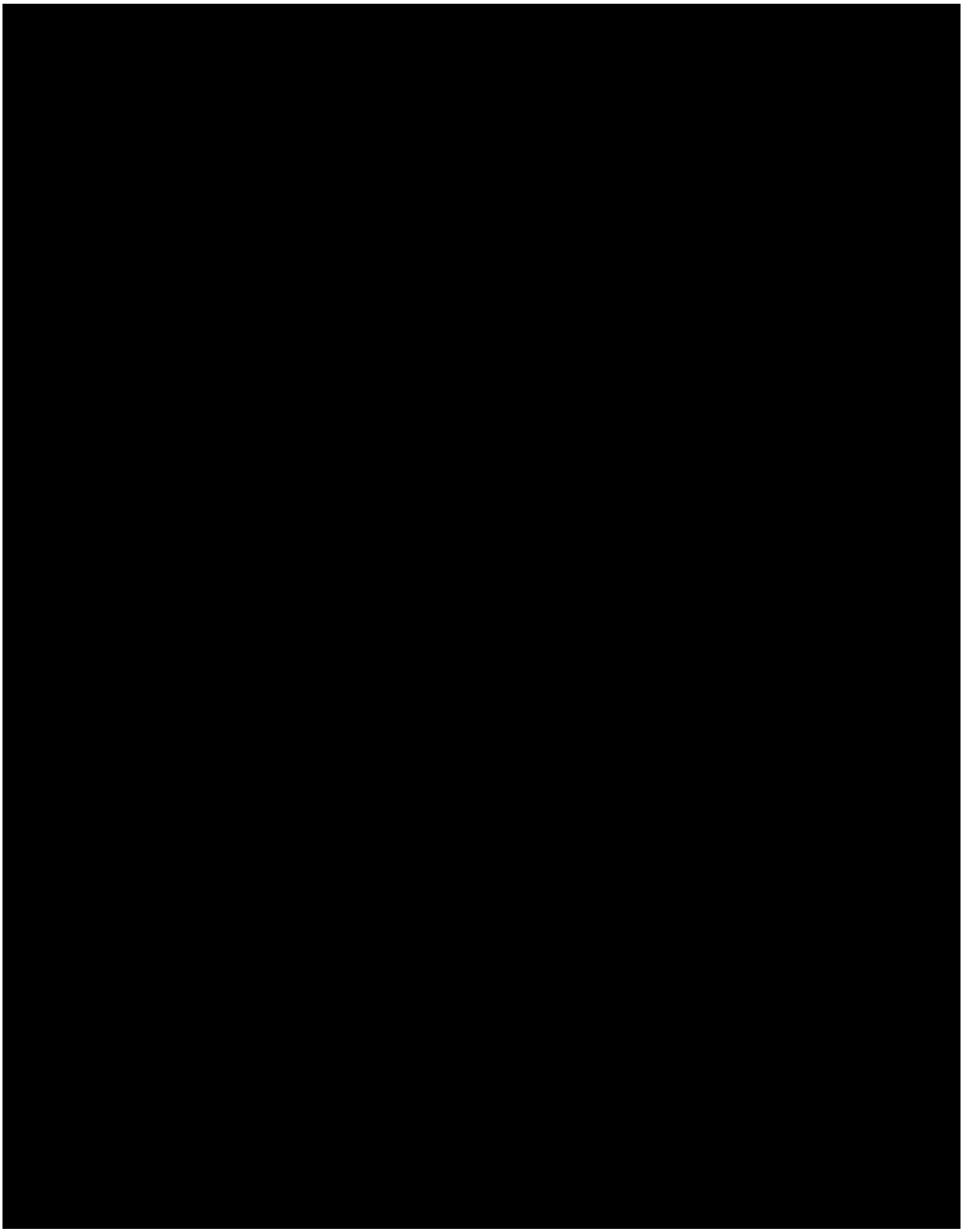
Source: Price change data, Price Committee Documents, Apple Press Release, Direct Sales Data, Everymac.com.











[redacted]

Exhibit 9

Sources:	Source 1	Source 2	Source 3	Source 4
Addictech	http://www.trademarkia.com/addictech-76553281.html	http://www.gizmag.com/go/7269/		
Amazon MP3	http://en.wikipedia.org/wiki/Amazon_MP3			
Amie Street	http://en.wikipedia.org/wiki/Amie_Street			
Arkade	http://www.arkade.com/			
artistxite	http://artistxite.com/	http://musowiki.net/index.php/ArtistXite	http://website.informer.com/artistxite.com	
Batanga (eLatinMusic)	http://www.bizjournals.com/triad/stories/2006/11/06/story6.html?page=all	http://www.batanganetwork.com/batanga-inc-announces-seamless-music-purchase-experience-linked-directly-with-		
Beatport	http://en.wikipedia.org/wiki/Beatport	http://www.beatport.com/		
Bleep.com	http://en.wikipedia.org/wiki/Bleep.com			
Boomkat	http://www.boomkat.com/	http://www.webwiki.com/boomkat.com		
BuyMusic	http://en.wikipedia.org/wiki/BuyMusic	http://usatoday30.usatoday.com/tech/news/2003-07-28-buymusic_x.htm	http://www.underconsideration.com/speakup/archives/001534.html	
CDBaby	http://www.cdbaby.com/About	http://en.wikipedia.org/wiki/CD_Baby		
Cdigix	http://en.wikipedia.org/wiki/Cdigix			
Classical Archives	http://www.classicalarchives.com/about.html	http://en.wikipedia.org/wiki/Classical_Archives		
Digital-Tunes	http://www.digital-tunes.net/	http://www.prleap.com/pr/73840/		
Discogs	http://en.wikipedia.org/wiki/Discogs			
eBay Digital Music Center	http://news.cnet.com/eBay-plugs-into-digital-music-market/2100-1025_3-5270681.html	http://www.ebaychatter.com/the_chatter/2008/03/digital-downloa.html		
eMusic	http://en.wikipedia.org/wiki/Emusic	http://www.emusic.com/listen/#/		
FYE Download Zone	http://www.trademarkia.com/fye-download-zone-78763697.html	http://www.prnewswire.com/news-releases/trans-world-entertainment-announces-launch-of-fye-download-zone-74257247.html	http://www.billboard.biz/bbbiz/retail/trans-world-to-launch-digital-service-1003571570.story	
GoMusicNow	http://en.wikipedia.org/wiki/GoMusicNow	http://hardnews1.ansci.usu.edu/archive/dec2006/121306_15cents.html		
Grazemusic	http://www.billboard.biz/bbbiz/retail/trans-world-to-launch-digital-service-1003571570.story	http://news.minnesota.publicradio.org/features/2005/10/26_horwichj_graze/		
HDtracks	https://www.hdtracks.com	http://www.berkleegroove.com/2010/04/29/david-chesky-hd-tracks/	http://en.wikipedia.org/wiki/Chesky_Records	
iMesh	http://en.wikipedia.org/wiki/Imesh			
Indieburn	http://www.prweb.com/releases/2005/07/prweb258343.htm			
iTunes Music Store	http://en.wikipedia.org/wiki/ITunes_Store			
Jamendo	http://www.jamendo.com/en	http://en.wikipedia.org/wiki/Jamendo		
Juno / Juno Download	http://en.wikipedia.org/wiki/Juno_Records	http://www.junodownload.com/	http://www.junodownload.com/welcome_to_junodownload/	

Exhibit 9

Sources:	Source 1	Source 2	Source 3	Source 4
Kazaa	http://deadspin.com/titus-young-will-take-a-nap-in-your-at-t-store-496122722?utm_campaign=socialflow_deadspin_twitter&utm_source=deadspin_twitter&utm_medium=socialflow			
Lifeway Stores	http://www.baptiststandard.com/index.php?option=com_content&task=view&id=1249&Itemid=131			
LimeWire	http://en.wikipedia.org/wiki/LimeWire			
Misrolas	http://www.billboard.com/features/misrolas-com-shuts-download-store-1003844475.story#/features/misrolas-com-shuts-download-store-1003844475.story	http://www.theorchard.com/news/2005_08C.htm	http://www.billboard.com/features/misrolas-mobile-links-with-at-t-1003716969.story	
mMode Music Store	http://news.cnet.com/AT38T-Wireless-opens-mobile-music-store/2100-1027_3-5396072.html?tag=item	http://www.phonenews.com/cingular-to-shut-down-mmode-lbs-services-1117/	http://en.wikipedia.org/wiki/MMode	
Morpheus	http://en.wikipedia.org/wiki/Morpheus_(software)			
mp3tunes.com	http://www.mp3tunes.com/cb/about/	http://news.cnet.com/MP3tunes.com-shuns-digital-rights-management/2100-1027_3-5569293.html		
Mperia	http://en.wikipedia.org/wiki/BitPass			
MSN Music	http://en.wikipedia.org/wiki/MSN_Music	http://news.cnet.com/8301-10784_3-9926476-7.html		
Music Giants	http://www.stereophile.com/news/more_on_musicgiants/index.html	http://www.wired.com/listening_post/2007/09/musicgiants-a-h/		
Music Rebellion	http://keynet.blogs.com/networks/2004/01/psychology_schm.html	http://www.avsforum.com/t/365725/is-http-www-musicrebellion-com-legal-in-usa	http://web.archive.org/web/20060425071714/http://www.musicrebellion.com/	
Musica360	http://www.latinrapper.com/news_october25d.html	http://www.cnet.com/profile/Musica360.com/	http://web.archive.org/web/20070312054839/http://musica360.com/store/aboutus.php	
MusicNOW	http://www.internetretailer.com/2003/11/10/best-buy-music-now-launch-digital-music-store	http://news.cnet.com/aols-got-musicnow/2100-1027_3-5930749.html	http://www.pcworld.com/article/128520/aol_scraps_music_now_in_favor_of_napster.html	http://reviews.cnet.com/music-services/fullaudio-music-now/4505-9240_7-30974743-2.html
Napster 2.0	http://news.cnet.com/8301-17938_105-9945987-1.html	http://en.wikipedia.org/wiki/Napster_(pay_service)	http://techcrunch.com/2011/10/06/jon-irwin-on-why-rhapsody-bought-napster/	
National Geographic World Music	http://press.nationalgeographic.com/2006/08/03/worldmusicchanneldeliverssoundtrackoftheworldwithfreedownloads/	http://worldmusic.nationalgeographic.com/		
Optus Music Store	http://en.wikipedia.org/wiki/Optus_Music_Store			
Pandora Radio	http://www.tech-recipes.com/rx/1391/pandora_how_to_rip_save_music_mp3/	http://lifehacker.com/232533/download-of-the-day-pandora-downloader-windows	http://lifehacker.com/219114/download-of-the-day-pandoras-jar-windows?tag=softwarepandora	
Pass Along	http://en.wikipedia.org/wiki/PassAlong_Networks			
PayPlay.FM	http://en.wikipedia.org/wiki/PayPlay.FM			

Exhibit 9

Sources:	Source 1	Source 2	Source 3	Source 4
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Philadelphia Orchestra	http://www.philorch.org/recordings/	http://www.playbillarts.com/news/article/5262.html		
PlayNow	http://en.wikipedia.org/wiki/PlayNow_Arena	http://www.javamidlet.com/2007/11/09/playnow-music-download-service.html	http://news.cnet.com/8301-1023_3-10049186-93.html	
Puretracks	http://en.wikipedia.org/wiki/Puretracks	http://us.puretracks.com/content/viewer.aspx?cid=GlobalNav_Home		
RCN Music	http://music.rcn.net/	http://www.businesswire.com/news/home/20061117005100/en/RCN-Reaches-Enhance-Music-Game-Content-Choices		
Rhapsody (Started as Listen.com)	http://en.wikipedia.org/wiki/Rhapsody_(online_music_service)			
Rhino Entertainment	http://www.rhino.com/global/faq#restrictions_on_digital	http://www.allamericanpatriots.com/48735056_music_led_zeppelin_rocks_over_air_verizon_wireless		
Songtouch	http://www.songtouch.com/	http://christianmusic.about.com/od/top10songtouchsongs/tp/tpSTsgl41805.htm	http://www.gazette.com/articles/music-15226-christian-songtouch.html	
Sony Connect	http://en.wikipedia.org/wiki/Sony_Connect	http://downloadsquad.switched.com/2007/08/30/sony-kills-off-connect-online-music-store-atrac-format/		
Streamwaves	http://en.wikipedia.org/wiki/Streamwaves			
Tower Records Digital	http://www.ipodobserver.com/ipo/article/Tower_Records_Digital_Joins_Music_Download_Market/	http://www.dmwmedia.com/news/tag/tower_records		
Traxsource	http://www.traxsource.com/index.php?act=page&page_id=311			
TVT Records	http://en.wikipedia.org/wiki/TVT_Records			
URGE	http://en.wikipedia.org/wiki/URGE_(digital_music_service)	http://www.pcmag.com/article2/0,2817,2009421,00.asp	http://betanews.com/2007/07/24/drm-free-mp3s-coming-to-yahoo-urge/#comments	
Virgin Digital	http://en.wikipedia.org/wiki/Virgin_Digital			
Vitaminic Music Club	http://www.prnewswire.com/news-releases/epo-technology-announces-bundle-agreement-with-vitaminic-to-add-instant-music-access-to-the-vitaminic-music-club-76927317.html	http://www.vitaminic.co.uk/press-releases.html		
Voy Music	http://www.dmwmedia.com/news/2006/06/08/starmedia-voy-music-launch-latin-digital-music-service	http://www.hispanicbusiness.com/2005/11/21/voyr_announces_launch_of_voy_musictm.htm	http://www.dmwmedia.com/news/tag/voy	
Wal-Mart	http://www.macobserver.com/tmo/article/Inside_Wal-Marts_Online_Music_Store_Digital_Rights_Management/	http://arstechnica.com/business/2011/08/walmart-pulling-the-plug-on-its-mp3-store-but-not-its-drm-servers/	http://tech.fortune.cnn.com/2011/08/10/itunes-triumphant-walmart-kills-its-music-download-store/	
Yahoo! Music Unlimited	http://en.wikipedia.org/wiki/Yahoo!_Music_Unlimited	http://www.informationweek.com/news/191000022		

Exhibit 9

Sources:	Source 1	Source 2	Source 3	Source 4
YouTube	http://labnol.blogspot.com/2007/04/how-to-rip-audio-from-youtube-videos.html			
Zune Marketplace	http://en.wikipedia.org/wiki/Zune	http://www.zune.net/en-US/		

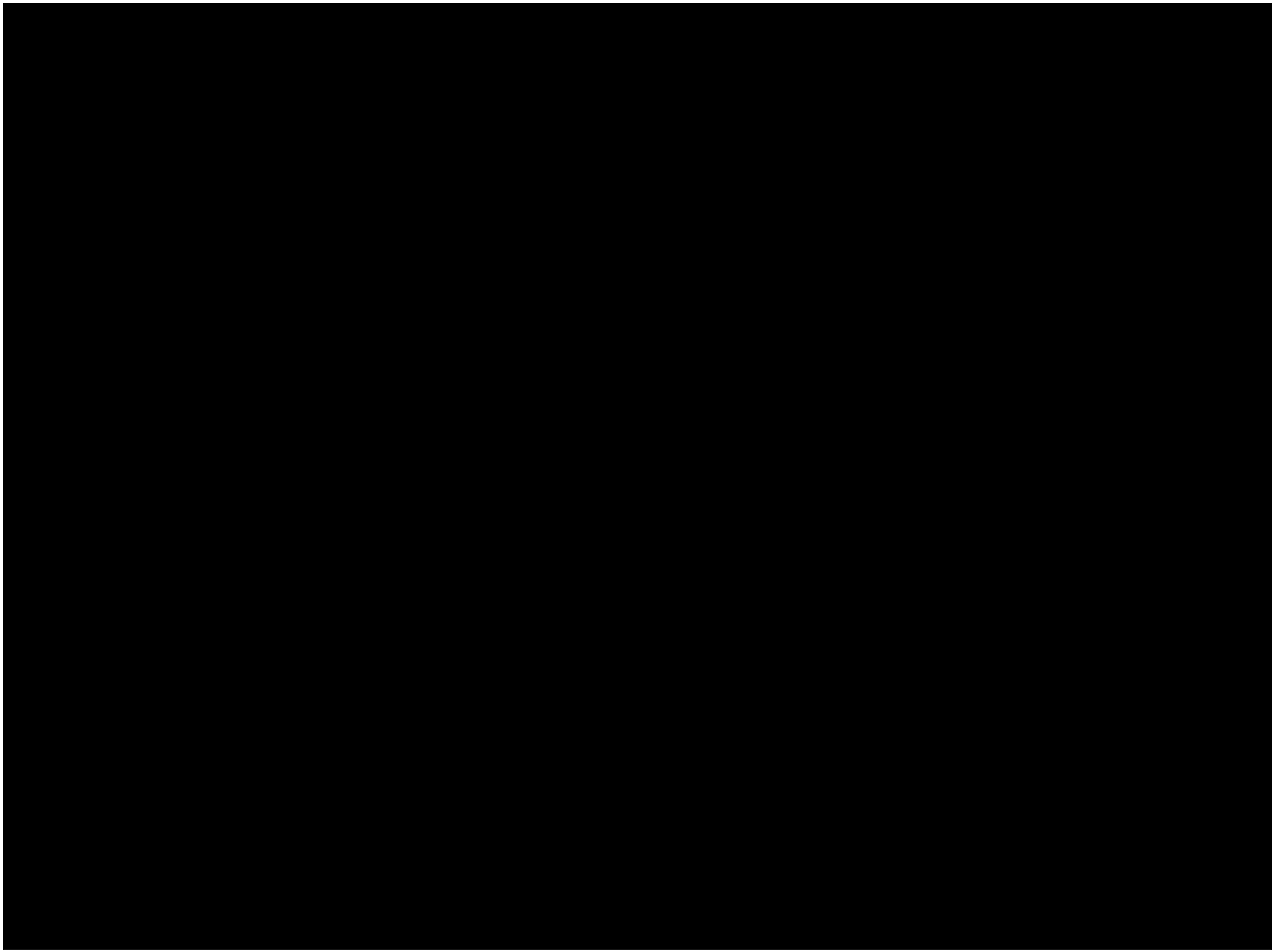


Exhibit 11

iTunes 7.0 Features

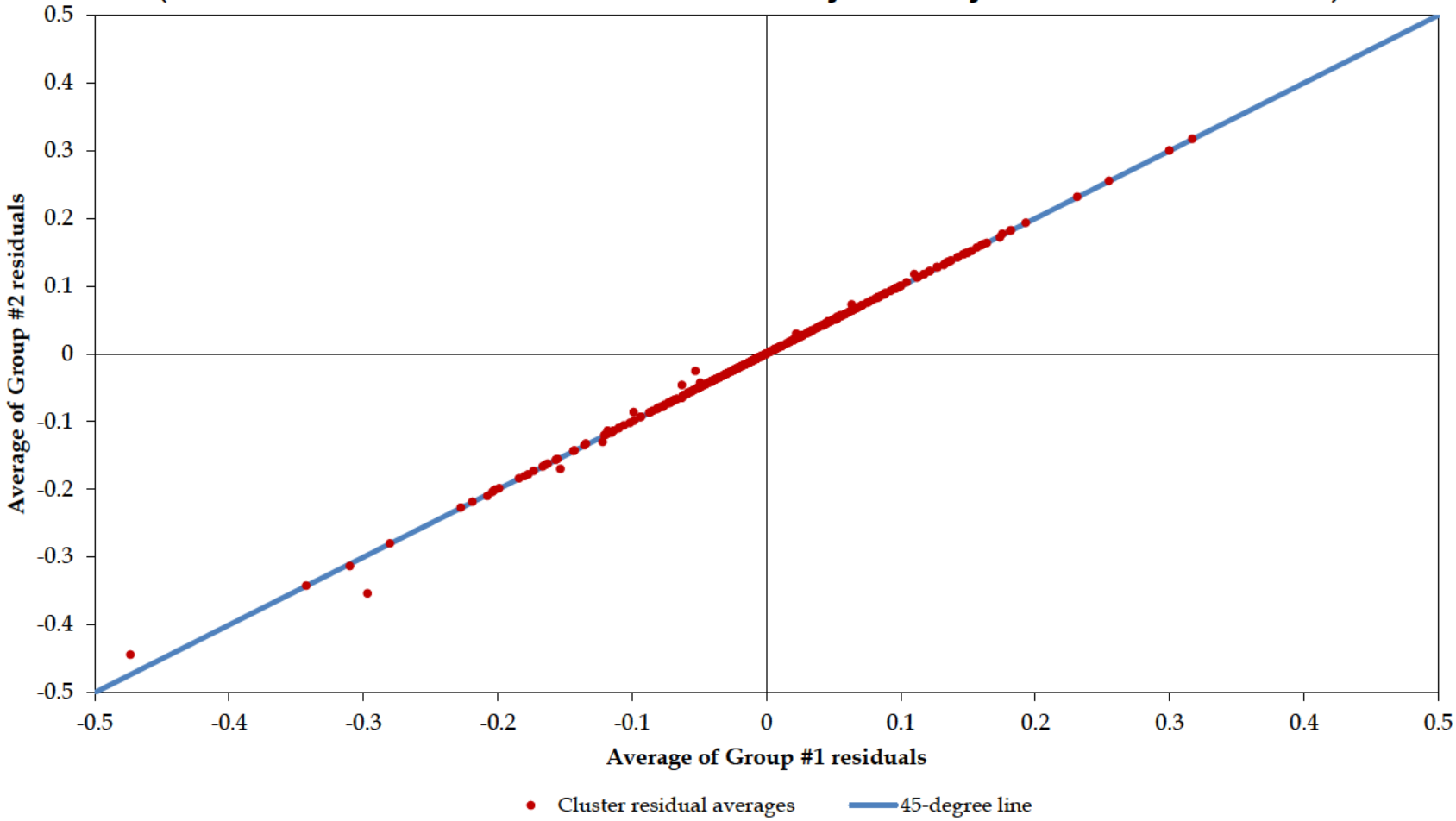
- Released 9/12/2006
- First version of iTunes to sell movies (All of the first 75 movies from 4 studio of the Walt Disney Company)
- Movies will become available on the iTunes Store the same day they are released on DVD, with new releases priced at $12.99 when pre-ordered and during their first week of availability, and $14.99 thereafter, and library titles available for just $9.99 every day
- Delivers video near-DVD quality at a resolution of 640x480, 4 times higher than the previous version
- Redesigned layout to better organize and enjoy digital music and video
- New Cover Flow which lets you visually browse through your music and video by cover art
- iPod can now be used to transfer content to different computers
- The iTunes Store now also offers downloads of popular video games for fifth generation iPods (New iPod Classic only) available for $4.99 each
- Existing iPods can be updated with all features listed above
- [redacted]

Sources:

Apple_AIIA00974436
http://www.apple.com/pr/library/2006/09/12Apple-Announces-iTunes-7-with-Amazing-New-Features.html

Exhibit 13a

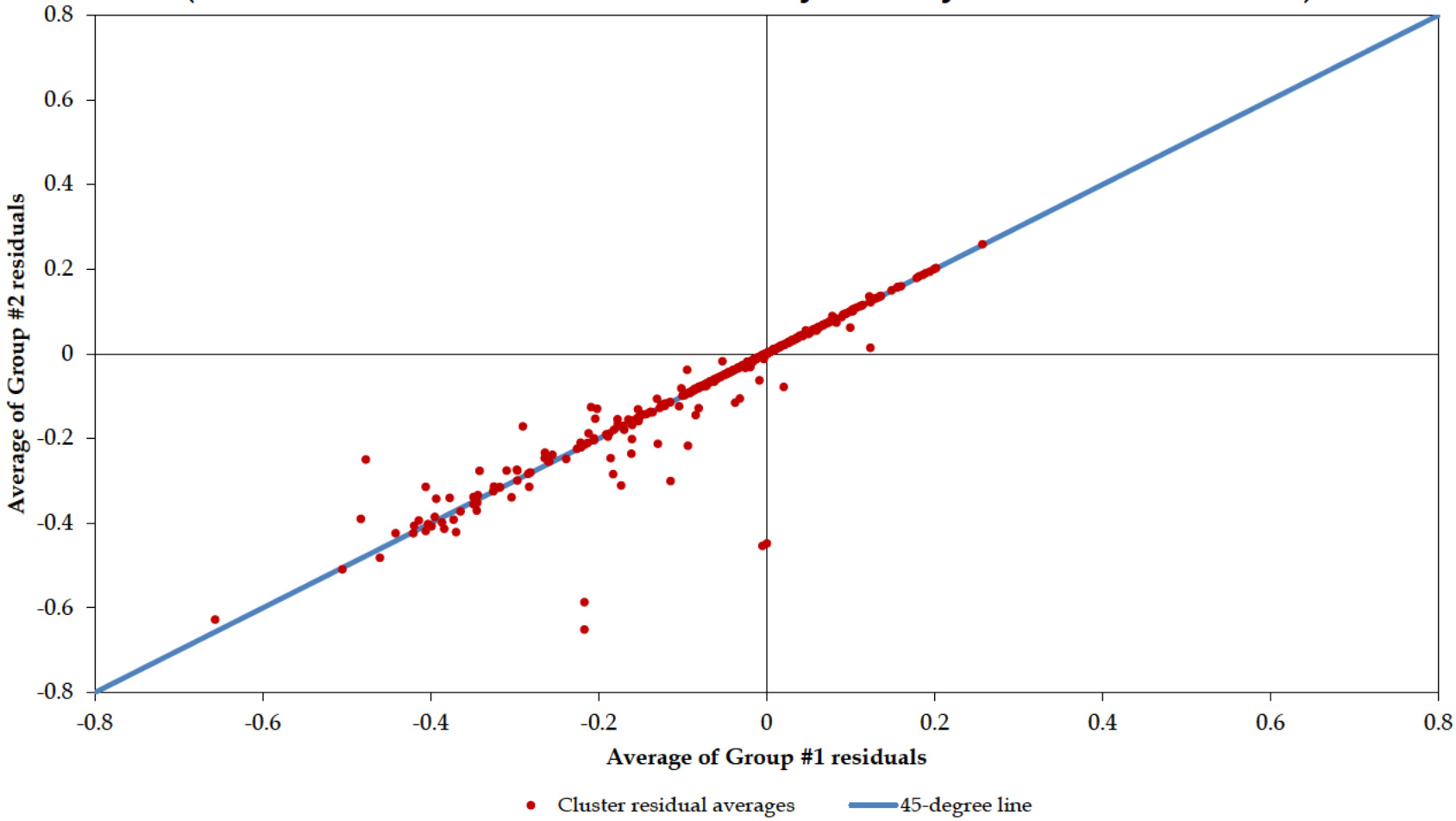
Average of Regression Residuals
Divided Randomly in Two Groups, by Cluster
(Resellers Sales, Clusters Defined by Family and Year-Quarter)



Sources: Apple iPod Sales Data

Exhibit 13b

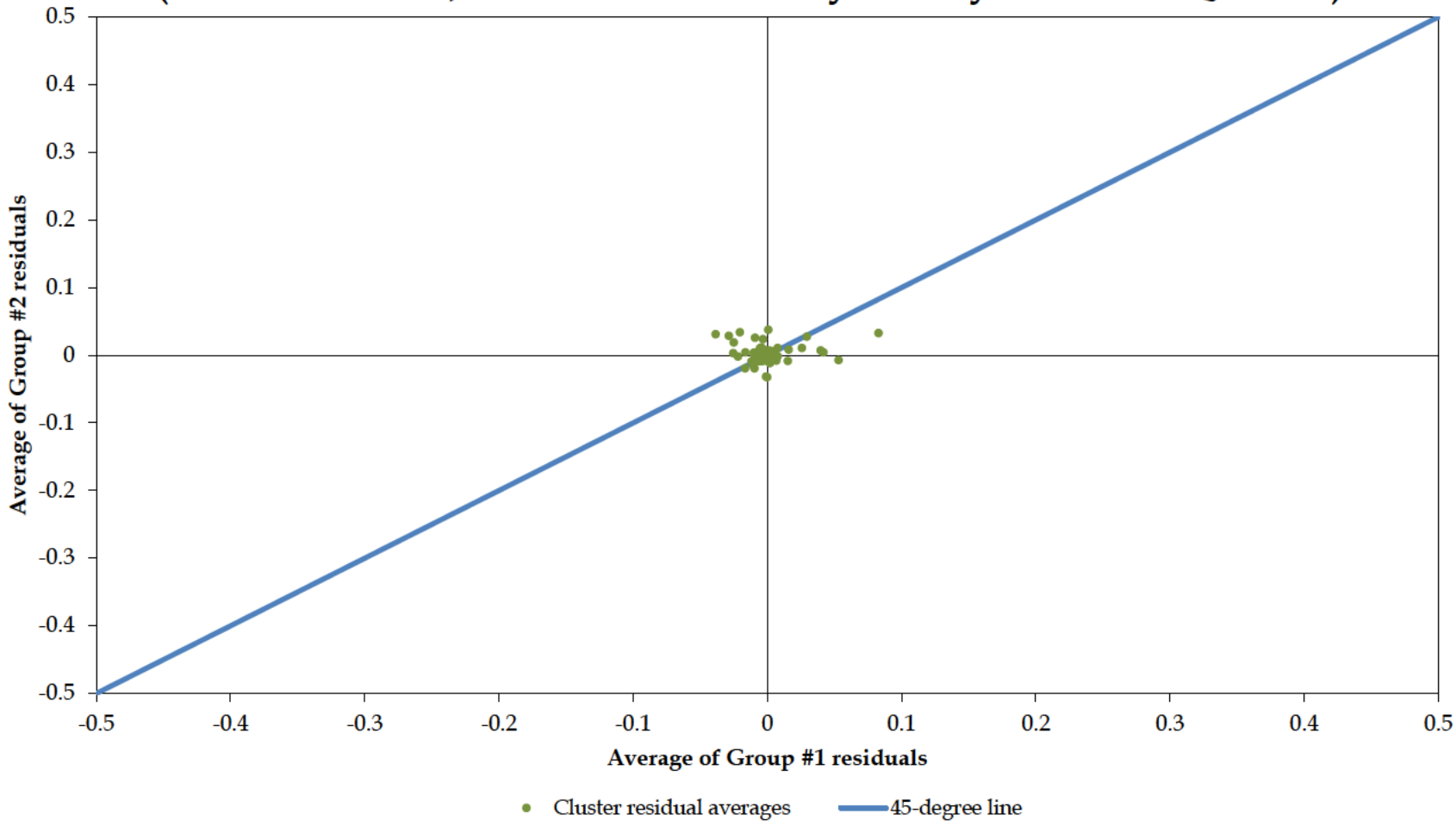
Average of Regression Residuals
Divided Randomly in Two Groups, by Cluster
(Direct Sales, Clusters Defined by Family and Year-Quarter)



Sources: Apple iPod Sales Data

Exhibit 14a

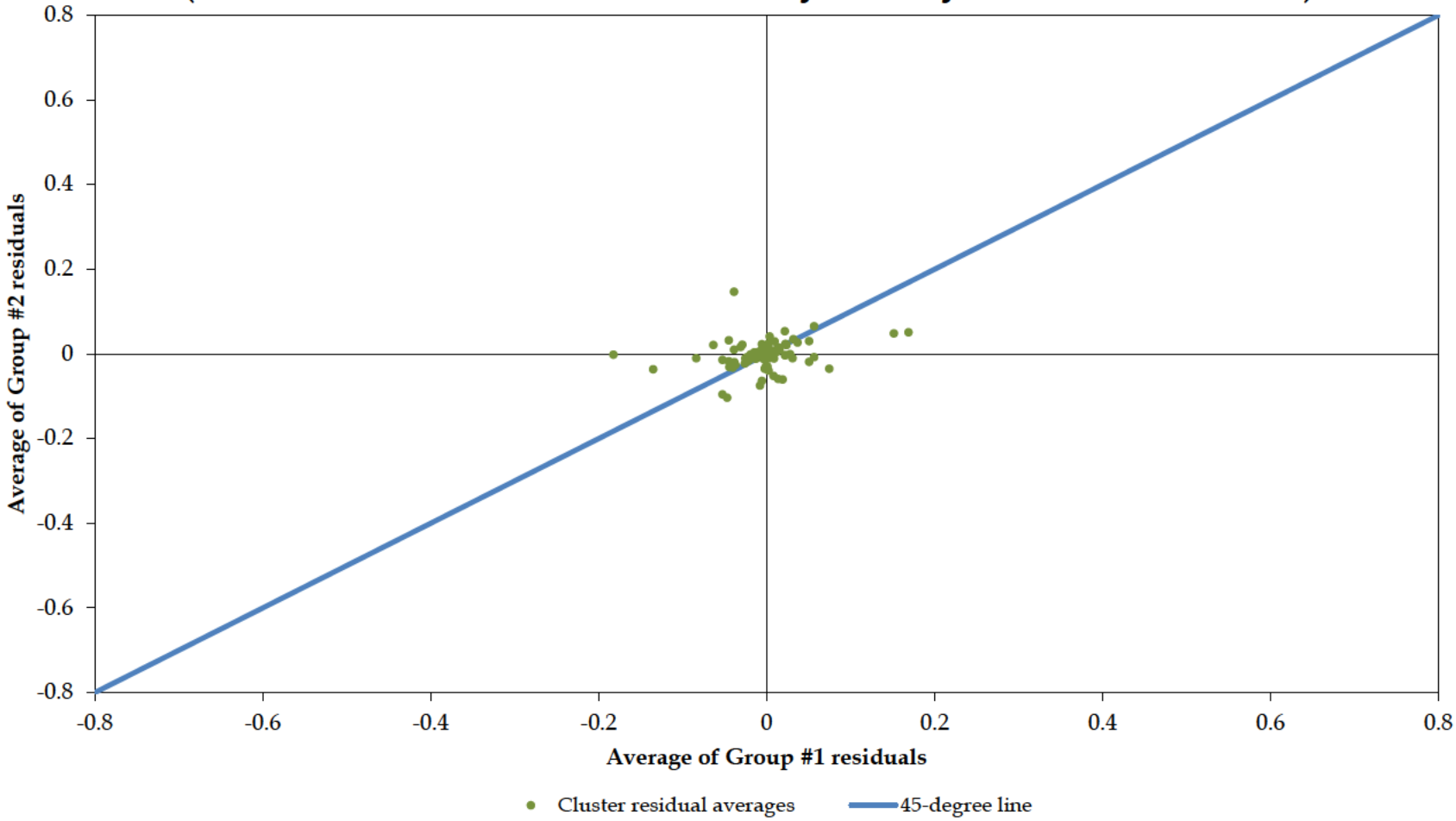
Average of Randomized Regression Residuals Divided Randomly in Two Groups, by Cluster (Resellers Sales, Clusters Defined by Family and Year-Quarter)



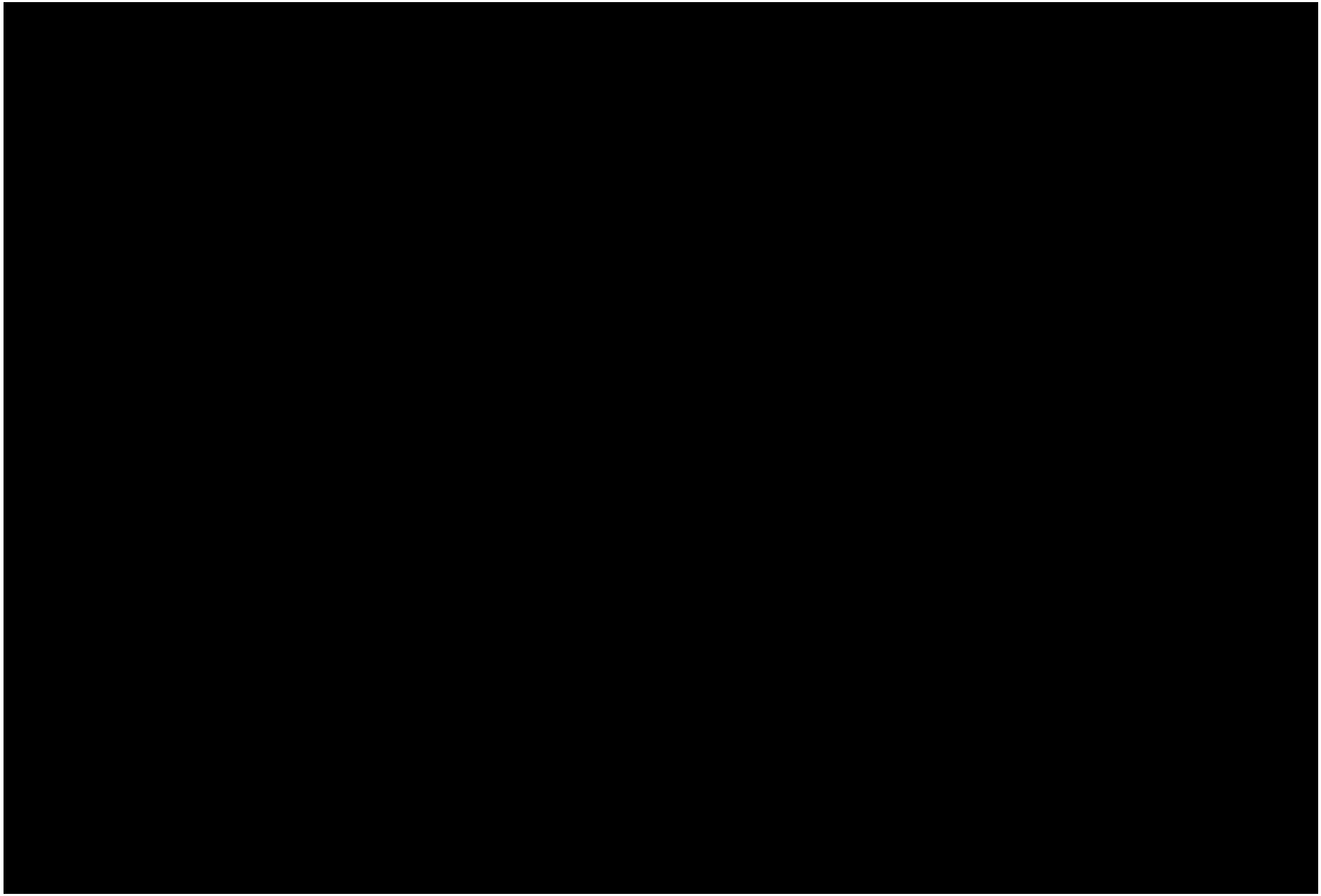
Sources: Apple iPod Sales Data

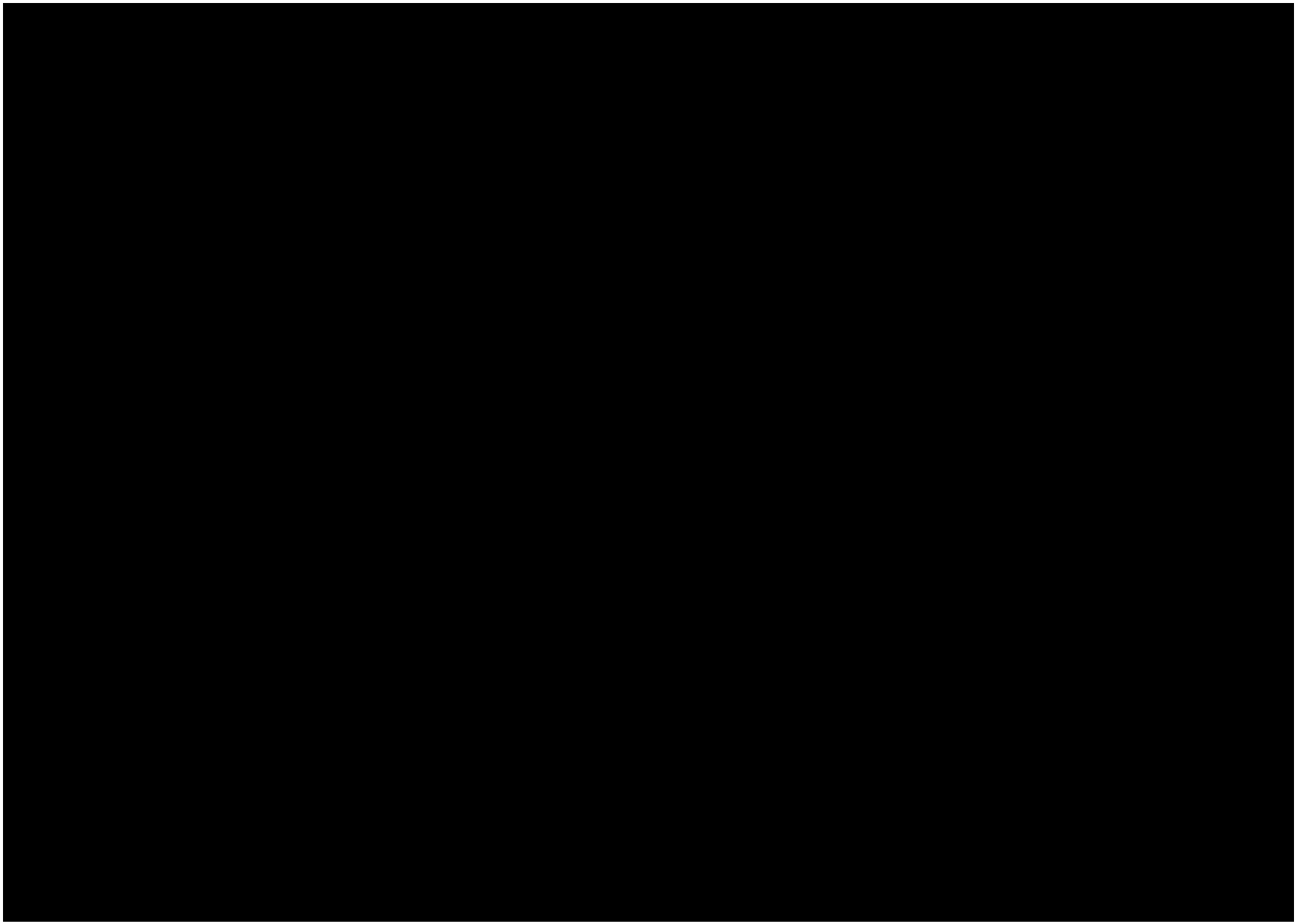
Exhibit 14b

Average of Randomized Regression Residuals Divided Randomly in Two Groups, by Cluster (Direct Sales, Clusters Defined by Family and Year-Quarter)



Sources: Apple iPod Sales Data





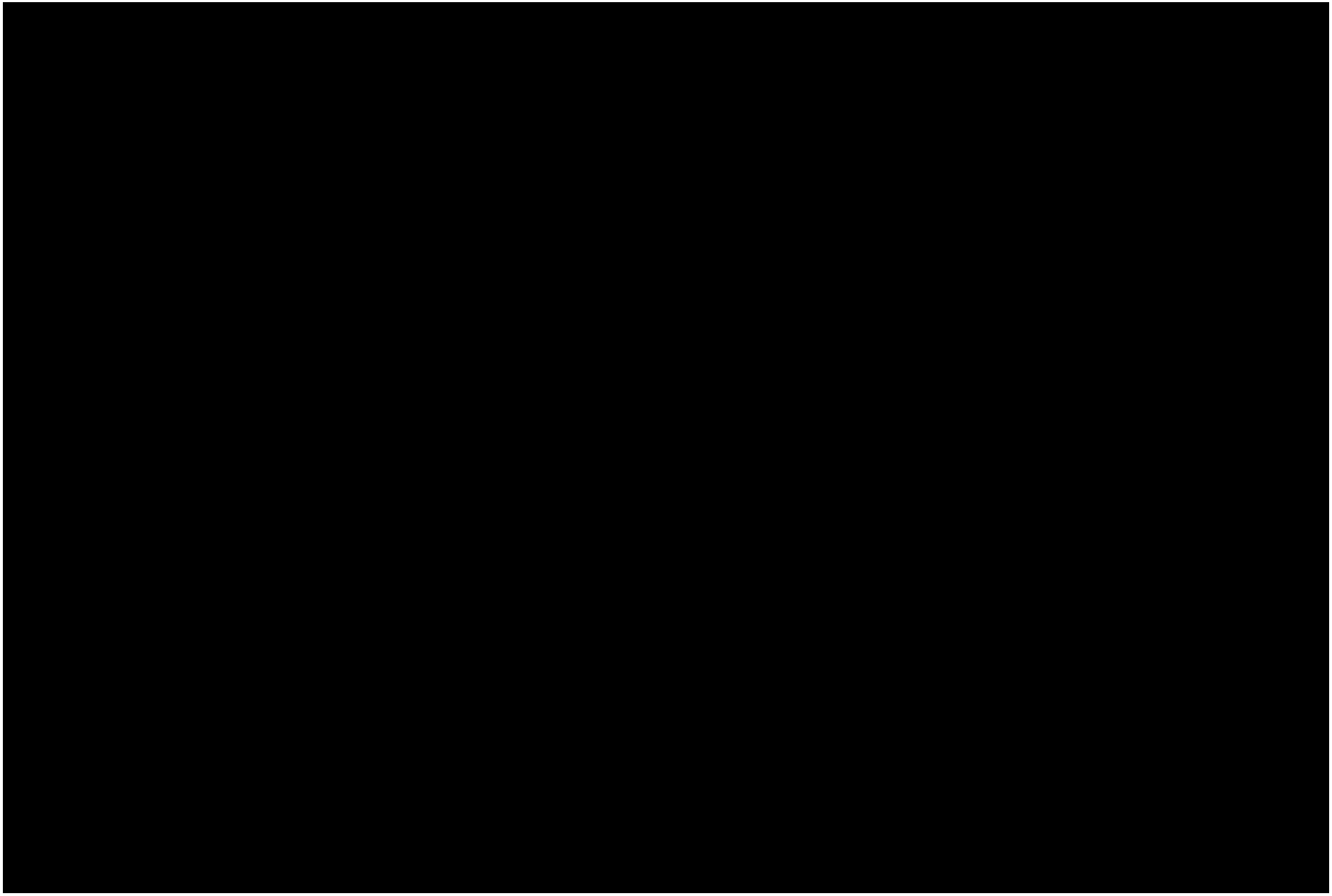


Exhibit 16

iTunes 7.4 Features

- Released 9/5/2007
- iTunes unveiled the iTunes Wi-Fi Music Store, offering music fans the ability to browse, search, preview, purchase and download songs and albums from the iTunes Music Store over a Wi-Fi network directly onto their iPod touch or iPhone to enjoy immediately.
- Music is automatically downloaded back to their iTunes library when the iPod touch or iPhone is connected to their PC or Mac
- iTunes customers will now be able to create custom ringtones by selecting up to a 30-second segment from over a million participating songs on iTunes and easily sync them onto their iPhone. Once a customer has purchased a participating song from iTunes, including previously purchased participating songs, it will only cost 99 cents to make up to a 30-second segment of that song into a ringtone and easily sync it onto their iPhone.
- iTunes 7.4 includes a larger viewing area for movies and TV, filling the entire iTunes window for a richer, seamless video playback experience that looks better than ever
- User can now rate entire albums as well as individual songs.
- Support for iPod Touch, Classic (6G), Nano (3G), and adds interface art for new iPod Shuffle colors
- [redacted]

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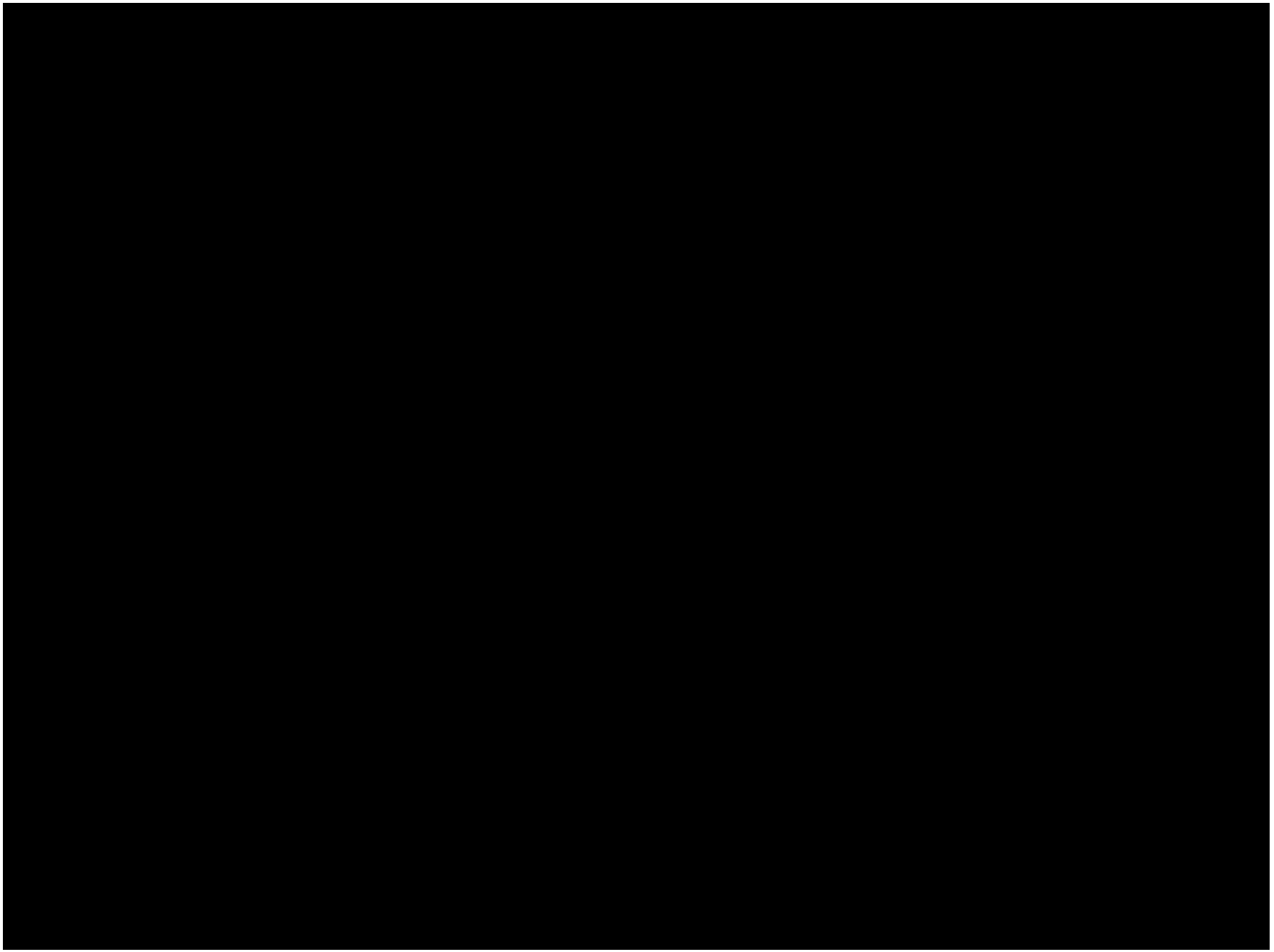

Curriculum Vitae

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November 2013

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Current Positions

July 2005-Present: George J. Stigler Distinguished Service Professor of Economics, Department of Economics and Booth School of Business, University of Chicago

Faculty Research Associate, National Bureau of Economic Research

Education

University of California, Los Angeles, A.B., Economics, 1981

University of Chicago, Ph.D., 1986

Thesis Topic: *Specialization and Human Capital*

Previous Research and Academic Positions

2002-2005: George J. Stigler Professor of Economics, Department of Economics and Booth School of Business, University of Chicago

1993 – 2002: George Pratt Shultz Professor of Business Economics and Industrial Relations, University of Chicago

1989 – 1993: Professor of Business Economics and Industrial Relations, University of Chicago

1988 – 1989: Associate Professor of Business Economics and Industrial Relations, University of Chicago

1986 – 1988: Assistant Professor of Business Economics and Industrial Relations, University of Chicago

1983 – 1986: Lecturer, Booth School of Business, University of Chicago

1982 – 1983: Teaching Associate, Department of Economics, University of Chicago

1979 – 1981: Research Assistant, Unicon Research Corporation, Santa Monica, California

Honors and Awards

2008: John von Neumann Lecture Award, Rajk College, Corvinus University, Budapest

2007: Kenneth J. Arrow Award (with Robert H. Topel)

October 2005: Garfield Research Prize (with Robert H. Topel)

September 2005: MacArthur Foundation Fellow

1998: Elected to the American Academy of Arts & Sciences

1997: John Bates Clark Medalist

1993: Fellow of The Econometric Society

1989 – 1991: Sloan Foundation Fellowship, University of Chicago

1983 – 1984: Earhart Foundation Fellowship, University of Chicago

1981 – 1983: Fellowship, Friedman Fund, University of Chicago

1980 – 1981: Phi Beta Kappa, University of California, Los Angeles

1980 – 1981: Earhart Foundation Fellowship, University of California, Los Angeles

1979 – 1981: Department Scholar, Department of Economics, University of California, Los Angeles

Publications

Books

Social Economics: Market Behavior in a Social Environment with Gary S. Becker, Cambridge, MA: Harvard University Press (2000).

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Expert Report of Kevin M. Murphy, July 3, 2013, in re: Text Messaging Antitrust Litigation, in The United States District Court For the Northern District of Illinois Eastern Division.

Video Deposition of Kevin M. Murphy, July 5, 2013, in re: High-Tech Employee Antitrust Litigation, in United States District Court Northern District of California San Jose Division.

Expert Report of Kevin M. Murphy, July 19, 2013, in The Apple iPod iTunes Antitrust Litigation, in The United States District Court For the Northern District of California Oakland Division.

Trial Testimony of Kevin M. Murphy, August 29, 2013 and August 30, 2013, in the Matter of Microsoft Corporation v. Motorola, Inc., et al., The United States District Court Western District of Washington at Seattle.

Trial Testimony of Kevin M. Murphy, September 17, 2013, in the Matter of Retractable Technologies, Inc. and Thomas Shaw v. Becton, Dickinson and Company, The United States District Court for the Eastern District of Texas Marshall Division.

Deposition of Kevin M. Murphy, September 26, 2013, in re: Text Messaging Antitrust Litigation, in The United States District Court For the Northern District of Illinois Eastern Division

Expert Report of Kevin M. Murphy, September 27, 2013, in re: Petition of Pandora Media, Inc., related to United States of America v. American Society of Composers Authors and Publishers, in The United States District Court for the Southern District of New York.

Rebuttal Expert Report of Kevin M. Murphy, October 21, 2013, in re: Petition of Pandora Media, Inc., related to United States of America v. American Society of Composers Authors and Publishers, in The United States District Court for the Southern District of New York.

Expert Report of Kevin M. Murphy, October 21, 2013, in the Matter of Mary A. Carroll and Betty C. Lynn, et al., v. Philip Morris USA, Inc., et al., Superior Court for the State of Delaware in and for New Castle County.

Deposition of Kevin M. Murphy, November 2, 2013, in re: Petition of Pandora Media, Inc., related to United States of America v. American Society of Composers Authors and Publishers, in The United States District Court for the Southern District of New York.

Rebuttal Expert Report of Kevin M. Murphy, November 8, 2013, in the Matter of US Airways, Inc. v. Sabre Holdings Corp., Sabre, Inc., and Sabre Travel International Ltd., The United States District Court for the Southern District of New York.

Appendix B: List of Materials Relied Upon

Court Documents

1. DECLARATION OF ROGER G. NOLL ON LIABILITY AND DAMAGES – April 3, 2013 (and sources and documents considered, cited or relied upon therein)
2. CORRECTIONS TO DECLARATION OF ROGER G. NOLL ON LIABILITY AND DAMAGES – May 31, 2013 (and sources and documents considered, cited or relied upon therein)
3. EXPERT REPORT OF DAVID M. MARTIN – April 8, 2013 (and sources and documents considered, cited or relied upon therein)
4. DEPOSITION OF JEFFREY L. ROBBIN – December 3, 2010 (and sources and documents considered, cited or relied upon therein)
5. DEPOSITION OF ROGER G. NOLL – September 19, 2008 (and sources and documents considered, cited or relied upon therein)
6. DEPOSITION OF ROGER G. NOLL - April 7, 2011 (and sources and documents considered, cited or relied upon therein)
7. DEPOSITION OF ROGER G. NOLL - May 16, 2013 (and sources and documents considered, cited or relied upon therein)
8. DECLARATION OF ROGER G. NOLL – January 18, 2011 (and sources and documents considered, cited or relied upon therein)
9. SUPPLEMENTAL DECLARATION OF ROGER G. NOLL - July 18, 2011 (and sources and documents considered, cited or relied upon therein)
10. SECOND SUPPLEMENTAL DECLARATION OF ROGER G. NOLL – September 23, 2011 (and sources and documents considered, cited or relied upon therein)
11. SECOND SUPPLEMENTAL REPORT OF DR. MICHELLE M. BURTIS – November 14, 2011 (and sources and documents considered, cited or relied upon therein)
12. DECLARATION OF DR. JOHN P. J. KELLY - April 18, 2011 (and sources and documents considered, cited or relied upon therein)
13. See Expert Report of Dr. John P. J. Kelly - July 19, 2013 (and sources and documents considered, cited or relied upon therein)
14. DEPOSITION OF AUGUSTIN J. FARRUGIA - December 8, 2010 (and sources and documents considered, cited or relied upon therein)
15. DECLARATION OF AUGUSTIN FARRUGIA – January 18, 2011 (and sources and documents considered, cited or relied upon therein)
16. SUPPLEMENTAL DECLARATION OF AUGUSTIN FARRUGIA - July 2, 2013 (and sources and documents considered, cited or relied upon therein)
17. DEPOSITION OF JOHN P.J. KELLY, Ph.D. - February 22, 2011 (and sources and documents considered, cited or relied upon therein)
18. DECLARATION OF DAVID F. MARTIN – February 28, 2011 (and sources and documents considered, cited or relied upon therein)
19. DEPOSITION OF DAVID M. MARTIN, JR., PH.D. - May 9, 2013 (and sources and documents considered, cited or relied upon therein)

20. DEFENDANT APPLE INC.'S RESPONSES TO PLAINTIFF'S FIRST SET OF INTERROGATORIES August 29, 2008 (and sources and documents considered, cited or relied upon therein)
21. DECLARATION OF BONNY E. SWEENEY – January 18, 2011 (and sources and documents considered, cited or relied upon therein)
22. DECLARATION OF DAVID KIERNAN - January 18, 2011 (and sources and documents considered, cited or relied upon therein)
23. DECLARATION OF BONNY E. SWEENEY – February 28, 2011 (and sources and documents considered, cited or relied upon therein)
24. DECLARATION OF DAVID KIERNAN - February 28, 2011 (and sources and documents considered, cited or relied upon therein)
25. DECLARATION OF MICHAEL SCOTT – June 6, 2006 (and sources and documents considered, cited or relied upon therein)
26. Deposition of Michelle Burtis – September 30, 2009 (and sources and documents considered, cited or relied upon therein)
27. Deposition of David K. Heller – December 15, 2010 (and sources and documents considered, cited or relied upon therein)
28. Deposition of Arthur Rangel – December 17, 2010 (and sources and documents considered, cited or relied upon therein)
29. Deposition of Eddy Cue – December 17, 2010 (and sources and documents considered, cited or relied upon therein)
30. APPLE'S MOTION FOR SUMMARY JUDGMENT - April 18, 2011 (and sources and documents considered, cited or relied upon therein)
31. AMENDED CONSOLIDATED COMPLAINT FOR VIOLATIONS OF SHERMAN ANTITRUST ACT, CLAYTON ACT, CARTWRIGHT ACT, CALIFORNIA UNFAIR COMPETITION LAW, CONSUMERS LEGAL REMEDIES ACT, AND CALIFORNIA COMMON LAW OF MONOPOLIZATION – January 25, 2010 (and sources and documents considered, cited or relied upon therein)
32. ORDER GRANTING IN PART AND DENYING IN PART DEFENDANT'S MOTION FOR SUMMARY JUDGMENT; DENYING AS PREMATURE PLAINTIFFS' MOTION FOR CLASS CERTIFICATION – May 19, 2011 (and sources and documents considered, cited or relied upon therein)
33. UNREDACTED MEMORANDUM IN OPPOSITION TO MOTION FOR CLASS CERTIFICATION (December 15, 2008)
34. Plaintiffs' Rule 30(b)(6) Notice of Videotaped Deposition of Corporate Designees (2010-11-17)
35. SFI_658005_1_AIIA_ Responses to Data Questions 12.23.10
36. Plaintiffs' Notice of Motion and Renewed Motion for Class Certification and Appointment of Lead Class Counsel Under Seal (April 18, 2011)
37. SFI_658005_3_Responses to Data Questions 12.23.10
38. SFI_658269_4_Responses to Reseller Transaction Data Questions 2011-01-28
39. SFI_658573_3_Updated answers to 1.6.11 Follow Up Data Questions
40. SFI_658573_4_Responses to 1.7.2011 Data Questions
41. SVI_88493_7_Responses to iPod BOM and Gross Margin Reports 2011-02-04
42. PLAINTIFFS' MEMORANDUM IN OPPOSITION TO APPLE'S MOTION FOR SUMMARY JUDGMENT - April 18, 2011

43. DECLARATION OF BONNY E. SWEENEY IN SUPPORT OF PLAINTIFFS' MEMORANDUM IN OPPOSITION TO APPLE'S MOTION FOR SUMMARY JUDGMENT - April 18, 2011
44. EXPERT REPORT OF DR. MICHELLE M. BURTIS - April 18, 2011 (and sources and documents considered, cited or relied upon therein)
45. APPLE'S OPPOSITION TO RENEWED MOTION FOR CLASS CERTIFICATION - April 18, 2011
46. APPLE'S REPLY IN SUPPORT OF ITS MOTION FOR SUMMARY JUDGMENT - April 18, 2011
47. DECLARATION OF MICHAEL T. SCOTT IN SUPPORT OF APPLE'S REPLY IN SUPPORT OF ITS MOTION FOR SUMMARY JUDGMENT - April 18, 2011
48. DECLARATION OF CARMEN A. MEDICI IN SUPPORT OF REPLY MEMORANDUM IN SUPPORT OF PLAINTIFFS' RENEWED MOTION FOR CLASS CERTIFICATION - April 18, 2011
49. REPLY MEMORANDUM IN SUPPORT OF PLAINTIFFS' RENEWED MOTION FOR CLASS CERTIFICATION - April 18, 2011
50. Reply Declaration of Roger G. Noll 2011-03-28
51. SFI_662507_4_AIIA_ APPLE'S OPPOSITION TO RENEWED MOTION FOR CLASS CERTIFICATION 2011-04-11
52. ORDER GRANTING IN PART AND DENYING IN PART DEFENDANT'S MOTION FOR SUMMARY JUDGMENT; DENYING AS PREMATURE PLAINTIFFS' MOTION FOR CLASS CERTIFICATION 2011-05-19
53. SUPPLEMENTAL REPORT OF DR. MICHELLE M. BURTIS 2011-07-26
54. Exhibit 1 to DECLARATION OF DAVID C. KIERNAN IN SUPPORT OF APPLE'S RESPONSE TO PROFESSOR NOLL'S JULY 18 DECLARATION 2011-01-26
55. Exhibit 2 to DECLARATION OF DAVID C. KIERNAN IN SUPPORT OF APPLE'S RESPONSE TO PROFESSOR NOLL'S JULY 18 DECLARATION 2011-01-26
56. DECLARATION OF DAVID C. KIERNAN IN SUPPORT OF APPLE'S RESPONSE TO PROFESSOR NOLL'S JULY 18 DECLARATION
57. APPLE'S RESPONSE TO PROFESSOR NOLL'S JULY 18 DECLARATION
58. ORDER GRANTING PLAINTIFFS' MOTION FOR CLASS CERTIFICATION 2011-11-22
59. ORDER REGARDING SCHEDULE 2013-01-28
60. Class Certification Report Backups for Michelle Burtis
61. DECLARATION OF JEFFREY ROBBIN IN SUPPORT OF DEFENDANT'S RENEWED MOTION FOR SUMMARY JUDGEMENT - January 18, 2011

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82. iPod Owner Survey - Wave 2 January 2006
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84. iPod Owner Survey - Wave 3 June 2006
85. W5 iPod/iPhone Buyer Survey - Nov 2007 Apple Confidential Internal Use Only
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365. Upgrades by month (version 1).xlsb - For US Units and Revenue for Upgardes by month Since January,2009 to 17th October,2010
366. AIIA_US iPod Sales_Family Level_Direct-Indirect-OEM.xlsx
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792. All documents and other information, including information from various websites, as listed or cited in the report or the footnotes, exhibits, and appendices thereto

Appendix C: Collection of iPod Characteristics

1. The iPod characteristics research was initiated based on the list of order numbers (also called "MPN" or "Product Identifier") provided in the direct sales and reseller sales transaction data from Professor Noll's latest declaration backup materials. The order numbers were then individually searched online, and the available characteristics from all sources consulted were collected. For example, by searching order number "M8737LL/A" online, we collected information from sources such as"support.apple.com", "everymac.com", and "amazon.com". The list of characteristic variables is a result of the union of the information collected from the different sources.

2. The full list of sources consulted includes Apple.com, Apple Price Documents (provided by client), Everymac.com (also known as "everyipod.com"), abt.com, amazon.com, bestbuy.com, brokerbin.com, buy.com, cdw.com, cnet.com, collegestoreonline.com, cowboom.com, ebay.com, facebook.com, falabella.com, flash-memory-store.com, ipodused.com, lowerpricestoday.com, milo.com, model spec, mp3-players.toptenreview.com, nexttag.com, onyougo.com, outlet.amazonwebstore.com, overstock.com, pacificgeek.com, partnumber.org, pcsuperstore.com, personafile.com, pricecheck.co.za, pricegrabber.com, reviewindex.net, shop.com, shop.neobits.com, techforless.com, Todoclon.com, toolowtogo.com, topperise.ch, warrantylife.com, wikipedia, youfindit.ca.

3. After the search of characteristics was completed for all order numbers, we compared and consolidated the information from various sources for each order number to obtain the order number level data. We first ranked the sources for a given order number depending on its reliability and the completeness of its information (referred to as "the ranking process" below). Reliability is determined by degree of consistency between the information reported by the source and Apple.com. Apple.com is considered the most reliable source, and all characteristics available on the Apple site were used for in constructing our characteristics dataset. However when information for certain characteristics or order numbers was not available on Apple.com (e.g., "discontinued dates"), we would refer to everymac.com as our second best source for characteristics since it has the most comprehensive technical specifications for most iPods, and its information is consistent with that on Apple.com when the latter is available. With these two

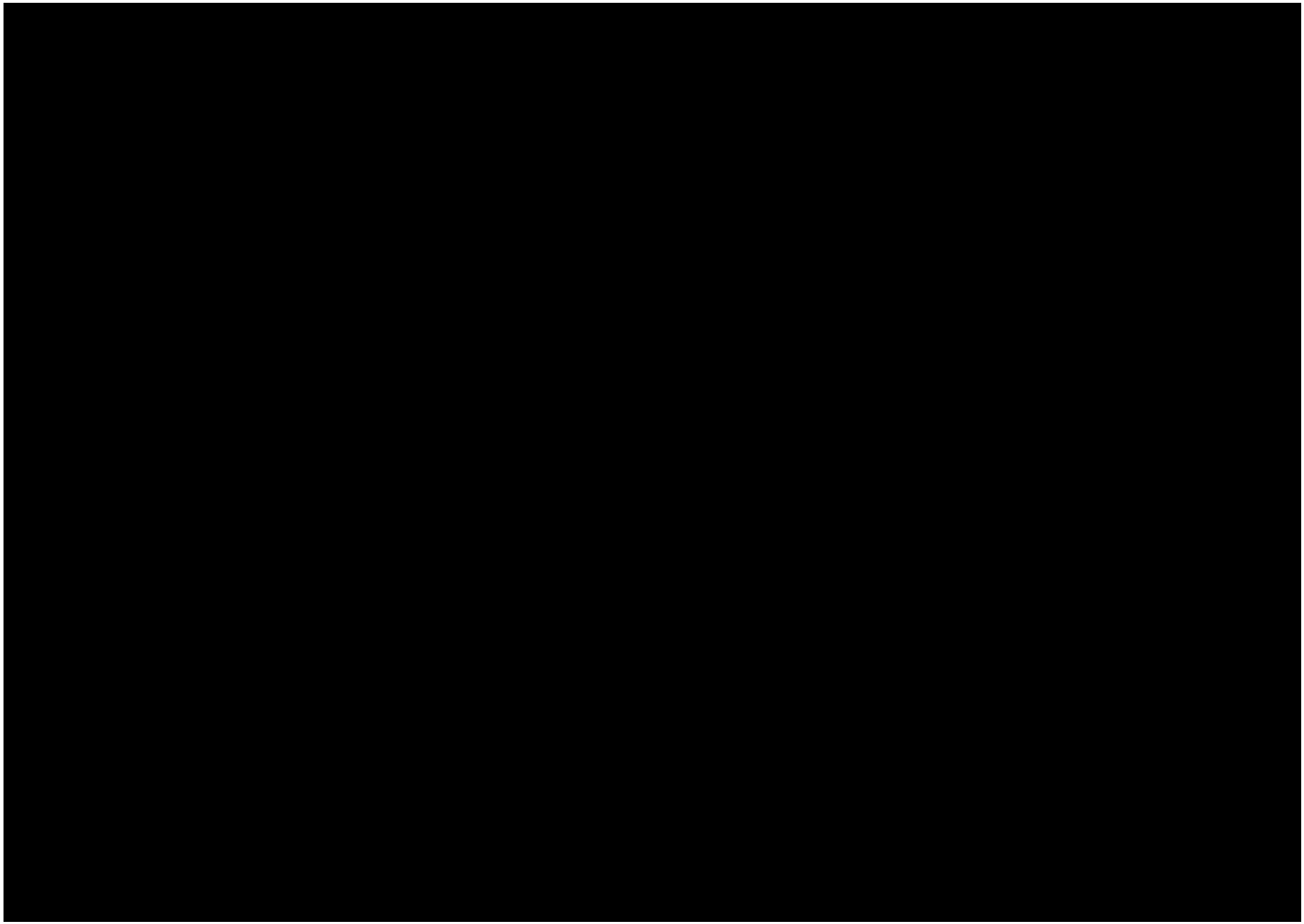
sources (apple.com and everymac.com), we were able to collect information on the characteristics for most models across all iPod families.

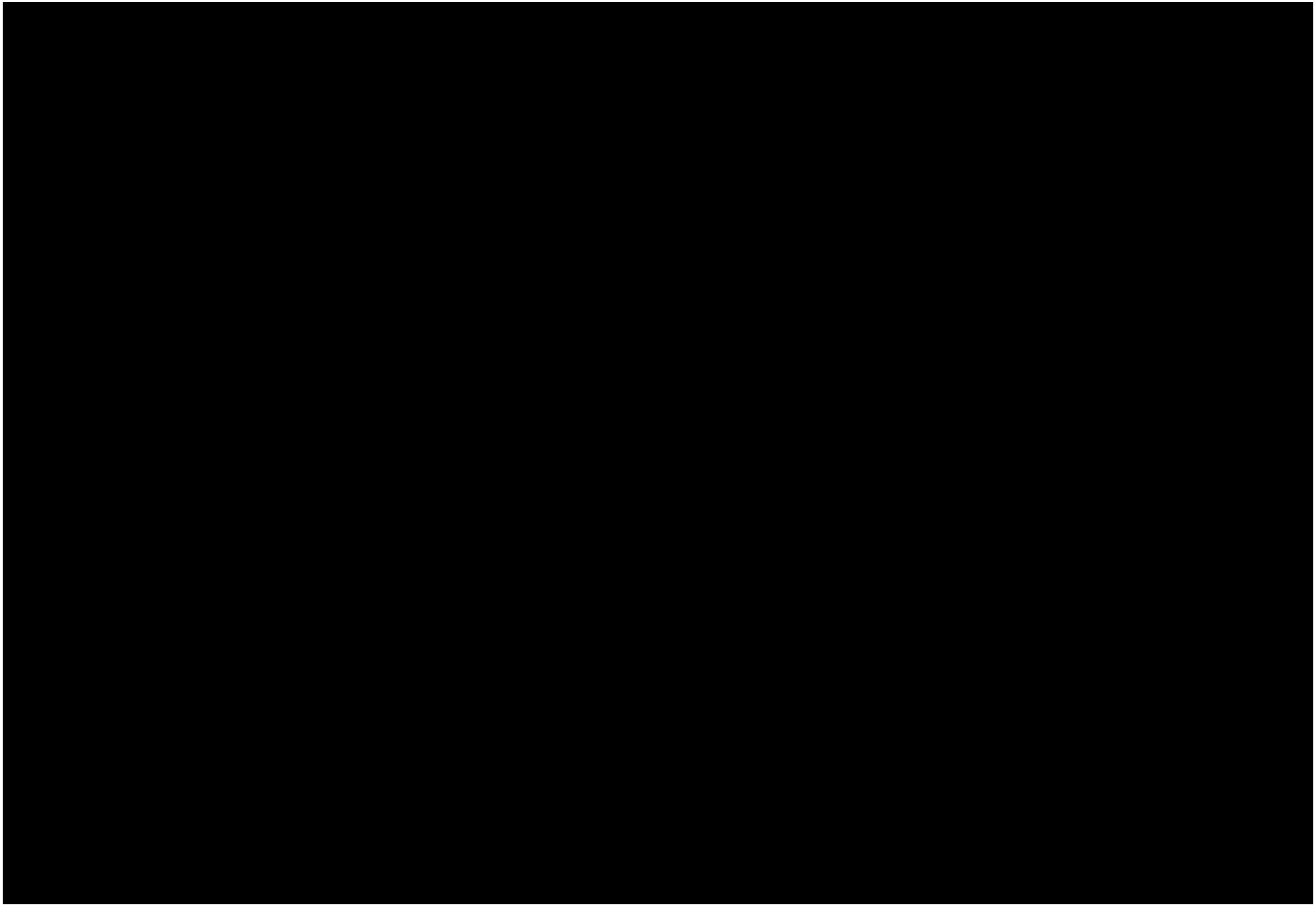
4. We further compared characteristics of the order numbers within the same iPod family to collapse the information from the order number level to the family level. Order numbers within the same family should have the same characteristics. Through comparison, we resolved differences in characteristics by cross-checking the information against the comparable iPod description in the corresponding Apple press release. For example, suppose "order No. 123" and "order No. 321" belong to the same iPod family. We checked their characteristics for internal consistency and also for consistency with the description on the Apple's product launch press for the respective family. If all sources agree, we use the characteristics for the family. If not, we adopt the information from the Apple press release when available. There are a few models for which some characteristics are not reported by Apple. In that case, we repeat the ranking process and use the information from the most reliable source. When using information from sources other than Apple.com, we verified the data by crosschecking multiple other sources. For example, if Apple.com does not report the battery life for iPod X and everymac.com reports 8 hours, we verified the data against a third reliable source such as "Amazon.com" or "CNET review," if possible.

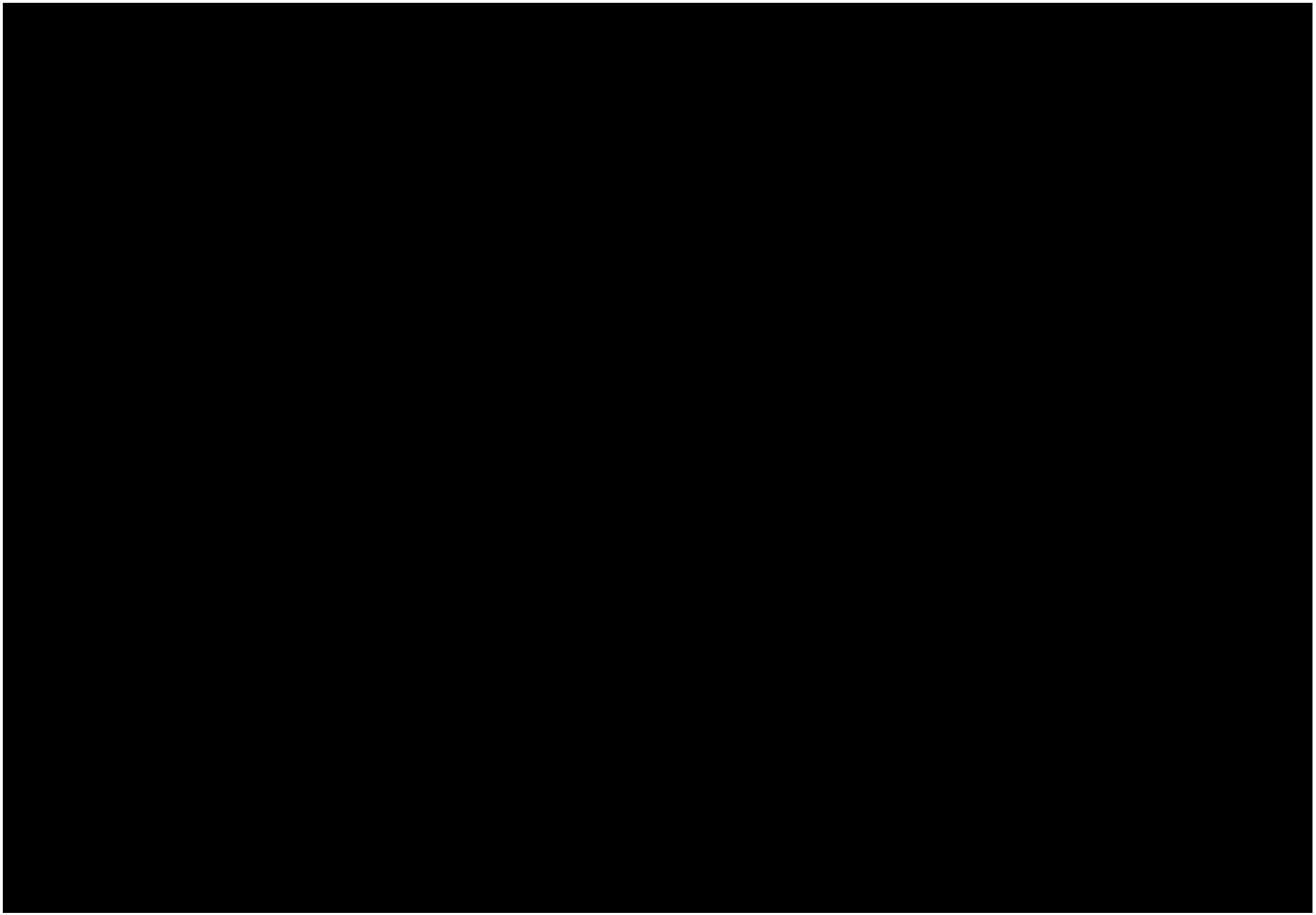
5. Final results are compared with the characteristics provided in Professor Noll's latest declaration backup materials. The non-trivial differences between the two datasets are summarized in the table below. (In making this table, we exclude, for example, a difference in product width due to rounding – 2.43 inches vs. 2.4 inches.)

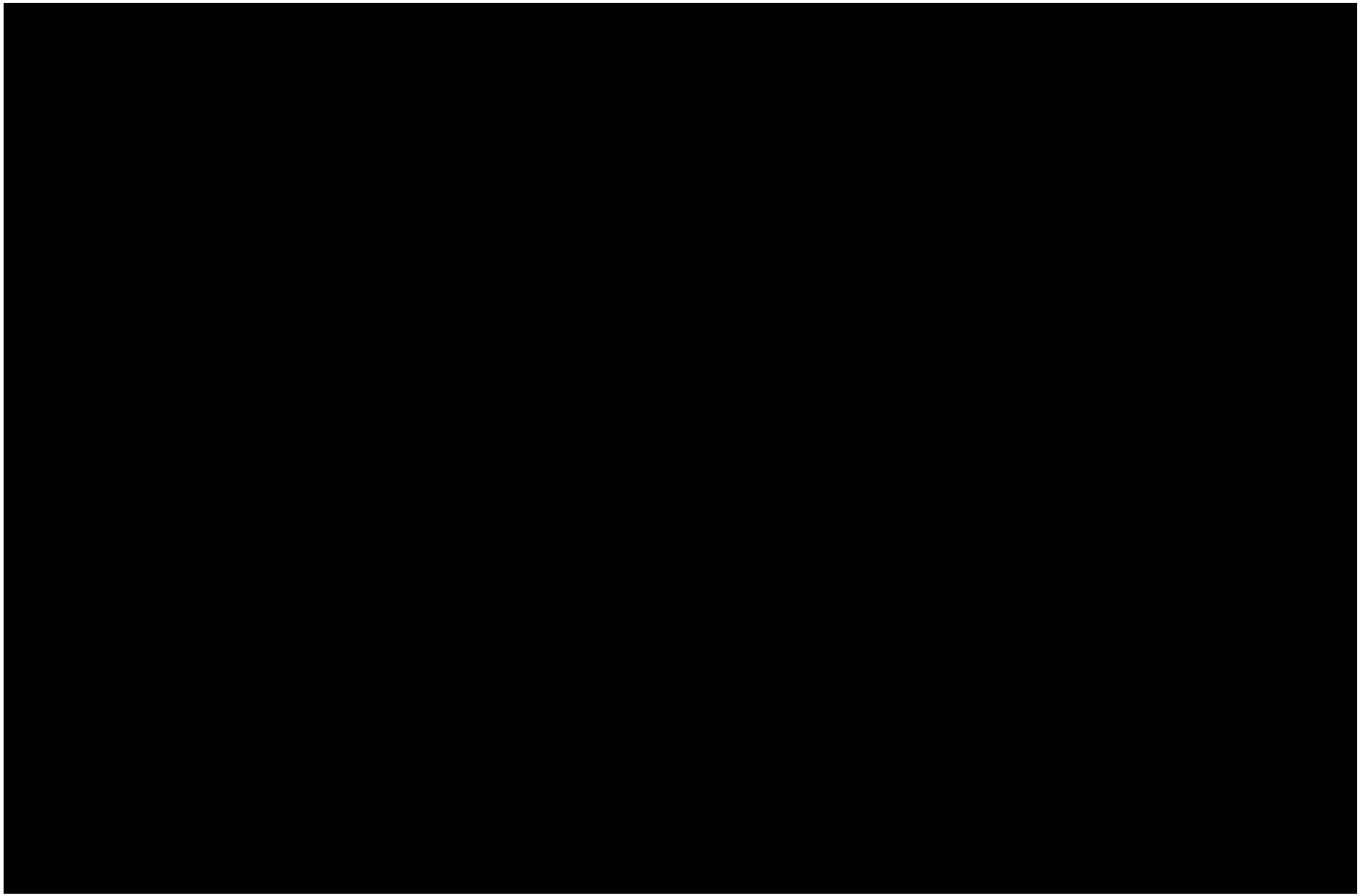
Appendix D

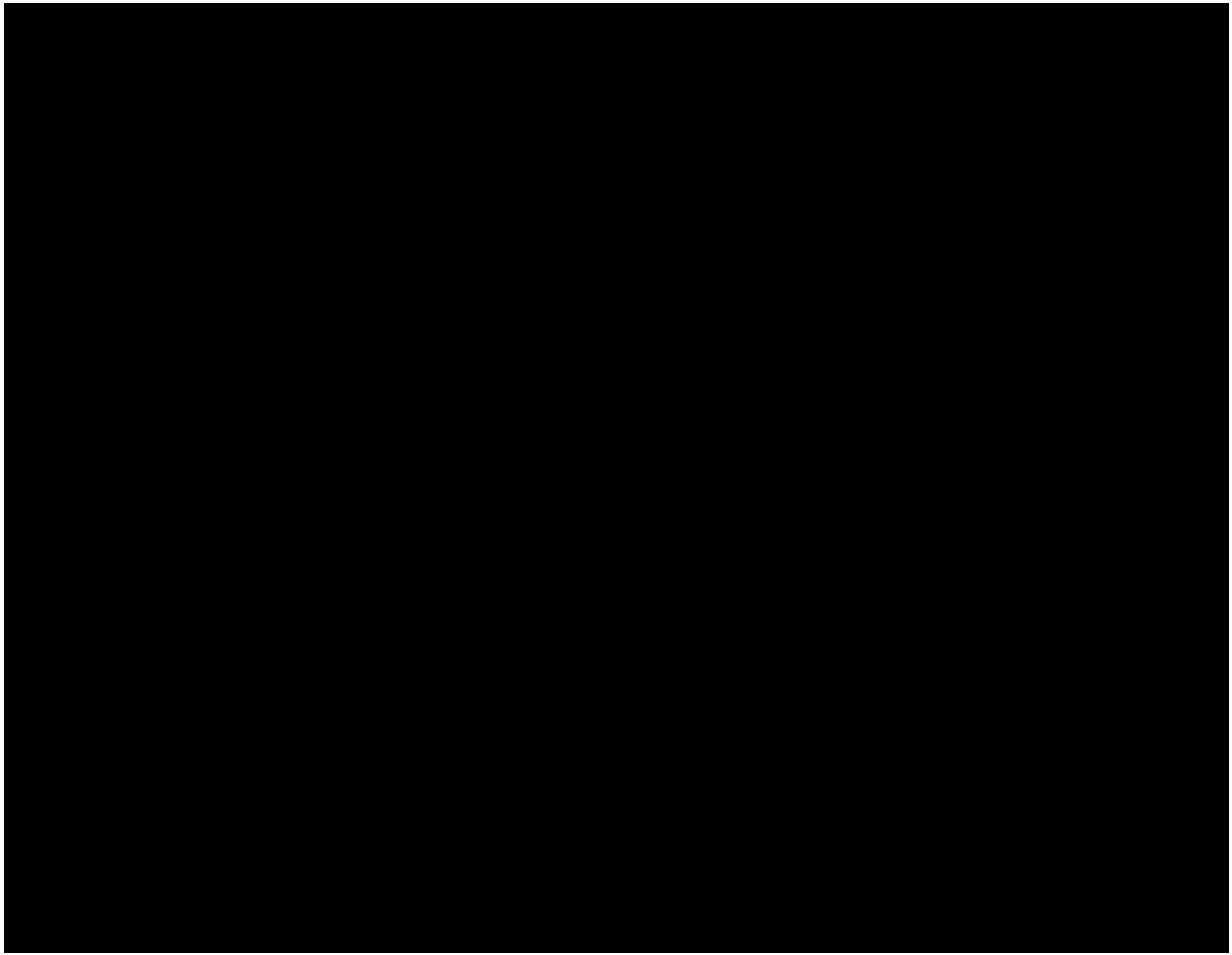
Additional Regression Results

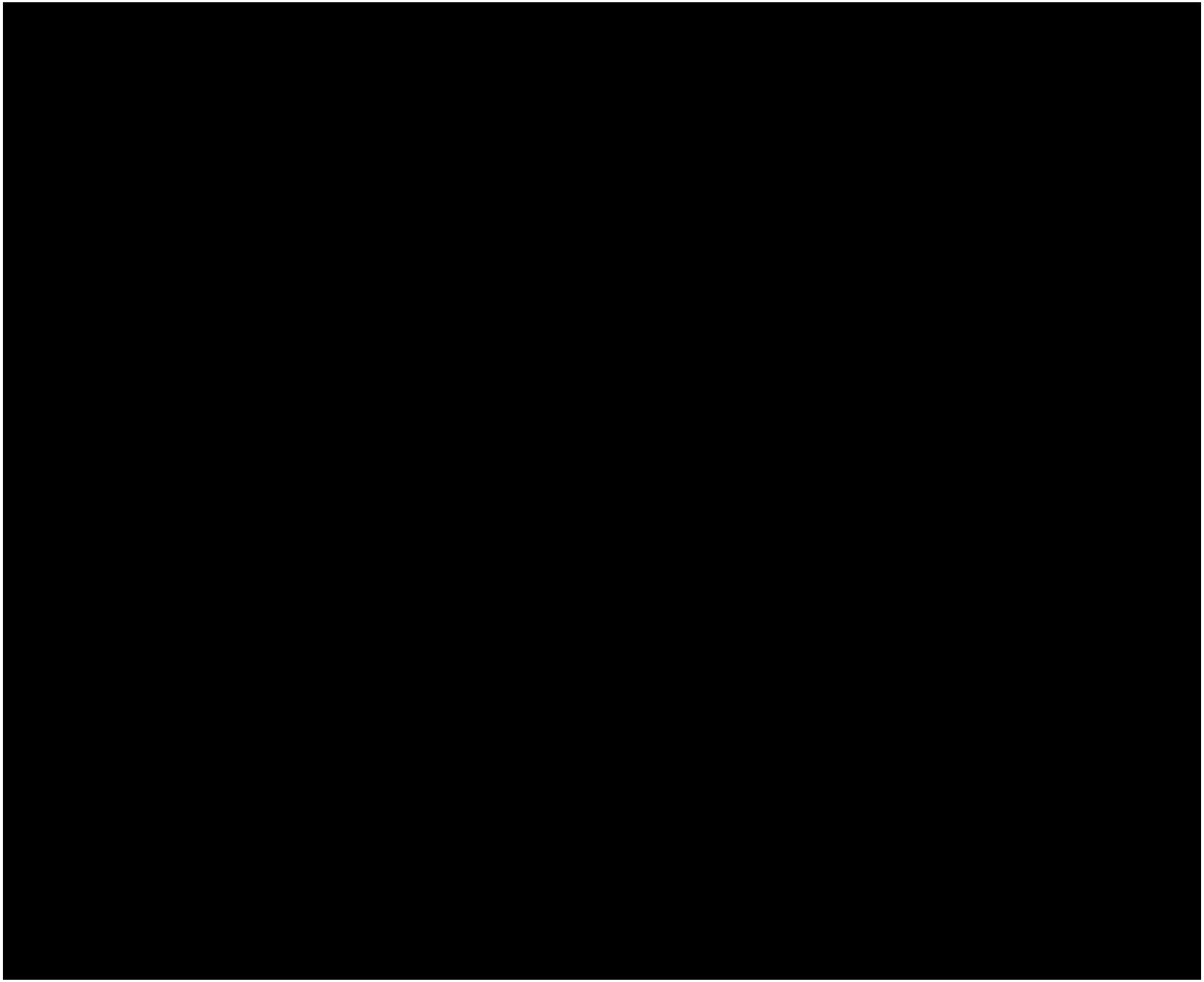


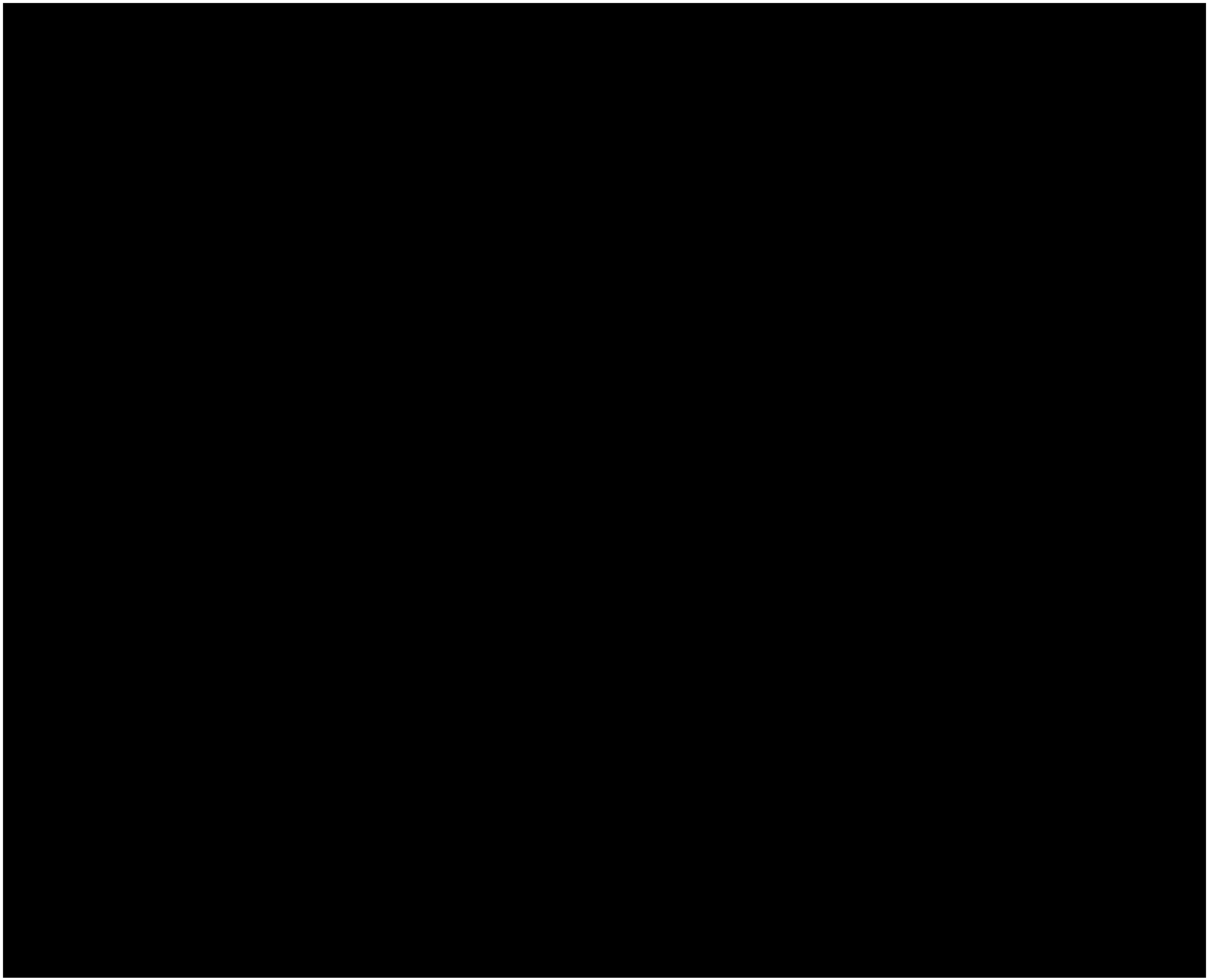


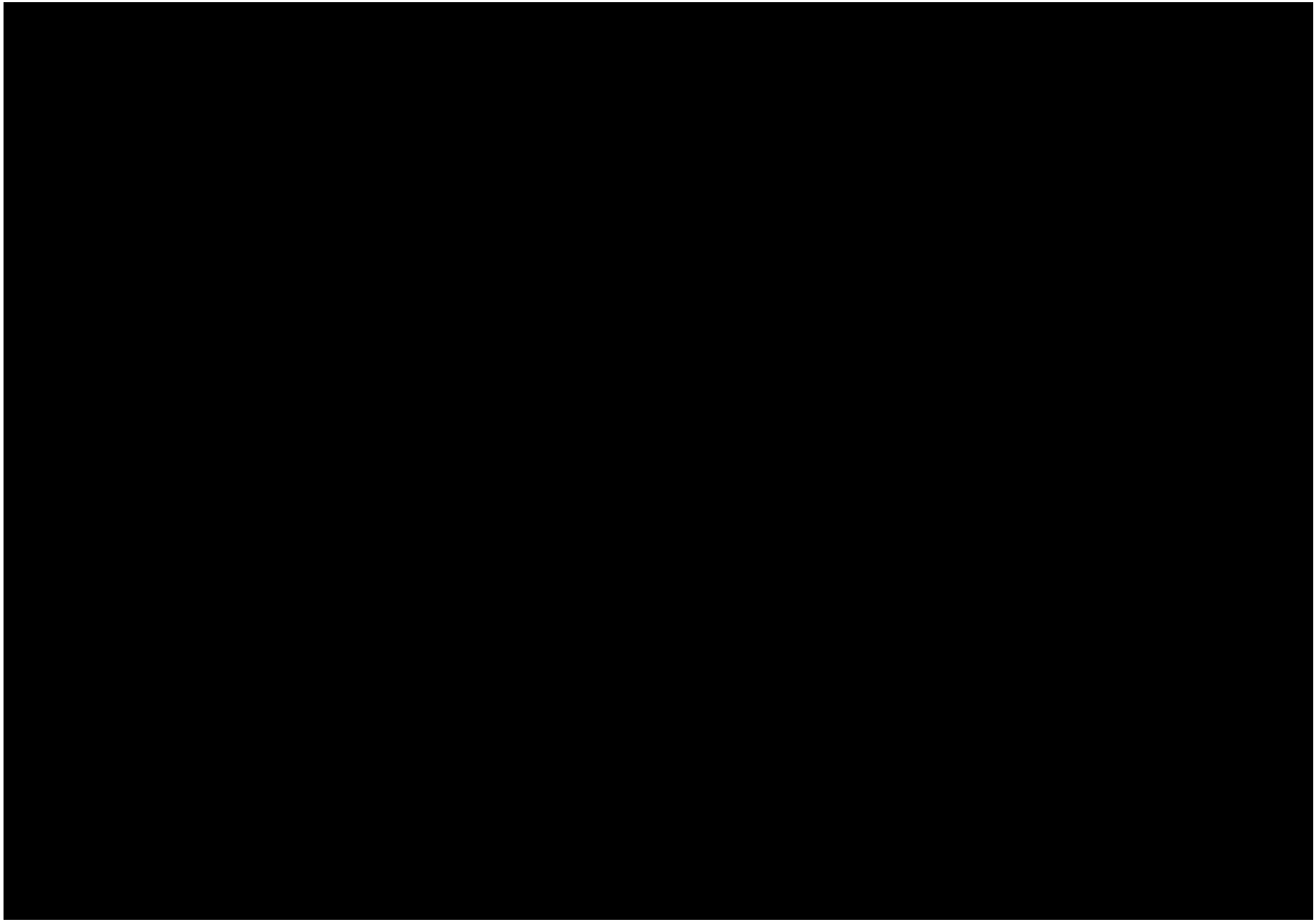


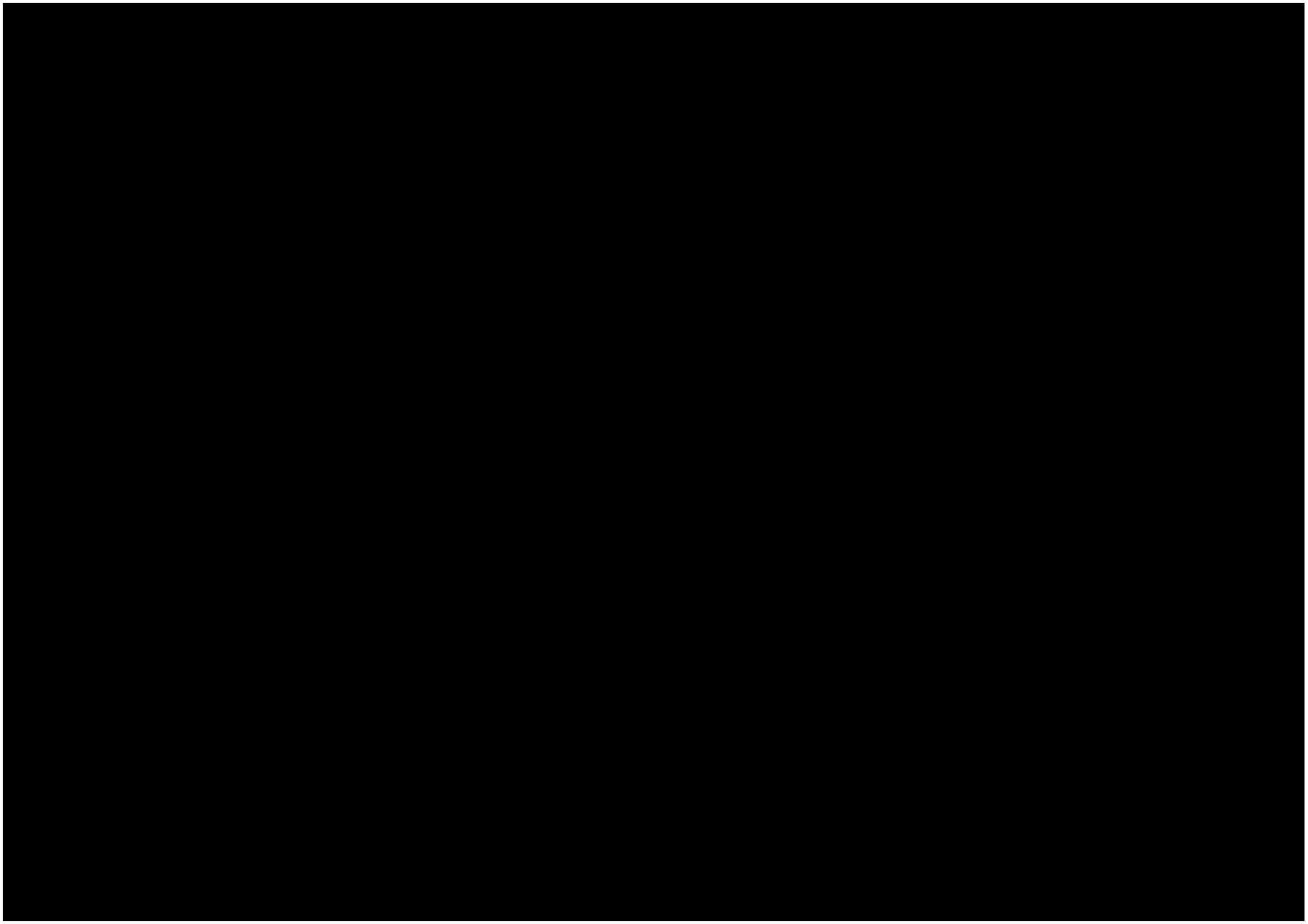


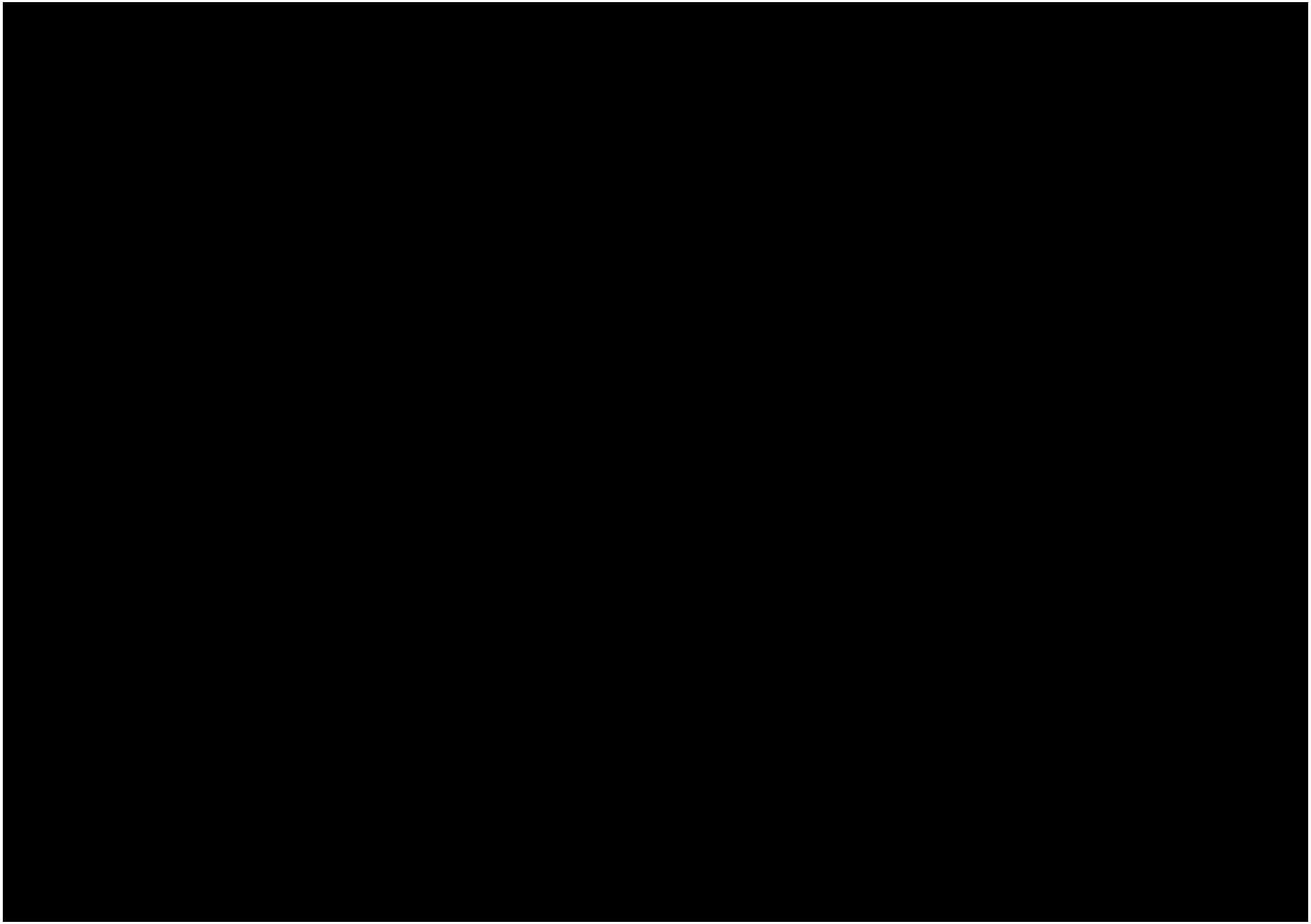


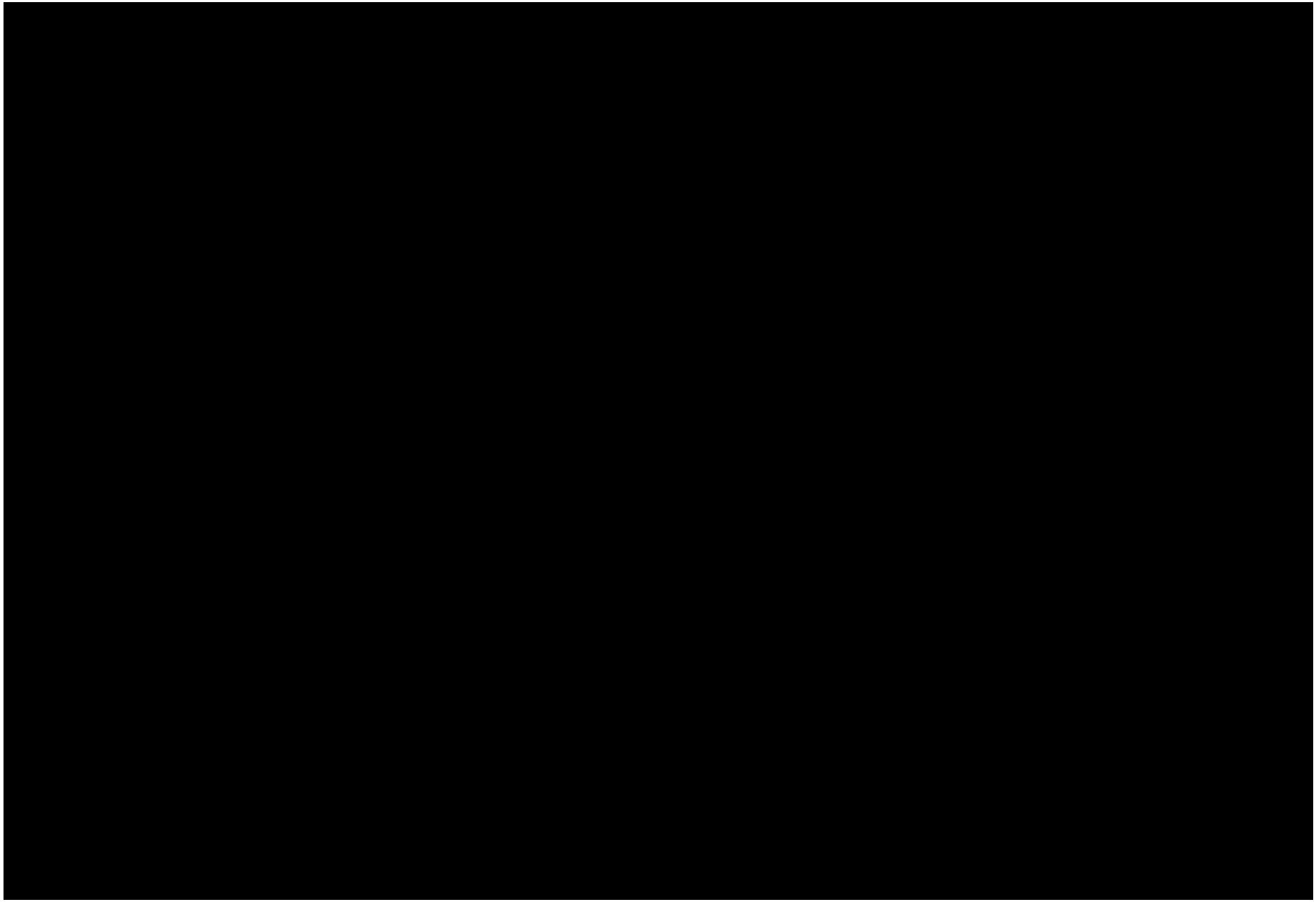


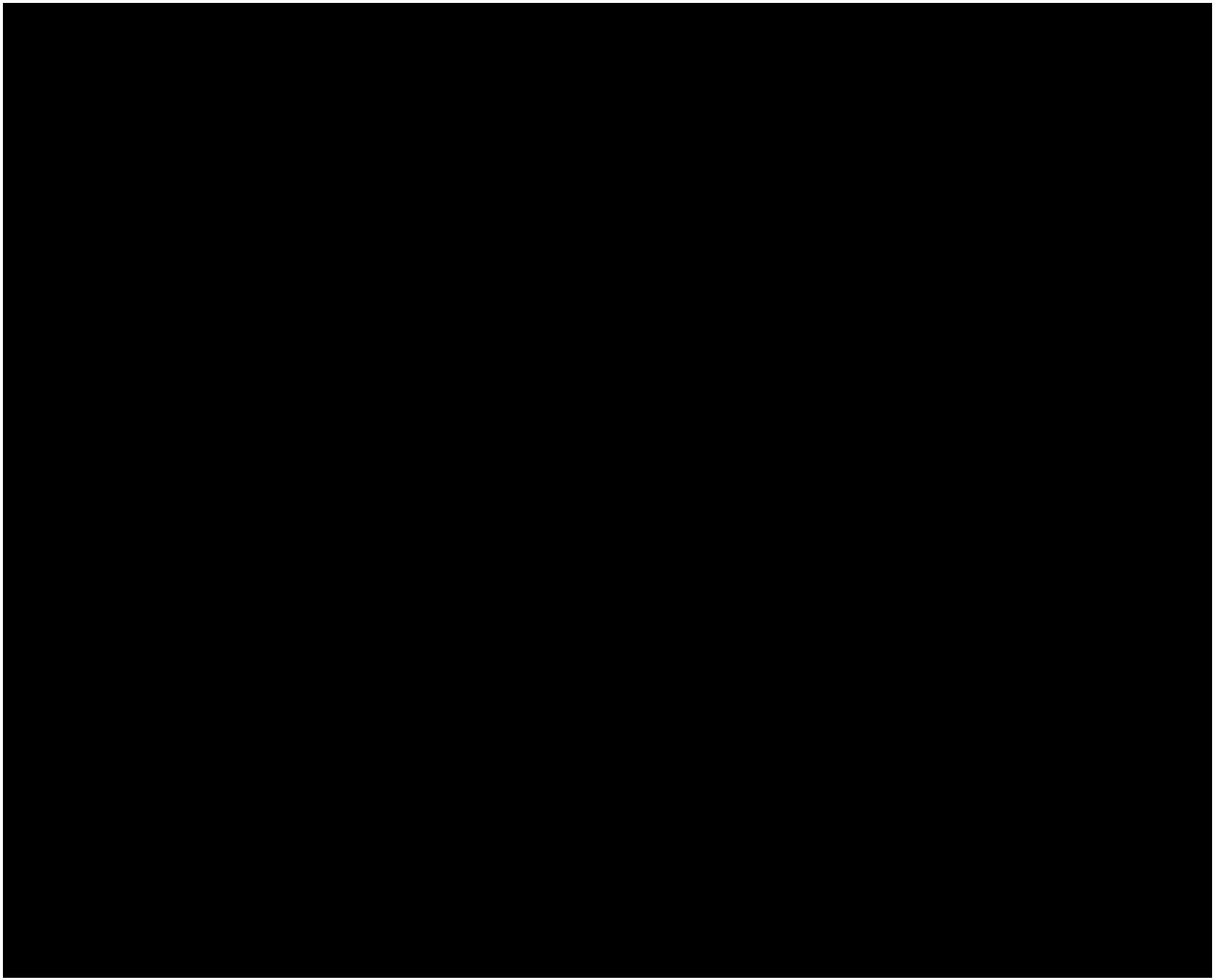


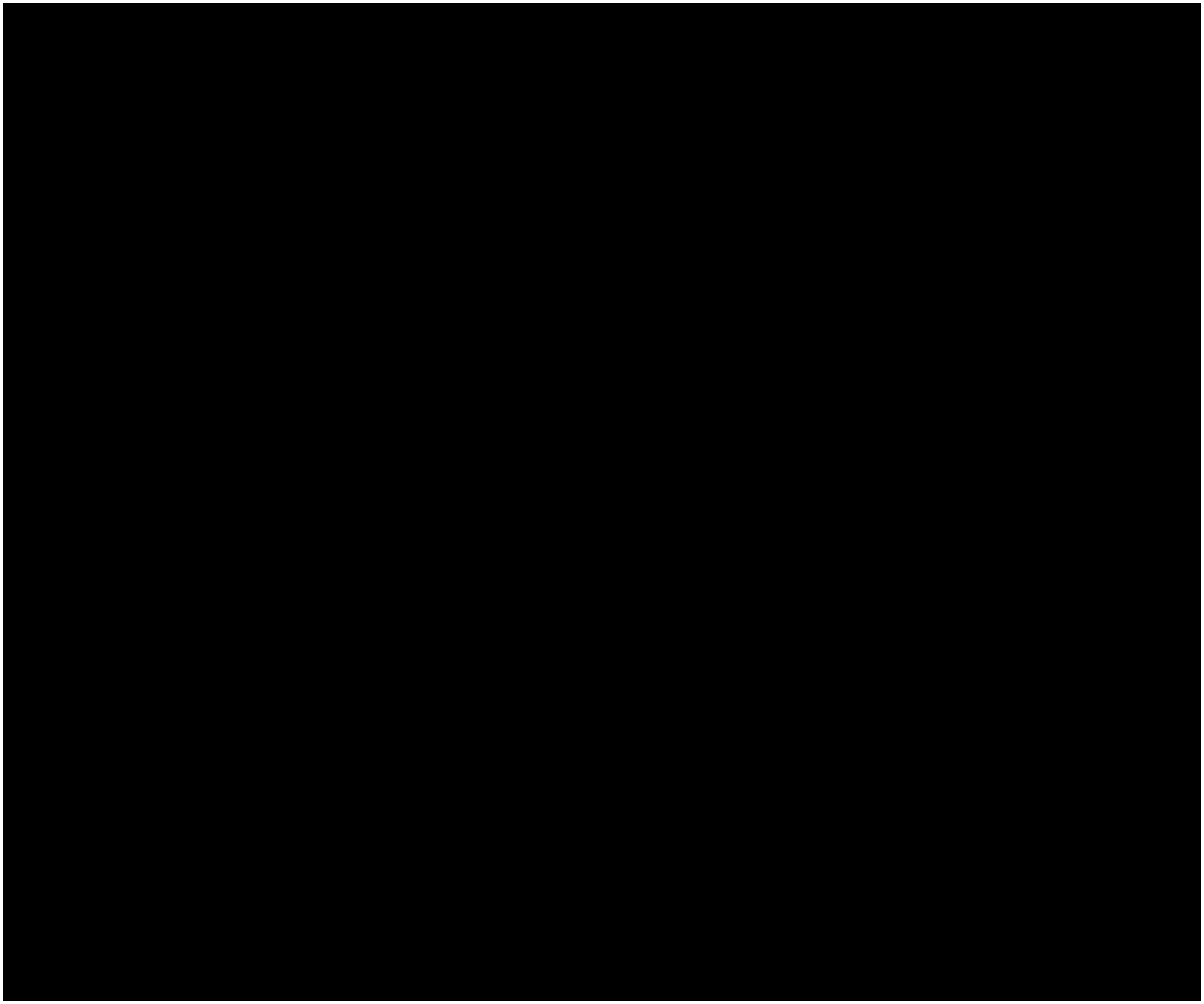


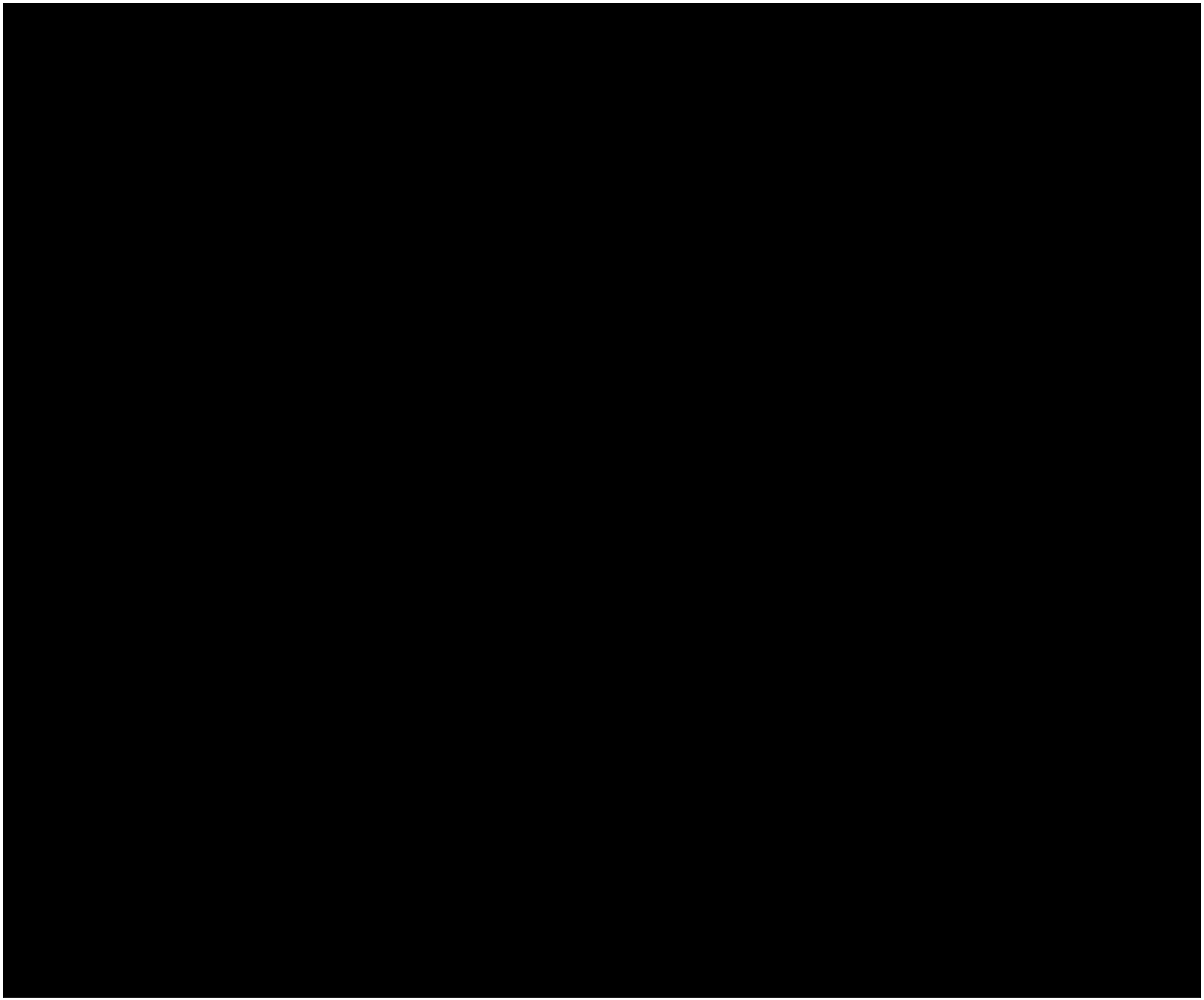


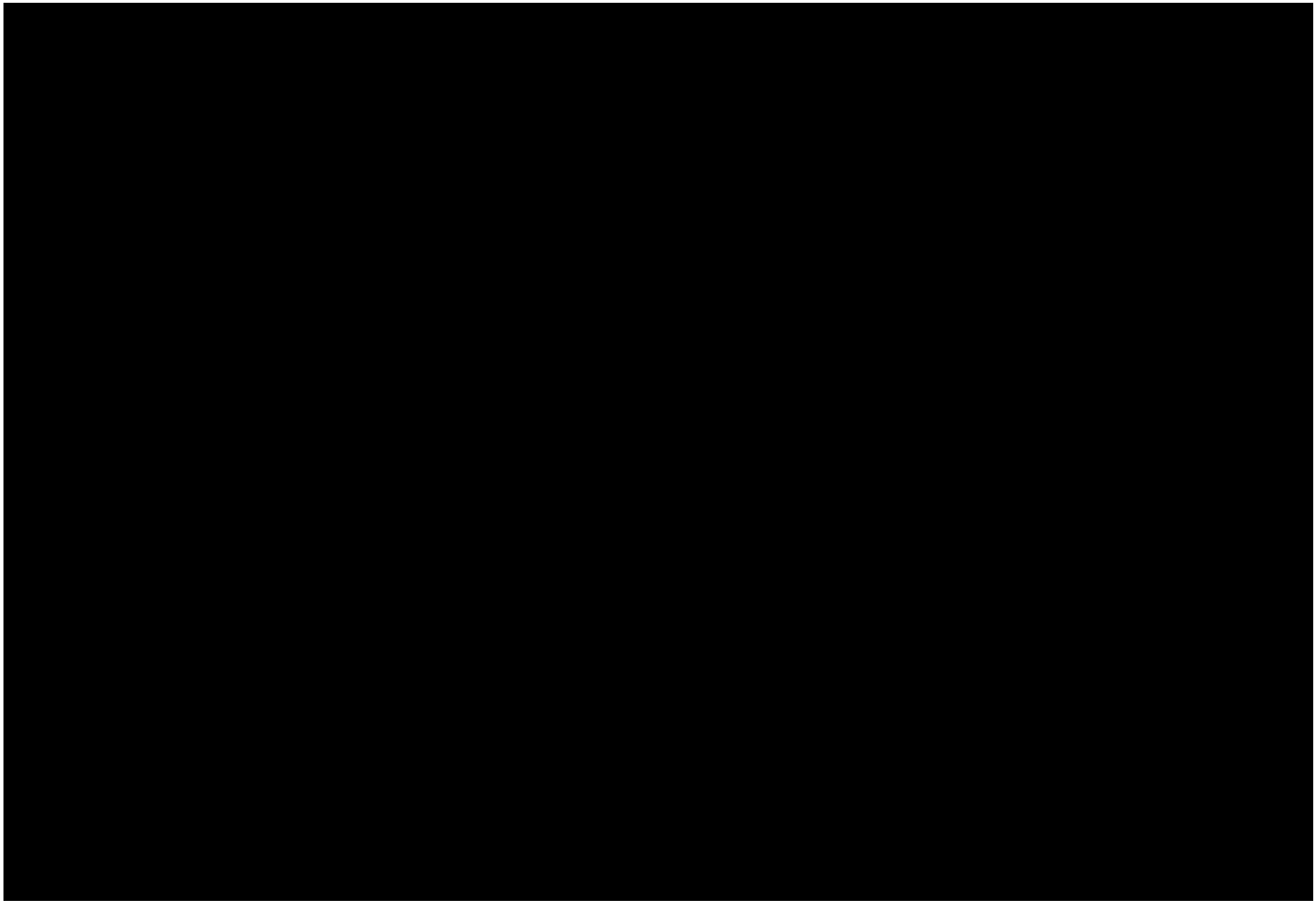


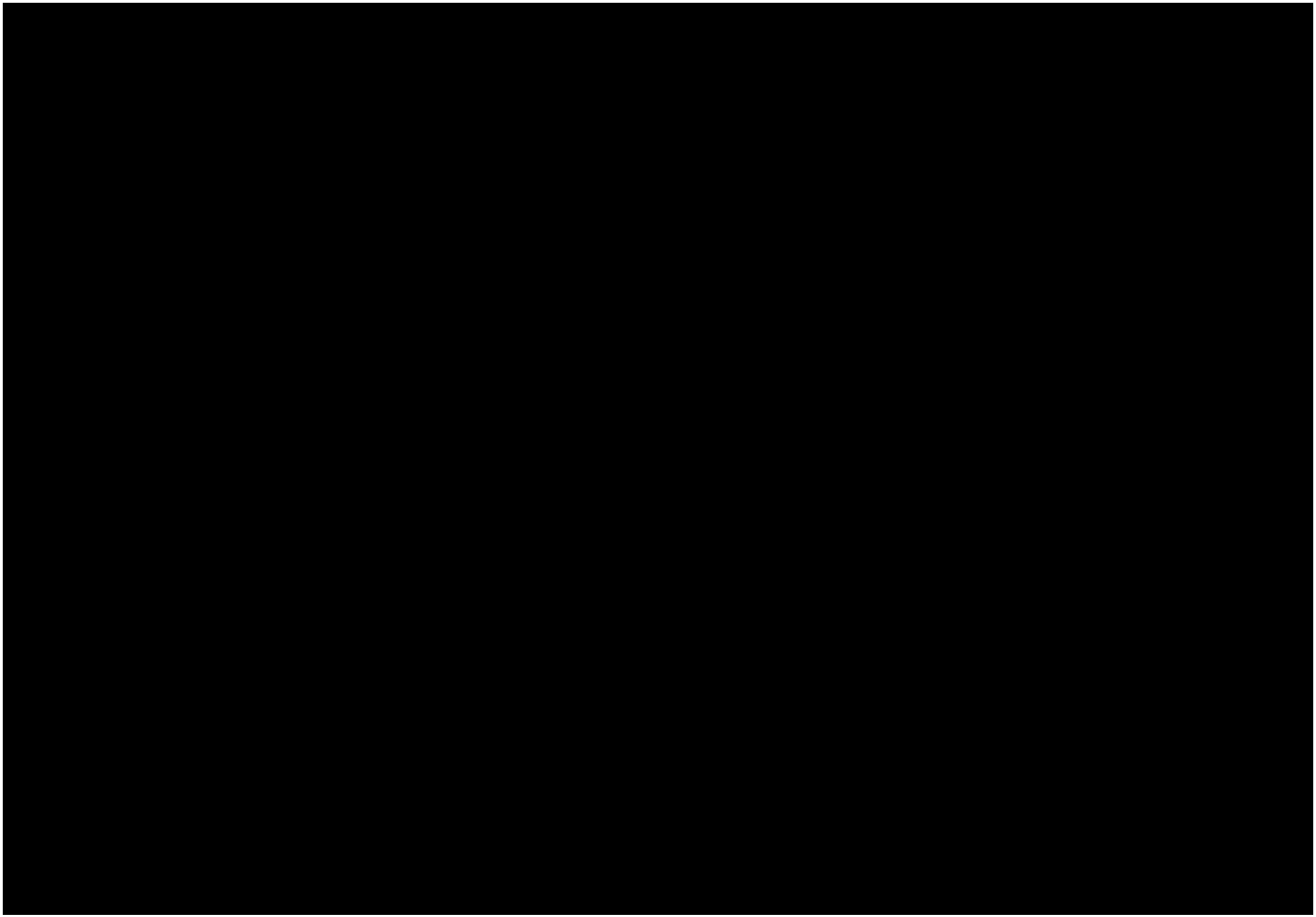


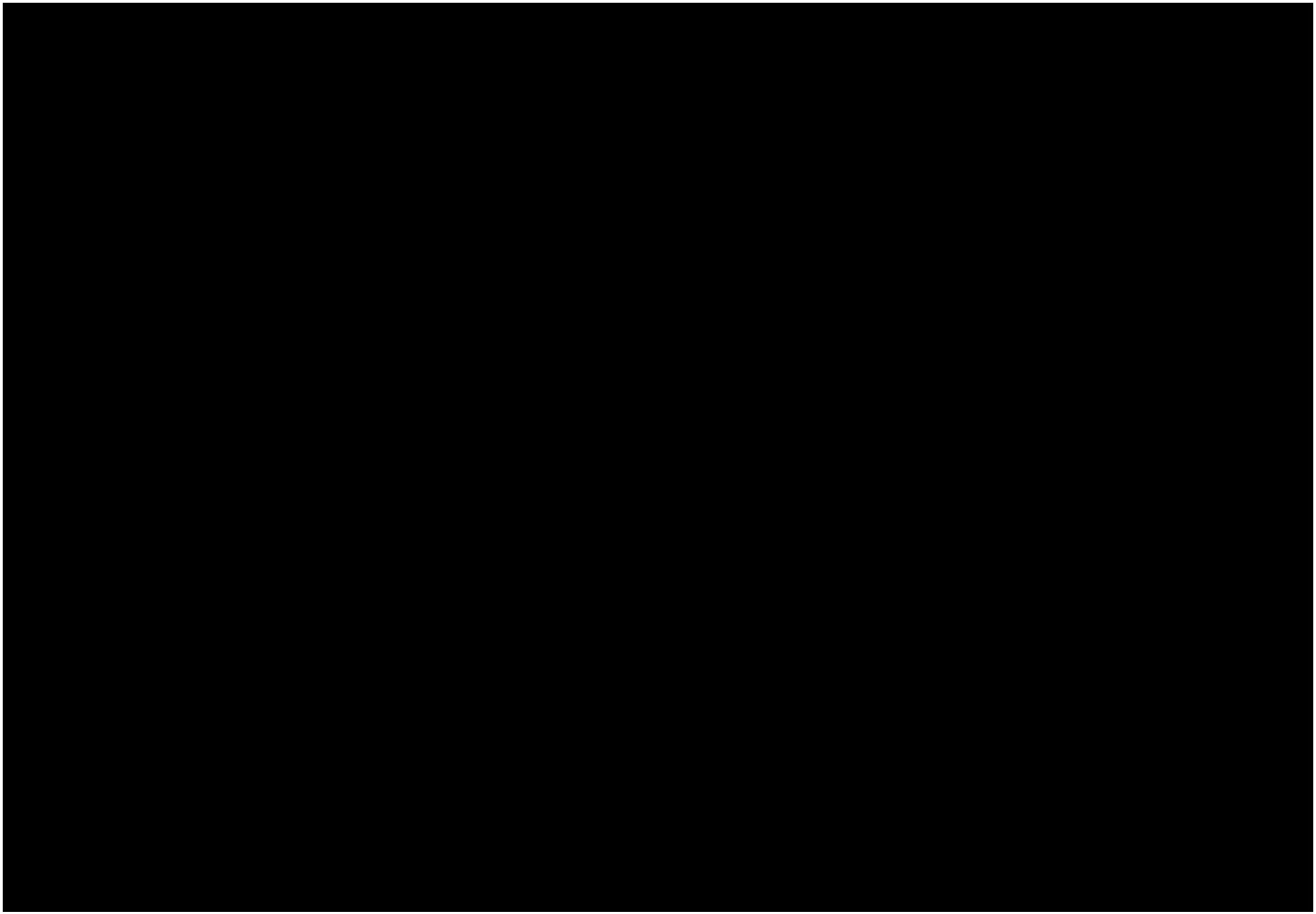


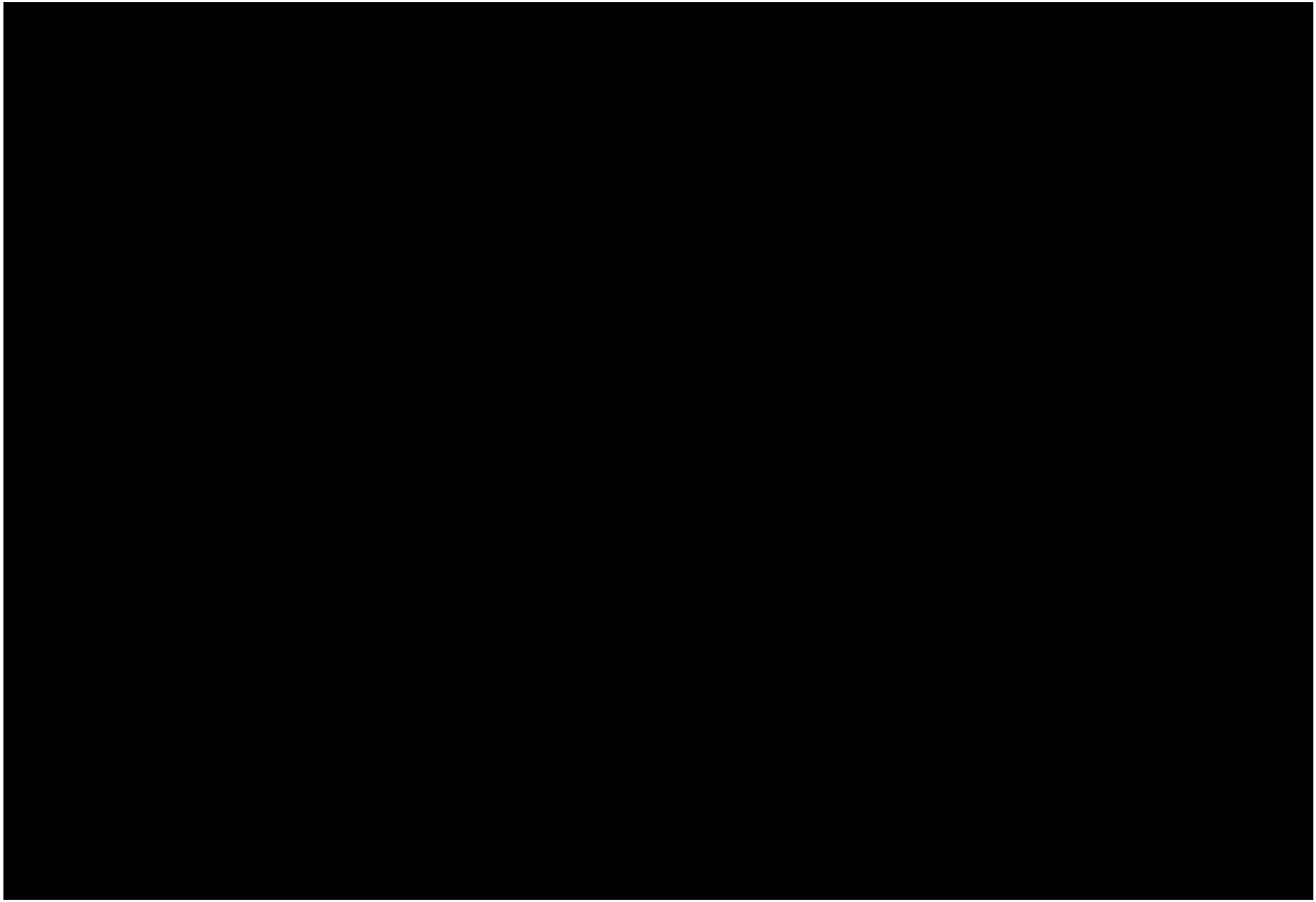


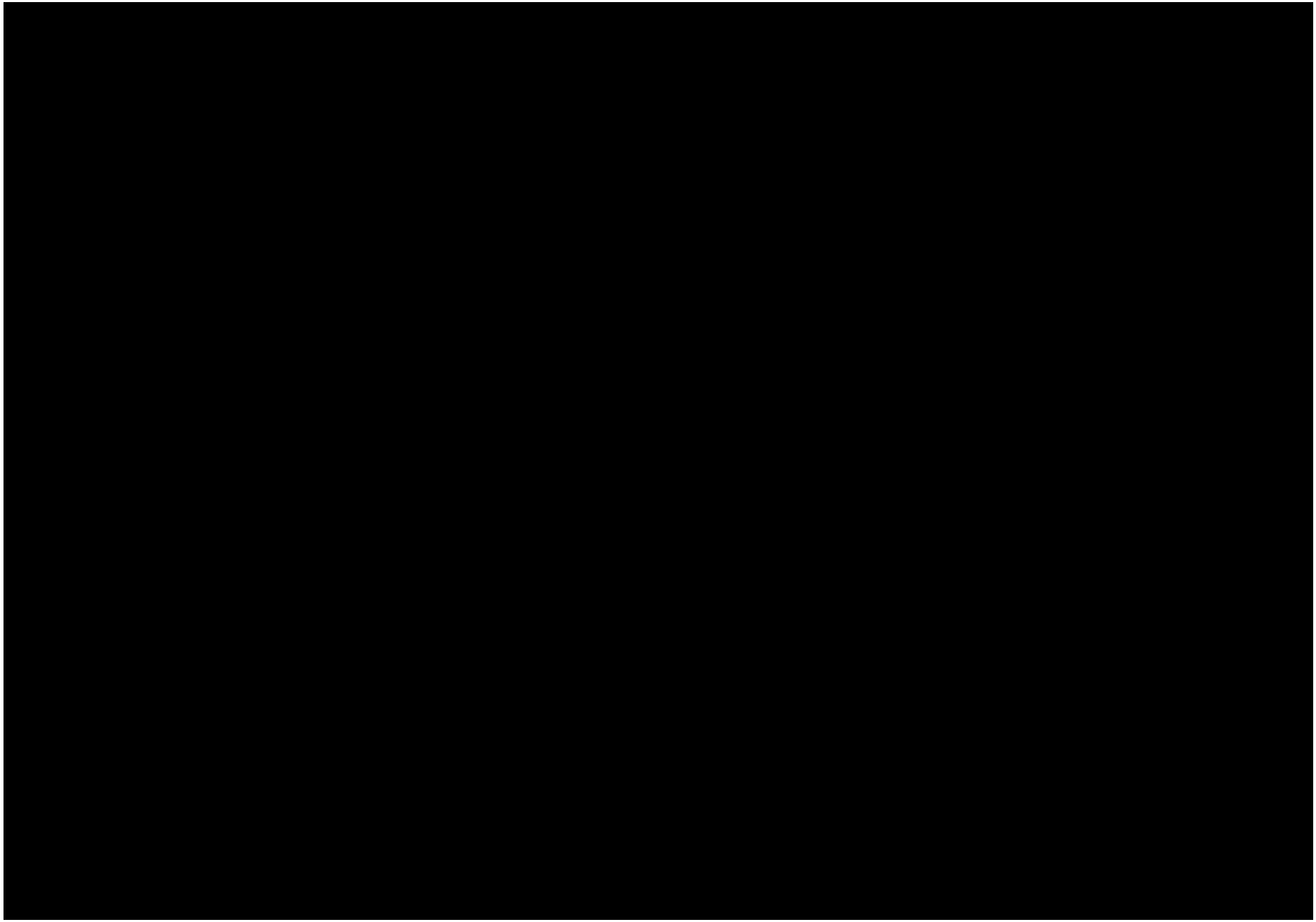


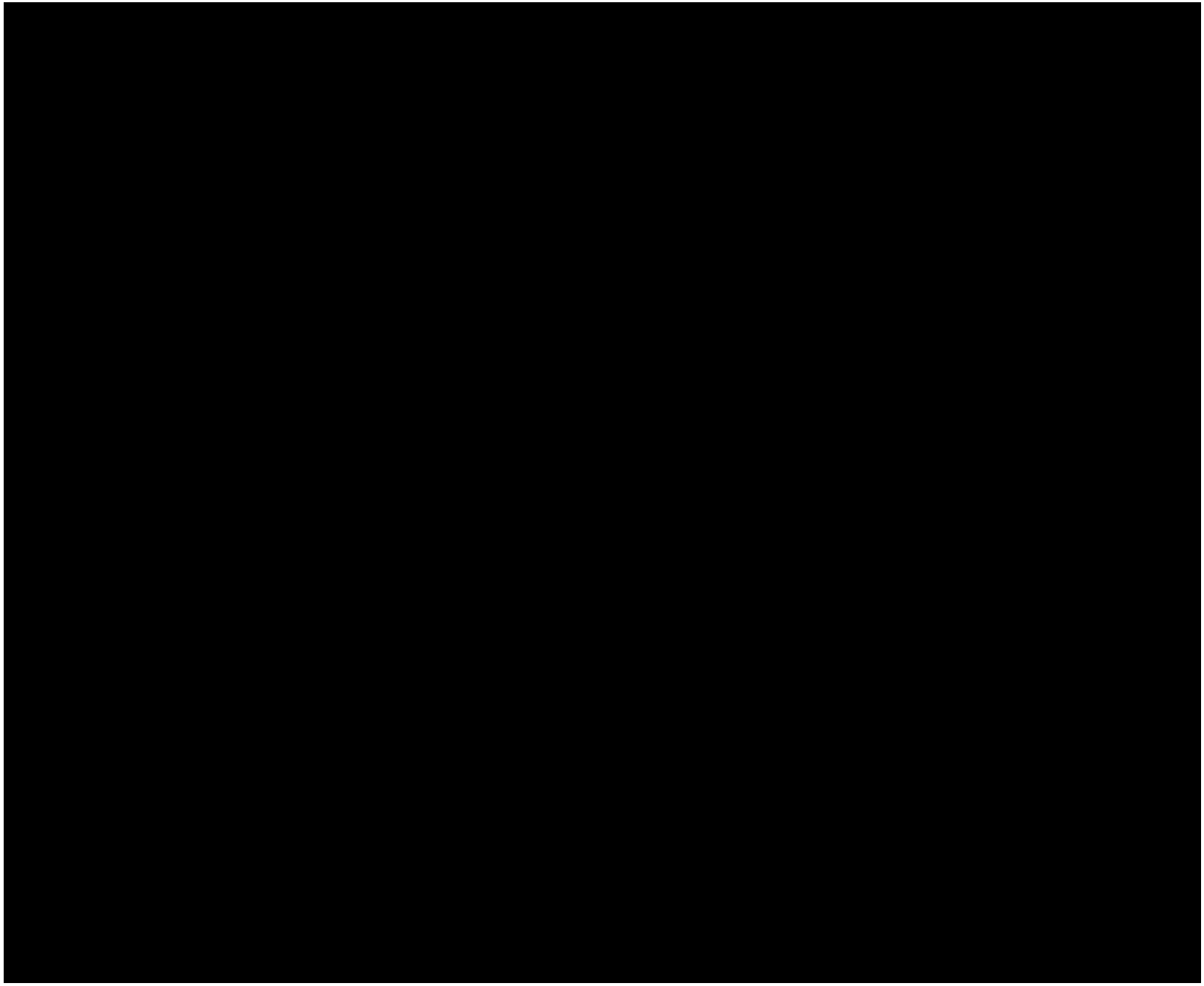


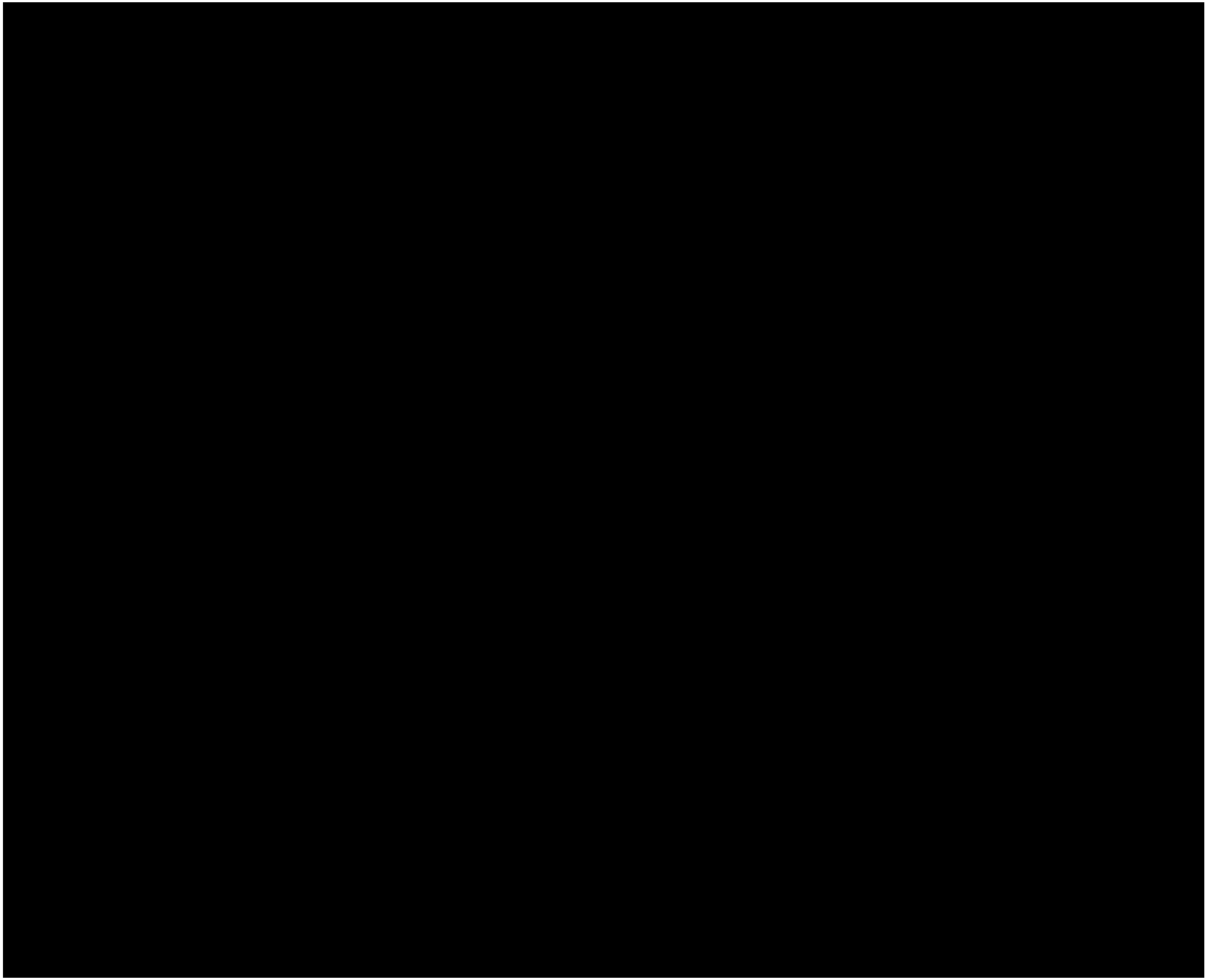


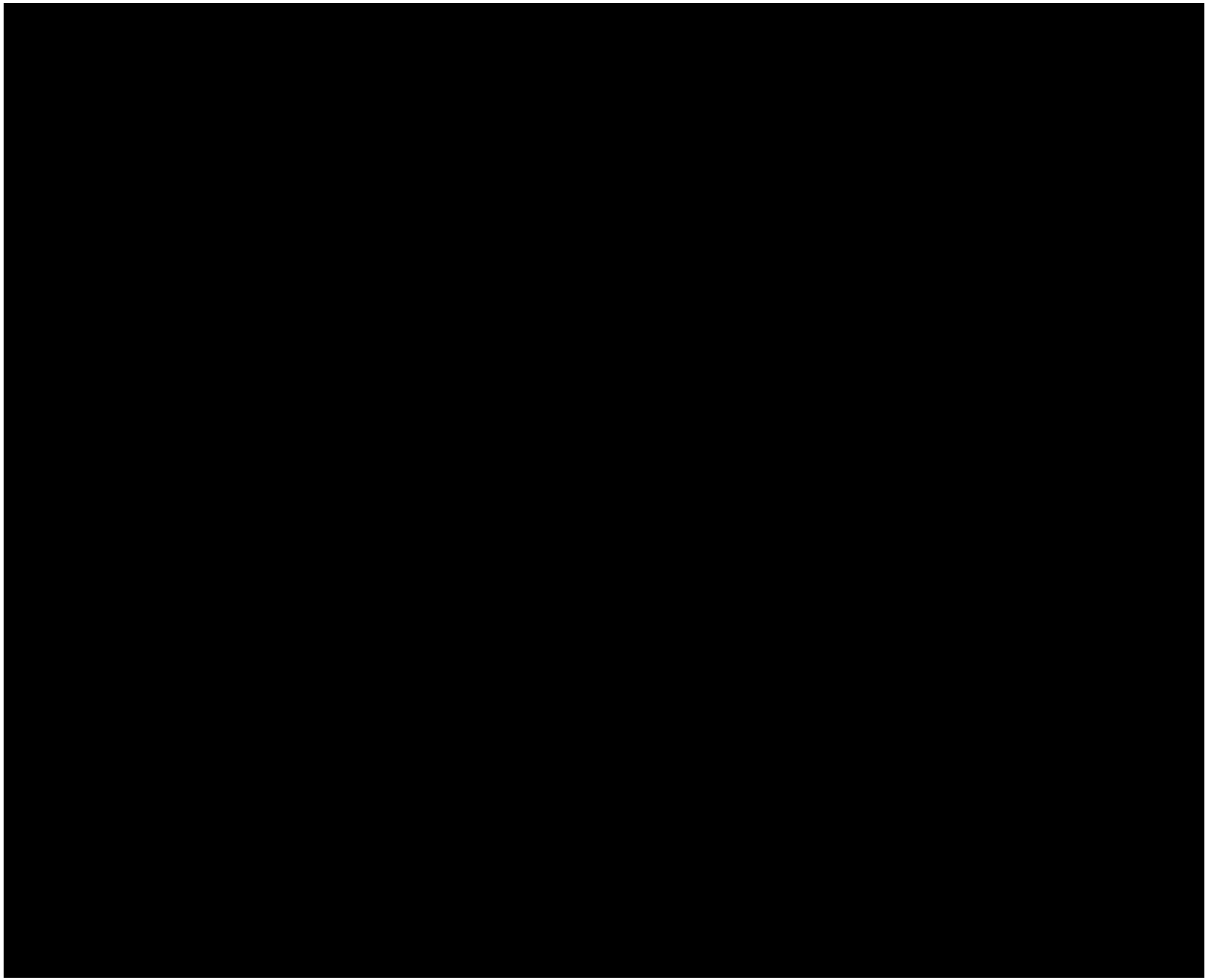


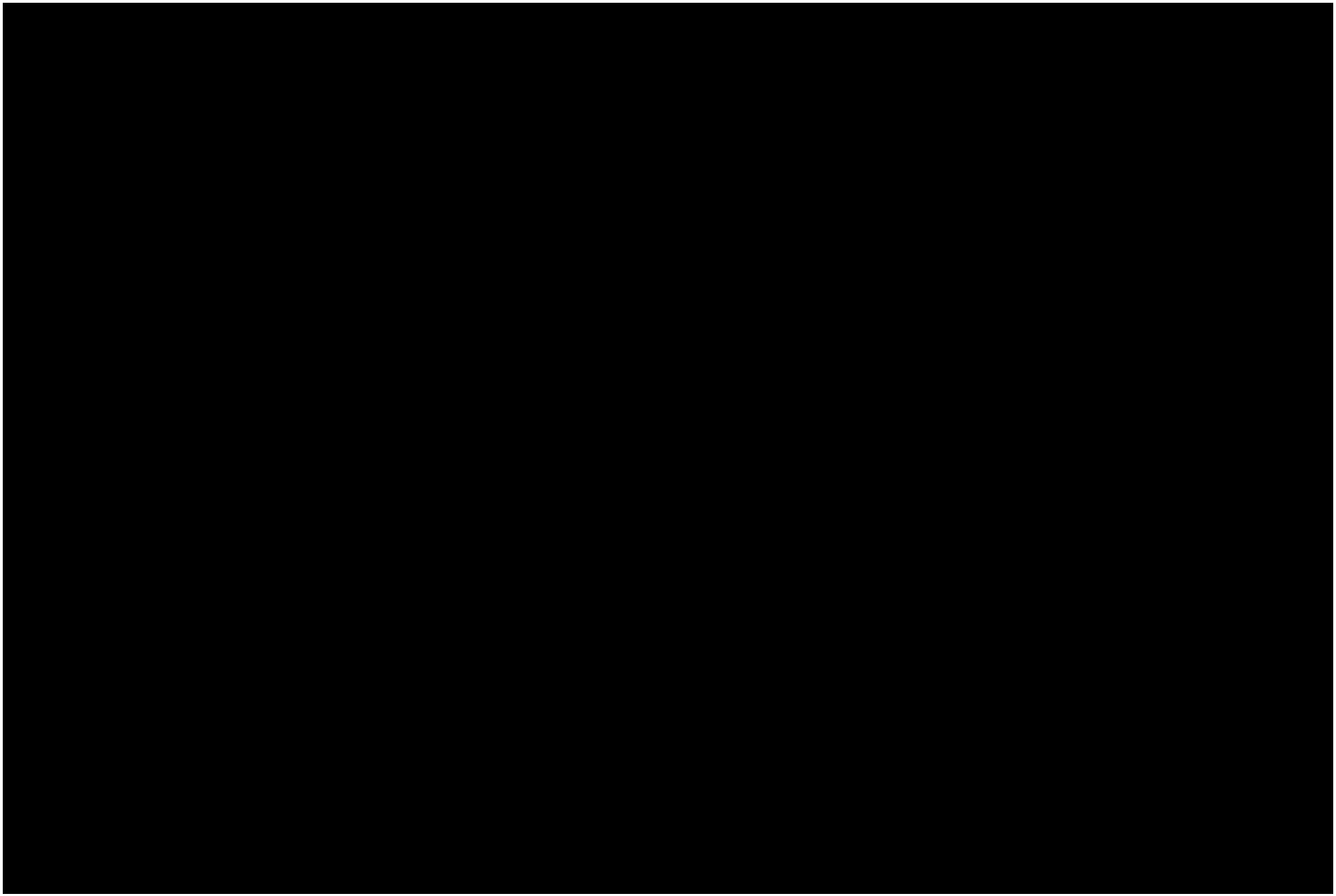


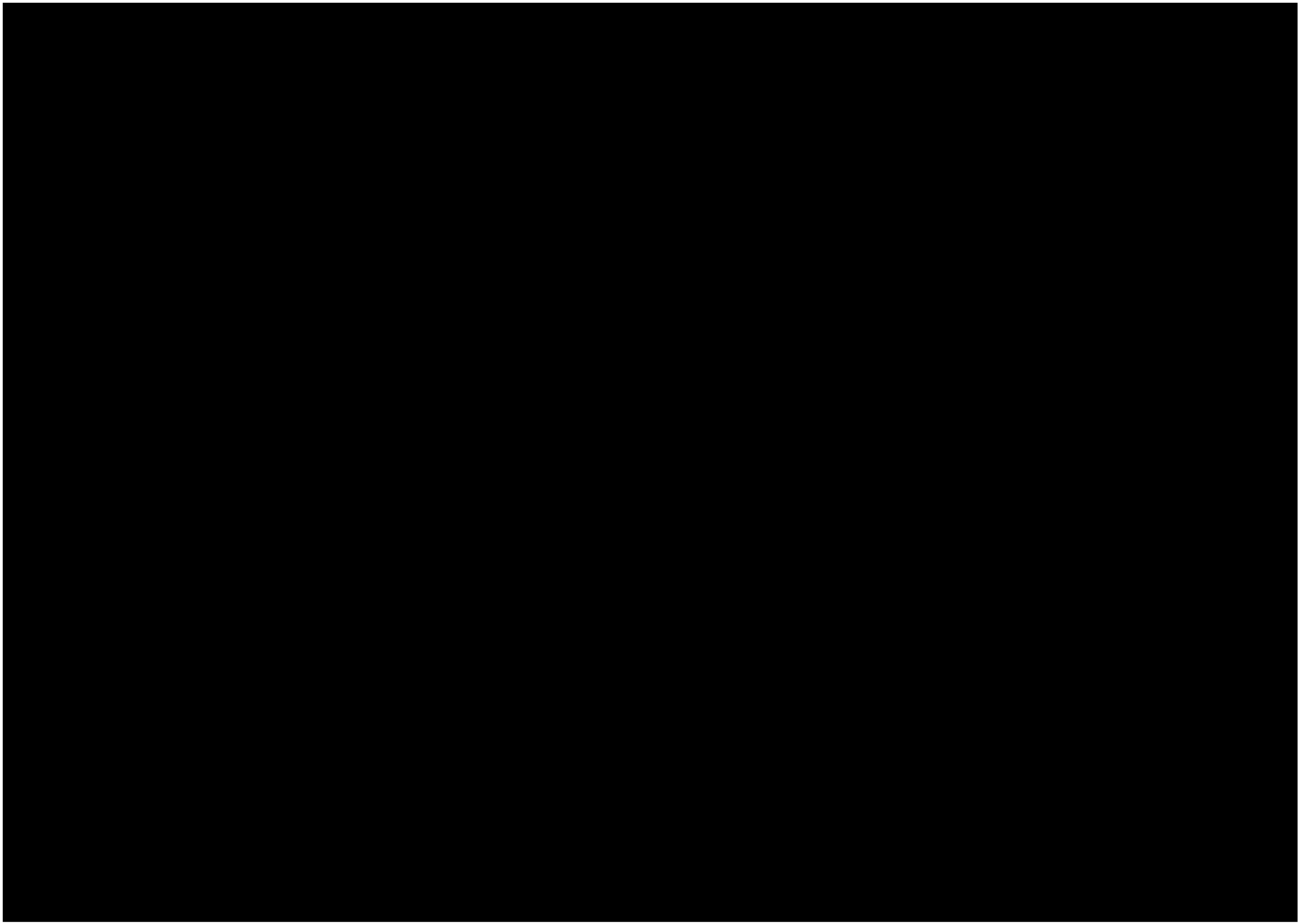


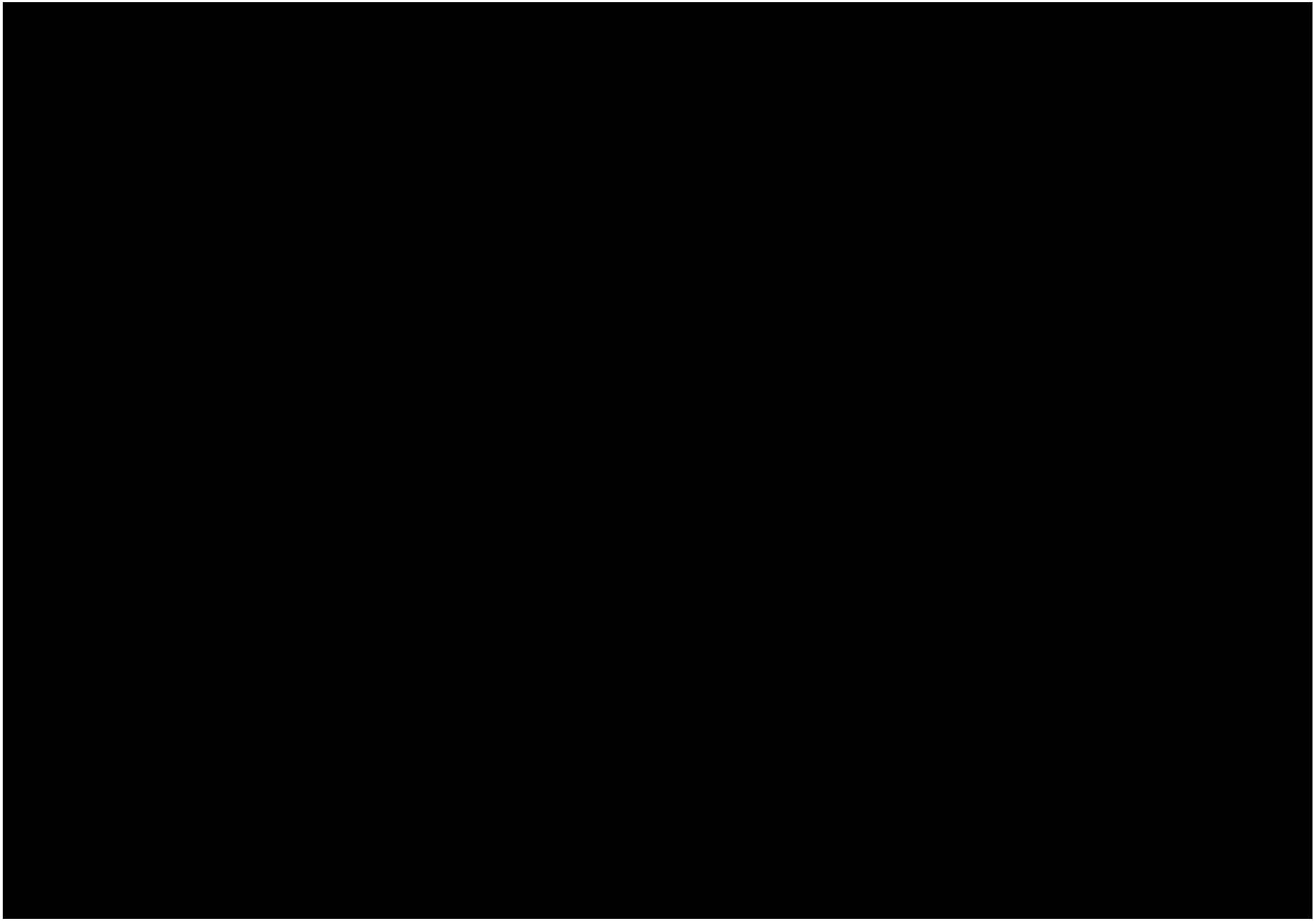


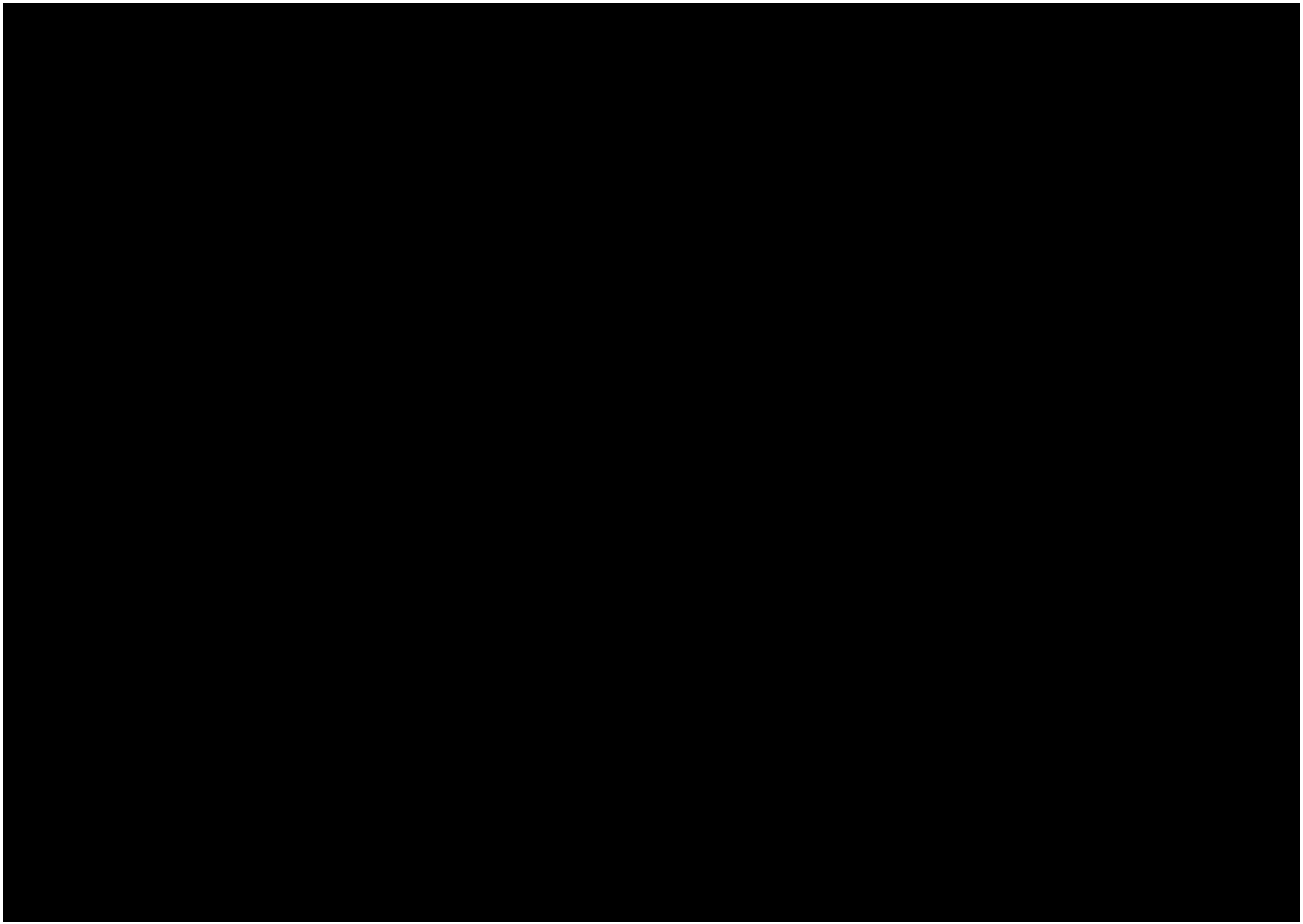


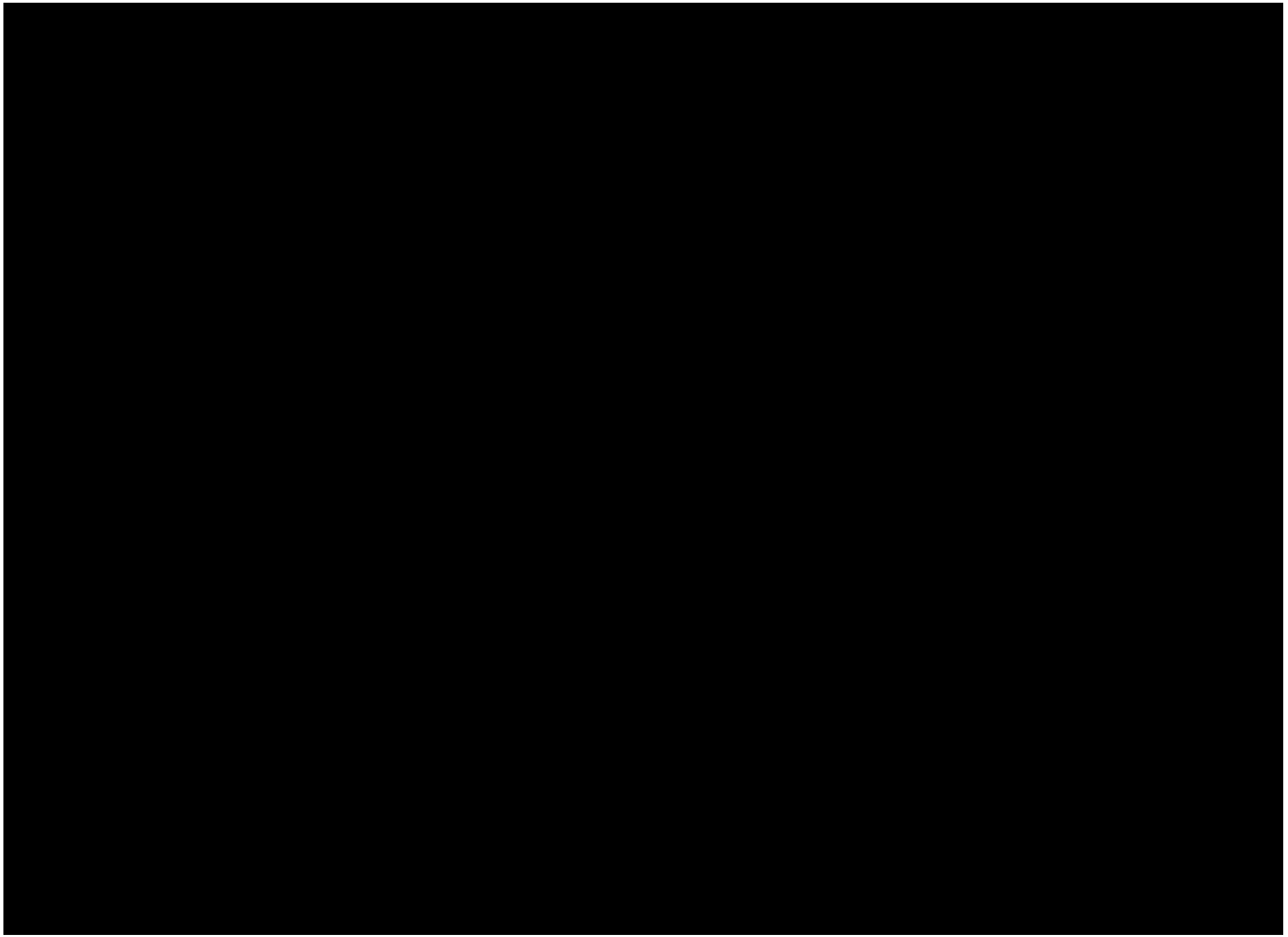


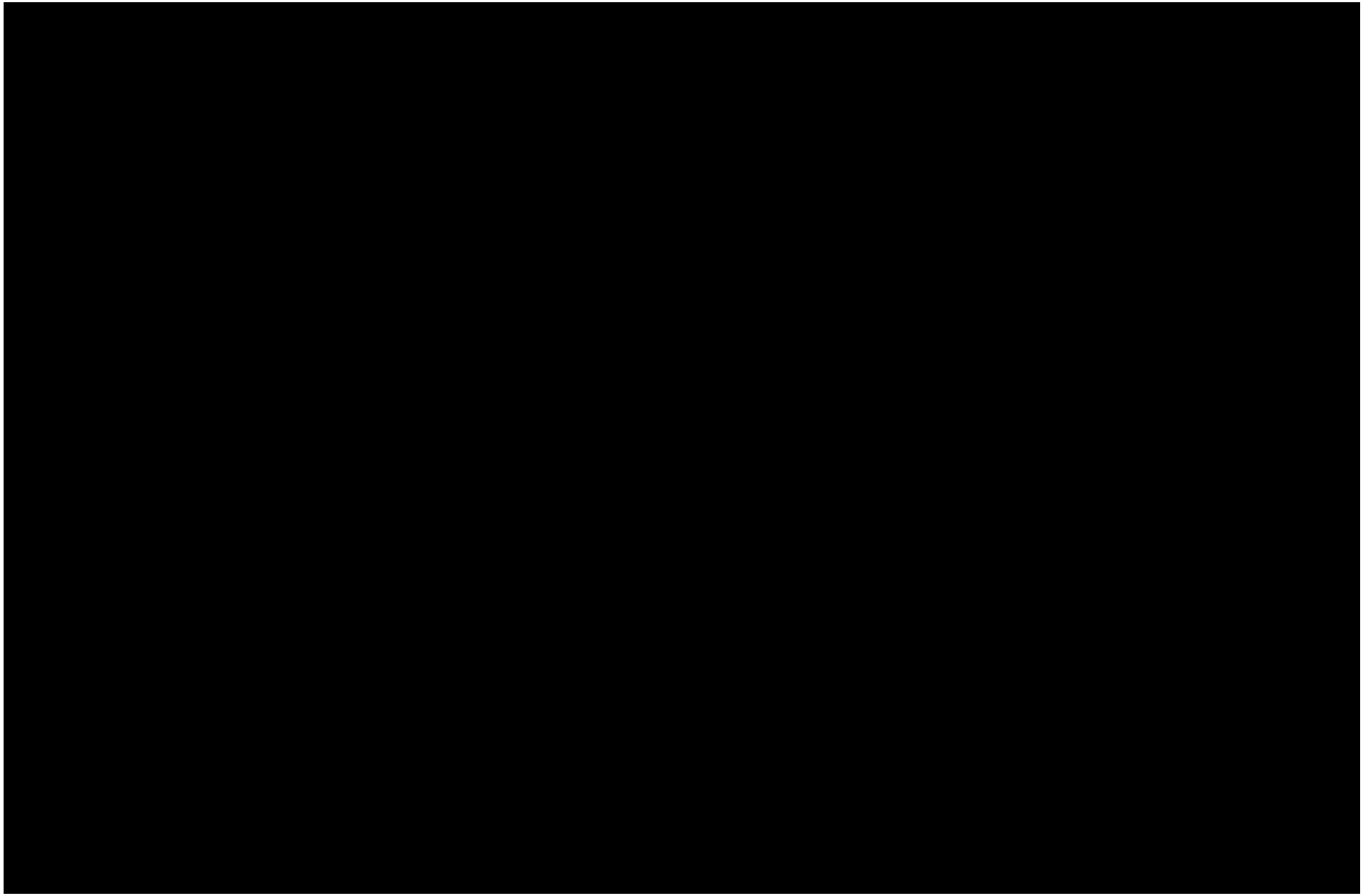


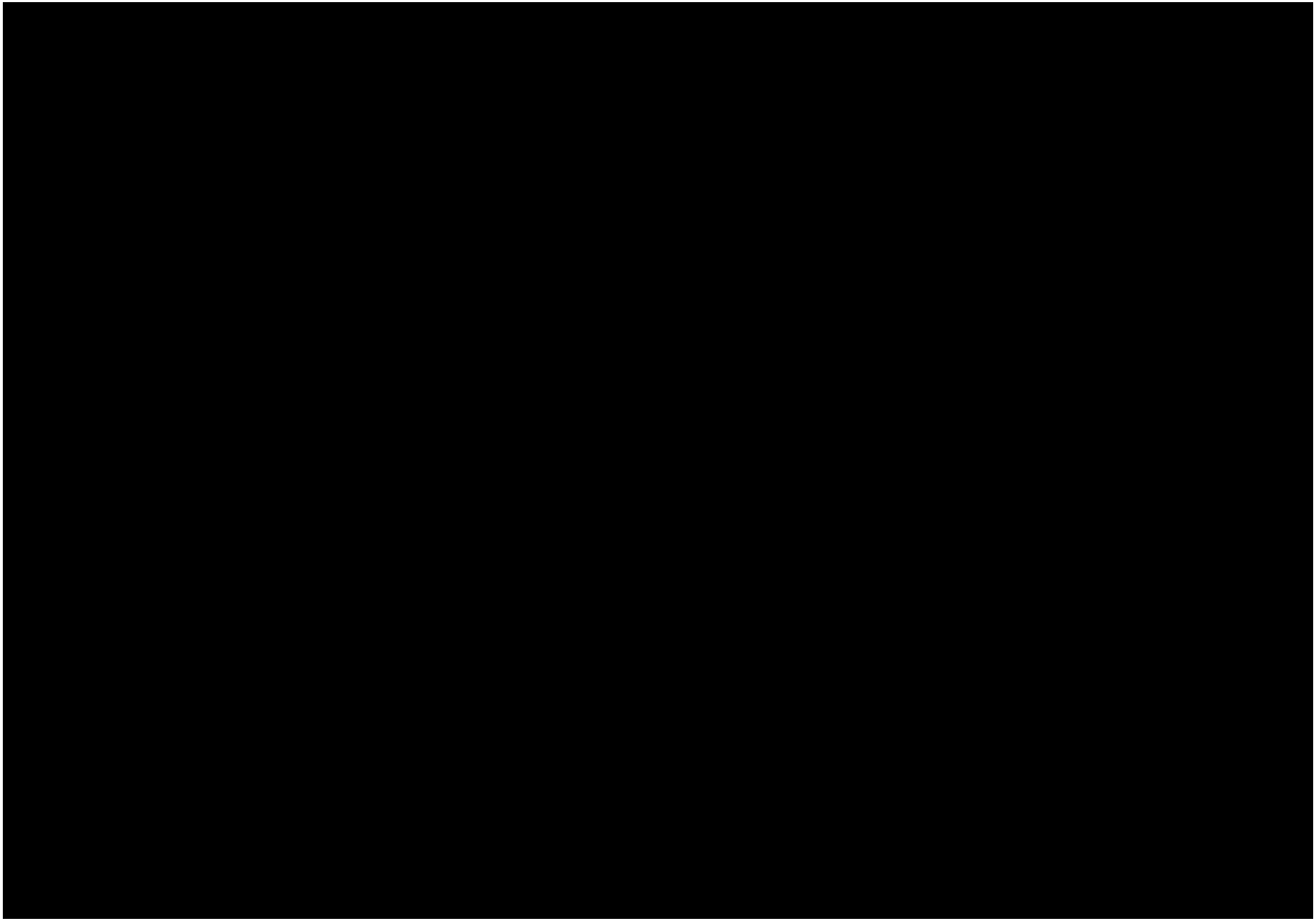


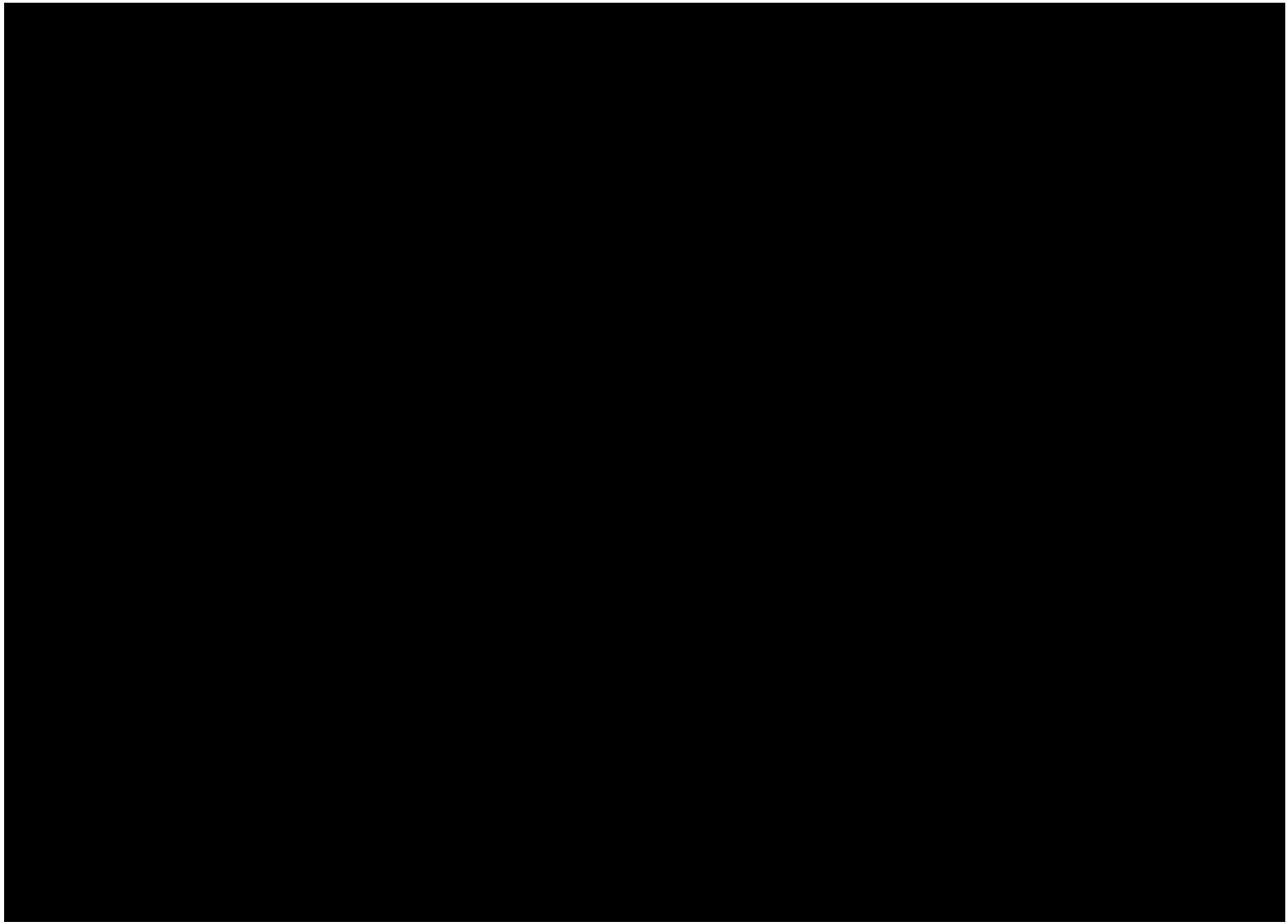


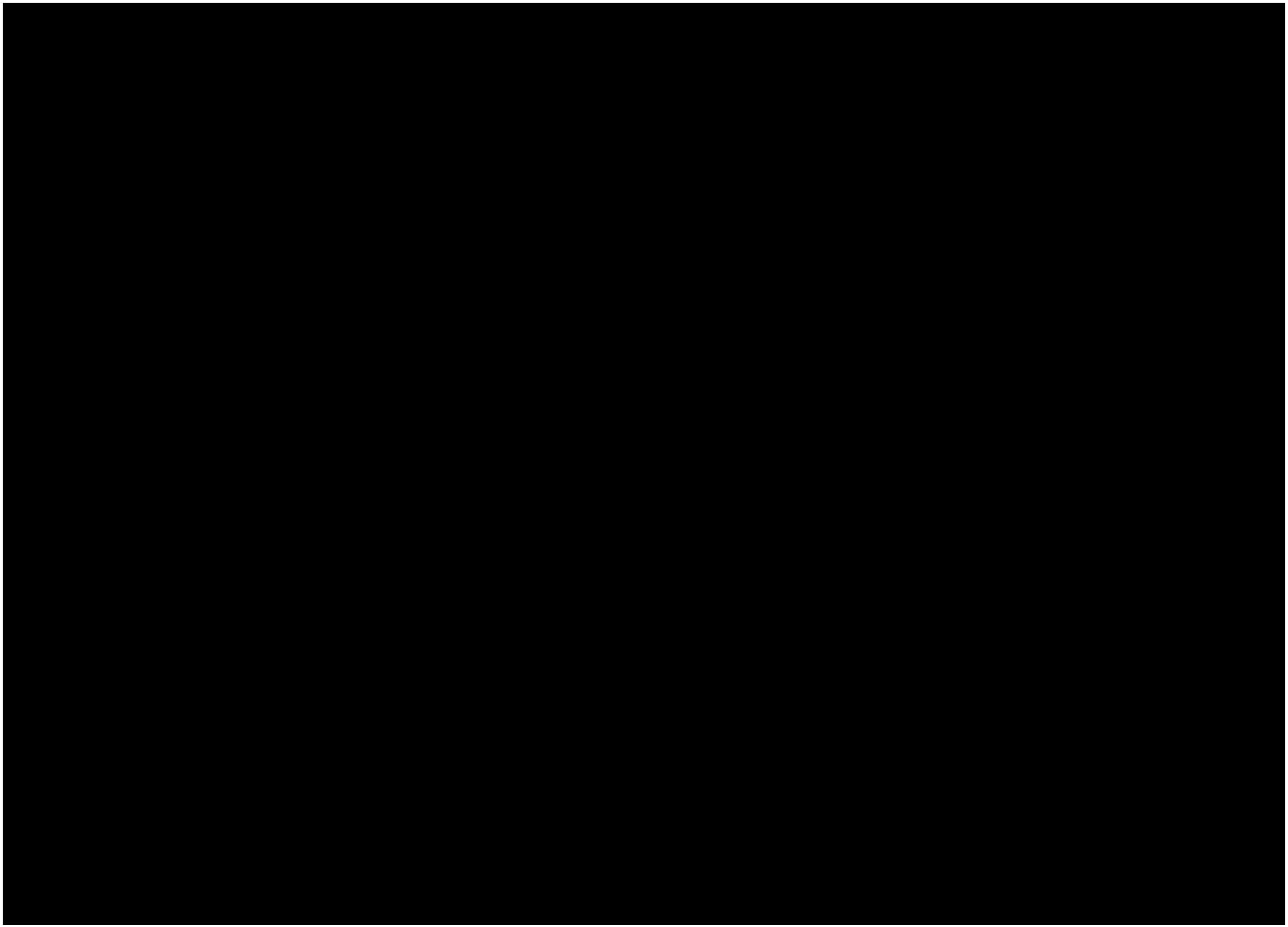


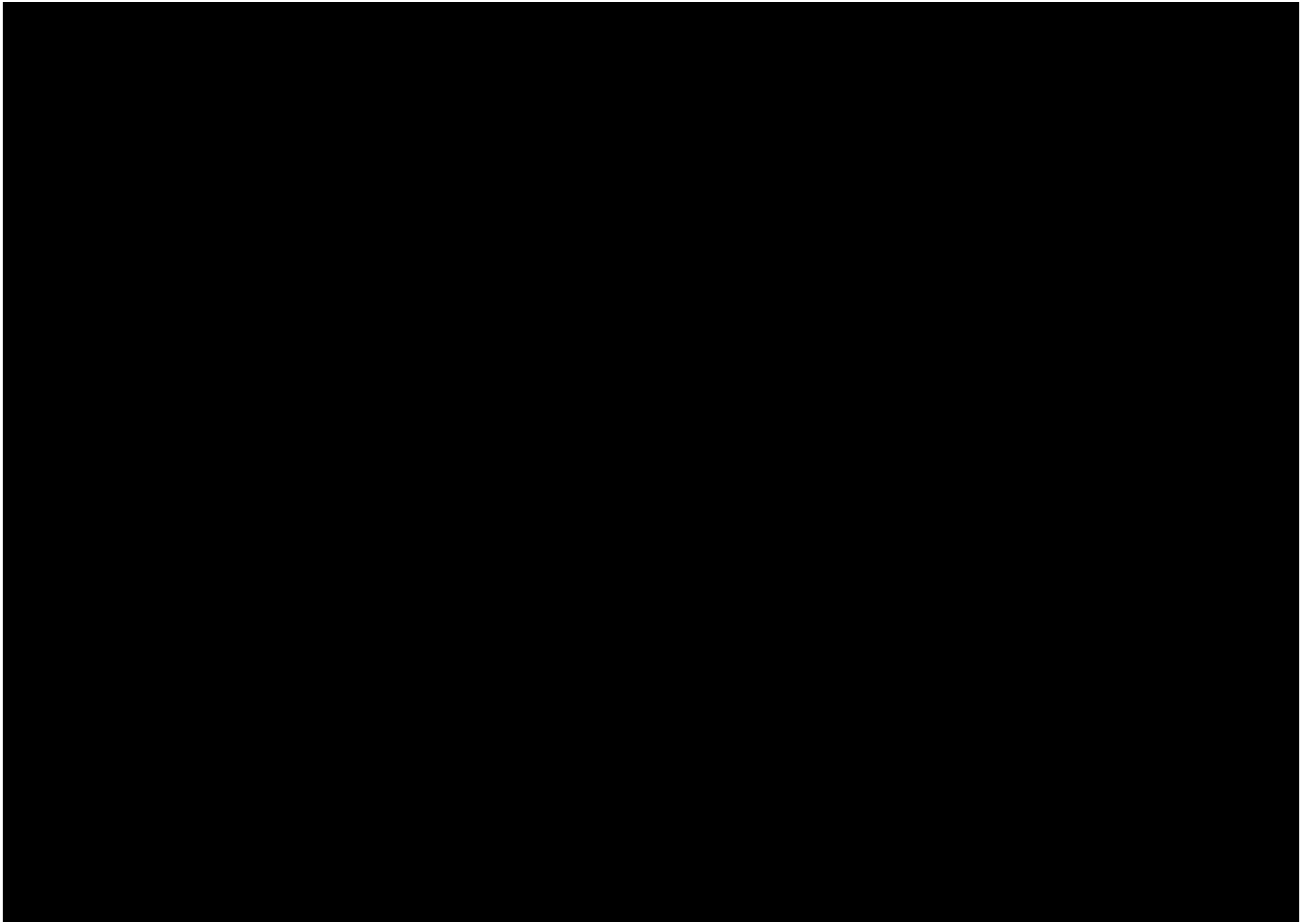


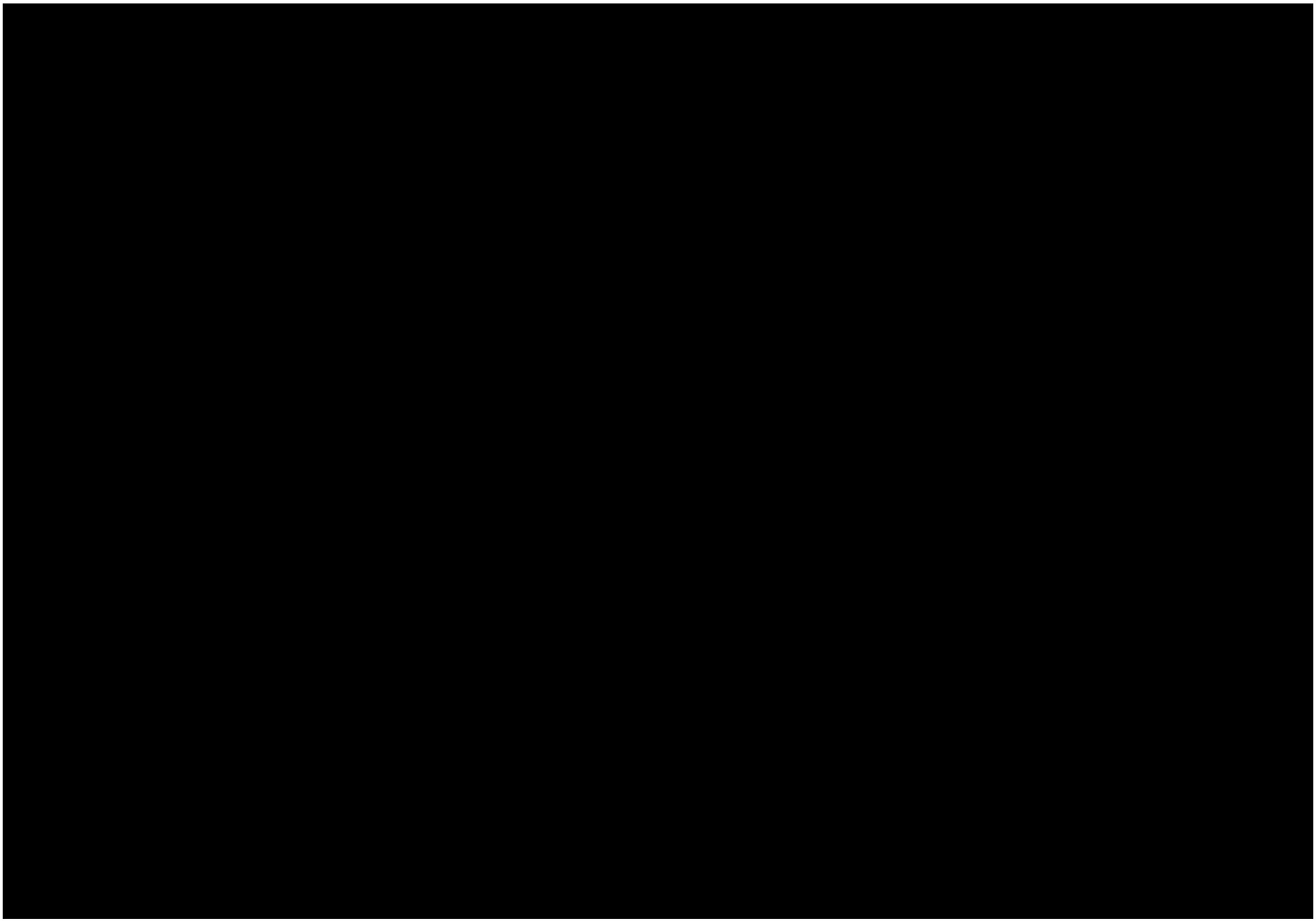


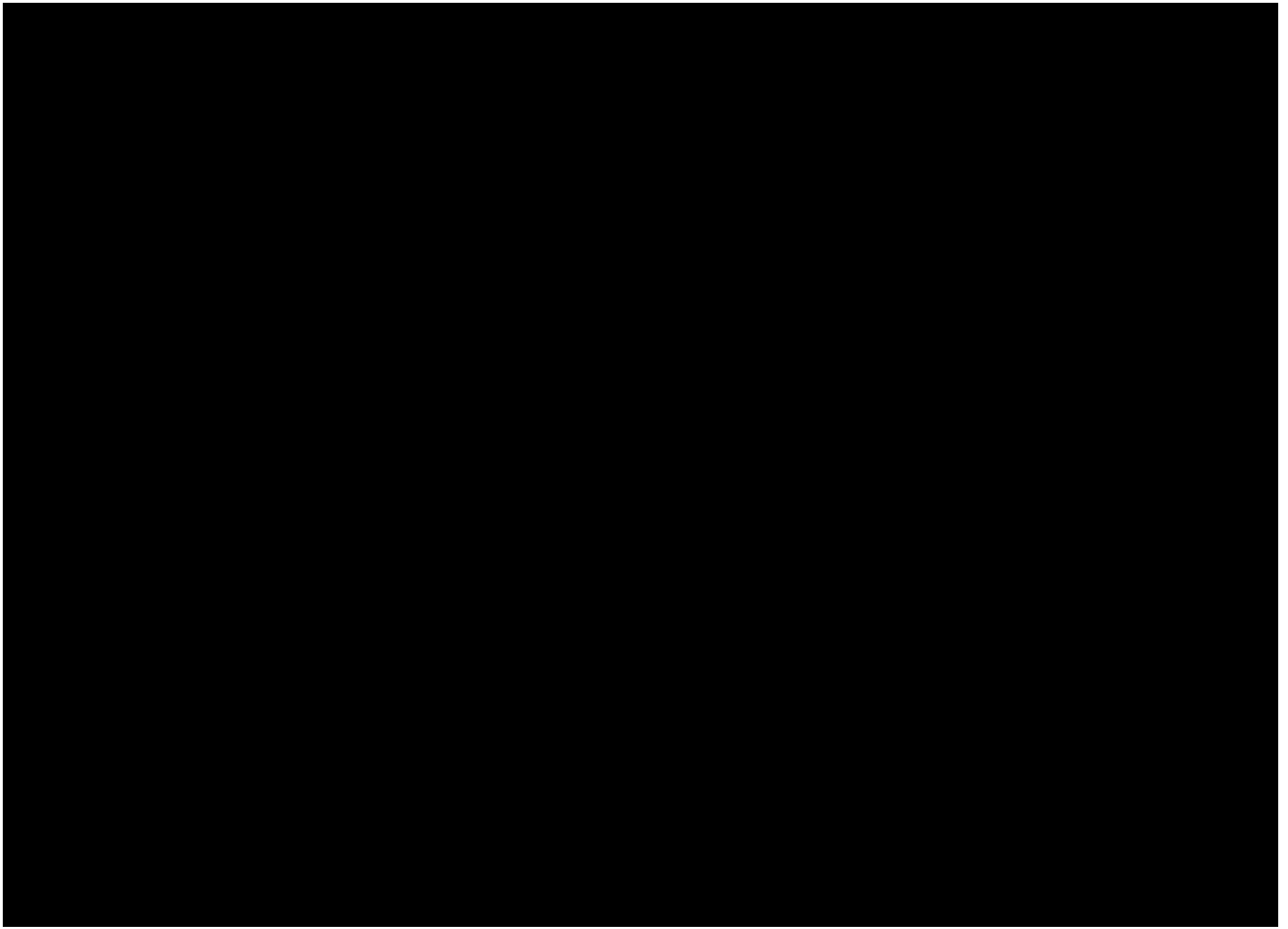


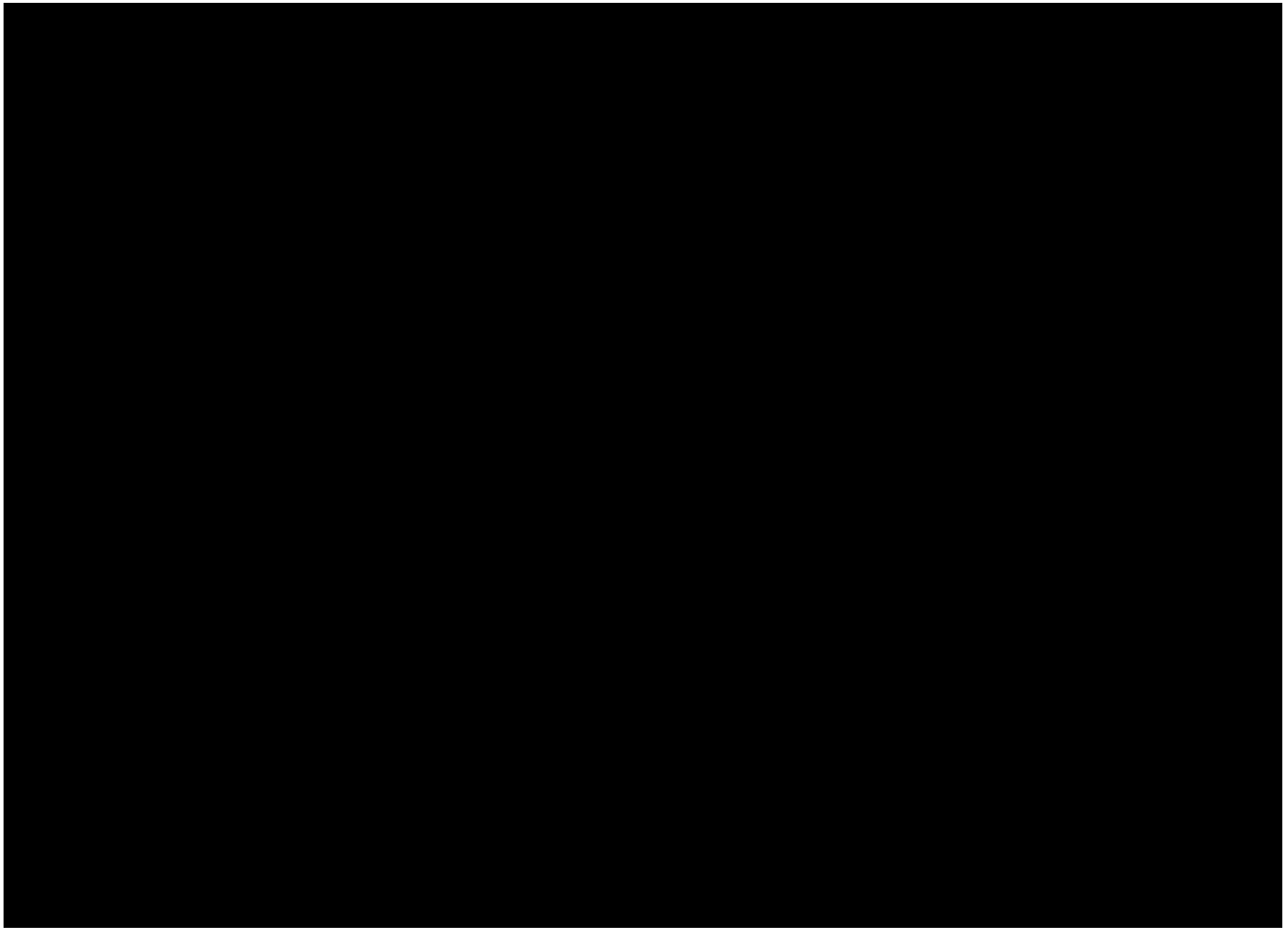


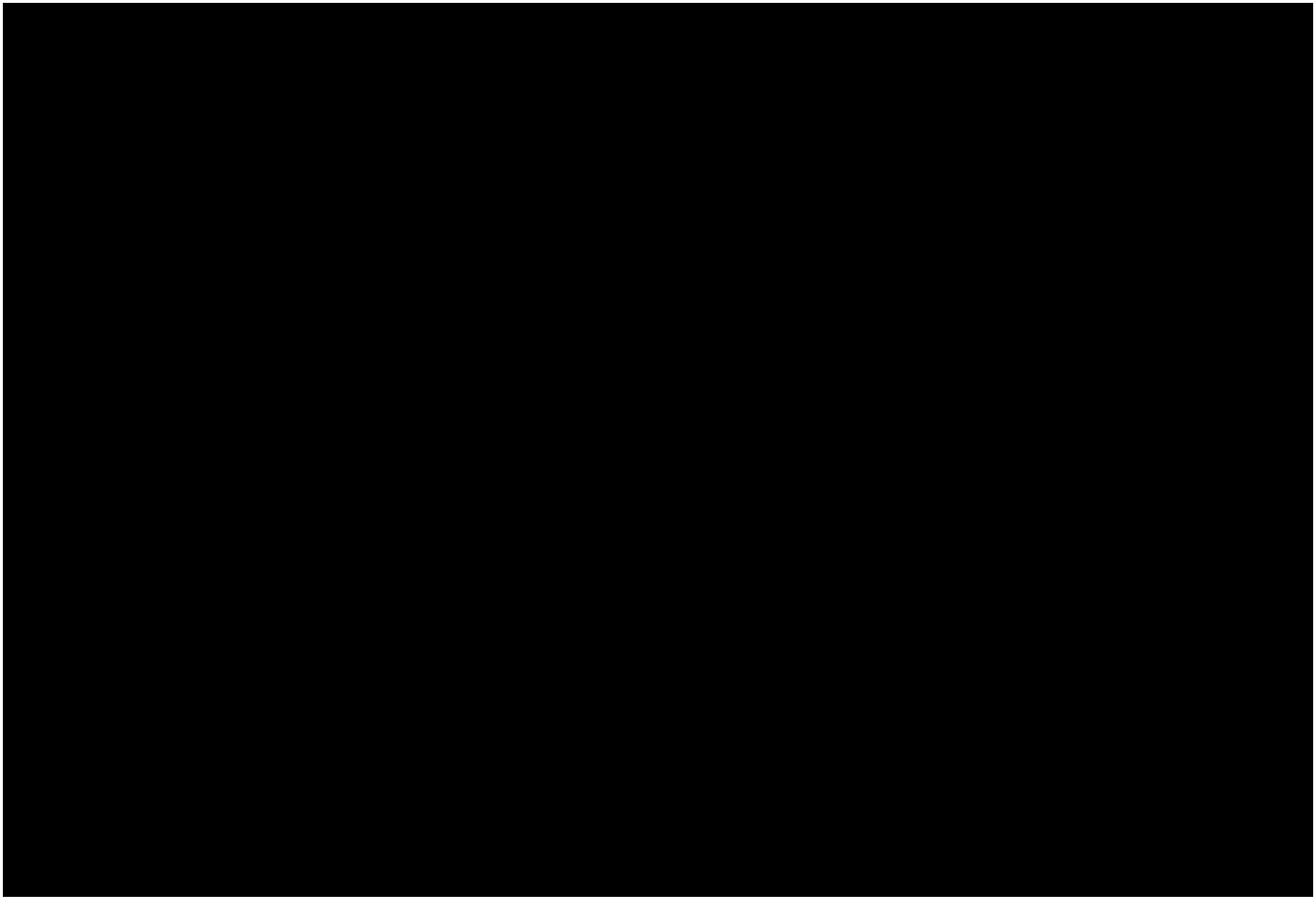


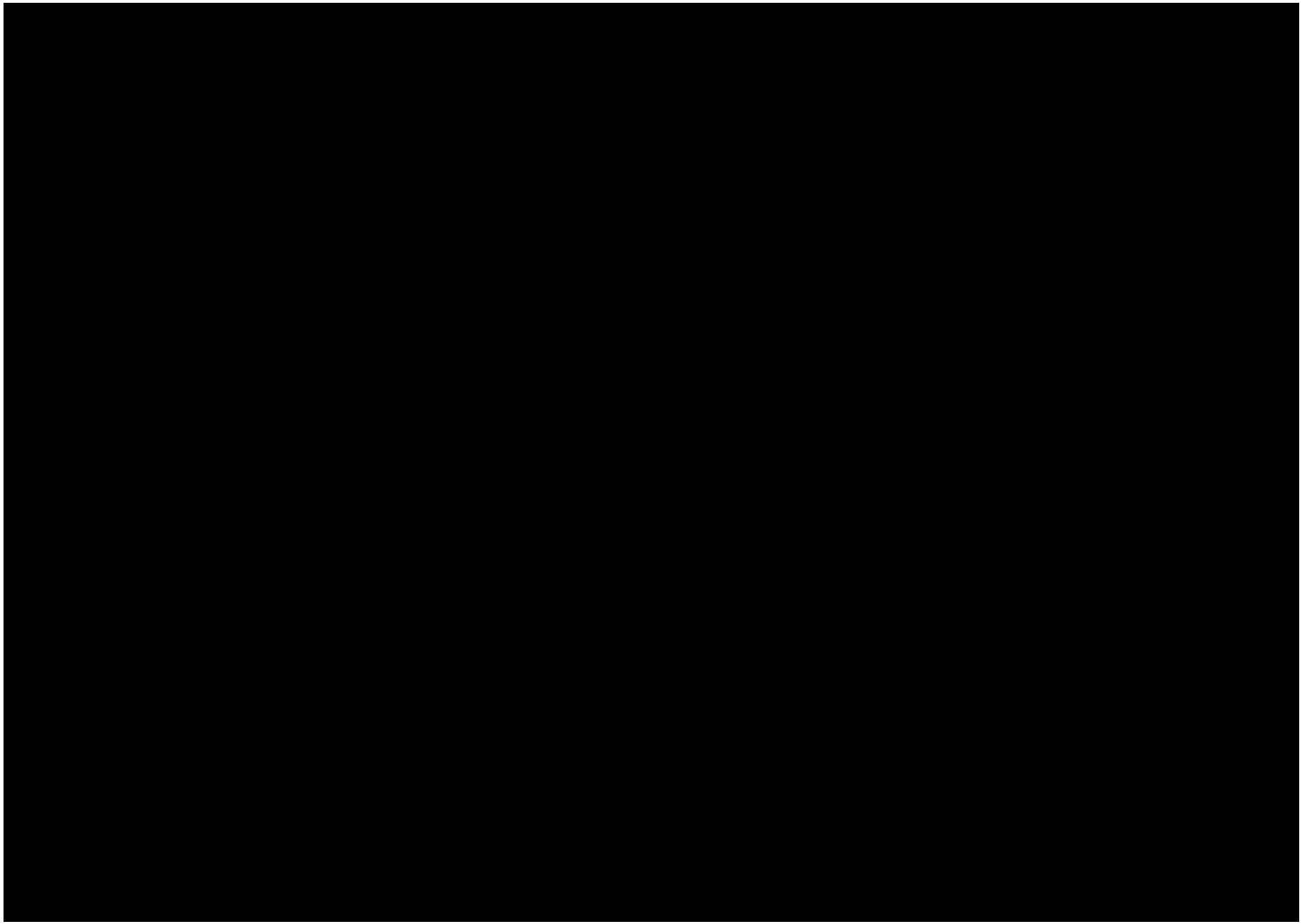


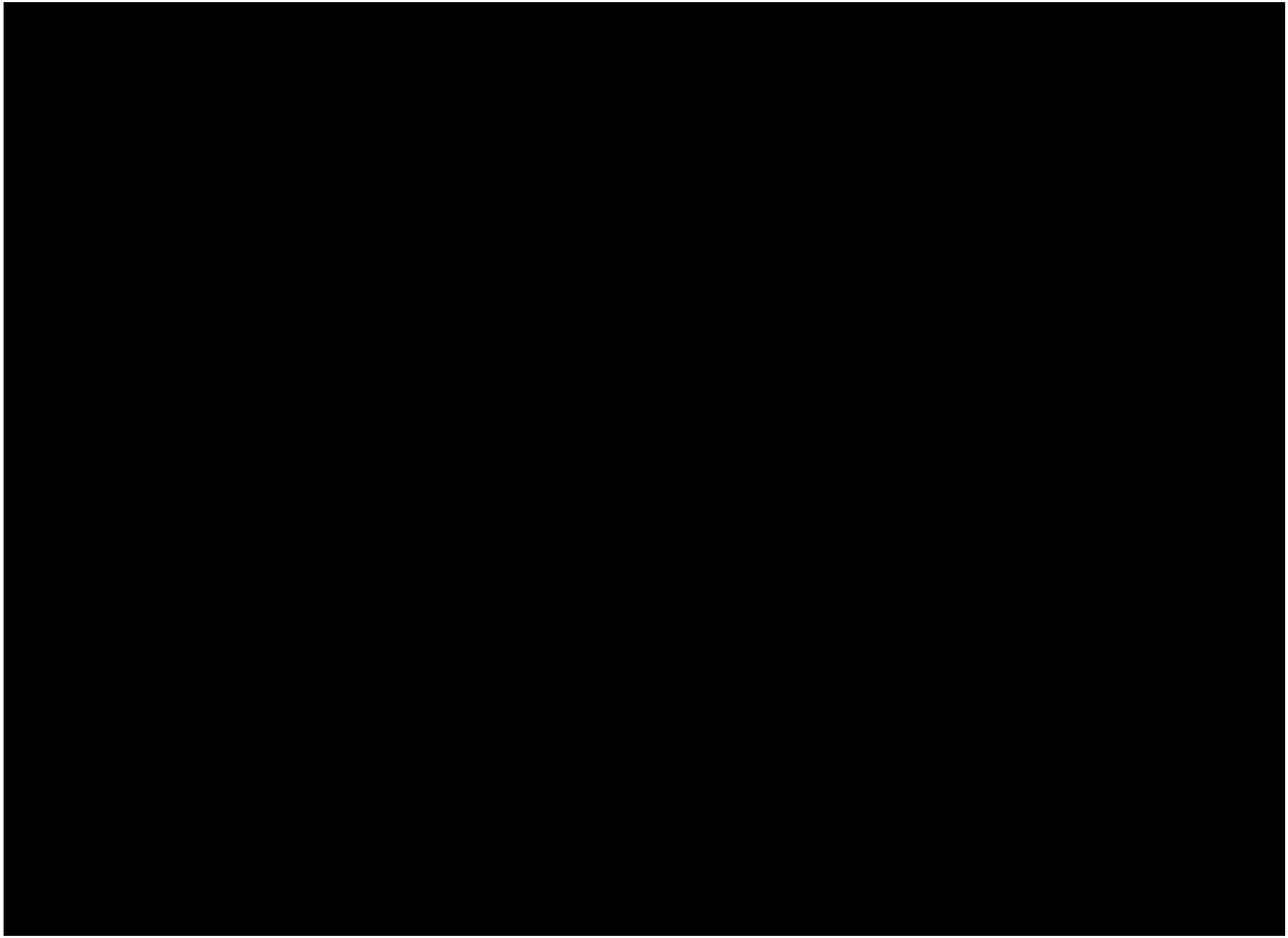


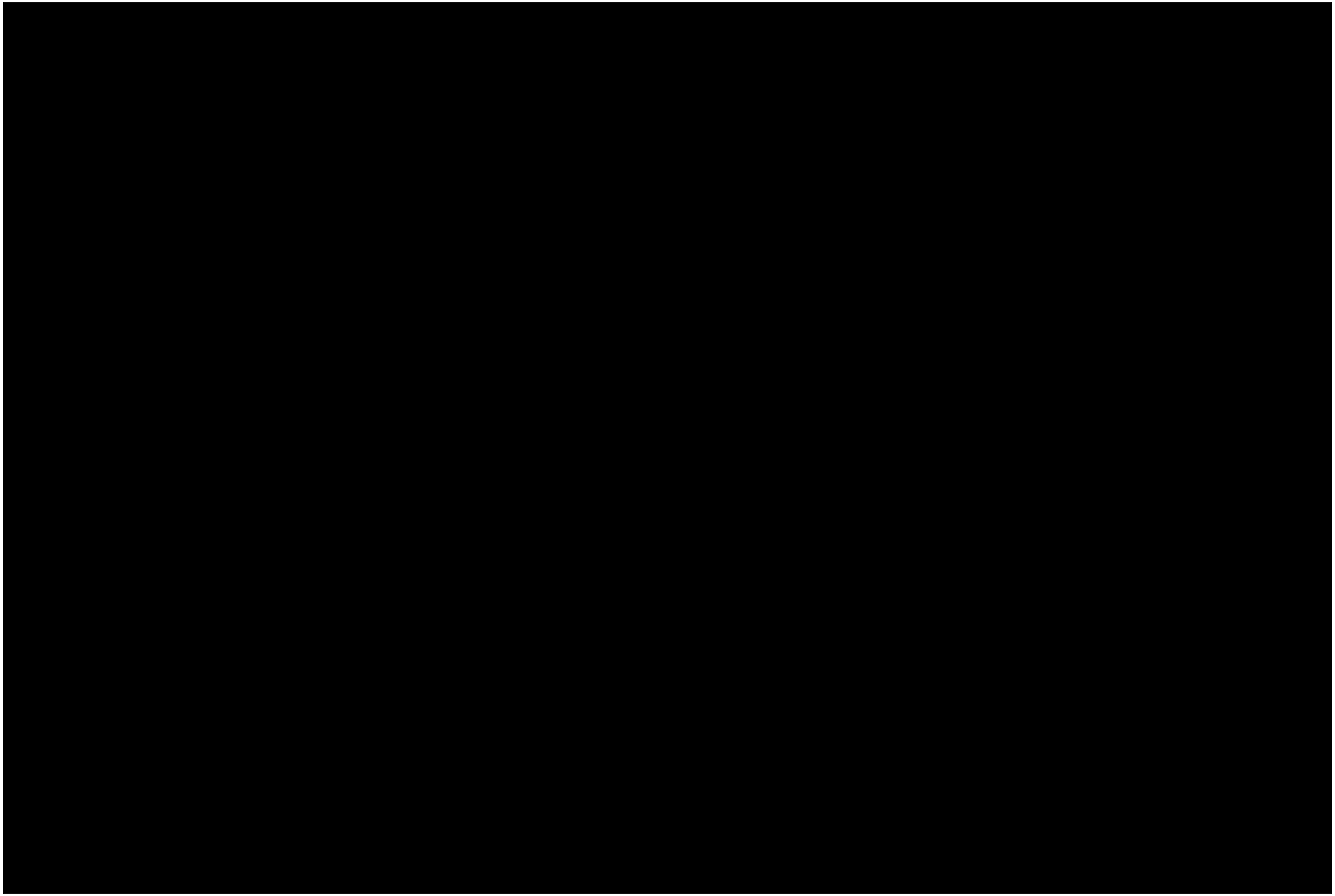


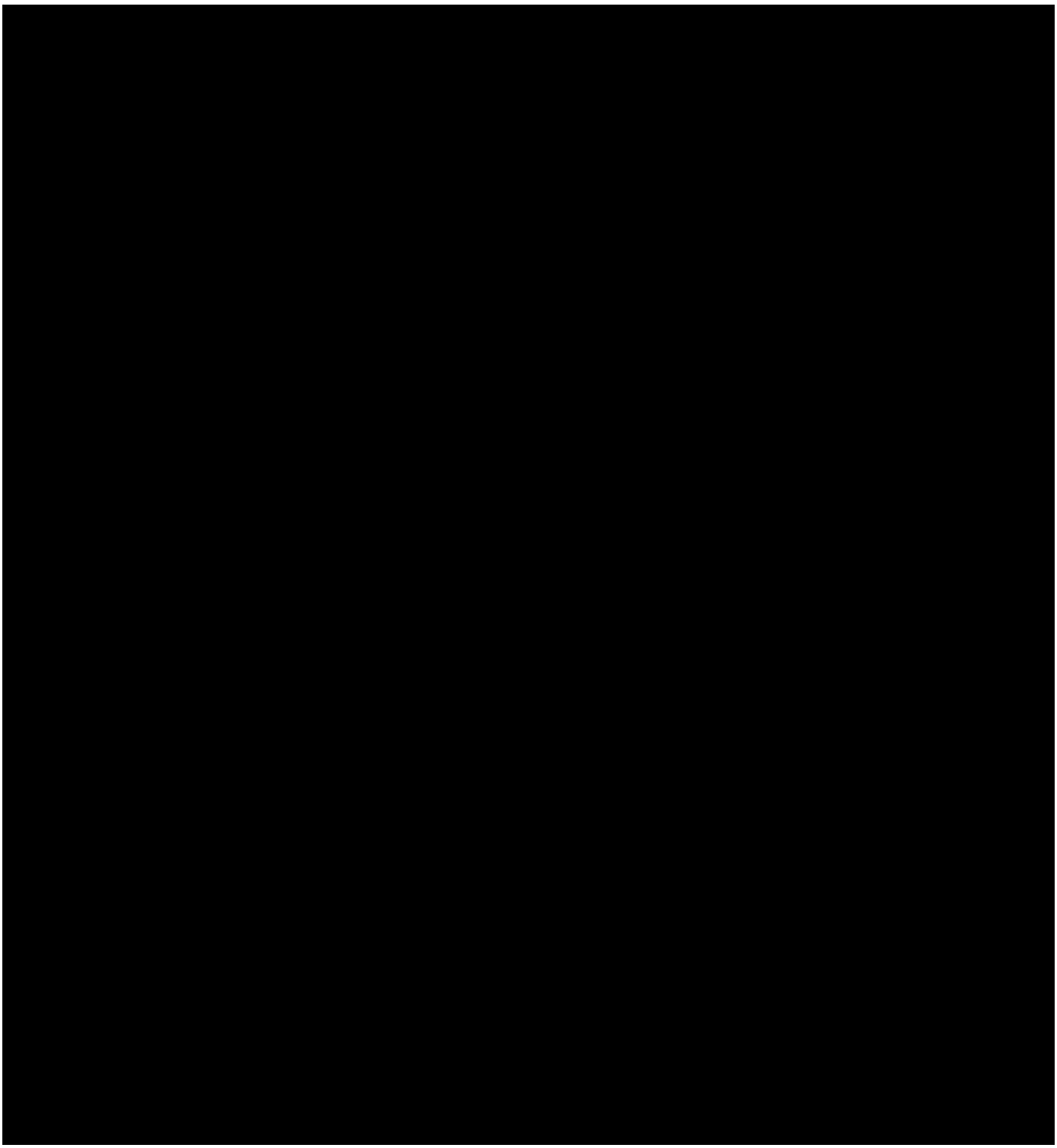












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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

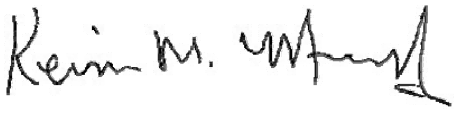
OAKLAND DIVISION

THE APPLE iPOD iTUNES ANTI-TRUST LITIGATION.	Case No. C 05-00037 (YGR) [CLASS ACTION] **DECLARATION OF DR. KEVIN MURPHY**

I, Kevin M. Murphy, Ph.D submitted my Amended Expert Report in the above-captioned matter on August 19, 2013, with supplemented exhibits served on November 11, 2013. The report and corrected exhibits are true and correct and based on my own personal knowledge.

I declare the forgoing is true and correct to the best of my knowledge and belief.

Executed this 19 day of December, 2013 in Mokena, Illinois.



Kevin M. Murphy, Ph.D.