

UNITED STATES DISTRICT COURT  
DISTRICT OF MASSACHUSETTS

SINGULAR COMPUTING LLC,	)	
	)	
Plaintiff,	)	
	)	
v.	)	Civil Action No.
	)	19-12551-FDS
GOOGLE LLC,	)	
	)	
Defendant.	)	

**MEMORANDUM AND ORDER ON MOTIONS  
TO EXCLUDE EXPERT TESTIMONY**

**SAYLOR, C.J.**

This is a patent dispute over computer system architectures. Plaintiff Singular Computing LLC seeks a judgment against defendant Google LLC that the use of certain chips, embodying a form of computer architecture, infringed its patents. Singular alleges willful infringement of its patents by Google and seeks treble damages.

Both parties have moved to exclude certain expert testimony from the trial. Google seeks to exclude the testimony of Dr. Sunil Khatri, a technical expert, and Philip Green, a damages expert. Singular has moved to exclude specific testimony of defendant’s experts, Laura B. Stamm and Dr. Martin Walker, concerning their application of an alleged noninfringing alternative to the accused products. For the reasons below, Google’s motion will be granted in part, and Singular’s motion will be denied.

**I. Standard of Review**

The admission of expert testimony is generally governed by Rule 702 of the Federal

Rules of Evidence.<sup>1</sup> The adoption of Rule 702 in its present form codified the standard of admissibility for expert testimony that was set forth in *Daubert v. Merrell Dow Pharms. Inc.*, 509 U.S. 579 (1993). *United States v. Diaz*, 300 F.3d 66, 73 (1st Cir. 2002).

Under Rule 702, district courts considering the admissibility of expert testimony must “act as gatekeepers, ensuring that an expert’s proffered testimony ‘both rests on a reliable foundation and is relevant to the task at hand.’” *Samaan v. St. Joseph Hosp.*, 670 F.3d 21, 31 (1st Cir. 2012) (quoting *Daubert*, 509 U.S. at 597). That gatekeeping function requires that the court consider three sets of issues: (1) whether the proposed expert is qualified by “knowledge, skill, experience, training or education”; (2) whether the subject matter of the proposed testimony properly concerns “scientific, technical, or other specialized knowledge”; and (3) “whether the testimony [will be] helpful to the trier of fact, *i.e.*, whether it rests on a reliable foundation and is relevant to the facts of the case.” *Bogosian v. Mercedes-Benz of N. Am.*, 104 F.3d 472, 476 (1st Cir. 1997) (quoting FED. R. EVID. 702) (quotations omitted).

The requirement that an expert’s testimony must be based on a reliable foundation is often the “central focus of a *Daubert* inquiry.” *Ruiz-Troche v. Pepsi Cola of P.R. Bottling Co.*, 161 F.3d 77, 81 (1st Cir. 1998). In *Daubert*, the Supreme Court set forth a non-exhaustive list of factors that a court may consider in undertaking its reliability analysis: (1) whether the theory or

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<sup>1</sup> Rule 702 provides as follows:

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

- (a) the expert’s scientific, technical or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) the testimony is based on sufficient facts or data;
- (c) the testimony is the product of reliable principles and methods; and
- (d) the expert has reliably applied the principles and methods to the facts of the case.

FED. R. EVID. 702.

technique can be (and has been) tested; (2) whether it has been subjected to peer review and publication; (3) whether it has a known rate of error; (4) whether there are standards controlling its application or operation; and (5) whether it is generally accepted in the relevant community. *Daubert*, 509 U.S. at 593-94; *see also Samaan*, 670 F.3d at 31-32.

Less centrally, but importantly, Rule 702 requires the court to examine whether those methods have been reliably applied. In other words, the court must “ensure that there is an adequate fit between the expert’s methods and his conclusions.” *Samaan*, 670 F.3d at 32 (citing *Daubert*, 509 U.S. at 591).

In evaluating whether expert testimony will be helpful to the trier of fact, the court must determine whether it is relevant, “not only in the sense that all evidence must be relevant, but also in the incremental sense that the expert’s proposed opinion, if admitted, likely would assist the trier of fact to understand or determine a fact in issue.” *Ruiz-Troche*, 161 F.3d at 81 (citations omitted); *see also Cipollone v. Yale Indus. Prods.*, 202 F.3d 376, 380 (1st Cir. 2000) (“The ultimate purpose of the *Daubert* inquiry is to determine whether the testimony of the expert would be helpful to the jury in resolving a fact in issue.”).

The focus of the Rule 702 inquiry is on the principles and methodology employed by the expert, not the ultimate conclusions. *Daubert*, 509 U.S. at 595. The court may not subvert the role of the factfinder in assessing credibility or in weighing conflicting expert opinions. Rather, “[v]igorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence.” *Id.* at 596; *see also Ruiz-Troche*, 161 F.3d at 85 (admitting testimony notwithstanding a lack of peer-reviewed publications because the opinion rested upon good grounds generally and should be tested by the “adversary process”).

Expert testimony that is admissible under Rule 702 may still be excluded under Rule 403 “if its probative value is substantially outweighed by the danger of one or more of the following: unfair prejudice, confusion of the issues, misleading the jury, undue delay, wasting time, or needlessly presenting cumulative evidence.” FED. R. EVID. 403; *see also Daubert*, 509 U.S. at 595. Thus, expert testimony that is relevant and passes muster from a scientific or technical standpoint may still be excluded if it is likely to be misinterpreted or misused by the jury.

## **II. Analysis**

### **A. Defendant’s Motion to Exclude Testimony of Dr. Sunil Khatri**

Google seeks to preclude the testimony of Singular’s technical expert, Dr. Sunil Khatri. Dr. Khatri is a professor of electrical and computer engineering at Texas A&M University. He issued an expert report on December 22, 2022. Among other things, the report provided a technical apportionment to determine what value of the accused products is attributable to their patented features. (Khatri Rpt. 53). Dr. Khatri concluded that those patented features were responsible for approximately 40 percent of the added technical value of the accused products over their allegedly closest noninfringing alternatives. (*Id.* at 63).

While Google seeks to exclude Dr. Khatri’s testimony in its entirety, it specifically objects to four aspects of his opinion. Google asserts that the report (1) improperly constructed the term “processing element”; (2) improperly apportioned the value of the patented features; (3) impermissibly considered the “commercial success” of the accused products; and (4) impermissibly inferred Google’s state of mind in using the accused products.

#### **1. Claim Construction**

Google first asserts that Dr. Khatri improperly construed the term “processing element” by failing to employ the plain and ordinary meaning of the term to one of ordinary skill in the art. In support of its contention, Google points to the “plain and ordinary meaning” as defined by its

own rebuttal expert, Dr. Martin Walker. It also contends that Dr. Khatri was not permitted to consider the use of the term in reference to the patent specification at issue. Singular responds that the meaning used by Dr. Khatri is fairly inferred from the Court's *Markman* order, and, contrary to Google's assertion, that Dr. Khatri could interpret the claim language within the context of the patent specification.

The Court has not had occasion to construe the term "processing element." The term was not raised at the claim-construction stage, although the Court construed the disputed term "execution unit" to mean a "processing element comprising an arithmetic circuit paired with a memory circuit." (ECF No. 354 at 25). Although the Court did note that a processing element might be fairly used to describe a device that performs simple functions without access to a memory circuit, doing so did not amount to a true construction of the term. (*Id.*).

Because the term "processing element" was not construed, the term takes its plain and ordinary meaning as understood by one of ordinary skill in the art. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (en banc) (quotation omitted). Experts may present differing understandings of a term's plain and ordinary meaning at trial, provided doing so does not amount to claim construction. *See Apple Inc. v. Samsung Elecs. Co.*, 2014 WL 660857, at \*3 (N.D. Cal. Feb. 20, 2014). To determine how a person of ordinary skill in the art would understand that term in the accused products, Dr. Khatri may review the patent to determine the technical context of the claimed invention and then use his technical expertise to form his opinions on whether the accused products infringe. *See Multiform Desiccants Inc. v. Medzam Ltd.*, 133 F.3d 1473, 1477 (Fed. Cir. 1998). He may not, however, merely rely on intrinsic evidence to provide the entire definition. *Id.*

Google appears to base its objection to Dr. Khatri's understanding of "processing

element” on a single exchange during his deposition, during which he said that its meaning was “pretty evident” upon review of the contents of the patent. (Khatri Dep. at 185). It then disputes, based on its own expert’s testimony, that Dr. Khatri’s understanding of the term’s plain and ordinary meaning is valid. In doing so, Google seems to be seeking to raise a new dispute that should have been raised at the claim-construction stage. If so, that argument has likely been waived. *See Cent. Admixture Pharm. Servs. Inc. v. Advanced Cardiac Sols. P.C.*, 482 F.3d 1347, 1356 (Fed. Cir. 2007) (affirming district court finding that defendant “waived any argument with respect to [a] term by failing to raise it during the claim construction phase”). Even so, as the Federal Circuit has instructed, “district courts are not (and should not be) required to construe every limitation present in a patent’s asserted claims,” particularly when such claims arise after the claim-construction stage. *O2 Micro Int’l Ltd. v. Beyond Innovation Tech.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (emphasis in the original).

Google has not demonstrated that Dr. Khatri engaged in any claim construction beyond reading the disputed term in the context of the accused products, which he is permitted to do. Of course, Google can cross-examine Dr. Khatri with its own understanding of the plain meaning of “processing element,” but his opinion will not be excluded on the grounds that he engaged in improper claim construction.

## **2. Apportionment**

Google next asserts that Dr. Khatri failed to apply the correct legal standard for apportionment during his analysis. Specifically, it suggests that the *inter partes* review proceedings before the U.S. Patent & Trademark Office (“IPR proceedings”) necessarily limited the scope of Dr. Khatri’s analysis, because certain of Singular’s individual claims were found to be conventional and thus unpatentable. According to Google, Dr. Khatri is only permitted to consider the patentable feature remaining after the IPR proceeding. Singular responds that even

if individual limitations were unpatentable, that does not selectively remove those limitations from every other patent claim asserted. It contends that even if some constituent limitations are conventional, their patentable combination delimits the value of that patent.

Contrary to Google's assertions, the fact that certain claims were found to be conventional does not necessarily limit the surviving patent claim that was the subject of Dr. Khatri's inquiry. Even if specific component elements of the claim, standing alone, are considered conventional, that does not preclude a determination that they are novel and therefore patentable when considered in combination.

In patent cases, "[e]ach claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims[.]" 35 U.S.C. § 282(a). It is true that in damages calculations, the value of multi-component products must be apportioned between patented and unpatented features, unless applying the entire market value rule (discussed below). *See, e.g., Omega Pats. LLC v. CalAmp Corp.*, 13 F.4th 1361, 1377-78 (Fed. Cir. 2021). However, that principle does not extend to reducing the reach of a validated claim merely because certain component claims were found to be conventional. Indeed, were it to do so, new combinations of otherwise conventional constituent parts would be impossible to successfully patent because none of the underlying components would survive *inter partes* review.

Here, although some of the patented features at issue in the tensor processing unit ("TPU") chips were determined to be conventional, together they form the invention that Singular contends Google infringed. Dr. Khatri was tasked with apportioning the value derived from that claimed combination as distinct from other unpatentable elements of Google's system architecture. To do so, he correctly stated the principle of apportionment in his opening report.

(Khatri Rpt. 53 (noting that it is necessary to “determine the proportion of the technical value of the Accused Products . . . that is due to the claimed invention [versus] the proportion of the value of the Accused Products . . . that can be attributed to unpatented features of the Accused Products”)).<sup>2</sup> He then proceeds to apportion approximately 40 percent of the added technical value of the accused products over their closest noninfringing alternatives, discounting conventional components of the total TPU product, including both hardware and software. (Khatri Rpt. 63). Google does not dispute the technical aspects of his analysis beyond the contention that it should have omitted underlying conventional claims.

In sum, the Court is not persuaded by Google’s theory that previously-determined conventional claims should be excised from a valid claim that includes them as component elements. Accordingly, there is no basis on that ground to exclude Dr. Khatri’s testimony.

Google further contends that Dr. Khatri improperly engaged in a system-level comparison between the TPU chips and graphics processing unit (“GPU”) chips as deployed in a larger architecture.<sup>3</sup> Dr. Khatri considered a chip-to-chip comparison in isolation before proceeding to a system-level analysis. (Khatri Rpt. 50-51). He then considered the differences between the TPU system and his proffered closest noninfringing alternative, the GPU system, to assess the differences between the individual chips. (*Id.* at 51-52). He then parsed the added value attributable to the patentable features, apportioning the value of the chips within the systems. (*Id.* at 56-63). Dr. Khatri’s opinion thus seeks to apportion the added value of the patented features, and so his opinion will not be excluded for failure to do so. Because that

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<sup>2</sup> Although Google points to Dr. Khatri’s deposition testimony as indicating that he did not understand that legal principle (Def. Khatri Mot. at 9), the plain statement in his opening report is sufficient to show his awareness of it.

<sup>3</sup> Google raises a similar argument in its motion to exclude the testimony of Mr. Philip Green, discussed below.



apportionment method is not inherently unreliable as a matter of law, the motion to exclude Dr. Khatri's apportionment analysis will be denied.

### 3. Commercial Success

Google next contends that Dr. Khatri's rebuttal opinion that the infringing products are "directly tied" to its commercial success are outside the scope of his expertise. (*See* Khatri Rebuttal Rpt. 61). Dr. Khatri came to that conclusion based on an internal Google presentation discussing the deployment of the accused products. (*Id.*) Singular responds that "one does not have to be an economist to understand that an invention is a 'commercial success' if it is used by one of the largest companies in the world to power its flagship products and services." (Pl. Opp'n at 12).

Dr. Khatri's opinions are based on his review of Google's internal presentations concerning the use of TPUs in various Google services. Google is likely correct that Dr. Khatri is not competent to testify that *all* of that usage is due to the patented features of those chips, nor is it appropriate for him to testify that Google "leveraged the abundance of power made available" by those features. (Khatri Rebuttal Rpt. 61). Similarly, he does not appear to have a sufficient foundation to testify that the services' commercial success is "directly" tied to the patented features, or "largely" due to them. (*Id.*).

Nonetheless, Dr. Khatri will be permitted to testify in general terms that the patented features were deployed in the chips that in turn contributed to some of Google's major services. That nexus is established by Google's internal documents. Furthermore, such testimony is essentially a lay opinion that is well within Dr. Khatri's competency. Whether that opinion is correct is properly the subject of cross-examination, not grounds for excluding it entirely.

Accordingly, Google's motion will be granted to the extent that it seeks to exclude certain of Dr. Khatri's statements, but otherwise denied.

#### 4. State of Mind

Finally, Google contends that Dr. Khatri should not be allowed to testify as to Google's purported "state of mind"—among other things, "why" Google built the TPU chips how they did. (*See* Khatri Rpt. ¶ 124). Singular responds that all of Dr. Khatri's opinions are supported by direct quotations from internal Google communications. (ECF No. 500 at 12).

"Inferences about the intent or motive of parties or others lie outside the bounds of expert testimony." *See In re Solodyn Antitrust Litig.*, 2018 WL 734655, at \*2 (D. Mass. Feb. 6, 2018) (quoting *In re Rezulin Prods. Liab. Litig.*, 309 F. Supp. 2d 531, 547 (S.D.N.Y. 2004)). Narrative summaries of otherwise admissible internal documents with little reliance on expertise, meanwhile, are normally inadmissible in this context. *See In re Zofran Prod. Liab. Litig.*, 2019 WL 5685269, at \*9 (D. Mass. Nov. 1, 2019).

Dr. Khatri came to his conclusion by reviewing e-mails between Google engineers discussing the disputed technology after it had been presented to them by Dr. Bates. In most of his comments, he directly quotes engineers' statements of their own feelings about the technology. (*See, e.g., id.* ¶ 121 (quoting a Google engineer relating that he was "nervous" about the patent)). Some of those statements connect qualities of the allegedly patented characteristics of the TPUs that Singular contends were advantageous to Google. (*See, e.g., id.* ¶¶ 112-13). In others, however, Dr. Khatri summarizes his impression with his own language. (*See, e.g., id.* ¶ 121 (stating that "Google's top minds started to get excited about [Dr. Bates's] invention")). According to Dr. Khatri, the purpose of that discussion is to show that "infringement [was] not the result of a mere technicality or a quirk of semantics," but an intentional act. (*Id.* ¶ 111).

Google is correct that Dr. Khatri cannot testify as to its intent or the state of mind of its employees. *See In re Rezulin Prod. Liab. Litig.*, 309 F. Supp. 2d 531, 551 (S.D.N.Y. 2004) (finding an expert's testimony should be excluded when it simply asserted an interpretation of

the defendant's conduct). Nor can he characterize that language in argumentative terms. However, Dr. Khatri may rely on the statements of Google's employees in determining the non-obviousness of the patentable features. And to some extent, he can use the Google internal e-mails to provide context for his permissible opinions. Again, however, he may not interpret or characterize those determinations, or testify as to how they reflect the state of mind of any Google employee. Such interpretations of those statements do not rely on his expertise. Therefore, Google's motion to exclude these paragraphs of his report will be granted to the extent that Dr. Khatri purports to opine on the intent or state of mind of Google employees, but otherwise will be denied.

**B. Defendant's Motion to Exclude Testimony of Philip Green**

Google also seeks to exclude the testimony of Singular's damages expert, Philip Green. Green is a founding principal at a consulting firm in Newton, Massachusetts. He issued an expert report in April 2023, in which he projected that a hypothetical negotiation between Google and Singular in March 2017 for a license to the patents-in-suit would have resulted in a royalty payment of "up to \$6.6 billion." (Green Rpt. 6).

Google contends that Green's estimated damages calculations are inadmissible because (1) he failed to properly apportion the incremental value derived from the infringed products; (2) his conclusion assumed Singular would have received the entire benefit of all cost savings Google obtained due to its alleged infringement; and (3) the resulting range of damages was speculative and potentially misleading. Google also asserts that Green should not be allowed to testify as to its "state of mind" at the time of the hypothetical negotiation.

**1. Royalty-Base Calculation**

Google first contends that Green impermissibly calculated the royalty base based on the deployment of the allegedly infringing tensor processing unit chips ("TPUs") as part of a system

that included both accused and non-accused components.

The Federal Circuit has made clear that when “small elements of multi-component products are accused of infringement, calculating a royalty on the entire product carries a considerable risk that the patentee will be improperly compensated for non-infringing components of that product.” *LaserDynamics Inc. v. Quanta Comput. Inc.*, 694 F.3d 51, 66-67 (Fed. Cir. 2012); *see also VirnetX Inc. v. Cisco Sys.*, 767 F.3d 1308, 1326 (Fed. Cir. 2014) (collecting cases). In such cases, there is an “evidentiary principle” that “the ultimate combination of royalty base and royalty rate must reflect the value attributable to the infringing features of the product, and no more.” *Ericsson Inc. v. D-Link Sys.*, 773 F.3d 1201, 1226 (Fed. Cir. 2014). Acknowledging that risk, courts generally mandate “that royalties be based not on the entire product, but instead on the ‘smallest salable patent-practicing unit’” (“SSPPU”). *LaserDynamics*, 694 F.3d at 67 (quoting *Cornell Univ. v. Hewlett-Packard Co.*, 609 F. Supp. 2d 279, 283, 287-88 (N.D.N.Y. 2009)). The narrow exception to that principle is the “entire market value rule” (“EMVR”), which allows a patentee to assess damages based on the entire product if they can show that the patented feature either “creates the basis for customer demand” or “substantially create[s] the value of the component parts.” *Uniloc USA Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1312 (Fed. Cir. 2011). If a proponent cannot meet that burden, however, then “principles of apportionment apply,” under which damages must be reduced to the contribution value of the patented features. *VirnetX*, 767 F.3d at 1326. A failure to apportion appropriately is grounds for exclusion of expert testimony. *Id.*

Google asserts that Green was required to limit his analysis to a “chip-to-chip” comparison between Nvidia’s GPU chips and the TPU chips containing the patent-practicing elements. Specifically, it contends that the TPU chip alone should be considered the SSPPU, and

thus any royalty calculations should be limited to the use of that chip. The effect of many chips together cannot be part of that calculation, according to Google, because using the TPU chips in parallel and at scale necessarily includes the use of its bespoke connection architecture, the “Intercore Interconnect” (“ICI”). It contends that comparing the “TPU system,” incorporating both patent-practicing chips and the ICI, to the GPUs, which Google used in its own benchmark comparisons, makes Green’s royalty-base calculation improper.

In response, Singular makes two separate arguments. First, it contends that neither the SSPPU doctrine nor the EMVR apply because Green does not base his calculations on any supposed *value* of the TPU system; instead, he compares the cost savings Google realized by using the TPU system compared to the GPU option based on the number of TPU *chips* required (which translates to the number of systems, and ultimately the number of data centers necessary for Google to achieve its desired computing output). Second, Singular asserts that Green accounts for the noninfringing ICI architecture by apportioning between the contributions of the patented technology and the noninfringing components of the TPU systems.

The critical challenge posed here is that it would be impossible to account properly for the accumulated effects of a large number of deployed TPU chips without recognizing that those chips were only deployable because of the ICI, a noninfringing element. But Green’s response to that challenge is neither clearly unreasonable nor obviously unreliable. He acknowledges that considering the total output of the TPU systems, including the ICI, would defy the principle against capturing value derived from noninfringing sources. To address that problem, he engages in two methods of apportionment.

Green’s primary method is to rely on the technical apportionment conducted Dr. Khatri. As discussed, Dr. Khatri’s analysis is sufficiently reliable to be admitted, and thus Green may

rely on it to arrive at his upper-range apportionment value of 40 percent of the total development cost of using the TPU systems, which correspondingly discounts the noninfringing ICI elements. Without the ICI elements as a factor, Green's comparison with the alternative GPU is admissible, as it complies with the essential principle of only reflecting the value of the infringing components, based as it is on the contributions of the TPU chips. Contrary to Google's contentions, Green does not assign cost savings across the whole of the system without adjusting for the use of the TPU or GPU chip. *Cf. Microchip Tech. Inc. v. Aptiv Servs. US*, 2020 WL 5203600, at \*5 (D. Del. Sept. 1, 2020).

Green also uses an accounting method. (Green Rpt. 101-04). In that analysis, he uses Google's development costs of transitioning from TPUv1 (which is not alleged to be infringing) to TPUv2 (which is alleged to have infringing elements). Based on his review of the evidence and discussions with Dr. Khatri, he determined that there were two primary differences between these versions, one infringing and one noninfringing. (*Id.* at 102). He concluded that "it would be reasonable to allocate 50% of the development cost" to the infringing component. (*Id.* at 104). He acknowledges that he lacked access to specific information to account for that equal division, but reasons that it approximates the incremental value of the infringing components in the resulting system. (*Id.*). Using that metric, Green estimates his lower-range value of cost savings to Google as approximately 23 percent of the total development cost of advancing from the TPUv1 to the TPUv2.

Although experts cannot use estimates that have been "plucked out of thin air based on vague qualitative notions," an estimate based on reasonable inferences from limited data is permissible. *See LaserDynamics*, 694 F.3d at 69. Where the precise allocation of that development cost is clearly unsettled, the question is properly the subject of cross-examination.

The methodology by which Green arrived at his conclusion, therefore, is not so unreliable or improper that it must be excluded.

Neither case cited by Google supports its position. First, in *LaserDynamics*, the testimony of a damages expert was excluded because he based his running royalty calculation as a percentage of the entire market value of a laptop computer, despite the infringing component being limited to a disk drive. 694 F.3d at 67-69. The expert offered “no credible economic analysis to support [his] conclusion.” *Id.* at 69. Here, Green is not seeking to base his calculation on the total value gained by Google as the result of its TPU systems and offers a technical analysis in support of his method of apportionment. Similarly, in *Microchip*, an expert’s testimony was excluded because he focused primarily on a system that incorporated a chip with patented features, including that total system’s profitability, without accounting for the specific alleged infringements. 2020 WL 5203600, at \*5-6. Green does not seek to base his calculation on Google’s profitability from the TPU systems and adjusts his cost comparison by discounting the noninfringing elements of that system. (Green Rpt. 104).

Accordingly, Green’s royalty calculation based on technical apportionment is reliable enough to be admissible under Rule 702.

## **2. Allocation of Cost Savings**

Google next contends that Green improperly allocated all of the supposed cost savings of using TPUs, rather than GPUs, to Singular. In support of its position, Google relies on *Looksmart Grp. Inc. v. Microsoft Corp.*, 2019 WL 4009263 (N.D. Cal. Aug. 5, 2019). There, a district court rejected an expert’s damages calculation because it assumed that the entire asserted cost savings of using the infringing product would be awarded to the plaintiff, reduced only by the defendant’s discount rate. *Id.* at \*3.

Here, it appears that Green used the discount rate to show that Google would have

engaged in a hypothetical negotiation in March 2017, because the excess returns it would have expected exceeded both its standard 12.5 percent discount rate and its 26 percent “Moonshot” discount rate for riskier projects. (Green Rpt. 81). Although Google is correct that Green allocates the immediate development cost savings to Singular, he does not include the incremental revenues and related profits that Google could have realized were it to have engaged in the hypothetical negotiation. (See Green Rpt. 99-100, 104-05). Unlike the defendant in *Looksmart*, therefore, Google would not have been left indifferent between infringing and noninfringing options and would have considerably benefited from the negotiation Green hypothesizes. Cf. *Looksmart*, 2019 WL 4009263, at \*3. Accordingly, his allocations are not so unreliable that his testimony should be excluded on this basis.

### **3. Damages Range**

Google further contends that the different calculations Green used suggests a range of damages that is too broad to be helpful to a jury.

The Federal Circuit “has recognized that estimating a reasonable royalty is not an exact science. The record may support a range of reasonable royalties, rather than a single value. Likewise, there may be more than one reliable method for estimating a reasonable royalty.” *Summit 6 LLC v. Samsung Elecs.*, 802 F.3d 1283, 1296 (Fed. Cir. 2015). Although a “party runs the risk . . . of loss to its expert’s credibility on cross-examination if the expert does not identify a single royalty rate,” such disputes are properly the province of the jury. *Bayer HealthCare LLC v. Baxalta Inc.*, 989 F.3d 964, 985 (Fed. Cir. 2021).

Here, Green suggests that Google’s cost savings resulting from its use of the patents in-suit could range from \$2.3 billion, based on its projected deployment in March 2017, up to \$6.6 billion, based on its actual deployment. (Green Rpt. 105). Green further testified during his deposition that he “intend[s] to describe both [values] to the jury and enable them to evaluate the



facts that they believe to be relevant.” (Green Dep. at 34).

Contrary to Google’s contention, Green’s conclusion does not suggest that the reasonable royalty could have been any uncertain number between these two values, but suggests two results based on either projected or actual deployments of the disputed technology. The comparative strength or weakness of either approach is properly the subject of cross-examination and best determined by the jury. Although it is true that the results derived from Green’s two methodologies are highly divergent, that fact alone cannot warrant exclusion under either Rule 702 or Rule 403 when both methodologies appear to be reliable and grounded in the facts of the case. Google has made no showing that Green would be incapable of explaining the underpinnings and purposes behind his different approaches.

In summary, Green’s proposed lump-sum royalty outcomes are not unreliable enough to require exclusion under Rule 702, nor so misleading as to require exclusion under Rule 403. Again, those conclusions should be put to the test on cross-examination rather than be excluded entirely at this stage.

#### **4. Commercial Relationship Between Parties**

Finally, Google contends that Green should be precluded from discussing the “relationship” between Singular and Google before any hypothetical negotiation between them. It agrees that damages experts are allowed to “compare the parties’ respective circumstances as part of their reasonable royalty analysis under *Georgia-Pacific*,” but asserts that Green oversteps that limited role and trespasses into “factual narratives, attorney argument, and speculation about [Google’s] state of mind.” (Def. Reply at 11). Singular responds that it “does not intend to elicit testimony from Mr. Green concerning Google’s intent or state of mind,” but only the background relationship between the parties that prompted his opinions. (Pl. Opp’n at 20).

Google’s objection to that testimony is more properly the subject of specific objections

during Green’s testimony rather than wholesale exclusion at this stage. Although Green may not testify directly as to Google’s state of mind at the time of the hypothetical negotiation, he may provide background and testify as to the circumstances of Google and Singular in March 2017. For that reason, the Court will not wholly exclude Green’s testimony, but Google may seek to reassert its objections at trial on a question-by-question basis as appropriate.

In summary, Google has not shown that Green’s testimony should be excluded under Rule 702 or Rule 403.

**C. Plaintiff’s Motion to Exclude Testimony of Laura B. Stamm and Dr. Martin Walker on Reasonable Royalty**

Singular seeks to preclude certain testimony of Laura B. Stamm, Google’s damages expert, and Dr. Martin Walker, its technical expert. Stamm is a damages expert employed at the consulting firm Analysis Group Inc. (Stamm Rpt. 2). Dr. Walker is an electrical engineer with more than 40 years of experience in electronic systems and computer software, and is an independent consultant employed by Brass Rat Group Inc. (Walker Rpt. 1-2).

On March 3, 2023, Stamm issued an expert report setting forth her opinion on the royalties due to Singular based on the alleged patent infringement. Her opinion was based, in part, on technical information provided by Dr. Walker that suggested the Google could have avoided infringement by using a “bf20” format in its TPU devices, rather than the allegedly infringing “bf16” format that it deployed. (Stamm Rpt. 34). According to Stamm, using the bf20 format would have been the best noninfringing alternative to using the accused products. (*Id.* at 5).

Singular contends that Stamm and Dr. Walker’s testimony involving the bf20 alternative should be precluded (1) under Fed. R. Civ. P. 37 because it was not disclosed during discovery and (2) as unreliable under Rule 702 or as likely to mislead the jury under Rule 403.

**1. Rule 37**

Singular first contends that discussions of the bf20 alternative by Stamm and Dr. Walker should be excluded as a discovery sanction under Fed. R. Civ. P. 37 because it was not specifically identified as a noninfringing alternative until the release of their expert reports. Google responds that the bf20 alternative was one possible configuration in a range of number formats that it disclosed in response to one of Singular's interrogatories. The parties appear to agree that the bf16 format comprises "an exponent of 8 bits, one sign bit, and 7 mantissa bits," while the bf20 format represents numbers using an "exponent of 8 bits, [one] sign bit, and 11 mantissa bits." (Def. Opp'n at 5, ECF No. 509).

On April 7, 2021, Singular served Google with the following interrogatory:

16. Identify any products or processes that You contend are acceptable non-infringing alternatives to the Accused Products, describing specifically:

a. The nature of each alleged non-infringing alternative; . . .

(Def. Opp'n Ex. B at 5-6).

Google's interrogatory response, as supplemented, included the following:

[N]on-infringing alternatives to the accused TPUv2 and TPUv3 include devices or techniques, or systems incorporating devices or techniques, that have been designed or adapted to perform machine learning processes using numerical formats other than bfloat16 and/or that use prior art techniques for hardware and software implementation of arithmetic operations and various number formats. . . . Examples of such techniques, devices, and systems include, but are not limited to: . . . [v]ersions of the TPUv2 and TPUv3 that have been modified to avoid the allegedly infringing functionality by, for example, representing numbers using formats other than bfloat16, including the IEEE 754 half-precision floating-point number format, . . . formats that represent numbers using an exponent of 8 bits, a sign bit, and a fraction of up to 15 bits, which the TPUv2 and TPUv3 MXU multiplier could have supported with no modification or limited modification; or any other number format.

(Kamber Decl. Ex. E (Def, Second Supp. Resp. & Objs. to Singular's Third Set of Interrogs.) at 10-11 (emphasis added)).

Google contends, and Singular does not contest, that the supplemental interrogatory

response was served two weeks before any Google witnesses were deposed. It does not appear that any Google witnesses were questioned about noninfringing alternatives.

Relying on Dr. Walker's technical report, Stamm opined that Google would have employed a bf20 chip rather than a bf16 chip as a reasonable noninfringing alternative. Again, the parties do not dispute the relative formats of the bf16 versus the bf20. They likewise do not dispute that the bf20 format is literally within the description provided by Google in its interrogatory response of "an exponent of 8 bits, a sign bit, and a [mantissa] of up to 15 bits."

"If a party fails to provide information or identify a witness as required by [Fed. R. Civ. P.] 26(a) or (e), the party is not allowed to use that information or witness to supply evidence on a motion, at a hearing, or at a trial, unless the failure was substantially justified or is harmless." FED. R. CIV. P. 37(c). "[T]he required sanction in the ordinary case is mandatory preclusion." *Poulis-Minott v. Smith*, 388 F.3d 354, 358 (1st Cir. 2004) (alteration in original) (internal quotation marks omitted) (quoting *Klonoski v. Mahlab*, 156 F.3d 255, 269 (1st Cir. 1998)). But "preclusion is not a strictly mechanical exercise; district courts have some discretion in deciding whether or not to impose that onerous sanction." *Santiago-Díaz v. Laboratorio Clínico y de Referencia del Este*, 456 F.3d 272, 276 (1st Cir. 2006). In determining the proper sanction, the court should consider "(1) the party's justification for the late disclosure; (2) the opposing party's ability to overcome any prejudice; (3) the impact on the court docket; (4) the party's history of litigation abuse; and (5) the party's need for the late evidence." *Glass Dimensions Inc. v. State St. Bank & Tr.*, 290 F.R.D. 11, 17 (D. Mass. 2013) (citing *Harriman v. Hancock Cnty.*, 627 F.3d 22, 30 (1st Cir. 2010)).

Whether a failure to disclose a specific noninfringing alternative should be grounds for exclusion is a fact-dependent inquiry. *Compare Medline Indus. v. C.R. Bard Inc.*, 2021

WL 809734, at \*5 (N.D. Ill. Mar. 3, 2021) (finding a violation of Rule 26 when a defendant did not disclose a specific alternative noninfringing product, despite having disclosed other products with shared features) *with Promethean Insulation Tech. LLC v. Sealed Air Corp.*, 2015 WL 11027038, at \*2 (E.D. Tex. Oct. 13, 2015) (declining to strike an expert’s opinion about a specific noninfringing product because the plaintiff’s interrogatory had not specifically requested it and it may have been impossible to identify that product before the production of the expert’s report).

Here, there is a threshold question as to whether Google failed to provide required discovery—specifically, whether Stamm and Dr. Walker’s discussion of the bf20 alternative constituted new information that should have been disclosed in Google’s interrogatory response. Again, Singular’s interrogatory during fact discovery asked Google to “[i]dentify any products or processes that [Google] contend[ed] are acceptable non-infringing alternatives to the Accused Products,” including their “nature,” the time it would take to develop, and the estimated cost of that development. (Pl. Mot. Ex. B, “Interrogatory 16,” ECF No. 466). Google’s response provided a range of potential noninfringing alternative formats that included the bf20 format.

That interrogatory response was not false, nor did it fail to disclose the claimed noninfringing alternative. If there is an issue, it arises from the fact that Google identified a range of formats (presumably, bf18, bf20, bf22, and bf24), from which its experts later settled on a single alternative (bf20). It is at least conceivable that doing so violated Rule 26 or was otherwise unfair. For example, if an interrogatory asked to provide the names of witnesses to an automobile accident, a response that stated, “one of the 330 million residents of the United States” would surely be inadequate, and perhaps might require exclusion of a subsequent attempt to call a specific witness.

The problem is that Singular has provided almost nothing to show that Google’s literally truthful disclosure was misleading, unfair, or unduly prejudicial under the circumstances. Instead, it argues in general terms that it did not have an opportunity to ask any fact witnesses for Google about the bf20 format. It is not clear that Singular did not have such an opportunity, and it is certainly unclear how Singular has actually been prejudiced. Put another way, Singular has not explained what kinds of questions it might have asked, to whom those questions would have been asked, and how the possible answers might have changed the course of the trial.<sup>4</sup>

Under the circumstances, the Court will not exclude the expert testimony as a discovery sanction under Rule 37.

**2. Rules 702 and 403**

**a. Availability of the bf20 Format as a Noninfringing Alternative**

Singular next contends that the opinions should be excluded under Rules 702 and 403. The first question is whether the bf20 format was, in fact, an “available” noninfringing alternative. Singular contends that it was not, and that Stamm’s opinion should be excluded on that basis.

According to Singular, Stamm’s opinion concerning the bf20 format should be excluded because alternatives that are “only theoretically possible” cannot limit the amount of a reasonable royalty. *DataTreasury Corp. v. Wells Fargo & Co.*, 2011 WL 8810604, at \*13 (E.D. Tex. Aug. 2, 2011) (citing *Grain Processing Corp. v. Am. Maize-Prod. Co.*, 185 F.3d 1341, 1353 (Fed. Cir. 1999)); *see also Grain Processing Corp. v. Am. Maize-Prod. Co.*, 108 F.3d 1392, at \*2

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<sup>4</sup> Among other things, Google tries to shift the blame to Singular, because it did not seek to compel any further clarification on Interrogatory 16. Google also argues that disclosing the bf20 format earlier would be exposing their trial strategy. Neither contention has merit. An inadequate discovery response cannot be excused because the recipient failed to seek relief through a motion to compel. And if discovery disclosure requirements have the effect of disclosing trial strategy, that is simply an unremarkable consequence of the process.

(Fed. Cir. 1997) (“this court rejected an attempt to rely on a noninfringing substitute that was not available during the period of infringement”).

Stamm acknowledged in her deposition that, as of the date of the hypothetical negotiation, which was March 2017, Google had not designed the bf20 chip (and, indeed, never did so). (Gannon Decl. Ex. L, Stamm Dep. at 38). She was also unaware whether anyone, anywhere, had ever designed such a chip. (*Id.* at 30-33). Dr. Walker, in turn, testified at his deposition that it would have taken Google around two years to develop and deploy the alternative bf20 chip. (Kamber Decl. Ex. M, Walker Dep. at 208-09 (stating that it would have taken the same amount of time to develop a bf20 TPU chip as it took for a bf16 chip, which was two years)).

According to Singular, only a “concrete and readily available alternative” may be considered in determining a reasonable royalty rate. *DataTreasury*, 2011 WL 8810604, at \*13 (citing *Spectralytics Inc. v. Cordis Corp.*, 649 F.3d 1336, 1346 (Fed. Cir. 2011)); *see also SRI Intern. Inc. v. Internet Sec. Sys.*, 2011 WL 5166436, at \*2 (D. Del. Oct. 31, 2011) (precluding expert testimony where the putative alternative was “more than eight months away from being ready”). Singular relies in part on the following passage by the Federal Circuit in *Mars Inc. v. Coin Acceptors Inc.*:

Coinco is simply wrong to suggest that the district court found that there were available, acceptable, noninfringing alternatives. What the district court found was that “Coinco had the ability, resources, and the desire to design around Mars’ patents,” that “it could probably figure out a way to avoid infringement,” but that the available “design around was not as good as it would like.” There was, therefore, no available and acceptable noninfringing alternative to which Coinco could have switched *at the time of the hypothetical negotiation*, there was merely the possibility that it could have come up with one.

527 F.3d 1359, 1372-73 (Fed. Cir. 2008). According to Singular, the bf20 alternative was not available as of the date of the hypothetical negotiation and should not be considered.

*See also SynQor Inc. v. Artesyn Techs.*, 2011 WL 3625036, at \*11 (E.D. Tex. Aug. 17, 2011) (“even if Defendants make acceptable [alternatives] sometime in the near future, that fact was not probative of the availability of acceptable alternatives during the damages period”), *aff’d*, 709 F.3d 1365 (Fed. Cir. 2013).

Google, in turn, contends that Singular ignores the meaning of “available” in the context of a reasonable royalty analysis. In *Grain Processing*, the Federal Circuit stated that an alternative was “available” where the infringer “could readily obtain all of the materials needed” to produce the substitute, that it “had all of the necessary equipment, know-how, and experience” to make the substitute, and that making the substitute was “not prohibitively expensive” to the infringer. 185 F.3d at 1349, 1353-54. The fact that the alternative was not on the market during the time of first infringement did not prevent it from being found to be an available noninfringing alternative. *Id.*; *see also Mars*, 527 F.3d at 1373 (holding that the district court appropriately considered that defendant “did not have—but probably could have designed—an acceptable alternative” in awarding reasonable royalty).

Here, Google’s experts contend that the company had the “materials needed” to produce the bf20 alternative, it had the “know-how” to do so, and that doing so was “not prohibitively expensive.” (*e.g.*, Kamber Decl. Ex. O at 27). They also contend that the changes necessary to develop the bf20 format were relatively minimal. (*e.g.*, Walker Rpt. ¶¶ 306-07).

Under the circumstances, the Court cannot conclude, as a matter of law, that the bf20 design was not “available” at the time of the hypothetical negotiation. *See Verinata Health Inc. v. Ariosa Diagnostics Inc.*, 2018 WL 288050, at \*5 (N.D. Cal. Jan. 4, 2018) (finding objections to the availability of noninfringing alternatives “go to the weight rather than the admissibility of the evidence” and declining to preclude such testimony); *Greatbatch Ltd. v. AVX Corp.*, 2015



WL 9171042, at \*7 (D. Del. Dec. 11, 2015) (same), *aff'd*, 813 F. App'x 609 (Fed. Cir. 2020); *Carnegie Mellon Univ. v. Marvell Tech. Grp. Ltd.*, 2012 WL 3686736, \*4-5 (W.D. Pa. Aug. 24, 2012) (denying motion to exclude damages experts over patentee's objections that the experts did not know if the purported noninfringing alternatives had actually been built, tested or sold, and at what costs, as those details went to the factual question of the alternatives' existence, not the admissibility of the opinions). It is certainly possible, of course, that the evidence as developed at trial requires a directed finding that bf20 format was not actually "available," but the Court cannot make that determination on the evidentiary record before it.

Accordingly, to the extent that Singular seeks to exclude Stamm's testimony on the available noninfringing alternative, the motion will be denied.

**b. "Capping" Damages**

Stamm's expert report contains the following passage:

Google would have approached the negotiation with the position that it could design around the Asserted Claims by using a different number format, bfl20, that would not infringe the patents-in-suit. This alternative would result in Google incurring at most a present value amount of \$12.9 million in added electrical and cooling expenses. These added costs inform the amount Google would be willing to pay for a license to the patents-in-suit that would allow it to benefit from the lower costs associated with the use of the Accused Chips.

(Stamm Rpt. ¶ 180).

According to Singular, as a matter of law, reasonable royalty damages cannot be "capped at the cost of implementing the cheapest available, acceptable, noninfringing alternative." (Pl. Mot. at 10 (citing *Mars*, 527 F.3d at 1373)).

In *Mars*, the defendant argued that "the district court erred by awarding a reasonable royalty rate higher than the cost to [the defendant] of implementing acceptable noninfringing alternatives." *Mars*, 527 F.3d at 1372. The court determined that, even assuming the defendant's theoretical noninfringing alternative existed at the time of the hypothetical

negotiation, the defendant was “wrong as a matter of law to claim that reasonable royalty damages are capped at the cost of implementing the cheapest available, acceptable, noninfringing alternative.” *Id.* at 1373. Instead, the court held that “an infringer may be liable for damages, including reasonable royalty damages, that exceed the amount that the infringer could have paid to avoid infringement.” *Id.*

A number of courts have rejected Singular’s interpretation of *Mars*. *See, e.g., Ergotron Inc. v. Rubbermaid Com. Prods.*, 2012 WL 3733578, at \*12 (D. Minn. Aug. 28, 2012) (collecting cases); *Kimberly-Clark Worldwide Inc. v. First Quality Baby Prod.*, 2013 WL 6036029, at \*3 (M.D. Pa. Nov. 13, 2013) (“the court examined the pertinent case law—including *Mars*—and concluded that it did not prohibit experts from testifying regarding the behavior of economically rational actors. Rather, it stood for the proposition that courts could not cap infringement damages as a matter of law at the cost of creating a noninfringing alternative”); *see also Meridian Mfg. v. C & B Mfg.*, 340 F. Supp. 3d 808, 846 (N.D. Iowa 2018) (refusing to strike accused infringer’s damages expert’s opinion because the expert’s “opinion does not place an automatic cap on damages at the cost of redesign” and instead “concludes based on the facts and circumstances of this case that a reasonable royalty would not exceed the cost of redesigning,” an opinion more appropriate for cross-examination).

As a general matter, damages experts may consider the cost of implementing a noninfringing alternative in their damages analysis. *See Zygo Corp. v. Wyko Corp.*, 79 F.3d 1563, 1571-72 (Fed. Cir. 1996). In some circumstances, an expert may permissibly conclude that a reasonable royalty rate effectively aligns with the costs of implementation. *See Riles v. Shell Expl. & Prod. Co.*, 298 F.3d 1302, 1312 (Fed. Cir. 2002) (“The economic relationship between the patented method and non-infringing alternative methods, of necessity, would limit

the hypothetical negotiation.”); *Grain Processing*, 185 F.3d at 1347 (finding that the difference between the production costs of the infringing and noninfringing products would “effectively cap[] the reasonable royalty award” because under the facts, the defendant would not have paid more than that in a hypothetical negotiation).

Accordingly, to the extent Singular seeks to preclude Stamm from testifying as to the effect of the cost of implementing the bf20 alternative, it will be denied.

### **III. Conclusion**

For the foregoing reasons, defendant’s motion to exclude the testimony of Singular’s technical expert Dr. Sunil Khatri is GRANTED in part, consistent with the conclusions of this memorandum and order, and is otherwise DENIED. Defendant’s motion to exclude the testimony of Singular’s damages expert Mr. Philip Green is DENIED. Plaintiff’s motion to exclude the testimony of Google’s experts Ms. Laura Stamm and Dr. Martin Walker concerning a reasonable royalty is DENIED.

**So Ordered.**

Dated: December 20, 2023

/s/ F. Dennis Saylor IV  
F. Dennis Saylor IV  
Chief Judge, United States District Court