

NOTE: This disposition is nonprecedential.

**United States Court of Appeals  
for the Federal Circuit**

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**AMERICAN RADIO LLC,**  
*Plaintiff-Appellant,*

v.

**QUALCOMM INCORPORATED,**  
*Defendant-Appellee,*

AND

**CISCO SYSTEMS, INC.,**  
*Defendant-Appellee,*

AND

**INTEL CORPORATION,**  
*Defendant-Appellee,*

AND

**BROADCOM CORPORATION,**  
*Defendant-Appellee.*

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2013-1641, -1642, -1643, -1644

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Appeals from the United States District Court for the  
Central District of California in Nos. 12-CV-1123, 12-CV-

5908, 12-CV-5909, and 12-CV-5910, Senior Judge Mariana R. Pfaelzer.

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Decided: August 22, 2014

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THOMAS G. PASTERNAK, Steptoe & Johnson LLP, of Chicago, Illinois, argued for plaintiff-appellant. With him on the brief were MEREDITH MARTIN ADDY and THOMAS A. RAMMER, II.

DAVID C. MARCUS, Wilmer Cutler Pickering Hale and Dorr LLP, of Los Angeles, California, argued for all defendants-appellees. With him on the brief were ANDREA WEISS JEFFRIES, of Los Angeles, California, GREGORY P. TERAN, LAUREN B. FLETCHER, KEVIN A. GOLDMAN, and PROSHANTO MUKHERJI, of Boston, Massachusetts, for Intel Corporation. On the brief were L. NORWOOD JAMESON, MATTHEW S. YUNGWIRTH and JOHN R. GIBSON, Duane Morris, LLP, of Atlanta, Georgia, for Cisco Systems, Inc.; DAVID A. NELSON and MARC L. KAPLAN, Quinn Emanuel Urquhart & Sullivan LLP, of Chicago, Illinois, JUSTIN C. GRIFFIN, of Los Angeles, California, and JENNIFER A. KASH, of San Francisco, California, for Qualcomm Incorporated; and DARIN W. SNYDER and MELODY DRUMMOND-HANSEN, O'Melveny & Myers LLP, of San Francisco, California, for Broadcom Corporation. Of counsel for Intel Corporation was JORDAN LAWRENCE HIRSCH, Wilmer Cutler Pickering Hale and Dorr, of Boston, Massachusetts.

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Before LOURIE, O'MALLEY, and CHEN, *Circuit Judges*.

LOURIE, *Circuit Judge*.

American Radio LLC (“American Radio”) appeals from the judgment of noninfringement of the United States

District Court for the Central District of California following stipulation by the parties after the court construed several claim limitations of U.S. Patents 5,864,754 (the “754 patent”), 7,831,233 (the “233 patent”), 8,045,942 (the “942 patent”), 8,170,519 (the “519 patent”), and 8,280,334 (the “334 patent”) (collectively, “the Hotto patents”). *See Am. Radio, LLC v. Qualcomm Inc.*, No. CV-12-5908-MRP (C.D. Cal. Aug. 29, 2013), ECF No. 78 (“*Stipulation of Noninfringement*”); *Am. Radio, LLC v. Qualcomm Inc.*, No. CV-12-5908-MRP, 2013 WL 3270404 (C.D. Cal. May 23, 2013) (“*Claim Construction Order*”). Because the district court did not err in construing the claims of the Hotto patents, and its consequent judgment of noninfringement, we affirm.

#### BACKGROUND

In radio technology, digital information is transmitted by: (1) converting that information into a low frequency analog signal known as the baseband signal; (2) upconverting the baseband signal into a high frequency signal known as the carrier signal by changing, or “modulating,” the baseband signal with a higher frequency one; (3) transmitting the modulated carrier signal; (4) receiving the transmitted modulated carrier signal; and (5) downconverting the received carrier signal in one or more steps to the baseband signal to extract the information. *See Claim Construction Order*, 2013 WL 3270404, at \*2.

For the downconversion of the carrier signal, the receiving system can either directly downconvert it to the baseband frequency, or it can downconvert it to another frequency using a process involving two or more steps before extracting the baseband signal. Receivers that directly downconvert the carrier signal are referred to as “homodyne” or “zero-IF” (“intermediate frequency”) receivers; those that downconvert a signal using two or more steps are referred to as “superheterodyne” receivers. *See id.* at \*11.

Received radio frequency (“rf”) signals can be influenced by outside signals and environmental factors, which introduce distortion to the transmitted signal. ’754 patent col. 1 ll. 20–22. After the radio signal has been received, the receiver can use a variety of techniques to remove the distortion, or noise, from that signal. *See, e.g., id.* col. 7 l. 13–col. 8 l. 11.

American Radio owns the Hotto patents, which share a common specification; all derive from the same initial application.\* The patents disclose systems and methods for correcting noisy signals by replacing the distorted sections of the signal with undistorted portions. *E.g., id.* col. 5 ll. 59–65 (describing a method of identifying the distorted portions of a received waveform and replacing those portions with undistorted portions); *id.* col. 1 ll. 51–58 (describing a method of analyzing both “halves” of the signal and replacing the distorted half with the undistorted half). The Hotto patents refer to the method of replacing distorted portions of a signal with undistorted portions as “reconstruction.”

Claim 10 of the ’754 patent is representative of the claims at issue and recites a receiver that receives an analog signal, digitizes that signal, and “reconstructs” the signal to remove distortion. That claim reads as follows:

10. An rf receiver, comprising:
- an antenna;
  - a reconstruction circuit electrically connected to the antenna for receiving an analog rf signal

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\* The district court and the parties each treat the specification of the ’754 patent as representative of all of the Hotto patents. *See* Appellant’s Br. 3 n.1. Accordingly, we also treat the ’754 patent specification as representative.

from the antenna and generating a reconstructed waveform having substantially no distortions therein, wherein the reconstruction circuit includes:

an analog to digital converter (ADC) electrically connected to the antenna for receiving the analog rf signal therefrom and outputting a digitized rf signal in response;

a digital processor electrically connected to the ADC for receiving the digitized rf signal and in response outputting the reconstructed waveform in accordance with a predetermined reconstruction paradigm.

*Id.* col. 9 l. 63–col. 10 l. 11.

Claim 1 of the '942 patent is representative of other claims at issue and recites a receiver that is similar to the one that is recited in claim 10 of the '754 patent, but also requires that the received signal not be downconverted to IF before it is digitized; it reads as follows:

1. A receiver, comprising:

an analog to digital converter (ADC) receiving as input an rf signal that has not been downconverted in the analog domain to IF by the receiver, the ADC outputting a digitized signal representing the rf signal; and

a digital processor electrically connected to the ADC, the digital processor being programmed with software to decode and extract baseband information from the digitized signal.

'942 patent col. 8 ll. 38–46. All of the contested claim limitations are in the above-recited claims.

American Radio sued Qualcomm Inc., Cisco Systems Inc., Intel Corp., and Broadcom Corp. (collectively “Qualcomm”) asserting that Qualcomm infringed claim 1 of the '754 patent; claims 1, 2, and 3 of the '519 patent; claim 10 of the '233 patent; claims 1, 2, and 3 of the '942 patent; and claim 29 of the '334 patent. The district court construed the claim terms “analog signal,” “digitized signal,” “IF,” and “reconstruction.” *Claim Construction Order*, 2013 WL 3270404, at \*3–16.

First, the district court construed the terms “analog rf signal,” “rf signal,” “analog sinusoidal signal,” and “electromagnetic signal” (collectively “analog signal limitations”) to mean the “waveform at the carrier frequency,” relying on the Hotto patents’ use of the analog signal limitations to describe the carrier signal received by the antenna. *Id.* at \*11. Secondly, the court construed the “digitized signal” limitation to mean the digitized version of the analog signal. *Id.* Third, the court construed “IF” to mean any “frequency to which the input signal is shifted, including shifting the signal to zero Hertz,” which it gleaned from usage of IF in the prior art. *Id.* at \*12–13. Finally, the court construed the “reconstruction” limitation to mean “replacing a distorted portion of the input waveform at the carrier frequency with an undistorted portion, wherein the operand of the reconstruction operation represents one full wave or cycle,” in view of the consistent use of the term in the specification. *Id.* at \*16. After the court issued its claim construction opinion, the parties stipulated to a judgment of noninfringement of all asserted claims. *Stipulation of Noninfringement* at 2–3.

American Radio timely appealed. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

## DISCUSSION

The words of a claim in a patent are generally given their ordinary and customary meaning, which is the meaning that a term would have to a person of ordinary skill in the art after reviewing the intrinsic record at the time of the invention, *i.e.*, as of the effective filing date of the patent application. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005). The intrinsic record includes the claims, the specification, and the prosecution history. *E.g.*, *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). The claims “must be read in view of the specification, of which they are a part.” *Phillips*, 415 F.3d at 1315 (quoting *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc), *aff’d*, 517 U.S. 370 (1996)).

## A.

We first consider the construction of the analog signal limitations and the digitized signal limitation. American Radio argues that the district court erred in construing both the analog signal and digitized signal claim terms as limited to “the waveform at the carrier frequency.” American Radio contends that the limitations should be construed in accordance with the plain meaning of the term “signal,” which is “a waveform that carries information.” Appellant’s Br. 44–45.

Qualcomm responds that each asserted claim uses the analog signal limitations to describe a signal that is received and then digitized. Qualcomm further argues that although the term signal may simply relate to a waveform, the Hotto patents use “analog signal” to describe a specific type of waveform, namely the waveform at the carrier frequency, and use “digitized signal” to describe the digitized version of that analog signal.

We agree with Qualcomm and the district court regarding the proper construction of the analog signal

limitations and the claim term “digitized signal,” because the Hotto patents consistently use the signal limitations to describe a waveform at the carrier frequency. As an initial matter, although American Radio argues that the district court misconstrued the plain meaning of the term “signal,” the court separately construed the analog signal limitations, *Claim Construction Order*, 2013 WL 3270404, at \*3, and then addressed the digitized signal limitation, *id.* at \*10–11. Accordingly, we address those limitations separately.

Regarding the analog signal limitations, the written description of the '754 patent consistently uses the analog signal limitations to refer to the analog signal at the carrier frequency. *See, e.g.*, '754 patent col. 1 ll. 20–22 (referring to the fact that “rf signals are corrupted by environmental factors during transmission”); *id.* col. 4 ll. 6–11 (referring to the rf signal as “an analog, sinusoidally-shaped signal that is relatively smooth and undistorted when transmitted”); *id.* col. 4 ll. 40–45 (describing an analog-to-digital converter as connected to the antenna “for receiving the analog signal therefrom”). It is important to recognize that these references in the specification to “rf signal” and analog signals received by the antenna necessarily mean a signal at the carrier frequency. *Id.* col. 1 ll. 19–20 (noting that the modulated information “is carried by the received rf signal”); *id.* col. 1 ll. 21–23 (noting that “rf signals are corrupted by environmental factors during transmission”).

Additionally, the figures of the '754 patent describe the “rf signal” as propagating until it is received by the antenna, further supporting the district court’s construction. *Id.* col. 4 ll. 3–19. The asserted claims, likewise, consistently use the analog signal limitations in the same manner. *See, e.g., id.* col. 9 l. 9–col. 10 l. 10 (requiring an antenna “for receiving an analog rf signal”).



Moreover, the '754 patent consistently refers to a “digitized signal” as the digitized version of the analog signal. *See, e.g., id.* col. 4 ll. 42–45 (describing an ADC converter that receives the “analog rf signal” and “outputs a digitized rf signal”); *id.* col. 4 ll. 47–48 (referring to a component that “receives the digitized signal from the ADC”). Additionally, the asserted claims support the district court’s construction of digitized signal. *See, e.g., id.* col. 10 ll. 3–6 (requiring an ADC for “receiving the analog signal . . . and outputting a digitized rf signal in response”).

The patent thus consistently uses the analog signal limitations to refer to the analog signal at the carrier frequency and uses digitized signal to refer to the digitized version of that analog signal. The district court thus did not err in construing those limitations accordingly. *See Honeywell Intern., Inc. v. ITT Indus., Inc.*, 452 F.3d 1312, 1318 (Fed. Cir. 2006) (affirming the district court’s construction of a claim term because of the consistent use of that term in the written description).

## B.

We next consider the construction of the IF limitation. American Radio argues that the IF limitation should be construed as any intermediate frequency between the carrier frequency and the baseband frequency, but not including the baseband frequency. American Radio contends that the specification consistently distinguishes the invention of the Hotto patents from prior art superheterodyne receivers. Additionally, it argues that allowing a direct downconversion ignores the “intermediate” aspect of intermediate frequency.

Qualcomm responds that the district court’s construction is consistent with the plain and ordinary meaning of IF and that the intrinsic record highlights that shifting the frequency directly to the baseband frequency of zero Hertz nonetheless produces an “IF” frequency. Qualcomm argues that adopting American Radio’s construction

would necessarily broaden the claim scope to encompass a directly downconverted signal. Specifically, Qualcomm contends that because claim 1 of the '942 patent recites IF as a negative limitation, *i.e.*, requiring that the signal *not* have been downconverted to IF, American Radio's construction broadens the scope of the claims by allowing them to cover a signal that has been directly downconverted to the baseband frequency, but not one that has been downconverted to some frequency between the carrier frequency and the baseband frequency.

We agree with Qualcomm and the district court that the meaning of the claim term IF, as understood by those skilled in the art, includes shifting the signal to the baseband frequency or zero Hertz. “[P]rior art . . . whether or not cited in the specification or the file history . . . can often help to demonstrate how a disputed term is used by those skilled in the art.” *Vitronics*, 90 F.3d at 1584. U.S. Patent 4,733,403, cited in the '942 patent states that “[g]enerally, any receiver with an intermediate frequency of zero Hertz is referred to as a direct conversion receiver.” U.S. Patent 4,733,403 col. 1 ll. 20–22. The district court also relied on U.S. Patent 4,709,402, which states that “[t]he description is also applicable where the receiver is of the homodyne type, *i.e.*, its intermediate frequency is zero [Hertz].” U.S. Patent 4,709,402 col. 5 ll. 64–65. Although that patent was not cited in the '942 patent, it is nonetheless relevant to determining how IF would be read by those skilled in the art. *Vitronics*, 90 F.3d at 1584. Based on these disclosures, the district court concluded that one skilled in the art at the time would understand that IF can include a frequency of zero Hertz.

Additionally, the portions of the specification that American Radio relies on to differentiate the invention of the Hotto patents from conventional uses of IF do not alter that definition. The written description of the '754 patent includes the statement that conventional super-

heterodyne structures downconvert “the received signal down to an intermediate frequency (IF) [that] is then sent through a bandpass filter and demodulated . . . to recover the information (colloquially referred to as ‘baseband’) that is carried by the received rf signal.” ’754 patent col. 1 ll. 13–19. However, that statement highlights that downconverting to an intermediate frequency before error correction can cause some of the signal information to be permanently lost, and teaches that the invention of the ’754 patent performs error correction before downconverting the signal. *Id.* col. 1 ll. 55–63 (“[I]t would be advantageous to accomplish [reconstruction] prior to the non-linear transformation of the rf signal to the IF signal during mixing by the oscillator . . . since the mixing function causes certain data in the signal to be irrecoverable and therefore precludes identification of some distortion and corruption in the ‘true’ signal post-mixing.”). Accordingly, the district court did not err in relying on the prior art to construe IF to mean any “frequency to which the input signal is shifted, including shifting the signal to zero Hertz.”

### C.

We finally consider the district court’s construction of the claim term “reconstruction.” American Radio argues that the reconstruction limitation should be construed as “reducing errors in communication signals” in accordance with the plain meaning of the term. Appellant’s Br. 55–56. American Radio contends that the district court imported limitations from the specification into its construction to require replacing a part of the waveform. It also argues that the district court’s construction renders several dependent claims of the patent superfluous.

Qualcomm responds that the term “reconstruction” has no plain meaning in the art and that the specification consistently uses reconstruction to refer to instances where parts of the received signal are replaced with

undistorted portions of the received signal. Qualcomm contends that although the other limitations the district court read into the term “reconstruction”—“at the carrier frequency” and “wherein the operand of the reconstruction cycle represents one full wave or cycle”—are properly part of the term as used in claim 10 of the ’754 patent, it need not rely on those limitations because the accused devices simply do not replace distorted portions of the input waveform with undistorted ones. American Radio does not disagree that the district court’s conclusion that distorted portions of the input waveform must be replaced with undistorted ones is determinative of its infringement claims, without reference to the additional limitations.

We again agree with Qualcomm and the district court that the claim term “reconstruction” refers to replacing a distorted portion of the signal with undistorted ones. The specification consistently uses reconstruction to mean replacing the distorted portion of the input waveform. The written description of the ’754 patent repeatedly describes reconstruction as being accomplished by replacing distorted portions of the waveform with undistorted ones. *See, e.g., id.* col. 1 ll. 51–55 (“[I]t would be advantageous to analyze both the positive and negative halves of an rf signal cycle and determine which half is the ‘best’ half, and then extract the useful signal from the ‘best’ half.”); *id.* col. 7 ll. 24–46 (describing comparing the halves of the waveform to determine which is the undistorted half, after which “the distorted portion is replaced with the inverse of the corresponding waveform portion” one wave at a time); *id.* col. 7 ll. 48–60 (describing a fast Fourier transform reconstruction wherein distorted portions of the waveform are replaced by smooth portions of the waveform); *id.* col. 7 l. 61–col. 8 l. 11 (describing replacing distorted portions of the input waveform with smooth portions based on a “wavelet analysis”).

Additionally, the district court’s construction of the claim term “reconstruction” does not render any depend-

ent claims of the asserted patents superfluous. American Radio points to claims 3 and 4 of the '942 patent to argue that under the district court's construction, claim 3's reconstruction limitation requires replacing distorted portions of the signal with undistorted portions. According to American Radio, that construction renders superfluous the language of claim 4, which depends from claim 3, requiring "replacing at least one distorted portion of the signal with a replacement portion that is based on at least some undistorted portions of the signal." '942 patent col. 8 ll. 64–67. However, the district court's construction of the claim term "reconstruction" only requires that a distorted portion of the signal be replaced with an undistorted portion and does not limit the source of that undistorted portion. Claim 4, on the other hand, requires that the replacement portion of the signal be based on at least some undistorted portions of the received signal, and is therefore narrower than the district court's construction of the reconstruction limitation. The district court thus did not err in construing reconstruction to mean "replacing a distorted portion of the input waveform with an undistorted portion."

The parties in this case stipulated that, under the district court's claim constructions, Qualcomm does not infringe the asserted claims. Because we have affirmed the court's relevant claim constructions, we accordingly affirm the judgment of noninfringement.

#### CONCLUSION

For the foregoing reasons, the decision of the district court construing the analog signal, digitized signal, IF, and reconstruction limitations of the Hotto patents, and hence the judgment of noninfringement, are affirmed.

**AFFIRMED**