

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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SILICON LABORATORIES, INC.,  
Petitioner,

v.

CRESTA TECHNOLOGY CORPORATION,  
Patent Owner.

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Case IPR2014-00809  
Patent 7,265,792 B2

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Before PHILLIP J. KAUFFMAN, GREGG I. ANDERSON, and  
PATRICK M. BOUCHER, *Administrative Patent Judges*.

ANDERSON, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
*35 U.S.C. § 318(a) and 37 C.F.R. § 42.73*

## I. INTRODUCTION

### A. Background

Silicon Laboratories, Inc. (“Petitioner”) filed a Petition and Corrected Petition pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–17, 26, and 27 of U.S. Patent No. 7,265,792 B2 (“the ’792 patent”), filed July 1, 2004. Papers 1 and 32 (“Pet.”).<sup>1</sup> Cresta Technology Corporation (“Patent Owner”) filed a Preliminary Response. Paper 8. Based on these submissions, we granted the Petition and instituted trial for claims 1–17, declining to institute trial on claims 26 and 27. Paper 10 and Paper 28 (collectively “Institution Decision” or “Dec.”).

After institution of trial, Patent Owner filed a Patent Owner Response. Paper 35 (“PO Resp.”). Petitioner filed a Reply. Paper 40 (“Pet. Reply”). In addition, the parties rely upon expert testimony. Petitioner proffered the Declaration of Dr. Douglas Holberg (“Holberg Declaration,” Ex. 1009) with the Petition and the Declaration of Douglas Holberg with Petitioner’s Reply (“Holberg Reply Declaration,” Ex. 1072). Patent Owner proffered the Declaration of Dr. Ion E. Opris (“Opris Declaration,” Ex. 2003) with its

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<sup>1</sup> Petitioner filed a Motion to Correct the Petition and Modify the Institution Decision based on a mistake relating to evidence supporting Petitioner’s challenge to claim 3. Paper 22 (“Motion to Correct”). We granted the Motion to Correct in our Decision on Motion to Correct. Paper 28. Petitioner filed the Corrected Petition and Exhibit 1038, replacing expert declaration Exhibit 1009. Notwithstanding the preceding, Patent Owner cites to the Petition in its Response and not the Corrected Petition. *See* PO Resp. 26. Both the Corrected Petition and the Patent Owner’s Motion to Exclude the Holberg Declaration and Holberg Reply Declaration (Paper 43, “Mot. Exclude”) incorrectly continue to cite Exhibit 1009 and not Exhibit 1038. *See* Corrected Petition 25; Mot. Exclude 1. Nonetheless, to remain consistent with papers filed by both parties, unless otherwise indicated, all citations are nominally to the original Petition and Exhibit 1009.

Response. A transcript of Dr. Opris's deposition ("Opris Dep.," Ex. 1056) was submitted by Petitioner. A transcript of Dr. Holberg's deposition ("Holberg Dep.," Exhibits 2048 and 2049) was submitted by Patent Owner.

Patent Owner filed its Motion to Exclude the Holberg Declaration (Exhibit 1009) and Holberg Reply Declaration (Exhibit 1072). Paper 43 ("Mot. Exclude"). Petitioner filed an Opposition to the Motion to Exclude (Paper 49, "Pet. Opp. Mot. Exclude") and Patent Owner filed a Reply. Paper 50 ("PO Reply Mot. Exclude").

An oral hearing was held on June 12, 2015. The transcript of the hearing has been entered into the record. Paper 53 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). We conclude for the reasons that follow that Petitioner has shown by a preponderance of the evidence that claims 1–3 and 4–17 of the '792 patent are unpatentable.

#### *B. Related proceedings*

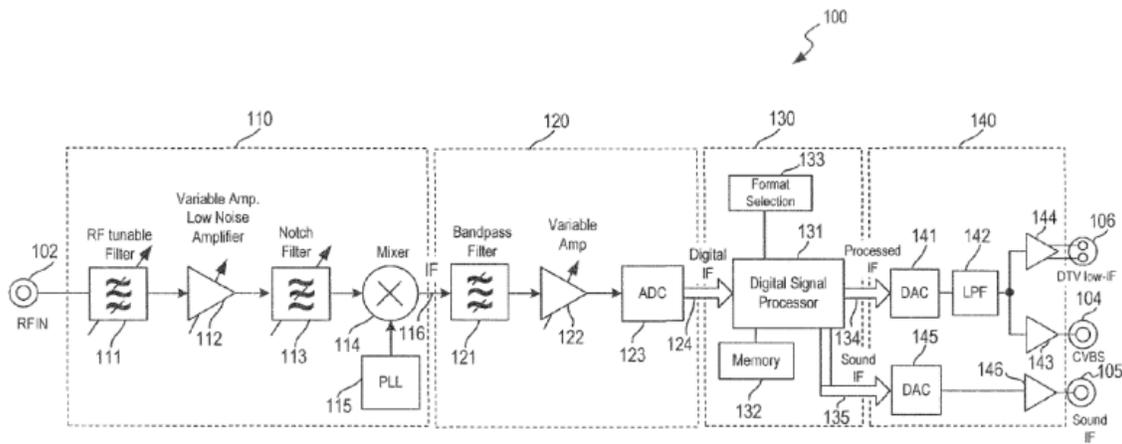
Patent Owner has asserted the '792 patent against Petitioner in the following two actions: *Cresta Technology Corporation v. Maxlinear, Inc. et al.*, 1:14-cv-00079-RGA (D. Del.); *Certain Television Sets, Television Receivers, Television Tuners, and Components Thereof*, Investigation No. 337-TA-910 (USITC). Pet. 1.

#### *C. The '792 patent (Ex. 1001)*

The '792 patent is directed towards "a broadband television signal receiver for receiving multi-standard analog television signals and digital television signals." Ex. 1001, 1:7–10. A dual-format television receiver includes a signal input terminal for receiving an incoming radio frequency ("RF") signal. *Id.* at 3:57–59. A frequency conversion circuit converts the

input RF signal to an intermediate frequency (“IF”) signal. *Id.* at 4:55–57. The analog IF signal generated by the frequency conversion circuit is converted to a digital signal that digitizes an IF circuit. *Id.* at 5:22–23. The receiver processes the digitized signal entirely in the digital domain. *Id.* at 5:23–25.

Figure 1 of the ’792 patent is reproduced below.



**Fig. 1**

Figure 1 depicts a schematic diagram of a dual-format television receiver. As shown in Figure 1, in addition to frequency conversion circuit 110 and digitizing IF circuit 120, receiver 100 includes digital signal processor (DSP) circuit 130 and signal output circuit 140. *Id.* at 4:49–52. “By applying . . . the appropriate signal processing functions at DSP circuit 130, receiver 100 can handle television signals in any format (analog or digital) and in any standard (e.g., NTSC, PAL, SECAM, DVB or ATSC).” *Id.* at 5:25–29.

The receiver disclosed in the ’792 patent processes all signals in the digital domain, and it therefore eliminates the need for analog components like a Surface Acoustic Wave (“SAW”) filter. *Id.* at 1:55–56, 3:32–35. In

addition, a single signal processing path is used to process television signals in either the analog format or the digital format. *Id.* at 3:45–49.

*D. Illustrative claim*

Claim 1 is the only independent claim of the '792 patent and is illustrative of the claims at issue:

1. A television receiver comprising:

a frequency conversion circuit for receiving an input RF signal and for converting the input RF signal to an intermediate frequency signal having an intermediate frequency (IF), the input RF signal encoding information in one of a plurality of television signal formats;

an analog-to-digital converter for sampling the intermediate frequency signal and generating a digital representation thereof;

a signal processor for processing the digital representation of the intermediate frequency signal in accordance with the television signal format of the input RF signal, the signal processor generating digital output signals indicative of information encoded in the input RF signal, wherein the signal processor applies one of a plurality of finite impulse response filters to the digital representation of the intermediate frequency signal, each of the plurality of finite impulse response filters corresponding to a format of the input RF signal; and

a signal output circuit for receiving the digital output signals from the signal processor and for providing one or more output signals corresponding to the digital output signals.

Ex. 1001, 10:51–11:6.

*E. Grounds upon Which Trial Was Instituted*

*Inter partes* review was instituted on the following grounds:

(1) claims 1, 2, 4, 10, and 11 as obvious over Thomson<sup>2</sup> and Harris<sup>3</sup> under

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<sup>2</sup> EP 0696854 A1 to Thomson, published Feb. 14, 1996 (“Thomson,” Ex.

35 U.S.C. § 103; (2) claim 3 as obvious over Thomson, Harris, and Gunter<sup>4</sup> under 35 U.S.C. § 103; (3) claims 5 and 6 as obvious over Thomson, Harris and Cirrus Logic<sup>5</sup> under 35 U.S.C. § 103; (4) claims 7 and 12 as obvious over Thomson, Harris, and Kerth<sup>6</sup> under 35 U.S.C. § 103; (5) claims 13–17 as obvious over Thomson, Harris, Kerth, and Oku<sup>7</sup> under 35 U.S.C. § 103; and (6) claims 8 and 9 as obvious over Thomson, Harris, Kerth, and Cirrus Logic under 35 U.S.C. § 103. Dec. 30; Paper 28 at 8.

## II. ANALYSIS

### A. Claim Construction

In an *inter partes* review, “[a] claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears.” 37 C.F.R. § 42.100(b); *see In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1275–76 (Fed. Cir. 2015), *reh’g en banc denied*, 793 F.3d 1297 (Fed. Cir. 2015); *see also* Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012) (Claim Construction).<sup>8</sup>

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1004).

<sup>3</sup> Clay Olmstead and Mike Petrowski, *A Digital Tuner for Wideband Receivers*, DSP Applications Magazine (Sept. 1992) (“Harris,” Ex. 1005).

<sup>4</sup> US 4,782,385 to G. Gunter et al., issued Nov. 1, 1988 (“Gunter,” Ex. 1022).

<sup>5</sup> Cirrus Logic, Product Bulletin CS92288 (2002) (Ex. 1015), Cirrus Logic, Data Sheet CS4223/CS4224 (April 2000) (Ex. 1016), Cirrus Logic, Data Sheet CS4954/CS4955 (April 1999) (Ex. 1017) (collectively “Cirrus Logic”).

<sup>6</sup> US 6,804,497 B2 to D. Kerth et al., issued Oct. 12, 2004 (“Kerth,” Ex. 1011).

<sup>7</sup> US 2002/0057366 A1 to M. Oku et al., published May 16, 2002 (“Oku,” Ex. 1018).

<sup>8</sup> Patent Owner’s Response argues that the claim interpretation standard for *inter partes* review should be judicial standard established by the Federal

Under the broadest reasonable construction standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a special definition or other consideration, “limitations are not to be read into the claims from the specification.” *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Petitioner contended originally that all terms save “signal processor” should be given their plain and ordinary meaning. Pet. 12. Patent Owner proposes constructions for several terms. PO Resp. 9–14. Petitioner continues to argue the terms should be given their plain and ordinary meaning and that Patent Owner’s construction is not the broadest reasonable interpretation. Pet. Reply 2–5.

### *1. Disputed Terms*

Patent Owner argues the construction of four terms as part of its arguments regarding patentability. PO Resp. 9–14.

#### *a. “input RF signals”*

The term “input RF signal” appears in claim 1 and, thus, in all of the challenged dependent claims. In the Institution Decision we construed “RF

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Circuit in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). PO Resp. 15–19. Patent Owner’s Response was filed prior to the *Cuozzo* decision, which considered the proper claim construction standard and affirmed the standard is broadest reasonable interpretation. *See Cuozzo*, 793 F.3d at 1275–77. The issue has been decided by our reviewing court and we need not address Patent Owner’s argument.

signals” as “signals having a frequency between 10 kHz and 100 GHz.” Dec. 7. Neither the Petition nor the Preliminary Response (Paper 8) proposed a construction for either “RF signals” or “input RF signal.” We relied on the definition of “RF” in the ’792 patent as an abbreviation for “radio frequency” (Ex. 1001, 1:36), which *The Authoritative Dictionary of IEEE Standards Terms* identifies as a frequency roughly between 10 kHz and 100 GHz. Dec. 7 (citing Ex. 3001, 912).

Patent Owner argues that our preliminary construction of “RF signal” improperly dissected the claim term “input RF signal” by relying solely on the “RF” portion of the term. PO Resp. 10. Patent Owner argues the ’792 patent is not limited to the referenced frequency range. *Id.* Patent Owner contends that the fact that “RF” means “radio frequency” does not define “input RF signal” of claim 1, noting the Specification of the ’792 patent states that “the receiver receives the incoming television signal in radio frequency (RF).” *Id.* (citing Ex. 1001, 1:35–38, Fig. 1). Patent Owner also argues that the “input RF signal” is “received from terrestrial broadcast or on a cable line transmissions.” *Id.* at 11 (quoting Ex. 1001, 4:51–55). Patent Owner concludes that the preceding necessitates that the “input RF signal” is an “external signal to the frequency conversion circuit” of claim 1. *Id.* at 11–12. Patent Owner proposal for construction of “input RF signal” is “a signal that is an incoming signal that comes out of the medium of propagation and is external to the frequency conversion circuit without any processing by the frequency conversion circuit.” *Id.* at 12.

Petitioner adopts the construction from the Institution Decision. Pet. Reply 2. Citing to the Holberg Reply Declaration, Petitioner contends that “input RF signals” do not incorporate the source of those signals or the

medium over which the signal is propagated. *Id.* at 3 (citing Ex. 1072 ¶¶ 10–12). Petitioner further notes that “the specification and the claims use permissive language when referring to the source of that signal—‘input RF signals *can be received* from terrestrial broadcast or cable transmissions.’” *Id.* (emphasis added) (citing Ex. 1001, 4:53–55, 14:50–53; *Trebro Mfg., Inc. v. Firefly Equipment, LLC*, 748 F.3d 1159, 1166 (Fed. Cir. 2014)).

The Specification of the ’792 patent describes “input signal” without reference to “RF” or the RF spectrum of frequencies. *See* Ex. 1001, 4:3–7, 4:18–23, 4:28–31. Conversely, the Specification acknowledges separately that “RF” is understood to mean radio frequency. *Id.* at 1:35–38, Fig. 1 (“RFIN”). Relying almost totally on incorporating the word “input,” the additional language Patent Owner proposes regarding transmission of the signal is not supported by any evidence beyond attorney argument.<sup>9</sup> Patent Owner’s implication that “input RF signal” can only be considered as an undivided expression is belied by the preceding description, which does parse the expression. Thus, we are not persuaded that Patent Owner’s proposal corresponds to the broadest reasonable interpretation in light of the Specification. We construe “input RF signals” as signals that are input having a frequency between 10 kHz and 100 GHz.

*b. “frequency conversion circuit”*

Claim 1 recites, in part, “a *frequency conversion circuit* for receiving an input RF signal and for converting the input RF signal to an intermediate

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<sup>9</sup> As discussed above, Petitioner has provided expert testimony that Patent Owner’s construction is unsupported in the Specification. Ex. 1072 ¶¶ 10–12. However, given the underlying rationale for our construction, we need not rely on this evidence.

frequency signal having an intermediate frequency (IF)” (emphasis added). We did not construe the term in the Institution Decision.

Patent Owner contends “a frequency conversion circuit receiv[es] a transmitted RF signal that has not been further processed or converted.” PO Resp. 12–13. Patent Owner contends that “the frequency conversion circuit receives external signals that have not been processed by the frequency conversion circuit comprised of signals that have been provided by a medium of propagation (e.g. atmosphere, cable, etc.)” *Id.* at 13. Thus, Patent Owner’s proposed construction of “a frequency conversion circuit” is a circuit “that receives an incoming signal that comes out of the medium of propagation and is external to the frequency conversion circuit without any processing.” *Id.* Petitioner argues Patent Owner’s proposal improperly reads “medium of propagation” into the construction of the term and does so without adequate support. Pet. Reply 3–4.

Absent sufficient showing, we decline to read “medium of propagation” into the construction of the term. We agree with Petitioner that the plain and ordinary meaning of “frequency conversion circuit” is found in the claim language itself. Pet. Reply 4 (citing Ex. 1072 ¶ 17<sup>10</sup>). Thus, we construe “frequency conversion unit” to mean “a circuit for converting the frequency of the input RF signal to an intermediate frequency signal having an intermediate frequency.”

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<sup>10</sup> We rely on the plain and ordinary meaning of the claim language and its broadest reasonable interpretation without resort to the Holberg Reply Declaration.

*c. “input RF signals encoding information in one of a plurality of formats”*

Independent claim 1 recites “the input RF signal encoding information in one of a plurality of television signal formats.” Patent Owner contends that the phrase “the input RF signals encoding information in one of a plurality of television signal formats” requires “receiving one television format RF signal at a time.” PO Resp. 13. It is unclear what Patent Owner means by “format RF signal,” which appears nowhere in the ’792 patent, including its claims. Petitioner proposes the term receives its ordinary meaning, and that “a” or “an” is open ended and means one or more. Pet. Reply 4.

In describing the function of standard signal processing circuit, the ’792 patent Specification makes clear that different received input RF signals may encode information in different formats. Ex. 1001, 3:9–16. However, each received input RF signal encodes information in exactly one format: “Dual-format TV receiver 100 processes the incoming RF signal and provides output signals *depending on the television format* of the incoming RF signal.” *Id.* at 4:30–33 (emphasis added). Thus, applying the broadest reasonable interpretation in light of the specification for purposes of this Decision, we construe “the input RF signal encoding information in one of a plurality of television signal formats” as requiring that each received input RF signal encode information in exactly one format.

*d. “signal processor for processing ... in accordance with the television signal format”*

Independent claim 1 recites a “signal processor,” which we construed in the Institution Decision as “a digital module that processes signals in the digital domain.” Dec. 8–9. The parties do not dispute our construction of

signal processor but focus on the functionality of the signal processor. Pet. Reply 4–5, PO Resp. 13–14. Responding to the functionality recited, Petitioner asserts that this term is not a means-plus-function limitation under 35 U.S.C. § 112, ¶ 6. *See* Pet. 13. Patent Owner does not respond or discuss the issue. We agree that claim 1’s recitation of a signal processor, on this record, does not require construction under 35 U.S.C. § 112, ¶ 6.<sup>11</sup>

Apart from the section 112 question, Patent Owner points to the remaining claim language of claim 1, i.e., “a signal processor for processing . . . in accordance with the television signal format . . . the signal processor applies one of a plurality of finite impulse response filters . . . each of the plurality of finite impulse response filters corresponding to a format” and argues “that the claim limitation requires that the signal processor processes only **one** format and does not process a plurality of formats in parallel.” PO Resp. 13–14. Patent Owner relies not only on the claim language but also on the Specification, which it alleges supports that the DSP 131 (“digital signal processor”) operates to process only analog or digital formats depending on the input RF signal. *Id.* at 14 (citing Ex. 1001, 6:24–48).

Petitioner disagrees and argues that, even if Patent Owner’s proposal is supported by the Specification, it is not the broadest reasonable interpretation. Pet. Reply 4–5. Petitioner concludes that a plain reading of

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<sup>11</sup> The term does not include the word “means” and presumptively is not a means-plus-function limitation under 35 U.S.C. § 112, ¶ 6. However, that presumption can be overcome, such as when the phrase does not recite sufficiently definite structure. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015) (en banc). There is insufficient evidence in this record to overcome the presumption.

the term does not limit it to “one and only one” format. *Id.* at 5 (citing Ex. 1072 ¶ 19).

We are persuaded that Patent Owner’s construction of processing “only **one** format and does not process a plurality of formats in parallel” is supported by the Specification. Petitioner’s citation to the Holberg Reply Declaration does not alter our determination, as it relies on an unpersuasive legal principle and not a technical argument. Accordingly, we construe “signal processor for processing . . . in accordance with the television signal format” to mean “a digital module that processes signals in the digital domain in the exactly one format in which each received input RF signal is encoded.”

## 2. *Previously Construed Terms*

In the Institution Decision we construed the terms “format” and “baseband signal.” Dec. 7–9. Neither party takes issue with our construction nor proposes a different construction. Our analysis from the Institution Decision is repeated below.

### a. *“format”*

Independent claim 1 recites that the input RF signals encode information “in one of a plurality of television signal formats.” The Specification draws a distinction between “formats” and “standards”: “Television signals are transmitted in analog or digital *formats* and in accordance with a variety of *standards*.” Ex. 1001, 1:18–20 (emphasis added). Further, the Specification expressly states “the television signal formats include an analog television format and a digital television format.” Ex. 1001, 2:46–47. Based on the preceding, in the Institution Decision we concluded that analog and digital signals are examples of distinct “formats.”

Dec. 7–8. We therefore adopt the conclusion from the Institution Decision for purposes of this Decision.

*b. “baseband signal”*

Claims 4, 5, 8, and 14 recite the claim term “baseband signal(s).” Neither party proposes a construction of this term. *The Authoritative Dictionary of IEEE Standards Terms* defines “baseband signaling” as “[t]he transmission of a signal at its original frequency, that is, not changed by modulation. *Note:* It can be an analog or a digital signal.” Ex. 3001, 87. We discern nothing in the ’792 patent Specification inconsistent with this ordinary meaning. Accordingly, we construe “baseband signal” as a signal without transmission modulation.

*B. Obviousness of Claims 1, 2, 4, 10, and 11 over Thomson and Harris*

Petitioner contends that claims 1, 2, 4, 10, and 11 of the ’792 patent would have been obvious under 35 U.S.C. § 103 over Thomson and Harris. Pet. 13–25. To support this position, Petitioner cites to the Holberg Declaration. Ex. 1009 ¶¶ 16–36.<sup>12</sup> The invention recited in claim 1 of the ’792 patent includes a frequency conversion circuit, an analog-to-digital converter, a signal processor, and a signal output circuit. Ex. 1001, Fig. 1 (elements 110, 120, 130, and 140).

*1. Overview of Thomson*

Thomson describes a broadcast receiver. Ex. 1004, 1:3–4. Figure 1 of Thomson is reproduced below.

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<sup>12</sup> Patent Owner argues Dr. Holberg is not a qualified expert because, *inter alia*, he does not possess the level of ordinary skill in the art. PO Resp. 20–22. We disagree for the reasons discussed below in our decision on Patent Owner’s Motion to Exclude.

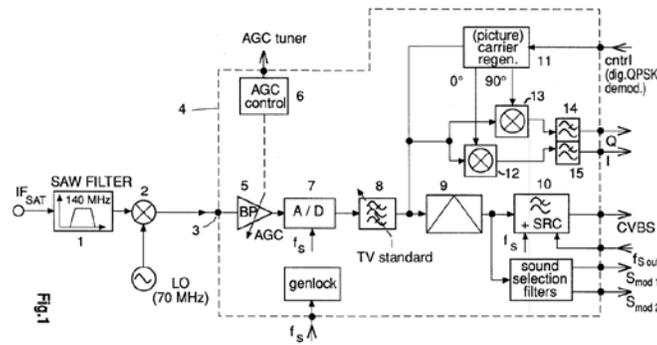


Figure 1 is a block diagram showing components of the broadcast receiver, which may receive incoming signal  $IF_{SAT}$  from an outdoor station. *Id.* at 2:24–26, 30–31. Incoming signal  $IF_{SAT}$  results from the outdoor station supplying satellite channels already down-converted in a frequency band covering 950–1750 MHz. *Id.* at 1:56–2:1. Incoming signal  $IF_{SAT}$  is, therefore, an “RF signal” as we have construed the term. Thomson teaches that the “proposed architecture allows a digitising of the Sat-IF signals no matter that they are analog or digital ones.” *Id.* at 1:42–43.

Incoming signal  $IF_{SAT}$  is down-converted by SAW filter 1 and mixer 2, which respectively suppress adjacent channel components and achieve a “frequency transposition into an IF signal of around 75 MHz.” *Id.* at 2:56–57; *see also id.* at 2:30–33, 47–57. AGC amplifier 5 includes “an internal bandpass limitation” (*id.* at 2:58–59) that prevents aliasing when A/D converter 7 digitizes the IF signal at a sampling frequency. *Id.* at 3:1–14. Bandpass filter 8 applies “an adaptively controlled bandwidth [to] select[] the desired signal with a minimal remainder of the adjacent channel signals.” *Id.* at 3:17–19. FM demodulator 9 and low-pass filter 10 output a CVBS (“composite video baseband signal”), and synchronous demodulators 12 and 13 effect QPSK (“quadrature phase shift keying”) demodulation to provide quadrature (“Q”) and in-phase (“I”) signals. *Id.* at 2:37–44.

2. *Claims 1, 2, 4, 10, and 11*

We have reviewed Petitioner’s analysis of claims 1, 2, 4, 10, and 11, and conclude that Petitioner has shown, by a preponderance of the evidence that these claims would have been obvious over Thomson and Harris. Pet. 13–25. Patent Owner raises the following issues in responding to Petitioner’s argument.

a. *“frequency conversion circuit”*

As recited in claim 1, Patent Owner argues Thomson does not expressly teach a frequency conversion circuit for receiving input RF signals. PO Resp. 22–26. While Patent Owner acknowledges Thomson “purports to deal with digital television, most of the claimed [disclosed] architecture is analog.” *Id.* at 22. Patent Owner’s acknowledgement that Thomson deals with digital television is enough to find Thomson is in the relevant field of endeavor.

Patent Owner argues Thomson receives an *input IF signal* and not an *input RF signal* as recited in the frequency conversion circuit limitation of claim 1. PO Resp. 23–25. Among other things, Patent Owner points to Figure 1 of Thomson which shows the input signal as  $IF_{SAT}$ . *Id.* at 23. Patent Owner also notes that Figure 1 describes the incoming IF signal as coming from an outdoor station and then fed to SAW (surface acoustic wave) filter 1 and has “already undergone down conversions by undisclosed components.” *Id.* at 23–24 (citing Ex. 1004, 2:30–32). Patent Owner concludes the input IF signal cannot be the input RF signal because the input RF signal is “what comes out of the medium of propagation, not what comes out of a down conversion.” *Id.* at 24 (citing Ex. 2003 ¶ 63).

The input IF signal argument is not persuasive because it is based on Patent Owner's proposed construction of input RF signal, i.e., "a signal that is an incoming signal that *comes out of the medium of propagation and is external to the frequency conversion circuit* without any processing by the frequency conversion circuit." PO Resp. 12 (emphasis added). We rejected Patent Owner's proposal as detailed in section II.A.1. above. Patent Owner restates the argument, contending that Thomson's IF signal has already been down converted whereas under Patent Owner's proposed construction the down conversion happens from the medium of propagation. PO Resp. 25 (citing Ex. 2003 ¶ 65). To the extent there is a difference, this argument is likewise unpersuasive as there is nothing about our construction of input RF signal that limits how the RF signal is downloaded or otherwise processed before it is input to the frequency conversion circuit. All that is required is an input signal in the RF frequency range.

Patent Owner notes that Petitioner argues that the outdoor unit of Thomson that feeds the  $IF_{SAT}$  signal to the frequency conversion circuit of Figure 1 would meet Patent Owner's construction of input RF signal. PO Resp. 25–26 (citing Pet. 23); *see* Pet. Reply 7–8 (the outdoor unit expressly discloses a "frequency conversion unit" under Patent Owner's construction of "input RF signal"). However, Patent Owner contends the description of the circuitry of the outdoor unit is "skeletal at best." *Id.* at 26 (citing Ex. 2003 ¶¶ 66, 67). The argument appears to be Thomson does not expressly disclose a frequency conversion circuit. Patent Owner contends the outdoor unit cannot be used to teach an input RF signal because it does not expressly disclose the circuitry.

Our construction of “frequency conversion circuit” is “a circuit for converting the frequency of the input RF signal to an intermediate frequency signal having an intermediate frequency.” Both a “circuit” and the required functionality are necessary to meet the construction.

We determine that the required functionality is present in the outdoor unit of Thomson. Thomson discloses that the “outdoor unit supplies the satellite channels *already down-converted* in a frequency band covering 950-1750 MHz.” Ex. 1004, 1:56–59 (emphasis added). Patent Owner does not dispute the functional part of what Thomson discloses.

We are not persuaded that the *precise* circuitry used to establish the functionality must be disclosed in Thomson in order for the “frequency conversion circuit” limitation to be rendered obvious. Patent Owner agrees that there is a circuit, albeit “skeletal.” PO Resp. 26. Regardless, Petitioner is entitled to presume the enablement of the prior art, i.e., the circuit associated with the outdoor unit. *See Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1355 (Fed. Cir. 2003). The burden of production as to whether the circuit must be disclosed in order for the disclosure to be enabled is on Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, No. 2015-1214, 2015 WL 5166366, at \*2–3 (Fed. Cir. Sept. 4, 2015). Patent Owner has not carried its burden on the issue.

Paragraph 66 of the Opris Declaration (Ex. 2003) is a conclusory denial, i.e., “Thomson does not teach the circuitry.” Patent Owner has not persuaded us that Petitioner failed to meet its burden of persuasion. Thus, even if we were to adopt Patent Owner’s construction of input RF signal, the outdoor unit of Thomson expressly teaches receiving and converting an input RF signal from the medium of propagation.

Patent Owner then argues the outdoor unit of Thomson does not inherently disclose the frequency conversion circuit. PO Resp. 26–28 (citing *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, 999–1000 (Fed. Cir. 2006) (inherent disclosure requires that the prior-art reference “necessarily include the unstated [frequency] limitation”). Petitioner does not rely on inherency (Pet. Reply 7–8) and, having determined that the frequency conversion circuit is rendered obvious in Thomson over the preceding arguments of Patent Owner, we need not address inherency.

*b. frequency conversion element—“input RF signal encoding information in one of a plurality of television signal formats” and signal processor element—“a signal processor for processing ... in accordance with the television signal format”*

Patent Owner continues to assert that the limitations of the claimed frequency conversion circuit are not found in Thomson. It next focuses on claim 1’s recitation that the frequency conversion circuit includes an “input RF signal encoding information in one of a plurality of television signal formats.” PO Resp. 28–33. Patent Owner’s argument intertwines with the signal processor element, which recites “a signal processor for processing . . . in accordance with the television signal format.”<sup>13</sup> *Id.*

Patent Owner first argues the bandpass filter does not process “in accordance with **one** television signal format instead of processing in accordance with a plurality of formats.” PO Resp. 29. Patent Owner then argues Petitioner has not shown the bandpass-filter 8 shown in Figure 1 of Thomson is an adaptive filter, and thereby is a signal processor. *Id.* at 29 (citing Pet. 15–16). Petitioner contends that an adaptive filter would be

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<sup>13</sup> We note that we construed both of these limitations above as limited to one format.

understood by one of ordinary skill in the art to be a signal processor. Pet. 17 (citing Ex. 1009 ¶ 22).

We first analyze whether Thomson teaches processing in accordance with **one** television signal format or a plurality of formats. Petitioner's expert, Dr. Holberg, testifies that Thomson describes a "bandpass filter 8" that has "an adaptively controlled bandwidth" that passes the analog or digital TV encoded information. Ex. 1009 ¶ 21 (citing Ex. 1004, 3:16–25). In addition, Dr. Holberg testifies the analog or digital input selection is based on the "TV standard" input to the filter. *Id.* (citing Ex. 1004, Fig. 1). Patent Owner's expert, Dr. Opris, finds the position of Dr. Holberg unconvincing and unsupported in the Thomson specification. Ex. 2003 ¶ 74. While Dr. Opris states in paragraphs 71 and 72 of the Opris Declaration that Thomson does not teach processing in accordance with one format, there is no discussion of why that is the correct conclusion. Dr. Holberg explains in the Holberg Reply Declaration that:

As Fig. 2 of Thomson clearly illustrates, the output of the tuner shows the desired channel tuned to  $IF_{SAT}$  (at 140MHz). This desired channel is either a digital or analog transmission—not both. The SAW filter then limits adjacent channel interference and the LO mixes this channel down to 75MHz where it is digitized and processed by filter 8 based on the known TV standard (format) of the desired channel. Thus, the adaptive filter 8 processes only one channel at a time and thus processes only one format at a time.

Ex. 1072 ¶ 40.

We are not persuaded of the relevance of Patent Owner's argument that Thomson discloses "two parallel paths for processing, one for analog format processing and the other for digital television format processing after

the Thomson bandpass filter 8.” PO Resp. 31–33. For support, Patent Owner points to the outputs of Figure 1 of Thomson, digital (Q and I) and analog (CVBS,  $S_{\text{mod1}}$  and  $S_{\text{mod2}}$ ). Dr. Opris testified that parallel processing path was the conventional means to provide a multi-format bandpass filter. Ex. 2003 ¶ 76. Patent Owner’s argument is not relevant because Dr. Holberg testified that Thomson’s use of parallel demodulators is not inconsistent with processing only one format at a time. *Id.* ¶¶ 40–42. Dr. Holberg also testified that Patent Owner’s position would “render[] the ‘TV standard’ input superfluous.” *Id.* ¶ 41. We agree and note separately Thomson teaches that “[f]or the reception of digitally transmitted video signals the analogue pre-processing blocks can be kept.” Ex. 1004, 3:40–41. Thus, the same circuitry is used for “pre-processing” whether the input is digital or analog. In sum, while both digital and analog signals can be processed in Thomson, the input is via one format. We are persuaded that Thomson discloses processing in accordance with one television signal format.

Patent Owner also argues Thomson does not disclose the signal processor claimed. PO Resp. 29–30. Petitioner identifies the bandpass filter as meeting the signal processor limitation. Pet. 15–16 (citing Ex. 1009 ¶¶ 21–22). Patent Owner disagrees that the bandpass filter is the claimed signal processor. PO Resp. 29–30. Patent Owner explains that the only description of the bandpass filter in Thomson is as follows: “The following bandpass filter 8 (see Fig. 2g) with an adaptively controlled bandwidth selects the designed signal with a minimal remainder of the adjacent channel signals.” *Id.* at 29 (quoting Ex. 1004, 3:16–19). Patent Owner concludes that, because Thomson is silent as to “the apparatus through which the filter

8 adapts itself,” the bandpass filter is not a signal processor because it cannot fulfill the “adaptive” function. *Id.* (citing Ex. 2003 ¶ 72). Patent Owner adds that the person of ordinary skill would “have serious difficulties in implementing the adaptive filter 8 in Thomson.” *Id.* (citing Ex. 2003 ¶ 72). In support of its position, Dr. Opris testifies Thomson is silent about the criteria for changing the filter shape and “the algorithm and apparatus for doing so automatically, as required by the term ‘adaptive.’” *Id.* (citing Ex. 2003 ¶ 72).

Petitioner responds that the bandpass filter of Thomson is an adaptive filter because it includes “adaptively controlled bandwidth.” Pet. Reply 7–8 (citing Ex. 1072 ¶¶ 40–43). Based on Thomson’s disclosure that the incoming signal is a “TV standard” signal, i.e., analog or digital, the bandpass filter “would then be used to control the bandwidth . . . so that it could adapt the filter characteristics to the particular bandwidth of the incoming TV signal.” Ex. 1072 ¶ 42.

We agree with Petitioner that, because Thomson discloses receiving both digital and analog TV signals (Ex. 1004, 1:26–33), the “TV standard” signal is either analog or digital. We quote Dr. Opris’s deposition testimony as follows:

Q. Okay. What do you think TV standard represents in Figure 1?

A. I have no idea.

Ex. 1056, 152:18–20. The Opris Declaration is similarly unenlightening when it states:

Holberg claims that the words “TVstandard” on Figure 1 indicate that the bandpass filter is processing in accordance

with format. This is far from clear or convincing, in light of the total absence of any support for the same in the specification.

Ex. 2003 ¶ 74. Patent Owner's expert in the related proceeding, identified above, testified that "[t]hat the variability in the specification of filter number 8 is TV standard-dependent." Ex. 1054, 1230:17–21.<sup>14</sup> Dr. Opris's lack of knowledge in response to the deposition question and contention that there is no support for what a TV standard signal is in Thomson are conclusory denials. Indeed, there is support for Petitioner's contention regarding what is meant by "TV standard" in the Specification.

Accordingly, and contrary to Dr. Opris's testimony, Patent Owner's bald statements that Dr. Holberg's testimony is unsupported are not borne out. *See* PO Resp. 30–31. Thus, we credit Petitioner's evidence, including the Holberg Reply Declaration, and determine that the bandpass filter of Thomson is adaptive in that it adapts the filter characteristics to the particular bandwidth of the incoming TV signal.

Petitioner's alternative argument for showing the "signal processor" is that it would have been obvious to a person of ordinary skill in the art to implement the Thomson adaptive filter using a digital signal processor ("DSP") as taught by Harris. Pet. 16–17 (citing Ex. 1009 ¶ 23; Ex. 1005, 1). Harris describes a digital signal processor to convert and filter IF signals. Ex. 1005, 3. We determine Petitioner's evidence that there are rational underpinnings for combining Thomson and Harris in the manner suggested sufficient for two reasons. First, digital signal processor circuitry was available and would be resorted to by the person of ordinary skill to replace

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<sup>14</sup> Partial transcript of trial testimony of Dr. Caloyannides, citing to the page in the related trial record, which is page 35 of Exhibit 1054.

other circuit components, like the adaptive filter of Thomson. *Id.* Second, below we find rational underpinnings are shown to combine Harris’s finite impulse response (“FIR”) filter with Thomson. We are persuaded that a rational basis for the combination is shown where the same reference is otherwise shown to be combined. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007) (common sense can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements). Patent Owner’s position regarding the combination was not presented in connection with its arguments regarding the limitation under consideration but is analyzed in section II.B.2.c. below.

Patent Owner’s argument that the person of ordinary skill would “have serious difficulties in implementing the adaptive filter 8 in Thomson” appears to be predicated on a determination that the bandpass filter is not an adaptive filter in the first instance. A simple digital filter with two filter characteristics—one for digital and one for analog—is something well within the level of the person of ordinary skill. Ex. 1072 ¶ 43 (“numerous text books and patents on the design of such filters”). As was the case above, Dr. Opris does not provide adequate underlying basis for his conclusion to the contrary. *See* 37 C.F.R. § 42.65(a).

*c. “the signal processor applies one of a plurality of finite impulse response filters... each of the plurality of finite impulse response filters corresponding to a format”*

Petitioner relies on the Harris reference for implementing the functions of bandpass filter 8 of Thomson with the Harris disclosure of finite impulse response (“FIR”) filters. Pet. 16–21. Like Thomson’s band pass filter, Harris teaches as digital decimation filter (“DDF”), including an FIR filter. *Id.* at 19. Petitioner argues the DDF “can be rapidly reconfigured via

a standard microprocessor interface.” *Id.* (citing Ex. 1005, 5). Dr. Holberg concludes that this filter and microprocessor can retrieve the FIR filter coefficients from memory and store those in the “coefficient RAM.” *Id.* at 19–20 (citing Ex. 1009 ¶ 27). This is “just like the ’792 Patent.” *Id.* at 20 (citing Ex. 1001, 5:59–63).

Petitioner’s asserts the following rationale for the combination.

Although both FIR and infinite impulse response (IIR) filters were well known in the art, (*See, e.g.*, Ex. 1006; Ex. 1009, ¶ 28), a POSITA would have been motivated to choose a FIR filter over an IIR filter for several reasons. A FIR filter produces “a linear phase, and only FIR filters can be designed to have linear phase,” which is a critical parameter in audio and video applications such as Thomson. (*Id.* (quoting TI App Note, Ex. 1006 at 21)). FIR filters are also more stable and have less sensitivity to coefficient quantization than IIR filters. (Ex. 1009, ¶ 28).

Pet. 20. Petitioner also contends the combination would have been an obvious design choice. *Id.*

In response, Patent Owner refers, in part, to arguments previously made, which arguments we rejected and need not repeat again. *See* PO Resp. 34. Patent Owner also disagrees that Harris would have been combined with Thomson by the person of ordinary skill in the art. *Id.* at 34–43. Patent Owner’s legal arguments are principally based on *KSR* that the combination would not achieve the desired results, focusing on differences between Harris and the claimed invention. *KSR*, 550 U.S. at 416–417; PO Resp. 38–40. Patent Owner’s arguments will be addressed in the order presented in Patent Owner’s Response.

First, Patent Owner argues Harris is low pass filter and not a bandpass filter. PO Resp. 35–36 (citing Ex. 2003 ¶ 83). In Figure 4, Harris references

the Harris HSP43220 DDF datasheet (Ex. 2050, 1). Patent Owner cites to Dr. Opris's testimony based on the datasheet to conclude the Harris HSP43220 DDF is not a bandpass filter but instead "a linear phase low pass decimation filter" and the person of ordinary skill in the art would not have recognized that the substitution of the Harris DDF for the Thomson filter 8 would have yield desired results. PO Resp. 35 (citing Ex. 2003 ¶ 82). To show further that Harris cannot be combined with Thomson, Patent Owner argues the maximum input data sampling rate for Harris is limited to 33 Msps and there is no apparatus to "up convert" the signal downconverted in Harris. *Id.* at 35– 36 (citing Ex. 2003 ¶ 82).

We are not persuaded that the details of the Harris DDF should cause us to ignore the other teachings of Harris. Harris teaches generally the use of DSP components to replace "analog intermediate frequency (IF) processing stage in wideband receivers." Ex. 1005, 1. While Figure 4 references the Harris HSP43220 DDF, the teaching of Harris is much broader. In addition to the general teaching clearly suggesting the use of DSP, Harris Figure 1 shows a single channel receiver including a band pass filter and in Figure 4 an FIR connected to "Coefficient RAM." Petitioner cites to both Harris's DSP and FIR teachings. Pet. Reply 10; Pet. 19.

Patent Owner's remaining arguments directed to Harris include: (1) the Harris DDF is not an adaptive filter (PO Resp. 36–37); (2) the Harris DDF cannot be made adaptive by the microprocessor interface argued by Petitioner (PO Resp. 37 (citing Pet. 37)); and (3) Harris is a cellular phone application (PO Resp. 37–39). Arguments (1) and (2) are interrelated and, as detailed above in analyzing the low pass filter argument, the details of Harris do not detract from the general teachings of Harris relied on by

Petitioner. As to (3), the analysis above also applies. We observe separately that the overall teaching of Harris is directed to wideband receivers generally, including cellular phones, mobile radio, and wireless LANs as “a few examples of potential applications.” Ex. 1005, 1.

We determine that Petitioner’s citation to the above teachings of Harris is sufficient to show the FIR claim limitation and, further that there was motivation to combine Harris with Thomson and that the result would be predictable. Thomson requires an adaptive filter that operates in the digital domain when the input RF signal is in the digital TV format. As Dr. Holberg testified, the “industry already recognized the benefits of processing communication signals in the digital domain using ‘standard off the shelf DSP IC’s as digital replacements for the analog intermediate frequency (IF) processing state in wideband receivers.’” Ex. 1072 ¶ 45 (citing Ex. 1005, 1). A person of ordinary skill would be directed by Harris to use DSP and FIR in a wideband receiver, like Thomson. Patent Owner’s expert acknowledges (Ex. 1056, 181:5–19) the linear phase characteristics of a FIR can be advantageous, further reinforcing the motivation behind this combination.

Patent Owner’s argument tying reasonable expectation of success into the lack of predictable result analysis (PO Resp. 40–42) is not persuasive because Petitioner has shown success would be expected and that the modification to Thomson amounts to little more than substituting a digital component, with known desirable characteristics, into the disclosed circuit. Dr. Opris’s testimony that the person of ordinary skill would have had no reason to substitute the Harris FIR for the band pass filter of Thomson (Ex. 2003 ¶ 90) is belied by his testimony cited above that the person of ordinary

skill in the art would know that a digital filter could be implemented using an FIR filter and the linear phase of an FIR filter is helpful in processing TV signals. Ex. 156, 181:8–19. Dr. Opris testifies that there are other reasons that combining Harris with Thomson would not achieve predictable results. PO Resp. 39–40 (citing Ex. 2003 ¶ 86). However, details about the differences, for example, between the TV receivers and cellular systems are, as discussed above, not the basis for the challenge. *Id.* at 40 (citing Ex. 2003 ¶ 87 (comparing sampling rates)).

Patent Owner does not separately argue claims 2, 4, 10, and 11.

*d. Summary (claims 1, 2, 4, 10, and 11)*

Based on the foregoing discussion and evidence of record, Petitioner has shown by a preponderance of the evidence that claims 1, 2, 4, 10, and 11 would have been obvious over Thomson and Harris.

*C. Obviousness of Claims 5 and 6 Over Thomson, and Cirrus Logic*

Petitioner contends that claims 5 and 6 of the '792 patent would have been obvious under 35 U.S.C. § 103 over Thomson, Harris, and Cirrus Logic. Pet. 31–35. To support this position, Petitioner cites to the Holberg Declaration. Ex. 1009 ¶¶ 43–47. The invention recited in claim 1 of the '792 patent includes a frequency conversion circuit, an analog-to-digital converter, a signal processor, and a signal output circuit. Ex. 1001, Fig. 1 (elements 110, 120, 130, and 140).

Claim 5 depends from claim 4, which depends from claim 1, and recites as an additional limitation “a *first decoder circuit* . . . for providing video display signals corresponding to the analog television format; and a *second decoder circuit* . . . for providing audio signals corresponding to the analog television format” (emphasis added).

Petitioner contends that “[m]erely designing a decoder circuit to process video and audio signals according to a known analog television format was well known in the prior art so processing (or decoding) the data into known analog audio and video television formats (such as PAL/NTSC/SECAM) was within the skill of a POSITA.” Pet. 31–32 (citing Ex. 1001, 1:52–2:3 (NTSC, PAL, and SECAM formats known in the prior art); Ex. 1009 ¶ 43). Petitioner cites to Cirrus Logic product CS92288, a USB-DVR 2.0 reference design, for its teaching of an “audio/video encoder/decoder (CODEC).” *Id.* at 32 (citing Ex. 1015, 4). The USB-DVR 2.0 design is further described in Exhibit 1016, a CODEC circuit which outputs audio at baseband, and Exhibit 1017, a CODEC circuit which outputs video at baseband. *Id.* at 32–33 (citing Ex. 1016, 1; Ex. 1017, 1).

Patent Owner takes exception to Petitioner’s characterization of the language from column 1 line 52 to column 2 line 3 of the ’792 patent, that decoder circuit to process video and audio signals according to a known analog television format was well known in the prior art. PO Resp. 43–44 (citing Pet. 31–32). Patent Owner says the description cited only “address[es] demodulators and not decoders for decoding the output of the demodulators.” *Id.* at 44. The ’792 patent does state the video and audio “baseband signals are coupled to appropriate video and audio *decoders* to generate the display video signals (e.g. RGB) or sound.” *See* Pet. Reply 11 (quoting Ex. 1001, 1:34–42) (emphasis added).

Patent Owner’s principal argument is that there is no reason to combine the Cirrus Logic teachings in Exhibits 1015–1017, which relate to editing and storing audio and video material on a computer with the analog audio and video signals necessary for analog television. PO Resp. 46 (citing

Ex. 2003 ¶ 95). Additionally, there would be no expectation of success and such could not be a design choice. *Id.*

We are not persuaded that the person of ordinary skill would not consult Cirrus Logic. Cirrus Logic describes a video editing board that receives broadcast and cable TV and produces video display on “a standard NTSC/PAL video monitor.” Ex. 1015, 1. Further, Dr. Holberg has articulated rational underpinnings to combine Cirrus Logic with Thomson and Harris. *See* Ex. 1009 ¶ 46.

Claim 6 depends from claim 5 and recites, “wherein the first decoder circuit comprises a PAL/SECAM/NTSC decoder circuit.” Petitioner cites to Exhibit 1017 as describing an NTSC and PAL decoder. Pet. 35 (citing Ex. 1017, 1; *see also* Ex. 1009 ¶ 47).<sup>15</sup> Patent Owner provides insufficient factual or legal justification for its argument that “PAL/SECAM/NTSC” should be interpreted as requiring that all three standards be supported, as opposed to any one. PO Resp. 46–47. In the Institution Decision we determined, on that record, that the virgules in “PAL/SECAM/NTSC” mean the disjunctive, not the conjunctive, and we see no compelling reason to alter that determination based on the development of issues during the trial.<sup>16</sup> Patent Owner does not object to that determination nor does it propose any contrary construction or legal argument. Patent Owner’s citation to paragraph 96 of the Opris Declaration restates Patent Owner’s argument and

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<sup>15</sup> Petitioner also points to the ’792 patent disclosure that television receivers are capable of receiving multiple different standards such NTSC, PAL, and SECAM. Pet. 35 (citing Ex. 1001, 1:20–24).

<sup>16</sup> Dec. 18 n.3: “Virgule. ‘A diagonal mark (/) used especially to separate alternatives, as in *and/or*.’ *The American Heritage Dictionary of the English Language*, 1431 (1981). Ex. 3002.”

does not change the outcome. Accordingly, Cirrus Logic teaches one of the claimed standards, which is all that is required by the claim.

Based on the foregoing discussion and evidence of record, Petitioner has shown by a preponderance of evidence that claims 5 and 6 would have been obvious over Thomson, Harris, and Cirrus Logic.

*D. Obviousness of Claims 7 and 12 over Thomson, Harris, and Kerth*

Petitioner contends that claims 7 and 12 of the '792 patent would have been obvious under 35 U.S.C. § 103(a) over Thomson, Harris, and Kerth. Pet. 35–38. To support this position, Petitioner presents the testimony of Dr. Holberg. Ex. 1009 ¶¶ 48–51.

Claim 7 depends from claim 1 and recites, “wherein the signal output circuit provides a *first output signal* and a *second output signal* corresponding to the digital output signals, the first output signal and the second output signal being *differential output signals* corresponding to a digital television format” (emphasis added).

Petitioner argues the limitation is taught by Kerth’s disclosure of “differential I and Q components capable of carrying video and audio using a well-known quadrature demodulation technique. (Ex. 1011, 14:58–15:7; Ex. 1009, ¶ 49).” Pet. 36. In further support, Petitioner points to first and second differential output signals (RX-I 448 and RX-Q 451 of Figs. 1 and 8) of Kerth’s digital-to-analog converter (DAC) circuitry. *Id.* (citing Ex. 1011, 8:63.

Patent Owner argues Kerth relates to telephony and not television and has an entirely different purpose and the person of ordinary skill would have no reasonable expectation of success. PO Resp. 48–49. Patent Owner also contends that the problems presented are different. *Id.* at 49 (citing Ex. 2003

¶ 99). Petitioner responds that Kerth is not limited to telephony. Pet. Reply 13 (citing Ex. 1072 ¶ 60). Kerth is in the field of “radio-frequency (RF) receivers and transceivers.” Ex. 1011, 1:21–27. We agree with Petitioner that Kerth’s field of invention is either within the same field as the ’792 patent or “reasonably pertinent” thereto. Pet. Reply 13 (citing *In re Klein*, 647 F.3d 1343, 1348 (Fed. Cir. 2011)). Petitioner also cites to deposition testimony from Dr. Opris that the use of differential outputs: “(1) ‘was well known’ to a POSITA; and (2) ‘particularly well-suited’ in ‘[a]ny high-accuracy system.’” *Id.* (citing Ex. 1056, 206:22–25).

We are persuaded by Petitioner that Kerth is analogous prior art that would be consulted for its showing of differential outputs. Television systems fall within the high accuracy systems where differential outputs are useful. Ex. 2003 ¶ 102 (e.g., “heightened TV design requirements [including] video signal-to-noise ratio”). Petitioner has articulated adequate rational underpinnings for the combination of Kerth with Thomson and Harris. *See* Ex. 1009 ¶ 50. Neither are we are persuaded that there would not be a reasonable expectation of success were the person of ordinary skill make the asserted combination.

Claim 12 depends from claim 1 and recites, “wherein the signal output circuit comprises one or more output terminals, each of the one or more output terminals of the signal output circuit comprises *a single-ended output terminal or a differential output terminal*” (emphasis added).

Petitioner relies on the teachings of Thomson of a single output terminal and Kerth regarding differential output terminal, as discussed above. Pet. 37–38 (citing Ex. 1009 ¶ 59). Patent Owner argues Petitioner has not shown that Thomson teaches a single-ended signal output circuit or

address the claim limitation, “a single-ended output terminal.” PO Resp. 50–51. However, Kerth discusses both single-ended and differential outputs. Ex. 1011, 8:57–60. Petitioner does argue that Thomson discloses a single-ended output circuit. Pet. 38 (citing Ex. 1009 ¶ 51; Pet. 21–22 (section V(A)(6))).

Based on the foregoing discussion and evidence of record, Petitioner has shown by a preponderance of evidence that claims 7 and 12 would have been obvious over Thomson, Harris, and Kerth.

*E. Obviousness of Claims 13–17 Over Thomson, Harris, Kerth, and Oku*

Petitioner contends that claims 13–17 of the '792 patent could have been obvious under 35 U.S.C. § 103 over Thomson, Harris, Kerth, and Oku. Pet. 38–44. To support this position, Petitioner presents the testimony of Dr. Holberg. Ex. 1009 ¶¶ 52–63.

Claim 13 depends from claim 1 and recites as a first additional limitation first and second “digital-to-analog converter[s]” “coupled to receive digital output signals from the signal processor and convert the digital output signals to analog output signals.” First, second and third driver circuits that drive analog output signals to output terminals are also recited. Claim 13 recites (emphases added):

wherein the first and second output terminals provide signals *indicative of video and audio information* encoded in the input RF signal and the third output terminal provides signals *indicative of audio information* encoded in the input RF signal.

Figure 4 of Oku is reproduced below.

FIG. 4

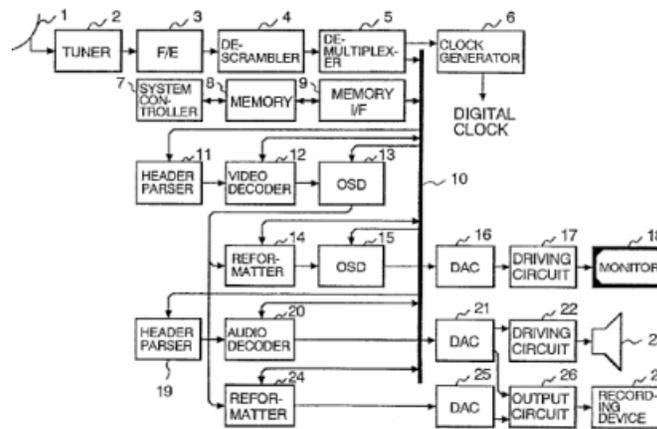


Figure 4 of Oku is a block diagram of a digital broadcasting receiver. Ex. 1018 ¶ 22. Petitioner argues Figure 4 discloses first and second digital-to-analog converters (“DAC”) 16 and 21 and first, second, and third driver circuits 22, 26, and 17. Pet. 38–39. As discussed above, Kerth is cited by Petitioner as teaching first and second outputs from a DAC. *Id.* at 39. Oku also discloses an audio output 23 and driving circuit from DAC 21. *Id.* at 40. Oku also teaches a video output. Ex. 1018, Fig. 4, element 18. Citing to the preceding disclosures from Figure 4 of Oku, Petitioner alleges “[i]t would have been obvious to one of ordinary skill in the art to combine the teachings of Kerth and Oku for any receiver where multiple outputs from a DAC was desired or required.” Pet. 39. Petitioner further contends that this would have been a simple design choice, relying on ’792 patent, column 6:51–56, and the Holberg Declaration. *Id.* (citing Ex. 1009 ¶ 54). Petitioner also asserts Kerth and Oku would be combined based on disclosure from the ’792 patent that:

[desired output signals] can assume various configurations to provide output signals in different formats. A configuration for signal output circuit 140 can be selected based on factors such

as the desired pin count for receiver 100 and the desired format for the output signals.

Ex. 1001, 6:51–52, *cited in* Pet. 39.

Patent Owner argues the preceding does not articulate a reason to combine Kerth and Oku. PO Resp. 53. Patent Owner asserts there is no rational basis for the combination outside attorney argument, including the Holberg Declaration. *Id.* at 54. Patent Owner notes additionally that Thomson does not use a digital to analog converter (DAC) and a “POSITA would not have a reason or be motivated to include the Oku digital-to-analog converters in the Thomson system to obtain the receiver as recited in ‘792 patent claim 13.” *Id.* at 55.

We are persuaded that person of ordinary skill would indeed have combined Thomson, Kerth, and Oku based on the evidence. Dr. Holberg says use of a digital-to-analog converter is a matter of design choice. Ex. 1009 ¶ 54. Dr. Opris testified the combination would not be considered because “minimizing the number of electronic components would have led a POSITA away from using another digital-to-analog converter.” Ex. 2003 ¶ 105. We are persuaded that what components to use is a matter of design choice that would be within the skill of the person of ordinary skill in the art.

In addition to the arguments relating to whether or not Kerth, Oku, and Thomson should be combined, Patent Owner contends that Petitioner relied only on Oku to teach a signal output circuit comprising “first and second output terminals.” PO Resp. 56. Without citation, Patent Owner contends the Board went beyond the Petition in relying on Kerth, not Oku, to teach “the first and second output terminals.” PO Resp. 56. But Kerth is cited by Petitioner as teaching first and second outputs from a DAC. Pet. 39.

Regardless, Oku was cited by Petitioner to teach the digital-to-analog converter and the first and second driving circuits. Pet. 38–39 (citing Ex. 1018, Fig. 4 (references 21, 26, DAC 21, DAC 25), ¶ 46).

Claims 14–17 all depend from claim 13 and are not separately argued.

Based on the foregoing discussion and evidence of record, Petitioner has shown by a preponderance of evidence that claims 13–17 would have been obvious over Thomson, Harris, Kerth, and Oku.

*F. Obviousness of Claims 8 and 9 Over Thomson, Harris, Kerth, and Cirrus Logic*

Petitioner contends that claims 8 and 9 of the '792 patent would have been obvious under 35 U.S.C. § 103 over Thomson, Harris, Kerth, and Cirrus Logic. Pet. 45–48. To support this position, Petitioner presents the testimony of Dr. Holberg. Ex. 1009 ¶¶ 64–68.

Claim 8 depends from claim 7, which depends from claim 1, and recites as a first limitation a “demodulator circuit” to demodulate the first and second output signals to video and audio baseband signals corresponding to the input RF signal. As a second limitation, claim 8 recites “a decoder circuit coupled to decode the video and audio baseband signals for providing video and audio display signals corresponding to the digital television format.”

As addressed above, Petitioner cites to Thomson’s output circuit with a demodulator to teach the first limitation. Pet. 45 (citing Ex. 1009 ¶ 64); *see* Ex. 1004, Fig.1, elements 9, 12, and 14. As to the second limitation, Petitioner relies on the decoder circuits taught by Cirrus Logic (Exs. 1015–1017). *Id.* Petitioner argues the person of ordinary skill in the art would be motivated to combine Thomson’s digital TV signals, which would be

encoded in MPEG, with the MPEG circuitry of Cirrus Logic, which decodes both audio (Ex. 1016) and video (Ex. 1017) signals.

Patent Owner argues that the prior art references are “not combinable.” PO Resp. 56–67. No specific argument is made beyond referencing the arguments made in connection with claims 5 and 6, which also involve Cirrus Logic. For reasons stated previously, these arguments are not persuasive.

Based on the foregoing discussion and evidence of record, Petitioner has shown by a preponderance of evidence that claims 8 and 9 would have been obvious over Thomson, Harris, Kerth, and Cirrus Logic.

*G. Obviousness of claim 3 over Thomson, Harris, and Gunter*

Petitioner contends that claim 3 of the ’792 patent would have been obvious under 35 U.S.C. § 103 over Thomson, Harris, and Gunter. Pet. 29–31.<sup>17</sup> To support this position, Petitioner presents the testimony of Dr. Holberg. Ex. 1009<sup>18</sup> ¶¶ 41–42.

Claim 3 depends from claim 1 and recites, “wherein the television receiver is formed as a *monolithic integrated circuit*” (emphasis added).

Petitioner relies on Gunter (Ex. 1022) to teach the “monolithic integrated circuit” limitation. Pet. 29 (citing Ex. 1022, 3:50–55, Abstract; Ex. 1009 ¶ 41).

Patent Owner disputes whether Thomson’s circuit could be modified because Thomson uses an analog SAW filter. PO Resp. 58–59. We agree with Petitioner that Thomson’s SAW filter is not a part of what is cited to meet the limitations of claim 1. Pet. Reply 15. The input signal to mixer 2

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<sup>17</sup> As in Corrected Petition.

<sup>18</sup> As corrected in Exhibit 1038.

in Thomson is a signal centered around 140 MHz. The mixer 2 converts the RF signal to an intermediate frequency signal “which realizes a frequency transposition into an IF signal of around 75 MHz (see Fig. 2d and 2e).” Ex. 1004, 2:55–57. Thus, as Petitioner argues (Pet. Reply 15) the mixer 2 and LO (“local oscillator frequency,” Ex. 1004, 2:53–54) themselves satisfy the “frequency conversion circuit” element of claim 1.

Based on the foregoing discussion and evidence of record, Petitioner shows by a preponderance of evidence that claim 3 would have been obvious over Thomson, Harris, and Gunter.

#### *H. Secondary Considerations of Nonobvious Subject Matter*

Patent Owner shows evidence of alleged secondary considerations of nonobvious subject matter. PO Resp. 59–60. However, for objective evidence of secondary considerations to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention. *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010) (citing *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995)).

Patent Owner fails to show the required nexus to any of the claimed subject matter. Because Patent Owner’s evidence fails to show any nexus with the invention, we do not consider it in our obviousness analysis.

#### *I. Patent Owner’s Motion to Exclude*

Dr. Holberg’s support of the Petition appears in two declarations, filed as Exhibits 1009 and 1072. Patent Owner moves to exclude both declarations because Dr. Holberg’s “knowledge is below what one of ordinary skill in the relevant art would know, and would have to know to understand the relevance of the prior art and the invention” and because “his testimony clearly shows lack of credibility.” Mot. Exclude 1. Patent Owner

clarified at the oral hearing that “credibility” does not refer to Dr. Holberg’s honesty, but to his ability to put support for his opinions on the record. Tr. 76:9–77:24. Petitioner opposes, contending that Dr. Holberg is qualified as an expert in the relevant field. Pet. Opp. Mot. Exclude 3–4.

The parties disagree in their characterization of the relevant field in evaluating whether Dr. Holberg is “qualified as an expert by knowledge, skill, experience, training, or education.” *See* Fed. R. Evid. 702. Patent Owner contends that a person of ordinary skill in the art at the time of the invention of the ’792 patent

would be familiar with: 1) fundamental RF circuit design concepts, e.g. heterodyne, superheterodyne, tuner, baseband, intermediate frequency, 2) fundamental RF television circuit design criteria, e.g. sensitivity, signal-to-noise ratio, linearity, 3) the required signal-to-noise ratio for an analog TV tuner, and 4) basic usage of the Cadence design platform (the most widespread RF integrated circuit design tool).

Mot. Exclude 3–4. We find Patent Owner’s characterization of the relevant field too narrow. The ’792 patent characterizes the field of the invention as follows, notably lacking the strong focus of Patent Owner’s characterization on RF circuit design:

The present invention relates to a television signal receiver, and in particular, the present invention relates to a broadband television signal receiver for receiving multi-standard analog television signals and digital television signals.

Ex. 1001, 1:5–9. As Petitioner observes, the only RF component of the claimed receiver is the “tuner for receiving input RF signals and for converting said input RF signals to intermediate signals having an intermediate frequency.” Pet. Opp. Mot. Exclude 2. Patent Owner’s expert,

Dr. Opris, acknowledged that heterodyne and superheterodyne conversion has been known for about 100 years. Ex. 1056, 26:11–20. These factors weigh significantly against defining the field of *invention* as narrowly as Patent Owner proposes. Instead, we agree with Petitioner and find that a person of ordinary skill in the art would have held at least a master of science or higher degree in electrical engineering, have at least four years of experience with mixed signal system design, including analog front ends and subsequent digital signal processing of various analog and digital signal formats of video and audio content. Pet. 11.

Dr. Holberg’s education and experience exceed these qualifications. Ex. 1009 ¶ 3, App. A. We have also considered Patent Owner’s contention that Dr. Holberg’s cross-examination testimony shows that he lacks ordinary skill in the art of the invention, and have reviewed that testimony. We conclude that Dr. Holberg is an expert in the relevant field of the invention.

Patent Owner’s Motion to Exclude is denied.

### III. ORDER

For the reasons given, it is

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–17 of U.S. Patent No. 7,265,792 B2 are unpatentable;

FURTHER ORDERED that Patent Owner’s Motion to Exclude is denied; and

FURTHER ORDERED that, because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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