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Paper 34
Entered: March 9, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOSHIBA CORPORATION,
Petitioner,

v.

OPTICAL DEVICES, LLC,
Patent Owner.

Case IPR2014-01447
Patent 8,416,651 B2

Before ERICA A. FRANKLIN, GLENN J. PERRY, and JAMES B. ARPIN, *Administrative Patent Judges*.

ARPIN, *Administrative Patent Judge*.

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

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Toshiba Corporation ("Petitioner") challenges the patentability of claims 1–39 ("the challenged claims") of Patent No. US 8,416,651 B2 to Kadlec (Ex. 1001, "the '651 patent"), owned by Optical Devices, LLC ("Patent Owner"). We have jurisdiction under 35 U.S.C. § 6(c), and this Final Written Decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, addresses issues and arguments raised during trial. For the reasons discussed below, we determine that Petitioner has not met its burden to prove, by a preponderance of the evidence, that any of claims 1–39 of the '651 patent are unpatentable on any of the asserted grounds, upon which we instituted *inter partes* review.

A. Procedural History

On September 3, 2014, Petitioner filed a Petition (Paper 4, "Pet.") to institute an *inter partes* review of claims 1–39 of the '651 patent. Petitioner asserted grounds for unpatentability based on the following references:

Exhibit Nos.	References
1003	Patent No. US 6,204,787 B1 to Baird, filed March 31, 1999 ("Baird")
1004	A. Baschirotto *et al.*, "A Compact-Disc Analog-to-Digital Front-End in BiCMOS Technology," IEEE Transactions on Consumer Electronics, May 2000 ("Baschirotto")
1005	Product Preview for ST TDA7522, "Digital Servo and Decoder," May 1998[1] ("ST Datasheet")

[1] "May 1998" is the date that appears on the reference. As discussed in this Final Written Decision, that date has not been established as a "printed publication" date so as to qualify the reference as prior art under 35 U.S.C.

Patent Owner filed a Preliminary Response (Paper 8, "Prelim. Resp."). On March 10, 2015, we issued an Institution Decision of *inter partes* review (Paper 9, "Inst. Dec."), instituting review on the following grounds:

Ground	Reference(s)	Challenged Claims
35 U.S.C. § 102(e)	Baird	1–13, 30, 32, 35, and 37
35 U.S.C. § 103(a)	Baird and Baschirotto	14–29, 31, 33, 34, 36, 38, and 39
35 U.S.C. § 103(a)	Baird and ST Datasheet	1–13, 30, 32, 35, and 37
35 U.S.C. § 103(a)	Baird, Baschirotto, and ST Datasheet	14–29, 31, 33, 34, 36, 38, and 39

After institution, Patent Owner filed a Patent Owner Response to the Petition (Paper 19, "PO Resp."), and Petitioner replied (Paper 21, "Pet. Reply"). A combined oral hearing for the instant proceeding and related Cases IPR2014-01445 and IPR2014-01446 was held on January 13, 2016. A transcript (Paper 33, "Tr.") of that hearing is included in the record.

B. Related Proceedings

Petitioner indicates that the '651 patent is asserted in *Optical Devices, LLC v. Toshiba Corporation*, Case No. 1:13-cv-10530 (D. Del. 2013). Pet. 1. Petitioner also indicates that the '651 patent is the subject of an investigation before the U.S. International Trade Commission: *In the Matter of Certain Optical Disc Drives, Components Thereof, and Products Containing the Same*, Investigation No. 337-TA-897. *Id.*

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§ 102.

Patent Owner identifies additional litigation that may affect or be affected by this *inter partes* review, including *Optical Devices, LLC v. Panasonic Corp., et al.*, Civil Case No. 1:13-cv-00726 (D. Del. 2013); *Optical Devices, LLC v. Lenovo Group, Ltd., et. al.*, Civil Case No. 1:13-cv-01526 (D. Del. 2013); *Optical Devices, LLC v. Nintendo Co., Ltd., et. al.*, Civil Case No. 1:13-cv-01528 (D. Del. 2013); *Optical Devices, LLC v. Samsung Electronics Co., Ltd., et. al.*, Civil Case No. 1:13-cv-01529 (D. Del. 2013); and *Optical Devices, LLC v. LG Electronics, Inc.*, Civil Case No. 1:13-cv-01033 (D. Del. 2013). Paper 6, 1–2.

Patent Owner indicates that the ’651 patent claims priority to U.S. Provisional Application No. 60/264,351, as do Patent Nos. US 7,839,729 B2 and 7,196,979 B2, which are involved in *inter partes* reviews IPR2014-01445 and IPR2014-01446, respectively, upon which we also have instituted *inter partes* review. Pet. 1–2; Paper 5, 1.

> The ’729 patent is the parent of the ’651 patent, and the claims of the ’729 and ’651 patents are similar. The subject matter of the ’979 patent overlaps to a significant degree with the subject matter of the ’651 patent, and the claims of the ’979 and ’651 patents contain common limitations.

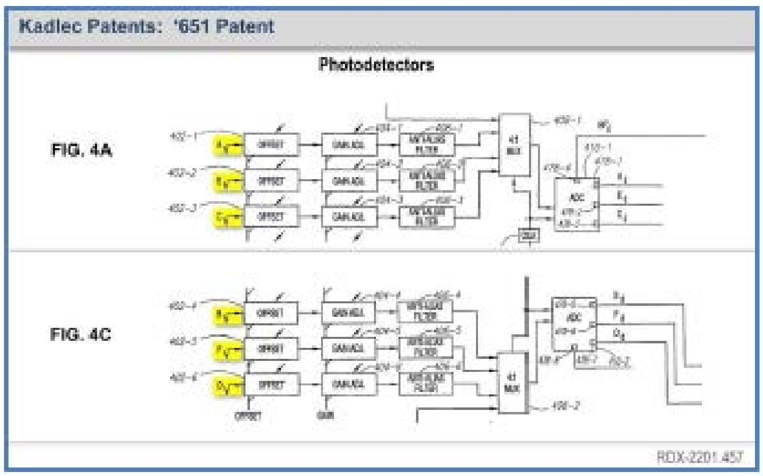
Pet. 1–2. Petitioner also filed other petitions for *inter partes* review with respect to related patents, including IPR2014-01439 (Patent No. US RE42,913 E), IPR2014-01441(Patent No. US RE43,681 E), IPR2014-01442 (Patent No. US RE43,681 E), and IPR2014-01443 (Patent No. US RE40,927 E). *See* Pet. 1–2; Paper 6, 1.

II. THE ’651 PATENT (EX. 1001)

A. Subject Matter

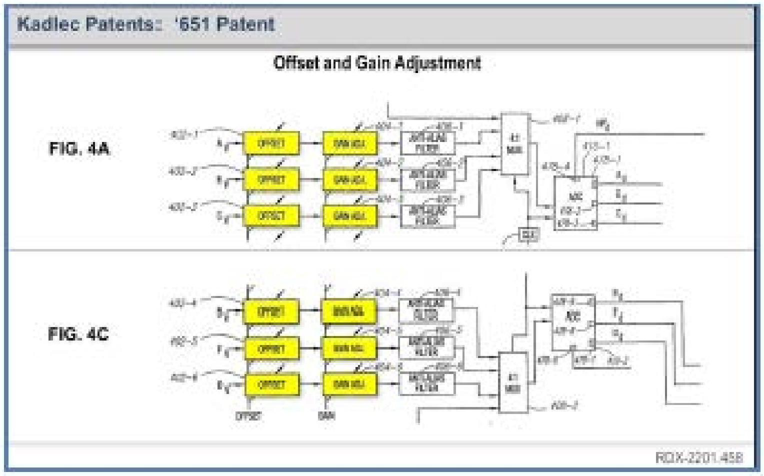
The ’651 patent generally relates to tracking and focus servo systems. Components of the apparatus recited in the challenged claims are depicted in Figures 4A–4D of the ’651 patent.

Portions of Figures 4A and 4C, as annotated by Petitioner, are reproduced below:



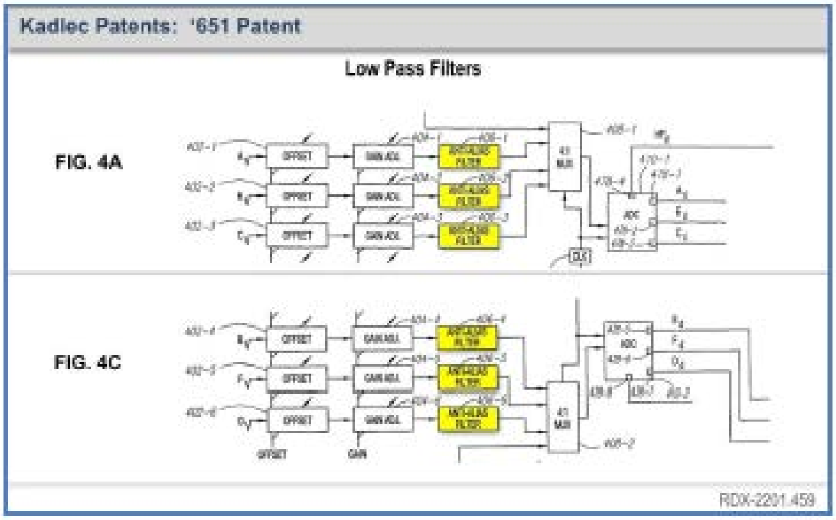
In the illustration above, analog signals from each of the photodetectors are highlighted. The photodetectors receive light reflected from an optical disc and generate analog electrical signals indicative of the received light. Pet. 16. Photodetectors are labeled A through F, and the analog signals received by the photodetectors are labeled AV through FV. Ex. 1001, Figs. 4A, 4C; col. 11, ll. 25–46, col. 13, ll. 47–50.

Portions of Figures 4A and 4C, as annotated by Petitioner, again are reproduced below:



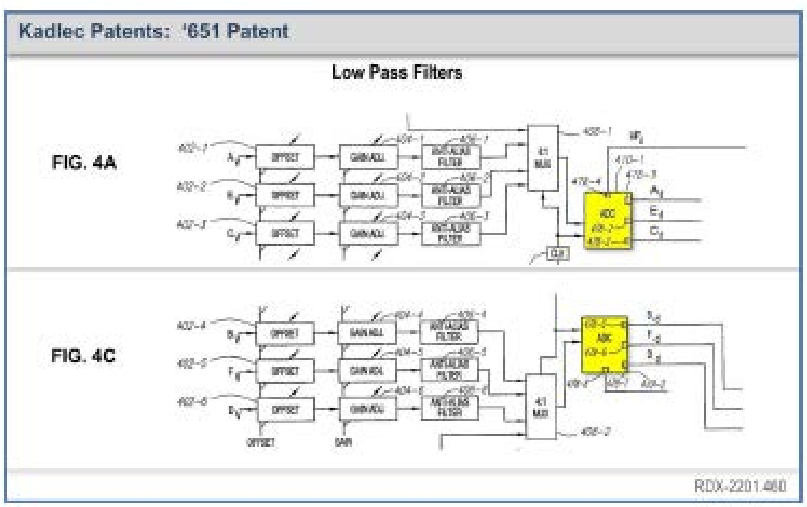
Id. at Figs. 4A, 4C. The highlighted offset blocks perform offset adjustments. An offset adjustment block may adjust the analog signals to compensate for offset, and a gain adjustment block may adjust the amplitude of the signal. *Id.* at col. 13, l. 47–col. 14, l. 24. The highlighted gain adjustment blocks amplify the analog signals from the photodetectors. *Id.* By removing offsets and amplifying the signals before sampling, the signals may be scaled to a desired range of amplitudes for digitization. *Id.* at col. 14, ll. 37–40.

Portions of Figures 4A and 4C, as annotated by Petitioner, again are reproduced below:



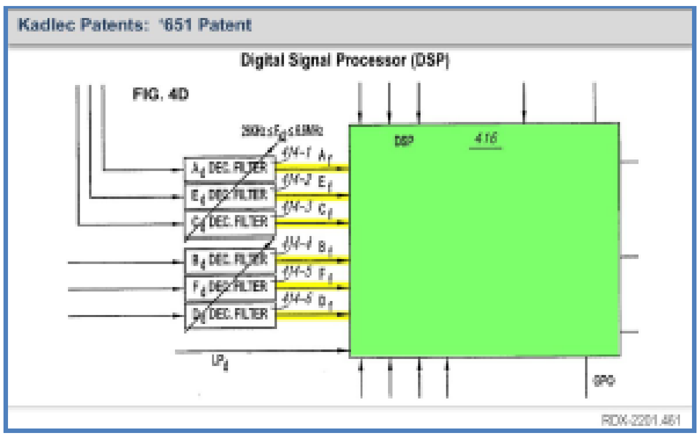
Id. at Figs. 4A, 4C. After offsets are removed and the signals are amplified, the signals are sent through low pass filters. *Id.* at col. 14, ll. 46–59. A low-pass filter blocks high frequency signals and allows only low frequency signals to pass. Pet. 18. The low-pass filters are highlighted, and the filters are labeled as anti-alias filters 406-1 through 406-6. *Id.*

Portions of Figures 4A and 4C, as annotated by Petitioner, once again are reproduced below:



Id. at Figs. 4A, 4C. The analog signals are converted into digital signals using analog-to-digital converters ("ADCs"). *Id.* at col. 15, ll. 13–34. The analog-to-digital converters are highlighted, and the converters are labeled as ADC in the figure. *Id.* After the signals are low-pass filtered and amplified, the signals are digitized using an ADC. *Id.* Consequently, the analog signals are sampled and converted into a numerical representation as digital signals. Pet. 19–20.

A portion of Figure 4D, as annotated by Petitioner, is reproduced below:



Id. at Fig. 4D; col. 15, ll. 35–41. The digital signal processor ("DSP") and the input digital signals are highlighted.

The DSP calculates a tracking error signal using digital signals and performs servo algorithms to generate a tracking control signal. *Id.* at col. 19, ll. 5–17; col. 25, ll. 35–51. The tracking control signal may be used to adjust the tracking actuator, which may move an arm containing the optical pickup unit across the tracks. *Id.* at col. 12, l. 63–col. 13, l. 8. Calculating a tracking error signal and running servo algorithms to generate a tracking control signal may include performing arithmetic functions on the photodetector signals. Pet. 20–21 (citing Ex. 1006 ¶ 57).

The DSP then calculates a focus error signal using digital signals and performs servo algorithms to generate a focus control signal. *Id.* at col. 19, ll. 5–57. After computing the focus error signal, the digital signal processor generates a focus control signal. Pet. 21. The focus control signal may be used to control the focus actuator, which may use an actuator arm including a flex axis to move the optical pickup unit toward or away from the disc. *Id.* at col. 6, ll. 3–14; col. 12, l. 63–col. 13, l. 8. Calculating a focus error signal and running servo algorithms to generate a focus control signal may include performing arithmetic functions on the photodetector signals. Pet. 21 (citing Ex. 1006 ¶ 58).

B. Illustrative Claims

Independent claims 1, 5, 9, and 13 are illustrative and are reproduced below:

> 1. A digital servo for an optical disk drive, comprising:
>
> an analog-to-digital converter for converting low-pass filtered and gain-adjusted versions of photo detector output signals into digital signals; and
>
> *a digital signal processor configured to receive the digital signals, the digital signal processor being further configured to determine a focus error signal (FES) and a tracking error signal (TES) from the digital signals,*
>
> *the digital signal processor being further configured to process TES and FES through servo algorithms to produce tracking and focus control signals*.
>
> 5. A digital servo method for an optical disk drive, comprising:
>
> receiving at an integrated circuit low-pass filtered and gain-adjusted versions of photodetector output signals resulting from an illumination of an optical disk;
>
> within the integrated circuit, digitizing versions of the photodetector signals to produce digital signals;
>
> *in a digital signal processor, processing the digital*

> *signals into either a tracking error signal (TES) or a focus error signal (FES); and*
>
> *in the digital signal processor, processing TES or FES through a servo algorithm to produce a control signal, the control signal being adapted to drive an actuator such that either TES or FES is minimized*.
>
> 9. A digital servo for an optical disk drive, comprising:
>
> an analog-to-digital converter configured to convert lowpass filtered and gain-adjusted versions of photo detector output signals into at least one digital signal; and
>
> *a digital signal processor configured to determine at least one of tracking error and focus error from the at least one digital signal and to determine, through at least one servo algorithm, at least one of a tracking control signal from the tracking error and a focus control signal from the focus error*.
>
> 13. A digital servo method for an optical disk drive, comprising:
>
> receiving low-pass filtered and gain-adjusted versions of photo detector output signals resulting from an illumination of an optical disk;
>
> digitizing versions of the photo detector signals to produce digital signals; and
>
> *determining, through servo algorithms in a digital signal processor, at least one of a tracking control signal based on a tracking error determined from the digital signals and a focus control signal based on a focus error determined from the digital signals*.

Ex. 1001, col. 45, ll. 41–51, col. 45, l. 60–col. 46, l. 3, col. 46, ll. 12–22, 31–43 (emphasis added to identify disputed limitations).

Claims 2–4, 17, 25, and 30 depend directly or indirectly from claim 1; claims 6–8, 18–20, 26–28, and 32–34 depend directly or indirectly from claim 5; claims 10–12, 21, 29, and 35 depend directly or indirectly from claim 9; and claims 14–16, 22–24, and 37–39 depend directly or indirectly from claim 13. *See id*. at col. 45, l. 52–col. 48, l. 37.

III. CLAIM CONSTRUCTION

In an *inter partes* review, the Board interprets claim terms in an unexpired patent according to the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278–79 (Fed. Cir. 2015), *cert. granted sub nom. Cuozzo Speed Techs., LLC v. Lee*, 84 USLW 3218 (U.S. Jan. 15, 2016) (No. 15-446). Under that standard, and absent any special definitions, we give claim terms their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc*., 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). "In such cases, the inventor's lexicography governs." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005) (en banc). In the absence of such definitions, limitations are not to be read from the specification into the claims. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

A. "digital signal processor" (*Claims 1, 5–9, 13, 15, 17–19, 21–23, 25–27, 29, 31, 33, 36, and 38)*

In the Institution Decision, we construed the claim term "digital signal processor" ("DSP") as meaning "an integrated circuit designed for processing digital signals in accordance with programmed commands." Inst. Dec. 12.

In its Patent Owner Response, Patent Owner asserts that our initial construction is "overly broad and unreasonable" because it "encompasses virtually any general purpose microprocessor or microcontroller unit." PO Resp. 13. According to Patent Owner, "[o]ne of ordinary skill in the art would understand that a digital signal processor or DSP is a *specialized* microprocessor—one that is structured and arranged for high speed processing of digital signals—particularly real-time digital data streams." *Id.* at 13. In particular, Patent Owner asserts that the Specification "frequently relies on the difference between a general purpose microprocessor and a DSP in describing embodiments of the invention." *Id*. at 13–14 (citing Ex. 1001, col. 18, ll. 51–60 (describing, for example, that "[i]n some embodiments, DSP 416 operates under instructions from microprocessor 432." (emphasis omitted))).

In further support of its proposed claim construction, Patent Owner also provides two dictionary definitions for a DSP, with one defining the term as "[a]n integrated circuit designed for high speed data manipulation and used in audio communications, image manipulation, and other data acquisition and data control applications" (Ex. 2002, 145) and the other defining the term as "[a] high-speed coprocessor designed to do real-time manipulation of signals" (Ex. 2003, 198). PO Resp. 15–16. In further support of its proposed construction, Patent Owner relies upon the Declaration of Raymond de Callafon, Ph.D. (Ex. 2008, "de Callafon Declaration" or "de Callafon Decl."). Patent Owner also relies upon the deposition testimony of Petitioner's declarant, Richard Zech, Ph.D. (Ex. 1006, "Zech Declaration" or Zech Decl."), that a DSP is a *specialized* microprocessor architected and designed to perform *high speed processing* of digital signals, particularly real-time data processing. PO Resp. 15. In particular, Patent Owner notes that Petitioner's declarant, Dr. Zech, testified that

> In order to achieve high speed processing of digital signals and low latency, one of ordinary skill in the art would understand that most DSP processors have a specialized data path, a specialized instruction set, many memory banks and buses, and execution control, among other things.

Id. at 15 (citing Ex. 2001, 56:16–57:7). Accordingly, Patent Owner contends that "a digital signal processor or DSP should be construed as 'a specialized integrated circuit structured and arranged for high speed processing of digital signals in accordance with programmed commands.'" *Id*. at 16 (quoting Ex. 2008 ¶ 23(a)).

In its Reply, Petitioner asserts that Patent Owner's proposed construction "finds no support in the specification" and attempts improperly to import two amorphous limitations into that construction – "specialized" and "high speed." Pet. Reply 3–6. In particular, Petitioner asserts that "[n]owhere in the '651 patent specification or claims is a DSP described as a 'high speed' processor." *Id*. at 6; *see* Tr. 9:17–10:3. Further, of Patent Owner's proposed construction, Petitioner notes that "[i]t also begs the question of the difference between 'high speed' and normal speed. Patent Owner's additional limitation appears to come from two dictionaries and not from the specification. *See* Exhibits 2002, 2003." Pet. Reply 6; *see* Tr. 94:20–96:3. We agree.

During the oral hearing, we asked Patent Owner how we should construe or understand the term "high speed." Tr. 38:15–17. Patent Owner stated that "high speed is more than just the normal evolution of microprocessors. It is a result of the specialized architecture of a DSP." *Id*. at 38:19–21. Patent Owner further stated that "high speed is higher than a general purpose processor" and that this "higher speed" is obtained because the DSP has a "specialized" architecture. *Id*. at 39:7–15. Thus, Patent Owner contends that the DSP is "high speed" because it is "specialized" (*id*. at 38:24–39:2) and is "specialized," so that it can be "high speed" (*id*. at 39:21–40:3. Nevertheless, Patent Owner provides neither an absolute nor relative measure of "high speed" (*id*. at 98:12–23) nor a precise description of "specialized" (*id*. at 41:8–20). Patent Owner's proposed construction is vague and ultimately circular.

As in our Institution Decision, here again we agree with Patent Owner that the Specification of the '651 patent recognizes that a DSP is different from a general purpose microprocessor. For example, the Specification states:

> FIG. 4 shows an embodiment of control chip 350 of control system 300. The embodiment of control chip 350 shown in FIG. 4 includes a microprocessor 432 and a digital signal processor (DSP) 416. Since DSP 416 operates much faster, but has lower overall capabilities (e.g., code and data storage space), than microprocessor 432, in some embodiments real time digital servo system algorithms can be executed on DSP 416 while other control functions and calibration algorithms can be executed on microprocessor 432. A control structure for embodiments of control chip 350, and interactions between DSP 416 and microprocessor 432, are further discussed in the System Architecture disclosures.

Ex. 1001, col. 13, ll. 35–46. From this disclosure, the Specification suggests that a DSP operates faster than a microprocessor, and, in some embodiments, real time digital servo algorithms can be executed on a DSP. The Specification, however does not expressly define the term "digital signal processor."

We further note the competing views of Dr. de Callafon (Ex. 2008), on behalf of Patent Owner, and of Dr. Zech (Ex. 1006), on behalf of Petitioner. In particular, we note issues regarding the testimony of each declarant. For example, in some respects, Dr. de Callafon bases his proposed construction of a DSP on features that he asserts one of ordinary skill in the art would understand that "*most* DSP processors have," as opposed to features that *all* DSP processors require. Ex. 2008 ¶ 21(a) (emphasis added). Dr. Zech's deposition testimony describing the design of a DSP, also relied upon by Patent Owner, is given reduced weight because Dr. Zech testified that he had "no expertise" as to design elements distinguishing a DSP from a general processor. *See, e.g.*, Ex. 2001, 35:12–13, 44:12–14.

As we seek to give the term "digital signal processor" its ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention, we take into account the Microsoft and IBM dictionary definitions submitted by Patent Owner. Ex. 2002, 145; Ex. 2003, 198. We note that each of those dictionaries define a DSP as being designed for "high speed" manipulation of data/digital signals. *Id*. Patent Owner, however, has not directed our attention to evidence establishing what "high speed" encompasses. *See* Tr. 98:12–23; *see also id*. at 95:10–96:3 (Petitioner's argument that speed governed by function).

We also note one of the submitted dictionary definitions characterizes "high speed," such that digital signal manipulation as "real-time." Ex. 2003,

198. Another dictionary definition simply includes "high speed." Ex. 2002, 145. However, the Specification discloses that only some embodiments can execute real time digital servo algorithms on a DSP. *See* Ex. 1001, col. 13, ll. 38–42. We determine that Patent Owner has not established persuasively that the broadest reasonable interpretation of a DSP requires "high speed" processing achieving this "real time" feature. Indeed, Patent Owner's "basic" construction for a DSP does not include a requirement for "real time" processing. *See* PO Resp. 16 (providing a minimal definition for a DSP).

We are persuaded, however, that the broadest reasonable interpretation of the term "digital signal processor," consistent with the Specification and the ordinary and customary meaning of the term as understood at the time of the invention by a person of ordinary skill in the art, is "an integrated circuit structured and arranged for manipulation of digital signals in accordance with programmed commands, and in a manner that operates faster than a microprocessor." We do not adopt Patent Owner's proposal to characterize further an integrated circuit as "specialized." We determine that proposed modification is superfluous in that our construction describes that the integrated circuit is structured and arranged to achieve a specific function, i.e., manipulation of digital signals and operation faster than a microprocessor.

B. "versions of photodetector output signals" (Claims 1, 5, 9, and 13)

We construed "versions of photodetector output signals" in the Institution Decision, as "individual analog signals derived from photodetector output signals." Inst. Dec. 10–11. The parties do not challenge this construction, and we do not find any reason to depart from it. PO Resp. 16; *see* Pet. Reply 1–2.

C. “digital signals” (Claims 1, 5–7, and 13) and “digital signal” (Claim 9)

We construed “digital signal(s)” in the Institution Decision, as “a signal or signals using two or more states, e.g., ‘0’ or ‘1,’ to represent signal values.” Inst. Dec. 13. The parties do not challenge this construction, and we do not find any reason to depart from it. PO Resp. 16; *see* Pet. Reply 1–2.

D. “focus error signal” (Claims 1, 5, 7, and 13) and “focus error” (Claim 9)

We construed “focus error signal” and “focus error” in the Institution Decision, as “a digital signal representing an out-of-focus condition.” Inst. Dec. 13–14. The parties do not challenge this construction, and we do not find any reason to depart from it. PO Resp. 17; *see* Pet. Reply 1–2.

E. “tracking error signal” (Claims 1, 5, 6, and 13) and “tracking error” (Claim 9)

We construed “tracking error signal” and “tracking error” in the Institution Decision, as “a digital signal representing an off-track condition.” Inst. Dec. 15–16. The parties do not challenge this construction, and we do not find any reason to depart from it. PO Resp. 17; *see* Pet. Reply 1–2.

F. “the digital signal processor being further configured to determine a focus error signal (FES) and a tracking error signal from the digital signals” (Claim 1); “in a digital signal processor, processing the digital signals into either a tracking error signal (TES) or a focus error signal (FES)” (Claim 5); “a digital signal processor configured to determine at least one of tracking error and focus error from the at least one digital signal” (Claim 9); and “in a digital signal processor . . . a tracking error determined from the digital signals and . . . a focus error determined from the digital signals” (Claim 13)

We construed these terms in the Institution Decision, as “the digital signal processor being further configured to use programmed commands to calculate a focus error signal and a tracking error signal from the digital signals.” Inst. Dec. 16–17. The parties do not challenge this construction, and we do not find any reason to depart from it. PO Resp. 18–19; *see* Pet. Reply 1–2.

G. Other Claim Terms

Neither party offers constructions of other terms in the challenged claims. *See* PO Resp. 12–19; Pet. Reply 1–2. Only terms that are in controversy in this proceeding need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). Therefore, no other claim terms require express construction.

IV. PRIOR ART CHALLENGES

Petitioner asserts that claims 1–39 of the ’651 patent are unpatentable under 35 U.S.C. § 102(e) as anticipated by Baird or under 35 U.S.C. § 103(a) as rendered obvious over Baird in combination with Baschirotto or ST Datasheet, or both. *See supra* Section I.A. Petitioner also relies upon the Zech Declaration.

A. Anticipation by Baird

1. Overview

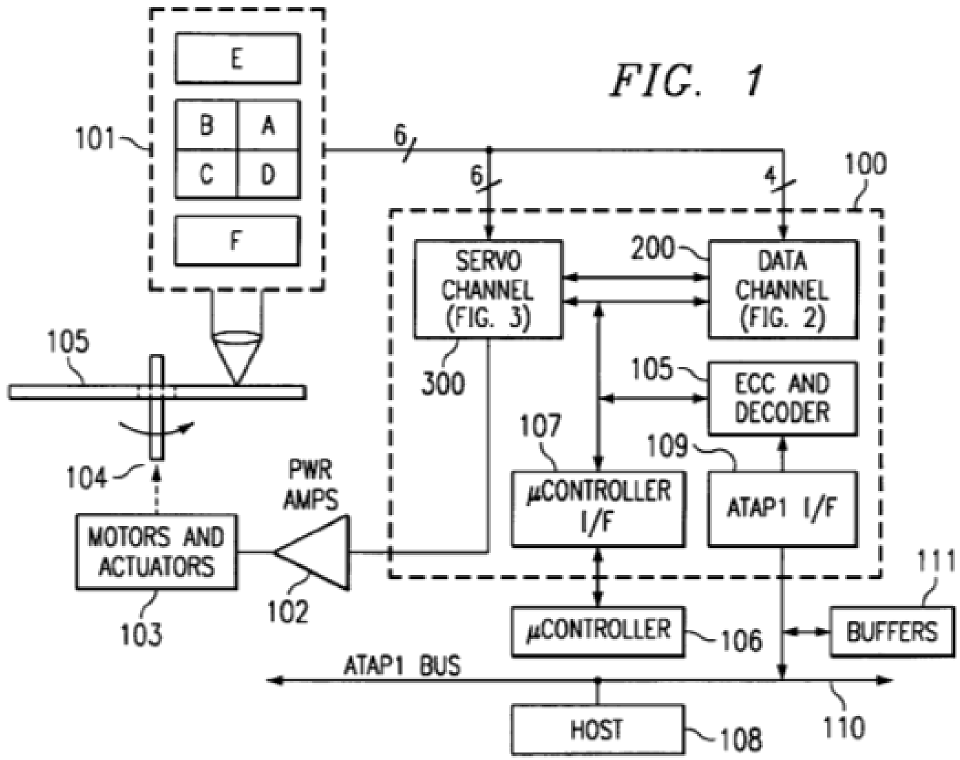
Petitioner argues that claims 1–13, 30, 32, 35, and 37 of the ’651 patent are anticipated by Baird. *See supra* Section I.A. “A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test. *In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990).

> [U]nless a reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations arranged or combined in the same way as recited in the claim, it cannot be said to prove prior invention of the thing claimed, and thus, cannot anticipate under 35 U.S.C. § 102.

Net MoneyIN, Inc. v. VeriSign, Inc., 545 F.3d 1359, 1371 (Fed. Cir. 2008); *accord Application of Arkley*, 455 F.2d 586 (CCPA 1972). Moreover, “it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom.” *In re Preda*, 401 F.2d 825, 826 (CCPA 1968).

2. Baird (Ex. 1003)

Baird is directed to circuits and methods for gain ranging in an analog modulator and systems using the same. Ex. 1003, 1:33–35. Baird’s Figure 1 is reproduced below.



Baird's Figure 1 is a conceptual and block diagram of an exemplary personal computer based optical disk playback system. Ex. 1003, 2:59–60. Optical pick-up unit 101 includes photodetectors A–F which provide six respective signals to a "drive manager integrated circuit" ("IC") 100. IC 100 includes "servo channel" 300, which provides servo control for motors and actuators associated with mechanical manipulation of the optical playback system. Integrated circuit 100 also includes "data channel" 200 for processing data signals read from disk 105. *Id.* at 3:24–61. The "servo channel" is shown in more detail in Baird's Figure 3, reproduced below.

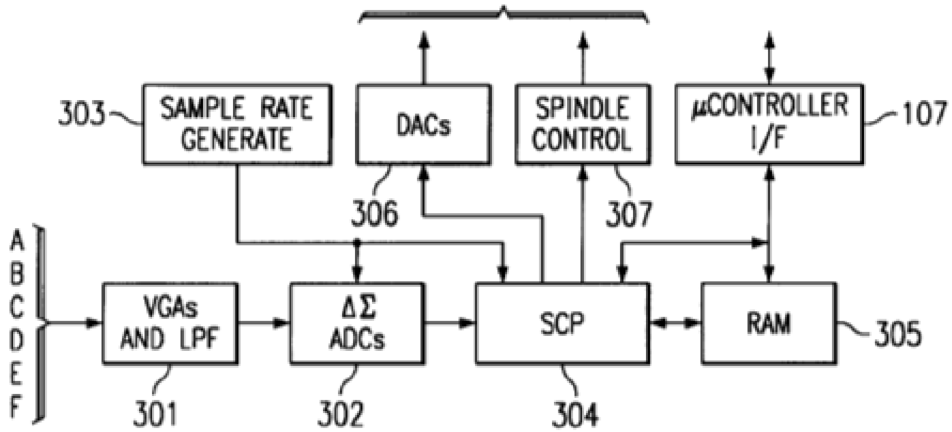


FIG. 3

Baird's Figure 3 is a diagram showing further detail of the servo control path shown in Baird Figure 1. Ex. 1003, 2:64–65. Servo data is received from six photodiodes 101 (i.e., photodetectors A–F) and converted into digital signals by analog to digital converters ("ADCs") 302. *Id.* at 5:63–65. Servo data processing is performed by on-board servo control processor ("SCP") 304. *Id.* at 6:12–15. SCP 304 operates according to an instruction set provided by microcontroller 106 (Figure 1). *Id.* at 6:12–15.

a. "a digital signal processor configured to receive the digital signals" (Claim 1)[2]

According to Petitioner, Baird discloses an "'on-board servo control processor (SCP) 304' which receives the claimed digital signals from the analog-to-digital converters." Pet. 40 (quoting Ex. 1003, col. 6, ll. 4–15); *see* Ex. 1003, Fig. 3; Ex. 1006 ¶ 72). Specifically, Petitioner asserts that the SCP receives six separate digitized photodetector signals, each of which has been amplified using six separate VGAs 301 and amplified using separate

[2] Similar limitations appear in the other challenged, independent claims. Tr. 35:17–20.

ADCs 302. *Id*. (citing Ex. 1003, col. 5, l. 63–col. 6, l. 11). In addition, Petitioner asserts that Baird discloses the SCP as part of an "'integrated servo system that operates four control loops: focus, tracking[,] sled[,] and spindle, using an intermal servo control processor requiring little external microcontroller intervention.'" *Id*. at 42 (quoting Ex. 1003, col 5, ll. 56–62; citing Ex. 1006 ¶ 76). Petitioner asserts that Baird also discloses that the servo data processing "'is performed by on-board servo control processor (SCP) 304, which receives its instruction set from the user selected local microcontroller 106 through interface 107 and RAM 305.'" *Id*. (quoting Ex. 1003, col. 6, ll. 12–15). In view of these disclosures, Petitioner argues that one of ordinary skill in the art would understand that Baird's SCP is a (1) DSP used for performing servo functions; and (2) a non-dedicated programmable device that is optimized for processing received digital signals using programmed commands. *Id.* at 40–41; *see* Ex. 1006 ¶ 72.

In further support of its argument that one skilled in the art would understand Baird's servo processor is a DSP, Petitioner refers to the file history of the parent application, U.S. Patent Application No. 11/969,190, wherein Applicant stated the following:

> Applicant appreciates the suggested replacement titleprovided by the examiner. However, it is respectfully noted that prior art optical disk drive servos also usedigital signal processors —that use is old. What is notold, however, is ***the provision of a servo processor (e.g., a DSP)*** that receives versions of the photodetectorsignals such that the servo processor is the component that calculates the resulting servo algorithm error signals(FES for focus and TES for tracking).

Pet. 41 (quoting Ex. 1009, 139) (bolding added in Petition). We note that

Applicant further states that:

> Thus, just as the Examiner would hear a version of a caller's voice on the telephone (as opposed to the actual sound of the caller's voice that would be heard by the Examiner in a face-to-face conversation) so does *the claimed servo processor* receive processed versions of the photodetector signals.

Ex. 1009, 140–141 (emphasis added, underlining in original); *see* Tr. 32:19–21. According to Petitioner, "'servo control processor' of Baird also must be a 'digital signal processor,' particularly since it also receives *versions* of photodetector signals, which was the alleged point of novelty continually advocated by the Applicants during prosecution." Pet. 41 (emphasis added). Moreover, we are persuaded that Applicant's use of the terms "digital signal processor" and "servo processor" interchangeably further evidences that Baird's SCP encompasses a DSP.

Patent Owner contends that Baird's SCP does not constitute "a digital signal processor (DSP)," as required by independent claims 1, 5, 9, and 13. PO Resp. 22–30. According to Patent Owner, a "DSP *typically* comes with additional flash memory and/or RAM," and is distinguished from a general purpose microprocessor and/or microcontroller "due to the specialized architecture for the computational needs in digital signal processing." *Id*. at 25 (citing Ex. 2008 ¶ 33) (emphasis added). Patent Owner contends that the "specialization ensures that calculations can be done as fast as possible with as little latency as possible." *Id*. at 26 (citing Ex. 2008 ¶ 35).

Patent Owner asserts that Baird's Figure 3 shows that "the RAM (memory) is separate from the SCP and data flow would go through the SCP to the RAM." *Id*. at 29 (citing Ex. 2008 ¶ 40); *see* Tr. 44:22–46:15. According to Patent Owner, because the memory to process data is not part of the processor architecture, "the SCP is inconsistent with a *typical* DSP architecture." *Id*. (emphasis added). In other words, Patent Owner contends that Baird's SCP "does not consitute a DSP, since hardware assisted computations would have to have direct memory access to qualify as a DSP programmed command." *Id*. at 29–30 (citing 2008 ¶ 43).

Based on Petitioner's argument and our review of Baird, we disagree with Patent Owner's characterization of the SCP depicted in Figure 3 as not having direct access to RAM. *See* Tr. 14:23–15:16. Although the RAM is separated from the SCP, Figure 3 depicts a two-way arrow positioned directly between the two elements. Ex. 1003, Fig. 3. Patent Owner has not explained persuasivley why a person skilled in the art would not understand that two-way arrow as indicating direct access to RAM by the SCP. *See* Tr. 46:16–50:8. Moreover, we note that Dr. de Callafon characterizes a DSP as "typically" having RAM and testifies that, because Baird's RAM is separate from the SCP, it is inconsistent with "typical" DSP architecture. Ex. 2008 ¶¶ 33, 42. What is typical of an element is not definitive of its characteristics. Thus, neither Dr. de Callafon's declaration nor our construction of DSP prohibits RAM from being separate from the DSP.

Further, based upon our review of the record, Patent Owner has not addressed either of Applicant's statements referenced above wherein the terms "digital signal processor" and "servo processor" were used interchangeably, suggesting that Baird's SCP may be considered a DSP.

Based on our review of the record as a whole, and in view of our claim construction for the claim term "digital signal processor," the preponderance of the evidence establishes that one of ordinary skill in the art would understand Baird's SCP to disclose a DSP used to perform servo functions.

b. "Determine a focus error signal (FES) and a tracking error signal (TES) from the digital signals" (Claim 1)[3]

Having determined that Baird's servo control processor discloses the recited, digital signal processor, we next consider whether Baird's servo control processor performs all of the recited operations of the challenged claims. In particular, Petitioner argues that "[i]t is *inherent* that the servo control processor of Baird determines focus error signal and tracking error signal." Pet. 42 (emphasis added).

> To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. *Inherency, however, may not be established by probabilities or possibilities.* The mere fact that a certain thing may result from a given set of circumstances is not sufficient.

PO Resp. 30–31 (quoting *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999) (emphasis added) (citations omitted)). Petitioner argues that, because Baird discloses that the servo control processor performs focus and tracking control loops (Ex. 1003, col. 5 l. 63–col. 6, l. 11), "it is necessarily the case that a focus error and tracking error signal are generated" in order to perform that function (Pet. 42–43). *See* Ex. 1006 ¶ 77; Tr. 20:21–23:5. According to Petitioner and, its declarant, Dr. Zech, one of ordinary skill in the art would

[3] Similar limitations appear in the other challenged, independent claims. Tr. 35:17–20.

understand that those error signal calculations *must* occur within the servo control processor because Baird does not disclose any other circuitry or block in its design that could perform that function. Pet. 41–43; Ex. 1006 ¶ 77. In addition, Petitioner argues that Baird's servo control processor *necessarily* determines a focus error signal and a tracking error signal because Baird's disclosure that the servo control processor receives digitized photodetector signals and generates servo control signals requires a determination of the error signals. Pet. 42–43 (citing Ex. 1003, Figs. 1, 3; Ex. 1006 ¶ 77).

Patent Owner contends that it is not inherent that the servo control processor of Baird is configured to determine a focus error signal (FES) and a tracking error signal (TES) from the digital signals it receives, as required by both independent claims. PO Resp. 30–39; *see* Ex. 2008 ¶ 45. Patent Owner acknowledges that Baird teaches that "[t]he integrated servo system *operates four control loops: focus, tracking*, sled, and spindle, using an internal servo control processor requiring little external microcontroller intervention." PO Resp. 31 (quoting Ex. 1003, col. 5, ll. 59–62 (emphasis added)); *see* Ex. 2008 ¶ 46. However, Patent Owner asserts that "Baird is silent with respect to the operations and locations of the four control loops, as well as any generation of focus or tracking error signals." *Id*. at 32.

Regarding Baird's disclosure that the SCP processes the servo loops to create control signals, Patent Owner contends that "Baird fails to provide any description of how its control loops operate" or even if the loops are "open" or "closed." *Id*. at 34 (citing Ex. 2008 ¶ 52). According to Patent Owner, "a person of ordinary skill in the art would also understand that there are different types of servo control loops, including, but not limited to, ‘open’ and ‘closed’ servo control loops.” *Id*. at 33 (citing Ex. 2008 ¶ 51). Patent Owner contends that one of ordinary skill in the art also would have understood that open loops operate without any feedback and, thus, do not require the determination of error signals. *Id*. at 34 (citing Ex. 2008 ¶ 52).

For example, Patent Owner asserts that “[o]ne example of ‘open loop’ control system is one which reacts before an error actually occurs, which is called feedforward control or predictive control.” *Id*. at 34–35 (citing Ex. 2008 ¶ 53). Patent Owner and Dr. de Callafon explain that “[f]eedforward control is not error-based, but instead is based on knowledge about the process in the form of a mathematical model of the process or knowledge about or measurements of the process disturbances.” *Id*. According to Patent Owner and Dr. de Callafon, such knowledge is useful for a servo system wherein the process and process disturbances have a repetitive nature, making it easier to predict and react before any error occurs. *Id*. at 35 (citing Ex. 2008 ¶ 53). Patent Owner and Dr. deCallafon explain further that “[r]epetitive movements and repetitive control signals are found in an optical disk drive where the disk is constantly rotating creating repetitive and predictable error signals.” *Id*. (citing Ex. 2008 ¶ 54). Patent Owner asserts that it was known in the art that repetitive control signals needed for such a repetitive system could be designed via iterative learning or a repetitive control algorithm and that one of skill in the art would have understood “that the repetitive control signals are applied in an *open loop* fashion to control the actuator in the optical disk drive.” *Id*. (emphasis added). Therefore, according to Patent Owner and Dr. de Callafon, Baird’s disclosure of a servo system “does not imply unequivocally that the servo system is either ‘open’ or ‘closed’.” *Id*.

Further, Patent Owner asserts that one of skill in the art would have understood that, although closed loops operate based upon feedback, “that feedback need not result in the determination of error signals.” *Id*. at 35–36 (citing Ex. 2008 ¶ 55). In such cases, Patent Owner contends that “servo control can be done on the basis of feedback of the measurement of the actual reference signal as opposed to a measurement of the difference between the reference and the output.” *Id*. at 36 (citing Ex. 2008 ¶ 55). Thus, Patent Owner contends that Baird’s teaching that the servo system uses the SCP to operate focus and tracking control loops does not *inherently* disclose that the SCP determines any error signals, much less FES and TES. *Id*. at 33; *see* Tr. 64:16–65:14.

In its Reply, Petitioner argues that Patent Owner has not provided any evidence that alternative control methods could be used for an optical disk system, such as the system disclosed in Baird. Pet. Reply 13. According to Petitioner, Patent Owner’s declarant, Dr. de Callafon, testified that photodetector signals are not used in open loop systems. *Id*. at 12 (citing Ex. 1017, 110:24–111:6 (“If they are purely open loop, *probably* not. If they were closed loop implementations, I can imagine they used a photodetector signal also for servo.” (emphasis added))). Because Baird discloses receiving servo data from photodetector signals, Petitioner argues that, “by Patent Owner’s own admission, Baird *teaches away* from using an open loop system for servo control.” Pet. Reply 12 (emphasis added). Further, Petitioner argues that optical disks contain imperfections, such that an open loop control system would lack the necessary feedback to adjust for those imperfections. *Id*. at 12–13 (citing Ex. 1006 ¶¶ 24, 33–35). We take Petitioners's argument to be that Patent Owner makes a weak argument in suggesting that Baird may use open loop control.

Having considered the arguments and evidence, we are not persuaded that Petitioner has established by a preponderance of the evidence that Baird inherently discloses a DSP configured to determine a FES and a TES from digital signals received by the SCP. In particular, Petitioner's primary contention with respect to inherency is that one of ordinary skill in the art would have understood that Baird must determine a FES and TES in order for the SCP to operate focus and tracking control loops. Pet. Reply 14 (citing Ex. 1006 ¶ 77). However, neither Petitioner nor Petitioner's declarant, Dr. Zech, provides any explanation why that is so. When asked for an explanation during his deposition, Dr. Zech responded in a manner that relied upon a *probability* that Baird's SCP determines FES and TES. In particular, the following is an excerpt from Dr. Zech's deposition:

> Q Can you explain to me why it is your
> opinion that it is inherent that a servo control
> processor in Baird determines a focus error signal
> and a tracking error signal?
> A Well, because the way he designed it, it
> does. And I can't imagine why somebody, an engineer
> at Cirrus Logic, would swim against the current and
> come up with something entirely new. The chip
> surely would not sell. I know that from pretty
> broad experience in sales and marketing.
> Once you tell me optical disk drive --
> *I've explained to you the statistics of it* --
> *99 percent plus are probably using continuous*
> *composite servoing*. When you use continuous
> composite servoing, you need to have a tracking
> error and a focus error signal. *So it's not much of*

> *a leap for me to conclude that that's what's going on here.*

Ex. 2001, 151:3–20 (emphases added); *see* Tr. 100:13–101:2. Dr. Zech's deposition testimony describes what functions and systems optical disk drives "are probably using" and that "it's not much of a leap" for him to conclude what is occuring in Baird with respect to whether error signals are determined Ex. 2001, 151:15–18; *see MEHL/Biophile Int'l. Corp. v. Milgraum*, 192 F.3d 1362, 1365 (Fed. Cir. 1999) (inherency is not to be established by probabilities or possibilities). Moreover, both in his declaration and at the deposition, Dr. Zech bases his opinion regarding that issue on assumptions unsupported by evidence. *See* Office Patent Trial Practice Guide 77 Fed. Reg. 48, 756, 48,763 (Aug. 14, 2012) ("Affidavits expressing an opinion of an expert must disclose the underlying facts or data upon which the opinion is based. . . . Opinions expressed without disclosing the underlying facts or data may be given little to no weight.") (citing Fed. R. Evid. 705; 37 C.F.R. § 42.65; *Rohm & Haas Co. v. Brotech Corp.*, 127 F.3d 1089, 1092 (Fed. Cir. 1997)). Thus, we do not credit Dr. Zech's unsupported opinions with persuasive weight.

Further, based upon our review of the record, we find that Patent Owner has presented a persuasive rebuttal to Petitioner's assertion that Baird's SCP necessarily determines FES and TES. *See* PO Resp. 30–39 (discussed *supra*). In particular, Patent Owner and Dr. de Callafon have provided reasonable explanations and examples demonstrating that Baird's SCP may operate using an open loop that is not dependent upon the determination of FES or TES, rather than a closed loop that is based upon feedback not requiring the determination of those error signals. *Id*. Thus, we are not persuaded that a person of ordinary skill in the art would have understood that Baird *must* operate as a closed loop that is based upon feedback requiring the determination of FES or TES.

We disagree with Petitioner's assertion that Patent Owner has not provided examples or explained how or why open loop systems could be used in a servo control system in an optical disk drive system. *See* Pet. Reply 13. Patent Owner and Dr. de Callafon explained that, in an optical disk drive, where the disk is constantly rotating, repetitive control signals are found. PO Resp. 34–35; Ex. 2008 ¶ 53. Patent Owner and Dr. de Callafon also explained that it was known in the art that a repetitive system could be designed via iterative learning or a repetitive control algorithm to produce repetitive control signals needed for such a repetitive system. PO Resp. 35; Ex. 2008 ¶ 53. Further, Patent Owner and Dr. de Callafon explained that the repetitive control signals are applied in an open loop fashion to control the actuator in the optical disk drive. *Id*.

We also do not agree with Petitioner's assertion that Dr. de Callafon's testimony amounts to an admission by Patent Owner that Baird "teaches away"[4] from using an open loop system for servo control. Pet. Reply 12. In support of that contention, Petitioner relies on Dr. de Callafon's deposition testimony relating to some "very simple open loop solutions for optical drives that didn't use any error measurement." Ex. 1017, 110:24–111:6.

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[4] "Teaching away" arguments, moreover, are not appropriate in the context of anticipation. *Celeritas Techs. Ltd. v. Rockwell Int'l Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998) (The prior art was held to anticipate the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed.").

Petitioner asked whether “those systems utilize photodetector signals for the purposes of servo?” *Id*. at 110:24–111:1. Dr. de Callafon answered, “*If* they are purely open loop, *probably* not.” *Id.* at 111:3–6 (emphases added). However, prior to that conditional statement, Dr. de Callafon explained that the photodetector signals received by the SCP in Baird would be useful in an open loop servo because those signals can provide information about the repetitive motion of the disk. *Id.* at 75:17–76:24. Dr. de Callafon explained further that the repetitive motion need not be a FES or TES, but, instead, a “reference signal,” that is not based upon any error signal. *Id*. at 76:14–77:2.

In view of the evidence, arguments, and Baird’s silence with respect to how focus and tracking control are accomplished by the SCP, and, in particular, whether such control relies upon determining any error signals, or, even if the servo could operate in an open or closed loop, we are persuaded that Petitioner has failed to establish by a preponderance of the evidence that Baird’s SCP must determine, calculate, or otherwise provide FES and TES, as required by the challenged independent claims 1, 5, 9, and 13. Thus, Petitioner has failed to establish by a preponderance of the evidence that Baird anticipates claims 1–13, 30, 32, 35, and 37 of the ’651 patent.

B. *Obviousness Over Baird in Combination with Other References*

1. Overview

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are “such that the subject matter[,] as a whole[,] would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.[5] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

2. Level of Ordinary Skill in the Art

The level of skill in the art is a factual determination that provides a primary guarantee of objectivity in an obviousness analysis. *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 1324 (Fed. Cir. 1999) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991)).

Petitioner argues that one of ordinary skill in the art at the time of the filing of the '651 patent as having:

> (1) a Bachelor's of Science Degree in Electrical Engineering, Mechanical Engineering, Physics *or* a related field and at least two years of additional experience in control system technology, optical disk servo technology, magnetic disk servo technology, or related technologies, either in industry or research[,] *or* (2) at least a Master's of Science Degree in Electrical Engineering, Mechanical Engineering, Physics *or* a related field with coursework in control system technology, optical disk servo technology, magnetic disk servo technology, or related technologies.

[5] Patent Owner did not contend in its Patent Owner Response that secondary considerations are present, which would render the challenged claims patentable over the applied references. *See* Pet. Reply 25; *see also* Paper 10, 3 ("The patent owner is cautioned that any arguments for patentability not raised in the response will be deemed waived.").

Pet. 34 (citing Ex. 1006 ¶¶ 63–64) (emphases added).

Patent Owner contends that one of ordinary skill in the art would have "a Bachelor of Science in Mechanical or Electrical Engineering *and* at least two years of experience in control systems technology." PO Resp. 11 (citing Ex. 2008 ¶¶ 9–11) (emphasis added).

Despite the presentation of an alternative definition for a person of ordinary skill in the art by Patent Owner, neither Patent Owner nor Petitioner presents argument or evidence as to how and why its definition affects any determination in this proceeding. Moreover, neither Patent Owner nor Petitioner challenges the other party's declarant's qualifications to testify regarding what a person of ordinary skill in the art would have understood as of the date of the alleged inventions. Upon review of the declarants' credentials (Ex. 1007 (Dr. Zech's Curriculum Vitae); Ex. 2008 (Attachment A – Dr. de Callafon's Biography)), we find that each declarant exceeds either party's definition of a person of ordinary skill in the art, and we are persuaded that each declarant is qualified to testify as to what a person of ordinary skill in the art would have understood (*see, e.g.*, Ex. 1006 ¶ 64; Ex. 2008 ¶ 10).

Based on our consideration of the record, we find that the evidence as a whole supports Petitioner's description of the level of ordinary skill in the art. Therefore, to the extent that it is necessary for us to determine the definition of a person of ordinary skill in the art, we continue to apply Petitioner's definition. *See Trustees of Columbia Univ. v. Illumina, Inc.*, 620 F.App'x. 916, 921–22 (Fed. Cir. 2015) (non-precedential).

3. Baird and Baschirotto

Petitioner argues that claims 14–29, 31, 33, 34, 36, 38, and 39 of the ’651 patent are rendered obvious over Baird and Baschirotto. *See supra* Section I.A. For the reasons set forth below, we are persuaded that Petitioner fails to establish by a preponderance of the evidence that the challenged claims are rendered obvious over Baird and Baschirotto.

a. Baschirotto (Ex. 1004)

According to Petitioner (Pet. 48–49), Baschirotto discloses an integrated circuit for a compact disc player that includes a servo processor for processing focus and tracking error signals. Ex. 1004, 0002. Baschirotto explains that its photodetector signals are offset adjusted and gain-adjusted before being digitized and provided to a digital signal processor.

> The input signals coming from a Compact Disc (CD) are generated by four pick-ups. . . . The CD signal four components (which are typically called AC, BD, E, and F) are currents or voltages, depending from the used pick-up. *These signals are preamplified (cancelling the offset) by a voltage-to-voltage or current-to-voltage stage.* The output voltage signals are then fed into the ADC and supplied to the digital chip. . . . *The preamplifier gain is 8-bit digitally controlled in order to fully fit the ADC full scale.*

Id. (emphases added).

Baschirotto discloses that the digital signal processor in the digital section determines the gain used to gain-adjust the photodetector signals and the offset cancellation used to offset-adjust the photodetector signals:

> The full system takes advantage of the availability of DSP in the digital section. *In fact the offset cancellation and the gain control algorithms are implemented in the digital chip and the results are received through I2C-likebus by the analog chip and used to*

> *digitally control the preamplifier section.* The same concept is used for the servo digital control whose main benefits are: improved playability (adjustments usually semi-fixed now become automatic and continuous); adjustment-free system (all adjustments are automatic, performed by the system itself); use of DSP (the use of digital signal processorsimproves the possibilities and future features).

Id. at 0003 (emphasis added)).

b. Analysis

Petitioner argues that dependent claims 14–21, 31, 33, 34, 36, 38, and 39 recite additional limitations relating to gain adjustments to versions of the photodetector output signals. Pet. 49–52. Each of these challenged claims depends, directly or indirectly, from one of independent claims 1, 5, 9, and 13.

Petitioner argues that Baird teaches the use of variable gain amplifiers (Ex. 1003, col. 5, l. 63–col. 6, ll. 11), and, as noted above, Baschirotto teaches the use of "a digital signal processor to determine a plurality of variable gain amplifiers in a digital servo system for an optical drive" (Pet. 53; *see* Ex. 1004, 0002, 0003; Ex. 1006 ¶ 89–90). Further, Petitioner argues that claims 22–29 recite additional limitations relating to offset adjustments to versions of the photodetector output signals. Pet. 53–55. In particular, Petitioner argues that Baird teaches the use of offset control for the data path. *Id.* at 55. Baird teaches that

> *Automatic offset control is effectuated by the loop including envelope detectors 208, offset controls 209 and DACs 210.* Envelope detectors 208 detect both the top and bottom envelopes of the high speed data signal. The envelopes are summed to produce an error signal which is passed through an offset loop

> compensation filter within offset control block 209 and integrated.

Ex. 1003, col. 4, ll. 26–29 (emphasis added); *see* Ex. 1006 ¶ 92. Thus, Petitioner argues that Baschirotto teaches using a digital signal processor to determine the offset-adjusting of the photodetector signals. Pet. 56.

Nevertheless, Petitioner does not argue that Baschirotto teaches or suggests the limitations of independent claims 1, 5, 9, and 13 that are missing from Baird. *See supra* Section IV.A.2.b. Thus, Petitioner has failed to establish by a preponderance of the evidence that dependent claims 14–29, 31, 33, 34, 36, 38, and 39 are rendered obvious over Baird and Baschirotto.

4. Baird and ST Datasheet, Alone or in Combination with Baschirotto

Petitioner argues that claims 1–13, 30, 32, 35, and 37 of the ’651 patent are rendered obvious over Baird and the ST Datasheet *and* claims 14–29, 31, 33, 34, 36, 38, and 39 of the ’651 patent are rendered obvious over Baird, Baschirotto, and the ST Datasheet. Pet. 55–59. Patent Owner disagrees. PO Resp. 40–57. In particular, our analysis focuses on Patent Owner’s contention that the ST Datasheet does not qualify as a prior art. *Id*. at 40–44.

a. ST Datasheet (Ex. 1005)

The ST Datasheet describes a TDA7522 Digital Servo and Decoder having a built in microcontroller. Ex. 1005, 1. The ST Datasheet is a twenty-three page document that contains the date of “May 1998” at the bottom of the first page. *Id*. Below the date is a statement that characterized the document as containing “*preliminary* information on a new product now in development. Details are subject to change without notice.” *Id*.

(emphasis added). On the last page of the document is a statement that the "[i]nformation furnished is believed to be accurate and reliable." *Id*. at 23. Additionally, the last page of the document states, "Specifications mentioned in this *publication* are subject to change without notice. This publication supersedes and replaces all information previously supplied." *Id*. (emphasis added).

b. Analysis

For a reference to be considered a "printed publication" so as to qualify as a prior art printed publication under 35 U.S.C. § 102, the reference must be shown to have been "sufficiently accessible to the public interested in the art" prior to the earliest effective filing date. *In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989).

> "Because there are many ways in which a reference may be disseminated to the interested public, 'public accessibility' has been called the touchstone in determining whether a reference constitutes a 'printed publication' bar under 35 U.S.C. § 102(b)." *In re Hall*, 781 F.2d 897, 898–99 (Fed. Cir. 1986). A reference will be considered publicly accessible if it was "disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it." *Kyocera Wireless Corp. v. Int'l Trade Comm'n*, 545 F.3d 1340, 1350 (Fed. Cir. 2008). Whether a reference qualifies as a printed publication is a legal conclusion based on underlying factual determinations. *In re Lister*, 583 F.3d 1307, 1311 (Fed. Cir. 2009).

Blue Calypso, LLC v. Groupon, Inc., Dkt. Nos. 2015-1391, 2015-1393, 2015-1394, slip op. at 28–29 (Fed. Cir. Mar. 1, 2016).

Petitioner argues in the alternative that the ST Datasheet discloses a digital signal processor, which, combined with the other cited prior art, renders the challenged claims obvious. Pet. 55–59 (citing Ex. 1005, 1, 7). According to Petitioner, the ST Datasheet qualifies as a printed publication under pre-AIA 35 U.S.C. § 102(b) with respect to the ’651 patent because the ST Datasheet “was published in May 1998 in the United States.” *Id.* at 55. In support of this alleged publication date, Petitioner relies upon the “May 1998” date on the front page of ST Datasheet, a Technical/Product Press Announcement (Ex. 1012) dated May 18, 1998, describing the TDA7522 Digital Servo and Decoder (Pet. 55), and the declaration testimony of Dr. Zech (Ex. 1006 ¶ 94). At institution, we determined that Petitioner provided sufficient evidence tending to show that the ST Datasheet was publicly available and accessible as of May 1998. Inst. Dec. 29–30.

In the Patent Owner Response, Patent Owner contends that the ST Datasheet “does not qualify as a prior art printed publication because there is no evidence to prove that it was made sufficiently accessible to the public” during “May 1998,” or at any time prior to the critical date of the ’651 patent. PO Resp. 40–41. According to Patent Owner, that date printed on the lower left portion of the datasheet “is inadequate on its face to demonstrate availability and accessibility to the public.” *Id*. at 41. With respect to the press announcement[6] (Ex. 1012), Patent Owner asserts, among other things, that the announcement also “does not provide any evidence to prove that the ST Datasheet was made sufficiently accessible to the public interested in the art before the critical date of the ’651 Patent.” *Id*. at 43. Rather, Patent Owner contends that the press announcement only suggests

[6] Ex. 1012 is printed from the Internet Archive’s “Wayback Machine.”

the availability of a purported *product*, i.e., the ST TDA 7522 chip, and not the availability or accessibility of the *document* at issue, i.e., ST Datasheet, on a particular date. *Id*. at 44.

In its Reply, Petitioner responds to Patent Owner's contention by asserting that the disclaimer information included at the end of the datasheet "is evidence of clear *intent* for the publisher to share the document with potential customers." Pet. Reply 17 (emphasis added). According to Petitioner, from this evidence along with the details of the datasheet itself (Ex. 1005) and the release of the product in May 1998 (Ex. 1012), it is clear that the ST Datasheet was available for interested parties to access well before the priority date of the '651 patent. *Id*. at 17–18.

After considering the admissible evidence and arguments,[7] we find that Patent Owner has challenged persuasively Petitioner's argument that the ST Datasheet was publicly accessible prior to the critical date. While the ST Datasheet contains a May 1998 date and refers to itself as a "publication," (*see* Ex. 1005, 23), this is at best circumstantial evidence of its publication, and the reference does not provide any definitive statement or identification that it was accessible to the public interested in the art in May 1998. At most, Petitioner has established that the version of ST Datasheet provided as Exhibit 1005 was *printed* in May 1998. In other words, the document represents a May 1998 version of the "preliminary information" compiled for the TDA7522 product that was in development. *See* Ex. 1005, 1 ("This is *preliminary* information of a new product *now in development*."

[7] *See infra* Section V (addressing the Motion to Exclude with respect to Exhibits 1015 and 1016).

(emphases added)). We also note that the ST Datasheet contains a statement that "[t]his publication supersedes and replaces all information previously supplied." *Id*. at 23. However, the ST Datasheet does not state or otherwise indicate to whom and under what circumstances information was "supplied," much less when.

Upon further consideration of the press announcement, dated May 18, 1998, describing the TDA7522 chipset (Ex. 1012), we agree with Patent Owner that the press announcement describes the availability of a *product*, i.e., the ST TDA 7522 chip, (*see* Ex. 1012, 1 ("a special version of the TDA 7522 is available")), but not the availability or accessibility of the *ST Datasheet* at that time. The press announcement does not refer to the ST Datasheet or mention that such information regarding the product was available.

Indeed, Petitioner's declarant, Dr. Zech, acknowledges that the press announcement refers only to the availability of the TDA7522 chip in May 1998. Ex. 1006 ¶ 94. Beyond that acknowledgement, Dr. Zech offers only conjecture stating that "it stands to *reason* that the ST Datasheet also was available in May 1998, as chip companies *typically* disseminate a datasheet when they introduce a new chip." *Id*. (emphases added). Dr. Zech, however, did not provide testimony or evidence to support that *reasoning*. Nor did Dr. Zech assert that he had knowledge specifically relating to ST Micro's business practices in 1998. Thus, we do not give persuasive weight to Dr. Zech's unsupported opinion regarding the possible availability of the ST Datasheet. *See* Office Patent Trial Practice Guide, 77 Fed. Reg. at 48,763 ("Affidavits expressing an opinion of an expert must disclose the underlying facts or data upon which the opinion is based. . . . Opinions expressed without disclosing the underlying facts or data may be given little or no weight.") (citations omitted).

Without more, for example, a declaration from a knowledgeable representative of ST Micro regarding the normal business practice in May 1998 of making datasheets available for download on or near the date provided on the publication, we do not find that Petitioner has supported adequately its contention that ST Micro made the ST Datasheet (Ex. 1005) available for download on its public website or otherwise publicly accessible, prior to the critical date. *See, e.g., In re Enhanced Security Research, LLC*, 739 F.3d 1347, 1354–55 (Fed. Cir. 2014) (finding dated manual was "publically-available" based, in part, upon the declaration of the Chief Executive Officer of the company that produced the product described in the manual averring that the version of the manual relied upon was accessible to public on the date inscribed on the manual).

A determination whether a particular reference qualifies as a printed publication "must be approached on a case-by-case basis." *Hall*, 781 F.2d at 899. In this case, based on the evidence and argument discussed above, we determine that Petitioner has not established that the ST Datasheet was publicly accessible prior to the critical date so as to render it a "printed publication" for the purposes of 35 U.S.C. § 102. Thus, Petitioner may not rely upon the teachings of the ST Datasheet in its challenges to the claims of the '651 patent.

Accordingly, Petitioner has not shown by a preponderance of the evidence that the challenged claims would have been obvious over the combination of Baird and the ST Datasheet or Baird, Baschirotto, and the ST

Datasheet, because the ST Datasheet is not available as prior art.

V. MOTION TO EXCLUDE

Patent Owner filed a Motion to Exclude, seeking to exclude Exhibits 1005, 1012, 1015, and 1016. Paper 27 ("Mot."). Petitioner filed an Opposition (Paper 30, "Opp.") to Patent Owner's Motion to Exclude, and Patent Owner filed a Reply to Petitioner's Opposition (Paper 31, "PO Reply"). In its motion, Patent Owner characterizes its challenge of Exhibit 1005 (the ST Datasheet) and Exhibit 1012 (the Press Announcement) as "lacking authentication, inadmissible hearsay, and/or irrelevant." Mot. 1. With regard to the authentication of Exhibits 1005 and 1012, we are persuaded that, considered in the light of circumstances here, the documents bear sufficient indicia of their sources that Petitioner has shown that it is reasonable to conclude that they are what they purport to be. Opp. 4–8; PO Reply 2. Although Patent Owner notes that Exhibit 1005 bears a trademark notice, rather than a copyright notice, trademarks identify the source of a product, and Patent Owner does not contend that the trademark notice here is improper. Opp. 4–5; PO Reply 2–3. To the extent that Patent Owner is questioning the date associated with the trademark notice, the significance of that date properly was addressed above.

With regard to Patent Owner's request to exclude Exhibit 1005 as hearsay, we note that Patent Owner does not contend that the "May 18, 1998" date does not appear on the document or that the document was not created or printed on or by that date. Mot. 7–8; Ex. 2009, 3. The fact that the document bears a date is not hearsay.

It is apparent from Patent Owner's arguments in support of its lack of authentication and hearsay contentions that the issues here relate instead to the sufficiency of the evidence with respect to whether Exhibits 1005 and 1012 establish that Exhibit 1005 qualifies as a "printed publication." *Id*. at 2 ("For example, there is *insufficient evidence* to support a finding that TOSH-1005 and TOSH-1012 are documents that were publicly available at the time Petitioner purports they were." (emphasis added)), 7 ("Indeed, there is no evidence demonstrating the circumstances regarding who, when, where, and how the ST Datasheet was made *sufficiently* accessible to the public interested in the art." (emphasis added)); Ex. 2009, 2–3; *see* Opp. 2–3. That issue properly was addressed in our analysis above, rather than in the context of a Motion to Exclude. Accordingly, we *deny* the Motion to Exclude with respect to Exhibits 1005 and 1012.

Petitioner submitted Exhibits 1015 and 1016 for the first time with its Reply Brief, without authorization. Petitioner describes Exhibit 1015 as a current STMicro webpage containing a link to a downloadable datasheet for a digital UV index sensor, i.e., "UNIS25." Pet. Reply 18. Petitioner describes Exhibit 1016 as an "Internet Archive screenshot of one of STMicro's websites as of December 4, 2000" purportedly displaying a list of downloadable ST Micro datasheets describing "Audio & Radio" products, including the datasheet for "part number 'TDA7522.'" *Id*. at 17. Exhibit 1016 includes a declaration by an employee at the Internet Archive stating that the screenshots submitted as Exhibit 1016 "are true and accurate copies of printouts of the Internet Archive's records of the HTML files for URLs and the dates specified in the footer of the printout." Ex. 1016, 1.

Petitioner admits that those exhibits were neither served nor filed under 37 C.F.R. § 42.64(b) in response to Patent Owner's evidentiary objections (*see* Ex. 2009 (serving objections to Exhibits 1005 and 1012 on Mar. 24, 2015); Ex. 2010 (serving objections to Exhibits 1015 and 1016 on Sept. 21, 2015)), nor filed under 37 C.F.R. § 42.123(b) as "supplemental information." Opp. 14–15. Instead, according to Petitioner, Exhibits 1015 and 1016 "were introduced for purposes of responding to Patent Owner's arguments in its Response (Paper 16) pursuant to 37 C.F.R. § 42.23." *Id*.

Petitioner's reliance on 37 C.F.R. § 42.23 as justification for submitting evidence not initially part of the record is misplaced. Section 42.23(b) states that "[a] reply may only respond to arguments raised in the corresponding opposition or patent owner response." That Rule, however, does not authorize or otherwise provide a means for supplementing the evidence of record. As explained in the Office Patent Trial Practice Guide, "a reply that … belatedly presents evidence will not be considered and may be returned." 77 Fed. Reg. at 48,767.

An *inter partes* review is subject to strict statutory deadlines at both the institution stage and at the final decision. 35 U.S.C. §§ 314(b), 316(a)(11). Unnecessary delay in the presentation of arguments or evidence by either party impedes the Board in fulfilling its mandate "to secure a just, speedy, and inexpensive resolution of every proceeding." 37 C.F.R. § 42.1(b); *see Redline Detection, LLC v. Star Envirotech, Inc.*, 811 F.3d 435, 445 (Fed Cir. 2015) ("The guiding principle for the PTAB in making any determination is to 'ensure efficient administration of the Office and the ability of the Office to complete IPR proceedings in a timely manner.'" (citations omitted)). The Petition represents Petitioner's case-in-chief, and Petitioner is tasked with presenting the evidence, upon which Petitioner relies in support of its challenges to Patent Owner's claims in its Petition. 35

U.S.C. § 312(a)(3); *see* 37 C.F.R. § 42.104(b)(5).

Nevertheless, our Rules expressly provide procedures for introducing supplemental evidence or supplemental information into a proceeding. *See* 37 C.F.R. §§ 42.64(b)(2) (supplemental evidence), 42.123(a)–(c) (supplemental information). Petitioner was aware of Patent Owner's challenge to the public accessibility of the ST Datasheet by at least December 11, 2014, the filing date of the Preliminary Response (*see* Prelim. Resp. 19–23), and certainly by no later than March 24, 2015, the service date of Exhibit 2009, noting objections to Exhibits 1005 and 1012. Although Petitioner was aware early on of the possible need for such supplemental evidence or information in this proceeding, Petitioner made no apparent effort to take advantage of the available procedures. *See Avocent Huntsville Corp. v. Cyber Switching Patents, LLC*, Case IPR2015-00690, slip op. at 5–7 (PTAB Oct. 2, 2015) (Paper 28) ("Supplemental evidence, served in response to an evidentiary objection, is offered solely to support admissibility of the originally filed evidence and to defeat a motion to exclude that evidence, and not to support any argument on the merits (i.e., regarding the patentability or unpatentability of a claim)."); *Palo Alto Networks, Inc. v. Juniper Networks, Inc.*, Case IPR2013-00369, slip op. at 2–3 (PTAB Feb. 5, 2014) (Paper 37) (granting a motion to submit supplemental information regarding public accessibility of references serving as a basis for instituted grounds). Petitioner does not contend that Exhibit 1015 or 1016 was not available to Petitioner prior to the filing of Petitioner's Reply (Opp. 14–15; *see* Pet. Reply 17–19 (discussing Exhibits 1015 and 1016)), and Petitioner has not provided any other persuasive explanation for the undue delay in submitting Exhibits 1015 and 1016.

Accordingly, we *grant* Patent Owner's Motion to Exclude with respect to Exhibits 1015 and 1016. Therefore, we exclude Exhibits 1015 and 1015, and we do not consider those exhibits, or the arguments in the Reply Brief addressing those exhibits, in this proceeding.

VI. CONCLUSIONS

For reasons stated above, we conclude that

1. Petitioner has not established by a preponderance of the evidence that independent claims 1, 5, 9, and 13 of the '651 patent are anticipated by Baird, and, consequently, Petitioner has not established by a preponderance of the evidence that any of the challenged dependent claims of the '651 patent are anticipated by Baird or rendered obvious over Baird and Baschirotto; and

2. Petitioner has not established that the ST Datasheet was publicly accessible prior to the critical date of the '651 patent; and, consequently, Petitioner has not established by a preponderance of the evidence that any of the challenged claims of the '651 patent are rendered obvious over Baird and ST Datasheet, alone or in combination with Baschirotto.

VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner's request for cancellation of claims 1–39 of the '651 patent is *denied*;

FURTHER ORDERED that Patent Owner's Motion to Exclude is *denied* with respect to Exhibits 1005 and 1012;

FURTHER ORDERED that Patent Owner's Motion to Exclude is *granted* with respect to Exhibits 1015 and 1016; 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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