

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
SAMSUNG ELECTRONICS AMERICA, INC., and
SAMSUNG SEMICONDUCTOR, INC.,
Petitioner,

v.

IMPERIUM (IP) HOLDINGS,
Patent Owner.

Case IPR2015-01233
Patent 6,836,290 B1

Before JAMES B. ARPIN, BART A. GERSTENBLITH, and
CHARLES J. BOUDREAU, *Administrative Patent Judges*.

BOUDREAU, *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, Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., and Samsung Semiconductor, Inc. (collectively, “Samsung”) challenge the patentability of claims 1 and 10 of U.S. Patent No. 6,836,290 B1 (Ex. 1001, “the ’290 patent”), owned by Imperium (IP) Holdings (“Imperium”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. We base our decision on the preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

Having reviewed the arguments of the parties and the supporting evidence, we conclude that Samsung has demonstrated by a preponderance of the evidence that the challenged claims are unpatentable.

A. Procedural History

Samsung filed a Petition for *inter partes* review of claims 1 and 10 of the ’290 patent. Paper 4 (“Pet.”). Imperium filed a Preliminary Response. Paper 13 (“Prelim. Resp.”). We instituted an *inter partes* review of both challenged claims of the ’290 patent on certain of the asserted grounds of unpatentability. Paper 14 (“Dec. on Inst.”). After institution, Imperium filed a Patent Owner Response, Paper 22 (“PO Resp.”), and Samsung filed a Reply to the Patent Owner Response, Paper 29 (“Pet. Reply”). A hearing for the instant proceeding and related Case IPR2015-01232 was held on September 1, 2016. A transcript of the hearing has been entered into the record. Paper 50 (“Tr.”).

B. The '290 Patent

The '290 patent, titled “Combined Single-Ended and Differential Signaling Interface,” issued December 28, 2004, from U.S. Patent Application No. 09/302,090 (Ex. 1002, 24–50; “the '090 application”), filed April 29, 1999, as a continuation-in-part of U.S. Patent Application No. 09/062,343 (Ex. 1003, 32–46; “the '343 application”), filed April 17, 1998. Ex. 1001, at [21], [22], [45], [54], [63]. In the Petition, Samsung contended that the challenged claims are not entitled to the filing date of the '343 application because, “*inter alia*, the ['343 application] does not disclose a data interface circuit that is selectable between a single-ended interface output and a differential interface output, as required by the Claims.”

Pet. 12. Samsung’s arguments are persuasive. Indeed, although Imperium stated in both the Preliminary Response and its Patent Owner Response that the '290 patent “claims priority to and the benefit of” the '343 application (Prelim. Resp. 3; PO Resp. 3), Imperium does not make any showing in either paper of the challenged claims’ entitlement to benefit of the '343 application’s filing date. Accordingly, we do not accord the challenged claims a filing date any earlier than the April 29, 1999, filing date of the '090 application. *See, e.g., Polaris Wireless, Inc. v. TruePosition, Inc.*, Case IPR2013-00323, slip op. at 29 (PTAB Nov. 15, 2013) (Paper 9) (explaining that a patent is “not presumed to be entitled to the earlier filing dates of ancestral applications which do not share the same disclosure”; and once the issue of priority has been raised by a petitioner, a patent owner “has to make a sufficient showing of entitlement to earlier filing date or dates, in a manner that is commensurate in scope with the specific points and contentions raised” by the petitioner); *Liberty Mut. Ins. Co. v. Progressive*

Cas. Ins. Co., Case CBM2013-00009, slip op. at 18 (PTAB Mar. 28, 2013) (Paper 10) (explaining that although the burden of proof on the ultimate issue of unpatentability stays with a petitioner, entitlement to a priority date for any claim is a matter for which a patent owner bears the burden of proof).

According to the '290 patent, “[t]he . . . invention relates generally to the field of interface circuits, and more particularly, to interface circuitry for providing selectable single-ended and differential signal output from a [complementary metal-oxide semiconductor (CMOS)] image sensor to an external digital signal processor.” Ex. 1001, 1:11–15. The '290 patent explains that single-ended interfaces were “the most common and simplest implementation for data transfer,” and that “[t]he single-ended interface provides compatibility with many existing external devices.” *Id.* at 1:27–28, 3:24–25. The '290 patent states that differential interfaces also were known, and that, for example, conventional low voltage differential signaling (LVDS) technology “saves power in several important ways,” but that “existing image processing devices may only support the common single-ended interface . . . and not the differential interface.” *Id.* at 1:35–55, 2:38–42. According to the '290 patent, “[it] is possible to place both interfaces on the imager in order to support both types of companion chips [i.e., chips that receive single-ended and differential signals], but this would add pins and cost.” *Id.* at 2:42–44. The '290 patent seeks to solve this problem by providing a data interface for CMOS imagers that can be “either a single-ended interface or a differential interface,” providing compatibility with many existing external devices while also allowing a lower noise and a lower power interface for external devices that can support a differential

signal. *Id.* at 3:22–28, 4:3–4. According to the '290 patent, moreover, the “combined single-ended and differential signal interface does not increase the number of pins required for a single-ended only interface.” *Id.* at 3:28–30. Figure 5 of the '290 patent, reproduced below, is illustrative of an interface of the '290 patent.

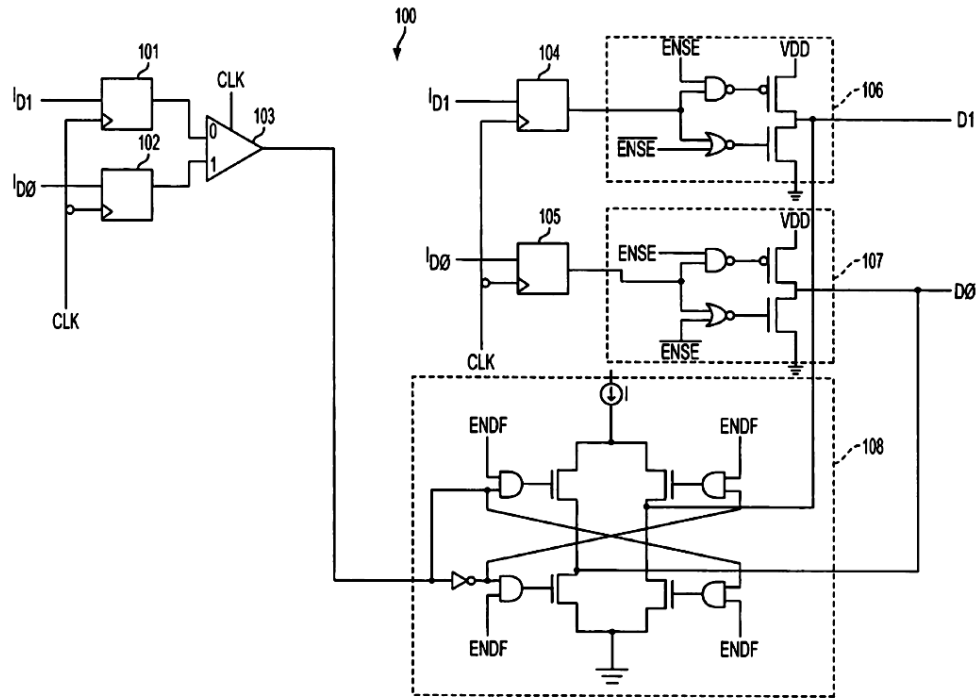


FIG. 5

Figure 5 is a schematic diagram of one embodiment of the invention of the '290 patent. *Id.* at 3:55–56, 4:4–6.

According to the '290 patent, circuit 100 in Figure 5 is selectable to provide either a single-ended output or a differential output. *Id.* at 4:6–8. If a single-ended output is desired, signal “ENSE” is enabled; and, if a differential output is desired, signal “ENDF” is enabled. *Id.* at 4:8–10. For single-ended operation, internal digitized signals I_{D0} and I_{D1} are clocked through flip-flops 104 and 105, and single-ended output drivers 106 and 107 drive the output signal lines. *Id.* at 4:22–25. Single-ended outputs $D0$ and

D1, thus, are provided to the companion chip or other off-chip circuitry. *Id.* at 4:25–26. Differential circuitry 108 is not enabled, and, thus, does not interfere with the single-ended operation. *Id.* at 4:26–28.

When a differential output is desired, differential circuitry 108 is instead enabled, and single-ended circuitry (i.e., output drivers 106 and 107) is disabled. *Id.* at 4:30–32. Internal digitized signals I_{D0} and I_{D1} are clocked through flip-flops 101 and 102 and multiplexer 103, such that, on a rising clock edge, one signal is selected, and on a falling clock edge, the other signal is selected. *Id.* at 4:38–41. The output of multiplexer 103 is provided to differential interface circuitry 108 to produce both the normal output and the complement output signal. *Id.* at 4:41–44.

C. Related Matters

The parties identify two district court proceedings in which the '290 patent has been asserted: *Imperium IP Holdings (Cayman), Ltd. v. Samsung Electronics Co.*, 4:14-cv-00371 (E.D. Tex.) (filed June 9, 2014), and *Imperium IP Holdings (Cayman), Ltd. v. Samsung Techwin Co.*, 4:15-cv-00026 (E.D. Tex.) (filed Jan. 9, 2015). *See* Pet. 4; Paper 12, 1.

D. The Challenged Claims

Challenged claims 1 and 10 are reproduced below:

1. A data interface circuit comprising:
 - a first single-ended interface connected to a first signal output line;
 - a second single-ended interface connected to a second signal output line; and a differential interface having a normal signal output connected to the first output line and a complementary signal output connected to the second signal output line;wherein an output of the data interface circuit is selectable between a single-ended interface output and a differential interface output.

Ex. 1001, 5:6–18.

10. A CMOS imaging apparatus comprising:
 - a CMOS image sensor, the sensor having a data interface circuit comprising:
 - a first single-ended interface connected to a first signal output line;
 - a second single-ended interface connected to a second signal output line; and
 - a differential interface having a normal signal output connected to the first output line and a complementary signal output connected to the second signal output line;wherein an output of the data interface circuit is selectable between a single-ended interface output and a differential interface output; and
 - an image processor connected to the CMOS image sensor to receive the signals output by the data interface circuit.

Id. at 5:45–6:6.

E. Instituted Grounds of Unpatentability

We instituted an *inter partes* review of claims 1 and 10 of the '290 patent on the following grounds:

Reference(s)	Basis	Challenged Claim
Roe ¹	35 U.S.C. § 102(e)	1
Toshiba ²	35 U.S.C. § 102(b)	1
Umeda ³ and Roe	35 U.S.C. § 103(a)	10
Umeda and Toshiba	35 U.S.C. § 103(a)	10
Sears ⁴ and Roe	35 U.S.C. § 103(a)	10
Sears and Toshiba	35 U.S.C. § 103(a)	10

II. DISCUSSION

A. Claim Construction

In an *inter partes* review, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (holding that 37 C.F.R. § 42.100(b) “represents a reasonable exercise of the

¹ U.S. Patent No. 5,929,655, issued July 27, 1999 (filed Mar. 25, 1997) (Ex. 1004, “Roe”).

² Certified English-language translation of Japanese Laid-Open Application H09-006592 A, published Jan. 10, 1997 (Ex. 1005, “Toshiba”).

³ U.S. Patent No. 6,452,632 B1, issued Sept. 17, 2002 (filed Jan. 30, 1998) (Ex. 1006, “Umeda”).

⁴ U.S. Patent No. 6,115,482, issued Sept. 5, 2000 (filed Oct. 22, 1998) (Ex. 1007, “Sears”).

rulemaking authority that Congress delegated to the Patent Office”). Under that standard, a claim term generally is given its ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). An inventor may provide a meaning for a term that is different from its ordinary meaning, but any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

In our Decision on Institution, we concluded on the record then before us that it was not necessary for our determination of whether to institute *inter partes* review to interpret expressly any terms of the challenged claims. Dec. on Inst. 9. Based on the parties’ arguments in post-institution briefing, we provide the following additional discussion.

1. Terms Construed in District Court Litigation

In the Petition, Samsung related that the parties had proposed the following constructions for certain terms in the related *Imperium v. Samsung Electronics* District Court litigation:

Term	Samsung’s Proposed Construction	Imperium’s Proposed Construction
“single-ended interface” (claims 1 and 10)	“an interface that uses a single line to transmit a signal” (parties agreed)	
“differential interface” (claims 1 and 10)	“an interface that uses two lines to communicate a signal” (parties agreed)	

Term	Samsung’s Proposed Construction	Imperium’s Proposed Construction
“wherein an output of the data interface circuit is selectable between a single-ended interface output and a differential interface output” (claims 1 and 10)	“wherein either the single-ended interfaces or the differential interface can be selected to output data from the data interface circuit”	“a single-ended interface output or a differential interface output can be chosen”
“the sensor having a data interface circuit” (claim 10)	“the CMOS image sensor including a circuit that communicates image data”	“the CMOS image sensor has a data interface circuit”
“an image processor connected to the CMOS image sensor to receive the signals output by the data interface circuit” (claim 10)	“a processor connected to the CMOS image sensor for processing image data received from the single-ended and the differential interfaces”	[plain and ordinary meaning applies]

Pet. 13–16. Samsung asserted, however, that the proposed constructions do not impact the analysis in this proceeding, because, according to Samsung, the prior art presented herein renders the claims unpatentable under either the broadest reasonable construction standard under 37 C.F.R. § 42.100(b) or the potentially narrower constructions proposed in litigation under the claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). *Id.* at 13–14.

As reported by Imperium (PO Resp. 10–15), the district court (1) accepted the parties’ agreed-upon constructions of the phrases “single-ended interface” and “differential interface,” set forth above (Ex. 2002 (claim construction order), 8–9); (2) construed the phrase “wherein an output of the data interface circuit is selectable between a single-ended interface

output and a differential interface output” to have its plain meaning, after “expressly reject[ing Samsung’s] proposal of referring to selection of an interface” (*id.* at 11–12); (3) construed “the sensor having a data interface circuit” to mean “the CMOS image sensor has a circuit that communicates image data signals,” “with the . . . understanding that the data interface circuit need not be restricted to communicating *only* image data” (*id.* at 14–16); and (4) adopted Samsung’s proposed construction of “an image processor connected to the CMOS image sensor . . . ,” further explaining that “although an ‘image processor’ might perhaps process signals *in addition to* image data signals, an ‘image processor’ must *at least* process image data signals,” that the “image processor” need not necessarily be a distinct hardware component, and that the court rejected as lacking adequate support any argument that the “image processor” limitation is not met by an appropriately configured, general-purpose processor (*id.* at 17–18).

In its Patent Owner Response, Imperium urges us to reject Samsung’s interpretation of the “wherein an output . . . is selectable . . .” element “to refer to selection of an ‘interface,’ rather than to more specific selection of ‘an output,’ for similar reasons reached by the District Court” (PO Resp. 14), and to use the district court’s constructions with respect to the “the sensor having a data interface circuit” and “an image processor connected to the CMOS image sensor . . .” elements (*id.* at 14–15).

Having considered the parties’ arguments, we again determine that it is not necessary to interpret expressly any of the above terms presented to the district court for construction. *See Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy.’” (quoting

Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999))).

2. “*interface*”

As set forth above, the district court adopted the parties’ agreed constructions of “single-ended interface” and “differential interface.” Ex. 2002, 8–9. Although the “interface” term within those phrases was not itself construed by the district court, Imperium contends that “[t]he proper interpretation of this term . . . confirms that neither Roe nor Toshiba disclose[s] each ‘interface’ as recited in [claims 1 and 10].” PO Resp. 11. Relying on testimony of its declarant, Dr. Wright, Imperium asserts that “a data interface circuit performs a data interfacing function, and a data interfacing function must be performed in accordance with a protocol that is recognized and implemented by both the transmitting device and the receiving device.” *Id.* (citing Ex. 2008 (Wright Declaration) ¶ 35). According to Imperium, “[w]ithout such a protocol, a conventional input/output circuit, as in Roe, may transmit data, or may provide output data signals at a generic output pad or pin . . . [b]ut . . . does not serve as a data interface without a data interfacing scheme.” *Id.* (citing Ex. 2008 ¶ 45). Imperium further contends that the claimed “interface” also “should be distinguished from a ‘buffer circuit’ . . . as in Toshiba.” *Id.* at 12 (citing Ex. 2008 ¶ 60). According to Imperium, a “buffer circuit is a lower-level logical building block of a larger integrated circuit, while an interface (and a data interface circuit) is a higher-level circuit with subcomponents that may (but need not) include buffer circuits.” *Id.* (citing Ex. 2008 ¶ 60). Imperium concludes,

While it is not necessary for the Board to adopt a specific construction of “interface” for the purpose of this [*inter partes* review], it should be recognized in the analysis of the substantive challenges that neither Roe’s [input/output] circuit nor Toshiba’s buffer circuit disclose[s] or even suggest[s] each “interface” as required and claimed by claims 1 and 10

Id.

In its Reply, Samsung responds that “[t]here is nothing in the intrinsic or extrinsic evidence to support” Imperium’s and Dr. Wright’s requirements that an “interface” “function according to a protocol or data interfacing scheme; and be a ‘higher-level circuit’ (as distinguished from a ‘lower-level logical building block’).” Pet. Reply 2 (citations and emphasis omitted) (citing PO Resp. 11–12, 19–22, 24–25; Ex. 1040 (Wright Deposition Transcript), 55:6–25, 57:8–17). Citing definitions from two technical dictionaries and the testimony of its declarant, Dr. Baker, Samsung asserts that “interface” instead should be construed as “a connection used for communicating signals between two or more electrical components.” *Id.* at 2, 6 (emphasis omitted) (citing Ex. 1008 (First Baker Declaration) ¶ 36; Ex. 1041 (Second Baker Declaration) ¶¶ 19–28; Ex. 1042, 4 (excerpt from Modern Dictionary of Electronics); Ex. 1043, 4 (excerpt from McGraw-Hill Dictionary of Scientific and Technical Terms)). Samsung contends “[t]he claims, specification and prosecution do not use the term ‘protocol’ (or its equivalent) and do not describe, imply or suggest that an interface must function according to a protocol.” *Id.* at 3 (citing Ex. 1041 ¶¶ 8–10, 20, 21). While Dr. Wright relies on a discussion in the specification of “[s]etting the data transfer width to the word width” as supporting a “protocol” requirement, Samsung contends that discussion “relates to the amount of data the interface is capable of transmitting, rather than defining an interface

to function according to a protocol.” *Id.* (citing Ex. 1001, 4:57–61; Ex. 1041 ¶ 10; Ex. 2008 ¶ 35). Moreover, Samsung contends, dependent claims 8, 9, 15, and 16 of the ’290 patent require setting the word width, so that requirement cannot be read into “interface” in independent claims 1 and 10, from which those claims indirectly depend. *Id.* (citing *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004) (“[W]here the limitation that is sought to be ‘read into’ an independent claim already appears in a dependent claim, the doctrine of claim differentiation is at its strongest.”)). Regarding Imperium’s assertion that an interface is a “higher-level circuit,” Samsung contends that the term “higher-level circuit” is “subjective and undefined” and is unsupported by both the intrinsic and extrinsic evidence. *Id.* at 4–5 (citing Ex. 1001, 5:5–18, 5:45–67; Ex. 1040, 57:18–59:21, 61:20–64:1, 67:14–22; Ex. 1041 ¶¶ 13–15; Ex. 2008 ¶ 60).

Having considered the parties’ arguments, we agree with Samsung that the broadest reasonable interpretation of “interface” in light of the specification of the ’290 patent is “a connection used for communicating signals between two or more electrical components,” and we expressly decline to read into claims 1 and 10 requirements that the recited interfaces (1) must perform a data interfacing function “in accordance with a protocol that is recognized and implemented by both the transmitting device and the receiving device” and (2) necessarily must be “higher-level circuits,” as Imperium suggests. *Id.* at 2, 6–8; PO Resp. 12–13; *see Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 950 (Fed. Cir. 1993) (“It is improper for a court to add ‘extraneous’ limitations to a claim, that is, limitations added ‘wholly apart from any need to interpret what the patentee meant by

particular words or phrases in the claim.’” (quoting *E.I. du Pont de Nemours & Co. v. Phillips Petroleum Co.*, 849 F.2d 1430, 1433 (Fed. Cir. 1988))).

B. Principles of Law

To prevail in challenging the claims of the ’290 patent, Samsung must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

1. Anticipation

“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., Inc. v. Union Oil Co. of Cal.*, 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 *In re Arkley*, 455 F.2d 586, 587 (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. Obviousness

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;⁵ and (4) objective evidence of nonobviousness, i.e., secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

C. Asserted Grounds of Unpatentability

We have reviewed Samsung’s Petition, Imperium’s Patent Owner Response, and Samsung’s Reply, as well as the relevant evidence discussed therein. For the reasons that follow, we determine Samsung has shown by a preponderance of the evidence that claims 1 and 10 are unpatentable on the instituted grounds.

1. Anticipation of Claim 1 by Roe

a. Overview of Roe

Roe is directed to “dual-purpose I/O circuits” that “can be configured to support either one, or both, single-ended and differential I/O signaling modes.” Ex. 1004, 3:38–43. According to Roe, the disclosed circuits “can be used for any integrated circuit that requires the inputting and outputting of signals.” *Id.* at 3:46–49. Figure 2c of Roe is reproduced below.

⁵ See *infra* Section II.C.3.b.

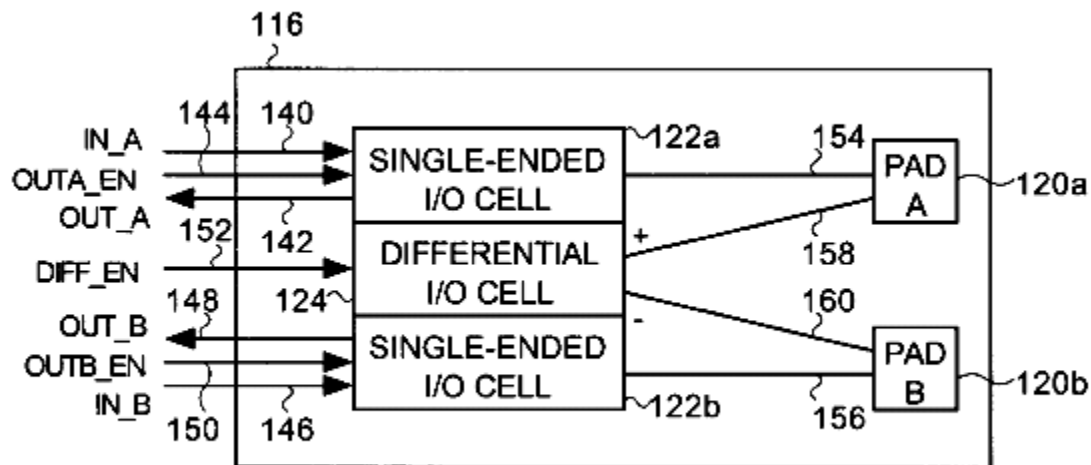


FIGURE 2c

Figure 2c is a block diagram of a dual-purpose I/O circuit, designated 116, in accordance with one embodiment of Roe's invention. *Id.* at 5:11–13, 6:49–51. Circuit 116 includes, among other elements, first single-ended I/O cell 122a, second single-ended I/O cell 122b, and differential I/O cell 124. *Id.* at 6:49–54. According to Roe, “[f]irst single-ended I/O cell 122a is arranged to transfer a first I/O signal between first conducting pad 120a (via line 154), and an input line IN_A 140 and an output line OUT_A 142 which are coupled to primary circuit 114”; “second single-ended I/O cell 122b is arranged to transfer a second I/O signal between second conducting pad 120b (via line 156), and an input line IN_B 146 and an output line OUT_B 148 which are coupled to primary circuit 114”; and “[d]ifferential I/O cell 124 is coupled to first single-ended I/O cell 122a, second single-ended I/O cell 122b, first conducting pad 120a (via line 158), and second conducting pad 120b (via line 160).” *Id.* at 6:55–7:8. Differential I/O cell 124 is “coupled to receive an enable signal over control signal line DIFF_EN 152 which enables and disables differential I/O cell 124” and also receives “enable signals . . . [that] establish the direction of one or more

differential I/O signals (i.e., input or output) in relationship to integrated circuit 110.” *Id.* at 7:8–15.

b. Discussion

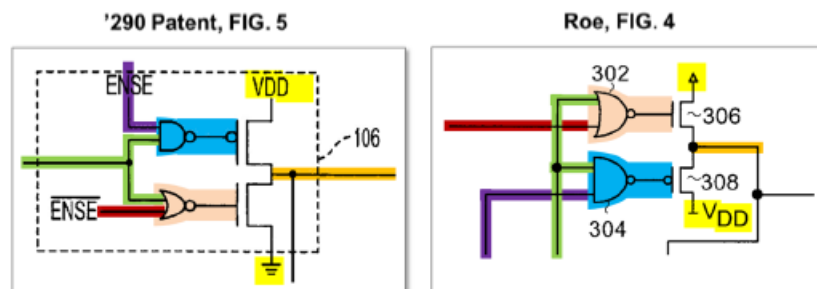
In the Petition, Samsung contends that Roe’s dual-purpose I/O circuit 116 is “[a] data interface circuit” comprising “a first single-ended interface connected to a first signal output line” (i.e., first single-ended I/O cell 122a, connected to first conducting pad 120a via line 154), “a second single-ended interface connected to a second signal output line” (second single-ended I/O cell 122b, connected to second conducting pad 120b via line 156), and “a differential interface having a normal signal output connected to the first output line and a complementary signal output connected to the second signal output line” (differential I/O cell 124 connected to pads 120a and 120b, respectively, via lines 158 and 160). Pet. 18–23 (citing Ex. 1004, 3:38–60, 5:15–17, 6:49–7:20, 7:65–8:34, Figs. 2c, 3). Samsung further contends that Roe discloses “wherein an output of the data interface circuit is selectable between a single-ended interface output and a differential interface output.” *Id.* at 23. In particular, Samsung contends, I/O signal outputted from conducting pads 120a or 120b is selectable, via enable/disable signal DIFF_EN, between “a single-ended interface output” (e.g., outputs from output buffers 202 and 204, respectively, of single-ended I/O cells 122a and 122b) and “a differential interface output” (e.g., output from differential output buffer 210 of differential I/O cell 124). *Id.* at 23–25 (citing Ex. 1004, at [57], 5:15–17, 5:46–53, 7:16–24, 8:6–41, Table 1, Figs. 2c, 3).

In its Response, Imperium argues that Roe does not characterize or describe Figure 2c (depicting dual-purpose I/O circuit 116) as an “interface.”

PO Resp. 16. Further, Imperium contends, “[w]hile Roe characterizes Fig. 2a as ‘a block diagram illustrating an improved interface,’ Roe is careful to refer to each circuit shown in Figs. 2c, 3, and 4 as an ‘I/O circuit.’” *Id.* at 19 (citing Ex. 1004, 5:12–20). Referring to its arguments concerning the construction of the term “interface,” discussed in Section II.A.2 *supra*, Imperium asserts that, whereas “claims 1 and 10, when properly construed, require a ‘data interface circuit’ including at least two single-ended interfaces and a differential interface, which are selectable” (*id.* (citing claims 1 and 10)), “an I/O circuit is not an ‘interface,’ and Roe’s I/O circuit does not disclose data interfacing features” (*id.*). Further, according to Imperium, a person of ordinary skill in the art would understand that “an interface is designed with a receiving end in mind” and that “a data interface circuit with switchable modes such as that claimed in the ’290 patent could not function properly without matching the output of a single-ended transmitter with a single-ended receiver, and matching the output of a differential transmitter with a differential receiver.” *Id.* at 20. Imperium further contends, “it is clear that Roe does not describe sending selection signals to any components on the downstream/receive-side of the output lines,” and “within the confines of Roe, it is the dual-purpose I/O circuit inside the primary interface—but not the primary interface itself—that has selectable single-ended and differential components.” *Id.* at 21 (citing Ex. 1004, 4:5–29, 7:51–64, 12:16–17; Ex. 2008 ¶¶ 46, 52).

In its Reply, Samsung responds that an “interface” does not require “a protocol, a data interfacing scheme or data interfacing features,” but is “a connection used for communicating signals between two or more electrical components.” Pet. Reply 9–10. Samsung contends that the fact that Roe

calls the disclosed components I/O circuits, cells, and buffers “is of no consequence,” as a person of ordinary skill in the art would understand that I/O circuits, cells, and buffers are commonly used as interfaces. *Id.* at 10 (citing Ex. 1041 ¶¶ 35–41). Samsung additionally cites several patents and a textbook that it alleges confirm that buffers can serve as interfaces. *Id.* (citing Ex. 1036 (U.S. Patent No. 5,761,244), 1:45–55, 3:44–45; Ex. 1037 (excerpts from Godse et al., Digital Systems, 2005), 3–5; Ex. 1039 (U.S. Patent No. 5,977,796), 1:5–9, 1:46–51). Indeed, Samsung argues, “the ’290[patent]’s single-ended interface and Roe’s single-ended I/O buffer are *identical*.” *Id.* (citing Ex. 1041 ¶¶ 50–51). In support of that argument, Samsung provides the following illustration:



The above illustration is a side-by-side comparison of single-ended circuitry 106, as depicted in Figure 5 of the ’290 patent, with the circuitry of single-ended I/O buffer 202, as depicted in Figure 4 of Roe, with color coding added by Samsung to show corresponding components. *Id.* at 11. Lastly, Samsung argues that Roe does disclose that dual-purpose I/O circuit 116 operates in accordance with a protocol to allow communication between internal circuits and external components, and incorporates by reference the IEEE-1394 standard. *Id.* at 13–14 (citing Ex. 1004, 1:62–64, 5:64–7:51, Figs. 2a–2c; Ex. 1041 ¶¶ 53–57).

We are persuaded by Samsung's arguments and evidence presented in the Petition that Roe's dual-purpose I/O circuit discloses the "data interface circuit" of claim 1 of the '290 patent, including single-ended and differential interfaces with selectable outputs arranged as set forth in claim 1, and neither Imperium's arguments nor its cited evidence persuade us otherwise. *See* Pet. 17–25; PO Resp. 16–22. As stated in Section II.A.2 *supra*, we agree with Samsung that the broadest reasonable interpretation of the term "interface," as recited in claim 1 of the '290 patent, is "a connection used for communicating signals between two or more electrical components," and we do not read into claim 1 any requirement that the recited interfaces must be a "higher-level circuit" that performs a data interfacing function in accordance with any particular protocol. Accordingly, we are not persuaded by Imperium's arguments or Dr. Wright's testimony that Roe's I/O circuits are not "interfaces" within the meaning of claim 1. PO Resp. 16–20. We also agree with Samsung that claim 1 does not require sending the selected mode to a downstream receiver. Pet. Reply 12. Accordingly, we are not persuaded by Imperium's argument that Roe does not describe "sending selection signals to any components on the downstream/receive-side of the output lines." PO Resp. 21. Additionally, because we understand Samsung to rely on Roe's "dual-purpose I/O circuit" to disclose the claimed "data interface circuit" (*see* Pet. Reply 12), we are not persuaded by Imperium's argument that Roe's "primary interface itself" does not have selectable single-ended and differential components (PO Resp. 21).

c. Conclusion

For the foregoing reasons, we conclude that Samsung has shown by a preponderance of the evidence that claim 1 is anticipated by Roe.

2. *Anticipation of Claim 1 by Toshiba*

a. *Overview of Toshiba*

Toshiba is directed to a semiconductor integrated circuit comprising an I/O circuit for interfacing “with the outside,” such as, for example, with external peripheral large-scale integration (LSI) devices. Ex. 1005 ¶¶ 1–4. Toshiba discloses that improvements in the internal frequencies of semiconductor integrated circuits had required that I/O circuits also be made faster, and, therefore, differential interfaces capable of higher processing speeds than single-ended interfaces had come into use. *Id.* ¶ 5. According to Toshiba, however, “only one type of signal transmission mode interface could be provided in a conventional semiconductor integrated circuit,” limiting the peripheral LSIs capable of being connected. *Id.* ¶ 6. It was, accordingly, an object of Toshiba’s invention to provide a semiconductor integrated circuit capable of selectively using a differential interface and a single-ended interface without changing boards, making it possible to broaden peripheral LSI options. *Id.* ¶ 7; *see also id.* at [57].

According to Toshiba, one feature of the disclosed apparatus is an interface circuit having, among other components, “an output buffer selection circuit for outputting an output buffer selection signal in accordance with either a differential transmission mode or a single-ended . . . transmission mode for the data outputted from the semiconductor integrated circuit.” *Id.* ¶ 11. Figure 2 of Toshiba, reproduced below, is illustrative.

【図2】

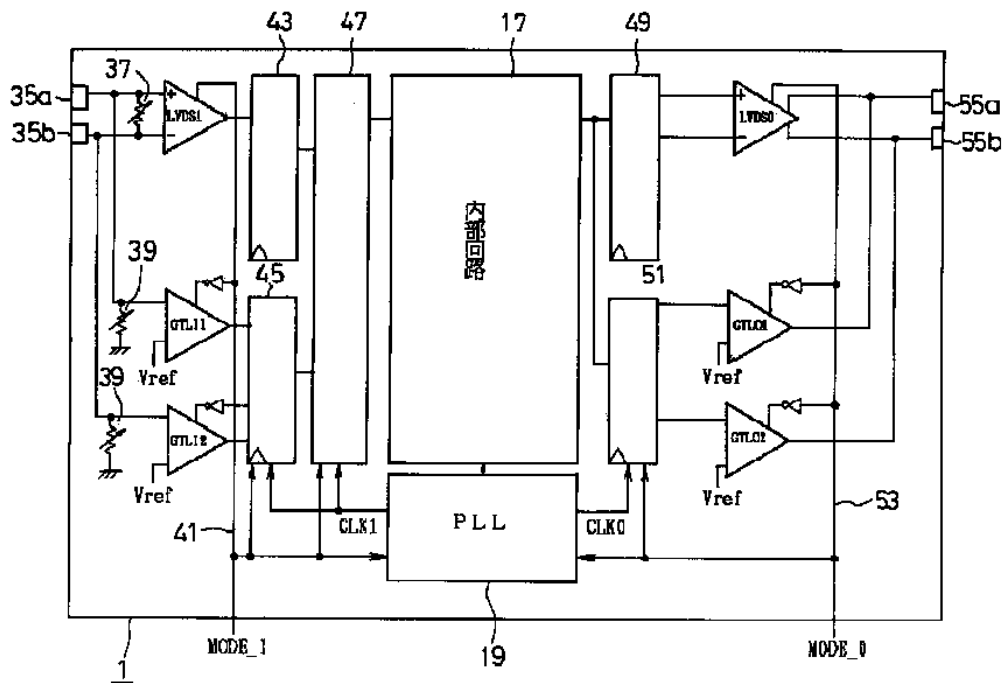


Figure 2 is described as an illustration of a semiconductor integrated circuit of Toshiba's invention. *Id.* ¶ 41 (Brief Explanation of the Drawings). As shown in Figure 2, the output buffer selecting signal, labeled as MODE_O, permits selection between differential output from a low voltage differential signaling (LVDS) interface (i.e., LVDS(O), when MODE_O = 1) and single-ended outputs from first and second gunning transceiver logic (GTL) interfaces (i.e., GTLs (O1) and (O2), when MODE_O = 0) to signal output pads 55a and 55b via output buffer selection signal line 53. *Id.* ¶¶ 31–32. According to Toshiba, the ability “to selectively utilize the mode of the data to be outputted to the outside, whether it be the differential transmission mode or the [single-ended] transmission mode, while maintaining the data transfer rate as-is” makes it possible to provide a semiconductor integrated circuit “with a wide range of uses and applications independent of the peripheral LSI.” *Id.* ¶ 16.

b. Discussion

In the Petition, Samsung contends that the I/O circuit of semiconductor integrated circuit 1, as shown in Figure 2 of Toshiba, is “[a] data interface circuit” comprising “a first single-ended interface connected to a first signal output line” (i.e., output buffer GTL(O1) is connected to signal output pad 55a through a first signal output line), “a second single-ended interface connected to a second signal output line” (output buffer GTL(O2) is connected to signal output pad 55b through a second signal output line), and “a differential interface having a normal signal output connected to the first output line and a complementary signal output connected to the second signal output line” (LVDS(O) is connected to signal output pads 55a and 55b). Pet. 26–29 (citing Ex. 1005 ¶¶ 1, 4, 5, 15, 16, 23, 24, 31, 38, 39, Fig. 2). Samsung further contends that Toshiba discloses “wherein an output of the data interface circuit is selectable between a single-ended interface output and a differential interface output.” *Id.* at 29–30. In particular, Samsung contends, data output from signal output pad 55a or 55b is selectable via output buffer selecting signal MODE_O, between output of single-ended interface output buffer GTL (O1) or (O2) and differential interface output LVDS(O). *Id.* (citing Ex. 1005, at [57], ¶¶ 11, 31, Fig. 2).

Imperium argues that a person of ordinary skill in the art would understand that “Toshiba discloses the use of only single-ended and differential output buffer circuits connected to output lines,” and “Toshiba thus does not disclose single-ended or differential interfaces connected to output lines.” PO Resp. 24 (emphasis omitted) (citing Ex. 2008 ¶ 59). According to Imperium, referring back to its contentions regarding the construction of “interface” discussed in Section II.A.2 *supra*, a person of

ordinary skill in the art would have known that a buffer circuit is distinct from an interface. *Id.* Imperium further argues that “Toshiba only ever describes sending selection signals to the output buffer circuits—i.e., the components of the semiconductor integrated circuit that lie on the upstream/transmit-side of the output lines,” and “does not describe or contemplate sending selection signals to any components on the downstream/receive-side of the output lines, which would be required for an output of the claimed ‘data interface circuit’ to be characterized as ‘selectable.’” *Id.* at 25–26 (citing Ex. 2008 ¶ 68).

Samsung replies that Toshiba’s buffers are “interfaces,” arguing, *inter alia*, that Imperium’s argument contradicts Toshiba’s express language, which states that an object of the invention is “the provision of a semiconductor integrated circuit that is capable of selectively using a differential interface and an SE [single-ended] interface without changing boards,” that “[a]n LVDSI (Low Voltage Differential Signaling [Interface]) is used as the first input buffer circuit,” and that “[t]his LVDSI comprises the above-noted differential interface.” Pet. Reply 15 (emphasis omitted) (quoting Ex. 1005 ¶¶ 7, 23; citing Ex. 1005 ¶ 24). Samsung further argues that “there is no question that Toshiba’s buffers are circuits that form a connection between components”; that, contrary to Imperium’s assertions (see PO Resp. 24), interfaces are not limited to “higher-level” circuits; and that although an “interface” does not need to function according to a protocol, Figure 4 of Toshiba nonetheless shows that Toshiba’s buffers operate with a fixed timing relationship for single-ended and differential modes that Imperium’s declarant, Dr. Wright, identifies in the ’290 patent as a “protocol.” Pet. Reply 15–16 (citing Ex. 1005 ¶ 35, Fig. 4; Ex. 1008 ¶ 36;

Ex. 1041 ¶¶ 35–41, 59–68). Samsung further argues that, contrary to Imperium’s contention (*see* PO Resp. 25), claim 1 of the ’290 patent does not require sending selection signals to downstream/receive-side components. Pet. Reply 17.

We are persuaded by Samsung’s arguments and evidence presented in the Petition that Toshiba discloses each of the elements of claim 1, arranged as set forth in the claim. *See* Pet. 25–30. As stated in Section II.A.2 *supra*, we agree with Samsung that the broadest reasonable interpretation of the claim term “interface” is “a connection used for communicating signals between two or more electrical components,” and we do not read into claim 1 any requirement that the recited interfaces must be a “higher-level circuit” that performs a data interfacing function in accordance with any particular protocol. Accordingly, we are not persuaded by Imperium’s arguments or Dr. Wright’s testimony that Toshiba’s buffer circuits are not “interfaces” within the meaning of claim 1. *See* PO Resp. 24–25. Further, as stated in Section II.C.1 *supra*, we also agree with Samsung that claim 1 does not require sending the selected mode to a downstream receiver. Pet. Reply 17. Accordingly, we are not persuaded by Imperium’s argument that Toshiba “does not describe or contemplate sending selection signals to any components on the downstream/receive-side of the output lines, which would be required for an output of the claimed ‘data interface circuit’ to be characterized as ‘selectable.’” PO Resp. 25–26.

c. Conclusion

For the foregoing reasons, we conclude that Samsung has shown by a preponderance of the evidence that claim 1 is anticipated by Toshiba.

3. *Obviousness of Claim 10 over Umeda in Combination with Either Roe or Toshiba*

a. *Overview of Umeda*

Umeda generally describes solid state image sensors, including CMOS type image sensors, and video systems using such sensors. Ex. 1006, 1:6–8, 2:55–60, 9:19–20. An example of such a system is depicted in Figure 14 of Umeda, reproduced below.

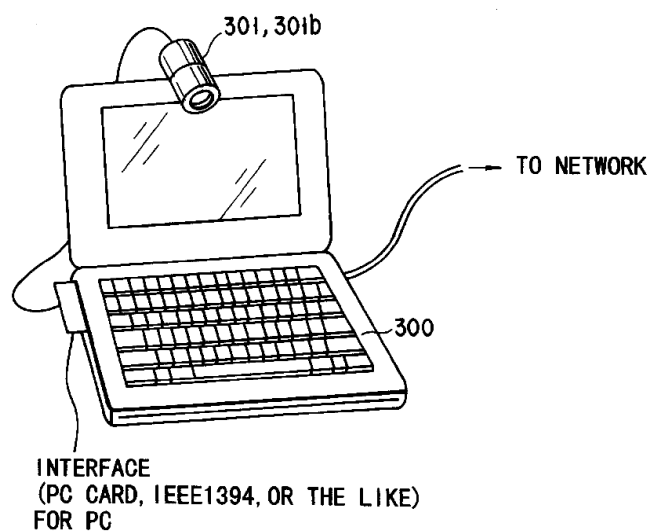


FIG. 14

Figure 14 is described by Umeda as a perspective view of a personal computer to which a solid state image sensor of Umeda's invention is connected. *Id.* at 5:62–62. According to Umeda, camera 301 in Figure 14 uses “image sensor 100,” which may include a CMOS type image sensor (*id.* at 13:27–28, 14:43–44). An example of image sensor 100 is depicted in Figure 31, reproduced below.

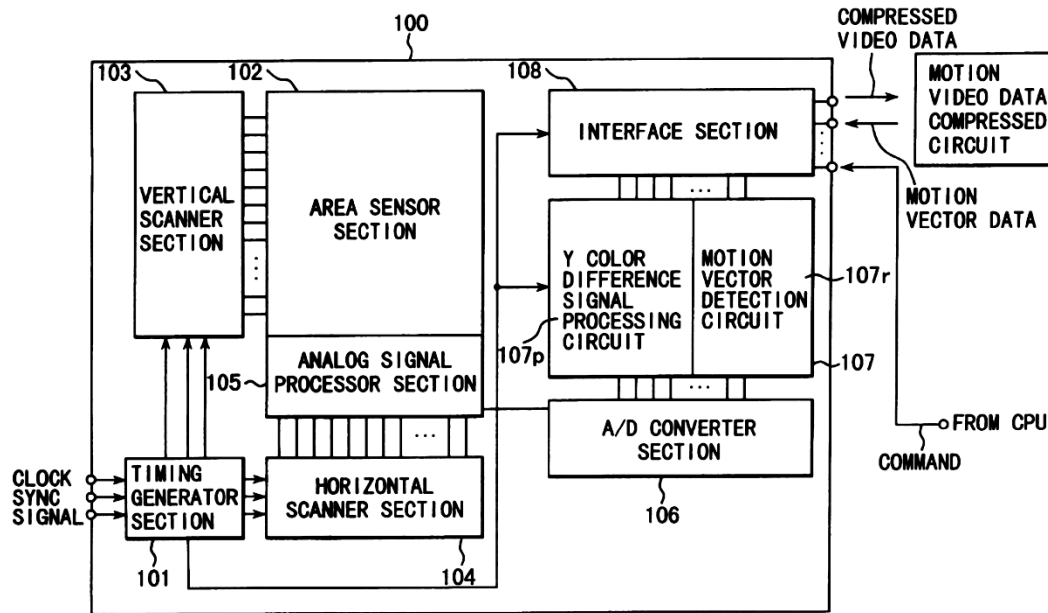


FIG. 31

Figure 31 is described by Umeda as a block diagram showing a solid state image sensor of Umeda's invention. *Id.* at 6:35–36. According to Umeda, image sensor 100 includes interface section 108 “for outputting digital video data to the outside.” *See, e.g., id.* at 9:15–17. In the embodiment shown in Figure 31, the interface circuit outputs digital video data from the CMOS image sensor to video data compression circuit 400, which is connected externally to the CMOS image sensor. *Id.* at 17:54–56, 18:32–33.

b. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). In that regard, based on the testimony of Dr. Baker,

Samsung proposes that the applicable person of ordinary skill in the art relating to the technology of the '290 patent as of April 29, 1999, would have had, at minimum, “a Bachelor’s degree in the field of electrical engineering, computer engineering, physics, or the equivalent, and two years of experience in the field of interface design and/or a comparable field”; or “a Master’s degree in electrical engineering, physics, computer engineering, or the equivalent, and one year of experience in the field of interface design and/or a comparable field.” Pet. 16 (citing Ex. 1008 ¶¶ 23–26). Imperium does not contest this assessment expressly or present an alternative assessment. Based on our review of the record, we adopt Samsung’s assessment of the level of ordinary skill in the art.

c. Discussion

As reproduced in Section I.D above, challenged claim 10 of the '290 patent is directed to a CMOS imaging apparatus comprising “a CMOS image sensor” having a data interface circuit with each of the limitations of challenged claim 1 identically recited, together with “an image processor connected to the CMOS image sensor to receive the signals output by the data interface circuit.” Having already provided claim charts mapping the respective disclosures of Roe and Toshiba to each element of claim 1 (see Pet. 18–25, 27–30), Samsung supports its challenges of claim 10 over the combination of Umeda with each of those references with a similarly detailed claim chart mapping the disclosure of Umeda to the preamble and image sensor and image processor elements additionally recited in claim 10. Pet. 39–42.

Imperium does not dispute that the cited portions of Umeda describe the preamble, image sensor, and image processor elements of claim 10, but

contends (1) that Samsung has not established a basis for combining Umeda with Roe or Toshiba; (2) that, for the reasons set forth in the discussion of claim 1, Roe and Toshiba also do not disclose the “data interface circuit” element of claim 10, and, thus, even if combined, the references would fail to disclose all features of claim 10; and (3) that secondary considerations weigh against a finding of obviousness. PO Resp. 26–33, 39–41.

As set forth in Sections II.C.1 and II.C.2 *supra*, Samsung has demonstrated by a preponderance of the evidence that Roe and Toshiba disclose all elements of the data interface circuit of claim 1. For the same reasons, we determine that Samsung has demonstrated that Roe and Toshiba teach the identical elements of claim 10. Accordingly, the only issues before us are whether Samsung has established a sufficient basis for combining the asserted references and whether evidence of secondary considerations weighs against a finding of obviousness. We address each in turn.

i. Reason to Combine

In the Petition, Samsung asserts that a person of ordinary skill in the art in April 1999 “would have been motivated and would have found it obvious and straightforward to implement Umeda’s video system according to either Roe’s or Toshiba’s teaching of a dual interface.” Pet. 33. Samsung contends that all three references are in the same field—i.e., optimizing interface circuits to communication data—and that each includes express statements that would have provided a reason for a person of ordinary skill in the art to combine their teachings. *Id.*

Samsung argues that Umeda, for example, “stresses the requirement of choosing an ‘appropriate’ interface circuit that ‘make[s] the most of the[] characteristic features’ of an MOS type image sensor, while “[a]t the same

time . . . caution[ing] against the selection of an interface that requires a ‘large number of pins,’ which would ‘result in an increase in the chip area of the sensor or the size of the package’ and unavoidably increase costs.” *Id.* at 33–34 (citing Ex. 1006, 1:61–64). Samsung points out that Umeda “lists various single-ended (*e.g.*, ‘PC Card’), and differential interfaces (*e.g.*, ‘IEEE 1394’) that could interchangeably be used to connect a CMOS image sensor to a personal computer” (*id.* at 34 (citing Ex. 1006, Fig. 14)), and contends that “to achieve a ‘highly versatile’ CMOS sensor and to better ‘cope with existing’ video compression circuits, a [person of ordinary skill in the art] would have been motivated to utilize an interface circuit that is compatible with both single-ended and differential signaling” (*id.* at 35 (citing Ex. 1008 ¶ 103)). Thus, Samsung concludes, Umeda provides strong motivations for a person of ordinary skill in the art to implement an interface circuit that fulfills the following demands: “(1) enhancing the versatility and performance of the CMOS image sensor by providing compatibility with both single-ended and differential signals, and (2) minimizing pin and board usage, which reduces costs.” *Id.*

According to Samsung, Roe’s and Toshiba’s teachings of dual interfaces both met these demands:

Roe’s dual interface, for example, is capable of receiving and sending I/O signals in both single-ended and differential modes, thereby enhancing the performance (especially in differential mode) and versatility of image sensors, as “urgently” desired by Umeda. *See, e.g.*, Ex. 1004 5:51-53; Ex. 1008 ¶¶ 67-70, pp. 113. Further, Roe’s dual interface circuit reuses the same pins to output data from both single-ended and differential interfaces, thereby reducing chip size and cost due to reduced pin count and board space, as desired by Umeda. Ex. 1004 5:41-63; Ex. 1008 ¶¶ 70, pp. 113. Indeed, Roe highlights these reductions

as among the chief benefits of its dual interface. *See, e.g.*, Ex. 1004 5:51-53; Ex. 1008 at pp. 113.

Furthermore, in addition to disclosing single-ended interfaces, Roe repeatedly refers to the “IEEE 1394” standard as a target application for its dual-purpose I/O circuit and even incorporates one of the earlier specifications (P1394 draft 8.0 Version 2) by reference. . . . Indeed, as mentioned above, Umeda itself lists the IEEE 1394 interface as a suitable interface for connecting a CMOS sensor to a personal computer in its video system. Ex. 1006 Fig. 14; Ex. 1008 ¶¶ 98-99, pp. 106, 110-111, 147, 151-152. Taken together, these overlapping teachings of Umeda and Roe further confirm how well their two systems fit together, thereby providing yet another motivation for a [person of ordinary skill in the art] to implement the interface in Umeda according to the teachings of Roe. Ex. 1008 at pp. 110-115.

Toshiba, similarly, discloses a dual interface that “selectively use[s] a differential interface and an SE [single-ended] interface” via a selection signal (*e.g.*, MODE_O) to output data to peripheral devices, thereby enhancing the performance and versatility of image sensors, as “urgently” desired by Umeda. Ex. 1005 ¶ 7; Ex. 1008 ¶ 84, 104, pp. 152-155. Further, Toshiba discloses that its I/O circuit provides these benefits “without changing boards.” Ex. 1005 ¶ 7; Ex. 1008 ¶ 88, pp. 153-154. In particular, Toshiba reuses the *same pins* to output data from both single-ended and differential interfaces, thereby reducing chip size and cost due to reduced pin count and board space. Ex. 1005 ¶ 7; Ex. 1008 ¶¶ 84, 88, 93, 96, pp. 153-154. Thus, Toshiba’s dual interface provides high versatility and performance while minimizing pin count and cost and, for the same reasons as discussed above, a [person of ordinary skill in the art] would be motivated to apply Toshiba’s advantageous teachings of a dual interface in implementing Umeda. Ex. 1008 ¶ 87-88, pp. 150-156.

Pet. 35–37. Citing Dr. Baker’s testimony, Toshiba, Umeda, and several references predating the filing date of the ’290 patent, Samsung further contends that a person of ordinary skill in the art “would have been familiar with industry trends in interface design and would have understood that

compatibility with both existing single-ended and differential interfaces was important in the marketplace.” *Id.* at 38 (citing Ex. 1005 ¶¶ 5–6; Ex. 1006, 2:44–52; Ex. 1008 ¶ 64; Ex. 1010 (Stone, 1982), 63; Ex. 1012 (Goldie, 1998), 1; Ex. 1018 (Unewisse, 1993), 5); *see KSR*, 550 U.S. at 417 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”), 421 (“When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.”).

In its Response, Imperium counters that “[n]either the specification nor the claims in Umeda provides any detail about the characteristics of Umeda’s interface section, such as how it may be constructed, how it may be configured, or even what type of interface circuit it should be.” PO Resp. 27–28 (citing Ex. 2008 ¶¶ 83, 99). According to Imperium,

While Umeda does recognize that “[i]f . . . an **appropriate interface** is not used, a large number of pins are required to result in an increase in the chip area of the sensor or the size of the package,” (Ex. 1006 at 1:64–67 (emphasis added)), Umeda does not disclose what an “appropriate interface” is.

Id. at 28. Citing Dr. Wright’s declaration, Imperium contends that a person of ordinary skill in the art “would not have viewed the appropriate interface to be . . . a data interface circuit with first and second single-ended and differential interfaces connected to the same output lines and with selectable single-ended and differential interface outputs,” but, “[r]ather, given the state of the art at the time, a [person of ordinary skill in the art] would have

viewed the required ‘appropriate interface’ for Umeda to be a parallel interface or a purely single-ended interface or a purely differential interface.” *Id.* (citing Ex. 2008 ¶¶ 83, 99). Imperium further contends Samsung’s “stated bas[e]s for the proposed modifications of Umeda with Roe and Toshiba are based purely on hindsight,” as “the only suggestion in the record of selectable interface outputs in a video imaging environment comes from the ’290 patent.” *Id.* at 29.

Moreover, Imperium contends, “a [person of ordinary skill in the art] faced with Umeda would have treated both Roe and Toshiba to be non-analogous art.” *Id.* (citing Ex. 2008 ¶¶ 81–82, 97–98). According to Imperium, “Umeda deals with image sensing,” whereas “Toshiba and Roe, by contrast, deal with input/output circuits,” and “[t]he non-analogous art is more pronounced by the fact that the invention in Umeda is directed toward solving a different problem than both Roe and Toshiba.” *Id.* (citing Ex. 2008 ¶¶ 81–82, 97–98).

Imperium additionally argues that “to reliably integrate either Roe or Toshiba into Umeda would have required significantly higher knowledge than that possessed by one of ordinary skill in the art,” and that a person of ordinary skill in the art would have been discouraged from combining the cited references by certain potential synchronization, incompatibility, and optimization issues. *Id.* at 30–32 (citing Ex. 2008 ¶¶ 84, 85, 87, 100, 101, 103). According to Imperium, “in the late 1990s and early 2000s, those of ordinary skill in the art were still trying to figure out how to successfully integrate multiple components onto a single CMOS circuit,” and “[a] person of ordinary skill in the art attempting to add the circuit of either Roe or Toshiba to the image sensor circuit of Umeda would have faced

unpredictable results and likely failure given the difficulties of adding circuits to a CMOS image sensor.” *Id.* at 32 (citing Ex. 2008 ¶¶ 90, 105). Imperium further contends that Samsung has not cited any evidence that the various standards disclosed by Umeda “could be interchangeably used with a single-ended interface and a differential interface on a single chip, much less that such a configuration would be desirable.” *Id.* at 32.

Samsung replies that Umeda, Roe, and Toshiba are analogous art with respect to the claimed invention, contending that Imperium applies the wrong analysis in its argument to the contrary. Pet. Reply 17–18. Further contrary to Imperium’s arguments, Samsung contends Umeda provides extensive details about its interface, including how to select an appropriate interface based on desirable characteristics (e.g., to achieve a high-performance, high-versatility sensor with minimal pins that supports well-known standards and is small in size and low in cost) and then how to construct and configure it. Pet. Reply 18–19 (citing Ex. 1006, 1:61–67; Ex. 1041 ¶¶ 82–86). Indeed, Samsung argues, Imperium’s declarant admitted that Umeda’s figures illustrate how Umeda’s “interface section 108” is connected and configured in relation to other components, and the signals it sends and receives. Pet. Reply 19 (citing Ex. 1040, 161:6–16). Samsung further replies that a person of ordinary skill in the art would have been motivated to use a dual interface with Umeda in view of Umeda’s statements that it is “urgently necessary” to design a “high-versatility solid state image sensor” that is more than just a “single-function device” (*id.* (citing Ex. 1006, 2:36–52)), and Umeda’s disclosure of connecting a CMOS sensor to a computer over a PC Card or IEEE-1394 interface (*id.* at 20 (citing Ex. 1006, Fig. 14)). Samsung argues that Dr. Baker and Dr. Wright

agree that PC Cards use single-ended signaling and IEEE-1394 used differential signaling. *Id.* (citing Ex. 1008 ¶¶ 44, 54; Ex. 1040, 158:20–160:20). Thus, Samsung contends, a person of ordinary skill in the art would have found it advantageous to use the dual interfaces of Roe or Toshiba, to achieve a “high-versatility” CMOS sensor that can communicate with both types of image processors (*e.g.*, using PC Card or IEEE-1394). *Id.* (citing Ex. 1041 ¶ 91).

Samsung further replies, contrary to Imperium’s arguments, that “it would have been easy and routine for a [person of ordinary skill in the art] to use known methods to reliably implement Roe and Toshiba’s interfaces in Umeda’s system based on the references’ teachings.” *Id.* at 21. Indeed, Samsung argues, the ’290 patent itself does not describe explicitly how to integrate its dual interface with a CMOS sensor and image processor, providing only a single sentence suggesting substituting a differential interface with the combined interface. *Id.* (citing Ex. 1001, 4:62–64). Despite this lack of detail, Samsung contends Dr. Wright opined that the ’290 patent’s disclosure enables a person of ordinary skill in the art to build the CMOS imaging apparatus of claim 10. *Id.* at 21–22 (citing Ex. 1040, 168:5–10). Because Umeda similarly provides a placeholder for an appropriate interface to be used with its CMOS image sensor, Samsung contends a person of ordinary skill in the art also would be able to integrate the Roe and Toshiba interfaces with the CMOS sensor of Umeda. *Id.* at 22 (citing Ex. 1006, Fig. 31). Further, according to Samsung, Imperium’s synchronization, incompatibility, and optimization arguments are baseless, as any such issues would have been predictable and within the skill of a person of ordinary skill in the art to resolve. *Id.* at 22–23. Indeed, Samsung

contends, Dr. Wright testified that a person of ordinary skill in the art would be able to resolve “any possible incompatibilities” resulting in a system with a CMOS sensor, image processor, and combined single-ended and differential interface, even though the ’290 patent did “not explicitly” explain how to do this. *Id.* at 23 (quoting Ex. 1040, 169:17–171:4, 118:4–16). Moreover, Samsung contends, Toshiba addresses synchronization incompatibilities resulting from combining single-ended and differential signaling into one interface and discloses a timing chart illustrating how to maintain the data transfer rate across both modes. *Id.* (citing Ex. 1005 ¶¶ 33, 35, Fig. 4; Ex. 1041 ¶¶ 65–68, 106). Finally, Samsung responds that, contrary to Imperium’s arguments, the image compression standards disclosed by Umeda could be used with both single-ended and differential signaling, and image data format is ultimately irrelevant to the type of signaling used by an interface to transmit data. *Id.* at 24.

In view of Samsung’s unchallenged assessment of the level of ordinary skill in the art, adopted in Section II.C.3.b *supra*, as well as the testimony of both Dr. Wright (Ex. 1040; Ex. 1046; Ex. 2008) and Dr. Baker (Ex. 1008; Ex. 1041; Ex. 2007), we are persuaded by Samsung’s arguments and evidence that it would have been within the skill of a person of ordinary skill in the art to incorporate a dual interface as taught by either Roe or Toshiba into Umeda’s image sensor. We also agree with Samsung that Umeda, Roe, and Toshiba are analogous art with respect to claim 10 of the ’290 patent. *See* Pet. Reply 17–18; PO Resp. 29. As Samsung points out (Pet. Reply 17), the question of whether prior art references are “analogous” is evaluated with respect to the claimed invention, not with respect to other references. *See, e.g., Innovention Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d

1314, 1321 (Fed. Cir. 2011) (“A reference qualifies as prior art for a determination under § 103 when it is analogous to the claimed invention.”). A prior art reference is considered to be analogous to a claimed invention if it is either: (1) from the same field of endeavor, regardless of the problem addressed; or (2) reasonably pertinent to the particular problem with which the inventor is concerned, regardless of the field of endeavor. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004). In this case, we determine that Umeda is analogous art with respect to claim 10 under at least the first prong of *Bigio*, and that Roe and Toshiba are both analogous art under at least the second prong. In particular, Umeda generally describes solid state image sensors, including CMOS-type image sensors, that include a data interface circuit and an image processor connected to the image sensor to receive the signals output by the data interface circuit (*see supra* Section II.C.3.a and citations therein), which are within the same field of endeavor as the CMOS imaging apparatus of claim 10. Moreover, because each of Roe and Toshiba discloses an interface that provides selectable single-ended and differential signal output with reuse of output pins, we find that those references clearly are pertinent to the problem set forth in the ’290 patent, namely fulfilling a “need for an improved interface circuit that would allow either a single-ended or a differential output and using as few pins as possible” (Ex. 1001, 3:17–19; *see also id.* at 1:11–15 (“The field of the invention relates generally to the field of interface circuits, and more particularly, to interface circuitry for providing selectable single-ended and differential signal output from a CMOS image sensor to an external digital signal processor.”)).

We are persuaded, moreover, that a person of ordinary skill in the art would have had reason in view of Umeda’s teachings, as cited by Samsung,

to make the proffered combinations. *See, e.g.*, Ex. 1006, 1:61–67 (stating the goal of “mak[ing] the most of the[] characteristic features” of a MOS type image sensor and the importance of using “an appropriate interface” to avoid increases in chip area, package size, and cost), Fig. 14 (listing both single-ended (“PC Card”) and differential (“IEEE 1394”) interface types). We conclude that the recited combination of claim 10 is no more than “the predictable use of prior art elements according to their established function,” and that a person of ordinary skill in the art would have been prompted to combine those elements in the claimed fashion. *KSR*, 550 U.S. at 417, 418.

We, accordingly, are persuaded that Samsung has shown that the first three *Graham* factors weigh in favor of finding that Umeda in combination with either Roe or Toshiba would have rendered the subject matter of claim 10 of the ’290 patent obvious to one of ordinary skill in the art at the time of the invention.

ii. Secondary Considerations

Imperium contends that secondary considerations of non-obviousness further weigh against Samsung’s challenges to claim 10. PO Resp. 39. In particular, Imperium asserts that it has “achieved commercial success from licensing its patents to many of Samsung’s competitors” and that “Samsung admitted during litigation that Imperium has collected more than \$22 million in licenses from Samsung’s competitors on Imperium’s patents including the ’290 patent.” *Id.* at 40. Imperium contends that each of its licensees “was and is a large and sophisticated technology company.” *Id.* Citing the testimony of Dr. Wright, Imperium further contends that “[s]ophisticated corporations such as those that took licenses to Imperium’s patents would have necessarily considered the validity of the patent claims to which they

took licenses.” *Id.* (emphasis omitted) (citing Ex. 2008 ¶ 141). Imperium additionally alleges that Samsung “knew about and attempted to buy Imperium’s patents – including the ’290 patent – in 2011,” which, Imperium argues, “further demonstrates a long-felt need and praise by the accused infringer (Samsung).” *Id.* Again citing Dr. Wright’s testimony, Imperium asserts that “Imperium did not file suit against Samsung until 2014, and so Samsung’s pursuit of the patents in 2011 must have been based on the merits of the patents themselves, including the ’290 patent.” *Id.* at 41 (citing Ex. 2008 ¶ 143).

In its Reply, Samsung contends that Imperium’s “commercial success argument should be disregarded,” as,

[b]eyond failing to prove nexus, [Imperium] omits key facts, including that: 1) [Imperium] never licensed the ’290 [patent] individually but rather only as part of its 100-patent portfolio; 2) no licensing revenue is specifically attributable to the ’290 [patent]; and 3) the licenses were entered to settle litigation that did not concern the ’290 [patent].

Pet. Reply 27 (emphasis omitted). Samsung further argues that Imperium’s “long-felt need and praise” argument is “similarly baseless.” *Id.* at 28. Samsung contends, for example, that Imperium cites in support of that argument only attorney argument from parallel litigation (*id.* (citing PO

Resp. 40; Ex. 2005, 7:11–8:12⁶)), and even then, the citation indicates only that Samsung *explored* a potential purchase of Imperium’s patents *as a group* (*id.* (citing Ex. 2005, 7:20–23)). Samsung further contends that it, in fact, never made any *offer* for Imperium’s patents, and there is no evidence that it ever investigated the ’290 patent. *Id.*

Having reviewed the parties’ contentions, we conclude that Imperium’s secondary consideration arguments are unpersuasive and do not outweigh Samsung’s strong evidence of obviousness in this case. Imperium, in particular, provides no persuasive evidence of any nexus between the alleged success of its licensing program and the merits of the ’290 patent. *See In re Huai-Hung Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (explaining that 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”); *CBS Interactive Inc. v. Helferich Patent Licensing, LLC*, IPR2013-00033, slip op. at 22 (PTAB Mar. 25, 2013) (Paper 21) (concluding that alleged secondary considerations were insufficient to defeat obviousness in light of failure to provide evidence of a nexus between the success of licensing program and merits of claimed

⁶ We note that Exhibit 2005 (along with Exhibit 2006, which Imperium also cites in support of its secondary considerations argument; *see* PO Resp. 40) is the subject of a Motion to Exclude Evidence filed by Samsung. *See infra* Section II.E.2. Because we exclude Exhibit 2006, we do not consider it further in our analysis of Imperium’s arguments concerning secondary considerations. Nevertheless, because Imperium alleges that Exhibit 2006 includes “similar statements” to those contained in Exhibit 2005, we are persuaded that the deficiencies noted here with respect to Exhibit 2005 would apply equally to Exhibit 2006, and that our consideration of Exhibit 2006 would not alter the result we reach herein.

invention rather than avoidance of litigation). Although Imperium advances a vague attorney argument that its success in licensing its portfolio “is tied to the merits of [the] ’290 patent” (PO Resp. 40), Imperium cites no evidence in support of that argument. *See In re Geisler*, 116 F.3d 1465, 1471 (Fed. Cir. 1997) (attorney argument cannot take the place of evidence). The evidence that Imperium does cite, namely Dr. Wright’s opinions that corporations such as Imperium’s licensees “would have necessarily considered the validity of patent claims to which they took licenses” and that Samsung’s alleged pursuit of Imperium’s patents “must have been based on the merits of the patents themselves, including the ’290 patent” (Ex. 2008 ¶¶ 141, 143), do not appear to be based on any actual knowledge regarding licensing negotiations. *See* Ex. 1040, 10:5–7 (“Q. Have you ever been involved with patent licensing negotiations? A. No, I have not.”). Moreover, Dr. Wright’s testimony does not appear to be based on any actual knowledge as to whether Samsung or any of Imperium’s licensees concluded that the ’290 patent *in particular*, among all the patents in Imperium’s licensing portfolio, was likely valid or meritorious in any regard, or whether Samsung ever had any interest in purchasing the ’290 patent. *See* PO Resp. 40–41; *see also* Ex. 1040, 9:10–10:10 (Dr. Wright testifying that he is not an expert in, and has had no personal experience with, patent licensing); Ex. 1046, 15:6–20 (accord). As such, we agree with Samsung that such opinions amount to “pure conjecture and speculation” (Pet. Reply. 27), and, together with Patent Owner’s contentions, are unpersuasive.

d. Conclusion

For the foregoing reasons, we conclude that Samsung has shown by a preponderance of the evidence that the subject matter of claim 10 would have been obvious over Umeda in combination with either Roe or Toshiba.

4. Obviousness of Claim 10 over Sears in Combination with Either Roe or Toshiba

a. Overview of Sears

Sears is directed generally to an electronic reading system for converting text to synthesized speech. Ex. 1007, 1:23–24. Sears discloses that a preferred embodiment of the system includes a camera that may comprise, for example, a CMOS imaging sensor. *Id.* at 4:62–66, 5:2–9, 6:56–57. Images obtained by the camera are output to an electronic computing device (e.g., a general purpose personal computer or an embedded computer optimized for use in the reading system) for processing or analysis. *Id.* at 5:34–43, 51–54. According to Sears, the image sensor may communicate through various means with the main system computer, including, *inter alia*, parallel, universal serial bus (USB), IEEE 1394, or 16-bit (PCMCIA) or 32-bit (CardBus) connections. *Id.* at 6:58–62.

b. Discussion

As it did with its challenges of claim 10 over the combination of Umeda with Roe and Toshiba, Samsung supports its challenges of claim 10 over the combination of Sears with each of Roe and Toshiba with a detailed claim chart mapping the disclosure of Sears to the preamble and image sensor and image processor elements of claim 10. Pet. 54–59.

Imperium does not dispute that the cited portions of Sears describe the preamble, image sensor, and image processor elements of claim 10, but

contends (1) that Samsung has not established a basis for combining Sears with Roe or Toshiba; (2) that, for the reasons set forth in the discussion of claim 1, Roe and Toshiba also do not disclose the “data interface circuit” element of claim 10, and thus, even if combined, the references would fail to disclose all features of claim 10; and (3) that secondary considerations weigh against a finding of obviousness. PO Resp. 33–41.

As set forth in Sections II.C.1 and II.C.2 *supra*, Samsung has demonstrated by a preponderance of the evidence that Roe and Toshiba disclose all of the limitations of the data interface circuit of claim 1. We again determine, for the same reasons, that Samsung has demonstrated that Roe and Toshiba teach the identical elements of claim 10. *See supra* Section II.C.3. Accordingly, as with Samsung’s obviousness challenges based on Umeda (*see id.*), the remaining issues before us with respect to Samsung’s obviousness challenges based on Sears are whether Samsung has established a basis for combining the asserted references and whether evidence of secondary considerations weighs against a finding of obviousness. We again address each in turn.

i. Reason to Combine

In the Petition, Samsung asserts that a person of ordinary skill in the art in April 1999 “would have been motivated and would have found it obvious and straightforward to use either Roe’s or Toshiba’s teaching of a dual interface in the electronic reading system of Sears.” Pet. 47–48. Samsung contends that all three references are in the same field as the challenged claims—i.e., optimizing interface circuits to communication data—and that each includes express statements that would have provided a

reason for a person of ordinary skill in the art to combine their teachings. *Id.* at 48.

Samsung argues that Sears, for example, “teaches that the selection of the interface connecting CMOS imaging sensor 41 to the main system 35 computer is based on factors such as cost and throughput.” *Id.* (citing Ex. 1007, 6:52–57). Samsung points out that Sears, moreover, expressly discloses using both single-ended (e.g., “16-bit PCMCIA or 32-bit (CardBus) connections”) and differential interfaces (e.g., IEEE 1394) to connect a CMOS image sensor to an image processor. *Id.* at 49 (citing, e.g., Ex. 1007, 5:34–44, 6:58–65, 7:1–23, 27:31–34; Ex. 1008 ¶¶ 106–107). Samsung contends Sears thus “expressly teaches using both single-ended and differential interfaces and selecting a data interface that enables it to achieve the expressly stated desirable goals of high throughput, low cost, increased portability and compatibility with general purpose computers.” *Id.* at 49–50 (citing Ex. 1008 ¶¶ 106, 108–109, pp. 122–23). Moreover, Samsung contends, Roe’s and Toshiba’s express teachings of dual interfaces met the precise requirements and goals Sears set forth for its data interface circuit (*id.* at 50–52), and implementing the electronic reading system of Sears using Roe’s or Toshiba’s teachings of a dual interface would have been routine and well within the knowledge and skill of a person of ordinary skill in the art (*id.* at 52–53). As in its arguments in support of its grounds based on Umeda with Roe or Toshiba, Samsung again cites Dr. Baker’s testimony, Toshiba, Umeda, and several references predating the filing date of the ’290 patent in support of the contention that a person of ordinary skill in the art “would have been familiar with industry trends in interface design and would have understood that compatibility with both existing standards

for single-ended and differential interfaces was extremely important.” *Id.* at 53 (citing Ex. 1005 ¶¶ 5–6; Ex. 1006, 2:44–52; Ex. 1008 ¶ 64; Ex. 1010, 63; Ex. 1012, 1; Ex. 1018, 5). Samsung further contends, “[t]he industry demands to support both single-ended and differential interfaces while minimizing pin count and cost provide a further motivation to use Roe’s and Toshiba’s teachings of dual interfaces in implementing the electronic reading system of Sears.” *Id.* at 53–54 (citing, e.g., Ex. 1008 ¶¶ 64, 70, 88).

In its Response, Imperium makes similar arguments to those made against the combinations of Umeda with Roe or Toshiba. *See* PO Resp. 35 (“For reasons similar to those explained above for Umeda, a [person of ordinary skill in the art] would not have been motivated to combine Sears with either Roe or Toshiba to arrive at a CMOS image sensor with a data interface circuit, as set forth in claim 10.”). More particularly, Imperium contends that

Sears simply states that the image sensor “may communicate through various means” that include certain types of buses. But none of these cited buses comprises a data interface circuit with first and second single-ended and differential interfaces connected to first and second signal output lines with selectable single-ended and differential interface, as is claimed in the ’290 patent.

Id.

As it argued with respect to Umeda (*see id.* at 28), Imperium contends that a person of ordinary skill in the art faced with Sears “would not have viewed the appropriate interface of Sears to be . . . a data interface circuit with first and second single-ended and differential interfaces connected to the same output lines and with selectable single-ended and differential interface outputs,” but “[r]ather, given the state of the art at the time, a

[person of ordinary skill in the art] would have viewed the appropriate interface to be a parallel interface or a purely single-ended interface or a purely differential interface.” *Id.* at 35–36 (citing Ex. 2008 ¶¶ 113, 129). According to Imperium, parallel interfaces were very common for image data in the late 1990s, and “Sears teaches **toward** those particular buses and **away** from using other types of interfaces.” *Id.* at 36 (citing Ex. 2008 ¶¶ 110, 113, 128–129).

Also, as it argued with respect to Umeda (*see id.* at 29), Imperium contends that “a [person of ordinary skill in the art] faced with Sears would have treated both Roe and Toshiba to be non-analogous art.” *Id.* (citing Ex. 2008 ¶¶ 116, 131). According to Imperium, “[w]hile Sears does deal in part with digital imaging and image sensing, it also deals with haptics, speech, and communication,” whereas “Toshiba and Roe, by contrast, deal with input/output circuits.” *Id.*

Imperium additionally argues that “Petitioners assume, incorrectly, that Sears could implement a dual-purpose CMOS image sensor and dual-purpose image processor for CMOS image data, and that the peripheral I/O circuit of Toshiba could simply be placed between these components,” “[b]ut Sears never discloses that the outputs from the CMOS image sensor support both single-ended and differential signaling; nor does Sears disclose that the inputs to the image processor of Sears can support both single-ended and differential signaling.” *Id.* at 37. As with the combinations with Umeda, Imperium contends that a person of ordinary skill in the art would have been discouraged from combining the cited references by potential incompatibility and optimization issues. *Id.* at 37–38 (citing Ex. 2008 ¶¶ 120, 138). Imperium again asserts that, “in the late 1990s and early

2000s, those of ordinary skill in the art were still trying to figure out how to successfully integrate multiple components onto a single CMOS circuit,” and “[a] person of ordinary skill in the art attempting to add the circuit of either Roe or Toshiba to the CMOS sensor of Sears would have faced unpredictable results and likely failure given the difficulties of adding circuits to a CMOS image sensor.” *Id.* at 38 (citing Ex. 2008 ¶¶ 123, 137). Imperium further contends that “the CMOS image sensor in the ’290 patent is designed to operate unidirectionally,” whereas “Roe . . . is designed to be bidirectional.” *Id.* (citing Ex. 2008 ¶ 121). For this reason, Imperium contends, “a person having ordinary skill in the art would not have considered combining Roe with Sears.” *Id.* (citing Ex. 2008 ¶ 121).

Samsung replies that Imperium again applies the wrong legal standard and that Sears, like Umeda, is analogous art with respect to the claimed invention. Pet. Reply 24. Samsung further replies that, contrary to Imperium’s arguments, Sears motivates, rather than teaches away from, using a dual interface. *Id.* at 25. In particular, according to Samsung:

Sears discloses a CMOS sensor that communicates with a main system computer over an interface chosen based on, *e.g.*, “cost” and “throughput.” EX1007 6:58-67. Though Sears discloses examples of differential (*e.g.*, IEEE-1394) and single-ended (*e.g.*, PCMCIA) interfaces, *id.*, that would not have discouraged a [person of ordinary skill in the art] from using a dual-interface that combined the two. To the contrary, a [person of ordinary skill in the art] would have been motivated to use Roe or Toshiba’s interfaces to decrease cost and increase throughput. EX1041 ¶¶121-23; EX1008 ¶¶105-08.

And Sears encourages use of “ubiquitous” general-purpose computers to perform computationally intensive image processing. EX1007 26:59-27:8; 27:22-33; 5:34-44; 7:1-23; P47; EX1041 ¶121; EX1008 ¶108. Because such computers could receive different types of signals, a [person of ordinary

skill in the art] would have found it advantageous to use Roe or Toshiba's dual-interfaces to achieve greater compatibility. *Id.*

Pet. Reply 25.

Further, according to Samsung, Imperium's synchronization, incompatibility, and optimization arguments are incorrect for the same reasons provided in the discussion of the combinations with Umeda, namely that a person of ordinary skill in the art would have known how to resolve these issues and would not have been discouraged by any such issues. *Id.* at 26 (citing Ex. 1041 ¶ 125).

Lastly, in reply to Imperium's assertion that a person of ordinary skill in the art would not have considered using Roe's bidirectional I/O circuit to transfer image data from Sear's CMOS sensor because the '290 patent's CMOS sensor is "designed to operate unidirectionally" (PO Resp. 38), Samsung contends that the claims and specification of the '290 patent do not require the claimed data interface to be unidirectional, Imperium does not make any claim construction argument that would so limit the claims, and nothing in Sears requires that its CMOS sensor be unidirectional.

Pet. Reply 26.

As an initial matter, we again agree with Samsung (Pet. Reply 24) that Sears—like Umeda, Roe, and Toshiba—is analogous art with respect to claim 10 of the '290 patent. *See* Section II.C.3.c *supra*; *see also* *Innovention Toys*, 637 F.3d at 1321 ("A reference qualifies as prior art for a determination under § 103 when it is analogous to the claimed invention."); *contra* PO Resp. 36–37. In particular, we find that Sears's reading system that includes a camera comprising a CMOS imaging sensor (*see, e.g.*, Ex. 1007, 4:62–66, 5:2–9, 6:56–57) is squarely within the same field of

endeavor as the CMOS imaging apparatus of claim 10. *See Bigio*, 381 F.3d at 1325.

Further, in view of Samsung’s unchallenged assessment of the level of ordinary skill in the art, adopted in Section II.C.3.b *supra*, as well as the testimony of both Dr. Wright (Ex. 1040; Ex. 1046; Ex. 2008) and Dr. Baker (Ex. 1008; Ex. 1041; Ex. 2007), we again are persuaded by Samsung’s arguments and evidence as set forth above, and we conclude that it would have been within the skill of a person of ordinary skill in the art to incorporate a dual interface as taught by either Roe or Toshiba into Sears’s image sensor, as well as that a person of ordinary skill in the art would have had reason in view of Sears’s teachings cited by Samsung to make such combinations. *See, e.g.*, Ex. 1007, 6:58–67 (disclosing that the image sensor may communicate through various means with the main system computer, including, *inter alia*, PCMCIA, CardBus, and IEEE 1394 connections, and that “[t]he choice of communications interface is made on the basis of cost, throughput, and DMA capabilities”). Thus, we again conclude that the recited combination of claim 10 is no more than “the predictable use of prior art elements according to their established function,” and that a person of ordinary skill in the art would have been prompted to combine those elements in the claimed manner. *KSR*, 550 U.S. at 417, 418.

Imperium’s contentions do not persuade us otherwise. Whereas Imperium contends, for example, that Sears “teaches . . . away” from interfaces other than parallel interfaces (PO Resp. 36 (citing Ex. 2008 ¶¶ 110, 113, 128–129)), we are not persuaded by Imperium’s arguments or the cited testimony of Dr. Wright that anything in Sears would have discouraged a person of ordinary skill in the art from using a dual interface

with Sears's image sensor. *See In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994) ("A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant."); *see also Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n. 8 (Fed. Cir. 2000) ("The fact that the motivating benefit comes at the expense of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another."). To the contrary, because Sears discloses examples of both single-ended and differential interfaces, we are persuaded that a person of ordinary skill in the art would have been motivated to use Roe's or Toshiba's dual interfaces to decrease cost and increase throughput, and we, accordingly, agree with Samsung that "Sears motivates, rather than teaches away from, using a dual-interface." Pet. Reply 25.

For the foregoing reasons, we are persuaded that Samsung has shown that the first three *Graham* factors weigh in favor of finding that Sears in combination with either Roe or Toshiba would have rendered the subject matter of claim 10 of the '290 patent obvious to one of ordinary skill in the art at the time of the invention, and we turn to Imperium's assertion that secondary considerations weigh against a finding of obviousness.

ii. Secondary Considerations

Imperium's secondary consideration arguments (*see* PO Resp. 39–41) were previously addressed in our discussion of Samsung's obviousness grounds based on Umeda. *See supra* Section II.C.3.c.ii. For the reasons there set forth, Imperium's arguments are not persuasive. *Id.* We again find

that Imperium's weak evidence of secondary considerations does not outweigh Samsung's stronger evidence of obviousness.

c. Conclusion

For the foregoing reasons, we conclude that Samsung has shown by a preponderance of the evidence that the subject matter of claim 10 would have been obvious over Sears in combination with either Roe or Toshiba.

D. Alleged Procedural Defects in the Petition

In its Preliminary Response, Patent Owner contended that the Petition fails to comply with the Board's Rules for particularity. Prelim Resp. 11–15. In the Institution Decision, we determined, for example, that

contrary to Patent Owner's contention that “procedural defects in the Petition render it impossible to determine the precise Grounds that Petitioner is raising, including Petitioner's reasons for alleging obviousness and the proposed modifications of each set of references” (Prelim. Resp. 11), Petitioner also provides a sufficiently clear articulation of the reasons why it would have been obvious to a person of ordinary skill in the art to use Roe's or Toshiba's dual interface with Umeda's CMOS image sensor and image processor (see Pet. 33–39) to demonstrate a reasonable likelihood of prevailing in showing that claim 10 is unpatentable over the combinations of Umeda with either Roe or Toshiba.

Inst. Dec. 20. In its Patent Owner Response, Patent Owner asserts substantially identical complaints against the particularity of the Petition. PO Resp. 41–43; see Pet. Reply 28–29 (noting that “PO's argument that the Petition obfuscates the actual challenges being presented is baseless, as PO unsuccessfully argued previously.”). After again considering Patent Owner's contentions, we remain persuaded that the Petition meets the required level of particularity with regard to each of the instituted grounds.

E. Motions to Exclude

1. Imperium's Motion to Exclude Samsung's Evidence

Imperium filed a Motion to Exclude Evidence, seeking to exclude a total of ten lines of Dr. Baker's deposition transcript, spanning from page 39, line 18, to page 40, line 2, of Exhibit 2017, as being non-responsive.

Paper 36. Samsung filed an Opposition to Imperium's Motion to Exclude Evidence (Paper 42), and Imperium filed a Reply to Samsung's Opposition (Paper 43).

Because we have not relied on the testimony that is the subject of Imperium's Motion to Exclude Evidence in rendering our decision in this proceeding, we dismiss Imperium's Motion to Exclude Evidence as *moot*.

2. Samsung's Motion to Exclude Imperium's Evidence

Samsung filed a Motion to Exclude Evidence, seeking to exclude Imperium's Exhibits 2005 and 2006. Paper 37 ("Mot."). Imperium filed an Opposition (Paper 40, "Opp.") to Samsung's Motion to Exclude Evidence, and Samsung filed a Reply to Imperium's Opposition (Paper 44, "Opp. Reply").

In its motion, Samsung characterizes its challenge of Exhibits 2005 and 2006, stating "[t]hese exhibits appear to be incomplete snippets of opening and closing arguments from a trial earlier this year, with no indication of who is arguing or which party they represent; they are not evidence." Mot. 1; *see id.* at 5–6. Further, Samsung contends, to the extent that these "snippets" are evidence, they are inadmissible hearsay. *Id.* at 6–7.

With respect to Exhibit 2005, Imperium disagrees with Samsung's assertion that there is no indication of who made the purported statements. Opp. 4. Imperium contends, instead, that, regarding Exhibit

2005, “[i]t is clear from the surrounding context that the statements on pages 58-60 were all delivered by *an attorney* for Petitioner.” *Id.* (emphasis added). With respect to Exhibit 2006, Imperium acknowledges not only that the exhibit presents attorney argument, but also that it presents the argument of Imperium’s attorneys. *Id.* at 5 (“While Patent Owner acknowledges that the statements in Exhibit 2006 regarding the licensing agreements, *see, e.g.*, Exhibit 2006 at 16:23-17:2, were delivered by its attorneys, not Petitioners’ attorneys, that fact does not alter the conclusion.”).

With respect to Exhibits 2005 and 2006, Imperium contends that party admissions in opening and closing statements are admissible as exceptions to the rule against hearsay. *Id.* at 1–3 (“These statements thus qualify as relevant admissions of a party, and fall under that exception to the hearsay rule.”). Federal Rules of Evidence 801(d)(2)(C) and (D) provide that a hearsay exception exists when “[t]he statement is offered against an opposing party and . . . was made by a person whom the party authorized to make a statement on the subject [or] was made by the party’s agent or employee on a matter within the scope of that relationship and while it existed.” *See* Opp. 3 (citing 37 C.F.R. § 42.62 for applicability of Federal Rules of Evidence to inter partes review proceedings). If, as Imperium asserts, Exhibit 2005 includes statements against Samsung’s interest by Samsung’s counsel, we agree that those statements would fall within the hearsay exception. What is less clear, however, is the scope of those statements upon which Imperium is relying. The statements, allegedly delivered by Samsung’s counsel, go to the contention that Imperium licensed several of Imperium’s patents for \$22 million dollars. *Id.* (“Here, statements in Exhibit 2005 that Patent Owner had entered into above-mentioned

agreements totaling more than \$22 million were offered by Petitioners' counsel, in support of Petitioners' defense, and are thus admissible against Petitioners."'). Such statements arguably fall within the hearsay exception. As noted above, although we consider Petitioner's statements, we do not necessarily draw the inferences from those statements that Imperium suggests.⁷

Federal Rule of Evidence 801(d)(2)(B) provides that a hearsay exception exists when "[t]he statement is offered against an opposing party and . . . is one the party manifested that it adopted or believed to be true." Imperium overstretches this hearsay exception when it attempts to apply it to its counsel's "similar statements" to those allegedly made by Samsung's counsel. Opp. 3; Opp. Reply 3 ("Even assuming, *arguendo*, [Imperium] had somehow shown that the statements on pages 58–60 of Exhibit 2005 were attributable to Petitioners—a fact [Imperium] has not established—[Imperium] neglects to explain how they manifest, even circumstantially, assent to the truth of [Imperium's] ***non-identical*** statements in Exhibit 2006."'). We are not persuaded that such "similar statements" fall within this hearsay exception.

Imperium, the proponent of these Exhibits 2005 and 2006, does not identify *expressly* the person or persons presenting the testimony reproduced in the exhibits either in the exhibits or in its Opposition to Samsung's

⁷ With regard to Samsung's arguments that Exhibit 2005 is not relevant to Imperium's contentions regarding secondary considerations of non-obviousness (Mot. 7 (citing Fed. R. Evid. 401 and 402)), the bar for relevancy here is relatively low. Although we find Exhibit 2005 relevant, as noted above, we do not find Exhibit 2005 persuasive. See Opp. Reply 5 (conflating relevancy with weight).

Motion to Exclude Evidence. Opp. 2–3. This is especially remarkable with respect to Exhibit 2006, which Imperium acknowledges was made by its own attorneys. Samsung argues that

while Patent Owner relies on certain portions of the Exhibits to show what Petitioners “admitted” (see Patent Owner’s Response at 40), the Exhibits fail to identify the individuals who made the purported admissions, or which side they were on. *Without such information, Patent Owner cannot possibly establish that the statements contained within the Exhibits are non-hearsay. See F.R.E[.] 801(d)(2)(A)–(D) (party admissions must be “made by the party” or the party’s agent, employee or authorized representative).*

Mot. 7 (emphasis added). We agree, but we note that Samsung does not dispute that the statements in Exhibit 2005 were made by its counsel, that its counsel was authorized to make those statements, or that the statements in Exhibit 2006 were made by Imperium’s counsel. Generally, we would find it insufficient that the parties may be able to determine who the person or persons presenting the testimony reproduced in Exhibit 2005 or 2006 are by other means. See Opp. 4 n.1. Although we do not know the names of the speakers, there appears to be no dispute that the speaker in Exhibit 2005 is counsel for Samsung and the speaker in Exhibit 2006 is counsel for Imperium. For purposes of ruling on Samsung’s Motion, that is enough.

Samsung argues that “the Board, sitting as a non-jury tribunal with administrative expertise, is well-positioned to determine and assign the appropriate weight to be accorded to the exhibits and evidence presented by both Petitioners and Patent Owner . . . *without the need for formal exclusion.*” Mot. 1 (emphasis added). We agree. Nevertheless, we must rule on Samsung’s motion based on the Federal Rules of Evidence.

37 C.F.R. § 42.62(a). Accordingly, we are not persuaded that Samsung has

shown that Exhibit 2005 should be excluded as inadmissible hearsay or as irrelevant, and we *deny* Samsung’s Motion to Exclude Evidence with respect to Exhibit 2005. Nevertheless, we are persuaded that Exhibit 2006 does not fall within the hearsay exceptions, and we *grant* Samsung’s Motion to Exclude Evidence with respect to Exhibit 2006. Therefore, we exclude Exhibit 2006, and we do not consider that exhibit, or credit the arguments in the Patent Owner Response relying on that exhibit for support, in this proceeding.

F. Motion for Observations

Imperium filed a Motion for Observations regarding Dr. Baker’s cross-examination. Paper 34 (“Obs.”). Samsung, in turn, filed a Response. Paper 41 (“Obs. Resp.”). To the extent Imperium’s Motion for Observations pertains to testimony purportedly impacting Dr. Baker’s credibility, we have considered Imperium’s observations and Samsung’s responses in rendering this Final Written Decision, and accorded Dr. Baker’s testimony appropriate weight in view of Imperium’s observations. *See* Obs. 1–7; Obs. Resp. 1–11.

G. Constitutionality of Inter Partes Review

In the Patent Owner Response, Imperium contends that the *inter partes* review process “violates the Separation of Powers doctrine of the United States Constitution.” PO Resp. 44. In particular, Imperium contends that

Supreme Court authority dating back more than a century holds that a patent, upon issuance becomes the property of the patentee, is no longer within the control and jurisdiction of the Patent Office, and thus is not subject to revocation or cancellation by any executive agent, including by any part of the USPTO. *McCormick Harvesting Mach. Co. v. Aultman*, 169 U.S. 606, 609 (1898).

Id. Samsung responds that the Federal Circuit has rejected Imperium’s argument. Pet. Reply 29 (citing *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1288–92 (Fed. Cir. 2015), *cert. denied* 2016 WL 1724103 (U.S. Oct. 11, 2016)); *see Cooper v. Square, Inc.*, 645 F. App’x 1014 (Fed. Cir. 2016), *cert. denied* 2016 WL 3856113 (U.S. Nov. 14, 2016). Although “administrative agencies do not have jurisdiction to decide the constitutionality of congressional enactments,” we are bound by the precedential decision by our reviewing court. *See Riggin v. Office of Senate Fair Emp’t Practices*, 61 F.3d 1563, 1569 (Fed. Cir. 1995); *Apple Inc. v. Smartflash LLC*, Case CBM2015-00028, slip op. at 23–24 (PTAB May 26, 2016) (Paper 44); *see also Harjo v. Pro-Football, Inc.*, 50 USPQ2d 1705, 1710 (TTAB 1999) (“[T]he Board has no authority . . . to declare provisions of the Trademark Act unconstitutional.”); *Blackhorse v. Pro-Football, Inc.*, 111 USPQ2d 1080, 1082 n.1 (TTAB 2014); *but see Am. Express Co. v. Lunenfeld*, Case CBM2014-00050, slip op. at 10 (PTAB May 22, 2015) (Paper 51) (explaining that “for the reasons articulated in *Patlex [Corp. v. Mossinghoff]*, 758 F.2d 594 (Fed. Cir. 1985)], we conclude that covered business method patent reviews, like reexamination proceedings, comply with the Seventh Amendment”). Thus, because the Federal Circuit previously has rejected substantially similar constitutional challenges, Imperium’s challenge to the constitutionality of the *inter partes* review process is *denied*.

III. CONCLUSION

Based on the evidence and arguments, Samsung has demonstrated by a preponderance of the evidence that claim 1 of the ’290 patent is anticipated by both Roe and Toshiba and that claim 10 is unpatentable over each of the

combinations of Umeda and Roe, Umeda and Toshiba, Sears and Roe, and Sears and Toshiba.

IV. ORDER

Accordingly, it is:

ORDERED that claims 1 and 10 of U.S. Patent No. 6,836,290 B1 have been shown to be unpatentable;

FURTHER ORDERED that Imperium's Motion to Exclude Evidence (Paper 36) is dismissed as moot;

FURTHER ORDERED that Samsung's Motion to Exclude Evidence (Paper 37) is *granted-in-part and denied-in-part*; the motion is *granted* as to Exhibit 2006 and *denied* as to Exhibit 2005;

FURTHER ORDERED that Exhibit 2006 is excluded; 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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