

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

KANGXI COMMUNICATION TECHNOLOGIES
(SHANGHAI) CO., LTD.,
Petitioner,

v.

SKYWORKS SOLUTIONS, INC.,
Patent Owner.

IPR2024-01456
Patent 9,450,579 B2

Before JON M. JURGOVAN, AMBER L. HAGY, and
STEPHEN E. BELISLE, *Administrative Patent Judges*.

HAGY, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background and Summary

Kangxi Communications Technologies (Shanghai) Co., Ltd. (“Petitioner”) filed a petition requesting *inter partes* review (Paper 2, “Pet.”) of claims 1–3, 7–9, and 13–15 (“the challenged claims”) of U.S. Patent No. 9,450,579 B2 (Ex. 1001, the “’579 patent”). *See* 35 U.S.C. § 311. Skyworks Solutions, Inc. (“Patent Owner”) did not file a Preliminary Response.

Under 37 C.F.R. § 42.4(a), we have authority to determine whether to institute review. The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted unless the information presented in the Petition shows “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

Applying those standards, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing unpatentability of at least one challenged claim of the ’579 patent. We institute review on all challenged claims and on all grounds raised in the Petition. *See* 37 C.F.R. § 42.108(a) (“When instituting *inter partes* review, the [Board](#) will authorize the review to proceed on all of the challenged claims and on all grounds of unpatentability asserted for each claim.”).

Our findings of fact and conclusions discussed below are based on the evidentiary record developed thus far. This Decision to institute trial is not a final decision as to the patentability of any challenged claim. Any final decision will be based on the full record developed during trial. Any

arguments not raised by Patent Owner in a timely filed response may be deemed waived, even if they were presented in the Preliminary Response.

B. Real Parties in Interest

Petitioner identifies itself as the real party in interest. Pet. 76.

Patent Owner identifies itself as the real party in interest. Paper 3.

C. Related Matters

Petitioner states that “to the best knowledge of Petitioner, the ’579 Patent is involved in the following litigation:” *Skyworks Solutions, Inc. v. Kangxi Communication Technologies Shanghai Co., Ltd et al.*, CDCA-8-24-cv-00974 (CDCA, filed May 6, 2024); and *Wireless Front-End Modules, Devices Containing the Same, and Components Thereof*, Inv. No. 337-TA-3762 (ITC, filed July 17, 2024). Pet. 76–77.

Patent Owner identifies the same matters. Paper 3.

Petitioner also notes that the district court litigation has been stayed pending resolution of the ITC proceeding. Pet. 75–76.

D. The ’579 patent (Ex. 1001)

The ’579 patent is titled “Radio Frequency Devices Having Reduced Intermodulation Distortion” (Ex. 1001, code (54)) and “relates . . . to radio-frequency switches” (*id.* 1:20–22). The ’579 patent issued on September 20, 2016, and claims priority to U.S. Provisional Application No. 61/669,045, filed July 7, 2012. *Id.* at codes (45), (60). Petitioner does not dispute this priority date. Pet. 17–18.

By way of background, the ’579 patent describes “Related Art” by stating, “Radio-frequency (RF) switches, such as transistor switches, can be used to switch signals between one or more poles and one or more throws” by “biasing and/or coupling” that “can affect switching performance.”

Ex. 1001, 1:23–30. The '579 patent purports to describe and claim an improvement to such switches, comprising a “switch having a stack of field-effect transistors (FETs) connected in series between first and second nodes” (e.g., “antenna node” and “input node for an amplified RF signal”) by including a “capacitor connected in series with the switch and configured to inhibit a low-frequency blocker signal from mixing with a fundamental-frequency signal in the switch.” *Id.* at 1:38–40.

Generally speaking, switch 100 includes RF core 110 and energy management (EM) core 112. *Id.* 3:43–45. RF core 110 routes RF signals between ports. *Id.* 3:45–47. EM core 112 supplies voltage control signals to the RF core. *Id.* 3:51–52. Figure 3, reproduced below, “shows a more detailed example configuration of an RF core 110.” *Id.* 3:62–63.

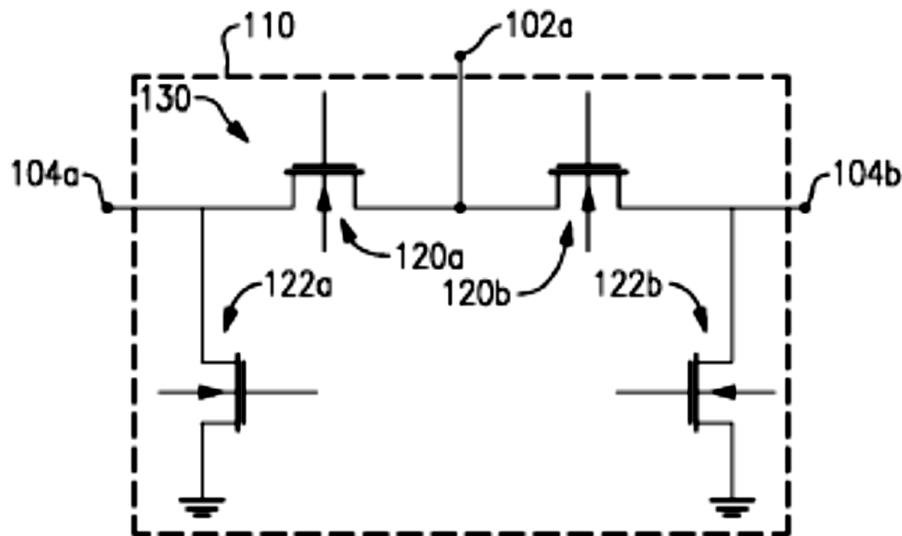


Figure 3 of the '579 patent, reproduced above, shows an example of an RF core “implemented in an single-pole-double-throw (SPDT) configuration.” Ex. 1001, 2:55–57.

As illustrated in Figure 2, RF signals are selectively routed either from first throw 104a to pole 102a by first FET 120a or from second throw 104b

to pole 102a by second FET 120b. Ex. 1001, 3:48–50, 3:64–66. First and second throw nodes 104a, 104b are selectively grounded/shunted via respective FETs 122a, 122b. *Id.* 3:66–4:4.

In the Figure 3 example above, “the transistors between the pole 102a and the two throw nodes 104a, 104b are depicted as single transistors” but “such switching functionalities between the pole(s) and the throw(s) can be provided by switch arm segments” each including transistors. *Id.* at 4:25–30.

Figure 4 of the '579 patent depicts a different embodiment, and is reproduced below.

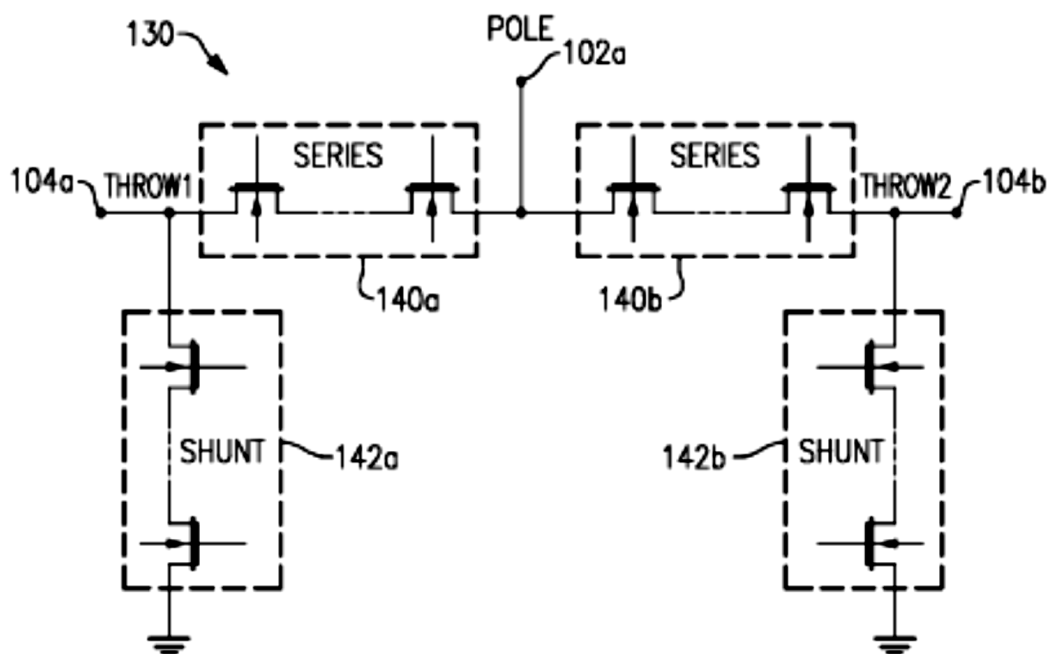


Figure 4 of the '579 patent, reproduced above, “shows an example of the RF core implemented in an SPDT configuration where each switch arm can include a plurality of [FETs] connected in series.” Ex. 1001, 2:57–60.

As shown in Figure 4, four switch arm segments 140a, 140b, 142a, 142b each include two FETs in series (i.e., four pairs) and each such pair of

FETs replaces a respective one of FETs 120a, 120b, 122a, 122b in the Figure 3 example. Ex. 1001, 4:31–41. Each switch arm segment 140a, 140b, 142a, 142b provides the functionality of the respectively replaced FET 120a, 120b, 122a, 122b. *Id.*

Figure 9 of the '579 patent, reproduced below, “shows a switching configuration 250 in an example context of a [SPDT] application.” Ex. 1001, 9:22–23.

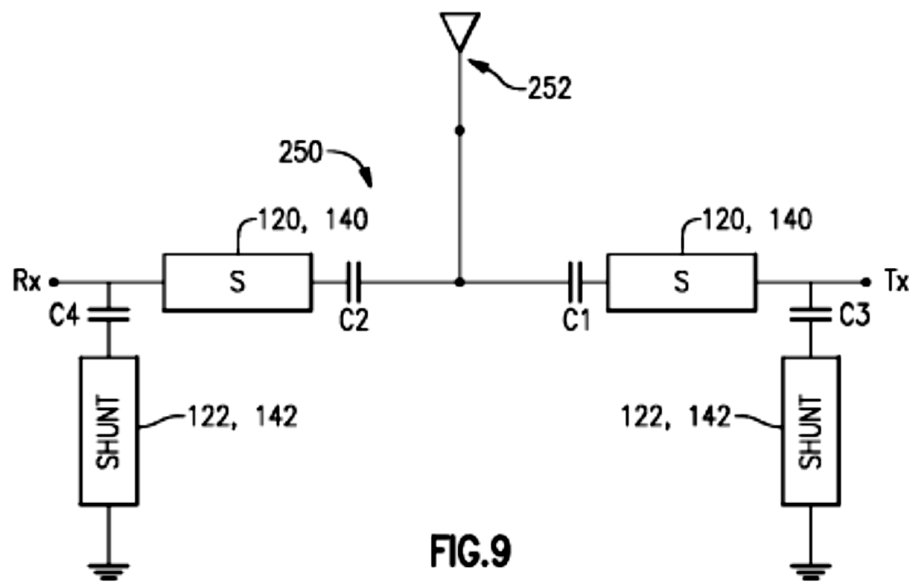


Figure 9 of the '579 patent, reproduced above, “shows an example where an RF switching configuration can include one or more capacitors to . . . inhibit a low-frequency blocker from mixing with a fundamental frequency.” Ex. 1001, 3:7–10.

As shown in Figure 9, the single pole is connected to antenna 252, the first throw is coupled to a receive Rx port via first switch circuit S 120/140, and the second throw is coupled to a receive transmit Tx port via second switch circuit S 120/140. Ex. 1001, 9:23–30. The Rx port and Tx port are coupled to ground via a respective shunt switch arm (122/142). *Id.*

The '579 patent describes that capacitors “inhibit a low-frequency blocker from mixing with a fundamental frequency.” *Id.* at 9:40–41. Specifically, two capacitors C1, C2, C3, C4 are respectively provided between: (C1) the antenna node and the switch arm S of the transmit Tx throw; (C2) the antenna node and the switch arm S of the receive Rx throw; (C3) the transmit Tx node and its shunt switch arm; and (C4) the receive Rx node and its shunt switch arm. *Id.* at 9:39–58. “With the foregoing capacitors, a low-frequency jammer signal can be blocked or reduced from mixing with any ON or OFF paths.” *Id.* at 9:49–51. “This can lead to improvement in [intermodulation distortion (IMD)] performance, especially for low-frequency blocker signals.” *Id.* at 9:51–52.

E. Illustrative Claim

Of the challenged claims, claims 1, 7, and 13 are independent. Claims 2–6 depend from claim 1. Claims 8–12 depend from claim 7. Claims 14–18 depend from claim 13. Claim 1, reproduced below (with bracketed numbering as added by Petitioner), illustrates the claimed subject matter:

1. [1.0] A semiconductor die comprising:
 - [1.1] a semiconductor substrate;
 - [1.2] a first switch circuit formed on the semiconductor substrate connected between an antenna node and a transmit node;
 - [1.3] a second switch circuit formed on the semiconductor substrate and connected between the antenna node and a receive node;
 - [1.4] a first capacitor formed on the semiconductor substrate and connected in series with the first switch circuit between the first switch circuit and the antenna node;

[1.5] a second capacitor formed on the semiconductor substrate and connected in series with the second switch circuit between the second switch circuit and the antenna node; and

[1.6.1] a first shunt arm formed on the semiconductor substrate and connected to the first switch circuit and the transmit node, [1.6.2] the first shunt arm including a third switch circuit connected to ground.

Ex. 1001, 12:60–13:11.

F. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–3, 7–9, and 13–15 are unpatentable on the following grounds:

Claim(s) Challenged	35 U.S.C. §	References/Basis ¹
1–3, 7–9, 13–15	103 ²	Huang ³

¹ Petitioner’s obviousness challenges to the listed claims are based on the listed references (Huang, Seshimo) “in view of the knowledge, skill and creativity (‘Knowledge’) of POSITAs,” where “POSITA” means a person of ordinary skill in the art. Pet. 35. We consider, however, such knowledge as part of any obviousness analysis. *See Randall Mfg. v. Rea*, 733 F.3d 1355, 1362–63 (Fed. Cir. 2013).

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended several provisions of 35 U.S.C., including § 103. Because the ’579 patent has an effective filing date of July 7, 2012, which is before the March 16, 2013, effective date of the applicable AIA amendments, we preliminarily apply the pre-AIA version of § 103. Neither party argues that the outcome of this case would differ based on applying the pre-AIA or post-AIA versions of these laws.

³ U.S. Patent Appl. Pub. No. 2011/0254614 A1, published October 20, 2011 (Ex. 1005).

Claim(s) Challenged	35 U.S.C. §	References/Basis ¹
1–3, 7–9, 13–15	103	Seshimo ⁴

As further support, Petitioner offers the Declaration of Lawrence E. Larson, Ph.D. Ex. 1003.

II. ANALYSIS

A. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) “if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains.” 35 U.S.C. § 103(a); *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 ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.⁵ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic, Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363

⁴ Japanese Patent Pub. No. 2006-121217, published May 11, 2006 (Exs. 1006, 1007) (citations herein to Seshimo are to the certified translation thereof included in Exhibit 1007).

⁵ We have no evidence of secondary considerations before us at this stage.

(Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). This burden of persuasion never shifts to Patent Owner. See *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review).

B. Level of Ordinary Skill in the Art

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

Relying on the declaration testimony of Dr. Larson, Petitioner characterizes a person of ordinary skill in the art as follows:

[An ordinarily skilled artisan] in July 2012 would have been someone knowledgeable and familiar with RF electronics, including RF switches and electrical components of such switches, and semiconductor manufacturing processes. [Ordinarily skilled artisans] would have gained knowledge of these concepts through a mixture of training and work experience, such as by having a Bachelor’s degree in electrical engineering, or related field, and approximately two to three years of related experience; or by obtaining a Master’s degree in electrical engineering, or related field, but having only a year of related experience; or by having no formal education but experience in RF electronics and semiconductor packaging of at least six to eight years.

Pet. 18 (citing Ex. 1003 ¶ 51).

Patent Owner has not filed a preliminary response, and therefore Petitioner’s assessment is unchallenged at this stage.

For purposes of this institution decision, and based on the present record including the disclosure in the '579 patent, we apply Petitioner's definition of the level of ordinary skill in the art (*see* Pet. 18). We determine this level of skill comports with the qualifications a person would have needed to understand and implement the teachings of the '579 patent and the prior art of record. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (noting that the prior art itself may reflect an appropriate level of skill in the art).

C. Claim Construction

In interpreting the claims of the '579 patent, we “us[e] the same claim construction standard that would be used to construe the claim[s] in a civil action under 35 U.S.C. [§] 282(b).” *See* 37 C.F.R. § 42.100(b) (2024). The claim construction standard includes construing claims in accordance with the ordinary and customary meaning of such claims as would have been understood by one of ordinary skill in the art in light of the written description and the prosecution history pertaining to the patent. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

Petitioner states that it “proposes that each claim term in the Challenged Claims be given its plain and ordinary meaning in this proceeding, and that no specific construction of any claim term is required because the prior art relied on in this Petition meets each of the claim terms under any reasonable construction.” Pet. 17. As noted, Patent Owner has not submitted a preliminary response, and hence also does not propose any terms for construction at this stage.

At this stage, and for purposes of this Decision, we determine that no claim term requires express interpretation at this time. *See Nidec Motor*

Corp. v. Zhongshan Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (per curiam) (claim terms need to be construed “only 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))).

D. Asserted Obviousness

1. Ground 1: Obviousness of Claims 1–3, 7–9, and 13–15 over Huang

Petitioner contends claims 1–3, 7–9, and 13–15 are unpatentable under 35 U.S.C. § 103(a) over Huang, in view of the knowledge of the ordinarily skilled artisan. Pet. 58–73. Patent Owner has not submitted a preliminary response and, therefore, does not challenge Petitioner’s showing at this stage. The burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware*, 800 F.3d at 1378.

For the reasons explained herein, we are persuaded, on this record, that Petitioner has established a reasonable likelihood of establishing unpatentability of at least one of these claims on this basis.

a. Overview of Huang (Ex. 1005)

Huang is a published U.S. patent application titled “System And Method Of Transistor Switch Biasing In A High Power Semiconductor Switch.” Ex. 1005, code (54). Huang was filed on April 16, 2010, and published on October 20, 2011. *Id.* at codes (22), (43). Petitioner contends Huang is prior art under 35 U.S.C. § 102(a). Pet. 36.

Huang “relates to high power semiconductor switches, and more particularly to FET switch layouts and biasing thereof.” Ex. 1005 ¶ 1. According to the description of the invention’s background, “[m]any of the advances in semiconductor-based transmit-receive switches have been with respect to isolation and insertion loss” and “[o]ne general approach utilizes,

instead of a single FET switch along each alternative path, a group of FET switches in series.” *Id.* ¶ 3. “This general approach moreover does not simply turn the FETs on and off by utilizing only a voltage at the gate, but instead biases both the gate and the source/drain in a forward and reverse manner to turn the FETs full-on and full-off respectively.” *Id.*

Huang also describes that “a quality of the signals passing through the [above-improved] transmit-receive switch depends upon, amongst other things, the particular voltages chosen for off-state V_{gsd} and on-state V_{gsd} of the FETs within the switch.” *Id.* ¶ 39 “[M]aximizing the on-state V_{gsd} of the on-state FET group switches and fully maximizing the off-state V_{gsd} of the off-state FET group switches achieves respectively low insertion loss and high isolation where and as needed.” *Id.* ¶ 39. Huang states that, however, “little advantage is gained from maximizing the off-state V_{gsd} of the off-state FET group switches to the same level that the on-state FET group switches are biased.” *Id.* ¶ 41. Further, “spurious harmonic emissions increase with increasing off-state V_{gsd} beyond a certain bias voltage.” *Id.* ¶ 42. Huang asserts that the described invention, accordingly, “improve[s] signal quality . . . from biasing the FETs at a level other than at the largest possible bias within the reliability/breakdown limits of operation.” *Id.* ¶ 40.

Figure 2 of Huang is reproduced below.

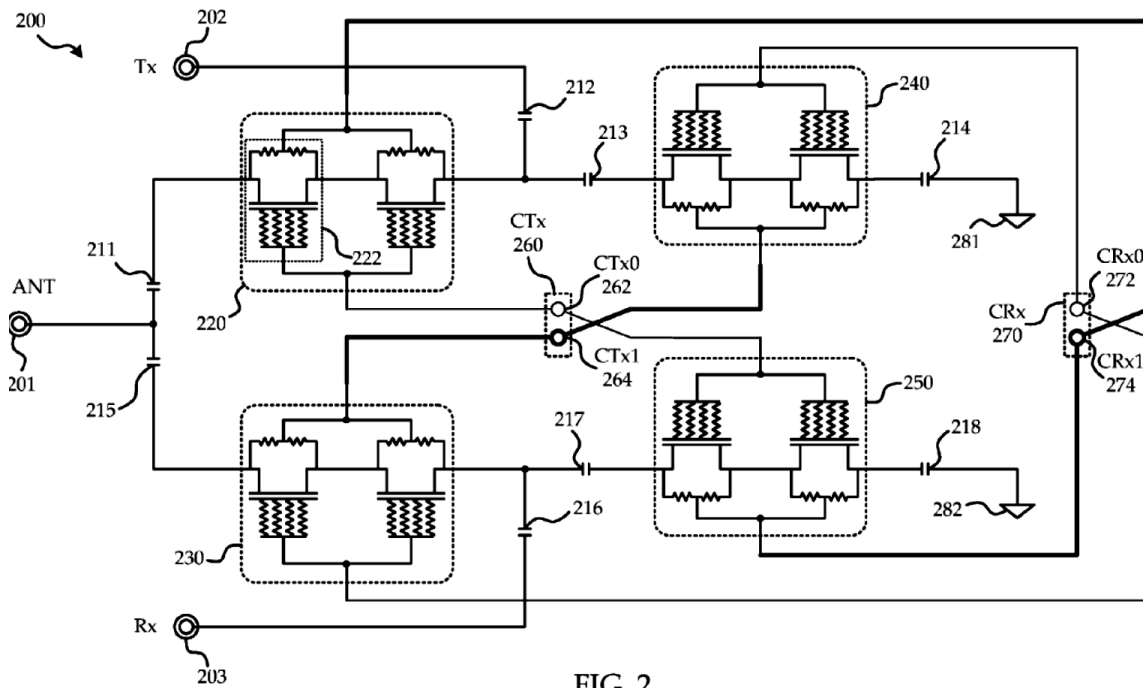


Figure 2 of Huang, reproduced above, “is a circuit diagram illustrating a SPDT switch.” Ex. 1005 ¶ 22.

Huang discloses SPDT switch 200 comprises antenna 201, transmit terminal 202, receive terminal 203, transmit branch ground connection 281, and receive branch ground connection 282. Ex. 1005 ¶ 45. Along a signal path from antenna 201 to transmit terminal 202, antenna 201 is coupled to blocking capacitor 211 coupled in series with first series FET group switch 220 and another blocking capacitor 212. *Id.* Along a signal path from antenna 201 to receive terminal 203, antenna 201 is coupled to blocking capacitor 215 and coupled in series with second series FET group switch 230 and another blocking capacitor 216. *Id.* Along a shunt path from transmit terminal 202 to transmit branch ground connection 281, transmit terminal 202 is coupled to blocking capacitor 212, blocking capacitor 213 in series with first shunt FET group switch 240, and another blocking capacitor 214. *Id.* Along a shunt path from receive terminal 203 to receive branch

ground connection 282, receive terminal 203 is coupled to blocking capacitor 216, blocking capacitor 217 in series with a second shunt FET group switch 250, and another blocking capacitor 218. *Id.* Each of the series and shunt FET group switches 220, 230, 240, 250 comprises two FETs connected in series and having common gate and bias connections. *Id.*

We further discuss below the disclosures of Huang in connection with Petitioner’s arguments.

b. Claim 1

- (1) “[1.0] A semiconductor die comprising:
[1.1] a semiconductor substrate;”

Petitioner presents evidence that Huang discloses a “semiconductor die,” as recited in the preamble,⁶ and a “semiconductor substrate,” as recited in limitation [1.1]. Pet. 39–40 (citing Ex. 1005 ¶¶ 1–3, 40, 42–43, 122, Abs., claims 5, 19, Fig. 2; Ex. 1003 ¶¶ 82–84). In particular, Petitioner points to Huang’s disclosure of “high power semiconductor switches,” which can be “silicon-on-insulator FET switches.” *Id.* at 39 (citing Ex. 1005 ¶¶ 1–3, Abs., 40, 42–43, 122, Fig. 2, claims 4, 19; Ex. 1003 ¶ 83). Petitioner asserts the ordinarily skilled artisan would have understood from this disclosure that “all of the components of the SPDT switch 200 are formed on a semiconductor substrate of a semiconductor die, where, in some embodiments, the semiconductor die is a silicon-on-insulator (SOI) die in which the SPDT switch 200 components would be formed on an insulator layer.” *Id.* Petitioner additionally contends that if Patent Owner were to

⁶ Petitioner does not take a position on whether the preambles to the claims are limiting. At this stage, for purposes of this Decision, we accept Petitioner’s showing that the preambles are taught or suggested by the prior art, without deciding whether the preambles are limiting.

assert “Huang does not explicitly state that the SPDT switch 200 components are formed on a semiconductor substrate of a semiconductor die,” then it would nevertheless have been obvious to the ordinarily skilled artisan to do so, as “this was the well-known and widely-implemented approach to provide a stable foundation for fabrication of components of high-power, semiconductor-based, transmit/receive switches, and in order to make manufacturing, testing and production of integrated circuits (‘ICs’) (including such switches and related circuits (e.g., LNAs)) easier and less costly.” *Id.* at 39–40 (citing Ex. 1018, 4:27–41; Ex. 1010 ¶¶ 9, 13, Fig. 3A, ¶ 46; Ex. 1019 ¶¶ 1, 4, Fig. 1; Ex. 1039, 9–10, Fig. 12; Ex. 1020, Figs. 1, 4; Ex. 1009 ¶¶ 4–5, 58, Fig. 2; Ex. 1022, Fig. 7, ¶¶ 46–50; Ex. 1024, 1, 3–4, Fig. 8; Ex. 1029, Figs. 1, 2, 35–36, 40; Ex. 1028, 2–3, Figs. 2, 4, 5; Ex. 1021, 2–3, Figs. 1–2, 4–5; Ex. 1019 ¶¶ 1, 4, Fig. 1; Ex. 1011, 2613–2617, Figs. 1–2, 4–6, 8; Ex. 1036, 1–2; Ex. 1003 ¶ 84).

We have reviewed the arguments and evidence submitted by Petitioner. At this stage, and on this record, we determine that Petitioner has shown sufficiently for institution that the prior art teaches or suggests these limitations.

(2) *Remaining Limitations of Claim 1*

Petitioner presents evidence that Huang teaches or suggests the remaining limitations by pointing primarily to Figure 2 of Huang and associated disclosure. Pet. 40–44 (citing Ex. 1005 Abs., ¶¶ 1–3, 40, 42, 43, 45, 122, claims 5, 19; Ex. 1003 ¶¶ 86–92). In particular, Petitioner provides the following color annotated version of Figure 2 of Huang:

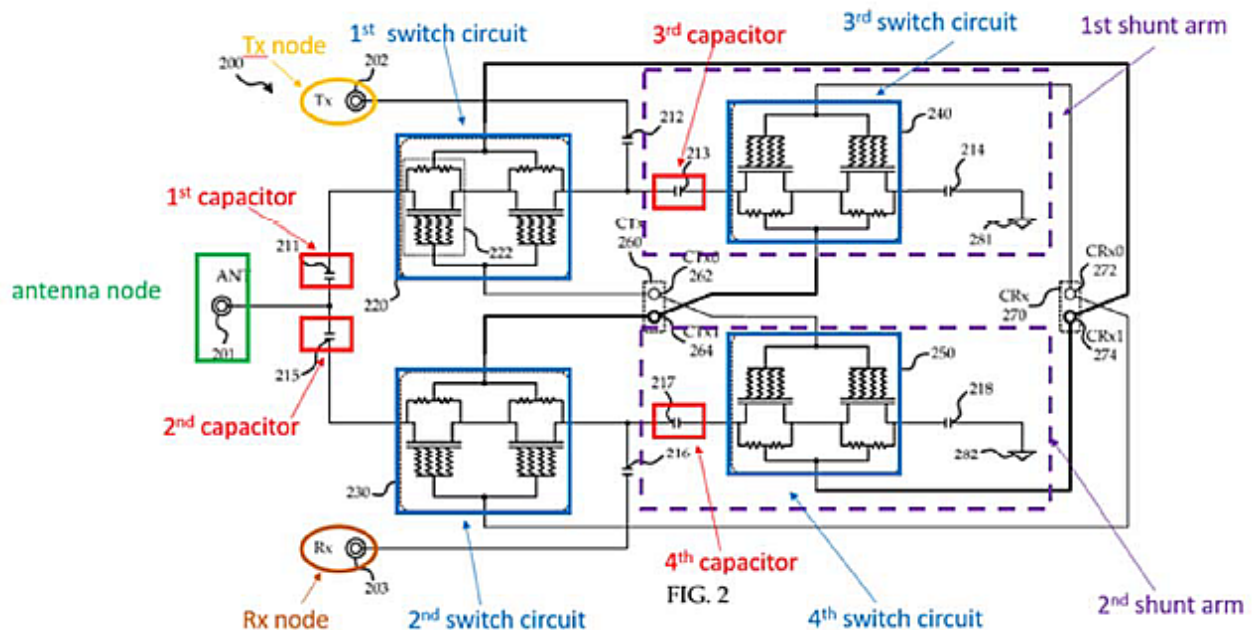


Figure 2 of Huang, reproduced above as annotated in color by Petitioner (Pet. 41), depicts “a circuit diagram illustrating a SPDT switch.” See Ex. 1005 ¶ 22.

Petitioner provides argument and explanation tying the components of the circuit depicted in Huang’s Figure 2 to each of the remaining elements recited in claim 1. Pet. 40–44. In particular, referring to the annotated Figure 2, Petitioner contends as follows for each of limitations [1.2]–[1.6].

- [1.2], [1.3] “first [and second] switch circuit[s] formed on the semiconductor substrate connected between an antenna node and a transmit node”: Huang discloses “first series FET group switch 220” and “second series FET group switch 230” (blue boxes), which may each be a “silicon-on-insulator FET switch” and which are each connected between antenna 201 (green box) and transmit terminal 202 (yellow circle). *Id.* 40–41 (citing Ex. 1005 ¶¶ 45, 122, claims 5, 19; Ex. 1003 ¶ 86) (color emphasis omitted). Petitioner further notes Huang’s disclosure that each FET group switch “includes multiple

FETs connected in series to each other.” *Id.* at 41 (citing Ex. 1004 ¶¶ 3, 40).

- [1.4], [1.5] “a first [and second] capacitor formed on the semiconductor substrate and connected in series with the first switch circuit between the first switch circuit and the antenna node”: Huang discloses “blocking capacitor 211” and “blocking capacitor 215” (red boxes) that are “coupled in series with . . . first series FET group switch 220” and “second series FET group switch 230,” respectively (blue boxes), and connected between the first/second series FET group switches 220/230 and antenna 201 (green box). Pet. 42–43 (citing Ex. 1005 ¶¶ 1, 3, 40, 42, 43, 45, 122, Abs.; Ex. 1003 ¶ 88) (color emphasis omitted).
- [1.6.1], [1.6.2] “a first shunt arm formed on the semiconductor substrate and connected to the first switch circuit and the transmit node, the first shunt arm including a third switch circuit connected to ground”: Huang discloses “[a]long a shunt path from the transmit terminal 202 [yellow circle] to . . . transmit branch ground connection 281, the transmit terminal 202 is coupled to . . . blocking capacitor 213 [red box] in series with a first shunt FET group switch 240 [blue box].” Pet. 44 (citing Ex. 1005 ¶ 45; Ex. 1002, 37–39; Ex. 1003 ¶ 91) (color emphasis omitted). Petitioner further contends that the ordinarily skilled artisan would have understood that Huang discloses SPDT switch 200 including, as shown in Annotated Figure 2, “a first shunt arm [purple box] that (i) is formed on the semiconductor

substrate (*see* [1.0], [1.4]), (ii) is connected to the first series FET group switch 220 [blue box] (*first switch circuit*) and transmit terminal 202 [yellow circle] (*transmit node*), and (iii) includes (among other components) a first shunt FET group switch 240 [blue box], that may be a ‘silicon-on-insulator FET switch’, and that is connected to ‘the transmit branch ground connection 281’ (*third switch circuit connected to ground*).” Pet. 44 (citing Ex. 1005 ¶¶ 1–3, Abs., 40, 42, 43, 122, claims 5, 19; Ex. 1003 ¶ 92) (color emphasis omitted).

Petitioner additionally contends that, in the event Patent Owner asserts that Huang does not explicitly disclose forming “blocking capacitor 211” (and, e.g., “blocking capacitor 213”) on the same semiconductor substrate of the same semiconductor die as the other components of SPDT switch 200, the ordinarily skilled artisan:

would have been motivated to do so as a mere design choice to achieve known and predictable benefits, including making manufacturing, testing, and production of SPDT switch 200 (and ICs incorporating the same) easier and less costly, with a reasonable expectation of success, including because low capacitance value (picofarad) capacitors are small in size and typically used in RF switches since, as was well-known to [the ordinarily skilled artisan], they would pass (with very low impedance) the high frequencies-of-interest (e.g., 2.4GHz associated with “traditional WLAN radio[s]”) while impeding low, out-of-band-blocker frequencies.

Pet. 42–43 (citing Ex. 1034, Fig. 2; Ex. 1035, 2–5; Ex. 1023, 10:13–17, Fig. 5; Ex. 1011, 2616–2617, Fig. 4; Ex. 1029, Figs. 1–2, pp. 35–36, 40; Ex. 1022 ¶ 28, Fig. 7, ¶¶ 46–50; Ex. 1010 ¶¶ 9, 13, 46, Fig. 3A; Ex. 1012, 231–234, 175–176; Ex. 1027, 82–83, 50; Ex. 1014, 29–32, 36–37, 42;

Ex. 1043, 128–129, 137–139, 236–238; Ex. 1032, 1–2; Ex. 1033, 1;
Ex. 1011, 2615–2618; Ex. 1026 ¶ 49; Ex. 1024, 3–4; Ex. 1031, 8–9;
Ex. 1044, 1–2; Ex. 1010 ¶ 40; Ex. 1009, Fig. 2, ¶¶ 83–84, Ex. 1035, 5;
Ex. 1042, 96, 172, 180, 227, 275, 286; Ex. 1029, 36–39; Ex. 1017 ¶ 25;
Ex. 1024, 1, 3–4; Ex. 1039, Fig. 5, 2–6, 9–12; Ex. 1040, 3–6, Figs. 3–4;
Ex. 1036, 1–2; Ex. 1019, Fig. 19, ¶¶ 191, 199; Ex. 1046, 23–24; Ex. 1045, 1,
Ex. 1049, p.3; Ex. 1003 ¶ 89).

We have reviewed the arguments and evidence submitted by
Petitioner. At this stage, and on this record, we determine that Petitioner has
shown sufficiently for institution that the prior art teaches or suggests these
limitations.

(3) *Claim 1: Conclusion*

For the foregoing reasons, we find, on the present record, Petitioner
has presented arguments and evidence sufficient for institution that Huang,
along with the knowledge of the ordinarily skilled artisan, teaches or
suggests all elements of claim 1. Therefore, Petitioner has established a
reasonable likelihood of prevailing in showing that claim 1 is unpatentable.

*c. Claims 2, 3: “The semiconductor die of claim 1 further comprising
an insulator layer disposed between the first and second switch
circuits and the semiconductor substrate” and “The semiconductor die of
claim 2 wherein the semiconductor die is a silicon-on-insulator (SOI) die.”*

Petitioner presents evidence that Huang teaches or suggests the
limitations of these dependent claims by disclosing an SPDT switch that is a
“semiconductor-based,” “high-power transmit-receive switch” that may be
“implement[ed] . . . using silicon on insulator (SOI)” technology, with its
“transistor switches” being “silicon on insulator FET switches.” Pet. 45
(citing Ex. 1005 ¶¶ 1–3, 40, 42–43, 122, Abstract, claims 5, 19; Ex. 1003

¶¶ 94–96). Petitioner contends that although Huang “does not disclose the well-known details of implementing SOI technology to manufacture SOI FET switches,” the ordinarily skilled artisan would have understood Huang’s implementation of SOI included an insulator layer disposed between the SOI first and second series FET group switches. *Id.* (citing Ex. 1005 ¶¶ 1–3, Abs., 40, 42, 43, 122, claims 5, 19; Ex. 1003 ¶ 96). Petitioner also argues, alternatively, that it would have been obvious to the ordinarily skilled artisan to do so as this was “the well-known and widely-implemented approach to using the disclosed SOI technology to manufacture ‘semiconductor-based high power switches’, such as SPDT switch 200, with well-known and predictable benefits.” *Id.* at 46 (citing Ex. 1018, 4:37–41; Ex. 1026 ¶ 30; Ex. 1021, 2; Ex. 1009 ¶ 5; Ex. 1010 ¶ 13; Ex 1003 ¶ 97).

We have reviewed the arguments and evidence submitted by Petitioner. At this stage, and on this record, we determine that Petitioner has shown sufficiently for institution that the prior art teaches or suggests the limitations of these dependent claims.

d. Claims 7–9 and 13–15

Petitioner also presents evidence and argument supporting its contentions that independent claims 7 and 13, and their respective dependent claims 8–12 and 14–18, would have been obvious over Huang. Pet. 46–54.

Independent claim 7 recites a “method for operating a radio-frequency (RF) device,” comprising “providing an RF device” that includes essentially the circuitry recited in claim 1, and “controlling an RF switch of the RF device by placing the first switch circuit in an ON state and placing the third switch circuit in an OFF state,” and “inhibiting a low-frequency blocker

signal from mixing with a fundamental-frequency signal in the RF switch using the first capacitor.” Ex. 1001, 13:29–48.

Petitioner presents evidence that Huang teaches or suggests the limitations of claim 7: preamble (Pet. 46–47, citing Ex. 1005 ¶¶ 2, 44, 45, 50, 55–59, Fig. 2 (describing using an SPDT switch “in a traditional WLAN radio” and in a “modern RF communication system”)); details of RF device circuitry (Pet. 47, referring to arguments and evidence for claim 1); “controlling an RF switch” (Pet. 48, citing Ex. 1005 ¶¶ 56, Fig. 2; Ex. 1003 ¶ 108); and “inhibiting a low-frequency blocker signal” (Pet. 48–52, discussing Huang’s teachings including use of “blocking capacitors” along a signal path and arguing the ordinarily skilled artisan would have understood Huang’s implementation as being a “high-pass filter” that would satisfy this limitation, citing, *inter alia*, Ex. 1005 ¶¶ 2, 3, 39, 40, 43–45, 55–59; Ex. 1003 ¶¶ 109–118).

Independent claim 13 recites a “wireless device” comprising a “transceiver configured to process RF signals,” and “antenna in communication with the transceiver,” and a “switch module” comprising essentially the circuitry recited in claim 1. Ex. 1003, 14:16–32.

Petitioner presents evidence that Huang teaches or suggests the limitations of claim 13: preamble (Pet. 52, referring to analysis for claim 7 preamble); transceiver and antenna (Pet. 53 (noting Huang’s teachings of an RF/wireless device used for both transmission and reception, which would have been understood by the ordinarily skilled artisan to be a transceiver, citing, *inter alia*, Ex. 1005 ¶¶ 2, 44–45, 51, 55–59; Ex. 1003 ¶¶ 122–123)); and details of RF device circuitry (Pet. 54, referring to arguments and evidence for claim 1).

For the claims dependent on claims 7 and 13, Petitioner refers to its analysis for dependent claims 2 and 3, which recite essentially the same limitations. Pet. 52, 54.

As this stage of the proceeding, Patent Owner has not submitted a preliminary response and, therefore, does not challenge Petitioner's arguments or evidence as to these claims.

We have reviewed Petitioner's evidence and arguments and we determine, at this stage and on this record, that they are sufficient to show a reasonable likelihood that claims 7–9 and 13–15 would have been obvious over Huang.

2. Ground 2: Obviousness of Claims 1–3, 7–9, and 13–15 over Seshimo

Petitioner contends that claims 1–3, 7–9, and 13–15 are unpatentable under 35 U.S.C. § 103(a) over Seshimo. Pet. 55–75. Patent Owner has not submitted a preliminary response and, therefore, does not challenge Petitioner's showing at this stage.

At this stage of the proceeding, it is not necessary for us to provide a detailed assessment of this additional ground. A decision to institute under 35 U.S.C. § 314 may not institute review on fewer than all claims challenged in a petition. 37 C.F.R. § 42.108(a). In light of our determination that Petitioner has met its burden under 35 U.S.C. § 314(a) as to its challenge as to at least one claim with regard to Huang (*see supra* § II.D.1), we also determine that it is appropriate to institute *inter partes* review based on Petitioner's other asserted ground with regard to Seshimo.

III. CONCLUSION

For the foregoing reasons, we determine Petitioner has established a reasonable likelihood of prevailing in showing that one or more claims are unpatentable over the cited prior art.

IV. ORDER

For the reasons given, it is:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–3, 7–9, and 13–15 of U.S. Patent No. 9,450,579 B2 is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the '579 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

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Patent 9,450,579 B2

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