

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INFINEON TECHNOLOGIES AG,
Petitioner,

v.

AMATECH GROUP LIMITED,
Patent Owner.

IPR2022-00951
Patent 9,165,240 B2

Before STACEY G. WHITE, BRIAN D. RANGE, and
JULIET MITCHELL DIRBA, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* WHITE.

Opinion Concurring-in-part filed by *Administrative Patent Judge* DIRBA.

Opinion Dissenting-in-part filed by *Administrative Patent Judge* RANGE.

WHITE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Some Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Infineon Technologies AG (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 1–11 of U.S. Patent No. 9,165,240 B2 (Ex. 1001, “the ’240 patent”). Paper 2 (“Pet.”). We instituted *inter partes* review of the challenged claims on all asserted grounds. Paper 10 (“Dec.”). After institution, AmaTech Group Limited (“Patent Owner”) filed a Patent Owner Response (Paper 16, “PO Resp.”), Petitioner filed a Reply (Paper 20, “Reply”), and Patent Owner filed a Sur-Reply (Paper 26, “Sur-Reply”). An oral hearing was held on September 7, 2023, and a transcript of the hearing is included in the record (Paper 36, “Tr.”). In response to our order (Paper 37) after the oral hearing, the parties each filed additional briefing regarding the construction of the term “connected in reverse phase with one another.” Paper 38 (Pet. Supp. Br.); Paper 39 (PO Supp. Br.).

We have jurisdiction under 35 U.S.C. § 6. This Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine Petitioner has shown, by a preponderance of the evidence, that claims 1, 2, 4–6, 8–10 of the ’240 patent are unpatentable, Petitioner has not established that claims 3 and 11 are unpatentable, and we cannot reach a determination regarding the patentability of claim 7.

A. Related Matters

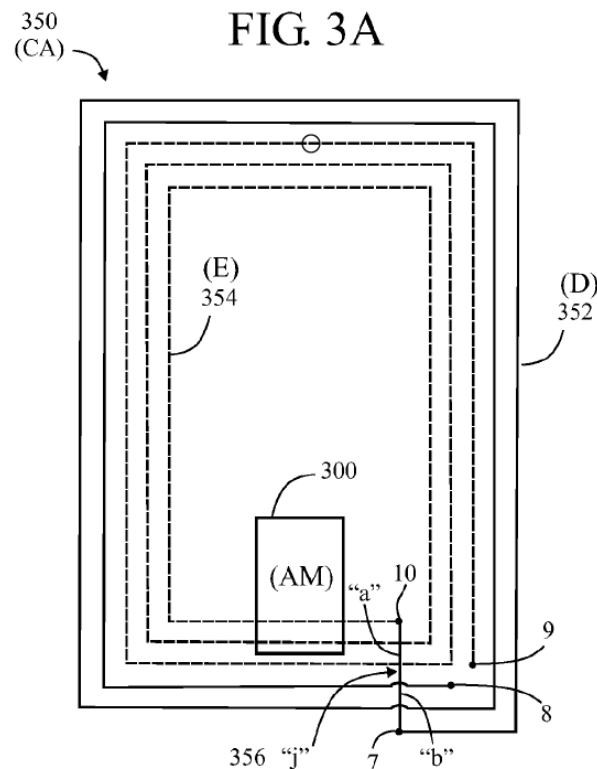
The parties identify the following related district court proceedings: *Smart Packaging Solutions SA v. CPI Card Group Inc.*, No. 1:21-cv-00556 (D. Del.); *Smart Packaging Solutions SA v. Perfect Plastic Printing Corp.*, No. 1:21-cv-00557 (D. Del.). Pet. xiii; Paper 4, 2. The parties further indicate that patents related to the ’240 patent were at issue in the following proceedings before the Board: IPR2022-00235 (U.S. Patent No. 9,195,932

B2) (final written decision issued June 13, 2023); IPR2022-00417 (U.S. Patent No. 9,033,250 B2) (final written decision issued July 6, 2023); IPR2022-00650 (U.S. Patent No. 9,633,304 B2) (final written decision issued September 1, 2023). Pet. xiii; Paper 4, 3.

B. The '240 Patent

The '240 patent, titled “Coupling In and To RFID Smart Cards,” relates to “smart cards having RFID (radio frequency identification) chips or chip modules,” and “more particularly to improving coupling between components within the smart card, such as between a module antenna (MA) associated with the chip module (CM) and a card antenna (CA) on the card body (CB) of the smart card and consequent improvements in interacting with external RFID readers.” Ex. 1001, code (54), 1:24–34.

Figure 3A of the '240 patent, showing a diagram of a card antenna (CA) for a smart card, is reproduced below:



As shown in Figure 3A, card antenna (CA) 350 is a “substantially planar, generally rectangular spiral of wire embedded in a card body (CB, not shown).” *Id.* at 13:59–61. Card antenna (CA) 350 comprises outer winding (D) 352 having outer end 7 and inner end 8 (shown as a solid line), and inner winding (E) 354 having outer end 9 and inner end 10 (shown as a dashed line). *Id.* at 13:61–14:3. Outer end 7 of outer winding (D) is connected with inner end 10 of inner winding (E), and “voltages induced in the inner and outer windings E, D have opposite phase from one another.” *Id.* at 14:16–26.

By connecting . . . inner end 10 of inner winding E to outer end 7 of outer winding D, or ‘reverse phase’[], the inner and outer windings are coupled in close proximity and the effect is additive since the induced voltage of the inner winding E has opposite phase (phase inversion) than the voltage induced in the outer winding D.

Id. at 15:11–18.

C. Illustrative Claims

Claims 1–11 are challenged, and claims 1 and 9 are independent. Claim 1 is illustrative and reproduced below.

1. A card body for a smart card, comprising:
 - a card antenna extending at least partially around a periphery of a surface of the card body;
 - wherein the card antenna comprises two windings, an inner winding and an outer winding, connected in reverse phase with one another.

Ex. 1001, 26:7–12.

D. Asserted Grounds of Unpatentability

Petitioner, supported by the Declarations of Dr. Daniel van der Weide (Exs. 1003, 1055), asserts the following grounds of unpatentability (Pet. 3, 9–76)¹:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–3, 9–11	103	Eray-WO799 ²
1 ³ , 4–7	103	Eray-WO799, Phillips-171 ⁴
1, 4 ⁵ , 8	103	Eray-WO799, Phillips-171, Caruana ⁶

Patent Owner opposes Petitioner’s contentions and relies upon the Declarations of Dr. William Eisenstadt. Exs. 2001, 2008.

II. ANALYSIS

A. Level of Ordinary Skill in the Art

In order to determine whether an invention would have been obvious, we consider the level of ordinary skill in the pertinent art at the critical time. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). The resolution of this

¹ We apply the pre-AIA version of 35 U.S.C. § 103 because the claims at issue have an effective filing date prior to March 16, 2013, the effective date of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”). *See* Ex. 1001, code (22).

² Eray, WO 2010/066799 A2, published June 17, 2010 (Ex. 1006, “Eray-WO799”).

³ Petitioner does not list claim 1 in its table on page 3, but Petitioner provides argument as to claim 1 in its discussion of the ground. *See* Pet. 56–57.

⁴ Phillips, US 2008/0203171 A1, published Aug. 28, 2008 (Ex. 1029, “Phillips-171”)

⁵ Petitioner does not list claims 1 and 4 in its table on page 3, but Petitioner provides argument as to claims 1 and 4 in its discussion of the ground. *See* Pet. 73.

⁶ Caruana et al., US 2008/0198078 A1, published Aug. 21, 2008 (Ex. 1026, “Caruana”).

question is important because it allows us to “maintain[] objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). Generally, it is easier to establish obviousness under a higher level of ordinary skill in the art. *Innovention Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d 1314, 1323 (Fed. Cir. 2011).

Petitioner contends that a person of ordinary skill in the art “would have had a Bachelor’s degree in electrical engineering or a similar field, and 1–2 years of experience researching and developing antennas used in RFID applications,” and that “[a]dditional educational background could substitute for professional experience and vice versa.” Pet. 8 (citing Ex. 1003 ¶¶ 22–26).

Patent Owner argues that Petitioner’s definition of the level of ordinary skill in the art is too broad and contends that that a person having ordinary skill in the art “would have had a Bachelor’s degree in electrical engineering or a similar field, and 1–2 years of experience researching and developing antennas for RFID devices that are used for inductive coupling; additional educational background could substitute for professional experience and *vice versa*.” PO Resp. 18. Patent Owner, however, goes on to state that “[n]onetheless, the difference between Petitioner’s and Patent Owner’s definition of a [person of ordinary skill in the art] is not material to the issues discussed herein.” *Id.* (citing Ex. 2008 ¶ 20–29).

We find that Petitioner’s description is consistent with the prior art and patent specification currently before us. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art itself may reflect an appropriate level of skill). For purposes of our Decision, we adopt Petitioner’s definition of the level of ordinary skill in the art as “a Bachelor’s degree in

electrical engineering or a similar field, and 1–2 years of experience researching and developing antennas used in RFID applications.” *See* Pet. 8. In addition, we note that we agree with Patent Owner’s statement that the distinction between the parties’ proposals is not material to any dispute before us and we find that our determinations would be the same under either definition of the person of ordinary skill in the art.

B. Dr. van der Weide’s Testimony

Patent Owner argues that we should give no weight to the testimony of Petitioner’s declarant, Dr. van der Weide, because “[h]is evasive ploys during cross-examination frustrated Patent Owner’s counsel’s opportunity to get clarification on the opinions in his declaration support the Petition.” PO Resp. 57–58. Patent Owner cites to a number of instances that Patent Owner contends to show Dr. van der Weide’s purportedly evasive conduct. *Id.* at 58 (collecting citations from Dr. van der Weide’s deposition testimony). Petitioner contends that Patent Owner’s assertions regarding Dr. van der Weide are mere distractions from the merits and are based on Dr. van der Weide’s “responses to irrelevant, incomprehensible hypotheticals.” Reply 32 (citing PO Resp. 57–58, Ex. 2009, 118:11–122:9).

We are not persuaded that Dr. van der Weide’s cited testimony is of a nature that should lead us to give his testimony no weight. We note that Patent Owner did not move to strike or exclude Dr. van der Weide’s testimony. When considering credibility and weight of evidence below, we consider Dr. van der Weide’s testimony as a whole as well as all other evidence of record and accord it the appropriate weight.

C. Claim Construction

In an *inter partes* review proceeding, a patent claim shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b) (as amended Oct. 11, 2018). Our rule adopts the same claim construction standard used by Article III federal courts, which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. Under this standard, the words of a claim are generally given their “ordinary and customary meaning,” which is the meaning the term would have to a person of ordinary skill at the time of the invention, in the context of the entire patent including the specification. *See Phillips*, 415 F.3d at 1312–13.

Petitioner asserts that “[n]o claim term requires an exact outer boundary construction, because the prior art relied upon herein meets the claim terms under any reasonable interpretation.” Pet. 9. Patent Owner proposes constructions for the claim terms (1) “an inner winding and an outer winding, connected in reverse phase with one another,” (2) “card antenna” and (3) “the inner end of the outer winding and the outer end of the inner winding are unconnected.” PO Resp. 18–46. For the purposes of this Decision, we determine that there is a need to address each of the terms proposed by Patent Owner and the language of claim 7, which states “wherein an outer end of the outer winding is connected with an inner end of the inner winding, and the inner end of the outer winding and inner end of the inner winding are left unconnected as free ends.”

*1. “an inner winding and an outer winding,
connected in reverse phase with one another”*

In our Decision on Institution, we preliminarily construed “‘an inner winding and an outer winding, connected in reverse phase with one another’

to mean ‘the inner end of the inner winding is connected to the outer end of the outer winding.’ Dec. 13. Patent Owner contends that our preliminary construction is incorrect and defines “an inner winding and an outer winding, connected in reverse phase with one another” as “an inner winding and an outer winding connected with each other, such that during operation, the phase of the induced voltage in the inner winding is shifted by 180 degrees from the phase of the induced voltage in the outer winding.” PO Resp. 20. Patent Owner contends that “reverse phase” was known and had an ordinary meaning of “a phase shifted by 180 degrees.” *Id.* at 21. According to Patent Owner, an ordinarily skilled artisan would have known that “connected in reverse phase with one another” refers to “two windings are ‘connected in reverse phase,’ and the voltages in the windings are 180 degrees out of phase from each other (*i.e.*, the voltage in one winding is shifted by 180 degrees with respect to the voltage in the other winding).” *Id.* at 23–24 (citing Ex. 2008 ¶ 62). Patent Owner further argues that “a [person of ordinary skill in the art] would not have understood ‘connected in reverse phase’ to refer to only ‘structure,’ as Petitioner alleges. Instead, ‘connected in reverse phase’ requires that the voltages in the connected coils are 180 degrees out of phase with each other.” *Id.* at 25 (citing Ex. 2008 ¶ 73, Pet. 32).

Petitioner responds by asserting that “(1) ‘connected in reverse phase’ is a **structural** limitation limiting how the inner/outer windings are connected; [and] (2) the only such connection the specification describes is between the inner end of the inner winding and the outer end of the outer winding.” Reply 10 (citing Pet. 28–33; Ex. 1001, 15:11–13). Petitioner argues that any shifting such as would be required by Patent Owner’s

construction would only occur during operation of the smart card and the claims are structural and do not recite “any electrical effect ‘during operation.’” *Id.* at 11. Petitioner further contends that Patent Owner “alleges that ‘connected in reverse phase’ is a purely functional limitation covering every *unspecified structure* that causes voltages in the inner and outer windings to be 180° out of phase ‘during operation.’” *Id.*

Both parties direct us to the same language in the specification to support their views on the claim language. Specifically, they direct us to this discussion in the specification:

By connecting the outer winding D and inner winding E in this manner (**inner end 10 of inner winding E to outer end 7 of outer winding D, or “reverse phase”**), the inner and outer windings are coupled in close proximity and the effect is additive since the induced voltage of the inner winding E has opposite phase (phase inversion) than the voltage induced in the outer winding D.

Ex. 1001, 15:11–17 (emphasis added), cited on PO Resp. 13 *and* Pet. 30.

The parenthetical indicates that connecting the inner end of the inner winding and the outer end of the outer winding is a reverse phase connection. We determine, and the parties agree, that a reverse phase connection may be made when the inner end of the inner winding is connected to the outer end of the outer winding. *See* Sur-Reply 12.

Patent Owner contends that “Petitioner’s proposed construction fails to acknowledge the doctrine of claim differentiation” and “renders claims 2 and 10 superfluous.” PO Resp. 36. Patent Owner points out that Petitioner’s proposed construction is “virtually identical” to the language of dependent claim 2. *Id.* Claim 2 which depends from claim 1 recites, in relevant part, “an outer winding having an outer end and an inner end; an inner winding having an outer end and an inner end; and the inner end of the

inner winding is connected with the outer end of the outer winding.” Ex. 1001, 15–18. Patent Owner asserts that claim 1 is not limited to the disclosed embodiments and that other possible variations are also within the scope of claim 1. PO Resp. 37.

Petitioner responds by noting correctly that “[c]laim differentiation ‘is a guide, not a rigid rule’ that ‘does not require the dependent claim tail wag the independent claim dog.’” Reply 20 (quoting *Howmedica Osteonics Corp. v. Zimmer, Inc.*, 822 F.3d 1312, 1323 (Fed. Cir. 2016)). Petitioner asserts (and we agree) that “[e]ven if the Board were to find that claim 1’s ‘connected in reverse phase’ must be broader than claim 2, that would only mean that claim 1 also covers some unidentified technique(s) nowhere described in the specification.” *Id.* at 21.

On Sur-reply, Patent Owner responded by asserting that Petitioner’s argument regarding claim differentiation fails because “‘reverse phase’ describes multiple embodiments in the ’240 patent.” Sur-reply 19. Specifically, Patent Owner directs us to the embodiment described in Figure 4I “that has nothing to do with an ‘inner winding’ or an ‘outer winding.’” *Id.* at 15. As such, Patent Owner contends that “Petitioner is wrong when it repeatedly contends that ‘reverse phase’ only refers to the inner end of the inner winding connected with the outer end of the outer winding.” *Id.* at 16.

As the Federal Circuit has stated, “[b]y definition, an independent claim is broader than a claim that depends from it, so if a dependent claim reads on a particular embodiment of the claimed invention, the corresponding independent claim must cover that embodiment as well.” *Littelfuse, Inc. v. Mersen USA EP Corp.*, 29 F.4th 1376, 1380 (Fed. Cir. 2022) (citing *Baxalta Inc. v. Genentech, Inc.*, 972 F.3d 1341, 1346 (Fed. Cir.

2020)). As such, we agree it may be proper to interpret the reverse phase connection of claim 1 as being broader than the specific connection recited in dependent claim 2. In our above discussion of the language of column 15 of the '240 specification, however, we merely state that the parenthetical indicates that connecting the inner end of the inner winding and the outer end of the outer winding is *a* reverse phase connection. This does not foreclose the possibility that there may be other ways to connect in reverse phase that go beyond the connection described in column 15. As such, we find that a construction that includes but is not limited to a connection in which the “the inner end of the inner winding is connected to the outer end of the outer winding” would not render claim 2 superfluous. The question is whether more is required.

Patent Owner argues that “connected in reverse phase” is not merely a structural limitation. PO Resp. 25. In support, Patent Owner reasons that an ordinarily skilled artisan would have understood “reverse phase” to refer to two signals that are “phase shifted by 180 degrees” (*id.* at 11–14, 21–23), but the claim recites *windings connected in* reverse phase, not *signals having* reverse phase. In addition, according to Patent Owner, “[t]he file history of the '240 patent further makes clear that ‘connected in reverse phase’ refers to the function or operation of the card antenna.” *Id.* (citing Ex. 1002, 156. Ex. 2008 ¶ 74). In the cited portion of the prosecution history, the claims stood rejected over the Emori reference. Ex. 1002, 152. The applicant stated that

Emor[i]’s antenna coils (4a, 4b) are disposed on two opposite surfaces of the substrate. ***It is not evident that they are connected in reverse phase with one another.*** Rather, since they are intended to function as a capacitor, it is likely that they are exact clones of one another (with the windings of one coil being

disposed directly atop the windings of the other coil, but on the opposite surface of the substrate).

Id. at 156 (emphasis added). In Patent Owner's view, the statement that Emori's coils were "intended to function as a capacitor" indicates that reverse phase relates to the function or operation of the circuit. PO Resp. 25, Ex. 2008 ¶ 74. We do not find this argument to be persuasive. The applicant's statement does not focus on Emori's coils' function as a capacitor, but rather on the coils' structure. *See* Ex. 1002, 156 ("with windings of one coil being disposed directly atop the windings of the other coil, but on the opposite surface of the substrate.")). The description of Emori's coils is meant to show a distinction between Emori and the description of "Applicant's antenna structures[, which] are substantially coplanar, disposed on one surface of the substrate, one winding (E) is disposed inside of the other winding (D), and may be formed as one continuous structure." *Id.* As such, this language from the prosecution history does not indicate to us that there is a functional element required of the reverse phase connection.

Patent Owner further argues that "numerous prior art references" support its contention that one of ordinary skill in the art would have known that when windings are connected in reverse phase "the voltages in the windings are 180 degrees out of phase from each other." PO Resp. 23. For example, Patent Owner directs us to U.S. Pat. No. 3,217,096 (Ex. 2010, "the '096 patent"). *Id.* at 24. The '096 patent "relates in general to an interstage coupling circuit and more particularly to a filter trap network useful for rejecting a relatively narrow band of frequencies in a transistor television receiver." Ex. 2010, 1:9–12. The '096 patent states that "[b]y connecting the polarity of inductors 72 and 75 in reverse phase relationship, the

alternate signal path provides a signal at junction 66 which is 180 [degrees] out of phase with the signal path through coupling coil 53 and capacitor 54.”
Ex. 2008 ¶ 63 (quoting Ex. 2010, 4:30–35). Figure 1 of the ’096 patent is reproduced below.

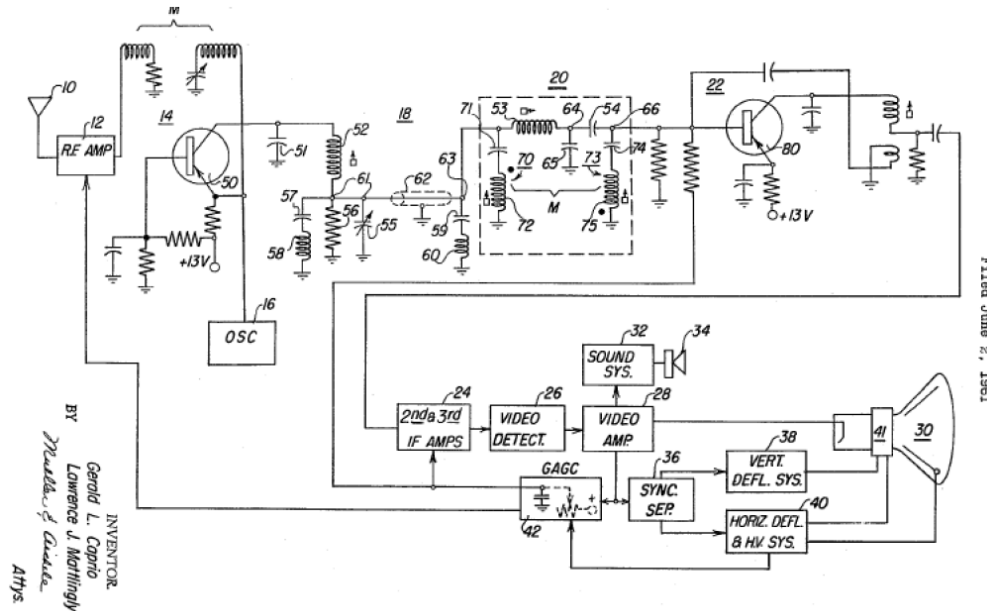


Figure 1, reproduced above, depicts the general operation of a television receiver. Ex. 2010, 2:34–35. As noted above, the ’096 patent describes inductors 72 and 75 as being connected in reverse phase. Dr. Eisenstadt directs us to passages from the ’096, which he opines explain the relevant operation. Ex. 2008 ¶ 64 (quoting Ex. 2010, 2:19–28).

The series-resonant circuits each include a capacitor and an inductor with the inductors having a mutual coupling therebetween to effectively provide an alternate signal path in shunt with the signal path through the secondary coupling coil. By further connecting the inductors of the series resonant circuits in reverse polarity relation, a reverse phase shift is effected through the alternate signal path whereby a range of frequencies is cancelled within the pass band range of the interstage coupling circuit.

Ex. 2010, 2:19–28. According to Dr. Eisenstadt this shows that by “connecting inductors in the series-resonant circuits in reverse polarity relationship, a reverse phase shift is effected.” *Id.*

This evidence and Patent Owner’s other cited references (*see* Exs. 2010–2012) led us to explore during the oral hearing whether connecting the windings in reverse phase would be achieved if the inner winding and an outer winding were wound in the same direction. *See* Tr. 13:16–17:18. As such, we directed the parties to provide further briefing as to whether connected in reverse phase as recited in claims 9 and 11 “includes (but is not limited to) an arrangement where an inner winding and an outer winding are wound in the same direction and the inner end of the inner winding is connected to the outer end of the outer winding.” Paper 37. In response to our order, the parties each filed additional briefing responding to this potential construction. Pet. Supp. Br.; PO Supp. Br.

Petitioner responded that the construction proposed in our Order “is a proper construction for resolving the parties’ dispute.” Pet. Supp. Br. 1. Petitioner explained that it believes that while the claim term is not limited to an arrangement where the windings are wound in the same direction “[t]he specification fully supports that ‘connected in reverse phase . . . *includes* an arrangement where the inner and outer windings are wound in the same direction and have an inner/inner to outer/outer connection.” *Id.* at 2.

Petitioner contends that the Board’s proposed construction comports with its view as to the “additive effect” mentioned in the above cited passage from column 15 of the ’240 specification. *Id.* at 3; *see also* Ex. 1001, 15:13–17 (“[T]he inner and outer windings are coupled in close proximity and the effect is additive since the induced voltage of the inner winding E has

opposite phase (phase inversion) than the voltage induced in the outer winding D.”), 18:10–13 (“When the inner winding E and outer winding D are exposed to the same magnetic field flux of a reader (Fig 1A), the voltages of the windings are added. The arrangement of the two windings is important, and the connection ‘j’ causes a phase inversion and has an additive effect.”). According to Petitioner, the functional effect resulting from connecting the inner and outer windings in the manner described above is that the voltages are added. Reply 14. “Each winding has a polarity (‘+’ and ‘–’ ends) reflecting the polarity of its induced voltage. To achieve an additive effect whereby the windings’ voltages are added, opposite-polarity ends of the windings are connected (‘+’ to ‘–’), like loading batteries into a flashlight.” *Id.* at 14–15 (internal citation omitted) (citing Ex. 1055 ¶¶ 43–46; Ex. 1056, 143:12–19, 145:1–2; Ex. 1057, 40–41, 298, Figs. 2.18–2.19). Petitioner argues that Figure 3A of the ’240 patent depicts an arrangement where “the inner/outer windings are wound in the same direction (clockwise inner-to-outer) so they have the same polarity.” *Id.* at 15 (citing Ex. 1055 ¶ 47).

Patent Owner argues that the proposed construction in our Order is incorrect and improper. PO Supp. Br. Patent Owner contends that providing a partial construction is not proper, the proposed construction does not account for a preferred embodiment, is of an improper scope, ignores claim differentiation, and is something that was not proposed by either party. *Id.* at 1–5. We address each of these arguments in turn.

First, we are not limited to claim constructions proposed by the parties. The Federal Circuit has rejected the argument that we are constrained to only select a construction proffered by the parties. So long as

the parties “ha[ve] notice of the contested claim construction issues and an opportunity to be heard” we may adopt our own construction of a contested claim term. *Hamilton Beach Brands, Inc. v. freal Foods, LLC*, 908 F.3d 1328, 1339 (Fed. Cir. 2018); *see also Axonics, Inc. v. Medtronic, Inc.*, 75 F.4th 1374, 1381 (Fed. Cir. 2023) (“it is permissible for the Board to adopt a new construction, proposed either by the patent owner or by the Board itself, in a final written decision”). Here, the meaning of reverse phase has been at issue throughout the entire proceeding. *See, e.g.*, Pet. 29; Prelim. Resp. 14–27; PO Resp. 19–38. Thus, the parties had full notice that this term was at issue and each provided argument and evidence regarding its view of the proper construction of this term.

Second, contrary to Patent Owner’s assertions, we are not required to provide an express construction of the full breadth of a claim term. “The Board is required to construe ‘only those terms ... that are in controversy, and only to the extent necessary to resolve the controversy.’” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019). As such, we proceed in line with Federal Circuit case law, which “prescribes—deciding only the issues necessary to resolve the dispute before it.” *Nichia Corp. v. DSS, Inc.*, No. 2022-1704, 2023 WL 7211097, at *3 (Fed. Cir. Nov. 2, 2023) (citing *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017)). The Federal Circuit has long recognized that “[c]laim construction is a matter of resolution of disputed meanings and technical scope” and that claim construction may be required in an obviousness context “when the meaning or scope of technical terms and words of art is unclear and in dispute and requires resolution in order to determine obviousness.” *U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d

1554, 1568 (Fed. Cir. 1997). In order to determine whether Petitioner’s obviousness grounds meet their required burden of proof, we need not expressly state the full scope of this claim term. Thus, we are within our authority to proffer a construction that determines the scope of a claim term in a manner sufficient to determine whether the asserted art teaches the claim. In other words, there may be other ways to meet the disputed limitation, but for the purposes of our Decision, it is proper to expressly determine a claim term’s scope only as much as is required to resolve the disputed issues before us.

Third, Patent Owner contends that requiring the inner end of the inner winding to be connected to the outer end of the outer winding is a flawed construction because it excludes the embodiment described in Figure 4I of the ’240 patent. PO Supp. Br. 2. This argument is premised upon the assertion that a partial construction that does not define the full scope of the claim term is “incorrect and unprecedented.” *Id.* As explained above, we are not required to provide an express construction beyond that necessary to resolve the obviousness issues before us. Patent Owner acknowledges that the embodiment described in Figure 4I does not include inner or outer windings. *Id.* (citing Ex. 1001, 20:5–7, Sur-Reply, 15–16). Thus, Figure 4I is outside of the scope of all of the challenged claims, which expressly recite “two windings, an inner winding and an outer winding.” Ex. 1001, 26:10–11 (independent claim 1), 26:40–41 (“two winding portions, an inner winding and an outer winding”) (independent claim 9). Therefore, a determination of how reverse phase must be interpreted in the context of Figure 4I is outside of the scope of the issues currently before us.

Fourth, Patent Owner argues that the Board’s proposed construction does not have proper scope. PO Resp. Br. 3–5. According to Patent Owner, the proposed construction is under-inclusive in that “[t]he ‘reverse phase’ language should not be limited by any single mechanical configuration. Instead, the limitation-at-issue refers to the electromagnetic characteristics of the electrical signals in the windings when the windings are connected.” *Id.* at 3 (citing PO Resp. 19–34). As such, Patent Owner contends that the Board’s proposed construction is improper because “Petitioner has provided no evidence that connecting the inner end of the inner winding with the outer end of the outer winding is the **only way** by which ‘reverse phase’ can be achieved.” *Id.* at 3–4 (citing Tr. 9:15–16). As explained above, our proposed construction is not an outer bounds construction that expressly provides for the full scope of ways that the claim language may be met. We need not determine whether there are other ways to meet the claim language, but rather we need only determine for the purposes of this Decision the scope of the claim term necessary to resolve the issues before us.

Patent Owner also argues that our proposed construction is over-inclusive. *Id.* at 4–5. Patent Owner’s declarant opines that reverse phase requires the windings to have open ends and thus, a construction that does not require open ends will include structures that cannot meet the claims. *Id.* at 4. In his testimony, Dr. Eisenstadt opines that it is necessary “that the phase of the voltage in the inner winding [be] shifted by 180 degrees from the phase of the voltage in the outer winding.” Ex. 2008 ¶ 101 *cited on* page 53 of PO Resp. He states that the asserted art does not reverse phase because “no part of [the alleged inner winding] is open circuited which is necessary to order to have reversed phase in [the alleged inner winding].

There needs to be an open . . . end of [the alleged inner winding] for it to be able to see reverse phase voltages from [the alleged outer winding] as described in '240 patent.” *Id.* ¶ 102.

Petitioner responds that this testimony “warrants no weight because [Patent Owner’s] expert *cites no supporting evidence.*” Reply 27–28. Further, Petitioner contends that Patent Owner’s own references (*see* Exs. 2010–2012) proffered to show that “connected in reverse phase” was a known term in the art “describe phase in version between coils despite no open circuit.” *Id.* at 28 (citing Ex. 1055 ¶¶ 78–79; Ex. 1056, 225:2–16, 231:14–25, 238:12–15). Dr. van der Weide opines in support of Petitioner that a person of ordinary skill in the art would have understood that an open circuit is not required and that Dr. Eisenstadt’s testimony acknowledges that Exhibits 2010–2012 do not show open circuits. Ex. 1055 ¶ 79 (citing Ex. 1056, 225:2–16 (“admitting that Exhibit 2012 was not open circuited and had no open [ends]”), 231:14–25 (“admitting same for Exhibit 2010”), 238:12–15 (“admitting same for Exhibit 2011”) (quoted language is Dr. van der Weide’s characterization of Dr. Eisenstadt’s testimony)). Based on the record before us, we agree with Petitioner’s assertion that Exhibits 2010–2012 do not include open ends. Thus, on this record, we determine that an ordinarily skilled artisan would not understand “connected in reverse phase” to require open ends.

Finally, Patent Owner argues that “[t]he Board’s proposed construction renders claim 2 entirely superfluous” and thus, is improper. PO Resp. Br. 5. Claim 2 depends from claim 1 and recites, in relevant part, “an outer winding having an outer end and an inner end; an inner winding having an outer end and an inner end; and the inner end of the inner winding

is connected with the outer end of the outer winding.” Ex. 1001, 26:15–18. Petitioner correctly argues that claim differentiation “is a guide, not a rigid rule that ‘does not require that the dependent claim tail wag the independent claim dog.’” Reply 20–21 (quoting *Howmedica Osteonics Corp. v. Zimmer, Inc.*, 822 F.3d 1312, 1323 (Fed. Cir. 2016)). Petitioner further contends that “[e]ven if the Board were to find that claim 1’s ‘connected in reverse phase’ must be broader than claim 2, that would only mean that claim 1 also covers some unidentified technique(s) nowhere described in the specification.” *Id.* at 21 (citing Pet. 6, 29–30; PO Resp. 13–14). We agree with Petitioner that claim 1 may include other ways to meet the recited reverse phase connection. For the purposes of this Decision, however, we need only determine whether our proposed construction of the term falls within the scope of arrangements that meet this disputed limitation.

Thus, for all of the foregoing reasons, we find for the purposes of this Decision that connected in reverse phase as recited in claims 1 and 9 “includes (but is not limited to) an arrangement where an inner winding and an outer winding are wound in the same direction and the inner end of the inner winding is connected to the outer end of the outer winding.”

2. “card antenna”

Patent Owner defines a “card antenna” as “an antenna tuned to a single resonance frequency that enables a chip to communicate with an external reader.” PO Resp. 38. Patent Owner contends that “the Petition fails to recite a cohesive and coherent construction of ‘card antenna.’” *Id.* at 41. According to Patent Owner, “the parties[] agree that (1) a card antenna is an antenna, (2) an antenna is tuned to a single resonance frequency, and (3) that the card antenna enables a chip to communicate with an external

reader.” *Id.* at 39 (citing Ex. 2008 ¶ 83). Patent Owner directs us to multiple citations in the ’240 patent specification that it argues indicate a single resonance frequency is required for the card antenna. *See, e.g.*, PO Resp. 40–41 (citing Ex. 1001, 16:16–19 (“The card antenna CA ... resonant frequency 13.56 MHz”)). Patent Owner also directs us to multiple citations to the Petition that Patent Owner asserts show agreement with its view of the claim term. *See, e.g., id.* at 40 (quoting Pet. 4 (“The antenna forms a resonant circuit tuned to resonate at the RFID reader’s transmission frequency”))).

Petitioner responds that it “does ***not*** ‘agree... an antenna is [or must be] tuned to a ***single*** resonance frequency.” Reply 3 (quoting PO Resp. 39). In the Institution Decision, we preliminarily decided to “decline Patent Owner’s request to limit the claims to the described single-frequency embodiments” and found that further express construction was not necessary for the purposes of the Institution Decision. Dec. 11. We find that our preliminary determination regarding this term is still sufficient for the purposes of this Final Written Decision.

As an initial matter, we note that none of the claims recite specific frequencies or frequency ranges. Further, the examples in the specification describe the frequency with permissive and approximate language. *See, e.g.*, Ex. 1001, 13:14–15 (“***may*** have a self-resonance frequency of ***approximately*** 75 MHz”) (emphasis added); 13:18–21 (capacitors “***may*** reduce the resonance frequency to a more desirable range of ***approximately*** 13~17 MHz”) (emphasis added). The specification also notes that “[w]hile the invention(s) has/have been described with respect to a limited number of embodiments, these should not be construed as limitations on the scope of

the invention(s), but rather as examples of some of the embodiments.” *Id.* at 25:65–26:1; *see also id.* at 6:18–20 (embodiments “should be construed as illustrative rather than limiting”), 5:22–24 (“non-limiting example”). The Federal Circuit has noted that “[e]mbodiments in the specification—even if there is only one embodiment—cannot limit the scope of the claims absent the patentee’s ‘words or expressions of manifest exclusion or restriction.’” *Apple Inc. v. Wi-LAN Inc.*, 25 F.4th 960, 967 (Fed. Cir. 2022) (citing *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1372 (Fed. Cir. 2014)). After reviewing the complete record, we see no such manifest exclusion or restriction in the ’240 patent specification.

We decline Patent Owner’s request to limit the claims to the described single-frequency embodiments. *See Phillips*, 415 F.3d at 1323. We need not provide further express construction of this claim language for purposes of this Decision.

3. “*the inner end of the outer winding and the outer end of the inner winding are unconnected.*”

Claim 3 depends from claim 1 and recites, in relevant part, “the inner end of the outer winding and the outer end of the inner winding are unconnected.” Ex. 1001, 26:20–21. Claim 11 depends from claim 9 and similarly recites, in relevant part “leaving an inner end of the outer winding and an outer end of the inner winding unconnected.” *Id.* at 26:46–48. Patent Owner asserts that these terms both should be construed to mean “the inner end of the outer winding and the outer end of the inner winding are open.” PO Resp. 42.

Petitioner argues that “[t]he plain meaning of ‘unconnected’ is ‘not connected.’” Pet. 35 (citing Ex. 1044, 1555). Thus, Petitioner asserts that the plain meaning of these terms “requires that the inner end of the outer

winding and the outer end of the inner winding are not connected to each other.” *Id.* Dr. van der Weide supports Petitioner by opining that “[t]he plain meaning of ‘unconnected’ to a [person of ordinary skill in the art] is ‘not connected.’” Ex. 1003 ¶ 140 (citing Ex. 1044, 1555) (dictionary definition of unconnected). Dr. van der Weide goes on to explain that “[w]hen the ’240 patent’s specification describes a winding end as not connected to *anything* else, it more narrowly describes the end as being ‘left unconnected’ and as a ‘loose’ end that ‘remain[s] open.’” *Id.* ¶ 141 (citing Ex. 1001, 14:21-23, 15:35-36, 18:30-34, 19:37-41, 19:50-54, 3:12-15, 2:40-42, 16:66-17:2).

Patent Owner directs us to evidence in the specification that it contends establishes that unconnected means that the ends are loose or open. PO Resp. 43 (“’240 patent, 3:14–15 (‘unconnected (loose)’); 12:41–42 (‘left unconnected (remain open)’); 15:3–4 (‘open (not connected with anything)’”). Dr. Eisenstadt opines in support of Patent Owner that “[t]he ’240 patent uses the synonyms ‘loose’ and ‘open’ for the term ‘unconnected.’” Ex. 2008 ¶ 88. He further testifies that

‘Open’ is a very well-known term to anyone familiar with circuits, and certainly a [person of ordinary skill in the art]. Although ‘open’ is not a claim term, the ’240 patent uses ‘open’ in its conventional way. ‘Open’ describes a[n] unconnected node or the state of a circuit. ‘Open’ describes the condition of a circuit when current cannot flow. Often, as is well-understood, a circuit that has an ‘open’ condition is referred to as an ‘open circuit.’ The concept of ‘open’ circuits is taught in introductory electrical engineering classes, including classes I teach.

Id. ¶ 89 (internal citations omitted).

We find that Patent Owner’s view of the claim language is correct. The ’240 specification equates unconnected with open and we note that

every reference to unconnected ends in the '240 specification refers to ends that are open or loose. *See* Ex. 1001, 3:14–15, 12:40–42, 14:22–23, 15:31–36, 18:1–2, 18:31–33, 19:40–41, 19:53–55 *but see* Ex. 1055 ¶ 88 (stating without citation to the '240 patent that “the patent never equates ‘unconnected’ with ‘loose’ or ‘open.’”). For example, in describing Figure 2B the specification states that “[t]he outer end 3 of the stub B and the inner end 6 of the stub C may be left unconnected (remain open).” Ex. 1001, 12:40–42. In addition, when describing Figure 3A, the specification states that “[t]he outer end 9 of the inner winding E and the inner end 8 of the outer winding D may be left open (not connected with anything),” and it contrasts “unconnected” ends 8 and 9 with the ends in a prior art reference that are connected to another circuit component. *Id.* at 15:2–4, 15:23–39. Similarly, the specification also describes a prior art reference as having ends that “are left unconnected (loose).” *Id.* at 3:14–15. We find that placing the words “remain open” and “loose” in parentheses after the word unconnected indicates that remain open and loose are definitions for unconnected.

Petitioner contends that the term “left” modifies the term “left unconnected” such that the inclusion of “left” changes the definition of unconnected from “not connected to each other” to “not connected to anything else.” *See* Ex. 1003 ¶¶ 140–141. As support for this position, Petitioner contrasts the language of claim 3 (ends “are unconnected”) with the language of claim 7 which recites, in relevant part, that ends “are left unconnected as free ends.” *See* Reply 30.

We do not agree with Petitioner’s argument. As to claim 7, to say the least, there is considerable ambiguity as to the meaning of this claim. *See infra* § II.C. 4. In addition, Patent Owner contends (and we agree) that this

is a circumstance where “different claim language, which appears in two different claims that are independent of each other, can have the same meaning.” PO Resp. 45 (citing *Baran v. Med. Device Techs., Inc.*, 616 F.3d 1309, 1316 (Fed. Cir. 2010)). Further, it is not clear why the term “left” would be interpreted to modify the term unconnected in the manner asserted by Petitioner. Petitioner has not provided sufficient evidence that “left” would indicate how the ends may or may not be connected. In other words, Petitioner has not established that ends “left unconnected” may not be connected to anything, but ends that are simply “unconnected” may be connected to something other than another end. *See also* Ex. 1001, Fig. 4A, 18:1 (discussing “[t]he unconnected ends 8 and 9” of Fig. 4A, which are depicted as open ends in Figure 4A). In addition, Patent Owner explains persuasively that the word “‘left’ is the past tense of ‘leave,’ which means ‘to allow or cause to remain behind... to have as a remainder.’” PO Resp. 44 (quoting Ex. 2008 ¶ 90). As such, Patent Owner asserts (and we agree) that “left” in “left unconnected” relates to “remain” in the parenthetical “remain open.” *Id.*

As such, we adopt Patent Owner’s construction and find that the unconnected terms of claims 3 and 11 mean “the inner end of the outer winding and the outer end of the inner winding are open.”

4. “*wherein an outer end of the outer winding is connected with an inner end of the inner winding, and the inner end of the outer winding and inner end of the inner winding are left unconnected as free ends*”

Claim 7, which depends indirectly from independent claim 1, recites in relevant part, “outer end of the outer winding ***is connected with an inner end of the inner winding.***” Ex. 1001, 26:31–33 (emphasis added). The claim goes on to recite, in relevant part, that the “inner end of the outer

winding and *inner end of the inner winding are left unconnected as free ends.*” *Id.* at 26:33–34 (emphasis added). Thus, on its face, claim 7 requires the inner end of the inner winding to be both an unconnected free end and connected to the outer end of the outer winding. Petitioner contends that “[t]he ’240 patent discloses no embodiment that satisfies both requirements and never explains how both could be met.” Pet. 64 (citing Ex. 1003 ¶¶ 220–221).

Petitioner further asserts that, should we determine that this is an error that should be corrected by the Board (e.g., by changing the claim such that it recites that the “outer end of the inner winding” be left unconnected as a free end), its cited art would render the claim obvious. Pet. 64–65 (citing Ex. 1003 ¶¶ 222–223). Patent Owner, however, does not address this portion of claim 7. *See* PO Resp. 44–46 (discussing the import of the term “free ends” as used in claim 7), Sur-Reply 6–7 (same).

In certain rare circumstances, obvious errors may be corrected via claim construction. *See Novo Indus., L.P. v. Micro Molds Corp.* 350 F.3d 1348, 1354 (Fed. Circ. 2003) (holding obvious errors in a claim can be corrected in construing the claim). This, however, is not an instance in which we have been presented with an obvious error with an obvious correction. The conflict in the language could be alleviated by changing the language to reflect that the inner end is to be left unconnected *or* the language could be changed such that the inner end is to be left connected. We decline to make such a determination. This is especially true in this circumstance where the Patent Owner has chosen not to speak on the apparent conflict in the language. We determine, therefore, that the conflicting language of claim 7’s limitation “wherein an outer end of the

outer winding is connected with an inner end of the inner winding, and the inner end of the outer winding and inner end of the inner winding are left unconnected as free ends” is such that we are unable to determine the scope and meaning of the claim.

D. Overview of the Asserted Prior Art

1. Eray-WO799 (Exhibit 1006)

Eray-WO799 relates to an RFID antenna circuit for use in, e.g., contactless cards and card readers. Ex. 1006, 1:1–10.

Figure 12 of Eray-WO799 shows an embodiment of the RFID antenna circuit and is reproduced below:

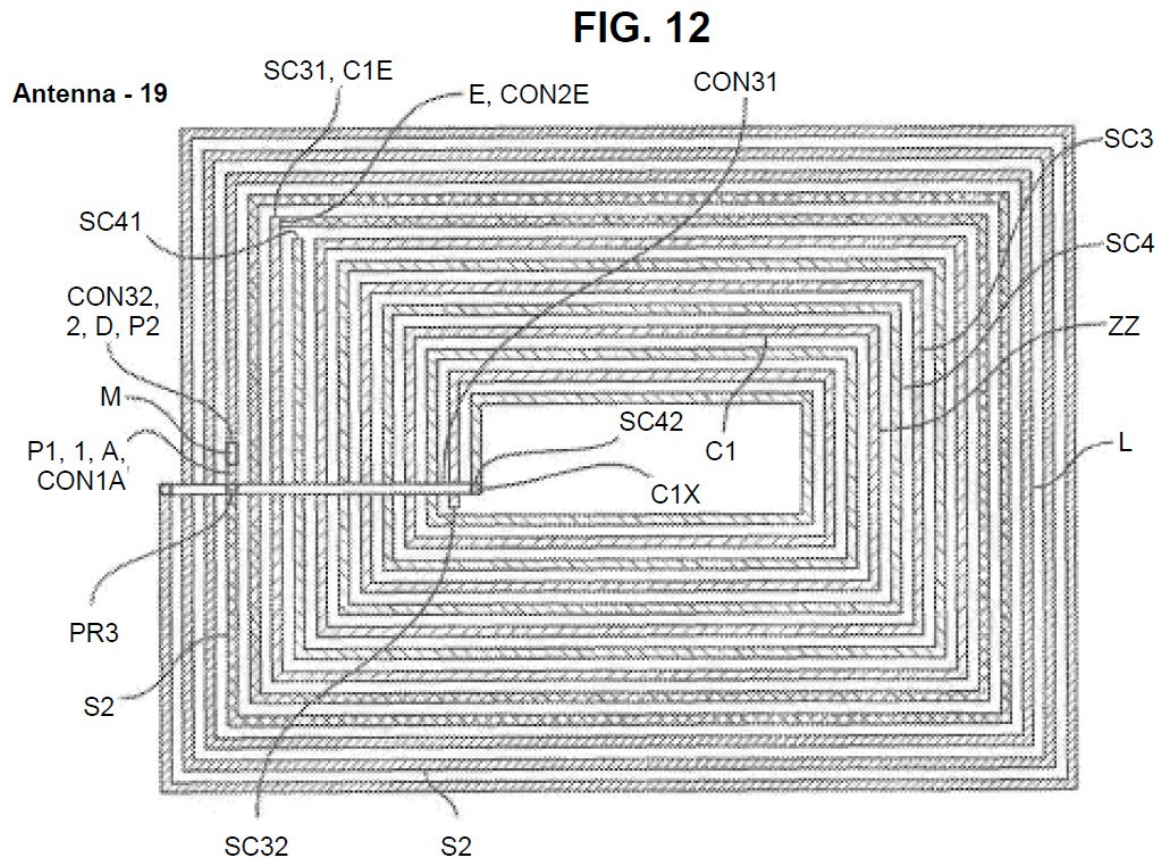


Figure 12 depicts antenna L formed by turns S1, S2 situated between first end terminal D and second end terminal E. *Id.* at 34:10–11. Tuning

capacitor C1 is formed by turns SC3 (having first and second ends SC31, SC32) and turns SC4 (having first and second ends SC41, SC42). *Id.* at 35:3–5.

2. Phillips-171 (Ex. 1029)

Phillips describes antenna designs for contactless payment cards in which “reduced size antennas are geometrical[ly] disposed in areas removed from card areas designated for embossing.” Ex. 1029, code (57).

3. Caruana (Ex. 1026)

Caruana discloses adjusting frequency tuning of a resonant circuit in a non-contact smart card by varying the regular spacing of adjacent turns on at least one zone of the antenna. Ex. 1026, code (57), ¶ 3.

E. Obviousness over Eray-WO799

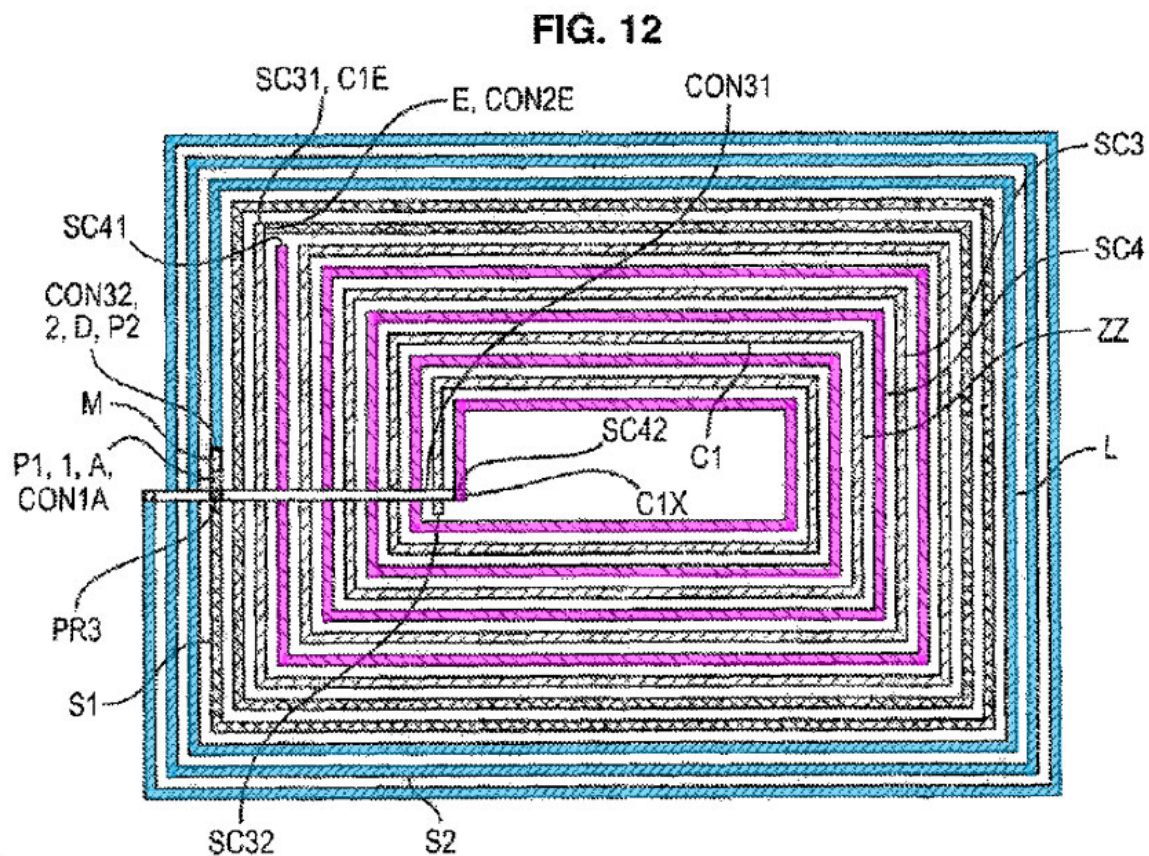
Petitioner asserts that claims 1–3 and 9–11 are unpatentable under 35 U.S.C. § 103 as obvious over Eray-WO799, citing the Declaration of Dr. Daniel van der Weide for support. Pet. 9–45 (citing Ex. 1003).

1. Independent Claim 1

Petitioner’s allegations may be summarized as follows: With respect to the preamble⁷ “[a] card body for a smart card,” Petitioner directs us to Eray-WO799’s card body for a smart card as depicted in Figure 12 of the reference. Pet. 16–18. As to the limitation “a card antenna extending at least partially around a periphery of a surface of the card body,” Petitioner directs us to Eray-WO799’s RFID antenna circuit as shown in Figure 12. *Id.* at 18–28. Specifically, Petitioner asserts that “interconnected turns S1, S2,

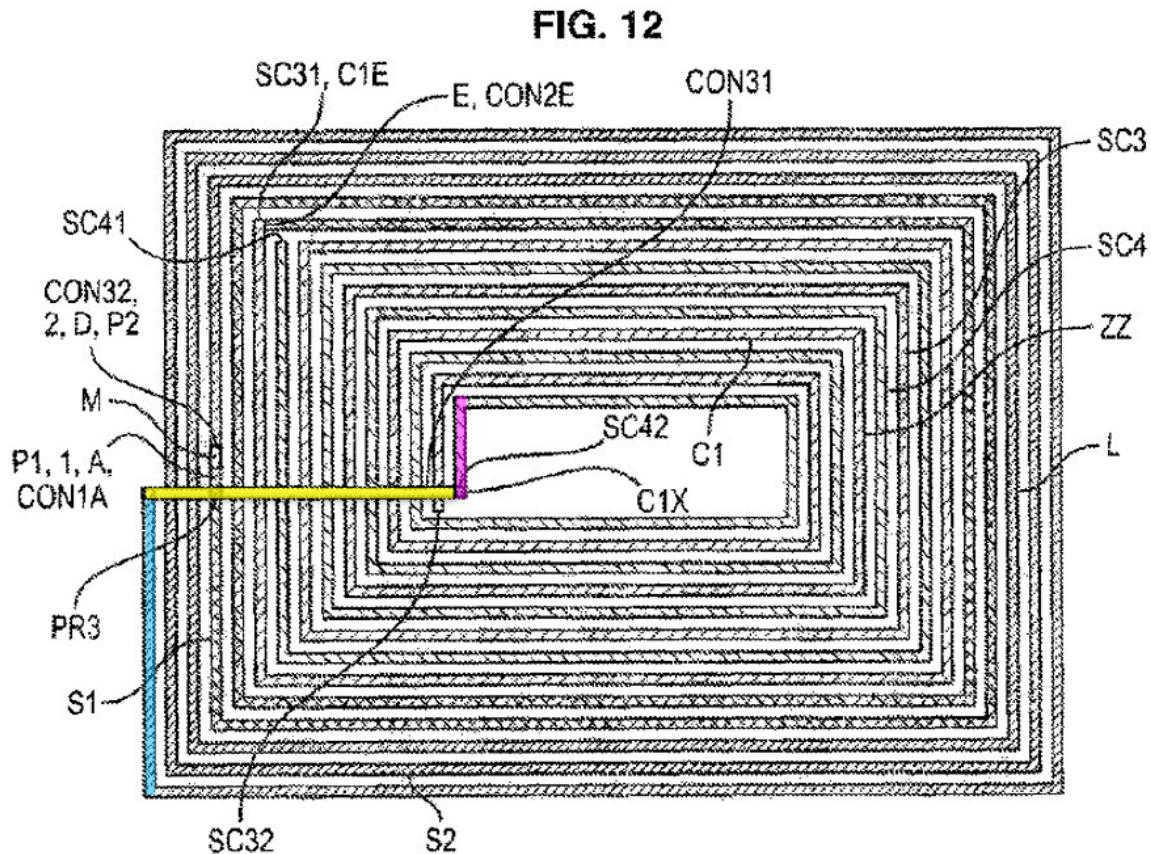
⁷ For the purposes of this Decision, we need not determine whether the preamble is limiting because Petitioner’s allegations show that Eray-WO799 would have taught the elements of the preamble.

SC3, and SC4 are a ‘card antenna,’ as claimed.” *Id.* at 21. For the limitation “wherein the card antenna comprises two windings, an inner winding and an outer winding,” Petitioner here again directs us to Eray-WO799’s Figure 12. *Id.* at 28–33. Petitioner argues that “[e]ach of S1, S2, SC3 and SC4 is a ‘distinct portion’ of the card antenna, comprises multiple ‘turns of wire’ formed in a coil, and thus is a ‘winding’ as claimed.” *Id.* at 28. Petitioner’s annotated Figure 12 is reproduced below.



Petitioner annotates Eray-WO799’s Figure 12, shown above, to illustrate its allegations. *Id.* at 29. According to Petitioner, “Eray-WO799 describes SC4 (magenta ...) as being closest to the ‘center’ and S2 (blue ...) as being at the ‘periphery.’” *Id.*

As to the limitation, “connected in reverse phase with one another,” Petitioner asserts that this is also taught by Eray-WO799’s Figure 12. *Id.* at 29–33. Petitioner’s annotated Figure 12 is reproduced below.



Petitioner annotates Eray-WO799’s Figure 12, shown above, to illustrate its allegations. *Id.* at 31. According to Petitioner, “the inner end (labeled SC42 and C1X) of turn SC4 (a portion thereof highlighted magenta...) is directly connected to the outer end of turn S2 (a portion thereof highlighted blue...).” *Id.* at 30.

Patent Owner disputes Petitioner allegations by arguing that Petitioner fails to identify in Eray-WO799 two claim limitations. PO Resp. 46. First, Patent Owner argues that Eray-WO799 does not disclose the recited inner and outer windings connected in reverse phase. *Id.* at 52–53. Second,

Patent Owner argues that Eray-WO799 does not disclose the recited card antenna. *Id.* at 53–55.

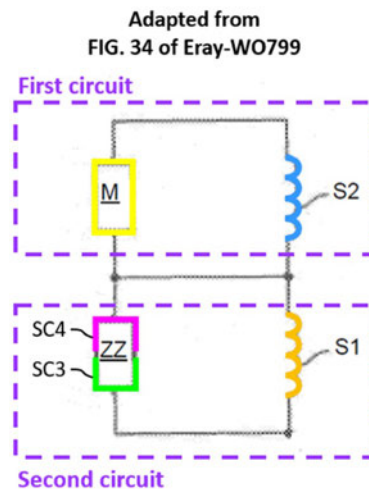
First, Patent Owner argues that Petitioner’s allegations and evidence are insufficient to disclose “an inner winding and an outer winding, connected in reverse phase with one another.” PO Resp. 52–53. Specifically, Patent Owner asserts that Petitioner has not shown that Eray-WO799 discloses “that the phase of the voltage in the inner winding is shifted by 180 degrees from the phase of the voltage in the outer winding.” *Id.*

Patent Owner’s argument is premised on its proposed claim construction that would have required the phase of the induced voltage in the inner winding to be shifted by 180° from the phase of the induced voltage in the outer winding. *Id.* at 52. For reasons discussed above, we do not adopt Patent Owner’s proposed construction. *See* § II.C.1.

As discussed, we construe connected in reverse phase such that it “includes (but is not limited to) an arrangement where an inner winding and an outer winding are wound in the same direction and the inner end of the inner winding is connected to the outer end of the outer winding.” Petitioner asserts that “[i]t is undisputed that Eray has inner and outer windings wound in the same direction, and that the inner end of the inner winding is connected to the outer end of the outer winding.” Pet. Supp. Br. 1–2 (citing Pet. 28–33; Reply 10, 22–23, 26). Dr. van der Weide supports Petitioner’s assertions by opining that “Eray-WO799’s windings—like those in ’240 patent Figure 3A—are wound in the same direction so the connection between the inner end of the inner winding and the outer end of the outer winding connects opposite-polarity ends of the inner and outer windings (‘+’

to ‘-’).” Ex. 1055 ¶ 61. He goes on to explain that in Eray-WO799’s Figure 12, “a magnetic field directed into the page . . . induces a current in a clockwise direction in both windings . . . , so that you have positive poles at the outer ends of both the inner and outer windings, and negative poles at the inner ends of both the inner and outer windings.” *Id.* ¶ 62. We find his testimony to be creditable. As such, we are persuaded by Petitioner’s argument and evidence that Eray-WO799 teaches connecting the inner and outer windings in reverse phase.

Second, Patent Owner contends that “Eray-WO799’s alleged card antenna is tuned to at least two resonance frequencies” and as such, does not disclose the recited card antenna. PO Resp. 53. Patent Owner provides an annotated and simplified version of Eray-WO799’s Figure 34, which is reproduced below.



Annotated Figure 34, reproduced above, depicts a simplified version of Eray-WO799’s circuit schematic, which removes some notations that are not relevant for our discussion and highlights in color the key aspects of the Figure. *See id.* at 49–51, Ex. 1006, Fig. 34. Patent Owner states that “M” is the chip module, while each of S1, S2, SC3, and SC4 are described as

‘turns.’” PO Resp. 50. M and S2 are part of Eray-WO799’s first circuit and turns S1, S3, and S4 are part of the second circuit. *Id.* Patent Owner asserts that Petitioner’s challenge fails because “nowhere does Eray-WO799 disclose that these resonance circuits are tuned to the same frequency. To the contrary, Eray-WO799 expressly discloses that the two resonance frequencies are used for the alleged benefit of increasing bandwidth of the smart card.” *Id.* at 54⁸.

Patent Owner’s argument is premised on its proposed claim construction that would have limited the card antenna to be one that is “tuned to a single resonance frequency.” *Id.* at 38. For reasons discussed above, we do not adopt Patent Owner’s proposed construction. *See* § II.C.2. Petitioner points out that none of the challenged claims recite a frequency. Reply 3.

In addition, even if we had adopted Patent Owner’s claim construction, we would still have found that Petitioner shows that Eray-WO799 teaches or suggests the claimed “card antenna.” Petitioner addresses the frequency of the alleged antenna circuit in its allegations. Specifically, Petitioner contends that

Eray-WO799 describes ‘frequency tuning[]’ for each ‘antenna circuit[] (M, S2) and (ZZ, S1).’ [Ex. 1006,] 36:22-24. SC3 and SC4 ‘make it possible to equalize the tuning frequency of’ the circuit formed by chip module M and S2 with ‘the tuning frequency of the circuit formed by’ S1 and ZZ (SC3 and SC4)

⁸ We note that Patent Owner provided its own translation of Eray-WO799. *See* Ex. 2015. Patent Owner directs us to one difference in the language of the translations without providing a sufficient explanation as to the import of this difference. PO Resp. 55 n. 13; *compare* Ex. 1006, 36:26–27 (“2 frequency tunings combined in one and the same frequency range”) *with* Ex. 2015, 31 (“2 tuning frequencies combined in the same frequency range”).

to ‘get the predetermined tuning frequency 13.56 MHz.’ [Ex. 1006], 36:10-14; [Ex. 1003] ¶¶ 66–67. By selecting ‘the value of the currents and intrinsic inductances of the turns,’ the two ‘antenna circuits (M, S2) and (ZZ, S1)’ can have ‘quasi-independent’ tuning frequencies or ‘frequency tunings combined in one and the same frequency range, making it possible to obtain a large bandwidth with respect to the RFID transmission channel.’ [Ex. 1006,] 36:22-37:2; [Ex. 1003] ¶ 68.

Pet. 15–16. Thus, Petitioner points out that Eray-WO799 expressly discloses that the circuits could have “2 frequency tunings combined in one and the same frequency range.” Ex. 1006, 36:22–28. Eray-WO799 teaches tuning its circuits in order to “to obtain a frequency tuning that is as close as possible to the useful frequency, for example 13.56 MHz.” *Id.* at 37:3–5. We find that, even under Patent Owner’s proposed construction, Petitioner shows the recited card antenna.

We have reviewed Petitioner’s arguments and evidence regarding the remaining limitations of claim 1, and we find them to show that Eray-WO799 teaches or suggests all of the elements of claim 1. Thus, we are persuaded that Petitioner has established by a preponderance of the evidence that claim 1 is unpatentable under § 103 as obvious over Eray-WO799.

2. *Independent Claim 9*

Petitioner argues that independent claim 9 would have been obvious over Eray-WO799. Pet. 41–44. The substance of independent claim 9 is substantially similar to that of independent claim 1. *Compare* Ex. 1001, 26:7–12 (claim 1) *with* Ex. 1001, 26:37–42 (claim 9). Patent Owner does not separately address claim 9. *See generally* PO Resp.

We note one key difference between claims 1 and 9. Claim 9 is a method claim directed to “improving coupling with a smart card” and it expressly recites “providing a card antenna in the smart card.” Ex. 1001,

26:37–39. Claim 1, on the other hand is directed to a “card body.” *Id.* at 26:7. Petitioner contends that Eray-WO799 teaches a smart card. *See, e.g.*, Pet. 41 (citing Ex. 1003 ¶¶ 151–152). We have reviewed Petitioner’s arguments and evidence regarding the limitations of claim 9, and we find them to establish by a preponderance of the evidence the unpatentability of claim 9 as obvious over Eray-WO799.

3. Dependent Claims 2 and 10

Petitioner accounts for the limitations recited in claims 2 and 10. Pet. 33–45. Petitioner provides detailed explanations as to how the prior art teaches or suggests these remaining limitations and claims, citing Dr. van der Weide’s testimony for support. *Id.* (citing Ex. 1003). Patent Owner’s Response does not separately address these dependent claims. *See generally* PO Resp.

Based on the evidence presented, we find that Petitioner has shown that Eray-WO799 teaches or suggests all of the limitations recited in claims 2 and 10. Thus, we find that Petitioner has established by a preponderance of the evidence that claims 2 and 10 are unpatentable under § 103 as obvious over Eray-WO799.

4. Dependent Claims 3 and 11

Petitioner asserts that dependent claims 3 and 11 would have been obvious over Eray-WO799. Pet. 34–41 (arguments for claim 3), 45 (arguments for claim 11). Claims 3 and 11 depend indirectly from claims 1 and 9 respectively. Claims 3 and 11 are substantially similar. *See* PO Resp. 42 n. 10 (“The variation between the language of claim 3 and claim 11 is immaterial to this IPR.”); Pet. 45 (referring to the discussion of claim 3 to support contentions for claim 11). Claim 3 recites, in relevant part, “the

inner end of the outer winding and the outer end of the inner winding are unconnected.” Ex. 1001, 26:20–21. Claim 11 similarly recites, in relevant part, “leaving an inner end of the outer winding and an outer end of the inner winding unconnected.” *Id.* at 26:46–48. Patent Owner argues that Petitioner’s challenges fail because Eray-WO799 does not teach ends that are unconnected. PO Resp. 55–57.

Petitioner contends that Eray-WO799’s “interconnected turns S1, S2, SC3, and SC4 are a ‘card antenna.’” Pet. 20. According to Petitioner, “SC4 and S2 are ‘inner’ and ‘outer’ ‘windings’ arranged in the same relative relationship that ‘inner’ and ‘outer’ ‘windings’ are arranged in the ’240 patent.” *Id.* at 29, 36. Petitioner argues that “SC4[’s] outer end . . . is not connected the inner end of S2 or to anything else—it ‘is free and insulated from SC3.’” *Id.* at 36 (citing Ex. 1006, 35:11–12; Ex. 1003 ¶ 143). As to S2, however, Petitioner argues that “the inner end of outer winding S2 is not connected to the outer end of inner winding SC4.” *Id.* Under Petitioner’s proposed construction this would be sufficient, but for reasons discussed above, we do not adopt Petitioner’s proposed construction. *See* § II.C.3.

For reasons discussed above, we adopted Patent Owner’s construction, and as such, we determined that unconnected means that “the inner end of the outer winding and the outer end of the inner winding are open.” *See* § II.C.3 Patent Owner notes that “Petitioner alleges that Eray-WO799’s, S2 is an outer winding, and that S2 has an inner end ‘terminal D.’ Petitioner admits that terminal D is connected to module M—i.e., not open.” PO Resp. 55 (citing Pet. 39). As such, Eray-WO799 on its face does not teach that the inner end of outer winding S2 (i.e., terminal D) is an open end, as required by our construction.

Petitioner argues that it would be appropriate for us to not consider Eray-WO799's chip when analyzing Petitioner's contentions because the chip is not part of the claimed card module. Pet. 39. While it is true that the open-ended nature of "comprising" claims allows for the existence of unclaimed elements, this is insufficient to save Petitioner's allegations. Here, we are not just faced with an unclaimed element that is part of the asserted art, but rather we are faced with a claim term that affirmatively requires the end to be unconnected. A loose or open wire is a different structure from Eray-WO799's disclosed wire that is attached to a chip. As such, we find that a winding connected to a chip cannot be said to render obvious the recited windings with open ends.

Petitioner further argues that "an obvious and conventional way to construct Eray-WO799 Fig. 12 would have been to form turns S1–S2 and SC3–SC4 on or in the card body by laying wire before connecting the wire to (or even forming) access terminals 1–2 between which module M will later be connected." Pet. 39. Claim 9, however, expressly recites "providing a card antenna in the smart card." Ex. 1001, 26:37–39. Claim 11 depends from claim 9 and as such, its card antenna is in a smart card. The '240 patent describes a smart card as comprising, in relevant part, a chip module. *See, e.g., id.* at code (57), 1:25–34, 3:36–37. Thus, for claim 11, a chip is required for the claim's limitations to be satisfied.

As for claim 3, however, a chip is not clearly required⁹ and thus, we examine the sufficiency of Petitioner's allegations and evidence regarding

⁹ Claim 3 depends indirectly from independent claim 1. The preamble of the independent claim is "[a] card body for a smart card," and the body of the claim recites "the card body." If the recited "smart card" is limiting, then Petitioner's contentions for claim 3 fail for the same reasons explained for

this potential method of manufacture. Dr. van der Weide testifies that one of ordinary skill in the art would have understood it to be obvious and conventional to construct Eray-WO799's card antenna before connecting access terminals and module M. Ex. 1003 ¶ 149. Dr. van der Weide cites two U.S. patents that support his testimony regarding the method of manufacture of Eray-WO799's card antenna and asserts that this is within the background knowledge of a person of ordinary skill in the art. *Id.* (citing Ex. 1015, code (57), 1:63–2:6, 3:40–50, Ex. 1028, 1:44–56).

Patent Owner argues that Petitioner's contentions regarding the manufacturing of Eray-WO799's device are improper and insufficient. PO Resp. 56–57, Sur-Reply 21. First, Patent Owner contends "Petitioner provides no rationale for why a POSA would remove Eray-WO799's module M that is or includes the chip." PO Resp. 57. Next, Patent Owner asserts "that Eray-WO799 does not teach or suggest implementing Figure 12 without module M, and that because module M is essential for Figure 12 in Eray to operate, a POSA would have been taught away from modifying Eray-WO799 to assemble the card without the chip." Sur-Reply 21. Patent Owner further contends that Petitioner's reliance "on an undisclosed manufacturing method" is improper because the ground "is not based 'only on . . . prior art consisting of patents or printed publications.'" *Id.* (citing 35 U.S.C. § 311(b)).

As to Patent Owner's assertions regarding removing the chip from Eray-WO799 and implementing Eray-WO799 without a chip, we find that

claim 11. However, we do not decide whether "smart card" is a limitation of these claims because Petitioner fails to make a sufficient showing for claim 3 for the reasons we explain.

Patent Owner's arguments misapprehend Petitioner's contentions. Petitioner is not arguing that the chip should be removed from Eray-WO799, but rather that we should not consider Eray-WO799's chip because it is not a part of claim 3 or that we should consider the process of manufacturing Eray-WO799's device because there is a point in the manufacturing process in which Eray-WO799's device would have the recited windings, but no chip and thus, would have the recited unconnected ends. We address above (and reject) Petitioner's argument that we should not consider the chip because it is not an element of the claim. Below we address Petitioner's argument regarding the manufacture of Eray-WO799. Here, however, we note that Petitioner is not required to present rationale for removing the chip because Petitioner is not arguing that the chip be removed. In that same vein, Patent Owner's teaching away argument is not germane because Petitioner is not arguing that Eray-WO799's Figure 12 be implemented without a chip.

We also are not persuaded by Patent Owner's argument that reliance on the purported manufacturing process for Eray-WO799 would be improper because it relies on something other than a patent or printed publication. *See* Sur-Reply 21. Petitioner may rely on “‘the background knowledge possessed by a person having ordinary skill in the art,’ and ‘the inferences and creative steps that a person of ordinary skill in the art would employ.’” *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (quoting *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007)); *see also Koninklijke Philips N.V. v. Google LLC*, 948 F.3d 1330, 1337 (Fed. Cir. 2020) (“Although the prior art that can be considered in inter partes reviews is limited to patents and printed publications, it does not follow that we ignore the skilled artisan's knowledge.”). This is true because “the knowledge of

such an artisan is part of the store of public knowledge that must be consulted when considering whether a claimed invention would have been obvious.” *Rea*, 733 F.3d at 1355.

As such, the question before us is whether Petitioner has established that the purported manufacturing process for Eray-WO799’s device is within the background knowledge of a person of ordinary skill in the art. We find that Dr. van der Weide’s testimony is insufficient to establish that such manufacturing processes would have been known ***by the person of ordinary skill in the art***. Dr. van der Weide opines (and we agree) that a person of ordinary skill in the art “would have had a Bachelor’s degree in electrical engineering or a similar field, and 1–2 years of experience researching and developing antennas used in RFID applications.” Ex. 1003 ¶¶ 22–26. It is not clear on this record that such an individual would have background knowledge regarding the details of the manufacturing process for smart cards. Petitioner has not provided us with evidence that one of ordinary skill in the art, while experienced in researching and developing RFID antennas, would have education or experience relating manufacturing processes. Dr. van der Weide’s supporting references do not alleviate this concern. Exhibit 1015 is U.S. Pat. No. 6,698,089 B2¹⁰ and this is a patent directed “to a

¹⁰ U.S. Patent No. 6,698,089 B2 is discussed in the specification of the ’240 patent. *See* Ex. 1001, 2:4–9. The Federal Circuit has stated that we may rely on admissions regarding prior art stated in the specification, but we must determine that there “is that substantial evidence [to] support[] the findings and inferences made based on those admissions.” *Koninklijke Philips N.V.*, 948 F.3d at 1337. Here, we find there is insufficient evidence to support a finding that one of ordinary skill in the art would have had the background knowledge as to how Eray-WO799 would have been manufactured.

process for the contacting of a wire conductor in the course of manufacture of a transponder unit.” Ex. 1015, 1:15–17. Similarly, Exhibit 1028 is U.S. Pat. No. 8,286,873 B2 and it is directed to solving problems that occur during the manufacture of cards. *See* Ex. 1028, 1:25–2:53. As such, these references are directed to manufacturing and may not be within the purview of the ordinarily skilled artisan that is engaged in the research and development of RFID antennas.

As such, we find that Petitioner has not proffered sufficient evidence to establish by a preponderance of the evidence that claims 3 and 11 would have been obvious over Eray-WO799.

F. Obviousness over Eray-WO799 and Phillips-171

Petitioner asserts that claims 1 and 4–7 are unpatentable under 35 U.S.C. § 103 as obvious over Eray-WO799 and Phillips-171, citing the Declaration of Dr. van der Weide for support. Pet. 45–65 (citing Ex. 1003). Patent Owner’s Response does not separately address these allegations. PO Resp. 57. Patent Owner’s contentions regarding the alleged insufficiency of Petitioner’s challenge to claim 1 as obvious over Eray-WO799 also would be applicable to this Petitioner’s allegations as to this ground, but they are unpersuasive for the reasons discussed above.

1. Claims 1, 4–6

Petitioner accounts for the limitations recited in claims 1 and 4–6. Pet. 45–63. Petitioner provides detailed explanations as to how the prior art teaches or suggests these remaining limitations and claims, citing Dr. van der Weide’s testimony for support. *Id.* (citing Ex. 1003). Patent Owner’s Response does not separately address these claims apart from the arguments

discussed above in regards to alleged obviousness over Eray-WO799 alone.
PO Resp. 57.

Based on the evidence presented, we find that Petitioner has shown that Eray-WO799 and Phillips-171 teach or suggest all of the limitations recited in claims 1 and 4–6. In addition, we are persuaded that an ordinarily skilled artisan would have been motivated to combine Eray-WO799 and Phillips-171 as proposed and would have had a reasonable expectation of success in doing so. Thus, we find that Petitioner has established by a preponderance of the evidence that claims 1 and 4–6 are unpatentable under § 103 as obvious over Eray-WO799 and Phillips-171.

2. *Dependent Claim 7*

As noted above claim 7 contains conflicting language that is not amenable to claim construction. *See* § II.C.4. As we are unable to determine the scope of claim 7, we cannot undertake the necessary factual inquiry for evaluating obviousness with respect to differences between the claimed subject matter and the prior art. *See In re Aoyama*, 656 F.3d 1293, 1296 (Fed. Cir. 2011) (holding that the “first step” in any application of the prior art is a proper interpretation of the claim at issue).

Our reviewing court has explained that we need not “reach a determination of the patentability of a claim on the presented prior-art grounds if such a determination is rendered impossible because of the indefiniteness of an essential claim limitation.” *Intel Corp. v. Qualcomm Incorp.*, 21 F.4th 801, 812–13 (Fed. Cir. 2021). Specifically, “the indefiniteness of a limitation . . . precludes a patentability determination only when the indefiniteness renders it logically impossible for the Board to reach such a decision.” *Id.*

Here, claim 7 includes conflicting language that renders it impossible for us to determine whether the subject matter of this claim is rendered obvious over Eray-WO799 and Phillips-171. As such, in this Decision, we do not determine the patentability of claim 7.

G. Obviousness over Eray-WO799, Phillips-171, and Caruana

Petitioner asserts that claims 1, 4, and 8 are unpatentable under 35 U.S.C. § 103 as obvious over Eray-WO799, Phillips-171, and Caruana, citing the Declaration of Dr. van der Weide for support. Pet. 65–76 (citing Ex. 1003). Patent Owner’s Response does not separately address these allegations. PO Resp. 57. Patent Owner’s contentions regarding the alleged insufficiency of Petitioner’s challenge to claim 1 as obvious over Eray-WO799 also would be applicable to this Petitioner’s allegations as to this ground, but they are unpersuasive for the reasons discussed above.

Based on the evidence in this present record, we are persuaded that Petitioner has shown that Eray-WO799, Phillips-171, and Caruana teach or suggest all of the limitations recited in claims 1, 4, and 8. In addition, we are persuaded that an ordinarily skilled artisan would have been motivated to combine Eray-WO799, Phillips-171, and Caruana as proposed and would have had a reasonable expectation of success in doing so. Thus, we find that Petitioner has established by a preponderance of the evidence that claims 1, 4, and 8 are unpatentable under § 103 as obvious over Eray-WO799, Phillips-171, and Caruana.

III. CONCLUSION

For the foregoing reasons, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1, 2, 4–6, and 8–10 of the

'240 patent are unpatentable.¹¹ Petitioner has not demonstrated by a preponderance of the evidence that claims 3 and 11 are unpatentable. Claim 7 was not amenable to construction and as such, we did not reach a decision as to the unpatentability this claim. Our conclusions are summarized in the following table.

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–3, 9–11	103	Eray-WO799	1–2, 9–10	3, 11
1, 4–7 ¹²	103	Eray-WO799, Phillips-171	1, 4–6	
1, 4, 8	103	Eray-WO799, Phillips-171, Caruana	1, 4, 8	
Overall Outcome			1, 2, 4–6, 8–10	3, 11

IV. ORDER

In consideration of the foregoing, it is hereby:

¹¹ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

¹² We found that claim 7 was not amenable to construction and as such, we could not ascertain the scope of the claim in a manner that would allow us to apply the asserted art. As a result, this Decision does not include a determination regarding the patentability of claim 7. See *supra* § II.F.2.

ORDERED that Petitioner has shown that claims 1, 2, 4–6, and 8–10 of the '240 patent are unpatentable;

FURTHER ORDERED that Petitioner has not shown that claims 3 and 11 of the '240 patent are unpatentable; 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.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INFINEON TECHNOLOGIES AG,
Petitioner,

v.

AMATECH GROUP LIMITED,
Patent Owner.

IPR2022-00951
Patent 9,165,240 B2

Before STACEY G. WHITE, BRIAN D. RANGE, and
JULIET MITCHELL DIRBA, *Administrative Patent Judges*.

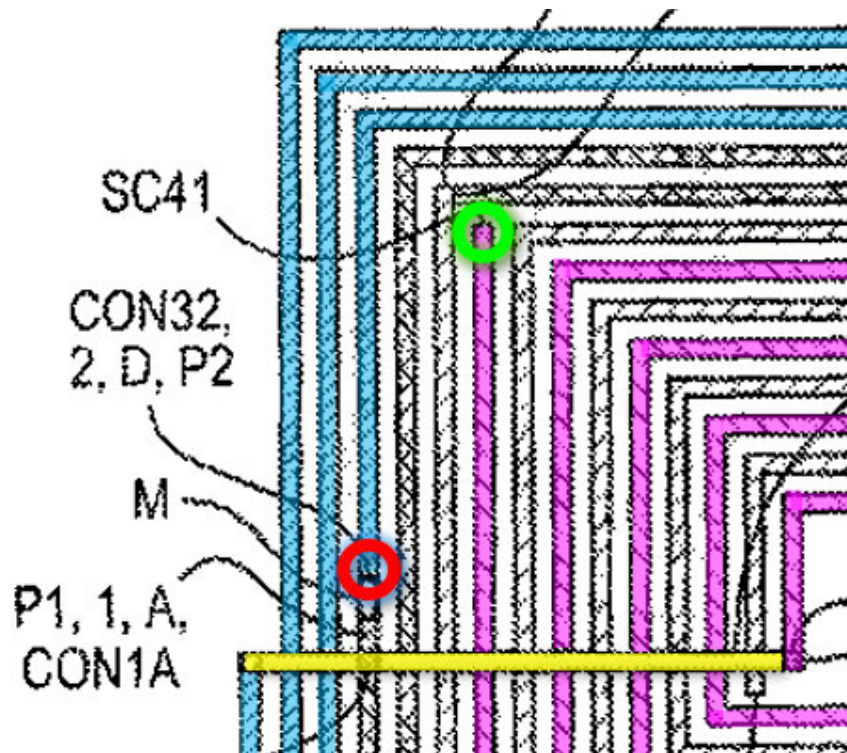
DIRBA, *Administrative Patent Judge, concurring-in-part*.

I agree with the majority’s conclusion that Petitioner has not shown that dependent claim 3 is unpatentable. I write separately to explain why.

Claim 3 recites “the inner end of the outer winding and the outer end of the inner winding are unconnected.” Ex. 1001, 26:20–21. As the majority opinion explains, the specification uses the term “unconnected” to mean that the ends are “open” or “loose.” *See, e.g., id.* at 3:14–15, 12:40–42. As a consequence, claim 3 requires that the identified ends (i.e., “the

inner end of the outer winding” and “the outer end of the inner winding”) are not connected to any other component on the card body.

For these claimed ends, Petitioner points to the outer end of SC4 and the inner end of S2. Pet. 36–40; *see also id.* at 29 (mapping the claimed windings). This contention is shown in Petitioner’s annotation of Figure 12 (*id.* at 38), an excerpt of which is reproduced below.



As shown in this excerpt, Petitioner highlights S2 in blue (the claimed “outer winding”), circles the inner end of S2 in red (the claimed “inner end of the outer winding”), highlights SC4 in magenta (the claimed “inner winding”), and circles the outer end of turns SC4 in green (the claimed “outer end of the inner winding”).

But, as shown above, the inner end of S2 (red circle) is not “unconnected” as claim 3 would require, but rather is connected to module M via terminal 2 (Ex. 1006, Fig. 12; *see also, e.g., id.* at 34:8–9, 34:12–13, 36:10–21, Fig. 12). In other words, Eray-WO799 teaches the opposite of

what the claim requires. Thus, Eray-WO799 fails to teach or suggest this claim limitation.

Petitioner does not persuasively argue otherwise, and it does not explain why an ordinarily skilled artisan would have been motivated to alter Eray-WO799 to yield this limitation. *See* Pet. 37–40; Reply 31; *see also* PO Resp. 56–57. Rather, Petitioner advances two theories for why we should find the subject matter of this claim to be obvious over Eray-WO799 despite the fact that Eray-WO799 describes the opposite of what is claimed. *See* Pet. 38–39. Both are unpersuasive.

First, Petitioner argues that we should ignore Eray-WO799’s chip module M (and only consider its antenna) because the claim recites a card antenna but not a chip. *See* Pet. 38–39. However, it is black-letter law that we must consider the entirety of the reference (*see, e.g., W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1550 (Fed. Cir. 1983)), and as the majority explains, this is not a situation where the disclosure in question is irrelevant to our inquiry. The claim affirmatively requires the ends to be unconnected, and Eray-WO799 simply teaches the opposite. *Cf. Spectrum Int’l, Inc. v. Sterilite Corp.*, 164 F.3d 1372, 1380 (Fed. Cir. 1998) (“‘Comprising’ is not a weasel word with which to abrogate claim limitations.”).

Second, Petitioner argues that “an obvious and conventional way to construct Eray-WO799 FIG. 12 would have been to form turns S1-S2 and SC3-SC4 on or in the card body by laying wire before connecting the wire to (or even forming) access terminals 1-2 between which module M will later be connected.” Pet. 39; *see also* Reply 31. In other words, Petitioner argues that it would have been obvious to manufacture the card shown in Figure 12

by forming the windings before connecting the chip (module M), and that this intermediate product satisfies the limitations of claim 3.

However, this alternative theory is premised on an assumption that an end is “unconnected” if (and when) it is open or loose, even if this occurs only briefly during the manufacturing process. In my view, such a construction is not supported by the intrinsic record. The specification consistently uses the term “unconnected” to refer to ends that are *left* open, loose, or unconnected as free ends. *See* Ex. 1001, 3:14–15, 12:40–42, 14:21–23, 15:27–43, 18:1, 18:30–33, 19:37–41, 19:51–54. I discern no intrinsic support for interpreting this term to encompass ends that are simply *not yet* connected. Indeed, the specification describes ways of connecting ends, but never refers to those ends as “unconnected” before connection. *Id.* at 14:17–15:4. Also, the specification contrasts those connected ends with other ends that are “left unconnected” or “left open (not connected with anything).” *Id.* Thus, the specification indicates that “unconnected” means left unconnected, open, or loose.¹³

This narrower understanding of the scope of the term “unconnected” is the most logical. A card’s components are not attached simultaneously, so some components will be placed before being connected. To conclude that those components are temporarily “unconnected”—simply because there is a point in time (however brief) when the connection has not yet been made—

¹³ This understanding is consistent with other claims. Claim 11 specifically recites “leaving” the identified ends “unconnected” (Ex. 1001, 26:47–48), and the parties treat claims 3 and 11 as having commensurate scope (*see* Pet. 45; PO Resp. 42 n.10). Although claim 7 more specifically recites ends that “are left unconnected as free ends,” its use of precise language does not suggest a broader meaning for the term “unconnected,” particularly where claim 7 is internally inconsistent, as explained by the majority.

strips this term of most of its meaning. As a result, in my view, an ordinary artisan would not have understood the term to encompass the not-yet-connected end in the intermediate product theorized by Petitioner.

In addition, Petitioner fails to sufficiently prove its alternative theory. Eray-WO799 is missing a claim limitation, and Petitioner seeks to fill that gap using the knowledge of an ordinary skilled artisan. But, in my view, Petitioner's evidence does not show that the missing limitation was common knowledge to a person of ordinary skill in the art. *See Arendi S.A.R.L v. Apple Inc.*, 832 F.3d 1355, 1361–1363 (Fed. Cir. 2016) (addressing use of “common sense” and “common knowledge” to supply a missing claim limitation). Petitioner's supporting evidence consists of two sentences from Dr. van der Weide's declaration, which cite to two exhibits:

[A person of ordinary skill in the art] would have understood that an obvious and conventional way to construct the smart card as shown in Eray-WO799 FIG. 12 would have been to form the turns S1, S2, SC3 and SC4 on or in the card body (e.g., by laying wire) before connecting the wire to (or forming) access terminals and connecting module M. For documentary evidence corroborating my testimony regarding a [person of ordinary skill in the art]'s background knowledge, *see, e.g.*, Ryu (Exhibit 1028) . . . Finn-089 (Exhibit 1015)

Ex. 1003 ¶ 149. Dr. van der Weide states that an ordinarily skilled artisan would have understood this to be a conventional way to construct Eray-WO799, but he fails to sufficiently explain or support this conclusion. As the majority explains, neither Exhibit 1015 or Exhibit 1028 indicate that the described manufacturing techniques are within the common knowledge of an ordinary artisan (i.e., a person with “a Bachelor's degree in electrical engineering or a similar field, and 1–2 years of experience researching and developing antennas used in RFID applications”). I also agree with the

majority that the record does not otherwise establish the alleged common knowledge.

For these reasons, I agree that Petitioner fails to show that the subject matter of claim 3 is obvious over Eray-WO799.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INFINEON TECHNOLOGIES AG,
Petitioner,

v.

AMATECH GROUP LIMITED,
Patent Owner.

IPR2022-00951
Patent 9,165,240 B2

Before STACEY G. WHITE, BRIAN D. RANGE, and
JULIET MITCHELL DIRBA, *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge, Dissenting-in-part*.

I agree with the entirety of the panel’s opinion except that I would determine that claim 3 is unpatentable under 35 U.S.C. § 103 as obvious over Eray-WO799.

Claim 3 recites, “The card body of claim 2, wherein: the inner end of the outer winding and the outer end of the inner winding are unconnected.” Ex. 1001, 26:19–21. Claim 3 depends from claims 1 and 2. *Id.* at 26:7–21. Notably for this analysis, claims 1, 2, and 3 are all directed to a “card body for a smart card.” None of the claims require a complete smart card or an IC chip.

As a threshold matter, I fully agree with the majority’s determination that claim 3’s recitation of “unconnected” means that “the inner end of the outer winding and the outer end of the inner winding are open.” Petitioner argues that, even under such a construction, the recitation of claim 3 would have been obvious over Eray-WO799. Pet. 37–41. A preponderance of the evidence supports Petitioner’s argument.

A person of ordinary skill in the art presented with Eray-WO799 would have been motivated to construct the Eray-WO799 device as Eray-WO799 depicts at Figure 12. The device is a combination of a card body and a module M. Pet. 39 (citing Ex. 1003 ¶¶ 147–148). Further, a person having ordinary skill in the art would have understood that an obvious and conventional way of making the Eray-WO799 would be to first make the card body and then connect module M. *Id.* (citing Ex. 1003 ¶ 149). For at least one moment in time¹⁴ prior to module M being connected to the card body, the person of ordinary skill in the art would have created a card body meeting all recitations of claim 3. Obviousness at a single point in time is sufficient to render claim 3 obvious even if something would later be connected to the card body. Nothing about claim 3 or the ’240 specification suggests that the recited “card body” is limited to a specific point in time.

¹⁴ The moment in time could be short or could be quite long. A person having ordinary skill in the art could make the card body and immediately (one second later, for example) add the module M chip so that the “unconnected” card body exists for only a second. Or, the person having ordinary skill in the art could make the card body and sell the card body to someone else who might have the card body sit on a shelf for years before eventually adding a module M once they were ready to finish crafting a fully functional device. No speculation as to the length of time is necessary for the instant analysis; claim 3 is obvious if it would have been obvious to reach all recitations of claim 3 for even a short moment.

Cf. Exxon Chem. Pats., Inc. v. Lubrizol Corp., 64 F.3d 1553, 1558 (Fed. Cir. 1995) (rejecting argument that the recited composition includes a temporal limitation). Put another way, claim 3 is directed to *structure* and nothing about claim 3 places a limit on what point in time the structure must exist or how long the structure must remain in existence.

Petitioner relies on the testimony of Dr. van der Weide. Pet. 39–40 (citing Ex. 1003 ¶ 149). Dr. van der Weide testifies that “a POSA would have understood that an obvious and conventional way to construct the smart card as shown in Eray-WO7999 FIG 12 would have been to form the turns ... on or in the card body (*e.g.*, by laying wire) before connecting the wire to (or forming) access terminals and connecting module M.” Ex. 1003 ¶ 149. Dr. van der Weide supports this opinion by citing the Ryu and Finn-089 references that describe fabricating an antenna and integrated circuit chip combination by attaching the IC chip after the card antenna is fabricated. *Id.* (citing Ex. 1028, 1:44–56; Ex. 1015, Abstract, 1:63–2:6, 3:40–50). Dr. van der Weide states that the Ryu and Finn-089 references “[corroborate his] testimony regarding a POSA’s background knowledge,” and this testimony adequately supports that a person having ordinary skill in the art would have either been aware of these references or, at a minimum, would have been aware of the obvious and routine notion of attaching an IC chip after the card antenna is fabricated (as evidenced by the fact that Ryu and Finn-089 demonstrate such an awareness). *Id.*

The majority opinion determines that insufficient evidence supports that a person having ordinary skill in the art (*i.e.*, “ha[ving] a Bachelor’s degree in electrical engineering or a similar field, and 1–2 years of experience researching and developing antennas used in RFID applications”)

would have been sufficiently aware of manufacturing processes for smart cards and determines the person of ordinary skill in the art may not have been aware of the Ryu and Finn-089 references. But, as explained above, the unrebutted testimony of Dr. van der Weide supports that a person having ordinary skill in the art would have understood the conventional way of manufacturing the Eray-WO799 Figure 12 smart card. Against this evidence, Patent Owner cites no countervailing evidence suggesting that a person having ordinary skill in the art would not have understood that Eray-WO799 Figure 12 could be constructed in this manner and does not offer any alternative ways of how Eray-WO799 might instead be constructed. *See* PO Resp. 42–46 (not addressing this argument); Reply 31 (noting that Patent Owner did not address this alternative argument in the Patent Owner Response); Sur-Reply 1–9 (not addressing this argument).

Patent Owner argues that Petitioner cannot rely upon Eray-WO799’s manufacturing method because Eray-WO799 does not explicitly address the method (i.e., making a card first and then adding a chip) and is therefore not “prior art consisting of patents or printed publications.” PO Sur-Reply 21. A person of ordinary skill in the art, however, would have relied on Eray-WO799 for “not only what it expressly teaches, but also for what it fairly suggests.” *In re Baird*, 16 F.3d 380, 383 (Fed. Cir. 1994) (citation omitted). Eray-WO799 explicitly teaches the structure of its device and it reasonably suggests actually making the device via known methods. Petitioner presents evidence, including unrebutted testimony and prior art “patents or printed publications” (the Ryu and Finn-089 references), to establish that Eray-WO799 fairly suggests first making a card and then adding a chip (thereby resulting in, at some moment in time, an unconnected card).

Patent Owner also argues that it would not have been obvious to “halt” assembly of Eray-WO799’s card before adding the chip and that a person of ordinary skill in the art would not “modify” Eray-WO799 to “assemble the card without the chip.” PO Sur-Reply 21; PO Resp. 56–57. This argument does not squarely address Petitioner’s position. There is no dispute that Eray-WO799 teaches including a module M with a chip for its apparatus to be functional as a product for an end user. Nonetheless, the evidence, as explained above, also establishes that at some point in time, a person of ordinary skill in the art would have known to make the Eray-WO799 card without a chip so that a chip could later be attached. It is this intermediate product that Petitioner asserts as meeting the “unconnected” recitation.

In sum, Petitioner presents evidence in the form of witness testimony supported by documentary evidence sufficient to establish by a preponderance that it would have been obvious in view of Eray-WO799 to reach a device meeting, at least at one moment in time during the manufacturing process, all recitations of claim 3. As such, I would determine that claim 3 is unpatentable because it would have been obvious in view of Eray-WO799.¹⁵

¹⁵ This same analysis does *not* apply to claim 11. Claim 11 depends from claim 9 rather than claim 1. Ex. 1001, 26:46–48. Unlike claim 1, claim 9 requires “providing a card antenna in the smart card.” *Id.* at 26: 37–42. Thus, claim 11 requires a card antenna already connected to the smart card and also “leaving an inner end of the outer winding and an outer end of the inner winding unconnected.” Petitioner’s alternative theory discussed here cannot establish all of these elements and any moment in time because once there is “a card antenna in the smart card” (as claim 9 recites) claim 11’s recited ends are no longer “unconnected.” I, thus, fully agree with the

majority's opinion that Petitioner has not established claim 11 is unpatentable.

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PETITIONER:

Richard Giunta

Anant Saraswat

Michael Attisha

Turhan F. Sarwar

WOLF, GREENFIELD & SACKS, P.C.

rgiunta-ptab@wolfgreenfield.com

mattisha-ptab@wolfgreenfield.com

asaraswat-ptab@wolfgreenfield.com

turhan.sarwar@wolfgreenfield.com

PATENT OWNER:

Christopher Carani

Scott McBride

Andrew Karp

MCANDREWS, HELD & MALLOY, LTD.

ccarani@mcandrews-ip.com

smcbride@mcandrews-ip.com

akarp@mcandrews-ip.com