

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INFINEON TECHNOLOGIES AG,
Petitioner,

v.

FEINICS AMATECH TEORANTA,¹
Patent Owner.

IPR2022-00417
Patent 9,033,250 B2

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

RANGE, *Administrative Patent Judge*.

JUDGMENT
FINAL WRITTEN DECISION
Determining All Challenged Claims Unpatentable
Dismissing Petitioner's Motion to Strike
35 U.S.C. § 318(a)

¹ Patent Owner is AmaTech Group Limited. Patent Owner's Mandatory Notice, Paper 5, 1.

I. INTRODUCTION

Infineon Technologies AG (“Petitioner”) filed a Petition requesting *inter partes* review of claims 1, 2, 4–8, 10–12, and 18 (“the challenged claims”) of U.S. Patent No. 9,033,250 B2 (Ex. 1001, “the ’250 patent”). Paper 2 (“Pet.”). We instituted *inter partes* review of the challenged claims on all asserted grounds. Paper 16 (“Dec.”). After institution, Patent Owner filed a Patent Owner Response (Paper 23, “PO Resp.”), Petitioner filed a Reply (Paper 25, “Pet. Reply”), and Patent Owner filed a Sur-Reply (Paper 30, “Sur-Reply”). An oral hearing was held on April 5, 2023, and a transcript of the hearing is included in the record (Paper 40, “Tr.”).

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 that Petitioner has shown, by a preponderance of the evidence, that claims 1, 2, 4–8, 10–12, and 18 of the ’250 patent are unpatentable.

II. BACKGROUND

A. Related Matters

The parties indicate that the ’250 patent is the subject of the following district court proceedings: *Smart Packaging Solutions SA v. CPI Card Group Inc.*, No. 1:21-cv-00556 (D. Del. 2021) and *Smart Packaging Solutions SA v. Perfect Plastic Printing Corp.*, No. 1:21-cv-00557 (D. Del. 2021). Pet. xiv; Paper 5, 2. Patent Owner further indicates that patents related to the ’250 patent are at issue in pending IPR petitions in IPR2022-00235, *Infineon Technologies AG v. Feinics AmaTech Teoranta* (filed Nov. 24, 2021) (U.S. Pat. No. 9,195,932 B2) and IPR2022-00650, *Infineon Technologies AG v. AmaTech Group Ltd.* (filed Feb. 28, 2022) (U.S. Pat. No. 9,633,304 B2). Paper 5, 3. We also note that in IPR2022-00951, petition

filed April 29, 2022, Petitioner challenges claims of related U.S. Patent No. 9,165,240 B2.

B. The '250 Patent

The '250 patent is titled “Dual Interface Smart Cards, and Methods of Manufacturing.” Ex. 1001, code (54). Generally, the '250 patent describes a booster antenna for a smart card. *Id.* at code (57). We reproduce Figures 1 and 1A of the '250 patent below.

FIG. 1

Dual Interface (DI) Smart Card, and Readers

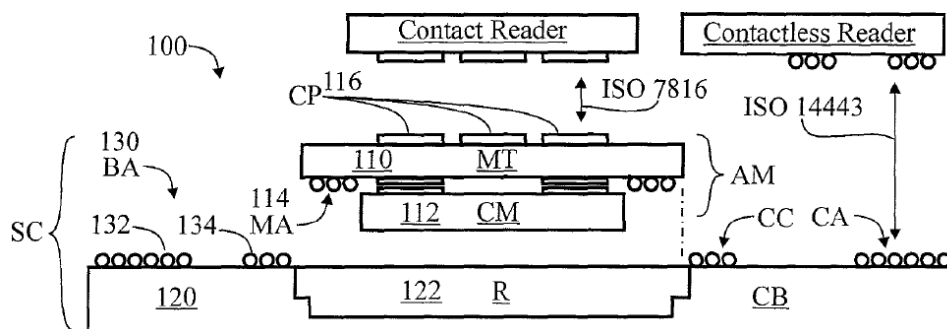


FIG. 1A

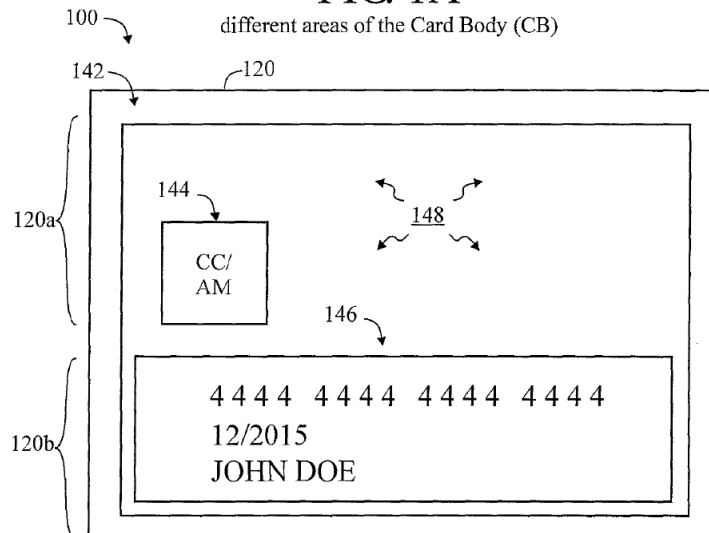


Figure 1 is a cross-section of a dual-interface smart card and reader and Figure 1A is the top view of a smart card's card body (CB). *Id.* at 7:30–33. A smart card may comprise card body (CB) (120) that has coupling area (144) in the location of antenna module (AM), and booster antenna (BA) (130). *Id.* at 1:58–62, 8:37–53, 9:3–10. Antenna module (AM) may comprise a module tape (MT) or an RFID (radio frequency identification) chip or chip module. *Id.* at 1:63–66, 8:39–44. Booster antenna (BA) (130) may comprise various antenna components, such as card antenna (CA) (132) for coupling with an external contactless reader, and coupling coil (CC) (134) for coupling with module antenna (MA) (114) of antenna module (AM). *Id.* at 2:24–31; 9:66–10:5.

We reproduce '250 patent Figure 4B below.

FIG. 4B

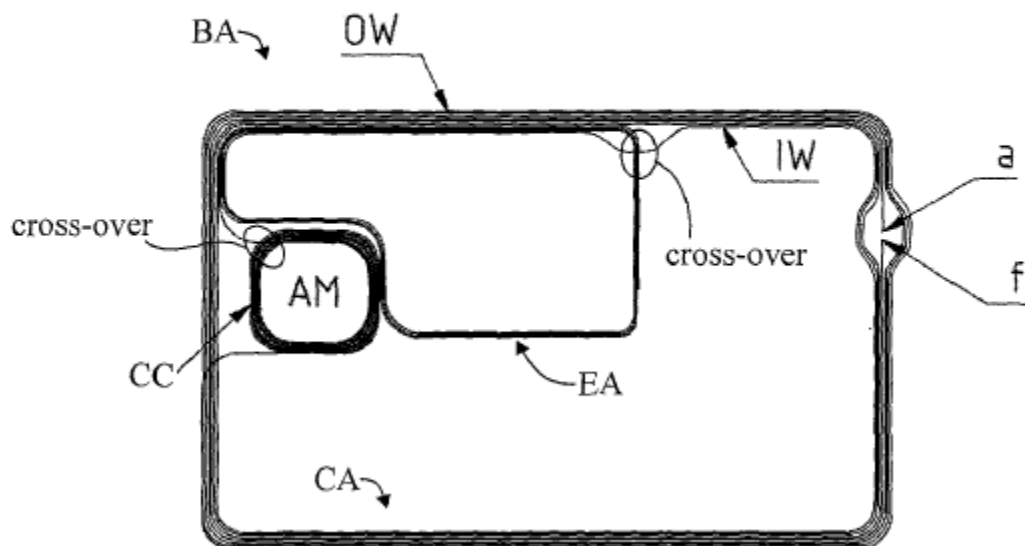


Figure 4B illustrates an embodiment of a booster antenna (BA) with card antenna (CA), a coupler antenna (CC), and an extension antenna (EA). *Id.* at 6:47–49. The booster antenna BA may be formed from “one, continuous”

wire laid in a pattern to form several coils that the '250 patent characterizes as the card antenna CA, coupler antenna CC, and extension antenna EA. *Id.* at 14:62–15:6. The coupler antenna CC may encircle or nearly encircle the antenna module AM for inductively coupling. *Id.* at 14:40–45. The extension antenna may serve to “increase the inductivity of the booster antenna BA while reducing its resonance frequency.” *Id.* at 15:23–25.

C. Illustrative Claim

Petitioner challenges claims 1, 2, 4–8, 10–12, and 18. Pet. 1. Claims 1 and 18 are independent, and we reproduce claim 1 below as illustrative.

1. Card Body (CB) for a smart card, comprising:

- a surface having a surface area, an upper portion of the surface constituting approximately half of the surface area of the card body and a lower portion of the surface constituting a remaining approximately half of the surface area of the card body;

- a first area extending around a peripheral portion of the card body in at least the upper portion of the card body;

- a card antenna (CA) disposed in the first area;

- a second area located in the upper portion of the card body and corresponding in size to and at a position corresponding to a location of an antenna module (AM) for the smart card;

- a third area located in the upper portion of the card body which is separate from the first area and the second area;

- a coupler coil (CC) disposed in the second area; and

- an extension antenna (EA) disposed in the third area.

Ex. 1001, 26:33–49.

D. Asserted Ground of Unpatentability

Petitioner, supported by the declaration of Dr. Daniel van der Weide (Ex. 1003), asserts the following ground of unpatentability (Pet. 1)²

Claims Challenged	35 U.S.C. §	References/Basis
1, 2, 4–8, 10–12, 18	103	Takeda-322 ³

Patent Owner’s Response is supported by the declaration of Dr. William Eisenstadt. Ex. 2003.

III. ANALYSIS

A. Petitioner’s Motion to Strike

Petitioner seeks to strike Exhibit 2028 and portions of Patent Owner’s Sur-Reply that quote Exhibit 2028 because, according to Petitioner, Patent Owner improperly introduced Exhibit 2028 as new evidence in its Sur-Reply. Paper 32, 1 (citing 37 C.F.R. § 42.23(b)). Patent Owner argues that Petitioner stipulated that Patent Owner could use Exhibit 2028 as evidence and, therefore, cannot move to strike. Paper 34, 1–4. Petitioner argues that the stipulation did not relate to the Board’s rules regarding the timing of new evidence and argues that Patent Owner needed Board authorization to add evidence via Sur-Reply. Paper 32, 2–5.

² The relevant sections of the Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, took effect on March 16, 2013. The application that issued as the ’250 patent was filed after this date, but claims the priority to applications filed before March 16, 2013. *See* Ex. 1001, codes (22), (60), (63). For the purposes of this Decision, we need not determine whether pre-AIA or AIA statutes apply because our analysis would be the same under either version of these statutes.

³ JP 4016322 B2, published November 21, 2003, Ex. 1005 (“Takeda-322”).

As explained below, our decision here remains the same, on the merits, even if we consider Exhibit 2028 as evidence. *See* Section III.F, *infra*. Resolution of Petitioner’s motion to strike, therefore, would have no impact on our decision. We, thus, dismiss Petitioner’s motion to strike as moot.

B. Patent Owner’s Objections to Petitioner’s Demonstrative Slides

Patent Owner objects to a number of Petitioner’s demonstratives for oral argument because, for example, the demonstratives constitute evidence that Petitioner did not reference or discuss in a prior paper. *See, e.g.*, Paper 39 *passim*.

We have considered the objections. Demonstratives for oral argument, however, are not evidence. Paper 33, 2 (Order Setting Oral Argument); *see also* Consolidated Trial Practice Guide 84, *available at* <https://www.uspto.gov/TrialPracticeGuideConsolidated> (“Demonstrative exhibits used at the final hearing are aids to oral argument and not evidence.”). We do not rely on demonstratives as evidence in our decision making; instead, we rely solely on the arguments properly presented in the parties’ briefs and the evidence of record. Because demonstratives do not affect our decision making, Patent Owner’s objections to the demonstratives likewise do not affect our decision making. We dismiss Patent Owner’s objections as moot.

C. Obviousness: Legal Standard

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and “the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said

subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).⁴

D. Level of Ordinary Skill in the Art

In order to determine whether an invention would have been obvious at the time the application was filed, we consider the level of ordinary skill in the pertinent art at critical time. *Graham*, 383 U.S. at 17. The resolution of this 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). In assessing the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation omitted). Generally, it is easier to establish obviousness under a higher level of ordinary skill in the art. *Innovation Toys, LLC v. MGA Entm’t, Inc.*, 637 F.3d 1314, 1323 (Fed. Cir. 2011) (“A less sophisticated level of skill generally favors a determination of nonobviousness . . . while a higher level of skill favors the reverse.”).

⁴ Here, the parties do not direct us to objective evidence of nonobviousness.

The Federal Circuit has identified a non-exhaustive list of factors to be considered in defining the level of skill in the art including: “(1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.” *Best Med. Int’l, Inc. v. Elekta Inc.*, 46 F.4th 1346, 1353 (Fed. Cir. 2022) (quotation omitted).

Petitioner asserts that a person having ordinary skill in the art “would have [] 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. Additional educational background could substitute for professional experience and vice versa.” Pet. 7 (citing Ex. 1003 ¶¶ 22–25).

Patent Owner argues that Petitioner’s definition of the level of ordinary skill in the art is too broad because the field of RFID is “incredibly wide,” with important differentiation criteria including the operating frequency of the reader, the physical coupling method, and the range of the system. PO Resp. 13 (citing Ex. 2003 ¶¶ 20–28; Ex. 2005, 11, 22). According to Patent Owner, the smart cards of the ’250 patent operate on relatively low frequencies, require antennas that perform inductive coupling, and are technologically distinct from antennas for microwave RFID devices. *Id.* at 13–14 (citing Ex. 2003 ¶¶ 24–26). Thus, Patent Owner asserts 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*.” *Id.* (citing Ex. 2003 ¶ 26) (emphasis original).

The parties are in general agreement as to the level of education (undergraduate degree in electrical engineering or equivalent) and the number of years of experience working with RFID devices (1–2 years), but differ as to the exact nature of that experience (developing antennae used in RFID devices versus developing antennae used in RFID devices for inductive coupling). The Specification of the ’250 patent describes its technical field as relating to a smart card that may comprise an RFID (radio frequency identification) chip with antenna components for operating in contactless modes. Ex. 1001, 1:37–54. The Specification discusses both inductive and capacitive coupling. *See, e.g., id.* at 3:14–39. Patent Owner submitted into the record a text titled RFID Handbook, which details different frequencies and types of coupling that may be at use by various RFID systems. *See* Ex. 2005, 22–23. Although this text differentiates between “inductively or capacitively coupled system[s] and microwave system[s] or backscatter system[s]” (*id.* at 23 (emphasis omitted)), its description of each of these types of RFID devices indicates that an ordinary artisan would have had experience with RFID devices generally. Thus, we are not persuaded that the level of ordinary skill should be narrowly confined to developing antenna for RFID devices that are used for inductive coupling. For the purposes of this 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.” Pet. 7.⁵

E. Dr. van der Weide’s Testimony

Patent Owner argues that we should not give substantial weight to the testimony of Petitioner’s declarant, Dr. van der Weide, for several reasons. Patent Owner first argues that Dr. van der Weide lacks relevant experience to provide opinions through the lens of a person having ordinary skill in the art. PO Resp. 27–38 (citing Ex. 2003 ¶ 71). According to Patent Owner, Dr. van der Weide “has experience with RFID that operates at microwave frequencies,” but “identifies no experience with relevant inductive RFID systems at lower frequencies (*e.g.*, frequencies such as 13.56MHz and 8.2MHz).” *Id.* This argument is based on Patent Owner’s articulation of the level of ordinary skill in the art, which we have not adopted. Moreover, Petitioner presents evidence that Dr. Van der Weide’s experience exceeds even Patent Owner’s articulation of the level of ordinary skill in the art. Pet. Reply 22–23 (citations omitted). Dr. van der Weide’s education and experience are sufficient to allow us to grant his testimony our full consideration. *See* Ex. 1003 ¶¶ 2–7; Ex. 1004 (van der Weide *curriculum vitae*).

Patent Owner also argues that Dr. van der Weide’s testimony “runs counter to fundamental principles of inductive coupling RFID technology.” PO Resp. 28–29 (formatting omitted). Patent Owner bases this argument on

⁵ We further note that our final determination, on the merits, would be the same even under Patent Owner’s definition of the level of ordinary skill in the art.

Dr. van der Weide failing to immediately know (and testify) that Takeda-322's L_2 inductance is much larger than L_1 . *Id.* Patent Owner further argues that this alleged failure “is directly relevant to his mistaken opinion that Takeda-322 discloses an ‘extension antenna.’” *Id.* at 30. Patent Owner further criticizes Dr. van der Weide's deposition testimony in various regards. *Id.* at 30–34; Sur-Reply 20–22. Petitioner argues that Dr. van der Weide's deposition testimony represents careful answers to irrelevant hypotheticals. Pet. Reply 24.

Patent Owner does not seek to 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.

F. 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. In applying this standard, claim terms are generally given their ordinary and customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the invention and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. “In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence.” *DePuy Spine, Inc. v. Medtronic Sofamor*

Danek, Inc., 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

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. 7–8. Patent Owner proposes constructions for the claim terms “coupler coil” and “extension antenna.” PO Resp. 15–26. According to Patent Owner, Petitioner also has proposed its own constructions for these terms, despite stating that no claim term requires construction. *Id.* at 15–16. We address “coupler coil” and “extension antenna” below.⁶

As to “coupler coil,” Patent Owner argues that “coupler coil” (as it appears in independent claims 1 and 18) should be construed as “a component in a booster antenna for coupling with a module antenna connected to an integrated circuit.” PO Resp. 15–16. We determine that it is unnecessary to construe this claim term for purposes of this Decision. *See, e.g., Nidec Motor Corp.*, 868 F.3d at 1017 (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))). As we explain herein, the preponderance of the evidence supports that Takeda-322 renders the recited “coupler coil” obvious even under Patent Owner’s proposed construction. *See* Section III(G)(2)(b), *infra*.

⁶ Patent Owner also argues that Petitioner belatedly construes “card body” in Petitioner’s Reply. Sur-Reply 16–18. We do not construe “card body” because this construction is not necessary to resolve this matter. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017).

As to “extension antenna,” Patent Owner’s arguments center around construction and application of this term. PO Resp. 16–28, 37–40; *see also* Sur-Reply *passim*. Patent Owner argues that the extension antenna (as it appears in independent claims 1 and 18) should be construed as “a component which enhances coupling between the module antenna and the booster antenna.” PO Resp. 16. According to Patent Owner, Petitioner construes the term to mean “an additional coil, disposed in available card space, that contributes to the booster antenna’s inductance.” *Id.* at 16–17; *see* Pet. 4. Petitioner does not propose an “outer bounds” construction for “extension antenna” but argues that the extension antenna should contribute to the inductance of the booster antenna. *See, e.g.*, Pet. 4, 14, 49–50.⁷

We begin our assessment of the parties’ arguments by examining the language of claims 1 and 18. Claim 1 recites “an extension antenna (EA) disposed in the third area.” Ex. 1001, 26:49. Claim 1 provides little context for the meaning of “extension antenna” except that it is in “a third area located in the upper portion of the card body which is separate from the first area and the second area.” *Id.* at 26:33–49. Claim 1 recites different structures separately and, from this, a person of ordinary skill in the art would understand that the extension antenna cannot be precisely the same structure within the card body as other recited elements such as the card body, the card antenna, the antenna module, and the coupler coil. *Id.*; *see*

⁷ Patent Owner argues that Petitioner fails to properly offer a construction for extension antenna. *See, e.g.*, Sur-Reply 1–2. While we agree that Petitioner has been less than clear on precisely how Petitioner believes “extension antenna” should be construed, Petitioner took the position that “ordinary and customary” meaning applies. Pet. 7–8. Petitioner’s position is sufficient to comply with 37 C.F.R. § 42.104(b)(3).

also PO Resp. 19–20, 22–23 (arguing that extension antenna is distinct from coupler coil and card antenna); Pet. Reply 2 (agreeing that the claimed coupler coil and extension antenna should not be conflated or construed identically). A person of ordinary skill in the art would also understand that the extension antenna functions as an “antenna” that extends the functioning of the device (for example by contributing to the inductance of the booster antenna).

Claim 18 is similar to claim 1 except that it provides additional structural limitations for the extension antenna. In particular, claim 18 requires that the extension antenna have the following structural characteristics:

- the extension antenna (EA) comprises at least two coils (EA-1, EA-2); wherein:
- the extension antenna (EA) comprises a first coil (EA-1) and a second coil (EA-2);
- a first end of the first coil (EA-1) is connected with an end of the coupler coil (CC);
- a second end of the first coil (EA-1) is connected with a first end of the second coil (EA-2), [and]
- a second end of the second coil (EA-2) is connected with the card antenna (CA).

Ex. 1001, 28:14–42. From these recitations, a person having ordinary skill in the art would understand that the term “extension antenna,” standing alone, does not require two coils as claim 18 recites. If it did, claim 18’s additional language would be superfluous.

Patent Owner argues that, because claims 12 and 18 require the extension antenna to comprise “at least two coils,” claim 1 “must be broad enough to cover two or more coils.” PO Resp. 20. As explained above, we agree that claim 18 requires that the extension antenna have at least two coils

and that claim 1 permits that the extension antenna *could* have two or more coils.

Patent Owner appears to argue that, because the extension antenna and coupler coil are separate recitations, they must also have entirely non-identical functions. PO Resp. 22–24. We disagree. All of the challenged claims are apparatus claims directed to physical structure. Thus, different claim terms have different meanings and refer to distinct structure of the claimed apparatus. There is no requirement, however, that different claim recitations in an apparatus claim necessarily perform entirely separate functions. Also, there is no requirement that different claim terms require that each separate structure within the apparatus necessarily has physical differences. *See Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1333 n.3 (Fed. Cir. 2006) (“[T]he use of two terms... connote[s] different meanings, not that they necessarily refer to two different structures.”); Pet. Reply 5.

We next consider the ’250 patent’s written description. The written description indicates that the extension antenna contributes to the inductance of the booster antenna. For example, the abstract refers to “an extension antenna (EA) contributing to the inductance of the booster antenna (BA).” Ex. 1001, code (57) (abstract); *see also id.* at 5:36–37 (“[t]he extension antenna (EA) contributes to the inductance of the booster antenna (BA)”), 23:67–24:3 (“In the present invention, the antenna extension EA . . . contributes to the inductance of the booster antenna BA.”).

Patent Owner appears to argue that merely “negligible” contributions of inductance to the booster antenna should not be sufficient for a structure to be an extension antenna. PO Resp. 21. The ’250 patent describes a

“dummy turn” with “the winding direction of the two conductor tracts being opposite with respect to one another so that the dummy turn does not supply any or a negligible contribution to the inductance of the booster antenna structure.” Ex. 1001, 23:55–60. In contrast, the extension antenna is described as contributing to inductance of the booster antenna. *See id.* at 5:36–37. Thus, the written description supports that the extension antenna’s contribution to the booster antenna is non-negligible.

Beyond contributing to booster antenna inductance, however, the written description refers to structure the extension antenna *may* employ. *See, e.g.*, Pet. Reply 11–12 (arguing that nothing in the Specification requires that the extension antenna enhance coupling between the module antenna and booster antenna). For example, the extension antenna *may* be a “true coil” having at least one cross-over. Ex. 1001, 4:50–51; *see also id.* at 5:36–38 (“extension antenna (EA) . . . may be in the form of a coil comprising at least one cross-over.” It *may* be “disposed adjacent at least 90° of the coupler coil (CC).”). *Id.* at 5:31–35. It *may* be connected to the coupler coil on one end and, on the other end, be connected to the card antenna or be unconnected. *Id.* at 5:40–43. The coupler coil and extension antenna *may* be formed as one continuous embedded coil. *Id.* at 14:16–21. The extension antenna *may* be formed of a spiral of wire embedded in the card body and *may* be formed of a spiral of wire contiguous with the card antenna CA and coupler coil CC. *Id.* at 14:51–54; *see also* 16:6–12 (explaining that in the example corresponding to Figure 4D, the “extension antenna has one end which is an extension of the coupler coil CC”). The extension antenna *may* have more than 15 windings or 7 or 8 windings. *Id.* at

15:25–31. The extension antenna *may* be formed with varying pitches. *Id.* at 18:4–11.

The written description also explains functions the extension antenna *may* perform. For example, in one particular example (corresponding to Figure 4B), the extension antenna *may* “increase the inductivity of the booster antenna BA while reducing its resonance frequency.” *Id.* at 14:62–15:33. Also, in *some* of the designs the ’250 patent describes, extension antenna may lower the resonance frequency of the booster antenna and may regulate or concentrate the electromagnetic field when in close proximity to the external contactless reader. *Id.* at 16:13–33.

Elsewhere, the ’250 patent similarly states that the extension antenna “may enhance the overall coupling between the booster antenna BA and the module antenna MA, and/or the booster antenna BA and the antenna of an external reader.” *Id.* at 16:37–44 (emphasis added). The “or” in the preceding quote indicates that the extension antenna may have only one of the two indicated functions but does not have to perform both functions. In other words, this passage is important because it indicates that the extension antenna does not *necessarily* enhance the overall coupling between the booster antenna and the module antenna.

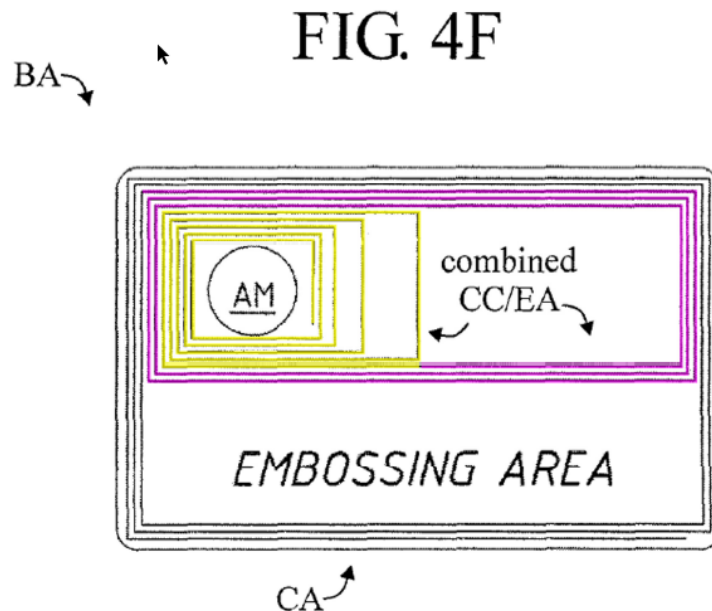
Patent Owner cites *Ethicon, Inc. v. United States Surgical Corp.*, 937 F. Supp. 1015, 1030 (D. Conn. 1996), for the proposition that a specification could use “may” throughout “to refer to matters that are not optional.” Sur-Reply 5. The Federal Circuit, however, has approved of Board cases in which we have held that the use of permissive language is indicative of optional language. *See, e.g., In re Johnston*, 435 F.3d 1381, 1384 (Fed. Cir. 2006) (“additional content did not narrow the scope of the claim because

these limitations are stated in the permissive form ‘may’”). *Ethicon* is also distinguishable for two reasons. First, the *Ethicon* court assessed a means plus function claim, claim 33, and determined that the specification described certain networks that were structure corresponding to the recited function pursuant to 35 U.S.C. § 112, ¶ 6. *Ethicon*, 937 F. Supp. at 1030. The use of the word “may” in the specification did not prevent the specification’s structure from limiting claim scope in this § 112, ¶ 6 context especially because the specification used “may” to also set forth required elements. *Id.* Here, in contrast, claims 1 and 18 do not invoke § 112, ¶ 6; there is, thus, no invocation of means plus function language that would provide a statutory reason to limit claim scope to the specification’s structure.

Ethicon also is distinguishable because the ’250 patent’s Specification omits “may” when describing the extension antenna’s function of contributing to the inductance of the booster antenna. *See, e.g.*, Ex. 1001, code (57) (abstract describing this function without use of “may”); 5:36–37 (“The extension antenna (EA) contributes to the inductance of the booster antenna (BA).”). In contrast, the Specification uses “may” or “can” when describing the extension antenna’s effect on coupling between the booster antenna and module antenna. *See, e.g.*, Ex. 1001, 16:37–40, 18:35–37. The ’250 patent Specification, therefore, indicates that contributing to inductance of the booster antenna is a required function of the extension antenna whereas improving coupling between the booster antenna and module antenna is a powerful, but optional, feature.

Petitioner argues that “the ’250 Specification says the same coil may serve as both an extension antenna and a coupler coil.” Pet. 51 (citing Ex.

1001, 17:28–42; Ex. 1003 ¶ 142) (emphasis removed). Patent Owner disagrees. PO Resp. 23 (citing Ex. 2003 ¶ 68); *see also* Sur-Reply 15–16. Patent Owner reproduces and colorizes Figure 4F of the '250 patent, and we provide that reproduction below.



PO Resp. 23–24. Figure 4F is a “diagram illustrating [an] embodiment[] of a booster antenna (BA) with card antenna CA, a coupler antenna (CC), and an extension antenna (EA).” Ex. 1001, 6:50–52. Patent Owner colorizes the figure by coloring smaller size rectangular windings near the antenna module with yellow and colorizing larger rectangular windings farther from the antenna module with purple.

Figure 4F illustrates that, in this embodiment, the extension antenna and coupler coil are combined to form one large coil. We agree with Petitioner that deciding where to switch from yellow (coupler coil) to violet (extension antenna) in the figure is arbitrary. Pet. Reply 7–9; Ex. 1055 ¶ 23 (Petitioner’s witness, Dr. van der Weide, opining that the annotation is arbitrary). Patent Owner’s witness agrees that the line could subjectively be

moved some amount. Ex. 1050, 143:10–20 (Patent Owner’s witness, Dr. Eisenstadt, indicating that the line could subjectively move). Moreover, Patent Owner’s witness indicates that at least a portion of the coupler coil could perform functions of either component. Ex. 1050, 144:18–146:16; *see also* Ex. 1055 ¶ 25 (Dr. van der Weide providing consistent testimony). Figure 4F, and the Specification’s discussion of that figure, as a whole suggests that the line between extension antenna and coupler coil may be blurred such that portions of a combined coil may perform functions of both the extension antenna and coupler coil. Ex. 1001, 17:31–35 (“In this [Figure 4F] example, the coupler coil CC and extension antenna EA are essentially combined with one another.”); *see also* Pet. Reply 8 (explaining that portions of the Figure 4F extension antenna are closer to the antenna module than portions of the coupler coil meaning that parts of the extension antenna will couple more strongly with the antenna module than parts of the coupler coil) (citing Ex. 1055 ¶ 27; Ex. 1050, 142:1–5, 146:10–13).

To summarize our analysis of the ’250 Specification, the Specification indicates that the extension antenna contributes to the inductance of the booster antenna. Ex. 1001, code (57) (abstract). The Specification also indicates, contrary to Patent Owner’s present position, that the extension antenna does not necessarily, for all disclosed embodiments, enhance coupling between the booster antenna and the module antenna.

Prosecution history may also impact claim construction. Here, claim 1 was amended to add a “coupler coil (CC)” so that the claim requires “three distinct antenna components on the card body.” Ex. 1002, 207–208; *see also* Pet. 6–7. The prosecution history does little to illuminate the meaning of

“extension antenna” except to further confirm the extension antenna is distinct from the card antenna and coupler coil.

Finally, we consider extrinsic evidence. Neither party, however, uses extrinsic evidence to argue what known or ordinary meaning “extension antenna” might have to a person having ordinary skill in the art, in this context. Just to the contrary, both parties appear to agree that “extension antenna” was not a known term. *See, e.g.*, Sur-Reply 6 (Patent Owner acknowledges that extension antenna “was not a known term”).

Based on extrinsic evidence apart from the ’250 patent, however, Patent Owner presents evidence⁸ that its witness, Dr. Eisenstadt, has testified that the extension antenna enhances overall coupling between the module antenna and the booster antenna. Sur-Reply 12–13 (citing Ex. 2028). But this evidence, at most, only addresses functions that an extension antenna, in view of Patent Owner’s patent disclosures, could perform. The evidence does not establish known or ordinary meaning of the words “extension antenna” to a person having ordinary skill in the art.

Patent Owner also states that the “extension antenna must be connected to at least one of the coupler coil or the card antenna,” but Patent Owner does not argue this point aside from referring to papers from a different proceeding. PO Resp. 21–22. Such incorporation by reference is improper. We do not discern anything in the present record that requires that the extension antenna be defined in terms of what it is connected to.

⁸ This evidence is the subject of Petitioner’s Motion to Strike. Paper 32. As we explain *supra*, Petitioner’s motion is moot because even if this evidence is considered, it does not affect the outcome of our decision.

In view of all of the evidence presented above, we construe the “extension antenna” to mean “an additional coil, disposed in available card space, that non-negligibly contributes to the booster antenna’s inductance.” This construction is consistent with the Specification which consistently describes the function of the extension antenna as contributing to booster antenna inductance without using the word “may.” The “non-negligible” requirement distinguishes from dummy circuits or other circuits that do not meaningfully perform this function. Further construction of extension antenna (for example, whether the extension antenna must be connected as Patent Owner argues (PO Resp. 21–22)) is unnecessary to resolve the matter before us. *Nidec Motor Corp.*, 868 F.3d at 1017.

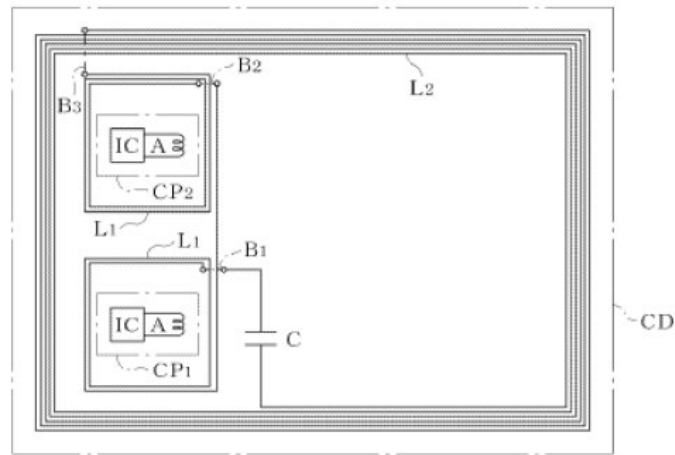
G. Obviousness Analysis

1. Overview of Takeda-322

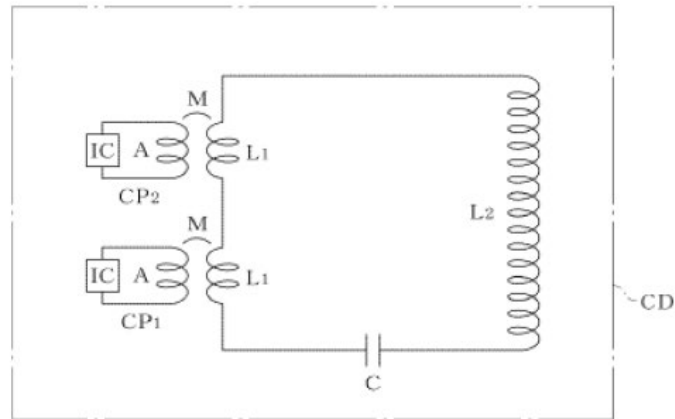
Takeda-322 describes “a contactless IC card.” Ex. 1005 ¶ 1. As described in Takeda-322 an IC card “can, by being provided with a booster coil that operates as an external antenna shared by a plurality of IC chips, provide an increased information transmission distance and have its included functions easily expanded.” *Id.* ¶ 5. Takeda-322’s “booster coil is formed, as a two-dimensional spiral of a plurality of turns.” *Id.* ¶ 6. The booster coil operates as an external antenna that boosts signals by providing increased transmission distance to facilitate communication with an external reader/writer. *Id.* ¶¶ 5, 12.

We reproduce Takeda-322’s Figure 3 below.

[FIG. 3]



(A)



(B)

Figure 3 depicts (A) a schematic plan view of the card substrate CD and (B) a circuit diagram of card substrate CD. *Id.* ¶ 29. Takeda-322’s “card substrate CD is formed in a thin card shape by an insulating material such as a paper material or a synthetic-resin material.” *Id.* ¶ 22. Booster coil L2 extends around the card substrate and is used to “perform data communication with the external reader/writer.” *Id.* at Fig. 3(A), ¶¶ 12, 29–30. IC chips CP1, CP2 each can use booster coil L2 as a shared external antenna and individually perform data communication with the external reader/writer to realize different functions of different applications. *Id.* ¶ 27.

Takeda-322 describes a multi-wire implementation with exciting coils L1, L1 for the IC chips CP1, CP2 inductively coupling the IC chips to booster coil L2. *Id.* ¶¶ 6, 14, 29. The reference also describes a single wire implementation in which the coils “may be formed on the card substrate CD using one wire member having an insulating coating.” *Id.* ¶ 33. Exciting coils L1 “act as a secondary coil for the antenna of the IC chip and exhibit a signal-amplifying action according to a ratio of the number of turns had by each.” *Id.* ¶ 14. CP1 is disposed inside of exciting coil L1 such that the antenna of the IC chip is inductively coupled to the exciting coil with sufficient closeness. *Id.* ¶¶ 14, 25, 29. “M,” shown on Figure 3(B), indicates the inductive coupling between antenna A of CP1 and exciting coil L1 and the inductive coupling between antenna A of CP2 and booster coil L2 due to the enclosed portion G. *Id.* ¶ 25.

2. Unpatentability over Takeda-322

Petitioner asserts that claims 1, 2, 4–8, 10–12, and 18 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takeda-322, citing the Declaration of Dr. Daniel van der Weide for support. Pet. 8–56 (citing Ex. 1003). Below, we first address Petitioner’s proposed obvious modifications of Takeda-322. We then separately address independent claim 1, dependent claim 12, and independent claim 18. We address other dependent claims collectively.

a. Obvious modifications of Takeda-322

Petitioner argues that a person of ordinary skill in the art would have found it obvious to implement several different modifications to Takeda-322’s teachings. Pet. 11–24. We address each modification below.

Petitioner first argues that Takeda-322 teaches using a single wire for its multi-coil antenna. *Id.* at 11 (citing Ex. 1005 ¶ 33). Petitioner argues that,

to the extent Takeda-322 does not expressly teach a single wire implementation, such an implementation would have been obvious because it was a known, conventional, technique and because it would lead to obvious and predictable results while avoiding drawbacks of multiple wires. *Id.* at 11–12 (citing Ex. 1003 ¶¶ 59–63; Ex. 1012, 3:54–60, 4:26–36, 5:35–60 (Ayala suggesting use of single wire)). Petitioner further argues, with supporting evidence, that a person of ordinary skill in the art would have had a reasonable expectation of success in achieving this implementation. *Id.* The preponderance of the evidence supports Petitioner’s argument that a person of ordinary skill in the art would have had both reason and a reasonable expectation of success in achieving this implementation, and Patent Owner does not dispute the argument. We, thus, determine that a single-wire embodiment of Takeda-322 would have been obvious.

Petitioner next argues that it would have been obvious to arrange Takeda-322’s antenna in a conventional portrait or landscape orientation. *Id.* at 14–17 (citing Ex. 1003 ¶¶ 70–76; Ex. 1007, 2000 (ISO/TEC 15693 industry standard for portrait-orientation smart cards); Ex. 1015 ¶ 132 (characterizing ISO/TEC 15693 as a “contactless smart card[]” standard); Ex. 1012, 3:54–60, 4:26–36, 5:35–60). Petitioner’s witness cites several references to support that portrait-orientation contactless IC cards/smart cards were well-known. Ex. 1003 ¶ 72 (citing Ex. 1022, Fig. 1; Ex. 1023, Figs. 51, 53; Ex. 1024, Figs. 9, 9A–9F; Ex. 1025, 8:33–47, Fig. 17, Ex. 1026, 3, Fig. 1). Petitioner argues that a person of ordinary skill in the art would have understood that Takeda-322’s Figure 3(A) embodiment was equally suitable in portrait or landscape mode and that either option would be obvious given the limited possibilities. Pet. 16 (citing Ex. 1002 ¶ 75; Ex.

1001, Fig. 3(a), ¶¶ 29–30). The preponderance of the evidence supports Petitioner’s argument that a person of ordinary skill in the art would have had both reason and a reasonable expectation of success in achieving this implementation, and Patent Owner does not dispute the argument. We, thus, determine that a landscape or portrait orientation embodiments of Takeda-322 would have been obvious.

Petitioner next argues that it would have been obvious to form the inner coils of Takeda-322 Figure 3 in an upper portion of a card substrate in landscape orientation. Pet. 18–24 (citing, for example, Ex. 1002 ¶¶ 77–93). Petitioner argues that Takeda-322 teaches placing its coils in an “effective area of the card substrate” which means an area “that excludes an embossing portion.” Pet. 18 (citing Ex. 1001 ¶¶ 11, 22, 23 Fig. 1; Ex. 1002 ¶¶ 77–78). Petitioner cites an industry standard to evidence card embossing areas. *Id.* at 18–19 (citing Ex. 1006, 1 (ISO/IEC 78-11-1:2002 standard)). Petitioner identifies an “Obvious Embossed Implementation” modification to Takeda-322’s teachings (*id.* at 20) and argues that a person of ordinary skill in the art would have had many reasons to implement this modification including the teachings of Takeda-322 and other references to avoid coils in embossed areas, the advantage of avoiding antenna in embossed areas, and because avoiding the embossed area was a known technique that would have been expected to be successful. *Id.* at 20–24 (citing Ex. 1002 ¶¶ 82–93; Ex. 1001 Figs. 1, 3A, ¶¶ 11, 22, 23; Ex. 1029 ¶¶ 14–18, Fig. 2 (Phillips); Ex. 1030, Fig. 5 (Takeda-98); Ex. 1010, 5:38–46, 10:59–63, 12:22–29, 13:8–28; Ex. 1010, Fig. 5 (Emori); Ex. 1006 (ISO/IEC 7811-1); Ex. 1034 ¶¶ 108, 109 (Eray-116); Ex. 1027 ¶¶ 45–48, Fig. 10 (Launay); Ex. 1031, 5:43–48 (Owada); Ex. 1032, 10:30–34 (Yeager); Ex. 1033, 8:58–64 (Cowcher); Ex.

1009, 10:55–12:12 (Eray); Ex. 1008, 40–42 (Finkenzeller)). The preponderance of the evidence supports Petitioner’s argument that a person of ordinary skill in the art would have had both reason and a reasonable expectation of success in achieving this implementation, and Patent Owner does not dispute the argument. We, thus, determine that it would have been obvious to a person of ordinary skill in the art to form the inner coils of Takeda-322 Figure 3 in an upper portion of a card substrate in landscape orientation.

Petitioner also argues that it would have been obvious to add a third IC chip to all of the obvious implementations of Takeda-322, Figure 3. Pet. 70–77 (citing Ex. 1005 Fig. 3, ¶¶ 16, 27–33 (Takeda-322); Ex. 1002 ¶¶ 191–206 (declaration of Dr. van der Weide); Ex. 1011, Abstract, 3:4–6, 8:55–58, 14:35–38, Fig. 5 (Chung); Ex. 1009, 10:55–12:12 (Eray); Ex. 1008, 18, 40–42 (Finkenzeller)). Importantly, Takeda-322 teaches that “any number of IC chips CP_i ($i=1, 2, \dots$) that use the booster coil L_2 as a shared external antenna can be provided as long as this number is 2 or more.” Ex. 1005 ¶ 33; *see also id.* ¶ 16; Ex. 1002 ¶ 191. The preponderance of the evidence supports that a person of ordinary skill in the art would have had reason to add a third chip to Takeda-322 as Petitioner argues and would have had a reasonable expectation of success in doing so. Patent Owner does not dispute the argument. We, thus, determine that it would have been obvious to a person of ordinary skill in the art to reach the three chip embodiments of Takeda-322 that Petitioner proposes.

To summarize, the Petition supports, by a preponderance of the evidence, that each of Petitioner’s proposed modifications to Takeda-322’s teachings would have been obvious to a person of ordinary skill in the art.

b. Independent Claim 1

Petitioner asserts that claim 1 is unpatentable as obvious over Takeda-322. Pet. 8. The preamble of claim 1 recites a “Card Body (CB) for a smart card, comprising.” Ex. 1001, 26:33. Petitioner argues that Takeda-322 describes a multi-coil antenna used in a “contactless IC card.” Petitioner asserts that obvious implementations of Takeda-322 Figure 3 have a card substrate CD which is a card body for a smart card. Pet. 25–27. Petitioner’s argument is persuasive and supported by a preponderance of the evidence. Takeda-322 teaches, for example, that its multi-coil antenna is used in “contactless IC card[s]” that incorporate “antenna-equipped IC chip[s].” *Id.* at 26 (citing Ex. 1005 ¶¶ 1–4).⁹

Claim 1 next recites “a surface having a surface area, an upper portion of the surface constituting approximately half of the surface area of the card body and a lower portion of the surface constituting a remaining approximately half of the surface of the card body.” Petitioner argues that Takeda-322 Figure 3A illustrates such a surface. Pet. 27–33. Petitioner’s argument is persuasive and supported by a preponderance of the evidence. Takeda-322 at, for example, Figure 3A illustrates a substrate having a surface. Ex. 1005 Fig. 3A. We agree with Petitioner that the substrate’s surface can be conceptually divided either horizontally or vertically into approximate halves. Pet. 27–33.

⁹ As we note above, Patent Owner argues that Petitioner belatedly attempts to construe “card body.” Sur-Reply 16–18. Patent Owner does not, however, dispute that Takeda-322 teaches or suggests a “card body” or argue for any particular construction of “card body.”

Claim 1 next recites “a first area extending around a peripheral portion of the card body in at least the upper portion of the card body.” Petitioner argues that Figure 3A depicts such an area. Pet. 34–35. Petitioner’s assertion is persuasive and supported by a preponderance of the evidence. As the Petition illustrates, Figure 3A depicts a substrate that includes a first area, as claim 1 recites, whether the Takeda-322 device is considered in portrait or embossed orientation. *Id.*

Claim 1 next recites “a card antenna (CA) disposed in the first area.” Petitioner argues that Takeda-322 Figure 3 depicts a card antenna—booster coil L2—within the first area. Pet. 36–28. Petitioner’s assertion is persuasive and supported by a preponderance of the evidence. Figure 3A depicts that booster coil L2 is within a peripheral portion of at least an upper portion of the card body.

We also agree with Petitioner that claim 1 does not require that the entirety of the card antenna be within the recited first area. Claim 1’s plain language does not include such a requirement, and, as Petitioner explains, embodiments of the ’250 patent do not place the entirety of the card antenna within a first area as claim 1 defines it. Pet. 37; *see also* Ex. 1003 ¶ 119 (Petitioner’s witness, Dr. van der Weide, testifies that no embodiment of the ’250 patent disposes the entirety of the card antenna in the peripheral portion of the upper portion of the substrate).

Claim 1 next recites “a second area located in the upper portion of the card body and corresponding in size to and at a position corresponding to a location of an antenna module (AM) for the smart card” and later recites “a coupler coil (CC) disposed in the second area.” Petitioner asserts that Takeda-322 teaches a CP1—the “IC chip” integrally equipped with antenna

A—that corresponds to claim 1’s antenna module. Pet. 38–41. Petitioner illustrates how, in either the portrait or embossed implementations, the Takeda-322 antenna module occupies a second area in the upper portion of the card body. *Id.* Petitioner also asserts that Takeda-322 Figure 3 illustrates a coupler coil (the inner coil for CP 1 which includes at least the exciting coil L1) disposed in the second area. Petitioner’s argument is persuasive and supported by a preponderance of the evidence. Takeda-322 teaches, for example, that CP 1 is an antenna-equipped IC chip disposed in exciting coil L1. Ex. 1005 ¶¶ 3, 25. Takeda-322 teaches that CP 1 may be located in the upper portion of the card body. *Id.* at Fig. 3A. Takeda-322 further suggests that the exciting coil would be in the same area as the antenna module because exciting coil L1 may be formed to have “a minimum opening area necessary to dispose the IC chip CP 1 therein.” Ex. 1005 ¶ 24.

Patent Owner argues that “coupler coil” should be construed as “a component in a booster antenna for coupling with a module antenna connected to an integrated circuit.” PO Resp. 15–16. Petitioner argues that the Takeda-322 coupler coil (including at least exciting coil L1) is arranged so that the chip’s antenna is inductively coupled to the exciting coil. Pet. 45–46 (citing Ex. 1005 ¶¶ 14, 24). Patent Owner does not dispute this argument, and the argument is supported by a preponderance of the evidence. Thus, Petitioner adequately establishes that Takeda-322 teaches or suggests this claim element even under Patent Owner’s proposed construction of “coupler coil.”

Claim 1 next recites “a third area located in the upper portion of the card body which is separate from the first area and the second area” and, later, recites “an extension antenna (EA) disposed in the third area.”

Petitioner argues that the Takeda-322 second inner coil is an extension antenna disposed in a third area as claim 1 recites. Pet. 41–43; 48–55. Petitioner’s argument is persuasive and supported by a preponderance of the evidence.

As we explain above, we construe “extension antenna” as “an additional coil, disposed in available card space, that non-negligibly contributes to the booster antenna’s inductance.” Petitioner argues that Takeda-322’s second inner coil (as Petitioner identifies in dark pink, Pet. 48, 49) “contributes to the inductance of the multi-coil antenna.” Pet. 49–50. To support this argument, Petitioner compares disclosures of the ’250 patent and Takeda-322. *Id.* at 50 (citing Ex. 1001, 9:27–36, 23:61–24:3, 15:52–57, 16:6–9, 16:60–64; Ex. 1005 ¶¶ 14, 15, 29, 30, Fig. 3(B), Fig. 4(B); Ex. 1002 ¶¶ 135–138). Petitioner further argues that, in each obvious implementation of Takeda-322 Figure 3, the second inner coil additively contributes to the inductance of the booster antenna. *Id.* (citing Ex. 1005 ¶¶ 15, 29, 30; Ex. 1002 ¶¶ 139, 140; Ex. 1013, 152–153). Takeda-322 states, for example, that “[t]he booster coil and exciting coil formed as two-dimensional spirals can each realize a necessary inductance.” Ex. 1005 ¶ 15. The identified extension antenna is connected to both the coupler coil and the card antenna. *Id.* at Fig. 3(A); *see also* Pet. 48–49 (illustrating this point). Petitioner also provides figures demonstrating that the identified extension antenna is located in available card space. Pet. 48–49. We, thus, agree with Petitioner that the preponderance of the evidence supports that Takeda-322’s second inner coil meets our construction of extension antenna.¹⁰

¹⁰ We further note that the second inner coil that Petitioner identifies is equivalent, at least in relevant respects, in structure and function to the

Patent Owner argues that Takeda-322 does not disclose an extension antenna. PO Resp. 37–42. In particular, Patent Owner first argues that the alleged Takeda-322 extension antenna is instead merely a coupler coil. PO Resp. 37–38. This argument is unpersuasive. Petitioner takes the position that the identified second inner coil meets the requirements of an “extension antenna” as to CP₁. Pet. 48–50. Nothing in our construction of “extension antenna” forbids an extension antenna from *also* functioning as a coupler coil with respect to CP₂. Patent Owner directs us to no portion of the claim (or the ’250 patent Specification) that forbids structure meeting the “extension antenna” requirement from performing multiple functions.

Patent Owner also argues that Petitioner has not shown that Takeda-322’s coil L₁-top non-negligibly contributes to inductance of the alleged booster antenna. PO Resp. 38–39; Sur-Reply 19–20. As explained above, we disagree. The Petition establishes by a preponderance of the evidence that the second inner coil meets this requirement. Importantly when considering the preponderance of the evidence, Patent Owner presents no evidence that

extension antenna of the ’250 patent. *Compare* Ex. 1001, 9:27–36 (explaining that the antenna extension EA may be “connected with one or both of the card antenna CA and coupler coil CC”), 15:52–57 (explaining that extension antenna EA may be a continuation of card antenna CA and may have several turns of wire), 16:6–9 (providing similar explanation), 23:61–24:3 (explaining that extension antenna involves a crossover that contributes to inductance) *with* Ex. 1005 ¶¶ 14 (explaining that antenna turns add to signal-amplifying action), 15 (explaining that booster coil spirals may achieve necessary inductance), 29 (explaining that exciting coils may be connected in series with the booster coils), 30 (providing similar teaching), Fig. 3; *see also* Ex. 1003 ¶¶ 135–138 (Petitioner’s witness, Dr. van der Weide, explaining how characteristics of Takeda-322’s coil and the ’250 patent’s coil are “comparable”).

contradicts Petitioner’s showing that the second coil improves inductance of the booster antenna. *See* Pet. Reply 13–15 (citing Ex. 1055 ¶¶ 44–45 (reply declaration of Dr. van der Weide)).

Patent Owner further argues that Petitioner has not shown that the alleged extension antenna enhances coupling between the module antenna and the booster antenna. PO Resp. 39–40; Sur-Reply 18–19. Patent Owner’s argument is unpersuasive because, as we explain above, we do not construe the term “extension antenna” as requiring this particular enhanced coupling.

Petitioner has shown by a preponderance of the evidence that Takeda-322 teaches or reasonably suggests all of the elements of claim 1 in the manner claim 1 recites. Thus, we are persuaded that Petitioner has established by a preponderance of the evidence that Takeda-322 renders claim 1 obvious.

c. Dependent Claim 12

Claim 12 recites, “[t]he card body of claim 1, wherein: the extension antenna (EA) comprises at least two coils (EA-1, EA-2).” Ex. 1001, 27:19–20. Above, we explain how Petitioner adequately establishes that a three-chip embodiment of Takeda-322 would have been obvious. *See* Section III(G)(2)(a), *supra*. Petitioner argues that in such an embodiment, the extension antenna would have at least two coils. Pet. 78–83. A preponderance of the evidence supports Petitioner’s argument. *See, e.g.*, Ex. 1002 ¶¶ 213–219. Again, the coils may serve as an extension antenna with respect to one chip while serving as a coupler coil with respect to a different chip. Pet. 81–82.

Patent Owner argues that Petitioner's proposed modifications of Takeda-322 would not have an extension antenna with two coils. PO Resp. 40–42. We disagree as explained above.

Patent Owner argues that an extension antenna is not limited to a single coil, but if it were, the modification of Takeda-322 would not satisfy this condition. Petitioner, however, never took the position that the extension antenna must be a single coil; rather, the Petition extensively argues, while citing a supporting preponderance of the evidence, how the three-chip embodiment of Takeda-322 would have a two-coil extension antenna. Pet. 78–83; *see also* Pet. Reply 16–17.

Patent Owner also argues that none of the obvious implementations of Takeda-322 disclose an extension antenna. PO Resp. 41–42. This argument is substantively the same as Patent Owner's argument as to why Takeda-322 fails to disclose an extension antenna that we address with regard to claim 1. The argument is unpersuasive for the reasons explained above.

Petitioner has shown by a preponderance of the evidence that Takeda-322 teaches or reasonably suggests all of the elements of claim 12 in the manner claim 12 recites. Thus, we are persuaded that Petitioner has established by a preponderance of the evidence that Takeda-322 renders claim 12 obvious.

d. Independent Claim 18

Petitioner asserts that claim 18 is unpatentable as obvious over Takeda-322. Pet. 8. Most of the recitations of claim 18 are substantively identical to claim 1's recitations. Ex. 1001, 28:14–29. As to these recitations, our analysis is the same as above.

Claim 18 also recites that “the extension antenna (EA) comprises at least two coils (EA-1, EA-2); wherein: the extension antenna (EA) comprises a first coil (EA-1) and a second coil (EA-2).” Petitioner argues that it would have been obvious to modify Takeda-322 Figure 3 with three integrated circuit chips. Pet. 70–82 (addressing claim 12’s requirement that the extension antenna comprise at least two coils). Petitioner argues that such an implementation would have a first coil (EA-1) and second coil (EA-2) as claim 18 recites. *Id.* at 93. Petitioner’s argument is persuasive and supported by a preponderance of the evidence. Takeda-322 reasonably suggests that it may include three or more integrated circuit chips along with associated antenna. Ex. 1005 ¶ 33 (“any number of IC chips CPi (I = 1, 2...) that use the booster coil L2 as a shared external antenna can be provided”). In such a configuration, the extension antenna would comprise multiple coils collectively occupying available card space. *Id.* (suggesting “freely combining inductive coupling by the enclosed portion G, inductive coupling by the exciting coil L1, and direct connection by the built-in coupling capacitor Cc for each [of the any number of coils].” (emphasis added)); see also Ex. 1003 ¶¶ 191–220, 231 (Petitioner’s witness Dr. van der Weide explains obviousness of including more than two IC chips and this configuration resulting in an extension antenna comprising two coils).

Claim 18 also recites (1) “a first end of the first coil (EA-1) is connected with an end of the coupler coil (CC),” (2) “a second end of the first coil (EA-1) is connected with a first end of the second coil (EA-2),” and (3) “a second end of the second coil (EA-2) is connected with the card antenna (CA).” Petitioner argues that this structure would result from obvious implementations of Takeda-322 Figure 3. Pet. 93–100. Petitioner’s

argument is persuasive. Petitioner illustrates how a three IC embodiment lead to the recited connection. Pet. 96, 99, 100. The preponderance of the evidence supports that this configuration would have been obvious; the configuration simply extends the unmodified Takeda-322 Figure 3A by adding more integrated circuits as Takeda-322 suggests. *See, e.g.*, Ex. 1003 ¶ 208 (Petitioner's witness, Dr. van der Weide, depicting configuration for Takeda-322 Figure 3A with an added third integrated circuit).

Petitioner has shown by a preponderance of the evidence that Takeda-322 teaches or reasonably suggests all of the elements of claim 18 in the manner claim 18 recites. Thus, we are persuaded that Petitioner has established by a preponderance of the evidence that Takeda-322 renders claim 18 obvious.

e. Dependent Claims 2, 4–8, 10, and 11

Petitioner accounts for the limitations recited in claims 2, 4–8, 10, and 11. Pet. 56–83. Petitioner provides detailed explanations as to how Takeda-322 teaches or reasonably suggests the limitations of these claims, citing Dr. van der Weide's testimony for support. *Id.* (citing Ex. 1003).

We are persuaded that Petitioner has shown by a preponderance of the evidence that Takeda-322 teaches or reasonably suggests all of the limitations recited in claims 2, 4–8, 10, and 11 in the manner those claims recite. Thus, we are persuaded that Petitioner has established by a preponderance of the evidence that Takeda-322 renders claims 2, 4–8, 10, and 11 obvious.

IV. CONCLUSION

Based on the evidence presented with the Petition, the evidence introduced during the trial, and the parties' respective arguments, Petitioner has shown by a preponderance of the evidence that claims 1, 2, 4–8, 10–12, and 18 of U.S. Patent No. 9,033,250 B2 are unpatentable.¹¹

In summary:

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1, 2, 4–8, 10–12, 18	103	Takeda-322	1, 2, 4–8, 10– 12, 18	

V. ORDER

For the foregoing reasons, it is

ORDERED that Petitioner establishes by a preponderance of the evidence that claims 1, 2, 4–8, 10–12, and 18 of U.S. Patent No. 9,033,250 B2 are unpatentable;

FURTHER ORDERED that Petitioner's Motion to Exclude is *dismissed as moot*;

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).

FURTHER ORDERED that Patent Owner's Objections to Petitioner's Demonstratives are *dismissed as moot*; and

FURTHER ORDERED that, because this is a Final Written Decision, the 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.

IPR2022-00417
Patent 9,033,250 B2

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