

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INFINEON TECHNOLOGIES AG,
Petitioner,

v.

FEINICS AMATECH TEORANTA,¹
Patent Owner.

IPR2022-00650
Patent 9,633,304 B2

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

RANGE, *Administrative Patent Judge*.

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

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 1–3, 5–8, 11–14, and 16 of U.S. Patent No. 9,633,304 B2 (Ex. 1001, “the ’304 patent”). Paper 2 (“Pet.”). AmaTech Group Limited (“Patent Owner”) did not file a preliminary response.

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless the information presented in the petition “shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” The following findings of fact and conclusions of law are not final, but are made for the sole purpose of determining whether Petitioner meets the threshold for initiating review. Any final decision shall be based on the full trial record, including any response timely filed by Patent Owner. Any arguments not raised by Patent Owner in a timely-filed response may be deemed waived.

For the reasons stated below, we determine that Petitioner has established a reasonable likelihood that it would prevail with respect to at least one claim. We hereby institute an *inter partes* review as to all of the challenged claims of the ’304 patent based upon Petitioner’s asserted grounds of unpatentability.

II. BACKGROUND

A. Related Matters

The parties indicate that the ’304 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. xvi; Paper 5, 2. Patent Owner further indicates that patents

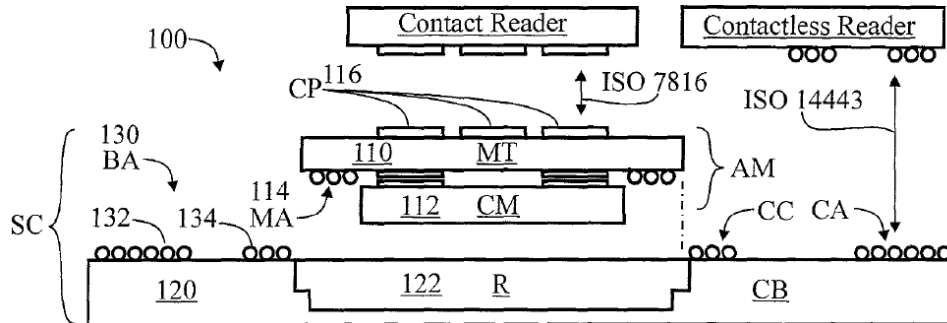
related to the '304 patent are at issue in pending IPR proceedings in IPR2022-00235, *Infineon Technologies AG v. Feinics AmaTech Teoranta* (filed November 24, 2021) (U.S. Pat. No. 9,195,932 B2) and IPR2022-00417, *Infineon Technologies AG v. AmaTech Group Ltd.* (filed January 10, 2022) (U.S. Pat. No. 9,033,250 B2). Paper 5, 3.

B. The '304 patent

The '304 patent is titled “Booster Antenna Configurations and Methods.” Ex. 1001, code (54). Generally, the '304 patent describes a booster antenna for a smart card. *Id.* at code (57). We reproduce Figures 1 and 1A of the '304 patent below.

FIG. 1

Dual Interface (DI) Smart Card, and Readers



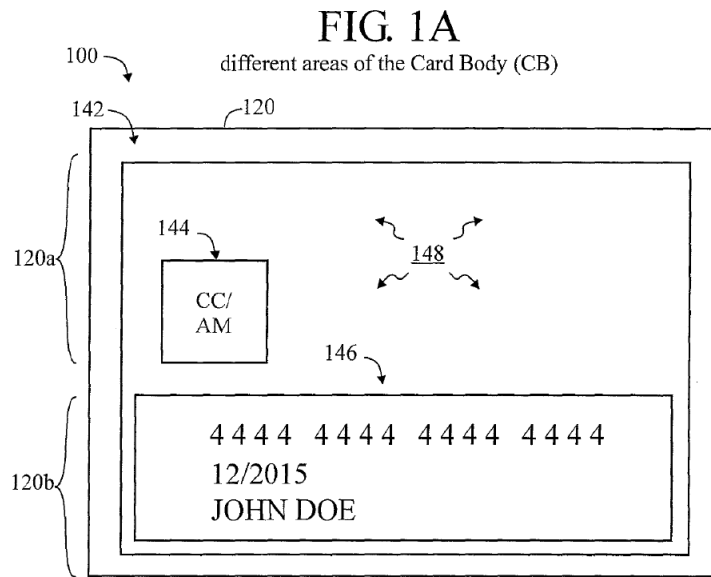


Figure 1 is a cross-section of a dual-interface smart card and reader and Figure 1A is the top view of a smart card's card body (CB). *Id.* at 7:35–38. A smart card may comprise card body (CB) (120) that has coupling area (144) in the location of antenna module (AM), and booster antenna (BA) (130). *Id.* at 1:63–2:1, 10:10–28. Antenna module (AM) may comprise a module tape (MT) or an RFID (radio frequency identification) chip or chip module. *Id.* at 1:65–2:4, 10:12–18. 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 2:4–8; 10:23–27.

We reproduce '304 patent Figure 4B below.

FIG. 4B

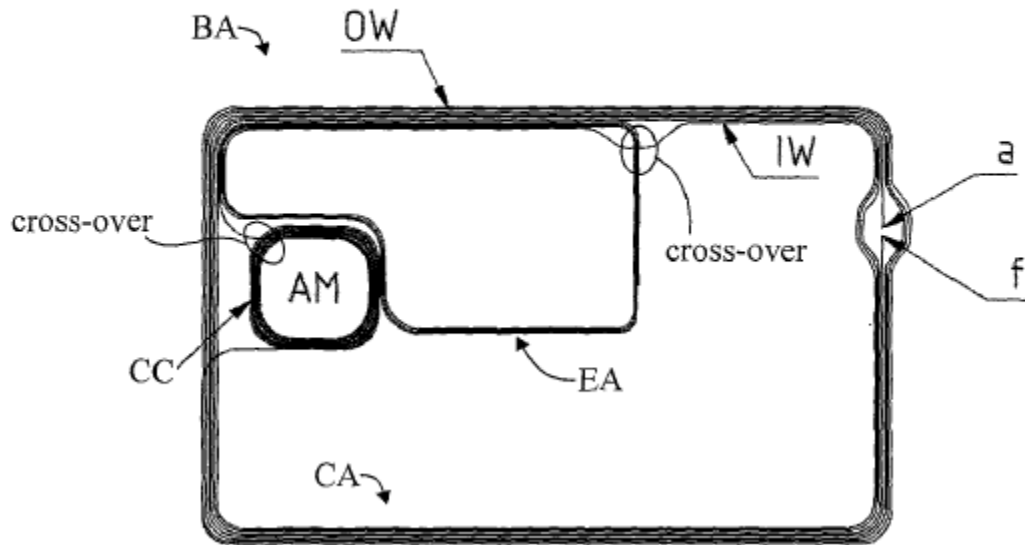


Figure 4B illustrates an embodiment of a booster antenna (BA) with card antenna (CA), a coupler antenna (CC), and an extension antenna (EA). *Id.* at 7:52–54. The booster antenna BA may be formed from “one, continuous” wire laid in a pattern to form several coils that the ’304 patent characterizes as the card antenna CA, coupler antenna CC, and extension antenna EA. *Id.* at 18:9–14. The coupler antenna CC may encircle or nearly encircle the antenna module AM for inductively coupling. *Id.* at 16:66–17:5. The extension antenna may serve to “increase the inductivity of the booster antenna BA while reducing its resonance frequency.” *Id.* at 17:52–60.

The ’304 patent describes a prior art reference, “U.S. Patent No. 8,130,166 (Assa Abloy, 2012)” as disclosing a “coupling device for transponder and smart card with such device.” *Id.* at 3:38–40. Petitioner explains that the “Assa Abloy” reference is the patent that issued from the application that Petitioner refers to as Ayala-362. Pet. 6; *see also* Ex. 1012 (the “Assa Abloy” patent); Ex. 1006 (the Ayala-362 patent application). The

'304 patent explains that this prior art device had a small spiral and large spiral where “the small spiral shows a larger pitch than the ones of the large spirals.” Ex. 1001, 3:40–49. The '304 patent explains that Assa Abloy teaches choosing the pitches of spirals as follows:

The pitches of the large spirals are chosen such as that the interturn stray capacitances is important and that the large spirals have mainly a capacitive behavior. And the pitch of the small spiral is chosen such as that the interturn stray capacitances are negligible, and that the small spiral has mainly an inductive behavior.

Id. at 3:49–54; *see also id.* at 26:7–22 (distinguishing Assa Abloy); Ex. 1006, code (57) (Ayala-362 abstract providing a similar explanation).

The '304 patent teaches that at least one of its components “may have a pitch which is different than one or more of the other components.” Ex. 1001, code (57). Figure 6A (not reproduced here) states that “pitch increases across width of card body (CB).” *Id.* at Fig. 6A. The '304 patent also explains that its device’s features may include “windings (turns) of CA, CC or EA having different pitches/spacings.” *Id.* at 5:27–28. In the paragraph we reproduce below, the '304 patent explains how it uses the word “pitch” and explains that pitch may vary during manufacturing:

As used herein, “pitch” may refer to the average distance, center-to-center (c-c), between adjacent turns of a wire for a winding (OW, IW) or the coupler coil (CC), as it is being laid. (Or, by analogy, to the center-to-center distance between adjacent conductive tracks made by additive or subtractive processes). It should be understood that during manufacturing (including as a result of subsequent manufacturing steps such as laminating), the pitch of the wire may vary or change somewhat, such as +/-5%, or more. And, when going around a corner, such as in a rectangular spiral, the pitch may be somewhat indeterminate. It should also be understood that the pitch of the windings (OW, IW) or coupler coil (CC) may be advertently altered (typically increased) locally, such as at the free ends “a” and “f”, to

accommodate manufacturing processes (such as starting and ending embedding the wire) and the like. “Pitch” may refer to the initial (during laying) or final (after laminating) distance (c-c) between adjacent turns of a winding.

Id. at 13:1–18. The ’304 patent explains that “pitch can be selected in order to vary the capacitance of the extension antenna (EA) and hence tune the resonance frequency of the booster antenna (BA).” *Id.* at 20:40–46.

C. Illustrative Claims

Petitioner challenges claims 1–3, 5–8, 11–14, and 16. Pet. 1. Claim 1 is the only independent claim, and we reproduce claim 1 below.

1. Booster [A]ntenna (BA) comprising the following components:
 - a card antenna (CA) component;
 - a coupler coil (CC) component; and
 - an extension antenna (EA) component;characterized in that:
 - at least one of the components has a pitch which is different than one or more of the other components.

Ex. 1001, 48:39–46.

D. Asserted Grounds of Unpatentability

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

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 ’304 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 or post-AIA statutes apply, as explained below. Moreover, our analysis

Claims Challenged	35 U.S.C. §	References/Basis
1–3, 5–8, 12–14, 16	103	Takeda-322, ³ Ayala-362 ⁴
1–3, 5–8, 11–14, 16	103	Murayama ⁵ , Ayala-362
1–3, 5–8, 11–14, 16	102/103 ⁶	Ayala-362

III. ANALYSIS

A. *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).

would be the same under either version of these statutes. *See* Pet. 52–54 (arguing that Murayama is prior art whether or not pre-AIA law applies).

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

⁴ US 2009/0152362 A1, June 18, 2009, Ex. 1006 (“Ayala-362”).

⁵ WO 2011/122162, published October 6, 2011, Ex. 1007 (“Murayama”).

⁶ In particular, Petitioner alleges that Ayala-362 anticipates claims 1–3, 5, and 12–14 and anticipates and/or renders obvious claims 6–8, 11, and 16. Pet. 77.

A claim may be invalid as anticipated by a prior art reference if “each and every limitation is found either expressly or inherently in a single prior art reference.” *Sanofi–Synthelabo v. Apotex, Inc.*, 470 F.3d 1368, 1375 (Fed. Cir. 2006) (internal quotation marks omitted). Anticipation under § 102 may be established by showing, as a matter of fact, that all elements arranged as specified in a claim are disclosed within the four corners of a reference, either expressly or inherently, in a manner enabling one skilled in the art to practice an embodiment of the claimed invention without undue experimentation. *See ClearValue, Inc. v. Pearl River Polymers, Inc.*, 668 F.3d 1340, 1344 (Fed. Cir. 2012).

B. 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.”).

Petitioner 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 RFID antennas; additional educational background could substitute for professional experience and vice versa.” Pet. 8 (citing Ex. 1003 ¶¶ 22–26). Petitioner also states that, “[t]he POSA’s level of skill would not differ in a manner material to the grounds between the ’304 patent’s earliest possible priority date (in 2010) and its actual filing date (in 2015).” *Id.* Petitioner’s description appears consistent with the prior art and patent specification before us and is supported by witness testimony. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (prior art itself may reflect an appropriate level of skill). For the purpose of this Decision, we adopt Petitioner’s description.

C. Claim Construction

In an *inter partes* review proceeding based on a petition filed on or after November 13, 2018, 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). This 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 does not propose any claim terms for construction and contends that “the prior art meets the claim terms under any reasonable

interpretation.” Pet. 9. Petitioner also argues that the plain meaning of “pitch” may refer to interturn gap distance (IGD). *See* Pet. 35–36; *see also id.* at 5 (explaining IGD). Petitioner also presents an alternative argument in the event that pitch is limited to average center-to-center distance (CCD). *Id.* at 36–39. As we explain below, Petitioner establishes a reasonable likelihood that it would prevail with respect to at least one claim under each of these constructions. Thus, we determine that no claim terms require express construction for purposes of this Decision. *See, e.g., Nidec Motor Corp. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[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))).

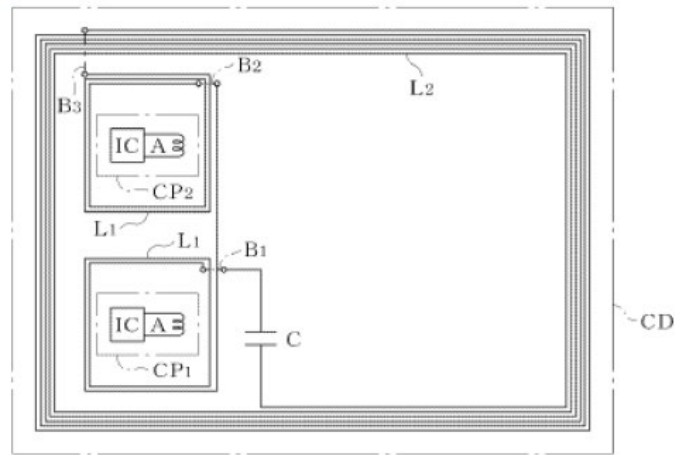
D. Overview of the Asserted Art

1. Takeda-322 (Exhibit 1005)

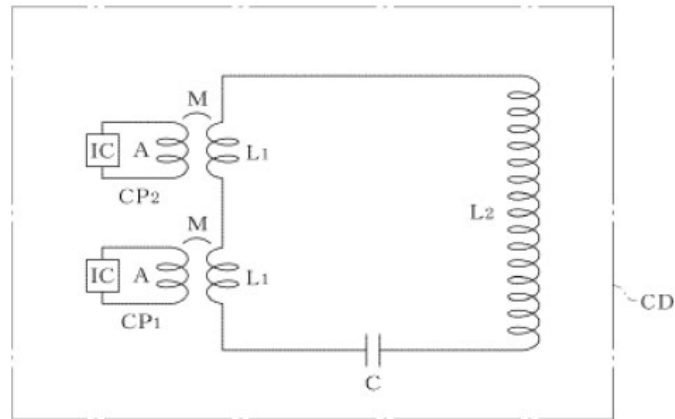
Takeda-322 describes “a contactless IC card.” Ex. 1005 ¶ 1. As described in Takeda-322 an IC card “can, by being provided with a booster coil that operates as an external antenna shared by a plurality of IC chips, provide an increased information transmission distance and have its included functions 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)

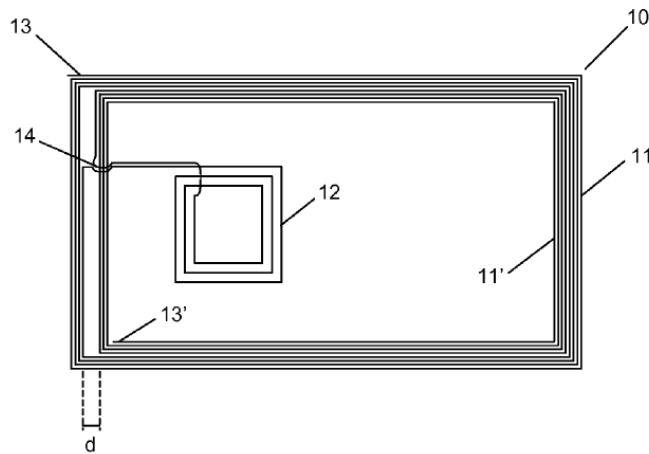
Figure 3 depicts (A) a schematic plan view of the card substrate CD and (B) a circuit diagram of card substrate CD. *Id.* ¶ 29. Takeda-322’s “card substrate CD is formed in a thin card shape by an insulating material such as a paper material or a synthetic-resin material.” *Id.* ¶ 22. Booster coil L2 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. Ayala-362 (*Exhibit 1006*)

Ayala-362 is the publication application that ultimately resulted in the Assa Abloy reference that the '304 patent discusses. Ex. 1001, 3:38–63, 11:32–34, 26:7–23, 27:66–28:2; Ex. 1006, code (10); Ex. 1012, code (65). Ayala-362 teaches a “coupling device” for a non-contact smart card. Ex. 1006, code (54), ¶¶ 1, 5. The device has a “small spiral for inductive coupling with [a] transponder device” and “large spiral[s] for inductive coupling with [a] reader device.” *Id.* at code (57), ¶ 24. Ayala-362’s Figure 5 illustrates its device, and we reproduce Figure 5 below.

Fig.5



Id. at Fig. 5. Ayala-362 Figure 5 shows a coupling device according to one of the reference’s embodiments. *Id.* ¶ 35. Large spirals, 11 and 11', surround the device’s edge. *Id.* ¶ 52. The small spiral, 12, is located within the large spirals. *Id.* ¶ 51. Ayala-362 teaches that its system’s performance may be improved by adding a spiral resonator in a second layer having “the same geometry and dimensions as the external large spiral 11.” *Id.* ¶ 54.

The small spiral and large spirals have different pitches. *Id.* at code (57). Ayala-362 explains how to adjust the pitches of its large and small spirals as follows:

The pitches of the large spirals are chosen such as that the interturn stray capacitances is important and that the large spirals have mainly a capacitive behavior. And the pitch of the small spiral is chosen such as that the interturn stray capacitances are negligible, and that the small spiral has mainly an inductive behavior.

Id. at code (57); *see also id.* ¶¶ 25–26 (providing a similar explanation of how “pitches ... are chosen”).

Ayala-362 defines pitch as “mean distance between the turns of a spiral.” *Id.* ¶ 18. Petitioner refers to this distance as “interturn gap distance” or “IGD.” Pet. 5. Ayala-362 also explains that design and manufacturing

constraints do not permit a perfectly constant interturn distance. Ex. 1006 ¶ 19. Ayala-362 thus states that “the definition of pitch herein has to be understood as the mean interturn distance of the whole spiral (weighted on the length of the spiral).” *Id.*

3. *Murayama (Exhibit 1007)*

Murayama is titled “Composite Antenna and Composite Wireless Communications Device.” Ex. 1007, code (54). Murayama’s compound antenna is composed of a first antenna that functions in a first frequency band (e.g., 8.2 MHz) and a second antenna that functions in a second frequency band (e.g., 13.56 MHz). When the second antenna is operating, the first antenna “functions as a radiating element (boost antenna) of the second antenna in the second frequency band, thereby improving gain.” *Id.* ¶ 8. Figure 1 of Murayama is reproduced below.

[FIG. 1]

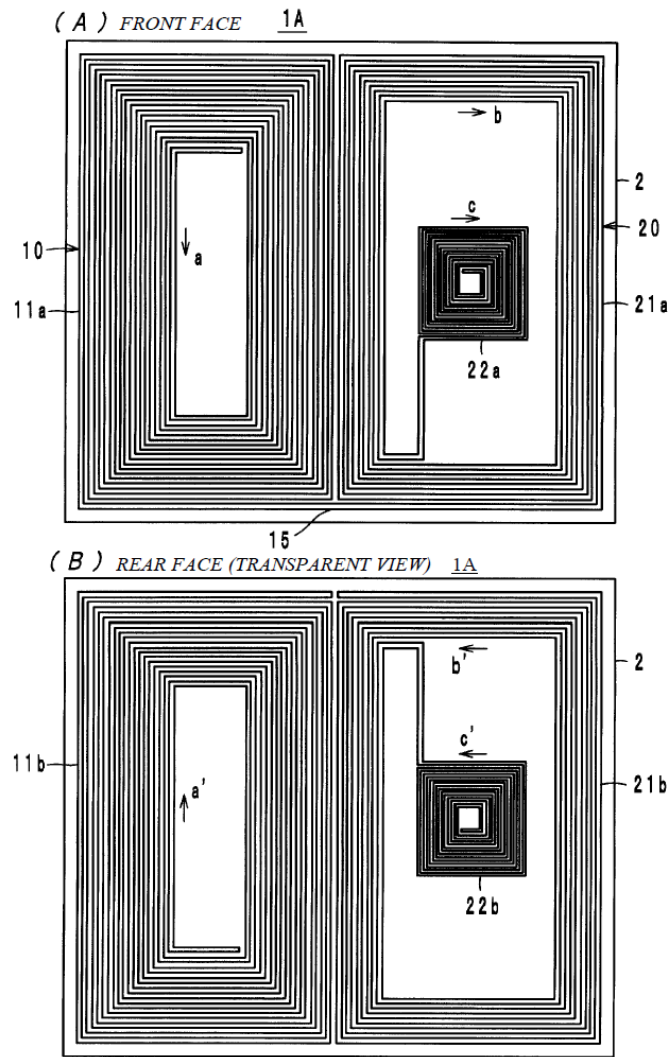


Figure 1 of Murayama, above, depicts a compound antenna “with (A) being a front face view, and (B) being a transparent view.” *Id.* ¶ 11. Compound antenna 1A is composed of insulating substrate 2, first antenna 10, and second antenna 20. *Id.* ¶ 13. First antenna 10 is composed of first and second coiled electrodes 11a, 11b formed opposing each other on a first main face (front) and a second main face (rear) of insulating substrate 2. *Id.* ¶ 14. Second antenna 20 is composed of first and second coiled electrodes 21a, 21b formed opposing each other on the front and rear faces of the

insulating substrate 2 and first and second coupling parts 22a, 22b that are looped in spiral patterns in the center. *Id.* ¶ 15.

E. Unpatentability Grounds

1. Unpatentability over Takeda-322 and Ayala-362

Petitioner asserts that claims 1–3, 5–8, 12–14, and 16 are unpatentable under 35 U.S.C. § 103(a) as obvious over Takeda-322 and Ayala-362, citing the Declaration of Dr. Daniel van der Weide for support. Pet. 9–73 (citing Ex. 1003). We have reviewed Petitioner’s arguments and evidence and have found them to be sufficient to meet the threshold of § 314(a). Below, we address independent claim 1 while addressing dependent claims collectively.

a. Independent Claim 1

Petitioner asserts that claim 1 is unpatentable as obvious over Takeda-322 and Ayala-362. Pet. 9. Both Takeda-322 and Ayala-362 relate to smart card multi-coil antennas. Pet. 16; Ex. 1003 ¶ 73; Ex. 1006, code (54), (57); Ex. 1005 ¶¶ 1–7. Takeda-322 and Ayala-362 are similar in that both teach inner coils (or a small spiral) and booster coils (or large spirals). Pet. 16; Ex. 1003 ¶ 74; Ex. 1006, Fig. 5, code (57), ¶¶ 5–7, 43; Ex. 1005 ¶¶ 12, 16, 24.

Takeda-322 does not explain how to space adjacent turns of its spiral booster and exciting coils. Ex. 1003 ¶ 75. As explained above, however, Ayala-362 explains how this spacing or pitch should be adjusted in order to optimize inductive coupling, resonant frequencies, and communication. Pet. 17; Ex. 1003 ¶¶ 76–77; Ex. 1006, code (57), 25–26. It has long been held that “where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine

experimentation.” *In re Aller*, 220 F.2d 454, 456 (CCPA 1955); *see also In re Boesch*, 617 F.2d 272, 276 (CCPA 1980) (“[D]iscovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art.”). The present record supports that a person of ordinary skill in the art would have known to choose a pitch for Takeda-322’s various coils as Ayala-362 suggests. The record also supports that such an implementation would have had a reasonable expectation of success. Pet. 19 (providing citations to evidence providing support); Ex. 1003 ¶ 85. As such, the present record adequately establishes that a person of ordinary skill in the art would have reached the “Takeda-322/Ayala-362 smart card” as Petitioner describes it. Pet. 21.

The preamble of claim 1 recites a “Booster antenna (BA) comprising the following components.” Ex. 1001, 48:39–40. Petitioner argues that the Takeda-322/Ayala-362 smart card includes a multi-coil antenna which is a booster antenna. Pet. 22–23. Based on the current record, we find Petitioner’s assertion to be persuasive and supported by evidence. Takeda-322 teaches, for example, a booster coil that “operates as an external antenna” and “increase[s] information transmission distance.” Ex. 1005 ¶¶ 5, 12, Fig. 3. Takeda-322 also teaches, for example, a smaller coupler coil. *Id.* at Fig. 3. Takeda-322 thus teaches a booster antenna within the parlance of claim 1. Ex. 1001, 2:48–62 (describing booster antenna).

Claim 1 next recites “a card antenna (CA) component.” Ex. 1001, 48:41. Petitioner argues that the booster coil L2 of Takeda-322/Ayala-362 is a card antenna. Pet. 24–25. Based on the current record, we find Petitioner’s assertion to be persuasive and supported by evidence. As explained above, Takeda-322 teaches that its booster coil operates as an external antenna.

Ex. 1005 ¶¶ 5, 12, Fig. 3. Takeda-322 teaches that its booster-coil has “a maximum opening area in the effective area of the card substrate” to “realize sufficiently high transmission and reception sensitivity.” *Id.* ¶ 12; *see also id.* ¶¶ 29–30, Figs. 3(a), 3(b).

Claim 1 next recites “a coupler coil (CC) component.” Ex. 1001, 48:42. Petitioner argues that the lower inner coil (including at least lower “exciting coil L_1 ”) of Takeda-322/Ayala-362 is a coupler coil. Pet. 25–27. Based on the current record, we find Petitioner’s assertion to be persuasive and supported by evidence. The ’304 patent states that the coupler coil component may be a “relatively small” component “for coupling with the ... antenna” of an antenna module. Ex. 1001, 2:4–8, 51–55. The ’304 patent further states that the coupler coil “may comprise a loop” encircling “a coupling area on the card body ... associated with the antenna module.” *Id.* 4:61–67, 40:11–12. The lower inner coil that Takeda-322 illustrates at, for example, Figure 3(A) meets this description of a coupler coil. Ex. 1005, Fig. 3(a), ¶ 5. Takeda-322 Figure 3(B) further illustrates antenna A being electromagnetically coupled with lower exciting coil L_1 . *Id.* at Fig. 3(B), ¶ 25; Ex. 1003 ¶ 108.

Claim 1 next recites an “extension antenna (EA) component.” Ex. 1001, 48:43. Petitioner argues that the combination of Takeda-322/Ayala-362 includes a third coil (the upper inner coil of Takeda-322’s Figure 3(a)) that is an extension antenna component. Pet. 28–33. Based on the current record, we find Petitioner’s assertion to be persuasive and supported by evidence. The ’304 patent refers to extension antenna EA as a component that may comprise “several turns (or traces) of wire (or other conductive material)” and may be connected or not connected with the card

antenna or coupler coil or both. Ex. 1001, 11:4–13, 27:63–28:5. The upper inner coil that Petitioner identifies meets these criteria for an extension antenna. Moreover, the identified structure may function as an extension antenna in the same manner as the '304 patent's EA component. Ex. 1003 ¶¶ 117–118.

Claim 1 next recites that the booster antenna is “characterized in that: at least one of the components has a pitch which is different than one or more of the other components.” Ex. 1001, 48:44–46. Petitioner argues that the components of the Takeda-322/Ayala-362 may have various pitches and that this is the case whether (1) pitch encompasses pitch when measured by interturn gap distance or (2) pitch is measured only by center to center distance. Pet. 33–39. Based on the current record, we find Petitioner's assertion to be persuasive and supported by evidence.

As we explain above, the Ayala establishes that pitch (which Ayala describes as interturn gap distance or “mean distance between the turns of a spiral”) is a result effective variable. Ex. 1006, code (57), ¶¶ 18–19, 25–26. A person of skill in the art would have known to select interturn gap distance of the Takeda-322 device in order to achieve the benefits Ayala teaches. Pet. 17; *see also* Ex. 1006 ¶¶ 25–26. Such a result would necessarily result in different center to center distance if, as would have been obvious, a single diameter was used for wires of each of the Takeda-322 coils. Pet. 19–21; *see also* Ex. 1003 ¶¶ 87–92 (Petitioner's witness explaining why it would have been obvious to use wires with a specific wire diameter and citing evidence to support this point); Ex. 1026 ¶¶ 7–8 (suggesting use of a single diameter of wire for smart card); Ex. 1014 ¶ 285 (supporting desirability of single size of wire). Moreover, given that Ayala suggests adjusting interturn gap

distance, a person of skill in the art would have designed its layout accordingly rather than attempting to achieve a perfectly uniform center to center distance; such design would result in different center-to-center distances. Pet. 16–18.

Based on the evidence in this present record, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that the combination of Takeda-322 and Ayala-362 teaches or reasonably suggests all of the elements of claim 1. Thus, we are persuaded that Petitioner has sufficiently established a reasonable likelihood of establishing that Takeda-322 renders claim 1 obvious.

b. *Dependent Claims 2–3, 5–8, 12–14, and 16*

Petitioner accounts for the limitations recited in claims 2–3, 5–8, 12–14, and 16. Pet. 39–51. Petitioner provides detailed explanations as to how the combination of Takeda-322 and Ayala-362 teaches or reasonably suggests the limitations of these claims, citing Dr. van der Weide’s testimony for support. *Id.* (citing Ex. 1003).

Based on the evidence in this present record, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that the combination of Takeda-322 and Ayala-362 teaches or reasonably suggests all of the limitations recited in claims 2–3, 5–8, 12–14. and 16. Having reviewed Petitioner’s arguments and supporting evidence in the present record, we are persuaded that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 2–3, 5–8, 12–14, and 16 are unpatentable as obvious over the combination of Takeda-322 and Ayala-362.

2. *Unpatentability over Murayama and Ayala-362*

Petitioner asserts that claims 1–3, 5–8, 11–14, and 16 are unpatentable under 35 U.S.C. § 103(a) as obvious over Murayama and Ayala-362, citing the Declaration of Dr. Daniel van der Weide for support. Pet. 52–73 (citing Ex. 1003).

Murayama was published October 6, 2011. Ex. 1007, code (43). The '304 patent claims priority to more than thirty U.S. Patent applications. Ex. 1001, codes (60), (63). The priority chain includes eight applications that predate the publication of Murayama with two of those applications predating the publication of Murayama by more than a year. *See id.* (listing provisional application No. 61/373,269, filed on Aug. 12, 2010 and provisional application No. 61/384,219, filed on Sep. 17, 2010). Petitioner argues that Murayama's October 6, 2011, publication date "establish[es] Murayama as prior art absent a showing by Patent Owner that the Challenged Claims are entitled to an earlier effective filing date." Pet. 53 (citing *Nat. Alternatives Int'l v. Iancu*, 904 F.3d 1375, 1380 (Fed. Cir. 2018)).

The Federal Circuit has held that in an *inter partes* review there are two distinct burdens of proof: the burden of persuasion and the burden of production. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)). Petitioner bears the ultimate burden of persuasion regarding unpatentability, which never shifts to Patent Owner. *Id.* at 1379. *Dynamic Drinkware*, however, also establishes that Petitioner has the initial burden of production to show a reference is prior art. *Id.* Once Petitioner's burden of production is satisfied, the burden of

production then shifts to Patent Owner to refute Petitioner’s argument by either showing the prior art does not actually render the claims unpatentable or does not qualify as prior art. *Id.* at 1380. The burden of production then shifts back to Petitioner to respond to Patent Owner’s argument. *Id.*

Petitioner contends that claim 9 requires that the coupler coil CC and extension antenna EA “are combined with one another, as a coil, wherein the turns increase in pitch as the combined CC/EA booster antenna component extends across an area of a card body (CB) of a smart card (SC).” Pet. 52. According to Petitioner, “[t]he ’304 patent’s ancestor applications do not *even arguably* disclose this subject matter before application 61/868,089 ..., filed August 21, 2013.” Pet. 52 (citing Ex. 1001, Fig 4F, 20:8–15; Ex. 1033, 54, Fig. 305; Ex. 1003 ¶ 198). Petitioner also contends that every challenged claim requires at least two of components (among card antenna CA, coupler coil CA, and extension antenna EA) have different pitch and that no such configuration is described “before Application No. 13/600,140 ..., which was filed (August 30, 2012) *after* Murayama’s publication date.” Pet. 53–54 (citing Ex. 1003 ¶¶ 196–197).

We have not at this point heard Patent Owner’s views as to which filings it believes supports the challenged claims. There are more than thirty applications in the priority history and at least eight applications that could potentially predate Murayama such that Murayama would not be prior art to the challenged claims. A robust discussion of the support for the challenged claims would greatly aid us in determining whether Murayama is in fact prior art. In light of our finding that Petitioner has met its burden as to claims 1–3, 5–8, 11–14, and 16 based on its allegations regarding (1) the combination of Takeda-322 and Ayala-362 and (2) Ayala-362 alone, we

decline to engage in the full analysis of the potential priority documents at this time. Consistent with their respective burdens of production and persuasion, we encourage the parties to address whether Murayama is prior art in subsequent trial briefing.

3. Unpatentability over Ayala-362

Petitioner asserts that claims 1–3, 5–8, 11–14, and 16 are unpatentable under 35 U.S.C. § 102 as anticipated by Ayala-362 or under 35 U.S.C. § 103 as obvious over Ayala-362, citing the Declaration of Dr. Daniel van der Weide for support. Pet. 74–88 (citing Ex. 1003). We have reviewed Petitioner’s arguments and evidence and have found them to be sufficient to meet the threshold of § 314(a). Below, we address independent claim 1 while addressing dependent claims collectively.

a. Independent Claim 1

Petitioner asserts that claim 1 is unpatentable under 35 U.S.C. § 102 over Ayala-362. Pet. 77.⁷ As we address above, Ayala-362 relates to a smart card multi-coil antenna. Pet. 16, 77; Ex. 1006, Fig. 5, code (57), ¶¶ 5–7, 43. Ayala-362 also explains how this spacing or pitch should be adjusted in order to optimize inductive coupling, resonant frequencies, and communication. Pet. 17; Ex. 1003 ¶¶ 76–77; Ex. 1006, code (57), ¶¶ 25–26.

The preamble of claim 1 recites a “Booster antenna (BA) comprising the following components.” Ex. 1001, 48:39–40. Petitioner argues that the Ayala-362 smart card is a transponder device with “booster antenna component” spirals that forms a booster antenna. Pet. 77. Based on the

⁷ We understand that Petitioner relies only on anticipation for claim 1. Pet. 77 (“Ayala-362 anticipates claims 1–3, 5, and 12–14, and anticipates and/or renders obvious claims 6–8, 11, and 16.”).

current record, we find Petitioner’s assertion to be persuasive and supported by evidence. Ayala-362 teaches, for example, a transponder device with an IC chip for communicating with an RFID reader. Ex. 1006, ¶¶ 43, 46, 54; Ex. 1003 ¶¶ 296–300.

Claim 1 next recites “a card antenna (CA) component.” Ex. 1001, 48:41. Petitioner argues that the large spirals 11 and 11' of Ayala-362 are a card antenna component. Pet. 78–79. Based on the current record, we find Petitioner’s assertion to be persuasive and supported by evidence. Ayala-362 teaches, for example, that 11 and 11' are meet the '304 patent’s description of a card antenna component because they are formed of a “single wire (or conductive trace) ... disposed in the peripheral area ... of the card body.” Ex. 1001, 11:29–36; Ex. 1006, Fig. 5, ¶¶ 23–25, 27, 52, 54, 65; Ex. 1003, ¶¶ 301–302.

Claim 1 next recites “a coupler coil (CC) component.” Ex. 1001, 48:42. Petitioner argues that Ayala-362’s small spiral 12 is a coupler coil component. Pet. 79. Based on the current record, we find Petitioner’s assertion to be persuasive and supported by evidence. For example, Ayala’s small spiral 12 matches the '304 patent’s description of a coupler coil component as a “relatively small” component “for coupling with the ... antenna.” Ex. 1001, 2:4–8, 2:51–55; Ex. 1006, Fig. 5, ¶¶ 24–25, 37–38, 43–44, 49, 66; Ex. 1003, ¶¶ 303–305.

Claim 1 next recites an “extension antenna (EA) component.” Ex. 1001, 48:43. Petitioner argues that Ayala-362’s spiral resonator is an extension antenna component. Pet. 80–81. Based on the current record, we find Petitioner’s assertion to be persuasive and supported by evidence. The '304 patent refers to extension antenna EA as a component that may

comprise “several turns (or traces) of wire (or other conductive material)” and may be connected or not connected with the card antenna or coupler coil or both. Ex. 1001, 11:4–13, 27:63–28:5. The Ayala-362 spiral resonator meets this characteristic. Ex. 1006, Fig. 5, ¶¶ 54; Ex. 1003 ¶¶ 306–309; *see also* Ex. 1001, 23:13–26 (disclosing components “on two separate layers which may then be laminated together”).

Claim 1 next recites that the booster antenna is “characterized in that: at least one of the components has a pitch which is different than one or more of the other components.” Ex. 1001, 48:44–46. Petitioner argues Ayala-362 teaches components of different pitches regardless of how pitch is measured. Pet. 83. Based on the current record and for the reasons we discuss above (*supra* at 20–21), we find Petitioner’s assertion to be persuasive and supported by evidence. For example, Ayala teaches that pitch of the large spiral is chosen so it has a largely capacitive behavior and pitch of the small spiral is chosen to have a mainly inductive behavior. Ex. 1006, code (57), ¶¶ 25–26. Along these lines, Figure 5 depicts the smaller spiral 12 having a larger pitch than smaller spirals 11 and 11'. *Id.* at Fig. 5. Ayala-362 states that “the small spiral shows a larger pitch than the ones of the large spirals.” *Id.* at code (57); *see also id.* at ¶¶ 24 (providing same text), 37 (describing “large spiral 11 with a small pitch” and “smaller spiral 12 ... with a larger pitch”).

Based on the evidence in this present record, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Ayala-362 teaches all of the elements of claim 1 in the manner recited by claim 1. Thus, we are persuaded that Petitioner has sufficiently established a reasonable likelihood of establishing that Takeda-322 anticipates claim 1.

b. *Dependent Claims 2–3, 5–8, 11–14, and 16*

Petitioner accounts for the limitations recited in claims 2–3, 5–8, 11–14, and 16. Pet. 83–76. Petitioner provides detailed explanations as to how Ayala-362 teaches or reasonably suggests the limitations of these claims, citing Dr. van der Weide’s testimony for support. *Id.* (citing Ex. 1003).

Based on the evidence in this present record, we are persuaded that Petitioner has shown sufficiently for purposes of this Decision that Ayala-362 teaches or reasonably suggests all of the limitations recited in claims 2–3, 5–8, 11–14, and 16. Having reviewed Petitioner’s arguments and supporting evidence in the present record, we are persuaded that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 2–3, 5–8, 11–14, and 16 are unpatentable as anticipated by Ayala-362 or obvious over Ayala-362.

IV. CONCLUSION

For the reasons above, we determine that the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail with respect to challenged claims 1–3, 5–8, 11–14, and 16 of the ’304 patent. At this juncture in the proceeding, we have not made a final determination with respect to the patentability of the challenged claims, or with respect to claim construction.

V. ORDER

For the foregoing reasons, it is

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–3, 5–8, 11–14, and 16 of the ’304 patent is hereby instituted with respect to the ground of unpatentability set forth in the Petition; and

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FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial; the trial will commence on the entry date of this Decision.

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