

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INDUCTEV INC.,¹
Petitioner,

v.

WITRICITY CORPORATION,
Patent Owner.

IPR2021-01166
Patent 8,304,935 B2

Before JAMESON LEE, MIRIAM L. QUINN, and SCOTT RAEVSKY,
Administrative Patent Judges.

QUINN, *Administrative Patent Judge.*

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)
Denying Patent Owner's Motion to Exclude
37 C.F.R. § 42.64

¹ On November 30, 2022, Petitioner filed an updated mandatory notice notifying the Board of the name change of Petitioner from "Momentum Dynamics Corporation" to the captioned "InductEV Inc." Paper 33.

I. INTRODUCTION

Momentum Dynamics Corporation (“Petitioner”) filed a Petition (Paper 2, “Petition” or “Pet.”) requesting an *inter partes* review of claims 1–23 (“the challenged claims”) of U.S. Patent No. 8,304,935 B2 (Ex. 1001, “the ’935 patent”). Patent Owner challenged the Petition by filing a Preliminary Patent Owner Response. Paper 6 (“Prelim. Resp.”). After considering the merits of the Petition and Patent Owner’s arguments against institution, we instituted *inter partes* review. Paper 7 (“Decision on Institution,” “Dec. on Inst.”).

During the trial phase, Patent Owner filed a Response (Paper 11, “PO Resp.”), Petitioner filed a Reply (Paper 20, “Reply”), and Patent Owner filed a Sur-reply (Paper 27, “Sur-reply”). Further, Patent Owner filed a Motion to Exclude (Paper 28, “Mot.”), Petitioner filed an Opposition to the Motion to Exclude (Paper 30, “Opp. Mot.”), and Patent Owner filed a Reply in support of its Motion to Exclude (Paper 32, “Reply Mot.”). No oral hearing was held as the parties jointly requested to withdraw their requests for oral argument in this proceeding. *See* Paper 31; Ex. 3001.

We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons explained below, we conclude that Petitioner has shown by a preponderance of the evidence that claims 1–23 of the ’935 patent are unpatentable. *See* 35 U.S.C. § 316(e) (2018).

II. BACKGROUND

A. Real Parties in Interest

Petitioner states that “[t]he real party-in-interest is InductEV Inc. (‘Petitioner’).” Paper 33. Patent Owner identifies itself, WiTricity Corporation, as the real party in interest. Paper 3, 1.

B. The ’935 Patent

The ’935 patent, titled “Wireless Energy Transfer Using Field Shaping to Reduce Loss,” relates to “wireless energy transfer, also referred to as wireless power transmission.” Ex. 1101, code (54), 1:32–34. By way of background, the ’935 patent describes known wireless transfers of energy, such as wireless information transfer, as inefficient for transferring useful amounts of electrical energy to power or charge electrical devices. *Id.* at 1:36–50. Using directional antennas to solve for this requires, however, “uninterruptible line-of-sight and potentially complicated tracking and steering mechanisms in the case of mobile transmitters and/or receivers.” *Id.* at 1:51–57.

Another known method of transferring power wirelessly is using near-field or non-radiative schemes, in which oscillating current passing through a primary coil generates an oscillating magnetic near-field that induces a current in a nearby secondary coil. *Id.* at 1:60–61. These schemes have been known to transmit modest to large amounts of power, but over very short distances and with very small offset tolerances between the primary power supply unit and the secondary receiving unit. *Id.* at 1:66–2:3.

The ’953 patent, therefore, seeks to address these shortcomings, resulting in wireless power transfer over greater distances and alignment offsets than previously realized and without the known limitations of using

antennas as discussed above. *Id.* at 2:6–14. The patent describes using a near-field wireless energy transfer scheme using coupled electromagnetic resonators with energy stored by the magnetic field and electric field primarily confined to the region surrounding the resonators. *Id.* at 2:17–35. Efficient wireless energy transfer is accomplished through the omnidirectional, but stationary (non-lossy) near-fields, resulting in distances between the power source-side resonator and the charging device resonator in the order of centimeters to meters. *Id.* at 2:41–53. Additionally, energy exchange between two electromagnetic resonators can be optimized when the resonators are tuned to substantially the same frequency and when the losses in the system are minimal. *Id.* at 2:66–3:2.

Figure 38 of the '935 patent, reproduced below, is a block diagram of a wireless power transmission system employing a two-resonator system. *Id.* at 10:33–34, 58:62–64.

Fig. 38

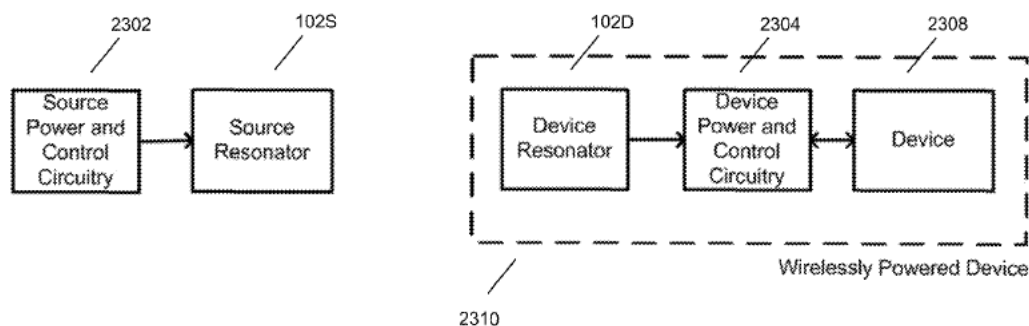


Figure 38 shows a wirelessly powered or charged device 2310 that includes or consists of device resonator 102D and device power and control circuitry 2304, along with device or devices 2308 to which either DC or AC, or both AC and DC power, is transferred. *Id.* at 58:62–59:10. The energy or

power source for a system may include the source power and control circuitry 2302, and a source resonator 102S. *Id.* Thus, device or devices 2308 receive power from device resonator 102D and power and control circuitry 2304. *Id.* For example, device resonator 102D and circuitry 2304 deliver power to device/devices 2308 that “may be used to recharge the battery of the device/devices, power the device/devices directly, or both when in the vicinity of the source resonator 102S.” *Id.* “The source and device resonators may be separated by many meters or they may be very close to each other or they may be separated by any distance in between.” *Id.* at 59:11–13.

The ’935 patent explains loss mechanisms extrinsic to the resonators affect their intrinsic quality factor (Q). *Id.* at 33:5–6. These mechanisms include absorption losses inside the materials of nearby objects and radiation losses related to scattering of the resonant fields from nearby objects. *Id.* at 33:6–9. Absorption losses may be associated with materials that, over the frequency range of interest, have non-zero, but finite conductivity. *Id.* at 33:8–10. Furthermore, according to the ’935 patent, “[a]n object may be described as lossy if it at least partly includes lossy materials.” *Id.* at 33:14–15.

An apparatus in which a high-Q resonator is integrated may include parts with lossy extraneous materials and objects. *Id.* at 35:66–67. The ’935 patent states that “dissipation of energy in these lossy materials and objects may be reduced by a number of techniques” including:

by using a high conductivity material or structure to partly or entirely cover lossy materials and objects in the vicinity of a resonator[;]

by placing a closed surface (such as a sheet or a mesh) of high-conductivity material around a lossy object to completely cover the lossy object and shape the resonator fields such that they avoid the lossy object[;]

by placing a surface (such as a sheet or a mesh) of a high-conductivity material around only a portion of a lossy object, such as along the top, the bottom, along the side, and the like, of an object or material[;] and

by placing even a single surface (such as a sheet or a mesh) of high-conductivity material above or below or on one side of a lossy object to reduce the strength of the fields at the location of the lossy object.

Id. at 35:65–36:20. Thus, the '935 patent explains, the impact of lossy materials on the quality factor of a resonator can be reduced by “us[ing] high-conductivity materials to shape the resonator fields such that they avoid the lossy objects.” *Id.* at 35:7–10.

Figure 19 of the '935 patent is reproduced below.

Fig. 19

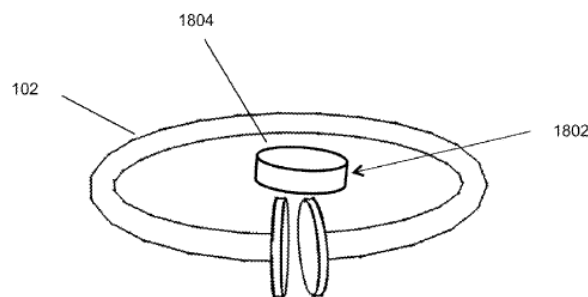


Figure 19 illustrates a magnetic resonator with a lossy object in its vicinity completely covered by a high-conductivity surface. *Id.* at 8:38–40. In particular, Figure 19 shows a capacitively-loaded loop inductor forming magnetic resonator 102 and a disk-shaped surface of high-conductivity material 1802 that completely surrounds lossy object 1804 placed inside the loop inductor. *Id.* at 36:20–31. The '935 patent explains that some lossy

objects may be components, such as electronic circuits, that may need to interact with, communicate with, or be connected to the outside environment and thus cannot be completely electromagnetically isolated, but partially covering a lossy material with high conductivity materials may still reduce extraneous losses while enabling the lossy material or object to function properly. *Id.*

The '935 patent further explains that another way to reshape the unperturbed resonator fields is to “use high permeability materials to completely or partially enclose or cover the loss inducing objects, thereby reducing the interaction of the magnetic field with the loss inducing objects.” *Id.* at 39:10–15, 39:28–34. The '935 patent then explains:

It may be desirable to keep both the electric and magnetic fields away from loss inducing objects. As described above, one way to shape the fields in such a manner is to use high-conductivity surfaces to either completely or partially enclose or cover the loss inducing objects. A layer of magnetically permeable material, also referred to as magnetic material, (any material or meta-material having a non-trivial magnetic permeability), may be placed on or around the high-conductivity surfaces. The additional layer of magnetic material may present a lower reluctance path (compared to free space) for the deflected magnetic field to follow and may partially shield the electric conductor underneath it from the incident magnetic flux. This arrangement may reduce the losses due to induced currents in the high-conductivity surface.

Id. at 39:35–51.

C. Related Matters

As required by 37 C.F.R. § 42.8(b)(2), the Parties identify judicial matters that would affect, or be affected by, a decision in this proceeding. In particular, the Parties indicate that the '935 patent was involved in the

following district court case: *WiTricity Corp. et al. v. Momentum Dynamics Corp.*, No. 1:20-CV-01671-MSG (D. Del.). Pet. 76; Paper 3, 1. Patent Owner indicates that the count involving the '935 patent has been dismissed in the identified district court case. Paper 23, 1.

The Parties also indicate the following related IPR Petitions:

Momentum Dynamics Corporation v. Auckland UniServices Limited,
IPR2021-01116 (PTAB) challenging Patent No. 9,767,955 B2;

Momentum Dynamics Corporation v. WiTricity Corporation,
IPR2021-01127 (PTAB) challenging Patent No. 9,306,635 B2;

Momentum Dynamics Corporation v. Massachusetts Institute of Technology, IPR2021-01165 (PTAB) challenging Patent No. 7,741,734 B2;
and

Momentum Dynamics Corporation v. WiTricity Corporation,
IPR2021-01167 (PTAB) challenging Patent No. 8,884,581 B2.
Paper 3, 1; Pet. 76.

D. Illustrative Claim

Petitioner challenges claims 1–23 of the '935 patent. Pet. 1–2. Claims 1, 15, and 23 are independent. Claims 1 and 23 are illustrative and reproduced below.

1. A system, comprising:
 - a source resonator optionally coupled to an energy source;
 - and
 - a second resonator located a distance from the source resonator,wherein the source resonator and the second resonator are coupled to provide near-field wireless energy transfer among the source resonator and the second resonator and wherein the field of at least one of the source resonator

and the second resonator is shaped using a conducting material and a magnetic material.

23. A system, comprising:

a resonator coupled to power and control circuitry;

wherein the resonator and the power and control circuitry are configured to provide near-field wireless energy transfer among other resonators, and

and wherein the power and control circuitry is at least partially covered by high permeability materials and conducting surfaces to shape magnetic fields of the resonator around the power and control circuitry.

Ex. 1001, 97:34–44, 98:49–57.

Claim 15 is substantively similar to claim 1 and, therefore, both claims are analyzed together in the Petition and in our analysis below.

E. Asserted Grounds and Testimony

Petitioner presents the challenges summarized in the chart below.

Pet. 2.

Claim(s) Challenged	35 U.S.C. §	Reference/Basis
1, 5–8, 15, 19–22	102(b) ²	O’Brien ³
1–23	103(a)	O’Brien, Haaster ⁴

Petitioner supports its challenge of invalidity with a declaration of

² The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), included revisions to 35 U.S.C. § 102 and § 103 that became effective after the effective filing date of the challenged claims. Therefore, we apply the pre-AIA version of 35 U.S.C. § 102 and § 103.

³ Kathleen O’Brien, *Inductively Coupled Radio Frequency Power Transmission System for Wireless Systems and Devices*, Technical University of Dresden Ph.D. dissertation (2007) (Ex. 1007, “O’Brien”).

⁴ U.S. Patent Pub. No. 2004/0001299 A1, published Jan. 1, 2004 (Ex. 1008, “Haaster”).

Mark Allen, Ph.D., filed as Exhibit 1003 (“Allen Decl.”). Petitioner also supports its assertions concerning the public availability of O’Brien with a declaration from Sylvia D. Hall-Ellis, Ph.D. (Ex. 1005). Petitioner further supports its assertions concerning the authenticity of O’Brien with a declaration from Michael T. Pierce. (Ex. 1024⁵).

Patent Owner has not supported its arguments with any testimonial evidence. *See generally* PO Resp.

III. ANALYSIS

A. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). “The importance of resolving the level of ordinary skill in the art lies in the necessity of maintaining objectivity in the obviousness inquiry.” *Ryko Mfg. Co. v. Nu-Star, Inc.*, 950 F.2d 714, 718 (Fed. Cir. 1991). The “person of ordinary skill in the art” is a hypothetical construct, from whose vantage point obviousness is assessed. *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). “This legal construct is akin to the ‘reasonable person’ used as a reference in negligence determinations” and “also presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan.” *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Petitioner contends that a person of ordinary skill in the art (“POSA”) “at the relevant time (around 2008) would have had at least a bachelor’s

⁵ Ex. 1024 was served, but not filed in this proceeding. Opp. Mot. to Exclude v.

degree in electrical engineering (or equivalent) and at least two years' industry experience, or equivalent research"; "[a]lternatively, a POSA could substitute directly relevant additional education for experience, e.g., an advanced degree relating to electrical engineering (or equivalent), with at least one year of industry experience." Pet. 8 (citing Allen Decl. ¶¶ 31–34).

Patent Owner does not dispute the level of ordinary skill in the art.
See generally PO Resp.

We adopt Petitioner's assessment of the level of skill in the art, which is consistent with the specification of the '935 patent and asserted prior art of record.

B. Claim Construction

In *inter partes* review proceedings based on petitions filed on or after November 13, 2018, such as this one, we construe claims using the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b), as articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. *See* 37 C.F.R. § 42.100(b) (2020).

Petitioner asserts that "prior art relied on in this Petition discloses the subject matter of the challenged claims under any reasonable construction, including their plain meaning" and "submits that no terms need to be construed to find the asserted claims unpatentable under the grounds set forth herein." Pet. 9. Patent Owner does not submit any claim construction for any term. *See generally* PO Resp.

We do not discern a dispute between the parties regarding any claim limitations, nor do we discern the need to expressly construe any claim limitations to resolve the controversy before us. *See, e.g., Nidec Motor*

Corp. v. 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))).

C. Overview of the Asserted References

Petitioner relies on two references as prior art. We summarize each reference below.

1. Overview of O'Brien (Ex. 1007)

O'Brien is a doctoral thesis titled “Inductively Coupled Radio Frequency Power Transmission System for Wireless Systems and Devices.” Ex. 1007, Title. Petitioner asserts that O'Brien “was publicly available more than one year prior to the '935 patent's filing date” as “O'Brien was completed and approved by faculty members at the University of Dresden on March 11, 2006” and the “‘Machine-Readable Cataloging’ (MARC) record for O'Brien demonstrates that O'Brien was received, cataloged, and indexed by the Verbundzentrale Des Gemeinsamen Bibliotheksverbundes as of March 2, 2007.” Pet. 10–11 (citing Ex. 1005 ¶¶ 38, 40–43). Patent Owner does not challenge Petitioner's assertions regarding O'Brien's public accessibility. *See generally* PO Resp.⁶ Because Petitioner has shown, by a preponderance of the evidence, public accessibility of O'Brien through the MARC record and the library indexing as of March 2, 2007, as discussed above, and there is no evidence to the contrary, we find that O'Brien was publicly available more than one year prior to the filing date of the

⁶ We note here, however, Patent Owner's contention that Petitioner has not properly authenticated O'Brien. Mot. Exclude 1. We address the issue of authentication below in connection with our denial of Patent Owner's Motion to Exclude. *See* Section IV.

'935 patent (December 28, 2009), and thus qualifies as prior art under 35 U.S.C. § 102(b).

As to the substance, O'Brien "presents a novel alternative to the problem of providing power to devices without the use of wires or regular maintenance" and "focuses on the development and analysis of methods by which reliable power can be delivered to a load even in highly shielded environments." *Id.* at 19–20.

O'Brien describes a "system [that] uses a magnetic field generated by a system of source coils," whereby "[t]he source coils couple inductively to the receiving coils, forming a system in which energy is transferred from source to receiver via a magnetic field." *Id.* at 21. O'Brien explains that "[o]perating both source and receiver at a resonant frequency allows for the compensation of the large inductance inherent in the source coils and increases the voltage at the receiver to a level that permits the use of standard power electronics components." *Id.* at 27. O'Brien further explains, "[t]his work will be limited to an analysis of the power transfer characteristics between distributed sources and sinks (receivers) using magnetic coupling in the near field," as "[o]peration in the near field allows significantly more energy to be transferred between source and receiver." *Id.* at 22.

a. Source Coils

O'Brien explains that "source coils consist of one or more turns of wire around an air-core." *Id.* at 24. Figures 2-4 to 2-9 of O'Brien, reproduced below, illustrate various source coil configurations. *Id.* at 24–25.

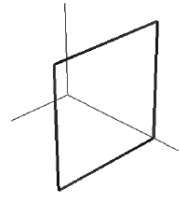


Figure 2-4 Uni-directional system

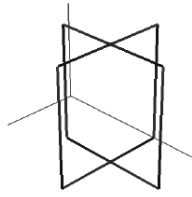


Figure 2-5 Bi-directional system

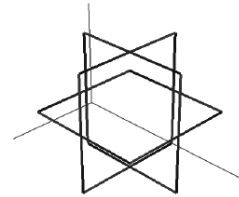


Figure 2-6 Omni-directional system

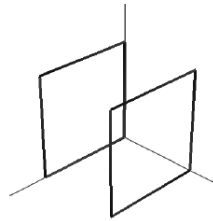


Figure 2-7 Uni-directional system using a coil pair to create a larger operating volume

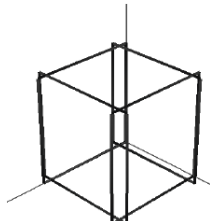


Figure 2-8 Bi-directional system using two coil pairs to create a larger operating volume

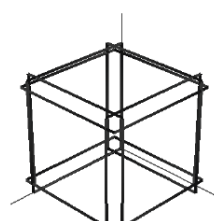


Figure 2-9 Omni-directional system using three coil pairs to create a larger operating volume

Figures 2-4 to 2-9 illustrate various source coil configurations. *Id.* at 24–25. Figure 2-4 depicts the simplest coil configuration and is referred to as a uni-directional system because it produces a magnetic field at the center of the coil, which has vector components in only one direction. *Id.* at 24. Figure 2-5 depicts an additional source coil placed in space quadrature with the coil shown in Figure 2-4 and it is referred to as a bi-directional system because it produces a magnetic field at the center of the coil, which has vector components in two directions. *Id.* Figure 2-6 adds a third source coil in the remaining plane; and Figures 2-7, 2-8, and 2-9 “increase the area or volume in which the receiving coils can receive power” by modifying the previous source coil systems “such that there are two coils laying in each of the three orthogonal planes.” *Id.* at 24–25.

b. Receiving Coils

O’Brien then describes receiving coils in a receiver. *Id.* at 25–27. In particular, O’Brien provides that “the receivers will obtain power from the source coils regardless of their orientation with respect to the source coils

and to each other” and “[t]he receivers consist of a ferrite cube with three mutually orthogonal receiving coils, each wrapped around one of the three axes of the cube.” *Id.* at 25–26. Figure 2-10 of O’Brien, reproduced below, illustrates a receiver including three receiving coils. *Id.*

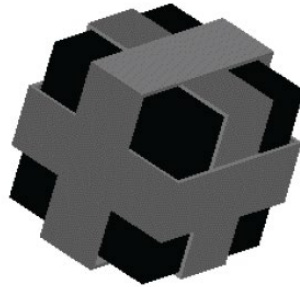


Figure 2-10 Receiver comprised of three receiving coils, each wound around one axis of a ferrite cube

Figure 2-10 illustrates a receiver including three receiving coils. *Id.* at 26.

c. Shielding

O’Brien next describes the “[p]artial or complete shielding of the source field [that] can occur which may effectively prevent the receiving coils from receiving adequate power for operation,” and explains that “[t]he effects of shielding on the source field are dependent upon the position of the objects causing the shielding relative to the orientation of the field created by the source coils, the position and orientation of the receiving coil(s), and upon the characteristics of the shielding material.” *Id.* at 63. Shielding of the source field can occur when conductive or permeable materials are placed in or near to the source field, and “its effects on system performance can range from negligible to intolerable.” *Id.* O’Brien explains that shielding of the source field may happen due to *highly conductive materials* located inside the operating volume or outside the operating

volume, and due to *highly permeable materials* placed inside the operating volume or outside the operating volume. *Id.* at 65 (“The presence of highly conductive materials in or near to the operating volume causes shielding of the source field due to the generation of opposing flux via Faraday’s law”), 67, 73, 75 (“The magnetic field can also be attenuated when a magnetic material of high permeability ($\mu > 1$) and sufficient cross-sectional area is placed inside the field”), 76, 79.

O’Brien also presents “solutions with respect to a minimization of the effects of shielding materials on system performance” and “solutions . . . for situations in which the shielding of receivers is unavoidable.” *Id.* at 63. One such solution includes, “[i]n cases where the current in one or more of the source coils cannot be increased, . . . install[ing] a layer of permeable material [(e.g., ferrite)] over the surface of any conducting object or material in order to negate the damping effects of the conductive shield.” *Id.* at 81–83. O’Brien explains that “[t]he addition of the ferrite counteracts the effect of the . . . shield, leaving the field strength along the axis of the [source] coil greater than or equal to its value in the unshielded case.” *Id.* at 83.

d. Equivalent Circuit Representation

After describing source coils, receiving coils, and solutions to the shielding of the source field, O’Brien proceeds to describe “the coupling between the source and receiver systems and develop equivalent models which will predict the behavior of a receiver located at any point within the operating volume.” *Id.* at 85. Figure 5-1 of O’Brien, reproduced below, shows a “basic block-diagram of the power transmission system.” *Id.*

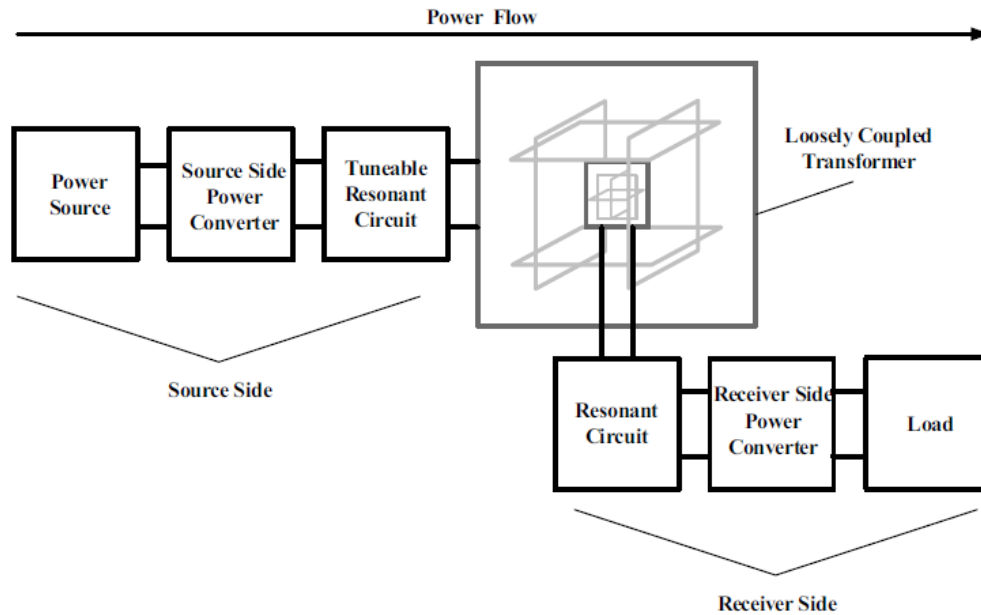


Figure 5-1 Block diagram of a wireless power system

Figure 5-1 illustrates a “basic block-diagram of the power transmission system.” *Id.* at 85. The wireless power system shown in Figure 5-1 includes the following illustrated components: a *loosely coupled transformer*, which is formed by coils (source coils being equivalent to primary coils, and receiving coils being equivalent to secondary coils); a *source side* including a single or multi-channel source side converter(s), and a “tuneable” resonant circuit; and a *receiver side* including one or more receiver side power converters, a load, and a resonant circuit. *Id.* at 85, 107, 111.

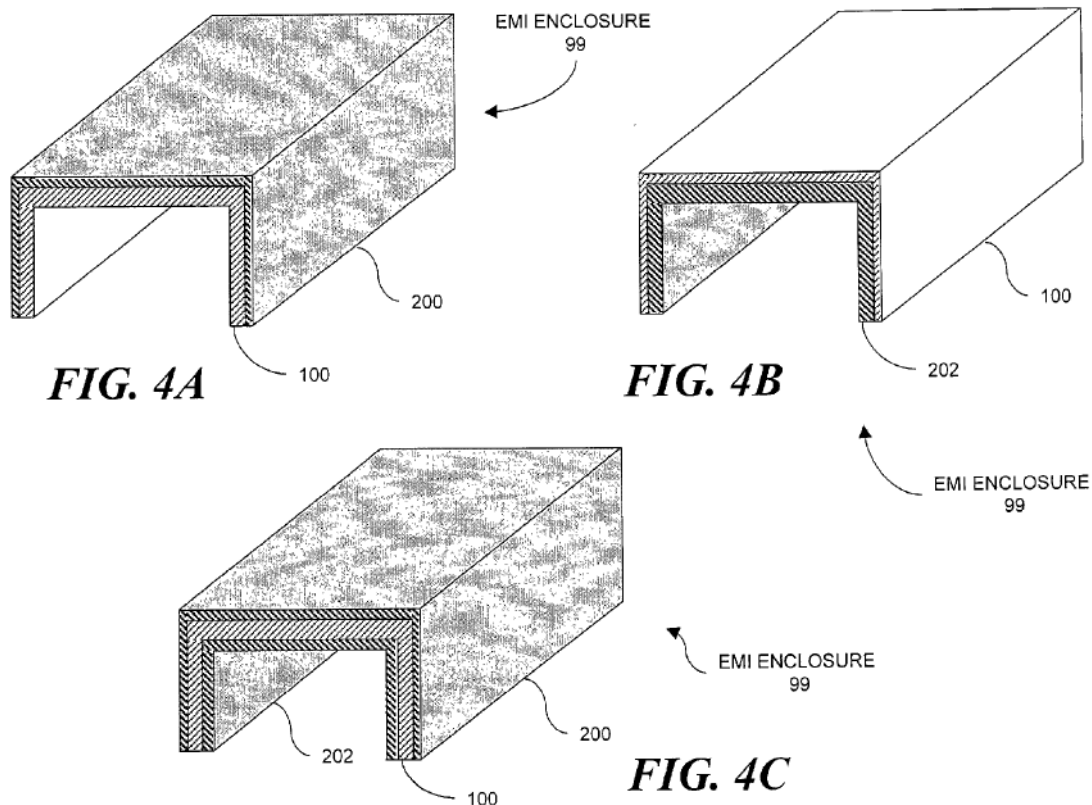
O’Brien designs “[t]he receiver side system . . . for operation at the maximum power point, autonomous start-up, and high reliability. . . . [with a] high receiver side power conversion efficiency . . . in order to provide the maximum possible power to the load and to allow for the highest possible packaging density.” *Id.* at 111. The input of source side converter(s) can be

connected to a power source (such as an ac power or dc power source). *Id.* at 111. O'Brien provides that "the source and receiver sides of the system are tuned to a resonant frequency, and form a transformer with a large air-gap," using "tuned circuits at the source and the receiving side [to] create[] a double-tuned circuit," as shown in Figure 5-1. *Id.* at 114–115.

2. Overview of Haaster (Ex. 1008)

Haaster is titled "EMI Shield Including a Lossy Medium." Ex. 1008, code (54). Haaster "relates [] generally to electronic component packaging and, more specifically, to electronic component packages that are shielded to protect against electromagnetic interference (EMI)." *Id.* ¶2. More particularly, Haaster discloses "methods for applying lossy materials to EMI shielded enclosures to improve EMI shielding effectiveness and the EMI shielded enclosures so produced," whereby "the EMI shielded enclosure includes a printed-circuit board mountable device." *Id.*, code (57) (Abstract). Haaster provides that the "lossy material can be applied to the interior of an EMI shielded enclosure," or "lossy materials can be applied to the exterior of the EMI enclosure to suppress EMI incident upon the EMI shielded enclosure, thereby reducing the susceptibility of electronics contained within the EMI shielded enclosure," or in yet another embodiment, "lossy materials can be applied to both the interior and exterior of the EMI enclosure." *Id.*

Figures 4A, 4B, and 4C of Haaster, reproduced below, show alternative applications of a lossy material to the outside portion of an EMI enclosure (Figure 4A), to the inside portion of an EMI enclosure (Figure 4B), and to both the inside and the outside of an EMI enclosure (Figure 4C). *Id.* ¶¶ 27–29.



Figures 4A, 4B, and 4C show other alternative applications of a lossy material to the outside portion of an EMI enclosure (Figure 4A), to the inside portion of an EMI enclosure (Figure 4B), and to both the inside and the outside of an EMI enclosure (Figure 4C). *Id.* ¶¶ 27–29. More particularly, Figure 4A shows a cross-section view of an EMI enclosure 99 with an external lossy material layer 200 applied to the external surface of conductive material 100. *Id.* ¶ 51. Figure 4B shows a cross-section view of EMI enclosure 99 with an internal lossy material layer 202 similarly applied to the internal surfaces of conducting material 100. *Id.* ¶ 52. Figure 4C shows a cross-section view of EMI enclosure 99 having both an external lossy material layer 200 and an internal lossy material layer 202 respectively applied to both the exterior and interior surfaces of enclosure 99. *Id.*

D. Anticipation Challenge Based on O'Brien

Petitioner contends that claims 1, 5–8, 15, and 19–22 are anticipated by O'Brien. Pet. 9–41. Patent Owner argues that O'Brien fails to disclose all limitations of independent claims 1 and 15. PO Resp. 3–7. After considering the evidence and arguments of record, we determine that Petitioner has demonstrated by a preponderance of the evidence that O'Brien anticipates claims 1, 5–8, 15, and 19–22.

1. Analysis of Claims 1 and 15

Claims 1 and 15 require two resonators (i.e., a source resonator and a second resonator) coupled to provide “near-field wireless energy transfer among” the resonators, and the claims recite that the field of one of the resonators is shaped “using a conducting surface and a magnetic material.” Ex. 1001, 97:35–44; 98:23–31. We begin our analysis with a discussion of the required resonators.

a. Source Resonator

For the “source resonator,” Petitioner relies on O'Brien's disclosure of the basic block diagram of a power transmission system illustrated by Figure 5-1 and states that “O'Brien's system includes a ‘Tuneable Resonant Circuit’ on the ‘Source Side’ that corresponds to the claimed ‘source resonator,’ which is connected to a ‘power source.’” Pet. 17–20 (citing Ex. 1007, 85, 111–112, 114–115, 119, 125, 139–140, Figs. 5-1, 6-1, 6-2, 6-4; Allen Decl. ¶¶ 74–78). Petitioner illustrates its reliance on the “Tuneable Resonant Circuit” with annotations to Figure 5-1, reproduced below. Pet. 18.

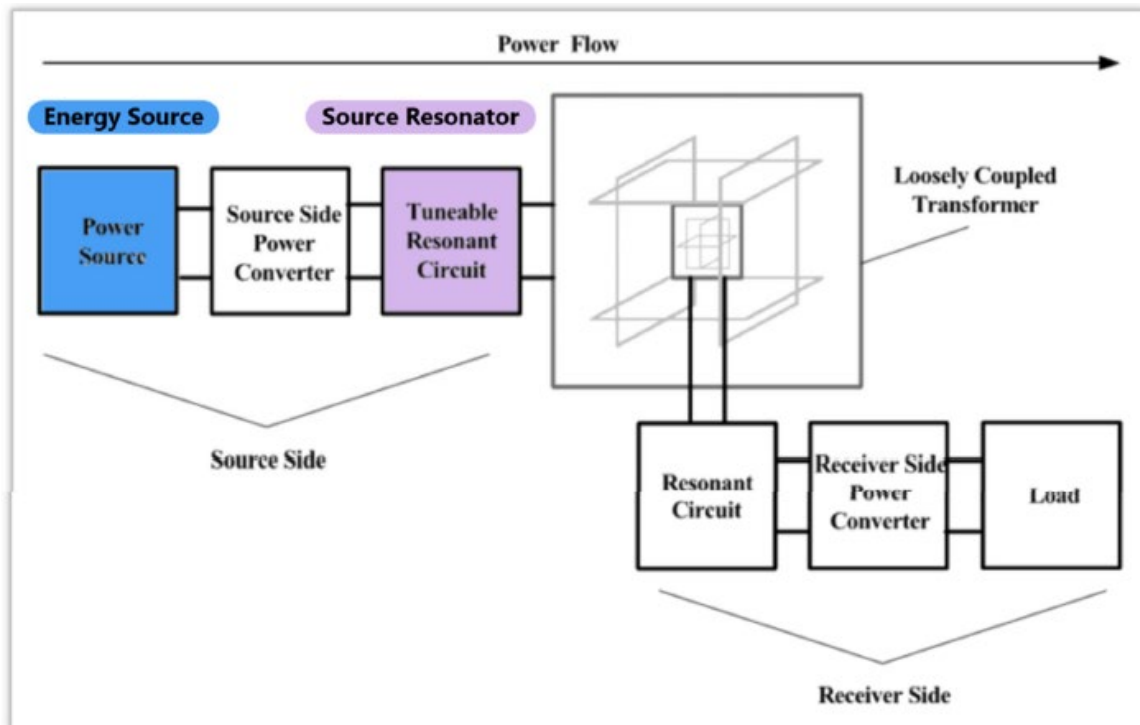


Figure 5-1 of O'Brien, as explained previously, shows a loosely coupled transformer coupled with a source side and a receiver side. On the source side, Petitioner has colorized in purple the "Tuneable Resonant Circuit" and has labeled this component a "Source Resonator" (highlighted in purple). Petitioner has also colorized in blue the depicted "Power Source" of the source side, and has labeled this component an "Energy Source" (highlighted in blue).

Although the Petition annotates the "Tuneable Resonant Circuit" of Figure 5-1 as the "Source Resonator," Petitioner provides additional explanation of what constitutes a "Source Resonator" beyond this single Figure. *See* Reply 3–4; Pet. 18–19. For example, Petitioner explains that Chapter 6 of O'Brien describes the characteristics of the tuning circuits in more detail and that the "series resonant configuration is chosen" for the "Source side resonant circuit." Pet. 18; Reply 4 (citing Pet. 17–19, 21; Ex. 1007, 85). Petitioner further identifies O'Brien's description of the

“series resonant configuration,” for the source side, shown in Figure 6-4 and depicted in the Petition. Reply 5 (citing Ex. 1007, 114–115, 119; Pet. 18–19).

Petitioner further cites Chapter 7 of O’Brien, which describes the experimental validation of the described system. Pet. 19–20 (citing Ex. 1007, 139–40). In the pages cited by Petitioner, O’Brien depicts a two coil system, one with a bi-directional coil system and another with a larger omni-directional source coil system, operating at a nominal frequency of 120 kHz. Ex. 1007, 139–140. O’Brien explains in detail the source coil characteristics in each of the “Source side systems,” and depicts the internal structure of the power supply, which includes the resonant circuits. *Id.* Thus, although the Petition prominently features the “Tuneable Resonant Circuit” and the power conversion explanations of Chapter 6, by also relying on the discussion of the “Source side systems” of Chapter 7, the Petition does not exclude O’Brien’s source coils from Petitioner’s mapping of the “source resonator.” Indeed, when addressing claims 5–7 and 19–21, the Petition specifically annotates the “Source Resonators” and “Secondary Resonators” as including both a “Tuning Circuit” and source coil. Reply 7; Pet. 36–37 (citing Ex. 1007, Fig. 6-1, 107, 111, 118 (“a single-stage resonant circuit per source coil is considered”); Allen Decl. ¶¶ 115–119).

Patent Owner urges that we interpret Petitioner’s mapping of the “source resonator” to encompass only the “source side resonant circuit” of O’Brien, without including the source coils. PO Resp. 5–6 (citing Ex. 1007, 22–24, 118–125, 132–136); *see also* Sur-reply 1–3. According to Patent Owner, O’Brien “makes clear that the ‘source side resonant circuit’ and the ‘source coil’ are separate components.” *Id.* at 6. Patent Owner also

contends that the Petition (especially the reference to Figure 5-1 of O'Brien) fails to identify the loosely coupled transformer as being mapped to the "source resonator"; hence, the Petition does not rely on O'Brien's source coils for this limitation. Because the claim requires coupling between resonators, Patent Owner contends the exclusion of O'Brien's source coils from the mapping of "source resonator" is fatal to Petitioner's case. *Id.* at 6–7. Patent Owner further argues that in the Reply, Petitioner for the first time asserts that "O'Brien's 'Tuneable Resonant Circuit'" and "source coil" together disclose the "source resonator." Sur-reply 1 (citing Reply 1, 3–8). As a result, Patent Owner contends that the Reply improperly presents a new theory in contrast to the position taken in the Petition. Sur-reply 2.

As stated in our Decision on Institution, although we agree with Patent Owner's explanation of how O'Brien describes source coils and tuning circuits in discrete chapters of the reference, the Petition explains sufficiently that the Tuneable Resonant Circuit is inexorably linked to the source coils and that the circuits are thus tuned to resonance. Dec. on Inst. 20. The arguments presented by Patent Owner do not persuade us otherwise. *See* Sur-reply 3–4 (arguing that O'Brien's disclosure of tuning circuits is distinct from its disclosure of coils and, therefore, Petitioner's discussion of one does not imply the other). As explained above, despite the Petition's prominent reliance on the source-side Tuneable Resonant Circuit, highlighted in purple in Figure 5-1, Petitioner also relies on the discussions in Chapter 6 that describe the characteristics of the tuning circuits and Chapter 7 that describe *source coils* and the resonant circuits as "Source side systems." Pet. 18–20. Accordingly, and as previously noticed in our Decision on Institution, the Petition gives sufficient notice that O'Brien's

source coils are part of the “source resonator.” Dec. on Inst. 20. Therefore, we are not persuaded by Patent Owner’s arguments that the Petition fails to show that O’Brien discloses the claimed “source resonator.” For the same reason, we are not persuaded that Petitioner’s Reply represents a new theory as compared with the position taken in the Petition.

Consequently, Petitioner has shown that the “source resonator optionally coupled to an energy source” of claim 1 is taught by O’Brien’s source side system where the tunable resonant circuit (including the source coils) is coupled to the power source. Pet. 18–20; Ex. 1007, Figs. 5–1 (depicting the coupling to the power source), 6–1 (depicting the source side power conversion part of the system with tuning circuits in three different axes in an omni-directional system); 112–112 (Chapter 6 – describing the power converter of the source side and stating that the “power rating of the source side converter is primarily determined by the losses in the source coils for operation at resonance”); 114–115 (Chapter 6 – describing resonant circuit parameters where the source and receiver sides are tuned to a resonant frequency and form a transformer); 139–140 (Chapter 7 – describing “Source side systems,” the source coils operating characteristics, and three resonators connected to three independent power supplies); Allen Decl. ¶¶ 76–78.

We also find that O’Brien at page 114 (cited in the Petition at page 19), further describes the tuning circuit characteristics highlighting that the source and receiver sides are tuned to a resonant frequency and form a transformer with a large air-gap. Ex. 1007, 114; Pet. 19. Petitioner explains further this cited paragraph in the Reply, as a response to Patent Owner’s contention that the source coils are excluded from the Petition. Reply 4. We

are persuaded by Petitioner's explanation that O'Brien's description of the tuning circuits together with the loosely coupled transformer means that the tuneable resonant circuit includes the source coils. Further, Petitioner explains, and the record has no contradictory evidence, that Figure 6-4 of O'Brien (reproduced *and discussed in the Petition at page 19*) explicitly shows that coil L_{sr} is the source coil coupled to the other components of the resonant circuit. Reply 5 (citing Ex. 1007, Fig. 6-4, 114-115).

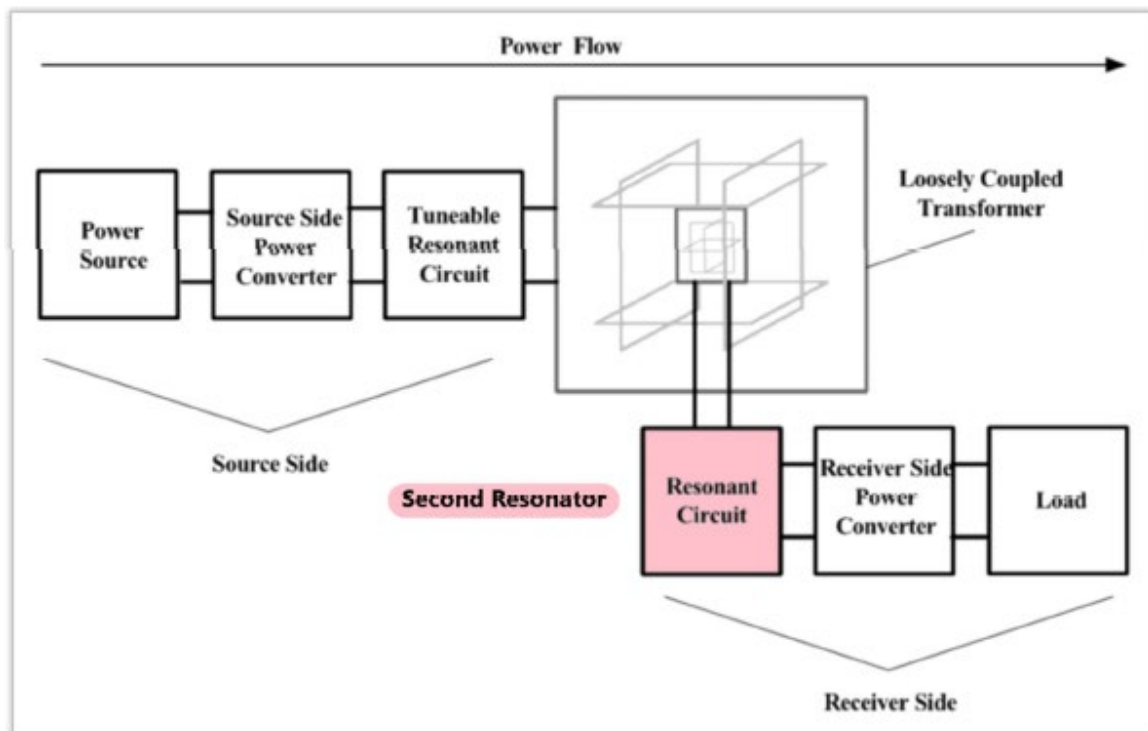
Before we conclude, we note that Patent Owner attempts to characterize some teachings of O'Brien as inconsistent with the contention that O'Brien's tuneable resonant circuits would be understood to take into account the coils integrated therewith. Sur-reply 3. For instance, Patent Owner argues that one configuration of O'Brien describes that a resonant circuit is used to extract power from the "separate receiving coil." *Id.* (citing Ex. 1007, 57). We are not persuaded that O'Brien makes such a distinction with the lone passage Patent Owner extracts from the reference. O'Brien describes various modulation schemes by which to produce the omnidirectional field at a constant magnitude. Ex. 1007, 55-56. The particular modulation scheme described in the passage allows for power to be transmitted at adjacent frequencies. *Id.* at 57. The source side of O'Brien, therefore, includes the tuned resonant circuit with the source coils transmitting the power at adjacent frequencies. *Id.* This passage is silent concerning whether O'Brien would use the source coils for transmitting power without any need of the tuneable resonant circuit or vice versa. As for the passage's reference to "extraction" of power by the receiving coil (which is discussed below in more detail), we are not persuaded that this in any way contradicts the Petition or the Reply contentions. The receiving

coils would be near the source coils for power transfer to occur, which, without the resonant circuit, could not be realized. Therefore, if anything, the cited passage proves that the receiving coil and the resonant circuit work together to “extract power,” much like the tuneable resonant circuit and the source coils work together to “transmit power.”

We determine, therefore, that Petitioner has shown by a preponderance of the evidence that O’Brien discloses the “source resonator” limitation, as recited in claims 1 and 15.

b. A second resonator

For the “second resonator,” Petitioner relies also on O’Brien’s Figure 5-1, this time annotated differently, as shown below. Pet. 21.



Petitioner’s annotated Figure 5-1 of O’Brien depicts the power transmission system discussed above with a Receiver Side that includes a “Resonant Circuit” (colorized in pink) with the added label that reads

“Second Resonator,” also highlighted in pink. Petitioner contends that “O’Brien’s ‘power transmission system’ includes a ‘Resonant Circuit’ on the ‘Receiver Side’ that is connected to the ‘Load,’ and corresponds to the claimed ‘second resonator,’ as shown [above].” Pet. 20–22 (citing Ex. 1007, 85, 114–118, 133–138, 141–142, Fig. 5-1; Allen Decl. ¶¶ 81–83). Petitioner further asserts that O’Brien describes the receiver-side resonant circuit “located a distance from the source resonator” as claimed, because “O’Brien discloses that its receivers are separated by a ‘large air-gap in the magnetic path’ and power can be transferred over hundreds of meters at an operating frequency of 120 kHz.” Pet. 22 (citing Ex. 1007, 19, 22–23, 27, 118, 153, Fig. 2-3; Allen Decl. ¶¶ 84–85).

As with the limitation discussed above, Patent Owner argues that the “receiver side resonant circuit” is separate and distinct from the “receiving coils,” and that Petitioner identified the resonant circuit as the “second resonator” without also identifying the loosely-coupled transformer for this limitation. PO Resp. 4–5. According to Patent Owner, because the claim requires coupling between the resonators, reliance on *only* O’Brien’s Resonant Circuit identified in Figure 5-1 of O’Brien as constituting the claimed “second resonator” fails to disclose the required coupling and the mapping is deficient. *Id.* at 5–6. We are not persuaded by Patent Owner’s argument.

We stated in our Decision on Institution that, although O’Brien discusses the receiver coils (or receivers) and resonant circuits in separate chapters, the Petition reasonably conveys that the receiver coils are part of the mapping to the “second resonator” limitation. Dec. on Inst. 22; Reply 2 (citing Pet. 20–24). For instance, as stated above, Petitioner relies on

O'Brien's disclosure of the large air-gap in the magnetic path that separates the "receivers." Pet. 22 (citing Ex. 1007, 19). And O'Brien describes, and Patent Owner agrees, the "receivers" are also receiving coils. Ex. 1007, 25; Fig. 2–10 (depicting a "[r]eceiver comprised of three receiving coils, each wound around one axis of a ferrite cube"); PO Resp. 5–6 (stating that O'Brien's disclosures at page 27 cited in the Petition refer to "receiving coils" as "receivers"). These disclosures, cited in the Petition, expressly refer to the operation of the receiver coils and the corresponding resonant circuit, which persuade us that the Petition reasonably refers to both the resonant circuit of the receiver side and the receiving coils for the limitation "second resonator."

Further, Petitioner points to Chapter 6 of O'Brien that describes the "receiver side resonant circuit" and its operation. Reply 9 (citing Pet. 21–22; Ex. 1007, 133–138). Chapter 6 of O'Brien, as discussed above with respect to the source coils disclosure, refers to the source and receiver side tuned to a resonant frequency and forming a transformer with a large air-gap. Ex. 1007, 114. There, O'Brien further discloses a "receiver side parallel resonant circuit with one coil." Reply 9 (quoting Ex. 1007, 134). These pages and more of O'Brien were cited in the Petition, and as we noted in our Decision on Institution, gave notice to Patent Owner that the "second resonator" of the claim was reasonably mapped to the resonant circuit without excluding the receiving coils. Dec. on Inst. 18–20.

Consequently, we determine that Petitioner has shown by a preponderance of the evidence that O'Brien discloses a "second resonator located a distance from the source resonator" in accordance with claims 1 and 15. The receiving coils and resonant circuit are both part of the receiver,

which is separated by a large air-gap in the magnetic path and power can be transmitted over hundreds of meters. Pet. 22; Ex. 1007, 19, 22–23 (disclosing a distance of up to 400 meters between sources and receivers).

Again, we note here that Patent Owner attempts to characterize O’Brien as being inconsistent with Petitioner’s position that the resonant circuit would be understood to take into account the coils integrated therewith. Sur-reply 3. However, as we explained above with respect to the source coils, the portions of O’Brien that Patent Owner relies on do not contradict Petitioner’s contention.

Based on the foregoing, we determine that Petitioner has shown by a preponderance of the evidence that O’Brien discloses the “second resonator” limitation, as recited in claims 1 and 15.

c. Coupling the Source and Second Resonators

Claims 1 and 15 require the source resonator and the second resonator coupled “to provide near-field wireless energy transfer among the source resonator and the second resonator.” Ex. 1001, 97:39–41; 98:26–28 (the “coupling” limitation). Petitioner argues that O’Brien describes the required coupling because “O’Brien specifically analyzes ‘the power transfer characteristics between distributed sources and sinks (receivers) using magnetic coupling in the near field,’” and discloses “[o]perating both source and receiver at a resonant frequency’ and designing the systems such that the ‘receivers are never located outside of the near field.’” Pet. 22–24 (citing Ex. 1007, 21–23, 27, 93–98, 153–154; Allen Decl. ¶¶ 87–89).

Patent Owner addresses this limitation in the context of the “source resonator” and “second resonator” arguments already discussed above. PO Resp. 4–6. Patent Owner argues

Independent claims 1 and 15 of the '935 patent also recite that “the source resonator and the second resonator are coupled to provide near-field wireless energy transfer among the source resonator and the second resonator.” '935 patent, claims 1, 15. In addressing this claim element, the Petition relies entirely on disclosure from O'Brien that fails to even mention the components it previously identified as the claimed “source resonator” (the “Tunable Resonant Circuit on the Source Side,” see Petition, 17) and the claimed “second resonator” (the “Resonant Circuit on the Receiver Side,” *see id.*, 20).

PO Resp. 5 (emphasis in original omitted). In other words, similar to the argument addressed above, Patent Owner argues that Petitioner improperly relies on O'Brien's “source coils” and “receiving coils” to teach the claimed near-field wireless energy transfer rather than the “Tunable Resonant Circuit” and “Resonant Circuit” that Patent Owner asserts are relied upon as the “source resonator” and “second resonator.” *Id.* (citing Pet. 17).

However, as above, this argument is predicated on Patent Owner's contention that O'Brien's “‘source coils’ and ‘receiving coils’ are separate from the ‘source side resonant circuit’ (the alleged source resonator) and the ‘receiver side resonant circuit’ (the alleged second resonator).” *Id.* at 6 (citing Ex. 1007, 118–125, 132–136). As we state above, and as stated in our Decision on Institution, we are not persuaded by Patent Owner's argument in this respect because the Petition does not *only* identify the resonant circuits as the recited “source resonator” and “second resonator.” Dec. on Inst. 24.

Consequently, we determine that Petitioner has shown by a preponderance of the evidence that O'Brien discloses the “coupling” limitation. As discussed, the Petition points to O'Brien's disclosure of operating the source and receivers at a resonant frequency and designing the system such that the receivers are never outside the near field. Pet. 23;

Ex. 1007, 27; Allen Decl. ¶ 87 (citing Ex. 1007, 22–23). The arrangement of O’Brien’s source and receiver results in power transfer in a narrow frequency band. Ex. 1007, 27; Allen Decl. ¶ 87.

Therefore, we determine that Petitioner has shown by a preponderance of the evidence that O’Brien discloses the “coupling” limitation, as recited in claims 1 and 15.

d. Shaping the Field

Claim 1 requires shaping the field of “at least one of the source resonator and the second resonator using a conducting material and a magnetic material.” Ex. 1007, 97:42–44. Claim 15 is substantively identical even though the claim recites using a “conductive *surface* and a magnetic material.” *Id.* at 98:29–31 (emphasis added). We refer to this as the “shaping” limitation.

Petitioner contends that O’Brien discloses the shaping limitation, at least in part, because it proposes installing a layer “of permeable material over the surface of any conducting object or material to negate the damping effects of the conductive shield.” Pet. 33 (citing Ex. 1007, 82–83; Allen Decl. ¶ 106). Petitioner also relies on the annotated Figure 4-33 of O’Brien, reproduced below. *Id.* at 34.

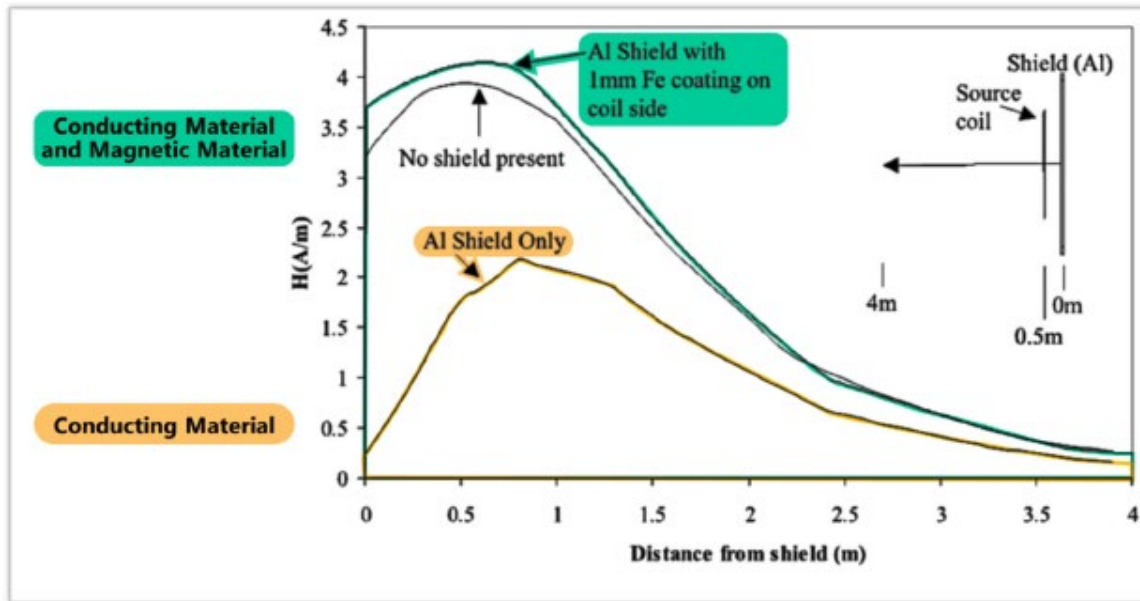


Figure 4-33 of O'Brien shows the strength of a source field (H) at certain distances, and illustrates the dampening of the field due to shielding by a conducting material (highlighted in orange), and the corrective effect (highlighted in green) of coating the conducting material (or surface) with 1 mm of ferrite, a magnetic material. *Id.*; Allen Decl. ¶ 108.

Patent Owner contends that Petitioner admits that "O'Brien does not . . . disclose how to intentionally shield devices or components in the first instance using such multi-layered shielding." PO Resp. 7 (quoting Pet. 46). Rather, Patent Owner argues that O'Brien "merely describes that components can be shielded in theory, but does not describe a 'system' in which 'the field of at least one of the source resonator and the second resonator is shaped using a conducting material and a magnetic material.'" *Id.* at 7–8.

In response, Petitioner asserts that there is no basis to consider "intentionally shield[ing] devices or components," a requirement of the claims. Reply 11. First, Petitioner contends that the claims recite that the shaping feature requires only a conducting material and a magnetic material

that shape the field of the source or second resonator. *Id.* Second, Petitioner argues that whether O’Brien was designed to shape a field using a conducting material and a magnetic material is irrelevant because anticipation does not require “actual performance of suggestions in a disclosure.” *Id.* at 12 (citing *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1379 (Fed. Cir. 2001)). Finally, Petitioner contends that O’Brien discloses in detail how the field generated by a source resonator would be shaped by conducting and magnetic materials. *Id.* (citing Pet. 24–35, Allen Decl. ¶¶ 90–110).

We agree with Petitioner. As discussed above, Petitioner points us to where O’Brien describes installing a layer “of permeable material over the surface of any conducting object or material to negate the damping effects of the conductive shield.” Pet. 33 (quoting Ex. 1007, 82–83; Allen Decl. ¶ 106). Further, Dr. Allen points out that O’Brien explains that “[t]he addition of the ferrite counteracts the effect of the aluminum shield, leaving the field strength along the axis of the coil greater than or equal to its value in the unshielded case.” Allen Decl. ¶ 108. This testimony is unrebutted and persuasive to show that the shape of O’Brien’s source field is shaped by using conducting material coated with a layer of magnetic material. Pet. 34. Therefore, we determine that Petitioner has shown by a preponderance of the evidence that O’Brien discloses the “shaping” limitation recited in claims 1 and 15.

e. Conclusion as to Claims 1 and 15

Having reviewed the Petition and accompanying evidence, in light of Patent Owner’s argument and evidence in opposition, we determine that

Petitioner has shown by a preponderance of the evidence that O'Brien anticipates claims 1 and 15 of the '935 patent.

2. Dependent Claims 5–8 and 19–22

With respect to dependent claims 5–8 and 19–22, which depend directly or indirectly from independent claims 1 and 15, Petitioner contends these claims are also anticipated by O'Brien, and provides arguments explaining how the reference discloses their limitations. Pet. 35–41.

a. Claims 5–7 and 19–21

Claims 5–7 depend from claim 1 and recite that the system of claim 1 comprises “more than one resonator” (claim 5), “more than one second resonator” (claim 6), and “more than three resonators” (claim 7). Ex. 1001, 97:53–58. Claims 19–21 depend from claim 15 and recite substantially similar subject matter to claims 5–7. *See id.* at 98:41–46.

To address these claims, Petitioner contends that O'Brien discloses “a high level block diagram of a power transfer system in Figure 5-1 having a source side resonator (i.e., a first resonator) and a receiving side resonator (i.e., a second resonator),” thus depicting “more than one resonator.” Pet. 17–22, 35–36 (citing Ex. 1007, Fig. 5-1; Allen Decl. ¶ 15). Petitioner further contends that O'Brien discloses an embodiment with more than three resonators by describing the high level block diagram of a power transfer system in Figure 5-1 implemented with three “source resonators” and six “secondary resonators.” Pet. 36–37 (citing Ex. 1007, Fig. 6–1, 49–62, 85–87, 107, 111–112, 114–118, 127–32; Allen Decl. ¶ 115). Patent Owner does not provide any separate argument against these dependent claims. *See generally* PO Resp. For the reasons set forth in the Petition and summarized

above, we determine that Petitioner has shown by a preponderance of the evidence that O'Brien anticipates claims 5–7 and 19–21 of the '935 patent.

b. Claims 8 and 22

Claim 8 depends from claim 1 and recites “wherein the field is shaped to avoid a loss-inducing object.” Ex. 1001, 97:59–60. Claim 22 depends from claim 15 and recites substantially similar subject matter to claim 8. Ex. 1001, 98:47–48. Petitioner contends that O'Brien describes the “‘effects of shielding on the source field’ based on the presence of ‘[h]ighly conductive objects’ both inside and outside of the operating volume of the source field.” Pet. 38 (citing Ex. 1007, 63, 67-75; Allen Decl. ¶¶ 121–123). Petitioner asserts that O'Brien discloses installing a “layer of permeable material over the surface of any conducting object or material in order to negate the damping effects of the conductive shield,” to cancel the effect of shielding. *Id.* at 39 (citing Ex. 1007, 73, 75; Allen Decl. ¶ 122). Dr. Allen explains that a person of ordinary skill in the art would have understood that installing a layer of permeable material would shape the field around the loss-inducing objects. Pet. 39–40 (citing Ex. 1007, Fig. 4-21, 76–79; Allen Decl. ¶ 124). We credit the testimony of Dr. Allen, which is unrebutted and is supported by the evidence of record. Allen Decl. ¶ 124 (explaining how O'Brien describes using permeable material placed on a surface of a conductive material to negate the damping effect of the conductive shield, among other explanations). Patent Owner does not provide any separate argument against these dependent claims. *See generally* PO Resp. For the reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that O'Brien anticipates claims 8 and 22 of the '935 patent.

3. Conclusion

Based on the foregoing, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1, 5–8, 15, and 19–22 of the '935 patent are anticipated by O'Brien.

E. Obviousness Challenge Based on O'Brien and Haaster

Petitioner sets forth an additional ground, supported by arguments and evidence, challenging claims 1–23 based on O'Brien and Haaster. *See* Pet. 2, 41–75.

1. Independent Claims 1 and 15

Petitioner contends that the combination of O'Brien and Haaster renders independent claims 1 and 15 obvious. Pet. 41–53. In particular, Petitioner contends that O'Brien describes all the limitations of the claims, and additionally, O'Brien in combination with Haaster teaches the “shaping” limitation. Pet. 51–53. Petitioner relies on Haaster for the teachings of using conductive and magnetic materials to shape an electromagnetic field to avoid a loss inducing object, such as electronic equipment, as recited in claims 8–14 and 22. *Id.* at 41. Although O'Brien teaches a way to address the dampening effect of a shielding device by applying a thin layer of magnetic material over any conductive shielding, it does not disclose how to intentionally shield devices or components in the first instance using such multi-layered shielding. Pet. 46; Allen Decl. ¶¶ 143–144.

Because we have already determined that O'Brien discloses the remaining limitations of claims 1 and 15, we focus below on the analysis of the combination of the “shaping” limitation and the reasons to combine the references as asserted by Petitioner.

a. Haaster Analysis

Petitioner points out that Haaster teaches a conducting material shield coated with magnetic material to provide an enclosure protecting electric devices, as shown in Petitioner's annotated Figure 4A of Haaster, below. Pet. 43.

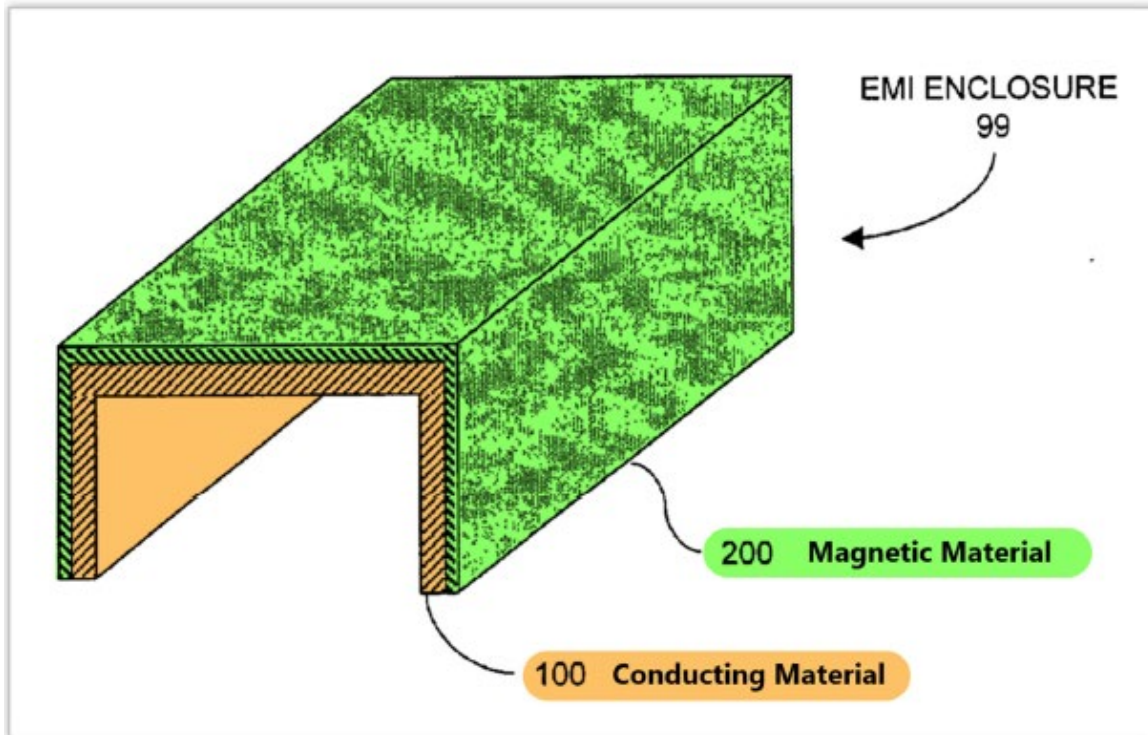


Figure 4A of Haaster depicts EMI enclosure 99 that shields three sides of a device with external lossy material layer 200 (colorized by Petitioner in green with the added label “Magnetic Material”) applied to the external surface of conductive material 100 (colorized in orange and labeled “Conducting Material” by Petitioner). *Id.* (citing Ex. 1008 ¶ 51, Fig. 4A; Allen Decl. ¶ 132). Petitioner also points out Haaster’s teachings that applying magnetic materials to the conductive surface of an EMI shield attenuates surface currents residing on the enclosure, as well as any proximate near fields at high frequencies. *Id.* at 52 (citing Ex. 1008 ¶ 48). We agree with Petitioner because Haaster expressly teaches that an external

application of lossy material to the exterior surface of the enclosure “attenuates any impinging EMI from other external systems and devices” and “attenuates surface currents residing on the enclosure 99, as well as any proximate near fields.” Ex. 1008 ¶ 48. According to Petitioner, and with support from Dr. Allen’s testimony, Haaster teaches that its shield enclosure comprising conducting and magnetic materials would shape O’Brien’s source field, especially since O’Brien describes, as stated above, that the field would be affected by shields of conductive and magnetic materials. *Id.* at 53 (citing Ex. 1007, 75–80, 82–83; Allen Decl. ¶ 154–57). We find Petitioner’s argument persuasive and credit the cited testimony of Dr. Allen that O’Brien’s source field would be shaped by Haaster’s enclosure with the conducting and magnetic layers as disclosed. Allen Decl. ¶ 154–57.⁷

b. Reasons to Combine Analysis

Petitioner offers several persuasive reasons to combine O’Brien with Haaster. Pet. 44–50. For example, Petitioner contends, and we agree, that a person of ordinary skill in the art would have been motivated to follow Haaster’s teachings: “to shield sensitive electrical components that are or may be used within or near the operating volume of O’Brien’s system, but are not intended to directly receive power from O’Brien’s source resonators.” Pet. 44 (citing Allen Decl. ¶ 140). Moreover, Petitioner argues, and we agree, that Haaster’s teachings “would shape the source magnetic field around the component, protecting the component from O’Brien’s magnetic flux, while minimizing attenuation of the source field due to the

⁷ Patent Owner challenges Petitioner’s arguments, stating that Haaster does not mention “shaping.” PO Resp. 8–9. We address Patent Owner’s arguments in this regard together with the other arguments presented in connection with our analysis of the reasons to combine.

shielding materials.” *Id.* at 44–45 (citing Allen Decl. ¶¶ 141–47). Finally, Petitioner argues, with supporting testimony from Dr. Allen, that Haaster’s EMI enclosure would reduce costs, and, thus a person of ordinary skill in the art would have been motivated to look to Haaster’s solution of providing a conductive shield that is cost effective. Pet. 49; Allen Decl. ¶ 148; Ex. 1007 67–73, 82–83; Ex. 1008 ¶ 46. We are persuaded by this testimony of Dr. Allen and credit it accordingly.

Patent Owner challenges Petitioner’s reliance on Haaster because Haaster does not “mention wireless power transfer,” nor does Haaster describe the disclosed shielding as shaping a magnetic field. PO Resp. 8–9. More specifically, Patent Owner argues that Haaster generally relates to shielding electronic component packages from electromagnetic interference. *Id.* at 8 (citing Ex. 1008 ¶ 2). And, Patent Owner adds, Haaster is directed to shielding components from electromagnetic “noise” and is unconcerned with disrupting the “electromagnetic energy” as it is “undesirable.” *Id.* at 9 (citing Ex. 1008 ¶ 4). Rather, Patent Owner argues, Haaster’s shielding is for “absorbing” electromagnetic energy from a magnetic field. *Id.* at 8–9 (citing Ex. 1008 ¶ 16). Patent Owner argues that in light of these differences, Petitioner has not shown that Haaster’s techniques for blocking electromagnetic noise would be suitable for shaping the magnetic field of O’Brien or that a person of ordinary skill in the art would have had a reasonable expectation of success in doing so. *Id.* at 9. These arguments are not persuasive for the reasons presented by Petitioner in its Reply.

For instance, in response to Patent Owner’s argument that Haaster does not mention “shaping” a magnetic field, Petitioner proffers Haaster’s explanation of “shaping” by disclosing that “shielding will ‘attenuate’ a

transfer of electromagnetic energy by reflecting and absorbing a magnetic field.” Reply 13–14 (citing Pet. 51–52, Allen Decl. ¶¶ 155–156).

According to Dr. Allen’s testimony, which we credit in this regard, Haaster teaches that the conductive materials for its EMI enclosure “shape a source field by, for example ‘reflecting electromagnetic energy.’” Allen Decl.

¶¶ 155 (citing Ex. 1008 ¶¶ 5, 15, 19, 57). Dr. Allen further explains that “[a] POSA would have understood that Haaster’s ‘lossy’ materials like ferrite and magnetic alloys would shape O’Brien’s source field because O’Brien taught how highly permeable materials, including ferrite specifically, will shape its source field.” *Id.* at ¶ 156 (citing Ex. 1007, 75–80). Hence, although Haaster does not use the word “shaping” when describing how shielding effects a magnetic field, we credit the testimony of Dr. Allen which details how Haaster’s shielding would “attenuate,” and thus “shape,” the magnetic field as it is consistent with the disclosures of both O’Brien and Haaster. Reply 13–14 (citing Pet. 51–52, Allen Decl. ¶¶ 155–156).

Petitioner further responds that Dr. Allen’s testimony, as well as arguments made in the Petition, demonstrate that Haaster’s shielding would be suitable for shaping the magnetic field of O’Brien. Reply at 14 (citing Pet. 52–53). Petitioner contends, with supporting testimony from Dr. Allen, that Haaster’s shielding would be suitable because Haaster discloses using shielding formed from copper, aluminum, or ferrite, which are the same materials that O’Brien discloses would shape its source field. *Id.* We agree. We credit Dr. Allen’s testimony that a person of ordinary skill in the art “would have understood Haaster’s highly conductive materials, like copper [and] aluminum would shape the source field in O’Brien because O’Brien identified those same materials as exemplary ‘highly conductive materials’

that would shape the near field in O'Brien's system." Allen Decl. ¶ 155 (citing Ex. 1007, 64–65, Figs. 4-1, 4-2; Ex. 1008 ¶¶ 5, 15, 19, 41, 44, 57). Further, we credit Dr. Allen's testimony that a person of ordinary skill in the art "would have understood that Haaster's 'lossy' materials like ferrite and magnetic alloys would shape O'Brien's source field because O'Brien taught how highly permeable materials, including ferrite specifically, will shape its source field." Allen Decl. ¶ 156 (citing Ex. 1007, 75–80, 82–83; Ex. 1008 ¶¶ 14, 38). As described above, we credit the testimony of Dr. Allen detailing how Haaster's shielding would "shape" the magnetic field, as it is consistent with the disclosures of both O'Brien and Haaster. Pet. 51–52 (citing Allen Decl. ¶¶ 155–156).

Finally, Petitioner contends that Patent Owner's argument as to the reasonable expectation of success in combining O'Brien and Haaster is conclusory and unsupported. We agree. Patent Owner provides bare and conclusory argument that Petitioner has not shown that Haaster's techniques for blocking electromagnetic noise would have a reasonable expectation of success in shaping the magnetic field of O'Brien. *See* PO Resp. 9. Petitioner, however, provides sufficient evidence and argument to support its position of reasonable expectation of success by a preponderance of the evidence. For example, the Petition explains that a person of ordinary skill in the art "would have had a reasonable expectation of success combining Haaster's EMI enclosures for electronic devices with O'Brien's wireless energy transfer system," because "both references teach the use of similar magnetic and conductive materials to shield electromagnetic energy, and both references (and others) describe successfully using those materials together to improve shield performance." Pet. 50 (citing Allen Decl. ¶¶ 145–

49). According to Dr. Allen's testimony, which we credit in this regard, a person of ordinary skill in the art would have known that at lower frequencies (i.e., the frequencies of interest in O'Brien), the nonconducting magnetic materials in Haaster are not lossy, but instead act to guide magnetic flux. Allen Decl. ¶ 140. A person of ordinary skill in the art also would have understood that O'Brien's system would involve electronic circuits that may require shielding at O'Brien's operating frequency of 120 kHz. *Id.* ¶ 142 (citing O'Brien 23 and other relevant references). And O'Brien already teaches using a layer of permeable material over the surface of any conducting object to negate the dampening effects of the conductive shield, thereby itself providing evidence that shielding to shape the magnetic field with a permeable layer would work. *See Id.* ¶ 143; O'Brien 82–83. Thus, it is unsurprising to conclude, as Dr. Allen does, that a person of ordinary skill in the art would be successful in applying Haaster's enhanced shielding of devices within an EMI enclosure to O'Brien's devices, not only because the references themselves attest to this predictable use, but the state of the art confirmed that shielding electromagnetic devices using magnetic and conductive materials was already well known. *Id.* ¶ 149 (citing Exs. 1013 35–40, Figs. 2–19(a)-(f); 1009, 2:29–3:4; 1010, 3:27–4:17, 5:12–47, Figs. 7, 8; 1011 ¶¶ 4, 8, 11, 12, 80–84; 1020 14:21–16:54). This testimony and the evidence of record is unrebutted.

Having reviewed the Petition and accompanying evidence, in light of Patent Owner's argument and evidence in opposition, we determine that Petitioner has shown by a preponderance of the evidence claims 1 and 15 of the '935 patent are unpatentable as obvious over O'Brien and Haaster.

2. *Independent Claim 23*

Independent claim 23 is reproduced below with added labels for ease of discussion:

23. A system, comprising:

[a] a resonator coupled to power and control circuitry;

[b] wherein the resonator and the power and control circuitry are configured to provide near-field wireless energy transfer among other resonators,

[c] and wherein the power and control circuitry is at least partially covered by high permeability materials and conducting surfaces to shape magnetic fields of the resonator around the power and control circuitry.

Ex. 1001, 98:49–57.

Petitioner contends that the combination of O’Brien and Haaster renders obvious independent claim 23. Pet. 71–75. In particular, Petitioner relies on O’Brien to teach the resonator (limitation [a]) recited in claim 23, referring, for the most part, to the arguments made for claims 1 and 15. However, for the “power and control circuitry,” Petitioner further relies on O’Brien’s disclosure of the source side power converter in combination with the power source. *Id.* at 72 (citing Allen Decl. ¶ 202). Based on our findings with regard to O’Brien’s disclosure of the tunable resonant circuit and corresponding source coils, we are persuaded further by Petitioner’s showing that O’Brien teaches the resonator recited in limitation [a] of claim 23.

As for limitation [b], Petitioner relies on O’Brien to teach the “near-field energy transfer among other resonators” recited in claim 23 in accordance with the arguments made for claims 1 and 15. *Id.* at 73. Based on our findings concerning O’Brien’s disclosure of the tuneable resonant

circuit and source coils generating a near field for wireless energy transfer, in connection with claims 1 and 15, we are persuaded that Petitioner has shown by a preponderance of the evidence that O'Brien further teaches limitation [b] of claim 23.

As for limitation [c], Petitioner relies on a combination of O'Brien and Haaster to teach the limitation of claim 23 that requires field shaping of the resonator around the power and control circuitry. *Id.* at 73–75. Petitioner's challenge of claim 23 relies on arguments that are substantially similar and supported with the same evidence presented with respect to the "shaping" limitation of claims 1 and 15 discussed above, except for the additional explanations to account for the power and control circuitry recited in claim 23. *Id.* In particular, Petitioner acknowledges that O'Brien does not teach that its source side power converter and power source (i.e., "power and control circuitry") are "at least partially covered by" magnetic materials and conducting surfaces, but Petitioner contends the limitation would have been obvious in light of Haaster. Pet. 73 (citing Allen Decl. ¶ 205). We agree with Petitioner and credit Dr. Allen's testimony that a person of ordinary skill in the art would have understood that power and control circuitry, designed using field effect transistors and other integrated circuits, would have been in need of protection from interference at O'Brien's operating frequency of 120 kHz. Pet. 74; Allen Decl. ¶ 206. Accordingly, we determine, based on our analysis of the reasons to combine described above with respect to claims 1 and 15, that it would have been obvious to shield O'Brien's power and control circuitry in light of Haaster's disclosure of an EMI enclosure that can partially or fully cover an electronic circuit susceptible to EMI with a conducting surface and a layer of high-

permeability material like ferrite. Pet. 73–74; Allen Decl. ¶ 205–207; Ex. 1008 ¶¶ 3–5, 10, 11.

Patent Owner does not raise arguments for claim 23 that are separate from those discussed above under the anticipation ground based on O’Brien. See PO Resp. 8–9. Having reviewed the Petition and accompanying evidence, in light of Patent Owner’s argument and cited support in opposition, we determine for the same reasons detailed above that Petitioner has shown by a preponderance of the evidence that claim 23 of the ’935 patent is unpatentable as obvious over O’Brien and Haaster.

3. Dependent Claims 2–4 and 16–18

With respect to dependent claims 2–4 and 16–18, which depend directly or indirectly from independent claims 1 and 15, Petitioner contends these claims are also unpatentable as obvious over O’Brien in view of Haaster, and provides arguments explaining how the references disclose their limitations. Pet. 54–59.

Claims 2–4 depend from claim 1 and recite that “at least one of the source resonator and the second resonator have a quality factor, $Q > 100$ ” (claim 2), “the source resonator Q is greater than 100 and the second resonator Q is greater than 100 (claim 3), and “the square root of the resonator Q times the second resonator Q is greater than 100” (claim 4). Ex. 1001, 97:45–52. Claims 16–18 depend from claim 15 and recite substantially similar subject matter to claims 2–4. See *id.* at 98:32–40.

Petitioner contends that O’Brien discloses the claimed quality factors by disclosing source resonators and second resonators, as discussed above with regard to claims 1 and 15, with quality factors of up to and including 500. Pet. 54 (citing Ex. 1007, Figs. 6-19 (showing quality values up to

Q=500), 6-20). Petitioner further contends that a person of ordinary skill in the art would have been motivated to implement quality factors between 100 and 500 because large quality factor values use small bandwidths and provide “[f]requency selectivity” for the system, suppressing interference from frequency components outside of the desired operating band. Pet. 56 (citing Ex. 1007, 111; Allen Decl. ¶ 163); *see also id.* at 54 (citing Allen Decl. ¶¶ 161–168). Patent Owner does not provide any separate argument against these dependent claims. *See generally* PO Resp. For the reasons set forth in the Petition as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claims 2–4 and 16–18 of the ’935 patent are unpatentable as obvious over O’Brien and Haaster.

4. Dependent Claim 9

With respect to dependent claim 9, which depends indirectly from independent claim 1, Petitioner contends this claim also is unpatentable as obvious over O’Brien in view of Haaster, and provides arguments explaining how the references disclose the limitations. Pet. 61–62.

Claim 9 recites that “the loss-inducing object is completely covered by the conducting material and the magnetic material.” Ex. 1001, 98:1–3. Here, Petitioner contends that Haaster teaches that an “EMI enclosure is a ‘substantially closed container, such as a box’ made of ‘a highly conductive reflecting material 100, such as aluminum [or] copper.’” Pet. 61 (citing Ex. 1008 ¶¶ 44-45; Allen Decl. ¶ 175). According to Petitioner, Haaster further teaches that the magnetic “lossy material 102” can be applied to the “entire internal and/or external surfaces of the EMI enclosure 99.” *Id.* (citing Ex. 1008 ¶ 46; Allen Decl. ¶ 175). Patent Owner does not provide any separate argument against claim 9. *See generally* PO Resp. For the

reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claim 9 of the '935 patent is unpatentable as obvious over O'Brien and Haaster.

5. Dependent Claim 10

With respect to dependent claim 10, which depends indirectly from independent claim 1, Petitioner contends this claim is also unpatentable as obvious over O'Brien in view of Haaster, and provides arguments explaining how the references disclose the limitations. Pet. 63–64.

Claim 10 recites that “the loss-inducing object is partially covered by the conducting material and the magnetic material.” Ex. 1001, 98:4–5. Petitioner contends that Haaster discloses an “EMI enclosure that is a ‘partially open container, such as a box or a cage having fewer than six sides.’” Pet. 63 (citing Ex. 1008 ¶¶ 45; Allen Decl. ¶ 179). For example, according to Petitioner, Haaster further teaches EMI enclosures with “five sides for applications in which the EMI enclosure [] is installed onto another surface,” or “wherein a loss-inducing object would be ‘partially covered by the conducting material,’ element 100, ‘and the magnetic material,’ element 200.” *Id.* (citing Ex. 1008 ¶ 45, Fig. 4A; Allen Decl. ¶ 179). Patent Owner does not provide any separate argument against claim 10. *See generally* PO Resp. For the reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claim 10 of the '935 patent is unpatentable as obvious over O'Brien and Haaster.

6. Dependent Claim 11

With respect to dependent claim 11, which depends indirectly from independent claim 1, Petitioner contends this claim is also unpatentable as

obvious over O'Brien in view of Haaster, and provides arguments explaining how the references disclose the limitations. Pet. 64–66.

Claim 11 recites that “wherein the loss-inducing object is nearer to at least one of the source resonator and the second resonator, and wherein a portion of the loss-inducing object facing the nearer resonator is partially covered by the conducting material and the magnetic material.” Ex. 1001, 98:7–11. Petitioner contends that O'Brien teaches having a source resonator and a second resonator, where loss-inducing conductive objects may be located outside the operating volume, such as within conductive walls or floors. Pet. 63–64 (citing Ex. 1007, 73–74; Allen Decl. ¶ 182). According to Petitioner, in these cases, O'Brien would partially coat the “coil side” of a conductive shield with a magnetic material. *Id.* (citing Ex. 1007, Fig. 4-33 (“Al shield with 1mm Fe coating on coil side”), 82–83; Allen Decl. ¶ 182). Petitioner further asserts that Haaster teaches that “applications in which only a portion of the EMI enclosure 99 is exposed to the EMI energy, the lossy material 102 can be applied in a limited manner, covering the most-vulnerable (i.e., exposed) surface or surfaces.” Pet. 65 (quoting Ex. 1008 ¶ 46; citing Allen Decl. ¶ 185). Patent Owner does not provide any separate argument against claim 11. *See generally* PO Resp. For the reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claim 11 of the '935 patent is unpatentable as obvious over O'Brien and Haaster.

7. Dependent Claim 12

With respect to dependent claim 12, which depends indirectly from independent claim 1, Petitioner contends this claim is also unpatentable as

obvious over O'Brien in view of Haaster, and provides arguments explaining how the references disclose the limitations. Pet. 66–67.

Claim 12 recites that “the conducting material comprises a first layer that covers the loss-inducing object, and wherein the magnetic material comprises a second layer that covers the first layer.” Ex. 1001, 98:12–15. Petitioner contends that Haaster discloses an EMI enclosure that “includes a first ‘conductive material 100’ that covers the shielded device and ‘an external lossy material layer 200 applied to the external surface of the conductive material.’” Pet. 66 (Ex. 1008, Fig. 4A; Allen Decl. ¶ 188). Patent Owner does not provide any separate argument against claim 12. *See generally* PO Resp. For the reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claim 12 of the '935 patent is unpatentable as obvious over O'Brien and Haaster.

8. Dependent Claim 13

With respect to dependent claim 13, which depends indirectly from independent claim 1, Petitioner contends this claim is also unpatentable as obvious over O'Brien in view of Haaster, and provides arguments explaining how the references disclose the limitations. Pet. 68.

Claim 13 recites that “the conducting material comprises a first layer that partially covers the loss-inducing object, and wherein the magnetic material comprises a second layer that partially covers the first layer.” Ex. 1001, 98:16–19. Petitioner contends that Haaster discloses an EMI enclosure that “includes a first ‘conductive material 100’ that partially covers a loss-inducing object, such as by forming a ‘box or a cage having fewer than six sides.’” Pet. 68 (Ex. 1008 ¶¶ 45, 47–48, 51–54; Allen Decl.

¶ 192). Petitioner further points out that Haaster discloses that “the magnetic ‘lossy material’ layer can be ‘selectively applied to a portion of the internal and/or external surfaces.’” *Id.* (citing Ex. 1008 ¶ 46). Patent Owner does not provide any separate argument against claim 13. *See generally* PO Resp. For the reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claim 13 of the ’935 patent is unpatentable as obvious over O’Brien and Haaster.

9. Dependent Claim 14

With respect to dependent claim 14, which depends indirectly from independent claim 1, Petitioner contends this claim is also unpatentable as obvious over O’Brien in view of Haaster, and provides arguments explaining how the references disclose the limitations. Pet. 69–70.

Claim 14 recites that “the loss-inducing object is a mobile electronic device.” Ex. 1001, 98:20–21. Petitioner asserts that O’Brien describes a system for industrial applications that a POSA “would have understood or found obvious could include moving objects like ‘mobile terminals’ with electronics to be shielded from O’Brien’s source field.” Pet. 69 (citing Ex. 1015, 1359). Similarly, Petitioner contends that a person or ordinary skill in the art would have understood that “the types of electronics that would benefit from Haaster’s EMI enclosure would be portable electronics, including a mobile terminal or other mobile electronics in O’Brien’s system.” Pet. 70 (citing Allen Decl. ¶ 197). As pointed out by Petitioner and Dr. Allen, Haaster incorporates by reference U.S. Patent No. 5,639,989 to Higgins, III, which described EMI shielding for electronics including “portable electronics.” *Id.* (citing Allen Decl. ¶ 197; Ex. 1008 ¶ 8;

Ex. 1023, 3:8–10, 4:26–30). Patent Owner does not provide any separate argument against claim 14. *See generally* PO Resp. For the reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claim 14 of the '935 patent is unpatentable as obvious over O'Brien and Haaster.

10. Dependent Claims 5–8 and 19–22

With respect to dependent claims 5–8 and 19–22, which depend directly or indirectly from independent claims 1 and 15, Petitioner contends these claims are also unpatentable as obvious over O'Brien in view of Haaster, and provides arguments explaining how the references disclose their limitations. Pet. 59–60.

For claims 5–7 and 19–21, Petitioner relies on the same arguments and evidence presented for the anticipation ground. Therefore, having found that O'Brien discloses the limitations further recited in these claims for the reasons discussed above, we determine that Petitioner has shown by a preponderance of the evidence that claims 5–7 and 19–21 would also have been obvious under the O'Brien and Haaster ground.

With regard to claims 8 and 22, Petitioner further relies on Haaster's teaching of the EMI enclosure shaping electromagnetic energy to avoid electronic devices, which are "loss-inducing objects," to teach the recited limitations. Pet. 59; Ex. 1008 ¶¶ 3–5, 10; Allen Decl. ¶¶ 171–172. Without a Haaster enclosure, "there will be a 'transfer of electromagnetic energy with respect to the shielded device'." Pet. 59; Allen Decl. ¶ 172. According to Petitioner, this loss of energy is reduced using Haaster's EMI shield comprising a conductive layer and a magnetic layer that shapes the field to avoid (i.e., shield) the loss-inducing object, as taught by O'Brien. Pet. 59;

Ex. 1007 68, 76; Ex. 1008 ¶¶ 15, 16, 19; Allen Decl. ¶ 173. We agree with Petitioner that Haaster's teachings, as described here, disclose using Haaster's enclosure to shape a field for the purposes of avoiding a loss-inducing object.

Petitioner further argues that it would have been obvious to a person of ordinary skill in the art that the shield arrangement described above could be implemented in any of O'Brien's embodiments, such as an arm of a robot in an assembly line, automated production machines, sensors and actuators, and micro-electro-mechanical systems. Pet. 60; Allen Decl. ¶ 172. Particularly, Petitioner argues, and we agree, that a person of ordinary skill in the art would have understood that industrial systems like those disclosed in O'Brien could include moving objects like mobile terminals and robot parts, which would have benefited from Haaster's enclosure. Pet. 60; Allen Decl. ¶ 172.

Patent Owner does not provide any separate argument against claims 8 and 22. *See generally* PO Resp. For the reasons set forth in the Petition and as summarized above, we determine that Petitioner has shown by a preponderance of the evidence that claims 8 and 22 of the '935 patent are unpatentable as obvious over O'Brien and Haaster.

IV. MOTION TO EXCLUDE

Patent Owner filed a Motion to Exclude seeking to exclude Petitioner's Exhibit 1007 (O'Brien). *See* Mot.; Reply Mot. Patent Owner argues that O'Brien should be excluded under Federal Rules of Evidence (FRE) 901 because Petitioner has failed to authenticate O'Brien by 'produc[ing] evidence sufficient to support a finding that the item is what' Petitioner 'claims it is.'" Mot. 1.

Petitioner bears the burden to authenticate O'Brien. *See* FRE 901 (stating "the proponent must produce evidence sufficient to support a finding that the item is what the proponent claims it is"). However, authentication is a low bar, requiring only a rational basis that O'Brien is what it is asserted to be. *See Caterpillar Inc. v. Wirtgen Am., Inc.*, IPR2018-01091, Paper 49 at 72 (Nov. 27, 2019) (quoting *United States v. Turner*, 934 F.3d 794, 798 (8th Cir. 2019)). Petitioner authenticates O'Brien through one declaration from Dr. Hall-Ellis (Ex. 1005) and one declaration from Michael T. Pierce (Ex. 1024).⁸

Patent Owner's main argument is that Dr. Hall-Ellis obtained O'Brien from counsel and "concluded that it was a 'true and correct copy' of the O'Brien Dissertation because 'the text is complete; no pages are missing, . . . the text on each page appears to flow seamlessly from one page to the next; [and] there are no visible alterations to the document.'" *Id.* at 4 (citing Ex. 1005 ¶ 38); Reply Mot. 2–3. As a result, Patent Owner argues that Dr. Hall-Ellis has no personal knowledge sufficient to authenticate O'Brien. Mot. 5. Furthermore, Patent Owner argues that other testimony of Dr. Hall-Ellis (identified as Ex. 1025)⁹ contradicts the testimony of the filed declaration (E. 1005) and raises doubts as to O'Brien's authenticity. *Id.* at 8.

⁸ We note that the parties did not follow the Board's procedure of filing the supplemental evidence served in response to the objections when filing a Motion to Exclude. *See* Consolidated Trial Practice Guide, at 78–79 (available at <https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf?MURL=>). Therefore, Exhibit 1024 is not in the record filed as an exhibit supporting Patent Owner's Motion or the Opposition. Nevertheless, Patent Owner reproduces the relevant portions of the declaration of Mr. Pierce for us to ascertain the merits of Patent Owner's Motion.

⁹ There is no Exhibit 1025 filed in the instant proceeding.

Patent Owner further argues that Petitioner's second declarant, Michael T. Pierce, provided merely conclusory testimony to support his conclusion that O'Brien was authentic. *Id.* at 2; Reply Mot. 1. Patent Owner expresses dissatisfaction with the succinct nature of the declaration and urges the Board to weigh the testimony according to the lack of detail. Mot. 7.

Notably, Patent Owner does not argue that the reference filed by Petitioner as Exhibit 1007, O'Brien, is different from the O'Brien reference whose catalog records Dr. Hall-Ellis reviewed or that the O'Brien reference filed in this proceeding has been altered. *See generally* Mot. Rather, Patent Owner merely contends that Petitioner's declarants provide testimony that is insufficient to authenticate O'Brien. We disagree with Patent Owner's arguments.

Weighing the parties' arguments and evidence, we determine that Petitioner demonstrates sufficiently that O'Brien is what Petitioner purports it to be — a doctoral dissertation by Kathleen O'Brien entitled "Inductively Coupled Radio Frequency Power Transmission System for Wireless Systems and Devices." Specifically, Petitioner submits the testimony of Dr. Hall-Ellis which details a Machine-Readable Cataloging (MARC) record identifying that O'Brien had been received, cataloged, and indexed by the Verbundzentrale Des Gemeinsamen Bibliotheksverbundes as of March 2, 2007. Pet. 14 (citing Ex. 1005 ¶ 38). The testimony also states that Exhibit 1007 can be found within the custody of the degree-granting higher education institution. Ex. 1005 ¶ 38. Furthermore, the dissertation was commercially published by the German publisher Shaker Verlag GmbH in

2007. *Id.* Dr. Hall-Ellis concludes that her inspection of O'Brien leaves her with no suspicion about its authenticity. *Id.*

The inspection Dr. Hall-Ellis conducted follows library practice of evaluating cataloging documents. *See* Opp. Mot. 4; Ex. 1005 ¶ 30. Furthermore, the witness has the qualifications to ascertain whether a document provided to her matches the indicia of the original work catalogued and indexed by the library, and Patent Owner has not called into question any of Dr. Hall-Ellis's qualifications to testify.

The un rebutted testimony of Dr. Hall-Ellis is that Dr. Hall-Ellis retrieved the catalog information for O'Brien, attached to the declaration at pages 31–34, which shows due diligence in comparing the ISBN of O'Brien and the MARC record. Further, Dr. Hall-Ellis testifies that she “personally identified and retrieved the library catalog” and she “personally identified and retrieved the MARC record.” Ex. 1005 ¶ 40. Thus, the testimony of Dr. Hall-Ellis alone shows that O'Brien's indicia of title, unique ISBN code, and dates align with those of the MARC record and library catalog that Dr. Hall-Ellis personally retrieved and investigated. And even though Dr. Hall-Ellis herself did not testify to comparing a cataloged version of O'Brien with the O'Brien document provided to her by counsel (*see* Reply Mot. 2–3), there is no reason to conclude that the inspection of the document provided and the matching data in the catalog are insufficient to authenticate that the O'Brien Dr. Hall-Ellis reviewed is not the same O'Brien that the catalog identifies.

As for the purported second declaration of Dr. Hall-Ellis that Patent Owner has raised to support the Motion, we find the testimony unavailing. First, there is no second declaration of Dr. Hall-Ellis proffered for authentication of O'Brien *filed* in this proceeding, so we are not able to

ascertain its contents or its relevance to this proceeding. Second, Petitioner points out that this other declaration of Dr. Hall-Ellis concerns a different reference altogether and has no bearing on the dispute in this proceeding. Opp. Mot. 6, n.2. Petitioner points out that the declaration was filed in IPR2021-01165 as Exhibit 1005 for that proceeding's prior art, none of which involve O'Brien. *Id.* at 6–7.

Further, Petitioner argues that Mr. Pierce's declaration provides a specific URL attesting to where O'Brien "was accessed." Opp. Mot. 3. According to the Motion, the following is an excerpt from Mr. Pierce's declaration:

Exhibit 1007 is a true and correct copy of Kathleen O'Brien, *Inductively Coupled Radio Frequency Power Transmission System for Wireless Systems and Devices* (2007) (Ph.D. dissertation, Technical University of Dresden), *available at* <http://www.shaker.de/de/content/catalogue/index.asp?lang=de&ID=8&ISBN=978-3-8322-5775-0>.

Mot. 6. Patent Owner does not assert that the link does not work or does not retrieve the same O'Brien dissertation submitted in this proceeding as Exhibit 1007. Patent Owner also does not assert that Mr. Pierce lacks personal knowledge of where O'Brien (Exhibit 1007) was obtained. Thus, we do not see Petitioner's attempt to provide Patent Owner a clear explanation of how O'Brien was accessed for use in this proceeding as a failure to prove that the reference filed as O'Brien in this proceeding is what Petitioner asserts it is—the dissertation of Kathleen O'Brien. Nevertheless, Petitioner asserts and there is no dispute that the URL link Mr. Pierce provided retrieves the same document filed in this proceeding. Opp. 3–4. Mr. Pierce establishes where Exhibit 1007 was obtained and how a copy can

still be accessed with identifying information including ISBN, number of pages, and publication date that matches the contents of O'Brien (Exhibit 1007). *Id.* at 3–4 (citing Ex. 1024 (not filed); Ex. 1007, 4). Moreover, we observe that the ISBN identification listed on O'Brien (*see* Ex. 1007, 4 (“ISBN 978-3-8322-5775-0”)) matches the ISBN identification listed in the MARC record associated with O'Brien submitted by Dr. Hall-Ellis. Ex. 1005, 33 (“020 9783832257750”), 13 (explaining that “an item’s International Standard Book Number (‘ISBN’) is recorded in field 020”).

Finally we note that there is a low bar to authentication, and the testimony of counsel attesting to the origin of a document and that what is filed is a true and correct copy is entitled to some weight unless proven untrustworthy. We find the above-described testimony and evidence sufficient to establish that O'Brien is authentic and find that Patent Owner's arguments to the contrary are not persuasive. *See* FRE 901(a). Consequently, we need not decide whether O'Brien is self-authenticating under FRE 902(7) or whether the document is authentic given its distinctive characteristics and the totality of the circumstances under (FRE 901(b)(4)). *See* Opp. Mot. 7–8.

Therefore, Patent Owner's request to exclude O'Brien is denied.

V. CONCLUSION

As explained above, we have addressed each challenged claim of the '935 patent and determine that Petitioner has shown by a preponderance of the evidence that the challenged claims are unpatentable.¹⁰ Consistent with

¹⁰ 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*

35 U.S.C. § 318, this Final Written Decision therefore disposes of all patent claims challenged by Petitioner. *SAS*, 138 S. Ct. at 1359.

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 5–8, 15, 19–22	102(b)	O’Brien	1, 5–8, 15, 19–22	
1–23	103(a)	O’Brien, Haaster	1–23	
Overall Outcome			1–23	

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–23 of the ’935 patent have been proven to be unpatentable; and

FURTHER ORDERED because this is a Final Written Decision, parties to this proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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).

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