

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NXP USA, INC.,
Petitioner,

v.

INSIDE SECURE and NFC TECHNOLOGY, LLC,
Patent Owner.

Case IPR2016-00681
Patent 7,098,770 B2

Before KEN B. BARRETT, PATRICK M. BOUCHER, and
CHARLES J. BOUDREAU, *Administrative Patent Judges*.

BOUDREAU, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

NXP USA, Inc.¹ (“NXP”) filed a Corrected Petition for *inter partes* review of claims 1–3, 6–8, 10, 11, 28–31, 34, and 35 of U.S. Patent No. 7,098,770 B2 (Ex. 1001, “the ’770 patent”). Paper 5 (“Pet.”). On September 2, 2016, we issued a Decision granting institution of *inter partes* review of claims 1–3, 6–8, 10, 11, 28–31, 34, and 35 of the ’770 patent on certain of the grounds asserted. Paper 12 (“Dec. on Inst.”), 45. Exclusive licensee NFC Technology, LLC (“NFCT”)² then filed a Patent Owner’s

¹ According to updated mandatory notice information filed under 37 C.F.R. § 42.8, “effective November 7, 2016, original petitioner NXP Semiconductors USA, Inc. merged with and into original petitioner Freescale Semiconductor, Inc., which then changed its name to ‘NXP USA, Inc.’” Paper 20, 1. We have updated the caption accordingly.

² U.S. Patent and Trademark Office assignment records indicate that the inventors assigned the ’770 patent to Inside Technologies, in an assignment recorded on April 10, 2003 (Reel/Frame 13959/852). A name change of Inside Contactless to Inside Secure was recorded on October 28, 2013 (Reel/Frame 31505/332); and a license of the ’770 patent from Inside Secure and France Telecom S.A. to France Brevets SAS was recorded on October 1, 2013 (Reel/Frame 31317/264). Additionally, although not recorded in connection with the ’770 patent, a name change of Inside Technologies to Inside Contactless S.A., executed on August 28, 2003, was recorded on August 25, 2016, in connection with certain other patents (Reel/Frame 39542/0427). In disclosures filed in this proceeding, NFCT asserts that it and its parent company, France Brevets SAS, are the real parties in interest. Paper 8, 2. NFCT further asserts that it “possesses all substantial rights to the ’770 Patent,” “exclusively owns ‘the right to defend the validity and/or enforceability’” of the ’770 Patent,” and “has standing to step into the shoes of the Patent Owner in this proceeding.” *Id.* at 2–3. NFCT also provides

Response (Paper 17, “PO Resp.”), and NXP filed a Reply (Paper 22, “Pet. Reply”). A consolidated hearing for this proceeding and related Cases IPR2016-00682, IPR2016-00683, and IPR2016-00684 was held on June 9, 2017. A transcript of that hearing is included in the record. Paper 28 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6, and we issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, we determine that NXP has shown by a preponderance of the evidence that claims 1–3, 6–8, 10, 11, 28–31, 34, and 35 of the ’770 patent are unpatentable on the grounds upon which we instituted *inter partes* review.

II. BACKGROUND

A. *Real Parties in Interest and Related Proceedings*

NXP identifies NXP Semiconductors N.V., NXP B.V., and NXP Semiconductors Netherlands B.V. as real parties in interest with itself for this proceeding. Paper 20, 1. NFCT identifies France Brevets, S.A.S., as a real party in interest with itself for this proceeding. Paper 8, 2; *see supra* note 2.

evidence to support these assertions, namely documents that purport to be license agreements between NFCT and Inside Secure. *See* Ex. 2001; Ex. 2002. In light of NFCT’s representations, we have treated NFCT as Patent Owner throughout this proceeding and continue to do so for purposes of this Decision, as reflected by the caption.

The parties identify *NFC Technology, LLC v. Samsung Electronics Co.*, No. 2:15-cv-00283 (E.D. Tex.), as a related case. Pet. 9; Paper 8, 3. NXP also filed three other petitions challenging certain subsets of claims of the '770 patent. Case IPR2016-00682, Paper 5 (Corrected Petition); IPR2016-00683, Paper 3 (Petition); IPR2016-00684, Paper 3 (Petition).

B. The '770 Patent

The '770 patent, titled “Contactless Integrated Circuit Reader,” was issued on August 29, 2006, and claims the benefit of a French patent application filed on October 16, 2000. Ex. 1001, [30], [45], [54], [63]. The '770 patent describes a contactless integrated circuit (“CIC”) reader that includes circuits for simulating the operation of a CIC, such that the CIC reader is able to send data to another CIC reader by inductive coupling. *Id.* at [57]. Figure 1 of the '770 patent is reproduced below.

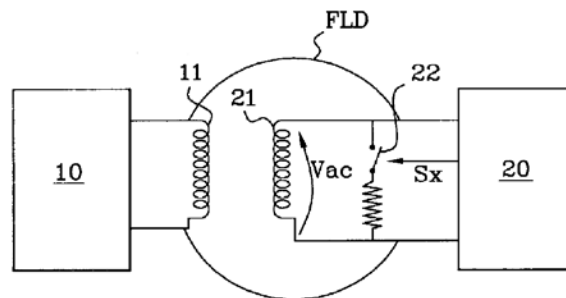


Fig. 1

Figure 1 is a schematic representation of a CIC reader and CIC. *Id.* at 5:6–8. With reference to Figure 1, CIC reader 10 produces alternating magnetic field FLD by means of antenna circuit 11, and transmits data by modulating field FLD’s amplitude. *Id.* at 1:15–19. Field FLD causes induced

alternating voltage Vac to appear in antenna circuit 21 of passive CIC 20, copying the amplitude modulations of field FLD and enabling the CIC to receive the data sent by the reader after filtering and demodulating induced voltage Vac. *Id.* at 1:25–30. CIC 20 sends data to CIC reader 10 via load modulation by short circuiting antenna circuit 21 by means of a switch driven by load modulation signal Sx. *Id.* at 1:31–34. The short circuiting of antenna circuit 21 cause a disturbance of field FLD that is detected by antenna circuit 11 of reader 10. *Id.* at 1:34–36. Reader 10 can extract load modulation signal Sx by filtering the signal present in antenna circuit 11, and deduce from it the data sent by CIC 20. *Id.* at 1:36–39.

According to the '770 patent, in applications that involve several terminals, it is sometimes desirable for this information to be collected by a data centralization system. *Id.* at 2:9–11. However, collecting such data manually can be tedious or costly. *Id.* at 2:11–22. To address this issue, the '770 patent describes a CIC reader capable of switching to a passive operating mode, in which the reader operates like a CIC in communicating with another reader. *Id.* at 2:29–33. “In other terms, this reader is capable of sending data to another reader according to the load modulation principle, and of receiving data that the other reader sends by modulating the magnetic field it sends out.” *Id.* at 2:33–37. Two contactless readers can, thus, communicate by having one of the two readers switch to the passive operating mode, allowing data to be exchanged without any physical contact between them. *Id.* at 2:38–42.

The '770 patent, thus, describes a CIC reader configured to operate in two different modes. In a first mode, the CIC reader generates and modulates a magnetic field to transmit data to another device, such as a CIC. *Id.* at 6:46–8:16. In the second mode, the CIC reader transmits data by applying a load modulation signal to its antenna circuit that disturbs the magnetic field generated by a second CIC reader. *Id.* at 8:17–9:62.

The load modulation of the second CIC reader's magnetic field can be accomplished in multiple ways, according to the '770 patent. The preferred embodiment of the '770 patent utilizes “pseudo active load modulation” in which the load modulation signal causes the antenna circuit to alternate between a ground state and an excitation state. *Id.* at 10:17–21. The '770 patent states that this method has the advantage of offering greater communication distance because the alternating signal pulses applied to the antenna circuit cause magnetic field pulses that can be detected by another reader at a greater distance than disturbances due to passive load modulation. *Id.* at 11:3–9. “By comparison with a classical load modulation, which is purely passive, the disturbance of the magnetic field obtained according to the third method can be qualified as ‘pseudo active load modulation’ due to the sending of the alternating magnetic field pulses.” *Id.* at 11:9–16.

C. Illustrative Claims

Of the challenged claims, claims 1 and 28 are independent. Each of challenged claims 2, 3, 6–8, 10, and 11 depends directly or indirectly from

claim 1, and each of challenged claims 29–31, 34, and 35 depends directly or indirectly from claim 28. Claims 1 and 28 are illustrative of the claimed subject matter and are reproduced below:

1. A device in order to transmit/receive data by inductive coupling comprising:

an antenna circuit to generate a magnetic field; and

an excitation circuit for delivering an alternating excitation signal to the antenna circuit,

the device being configured to operate in a first operating mode and a second operating mode,

when in the first operating mode, the device modulates the excitation signal when data is transmitted, and

when in the second operating mode, the device applies a load modulation signal with two states to the antenna circuit when data is transmitted, so as to simulate the operation of a contactless integrated circuit, the load modulation signal being configured to disturb a magnetic field generated by another device in order to transmit/receive data by inductive coupling and being configured to be detected by the other device as if the load modulation signal were a load modulation signal applied to an antenna load modulation switch of a contactless integrated circuit.

28. A contactless integrated circuit reader comprising:

an antenna circuit that generates a magnetic field; and

an excitation circuit to deliver an alternating excitation signal to the antenna circuit,

the reader including a first operating mode and a second operating mode,

when in the first operating mode, the reader is configured to exchange data with a contactless integrated circuit, and

when in the second operating mode, the reader is configured to exchange data with another contactless integrated circuit reader,

the reader includes one of a bit and a flag to switch the reader from one of the first and second operating modes to the other of the first and second operating modes.

Ex. 1001, 12:27–46, 15:21–34.

D. Evidence Relied Upon

The instituted grounds rely on the following references:

Reference		Exhibit
Gunnarsson	Gunnarsson, International Patent Publication WO 98/08311 (February 26, 1998)	Ex. 1004
RH-E	Klaus Finkenzeller, <i>RFID Handbook: Radio-Frequency Identification Fundamentals and Applications</i> (Rachel Waddington trans., John Wiley & Son, Ltd. 1999)	Ex. 1006
RH-G	Klaus Finkenzeller, <i>RFID-Handbuch: Grundlagen und praktische Anwendungen induktiver Funkanlagen, Transponder und kontaktloser Chipkarten</i> (Carl Hanser Verlag 1998) (Ex. 1008B); English translation provided by NXP	Ex. 1008A
Bashan	Bashan et al., US 6,045,043 (Apr. 4, 2000)	Ex. 1011

NXP also relies on two declarations of Richard T. Mihran, Ph.D. (Exs. 1003, 1016) in support of its Petition and its Reply, respectively, and NFCT relies on the Declaration of Alyssa B. Apsel, Ph.D. (Ex. 2004) in support of its Patent Owner Response.

E. Instituted Grounds of Unpatentability

We instituted *inter partes* review of the challenged claims under 35 U.S.C. § 103(a) over the following combinations of references:

References	Claims Challenged
Gunnarsson and either RH-E or RH-G ³	1–3, 6–8, and 11
Gunnarsson, either RH-E or RH-G, and Bashan	10, 28–31, 34, and 35

Dec. on Inst. 45.

III. ANALYSIS

A. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012).

³ NXP refers to RH-E and RH-G collectively as the “RFID Handbook” or simply as the “Handbook” and includes parallel citations to RH-E and RH-G throughout the Petition and Petitioner’s Reply. *See, e.g.*, Pet. 5; Pet. Reply 1. NXP asserts that the relied-upon portions of RH-E and RH-G are substantially similar and presents each ground in the Petition in the form of “counterparts” labeled as “A” and “B,” where the “A” counterpart relies on RH-E and the “B” counterpart relies on RH-G. Pet. 10–11. Except where otherwise noted, we follow NXP’s convention.

In the Decision on Institution, we addressed three claim terms that had been identified for construction by NFCT—“antenna circuit,” “load modulation signal,” and “contactless integrated circuit”—and determined that none required express construction at that stage of the proceeding. Dec. on Inst. 11–17.

NFCT in its Patent Owner Response again urges that construction of the terms “antenna circuit” and “load modulation signal” is necessary to determine whether the corresponding limitations are disclosed by Gunnarsson alone or whether they are disclosed only in the combination of Gunnarsson and the RFID Handbook. PO Resp. 5–16. We address each in turn.

1. “*antenna circuit*”

The term “antenna circuit” is recited in both challenged independent claims 1 and 28 and in challenged dependent claims 8, 29, 30, and 31.

NFCT contends that we should construe “antenna circuit” to be a “circuit, including a coil, for radiating and/or receiving a magnetic field.” PO Resp. 5–8. NFCT argues that this is the construction given to that term by the District Court in the *NFC Technology LLC v. Samsung Electronics Co.* case, and urges that it also is the broadest reasonable interpretation of the term in light of the specification and statements made during prosecution, and it is how a person of ordinary skill in the art would understand the term in view of the specification and prosecution history. *Id.* at 5–6 (citing Ex. 2003 (Claim Construction Memorandum and Order), 14; Ex. 2004 ¶ 30).

In support of its contentions, NFCT argues that the specification uses “antenna circuit” and “antenna coil” interchangeably, provides embodiments in which the antenna circuit includes a coil, and provides that the antenna circuit generates a magnetic field by way of the included coil. *Id.* at 6 (citing Ex. 1001, 1:16–17, 8:26, Fig. 1). NFCT also argues that the claims of the ’770 patent specify that the device transmits and receives data by “inductive coupling” and that the antenna circuit generates a “magnetic field”; and that extrinsic evidence cited by NXP confirms that inductive coupling requires an antenna circuit that includes a coil. *Id.* (citing Ex. 1001, 12:29–31; Ex. 1006, 36⁴; Ex. 2004 ¶¶ 31–32). NFCT further contends that the inventors “clearly and unmistakably limited the antenna circuit of their invention to require a coil” during prosecution by arguing, for example, that “utilizing the inductive coupling technique, *as in the present invention . . .*, a reader emits a radio frequency (RF) *magnetic field* by way of a resonant *antenna circuit which includes a coil.*” *Id.* at 6–7 (quoting Ex. 1002, 269 (Reply to Office Action filed Jan. 27, 2006, at 24)). NFCT contends, “[t]he inventors repeated this statement numerous times while distinguishing Gunnarsson, which discloses transmitting microwave signals using an antenna without a coil.” *Id.* (citing Ex. 1002, 268–69, 271, 274 (Reply to Office Action dated Jan. 25, 2006, at 23–24, 26, 29)). Lastly, NFCT

⁴ For consistency with the parties’ briefing, cited page numbers of Exhibits 1006 and 1008A herein refer to the original page numbers of RH-E and RH-G rather than the exhibit-stamped page numbers.

contends that the scope of this term is in dispute and that construction “is necessary to determine whether Gunnarsson alone discloses it or whether it is disclosed in combination with the RFID Handbook.” *Id.* at 7.

NXP replies that NFCT’s constructions are “immaterial” and “unnecessary.” Pet. Reply 1. In particular, according to NXP, NFCT does not dispute that the RFID Handbook, cited for all challenged claims, discloses inductive coupling, and “[NFCT’s] construction of ‘antenna circuit,’ while improperly requiring a coil, is immaterial because NFCT ‘admits all ‘inductive’ antennas ‘require . . . a coil.’” *Id.* at 1, 2 n.1 (citations omitted) (quoting PO Resp. 6–7).

In the Decision on Institution, in response to similar arguments previously presented by NFCT in its Preliminary Response filed in this case (Paper 10, 7–9), we explained that we agreed with NFCT and the District Court that, in view of the inventors’ statements during prosecution, the inventors disclaimed devices having antenna circuits that do not include a coil, but that that point did not appear to be in dispute on the record before us, and we determined that there was no need to construe further the term “antenna circuit” at that stage of the proceeding. Dec. on Inst. 13 (citing *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy.’”)). We further explained that, because challenged independent claims 1 and 28 already explicitly recite “an antenna circuit to generate a magnetic field” and “an antenna circuit that generates a magnetic field,” respectively (Ex. 1001, 12:29, 15:22), NFCT’s proposed inclusion of

“for radiating . . . a magnetic field” would not add meaningfully to the broadest reasonable interpretation of the term “antenna circuit.” Dec. on Inst. 13. Finally, we explained that although the specification of the ’770 patent describes an embodiment in which a magnetic field sent by a CIC reader appears by induction in the antenna circuit of another CIC reader (*see, e.g.*, Ex. 1001, 9:10–13), we were not persuaded on the record then before us that the broadest reasonable interpretation of the term “antenna circuit” requires the language “for . . . receiving a magnetic field.” Dec. on Inst. 13–14.

In light of the fully developed record before us, including Dr. Apsel’s testimony (Ex. 2004 ¶¶ 30–33) cited by NFCT and Dr. Mihran’s reply testimony (Ex. 1016 ¶¶ 7–21) cited by NXP, we continue to agree with NFCT that the broadest reasonable construction of “antenna circuit” requires a coil. Nonetheless, for the reasons discussed above, we remain unpersuaded that it would be necessary or proper additionally to include “for radiating and/or receiving a magnetic field” in the construction of “antenna circuit.” Thus, we determine that the broadest reasonable construction of “an antenna circuit,” as recited in the challenged claims, is “a circuit, including a coil.”

2. *“load modulation signal”*

The term “load modulation signal” is recited in challenged independent claim 1 and in challenged dependent claims 2, 3, 6, 8, and 29–31. NFCT contends that this term “requires a signal that transmits data *by*

disturbing the magnetic field of another device” and excludes signals used in microwave systems. PO Resp. 8–16.

Regarding the first contention, NFCT argues more particularly that “load modulation” is a term of art that refers, in the context of radio-frequency identification (“RFID”) systems, to the particular way in which data is transmitted between two inductive devices. *Id.* at 8 (citing Ex. 2004 ¶ 35). According to NFCT, the specification of the ’770 patent describes a load modulation signal in two different contexts. *Id.* In one, a CIC sends data to a reader by short-circuiting the antenna circuit using a switch driven by a load modulation signal. *Id.* (citing Ex. 1001, 1:31–34). In the other, a CIC reader sends data to another device by applying a load modulation signal to the antenna circuit. *Id.* (citing Ex. 1001, 2:63–3:2). This disturbs the magnetic field sent by the other device in a manner similar to short-circuiting the antenna circuit, and the other device detects the disturbance as a load modulation signal of a CIC despite the absence of a corresponding CIC load modulation switch. *Id.* (citing Ex. 1001, 11:48–57). In both of these contexts, NFCT contends, “the load modulation signal transmits data by causing a disturbance in a magnetic field generated by another device,” and “[t]he specification refers to both of these situations as sending data to another device ‘according to the *load modulation principle*.’” *Id.* at 8–9 (citing Ex. 1001, 2:35; Ex. 2004 ¶ 36). NFCT asserts that a person of ordinary skill in the art “would understand that the ‘load modulation principle’ is the principle of transmitting data by disturbing the magnetic field produced by another device, rather than the act of switching on and off

an impedance” (*id.* at 9 (citing Ex. 2004 ¶¶ 35–36)). In addition, NFCT contends that “[t]he prosecution history also supports this construction” (*id.* (citing Ex. 1002, 274 (Reply to Office Action filed Jan. 27, 2006, at 29) (inventors explaining that “the device applies a load modulation signal to *disturb the magnetic field* generated by another device.”))). In contrast, NFCT contends, NXP’s expert “Dr. Mihran adopts a construction that does not require another device to generate a magnetic field,” and “[h]is construction ignores the scope given to the term load modulation by the ’770 patent.” *Id.* (citing Ex. 2005 (Mihran deposition transcript), 53:10–20).

NFCT additionally asserts that the RFID Handbook confirms NFCT’s construction and expressly defines load modulation. *Id.* at 10 (citing Ex. 1006, 37–38; Ex. 2004 ¶ 39). In particular, NFCT contends:

The RFID Handbook explains that “inductively coupled systems are based upon a transformer-type coupling” between coils. Ex. 1006 at 37. When a resonant transponder is placed within the magnetic field of a reader’s antenna, the transponder “draws energy from the magnetic field.” *Id.* This additional power consumption is measured as a voltage drop in the reader. *Id.* at 37–38. By switching on and off a load resistance in the transponder’s antenna, a voltage change (*i.e.*, a disturbance) at the reader’s antenna is created. *Id.* at 38. As a result, if the switching is controlled by data, data may be transferred from the transponder to the reader. *Id.* “*This type of data transfer is called load modulation.*” *Id.* Thus, the RFID handbook confirms that “load modulation” refers to a particular “*type of data transfer*” and not simply to the act of varying an impedance. Ex. 2004 at ¶ 39.

PO Resp. 10. NFCT contends that Mr. Mihran's broad definitions of "load modulation" and "load modulation signal" ignore this definition. *Id.*

Lastly, NFCT points out that, in the Decision on Institution, we preliminarily declined to construe "load modulation signal" as a "signal that transmits data by causing a disturbance of a magnetic field generated by another device" on the basis that certain claims of the '770 patent already recite that the load modulation signal disturbs a magnetic field and that the signal causes the disturbance when data is to be transmitted. *Id.* at 10–11 (citing Dec. on Inst. 14–15). NFCT contends, however, that its construction "is focused on the particular mechanism *by which* data is transferred—that is, a 'signal that transmits data *by* causing a disturbance of a magnetic field generated by another device.'" *Id.* at 11. Through inclusion of the word "by," NFCT contends, its construction "specifies that the disturbance of magnetic field is the mechanism through which data transfer is achieved," and "[t]herefore, the fact that other claim elements may elaborate that the load modulation signal disturbs a magnetic field *when* data is transmitted does not obviate a construction that specifies that the disturbance is the mechanism *by which* data transfer is achieved." *Id.* (citing Ex. 2004 ¶¶ 34–39).

As noted above, NFCT also contends that the term "load modulation signal" excludes signals used in microwave systems. *Id.* at 11–12. NFCT argues that a skilled artisan would understand the same and that the factual record is devoid of any support—other than Dr. Mihran's statements—for construing the term to include signals used in microwave systems. *Id.* at 12

(citing Ex. 2004 ¶¶ 40–41). NFCT asserts that Petitioner’s extrinsic evidence confirms this point. *Id.* at 12–13 (citing Ex. 1006, Fig. 3.1, 25 (listing “load modulation” only under the category of inductive coupling, and “backscattering” under microwave), 37–41 (discussing load modulation and inductive coupling), 90–98 (same), 41–45 (discussing backscatter and microwave), 105–110 (same)). NFCT acknowledges that Dr. Mihran cited a Microchip Technology Inc. “application note” titled “Passive RFID Basics” that discusses “backscattering” using an “antenna coil” (Ex. 1014, 1), but contends that the referenced discussion “does not change this analysis because, even if taken as true, it merely suggests that load modulation is sometimes referred to under a broader umbrella as ‘backscatter’ and not that microwave backscatter signals are included within the term load modulation signal.” PO Resp. 13 (citing Ex. 1003 ¶ 41; Ex. 2004 ¶ 42). NFCT also acknowledges Dr. Mihran’s reference to the RFID Handbook as stating that load modulation and backscattering are “closely related,” but contends that a person of ordinary skill would understand that describing those techniques as closely related specifies that they are not the same. *Id.* at 14 (citing Ex. 1006, 44; Ex. 2004 ¶ 43; Ex. 2005, 129:2–130:21). Finally, NFCT contends that, although a skilled artisan would understand that communication in the broader context of electronic communications generally involves modulation of one or more characteristics such as frequency, phase, or amplitude of a signal, and such modulation often involves switching on and off of a load, “this does not mean all forms of modulation involving a load fall within the meaning of ‘load modulation,’ as

that term is used in the '770 patent and expressly defined in the RFID Handbook.” *Id.* at 15 (citing Ex. 2004 ¶ 47). Instead, NFCT argues, “a skilled artisan would understand that ‘load modulation’ refers to a particular way of transmitting information in an *inductive system* that excludes signals used in a microwave system.” *Id.* (citing Ex. 2004 ¶ 47).

NXP replies that NFCT’s constructions are “immaterial” and “unnecessary,” as noted in the above discussion of “antenna circuit.” Pet. Reply 1. In particular, according to NXP, NFCT does not dispute that the RFID Handbook, cited for all challenged claims, discloses inductive coupling, and “[NFCT’s] construction of ‘**load modulation signal**’ is also contrary to Handbook’s and ’770’s definitions of ‘load modulation.’” *Id.* at 1–2 (citations omitted) (quoting PO Resp. 6–7). NXP contends that both the RFID Handbook and the ’770 patent require “short-circuiting” a load. *Id.* at 2–3 (quoting Ex. 1001, 1:31–34 (“sends data to . . . a reader by load modulation, i.e. by short-circuiting its antenna circuit by means of a switch driven by a load modulation signal S_x ”); Ex. 1006, 38 (“If the switching on and off of the load resistor is controlled by data, then this data can be transferred from the transponder to the reader. This type of data transfer is called *load modulation*.”)) (citing Ex. 1003 ¶¶ 47–48; Ex. 1016 ¶ 27). According to NXP, neither definition requires “inductive-based systems.” *Id.* at 3 (citing Ex. 1016 ¶¶ 25–33; PO Resp. 8). Rather, NXP contends, the specification’s references to inductive coupling describe only exemplary embodiments and do not limit the term “load modulation.” *Id.* (citing

Ex. 1001, 1:15–16, 4:67–5:4, 12:19–25 (stating ’770 patent is “not limited” to disclosed embodiments)).

NXP further contends the claims of the ’770 patent also do not support NFCT’s construction, because, for example, claim 29 recites “load modulation signal” but does not further require “inductive coupling” or “disturbing the magnetic field,” and those limitations “cannot be read into” claim 29. *Id.* (citing Dec. on Inst. 15; Ex. 1016 ¶¶ 22–24; *SRI Int’l. v. Matsushita Elec. Co.*, 775 F.2d 1107, 1122 (Fed. Cir. 1985)). NXP asserts that NFCT’s construction improperly imports “being configured to disturb the magnetic field” from claim 30 into claim 29, from which it depends. *Id.* (citing Dec. on Inst. 15; Ex. 1016 ¶ 24; *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 910 (Fed. Cir. 2004) (“[T]he presence of a dependent claim that adds a particular limitation raises a presumption that the limitation . . . is not found in the independent claim.”)).

Lastly, NXP contends that NFCT “admits extrinsic evidence (*Microchip AN680* ([Ex. 1014,] 1) ‘suggests that load modulation is sometimes referred to ***under a broader umbrella as “backscatter”***’ ([PO Resp.] 13); and a [person of ordinary skill in the art] would ‘understand that . . . communication generally involves ***modulation***’ and ‘[m]odulation . . . can ***involve switching on and off an[sic] load***’ ([PO Resp.] 13–15); [Ex. 1016] ¶ 34.” Pet. Reply 2–3 (alterations in original). NXP concludes, “[l]oad modulation signal’ should be given its plain and ordinary meaning under [the broadest reasonable interpretation] in light of

the specification and, to the extent a construction is required, it means ‘signal used to alter a load.’” *Id.* at 4 (citing Ex. 1016 ¶ 35).

In light of the fully developed record now before us, particularly including Dr. Apsel’s testimony (Ex. 2004 ¶¶ 34–47) cited by NFCT and Dr. Mihran’s reply testimony (Ex. 1016 ¶¶ 22–35) cited by NXP, as well as further consideration of the claim differentiation arguments presented in connection with claims 29 and 30, we are persuaded that “load modulation signal” is a term of art in the context of RFID systems, specifically referring to a signal that transmits data by disturbing the magnetic field of another device in an inductive coupling system, and that NFCT’s proposed construction, accordingly, is the broadest reasonable construction of that term.

We also agree with NFCT that this construction does not conflict with the presumption that a limitation added by a dependent claim is not found in its base claim. *See Liebel-Flarsheim*, 358 F.3d at 910. Claim 29 depends from claim 28 and adds the limitation “wherein the reader is configured to apply a load modulation signal with two states to the antenna circuit when the reader operates in the second operating mode and when data is to be transmitted to the other reader.” Ex. 1001, 15:36–40. The consequence of applying NFCT’s construction to that claim, thus, is that the *reader* must be *configured* to apply a signal that transmits data by disturbing the magnetic field of another, unspecified device. Claim 30, however, additionally requires the reader to be configured to apply to the antenna circuit not merely such a “signal that transmits data by disturbing the magnetic field of

another,” but more specifically a signal “comprising pulses of an alternating signal, the duration of each pulse being longer than the period of the alternating signal” and that is “configured to disturb the magnetic field generated by the second reader and being configured to be detected by the second reader as if [it] were a load modulation signal applied to an antenna load modulation switch of a contactless integrated circuit.” *Id.* at 15:41–50. Because NFCT’s proposed construction does not simply read narrowing limitations from claim 30 into claim 29, we disagree with NXP’s contention that the claims of the ’770 patent do not support NFCT’s construction. Pet. Reply 3.

Thus, we determine that the broadest reasonable construction of “load modulation signal,” as recited in challenged claims 1–3, 6, 8, and 29–31, is a “signal that transmits data by disturbing the magnetic field of another device.”

B. Legal Principles

To prevail in an *inter partes* review, a petitioner must prove the unpatentability of the challenged claims by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). “[T]he petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). The burden of persuasion never

shifts to the patent owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review). Furthermore, a petitioner cannot satisfy its burden of proving obviousness by employing “mere conclusory statements.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of non-obviousness, i.e., secondary considerations.⁵ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Additionally, the obviousness inquiry typically requires an analysis of “whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring “articulated reasoning with some rational underpinning to support the legal conclusion of

⁵ The parties do not address secondary considerations, which, accordingly, do not form part of our analysis.

obviousness”)); *see also In re Warsaw Orthopedic, Inc.*, 832 F.3d 1327, 1333 (Fed. Cir. 2016) (“As part of the obviousness inquiry, we consider ‘whether a [person of ordinary skill in the art] would have been motivated to combine the prior art to achieve the claimed invention and whether there would have been a reasonable expectation of success in doing so.’” (quoting *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356, 1360 (Fed. Cir. 2006))).

We analyze the instituted grounds of unpatentability in accordance with the principles stated above.

C. Level of Skill in the Art

Based on testimony of Dr. Mihran, NXP contends that the applicable person of ordinary skill in the art would have a minimum of a bachelor’s degree in electrical engineering, or an equivalent field, and approximately three to five years of industrial or academic experience in working with wireless communication technology, including RFID devices and systems. Pet. 14 (citing Ex. 1003 ¶¶ 28–30). NFCT does not dispute this assessment of the level of skill and states that it and Dr. Apsel have used this definition in their analyses. PO Resp. 5 (citing Ex. 2004 ¶ 26).

We see no compelling reason to apply a different level of skill than that accepted by both parties and accordingly adopt the level of skill advocated by Petitioner.

*D. Overview of the Prior Art*⁶

1. *Gunnarsson*

Gunnarsson, titled “Information Link,” describes a system for transmitting information between communications units and/or transponders, where, for example, “a portable communications unit includes circuits for wireless communication with both transponders and with stationary communications units.” Ex. 1004, 1:3–7. Gunnarsson explains that microwave transponders are used “in many connections” for automatic identification, including in factory automation, logistic flows, and in entrances to control the entry of motor vehicles and people. *Id.* at 1:11–21. The transponders deliver data by forming information sidebands on one or both sides of an incident microwave signal from a communications unit, “without further energy being supplied from the transponder,” whereas the communications unit may be either a read-type unit designed solely to receive data from transponders, or a read-write-type unit designed also to write new data into the transponders via a coded microwave signal. *Id.* at 1:14–18, 1:25–29.

According to Gunnarsson, the transmission technology is “well described in the literature.” *Id.* at 1:23–24. Gunnarsson identifies as a

⁶ For consistency with the parties’ briefing, cited page numbers of Exhibits 1004, 1006, and 1008A herein refer to Gunnarsson’s and the RFID Handbook’s original page numbers, rather than to the exhibit-stamped page numbers.

problem with the described applications that the communications unit is often stationary and out of range of the transponder when it is necessary to read the transponder. *Id.* at 1:31–33. Gunnarsson states that one known solution was to provide a battery-powered mobile communication unit that was able to store temporarily data from transponders for later transmission to a central computer, or data from the central computer for later transmission to transponders, but that the connection from the mobile communications unit to the central computer was normally achieved through an inconvenient, time-consuming, and unreliable physical data line. *Id.* at 2:4–18.

Gunnarsson states that another known solution used microwaves both for transponder communication and for communication between communications units, such that wireless transmission could be achieved quickly and reliably, but that that solution required separate circuits in the communications unit for enabling the achievement of wireless transmission, and provided an often-greater-than-necessary effective transmission range. *Id.* at 2:20–3:2.

Gunnarsson discloses a solution in which the same technology is used for communication between the portable and the stationary communications unit as that applied when a communications unit reads a transponder. *Id.* at 3:11–14. According to Gunnarsson:

By varying the impedance experienced from another communications unit via the antenna system of the communications units in accordance with a pattern that corresponds to the transmitted data stream, information sidebands are generated in the same way as when the transponder

is read in a known manner. This variation in impedance may, for instance, be achieved by switching on and off one of the modulation circuits. These modulation circuits are often found in connection with the antenna system of the communications unit and are, e.g., intended to modulate the carrier wave for writing data into the transponder, to attenuate the input signal in order to reduce any interference, or to lower the power of the microwave signal in order to reduce the range of the communications unit in certain cases.

Id. at 3:18–32. Gunnarsson further discloses that the communications unit can behave in the field of another communications unit “as a transponder,” “provided that corresponding attenuators are controlled with a signal that corresponds to the data stream to be transferred,” and that it may be beneficial to establish communication between communications units. *Id.* at 3:35–4:20.

Figures 1–3 of Gunnarsson are reproduced below.

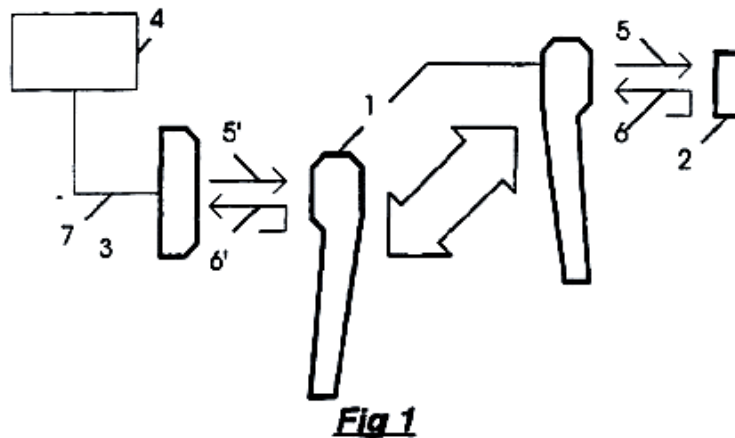


Figure 1 illustrates how a portable communications unit labeled as element 1 communicates with a transponder labeled as element 2, and also

with a stationary communications unit labeled as element 3 that is connected to a central computer labeled as element 4. *Id.* at 6:6–9.

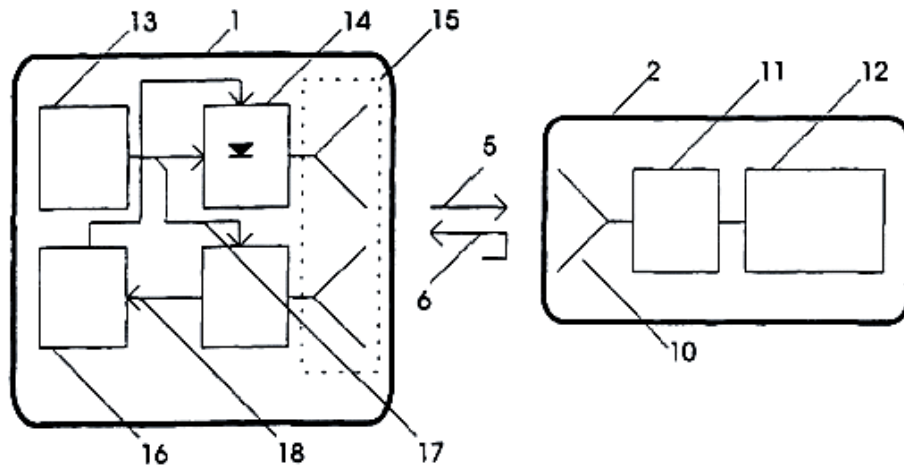


Fig 2

Figure 2 is a more detailed illustration of portable communications unit 1 and transponder 2. *Id.* at 6:28–29.

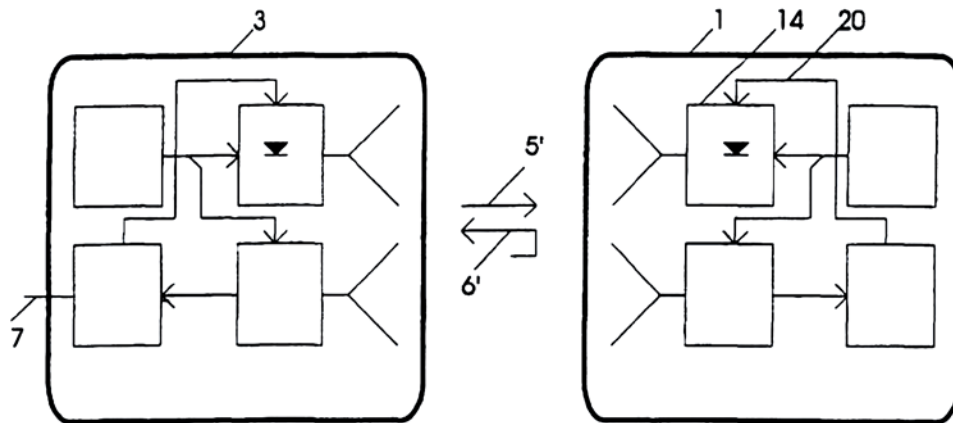


Fig 3

Figure 3 is a more detailed illustration of transmission of data from portable communications unit 1 to stationary communications unit 3. *Id.* at 7:24–25.

With reference to Figures 1 and 2, when portable unit 1 is to read transponder 2, microwave signal 5 is transmitted from portable unit 1 via antenna system 15 and received by transponder 2 via antenna system 10. *Id.* at 6:11–17, 6:29–34. Modulation circuits 11 of transponder 2 modulate signal 5 “in a known manner,” such as by forming information sidebands/spectrum signal 6 reflected out from transponder 2 via antenna system 10; and spectrum signal 6 is captured and decoded by portable unit 1. *Id.* Modulation circuit 14 of portable unit 1 is constantly open when reading the transponder. *Id.* at 7:5–7. When writing data to transponder 2, modulation circuit 14 is controlled with a bit stream from processor/memory 16 of portable unit 1, corresponding to the data to be transferred, and modulation circuits 11 function as detection circuits for entering the bit stream into memory/register 12 of transponder 2. *Id.* at 7:9–14.

With reference to Figures 1 and 3, information may be transferred between stationary communications unit 3 and portable communications unit 1 “in accordance with the same principle.” *Id.* at 6:20–22. In particular, stationary communications unit 3 transmits microwave signal 5' and receives data via information sidebands 6' from portable communications unit 1. *Id.* at 6:23–25. This function is reciprocal, so data may also be transferred from stationary communications unit 3 to portable communications unit 1. *Id.* at 7:26–28. Gunnarsson discloses that modulation circuits 14 of portable communications unit 1 may be of a type that changes its impedance depending on the status of signal 20, such that incident microwave signal 5' from the stationary unit will sometimes be reflected and sometimes be

absorbed in the modulator. *Id.* at 7:31–8:3. Thus, according to Gunnarsson, by controlling modulation circuits 14 via signal 20 with earlier-received transponder data, sideband signal 6' can be formed analogously with the function of the transponder. *Id.* Alternatively, modulator 14 may influence the phase of the reflective signal 6' or provide a combination of phase and amplitude modulation. *Id.* at 8:3–5. Thus, portable communications unit 1 need not be switched on when transmitting data to stationary communications unit 3. *Id.* at 8:5–7.

2. *RFID Handbook*

Both versions of the RFID Handbook, i.e., RH-E and RH-G, relate to automatic identification procedures and technology and have similar disclosures. The RFID Handbook explains that although the most common form of electronic-data-carrying device in use in everyday life is the smart card, the mechanical contact used in the smart card is vulnerable to degradation, and a contactless transfer of data between a data-carrying device and its reader avoids these disadvantages while providing other benefits. Ex. 1006, 1, 4–7; Ex. 1008A, 5, 7–8. One type of contactless ID system is an RFID system. Ex. 1006, 6; Ex. 1008A, 7. The RFID Handbook explains that RFID systems are made up of two components: a transponder, which is located on an object to be identified and stores data, and an interrogator or reader, which may be read-only or may have read/write capabilities. Ex. 1006, 6–7; Ex. 1008A, 7, 9. The transponder includes a coupling element, which may be a coil or microwave antenna, and an electronic microchip. Ex. 1006, 8, Fig. 1.6; Ex. 1008A, 9, Fig. 1.6. The

power required to activate the transponder, which does not usually possess its own voltage supply, is supplied contactlessly through the coupling unit, as is the timing pulse and data; hence, the transponder is only activated when it is within the interrogation zone of a reader. Ex. 1006, 8; Ex. 1008A, 10. The transponder is totally passive when not within the interrogation zone of a reader. Ex. 1006, 8; Ex. 1008A, 10.

A transponder is depicted in Figure 1.8 of the RFID Handbook, which is reproduced below.

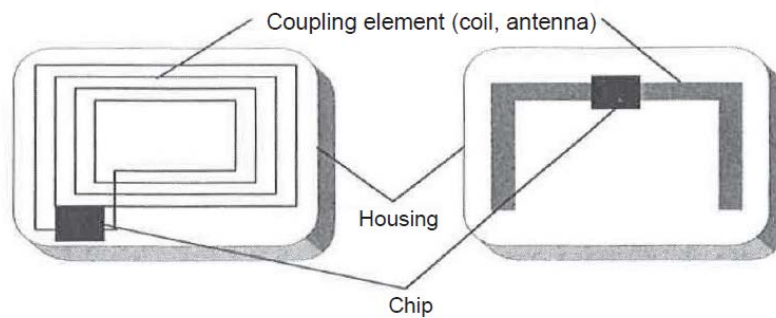


Figure 1.8 illustrates the basic layout of two types of transponders, including an inductively coupled transponder with an antenna coil on the left. Ex. 1006, 9; Ex. 1008A, 10. According to the RFID Handbook, in an inductive coupling system, “the reader’s antenna coil generates a strong, high frequency electro-magnetic field, which penetrates the cross-section of the coil area and the area around the coil,” and “[a] small part of the emitted field penetrates the antenna coil of the transponder,” generating “[a] voltage . . . in the transponder’s antenna coil by inductance.” Ex. 1006, 35; Ex. 1008A, 36. This voltage is rectified and serves as the power supply for a microchip on the transponder. Ex. 1006, 35; Ex. 1008A, 36. Further, “[t]he

switching on and off of a load resistance at the transponder's antenna . . . effects voltage changes at the reader's antenna and thus has the effect of an amplitude modulation of the antenna voltage by the remote transponder." Ex. 1006, 38; Ex. 1008A, 38. "If the switching on and off of the load resistor is controlled by data, then this data can be transferred from the transponder to the reader," and "[t]his type of data transfer is called *load modulation*." Ex. 1006, 38; Ex. 1008A, 38.

3. *Bashan*

Bashan, titled "Contact/Contactless Data Transaction Card," describes a "data transaction device having contact and contactless modes of operation, compris[ing] a semiconductor device for operating in contact and contactless modes in accordance with a respective contact or contactless data communications protocol." Ex. 1011, [57]. A coil antenna allows contactless data transmission in accordance with the contactless protocol. *Id.* Bashan discloses that alternating current (AC) voltage rails are connected to the coil connection terminals "for feeding an AC voltage thereacross when the coil antenna . . . is inductively coupled to an electromagnetic field." *Id.* at 5:1–4. In order to switch between contact and contactless modes of operation, Bashan discloses that the device contains a "mode status flag CM" that "is set to logic '0' for contactless mode and is set to logic '1' for contact mode." *Id.* at 8:5–7. The mode status flag is "used by the control logic within the antenna interface . . . in order to dictate its manner of operation." *Id.* at 8:8–10. Bashan further discloses that operation of "antenna interface 16 may be controlled and customized by

means of an EEPROM 53 and a programming unit 54,” and “in order that the output CM may be set to a desired logic level regardless of the presence or absence of the electromagnetic field across the coil antenna 15, the mode detector 52 is also responsively coupled to the EEPROM 53 so that its status can be programmed.” *Id.* at 6:34–36, 6:52–56.

E. Comparison of Claimed Subject Matter and Prior Art

1. NXP’s Contentions

NXP contends that claims 1–3, 6–8, and 11 of the ’770 patent are unpatentable under 35 U.S.C. § 103(a) over the combination of Gunnarsson and the RFID Handbook and that claims 10, 28–31, 34, and 35 are unpatentable over the combination of Gunnarsson, the RFID Handbook, and Bashan. Pet. 28–59.

NXP cites the RFID Handbook as disclosing, *inter alia*: (1) that RFID systems employing transponders having CICs for wireless communication with readers were well-known more than a year before the earliest priority date claimed by the ’770 patent; (2) that transponders/CICs in RFID systems employing inductive coupling were known at that time to communicate via “load modulation,” or modulating a magnetic field generated by the reader; (3) that transponders/CICs in microwave-based electromagnetic coupling RFID systems were known to communicate via “backscattering,” or modulation of a microwave-frequency RF carrier generated by the reader; (4) that the load modulation and backscattering techniques are “closely related”; and (5) that inductive coupling systems were the most common type of RFID system at that time. Pet. 1–3 (citing Ex. 1006, 5–9, 13, 21, 34,

37–39, 41–42, 202–03, 229, 241, 275–76; Ex. 1008A, 6–10, 13, 21, 34, 38–40, 42–43, 186–87, 217, 230, 259–60), 5–6 (citing Ex. 1006, 21, 34, 37–38, 41–42; Ex. 1008A, 21, 34, 38–39, 42–43). NXP also contends that the RFID Handbook discloses various applications of RFID systems that would motivate an RFID system designer to select inductive coupling over a microwave backscattering system. *Id.* at 6 (citing Ex. 1006, 276; Ex. 1008A, 260), 19. In particular, according to NXP, “Chapter 14 [of the Handbook] provides ‘points that should be considered in the selection of an RFID system,’ including the ‘range of an application’ which . . . generally dictates the choice of inductive coupling or microwaves.” *Id.* at 18 (citing Ex. 1006, 275–76; Ex. 1008A, 259–60). Moreover, “[t]he Handbook gives the example of contactless counting applications, such as tickets for public transport, where a designer would be motivated to choose inductive coupling over microwaves,” as the greater range of the latter system could lead to problems insofar as it would not be possible “to reliably match the ticket to the passenger.” *Id.* (citing Ex. 1006, 276; Ex. 1008A, 260).

NXP cites Gunnarsson as disclosing, more than a year before the earliest priority date claimed by the ’770 patent, an RFID reader (i.e., Gunnarsson’s “portable communications unit”) having a first mode of operation in which the reader communicates with transponders, and a second mode of operation in which the reader communicates with other readers by simulating a transponder. *Id.* at 4. NXP contends that, although Gunnarsson describes a microwave-based system, rather than an inductive coupling system, the RFID Handbook shows that a person of ordinary skill in the art

as of the earliest claimed priority date of the '770 patent “would have known that choosing a particular coupling implementation—inductive or microwave-based coupling—is a design choice based on the RFID system’s intended application” and “would also have known of the design benefits of using inductive instead of microwave-based coupling in appropriate RFID applications.” *Id.* at 5–6 (citing Ex. 1003 ¶ 57). According to NXP, “[t]he straightforward and predictable results achieved by these two known options were well understood, as were their practical implementation details: the Handbook explicitly explains, *inter alia*, that load modulation and backscattering are ‘closely related’ communication methods, chosen based on whether inductive or microwave-based coupling is selected.” *Id.* at 6 (citing Ex. 1003 ¶¶ 57–58; Ex. 1006, 34, 37–38, 41–42; Ex. 1008A, 34, 38–39, 42–43). NXP further contends it would have been obvious to a person of ordinary skill in the art to implement Gunnarsson’s dual-mode reader using the Handbook’s teachings of inductive coupling/load modulation in place of Gunnarsson’s microwave coupling/backscattering. *Id.* at 22 (citing Ex. 1003 ¶¶ 86–91). NXP explains that inductively coupled RFID systems greatly outnumbered microwave-based systems, and a person of ordinary skill in the art readily would have recognized that the benefits achieved by Gunnarsson’s dual-mode portable reader would also improve data collection in existing inductively coupled systems. *Id.* at 22–23 (citing Ex. 1003 ¶ 87). It would have been a straightforward and obvious design choice, NXP contends, to implement Gunnarsson’s reader using inductive coupling “so as to solve a similar problem in inductively coupled systems, for similar

benefits taught by Gunnarsson, as well as to enjoy in Gunnarsson the benefits of inductive over microwave communication . . . , and it would have been clear to a [person of ordinary skill in the art] that such a combination would work and provide expected functionality.” *Id.* at 23 (citing Ex. 1003 ¶ 87).

NXP acknowledges that Gunnarsson was cited by the Examiner during prosecution of the application for the ’770 patent as part of an obviousness combination and that the Examiner later allowed the claims without further comment following the applicants’ arguments (i) that Gunnarsson was not analogous art; (ii) that there was no motivation to combine Gunnarsson with another cited reference, Enguent; and (iii) that the combination failed to disclose all claimed limitations. *Id.* at 4–5 (citing Ex. 1002, 231–41, 266–75). Notwithstanding that the claims were allowed over Gunnarsson and Enguent, NXP contends that the Examiner did not have key prior art such as the RFID Handbook before him to show that the applicants’ arguments during prosecution were incorrect. *Id.* at 5.

NXP cites Bashan as disclosing a flag stored in a register to control switching from one of two operating modes to another in a system that includes inductive coupling, as recited in challenged claims 10 and 28. *Id.* at 22–23, 50–51 (citing Ex. 1011, 6:52–56, 8:5–11).

In the Petition, NXP provides both claim charts and a detailed descriptive mapping of Gunnarsson, the RFID Handbook, and Bashan onto each element of the challenged claims. *Id.* at 28–59. NXP also relies on the Declaration of Dr. Mihran (Ex. 1003 ¶¶ 83–108, 115–118, 123–125, 128–

130, 134–140, 143–148, 151–153, 156–158, 160–171, 174, 177, 180, 183, 186–188) to support its positions.

2. *NFCT's Contentions*

In response to NXP's contentions, NFCT raises six principal arguments: first, that NXP's proposed combination of Gunnarsson and the RFID Handbook lacks factual support and reasoned analysis, relying instead on impermissible hindsight (PO Resp. 1, 18–31); second, that a person of ordinary skill in the art would not have “converted” Gunnarsson from microwave to inductive technology (*id.* at 31–35); third, that Gunnarsson and the RFID Handbook fail to teach or suggest the “load modulation signal” limitation of claims 1–3, 6–8, 10, 11, 30, and 31 (*id.* at 35–40); fourth, that the prior art fails to teach or suggest a CIC reader configured to exchange data with another CIC reader, as recited in claims 28–31, 34, and 35 (*id.* at 40–43); fifth, that the prior art fails to teach or suggest a device that applies a load modulation signal comprising data representative pulses of an excitation signal, as required by dependent claims 2, 3, 30, and 31 (*id.* at 2, 43–58); and, sixth, that Gunnarsson does not qualify as prior art for an obviousness determination because it is not analogous to the '770 patent (*id.* at 58–60).

With respect to the first argument, NFCT contends that NXP's combination of Gunnarsson and the RFID Handbook lacks factual support and relies on hindsight and conclusory statements to supply critical components of the resulting dual-mode inductive reader, which components, NFCT contends, are neither disclosed in Gunnarsson nor the RFID

Handbook. *Id.* at 17–18. According to NFCT, “the asserted combination and its components result from an unexplained and factually unsupported *conversion* and/or *redesign* of Gunnarsson.” *Id.* at 18. NFCT contends that the “inductive coupling communications elements” for which NXP’s combination purports to exchange Gunnarsson’s components “were not ‘known’ as petitioner suggests.” *Id.* at 19 (citing Pet. 23). In particular, NFCT argues, the RFID Handbook “fails to disclose inductive coupling communications elements capable of operating in two modes or achieving reader-to-reader communications” and instead “limits its disclosure to traditional inductive readers that are incapable of performing load modulation in a second operating mode to communicate with another reader.” *Id.* at 19–20 (citing Ex. 2004 ¶ 50). Indeed, NFCT contends, “if the RFID Handbook already disclosed inductive coupling components, such as a modulator, capable of operating in two modes to achieve reader-to-reader communication by performing load modulation, Petitioner would not need to rely on Gunnarsson in the first place.” *Id.* at 20.

NFCT further contends that even if the RFID Handbook provided motivation to redesign Gunnarsson’s microwave system to employ inductive coupling, NXP fails to explain how that redesign would occur. *Id.* at 22. Relying on Dr. Apsel’s testimony, NFCT argues that neither Gunnarsson nor the RFID Handbook supports recognizing that teachings applicable to microwave systems are applicable to other systems, and neither reference explains how one would implement Gunnarsson’s principles in an inductive system. *Id.* (citing Ex. 2004 ¶ 52). According to NFCT, *choosing* between

inductive and microwave systems is not the same as *redesigning* a microwave system as inductive. *Id.* at 23 (citing Ex. 2004 ¶ 54). NFCT contends that the RFID Handbook is silent regarding any ability to convert between those technologies or to implement one as the other, and NXP provides no factual underpinning for the idea that a person of ordinary skill in the art would know how to “convert” between systems. *Id.* at 24 (citing Ex. 2004 ¶ 55).

Moreover, according to NFCT, neither Gunnarsson nor the RFID Handbook discloses that an inductive reader’s modulation circuit can also be used to perform load modulation, and neither reference suggests that a person of ordinary skill in the art would have known how to adapt a reader’s modulation circuit to perform load modulation. *Id.* at 28 (citing Ex. 2004 ¶¶ 64–66). Rather, according to NFCT, the only evidence that an inductive reader’s modulation circuit can also perform load modulation comes from the ’770 patent itself. *Id.* at 29. Therefore, NFCT contends, “even if the prior art supports somehow converting between microwave and inductive systems, it does not support Petitioner’s assertion that a skilled artisan would have recognized that the *redesigned* system would work.” *Id.* at 30 (citing Ex. 2004 ¶¶ 64–70).

NFCT next argues that a person of ordinary skill “would not have changed the fundamental operating principle of Gunnarsson by *redesigning* Gunnarsson from microwave to inductive,” but instead “would have simply plugged Gunnarsson’s portable communication unit in to ‘temporarily [store] data from several different transponders for later transmission of [the]

data to a central computer,” as “[s]uch an approach would achieve Petitioner’s stated purpose of collecting data in ‘existing’ inductive coupled systems without having to redesign and change the fundamental operating principle of Gunnarsson.” *Id.* at 31–32 (quoting Ex. 1004, 2:8–10) (citing Ex. 2004 ¶¶ 71–72); *see also id.* at 33–35 (alleging other possible options a person of ordinary skill in the art might instead have pursued).

In support of its argument that Gunnarsson and the RFID Handbook fail to teach or suggest the “load modulation signal” limitation of claims 1–3, 6–8, 10, 11, 30, and 31, NFCT contends, first, that Gunnarsson’s disclosure of microwave-based backscatter is not equivalent to “load modulation” and Gunnarsson “therefore fails to teach or suggest the load modulation signal feature of the claims.” *Id.* at 36. Additionally, NFCT contends, “Gunnarsson fails to teach or suggest a *load modulation* signal that is ‘configured to disturb [a / the] magnetic field generated by [another device / the second reader]’”—a point that NFCT contends NXP implicitly concedes by asserting in the Petition only that Gunnarsson’s signal “disturbs a field,” omitting the word “magnetic.” *Id.* at 37 (citing Pet. 33; Ex. 2004 ¶ 80). NFCT further contends that because Gunnarsson performs microwave backscatter, any signal in Gunnarsson could not be “*configured* to be detected as if it were a load modulation signal applied to an antenna load modulation switch of a contactless integrated circuit,” as required by the claims. *Id.* at 37–38 (citing Ex. 2004 ¶ 80).

While acknowledging that portions of the Petition specify exchanging Gunnarsson’s microwave communication elements for inductive coupling

communications elements (Pet. 23) or modifying Gunnarsson's portable communications unit to use inductive coupling (*id.* at 31), NFCT repeats its argument that the factual record does not contain anything that would lead a skilled artisan to conclude that microwave systems are convertible/redesignable into inductive systems, that the resulting signals would be configured to be detected as required by the claims, or that the resulting converted system would work. PO Resp. 38–39 (citing Ex. 2004 ¶ 81). Finally, NFCT asserts that, to the extent NXP contends that the RFID Handbook teaches how to convert and/or redesign Gunnarsson into an inductive device that applies a load modulation signal “configured to be detected by the [other device / second reader] as if the load modulation signal were a load modulation signal applied to an antenna load modulation switch of a contactless integrated circuit,” that contention is “wholly unsupported.” *Id.* at 39 (citing Ex. 2004 at ¶ 82).

NFCT contends that NXP “only asserts that the RFID Handbook teaches ‘[a] prior art way of achieving load modulation in [*a contactless integrated circuit*],’” and “[i]n each and every case, the RFID Handbook describes achieving load modulation in a CIC by switching on and off the *load modulation switch of the CIC*.” *Id.* (quoting Pet. 6) (citing Ex. 1006, 90–96; Ex. 2004 ¶ 82). According to NFCT, however, “Petitioner asserts that the load modulation signal feature in claims 1–3, 6–8, 10, 11, 30, and 31 is a negative limitation that ‘*expressly recites achieving load modulation without providing a load modulation switch of a CIC*,’” and “[t]herefore, because the RFID Handbook *only* teaches how to perform load modulation

using precisely what is excluded—a load modulation switch of a CIC—its teachings could not possibly be combined with Gunnarsson (which does not teach load modulation at all) to satisfy the load modulation signal feature of the claims.” *Id.* at 40 (quoting Pet. 13) (citing Ex. 2004 ¶ 83).

Regarding claims 28–31, 34, and 35, NFCT contends that the prior art fails to teach or suggest a CIC reader configured to exchange data with another CIC reader. *Id.* at 40–43 (citing Ex. 2004 ¶¶ 84–87). According to NFCT:

Petitioner contends that Gunnarsson, by itself, teaches “a portable contactless (*e.g.*, ‘wireless’) integrated circuit reader” because it is capable of reading a microwave transponder. Pet. at 51. But the claims are directed to an **inductive** CIC reader because they require an antenna circuit, which includes a coil that generates a magnetic field. Ex. 2004 at ¶ 85. And, as explained above in Section V.A [of the Patent Owner Response], Petitioner’s combination redesigns Gunnarsson into a system that no longer reads microwave transponders. Pet. at 52 (referring to claim element 1.1), 29 (describing claim element 1.1). Petitioner expressly relies on such a conversion for claims 28-31, 34, and 35 because each claim recites “generat[ing] a magnetic field” and Petitioner points to claim element 1.1 for teaching that element. Pet. at 52. Petitioner’s explanation for claim element 1.1 provides for “implement[ing] [the] Handbook’s teachings in Gunnarsson’s portable communications unit.” Pet. at 29. Dr. Mihran further states that the combination relies on using the RFID Handbook’s teaching of an inductive coupling antenna “*instead of* a microwave antenna.” Ex. 1003 at ¶ 94. Petitioner’s *resulting system* therefore is no longer capable of reading microwave transponders. Ex. 2004 at ¶ 86; *see also* Ex. 1003 at ¶¶ 160-65.

Thus, whether Gunnarsson's portable reader can read a microwave transponder is immaterial.

PO Resp. 41. NFCT further contends that “[b]y pointing to Gunnarsson’s reader alone, rather than Petitioner’s redesigned/converted reader, Petitioner chops the claims into pieces and attempts to show those pieces are disclosed *individually* in the prior art, rather than *together* in an asserted *combination*,” and “[t]his fails to establish obviousness.” *Id.* at 42.

Regarding dependent claims 2, 3, 30, and 31, NFCT contends that, in addition to issues set forth above affecting all the claims, “Gunnarsson, *even if converted* [into an inductive system], fails to teach or suggest a device that applies a load modulation signal comprising data representative pulses of an excitation signal, as recited in claims 2, 3, 30, and 31.” *Id.* at 43–44. In particular, NFCT contends, whereas “NXP asserts that Gunnarsson teaches two methods for performing microwave backscatter ([Pet.] 16, 24), one of which, when converted to inductive coupling, applies a load modulation signal comprising data representative pulses of the excitation signal to the antenna circuit,” “NXP is wrong because the cited portions of Gunnarsson both refer to the *same method* of passive backscatter modulation” and that “single method does not apply any signal comprising data representative pulses of the excitation signal to the antenna circuit.” PO Resp. 44–57. Moreover, NFCT contends, “even if Gunnarsson had disclosed applying an excitation signal to a microwave antenna, a person of ordinary skill in the art would not know to use an excitation signal to perform load modulation.” *Id.* at 44, 57–58.

Lastly, NFCT contends that “Gunnarsson does not qualify as prior art for an obviousness determination because it is not analogous to the ’770 patent.” *Id.* at 58. According to NFCT, Gunnarsson is neither in the same field of endeavor nor reasonably pertinent to the particular problem addressed by the invention of the ’770 patent. *Id.* at 59–60. In particular, NFCT contends, “[t]he specification, claims and prosecution history of the ’770 patent define the field of endeavor as inductively coupled transmitters and receivers, which are not within the same field as microwave-based ones.” *Id.* at 59 (citing Ex. 2004 ¶¶ 110–115). NFCT recognizes that we noted in the Decision on Institution that independent claim 28 and its dependent claims do not expressly recite “inductive coupling,” but NFCT contends that a skilled artisan would understand claim 28’s requirement of an “antenna circuit” that generates a magnetic field to specify inductive coupling. *Id.* (citing Dec. on Inst. 33; Ex. 2004 ¶ 112). NFCT further contends that “the more complete record now before the Board establishes that microwave and inductive systems are *not* readily interchangeable or convertible from one to the other,” and “[i]n view of the updated record, the Board should find that Gunnarsson is not within the same field of endeavor as the ’770 patent.” *Id.* (citing Ex. 2004 ¶ 115). NFCT additionally recognizes that we determined in the Decision on Institution that Gunnarsson is pertinent to the problem with which the claimed invention of the ’770 patent is concerned (*id.* at 60 (citing Dec. on Inst. 36–37)), but contends that “[t]he more complete record now before the Board demonstrates that Gunnarsson . . . would not have logically ‘commended

itself to an inventor’s attention in considering his problem’” (*id.* (quoting *K-Tec, Inc. v. Vita-Mix Corp.*, 696 F.3d 1364, 1375 (Fed. Cir. 2012))). NFCT contends that “[b]ecause a skilled artisan would not have understood microwave systems to be generally convertible/redesignable into inductive systems, a skilled artisan would not have looked to Gunnarsson to solve any problem in an inductive system.” *Id.* (citing Ex. 2004 ¶ 122). Thus, NFCT concludes, “because Gunnarsson is concerned with the problem of reading *out of range microwave transponders*, it is not directed to a problem that is reasonably pertinent to that of the ’770 patent, which addresses the problem of reading information from *fixed inductive terminals* used for access control and/or payments.” *Id.* (citing *In re Klein*, 647 F.3d 1343, 1348–52 (Fed. Cir. 2011)).

3. Analysis

a. Obviousness of Claims 1, 6–8, and 11 over Gunnarsson and the RFID Handbook

We have considered NXP’s explanations and supporting evidence in view of the arguments and evidence set forth in NFCT’s Patent Owner Response. We are persuaded that NXP has demonstrated by a preponderance of the evidence that claims 1, 6–8, and 11 are unpatentable over the combined teachings of Gunnarsson and the RFID Handbook.

As an initial matter, we disagree with NFCT’s arguments that Gunnarsson is not analogous art with respect to the claimed invention of the ’770 patent. PO Resp. 58–60. As we explained in our Decision on Institution, a prior art reference is considered to be analogous to a claimed

invention if it is either (1) from the same field of endeavor, regardless of the problem addressed or (2) reasonably pertinent to the particular problem with which the inventor is concerned, regardless of the field of endeavor. Dec. on Inst. 33 (citing *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004)). Based on the record then before us, we determined in the Decision on Institution that Gunnarsson is analogous art under either prong of *Bigio*. *Id.* at 33–37. After considering NFCT’s Patent Owner Response and cited evidence, we remain persuaded that Gunnarsson is analogous art under both prongs of *Bigio*. See PO Resp. 59–60; Ex. 2004 ¶¶ 110–122.

NFCT’s argument and Dr. Apsel’s opinion that Gunnarsson is not from the same field of endeavor both rest on an overly narrow definition of the field of the invention as “inductive coupling” systems. PO Resp. 59; Ex. 2004 ¶¶ 110–115. Although the specification and independent claim 1 of the ’770 patent recite inductive coupling, and although we also acknowledge NFCT’s contention that a skilled artisan would understand claim 28’s requirement of “an ‘antenna circuit’ that generates a magnetic field” also to specify inductive coupling (PO Resp. 59 (citing Ex. 2004 ¶ 112)), we remain persuaded by NXP’s evidence that the microwave-based communication system described by Gunnarsson is within the same field of endeavor as the inductive coupling system of the ’770 patent, namely, “contactless ID” or “RFID” systems. We also remain persuaded by that evidence that a person of ordinary skill in the RFID art would have regarded the selection of one technology over the other merely as being guided by the principles set forth in the cited prior art, such as based on a system’s desired

communication range. *See, e.g.*, Ex. 1006, 11–13, 21–22 (providing an overview of RFID systems, and explaining that systems with write and read ranges of up to 1 m “are based upon an *inductive (magnetic) coupling* between reader and transponder,” whereas systems “for ranges typically between 1 m and 10 m . . . operate using electromagnetic waves in the *microwave range*”); Ex. 1008A, 8, 11–14, 21 (same).

As we previously explained (Dec. on Inst. 34–35), *Bigio* does not limit the field of endeavor to *only* what is recited in the claims. In that case, in spite of the claims at issue being explicitly limited to a “hair brush,” the court held that the Board had correctly concluded that “Flemming’s toothbrush was in *Bigio*’s field of endeavor because ‘the structural similarities between toothbrushes and small brushes for hair would have led one of ordinary skill in the art working in the specific field of hairbrushes to consider all similar brushes including toothbrushes.’” *Bigio*, 381 F.2d at 1323, 1326; *see also Wyers v. Master Lock*, 616 F.3d 1231, 1238 (Fed. Cir. 2010) (“The Supreme Court’s decision in *KSR* . . . directs us to construe the scope of analogous art broadly . . .”). Similarly, we conclude that the similarities between inductive coupling and microwave-based RFID systems would have led one of ordinary skill in the art working with inductive coupling systems to consider microwave-based prior-art systems as being in the same field of endeavor. Although NFCT has pointed out differences between those systems, we are persuaded that the identified distinctions are such that one of ordinary skill working with one system still would have considered the other system.

Having determined that Gunnarsson is analogous art under the first prong of *Bigio*, we need not consider the second prong. We nonetheless note that after considering NFCT's assertions in the Patent Owner Response with respect to the second prong of *Bigio*, we remain persuaded that second prong is satisfied. See PO Resp. 60. As we previously explained (Dec. on Inst. 35–36), Gunnarsson identifies a need for RFID readers to be able to communicate with one another when multiple readers are required to read transponders (Ex. 1004, 1:31–2:6) and discloses that that problem may be solved by providing a reader (i.e., portable communications unit 1) having two modes: one in which the reader collects data from a transponder, and a second in which it transmits data, as if it were itself a transponder, to a second reader (stationary communications unit 3) (*id.* at 3:11–4:3, 5:9–20, 6:11–26, Fig. 1). Even apart from our determination *supra* that Gunnarsson and the '770 patent are in the same field of endeavor, we find Gunnarsson's disclosure of readers that extract data from other readers (i.e., portable communications units) (*see, e.g., id.* at 4:17–30, Fig. 1) clearly to be “reasonably pertinent to the particular problem with which the inventor” of the '770 patent was concerned, as identified by NFCT, namely, “the problem of reading information from fixed inductive terminals used for access control and/or payments” (PO Resp. 60 (emphasis omitted)). Furthermore, because the second prong of *Bigio* is evaluated regardless of the field of endeavor, NFCT's argument that “a skilled artisan would not have understood microwave systems to be generally convertible/redesignable into

inductive systems” (PO Resp. 60) also is unpersuasive with respect to the second prong.

With regard to the substantive disclosures of Gunnarsson and the RFID Handbook, we are persuaded that NXP sufficiently demonstrates that Gunnarsson teaches all elements of independent claim 1 and dependent claims 6–8 and 11, with the exception of transmitting or receiving data “by inductive coupling,” an “antenna circuit,” as that term is properly construed to require an antenna coil (*see supra* § III.A.1), and generating a “magnetic” field, as recited in claims 1 and 7; and that the RFID Handbook teaches those remaining elements not disclosed by Gunnarsson. Pet. 27–35, 41–49, 51–52. We also are persuaded by NXP’s argument, supported by Dr. Mihran’s testimony, as to the reasons that a person of ordinary skill in the art would have combined the teachings of Gunnarsson and the RFID Handbook. *See, e.g., id.* at 22–24; Ex. 1003 ¶¶ 86–91.

In contrast, we are not persuaded by NFCT’s arguments that the cited combination is the result of impermissible hindsight reconstruction and would not have resulted in the claimed invention. PO Resp. 1, 18–22, 27–35. For reasons similar to those explained in our above discussion of NFCT’s arguments that Gunnarsson is non-analogous art, we find that Gunnarsson identifies essentially the same problem addressed by the ’770 patent—i.e., how to extract from a plurality of CIC readers the data those readers have collected from transponders—and provides essentially the same solution—i.e., providing the readers with two operating modes, including one in which the readers simulate the operation of a transponder. We also

are persuaded by NXP's evidence that a person of ordinary skill in the art would have been motivated to adapt Gunnarsson's system to an inductive coupling system as described in the RFID Handbook, based at least on the RFID Handbook's disclosure of the prevalence and known benefits of inductive coupling systems as of the '770 patent's earliest priority filing date, and that such a person would have recognized that the benefits achieved by Gunnarsson's dual-mode portable reader would also improve data collection in existing inductively coupled systems. Pet. 22–25 (citing Ex. 1003 ¶¶ 86–91, 106–107; Ex. 1006, 21, 202–03; Ex. 1008A, 21, 186–87). We are persuaded by NXP's contentions, supported by Dr. Mihran's testimony, that, for example, it would have been a straightforward design choice to implement Gunnarsson's reader using inductive coupling (e.g., by exchanging Gunnarsson's microwave communications elements for known inductive coupling communications elements as taught by the RFID Handbook, and using load modulation for the second operating mode), so as to solve a similar problem for similar benefits, and that it would have been clear to a person of ordinary skill in the art that such a combination would work and provide the expected functionality. *Id.* (citing Ex. 1003 ¶¶ 86–91, 107).

NFCT cites *Arendi S.A.R.L. v. Apple Inc.*, 832 F.3d 1355 (Fed. Cir. 2016), and *MotivePower Inc. v. Cutsforth, Inc.*, IPR2013-00274 (PTAB Sept. 9, 2016) (Paper 44), for the proposition that “[a] petitioner cannot rely on ‘common sense’ or ‘design choices’ as a wholesale substitute for reasoned analysis and evidentiary support.” PO Resp. 18. But those cases

are not on point here, where we do not find that NXP is relying either on “common sense” or “design choices” as a substitute for reasoned analysis. As stated above, NXP characterizes the choice of inductive or microwave-based coupling as a “design choice *based on the RFID system’s intended application*” (Pet. 5 (emphasis added)) and proceeds to provide a reasoned analysis, supported by both the RFID Handbook and Dr. Mihran’s testimony, as to why a person of ordinary skill in the art would have chosen inductive coupling over microwave-based coupling (*see, e.g., id.* at 5–6 (citing, *inter alia*, Ex. 1003 ¶ 57; Ex. 1006, 21, 34, 37–38, 41–42, 276; Ex. 1008A, 21, 34, 38–39, 42–43, 260), 22–24 (citing Ex. 1003 ¶¶ 87, 89–90; Ex. 1006, 21, 202–03; Ex. 1008A, 21, 186–87), 34–35 (citing Ex. 1003 ¶¶ 105–106)).

Contrary to NFCT’s arguments (*see, e.g., PO Resp.* 18–22), we do not understand NXP to propose physically “converting” or “redesigning” Gunnarsson’s microwave-based system to include inductive coupling components.⁷ We instead understand NXP to contend that it would have

⁷ Indeed, NFCT appears to recognize this point, observing that “Dr. Mihran is careful to say that his combination does not rely on a *physical* conversion of Gunnarsson”; that the “exchange” of Gunnarsson’s microwave communications elements would be a conceptual conversion that would not retain Gunnarsson’s microwave components; and that “Dr. Mihran state[d] during his deposition that his combination is not ‘based on starting with one system and converting it into another,’” but instead is based on a “recognition that ‘the *principles* disclosed in Gunnarsson . . . would be

been obvious to a person of ordinary skill in the art, in view of, for example, the prominence, larger installed base, and lower cost of inductive coupling systems (*see, e.g.*, Pet. 24 (citing Ex. 1003 ¶ 90; Ex. 1006, 21; Ex. 1008A, 21)), to implement the *concept* of a dual-mode reader from Gunnarsson using inductive coupling communications elements taught by the RFID Handbook (*see, e.g.*, Ex. 1006, 202; Ex. 1008A, 186–87). We are persuaded by NXP’s evidence that it would have been within the ability of a person of ordinary skill in the art familiar with the RFID Handbook to make such a combination and that that person would have had a reasonable expectation of success in doing so. *See, e.g.*, Pet. 24–25 (citing Ex. 1003 ¶¶ 106–107).

The RFID Handbook teaches that microwave and inductive RFID technologies are closely related, share basic operating principles, and feature analogous components (e.g., oscillators, modulators, antennas, amplifiers, demodulators). *See* Ex. 1006, 34, 38, 40, 42, 134, 200, 275, Figs. 3.12, 3.16; Ex. 1008A, 34, 38, 40, 42, 115, 184, 259, Figs. 3.12, 3.16; *also compare* Ex. 1004, Fig. 3, *with* Ex. 1006, Fig. 11.5. Thus, for example, although we agree with NFCT that Gunnarsson does not teach “an antenna circuit to generate a magnetic field,” as recited in claim 1 and construed herein to include a coil, we are persuaded that the person of ordinary skill in the art nevertheless would have known from the portions of the RFID Handbook

recognized by a person of ordinary skill in the art’ as applicable to other systems.” PO Resp. 20–21 (quoting Ex. 2005, 164:16–18, 165:9–13).

cited by NXP that an antenna circuit in an inductive coupling system would include a coil and would generate a magnetic field. Similarly, although we agree with NFCT that Gunnarsson does not disclose applying a “load modulation signal,” as construed herein, when its reader operates in its second operating mode, we are persuaded that a person of ordinary skill in the art would have known from the portions of the RFID Handbook cited by NXP that a contactless integrated circuit in an inductive coupling system applies such a load modulation signal when data is transmitted.

NFCT’s argument that the RFID Handbook does not disclose dual-mode inductive readers or reader-to-reader communication (*see* PO Resp. 20) also does not persuade us that a person of ordinary skill in the art would not have been led to the claimed invention by the asserted *combinations*. As NFCT itself recognizes, “if the RFID Handbook already disclosed inductive coupling components . . . capable of operating in two modes to achieve reader-to-reader communication by performing load modulation, Petitioner would not need to rely on Gunnarsson in the first place.” *Id.* We agree, but note that NXP does not contend that the claims are anticipated by the RFID Handbook. NXP instead contends that the claims are unpatentable over the combination of the RFID Handbook with Gunnarsson and relies on Gunnarsson to teach the concept of an RFID reader operating in two modes to achieve reader-to-reader communication. Pet. 30–34. For similar reasons, we are not persuaded by NFCT’s arguments that Gunnarsson teaches backscatter modulation rather than load modulation and does not teach disturbing a magnetic field of another device. We are instead

persuaded by NXP’s evidence that a person of ordinary skill in the art would have known from the RFID Handbook that implementing a dual-mode reader in an inductively coupled system would involve load modulation and, hence, disturbing the magnetic field of another device. *See, e.g.*, Pet. 23–24 (citing Ex. 1003 ¶¶ 88–89; Ex. 1006, 202; Ex. 1008A, 187), 35–36 (citing Ex. 1003 ¶¶ 105–106, 111).

We also are not persuaded by NFCT’s argument that a person of ordinary skill in the art “would have simply plugged Gunnarsson’s portable communication unit in to ‘temporarily [store] data from several different transponders for later transmission of [the] data to a central computer,’” as “[s]uch an approach would achieve Petitioner’s stated purpose of collecting data in ‘existing’ inductive coupled systems without having to redesign and change the fundamental operating principle of Gunnarsson.” PO Resp. 31–32 (quoting Ex. 1004, 2:8–10) (citing Ex. 2004 ¶¶ 71–72). Gunnarsson itself explains that such a solution “is inconvenient and time-consuming” with “impaired” reliability. Ex. 1004, 2:16–18. It is unclear, moreover, how such a solution would achieve the purpose of collecting data in “inductive coupled” systems, when, as NFCT repeatedly points out, Gunnarsson is directed to microwave-based systems. *See, e.g.*, PO Resp. 31. Although NFCT points to a hybrid system disclosed by the RFID Handbook that includes both inductive and microwave interfaces (*id.* at 32–33 (citing Ex. 1006, 236, Fig. 13.8; Ex. 2004 ¶ 74)), NFCT’s evidence does not persuade us that a person of ordinary skill in the art would be motivated to add inductive functionality to Gunnarsson—presumably eliminating the

reuse of its modulation circuitry in dual modes—rather than simply implementing Gunnarsson’s concept entirely in an inductive coupling system as NXP proposes. Moreover, obviousness is not negated merely by the fact that there may have been other potential solutions that a person of ordinary skill in the art might have tried in view of the prior art. *See, e.g., Bayer Healthcare Pharm., Inc. v. Watson Pharm., Inc.*, 713 F.3d 1369, 1376 (Fed. Cir. 2013) (“[A] finding that the prior art as a whole suggests the desirability of a particular combination need not be supported by a finding that the prior art suggests that the combination claimed . . . is the preferred, or most desirable, combination.” (quoting *In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004))). Accordingly, in view of NXP’s persuasive showing, we are not persuaded by NFCT’s arguments that a person of ordinary skill might *also* have had other available options. *See* PO Resp. 31–35.

We also disagree with NFCT’s contention that the combination of Gunnarsson and the RFID Handbook fails to teach or suggest the “load modulation signal” limitation of the claims. *Id.* at 35–40. As reproduced in Section II.C. *supra*, claim 1 recites, in part, the following:

when in the second operating mode, the device applies a *load modulation signal* with two states to the antenna circuit when data is transmitted, so as to simulate the operation of a contactless integrated circuit, *the load modulation signal being configured to disturb a magnetic field generated by another device in order to transmit/receive data by inductive coupling and being configured to be detected by the other device as if the load modulation signal were a load modulation signal applied to an antenna load modulation switch of a contactless integrated circuit.*

Ex. 1001, 12:36–46 (emphasis added).

In support of its contention that claim 1 is unpatentable, NXP cites both Gunnarsson and the RFID Handbook as teaching intermeshing aspects of this limitation. Pet. 32–33 (citing Ex. 1004, 3:11–3:32, 6:20–26, 7:24–8:9, 8:17–25, Figs. 1, 3, 4; Ex. 1006, 7–9, 21, 25, 35–41, 128–136, 166, 202, 210–216, Fig. 3.1; Ex. 1008A, 8–9, 21, 25, 36–42, 108–117, 148, 186, 194–203, Fig. 3.1). NXP additionally argues as follows:

Gunnarsson discloses when in the second operating mode (*e.g.*, “unit 1”/“unit 3”), the device applies a load modulation signal with two states to the antenna circuit when data is transmitted (*e.g.*, “switching on and off one of the modulation circuits”), so as to simulate the operation of a contactless integrated circuit (*e.g.*, “will function as a reflecting transponder”), the load modulation signal being configured to disturb a field generated by another device (*e.g.*, “varying the impedance experienced from another communications unit”) in order to transmit/receive data (*e.g.*, “in accordance with a pattern that corresponds to the transmitted data stream”) and being configured to be detected by the other device as if the load modulation signal were a load modulation signal applied to an antenna load modulation switch of a contactless integrated circuit (*e.g.*, “information sidebands are generated in the same way as when the transponder is read in a known manner”); **Handbook** discloses a signal with two states (*e.g.*, “*Digital Modulation Procedures*”), and disturbing a magnetic field generated by another device (*e.g.*, “magnetic flux”) in order to transmit/receive data by inductive coupling (*e.g.*, “inductively coupled”)

A [person of ordinary skill in the art] would have been motivated and found it obvious to use Handbook’s teaching of inductive coupling in implementing the second operating mode

(i.e., transponder mode) of Gunnarsson's portable communications unit. See [Pet.] § V.C.5; Ex. 1003 ¶¶ 105–107. Gunnarsson discloses a number of methods for transmitting data in the second operating mode to simulate a transponder. One method varies the impedance of the modulator. Ex. 1004[,] 7:31–8:3. Another method “switch[es] on and off [the] modulator circuit.” Ex. 1004[,] 3:11–3:32; Ex. 1003 ¶ 106. Both of these methods when used in an inductive coupling system are “applying a load modulating signal” to the antenna circuit, and the latter method—switching on and off the modulator—is like the '770 patent's “third method” or “pseudo active load modulation.” Ex. 1003 ¶¶ 105–106; Ex. 1001[,] 9:58–62, 11:3–16.

Pet. 33–35.

We determine herein that the broadest reasonable construction of “load modulation signal” is a “signal that transmits data by disturbing the magnetic field of another device” (*see supra* § III.A.2.), and accordingly, we agree with NFCT that microwave backscatter is not a signal that transmits data by disturbing a “*magnetic*” field of another device (*see* PO Resp. 36). Hence, we further agree with NFCT that Gunnarsson alone does not teach a “load modulation signal.” *Id.* Nonetheless, the asserted ground of unpatentability is based on the combination of Gunnarsson and the RFID Handbook, not on Gunnarsson alone, and NXP relies on the RFID Handbook for the teaching of a magnetic field and inductive coupling. Because we are persuaded that (1) Gunnarsson teaches all aspects of the above-recited limitation except for inductive coupling and, relatedly, the disturbed field being a magnetic field such that the applied signal is a “load

modulation signal” as construed herein; (2) the RFID Handbook discloses that data is transmitted in inductive coupling by load modulation signals; and (3) a person of ordinary skill in the art would have had reason to combine the teachings of Gunnarsson and the RFID Handbook to implement a dual-mode reader using inductive coupling technology, we further are persuaded that the combination teaches this limitation in its entirety. In that regard, we also disagree with NFCT’s premise that because the RFID Handbook discloses only load modulation signals *actually* applied to an antenna modulation switch of a contactless integrated circuit, it therefore could not teach or suggest a “load modulation signal being . . . configured to be detected by [an] other device *as if* the load modulation signal were a load modulation signal applied to an antenna load modulation switch of a contactless integrated circuit,” as recited in claim 1 (emphasis added). PO Resp. 37–40. That limitation relates only to the *configuration* of the load modulation signal applied by the claimed device and does not impose a limitation on the device itself. Put another way, we are persuaded that the configuration of the signal would be the same whether actually applied to a load modulation switch of a contactless integrated circuit or only applied “as if” to such a switch. Indeed, because the result of the proposed combination would be a dual-mode contactless integrated circuit *reader*, and not a contactless integrated circuit, we understand that any load modulation signal applied by the reader to an antenna load modulation switch would necessarily be applied only “as if” applied to a switch of a contactless integrated circuit.

In summary, upon review of the parties' respective arguments and evidence, we are persuaded that NXP has demonstrated, by a preponderance of the evidence, that claim 1 is unpatentable over the combined teachings of Gunnarsson and the RFID Handbook. We also are persuaded upon review of NXP's arguments and cited supporting evidence that NXP has demonstrated by a preponderance of the evidence that claims 6–8 and 11, which depend from claim 1 and for which NFCT does not provide any separate argument, are unpatentable over the same combination. *See* Pet. 41–49, 51–52.

b. Obviousness of Claims 10, 28, 29, 34, and 35 over Gunnarsson, the RFID Handbook, and Bashan

Claim 10 depends from claim 1 and further recites “one of a bit and a flag stored in a register to control switching from one of the first and second operating modes to the other of the first and second operating modes.” Ex. 1001, 13:25–28. Independent claim 28 recites the same limitation. *Id.* at 15:33–35. We are persuaded by NXP's arguments and evidence (*see* Pet. 50–51 (citing Ex. 1003 ¶¶ 151–153; Ex. 1004, 1:3–7, 3:11–4:2, 5:9–20, 5:30–31, 6:6–9, 6:11–26, 6:28–8:33, Figs. 1–3; Ex. 1011, 6:52–56, 8:5–11), 55 (citing Ex. 1003 ¶ 171; Ex. 1004, 1:3–7, 3:11–4:2, 5:9–20, 5:30–31, 6:6–9, 6:11–26, 6:28–8:33, Figs. 1–3; Ex. 1011, 6:52–56, 8:5–11)), which are not challenged by NFCT, that a person of ordinary skill in the art would have been motivated to implement Gunnarsson's reader so that it switched between its two operating modes based on a flag or bit stored in a register, based on Bashan's teaching of switching between two modes of operation

using a mode status flag stored in a register. Accordingly, we determine that NXP has established by a preponderance of the evidence that the subject matter of each of claims 10, 28, 29, 34, and 35 would have been obvious over the combined teachings of Gunnarsson, the RFID Handbook, and Bashan.

In reaching this conclusion, we disagree with NFCT's argument that the prior art fails to teach or suggest a "contactless integrated circuit reader . . . [that] is configured to exchange data with [another] contactless integrated circuit reader," as recited by claim 28 (and, by virtue of dependency, by claims 29–31, 34, and 35), where the reader further includes an "antenna circuit that generates a magnetic field." PO Resp. 40–43. Although NFCT correctly points out (*id.* at 41) that NXP relies on Gunnarsson as teaching "a portable contactless integrated circuit reader" based on its capability of reading a transponder (Pet. 51 ("Gunnarsson further discloses that the device (*e.g.*, 'portable unit 1') is a portable contactless (*e.g.*, 'wireless') integrated circuit reader (*e.g.*, 'is to read the transponder 2') A [person of ordinary skill in the art] would have understood that Gunnarsson's disclosure of a portable communications unit that can read a transponder is a disclosure of a portable contactless integrated circuit reader.")), NXP further relies on the RFID Handbook for its teaching of "an antenna circuit that generates a magnetic field" (*id.* at 52 (citing claim chart for same element of claim 1, in turn citing the RFID Handbook)) as well as for additional teachings of "contactless integrated circuits" and "a contactless integrated circuit reader" (*id.* at 53–54). Further,

although claim 28 does not explicitly recite “inductive coupling” or “load modulation signal,” we understand from NXP’s analysis that it relies on the same combination of teachings of Gunnarsson and the RFID Handbook for claim 28 as for claims 1 and 11, with the addition of the teachings of Bashan for “the reader includ[ing] one of a bit and a flag,” as in claim 10. *See id.* at 52–54 (claim chart referring back to claim charts for claims 1, 10, and 11). For the same reasons as set forth in our discussion of claims 1 and 11 in Section III.E.3.a. *supra*, and claim 10 immediately above, we are persuaded that NXP has established by a preponderance of the evidence that it would have been obvious to a person of ordinary skill in the art in view of the combination of Gunnarsson, the RFID Handbook, and Bashan to implement a dual-mode CIC reader that would be configured to exchange data with another contactless integrated circuit reader in an inductively coupled system, wherein the reader includes one of a bit and a flag to switch the reader between its operating modes. Contrary to NFCT’s contentions, we do not ascribe any persuasive significance to the fact that the resulting reader may “no longer [be] capable of reading *microwave* transponders.” PO Resp. 41 (emphasis added).

In summary, upon review of the parties’ respective arguments and evidence, we are persuaded that NXP has demonstrated, by a preponderance of the evidence, that claims 10 and 28 are unpatentable over the combined teachings of Gunnarsson, the RFID Handbook, and Bashan. We also are persuaded upon review of NXP’s arguments and cited supporting evidence that NXP has demonstrated by a preponderance of the evidence that claims

29, 34, and 35, which depend from claim 28 and for which NFCT does not provide any separate argument, are unpatentable over the same combination. *See* Pet. 55, 57–59.

c. *Obviousness of Claims 2 and 3 over Gunnarsson and the RFID Handbook; and Obviousness of Claims 30 and 31 over Gunnarsson, the RFID Handbook, and Bashan*

Claim 2 depends from claim 1 and further recites “wherein the load modulation signal of the second operating mode comprises data representative pulses of the excitation signal, the duration of each data representative pulse being longer than the period of the excitation signal.” Ex. 1001, 12:47–51. Claim 30, which depends from claim 29, similarly recites “wherein the reader is configured to apply to the antenna circuit a load modulation signal comprising pulses of an alternating signal, the duration of each pulse being longer than the period of the alternating signal.” *Id.* at 15:41–45. In the Petition, NXP asserted with respect to claim 2 that Gunnarsson “discloses that the load modulation signal (*e.g.*, ‘switching on and off one of the modulation circuits’) of the second operating mode (*e.g.*, ‘unit 1’/‘unit 3’) comprises data representative pulses of the excitation signal” and that the RFID Handbook “discloses the duration of each data representative pulse being longer than the period of the excitation signal.” Pet. 37. In support of the assertion that Gunnarsson discloses data representative pulses of the excitation signal, NXP asserted:

Gunnarsson discloses multiple ways the portable reader may vary the impedance experienced from another

communications unit. In one embodiment, it varies the impedance of its modulator “in dependence on the status” of a data signal. Ex. 1004[,] 7:35–38. In another embodiment, like the third method for achieving load modulation disclosed by the ’770 [patent], it “switch[es] on and off” its modulation circuit, thereby transmitting pulses of its microwave carrier signal. *Id.* at 3:24–25; Ex. 1003 ¶ 70.

Pet. 16; *see also id.* at 24–25 (comparing Ex. 1004, 3:18–32 with Ex. 1001, 10:16–21, 11:11–13). NXP also quoted the following passage from Gunnarsson:

By varying the impedance experienced from another communications unit via the antenna system of the communications units in accordance with a pattern that corresponds to the transmitted data stream, information sidebands are generated in the same way as when the transponder is read in a known manner. This variation in impedance may, for instance, be achieved by switching on and off one of the modulation circuits. These modulation circuits are often found in connection with the antenna system of the communications unit and are, e.g., intended to modulate the carrier wave for writing data into the transponder

Id. at 36 (quoting Ex. 1004, 3:18–28 (italics added by NXP)) (citing Ex. 1004, 3:11–32, 7:24–29). NXP additionally cited paragraphs 115–118 of Dr. Mihran’s declaration in support of its contentions. *Id.* at 36–37; *see also id.* at 55–56 (relying on same arguments and evidence with respect to claim 30; additionally citing Ex. 1003 ¶ 177).

In the Decision on Institution, we determined on the record then before us that NXP had demonstrated sufficiently for purposes of

establishing a reasonable likelihood of prevailing that Gunnarsson teaches that “the load modulation signal of the second operating mode comprises data representative pulses of the excitation signal,” based on this argument and evidence. Dec. on Inst. 38–39. In view of the complete record now before us, we are persuaded that NXP has met its burden to demonstrate by a preponderance of the evidence that the subject matter of claims 2 and 30, as well as claims 3 and 31 respectively dependent therefrom, would have been obvious over the asserted combinations.

As indicated in Section III.E.2. *supra*, NFCT raises three arguments with respect to dependent claims 2, 3, 30, and 31 beyond those presented for the independent claims: first, that the portions of Gunnarsson cited by NXP refer only to a single method of passive backscatter, rather than one passive method and a different method that, when converted to inductive coupling, applies a load modulation signal comprising data representative pulses of the excitation signal to the antenna circuit; second, that the disclosed single method does not apply any signal comprising such data representative pulses; and third, that a person of ordinary skill in the art would not know to use an excitation signal to perform load modulation. PO Resp. 43–58 (citing Ex. 2004 ¶¶ 88–109). NFCT’s arguments are not persuasive.

Regardless whether Gunnarsson describes a single method of performing backscatter or two separate methods, we are persuaded by NXP’s argument, supported by Dr. Mihran’s testimony, that Gunnarsson’s disclosure of “varying the impedance . . . in accordance with a pattern that corresponds to [a] transmitted data stream . . . by switching on and off [a]

modulation circuit[] . . . intended to modulate the carrier wave for writing data into the transponder” teaches “data representative pulses of the excitation signal,” as recited in claims 2 and 30. We credit, in particular, Dr. Mihran’s testimony, cited in the Petition, that a person of ordinary skill in the art would have understood Gunnarsson’s teaching of switching on and off its modulator to mean that it alternately applies and does not apply a carrier signal to the antenna—i.e., produces pulses or bursts of the excitation signal—and that a person of ordinary skill would have understood that this method applies data representative pulses of the excitation signal to the antenna circuit in the same way as the “pseudo active load modulation” method of the ’770 patent. Ex. 1003 ¶ 116 (cited at Pet. 38). Further, as explained in the above discussion of claim 1, we are persuaded that the combination of Gunnarsson and the RFID Handbook would have rendered obvious implementing Gunnarsson’s reader using inductive coupling. We additionally credit Dr. Mihran’s testimony that it would have been routine for a person of ordinary skill in the art, in such an implementation, to use the RFID Handbook’s teaching of using a “subcarrier” to carry encoded data in implementing this method, as well as that “it would have been clear to a person of ordinary skill in the art that such a combination would work and provide the expected functionality.” Ex. 1003 ¶ 118 (cited at Pet. 38).

In summary, upon review of the parties’ respective arguments and evidence, we are persuaded that NXP has demonstrated, by a preponderance of the evidence, that claim 2 is unpatentable over the combined teachings of Gunnarsson and the RFID Handbook and that claim 30 is unpatentable over

the combined teachings of Gunnarsson, the RFID Handbook, and Bashan. We also are persuaded upon review of NXP's arguments and cited supporting evidence that NXP has demonstrated by a preponderance of the evidence that claims 3 and 31, which depend from claims 2 and 30, respectively, and for which NFCT does not provide any separate argument, are unpatentable over the same combinations. *See* Pet. 39–41, 56–57.

IV. CONCLUSION

Based on the evidence and arguments, NXP has demonstrated by a preponderance of the evidence that claims 1–3, 6–8, and 11 of the '770 patent are unpatentable under 35 U.S.C. § 103 over Gunnarsson and RH-E, as well as over Gunnarsson and RH-G; and that claims 10, 28–31, 34, and 35 are unpatentable under 35 U.S.C. § 103 over Gunnarsson, RH-E, and Bashan, as well as over Gunnarsson, RH-G, and Bashan.

V. ORDER

Accordingly, it is

ORDERED that claims 1–3, 6–8, 10, 11, 28–31, 34, and 35 of the '770 patent have been shown to be unpatentable; and

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

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