

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTEL CORPORATION,
Petitioner

v.

Telefonaktiebolaget L M Ericsson
Patent Owner.

IPR2024-00728

U.S. Patent 7,151,430

**PETITIONER'S REPLY TO PATENT OWNER'S
PRELIMINARY RESPONSE**

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Patent Trial and Appeal Board
U.S. Patent & Trademark Office
P.O. Box 1450
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EXHIBIT LIST

Exhibit	Reference
1001	U.S. Patent 7,151,430 to Mattsson
1002	File History for U.S. Patent 7,151,430
1003	Declaration of Dr. Manos Tentzeris in Support of Petition
1004	CV of Dr. Manos Tentzeris
1005	U.S. Patent Publication 2003/0063034 to Taniguchi, et al (“Taniguchi”)
1006	U.S. Patent 6,373,447 to Rostoker, et al (“Rostoker”)
1007	PCT Publication WO 98/05048 to Midya, et al (“Midya”)
1008	U.S. Patent Publication 2005/0077992 to Raghavan, et al (“Raghavan”)
1009	U.S. Patent Publication 2001/0030591 to Gardner (“Gardner”)
1010	“Signal Integrity Issues and Printed Circuit Board Design,” to Brooks (“Brooks”)
1011	Declaration of June Ann Munford
1012	“RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification” to Finkenzeller (Wiley, Second Edition)
1013	“Principles of Physics,” to Serway, 2nd Edition (“Serway”)
1014	“Fundamentals of Applied Electromagnetics” to Ulaby (“Ulaby”)
1015	Certified Translation of Excerpts from prosecution of JP2007526642
1016	Excerpts from the EP prosecution of EP3567614
1017	PCT Publication WO 2004/012213 to Einzinger (“Einzinger-US”)

Exhibit	Reference
1018	U.S. Patent 6,708,880 to Acher, et al (“US-Acher”)
1019	ITC-337-TA-1376 Claim Construction Order
1020	ITC-337-TA-1300 Claim Construction Order
1021	U.S. Patent 6,533,189 to Gaul (“Gaul”)
1022	U.S. Patent 5,345,231 to Koo (“Koo”)
1023	U.S. Patent 6,137,447 to Saitoh, et al (“Saitoh”)
1024	U.S. Patent 6,320,491 to Gevorgian, et al (“Gevorgian”)
1025	U.S. Patent 7,088,964 to O (“O”)
1026	U.S. Patent Publication 2002/0044058 to Heinrich, et al (“Heinrich”)
1027	U.S. Patent 6,970,088 to Kovach (“Kovach”)
1028	U.S. Patent 4,724,427 to Carroll (“Carroll”)
1029	U.S. Patent 7,057,514 to Mickle (“Mickle”)
1030	“A Comprehensive Explanation On the High Quality Characteristics of Symmetrical Octagonal Spiral Inductor” to Ooi, et al (“Ooi”)
1031	“Design and Analysis of Symmetric Dual-Layer Spiral Inductors for RF Integrated Circuits” to Lee, et al (“Lee”)
1032	“A Q-Factor Enhancement Technique for MMIC Inductors” to Danesh, et al (“Danesh”)
1033	PCT Publication WO 99/49513 to Zhou, et al. (“Zhou”)
1034	U.S. Patent 5,583,474 to Mizoguchi (“Mizoguchi”)
1035	Reserved

Exhibit	Reference
1036	“A Single-Chip 900-MHz Spread-Spectrum Wireless Transceiver in 1-up CMOS – Part 1: Architecture and Transmitter Design” by Ahmadreza Rofougaran, et al. , IEEE Journal of Solid-State Circuits, Vol. 33, No. 4 (April 1998)
1037	“A Single-Chip CMOS Transceiver for DCS-1800 Wireless Communication” by Michiel Steyaert, et al. ISSCC98, Session 3, Transceiver and Power Amplifiers (1998)
1038	“A 1.8-GHz Low-Phase-Noise CMOS VCO Using Optimized Hollow Spiral Inductors” by Craninckx, et al. (“Craninckx”)
1039	“Low-Phase-Noise LC Quadrature VCO Using Coupled Tank Resonators in a Ring Structure” by ElSayed, et al. (“ElSayed”)
1040	“A CMOS Frequency Synthesizer with an Injection-Locked Frequency Divider for a 5-GHz Wireless LAN Receiver” to Rategh, et al. (“Rategh”)
1041	“Illustrated Dictionary of Electronics” to Gibilisco, Eighth Edition
1042	“Class Definition for Class 343 Communications: Radio Wave Antennas,” U.S. Patent & Trademark Office (2001), https://web.archive.org/web/20011123183942/http://www.uspto.gov/web/patents/classification/uspc343/defs343.htm

I. Introduction

Taniguchi and Rostoker satisfy each of the two tests for analogous art. *See In re Bigio*, 381 F. 3d 1320, 1325 (Fed. Cir. 2004). First, Taniguchi and Rostoker are “from the same field of endeavor” as the ’430 patent—inductor design. Second, Taniguchi and Rostoker are both “reasonably pertinent to the particular problem with which the inventor is involved”—efficient circuit design. Patent Owner’s (“PO’s”) non-analogous art argument misapplies these tests, mischaracterizes the reference teachings, and ignores arguments and evidence in the Petition and Tentzeris Declaration.

II. Taniguchi and Rostoker are in the Same Field as the ’430 Patent.

The field of endeavor is determined “by reference to explanations of the invention’s subject matter . . . including the embodiments, function, and structure of the claimed invention.” *Bigio*, 381 F.3d at 1325. It is “not limited to the specific point of novelty, the narrowest possible conception of the field, or the particular focus within a given field.” *Unwired Planet LLC v. Google, Inc.*, 841 F. 3d 995, 1001 (Fed. Cir. 2016). Indeed, the Federal Circuit has “affirmed findings of analogous art where the references shared a general field of endeavor.” *See Netflix, Inc. v. DivX, LLC*, 80 F.4th 1352, 1359 (Fed. Cir. 2023).

The field of endeavor of the ’430 patent is inductor design. (*See, e.g.*, INTEL-1001, 3:4-10 (“various embodiments of the invention provide **an inductor**

design ...”), 5:32-39 (discussing “more complex **inductor designs**”).) The patent confirms this position, stating its “field of invention” is “in particular [] an **improved inductor design** in a VCO.” (INTEL-1001, 1:19-22.) Although the statement adds “in a VCO”, PO did not limit its inductor designs to a particular application. (*See, e.g.*, INTEL-1001, 3:32-40.) Instead, the patent’s focus is on the design of multi-loop inductors (e.g., 8-shaped or clover leaf). (*See* INTEL-1001, 4:5-50, 8:46-64, 9:39-63, cl. 20-21, Figs., 2, 10, 13, 1:61-2:12.) The ’430 patent further teaches use of these multi-loop inductor designs in a layout with a second inductor. (*See, e.g.*, INTEL-1001, 1:61-2:2, 2:25-34, 3:19-31, cl. 1, Figures 4-5, 7, and 11.)

Taniguchi is in the field of inductor design because it is directed to design of inductors used as loop antennas. (*See* Pet., 6-11; INTEL-1003, ¶¶85-93.) Contrary to PO’s myopic focus on Taniguchi’s use of alternative terminology, the electromagnetic (“EM”) field created by a structure does not change regardless of whether it is called an “antenna” or “an inductor.” This is recognized by the USPTO’s classification system in place at the time of prosecution of the ’430 patent, noting that Class 336 covers “inductor structure[s] ... which may be used as loop antennas” and classifying such structures in Class 336, Inductor Devices, “[i]f the disclosure is a loop antenna, but the claims recite merely an inductor device,” or in Class 343, Communications: Radio Wave Antennas, if what is claimed is “an antenna by name only.” (INTEL-1042, 13-14.) That is, the antenna class is

narrower than (and subsumed for certain designs in) the inductor class. Like Taniguchi, Rostoker teaches design of loop antennas which, as discussed above, are inductors. (INTEL-1006, Abstract, 3:52-65, 4:11-20, Figs. 2, 6, 7; INTEL-1003, ¶¶196-200.) PO argues terminology—implying because Rostoker uses both the terms “antenna” and “inductor”, its antennas are not inductors. (POPR, 11, 31.) As explained above, a loop antenna is an inductor but not all inductors are antennas and not all antennas are loop antennas. Because Taniguchi and Rostoker present designs of loop antennas/inductors, they share the same field as the ’430 patent—inductor design. (*See* INTEL-1001, class 336; INTEL-1005, class 343, INTEL-1006, class 343.)

And while not required to qualify as analogous art, Taniguchi even teaches a loop antenna/inductor with the same supposed novel structure as the ’430 patent’s two-loop, 8-shaped inductor. (*See, e.g.*, INTEL-1005, ¶55, Figure 3; INTEL-1001, 4:5-27, Figure 2; *see also*, INTEL-1003, ¶¶82-134; Pet., 5-30; *see also*, POPR, 32-33, 44-45 (alleging conventional prior art inductors were O-shaped or spiral).) Like the ’430 patent’s 8-shaped inductor, Taniguchi’s 8-shaped antenna/inductor 1 reduces the EM field. (*See* Pet. 14-17, 42-43; INTEL-1003, ¶¶94-99, 102-103.) Indeed, PO acknowledged this very function results from the 8-shaped structure used by both the ’430 patent and Taniguchi. (POPR, 5-6.)

III. Taniguchi and Rostoker are “Reasonably Pertinent”.

The '430 patent addresses the problem of efficient circuit design. (*See* Pet., 56; INTEL-1003, ¶203.) For example, the '430 patent describes advances in communication technology which in turn drove the need to place inductors closer to other circuit components. (*See, e.g.*, INTEL-1001, 1:26-28.) However, efficiently designing these circuits is hampered because circuitry producing EM fields cannot be placed close to one another due to effects such as mutual coupling. (*See*, INTEL-1001, 1:29-40.) The '430 patent addresses the problem of efficient placement of inductors in a circuit by reducing EM field generated by an inductor which in turn reduces EM coupling between the inductor and other components. (*See, e.g.*, INTEL-1001, Abstract, 3:4-18, 1:66-2:2, 3:36-40, 7:19-63, Table 2.)

Taniguchi is reasonably pertinent to the problem of efficient circuit design. (*See* Pet., 56; INTEL-1003, ¶203.) Indeed, Taniguchi's stated goal is "mak[ing] a data communication apparatus which is **small-sized**, lightweight and high in performance." (INTEL-1005, ¶¶22, 86, 95; *see also*, INTEL-1001, ¶1; Pet., 56-57 (describing small form factor devices used in various applications).) Taniguchi uses an identification apparatus comprising two antennas/inductors which communicate with tags via inductive coupling. (INTEL-1005, ¶¶1, 16, 49-50; Pet., 3-4; INTEL-1003, ¶¶64, 69-80.) The first antenna/inductor 1 is 8-shaped. (*See, e.g.*, INTEL-1005, ¶¶55, 73.) The second inductor is either a loop or an 8-shaped inductor. (*See, e.g., id.*) Because of the reduced EM field of 8-shaped antenna/inductor 1, the total

mutual EM coupling of antenna/inductor 1 with the second antenna/inductor 2 is significantly reduced, allowing the two antennas/inductors to be placed close to one another (e.g., on different planes or concentrically on the same plane). (Pet., 31-36, 42-43; INTEL-1003, ¶¶69-73, 138-166.) Taniguchi therefore is reasonably pertinent “because of the matter with which it deals,” it would have logically “commended itself to an inventor’s attention in considering his [or her] problem.” *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374, 1379-1380 (Fed. Cir. 2007) (finding analogous art to a folding mechanism of a treadmill “may come from any area describing hinges, springs, latches, counterweights, or similar mechanisms”).

Rostoker also recognized the need to integrate components (antennas) on a semiconductor chip with other circuitry. (See INTEL-1006, 1:10-15, Abstract, 3:55-57.) Rostoker’s techniques would have been important to a POSITA considering the problem of efficient circuit design, making Rostoker reasonably pertinent to the ’430 patent’s problem. *Airbus S.A.S. v. Firepass Corp.*, 941 F.3d 1374, 1382 (Fed. Cir. 2019); *see also*, Pet., 56; INTEL-1003, ¶203.

IV. PO’s Arguments Lack Merit.

Although PO attacks both Taniguchi and Rostoker as non-analogous, PO does not clearly articulate its position regarding the field or problem addressed by the ’430 patent. For example, at various points, the POPR attempts to narrowly define the ’430 patent as inductor design for a VCO on a semiconductor die. (POPR,

2, 4.) However, the '430 patent teaches that its techniques are broadly applicable. (INTEL-1001, 3:36-40, 3:13-16.) Moreover, none of its claims recites a VCO and only a subset recite a “semiconductor die.” PO also attempts to define the '430 patent by distinguishing Taniguchi with unclaimed limitations. For example, PO alleges Taniguchi “is not directed to inductors used on semiconductor chips having dimensions **measured in microns.**” (POPR, 2; *see also* POPR, 8.)

Instead of addressing existing case law, PO presents two new theories. First, PO contends that Taniguchi “is non-analogous art that teaches away from the '430 Patent.” (POPR, 19.) Even if this were a valid non-analogous art theory, Taniguchi does not teach away—it does not criticize or discourage any features in the '430 Patent. *See DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314, 1327 (Fed. Cir. 2009). To the contrary, Taniguchi teaches or suggests the features that pervade the challenged claims. (Pet., 5-43; INTEL-1003, ¶¶82-175.)

In addition, PO’s “teaching away” arguments are premised on mischaracterizations. The POPR attempts to distinguish Taniguchi by referring to the interaction of Taniguchi’s identification apparatus and its tags. (POPR, 20-21.) This interaction is irrelevant to Petitioner’s challenge. The Petition maps antenna/inductor 1 and antenna/inductor 2 of Taniguchi’s identification apparatus to the claims; antenna/inductor 1 has a reduced EM field and thus, reduced EM coupling with antenna/inductor 2. (Pet. 30-43, INTEL-1003, ¶¶135-175.) In fact, PO admits

Taniguchi's two antennas/inductors are "in close proximity without EM coupling with each other." (POPR, 24, 30.) This reduction of EM coupling was an object of Taniguchi, permitting beneficial use of two antennas/inductors in its identification apparatus. (INTEL-1003, ¶¶68-69, 145; INTEL-1005, ¶¶12, 14-16, 95.)

Second, PO alleges that "Taniguchi, viewed alone or in combination, would not have motivated a POSITA to substitute its radio guidance antenna, or any components thereof, for the claimed first and second inductors of the '430 patent" (POPR, 22). PO presents no case law to support "motivation to substitute" as a valid legal test for analogous art. Further, implicit in PO's argument is a wholly unsupported position that its claims are limited to inductors on the same plane separated laterally. (*Id.*; *see also*, POPR, 24, 29, 41.) The Petition and Tentzeris Declaration details the mapping of Taniguchi's antenna/inductors 1 and 2 in the manner specified by the claims.

PO similarly attacks Rostoker as non-analogous art "directed to antennas, not inductors," alleging that the "purpose and function of the antennas in Rostoker differ from the purpose and function of two inductors in the '430 Patent's claimed inductor layout." (POPR, 31-32.) PO's argument is again premised on its legally baseless "motivation to substitute" theory and an improper reliance on "terminology" in a vacuum. As Petitioner established above, Rostoker is in the same field and reasonably pertinent to the problem of the '430 patent.

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Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on August 12, 2024, a copy of the foregoing Reply to Patent Owner's Preliminary Response was served via email on the following attorneys for the Patent Owner:

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