

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AVX CORPORATION,
Petitioner,

v.

PRESIDIO COMPONENTS, INC.,
Patent Owner.

Case IPR2018-00167
Patent 7,075,776 B1

Before BEVERLY M. BUNTING, JEFFREY W. ABRAHAM, and
KIMBERLY McGRAW, *Administrative Patent Judges*.

ABRAHAM, *Administrative Patent Judge*.

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

I. INTRODUCTION

AVX Corporation (“Petitioner”) filed a Petition seeking *inter partes* review of claims 1–14 (the “challenged claims”) of U.S. Patent No. 7,075,776 B1 (Ex. 1001, “the ’776 patent”). Paper 2 (“Pet.”). Presidio Components, Inc. (“Patent Owner”) did not file a Patent Owner Preliminary Response to the Petition.

On May 16, 2018, we instituted an *inter partes* review of all of the challenged claims based on all of the grounds identified in the Petition. Paper 6 (“Inst. Dec.”). Subsequently, Patent Owner filed a Response (Paper 9, “PO Resp.”), and Petitioner filed a Reply (Paper 11). An oral hearing was held on February 12, 2019, and a transcript of the hearing has been entered into the record. Paper 15 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–14 of the ’776 patent are unpatentable.

II. BACKGROUND

A. *Related Proceedings*

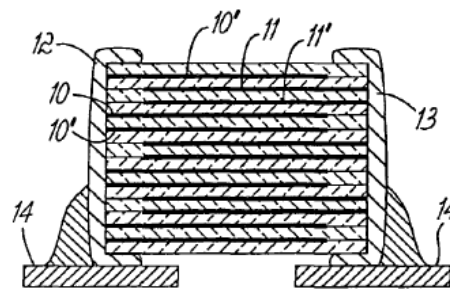
Patent Owner indicates that there are no related proceedings. Paper 4, 1. Petitioner indicates that the ’776 patent is a grandchild of U.S. Patent No. 6,816,356 (“the ’356 patent”) and lists several proceedings involving the ’356 patent. Pet. 1.

B. *The ’776 Patent*

The ’776 patent, titled “Integrated Broadband Ceramic Capacitor Array,” issued on July 11, 2006. Ex. 1001, at [54], [45]. The ’776 patent is

directed to “a capacitor having an effective wideband performance in an integrated, cost-effective structure.” *Id.* at 4:37–39.

The '776 patent explains that the performance of capacitors in electronic circuits can vary over different frequencies. *Id.* at 1:38–49. The '776 patent depicts a prior art multilayer ceramic capacitor in Figure 2A, reproduced below.



PRIOR ART
FIG. 2A

Figure 2A of the '776 patent shows internal plates 10 and 11 extending from the sides of the structure, with conductive material 12 and 13 at each end to form a connection point for any plate extending to that side. *Id.* at 2:28–33. The plates extend in pairs of upper and lower plates, 10 and 10', respectively, from the left side, and 11 and 11', respectively, from the right side. *Id.* at 2:33–37. Each set of adjacent plates, 10/11' and 10'/11 form a parallel plate capacitor. *Id.* at 2:37–38. This configuration results in a network of parallel-connected capacitors, and provides a “relatively large” capacitance value for the size of the device. *Id.* at 2:45–54.

Figure 4A of the '776 patent depicts an alternative type of capacitor known in the prior art, as reproduced below.

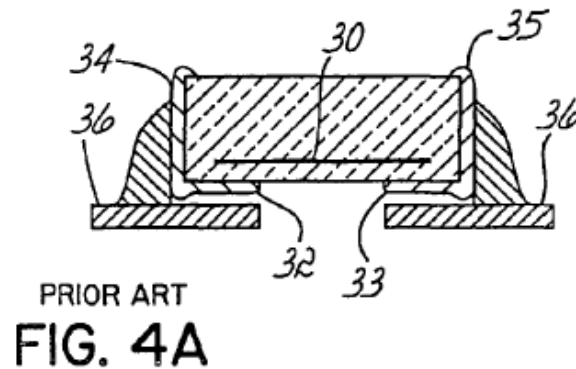


Figure 4A shows a structure including internal conductive plate 30 positioned to overlay conductive plates 32 and 33 on the outer surface of the device, which extend from conductive ends 34 and 35. *Id.* at 3:3–7. This configuration results in a series combination of capacitors, which provides “good high frequency performance but relatively low capacitance value.” *Id.* at 3:9–15.

The '776 patent explains that the different prior art structures represent “a tradeoff between capacitance value and broadband performance,” and “[o]ne known approach to managing series resistance and series inductance, is to parallel connect two capacitors,” a larger valued capacitor (having a lower resonant frequency), and a smaller valued capacitor (chosen for high frequency performance). *Id.* at 3:34–41. According to the '776 patent, there are several drawbacks to using parallel capacitor combinations, including variations in measured capacitance, production complications, and increased device height. *Id.* at 4:13–29.

To overcome these drawbacks, the '776 patent discloses a “monolithic capacitor structure” that includes both a “lower frequency, higher value capacitor” and a “higher frequency, lower value capacitor” in a single

dielectric body. *Id.* at [57]. The capacitors are formed as a series of plates arranged in a “substantially parallel and opposed configuration” in different regions of the dielectric body or on an external surface. *Id.* at 4:50–67. The ’776 patent further discloses that the conductive structures can be “opposed edges that are positioned to form a fringe-effect capacitance.” *Id.* at 5:1–2.

One embodiment of the claimed invention is illustrated in Figure 9A of the '776 patent, reproduced below.

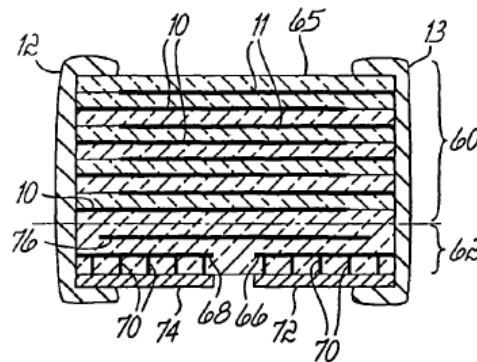


FIG. 9A

Figure 9A shows an upper section 60, including plates 10 and 11 extending from conductive contacts 12 and 13, respectively, and a lower section 62, including two additional internal plates 66 and 68, which extend from end contacts 13 and 12, respectively, and are coupled to external conductive plates 72 and 74, respectively. *Id.* at 6:37–45, 6:55–61. Plates 66 and 68 are “capacitively coupled to a floating interior plate 76.” *Id.* at 6:62–65. In this configuration, a high value capacitor is formed in the upper section, and a high frequency capacitor is formed in the lower section. *Id.* at 6:39–41, 6:55–56.

According to the '776 patent,

[t]he composition of the integrated capacitor array can be varied in order to tune the wideband capacitor to a particular application. Further, the integrated capacitor array of the

present invention provides superior performance by providing less insertion loss than combinations of discrete capacitors. In addition, the wideband capacitor of the present invention is smaller and easier to handle and mount on a circuit board than combinations of discrete capacitors.

Id. at 4:42–49; *see also id.* at 6:66–7:5 (stating that high frequency performance is affected by the relative position of plate 76 and the nearest multi-layer plate 10 in upper section 60).

C. Challenged Claims

Petitioner challenges claims 1–14 of the '776 patent. Representative claim 1 is the only independent claim, and is reproduced below:

1. A capacitor comprising:
 - a substantially monolithic dielectric body having a first and second external surface, the first external surface adapted to be positioned substantially parallel to a major surface of a circuit board; and
 - a lower frequency, higher value, first capacitor formed by a first plurality of conductive plates disposed within the dielectric body, the first plurality of conductive plates forming a plurality of capacitors connected in parallel with each other; and
 - a higher frequency, lower value, second capacitor formed by a second plurality of conductive plates disposed within the dielectric body, the second plurality of conductive plates forming the second capacitor, wherein said first and second capacitors are connected in parallel by conductors lying along said first and second external surfaces.

Id. at 13:35–51.

D. Reviewed Grounds of Unpatentability

Reference(s)	Statutory Basis	Claim(s) Challenged
Kuroda ¹	§ 102(b)	1–11, 13, and 14
Kuroda, Hiroyuki, ² and Herbert ³	§ 103	12
Kuroda and Li ⁴	§ 103	1–5, 7–9, and 13
Kuroda, Li, and Heron ⁵	§ 103	6, 10, 11, and 14
Kuroda, Li, Hiroyuki, Heron, and Herbert	§ 103	12

E. Level of Ordinary Skill in the Art

Petitioner contends that “a [person of ordinary skill in the art] for the ’776 patent is generally one who has a Bachelor’s degree in electrical engineering along with several years of relevant applied research and/or industry work experience in the field of multilayer ceramic capacitors.” Pet. 4 (citing Ex. 1002 (Declaration of Dr. Todd Hubing) ¶¶ 17–18). According to Patent Owner’s declarant, Dr. Michael Randall, a person of ordinary skill in the art “would have had a Master’s Degree in Materials

¹ Japanese Publication No. HS-21429, published March 19, 1993 (Ex. 1003 (English Translation); Ex. 1015 (original)). All references to foreign language documents in this Decision are made to the corresponding English translation.

² Japanese Publication No. H10-214751, published August 11, 1998 (Ex. 1006 (English Translation); Ex. 1016 (original)).

³ CERAMIC DIELECTRICS AND CAPACITORS (1985) (Ex. 1011).

⁴ U.S. Publication No. 2002/0195700 A1, published December 26, 2002 (Ex. 1005).

⁵ U.S. Patent No. 4,931,901, issued June 5, 1990 (Ex. 1004).

Science and Engineering or analogous degree, and at least two years of industry experience with capacitor manufacturing.” Ex. 2001 (Declaration of Dr. Michael Randall) ¶ 31. Dr. Randall, however, indicates that his opinions “would not change based upon” Petitioner’s proposed level of ordinary skill in the art. *Id.* ¶ 32.

In view of this, we find that a person of ordinary skill in the art, as defined by Petitioner, is “one who has a Bachelor’s degree in electrical engineering along with several years of relevant applied research and/or industry work experience in the field of multilayer ceramic capacitors.” Pet. 4. This level of ordinary skill is reflected by the prior art of record. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself can reflect the appropriate level of ordinary skill in the art).

III. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction⁶ in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2017).

⁶ In October 2018, the Office changed the claim construction standard applicable to an *inter partes* review. See Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (to be codified at 37 C.F.R. pt. 42). The rule changing the claim construction standard, however, does not apply to this proceeding because Petitioner filed its Petition before the effective date of the final rule, i.e., November 13, 2018. *Id.* at 51,340 (rule effective date and applicability date), 51,344 (explaining how the Office will implement the rule).

Claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). If the specification “reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor’s lexicography governs.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1316 (Fed. Cir. 2005) (en banc) (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)).

In the Petition, Petitioner offers a construction for the following terms: (1) “substantially monolithic dielectric body,” (2) “major surfaces,” and (3) “located sufficiently close . . . to form a . . . fringe-effect capacitance.” Pet. 5–9. In our Institution Decision, we determined that no express claim construction was necessary for purposes of that decision. Inst. Dec. 8.

In its Response, Patent Owner offers a construction for the following terms: (1) “major surfaces,” (2) “located sufficiently close . . . to form a . . . fringe-effect capacitance,” and (3) “first external surface adapted to be positioned substantially parallel to a major surface of a circuit board.” PO Resp. 17–28. With regard to “major surfaces” and “located sufficiently close . . . to form a . . . fringe-effect capacitance,” Patent Owner does not make any substantive arguments based on its constructions or otherwise explain what impact adopting its constructions would have on Petitioner’s unpatentability arguments. *See generally id.* Additionally, Patent Owner’s construction of the phrase “located sufficiently close . . . to form a . . . fringe-effect capacitance” utilizes the claim construction standard set forth in

Phillips.⁷ PO Resp. 27–28. The *Phillips* claim construction standard, however, does not apply to this IPR because Petitioner filed the Petition before Nov. 13, 2018. For all of the foregoing reasons, we decline to adopt Patent Owner’s proposed constructions of “major surfaces” and “located sufficiently close . . . to form a . . . fringe-effect capacitance.”

With regard to the phrase “first external surface adapted to be positioned substantially parallel to a major surface of a circuit board,” the parties focus on the meaning of the term “adapted to.” In *Aspex Eyewear, Inc. v. Marchon Eyewear, Inc.*, 672 F.3d 1335, 1349 (Fed. Cir. 2012), the Federal Circuit stated, “[i]n common parlance, the phrase ‘adapted to’ is frequently used to mean ‘made to,’ ‘designed to,’ or ‘configured to,’ but it can also be used in a broader sense to mean ‘capable of’ or ‘suitable for.’” Patent Owner argues that, in the context of the ’776 patent, “adapted to” should be interpreted narrowly, such that the claim requires the first external surface to be “made to, or designed to, or configured to be substantially parallel to the circuit board.” PO Resp. 17. As support for this interpretation, Patent Owner directs us to Figures 16, 17A, and 17B of the ’776 patent, and argues that the figures “show that when the capacitor is mounted, the ‘first external surface’ is mounted such that it is substantially parallel to the circuit board.” *Id.* Patent Owner further argues that the Specification describes the inventive capacitor as *actually being used* in a particular matter, as opposed to describing it as *merely capable of being used* in a particular matter. *Id.* at 17–18 (citing Ex. 1001, 10:53–60). Based on this, Patent Owner asserts that a person of ordinary skill in the art would

⁷ Patent Owner indicates that it offered this construction in response to footnote 6 in the Institution Decision. See PO Resp. 27–28.

have understood “that the claims of the ‘776 patent are directed to a capacitor that accomplishes a specific objective, *i.e.*, having a ‘first external surface’ that is, in use, ‘positioned substantially parallel to a major surface of a circuit board.[’]” *Id.* at 18 (citing Ex. 2001 ¶ 74; Ex. 2010, 11:19–12:1 (arguing that Petitioner’s declarant agrees that the claims of the ‘776 patent are directed to a capacitor that accomplishes this “specific objective”)).

Petitioner contends that “adapted to” should be construed as “capable of” because the claim merely recites an intended use, and the ‘776 patent does not indicate that the intended use requires a unique structural configuration. Reply 4; Pet. 13.

After considering the parties’ arguments and evidence of record, we determine that the outcome here is the same under either proposed construction, as explained below. Accordingly, no express claim construction for this, or any other, term is necessary for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (noting that “we need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy’”) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng’g Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

B. Legal Principles

i. Burden of Proving Unpatentability

In an *inter partes* review, the petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to the patent owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail in this proceeding, Petitioner must support its challenges by a preponderance of the evidence.

35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). Accordingly, all of our findings and conclusions are based on a preponderance of the evidence.

ii. *Anticipation*

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *Verdegaal Bros. Inc., v. Union Oil Co.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Moreover, “[b]ecause the hallmark of anticipation is prior invention, the prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements ‘arranged as in the claim.’” *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). Whether a reference anticipates is assessed from the perspective of an ordinarily skilled artisan. *See Dayco Prods., Inc. v. Total Containment, Inc.*, 329 F.3d 1358, 1368 (Fed. Cir. 2003) (“[T]he dispositive question regarding anticipation [i]s whether *one skilled in the art* would reasonably understand or infer from the [prior art reference’s] teaching that every claim element was disclosed in that single reference.”). In that regard, in an anticipation analysis, “it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom.” *In re Preda*, 401 F.2d 825, 826–27 (CCPA 1968). Furthermore, “[i]t is well settled that the recitation of a new intended use for an old product does not make a claim to that old product patentable.” *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997).

iii. *Obviousness*

In *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966), the Supreme Court set out a framework for assessing obviousness under § 103 that requires consideration of four factors: (1) the “level of ordinary skill in the pertinent art,” (2) the “scope and content of the prior art,” (3) the “differences between the prior art and the claims at issue,” and (4) “secondary considerations” of non-obviousness such as “commercial success, long-felt but unsolved needs, failure of others, etc.” *Id.* at 17–18. “While the sequence of these questions might be reordered in any particular case,” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007), the Federal Circuit has “repeatedly emphasized that an obviousness inquiry requires examination of all four *Graham* factors and that an obviousness determination can be made only after consideration of each factor.” *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1335 (Fed. Cir. 2016). We note that, with respect to the fourth *Graham* factor, the parties have not presented arguments or evidence directed to secondary considerations of nonobviousness. As such, our assessment is based on the first three factors.

“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *KSR*, 550 U.S. at 418. Rather, “it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *Id.* Furthermore, a party seeking to demonstrate that a patent would have been obvious must show that “a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a

reasonable expectation of success in doing so.” *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012) (quoting *Procter & Gamble Co. v. Teva Pharm. USA, Inc.*, 566 F.3d 989, 994 (Fed. Cir. 2009)). Ultimately, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (cited with approval in *KSR*, 550 U.S. at 418).

C. References

i. Kuroda (Ex. 1003)

Kuroda discloses, “[a] multilayer capacitor wherein a high capacitance first capacitor portion [C1] and a low capacitance second capacitor portion [C2] are formed within a sintered body 12 separated by a distance d.” Ex. 1003, Abstract. Kuroda depicts several embodiments wherein capacitor portions C1 and C2 are formed from a plurality of overlying internal electrodes connected to external electrodes formed on the end faces of the sintered body. *Id.* ¶ 7. Kuroda explains that the distance “d” between capacitor portions C1 and C2 is greater than the distance between the plurality of overlying internal electrodes that form each of C1 and C2. *Id.* ¶ 8. Kuroda teaches achieving different capacitance values for C1 and C2 by (1) varying the number of layers in each of C1 and C2, (2) varying the distance between the electrodes in each of C1 and C2, and/or (3) using non-connected internal electrodes to form C2. *Id.* ¶¶ 7–10.

Kuroda depicts one embodiment of its multilayer capacitor in Figure 1, reproduced below.

FIG. 1

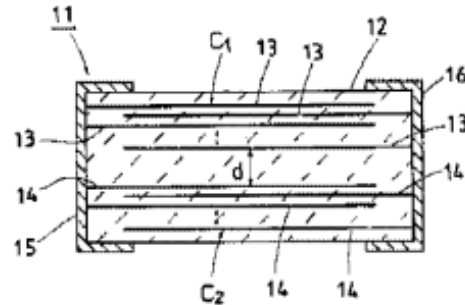


Figure 1 of Kuroda shows a cross-sectional view of a multilayer capacitor having first capacitor C1 and second capacitor C2 disposed within sintered body 12, and separated by gap “d”. *Id.* ¶ 7. First capacitor C1 is formed from a plurality of internal electrodes 13 positioned to overlay each other. *Id.* Second capacitor C2 is similarly formed from a plurality of internal electrodes 14. *Id.* Each of internal electrodes 13 and 14 lead out to external electrodes 15 and 16 formed on a pair of “end faces” of sintered body 12. *Id.*

Kuroda depicts another embodiment in Figure 5, reproduced below.

FIG. 5

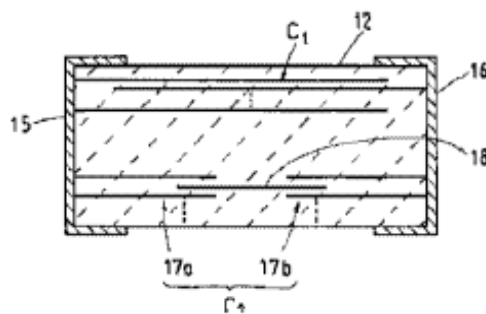


Figure 5 of Kuroda depicts a cross-sectional view of a multilayer capacitor having first capacitor C1 formed from a plurality of internal electrodes, each leading out to external electrodes 15 and 16 and positioned to overlay each

other (similar to C1 in Figure 1). *Id.* ¶ 10. Figure 5 also shows second capacitor C2 formed from a plurality of internal, coplanar electrodes 17a and 17b, each leading out to external electrodes 15 and 16, respectively, and connected in series to internal electrode 18, which is not connected to an external electrode. *Id.*

ii. Hiroyuki (Ex. 1006)

Hiroyuki is directed to a simple, reliable, and cost-effective method for manufacturing capacitors using surface capacitive electrodes. Ex. 1006 ¶ 10. Hiroyuki's method includes forming a capacitor having a single internal capacitive electrode and a corresponding single surface capacitive electrode, or a single pair of internal capacitive electrodes and a corresponding pair of surface capacitive electrodes. *Id.* ¶ 11.

iii. Herbert (Ex. 1011)

Herbert is a book designed to provide general background information on ceramic dielectrics. Ex. 1011, xix. Herbert "is intended to give the ceramist a broad understanding of the electrical side of his products and to give the electronic engineer a better insight into the properties, advantages, and limitations of one class of capacitive components." *Id.*

iv. Li (Ex. 1005)

Li is directed to an electronic assembly that includes one or more capacitors vertically connected to a housing instead of being horizontally connected to it. Ex. 1005, at [57], ¶ 30. Li explains that vertical connection of capacitors "enables more capacitors to be embedded within or surface mounted to the package," and enables "more off-chip capacitance to be supplied to die loads without increasing package sizes." *Id.* ¶ 30. Li discloses embodiments having capacitors vertically connected to pads of an

integrated circuit package such that the conductive terminals of the capacitor are substantially parallel to the top or bottom surface of the integrated circuit package. *Id.* ¶¶ 52–53, Fig. 7.

v. *Heron (Ex. 1004)*

Heron is directed to a method for making multilayer ceramic capacitors that includes forming a capacitor with overlapping electrodes as well as coplanar electrodes, to take advantage of the “fringing field capacitance” formed at the gap between the two coplanar electrodes. Ex. 1004, at [57], 2:7–19. Heron explains that the small capacitance between the pair of coplanar electrodes is “parallel connected with the base capacitor to bring the total capacitance up close to a target value.” *Id.* at [57].

According to Heron,

[t]his method is particularly valuable for making close tolerance capacitors having only a few conventional overlapping electrodes, because each pair of coplanar capacitance adjusting electrodes has a relatively small, stable, predictable incremental capacitance that is insensitive to changes in registration between successive electrodes.

Id.

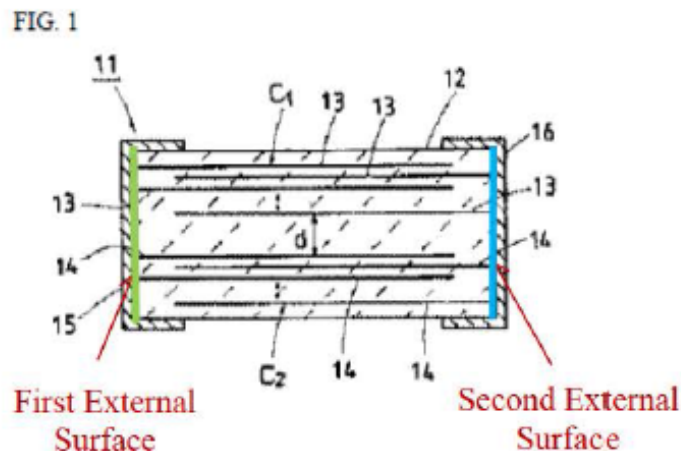
D. Claims 1–11, 13, and 14 – Anticipated by Kuroda

Petitioner contends that Kuroda teaches every element of claims 1–11, 13, and 14. Pet. 9–60. Petitioner presents arguments and information, demonstrating where Kuroda purportedly discloses each limitation of these claims. *Id.* In its Patent Owner Response, Patent Owner contends that Kuroda does not anticipate these claims because it fails to disclose a dielectric body having a “first external surface adapted to be positioned substantially parallel to a major surface of a circuit board.” PO Resp. 30–43.

i. *Claim 1*

1. *Undisputed Limitations in Claim 1*

Claim 1 requires a capacitor comprising “a substantially monolithic dielectric body having a first and second external surface.” Ex. 1001, 13:35–39. Petitioner argues that Kuroda’s capacitor 11 includes a “sintered body 12 made from a dielectric ceramic,” which is a substantially monolithic dielectric body. Pet. 10–11 (citing Ex. 1003 ¶¶ 6, 7; Ex. 1002, p. 19–20). Petitioner further contends that the “end faces” on Kuroda’s sintered body 12 correspond to the first and second external surfaces required in claim 1. *Id.* To support its arguments, Petitioner presents an annotated version of Kuroda’s Figure 1, which is reproduced below from the Petition. *Id.* at 11; Ex. 1002, pp. 19–20.



Petitioner’s annotated Figure 1 shows a cross-sectional view of a multilayer capacitor, wherein Petitioner identifies the first external surface and the second external surface as the surfaces on which external electrodes 15 and 16, respectively, are formed. Pet. 11.

Claim 1 also requires “a lower frequency, higher value, first capacitor formed by a first plurality of conductive plates disposed within the dielectric

body, the first plurality of conductive plates forming a plurality of capacitors connected in parallel with each other.” Ex. 1001, 13:40–44. Petitioner directs us to C1 in Figure 1 of Kuroda, noting that Kuroda describes C1 as “a ‘high capacitance capacitor’ effective in a ‘low frequency band.’” Pet. 13–15 (citing Ex. 1003 ¶ 2). Relying on the testimony of its declarant, Petitioner contends that a person of ordinary skill in the art “would recognize that such a capacitor is equivalent to the claimed ‘lower frequency, higher value, first capacitor.’” *Id.* at 15 (citing Ex. 1002, pp. 21–23). Petitioner also argues that internal electrodes 13 in C1 are conductive plates that form a plurality of capacitors between multiple opposing pairs of plates that are connected in parallel to each other via connections to electrodes 15 and 16. *Id.* at 15 (citing Ex. 1002, pp. 21–23, 32–33).

Claim 1 also requires “a higher frequency, lower value, second capacitor formed by a second plurality of conductive plates disposed within the dielectric body, the second plurality of conductive plates forming the second capacitor.” Ex. 1001, 13:45–48. Petitioner directs us to C2 in Figure 1 of Kuroda, asserting that electrodes 14 comprise a plurality of conductive plates, and noting that Kuroda describes C2 as “a ‘low capacitance capacitor’ effective in a ‘high frequency’ range formed from a plurality of conductive plates.” Pet. 16–17 (citing Ex. 1003 ¶ 2). Relying on the testimony of its declarant, Petitioner asserts that a person of ordinary skill in the art “would recognize that such a capacitor is equivalent to the claimed ‘higher frequency, lower value, second capacitor.’” *Id.* at 17–18 (citing Ex. 1002, pp. 23–24).

Claim 1 further requires the “first and second capacitors are connected in parallel by conductors lying along said first and second external surfaces.”

Ex. 1001, 13:49–51. Petitioner contends that this limitation is satisfied by Kuroda’s capacitors C1 and C2, which are connected in parallel between external electrodes 15 and 16, and argues that the external electrodes 15 and 16 lie along the first and second external surfaces of sintered body 12. Pet. 18–19 (citing Ex. 1003 ¶ 8, Figs. 1, 5, 6; Ex. 1002, pp. 24–25).

In its Response, Patent Owner does not dispute Petitioner’s mapping of these identified disclosures in Kuroda to the corresponding claim elements of claim 1. We previously instructed Patent Owner that “any arguments for patentability not raised in the [Patent Owner Response] will be deemed waived.” Paper 5, 3. After considering Petitioner’s undisputed arguments and evidence, we adopt as our own Petitioner’s analysis of the undisputed claim limitations as recited in claim 1. *See In re Nuvasive, Inc.*, 841 F.3d 966, 974 (Fed. Cir. 2016) (“Although the Board did not make findings as to whether any of the other claim limitations . . . are disclosed in the prior art, it did not have to: *NuVasive* did not present arguments about those limitations to the Board.”). As such, we determine that Petitioner has shown, by a preponderance of the evidence, that Kuroda discloses the aforementioned limitations in claim 1. We address below the limitation Patent Owner expressly contests in its Patent Owner Response.

2. Disputed Limitation in Claim 1

Claim 1 requires that the first external surface is “adapted to be positioned substantially parallel to a major surface of a circuit board.” Ex. 1001, 13:37–39. As noted above, Petitioner contends “adapted to” in this phrase means “capable of,” and asserts that Kuroda’s capacitors are “capable of being used in a manner that satisfies this claim element.” Pet. 12. In particular, Petitioner contends that Kuroda discloses this limitation

because it “would simply involve rotating the capacitor ninety degrees from the orientation shown in Figs. 1 and 5 of Kuroda when mounting the capacitor to a circuit board,”⁸ and “[s]uch mounting orientations were well-known in the art at the time of filing of the ’776 patent.” Pet. 12. (citing Ex. 1002, pp. 20–21; Ex. 1005 ¶¶ 31, 32, 49, 52, 53, Figs. 7, 17; Ex. 1007, Figs. 2–3).

Patent Owner argues that Kuroda’s capacitors are not “capable of” being positioned substantially parallel to a major surface of a circuit board because Kuroda’s devices would not work as a capacitor in a vertical orientation. PO Resp. 42. Specifically, Patent Owner contends that Kuroda’s capacitors have an external electrode on opposite terminal ends, such that when mounted with a terminal surface parallel to a circuit board, the capacitor would have only one terminal electrically connected to the circuit board and thus would “not work as a capacitor.” *Id.*

In its Reply, Petitioner responds by arguing that prior to the filing date of the ’776 patent, a person of ordinary skill in the art would have known that capacitors like those disclosed in Kuroda could have been rotated 90 degrees and mounted with an external surface positioned substantially

⁸ Patent Owner states that prior art capacitors, such as the ones Kuroda depicts in Figures 1 and 5, “are conventionally oriented horizontally,” such that rotating a capacitor 90 degrees to position a first external surface substantially parallel to a major surface of a circuit board would place the capacitor in a “vertical orientation.” PO Resp. 6, 8; Ex. 2001 ¶ 65. Petitioner likewise considers mounting Kuroda’s capacitor “vertically” to correspond to orienting the capacitor such that its first external surface is substantially parallel to a major surface of a circuit board. Reply 18. For purposes of this Decision, we use the terms “vertical mounting” and “vertical orientation” as do the parties, namely to refer to a capacitor positioned such that a first external surface is positioned substantially parallel to a major surface of a circuit board, as recited in claim 1.

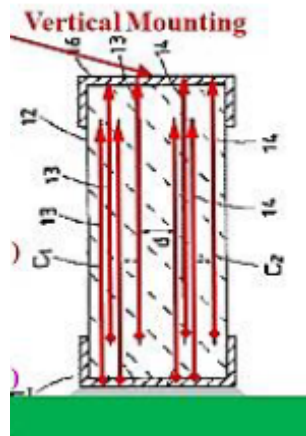
parallel to a major surface of a circuit board, and would have known a variety of ways to electrically connect the capacitor to the circuit board. Reply 16 (citing Ex. 1029 (Second Declaration of Dr. Todd Hubing) ¶¶ 19–24, 36; Ex. 1028). According to Petitioner, these techniques include embedding and wire bonding, the latter of which is described as prior art in the '776 patent. *Id.* (citing Ex.1001, Figs. 5A, 8B; 3:16–23, 3:66–4:12). Petitioner also argues that the '776 patent states that the capacitor shown in Figure 17A only has one contact area attached to a conductor on the circuit board, and does not indicate how the second contact is attached to the board. *Id.* at 16–17. Petitioner contends the fact that Patent Owner and its declarant assert Figure 17A of the '776 patent depicts a capacitor, as described in claim 1, undermines Patent Owner's argument that Kuroda's device, when oriented such that its first surface is substantially parallel to a major surface of the circuit board (i.e., as shown in Figure 17A), would not work as a capacitor. *Id.* (citing Ex.1026, 57:12–58:23; Ex. 1029 ¶¶ 25, 57).

We are persuaded by Petitioner's arguments and evidence that the first external surface of Kuroda's devices is "capable of" being positioned substantially parallel to a major surface of a circuit board. Pet. 12–13; Reply 15–17; Ex. 1002, pp. 20–21; Ex. 1005 ¶¶ 31, 32, 49, 52, 53, Figs. 7, 17; Ex. 1007, Figs. 2–3; Ex. 1029 ¶¶ 17–25. As discussed above, Petitioner has presented unchallenged evidence demonstrating that Kuroda's capacitors possess the structural features of the devices recited in claim 1 of the '776 patent. Pet. 10–19; Ex. 1002, pp. 19–24, 32–33; Ex. 1003 ¶¶ 2, 6–8, Figs. 1, 5, 6. It is undisputed that a person of ordinary skill in the art would have known that Kuroda's capacitors could be physically rotated 90 degrees to be oriented vertically. PO Resp. 22; Ex. 2001 ¶ 81. The evidence of record

also shows that a person of ordinary skill in the art would also have known of different ways to electrically connect a capacitor to a circuit board. *See e.g.*, Ex. 1002, pp. 20–21 (citing Ex. 1005, 1007); Ex. 1029 ¶¶ 19–21, 53; Pet. 12–13; Reply 16–17. For example, the ’776 patent states wire bonding was already known and used to electrically connect capacitors mounted in different configurations. *See, e.g.*, Ex. 1001, 1:32–37, 2:22–25, 3:16–23, Fig. 5A. Other references demonstrate electrically connecting capacitors oriented vertically through embedding. Ex. 1005 ¶¶ 31–32, 49, 52, 53, Figs. 7, 17; Ex. 1007, Figs. 2–3; *see Dayco Prods*, 329 F.3d at 1368 (“[T]he dispositive question regarding anticipation [i]s whether *one skilled in the art* would reasonably understand or infer from the [prior art reference’s] teaching that every claim element was disclosed in that single reference.”); *Preda*, 401 F.2d at 826–27 (“[I]t is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom.”).

Furthermore, we agree with Petitioner that Patent Owner’s assertion that Kuroda’s device would “not work as a capacitor” when oriented vertically, because only one surface would be in physical contact with the circuit board, is inconsistent with Patent Owner’s representations of the devices disclosed in the ’776 patent. *See, e.g.*, Reply 16–17 (stating the ’776 patent indicates that “only ‘one’” of the contact areas of the vertically orientated capacitor of Figure 17A is attached to the board); *see also* Ex. 1026, 57:12–58:23 (Dr. Randall testifying he does not have an opinion as to whether a person of ordinary skill in the art would understand how to connect the second contact area of the capacitor shown in Figure 17A of the ’776 patent to the circuit board); Ex. 1029 ¶¶ 23–25.

According to the '776 patent, when in use, the device shown in Figure 17A has only one surface (contact area 12 or 13) attached to a conductor. Ex. 1001, 10:55–60. This is similar to the configuration that would result from orienting Kuroda's device vertically, as depicted by Patent Owner and Dr. Randall in the figure reproduced below from the Patent Owner Response (PO Resp. 37) and the Randall Declaration (Ex. 2001 ¶ 143).



This figure shows the device depicted in Figure 1 of Kuroda rotated 90 degrees with external electrodes 15/16 oriented parallel to the circuit board and only one of the external electrodes (15) connected to the circuit board. See PO Resp. 37; Ex. 1003, Fig. 1.

Dr. Randall and Patent Owner maintain that the device in Figure 17A of the '776 patent is an example of the capacitor claimed in claim 1. Ex. 2001 ¶ 44. In view of Petitioner's evidence of the structural similarities between this device and Kuroda's, and the absence of any evidence showing any structural differences between the two, we fail to see how Kuroda's device, when rotated 90 degrees, would "not work as a capacitor," but the device in Figure 17A would. PO Resp. 42.

For all of the foregoing reasons, we find Petitioner has established, by a preponderance of evidence, that Kuroda discloses a capacitor having a first

external surface “adapted to be positioned substantially parallel to a major surface of a circuit board,” when “adapted to” is construed to mean “capable of.”

Petitioner alternatively argues that Kuroda discloses a capacitor having a first external surface that is “adapted to be positioned substantially parallel to a major surface of a circuit board” even under Patent Owner’s narrower construction of the phrase, i.e., when “adapted to” means “designed to” or “configured to.” In particular, Petitioner contends that “the limitation of ‘the first external surface adapted to be positioned . . .’ does not add any actual structure to the claimed capacitor that is not already present in the other elements of claim 1.” Pet. 13. Petitioner argues that Kuroda’s device has a structure identical to the apparatus set forth in claim 1 of the ’776 patent (*id.*; Reply 17), and that neither the claims nor Specification of the ’776 patent disclose any unique structural features of a device “adapted to be positioned substantially parallel to a major surface of a circuit board,” including any features that would distinguish the claimed invention over Kuroda’s devices. Pet. 13; Reply 17. Petitioner supports this position by directing us to the devices shown in Figure 5 of Kuroda and Figure 17A of the ’776 patent, emphasizing the structural similarities between the two. Reply 17. In view of these similarities, Petitioner contends that “to the extent the capacitor of claim 1 and/or the capacitors shown in Figures 17A and 18A of the ’776 patent are ‘designed to’ . . . be[] positioned as claimed, the capacitors of Kuroda are also so designed.” *Id.* (citing Ex. 1029 ¶¶ 27, 28); *see also* Pet. 13 (arguing that “[b]ecause the device disclosed by Kuroda has a structure identical to that of claim 1, it is necessarily ‘adapted to be positioned substantially parallel to a major surface of a circuit board’”).

Patent Owner argues that Kuroda is not designed or configured to have a first external surface positioned substantially parallel to a surface of a circuit board (i.e., oriented vertically) because Kuroda seeks to achieve specific broadband performance objectives and to eliminate directionality from the device, and Kuroda's capacitors must be oriented horizontally in order to achieve these objectives. PO Resp. 32–40.

With regard to Kuroda's broadband performance objectives, Patent Owner states that Kuroda discloses integrating two separate capacitors, C1 and C2, into a single device and that “[t]hese capacitors act independently of each other so as to create a broadband capacitor used for decoupling across a broad frequency band.” *Id.* at 33 (citing Ex. 1003 at Prior Art, Fig. 2; Ex. 2001 ¶ 129). According to Patent Owner, Kuroda's devices achieve these desirable characteristics by adjusting the magnitude of the capacitances C1 and C2, and the inductance L. *Id.* at 34. Patent Owner further asserts that the inductance of the first capacitor can be adjusted by changing the value of “d” shown in Figure 1 of Kuroda. *Id.* at 35–36 (explaining that increasing “d” increases the “effective length of external electrodes 15 and 16 for C1, which, in turn, increases the size of the current loop(s) for C1”).

Patent Owner thus argues that a person of ordinary skill in the art would have understood that “the device of Kuroda must be mounted such that increasing “d” increases the effective length of external electrodes 15 and 16 in a manner that increases the current loop(s) for C1, thus increasing inductance L1.” *Id.* at 36–37 (citing Ex. 2001 ¶ 143). According to Patent Owner, this only happens if the device is mounted horizontally, such that “d” is perpendicular to the mounting plate, because vertical mounting would result in a configuration where adjusting “d” would not result in a difference

between current paths C1 and C2, and, therefore fail to provide a difference in inductance between C1 and C2. *Id.* Without a difference in inductance between C1 and C2, Patent Owner contends Kuroda cannot achieve all of its desired broadband characteristics. *Id.* at 38.

As to eliminating directionality, Patent Owner argues that Kuroda discloses positioning a capacitor (C2) both above and below a first capacitor (C1) to provide an arrangement that removes directionality from the device when mounted horizontally (i.e., it will perform the same when mounted upside down or right-side up). *Id.* at 39. According to Patent Owner, elimination of directionality, which can only occur if the device is mounted horizontally, is important because it can lower costs, increase throughput and yield, and provide a benefit in terms of both mechanical and electrical performance of the capacitor. *Id.* at 39–40 (citing Ex. 2001 ¶¶ 151, 154, 156).

Relying on the rebuttal declaration of Dr. Hubing, Petitioner disputes Patent Owner’s contention that changing “d” would not impact inductance in a vertical orientation. Reply 18 (citing Ex. 1029 ¶ 37). According to Petitioner, even when the capacitor is positioned vertically, changing “d” could change the length of the current path, and, therefore, change inductance, depending on where the electrical connections are positioned. *Id.* Additionally, Petitioner contends that “d” is not the only design variable that can be used to tailor decoupling bandwidth. *Id.* at 19. According to Petitioner, “to the extent a POSITA could not tailor the decoupling bandwidth by changing distance d, the POSITA would have recognized that it could still tailor the decoupling bandwidth using a variety of other

parameters, including several discussed in Kuroda itself.” *Id.* (citing Ex. 1003 ¶¶ 9, 10).

Petitioner also argues that Kuroda and the ’776 patent both aim to achieve the same objective, increasing bandwidth across capacitors, in the same way, by combining into a single dielectric body multiple capacitors having different capacitance values and frequency performance. *Id.* at 18. Petitioner further asserts that there is no structural distinction between the design of the capacitors in the ’776 patent and those in Kuroda. *Id.* at 20. Thus, “to the extent that ‘vertically’ orienting the capacitors of Kuroda affects a designer’s ability to modify inductance, the same effect is also found in the capacitors of the ’776 patent.” *Id.* (citing Ex. 1029 ¶ 41). Petitioner contends that Patent Owner’s failure to explain how the design of the ’776 patent overcomes the alleged drawbacks associated with Kuroda’s devices undermines its argument that Kuroda’s capacitors are not designed to be vertically oriented. *Id.*

As to Patent Owner’s arguments regarding Kuroda’s desire to eliminate directionality, Petitioner asserts that this is a feature of a single embodiment disclosed in Kuroda. *Id.* at 21. Other embodiments, such as those shown in Figures 1 and 5, do not include a capacitor portion C1 sandwiched between two capacitor portions C2, and do not discuss directionality elimination. *Id.* Petitioner thus argues that directionality elimination “is irrelevant in determining whether such capacitors are ‘adapted to be positioned substantially parallel to a major surface of a circuit board,’ as recited in claim 1 of the ’776 patent.” *Id.* (citing Ex. 1029 ¶ 46). Petitioner also argues that the capacitors in the ’776 patent have a first capacitor portion sandwiched between two other identical capacitor portions,

and, therefore, would suffer from the same problems with regard to directionality elimination as Kuroda's capacitor would when oriented vertically. *Id.* Petitioner further argues that because "[n]either the '776 patent nor [Patent Owner] provide[s] any structural distinction or explanation for how the design of the '776 patent overcomes this alleged deficiency, . . . [Patent Owner] cannot properly use it as a distinction for why Kuroda's capacitors are not designed to be vertically oriented (but those of the '776 patent somehow are)." *Id.* at 21–22.

We are persuaded by Petitioner's arguments and evidence. Petitioner has demonstrated that Kuroda's capacitors contain all of the structural features of the capacitors recited in claim 1. Patent Owner does not direct us to any unique structural differences between Kuroda's devices and those recited in claim 1, nor does Patent Owner direct us to any structural features necessary to "design" or "configure" a capacitor to be oriented vertically. We thus agree with Petitioner that, to the extent capacitors embodying the structural features recited in claim 1 are "designed to" or "configured to" be positioned substantially parallel to a major surface of a circuit board, according to the '776 patent (as well as Patent Owner and Dr. Randall), Kuroda's capacitors, which also embody the structural features of claim 1, are likewise "designed to" or "configured to" be positioned in the same way. *See* Ex. 1029 ¶ 26; Reply 17 ("Given the structural similarities between the capacitors of Kuroda . . . and the capacitors of the '776 patent . . . a [person of ordinary skill in the art] would not discern any difference in the orientation in which the two capacitors are 'designed to' be mounted.").

The fact that the devices of the '776 patent asserted to be covered by claim 1 and Kuroda are structurally similar also undermines Patent Owner's

argument that Kuroda's devices are not designed or configured to be oriented vertically because doing so would prevent the devices in Kuroda from achieving certain broadband objectives and eliminating directionality. PO Resp. 32–40. To the extent Kuroda's capacitors do suffer from problems relating to broadband performance or elimination of directionality when oriented vertically, so too would the devices in the '776 patent, as any issues stemming from the structural configuration of one device when oriented vertically would also be present in the other. Yet Patent Owner contends that the devices in the '776 patent are “designed to” or “configured to” be oriented vertically. PO Resp. 17. In view of this, it follows logically that Kuroda's devices are likewise “designed to” or “configured to” be oriented vertically, even if they suffer from the aforementioned alleged problems with broadband performance or directionality elimination when oriented vertically.

Moreover, even if Patent Owner is correct, i.e., that vertical mounting would result in a configuration where adjusting “d” would not result in a difference between current paths C1 and C2, and, therefore fail to provide a difference in inductance between C1 and C2, Kuroda explains that other factors can influence inductance. *See, e.g.*, Ex. 1003 ¶ 10 (discussing how an internal electrode with a serpentine portion can achieve a larger inductance). The ability to influence inductance without adjusting “d” indicates that Kuroda could still achieve all of its desired broadband characteristics even in a vertical orientation.

As to Patent Owner's argument regarding directionality elimination, Petitioner is correct that Kuroda discloses several embodiments that do not

provide directionality elimination. Reply 21; Ex. 1003, Figs. 1, 5. Patent Owner's argument, therefore, is inapplicable to these embodiments.

In the portion of its Response addressing anticipation by Kuroda, Patent Owner argues a person of ordinary skill in the art would not utilize Kuroda's devices in a vertical orientation due to compatibility concerns, the need for package design modifications, increased costs, and reduced output. PO Resp. 40–42. These arguments, however, are not relevant to the question of whether Kuroda anticipates claim 1. *See Celeritas Techs., Ltd. v. Rockwell Int'l*, 150 F.3d 1354, 1361 (Fed. Cir. 1998) (holding that “[a] reference is no less anticipatory if, after disclosing the invention, the reference then disparages it,” and that “the question whether a reference ‘teaches away’ from the invention is inapplicable to an anticipation analysis”).

For all of the foregoing reasons, we find Petitioner has established, by a preponderance of evidence, that Kuroda discloses a capacitor having a first external surface “adapted to be positioned substantially parallel to a major surface of a circuit board,” when “adapted to” is construed to mean “designed to” or “configured to.”

3. Conclusion

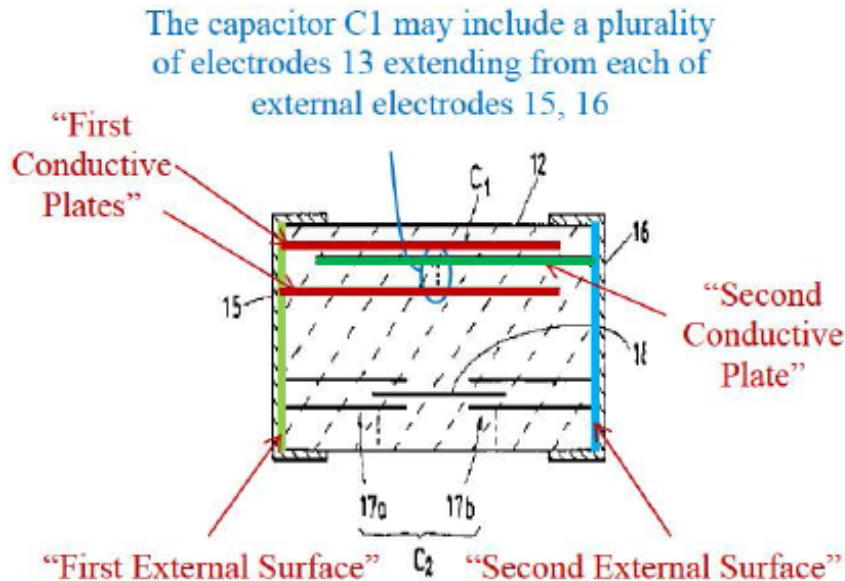
After reviewing the parties' arguments and the evidence of record, we find Petitioner has established, by a preponderance of evidence, that Kuroda discloses all limitations of claim 1. We, therefore, conclude that claim 1 of the '776 patent is unpatentable under 35 U.S.C. § 102 as anticipated by Kuroda.

ii. Claims 2–6, 11, 13, and 14

Claims 2 and 3, which depend from claim 1, require the first capacitor and second capacitor, respectively, to have major surfaces oriented substantially perpendicular to the first external surface of the dielectric body. Ex. 1001, 13:52–59. Petitioner identifies several major surfaces of the first and second capacitors that are perpendicular to the first external surface of the dielectric body, including front, back, top, and bottom surfaces in the images shown in in Figures 1, 5, and 6 of Kuroda. Pet. 19–25 (citing Ex. 1003 ¶ 7). Petitioner also argues that, “given that the shape and structure of the capacitors of Kuroda and the ’776 patent are identical, Kuroda necessarily discloses the elements of Claim 2 no matter which pair of surfaces are analogized to the claimed ‘major surfaces.’” *Id.* at 22–23 (citing Ex. 1002, pp. 28). Petitioner makes the same argument for Claim 3. *Id.* at 25.

Claim 4 also depends from claim 1, and further requires that the first capacitor comprises a first internal conductive plate conductively connected to the first external surface, a second internal conductive plate conductively connected to the second external surface, and the first and second plates to be arranged in a substantially parallel and opposed configuration to form a capacitor between them. Ex. 1001, 13:60–14:3. Petitioner contends that any of the internal electrodes 13 extending from external electrode 15 correspond to the first conductive plate, and any of the internal electrodes 13 extending from external electrode 16 correspond to the second conductive plate. Pet. 25–33.

Petitioner presents an annotated version of Kuroda Figure 5, reproduced below, to support its arguments. *Id.* at 29; Ex. 1002, pp. 34–35.



Petitioner’s annotated version of Kuroda Figure 5, reproduced above, shows a cross-sectional view of a multilayer capacitor with first conductive plates extending from the first external surface, and second conductive plate extending from the second external surface. Pet. 29. Petitioner contends that these plates are substantially parallel and overlap to form capacitor C1. *Id.* at 30–31 (citing Ex. 1003 ¶ 7). For example, Petitioner argues that Figures 1, 5, and 6 of Kuroda illustrate that “the ‘internal electrodes 13’ are substantially parallel, alternatingly opposed to each other, and form[] a capacitor between each opposing pair of adjacent electrodes.” *Id.* at 31 (citing Ex. 1002, p. 36.)

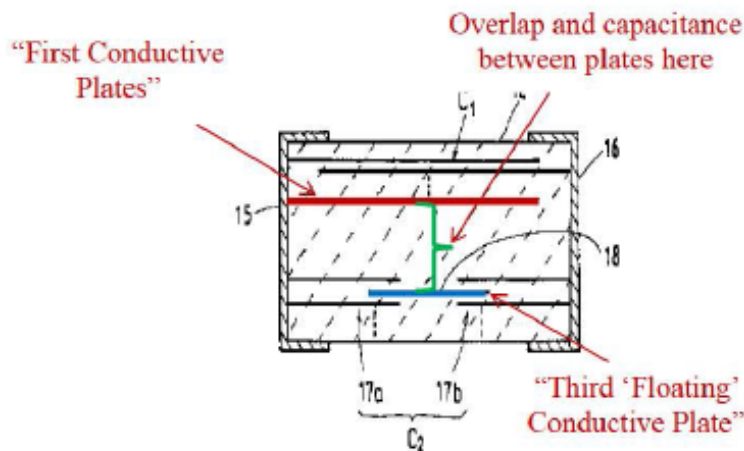
Claim 5 depends from claim 4, and recites that the second conductor further comprises a third internal conductive plate not conductively connected to any external surface and arranged to be substantially parallel and opposed to either the first or second internal plates in at least one region

of the dielectric body to form a capacitor between them. Ex. 1001, 14:4–11. Claim 5 also requires fourth and fifth internal conductive plates, which are conductively connected to the first and second external surfaces, respectively, wherein each plate is substantially parallel to and opposes the third plate in at least one region of the dielectric body to form a capacitor between them. *Id.* at 14:12–23.

Petitioner argues that “non-connected internal electrode 18” shown in Kuroda Figure 5 corresponds to the third conductive plate, and that a capacitor is formed between electrode 18 and first conductive plate 13. Pet. 33–34. Specifically, Petitioner states

in the central region of the sintered body 12, no electrodes are located between the non-connected internal electrode 18 and lowermost internal electrode 13 and only dielectric is located between the two electrodes. (Ex. 1002 at 37-38.) Because the non-connected internal electrode 18 and lowermost internal electrode 13 are respective conductors that are separated by a dielectric, a capacitor is necessarily formed between the electrodes.

Id. at 35 (citing Ex. 1002, pp. 37–38). To support its argument, Petitioner presents another annotated version of Kuroda Figure 5, reproduced below. *Id.*



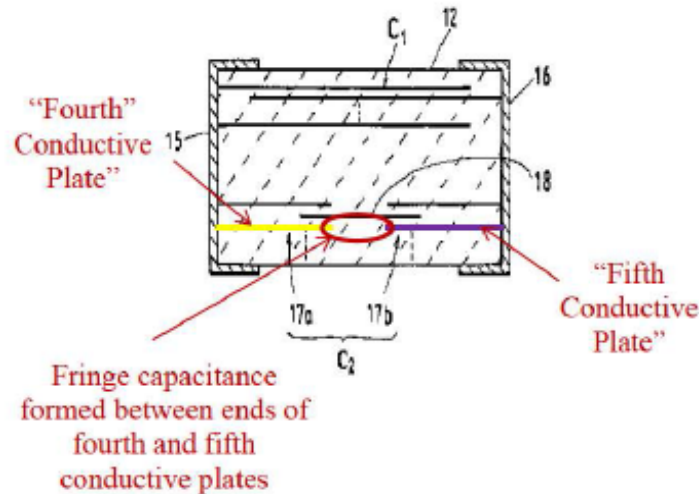
According to Petitioner, its annotated Figure 5 shows a cross-sectional view of a multilayer capacitor depicting first conductive plate 13, third conductive plate 18, and the overlap and capacitance between the plates. *Id.* (citing Ex. 1002, pp. 37–38).

Petitioner contends plates 17a and 17b correspond to the fourth and fifth conductive plates recited in claim 5. *Id.* at 37–39. Petitioner further contends that these plates are connected to external electrodes and are substantially parallel and opposed to the third plate (electrode 18), such that each plate forms a capacitor with the third plate. *Id.*

Petitioner presents a similar argument and evidence regarding claim 13, which contains limitations similar to those in claim 5. *Id.* at 58.

Claim 6 depends from claim 5 and further requires “the fifth conductive plate is located sufficiently close to the fourth conductive plate to form a first fringe-effect capacitance with the fourth conductive plate.” Ex. 1001, 14:24–27. Petitioner contends, “Figure 5 of Kuroda demonstrates that the fourth and fifth plates are arranged in a co-planar configuration such that a fringe-effect capacitance is formed therebetween.” Pet. 41 (citing Ex. 1002, pp. 43–45).

To support its argument, Petitioner presents an annotated version of Kuroda Figure 5, reproduced below. *Id.*

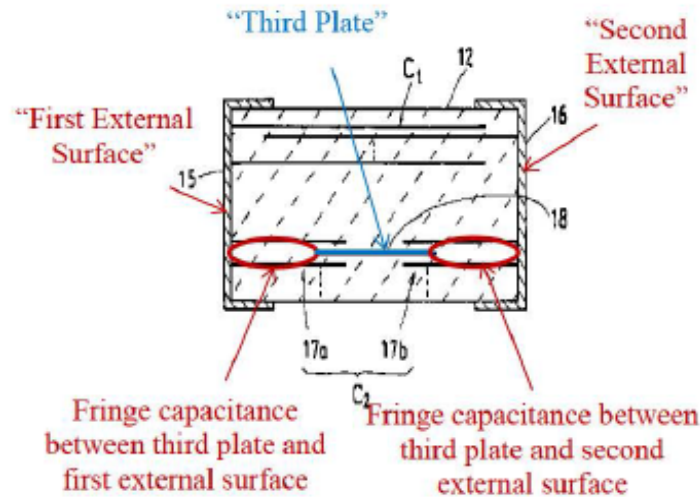


According to Petitioner, its annotated Figure 5 shows a cross-sectional view of a multilayer capacitor having a fourth conductive plate and fifth conductive plate, and an area where the fringe capacitance is formed between the co-planar fourth and fifth conductive plates. *Id.* Petitioner relies on Dr. Hubing’s testimony that “fringing/curving electric field lines will always extend between coplanar electrodes, and a fringe-effect capacitance is therefore always formed between adjacent edges of two opposed coplanar electrodes.” *Id.* (citing Ex. 1002, pp. 43–45).

Petitioner presents similar arguments and evidence with regard to claim 11, which contains limitations similar to those in claim 6. *Id.* at 54–57.

Claim 14, depends from claim 13, and requires a third plate located sufficiently close to one of the first and second external surfaces to form a fringe-effect capacitance with one of the surfaces. Ex. 1001, 16:10–14. Petitioner contends that non-connected electrode 18 forms a fringe effect

capacitance with external electrodes 15 and 16, as depicted in Petitioner's annotated Figure 5, reproduced below. Pet. 59–60 (citing Pet. 40–42; Ex. 1002, pp. 42–45).

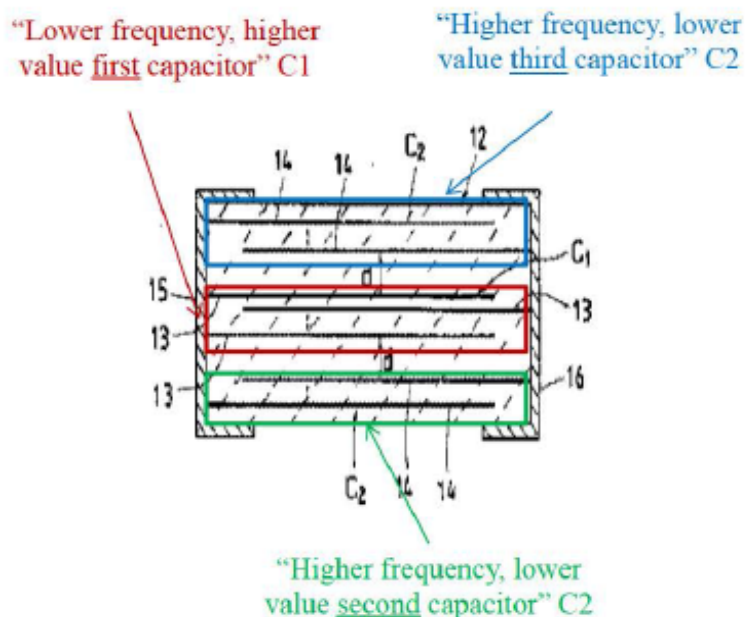


According to Petitioner, its annotated Figure 5 shows a cross-sectional view of a multilayered capacitor, and depicts the fringe capacitances (shown in red circles) formed between the third plate (electrode 18) and the first and second external surfaces. *Id.* at 59. Petitioner argues again “a fringe-effect capacitance is always formed between an end of an electrode plate and an adjacent conductor,” asserting that this statement holds true for electrode 18 and the perpendicularly arranged external electrodes 15 and 16. *Id.* at 59–60 (citing Ex. 1002, pp. 44, 61–65).

After reviewing Petitioner's arguments and information, including the Hubing Declaration, which are unchallenged by Patent Owner, we find Petitioner demonstrates sufficiently where Kuroda discloses each limitation in claims 2–6, 11, 13, and 14. As a result, we determine that the record before us establishes, by a preponderance of evidence, that Kuroda anticipates claims 2–6, 11, 13, and 14.

iii. Claims 7–10

Claim 7 depends from Claim 5 and further requires “a higher frequency, lower value, third capacitor formed by a third plurality of conductive plates disposed within the dielectric body, the third plurality of conductive plates forming the third capacitor connected in parallel with the first capacitor.” Ex. 1001, 14:28–33. Petitioner asserts Kuroda discloses a higher frequency, lower value, third capacitor disposed within a dielectric body. Pet. 42 (citing Ex. 1003 ¶ 10, Fig. 6; Ex. 1002, 46–50). Petitioner directs us to Figure 6 and paragraph 10 of Kuroda, arguing Kuroda “discloses that multiple ‘second capacitor portions C2 and C2 may be disposed [both] above and below the first capacitor C1 to eliminate the vertical directionality of the multilayer capacitor.’” *Id.* at 43 (quoting Ex. 1003 ¶ 10). To support its argument, Petitioner provides an annotated version of Kuroda’s Figure 6, reproduced below from the Petition.



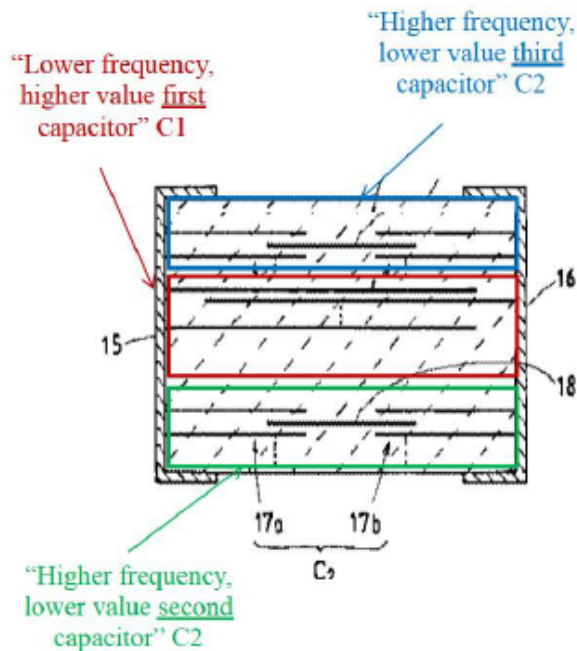
According to Petitioner, its annotated Figure 6 shows a cross-sectional view of a multilayer capacitor having a lower frequency, higher value first

capacitor C1, between a higher frequency, lower value, second capacitor C2 and a higher frequency, lower value, third capacitor C2. *Id.*; Ex. 1002, pp. 46–47.

Petitioner contends that Figures 1 and 5 of Kuroda illustrate various electrode plate configurations for C1 and C2, and that the position of multiple capacitor portions C2 above and below C1 is “equally applicable” to the plate configurations shown in Figures 1 and 5. Pet. 43–44 (citing Ex. 1002, pp. 46–47). Specifically, Petitioner argues that “the selection of the specific electrode configurations for the capacitor portions C1 and C2 is merely a design choice dependent on the desired capacitance values (and other parameters) for each capacitor portion.” *Id.* at 44 (citing Ex. 1002, pp. 47).

Based on this interpretation, Petitioner combines the electrode plate configurations of Kuroda’s Figure 5⁹ embodiment with the overall structure of Kuroda’s Figure 6 embodiment to produce an exemplary embodiment shown in the figure below, reproduced from the Petition. *Id.*

⁹ As discussed above, claim 7 depends from claim 5, and Petitioner contends that the embodiment shown in Kuroda Figure 5 satisfies the limitations recited in claim 5. Pet. 33–40.



According to Petitioner, its annotated figure shows a lower frequency, high value, first capacitor C1, positioned between higher frequency, lower value, second and third capacitors C2. *Id.* Petitioner contends that this figure, which is based on a combination of embodiments described in Kuroda, demonstrates that Kuroda discloses a capacitor that satisfies the limitations of claim 7. *Id.* at 44–45. In particular, Petitioner asserts that “the ‘higher frequency, lower value third capacitor’ includes a third plurality of conductive plates (*e.g.*, the corresponding electrodes of ‘capacity portions 17a and 17b’ and ‘non-connected internal electrodes 18’) and is connected in parallel to the other capacitor portions C1 and C2 (*i.e.*, the ‘first’ and ‘second’ capacitors).” *Id.* at 45 (citing Ex. 1003 ¶ 10, Fig. 5; Ex. 1002, p. 48). Petitioner further explains that “each of capacitor portions C1 and C2 (*i.e.*, the claimed ‘first, second, and third capacitors’) are connected in parallel between external electrodes 15 and 16.” *Id.*

In the Institution Decision, we indicated that we were not persuaded by Petitioner’s arguments and evidence that Kuroda anticipates claim 7,

based on the record at that time. Inst. Dec. 25. Specifically, we stated that Petitioner failed to demonstrate adequately that each and every element in a claim, arranged as recited in the claim, is found in a single prior art reference. *Id.*; see *NetMoneyIN, Inc. v. Verisign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). We also stated that Petitioner relies on an exemplary figure that is not found in Kuroda, instead creating a new figure by combining different features (i.e., different capacitors C2) from separate embodiments described in Kuroda. Inst. Dec. 25. Finally, we stated that “[s]uch picking and choosing . . . has no place in the making of a 102, anticipation rejection.” *Id.* (quoting *In re Arkley*, 455 F.2d 586, 587 (CCPA 1972) (quoted with approval in *Sanofi-Synthelabo v. Apotex, Inc.*, 550 F.3d 1075, 1083 (Fed. Cir. 2008))); see also *Microsoft Corp. v. Biscotti, Inc.*, 878 F.3d 1052, 1069 (Fed. Cir. 2017) (stating that anticipation is not proven by multiple, distinct teachings that the artisan might somehow combine to achieve the claimed invention).

Neither party addressed this issue in any subsequent papers. Therefore, we see no reason to modify our Institution Decision, and we incorporate our analysis from our Institution Decision in this Final Written Decision in finding Petitioner has failed to demonstrate, by a preponderance of evidence, that Kuroda anticipates claim 7. For the same reasons, in the context of the ground based on alleged anticipation by Kuroda, we reach the same conclusion for claims 8–10, which depend from claim 7.

iv. Conclusion

After considering the parties’ arguments and the evidence of record, we conclude Petitioner has demonstrated, by a preponderance of evidence,

that Kuroda anticipates claims 1–6, 11, 13, and 14, but has not shown by a preponderance of the evidence that Kuroda anticipates claims 7–10.

E. Claim 12 – Obvious over Kuroda, Hiroyuki, and Herbert

Petitioner contends that the subject matter of claim 12 would have been obvious based on the combination of Kuroda, Hiroyuki, and Herbert. Pet. 60 (citing Ex. 1002 ¶¶ 41–43 and pp. 67–73).

Claim 12 depends from claim 4, and further requires a conductive third plate and conductive fourth plate each positioned on an external surface and conductively connected to the first external surface and second external surface, respectively. Ex. 1001, 15:6–16. Claim 12 also requires that the third and fourth plates are opposed and located sufficiently close to one another to form a fringe-effect capacitance between them. *Id.*

Petitioner acknowledges that Kuroda discloses only internal third and fourth conductive coplanar plates, but argues that Hiroyuki teaches positioning plates on an external surface of a dielectric body in a coplanar configuration to form a fringe-effect capacitance between them. Pet. 62–64 (citing Ex. 1006 ¶¶ 3, 11, 18, 41–43, Figs. 1, 5).

Relying on the testimony of Dr. Hubing, Petitioner asserts that a person of ordinary skill in the art “would find it obvious to modify the structure of Kuroda such that the pair of electrodes corresponding to capacity portions 17a and 17b were formed on the external surface of the dielectric body as taught by Hiroyuki instead of internally within the dielectric body.” *Id.* at 63 (citing Ex. 1002, pp. 70–71). Petitioner contends that a person of ordinary skill in the art would have been motivated to modify Kuroda to include coplanar electrodes on an external surface to “allow easier adjustment of the capacitance of the capacitor portion C2,

easier optical recognition capabilities, and to improve device reliability and manufacturing.” *Id.* at 63–64 (citing Pet. 66–69; Ex. 1002, pp. 70–71).

Petitioner reiterates that a person of ordinary skill in the art would have understood that a fringe-effect capacitance is always formed between adjacent edges of two opposed coplanar electrodes (citing Ex. 1002, pp. 42–45, 71), but also argues that

even if the Board does not conclude that a fringe-effect capacitance is necessarily present between the coplanar electrodes [in view of Kuroda and Hiroyuki], it would have been obvious to a [person of ordinary skill in the art] to configure the coplanar electrodes on the surface of the sintered body 12 of Kuroda such that a fringe-effect capacitance was present between the electrodes.

Pet. 65. According to Petitioner, Herbert expressly discloses a fringe-effect capacitance between coplanar electrodes formed on the surface of a dielectric. *Id.* (citing Ex. 1011, 45). Petitioner further contends that Herbert teaches, “such a capacitor configuration is ‘useful as small capacitances for use at high frequencies in hybrid circuits.’” *Id.* (quoting Ex. 1011, 45).

Petitioner thus concludes it would have been obvious to a person of ordinary skill in the art, in view of Hiroyuki alone, or Hiroyuki and Herbert, to position the coplanar electrodes of Kuroda on a surface of sintered body 12 in a configuration to take advantage of the fringe-effect capacitance produced between the electrodes. *Id.* at 66 (citing Ex. 1002, pp. 72–73). Petitioner further concludes that a person of ordinary skill in the art would have combined the teachings of Kuroda, Hiroyuki, and Herbert with a reasonable likelihood of successfully forming a functioning capacitor. *Id.* at 63–69.

Patent Owner does not address Petitioner's arguments or evidence in its Response.

After reviewing the arguments and information presented by Petitioner, including the Hubing Declaration, which remain unchallenged by Patent Owner, we find that Petitioner has established sufficiently that the subject matter of claim 12 would have been obvious in view of Kuroda, Hiroyuki, and Herbert. We agree with and adopt Petitioner's explanation of how each claim limitation is taught or suggested by the combination of prior art references. *See, e.g., id.* at 63–70. Additionally, Petitioner's explanation that Hiroyuki and Herbert disclose the benefits of capacitors formed from coplanar surface electrodes supports, on this record, Petitioner's assertion that a person of ordinary skill in the art would have had reason to combine the teachings of Hiroyuki and Herbert with Kuroda to arrive at the claimed subject matter, and would have done so with a reasonable expectation of success. Petitioner's assertion is supported by Hiroyuki's disclosure of positioning plates on an external surface of a dielectric body in a coplanar configuration to form a fringe-effect capacitance between them, and Herbert's teaching that the formation of capacitors from coplanar electrodes on the surface of the dielectric can be “useful as small capacitances for use at high frequencies in hybrid circuits.” Ex. 1011, 45; Ex. 1006 ¶¶ 3, 11, 18, 41–43, Figs. 1, 5; Pet. 62–65.

Based on the complete record, we determine Petitioner has demonstrated, by a preponderance of evidence, that claim 12 is unpatentable under 35 U.S.C. § 103 as obvious in view of the combined teachings of Kuroda, Hiroyuki, and Herbert.

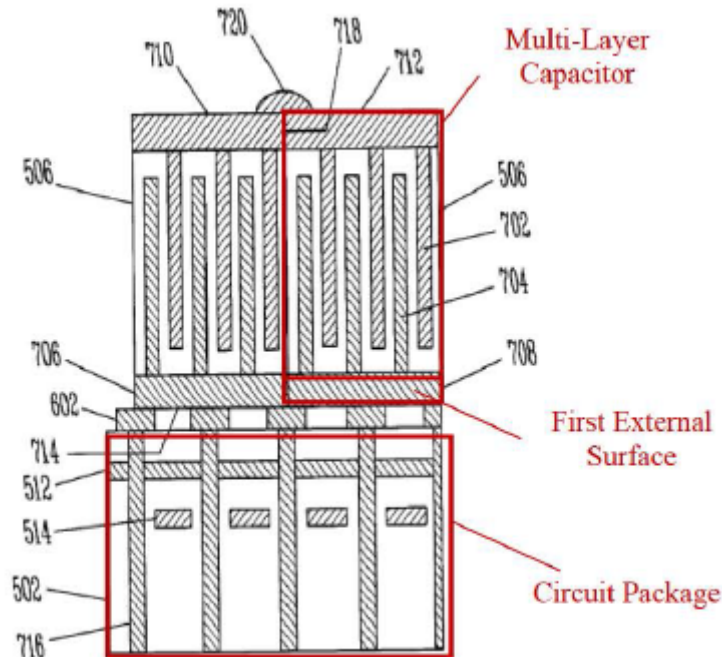
F. Claims 1–5, 7–9, and 13 – Obvious over Kuroda and Li

Petitioner contends that the subject matter of claims 1–5, 7–9, and 13 would have been obvious in view of the combined teachings of Kuroda and Li. Pet. 70–78 (citing Ex. 1002 ¶¶ 44–51). Patent Owner challenges Petitioner’s assertion that a person of ordinary skill in the art would have been motivated to combine the teachings of Kuroda and Li. PO Resp. 43–51.

i. Claim 1

With regard to independent claim 1, Petitioner argues “[t]o the extent that Kuroda is not found to disclose having a first external surface ‘adapted to be positioned substantially parallel to a major surface of a circuit board,’ this is expressly taught by Li.” Pet. 70. Specifically, Petitioner argues that Li teaches “surface mounting multilayer capacitors (*e.g.*, capacitors 506, 804, 1204) vertically with one external electrode (*e.g.*, terminals 706, 708) being attached to a circuit package (*e.g.*, package 502).” *Id.* at 70–71(citing Ex. 1005 ¶¶ 44, 52–56, 62, Abstract; Ex. 1002 ¶ 45).

To support its arguments, Petitioner presents an annotated version of Li's Figure 7, reproduced below from the Petition.



Id. at 71. Petitioner's annotated version of Li's Figure 7 shows a multi-layer capacitor having a first external surface 708 (i.e., electrode), wherein the capacitor is mounted on a circuit board such that the external electrode is parallel to the circuit board, as further shown in Figure 17 of Li. *Id.* at 71–72. Petitioner argues “Li teaches mounting external surfaces (on which electrodes are formed) of multi-layer capacitors parallel to the major surface of a circuit board” (*id.* at 73 (citing Ex. 1002 ¶¶ 45–48)), and reasons that “[i]t would have been obvious to configure the capacitor of Kuroda in a similar manner” (*id.* (citing Ex. 1002 ¶¶ 48–51)).

Petitioner contends Li teaches that mounting the capacitor in this way changes the footprint of the capacitor to allow more capacitors to fit on the mounting surface, and that this mounting configuration would reduce

inductance, which increases the performance and response time of the capacitor. *Id.* at 73 (citing Ex. 1005 ¶¶ 30, 34).

Petitioner concludes that it would have been obvious to a person of ordinary skill in the art to mount the multilayer ceramic capacitor of Kuroda such that its external surface is parallel to a major surface of a circuit board, and that a person of ordinary skill in the art would have had a reasonable likelihood of success in forming a fully functioning capacitor in view of Li's disclosure. *Id.* at 73–74 (citing Ex. 1002 ¶¶ 48–51; Ex. 1005 ¶¶ 30, 34).

Patent Owner counters that mounting Kuroda's capacitor in a vertical orientation, as shown in Li, would require wire bonding, which increases both the footprint of the capacitor and inductance, contrary to Petitioner's arguments. PO Resp. 44. According to Patent Owner, "[i]nductance is increased for the additional reason that the conduction paths of both sets of polarities of internal electrode plates flow in the same direction, thereby enhancing mutual inductance between them." *Id.* (citing Ex. 2001 ¶ 203).

Patent Owner also argues that Kuroda's device cannot be utilized as described in Li. *Id.* at 45. According to Patent Owner, Li's capacitors have at least two side terminals of differing polarity on each side, such that when Li's capacitors are oriented vertically, mounting pads of opposite polarity contact the package surface simultaneously. *Id.* Patent Owner distinguishes Kuroda's capacitors as having only one terminal on each end. *Id.* at 46. According to Patent Owner, adjustments such as adding wire bonding, skipping mounting pads or terminals, or miniaturizing Kuroda would be necessary, and would all have negative consequences. *Id.* at 47. For example, Patent Owner states that "wire bonding results in increased cost, specialized terminal materials, specialized packaging, specialized placement,

specialized manufacturing equipment and personnel requirements, reduced performance, greater board space requirements, eliminated broad band performance, and reduced throughput.” *Id.* at 48–49. Patent Owner contends that miniaturizing Kuroda would limit the capacitance of Li’s device, and failing to minimize Kuroda would necessitate increasing Li’s circuit package, which would result in unacceptable limitations on design flexibility and increased package inductance. *Id.* at 49.

Patent Owner also argues that a person of ordinary skill in the art would not use Kuroda’s devices in Li’s “embedded” arrangement because Kuroda’s devices “would electrically short with its nearest neighbors when embedded together as disclosed in Li,” and result in a non-functioning device. *Id.* at 49–50. Patent Owner further argues that a person of ordinary skill in the art would have understood that it would take an “extensive redesign” to get Kuroda’s devices to work in Li’s arrangement and would result in increased package size or a dramatic reduction in total package decoupling capacitance. *Id.* at 51 (citing Ex. 2001 ¶¶ 195–199).

In its Reply, Petitioner responds that a person of ordinary skill in the art would have understood that Kuroda’s capacitors could be used in Li’s circuits based on Li’s teaching that its invention is applicable to “multi-layer capacitors.” Reply 24 (citing Ex.1005 ¶¶ 40, 52; Ex.1029 ¶¶ 61–63). Petitioner also argues that Patent Owner “incorrectly implies that obviousness requires the capacitor of Kuroda be capable of being bodily incorporated into the exact circuit package shown in Li.” *Id.*

After considering the parties’ evidence and arguments, we determine that Petitioner has established, by a preponderance of evidence, that the

subject matter of claim 1 would have been obvious in view of Kuroda and Li.

First, Petitioner has shown that Kuroda and Li teach or suggest every limitation in claim 1. As discussed above, Petitioner has demonstrated sufficiently, and Patent Owner does not dispute, that Kuroda expressly discloses the limitations of claim 1 with the exception of the requirement that the first external surface is “adapted to be positioned substantially parallel to a major surface of a circuit board.” Ex. 1001, 13:37–39; *see* Section III.D.i.1, *supra*. For this obviousness challenge, Petitioner asserts, and has demonstrated sufficiently, that Li discloses a capacitor “adapted to be positioned substantially parallel to a major surface of a circuit board.” In particular, Li discloses a capacitor having a first external surface (terminal 708) positioned substantially parallel to a top or bottom surface of a circuit package, which is mounted onto a circuit board such that external surfaces of the capacitor are parallel to the circuit board. Pet. 70–73; Ex. 1005 ¶¶ 44, 52–56, 62, 92–94, 97–103, Figures 7, 17; Ex. 1002 ¶¶ 45–46. Patent Owner does not dispute Petitioner’s arguments and evidence regarding Li’s disclosure of this limitation.¹⁰

Petitioner’s arguments and evidence also demonstrate persuasively that a person of ordinary skill in the art would have had reason to combine the teachings of Kuroda and Li. Petitioner directs us to paragraphs 30 and 34 of Li, which discuss how vertically connecting a capacitor to a housing enables “more capacitors to be embedded within or surface mounted to the

¹⁰ Li discloses this limitation even under Patent Owner’s narrower interpretation, as Li depicts a capacitor, *in use*, having a first external surface positioned substantially parallel to a major surface of a circuit board. *See* Section III.A, *supra*.

package,” and thus “more off-chip capacitance to be supplied to die loads without increasing package sizes.” Ex. 1005 ¶ 30. Such a configuration also provides “lower vertical and/or lateral inductances” and shortened voltage droop response times. *Id.* ¶ 34.

The evidence of record also supports a finding that a person of ordinary skill in the art would have had a reasonable expectation of successfully combining the teachings of Kuroda and Li. *See* Ex. 1029 ¶¶ 20–22; Reply 15. For example, it is undisputed that a person of ordinary skill in the art knew that capacitors could be physically rotated. PO Resp. 22; Ex. 2001 ¶¶ 73, 81; Pet. 12. Additionally, both Li and Sakamoto¹¹ provide examples of systems that include vertically oriented capacitors. *E.g.*, Ex. 1005, Figs. 5, 7; Ex. 1007, Figs. 1–3; Pet. 12–13; Ex. 1002 ¶ 39 (page 20); Ex. 1029 ¶¶ 18, 21. And Li teaches the use of multilayer capacitors, like those disclosed in Kuroda, in its devices. Ex. 1005 ¶¶ 31, 40. In view of this, we credit Dr. Hubing’s testimony that a person of ordinary skill in the art “would have readily recognized at the time of the ’776 patent that the capacitor of Kuroda could have easily been rotated and connected such that its external surfaces on which its terminations were formed were parallel to a circuit board using any of the well-known techniques discussed” in the prior art. Ex. 1029 ¶ 22.

Furthermore, as noted above, Kuroda’s capacitors are structurally similar to those recited in claim 1 of the ’776 patent. *See* Section III.D, *supra*; Reply 13–14. With regard to bonding, the ’776 patent says only that “one of the metallized contact areas 12, 13 [of the capacitor shown in Figure 17A] is attached to a conductor extending over a major planar surface of a

¹¹ US 6,395,118 B1, issued May 28, 2002 (Ex. 1007).

printed circuit board.” Ex. 1001, 10:53–60; PO Resp. 15. We are directed to no other discussion in the ’776 patent regarding how the other contact area is attached. Reply 16. This lack of express teaching in the ’776 patent supports Dr. Hubing’s testimony that at the time the ’776 patent was filed, a person of ordinary skill in the art would have known how to mount and connect capacitors in this orientation. Ex. 1029 ¶ 22.

As to Patent Owner’s argument that mounting Kuroda’s capacitors vertically “requires wire bonding,” which actually increases inductance and the capacitor’s footprint (PO Resp. 44), Li and Sakamoto demonstrate that a person of ordinary skill in the art would have known about mounting techniques other than wire bonding that could have been used to electrically connect a multi-layer capacitor in a vertical orientation (*see, e.g.*, Ex. 1005 ¶ 32, Figs. 5, 7, 10; Ex. 1007, Figs. 2, 3). For example, both Li and Sakamoto teach that such capacitors may be embedded between layers of an electronic package and connected to other components by vias, traces, or other known electrically conductive components. Ex. 1005 ¶¶ 32, 39, 41, 53; Ex. 1007, 8:51–56 (referring to “via-holes”), Figs. 2, 3. At the very least, this undermines Patent Owner’s assertion that mounting Kuroda’s capacitors vertically “requires wire bonding.”

Nevertheless, even if we were to agree with Patent Owner’s assertion regarding the requirement for wire bonding, Li expressly discloses that the various embodiments disclosed therein “could be used with a number of different types of packages and packaging technologies,” including, but not limited to, wire bonding. Ex. 1005 ¶¶ 36, 99. This indicates that Li contemplated the use of wire bonding, and still concluded that there were advantages to using vertical orientation. Li itself thus contradicts Patent

Owner's assertion that a person of ordinary skill in the art would not have mounted Kuroda's capacitor vertically using wire bonding because doing so would actually increase inductance and the footprint size of the capacitor.

Furthermore, evidence of record presented by Petitioner also demonstrates that wire bonding is not the only factor that determines or controls inductance. According to Dr. Hubing, a person of ordinary skill in the art "would have been aware of numerous ways to adjust the inductance of a capacitor," including "changing the number[,] size, and shape of electrodes." Ex. 1029 ¶ 43. Consistent with Dr. Hubing's testimony, Kuroda teaches adjusting inductance by using an electrode with a "serpentine portion." Ex. 1003 ¶ 10. Kuroda further explains that "in the multilayer capacitor according to the present invention, the capacitances of the first and second capacitor portions and the inductance can be adjusted, to select the values thereof, enabling easy provision of a multilayer capacitor that is able to produce optimal decoupling effects across the desired frequency band." *Id.* ¶ 13. Patent Owner's declarant, Dr. Randall, cites this portion of Kuroda in his Declaration and refers to "setting" and "increasing" the inductance of the capacitors in Kuroda. Ex. 2001 ¶¶ 136–140. Therefore, the evidence in the record shows that even if the use of wire bonding does increase inductance, a person of ordinary skill in the art would have understood that there were other ways to adjust the inductance of the capacitor portions to provide a multilayer capacitor with desirable performance characteristics.

We also find that evidence in the record suggests that wire bonding would not necessarily have the other negative consequences or drawbacks alleged by Patent Owner, such as increasing cost and requiring specialized

materials, packaging, and equipment. For example, Dr. Randall testified that despite the various drawbacks he identified as being associated with wire bonding, the use of wire bonding is “situational,” and can be valuable in some structures. Ex. 1026, 63:24–64:15. Moreover, Patent Owner’s identification of alleged drawbacks or tradeoffs, such as specialized features, costs, and manufacturability, does not necessarily prevent the proposed combination. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (“[A] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine.”); *Orthopedic Equip. Co., Inc. v. United States*, 702 F.2d 1005, 1013 (Fed. Cir. 1983) (“[T]he fact that the two disclosed apparatus would not be combined by businessmen for economic reasons” is not “telling on the issue of nonobviousness.”).

In view of the foregoing, we find that Patent Owner’s alleged drawbacks do not negate the benefits of vertical orientation as suggested by Li. *See, e.g., KSR*, 550 U.S. at 417 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”)

In addition to these alleged drawbacks, we have considered Patent Owner’s other arguments, such as Kuroda’s specific capacitors “cannot be utilized as described in Li” without skipping mounting pads or terminals, or miniaturizing Kuroda’s device, or that Kuroda’s 5-sided external electrode would cause electrical shorting in Li’s arrangement. PO Resp. 45–51. Patent Owner’s arguments, however, appear to be based on bodily incorporating Kuroda’s capacitors into Li’s system. *See id.* The test for

obviousness, however, is what the combined teachings of the references would have suggested to a person of ordinary skill in the art, not whether one reference may be bodily incorporated into the structure of another reference. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

We credit Dr. Hubing’s testimony that a person of ordinary skill in the art “would readily understand that the specific via and conductive plane configurations need not be configured in the exact same manner as shown in Figs. 5 and 8” of Li, and would also understand that “the specific locations, number, and shape of vias and conductive planes could easily and obviously be changed or set based on the specific design requirements for the circuit package as well as the types of capacitors used therein.” Ex. 1029 ¶ 68; *see also id.* ¶ 64 (stating that a person of ordinary skill in the art “would recognize that a number of integrated circuit package designs are possible which may each include distinct conductive plane and via configurations that are usable with multi-layer capacitors such as those shown in Kuroda.”) Dr. Randall similarly suggests that a person of ordinary skill in the art would have understood how to design capacitors and/or circuits to achieve desired results. Ex. 2001 ¶¶ 55 (stating “capacitor designers have learned how to design capacitors so as to achieve desired impedance properties over a range of frequency”), 56 (noting that a circuit designer “can adjust their designs according to the needs of their circuit/application”).

Having considered the evidence and arguments presented regarding Petitioner’s assertion of unpatentability of independent claim 1, together with the evidence and arguments presented by Patent Owner to challenge the assertion, we conclude that Petitioner has proven by a preponderance of the evidence that claim 1 is unpatentable over Kuroda and Li.

ii. *Claims 2–5, 7–9, and 13*

With regard to dependent claims 2–5 and 13, Petitioner relies on its arguments regarding anticipation by Kuroda, which are unchallenged by Patent Owner. As discussed above, after reviewing the complete record developed during trial, we find Petitioner’s arguments to be persuasive. See Section III.D.ii, *supra*.

With regard to Claim 7, which depends from claim 5 and requires a higher frequency, lower value third capacitor connected in parallel with the first capacitor, Petitioner argues:

[t]o the extent the Board determines that Kuroda does not anticipate this element, it still would have been obvious to position separate high frequency, low value capacitor portions C2 above and below a central low frequency, high capacitor portion C1 as taught in Fig. 6 of Kuroda while using the specific electrode configurations for the capacitor portions C1 and C2 as taught in Fig. 5 of Kuroda.

Pet. 76. As discussed above, Petitioner’s argument that Kuroda discloses the limitations in claim 7 is based on a modified version of the embodiment depicted in Figure 5 of Kuroda, wherein an additional, third capacitor is positioned above C1, and has the same electrode configuration as the configuration shown in C2 present below C1 in Figure 5. *Id.* at 44.

Specifically, Petitioner argues it would have been obvious to a person of ordinary skill in the art to modify the embodiment shown in Fig. 5 of Kuroda “to include a second ‘high frequency, lower value, second capacitor’ (*e.g.*, another ‘second capacitor portion C2’) above the capacitor portion C1 in addition to the first ‘high frequency, lower value, second capacitor’ (*e.g.*, second capacitor portion C2) that is already below the capacitor C1.” *Id.* at 77 (citing Ex. 1002, pp. 49–50). Petitioner contends that modifying Kuroda

in this way would result in a capacitor having the elements recited in each of claims 7–9. *Id.* at 76–77; *see also id.* at 42–45 (explaining in detail how this configuration teaches or suggests the limitations in claim 7), 45–46 (explaining in detail how this configuration teaches or suggests the limitations in claim 8), 47–53 (explaining in detail how this configuration teaches or suggests the limitations in claim 9).

Petitioner further contends that a person of ordinary skill in the art “would have been motivated to make such a modification to reduce the directionality of the overall capacitance as discussed in Kuroda.” *Id.* at 77 (citing Ex. 1002, pp. 49–50). Petitioner also contends Kuroda teaches that various electrode configurations provide different capacitance and inductance characteristics, and, therefore, a person of ordinary skill in the art would have modified the embodiment shown in Figure 5 by including C2 above and below C1 “to further modify the characteristics (*e.g.*, inductance, capacitance, resonance, frequency characteristics, etc.) and performance of the overall capacitor.” *Id.* at 77; *see also id.* at 78 (arguing that selection of specific electrode plate configuration is routine optimization of a capacitor) (citing Ex. 1002, p. 50).

Patent Owner does not separately address claims 7–9 in its Patent Owner Response.

Based upon our review of the totality of the record after trial, we agree with, and adopt Petitioner’s arguments and evidence presented in the Petition demonstrating that a person of ordinary skill in the art would have had reason to modify the configuration of capacitors in Figure 5 of Kuroda as described, and would have done so with a reasonable expectation of success. Further, we find that Kuroda, as modified based on Li, teaches or suggests the

limitations of claims 7–9. Thus, we determine that the preponderance of the evidence supports a finding that Petitioner has demonstrated that the subject matter of claims 7–9 would have been obvious in view of Kuroda and Li.

iii. Conclusion

After considering the parties’ arguments and the evidence of record, we conclude Petitioner has demonstrated, by a preponderance of evidence, that the subject matter of claims 1–5, 7–9, and 13 would have been obvious in view of the combined teachings of Li and Kuroda

G. Claims 6, 10, 11, and 14 – Obvious over Kuroda, Li, and Heron

Petitioner contends that the subject matter of claims 6, 10, 11, and 14 would have been obvious in view of the combined teachings of Kuroda, Li, and Heron. Pet. 78–90 (citing Ex. 1002 ¶¶ 52–58).

Dependent claims 6, 10, 11, and 14 each require a capacitor configuration wherein two plates are located “sufficiently close” to one another so as “to form a fringe-effect capacitance” between them. Ex. 1001, 14:24–27, 14:59–62, 14:63–15:5, 16:10–14. For claims 6, 10, and 11, Petitioner directs us to embodiments in Kuroda having coplanar electrodes (e.g., C2 in Figure 5), and asserts that this configuration produces a fringe-effect capacitance between the ends of the coplanar conductive plates. Pet. 80–87. Petitioner also asserts that Heron “discloses that two coplanar electrodes may be spaced so as to create a desirable fringe-effect capacitance between the two coplanar electrodes.” *Id.* at 80–81 (citing Ex. 1004, 2:7–19, 3:12–26, 3:50–55, 4:1–35, Figs. 1, 7, 8), 83, 87. Petitioner argues that it would have been obvious to a person of ordinary skill in the art to space the coplanar electrodes of Kuroda in a way to create the desirable fringe-effect capacitance between them as taught by Heron. *Id.* at 82.

With regard to claim 14, in addition to reiterating its argument that “a fringe-effect capacitance is always formed between electrode 18 and the perpendicularly arranged external electrodes 15, 16 . . . of Kuroda,” Petitioner asserts, “Heron further discloses use of fringe-effect capacitance to create a close tolerance capacitor.” *Id.* at 88–89.

Petitioner also contends that it would have been obvious to combine the teachings of Kuroda, Li, and Heron. *Id.* at 89–90. In particular, Petitioner asserts that a person of ordinary skill in the art “would have found it obvious to space the coplanar electrodes of Kuroda to create a desirable fringe-effect capacitance between the coplanar electrodes as taught in Heron.” *Id.* at 89 (citing Ex. 1002 ¶¶ 55–56). Petitioner further argues that the configuration disclosed in Heron can be used to “enhance high frequency performance of hybrid capacitors” and to “creat[e] capacitors having very close tolerances (*e.g.*, capacitors having precise capacitance values) in order to satisfy specific bandwidth applications for the capacitor.” *Id.* (citing Ex. 1004, Abstract; 2:20–22, 3:18–4:51; Ex. 1002 ¶ 55).

Additionally, Petitioner contends that varying the spacing of Kuroda’s electrodes to “achieve a desirable fringe-effect capacitance as taught in Heron would have produced a predictably performing capacitor with a reasonable likelihood of success.” *Id.* at 90.

Patent Owner does not separately address Petitioner’s arguments.

Based on our review of the totality of the record after trial, we agree with, and adopt, Petitioner’s arguments and evidence presented in the Petition demonstrating that Kuroda, Li, and Heron teach or suggest all of the limitations in claims 6, 10, 11, and 14. We also agree with, and adopt, Petitioner’s arguments and evidence demonstrating that Heron teaches the

use and advantages of fringe-effect capacitance, such that a person of ordinary skill in the art would have had reason to combine the teachings of the prior art references to arrive at the claimed subject matter, and would have done so with a reasonable expectation of success.

Thus, we determine that Petitioner has proven, by a preponderance of evidence, that the subject matter of claims 6, 10, 11, and 14 would have been obvious in view of the combined teachings of Kuroda, Li, and Heron.

H. Claim 12 – Obvious over Kuroda, Li, Hiroyuki, Heron, and Herbert

Petitioner contends that the subject matter of claim 12 would have been obvious in view of the combined teachings of Kuroda, Li, Hiroyuki, Heron, and Herbert. *Id.* at 91–92 (citing Ex. 1002, pp. 67–82). For this challenge, Petitioner again contends that the combined teachings of Kuroda and Hiroyuki disclose the use of conductive plates in a coplanar configuration on an external surface, and that it would have been obvious to configure the coplanar electrodes to produce a fringe-effect capacitance between them in view of the advantages described in Heron. *Id.*

For the same reasons discussed above, we find Petitioner has established by a preponderance of evidence that the subject matter of claim 12 would have been obvious in view of Kuroda, Li, Hiroyuki, Heron, and Herbert. Petitioner provides evidence demonstrating how each claim limitation is taught or suggested by the combination of prior art, as well as demonstrating that a person of ordinary skill in the art would have had reason to combine the teachings of the prior art references to arrive at the claimed subject matter, and would have done so with a reasonable expectation of success based on the teachings of Kuroda, Li, Hiroyuki, Herbert, and Heron.

Thus, we determine that Petitioner has proven, by a preponderance of evidence, that the subject matter of claim 12 would have been obvious in view of the combined teachings of Kuroda, Li, Hiroyuki, Heron, and Herbert.

IV. CONCLUSION

Based on the information presented, we conclude that Petitioner has demonstrated, by a preponderance of evidence, that claims 1–14 of the '776 patent are unpatentable.

V. ORDER

For the reasons given, it is hereby

ORDERED that claims 1–14 of U.S. Patent 7,075,776 B1 are 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.

IPR2018-00167
Patent 7,075,776 B1

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