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Paper 7
Entered: January 21, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NEVRO CORP.,
Petitioner,

v.

BOSTON SCIENTIFIC NEUROMODULATION CORP.,
Patent Owner.

IPR2019-01315
Patent No. 7,127,298 B1

Before ROBERT A. POLLOCK, SCOTT C. MOORE, and RICHARD J. SMITH, *Administrative Patent Judges.*

SMITH, *Administrative Patent Judge*.

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

I. INTRODUCTION

Nevro Corp. ("Petitioner") filed a Petition to institute an *inter partes* review of claims 1–19 ("the challenged claims") of U.S. Patent No. 7,127,298 B1 (Ex. 1001, the "'298 patent") on July 18, 2019. Paper 1 ("Pet."). Petitioner relies on the Declaration of Benjamin Pless Regarding U.S. Patent No. 7,127,298 ("Pless Declaration") in support of the Petition. Ex. 1003.

Boston Scientific Neuromodulation Corp. ("Patent Owner") timely filed a Preliminary Response to the Petition on October 28, 2019. Paper 6 ("Prelim. Resp.").

We have authority under 35 U.S.C. § 314, which authorizes the Director of the U.S. Patent and Trademark Office to decide whether to institute an *inter partes* review. To institute an *inter partes* review, we must determine that the information presented in the Petition shows "a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a). A decision to institute under 35 U.S.C. § 314 may not institute on fewer than all claims challenged in the petition. *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348 (2018).

Upon considering the arguments and evidence presented in the Petition, we determine that Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of at least one of the challenged claims in the Petition. Accordingly, we institute an *inter partes* review of all claims and all grounds asserted in the Petition.

A. Real Parties in Interest

Petitioner identifies itself as the real party-in-interest. Pet. 3.

Patent Owner identifies itself and Boston Scientific Corp. as its real parties-in-interest. Paper 4, 2.

B. Related Proceedings

Petitioner and Patent Owner identify the following related proceeding: *Boston Scientific Corp. et al. v. Nevro Corp.*, Case No. 1-18-cv-00644 (D. Del.). Pet. 3; Paper 4, 2.

C. The '298 Patent (Ex. 1001)

The '298 patent "relates to implantable stimulators and, specifically, methods and systems for delivering stimulation through multiple output channels." Ex. 1001, 1:12–14. The '298 patent states that "[m]ulti-channel stimulators are used in a number of implantable medical devices," such as in "a cochlear device for restoration of hearing" and those for "spinal cord stimulation [(SCS)] for treating intractable pain." *Id.* at 1:15–23.

The '298 patent states that it "provide[s] a system for implementing a switched-matrix output for a multi-channel stimulator." Ex. 1001, 1:64–66. The '298 patent also states that because "[t]he large number of channels and advanced processing capability typically consume more power than devices having fewer channels," there is a need to "reduce the overall size of the implanted device" or to "implant a larger battery" while "enabl[ing] more channels, more processing power or longer device life." *Id.* at 1:30–32, 1:49–55. Thus, features described in the '298 patent include "provid[ing] a switching system and method which permits use of fewer DACs [(digital to analog converters)] th[a]n electrode contacts, thereby saving limited device space" and "tak[ing] advantage of the fact that not all electrode contacts are stimulated (active) at any one time, and thus, switches may be used to activate those active electrode groups which are 'on' at any one time." *Id.* at 2:47–55.

Two embodiments are described in the '298 patent for a stimulation output switching system for a multi-channel stimulator that uses switching

schemes to allow electrode contacts to share DACs. Ex. 1001, 1:66–2:32, 3:4–11, 4:22–34.

Figure 3 of the '298 patent depicts a first embodiment of a stimulation output switching system, and a method of switching outputs, for or in a multi-channel stimulator, and is reproduced below:

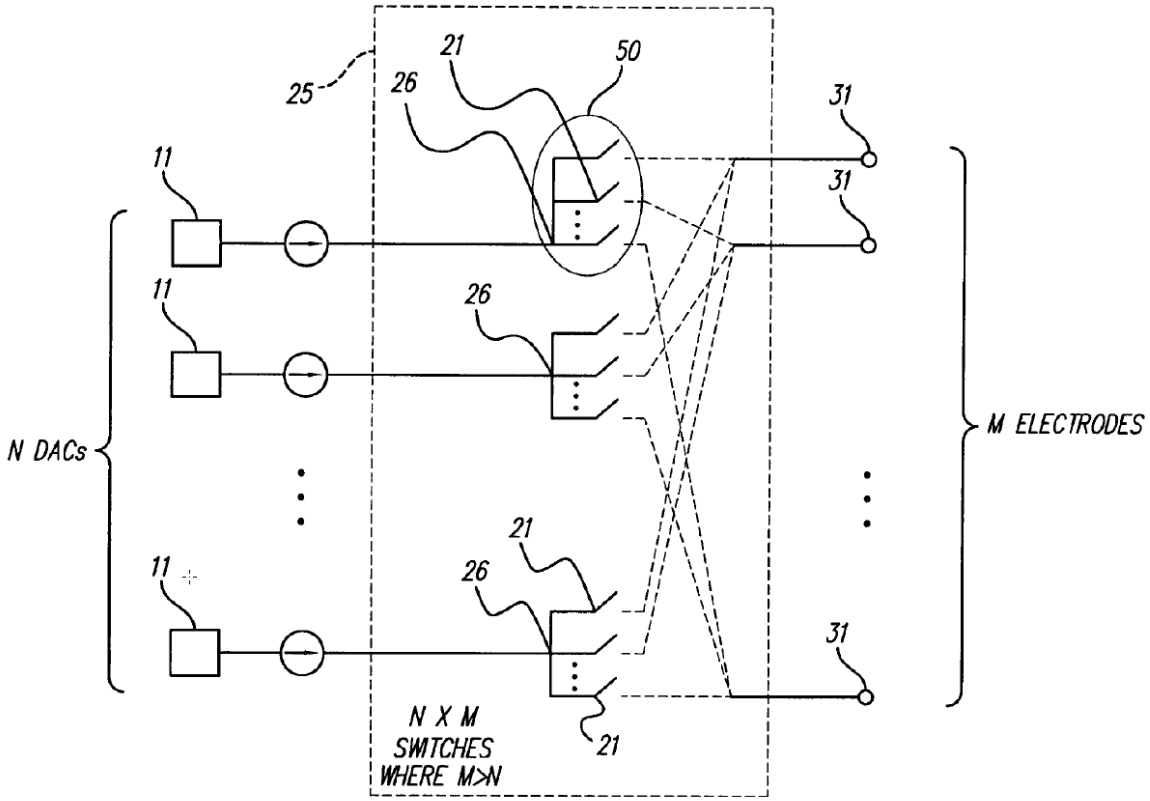

FIG. 3

Figure 3 above illustrates a fragmentary circuit diagram "in which NxM total number of switches are used to connect N number of DACs to M stimulation outputs (electrode contacts)." Ex. 1001, 3:4–7, Fig. 3.

The '298 patent discloses, in the embodiment shown in Figure 3 above, that N number of DACs 11 are connected to M number of electrode contacts 31 using *N x M* total number of switches 21. Ex. 1001, 4:22–34. As illustrated by the broken lines in Figure 3 above, each DAC 11 has its

own group or set 50 of switches 21 that allow it to connect to any of the electrode contacts 31 of the M number of electrode contacts. *Id.* at 4:27–31. DACs 11 can operate simultaneously, and the switches 21, "which may be programmed," can select which electrode contacts are stimulated. *Id.* at 4:58–62.

Figure 4A of the '298 patent depicts a second embodiment of a stimulation output switching system, and a method of switching outputs, for or in a multi-channel stimulator, and is reproduced below:

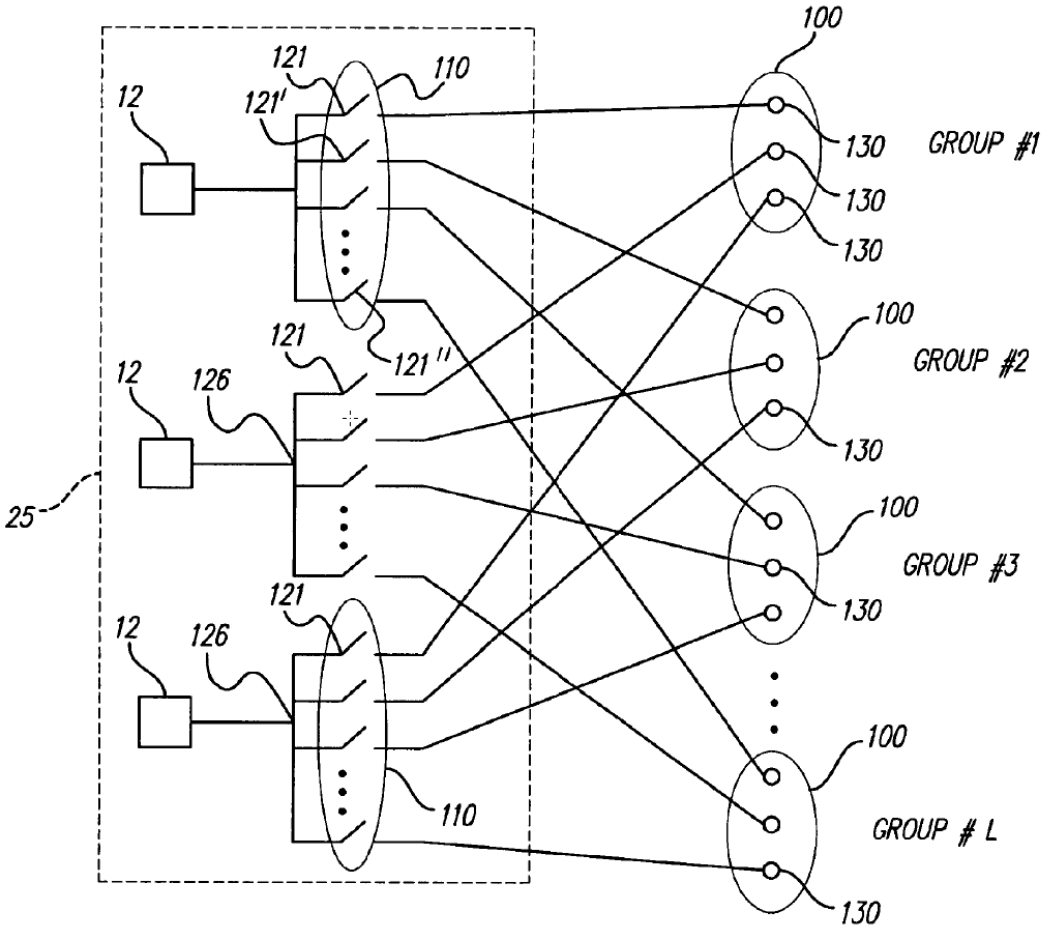

FIG. 4A

Figure 4A above illustrates a fragmentary circuit diagram "in which M total number of switches [121] are used to connect N number of DACs

[12] to M stimulation outputs (electrode contacts)." Ex. 1001, 3:8–11, Fig. 4A.

The '298 patent discloses, in the embodiment shown in Figure 4A above, that every DAC 12 is not connected to every electrode contact 130. Ex. 1001, 5:8–22. Rather, each DAC 12 is connected to a single electrode contact 130 in each electrode group or set 100. *Id.* at Fig. 4A. This embodiment "takes advantage of the fact that, in many multi-channel stimulators, not all stimulation channels are active (turned on) at a given moment." *Id.* at 5:10–12. Furthermore, in this embodiment, N number of DACs 12 are each connected to their own group or set 110 of L number of switches 121, resulting in a total of M number of switches 121 for the stimulation output switching system, i.e., $M = N \times L$. *Id.* at Fig. 4A. Because each group or set of switches 110 includes a single connection to each of L number of groups or sets 100 (labeled #1 through #L) of electrode contacts 130, the "top" position DAC can be connected to the "top" position electrode in each electrode group (and so on) via a switching group 110. *Id.* at 5:14–22.

D. Illustrative Claims

Claims 1, 6, 11, and 15 are the sole independent claims, and are reproduced below:

> **1**. A stimulation output switching system for a multi-channel stimulator, said system comprising:
> N number of DACs (**11**);
> M number of electrode contacts (**31**); and
> NxM number of switches (**21**);
> wherein each DAC (**11**) of the N number of DACs is coupled uniquely to one group (**50**) of M number of switches (**21**), each switch within each group (**50**) of M switches, in turn is coupled to each one of M electrode contacts (**31**); and
> wherein M and N are whole numbers and M is greater

than N.

Ex. 1001, 6:47–58.

6. A stimulation output switching system for a multi-channel stimulator, said system comprising:
N number of DACs (**12**);
M number of switches (**121**), grouped into N grouped sets (**110**) of switches, each set (**110**) having L number of switches (**121**);
M number of electrode contacts (**130**); and
L number of electrode contact groups (**100**),
wherein each DAC (**12**) of the N number of DACs is coupled to one of the N grouped sets (**110**) of switches (**121**);
wherein each switch (**121**) in one of the N set (**110**) of switches, in tum, is uniquely coupled to only one electrode contact (**130**) in each of L groups (**100**) of electrode contacts;
wherein the whole numbers N, L and M are chosen such that, NxL=M; and
wherein M is greater than N.

Id. at 7:4–21.

11. A method of switching outputs in a multi-channel stimulator, said method comprising:
(a) providing N number of DACs (**11**);
(b) providing M number of electrode contacts (**31**);
(c) coupling each of N DACs (**11**) to a group of M switches (**31**);
(d) coupling each of the M switches (**31**) uniquely to each of M electrode contacts (**31**); and
(e) connecting selected switches (**21**) by closing the switches, to electrically connect selected electrode contacts (**31**) to transmit current, while avoiding closing more than one switch (**21**) connected to the same electrode contact (**31**) at any one time, wherein there is at least NxM total number of switches (**31**); and
wherein M and N are whole numbers and M is greater than N.

Id. at 7:33–8:4.

15. A method of switching outputs in a multi-channel stimulator, said method comprising:

> (a) providing N number of DACs (**12**);
> (b) providing M number of electrode contacts (**130**) and M number of switches (**110**);
> (c) coupling each of N DACs (**12**) to at least one set (**110**) of switches having L number of switches (**121**) in the at least one set (**110**);
> (d) coupling each switch (**121**) within the at least one set (**110**) of switches, uniquely to one of the M electrode contacts (**130**); and
> (e) causing current to flow through selected electrode contacts (**130**) at any one time duration, T_d, by closing the associated switches (**121**),
> wherein the whole numbers N, L and M are chosen such that M=NxL, and M is greater than N.

Id. at 8:14–30.

Claims 2–5 depend directly or indirectly from claim 1, claims 7–10 depend directly or indirectly from claim 6, claims 12–14 depend directly or indirectly from claim 11, and claims 16–19 depend directly or indirectly from claim 15. *See* Ex. 1001, 6:59–8:43.

E. The Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims would have been unpatentable on the following grounds. Pet. 5.

Claims Challenged	35 U.S.C. §	Reference(s)
1–5, 11–14	102(b)	Hitzelberger[1]
1–5, 11–14	103	Hitzelberger
2, 3, 12, 13	103	Hitzelberger, Panescu[2]
1–5, 11–14	103	Panescu, Faltys[3]
6–10, 15–19	102(b)	Jones[4]
6–10, 15–19	103	Jones
7, 8, 16, 17	103	Jones, Panescu

II. ANALYSIS

A. Person of Ordinary Skill in the Art

Petitioner asserts that a person of ordinary skill in the art, in the field of the '298 patent in 2002, would have had

(1) "at least a bachelor's degree in electrical engineering, biomedical engineering, or equivalent coursework," and

(2) "at least one year of experience researching or developing implantable medical devices." Pet. 13 (citing Ex. 1003 ¶¶ 44–50).

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[1] Hitzelberger et al., *A Microcontroller Embedded ASIC for an Implantable Electro-Neural Stimulator*, PROC. OF THE 27TH EUROPEAN SOLID-STATE CIRCUITS CONF. (ESSCIRC), 428–31 (Frontier Group 2001) ("Hitzelberger"). Ex. 1005.
[2] Panescu et al., US 6,101,410, issued Aug. 8, 2000 ("Panescu"). Ex. 1008.
[3] Faltys et al., US 6,219,580 B1, issued Apr. 17, 2001 ("Faltys"). Ex. 1009.
[4] K. Jones and R. Normann, *An Advanced Demultiplexing System for Physiological Stimulation*, 44 IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING 12, 1210–20 (1997) ("Jones"). Ex. 1006.

Patent Owner states that "[f]or purposes of this Preliminary Response, Patent Owner has used Petitioner's proposed definition of a person of ordinary skill in the art ('POSA')," but that "Patent Owner reserves the right to propose a definition of POSA if this *inter partes* review is instituted." Prelim. Resp. 9.

For purposes of this Decision, and based on the current record, we apply Petitioner's assessment of a person of ordinary skill in the art. We also note that the level of ordinary skill in the art at the time of the invention may be reflected in the prior art in this proceeding. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (explaining that specific findings regarding ordinary skill level are not required "where the prior art itself reflects an appropriate level and a need for testimony is not shown") (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985)).

B. Claim Construction

In this *inter partes* review, filed July 18, 2019,[5] we construe the claims of the '298 patent by applying "the standard used in federal courts, in other words, the claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), which is articulated in *Phillips*."[6] Under that standard, "the words of a claim 'are generally given their ordinary and customary meaning' . . . [which] is the meaning that the term would have to a person of ordinary skill in the art in question at the

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[5] *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, 51,343 (amending 37 C.F.R. § 42.100(b) effective November 13, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)).
[6] *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

time of the invention, i.e., as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1312–13 (citations omitted). Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Petitioner argues that the term "multi-channel stimulator," recited in the preamble of each of the independent claims of the '298 patent, should be interpreted as limiting and "must be interpreted to require more than one DAC to be capable of simultaneously providing stimulation to two or more channels with different stimulation parameters." Pet. 13–17 (citing Ex. 1003 ¶¶ 51–57; Ex. 1001, code (54), 1:12–14, 1:32–34, 2:47–50, 3:66–4:1, 4:5–10, 4:18–21, 4:57–63, 5:2–7, 5:65–6:3, 6:47–58 (claim 1), 7:4–21 (claim 6), 7:33–8:4 (claim 11), 8:14–30 (claim 15)).

Patent Owner argues that "[r]esolving this Petition does not require claim construction," and that "[n]one of Petitioner's arguments depend on any issue of claim construction." Prelim. Resp. 9–10. Nevertheless, Patent Owner submits that the term "multi-channel stimulator" should be construed as "a stimulator capable of stimulating through two or more channels." *Id.* at 10.

We determine for purposes of our Decision that we need not construe the term "multi-channel stimulator" at this time. As discussed below, we find that Petitioner has established a reasonable likelihood of showing that both Hitzelberger and Jones disclose at least two DACs and stimulation channels, and Petitioner's challenges based on those references rely on those disclosures.

We determine, for purposes of this Decision, that we need not expressly construe any undisputed terms. *See Nidec Motor Corp. v.*

Zhongshan Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy'") (*quoting Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

C. Principles of Law

"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).

Anticipation requires a finding that the claim at issue "reads on" a prior art reference. *Atlas Powder Co. v. Ireco, Inc.*, 190 F.3d 1342, 1346 (Fed. Cir. 1999) (citing *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 781 (Fed. Cir. 1985)). "[I]f . . . [a] disputed claim would allow the patentee to exclude the public from practicing the prior art, then that claim is anticipated, regardless of whether it also covers subject matter not in the prior art." *Id.*

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 (CCPA 1968). Thus, "the dispositive question regarding anticipation is whether one skilled in the art would reasonably understand or infer from a prior art reference that every claim element is disclosed in that reference." *Eli Lilly v. Los Angeles Biomedical Research Inst. at Harbor-UCLA Med. Ctr.*, 849 F.3d 1073, 1074–75 (Fed. Cir. 2017) (quoting *AstraZeneca LP v. Apotex, Inc.*, 633 F.3d 1042, 1055 (Fed. Cir. 2010) (internal brackets and quotation marks omitted)).

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which that subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

An obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR, 550 U.S. at 418.*

D. Anticipation by Hitzelberger

Petitioner asserts that claims 1–5 and 11–14 of the '298 patent are anticipated by Hitzelberger. Pet. 17–38.

1. Hitzelberger (Ex. 1005)

Hitzelberger discloses that "implantable micro-electronic systems" can be used for "the electrical stimulation of nerves which have lost their natural functionality," such as "restoring basic movement abilities of a disabled hand, caused by a spinal cord injury." Ex. 1005, Abs.

Figure 1 of Hitzelberger, depicts a system block diagram of an electronic stimulation system, and is reproduced below:

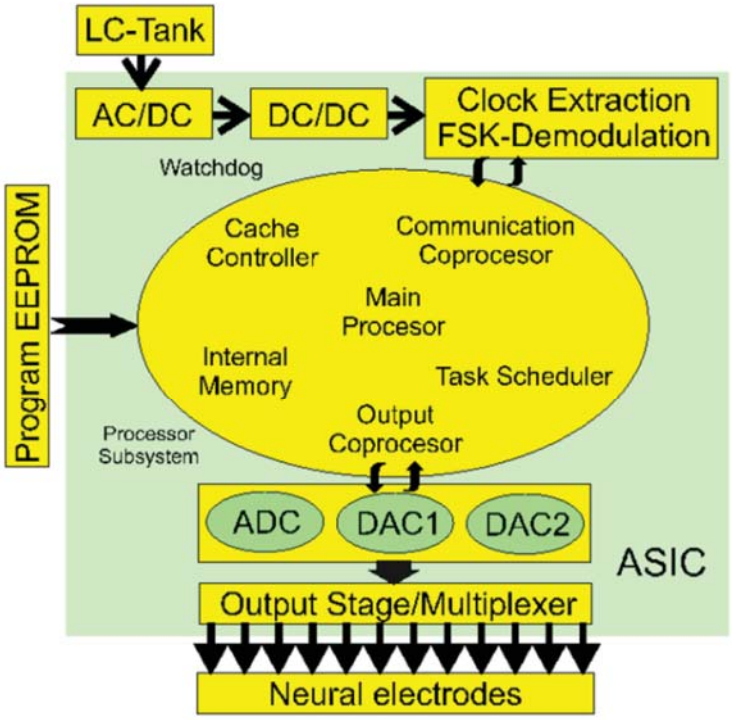


Figure 1. System Block Diagram

Figure 1 above illustrates a system block diagram of an electronic stimulation system. Ex. 1005, 1.

As shown in the system block diagram above, Hitzelberger's system uses "two current-output digital-to-analog converters" and "two independently controlled currents on one or more of 12 neural electrodes." *Id.* at Abs., 1.

Figure 5 of Hitzelberger depicts a multiplexing output stage and is reproduced below:

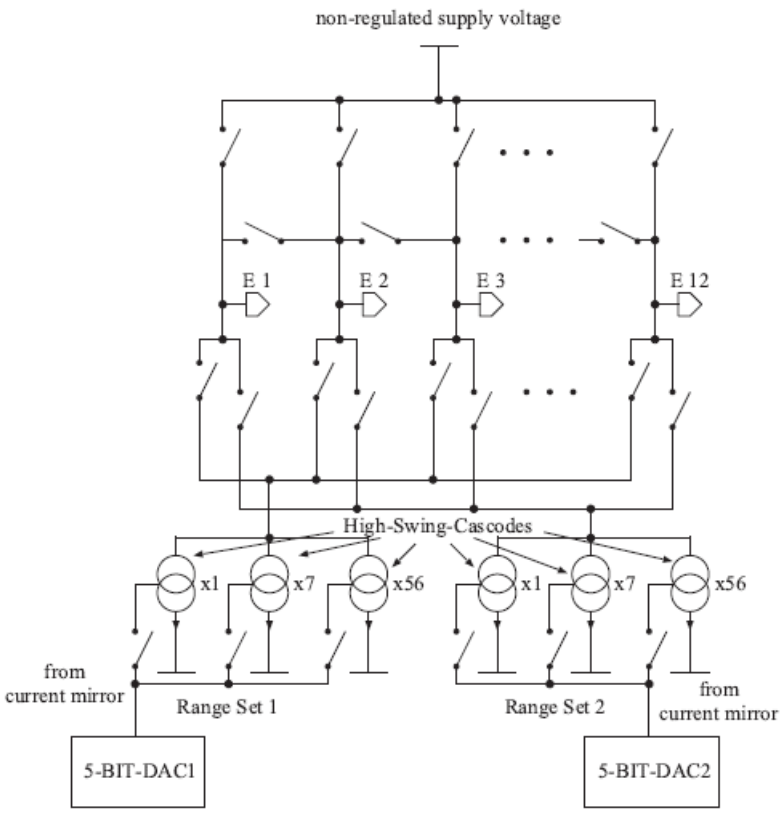


Figure 5. Multiplexing Output Stage

Figure 5 above illustrates a multiplexing output stage having a switching matrix. Ex. 1005, 3.

Hitzelberger discloses a "multi-tasking processor subsystem" that includes a "second coprocessor" which "starts feeding the DACs with data and controlling the multiplexers" after activation through the task scheduler. Ex. 1005, 3. Two DACs connect to a "multiplexing output stage" such that "[u]p to 12 neural electrodes can be stimulated and time multiplexed." *Id.* The "output stage contains a switching matrix (see Figure 5) which allows [it] to individually connect each electrode to each of the two current sinks or to V_{DD} [as] well as to other electrodes." *Id.* This "enables simple bipolar neural stimulation . . . as well as more sophisticated schemes." *Id.* Important stimulation variables include "not only amplitude, frequency and

stimulation waveform, but also the current density distribution." *Id.* Because there are two DACs and twelve electrodes, two channels can be stimulated simultaneously. *Id.* at 4 (Table 1).

2. Analysis

a. Claim 1

The Petition includes a limitation-by-limitation comparison of independent claim 1 to the disclosure of Hitzelberger, including citations to the Pless Declaration as support. Pet. 21–32 (citing Ex. 1003 ¶¶ 72–98). For example, Petitioner argues that Hitzelberger discloses a "stimulation output switching system for a multi-channel stimulator" by reference to annotated Figure 1 and annotated Figure 5 of Hitzelberger illustrated below:

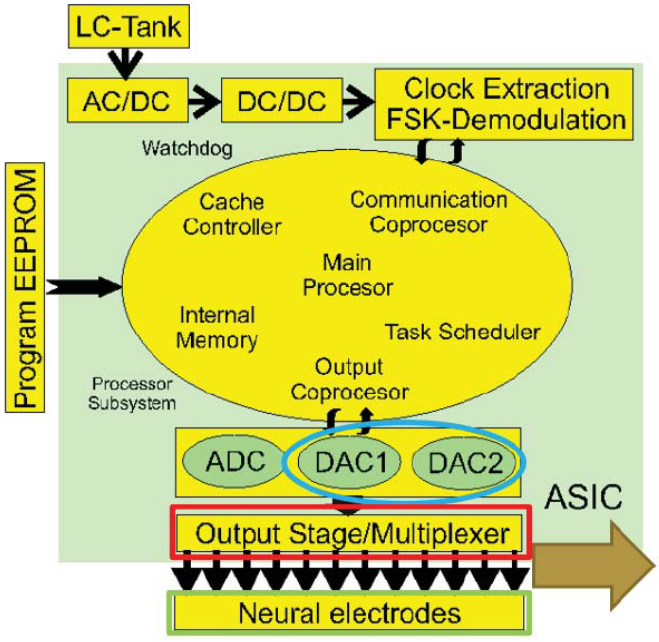


Figure 1. System Block Diagram

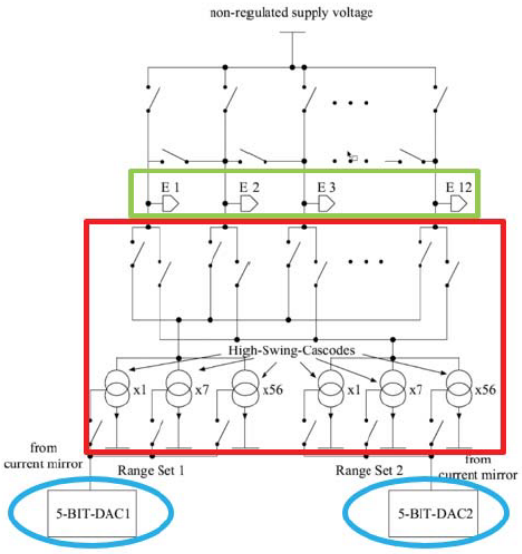


Figure 5. Multiplexing Output Stage

Annotated Figure 1 above illustrates a system block diagram of an electronic stimulation system. Ex. 1005, 1; Pet. 22. Annotated Figure 5 above illustrates a multiplexing output stage having a switching matrix. *Id.*

at 3; Pet. 22. As illustrated by the brown arrow, Figure 5 is a detailed illustration of the output stage multiplexer of Figure 1.

Petitioner argues that "Hitzelberger discloses an application specific integrated circuit (ASIC) that is a component in an 'implantable, batteryless electro-neural stimulation system,'" that "allows for [the] stimulation of nerves with two independently controlled currents on one or more of 12 neural electrodes." Pet. 21–22 (citing Ex. 1005, Abs., 1, 4) (alteration in original). Petitioner further argues that Hitzelberger discloses "'two current-output digital-to-analog converters' (DACs), a 'multiplexing input/output stage,' and the neural electrodes," with the electrodes shown in green outline and the output stage/multiplexer shown in red outline in Figures 1 and 5 above. *Id.* at 22 (citing Ex. 1005, 1, 3, annotated Figures 1 and 5; Ex. 1003 ¶ 73). Petitioner also argues that Hitzelberger's system is a multi-channel stimulator and that Hitzelberger discloses N number of DACs (= *2*) and M number of electrode contacts (= *12*). *Id.* at 22–26 (citing Ex. 1003 ¶¶ 74–81; Ex. 1005, Abs., 1, 3–4, Figure 5 (annotated)).

Petitioner also provides a further annotated version of Figure 5 of Hitzelberger, as shown below, to argue that Hitzelberger discloses N x M number of switches (= *24*), shown as switch pairs (yellow boxes) that connect the electrodes (green boxes) to each DAC source.

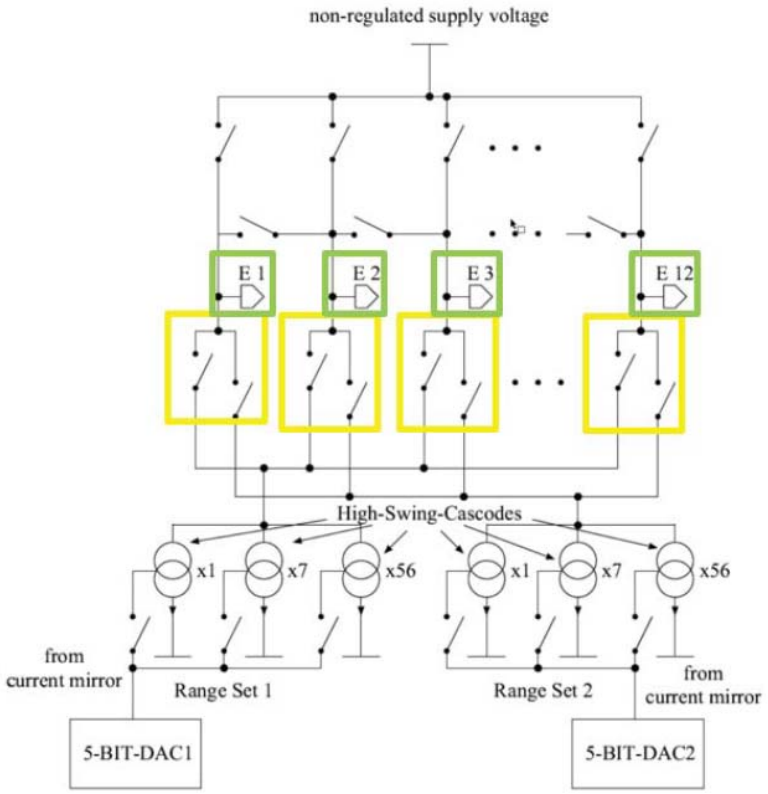


Figure 5. Multiplexing Output Stage

Annotated Figure 5 above shows a multiplexing output stage having a switching matrix, with yellow boxes around switch pairs and green boxes around electrodes. Pet. 26–28 (citing Ex. 1005, 3, Figure 5; Ex. 1003 ¶¶ 82–87).

Petitioner also provides additional annotated figures to show that Hitzelberger discloses the claim limitations that "wherein each DAC (**11**) of the N number of DACs is coupled uniquely to one group (**50**) of M number of switches (**21**)," and "each switch within each group (**50**) of M switches, in turn, is coupled to each one of M electrode contacts (**31**)." Pet. 28–32; *see* Ex. 1001, 6:52–56. Those annotated figures, including an enlarged portion of annotated Figure 5 of Hitzelberger, is shown below:

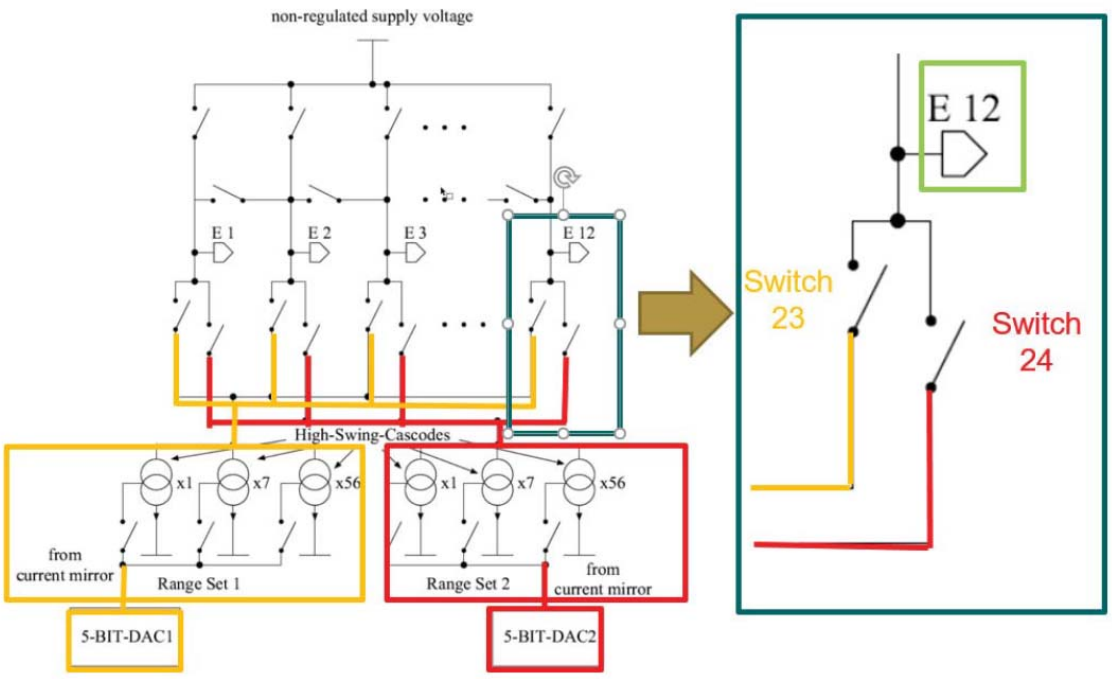


Figure 5. Multiplexing Output Stage

Annotated Figure 5 above shows a multiplexing output stage having a switching matrix, with an enlarged view of electrode 12 and switches 23 and 24; Pet. 31.

Petitioner argues that each switch in Hitzelberger is connected to a single DAC, and that annotated Figure 5 above shows a first orange circuitry group and a second red circuitry group with a DAC producing a current output in each group. Pet. 28–29 (citing Ex. 1003 ¶¶ 88–92; Ex. 1005, 3, Fig. 5 (annotated)). Thus, according to Petitioner, Hitzelberger "discloses two switch groups that are each connected to one of the two DACs." *Id.* at 30.

Petitioner also argues that Hitzelberger discloses two switch groups that each have a switch coupled to one electrode, such as switch 23 and switch 24 coupled to electrode 12 and belonging to the orange and red circuitry groups, respectively, as shown above. Pet. 31–32 (citing Ex. 1005, Figure 5 (annotated); Ex. 1003 ¶¶ 93–95). Thus, according to Petitioner and

annotated Figure 5 of Hitzelberger, "both the orange and red circuitry groups have switches (*e.g.*, switches 23 and 24 above) coupled to each electrode (*i.e.*, electrodes E1 through E12)." *Id.* at 32 (citing Ex. 1003 ¶ 95).

Petitioner further argues that Hitzelberger discloses that M (= *12*) and N (= *2*) are whole numbers and that M is greater than N, as recited in claim 1. Pet. 32 (citing Ex. 1003 ¶¶ 96–98).

b. Claim 11

Petitioner argues that Hitzelberger discloses the limitations of claim 11 for the same reasons as set forth with respect to claim 1. Pet. 36 (citing Ex. 1003 ¶¶ 112–116, 119). Petitioner also argues that Hitzelberger discloses the limitation of "*(e) connecting selected Switches (21) by closing the Switches, to electrically connect selected electrode contacts (31) to transmit current, while avoiding closing more than one Switch (21) connected to the same electrode contact (31) at any one time, wherein there is at least NxM total number of switches (31).*" *Id.* (citing Ex. 1003 ¶ 117) (alteration in original).

Petitioner specifically argues that Hitzelberger discloses that each DAC has several switches associated with an individual electrode, and that when selected, that switch is closed so as to cause current to stimulate the electrode. Pet. 36–37 (citing Ex. 1005, 3–4; Ex. 1003 ¶¶ 117, 118). Petitioner argues further that "[b]oth DACs can simultaneously provide current to different electrodes as selected by a switch in a DAC's circuity group," and that both of Hitzelberger's DACs "cannot stimulate the same electrode contact at any one time, which means that each DAC must necessarily have closed switches associated with different electrodes." *Id.* at 37 (citing Ex. 1005, 4; Ex. 1003 ¶ 118).

c. Dependent Claims

The Petition includes a limitation-by-limitation comparison of dependent claims 2–5 and 12–14 to the disclosure of Hitzelberger, with supporting citations to the Pless Declaration. Pet. 32–36, 37–38 (citing Ex. 1003 ¶¶ 99–111, 120, 122). For example, claim 2 recites "[t]he system of claim 1 wherein the switches are transistor switches." Ex. 1001, 6:59–60. Petitioner argues that Hitzelberger discloses that its switches use a CMOS process, and that "a CMOS transmission gate 'consists of one *n*-channel and one *p*-channel MOS transistors connected in parallel.'" Pet. 32–33 (citing Ex. 1005, 3; Ex. 1007, 427; Ex. 1003 ¶¶ 100, 103).

d. Patent Owner's Arguments

Patent Owner advances several arguments against Petitioner's reliance on Hitzelberger. Prelim. Resp. 20–22, 27–33. For example, Patent Owner argues that Hitzelberger expressly limits the number of electrodes that can be used to twelve and completely fails to recognize the benefits of increasing the number of electrodes, and thus does not enable the algorithm disclosed in the '298 patent. *Id.* at 20–22. According to Patent Owner, claim 1 does not place a limit on the number of electrodes that can be used, but rather "allows one of ordinary skill in the art to select the desired number of electrodes and DACs and to use the algorithm disclosed to determine the number of switches to use and how to connect them." *Id.* at 27. According to Patent Owner, the '298 patent meets a need in the field "by disclosing an algorithm and design that allows for such an increase in the number of electrodes while decreasing the space used by the DACs." *Id.* at 27–28. Patent Owner also argues that Petitioner has engaged in impermissible hindsight. *Id.* at 32.

We are not persuaded by these arguments at this stage of the proceeding. Petitioner has sufficiently shown on this record that

Hitzelberger discloses an embodiment of a stimulation output system switching system for a multi-channel stimulator, and a method of switching outputs in a multi-channel stimulator, that falls within the scope of at least challenged claims 1 and 11 such that those claims "read on" Hitzelberger. *See Atlas Powder*, 190 F.3d at 1346. A reasonable likelihood of finding anticipation is thus established at this stage of the proceeding regardless of whether those claims also read on other embodiments. *See, e.g., Titanium Metals*, 778 F.2d at 782 (citation omitted). Moreover, Patent Owner provides no evidence on this record that a person of ordinary skill in the art could not practice the subject matter of Hitzelberger without undue experimentation. *See Sanofi-Synthelabo v. Apotex, Inc.*, 550 F.3d 1075, 1082 (Fed. Cir. 2008). We thus find on this record that Hitzelberger is enabled for purposes of anticipation. Finally, impermissible hindsight is an issue for an obviousness inquiry, not anticipation. *See KSR*, 550 U.S. at 418.

3. Summary

For the reasons articulated by Petitioner, and in view of the record as a whole at this stage of the proceeding, we determine that the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail in showing that at least challenged claims 1 and 11 are anticipated by Hitzelberger.

E. Obviousness challenges based on Hitzelberger

Petitioner asserts that claims 1–5 and 11–14 of the '298 patent are unpatentable as obvious over Hitzelberger, and relies on the Pless Declaration in support of those assertions. Pet. 38–39 (citing Ex. 1003 ¶¶ 123–126). Patent Owner contends that "the Board should deny Ground 2 for at least the same reasons as Ground 1." Prelim. Resp. 34.

As discussed above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that Hitzelberger anticipates claims 1 and 11 of the '298 patent. *See supra* § II.D. Accordingly, we likewise find that Petitioner has established a reasonable likelihood of prevailing on its assertion that Hitzelberger renders obvious claims 1 and 11 of the '298 patent. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019) ("[I]t is well settled that 'a disclosure that anticipates under § 102 also renders the claim invalid under § 103, for 'anticipation is the epitome of obviousness.'") (citing cases). Patent Owner does not currently set forth any countervailing secondary considerations.

Petitioner also asserts that claims 2, 3, 12, and 13 of the '298 patent are unpatentable as obvious over Hitzelberger and Panescu, and relies on the Pless Declaration in support of those assertions. Pet. 39–41 (citing Ex. 1003 ¶¶ 128–133). Patent Owner contends that for the reasons discussed for ground 1 "dependent Claims 2–3, which depend from Claim 1, are not obvious" and "Claims 12–13, which depend from Claim 11, are not obvious." Prelim. Resp. 36.

Having found that Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of at least claims 1 and 11, as set forth above, we do not further address the patentability challenge of dependent claims 2, 3, 12 and 13 at this stage of the proceeding.

F. Obviousness over Panescu and Faltys

Petitioner asserts that claims 1–5 and 11–14 of the '298 patent are obvious over Panescu and Faltys. Pet. 41–58. This challenged claim set overlaps the obviousness challenge of claims 1–5 and 11–14 based on Hitzelberger, except that Petitioner relies on the combined teachings of Panescu and Faltys rather than Hitzelberger.

1. Panescu (Ex. 1008)

Panescu "relates to an application specific integrated circuit (ASIC) operable to configure multiple input electrodes for cardiac signal recording and analysis or stimulation based on the immediate necessities of a particular electrophysiological procedure." Ex. 1008, 1:18–22. Panescu discloses using the ASIC implemented as a CMOS switching matrix to effectively interface a number of individual electrodes with a variety of existing and custom biological recorders. *Id.* at code (57), Abs. Panescu discloses stimulation input channels for stimulators 36 to stimulate electrodes. *Id.* at Fig. 5, 8:60–9:5.

2. Faltys (Ex. 1009)

Faltys "relates to multichannel cochlear prosthesis . . . that offers flexible control of the stimulus waveforms." Ex. 1009, 1:25–28. The multichannel cochlear prosthesis provides "selected pulsatile stimulation" using electrodes. *Id.* at Abs., 4:16–18, 4:50–54. "Each electrode has its own current-mode DAC." *Id.* at 31:20–21. Furthermore, "[e]ach electrode also has three discharge switches." *Id.* at 31:25–26. Thus, multiple DACs "drive the stimulation electrodes." *Id.* at 26:11–12.

3. Analysis

The Petition includes a comparison of claims 1–5 and 11–14 to the combined teachings of Panescu and Faltys, including citations to the Pless Declaration as support. Pet. 42–58 (citing Ex. 1003 ¶¶ 136–191). For example, although Petitioner states that Panescu does not expressly use "DACs" to stimulate electrodes as recited in claim 1, Petitioner contends that it would have been obvious based on the teachings of Faltys for a person of ordinary skill in the art to have used "DACs" to stimulate the electrodes in Panescu. *Id.* at 46 (citing Ex. 1003 ¶ 145). Patent Owner argues that

"[t]he combination would not enable subject matter that falls within the scope of the claims at issue," and that Petitioner cites Faltys solely to demonstrate that DACs can be used to stimulate electrodes, while ignoring aspects of Faltys that teach away from the '298 patent. Prelim. Resp. 36–40.

Having found that Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of at least claims 1 and 11, as set forth above, we do not further address this overlapping patentability challenge at this stage of the proceeding.

G. Anticipation by Jones

Petitioner asserts that claims 6–10 and 15–19 of the '298 patent are anticipated by Jones. Pet. 58–80.

1. Jones (Ex. 1006)

Jones discloses that a "CMOS very large scale integration (VLSI) chip has been designed and built to implement a scheme developed for multiplexing/demultiplexing the signals required to operate an intracortical stimulating electrode array." Ex. 1006, Abs. Jones states that "[b]y incorporating multiple current sources on chip, many channels may be stimulated simultaneously." *Id.* Jones further discloses that an eight-channel stimulator "is scalable to a 625-channel stimulator." *Id.*

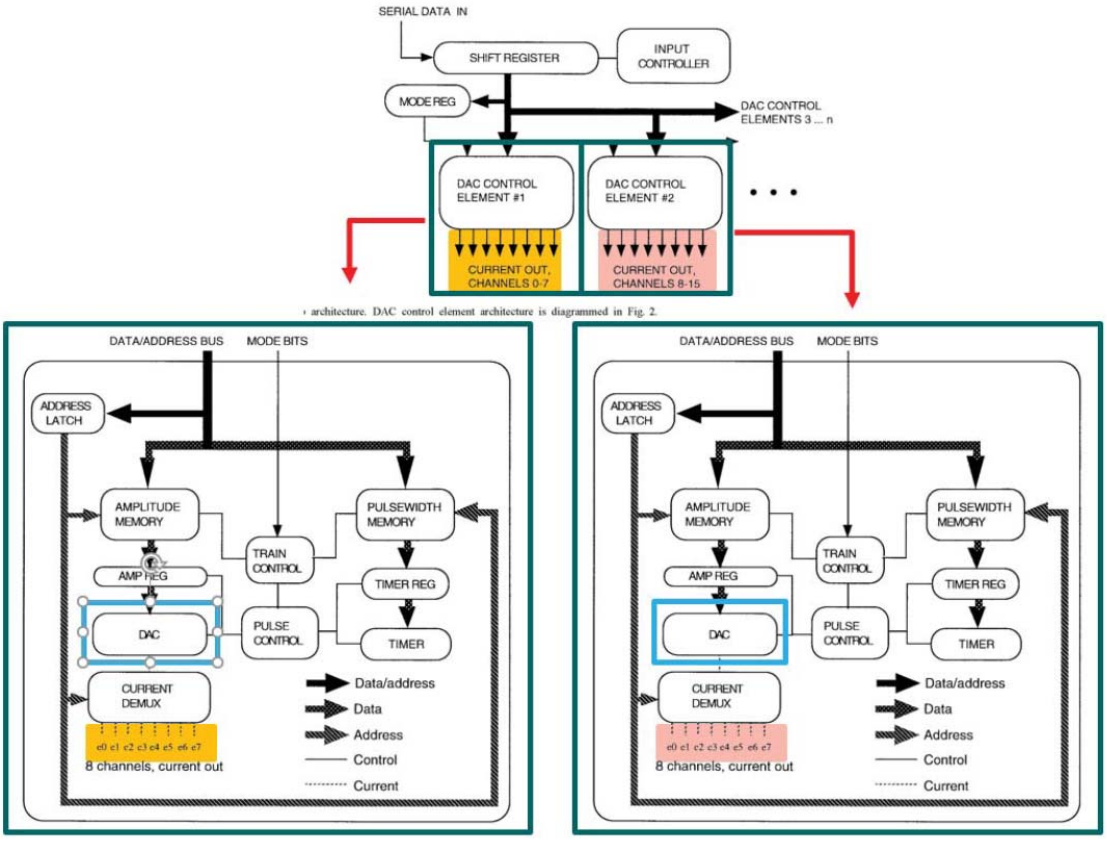
Jones discloses that "the area taken up by the DAC's (and their associated circuitry) is such that it may not be practical to employ one DAC per electrode on the chip." Ex. 1006, 1211. According to Jones, "many DAC's would not be required," such that "[i]t should not, in general, be necessary to pass current through all channels simultaneously," and that "it is possible to time-demultiplex the pulses coming from a DAC, and use one DAC to stimulate a number of electrode sites." *Id.* Jones discloses a chip architecture having one DAC "for each eight channels (electrodes) to be

serviced." *Id.* at 1212; *see also id.* at 1213, Fig. 1. DAC Demultiplexer/Passgates are used to "determine which of the eight channels is active." *Id.* at 1216.

2. Analysis

a. Claim 6

The Petition includes a limitation-by-limitation comparison of independent claim 6 to the disclosure of Jones, including citations to the Pless Declaration as support. Pet. 60–74 (citing Ex. 1003 ¶¶ 197–230). To assist in its comparison, Petitioner provides the following annotated version of Figures 1 and 2 of Jones:



The illustration above is an annotated version of Figures 1 and 2 of Jones showing its demultiplexing system for physiological stimulation. Pet. 62, 66, 70, 72.

Petitioner cites to Jones for the statement that its system can "'control a large quantity (up to several hundred) of stimulating electrodes' and is 'implemented as an eight-channel stimulator, [and] is scalable to a 625-channel stimulator.'" Pet. 60 (citing Ex. 1006, 1210 (Abs.)) (alteration in original). Petitioner argues that Jones discloses an input section and multiple DAC subsystems (containing a stimulation output switching system), one input section and one DAC subsystem for each eight channels (electrodes), illustrated above by the black arrows pointing out from each of two DAC control elements. *Id.* at 60–61 (citing Ex. 1006, Figure 1 (annotated), 1211; Ex. 1003 ¶ 198). Petitioner further argues that Jones discloses that its system is a "multichannel" stimulator, referring to Jones's disclosure of multiple current sources that allows "many channels [to] be stimulated simultaneously" and different stored "waveform parameters." *Id.* at 61 (citing Ex. 1006, 1210 (Abs.), 1212; Ex. 1003 ¶ 199) (alteration in original).

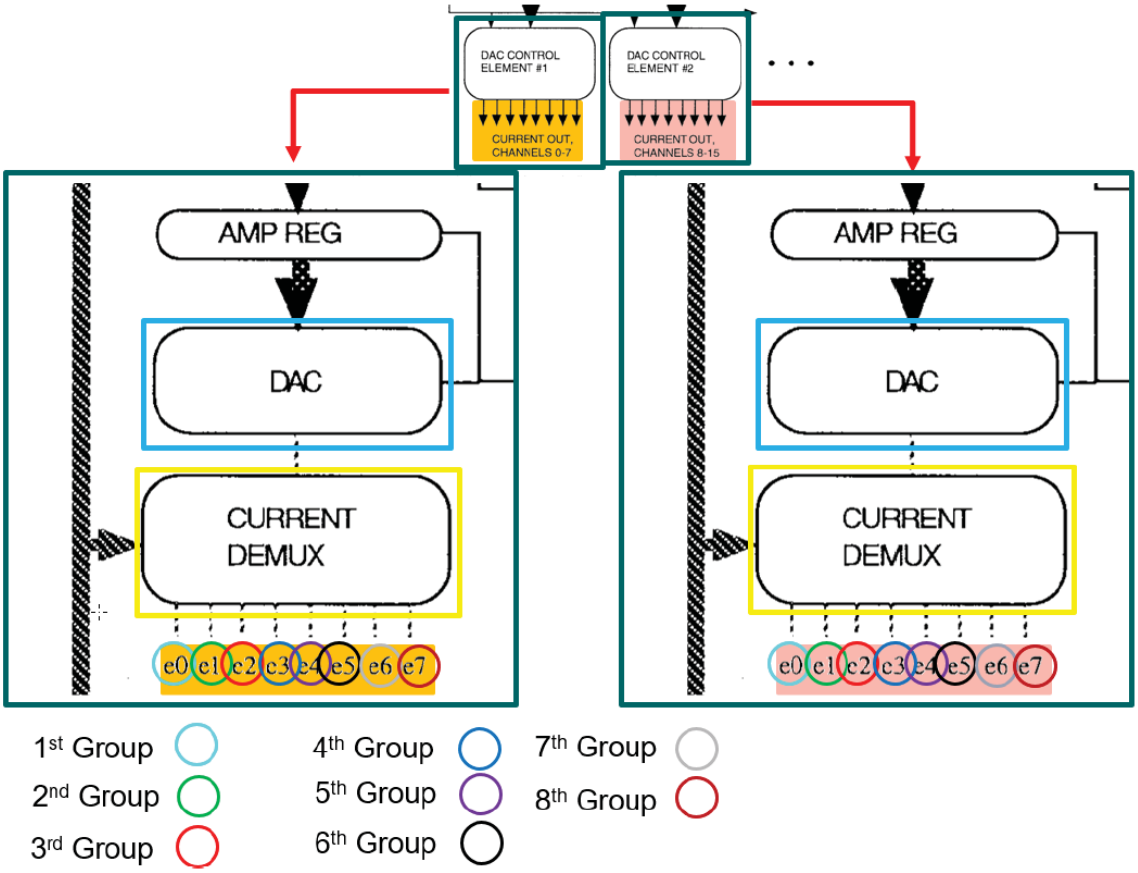
Petitioner also argues that Jones discloses N number of DACs (= *2*), that each DAC subsystem has a DAC current source (blue boxes shown above) and eight channels (electrodes) to be serviced (orange and pink boxes shown above). Pet. 61–63 (citing Ex. 1003 ¶¶ 200–202; Ex. 1006, 1213, Figures 1 and 2 (annotated)). Petitioner further argues that Jones discloses M number of switches (= *16*), grouped into N grouped sets (*N*= *2*) of switches, each set having L number (*L*= *8*) of switches. *Id.* at 63–65 (citing Ex. 1003 ¶¶ 203–209; Ex. 1006, 1216, annotated Figure 2).

Petitioner refers to Jones's disclosure of the "Current Demux" (shown above) as a "set of eight CMOS passgates," i.e. switches, "selected by a three-to eight decoder." Pet. 64 (citing Ex. 1006, 1216; Ex. 1003 ¶ 205). Thus, according to Petitioner, there are eight CMOS passgates (switches) for

each DAC control element, such that the two DAC control elements would have a total of sixteen CMOS passgates (M number of switches), with each set having eight (L number) of switches. *Id.* at 65 (citing Ex. 1006, 1216, annotated Figures 1 and 2; Ex. 1003 ¶¶ 205, 206). Petitioner further argues that the sixteen CMOS passgates are divided into two groups, an orange switch group and a pink switch group as illustrated above, each set having eight switches. *Id.* (citing Ex. 1003 ¶ 208).

Petitioner argues that Jones discloses M number (= *16*) of electrode contacts and L number (= *8*) electrode contact groups. Pet. 65–69. Referring to the annotated illustration above, Petitioner contends that each of the two DAC control elements (blue boxes) has eight channels (electrodes to be serviced (orange and pink boxes). *Id.* at 65–66 (citing Ex. 1003 ¶¶ 210–212; Ex. 1006, 1212–13, annotated Figures 1 and 2). Thus, according to Petitioner, Jones discloses a total of sixteen electrode contacts (*M = 16*). *Id.* (citing Ex. 1003 ¶ 212).

Petitioner provides an additional annotated illustration in connection with Jones's disclosure of L number (= *8*) of electrode contact groups, as shown below:



The illustration above shows a further annotated version of Figures 1 and 2 of Jones's demultiplexing system for physiological stimulation. Pet. 67.

Petitioner explains how Jones discloses that each of the 8 groups of electrodes shown above contains multiple electrodes and may be stimulated at the same time. Pet. 67–69 (citing Ex. 1003 ¶¶ 214–219).

Petitioner argues that Jones discloses that each DAC of the N number ($N = 2$) of DACs is coupled to one of the N (= 2) grouped sets of switches. Pet. 69–71 (Ex. 1003 ¶¶ 220–224). Petitioner refers to its annotated figures from Jones to show Jones's disclosure that "the DAC from 'DAC control element 1' is connected to 8 switches in the orange switch group. . . . [and] the DAC from 'DAC control element 2' is connected to 8 switches located in the pink switch group." *Id.* at 71 (citing Ex. 1003 ¶ 223).

Claim 6 also recites "wherein each switch (**121**) in one of the N set (**110**) of switches, in turn, is uniquely coupled to only one electrode contact (**130**) in each of L groups (**100**) of electrode contacts." Ex. 1001, 7:15–18. Petitioner argues that Jones discloses this limitation for *N = 2* and *L = 8*. Pet. 71–73 (citing Ex. 1003 ¶¶ 225–228).

Petitioner refers to Jones's disclosure of two DAC control elements, each having eight CMOS passgates (switches) in an orange switch group and a pink switch group (two switch groups). Pet. 71–72 (citing Ex. 1006, 1213, annotated Figures 1 and 2; Ex. 1003 ¶ 226). Petitioner further argues that Jones discloses that the eight CMOS passgates (switches) "determine which of the eight channels is active, and also connect all of the unused channels to the exhaust line." *Id.* at 72 (citing Ex. 1006, 1216). According to Petitioner, each CMOS passgate is associated with one channel and its corresponding electrode, and for both the orange and pink switch groups, each CMOS passgate is "uniquely coupled" to one of the eight electrodes associated with that switch group. *Id.* (citing Ex. 1003 ¶ 227).

Petitioner argues that Jones discloses that the whole numbers N, L, and M are such that *NxL = M* and M is greater than N. Pet. 73–74 (citing Ex. 1003 ¶¶ 229, 230). In particular, Petitioner argues with reference to its annotated Figures 1 and 2 of Jones that Jones discloses two DACs (*N = 2*), sixteen electrode contacts (*M = 16*), and eight electrode contact groups (*L = 8*). *Id.* at 73 (citing Ex. 1003 ¶ 230).

b. Claim 15

Petitioner argues that Jones discloses the limitations of claim 15 for the same reasons as set forth with respect to claim 6. Pet. 77 (citing Ex. 1003 ¶¶ 241–243, 246, 251). Petitioner also argues that Jones further discloses the limitation of "*(c) coupling each of N DACs (12) to at least one*

set (110) of switches having L number of switches (121) in the at least one set (110)." *Id.* at 78 (citing Ex. 1003 ¶ 224) (alteration in original); *see* Ex. 1001, 8:19–21. Petitioner cites to Jones's disclosure of two DAC control elements that have sixteen CMOS passgates between them (eight each, $L = 8$), and that each of the two DACs has its own set of eight CMOS passgates connected to electrodes in the orange and pink boxes. *Id*. (citing Ex. 1006, 1213, annotated Figures 1 and 2; Exhibit 1003 ¶¶ 244, 245).

Petitioner also argues that Jones discloses the limitation of "*(e) causing current to flow through selected electrode contacts (130) at any one time duration, T_d, by closing the associated switches (121).*" Pet. 78–79 (citing Ex. 1003 ¶¶ 248, 249) (alteration in original); *see* Ex. 1001, 8:26–28. Petitioner argues that the selected electrodes in Jones's system are stimulated using a "completed biphasic pulse through the DAC" and that "these pulses last for time that is controlled by register T_1." *Id.* at 78 (citing Ex. 1006, 1215). According to Petitioner, "Jones discloses a chip architecture program that selects which CMOS pass-gates to activate[,] thereby stimulating the corresponding electrode," and that Jones's "selected electrodes are active for a single time duration that is selected by register T_1 ('*at any one time duration T_d*')." *Id.* (citing Ex. 1003 ¶ 248) (alteration in original).

c. Dependent Claims

The Petition includes a limitation-by-limitation comparison of dependent claims 7–10 and 16–19 to the disclosure of Jones, with supporting citations to the Pless Declaration. Pet. 74–77, 79–80 (citing Ex. 1003 ¶¶ 232, 234, 236–240, 252–255). For example, claim 7 recites "[t]he system of claim 6 wherein the switches are transistor switches." Ex. 1001, 7:22–23. Petitioner argues that Jones discloses this limitation for reasons similar to

those argued with respect to claim 2. Pet. 74 (citing Ex. 1003 ¶¶ 232, 234; Ex. 1007, 427).

d. Patent Owner's Arguments

Patent Owner argues that Jones teaches that one DAC per electrode is preferable when a stimulating system does not require over 100 electrodes, which Patent Owner asserts is Jones's "direct teachings about spinal cord stimulators" and "which directly contradicts the teachings of the '298 patent." Prelim. Resp. 41–44. Patent Owner also argues that Jones "does not enable subject matter that falls within the scope of the claims." *Id.* at 23. Patent Owner further argues that "Jones does not disclose an algorithm to determine the number of switches to be used based on the number of DACs and electrodes," but that Jones prescribes "that 1 DAC should be used for 8 electrodes and each DAC must have 8 switches." *Id.* at 23, 43–44 (citing Ex. 1006, 1211).

We are not persuaded by Patent Owner's arguments at this stage of the proceeding. Here, the claims are not limited to spinal cord stimulators or a specific number of electrodes, and Jones specifically teaches that the number of electrodes may vary and its "eight-channel stimulator" is "scalable to a 625-channel stimulator." Ex. 1006, 1210 (Abs.)). Moreover, an anticipation inquiry considers whether the prior art references discloses every claim element. *See Eli Lilly*, 894 F.3d at 1074–75. Similar to the discussion regarding claims 1 and 11, Petitioner has sufficiently shown on this record that Jones discloses an embodiment of a stimulation output switching system for a multichannel stimulator, and a method of switching outputs in a multi-channel stimulator, that falls within the scope of at least challenged claims 6 and 15 such that those claims "read on" Jones. *See Atlas Powder*, 190 F.3d at 1346. A reasonable likelihood of finding

anticipation is thus established at this stage of the proceeding regardless of whether those claims also read on other embodiments. *See, e.g., Titanium Metals*, 778 F.2d at 782 (citation omitted). Moreover, Patent Owner provides no evidence on this record that a person of ordinary skill in the art could not practice the subject matter of Jones without undue experimentation. *See Sanofi-Synthelabo*, 550 F.3d at 1082. We thus find on this record that Jones is enabled for purposes of anticipation.

3. Summary

For the reasons articulated by Petitioner, and in view of the record as a whole at this stage of the proceeding, we determine that the information presented in the Petition establishes that there is a reasonable likelihood that Petitioner would prevail in showing that at least challenged claims 6 and 15 are anticipated by Jones.

H. Obviousness challenges based on Jones

Petitioner asserts that claims 6–10 and 15–19 of the '298 patent are unpatentable as obvious over Jones, and relies on the Pless Declaration in support of those assertions. Pet. 80–83 (citing Ex. 1003 ¶¶ 257–59, 61). Patent Owner contends that "Petitioner's obviousness analysis suffers from the same deficiencies as Ground 5." Prelim. Resp. 45.

As discussed above, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that Jones anticipates claims 6 and 15 of the '298 patent. *See supra* § II.G. Accordingly, we likewise find that Petitioner has established a reasonable likelihood of prevailing on its assertion that Jones renders obvious claims 6 and 15 of the '298 patent. *See Realtime Data,* 912 F.3d at 1373.

Petitioner asserts that claims 7, 8, 16, and 17 of the '298 patent are unpatentable as obvious over Jones in view of Panescu, and relies on the

Pless Declaration in support of those assertions. Pet. 83–84 (citing Ex. 1003 ¶¶ 264, 265). Patent Owner contends that for the reasons discussed for grounds 5 and 6 "dependent Claims 7-8, which depend from claim 6, are not obvious" and "Claims 16-[17], which depend from claim 15, are not obvious." Prelim. Resp. 46.

Having found that Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of claims 6 and 15, as set forth above, we do not further address the patentability challenge of dependent claims 7, 8, 16, and 17 at this stage of the proceeding.

III. CONCLUSION

Based on the record as a whole at this stage of the proceeding, and for the foregoing reasons, we conclude that Petitioner has established a reasonable likelihood that it would prevail in showing the unpatentability of at least one of the challenged claims of the '298 patent.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–19 of U.S. Patent No. 7,127,298 B1 is instituted with respect to all grounds set forth in the Petition; and

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

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