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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

QSC AUDIO PRODUCTS, INC.,

Petitioners,

v.

CREST AUDIO, INC.,

Patent Owner

Case IPR2014-00131

U.S. Patent 5,652,544

**SUBSTITUTE PATENT OWNER OPPOSITION TO PETITION
PURSUANT TO 37 C.F.R. § 42.120¹**

¹ This Substitute Patent Owner Opposition is identical to the Patent Owner Opposition (Paper 22) but for pages 11 and 24, which are rendered in color.

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	OVERVIEW OF THE TECHNOLOGY OF THE '544 PATENT.....	3
	A. The State of the Art at the Time of Invention	3
	B. The Audio Amplifier of the '544 Patent	5
III.	OVERVIEW OF THE CITED REFERENCES.....	8
	A. Overview of Sudo.....	8
	B. Overview of Porambo	9
	C. Overview of Krokstad	9
	D. Overview of TMS320.....	11
IV.	PRINCIPLES OF LAW	13
	A. Petitioner's Burden of Proof	13
	B. Obviousness under 35 U.S.C. § 103	14
V.	DR. ELLIS' OPINIONS ON OBVIOUSNESS SHOULD BE GIVEN LITTLE TO NO WEIGHT	14
	A. Dr. Ellis Does Not Have the Level of Skill of a PHOSITA.....	14
	B. Dr. Ellis spent an unreasonably short amount of time preparing his declaration	17
VI.	CLAIM CONSTRUCTION.....	18
	A. "at least one of a signal processing function and a signal processing function parameter	19
	B. "programming information from at least one of the input device and a control circuit of the amplifier"	19
	C. "control panel"	20

D.	“performance characteristics”	21
VII.	SUDO AND PORAMBO FAIL TO RENDER OBVIOUS INDEPENDENT CLAIM 1 AND DEPENDENT CLAIMS 2-6, 9-13, 15, AND 19 (GROUND 1)	21
A.	Sudo and Porambo fail to render obvious “the external programmer being removably connectable to the programming signal input port,” as recited in claim 1.....	22
B.	Sudo and Porambo fail to render obvious “a storage device for storing the input programming information and previously selected control signals,” as recited in claim 11	28
C.	Sudo and Porambo fail to render obvious “a microprocessor for receiving programming information from at least one of the input device and a control circuit of the amplifier,” as recited in claim 13	32
D.	Claims 2-6, 9-10, 12, 15, and 19 are patentable as depending from another patentable claim.....	33
VIII.	SUDO AND KROKSTAD FAIL TO RENDER OBVIOUS INDEPENDENT CLAIM 1 AND DEPENDENT CLAIMS 2-6, 9-13, 15, 19, 21, AND 25 (GROUND 2)	33
A.	Sudo and Krokstad fail to render obvious “the external programmer being removably connectable to the programming signal input port,” as recited in claim 1.....	33
B.	Sudo and Krokstad fail to render obvious “a storage device for storing the input programming information and previously selected control signals,” as recited in claim 11	37
C.	Sudo and Krokstad fail to render obvious “a microprocessor for receiving programming information from at least one of the input device and a control circuit of the amplifier,” as recited in claim 13	37
D.	Sudo and Krokstad fail to render obvious “wherein said digital signal processor receives and stores a combination of at least two signal processing functions,” as recited in claim 21	37

E.	Claims 2-6, 9-10, 12, 15, 19, and 25 are patentable as depending from another patentable claim.....	39
IX.	SUDO, PORAMBO, AND THE SPECIFICATION OF THE '544 PATENT FAIL TO RENDER OBVIOUS DEPENDENT CLAIMS 7, 20, 21, 23, 24, AND 26 (GROUND 3).	39
A.	Sudo, Porambo, and the specification of the '544 Patent fail to render obvious “a control panel, wherein said programming signal input port is provided on the control panel,” as recited in claim 7	40
B.	Sudo, Porambo, and the specification of the '544 Patent fail to render obvious “said digital signal processor receives and stores a combination of at least two signal processing functions,” as recited in claim 21	42
C.	Claims 20, 23-24, and 26 are patentable as depending from another patentable claim.....	44
X.	SUDO, KROKSTAD, AND THE SPECIFICATION OF THE '544 PATENT FAIL TO RENDER OBVIOUS DEPENDENT CLAIMS 7, 24, AND 26 (GROUND 4).	44
A.	Sudo, Porambo, and the specification of the '544 Patent fail to render obvious “a control panel, wherein said programming signal input port is provided on the control panel,” as recited in claim 7	45
B.	Claims 24 and 26 are patentable as depending from another patentable claim.....	45
XI.	SUDO, PORAMBO, AND TMS320 FAIL TO RENDER OBVIOUS DEPENDENT CLAIM 8 (GROUND 5).	45
XII.	SUDO, KROKSTAD, AND TMS320 FAIL TO RENDER OBVIOUS DEPENDENT CLAIM 8 (GROUND 6).	49
XIII.	SUDO, PORAMBO AND KROKSTAD FAIL TO RENDER OBVIOUS DEPENDENT CLAIMS 14 AND 18 (GROUND 7).....	49
XIV.	CONCLUSION	50

TABLE OF AUTHORITIES

CASES

<i>Blackberry Corp. v. MobileMedia Ideas, LLC</i> , IPR2013-00036 (JYC), Paper 40 (July 26, 2013)	3
<i>Graham v. John Deere Co.</i> , 383 U.S. 1 (1966)	18
<i>In re Fine</i> , 837 F.2d 1071 (Fed. Cir. 1988)	14, 33, 39, 44, 45, 50
<i>In re Gordon</i> , 733 F.2d 900 (Fed. Cir. 1984)	36
<i>In re Kahn</i> , 441 F.3d 977 (Fed. Cir. 2006)	14
<i>In re Wilson</i> , 57 C.C.P.A. 1029 (C.C.P.A. 1970)	38, 43
<i>KSR Int’l v. Teleflex, Inc.</i> , 550 U.S. 398 (2007)	14, 41
<i>Phillips v. AWH Corp.</i> , 415 F.3d 1303 (Fed. Cir. 2005)	14
<i>QSC Audio Products, LLC v. Crest Audio, Inc.</i> , IPR2014-00129, Paper 12	19
<i>Sundance, Inc. v. Demonte Fabricating Ltd.</i> , 550 F.3d 1356 (Fed. Cir. 2008)	15, 16
<i>Toyota Motor Corp. v. Leroy G. HagenBuch</i> , IPR2013-00483, Paper 21	18

STATUTES AND RULES

35 U.S.C. § 103	14
35 U.S.C. § 316(e)	13
37 C.F.R. § 42.100(b)	18
37 C.F.R. § 42.120	1
37 C.F.R. § 42.23(b)	2

OTHER AUTHORITIES

<i>Office Patent Trial Practice Guide</i> , 77 Fed. Reg. 48756	2
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EXHIBIT LIST

<u>CREST Ex. No.</u>	<u>DOCUMENT DESCRIPTION</u>
CREST Ex. 2001	Declaration of Bob Cordell (“Cordell Decl.”)
CREST Ex. 2002	Deposition Transcript of Dr. Ellis for IPR2014-00131 (“Ellis Dep. Tr.”)
CREST Ex. 2003	Deposition Transcript of Dr. Ellis for IPR2014-00129 (“Ellis Dep. Tr. ’129 IPR”)
CREST Ex. 2004	U.S. Patent No. 5,652,542 (the ’542 Patent)
CREST Ex. 2005	Declaration of Vivek A. Ganti, Esq. (“Ganti Decl.”)

I. INTRODUCTION

Pursuant to 37 C.F.R. § 42.120, Patent Owner Crest Audio, Inc. (hereinafter “Patent Owner”) hereby respectfully submits this Substitute Opposition to the Corrected Petition (hereinafter “the Petition”) filed by QSC Audio, Inc. (hereinafter “Petitioner”) for *inter partes* review of claims 1-15, 18-21, and 23-26 of U.S. Patent No. 5,652,544 (hereinafter “the ’544 Patent”). This filing is timely in accordance with the Scheduling Order (Paper 17), as it is being filed no later than August 4th, 2014. Patent Owner respectfully requests that the Patent Trial and Appeal Board (hereinafter “the Board”) issue a final written decision finding claims 1-15, 18-21, and 23-26 patentable over all the alleged grounds of unpatentability on which the *inter partes* review was initiated.

The Board instituted the *inter partes* review on only the following alleged grounds of unpatentability:

1. Claims 1-6, 9-13, 15, and 19 under 35 U.S.C. § 103 over U.S. Patent No. 5,822,775 to Sudo *et al.* (hereinafter “Sudo”) and U.S. Patent No. 5,450,624 to Porambo *et al.* (hereinafter “Porambo”);
2. Claims 1-6, 9-13, 15, 19, 21, and 25 under 35 U.S.C. § 103 over Sudo and PCT Publication No. W0 91/08654 by Krokstad *et al.* (hereinafter “Krokstad”);

3. Claims 7, 20, 21, 23, 24, 25, and 26 under 35 U.S.C. § 103 over Sudo, Porambo, and alleged admitted prior art (APA);
4. Claims 7, 24, and 26 under 35 U.S.C. § 103 over Sudo, Porambo and TEXAS INSTRUMENTS TMS320 SECOND GENERATION DIGITAL SIGNAL PROCESSORS, 1-67 (1991) (hereinafter “TMS320”);
5. Claim 8 under 35 U.S.C. § 103 over Sudo, Porambo, and TMS320;
6. Claim 8 under 35 U.S.C. § 103 over Sudo, Krokstad, and TMS320;
and
7. Claims 14 and 18 under 35 U.S.C. § 103 over Sudo, Krokstad, and Porambo.

No other alleged grounds of unpatentability were authorized by the Board.

This Response and Opposition responds to the arguments set forth in the Petition for the alleged grounds of unpatentability on which the *inter partes* review was instituted. Any attempt by Petitioner to make any different *prima facie* case for the unpatentability of any of the claims is improper and should not be considered. 37 C.F.R. § 42.23(b) (“A reply may only respond to arguments raised in the corresponding opposition or patent owner response.”). “[A] reply that raises a new issue or belatedly presents evidence will not be considered.” *Office Patent Trial Practice Guide*, 77 Fed. Reg. 48756, 48767 (Aug. 14, 2012). *See also*, *Blackberry Corp. v. MobileMedia Ideas, LLC*, IPR2013-00036 (JYC), Paper 40

(July 26, 2013), p. 3 (authorizing a petitioner to file a revised reply eliminating new issues and belatedly presented evidence).

Given Petitioner's failure to establish unpatentability of any of the claims, Patent Owner has elected to not file a Motion to Amend.

II. OVERVIEW OF THE TECHNOLOGY OF THE '544 PATENT

A. The State of the Art at the Time of Invention

Audio amplifiers may be installed in concert halls, buildings, music venues, and other large structures. Ex. 2001 (Cordell Decl.), ¶¶ 11, 27. Such audio amplifiers may deliver audio for a significant amount of space. *Id.* The weight, size, and bulkiness of an audio amplifier tend to scale with the amount of power that the audio amplifier delivers. As a result, audio amplifiers can be large and not easily moved when installed for loud audio applications. *Id.* Furthermore, audio amplifiers may be installed in locations that are difficult to access. *Id.*

A conventional audio amplifier, at the time of invention of the '544 Patent, typically included a signal processing circuit formed of several resistive elements, capacitive elements, switching elements, and operational amplifiers that modified input signals. Ex. 1001 (the '544 Patent) 1:27-30. Signal processing is a term that covers both analog and digital systems. Ex. 2001 (Cordell Decl.), ¶ 66. If a user wished to adjust the operation of an audio amplifier, some conventional amplifiers

allowed a user to set switches or replace physical circuit elements, such as resistors and capacitors. Ex. 1001, (the '544 Patent), 1:27-30. To set the switches or replace the resistors and capacitors, a user would need to open the housing of the conventional amplifier and remove the signal processing circuit support from the amplifier housing. *Id.* at 1:65-2:2. After the switches had been set or the resistors and capacitors replaced, the signal processing circuit support would then be re-inserted into the amplifier housing, and the amplifier housing would be closed. *Id.* at 2:2-5. Such modification would be time consuming and would not allow a user to immediately sound check the results of the modification. *Id.* at 1: 62-67 and 2: 1-10.

Some conventional amplifiers included manual control knobs that would modify the way in which the signal processing circuits processed audio signals. *Id.* at 2:22-28. However, someone could make unauthorized or unintentional modifications to the signal processing parameters by simply turning or bumping into one of the knobs. *Id.* Also, to duplicate the desired settings for multiple amplifiers in a network, the knobs for each amplifier would need to be set manually to be the exact same value. *Id.* at 2:22-34.

For various reasons, the settings of an audio amplifier may need to be changed. *Id.* at 43-45. It may be cumbersome to access and configure the various amplifiers that may be located in various areas of a venue. *Id.* at 2:6-14.

Additionally, there may be a desire to configure multiple amplifiers in the same manner to ensure sonic uniformity. *Id.* at 2:24-28.

B. The Audio Amplifier of the '544 Patent

The '544 Patent discloses an audio amplifier that solves many of the problems facing conventional audio amplifiers. The audio amplifier of the '544 Patent includes a digital signal processor that performs signal processing on the input signals provided to the amplifier. Ex. 1001 (the '544 Patent), 3:9-20; Ex. 2001 (Cordell Decl.), ¶¶ 17-18. Unlike many conventional audio amplifiers, the claimed digital signal processor of the audio amplifier is capable of receiving signal processing functions and storing those signal processing functions. Ex. 1001, (the '544 Patent), claim 1. This is a significant advantage over prior art audio systems. Prior art audio systems typically used digital signal processors with integrated, preconfigured read-only memories (ROMs). *See* Ex. 1006 (Porambo), 4:15-18; *see also* Ex. 1008 (TMS320), p. 1; *see also* Ex. 2001 (Cordell Decl.), ¶ 13. Once installed in an amplifier, a digital signal processor with an integrated, preconfigured ROM was incapable of receiving any signal processing functions. Ex. 2001 (Cordell Decl.), ¶ 13.

In some embodiments of the '544 Patent, the digital processing circuit includes non-volatile memory for storing variable data. Ex. 1001 (the '544 Patent),

claim 8. By being able to store variable data in a non-volatile memory of the digital signal processor, the programmed data for circuit elements remains programmed even if the power to the amplifier is removed. Ex. 1001 (the '544 Patent), 5:16-17; Ex. 2001 (Cordell Decl.), ¶ 60. This feature is advantageous over the prior art systems.

A portable programmer is also removably connectable to the audio amplifier of the '544 Patent. Ex. 1001 (the '544 Patent), 2:49-50. The portable programmer may include a connecting member that couples to a port on the amplifier. *Id.* at 2:59-62. When the portable programmer is connected to the amplifier, signal processing functions and signal processing parameters for the digital signal processor can be read and modified using the portable programmer. *Id.* at 4:1-5 and 4:22-34.

The audio amplifier disclosed in the '544 patent is advantageous over conventional amplifiers for several reasons. For example, if a user wishes to modify the way in which the amplifier processes input signals, the portable programmer can be used to modify signal processing functions and signal processing parameters for the digital signal processor without opening the amplifier housing and physically modifying or replacing elements within the amplifier housing. Ex. 1001 (the '544 Patent), 4:51-54. In addition, modifications to the signal processing functions and parameters can be evaluated immediately

after the modifications have been made using the portable programmer. *Id.* at 4:59-63. Furthermore, because the portable programmer may be used to modify the signal processing functions and signal processing parameters, embodiments of the '544 patent may prevent unauthorized or unintentional modifications being made to the amplifier. *Id.* at 5:7-12.

In addition to programming an audio amplifier by using a removably connectable external programmer, the external programmer may also store previously selected control signals. *Id.* at claim 11. As a result, the parameter values for each of the amplifier's circuit elements may be displayed in numerical form on the display of the programmer. *Id.* at 4:18-21.

Some claimed embodiments of the '544 Patent include a control panel that has a programming signal input port. *Id.* at claim 7. The control panel may include a plurality of control knobs for controlling gain, volume, an equalizer circuit, a level threshold, *etc.* *Id.* at 5: 50-55. Because the control panel 112 includes a programming signal input port and the control knobs, the user has the option to control the amplifier by the manipulating the control knobs or by using the removably connectable external programmer connected to the programming signal input port. *Id.* at 8:30-35. These options improve user control over an amplifier, which is another benefit that the technology of the '544 patent provides over the prior art.

III. OVERVIEW OF THE CITED REFERENCES

A. Overview of Sudo

Sudo is directed towards a system in which a microcomputer communicates with a digital signal processor (DSP) using a pipeline process. Ex. 1005 (Sudo), 1:8-13. When a key on the keyboard of the microcomputer is selected, a corresponding processing program and coefficients are transferred into the program RAM and the coefficient RAM of the DSP. *Id.* at 4:8-17. The DSP may perform arithmetic operation on a digital audio signal based on the information stored in the program RAM and the coefficient RAM. *Id.* at 1:9-12 and 35-42.

The system in Sudo receives an audio input signal via an analog-to-digital converter (A/D), and then applies an arithmetic operating process to the audio input signal. *Id.* at 4:17-21. According to Sudo, “it is *necessary* to write the coefficient data into new values *while continuing the arithmetic operation* in order not to cause an inconvenience, such as stopping the arithmetic operation currently being executed and breaking the reproduction sound of the audio signal.” *Id.* at 1:61-66 (*emphasis added*). Accordingly, the DSP in Sudo is configured to respond to data from a permanently connected microcomputer without interrupting the processing or sound production of the audio signal. *Id.*; *see also*, Ex. 2001 (Cordell Decl.), ¶ 40.

B. Overview of Porambo

Porambo discloses self-diagnosis circuitry used to determine the status of an amplifier-to-speaker connection. Ex. 1006 (Porambo), 2:14-21. More specifically, Porambo describes an amplifier and a digital signal processing circuit “adapted for installation in a motor vehicle.” *Id.* at 3:48-49. With respect to the diagnosis of the amplifier-to-speaker connection, Porambo describes a clip detection signal that indicates whether the amplifier is in the binary condition of either clipping or not clipping. *Id.* at 5:10-15. This binary clip detection signal is sent to the interrupt pin of a signal limiter. *Id.*

Porambo further describes a digital signal processing generator that generates an inaudible tone signal that is sent to an amplifier. *Id.* at abstract. The tone signal is initially generated at a maximum level and then continuously reduced in a linear manner. *Id.* at 5:14-18. Unlike the DSP of Sudo, Porambo’s DSP does not process a received audio signal. *See* Ex. 2001 (Cordell Decl.), ¶ 43. Instead, Porambo’s DSP generates a diagnostic test tone signal (without using an audio input signal) that is used to detect a short circuit condition or an open circuit condition. *Id.*

C. Overview of Krokstad

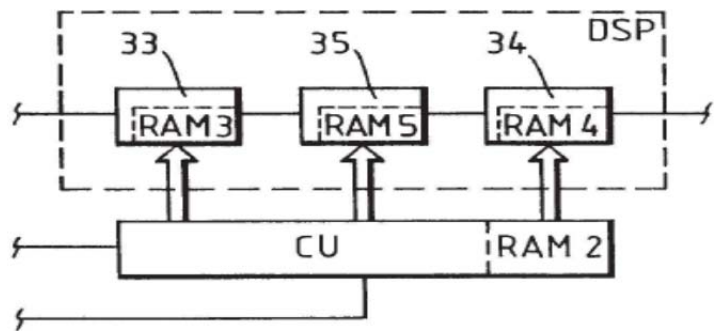
Krokstad describes a digital signal processor for use in a hearing aid device that is inserted into the ear canal. Ex. 1007 (Krokstad), abstract. Such

miniaturized hearing aid devices have been given the name “all-in-the-ear” aids. *Id.* at QSC p. 3. The hearing aid device in Krokstad may be stored in a case (also referred to as “a secondary section”) when the hearing aid is not in use. *Id.* at QSC p. 11. Additionally, the hearing aid case may be used to charge the hearing aid’s battery when the hearing aid is in the case. *Id.*

Krokstad’s digital signal processor includes predefined functional blocks, such as a compressor 33, an equalizer 34, and a cancellation filter 35. *Id.* at QSC p. 30. Each functional block

(compressor 33, equalizer 34, and cancellation filter 35) may be referred to as a filter that, as shown in FIG. 4c of Krokstad to the right, comprises its own

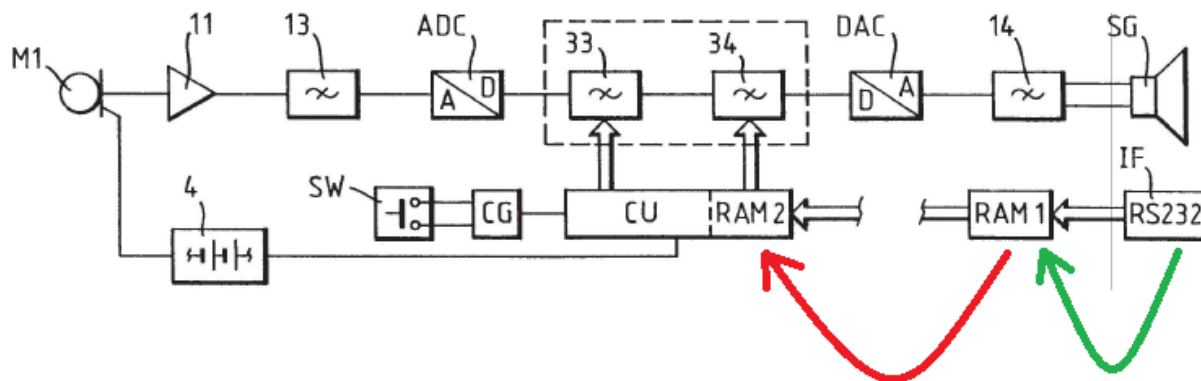
Fig. 4 c.



respective random-access memory RAM 3-5. *Id.* at QSC p. 12. Each RAM may be supplied with one or more new sets of filter coefficients. *Id.* at QSC p. 22. In this respect, “Each individual set of filter coefficients thus represents a specific response function.” *Id.* Krokstad further discloses use of a “parametric control” of filters by programming the parameters of a filter. *Id.* at QSC p. 15. However, Krokstad does not disclose modifying both a parameter and a signal processing function. Ex. 2001 (Cordell Decl.), ¶ 51.

To program the filter coefficients, a computer first programs RAM that is located in the hearing aid's case. Ex. 1007 (Krokstad), QSC p. 23. To this end, the computer is connected to the hearing aid case using an RS232 interface IF, and data is transferred across the RS232 interface IF to the RAM1 in the case, as indicated below in Fig. 4a with the green arrow (*annotations added*). *Id.* Data from the RAM1 in the case is eventually transferred to the memories of the hearing aid, as shown below with the red arrow (*annotations added*). *Id.* at p. 22.

Fig. 4a.



D. Overview of TMS320

At the time of invention of the '544 Patent, the TMS320 Second Generation Digital Signal Processor represented a conventional digital signal processor that was available for use in power amplifier systems. Ex. 2001 (Cordell Decl.), ¶ 58. In fact, Porambo references use of the TMS320 in its power amplifier system. Ex. 1006 (Porambo), 4:15-18.

The TMS320 series of digital signal processors included models with an on-board, integrated, read-only-memory (ROM) for storing program algorithms. Ex. 2001 (Cordell Decl.) at ¶ 59. It was standard practice to permanently program the ROM of the TMS320 at the factory with permanent static data and then install the TMS320 in the end device. *Id.* at ¶ 64. Due to the physical nature of the integrated ROM, the TMS320 digital signal processor was incapable of being reprogrammed. *Id.* at ¶ 65. Consequently, amplifier systems that used the TMS320 digital signal processor were incapable of being reprogrammed. *Id.* at ¶¶ 64-65. So, while a conventional amplifier may use a TMS320 device that stores an algorithm programmed at the factory, a TMS320 device having ROM was physically incapable of receiving another algorithm after it has been programmed and installed in the conventional amplifier. *Id.*

The TMS320 series of digital signal processors included other models that used an integrated electrically erasable ROM (EPROM). *Id.* at ¶ 59. Unlike ROM, the EPROM could be erased and reprogrammed, but only when the EPROM was exposed to ultraviolet light. *Id.* at ¶ 60. For the TMS320 model that uses EPROM, the device has a small window that allows ultraviolet light to shine on the EPROM in order to erase data in the EPROM. Ex. 1008 (TMS320), p. 60. The EPROM must be erased by shining ultraviolet light into the window before the device could receive a new algorithm. Ex. 2001 (Cordell Decl.), ¶ 60.

The TMS320 models having EPROM were intended to be used for testing and developing purposes, due to its re-writable nature. *Id.* at 61. In actual commercial applications, the TMS320 devices having the ROM would be used, instead of the EPROM. *Id.* Regardless, an EPROM would likely not have been used in any commercial programmable amplifier applications because performing any memory erase operation would require deconstruction and removal of the TMS320 in order to expose it to ultraviolet light. *Id.* at ¶ 63. TMS320 even states, “[n]ote that normal ambient light contains the correct wavelength for erasure. Therefore, *when using* the TMS320E25, the window should be covered with an opaque label.” Ex. 1008 (TMS320), p. 60 (*emphasis added*).

IV. PRINCIPLES OF LAW

A. Petitioner’s Burden of Proof

In an *inter partes* review, “the petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence.” 35 U.S.C. § 316(e). Accordingly, Petitioner has the burden of proving by a preponderance of the evidence that claims 1-15, 18-21, and 23-26 of the ’544 Patent are unpatentable under the alleged grounds of unpatentability on which the *inter partes* review was instituted.

B. Obviousness under 35 U.S.C. § 103

A claim is obvious under 35 U.S.C. § 103 only if each and every element of the claim is described or suggested by the prior art and if it would have been obvious to a person of ordinary skill in the art to combine or modify the elements in the manner recited by the claim. *In re Fine*, 837 F.2d 1071, 1073-1074 (Fed. Cir. 1988); *See also, KSR Int’l v. Teleflex, Inc.*, 550 U.S. 398, 411 (2007) (claim deemed obvious to one of ordinary skill where all claim elements were disclosed in the cited prior art references). In addition, “[r]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR Int’l*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

V. DR. ELLIS’ OPINIONS ON OBVIOUSNESS SHOULD BE GIVEN LITTLE TO NO WEIGHT

A. Dr. Ellis Does Not Have the Level of Skill of a PHOSITA

Whether a patent claim would have been obvious in light of prior art references is determined from the perspective of a person having ordinary skill in the art (PHOSITA) at the time of invention. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005). Dr. Ellis does not have the level of skill of a PHOSITA, and therefore, his opinion on what would have been obvious to a

PHOSITA at the time of invention should be given little to no weight. *See Sundance, Inc. v. Demonte Fabricating Ltd.*, 550 F.3d 1356, 1361-1362 (Fed. Cir. 2008) (rejecting the testimony of a purported expert who had no practical experience in the field of the patent at issue).

The technical field of the '544 Patent is audio amplifiers. Ex. 2001 (Cordell Decl.), ¶ 11. Petitioner also agrees that the '544 Patent is in the field of audio amplifiers. Paper 06 (the Petition), p. 5 ("The '544 patent describes and claims an audio amplifier"); *id.* at p. 22 (Making allegations of a "person of ordinary skill in the art of **audio amplifiers**[.]" (*emphasis added*)). Thus, the parties are in agreement as to the field of the '544 Patent. However, as discussed below, Petitioner's purported expert, Dr. Ellis, does not have the level of skill of a PHOSITA, even under Dr. Ellis's own definition of a PHOSITA.

Dr. Ellis states, "a person of ordinary skill in the art for this '544 patent would have had a Master's Degree in electrical or electronic engineering and Master's level course work **along with practical experience designing and testing electronic amplifiers** and the associated signal processing functions." Ex. 1003 (Ellis Decl.), ¶ 8, (*emphasis added*). Dr. Ellis appears to have experience researching the classification of speech and music, speech recognition, and the visualization of audio and speech databases. Ex. 1004 (Ellis CV), p. 1. However Dr. Ellis has no practical experience designing and testing electronic amplifiers,

which he indicates as being *necessary* to be considered a person of ordinary skill in the art. Additionally, Dr. Ellis even admitted that he does not fit the description of a person of ordinary skill in the art:²

Q. Do you consider yourself to be a person of ordinary skill in the art with respect to the '542 patent?

A. I don't exactly fit this description that I've given. Right? Because I don't—I don't exactly fit this description. I don't consider it necessary for me to be this person to be able to know what I think is obvious to such a person.

Ex. 2003 (Ellis Dep. Tr. '129 IPR), p. 180, ll. 14-21. Because Dr. Ellis is not a person of ordinary skill in the art of the '544 Patent, his opinion as to what would have been obvious to a PHOSITA should be given little to no weight, if any. *Sundance*, 550 F.3d at 1361-1362.

² Although Dr. Ellis gave this statement in his testimony with respect to IPR2014-00129 for U.S. Patent No. 5,652,542, Dr. Ellis's definition of a person of ordinary skill in the art for the 5,652,542 patent also requires "Master's level course work along with practical experience designing and testing electronic amplifiers." *QSC Audio Products, Inc. v. Crest Audio, Inc.*, IPR2014-00129 (Ex. 1003), ¶ 15.

B. Dr. Ellis spent an unreasonably short amount of time preparing his declaration

As demonstrated in the following excerpt from Dr. Ellis' cross examination, Dr. Ellis spent about 10 hours preparing for and drafting the opinions expressed in his declaration, which was submitted by Petitioner as Ex. 1003:

Q. I believe 20 hours is your best recollection?

A. That's correct.

Q. Was that 20 hours spent just for your efforts on the '542 patent or for one or more other patents that you may be serving as an expert on?

A. It's for the '542 patent and the '544 patent.

Ex. 2003 (Ellis Dep. Tr. '129 IPR), p. 77, ll. 6-11; *see also* Ex. 2002 (Ellis Dep. Tr.), p. 2, ll. 14-21 (stating that the 20 hours was split evenly between both matters).

During the 10 hours that Dr. Ellis spent on this case, Dr. Ellis claims to have reviewed and analyzed the '544 Patent, the file history of the '544 Patent, the cited references (Sudo, Porambo, Krokstad, and TMS320) as well as drafted and reviewed his 28 page declaration. Ex. 1003 (Ellis Decl.), ¶ 5.

Ten hours to develop obviousness opinions in this case is grossly inadequate. This is hardly enough time to fully consider the scope and content of the prior art, the differences between the prior art and the claims at issue, and the level of ordinary skill in the art, as required by *Graham v. John Deere Co.*, 383

U.S. 1, 17 (1966), nor is it enough time to generate and vet obviousness opinions and then draft a declaration with sufficient articulated reasoning to sustain a conclusion of obviousness. As a result of his lack of diligence with respect to this case, Dr. Ellis provides several statements that are without merit, which Dr. Ellis even admits during his cross examination, as discussed in further detail below. Additionally, Dr. Ellis' declaration provides numerous conclusory opinions concerning obviousness that have no evidentiary support, as also discussed in further detail below.

VI. CLAIM CONSTRUCTION

In an *inter partes* review, the claims of an unexpired patent are to be given the broadest reasonable construction/interpretation (BRI) in light of the specification of the patent.³ 37 C.F.R. § 42.100(b). However, in the event that a final written decision is rendered after the expiration of a patent, the Board may deem it necessary to adopt a non-BRI construction for the claims. *See Toyota Motor Corp. v. Leroy G. HagenBuch*, IPR2013-00483, Paper 21, p. 2 (applying a

³ Patent Owner reserves the right to seek different claim constructions in a different forum, due to the different claim construction standards applied by different forums.

non-BRI construction for a patent that had expired while an *inter partes* review was pending).

In either case, Patent Owner proposes the following claim constructions under the BRI standard.

A. “at least one of a signal processing function and a signal processing function parameter”

In a related *inter partes* review, IPR2014-00129, the Board interpreted this same phrase to “require that both a signal processing function and a signal processing parameter must be present in the prior art to meet that claim limitation.” *QSC Audio Products, LLC v. Crest Audio, Inc.*, IPR2014-00129, Paper 12 (May 2, 2014), pp. 7-8. For the sake of consistency, the same construction should be adopted for this claim term in the instant proceeding.

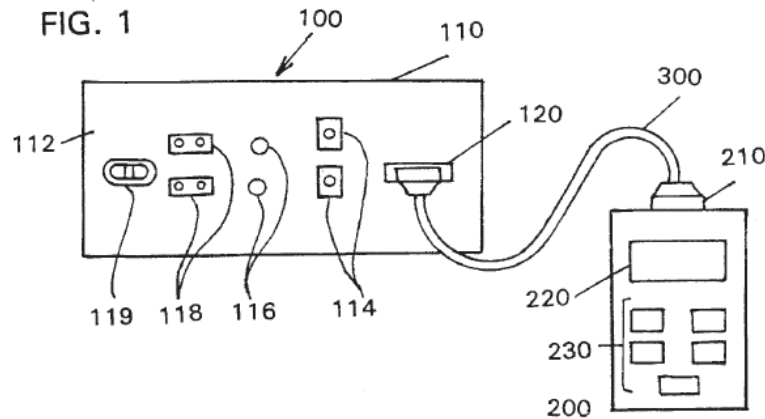
B. “programming information from at least one of the input device and a control circuit of the amplifier”

Based on the analysis relied upon by the Board in § VI.A above, for purposes of this proceeding, this claim term also requires that programming information from both the input device and the control circuit of the amplifier must be present in the prior art in order to meet this claim limitation.

C. “control panel”

As used in the claims, a “control panel” means “a physical interface having controls to control the amplifier.” Ex. 2001 (Cordell Decl.), ¶ 81. This construction is supported by the specification in at least the following instances:

- “a control panel 112 having a plurality of control elements and ports[.]” Ex. 1001 (the ’544 Patent), 5:48-49;
- “a plurality of control knobs 116 for controlling gain, volume, an equalizer circuit, a level threshold, etc. are provided on the control panel 112 as is conventional.” *Id.* at 5:51-55; and
- FIG. 1, which is provided below:



In addition to facilitating a user controlling the amplifier, a claimed embodiment of the control panel also includes “a programming signal input port.” *Id.* at claim 7.

D. “performance characteristics”

As used in the claims, “performance characteristics” means “any variable data relating to the behavior of the signal processing circuit, including signal processing functions and/or signal processing function parameters.” Ex. 2001 (Cordell Decl.), ¶ 82. The specification describes “control signals [sent] to the signal processing circuit *to modify the performance characteristics* of various control elements of the signal processing circuit.” Ex. 1001 (the ’544 Patent), 3:42-48. Because the performance characteristics are *modified, id.*, the data for the performance characteristics must be variable. Additionally, the word “performance” implies a state of a behavior that is dynamic. Therefore, the claim term “performance characteristics” requires variable data.

VII. SUDO AND PORAMBO FAIL TO RENDER OBVIOUS INDEPENDENT CLAIM 1 AND DEPENDENT CLAIMS 2-6, 9-13, 15, AND 19 (GROUND 1)

Under ground 1, Petitioner alleges that claims 1-6, 9-13, 15, and 19 are unpatentable under 35 U.S.C. § 103 over Sudo and Porambo. Paper 16 (Institution Decision), p. 19. However, these claims are patentable for at least the following reasons.

A. Sudo and Porambo fail to render obvious “the external programmer being removably connectable to the programming signal input port,” as recited in claim 1

With respect to the claim element “the external programmer being removably connectable to the programming signal input port,” Petitioner alleges that Sudo discloses a microcomputer 20 that is removably connectable to a DSP 2 through the interface 19. Paper 06 (the Petition), p. 21. However, there is no disclosure in Sudo showing or suggesting that the microcomputer 20 is removably connectable to the DSP 2. Ex. 2001 (Cordell Decl.), ¶¶ 36-40, 85-88. Petitioner’s only evidence with respect to this contention is the factually unsupported opinion of its witness, Dr. Ellis. Specifically, without citing to any factual evidence and without providing any articulated reasoning, Dr. Ellis concludes that “the interface 19 suggests that the microcomputer 20 is not hardwired to the DSP but is connected via some sort of removable connection.” Ex. 1003 (Ellis Decl.), ¶ 13. However, during his cross examination, Dr. Ellis testified that Sudo makes no suggestion of a removable connection at all:

Q. Describe for me how Interface 19 is connected to Microcomputer 20, according to your understanding of Sudo.

A. *It doesn't say.*

Q. Do you have any understanding?

A. I understand that the -- there is microcomputer which is delivering data to the system through that interface. So there must be some form of interface. And as it turns out, the ability to -- I think

the microcomputer has the ability to -- has quite a high level of control over the state of the internals of the digital signal processor through this interface and through its control of Main Bus 17.

Ex. 2002 (Ellis Dep. Tr.), p. 117, ll. 11-23 (*emphasis added*). Thus, Petitioner's own witness, Dr. Ellis, acknowledges that Sudo "doesn't say" anything about the connection between the interface 19 and the microcomputer 20 being removable.

Id.

In fact, Dr. Ellis' further cross examination testimony blatantly contradicts his declaration testimony:

Q. Does Sudo teach the concept of a removable connection?

A. **The subject matter of Sudo is not about those kinds of issues.**

Q. Is that a no?

A. **Sudo doesn't teach a removable connection.** Sudo is about ways of updating parameter RAM.

Id. at p. 180, l. 20-p. 181, l. 1 (*emphasis added*). Thus, according to Petitioner's own witness, Sudo does not show or suggest that the connection between the DSP 2 and microcomputer 20 is a removable connection.

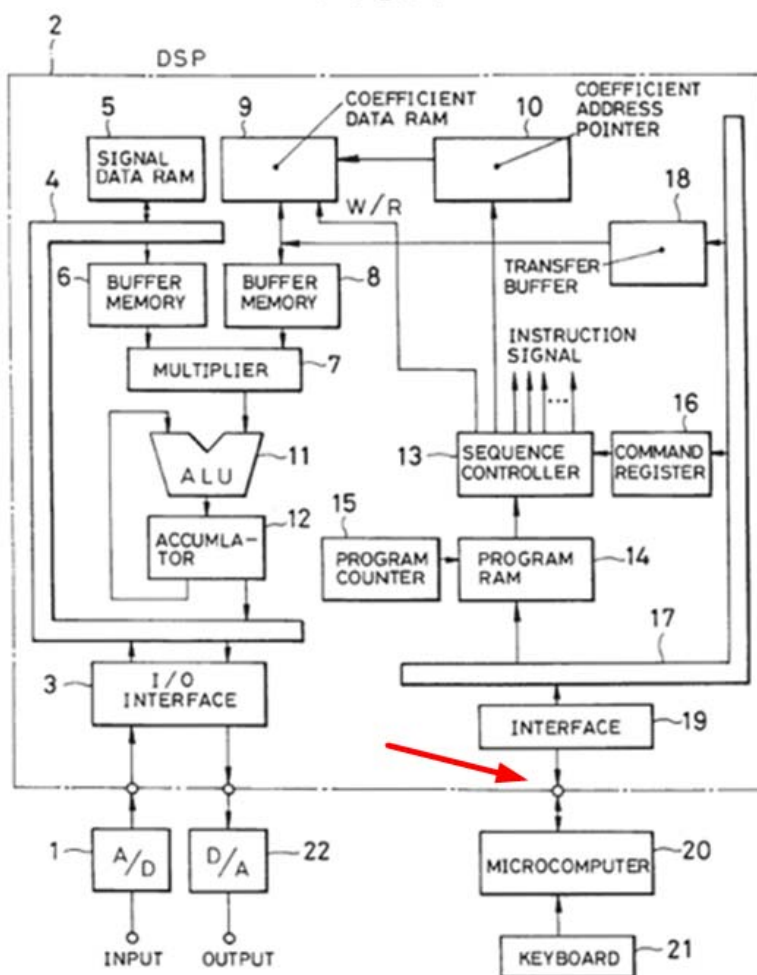
The Board, without having Dr. Ellis's cross examination testimony, decided to institute trial by reasoning that "Petitioner has shown sufficient evidence bearing on the factual determinations underlying a potential conclusion of obviousness, recognizing that Patent Owner has not yet provided evidence in opposition." Paper 16 (Institution Decision), p. 8. In view of Dr. Ellis's cross examination testimony

evidence above, Patent Owner respectfully submits that Petitioner has certainly not demonstrated by a preponderance of the evidence that Sudo discloses or renders obvious “the external programmer being removably connectable to the programming signal input port,” as recited in claim 1.

Now, given the opportunity to present evidence in the form of expert testimony, Patent Owner demonstrates that Sudo does not disclose or render obvious a removable connection between the microcomputer 20 and DSP 2.

FIG. 1

As shown in FIG. 1 of Sudo, provided to the right (*annotation added*), the interface 19 is located within the dashed box demarcating the DSP 2. This illustrates that the interface 19 resides within, and is internal to, the integrated circuit that forms the DSP 2. Ex. 2001 (Cordell Decl.), ¶ 35. The



interface 19 is not a connector. *Id.* at ¶ 37; Ex. 2002 (Ellis Dep. Tr.), p. 164, ll. 6-

8. Instead, the interface 19 involves high speed busses with numerous signal paths and tight timing constraints. Ex. 2001 (Cordell Decl.), ¶ 38. Thus, the interface 19 internal to the DSP 2 does not show or suggest that the microcomputer 20 is removably connectable to the DSP 2.

As indicated by the red arrow above, FIG. 1 of Sudo shows a circle where a line from the microcomputer 20 meets the DSP 2. This circle on the DSP 2 represents pins on the integrated circuit package of the DSP 2, and the line extending from the microcomputer 20 to the circle on the DSP 2 likely represents a hardwired connection, such as a trace (*i.e.*, a printed wire) of a circuit board, that permanently connects the microcomputer 20 to the pins of the DSP 2. *Id.* at ¶ 36. Such a hardwired connection as the one shown in FIG. 1 of Sudo is not a removable connection. *Id.*

Notably, FIG. 1 shows that the A/D converter 1 (analog-to-digital converter) and D/A converter 22 (digital-to-analog convertor) are connected to the DSP 2 in the exact same manner that the microcomputer 20 is connected to the DSP 2. A person of ordinary skill in the art would understand that FIG. 1 illustrates that the A/D converter 1 and D/A converter 22 are integrated circuit chips that are connected to the DSP 2 using a *hardwired connection*, such as a trace on a circuit board. *Id.* at ¶ 37. The fact that the microcomputer 20, A/D converter 1, and D/A converter 22 are connected to the DSP 2 in the exact same manner (*i.e.*, a

hardwired connection) is further evidence that the connection between the microcomputer 20 and DSP 2 is a permanent connection and not a removable connection. *Id.*

During his cross examination, Petitioner's witness, Dr. Ellis, raised for the first time the argument that the connection between the microcomputer 20 and DSP 2 could have been removable when the system in Sudo was being researched in a development environment:

Q. What other type of connections are there that we should also be concerned with? And let me define the universe. Within what we're talking about with Sudo here.

MR. DAS: Objection, form.

THE WITNESS: You know, I'm thinking about this as a development environment. So I'm thinking about systems where you might want to change the connections between the chips. So you might have a wish to have them implemented in some mechanism whereby you could connect things together without having to go out and solder things.

BY MR. CRAIN:

Q. And that would have been the case in 1992?

A. They were not—you don't—yeah, you don't get out your soldering iron every time you want to change a circuit.

Q. What suggests to you the desire to change the circuit?

A. Because they're doing research on the structure of this—of this system.

Q. Where do you see that?

A. Well, because it's a patent about—an idea about the structure of the system.

Q. But what makes you think there is a desire in the Sudo patent to change what's represented in the Sudo patent?

A. Well, because that's what they're talking about. They're talking about how they've come up with this new idea to how to arrange one of these, which means like—well, they must have—they must be starting from something different.

Ex. 2002 (Ellis Dep. Tr.), p. 166, l. 15 – p. 167, l. 16. However, there is no mention in Sudo of the disclosed system being a development environment where research is being performed on the system. Ex. 2001 (Cordell Decl.), ¶ 28.

Dr. Ellis' "development environment" argument demonstrates how Dr. Ellis has stretched the meaning of "removable" so unreasonably far as to render it completely meaningless. Under such an unreasonably broad interpretation of the term "removably connectable," any circuit schematic discloses a removable connection because any circuit could be redesigned in a development environment. The limitation "removable" means nothing to Dr. Ellis, as he believes that being able to change the structure of a circuit in a development environment suggests that connections can potentially be removable. Failure to give the term "removably connectable" any boundary demonstrates Dr. Ellis' lack of credibility as an expert witness. In addition, the premise of Dr. Ellis' conclusion that Sudo could be

applied to a development environment is a fabricated scenario that is simply not supported by the reference. *Id.* at ¶ 28.

Porambo does not cure the defects of the Petition, nor does Petitioner rely on Porambo to address this claim element. Thus, Sudo and Porambo, alone and in combination, fail to disclose or render obvious this claim element.

B. Sudo and Porambo fail to render obvious “a storage device for storing the input programming information and previously selected control signals,” as recited in claim 11

The subject matter of claim 11 is directed towards the capabilities of the external programmer, and more specifically, a storage device of the external programmer. Claim 11 adds the limitation that “previously selected control signals” are *stored in the external programmer*.

The specification of the '544 Patent provides context for this claim limitation, as presented below:

The microprocessor in the portable programmer is capable of receiving the previously set parameters of the circuit elements and transfers these parameter values to the display screen to enable a portable programmer operator to decide if a given parameter value should be changed. The keypad can be used to scroll through the parameter values for each of the circuit elements so that each of the parameters for the circuit elements is displayed on the display screen. Because the portable amplifier programmer can read a parameter for

each of the circuit elements, the programmer can prompt a portable programmer user to accept or change a parameter for each of the plurality of signal processing circuit elements.

Ex. 1001 (the '544 Patent), 4:22-34. Thus, one purpose of storing “previously selected control signals” is to allow a user to see the parameter values that have been previously selected for the signal processing functions implemented by the digital signal processor. *Id.*

Relying on its witness, Dr. Ellis, Petitioner alleges that this claim element is rendered obvious by Sudo. Paper 6 (the Petition), pp. 44-45. Dr. Ellis reasons, without any supporting evidence, that because ROM and RAM are included in Sudo’s microcomputer, it would have been obvious “to keep track of the last sound field selected by the user in order to determine if the desired sound field was switched and the external programmer should download a new program and parameters to the DSP.” Ex. 1003 (Ellis Decl.), p. 19.

Without any facts in the record to support its contention, Petitioner relies solely on the speculation of Dr. Ellis. Because Dr. Ellis provides an opinion without relying on any facts, his speculation should be entitled to little or no weight. 37 C.F.R. § 42.65(a) (“Expert testimony that does not disclose the underlying facts or data on which the opinion is based is entitled to little or no weight.”).

In his obviousness analysis, Dr. Ellis does not cite to any prior art system where a programmer receives control signals that had been previously selected, as is required by the claim. For example, there is no disclosure in Sudo indicating that Sudo's microcomputer 20 stores both the programming input of the current sound field *and* previously selected control signals of a previously selected sound field. Ex. 2001 (Cordell Decl.), ¶ 116. In fact, Dr. Ellis's obviousness analysis improperly focuses on switching sound fields *in the DSP*, rather than storing previously selected control signals in the programmer. Petition (Paper 3), p. 44 (asserting that Sudo updates "the DSP settings when a desired sound field is switched" in rewritable RAM of the DSP).

Additionally, Petitioner fails to provide any articulated reasoning as to *why* it would allegedly be desirable to keep track of the last sound field selected by the user in order to determine if the desired sound field was switched and the external programmer should download a new program and parameters to the DSP." Ex. 1003 (Ellis Decl.), p. 19. In Sudo, when a user wants to change sound fields, the user presses a key on the keyboard 21, and the microcomputer 20 transfers corresponding data to the DSP 2. Ex. 2001 (Cordell Decl.), ¶¶ 33, 115. Sudo is not concerned with tracking the sound fields selected by a user *in the programmer*, nor does Petitioner explain why it would be desirable to do so. *Id.* at ¶ 116.

Petitioner's conclusion is a bare assertion that is not based on the cited references or any facts in the record.

Additionally, Sudo does not show or suggest the ability of the microcomputer 20 to *receive* any information from the DSP 2. Ex. 2001 (Cordell Decl.), ¶ 116. There is no mention in Sudo of the DSP 2 sending any data to the microcomputer 20. *Id.* Although Sudo teaches the DSP 2 performing *read* cycle steal operations, the DSP 2 does not *write* to the microcomputer 20. *Id.*

Moreover, Petitioner fails to explain how Sudo could be modified to allow the DSP 2 to send data to the microcomputer 20, particularly when the DSP 2 is designed to implement a three cycle pipeline architecture consisting of an instruction fetch cycle, an instruction decode cycle, and an instruction execute cycle. Ex. 1005 (Sudo), 1:42-52. In other words, Petitioner fails to articulate a sufficient reasoning as to how a PHOSITA would modify Sudo's three cycle architecture so that the DSP could send data to the microcomputer 20 and how the microcomputer could read and store the received data, while still being able to process audio without interrupting the production of the audio signal. Such a modification would likely negatively impact Sudo's implementation of a read cycle steal. Ex. 2001 (Cordell Decl.), ¶ 116. Thus, there is no reason in the record that provides a sufficient rationale as to why a PHOSITA would modify Sudo in the manner suggested by Dr. Ellis.

Therefore, Sudo fails to disclose or render obvious “a storage device for storing the input programming information and previously selected control signals.” Porambo does not cure the defects of the Petition, nor does Petitioner rely on Porambo to address this claim element. Thus, Sudo and Porambo, alone and in combination, fail to disclose or render obvious this claim element.

C. Sudo and Porambo fail to render obvious “a microprocessor for receiving programming information from at least one of the input device and a control circuit of the amplifier,” as recited in claim 13

Claim 13, which depends on claim 9, adds the limitations that the controller of the external programmer receives programming information from the input device *and from a control circuit of the amplifier*. Petitioner alleges that Sudo discloses an external programmer with a CPU that receives programming information from an input device (keys on a keyboard).” Paper 6 (the Petition), p. 47. However, Petitioner does not explain how Sudo or Porambo discloses “a microprocessor for receiving programming information from . . . a control circuit of the amplifier.” In fact, the Petition *fails to even allege* that this claim element is disclosed in the prior art. *See id.*

As discussed in § VII.B above, the microcomputer 20 in Sudo does not receive any information from the DSP 2. Ex. 2001 (Cordell Decl.), ¶ 116. Additionally, Petitioner has failed to provide a sufficient reason to modify the three

cycle DSP pipeline architecture of Sudo to send information to the microcomputer. Thus, Sudo and Porambo, alone and in combination, fail to disclose or render obvious this claim element.

D. Claims 2-6, 9-10, 12, 15, and 19 are patentable as depending from another patentable claim

Claims 2-6, 9-10, 12, 15, and 19 depend from claim 1, which is patentable over the cited references for at least the reasons discussed above. As such, claims 2-6, 9-10, 12, 15, and 19 are patentable as depending from another patentable claim. *See In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988).

VIII. SUDO AND KROKSTAD FAIL TO RENDER OBVIOUS INDEPENDENT CLAIM 1 AND DEPENDENT CLAIMS 2-6, 9-13, 15, 19, 21, AND 25 (GROUND 2)

Under ground 2, Petitioner alleges that claims 1-6, 9-13, 15, 19, 21, and 25 are unpatentable under 35 U.S.C. § 103 over Sudo and Krokstad. Paper 16 (Institution Decision), p. 19. However, these claims are patentable for at least the following reasons.

A. Sudo and Krokstad fail to render obvious “the external programmer being removably connectable to the programming signal input port,” as recited in claim 1

Petitioner alleges:

A person of ordinary skill in the art would have been motivated to program the DSP of Sudo with a programmer that is connected via a removable connection such as the RS232 port shown in Krokstad, in order to allow the programmer to be easily connected to or disconnected from the DSP or to allow a general purpose computer that could be used for other tasks to be used in programming the DSP.

Paper 6 (the Petition), p. 25. In other words, Petitioner argues that it would have been obvious to replace the permanent connection between the interface 19 and microcomputer 20 in Sudo with the RS232 connection that is described in Krokstad. However, for the reasons set forth below, such a combination would not have been obvious to a PHOSITA.

Petitioner's conclusion stems from an analysis that ignores the numerous technical hurdles that would prevent the connection between the DSP and microcomputer in Sudo being modified to include the RS232 interface of Krokstad. First, a PHOSITA would not make the proposed combination because of data speed constraints that are imposed by Sudo. Ex. 2001 (Cordell Decl.), ¶ 54, 92. Sudo discloses that the interface 19 connects to the internal main bus 17 in the DSP 2. Ex. 1005 (Sudo), 3:51-53. A PHOSITA would understand that the internal main bus 17 operates at a high speed and is a "wide" bus comprising numerous communication lines. Ex. 2001 (Cordell Decl.), ¶ 92. Additionally, Petitioner's own witness, Dr. Ellis, acknowledged during his cross examination that the

connection between the DSP 2 and the microcomputer 20 must be a high-speed parallel connection. Ex. 2002 (Ellis Dep. Tr.), p. 179 line 11 – p. 180, line 8).

During his cross examination, Petitioner's witness, Dr. Ellis, explained that at the time of invention of the '544 Patent, serial connections were too slow to accommodate the requirements of Sudo's high speed parallel bus:

Q. Are there any other serial-type connections that we haven't talked about, that this could be?

A. *At this point in technology, serial connections were not fast enough for this.*

Ex. 2002 (Ellis Dep. Tr.), p. 180, ll. 14-17. Thus, at the time of invention of the '544 Patent, only high-speed parallel connections would be suitable for the connection between the DSP 2 and the microcomputer 20 in Sudo, and serial connections would be unsuitable for this purpose. *Id.*, see also, Ex. 2001 (Cordell Decl.), ¶¶ 92-93.

The RS232 interface relied upon by Petitioner is a *slow serial connection*. *Id.* at ¶ 54. Because only high-speed parallel connections would be suitable between the DSP 2 and the microcomputer 20, the slow serial RS232 interface in Krokstad would not be suitable for this purpose. *Id.* at ¶¶ 92-93.

In fact, Petitioner's own witness, Dr. Ellis, explained during his cross examination that the RS232 interface of Krokstad would not be suitable for use in Sudo:

Q. So RS-232 wouldn't be --

A. ***RS-232 would not be suitable.***

Q. Why?

A. ***Too slow.***

Q. Too slow for what?

A. Too slow for the detail of the way that the data transfers occur in this invention.

Q. So to be clear, according to your understanding of Sudo, you do not believe that the connection between Microcomputer 20 and Interface 19 could be an RS-232 connection.

A. ***Yes.***

Q. And it couldn't be a USB connection, because that hadn't been developed yet.

A. That's right. Yeah.

Ex. 2002 (Ellis Dep. Tr.), p. 180, l. 24- p. 181, l. 13 (*emphasis added*). Thus, according to the statements of Petitioner's own witness, it would not have been obvious to modify Sudo to incorporate the RS232 interface of Krokstad as alleged by Petitioner. *See In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (holding that a modification to a reference is not obvious when the resulting modification renders the reference unsuitable for its intended purpose). For at least these reasons, Sudo and Krokstad, alone and in combination, fail to disclose or render obvious this claim element.

B. Sudo and Krokstad fail to render obvious “a storage device for storing the input programming information and previously selected control signals,” as recited in claim 11

To challenge claim 11 under ground 2, Petitioner relies on the same arguments it presented with respect to its challenge of claim 11 under ground 1. As such, claim 11 is patentable over the cited references for the same reasons discussed in § VII.B above.

C. Sudo and Krokstad fail to render obvious “a microprocessor for receiving programming information from at least one of the input device and a control circuit of the amplifier,” as recited in claim 13

To challenge claim 13 under ground 2, Petitioner relies on the same arguments it presented with respect to its challenge to claim 13 under ground 1. As such, claim 13 is Patentable over the cited references for the same reasons discussed in § VII.C above.

D. Sudo and Krokstad fail to render obvious “wherein said digital signal processor receives and stores a combination of at least two signal processing functions,” as recited in claim 21

Claim 21 adds the limitation that the digital signal processor receives and stores *a combination of at least two signal processing functions.*” Petitioner alleges:

Krokstad discloses a DSP in an amplifier that is programmed to provide at least three signal processing functions including compression, equalization and pre-compensation. Ex. 1007 page 20, lines 1-2.

A person of ordinary skill in the art would have considered programming a DSP in an amplifier to perform at least two signal processing functions to have been obvious in view of Krokstad as a way to achieve more than one desired audio effect with a single digital signal processor without having to provide additional circuitry.

Paper 6 (the Petition), p. 54. Thus, Petitioner contends that merely programming a DSP with two separate signal processing functions satisfies this claim element. However, Petitioner's argument fails to consider the term "a combination" in the claim element "a combination of at least two signal processing functions," indicating that Petitioner has at least misunderstood this claim. Petitioner's conclusion of obviousness is insufficient for the reason that Petitioner has failed to consider all words of the claim. *In re Wilson*, 57 C.C.P.A. 1029, 1032 (C.C.P.A. 1970) ("All words in a claim must be considered in judging the patentability of that claim against the prior art.").

The '544 Patent incorporates by reference U.S. Patent Application No. 08/546,839, which later issued as U.S. Patent No. 5,652,542 (hereinafter "the '542 Patent"). Ex. 1001 (the '544 Patent), 3:11-12. The '542 Patent states "it is often necessary or desirable to change the signal processing function *or even combine*

several different signal processing functions in the signal processing circuit.

This is not possible with conventional amplifiers.” Ex. 2004, (the ’542 Patent), 2:62-65 (*emphasis added*). This description makes it clear that the claim element as issue requires at least two functions being *combined*. Ex. 2001 (Cordell Decl.), ¶ 125. Krokstad discloses merely that there are different types of separate functions. *Id.* at ¶ 126. A combination of two functions is not the same as two separate functions. *Id.* Thus, Sudo and Krokstad, alone and in combination, fail to disclose or render obvious “wherein said digital signal processor receives and stores a combination of at least two signal processing functions.”

E. Claims 2-6, 9-10, 12, 15, 19, and 25 are patentable as depending from another patentable claim

Claims 2-6, 9-10, 12, 15, 19, and 25 depend from claim 1, which is patentable over the cited references for at least the reasons discussed above. As such, claims 2-6, 9-10, 12, 15, 19, and 25 are patentable as depending from another patentable claim. *See In re Fine*, 837 F.2d at 1076.

IX. SUDO, PORAMBO, AND THE SPECIFICATION OF THE ’544 PATENT FAIL TO RENDER OBVIOUS DEPENDENT CLAIMS 7, 20, 21, 23, 24, AND 26 (GROUND 3).

Under ground 3, Petitioner alleges that claims 7, 20-21, 23-24, and 26 are unpatentable under 35 U.S.C. § 103 over Sudo, Porambo, and the specification of

the '544 Patent.⁴ Paper 16 (Institution Decision), p. 19. However, these claims are patentable for at least the following reasons.

A. Sudo, Porambo, and the specification of the '544 Patent fail to render obvious “a control panel, wherein said programming signal input port is provided on the control panel,” as recited in claim 7

Claim 7 adds the limitation that the programming signal input port is provided on a control panel. As discussed in § VI.C above, a control panel is a physical interface having controls to control the amplifier. One benefit of having a programming signal input port provided on the control panel is that it allows a user the option of controlling the amplifier using control knobs on the control panel or by programming the amplifier using the external programmer. *See* Ex. 1001 (the '544 Patent), FIG. 1.

⁴ The Institution Decision (Paper 16) has adopted Petitioner's phrase "admitted prior art ('APA')” for various statements made in the '544 Patent. In view of the discussion below, Patent Owner believes that this phrase is misleading. Accordingly, Patent Owner will use the phrase “the specification of the '544 Patent,” as it is more accurate.

Recognizing that the cited references fail to show or suggest this element, Petitioner relies on the conclusions of its witness, Dr. Ellis, who believes that a PHOSITA would have “considered the placement of a programming signal input port on a control panel that included other knobs, etc., for the amplifier to be an obvious way to conveniently group the inputs to the amplifier.” Paper 6 (the Petition), pp. 37-38. However, Dr. Ellis’ opinion is insufficient to sustain a conclusion of obviousness, as it fails to provide any articulated reasoning as to how or why Petitioner’s proposed combination of the cited references could be combined or modified to satisfy the claim limitation. *See KSR Int’l*, 550 U.S. at 418. In other words, Petitioner has failed to explain or even allege how its proposed combination of Sudo and Porambo in view of its arguments for claim 1 could be further modified to include a control panel having a “programming signal input port.” For at least this reason, Petitioner’s challenge to claim 7 is insufficient to sustain a conclusion of obviousness.

Petitioner alleges that the interface 19 in Sudo is a programming signal input port. Paper 6 (the Petition), p. 26. It would not have been obvious to modify the proposed combination of Sudo and Porambo so that the interface 19 would be located on a control panel. Ex. 2001 (Cordell Decl.), ¶ 96. In Sudo, a user controls the system by selecting keys on the keyboard 21. Ex. 1005 (Sudo), 3:61-63. As such, if anything in Sudo were considered to be a control panel, it would be the

keyboard 21. Ex. 2001 (Cordell Decl.), ¶ 96. Nonetheless, it would not be obvious to modify Sudo to put the interface 19 on the keyboard 21, as the system would not be able to function if modified in this way. *Id.* Additionally, there is no valid reason to put a control panel between the microcomputer 20 and the interface 19 in Sudo. *Id.* Thus, it would not have been obvious to modify Sudo to provide a programming signal input port on a control panel.

Therefore, Petitioner has failed to provide an articulated reasoning to sustain its conclusion of obvious. Additionally, Sudo, Porambo, and the specification of the '544 Patent, alone and in combination, fail to disclose or render obvious this claim element.

B. Sudo, Porambo, and the specification of the '544 Patent fail to render obvious “said digital signal processor receives and stores a combination of at least two signal processing functions,” as recited in claim 21

Claim 21 adds the limitation that the digital signal processor receives and stores *a combination of at least two signal processing functions.*” Petitioner alleges:

[T]he Patent Owner’s APA discloses that many different signal processing functions were provided with signal processors (mixing, compression, equalizing, cross-over, etc.). Ex. 1001 1:30-36. In addition, it was well known that a DSP can be programmed to provide signal processing functions formally performed with hardware.

A person of ordinary skill in the art would have considered programming a DSP in an amplifier to perform at least two signal processing functions to have been obvious in view of the APA as a way to achieve more than one desired audio effect with a single digital signal processor without having to provide additional circuitry.

Paper 06 (the Petition), p.53. Again, Petitioner fails to consider the term “a combination” in the claim element “a combination of at least two signal processing functions,” indicating that Petitioner has at least misunderstood this claim. Accordingly, Petitioner’s conclusion of obviousness is insufficient for the reason that Petitioner has failed to consider all words of the claim. *In re Wilson*, 57 C.C.P.A. at 1032 (“All words in a claim must be considered in judging the patentability of that claim against the prior art.”).

The cited portions of the specification of the ’544 Patent state:

The various elements of the signal processing circuit define a plurality of sound processing parameters such as a frequency and an amplitude of a cross-over function, relative levels and routing in a mixer, response times, ratios and thresholds in a compressor and frequency, gain and bandwidth in an equalizer.

Even assuming *arguendo* that this statement means that it would be obvious to provide a DSP with multiple separate signal processing functions (which it does not), multiple separate functions is not the same as “a combination of at least two signal processing functions.” Ex. 2001 (Cordell Decl.), ¶ 127. For at least these

reasons Sudo, Porambo, and the specification of the '544 Patent, alone and in combination, fail to disclose or render obvious this claim element.

C. Claims 20, 23-24, and 26 are patentable as depending from another patentable claim

Claims 20, 23-24, and 26 depend from claim 1, which is patentable over the cited references for at least the reasons discussed above. As such, claims 20, 23-24, and 26 are patentable as depending from another patentable claim. *See In re Fine*, 837 F.2d at 1076.

X. SUDO, KROKSTAD, AND THE SPECIFICATION OF THE '544 PATENT FAIL TO RENDER OBVIOUS DEPENDENT CLAIMS 7, 24, AND 26 (GROUND 4).

Under ground 4, Petitioner alleges that claims 7, 24, and 26 are unpatentable under 35 U.S.C. § 103 over Sudo, Krokstad, and the specification of the '544 Patent. Paper 16 (Institution Decision), p. 19. However, these claims are patentable for at least the following reasons.

A. Sudo, Porambo, and the specification of the '544 Patent fail to render obvious “a control panel, wherein said programming signal input port is provided on the control panel,” as recited in claim 7

To challenge claim 7 under ground 4, Petitioner relies on the same arguments it presented with respect to its challenge of claim 7 under ground 3. Paper 6 (the Petition), p. 38. As such, claim 7 is patentable over the cited references for the same reasons discussed in § IX.A above.

B. Claims 24 and 26 are patentable as depending from another patentable claim

Claims 24 and 26 depend from claim 1, which is patentable over the cited references for at least the reasons discussed above. As such, claims 24 and 26 are patentable as depending from another patentable claim. *See In re Fine*, 837 F.2d at 1076.

XI. SUDO, PORAMBO, AND TMS320 FAIL TO RENDER OBVIOUS DEPENDENT CLAIM 8 (GROUND 5).

Under ground 5, Petitioner alleges that claim 8 is unpatentable under 35 U.S.C. § 103 over Sudo, Porambo, and TMS320. Paper 16 (Institution Decision), p. 19. However, this claim is patentable for at least the following reasons.

Claim 8 adds the limitation that “a set of performance characteristics” is stored in nonvolatile memory. As discussed in § VI.D above, “a set of performance

characteristics” is any variable data relating to the behavior of the signal processing circuit, including signal processing functions and/or signal processing function parameters. Ex. 2001 (Cordell Decl.), ¶ 82. The use of nonvolatile memory in the signal processing circuit allows the amplifier to retain its programmed information after power has been removed from the amplifier. *Id.* at ¶ 60.

A PHOSITA would understand that the non-volatility requirement of claim 8 would require the nonvolatile memory to be *electronically re-writable in the signal processing circuit* in order to be capable of storing new performance characteristics as the variable performance characteristics are updated. *Id.* at ¶¶ 26, 105. Because performance characteristics are variable, read only memory is not suitable for storing a set performance characteristics. *Id.* at ¶ 64.

Petitioner first states that Sudo discloses “program counters, command registers, buffers, multiplier, I/O interface, etc.” Paper 6 (the Petition), p. 40. However, Petitioner does not establish or even allege that any of these components are non-volatile such that they retain its programmed information after power has been removed. To fill in this gap, Petitioner proposes to modify Sudo to include the nonvolatile memory of the TMS320. However, as discussed below, the TMS320 has no nonvolatile memory that is capable of being reprogrammed to store performance characteristics or any other variable data.

The TMS320 discloses DSP models that include read only memory (ROM) or erasable programmable ROM (EPROM) for nonvolatile storage. *Id.* at ¶ 59. The ROM is most likely preconfigured at a factory where the ROM was fabricated, and then shipped to another factory where the amplifier would be assembled. *Id.* at ¶ 64. It is well understood that, at the time of invention, ROM could not receive or store additional information after its one-time programming at the factory. *Id.* at ¶¶ 59, 108. In other words, the ROM of the TMS320 is incapable of being programmed/written as part of a programmable amplifier system. *Id.* at ¶¶ 59, 108. Therefore, the ROM in TMS320 does not show or suggest storing a set of performance characteristics because, as the name indicates, this memory is read-only. *Id.* at ¶¶ 59, 108.

EPROM is also not suitable for the nonvolatile storage of performance characteristics because it cannot be electronically be re-written when installed in an amplifier. *Id.* at ¶¶ 58-60, 106. Before EPROM can be reprogrammed, the EPROM must be erased in a specialized programming fixture by being exposed to ultraviolet light. *Id.* In fact, TMS320 discourages end users from unintentionally erasing the memory when in use: “Note that normal ambient light contains the correct wavelength for erasure. Therefore, when using the TMS320E25, the window should be covered with an opaque label.” Ex. 1008 (TMS320), p. 60. Because the EPROM could not be erased without being removed from the

amplifier and then exposed to ultraviolet light in a specialized fixture, the EPROM version of the TMS320 does not show or suggest storing a set of performance characteristics either. Ex. 2001 (Cordell Decl.), ¶ 108

In fact, Petitioner's witness, Dr. Ellis, agreed that neither the ROM nor the EPROM of the TMS320 DSP could receive and store variable data:

Q. Would you expect me to find variable data in the Program ROM/EPROM block?

A. No.

Q. Why not?

A. The definition I'm using for variable data is data that constitutes a variable in the program. That means that's something whose value changes during the operation of the program. You would not be able to change the value of something stored in the ROM during the operation of the program.

Q. What about if it was an EPROM?

A. In this case, the EPROM -- erasing and reprogramming the EPROM is a lengthy process. It requires several minutes say at least. So that's totally outside the scope of the program.

Q. Because a person actually has to shine a UV light on it?

A. We have to somehow cause UV light to be shown on it.

Ex. 2002 (Ellis Dep. Tr., p. 80, ll. 9-17. Thus, Petitioner's own witness recognizes that the proposed combination would not be suitable. For at least these reasons, the cited references, alone or in combination, fail to disclose or render obvious this claim element.

XII. SUDO, KROKSTAD, AND TMS320 FAIL TO RENDER OBVIOUS DEPENDENT CLAIM 8 (GROUND 6).

Under ground 6, Petitioner alleges that claim 8 is unpatentable under 35 U.S.C. § 103 over Sudo, Krokstad, and TMS320. However, these claims are patentable for at least the following reasons.

To challenge claim 8 under ground 6, Petitioner relies on the same arguments it presented with respect to its challenge of claim 8 under ground 5. As such, claim 8 is patentable over Sudo and TMS320 for the same reasons discussed in § XI above. Additionally, as depicted in FIGS. 4a-c, Krokstad discloses random access memory (RAM). Ex. 1007 (Krokstad), FIGS. 4a-c. A PHOSITA would understand that RAM is volatile. Ex. 2002 (Ellis Dep. Tr.), p. 69, ll 15-25; Ex. 2001 (Cordell Decl.), ¶ 65. Thus, the cited references, alone and in combination, fail to disclose or render obvious “a non-volatile storage means for storing a set of performance characteristics,” as recited in claim 8.

XIII. SUDO, PORAMBO AND KROKSTAD FAIL TO RENDER OBVIOUS DEPENDENT CLAIMS 14 AND 18 (GROUND 7).

Under ground 7, Petitioner alleges that claims 14 and 18 are unpatentable under 35 U.S.C. § 103 over Sudo, Krokstad, and Porambo. Claims 14 and 18 depend from claim 1, which is patentable over the cited references for at least the reasons discussed above. As such, Claims 14 and 18 are patentable over the cited

references as depending from another patentable claim. *See In re Fine*, 837 F.2d at 1076.

XIV. CONCLUSION

For at least the reasons discussed above, Petitioner has failed to prove by a preponderance of the evidence that claims 1-15, 18-21, and 23-26 of the '544 Patent are unpatentable under the grounds of unpatentability on which the *inter partes* review was initiated. Therefore, Patent Owner respectfully requests that the Board issue a final written decision confirming the patentability of claims 1-15, 18-21, and 23-26 of the '544 Patent.

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Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing SUBSTITUTE PATENT OWNER OPPOSITION TO PETITION was served on counsel of record on August 4, 2014, and that this document was filed through the Patent Review Processing System and served electronically via email.

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