IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

PRINCETON DIGITAL IMAGE CORPORATION, Plaintiff, v. KONAMI DIGITAL ENTERTAINMENT INC., HARMONIX MUSIC SYSTEMS, INC. and ELECTRONIC ARTS, INC., Defendants.	)	Civil Action No. 12-1461-LPS-CJB
PRINCETON DIGITAL IMAGE CORPORATION, Plaintiff, v. UBISOFT ENTERTAINMENT SA and UBISOFT, INC., Defendants.	)	Civil Action No. 13-335-LPS-CJB

REPORT AND RECOMMENDATION

In these two related actions (referred to herein as the "*Harmonix* Action" and the "*Ubisoft* Action," respectively) filed by Plaintiff Princeton Digital Image Corporation ("Plaintiff" or "PDIC") against Defendants Konami Digital Entertainment Inc. ("Konami US"), Harmonix Music Systems, Inc. ("Harmonix"), Electronic Arts, Inc. ("EA"), Ubisoft Entertainment SA ("Ubisoft SA") and Ubisoft Inc. ("Ubisoft Inc." and together with Ubisoft SA, "Ubisoft"), PDIC alleges that each of the Defendants ("Defendants") directly and indirectly infringe United States

Patent No. 5,513,129 (the "'129 patent").[1] Presently before the Court is the matter of claim construction. The Court recommends that the District Court adopt the constructions set out below for the five terms discussed in this Report and Recommendation.[2]

I. BACKGROUND

The Court incorporates by reference herein the factual and procedural background about these cases and the patent-in-suit that was set out in the Court's December 2, 2016 Report and Recommendation regarding claim construction. (D.I. 183 at 2-8)

II. STANDARD OF REVIEW

A. General Claim Construction Principles and Legal Principles Regarding Definiteness

The Court also incorporates by reference herein the discussion of general principles of claim construction, as well as the legal standard relating to the definiteness requirement, which were set out in its December 2, 2016 Report and Recommendation. (*Id.* at 8-10, 22-24)

B. Principles for Construction of Means-Plus-Function Limitations

35 U.S.C. § 112, ¶ 6 ("Section 112, paragraph 6")[3] provided as follows:

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[1] For simplicity's sake, the Court will refer herein to the "D.I." number in the earlier-filed *Harmonix* Action, unless otherwise indicated.

[2] The parties set out a total of seven terms for the Court to construe at the most recent *Markman* hearing in this case. (*See* D.I. 164 at 1) The first two terms were the "virtual reality"-related claim terms, while the remaining terms involve or are related to means-plus-function limitations. On December 2, 2016, the Court issued a Report and Recommendation regarding claim construction for the two "virtual reality" terms. (*Harmonix* Action, D.I. 183; *Ubisoft* Action, D.I. 123) This Report and Recommendation addresses the remaining terms.

[3] The Court here refers to the version of Section 112 as it existed prior to the passage of the Leahy-Smith America Invents Act ("AIA"). Although the structure of Section 112 changed after the AIA's passage, those changes are applicable only to any patent application filed on or after September 16, 2012. *See Alcon Research Ltd. v. Barr Labs., Inc.*, 745 F.3d 1180,

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The "means-plus-function" technique of claim drafting is a "convenience" that allows a patentee to express a claim limitation in functional terms "without requiring the patentee to recite in the claims all possible structures" that could perform that function. *Med. Instrumentation & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1211 (Fed. Cir. 2003) (internal quotation marks and citation omitted). In exchange for getting the benefit of this drafting convenience, however, patentees must disclose, in the written description of the patent, a corresponding structure for performing the claimed function. *Noah Sys, Inc. v. Intuit Inc.*, 675 F.3d 1302, 1318 (Fed. Cir. 2012); *see also Elekta*, 344 F.3d at 1211 ("'[T]he price that must be paid for use of that convenience is limitation of the claim to the means specified in the written description and equivalents thereof.'") (citation omitted). A patentee satisfies this requirement "only if the specification or prosecution history *clearly links or associates* that structure to the function recited in the claim." *In re Aoyama*, 656 F.3d 1293, 1297 (Fed. Cir. 2011) (emphasis added) (quoting *Elekta*, 344 F.3d at 1210); *see also Elekta*, 344 F.3d at 1220 ("The public should not be required to guess as to the structure for which the patentee enjoys the right to exclude. The public instead is entitled to know precisely what kind of structure the patentee has selected for the claimed functions, when claims are written according to section 112, paragraph 6."). "If the specification does not contain an adequate disclosure of the structure that corresponds to the

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1183 n.1 (Fed. Cir. 2014). Because the application at issue here was filed before that date, the Court refers to the pre-AIA version of Section 112.

claimed function, the patentee will have failed to particularly point out and distinctly claim the invention as required by . . . section 112, [paragraph 2], which renders the claim invalid for indefiniteness." *Blackboard, Inc. v. Desire2Learn Inc.*, 574 F.3d 1371, 1382 (Fed. Cir. 2009) (internal quotation marks and citation omitted).[4]

Construing a means-plus-function limitation is a two-step process. The first step is determining the claimed function of the limitation. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1351 (Fed. Cir. 2015); *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). The second step is identifying the corresponding structure disclosed in the specification and equivalents thereof. *Williamson*, 792 F.3d at 1351; *Medtronic, Inc.*, 248 F.3d at 1311.

When a patentee claims a computer-implemented invention and invokes means-plus-function limitations, the United States Court of Appeals for the Federal Circuit has "consistently required that the structure disclosed in the specification be more than simply a general purpose computer or microprocessor." *Aristocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008). This requirement seeks to avoid "pure functional claiming[,]" *id.*, and mandates that the patent must disclose sufficient algorithmic structure[5] or some other description explaining how the computer performs the claimed function, *see id.* at 1332-37; *Blackboard, Inc*, 574 F.3d at 1383-85; *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1340

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[4] Section 112, paragraph 2 provides that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. § 112, ¶ 2.

[5] An algorithm is "'a step-by-step procedure for accomplishing a given result[.]'" *Alfred E. Mann Found. for Sci. Research v. Cochlear Corp.*, 841 F.3d 1334, 1342 (Fed. Cir. 2016) (citation omitted).

(Fed. Cir. 2008) (explaining that a patentee is permitted "to express that algorithm in any understandable terms including as a mathematical formula, in prose, [], or as a flow chart, or in any other manner that provides sufficient structure") (internal citation omitted). The Federal Circuit has identified a "narrow exception" to this requirement; no algorithm need be disclosed "when the function 'can be achieved by any general purpose computer without special programming.'" *Ergo Licensing, LLC v. CareFusion 303, Inc.*, 673 F.3d 1361, 1364-65 (Fed. Cir. 2012) (quoting *In re Katz Interactive Call Processing Patent Litig.*, 639 F.3d 1303, 1316 (Fed. Cir. 2011)). For example, "a general-purpose computer is sufficient structure if the function of a term such as 'means for processing' requires no more than merely 'processing,' which any general-purpose computer may do without special programming." *Id.* at 1365. The Federal Circuit has emphasized that "[i]t is only in the rare circumstances where any general-purpose computer without any special programming can perform the function that an algorithm need not be disclosed." *Id*; *see also Alfred E. Mann Found. for Sci. Research v. Cochlear Corp.*, 841 F.3d 1334, 1342 (Fed. Cir. 2016).

III. DISCUSSION

The Court takes up the remaining five disputed terms addressed herein in the order in which the parties addressed them at the most recent *Markman* hearing. The first four terms are means-plus-function terms; the fifth term is not.

A. "means for supplying a first signal selected from a group consisting of a control signal having music and/or control information generated in response to a music signal, a prerecorded control track having music and/or control information corresponding to the music signal, and a control signal having music and/or control information generated in response to the prerecorded control track"

The first term at issue, "means for supplying a first signal selected from a group consisting of a control signal having music and/or control information generated in response to a music signal, a prerecorded control track having music and/or control information corresponding to the music signal, and a control signal having music and/or control information generated in response to the prerecorded control track[,]" appears in claim 12, from which asserted claim 14 depends. The parties agree that this term (as well as the next three terms) should be construed as a means-plus-function term pursuant to Section 112, paragraph 6. (D.I. 121 at 10, 12, 15, 18; D.I. 130 at 10, 17, 20, 23) As to this term, the parties disagree about the scope of the claimed function, as well as the sufficiency of the structure disclosed in the specification.

1. Function

Taking up function first, Plaintiff's proposed function for this term is "supplying a first signal." (D.I. 121 at 9) Defendants' proposed function is "supplying a first signal selected from a group consisting of [1] a control signal having music and/or control information generated in response to a music signal, [2] a prerecorded control track having music and/or control information corresponding to the music signal, [3] and a control signal having music and/or control information generated in response to the prerecorded control track." (D.I. 130 at 10)[6] In identifying the claimed function, the Court "must construe the function of a means-plus-function limitation to include the limitations contained in the claim language, and only those limitations." *Cardiac Pacemakers, Inc. v. St. Jude Med., Inc.*, 296 F.3d 1106, 1113 (Fed. Cir. 2002). "It is improper to narrow the scope of the function beyond the claim language[,]" and "[i]t is equally

[6] When the Court refers below to "element 1," "element 2" and "element 3" of the term, it is referring to those elements delineated here by the numerals contained in brackets.

improper to broaden the scope of the claimed function by ignoring clear limitations in the claim language." *Id.*

Defendants first argue that the doctrine of issue preclusion (as well as the doctrine of judicial estoppel) ends the inquiry with respect to the proper function for this term. (D.I. 182 (hereinafter "2nd Tr.") at 142; D.I. 130 at 12; D.I. 163 at 4; D.I. 180 at 1) During prior *inter partes* review ("IPR") proceedings involving Plaintiff and Ubisoft SA ("the Ubisoft IPR proceeding" or "the Ubisoft IPR"), in which the '129 patent was at issue, PDIC did *not* argue that the function for this term is "supplying a first signal." Instead, it advocated for the very function that it now opposes. (*See* D.I. 118, Joint Claim Construction Chart ("JCCC"), ex. 4 at 212, 354, 396 & n.9;[7] 2nd Tr. at 137 (PDIC's counsel acknowledging that during the IPR proceeding, it "identified the full term as [the] function"); *id.* at 141) The United States Patent and Trademark Office's Patent Trial and Appeal Board (or "PTAB") agreed, construing the function of this term to encompass the full scope of the claim term (referencing the three separate elements), just as Defendants currently propose. (JCCC, ex. 4 at 396 & n.9)

PDIC's briefing did not respond to this argument. (*See* D.I. 121 at 9-11; D.I. 147 at 4-6) When confronted with this issue at the most recent *Markman* hearing, PDIC's counsel explained that it was now advocating for a different, broader function because "when we took over the case [from PDIC's former counsel], we look at the issues anew and we're proposing what we think is the right answer here[.]"[8] (2nd Tr. at 137)

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[7] Citations to the Exhibits of the JCCC will be to the page numbers generated by the ECF system.

[8] While PDIC repeatedly asserted with respect to other claim construction issues that "the basic principle is that the claim should be construed the same for invalidity and for

The Federal Circuit has recently explained that "administrative decisions by the [PTAB] can ground issue preclusion in district court when the ordinary elements of issue preclusion are met[.]" *SkyHawke Techs., LLC v. Deca Int'l Corp.*, 828 F.3d 1373, 1376 (Fed. Cir. 2016). Issue preclusion (often referred to as the doctrine of "collateral estoppel") applies when "(1) the identical issue was previously adjudicated; (2) the issue was actually litigated; (3) the previous determination was necessary to the decision; and (4) the party being precluded from relitigating the issue was fully represented in the prior action." *Fairchild Semiconductor Corp. v. Power Integrations, Inc.*, C.A. No. 12-540-LPS, 2015 WL 1905871, at *1 (D. Del. Apr. 23, 2015) (quoting *Jean Alexander Cosmetics, Inc. v. L'Oreal USA, Inc.*, 458 F.3d 244, 249 (3d Cir. 2006)).[9]

Here, the Court agrees with Defendants that issue preclusion applies. The first prong of the test is met, for example, because the PTAB previously adjudicated the issue as to what is the proper function of this term. PDIC argues to the contrary, asserting that issue preclusion is not implicated here because: (1) the PTAB could not decide indefiniteness, an issue that is relevant to the construction of the term; and (2) when the PTAB construed this term (to require the function now suggested by Defendants), it then went on only to consider elements 1 and 2 in

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infringement[,]" (2nd Tr. at 132; *see also id.* at 45; D.I. 147 at 3 n.9 (citing *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1351 (Fed. Cir. 2001) ("[T]he claims must be interpreted and given the same meaning for purposes of both validity and infringement analyses."))), it is not clear why it believes this principle is inapplicable to the issue of this term's proper function.

[9] The law of the regional circuit governs the general procedural question of whether issue preclusion applies. *Soverain Software LLC v. Victoria's Secret Direct Brand Mgmt., LLC*, 778 F.3d 1311, 1314 (Fed. Cir. 2015). When substantive patent law issues are implicated in the issue preclusion analysis, however, Federal Circuit law applies. *Id.*

determining whether the patent disclosed sufficient structure. (2nd Tr. at 138; *see also id.* at 153-54 (PDIC's counsel arguing that because the PTAB did not consider whether the specification identified a structure for element 3, "the issue was not fully litigated in the IPR proceeding")) These two points, however, relate to the identification of the corresponding *structure* for the term, which is a separate and distinct inquiry that is addressed *after* a court has determined what is the claimed *function*. *See, e.g.*, *Kemco Sales, Inc. v. Control Papers Co.*, 208 F.3d 1352, 1361 (Fed. Cir. 2000); *Microsoft Corp. v. Commonwealth Sci. & Indus. Research Org.*, 572 F. Supp. 2d 786, 802 (E.D. Tex. 2008) ("Courts evaluate corresponding structure only after construing the recited function."). And as Ubisoft's counsel points out, (2nd Tr. at 142), the function *was* construed in the prior proceeding, even though issues of indefiniteness/insufficient structure were not applicable in that proceeding.

The remaining prongs of the test for issue preclusion are also met. The PTAB adopted this function using the same standard of claim construction as is applicable here, (JCCC, ex. 4 at 392), and its Final Written Decision constituted a final and valid judgment (one that was not appealed by PDIC), (*see* 2nd Tr. at 143). The claim construction regarding the function for this term was essential to the judgment, as it was part and parcel of the PTAB's determination. (*See, e.g.*, JCCC, ex. 4 at 395-96 (stating that "[s]everal terms [including this one] relevant to this decision are means-plus-function claim terms")) Finally, PDIC was fully represented in the IPR proceeding.

For these reasons, the Court adopts Defendants' proposed function.

2. Structure

With the claimed function for this term now established to be "supplying a first signal

selected from a group consisting of [1] a control signal having music and/or control information generated in response to a music signal, [2] a prerecorded control track having music and/or control information corresponding to the music signal, [3] and a control signal having music and/or control information generated in response to the prerecorded control track[,]" the parties next dispute whether the patent discloses sufficient structure. Defendants assert, and Plaintiff does not dispute, that the patent must disclose an algorithm or other sufficient structure for *each* of the alternative claimed functions described above. (D.I. 130 at 14 & n.17 (citing *Noah Sys., Inc.*, 675 F.3d at 1318-19)) And the corresponding structures must disclose how the different types of signals are both generated and supplied. (*See* D.I. 130 at 14-17; D.I. 147 at 5-6) Defendants claim that the specification does not sufficiently disclose structure corresponding to Function [3]. (*See, e.g.*, 2nd Tr. at 134; D.I. 163 at 5-7)[10] Before turning to that issue, the Court will first briefly set out the parties' agreements with respect to the structures corresponding to Functions [1] and [2], as they are relevant to the dispute regarding Function [3].

As a general matter, the '129 patent explains that "music cannot directly interact with the

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[10] PDIC asserts that "the Defendants are estopped from asserting [that this term requires as corresponding structure specific algorithms for the three separate functions] based on their arguments to the contrary in the IPR proceedings[,]" citing to the PTAB's determination in the Ubisoft IPR Final Written Decision that the structure required for this term was "'a *source* of music and/or a control track'" and "'a *processor* programmed to generate control signals from the input music and/or control track and send the control signals to the VR processor.'" (D.I. 147 at 4 & n.11 (quoting JCCC, ex. 4 at 398) (emphasis in original)) The Court finds that the doctrine of issue preclusion/collateral estoppel does not constrain it here. For one thing, Konami, Harmonix and EA were not parties to the Ubisoft IPR proceeding, and therefore cannot even arguably be estopped. (D.I. 163 at 5 n.5 (citing *In re Trans Texas Holdings Corp.*, 498 F.3d 1290, 1297 (Fed. Cir. 2007)) Moreover, the parties now agree on the corresponding structure for Functions [1] and [2], and only dispute whether the specification discloses corresponding structure for Function [3], which was not at issue in the Ubisoft IPR proceeding. (JCCC, ex. 4 at 396; D.I. 163 at 5 n.5; 2nd Tr. at 148)

virtual environment"; accordingly, the Acoustic Etch component of the invention "receives music (in some electronic, acoustic, or optical form) and generates control signals therefrom which are used by a VR [virtual reality] system to influence activity in the virtual world." ('129 patent, col. 4:63-67) And as Defendants note, with respect to the generation of control signals, the specification discusses the three alternative functions as separate and distinct: "the music signal of Fig. 3 has been delayed . . . in order to accomplish processing initiated *in response to the control track* [i.e., Function 2—prerecorded] (or control signals *generated from the control track* [i.e., Function 3—generated from prerecorded control track], or control signals *generated from analyzed music*) [i.e., Function 1—real-time][.]" (D.I. 130 at 14 (quoting '129 patent, col. 9:48-55) (emphasis added))

The specification discloses that with respect to Function [1a], "supplying a . . . control signal having music . . . generated in response to a music signal", the control signals are "extracted from the music directly"—i.e., live or in real time. ('129 patent, col. 5:1-10; *see also id.*, col. 8:33-41 ("An analog-to-digital conversion circuit within Acoustic Etch unit **3** receives and digitizes a music signal from source **1**. . . . Analyzer **5** within Acoustic Etch unit **3** receives the digitized output of circuit **4**, and generates control signals by processing the music signal (or both the music signal and the control tracks).")) In the Ubisoft IPR proceeding, the PTAB's construction did not specify an algorithm, and simply associated the following structure with this function: "(1) a source of music and/or a control track, such as a four-track audio tape, video-game cartridge or compact disc (CD); and (2) a processor *programmed to generate control signals* from the input music and/or control track and send the control signals to the VR processor." (JCCC, ex. 4 at 398 (emphasis added)) As for the specific programming required for

directly extracting control signals from music, the specification explains that the music is analyzed for spectral components to determine the rhythm or beat of the music:

> In this case, means are provided (for example within processor **5** [of the Acoustic Etch unit]) for filtering the incoming music, so that processor **5** can analyze the music in terms of its spectral components. By examining the level of a particular frequency range processor **5** can make a determination as to the rhythm or beat of the music. The beat of the music is passed on to the VR system which can then perform operations such as displaying virtual hands clapping in time to the beat of the music.

('129 patent, col. 11:31-37; *see also id.* at 5:1-10 ("[T]he Acoustic Etch can employ a simple algorithm . . . to extract a rhythm signal indicative of the beat of some frequency band of the music . . . or of some other parameter of a frequency band of the music. The rhythm signal is sent to the VR system which in turn generates control signals . . . .")) Defendants therefore propose that the corresponding structure clearly linked to Function [1a] is recited at '129 patent, cols. 5:1-10 & 11:31-37, (D.I. 130 at 15; D.I. 163 at 5-6), and PDIC does not dispute this structure, (*see* D.I. 147 at 5).

With respect to Function [1b], "supplying . . . a control signal having . . . control information generated in response to a music signal," Defendants first argued that the specification did not clearly link a corresponding structure to this function, (D.I. 130 at 16), but then ultimately accepted PDIC's position that "the structure for Function 1(b) [is recited in the '129 patent, cols.] 10:66-11:1 and 11:17-43[,]" (D.I. 163 at 6). The recited "control information" could be, for example, "the rhythm or beat of the music" or the "overall level of the music," ('129 patent, col. 11:34-41), and the Acoustic Etch component of the invention "extracts control information from the input music[,]" (*id.*, cols. 10:66-11:1; *see also id.*, col. 11:21-23 (explaining

that the Acoustic Etch "takes in music and processor **5** processes it to produce control information" which is then "passed on to the VR computer")).

Function [2], "supplying . . . a prerecorded control track having music and/or control information corresponding to the music signal," is described in the patent as an "alternative (or in addition) to extracting signals from music itself[.]" (*Id.*, col. 5:11-16 ("the invention can supply to the VR system one or more prerecorded control tracks corresponding to the music")) The specification explains that these prerecorded control tracks can be "generated automatically (e.g., by electronic signal processing circuitry) in response to a music signal and then recorded, or can be generated in response to manually asserted commands from a person (while the person listens to such music signal) and then recorded." (*Id.*, col. 5:21-26) Defendants assert that "[t]he algorithm for performing this function is disclosed at [the '129 patent, cols.] 12:63-13:10, 13:60-14:22, and 16:43-17:12[,]" (D.I. 130 at 16), and PDIC does not disagree, (D.I. 147 at 4-6; D.I. 163 at 5-6).

The parties do dispute, however, whether the '129 patent discloses corresponding structure to perform Function [3]: "supplying . . . a control signal having music and/or control information generated in response to the prerecorded control track[.]" Generally, the patent explains with respect to this function that "the invention can . . . generate control signals from prerecorded control tracks and then supply such control signals to the VR system for processing." ('129 patent, col. 5:13-16; *see also id.*, col. 6:1-6 ("[A]n operator can record a control track which is emotionally linked with a song. The VR system could then easily convert the control track into a variety of control signals, and can produce more repeatable and interesting results than could be achieved by processing the music directly")) The patent notes that "the control track is

optionally prerecorded on the same medium as the music signal corresponding thereto [and] Acoustic Etch unit **3** can, in effect, extract the control track from the medium and pass it (or a control signal generated therefrom) to VR processor **7**." (*Id.*, col. 8:52-57) Defendants argue, citing in part to the declaration of their expert, Dr. Vijay K. Madisetti, that the specification contains *no* disclosure—"even at a high level"—describing *how* control signals are generated from a prerecorded control track, and that claim 14 is therefore indefinite. (D.I. 130 at 16; D.I. 163 at 6-7; D.I. 131 (hereinafter, "Madisetti Decl.") at ¶¶ 57-58)

For its part, PDIC explains that "[t]he only difference between [Function 3] and [F]unction [2] (generating and supplying a prerecorded control track having music and/or control information corresponding to the music signal) is the intermediate step of *generating a control signal* containing the music and/or control information from the prerecorded control track." (D.I. 147 at 6 (emphasis added)) PDIC asserts that the patent sufficiently describes how this step is accomplished, as the same structure that corresponds to Function [2] also "describes the intermediate step of playing back the control track to produce 'control signals' 200X and 200Y that include the data previously encoded in the control track." (*Id.* (citing '129 patent, cols. 12:65-66, 13:60-65)) The Court agrees with PDIC that the specification contains sufficient corresponding structure for Function [3].

The plain language of the functions reflects that "[t]he only difference [between Function [2] and Function [3]] is that for [Function 2] the music and control information is still in the prerecorded control track. And for [Function [3]], the music or control information has been generated from or extracted from the prerecorded control track." (2nd Tr. at 135) Function 3 is an alternative process from Functions 1 and 2, as noted above, one requiring an extra step from

that described in Function 2—"a control signal [. . .] generated" from the prerecorded control track. (*Id.* at 151; *see also id.* at 148 (Ubisoft's counsel noting that "Function 2 is prerecorded, Function 3 is generated in response to the prerecorded control track. So it's clearly something that happens on top of the prerecording.")) As for where the patent discloses the structure that performs this extra step, the specification explains that:

> Fig. **5** is a diagram of a system for creating an audio tape with control tracks, for use in the playback system shown in Fig. **6**. . . . Recorded cassette tape **180**T thus has two tracks containing audio signals . . . (which are typically music signals), and two other tracks containing control tracks corresponding to the audio signals. Fig. **6** represents the system used to play back and experience the [4-Track Audio and Virtual Control Track Tape] **180**T (which has control tracks). A four-track audio tape player **200** outputs four audio signals: left and right audio signals **200**R and **200**L, and control track signals **200**X and **200**Y consisting of data encoded as audio signals.

('129 patent, cols. 12:40-42, 13:55-67; *see also* D.I. 147 at 6; PDIC's Claim Construction Presentation, Slide 47; 2nd Tr. at 156) Then tape IF converters extract serial data streams from the control track signals, which are inputted to a microprocessor unit which processes the data and supplies it to the VR system. ('129 patent., cols. 13:65-14:7; *see also id.*, cols. 16:43-17:12 ("Fig. **6** describes the playback phase of the invention. . . . [The audio tape 180T (which has control tracks)] is loaded into a four-track tape playing unit . . . . This unit plays the tape and produces 4 audio signals, two of which are standard signals meant to be listened to, while the two others contain control track data that will be processed and sent to VR system **250**[.]")) In view of these disclosures, the Court does not agree with Defendants' position that the patent "doesn't disclose playing back a control track to produce . . . additional control signals[.]" (2nd Tr. at 151-52; *see also id.* (Ubisoft's counsel arguing that the specification "just says you can play back

something that has control tracks, not that you can play back a control track to produce something else or how you would do that")) Accordingly, the Court agrees with PDIC that the specification discloses corresponding structure linked to Function [3], which is recited at '129 patent, cols. 12:63-13:10, 13:60-14:22, 16:43-17:12, 20:10-34 & Figs. 1, 2, 4, 6.[11]

B. "means for receiving the first signal and influencing action within a virtual environment in response to said first signal" (claim 14) and "means for producing the virtual environment in response to said prerecorded control track" (claims 19, 20)

The parties' disputes with respect to these two terms are identical, (*see, e.g.*, D.I. 121 at 18; D.I. 130 at 23; 2nd Tr. at 158-59), and so the Court will take the terms up together.

The functions for these means-plus-function terms are not in dispute. With respect to the term "means for receiving the first signal and influencing action within a virtual environment in response to said first signal," (found in claim 12, from which asserted claim 14 depends), the parties agree that the function is "receiving the first signal and influencing action within a virtual environment in response to said first signal." (D.I. 121 at 11-12; D.I. 130 at 17) With respect to the term "means for producing the virtual environment in response to said prerecorded control track," (found in claim 16 from which asserted claims 19 and 20 depend), the parties agree that the function is "producing the virtual environment in response to said prerecorded control track." (D.I. 121 at 18; D.I. 130 at 23)[12]

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[11] While this is the same basic corresponding structure that supports Function [2], it is not disputed that one structure can perform multiple functions if the patent clearly links the structure to those functions. (2nd Tr. at 136, 152-53); *see also, e.g.*, *Medtronic, Inc.*, 248 F.3d at 1313; *StrikeForce Techs. Inc. v. PhoneFactor Inc.*, Civil Action No. 13-490-RGA, 2015 WL 5708577, at *2 (D. Del. Sept. 29, 2015).

[12] PDIC notes that the "only difference between these two terms is that in claims 19 and 20 the virtual environment must be produced in response to a prerecorded control track

With respect to the associated structures for these terms, the parties agree on a few overarching principles. First, the parties agree that claims 14, 19 and 20 "describe generating a virtual environment based on a signal or control track containing 'music and/or control information'" and that, therefore, in order to generate the virtual environment, the claimed functions utilize (1) music information; (2) control information; or (3) music information and control information. (D.I. 147 at 7; *see also* D.I. 163 at 8; 2nd Tr. at 160) Second, the parties agree that the specification discloses that the claimed functions are performed by "VR System 250" in Figure 6. (D.I. 121 at 12-13; D.I. 130 at 18; *see also* '129 patent, col. 17:13 ("The VR system receives three signals[.]"); *id.*, col. 18:9-10 ("The VR program then creates, destroys, moves or modifies the virtual environment, or virtual objects therein.")) And third, the parties agree that a microprocessor cannot perform the functions of "influencing action within a virtual environment" and "producing the virtual environment" without special-purpose programming, and that the corresponding structure must therefore include an algorithm for performing the claimed functions. (D.I. 121 at 13; D.I. 130 at 18; 2nd Tr. at 168)

The parties do not agree, however, on the content of that algorithm. The parties' competing proposals for the structures associated with these terms is set out in the chart below:

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rather than in response to one of the other potential sources of the first control signal recited in claim 14." (D.I. 121 at 18 n.35)

Term	PDIC's Construction	Defendants' Construction
"means for receiving the first signal and influencing action within a virtual environment in response to said first signal"	"a processor *programmed with software (such as a graphics library)* for receiving the first signal and influencing action within a virtual environment in response to said first signal by processing the signal to create, destroy, move, and/or modify the display of the virtual environment or virtual objects in the virtual environment, and optionally to generate and/or play music or sounds, and structural equivalents thereof"	"a processor programmed to [1] receive the first signal, [2] *perform spectral analysis of digitized music information* and [3] create, destroy, move or modify the virtual environment or virtual objects therein *upon detecting a certain threshold of energy at a specific frequency band of the music information*"
"means for producing the virtual environment in response to said prerecorded control track"	"a processor *programmed with software (such as a graphics library)* for producing the virtual environment in response to said prerecorded control track by processing music information and/or control information derived from the prerecorded control track to create, destroy, move, and/or modify the display of the virtual environment or virtual objects in the virtual environment, and optionally to generate and/or play music or sounds, and structural equivalents thereof"	"a processor programmed to [1] *perform spectral analysis of digitized music information* and [2] create, destroy, move or modify the virtual environment or virtual objects therein *upon detecting a certain threshold of energy at a specific frequency band of the music information*"

(D.I. 121 at 12, 18 (emphasis added); D.I. 130 at 17, 23 (emphasis added)) The crux of the parties' dispute is: (1) whether, as Defendants argue, the corresponding structures require the processor to be programmed to perform a spectral analysis of music information, and to influence action within the virtual environment upon detecting a certain threshold of energy at a specific frequency band of the music information, or (2) whether, as PDIC argues, software such as a graphics library is a sufficient recitation of the associated structure. (*See* D.I. 121 at 13-14; D.I. 147 at 6-7; 2nd Tr. at 159-60)

In support of their proposal, Defendants assert that the specification discloses only one

algorithm for performing the claimed function, (D.I. 130 at 18; D.I. 163 at 8), as reflected in the below portion of the specification:

> A model of object **300**A (which is shown at later times at positions **300**B, **300**C, and so on) is loaded into the VR program directly from the control track. After the VR program has loaded the model, the control track instructs the VR program to display the object upon detecting a certain threshold of energy at a specific frequency band of the music information. The VR program performs a spectral analysis of the digitized music information (e.g., digital data **246** in FIG. 6) and tests the specified frequency band for energy level. Upon detecting the threshold level, the VR program creates (displays) the object at a given X, Y, and Z location.

('129 patent, col. 18:57-67) PDIC concedes that performing spectral analysis is indeed disclosed in the specification as a means of producing the virtual environment generated from *music* information. (*See* D.I. 121 at 13-14; PDIC's Claim Construction Presentation, Slide 53) PDIC asserts, however, that Defendants' proposed algorithm is not *required* to perform the claimed function, because the virtual environment may be generated based on a signal or control track containing *control* information (instead of, or in addition to, *music* information). (D.I. 121 at 14; D.I. 147 at 7) According to PDIC, Defendants' proposed algorithm "is not relevant when the virtual environment is generated based on control information alone." (D.I. 147 at 7; *see also* PDIC's Claim Construction Presentation, Slide 53; 2nd Tr. at 160) That is, with the claims stating that the virtual environment may be generated based only on control information, PDIC contends that it would be incorrect to read in a limitation that *requires* a spectral analysis of digitized music information all of the time. (2nd Tr. at 162)[13] PDIC argues this is so because the patent

[13] PDIC also again argues that Defendants are barred from asserting their proposed construction because during the IPR proceedings, "they argued to the Board . . . that these terms should be construed in a manner that does not require spectral analysis or analyzing music

explains that: (1) control information can be produced by spectral analysis, and once this has been done once, it would be redundant to do it again as Defendants' proposal would require; and (2) in some instances, control information will not contain information relating to music. (*See, e.g.*, 2nd Tr. at 175)

Defendants counter by suggesting that there would be nothing inappropriate in requiring this limitation—asserting that there is not a "sharp distinction" between music and control information in this context. (D.I. 163 at 8) In other words, Defendants claim that the spectral analysis at issue *can in fact* be performed on control information, because: (1) "[t]he claims state that control information 'correspond[s] to a music signal'; and (2) "the specification teaches generating control information by processing music information." (*Id.* (citing '129 patent, col. 11:21-22); Defendants' Claim Construction Presentation, Slide 88) For two reasons, however, the Court is not persuaded.

The first reason has to do with the issue of redundancy. It is true that control information may be generated by processing music, as Defendants note. One way to actually generate control information is to analyze the music in terms of its spectral components. (2nd Tr. at 175; PDIC's Claim Construction Presentation, Slide 56) As the specification explains, the Acoustic Etch component:

> takes in music and processor **5** processes it *to produce control information.* The control information is then passed on to the VR computer which is actually rendering the virtual environment. . . .

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frequencies, and the Board adopted this construction." (D.I. 147 at 7 & n.15 (citing JCCC, ex. 4 at 400-01)) The Court does not agree that it is precluded from considering Defendants' argument here on estoppel grounds, because, at a minimum, three of the five Defendants here were not parties to the Ubisoft IPR (or related parties), and therefore cannot even arguably be estopped. (D.I. 163 at 7)

> One embodiment of the internal algorithms that can be implemented by processor **5** . . . of Acoustic Etch unit **3**" are those related to simple filtering and analysis. In this case, means are provided (for example, within processor **5**) for filtering the incoming music, so that processor **5** can analyze the music *in terms of its spectral components*. By examining the level of a particular frequency range processor **5** can make a determination as to the rhythm or beat of the music. . . . The overall level of the music could be used to determine how many pairs of clapping hands there are at any particular time. As the music rises and falls in overall level, the VR processor could create and destroy virtual objects.

('129 patent, col. 11:20-43 (emphasis added)) In earlier describing a preferred embodiment of the invention, the specification notes that the Acoustic Etch unit: (1) "receives and digitizes a music signal" from a music source; (2) a processor/analyzer in that component receives it and processes it (along with optional prerecorded control tracks that accompany the music signal); and then (3) outputs those control signals to the VR processor which generates the virtual environment. (*Id.*, col. 8:33-50) Alternatively, the music signal (or the control tracks, or both the music signal and control tracks) can be supplied directly to the VR processor to, *inter alia*, "control generation of the virtual environment in response to the control tracks or music[.]" (*Id.*, col. 8:45-51) In scenarios where spectral analysis is performed at that earlier step (when the music is processed by the Acoustic Etch unit to create control information that is then passed on to the VR processor), it would seem redundant to again perform spectral analysis on the control information a second time in order to influence action in the virtual environment. (2nd Tr. at 175; PDIC's Claim Construction Presentation, Slide 56; *see also, e.g.*, '129 patent, col. 11:49-56 ("Processing of a control track (or a control signal generated therefrom, rather than from a corresponding music signal) within the VR processor is more powerful *than analysis of music in the Acoustic Etch* followed by processing of the resulting control signal in the VR processor[.]") (emphasis

added))

Second, as PDIC notes, the patent talks exclusively of performing spectral analysis on music information, and it makes clear that control information does not always have to include information that is related to music. (2nd Tr. at 175-76; PDIC's Claim Construction Presentation at Slides 55-56) For instance, the specification notes in a list of "objects and advantages of various embodiments of the present invention" that one such object/advantage is "to provide a control track which can contain information (such as images of a performer's face, for example) other than information extracted from corresponding music." ('129 patent, cols. 6:41-42, 7:1-4; *see also, e.g.*, *id.*, col. 16:8-29 (noting that control information may be produced manually by a human operator and that such information "may take on many forms and can (in many applications) practically be generated only by a human operator"); *id.*, col. 17:57-59 ("The VR program initially reads the control track information, which may precede the music information on a prerecorded tape")) And this is PDIC's main point in arguing that Defendants' proposed structure would inappropriately narrow the claims—"if [the VR system receives] a signal that includes only control information and there's no music information to read, then you skip [the spectral analysis] step and you draw things from the virtual environment based only on the control information." (2nd Tr. at 161; *see also id.* at 175-76)

Accordingly, the Court concludes that while spectral analysis is a required step of the algorithm when the VR system receives music information that has not previously undergone spectral analysis, it is not required when the system receives control information that was generated from music information that has previously been subjected to spectral analysis, or when the system receives only control information and there is no music information that needs

to be analyzed.

That leaves the question of whether the specification discloses sufficient structure for the latter scenarios. The Court concludes that it does.

As to PDIC's own proposal for the corresponding structure for these terms, it points to the disclosure in the specification stating that, in a preferred embodiment, the VR system "comprises a Silicon Graphics Crimson computer outfitted with Reality Engine graphics, a serial port card, and the GL software library and the Fakespace, Inc. VLIB Virtual Reality software package[,]" ('129 patent, col. 17:23-27), for creating, destroying, moving, and/or modifying virtual objects in the virtual environment, and generating or playing music or sounds, (*id.*, col. 18:9-14 ("The VR program then creates, destroys, moves or modifies the virtual environment, or virtual objects therein. This can be done using standard VR library software calls, and is preferable based upon all of the forms of data read by the system (including the control track information and corresponding music information) as described above"); *see also* D.I. 121 at 13) PDIC also cites to an earlier description in the specification that explains that the VR "graphics system **250** . . . can be, for example, a Silicon Graphics Crimson Computer with Reality Engine graphics, serial port board, and VLIB software available from Fakespace, Inc. (of Menlo Park, Calif.)." ('129 patent, col. 14:7-10 (cited in D.I. 121 at 13 n.25)) A few paragraphs later, the specification notes that "FIG. **10** is a block level description of the software which is preferably run on VR system **250**[.]" (*Id.*, col. 14:36-37 (cited in D.I. 121 at 13 n.25)) Figure 10, in turn, indicates that the software, *inter alia*, will (1) read control track information; (2) read digitized audio and input information; and (3) create; destroy; move and modify objects. (*Id.*, FIG. 10)

Defendants contend that PDIC's proposed structure fails because: (1) by covering

software "such as" a graphics library, it does not impose any limitation on the claim; and (2) it depends upon "generic off the-shelf software [which] is insufficient to provide structure for a means-plus-function limitation." (D.I. 130 at 19; 2nd Tr. at 170-71; Defendants' Claim Construction Presentation, Slides 89-91) The Court agrees with Defendants' first argument—by including non-limiting language "software *such as* . . . ," PDIC's proposal is really no algorithm at all. *See, e.g.*, *EasyWeb Innovations, LLC v. Twitter, Inc.*, No 11-CV-4550 (JFB)(SIL), 2016 WL 1253674, at *14 (E.D.N.Y. Mar. 30, 2016) (disregarding similar exemplary language in plaintiff's proposed structure because "[m]eans-plus-function claims are limited to the particular structures the specification describes as performing the recited function (and their statutory equivalents), even if a person of ordinary skill in the art would know what other structures could be employed to perform the function"). As for Defendants' second argument, while it is true that the Federal Circuit has held that reciting "software" alone is not sufficient to disclose structure, *see, e.g.*, *Finisar Corp.*, 523 F.3d at 1340-41, the Federal Circuit has also explained that special programming does not necessarily "denote a level of complexity[,]" and has rejected the notion that "special programming" cannot encompass commercially available off-the-shelf-software, *EON Corp. IP Holdings, LLC v. AT & T Mobility LLC*, 785 F.3d 616, 623 (Fed. Cir. 2015); *see also, e.g.*, *Elekta AB*, 344 F.3d at 1214 ("[H]ere there would be no need for a disclosure of the specific program code if software were linked to the converting function and one skilled in the art would know the kind of program to use."); *Thought, Inc. v. Oracle Corp.*, Case No. 12-cv-05601-WHO, 2014 WL 5408179, at *20 (N.D. Cal. Oct. 22, 2014) ("[T]he Federal Circuit has recognized that when a specification discloses a specific type of software that is 'linked' to (in other words can be used to perform) the function, that is sufficient.") (*citing Elekta*, 344 F.3d at

1212, 1214).[14] Here, the specification describes the function at issue as being performed by "GL software library and the Fakespace, Inc. VLIB Virtual Reality software package." ('129 patent, cols. 17:23-18:14; *see also id.*, col. 14:6-10) The specification indicates that the software will read the control track information, read digitized audio and input information, perform a spectral analysis of digitized music information that has not already been analyzed in this way, and then create, destroy, move or modify virtual objects. (*Id.*, cols. 17:23-18:67 & FIG. 10)

For these reasons, the Court finds that: (1) the structure for the function "receiving the first signal and influencing action within a virtual environment in response to said first signal" is "a processor programmed with GL software library and the Fakespace, Inc. VLIB Virtual Reality software package for receiving the first signal and influencing action within a virtual environment in response to said first signal by processing the signal to create, destroy, move, and/or modify the display of the virtual environment or virtual objects in the virtual environment (and where spectral analysis has not yet been performed on any music information, such processor shall be programmed to receive the first signal, perform spectral analysis of digitized music information and create, destroy, move or modify the virtual environment or virtual objects therein upon detecting a certain threshold of energy at a specific frequency band of the music information), and optionally to generate and/or play music or sounds, and structural equivalents

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[14] Defendants' briefing cites to *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302 (Fed. Cir. 2012) as standing for the proposition that a patentee cannot point to off-the-shelf software as performing a claimed function to provide requisite structure. (D.I. 130 at 19 n.20) But what actually happened in *Noah Sys.* is that the patentee had "attempt[ed] to import its 'off the shelf software' reference" from other portions of the specifications as sufficient structure, and the Court rejected "Noah's efforts to find structure in the portion of a specification linked to a different claim element[.]" *Noah Sys.*, 675 F.3d at 1317. And thus, the *Noah Sys.* Court did not "reject the idea that software products specifically identified in the specification could not satisfy the disclosed structure requirement." *Thought, Inc.*, 2014 WL 5408179, at *21.

thereof"; and (2) the structure for the function "producing the virtual environment in response to said prerecorded control track" is "a processor programmed with GL software library and the Fakespace, Inc. VLIB Virtual Reality software package for producing the virtual environment in response to said prerecorded control track by processing music information and/or control information derived from the prerecorded control track to create, destroy, move and/or modify the display of the virtual environment or virtual objects in the virtual environment (and where spectral analysis has not yet been performed on any music information, such processor shall be programmed to perform spectral analysis of digitized music information and create, destroy, move or modify the virtual environment or virtual objects therein upon detecting a certain threshold of energy at a specific frequency band of the music information), and optionally to generate and/or play music or sounds, and structural equivalents thereof." *See Viatech Techs., Inc. v. Microsoft Corp.*, Civil Action No. 14-1226-RGA, 2016 WL 3398025, at *11 (D. Del. June 14, 2016) ("A means-plus-function claim encompasses all structure in the specification corresponding to that element and equivalent structures.") (quoting *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999)).

C. "means for prerecording a control track having music and/or control information corresponding to a music signal"

The next term at issue, "means for prerecording a control track having music and/or control information corresponding to a music signal[,]" appears in claim 16, from which asserted claims 19 and 20 depend. With respect to this means-plus-function term, the parties disagree about the scope of the claimed function, as well as the sufficiency of the structure disclosed in the specification.

1. Function

Taking up function first, Plaintiff's proposed function for this term is "prerecording a control track." (D.I. 121 at 14) Defendants' proposed function is "[a] prerecording a control track having music corresponding to a music signal, [b] prerecording a control track having control information corresponding to a music signal, or [c] prerecording a control track having both music and control information corresponding to a music signal[.]" (D.I. 130 at 14) The dispute here is the same type of dispute as the parties had with respect to identifying the proper function for the first term discussed above. That is, PDIC asserts that the language "music and/or control information corresponding to a music signal" should not be included in the function because it is structural language that describes alternative structures for the control track, (*see, e.g.*, PDIC's Claim Construction Presentation, Slide 60; 2nd Tr. at 177), and Defendants argue that the recited function encompasses all of this language, (*see, e.g.*, Defendants' Claim Construction Presentation, Slide 96; 2nd Tr. at 180-81).

The "analysis . . . is [therefore] very similar[,]" to that undergone with respect to the first term above, (2nd Tr. at 177), and so is the result. In the Harmonix IPR, a very similar claim limitation (that simply replaces the term "music" in the term at issue with "audio") from claim 22 was at issue: "means for prerecording a control track having audio and/or control information corresponding to an audio signal." (JCCC, ex. 3 at 394-95) PDIC argued that the function of this term in claim 22 was "prerecording a control track having audio and/or control information corresponding to an audio signal[.]" (*Id.*, ex. 4 at 217-18; *see also* Defendants' Claim Construction Presentation, Slide 97) The PTAB agreed and construed the function of this term to encompass the full claim term. (JCCC, ex. 3 at 394-95; *see also* D.I. 130 at 20 & n.22) In the Ubisoft IPR, PDIC offered the same construction including the full function with respect to claim

22, and explained that "[t]he function of the claim limitation in claim 16 is the same except that the term 'audio' is replaced with 'music,' a particular type of audio[,]" (JCCC, ex. 4 at 217-18), and the PTAB agreed, (*id.* at 401).

For the same reasons discussed above with respect to the first term, then, issue preclusion applies. Thus, the Court agrees that the function of this term should be construed as Defendants propose: "[a] prerecording a control track having music corresponding to a music signal, [b] prerecording a control track having control information corresponding to a music signal, or [c] prerecording a control track having both music and control information corresponding to a music signal."

2. Structure

The parties next dispute whether there is requisite structure disclosed in the specification for Function [a] (prerecording a control track having music). (*See, e.g.*, D.I. 121 at 14, 16; Defendants' Claim Construction Presentation, Slide 98)

Defendants argue that the term is indefinite because the specification does not disclose prerecording a control track having music/audio, and therefore does not disclose corresponding structure for this function. (D.I. 130 at 20-21) In support of their argument, Defendants rely heavily on the PTAB's observation that the specification "appears to make no mention of the function of prerecording a *control track* having only audio and instead appears to distinguish prerecorded *control tracks* from prerecorded *audio*[.]" (JCCC, ex. 3 at 396-97 (emphasis in original); *see also id.*, ex. 4 at 402 (the PTAB reiterating in the Final Written Decision in the Ubisoft IPR that "the Specification does not describe prerecording a *control track* having audio")

(emphasis in original))[15]

For its part, PDIC asserts that the PTAB got it wrong, as the specification does disclose a prerecorded control track that has both audio information *and* control information on it, and that disclosure is sufficient structure for Function [a]. (D.I. 121 at 16 & n.32; D.I. 147 at 8-9 & n.19; 2nd Tr. at 179; PDIC's Claim Construction Presentation, Slide 63) The Court agrees with PDIC that the specification does indeed disclose prerecording a control track that includes music/audio information:

> The recording medium for the inventive *prerecorded control tracks* does not need to be a four-track audio tape. In fact, the compact disk (CD) and Digital Audio Tape (DAT) formats already offer control track capabilities. In addition to these capabilities, these and other formats can be modified to contain more control track information. For example, *the prerecorded control track(s) need not be recorded as a separate track.* In order to retrofit to existing consumer audio equipment, the *control track information* could be stored in a subsonic or supersonic fashion on the existing *audio information.*

('129 patent, col. 20:10-20 (emphasis added))

Defendants seem to acknowledge that the patent discloses "generating a prerecorded control track having audio or music signals [that also has] control information corresponding to an audio signal." (D.I. 130 at 21; *see also* Madisetti Decl. at ¶ 63 ("[T]he '129 patent does not

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[15] In support of its statement in this regard, the PTAB then cited to three portions of the specification that seem to distinguish between "music" and "prerecorded control tracks." (JCCC, ex. 4 at 402 (citing '129 patent, col. 4:41-45 ("The system includes means for interfacing between the computer software which controls production of the virtual world, and live or prerecorded music (and/or prerecorded control tracks)"); *id.*, col. 5:11-20 ("As an alternative (or in addition [to)] extracting signals from music itself . . . [,] one or more prerecorded control tracks corresponding to the music [can be supplied]"); *id.*, col. 9:61-63 ("Acoustic Etch unit **3**" of FIG. **4** can receive digital prerecorded music and/or control track or analog prerecorded music and/or control track"))

describe generating a prerecorded control track having audio or music signals without also having control information corresponding to an audio signal."))[16] Indeed, Defendants and Dr. Madisetti acknowledge that the specification describes control tracks and audio signals as being recorded side-by-side on the same medium. (D.I. 130 at 21; Madisetti Decl. at ¶ 63 (citing '129 patent, cols. 8:36-38, 13:56-59, 15:1-17, 16:5-7)) As PDIC notes, then, Defendants' "argument that the claims are indefinite is based on the false and unsupported premise that this same structure cannot also correspond to function [a] (prerecording a control track having music)." (D.I. 147 at 9) The specification's disclosure of prerecording a control track that has music and control information is adequate disclosure of a prerecording a control track that has only music. (2nd Tr. at 186 ("With respect to this concept that an algorithm of recording two things together doesn't support recording either one of them separately, I think that's just not true as a matter of common sense. If I know how to record one thing, then I know how to record it. And it doesn't matter that I also know how to record something else."))[17] Accordingly, as PDIC suggests, the corresponding structure linked to Function [a] (as well as to Function [c]) is recited at '129

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[16] This disclosure corresponds to Function [c]—prerecording a control track having both music and control information corresponding to a music signal. And therefore, these statements by Defendants and Dr. Madisetti conflict with the PTAB's statement that there is likewise no disclosed corresponding structure for Function [c], as that function requires a control track having audio and control information. (JCCC, ex. 3 at 398 n. 6)

[17] In support of their argument that the patent does not disclose sufficient structure for Function [a], Defendants point out that the specification states that "music cannot directly interact with the virtual environment[,]" (D.I. 163 at 9 (quoting '129 patent, col. 4:62-63)), and then asserts that this reality "goes directly against an argument that there may be some other disclosure in the patent that may get us there[,]" (2nd Tr. at 182). The Court is not persuaded that this statement from the patent means that there can be no structure for Function [a]. This is because the patent explains that the VR processor receives music information, performs a spectral analysis on it, and then displays virtual objects upon detecting a certain threshold of energy at a specific frequency band of the music information. ('129 patent, cols. 17:50-18:67)

patent, cols. 7:30-32, 8:58-9:3, 12:38-42, 12:57-62, 13:50-59, 14:55-15:16, 20:10-20 & Figs. 2, 5. (D.I. 147 at 8-9)

The parties' other dispute as to structure for this means-plus function term relates to Function [b] (prerecording a control track having control information corresponding to a music signal). Defendants argue that the structure identified by the PTAB during the IPR proceedings, if adopted, must be modified to reflect statements made by PDIC during those proceedings in the course of distinguishing prior art. That is, Defendants point to PDIC's prior statements to the effect that the corresponding structure should be limited to microprocessors that generate the control track based on the content of a sound recording itself, and not based merely on time, positions or locations within a sound recording. (D.I. 121 at 17; D.I. 130 at 21-22)

By way of background as to this dispute, in its Petition for IPR review in the Ubisoft IPR proceeding, Ubisoft argued that a prior art reference known as Williams, which "discloses a process for prerecording a sound recording and animation images together with the software for synchronizing the actions and sounds on a memory device[,]" anticipated and/or rendered certain claims of the '129 patent obvious. (JCCC, ex. 4 at 47-69) In response, PDIC had posited that Williams did not disclose "prerecording a control track having audio and/or control information corresponding to an audio signal" because Williams discloses that "different actions such as . . . face changes, arm movements, a bird flying, or a candlestick appearing out of nowhere . . . can be associated with the time, positions or locations in the sound recording either manually or automatically." (*Id.* at 124-25 (internal quotation marks and citation omitted)) Therefore, PDIC argued, "the control information in Williams corresponds to time, position or location, not to an audio signal as required by the claims. That is, once the timer starts, the graphics are displayed

irrespective of the audio content." (*Id.* at 125) Ultimately, the PTAB agreed with PDIC and declined to institute review with respect to *Williams*:

> We are persuaded by Patent Owner's argument that Williams discloses control information that corresponds to time, position, or location, rather than to an audio or music signal because Williams determines the locations in a sound recording where predetermined actions are to be displayed and then associates actions with the time positions or locations, rather than based on the content of the sound recording itself. . . . Petitioner contends that independent claim[] 16 . . . would have been obvious over Thalmann and Williams. . . . Petitioner relies on Williams to satisfy the limitation relating to prerecording a control track having audio and/or control information corresponding to an audio signal. . . . For the same reasons described above in connection with the challenge based on anticipation by Williams, we are not persuaded that Williams teaches a control track having audio and/or control information corresponding to an audio signal. Consequently, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that the subject matter of independent claim[] . . . 16 and dependent claim[] 19 is rendered obvious over Thalmann and Williams.

(*Id.* at 170-71, 174-75)

The Court agrees with Defendants that the substance of Plaintiff's prior argument in the IPR should bind it here. In the Court's view, this is most accurately expressed as application of the doctrine of prosecution history disclaimer. (*See* Tr. at 185 (Defendants' counsel pointing out that PDIC's statements distinguishing Williams from the claimed invention during the *Ubisoft* IPR "are now part of the intrinsic record and part of the prosecution history")) The Federal Circuit has recently held that "statements made by a patent owner during an IPR proceeding [including in a preliminary response filed prior to an institution decision] can be considered during claim construction and relied upon to support a finding of prosecution disclaimer." *Aylus Networks, Inc. v. Apple, Inc.*, 856 F.3d 1353, 1361-62 (Fed. Cir. 2017). The

doctrine of prosecution history disclaimer "preclud[es] patentees from recapturing through claim interpretation specific meanings disclaimed during prosecution." *Id.* at 1359 (citation omitted). The Federal Circuit explained that its extension of the doctrine to IPR proceedings "will ensure that claims are not argued one way in order to maintain their patentability and in a different way against accused infringers." *Id.* at 1360. Here, it is clear that before the PTAB, PDIC argued that the claim limitation "prerecording a control track having audio and/or control information corresponding to an audio signal" required that control information must correspond not to time, position, or locations in a sound recording, but simply to the audio signal itself. Here, in contrast, it argues that the claim term should not be limited to a structure that generates a control track based on the content of a sound recording itself, and instead could amount to a structure that generates a control track based merely on time, positions or locations within a sound recording.[18] Plaintiff should be bound by its earlier interpretation of this claim limitation.[19]

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[18] As noted above, PDIC asserted during the IPR proceedings that the function and structure for the claim limitation "prerecording a control track having audio and/or control information corresponding to an audio signal" is "the same" as for the claim limitation "prerecording a control track having music and/or control information corresponding to a music signal" that is found in claim 16. (JCCC, ex. 4 at 217-18)

[19] PDIC argues that it is Defendants who are estopped from arguing that the structure corresponding to Function [b] should encompass PDIC's statements relating to Williams, "based on the broader construction that they proposed, and that was adopted, in the IPR proceedings." (D.I. 147 at 9) Again, at a minimum, because the non-Ubisoft Defendants were not associated with this proceeding, they could not even arguably be estopped here. Morever, in the proceeding, it is true that no party's recited structure for this term included the additional limitations that Defendants now seek. During the IPR, however, in arguing that prior art references like Williams read on this claim limitation, Ubisoft's interpretation of this claim was broader than it now proposes (i.e., then it was interpreting the limitation in the same way that PDIC wants it interpreted now), (*see, e.g.*, JCCC, ex. 4 at 48-49), but PDIC argued against that broader interpretation (distinguishing Williams in the manner set out above), and the PTAB agreed with PDIC in denying to institute review on Williams. Plaintiff thus had the last word on this issue during the IPR proceeding, and prevailed, and so should not be permitted now to take a

The Court will therefore recommend that the structure for Function [b] be construed as follows: (i) a first media player unit (e.g., four-track tape player, CD or DAT playback device), a microprocessor for generating a control track from the received data from the media player unit (based on the content of a sound recording itself, and not based merely on time, positions or locations within a sound recording), and a media recorder (*see* D.I. 130 at 22 (citing '129 patent, cols. 13:11-31, 20:10-13)); or (ii) one or more input devices for inputting signals, a microprocessor for generating a control track from the received signals (based on the content of a sound recording itself, and not based merely on time, positions or locations within a sound recording), and a media recorder (*id.* (citing '129 patent, cols. 13:32-48, 20:10-13)).

D. "control track is time shifted relative to the music signal"

Dependent claim 20 requires that "said control track is time shifted relative to the music signal to compensate for delays in said virtual reality computer system." ('129 patent, col. 30:45-47) The patent notes that an object of the invention is "to provide a VR system which delays audio (in response to which control signals are generated) in order to compensate for the lag introduced by other components of the VR system[.]" (*Id.*, col. 6:41-42, 50-53; *see also id.*, Abstract) The patent later explains that "preferred embodiments of the invention will implement one of two delay compensation techniques": (1) causing the music signal to be "delayed (phase shifted)" while the control track is being processed by the VR system; or (2) causing the control track to be "phase shifted in advance" at the time it is prerecorded. (*Id.*, cols. 9:41-10:65; *see*

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contrary position. The Court does not view Ubisoft's failure to explicitly include the language Defendants now seek in their proposed structure for this claim term after the PTAB's institution decision was issued, as somehow trumping any argument that PDIC should be bound by its earlier position.

also D.I. 121 at 19; D.I. 130 at 24)

Defendants propose that this term be construed to mean "a pre-selected delay between music and control track[s] is implemented at the time when both the control tracks and the music are prerecorded[.]" (D.I. 130 at 23) PDIC proposes that the term be construed to mean "control track is time shifted relative to the music signal when the control track is recorded and/or processed." (D.I. 121 at 19) The crux of the dispute, then, is whether the term encompasses only the second of the above-referenced two delay compensation techniques (as Defendants argue), or whether (as PDIC argues) both forms of delay compensation techniques are examples of "where the control track is phase shifted relative to the music signal[.]" (*Id.* at 19-20; D.I. 130 at 23-24)

Looking first to the claim language itself, the Court notes that it "requires that the *control track* is shifted, not the music signal." (D.I. 163 at 10 (certain emphasis in original); *see also* '129 patent, col. 30:45-46) Additionally, claim 20 depends from claim 16, which claims a VR computer system wherein a "prerecorded control track" is generated and the virtual environment is produced in response to that prerecorded control track. ('129 patent, col. 30:22-28) Thus, in claim 20, the "said control track" that is time shifted is the "prerecorded control track." (*Id.*, col. 30:45-47; *see also* 2nd Tr. at 188-89, 194)

The Court next turns to claim 14, to which Defendants point in support of their argument. Claim 14 depends from independent claim 12, and it recites "[t]he apparatus of claim **12**, wherein *said music signal is delayed in time to compensate for delays in other parts of the virtual reality computer system.*" ('129 patent, col. 30:16-18 (emphasis added)) The term at issue cannot be construed "in a vacuum, but rather in the context of the intrinsic evidence" including "the other claims [and] the specification[.]" *Jansen v. Rexall Sundown, Inc.*, 342 F.3d

1329, 1333 (Fed. Cir. 2003); *see also* (2nd Tr. at 195). With claim 14 covering the delay compensation technique whereby the music signal is delayed, it makes sense that, as Defendants argue, claim 20 covers the other delay compensation technique described in the patent, whereby the control track is time shifted at the time when it is prerecorded. (D.I. 130 at 24; Defendants' Claim Construction Presentation, Slides 111-13; 2nd Tr. at 188-90) While PDIC contends that Defendants' proposal would improperly "limit this term to only one of the two exemplary methods of delay," (D.I. 121 at 19), "[i]t is often the case that different claims are directed to and cover different disclosed embodiments[,]" *Helmsderfer v. Bobrick Washroom Equip., Inc.*, 527 F.3d 1379, 1383 (Fed. Cir. 2008); *see also Intamin Ltd. v. Magnetar Techs., Corp.*, 483 F.3d 1328, 1337 (Fed. Cir. 2007) ("[A] claim need not cover all embodiments. . . . A patentee may draft different claims to cover different embodiments.").

In arguing for a broader construction, PDIC asserts that the "patent states that both forms of delay are examples of 'where the control track is phase shifted relative to the music signal'"; therefore, it argues, the term should be construed such that the control track could be time shifted when it is recorded (i.e., in advance), or when it is processed (i.e., meaning the music signal will be delayed while the control track is being processed). (D.I. 121 at 19; *see also* 2nd Tr. at 191 (PDIC's counsel arguing that delay compensation techniques "can be done in advance or it can be done later using delays vis-à-vis the music. It makes no difference . . . . The control track shifted vis-à-vis the music versus the music being shifted vis-à-vis the control track . . . makes no difference")) But as Defendants note, the '129 patent does distinguish between "music signal is delayed" as recited in claim 14 and "control track is time shifted" as in claim 20. (Defendants' Claim Construction Presentation, Slide 113) The specification explains that:

> With reference again to FIG. **3**, in a variation on the scheme implemented by delay unit **4A** (of Fig. **2**) or delay circuit **13** of FIG. **4**) instead of delaying the music, a pre-selected delay between music and control tracks is implemented at the time when both the control tracks and the music are prerecorded. The control track is, in effect, phase shifted in advance to account for lags expected to be introduced by the analysis (i.e., the time required by analyzer **5** of FIG. **2** to generate control signals from music) and/or by VR graphics system **7**. The advantage of implementing this phase shifting when prerecording the control track(s) is that it minimizes the hardware required to implement the Acoustic Etch unit. There is also no need to delay the music, which could be expensive.

('129 patent, col. 10:20-33) Thus, in distinguishing these two delay compensation techniques, this passage articulates reasons why shifting the control track at the time when both the control tracks and the music are prerecorded does make a real difference—it requires less equipment and it can be cheaper. It makes sense, then, that the claims would use different wording to refer to these two different techniques.

For these reasons, the Court finds that the claim language, surrounding claims, and specification corroborate the notion that dependent claim 20 covers the delay compensation technique whereby the prerecorded control track is time shifted at the time it is prerecorded. The language of Defendants' proposal comes directly from the specification when it describes this embodiment: "a pre-selected delay between the music and control tracks is implemented at the time when both the control tracks and the music are prerecorded." ('129 patent, col. 10:22-25) The Court therefore recommends that Defendants' proposal be adopted for this term.

IV. CONCLUSION

For the foregoing reasons, the Court recommends the following constructions:

1. For the term "means for supplying a first signal selected from a group consisting

of a control signal having music and/or control information generated in response to a music signal, a prerecorded control track having music and/or control information corresponding to the music signal, and a control signal having music and/or control information generated in response to the prerecorded control track" the function is "supplying a first signal selected from a group consisting of [1] a control signal having music and/or control information generated in response to a music signal, [2] a prerecorded control track having music and/or control information corresponding to the music signal, [3] and a control signal having music and/or control information generated in response to the prerecorded control track." The corresponding structure for Function [1a] ("supplying . . . a control signal having music . . . generated in response to a music signal") is recited at '129 patent, cols. 5:1-10 & 11:31-37. The corresponding structure for Function [1b] ("supplying . . . a control signal having . . . control information generated in response to a music signal") is recited at '129 patent, cols. 10:66-11:1 and 11:17-43. The corresponding structure for Function [2] ("supplying . . . a prerecorded control track having music and/or control information corresponding to the music signal") is recited at '129 patent, cols. 12:63-13:10, 13:60-14:22, and 16:43-17:12. The corresponding structure for Function [3] ("supplying . . . a control signal having music and/or control information generated in response to the prerecorded control track") is recited at '129 patent, cols. 12:63-13:10, 13:60-14:22, 16:43-17:12, 20:10-34 & Figs. 1, 2, 4, 6.

2. For the term "means for receiving the first signal and influencing action within a virtual environment in response to said first signal" the function is "receiving the first signal and influencing action within a virtual environment in response to said first signal." The corresponding structure for this term is "a processor programmed with GL software library and

the Fakespace, Inc. VLIB Virtual Reality software package for receiving the first signal and influencing action within a virtual environment in response to said first signal by processing the signal to create, destroy, move, and/or modify the display of the virtual environment or virtual objects in the virtual environment (and where spectral analysis has not yet been performed on any music information, such processor shall be programmed to receive the first signal, perform spectral analysis of digitized music information and create, destroy, move or modify the virtual environment or virtual objects therein upon detecting a certain threshold of energy at a specific frequency band of the music information), and optionally to generate and/or play music or sounds, and structural equivalents thereof." For the term "means for producing the virtual environment in response to said prerecorded control track" the function is "producing the virtual environment in response to said prerecorded control track." The corresponding structure for this term is "a processor programmed with GL software library and the Fakespace, Inc. VLIB Virtual Reality software package for producing the virtual environment in response to said prerecorded control track by processing music information and/or control information derived from the prerecorded control track to create, destroy, move and/or modify the display of the virtual environment or virtual objects in the virtual environment (and where spectral analysis has not yet been performed on any music information, such processor shall be programmed to perform spectral analysis of digitized music information and create, destroy, move or modify the virtual environment or virtual objects therein upon detecting a certain threshold of energy at a specific frequency band of the music information), and optionally to generate and/or play music or sounds, and structural equivalents thereof."

3. For the term "means for prerecording a control track having music and/or control

information corresponding to a music signal" the function is "[a] prerecording a control track having music corresponding to a music signal, [b] prerecording a control track having control information corresponding to a music signal, or [c] prerecording a control track having both music and control information corresponding to a music signal." The corresponding structure for Functions [a] and [c] is recited at '129 patent, cols. 7:30-32, 8:58-9:3, 12:38-42, 12:57-62, 13:50-59, 14:55-15:16, 20:10-20 & Figs. 2, 5. The corresponding structure for Function [b] is (i) a first media player unit (e.g., four-track tape player, CD or DAT playback device), a microprocessor for generating a control track from the received data from the media player unit (based on the content of a sound recording itself, and not based merely on time, positions or locations within a sound recording), and a media recorder (*see* D.I. 130 at 22 (citing '129 patent, cols. 13:11-31, 20:10-13)); or (ii) one or more input devices for inputting signals, a microprocessor for generating a control track from the received signals (based on the content of a sound recording itself, and not based merely on time, positions or locations within a sound recording), and a media recorder (*id.* (citing '129 patent, cols. 13:32-48, 20:10-13)).

4. "control track is time shifted relative to the music signal" means "a pre-selected delay between music and control track[s] is implemented at the time when both the control tracks and the music are prerecorded"

This Report and Recommendation is filed pursuant to 28 U.S.C. § 636(b)(1)(B), Fed. R. Civ. P. 72(b)(1), and D. Del. LR 72.1. The parties may serve and file specific written objections within fourteen (14) days after being served with a copy of this Report and Recommendation. Fed. R. Civ. P. 72(b)(2). The failure of a party to object to legal conclusions may result in the loss of the right to de novo review in the district court. *See Sincavage v. Barnhart*, 171 F. App'x

924, 925 n.1 (3d Cir. 2006); *Henderson v. Carlson*, 812 F.2d 874, 878–79 (3d Cir. 1987).

The parties are directed to the Court's Standing Order for Objections Filed Under Fed. R. Civ. P. 72, dated October 9, 2013, a copy of which is available on the District Court's website, located at http://www.ded.uscourts.gov.

Dated: June 16, 2017

Christopher J. Burke
UNITED STATES MAGISTRATE JUDGE