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17 Attorneys for Plaintiff  
18 MZ AUDIO SCIENCES, LLC

19 **UNITED STATES DISTRICT COURT**  
20 **CENTRAL DISTRICT OF CALIFORNIA**  
21 **WESTERN DIVISION – LOS ANGELES**

22 MZ AUDIO SCIENCES, LLC,

23 Plaintiff,

24 v.

25 SONY GROUP CORPORATION (JAPAN),  
26 SONY CORPORATION OF AMERICA,  
27 SONY INTERACTIVE ENTERTAINMENT  
28 LLC, SONY PICTURES ENTERTAINMENT  
INC., SONY ELECTRONICS INC.,

Defendants.

Case No.: 2:22-cv-00866

**COMPLAINT FOR PATENT  
INFRINGEMENT**

**DEMAND FOR JURY TRIAL**

1 Plaintiff MZ Audio Sciences, LLC (“MZ Audio”) as and for its complaint for  
2 patent infringement against Defendants Sony Group Corporation (Japan) (“SGCJ”),  
3 Sony Corporation of America (“SCA”), Sony Interactive Entertainment LLC (“SIEL”),  
4 Sony Pictures Entertainment Inc. (“SPE”), and Sony Electronics Inc. (“SEI”)  
5 (collectively, “Sony” or “Defendants”) and alleges as follows:

6 **PARTIES**

7 1. MZ Audio Sciences, LLC is a Delaware corporation with a principal place  
8 of business at of 3045 Idas Lane, Caledonia, New York 14423.

9 2. Defendant Sony Group Corporation (Japan) (formerly known as Sony  
10 Corporation) is a Japanese entity with a principal place of business at 1-7-1 Konan  
11 Minato-Ku, Tokyo, 108-0075, Japan. SGJC is a multinational conglomerate  
12 headquartered in in Konan Minato-ku, Tokyo.

13 (<https://www.sony.com/en/SonyInfo/CorporateInfo/data/>; last visited Feb. 1, 2022). On  
14 information and belief, SGCJ or its agents performs infringing methods in the United  
15 States, and/or makes, sells, offers to sell, and/or imports products in the United States,  
16 including in this Judicial District, and introduces infringing products into the stream of  
17 commerce knowing that they would be sold and/or used in this Judicial District and  
18 elsewhere in the United States.

19 3. Defendant Sony Corporation of America is a New York corporation with  
20 a principal place of business at 25 Madison Avenue, 26th Floor, New York, New York  
21 10010. On information and belief, SCA or its agents perform infringing methods in the  
22 United States, and/or makes, sells, offers to sell, and/or imports infringing products in  
23 the United States, including in this Judicial District, and introduces infringing products  
24 into the stream of commerce knowing that they would be sold and/or used in this  
25 Judicial District and elsewhere in the United States. SCA “is the U.S. headquarters of  
26 Sony Group Corporation based in Tokyo, Japan. Sony’s principal U.S. businesses  
27 include Sony Electronics Inc., Sony Interactive Entertainment LLC., Sony Pictures  
28 Entertainment Inc., Sony Music Entertainment and Sony Music Publishing. Sony

1 recorded consolidated annual sales of approximately \$76.67 billion USD for the fiscal  
2 year ended March 31, 2020 and employs approximately 114,400.”  
3 ([https://www.sony.com/content/sony/en/en\\_us/SCA/who-we-are/overview.html](https://www.sony.com/content/sony/en/en_us/SCA/who-we-are/overview.html), under  
4 “Sony Corporation of America” heading; last visited Feb. 1, 2022). SCA may be  
5 served with process through its registered agent, Corporation Service Company Which  
6 Will Do Business in California as CSC-Lawyers Incorporating Service, 2710 Gateway  
7 Oaks Drive, Suite 150N, Sacramento, CA 95833.

8 4. Defendant Sony Interactive Entertainment LLC is a California limited  
9 liability company with a place of business at 6080 Center Dr., Los Angeles, California  
10 90045. On information and belief, SIEL or its agents makes, sells, or offers to sell  
11 products, or practices claimed methods throughout the United States, including in this  
12 Judicial District, and introduces infringing products into the stream of commerce  
13 knowing that they would be sold and/or used in this Judicial District and elsewhere in  
14 the United States. SIEL “is responsible for the PlayStation brand and family of  
15 products and services.” (<https://www.playstation.com/en-us/corporate/about-us/>; last  
16 visited Feb. 1, 2022). SIEL “is a wholly owned subsidiary of Sony Group Corporation  
17 and has global functions in California, London, and Tokyo.” (*See id.*) SIEL may be  
18 served with process through its registered agent, Corporation Service Company Which  
19 Will Do Business in California as CSC – Lawyers Incorporating Service, 2710  
20 Gateway Oaks Drive, Suite 150N, Sacramento, CA, 95833.

21 5. Defendant Sony Pictures Entertainment Inc. is a Delaware corporation  
22 with a principal place of business at 10202 West Washington Boulevard, Culver City,  
23 CA 90232. On information and belief, SPE or its agents performs infringing methods  
24 in the United States, and/or makes, sells, offers to sell, and/or imports infringing  
25 products in the United States, including in this Judicial District, and introduces  
26 infringing products into the stream of commerce knowing that they would be sold  
27 and/or used in this Judicial District and elsewhere in the United States. SPE may be  
28 served with process through its registered agent, Corporation Service Company Which

1 Will Do Business in California as CSC – Lawyers Incorporating Service, 2710  
2 Gateway Oaks Drive, Suite 150N, Sacramento, CA, 95833.

3 6. Defendant Sony Electronics Inc. is a Delaware corporation with a place of  
4 business at 10202 Washington Blvd., Culver City, California 90232. On information  
5 and belief, SEI or its agents performs infringing methods in the United States, and/or  
6 makes, sells, offers to sell, and/or imports infringing products in the United States,  
7 including in this Judicial District, and introduces infringing products into the stream of  
8 commerce knowing that they would be sold and/or used in this Judicial District and  
9 elsewhere in the United States. SEI may be served with process through its registered  
10 agent, Corporation Service Company Which Will Do Business in California as CSC –  
11 Lawyers Incorporating Service, 2710 Gateway Oaks Drive, Suite 150N, Sacramento,  
12 CA, 95833.

13 **JURISDICTION AND VENUE**

14 7. This action arises under the patent laws of the United States, Title 35 of  
15 the United States Code. Accordingly, this Court has subject matter jurisdiction under  
16 28 U.S.C. §§ 1331 and 1338(a).

17 8. This Court has specific and general personal jurisdiction over Defendants  
18 pursuant to due process and/or the California Long Arm Statute, due to Defendants  
19 having availed themselves of the rights of benefits of California by incorporating under  
20 California law and/or due to their substantial business in this forum, including: (i) at  
21 least a portion of the infringement alleged herein; and (ii) regularly doing or soliciting  
22 business, engaging in other persistent courses of conduct, and/or deriving substantial  
23 revenue from goods and services provided to individuals in California and in this  
24 Judicial District. Defendants have more than minimal contacts with this District, and  
25 maintenance of this action within this District would not offend traditional notions of  
26 fair play and substantial justice.

1 9. Venue is proper in this District under 28 U.S.C. §1400(b) because  
2 Defendants have committed acts of patent infringement (as detailed herein) and have  
3 regular and established places of business in this Judicial District as identified below.

4 10. For example, SPE has regular and established places of business in this  
5 District, including SPE's headquarters that are located at 10202 West Washington  
6 Boulevard in Culver City, California 90232.

7 11. SEI also has regular and established places of business in this District,  
8 including at 10202 West Washington Boulevard in Culver City, California 90232; as  
9 well as 2706 Media Center Drive, Suite 130, Los Angeles, CA 90065; 3333 Bristol  
10 Avenue, Costa Mesa, CA 92626; and 2201 E Carson St, Los Angeles, CA 90065.

11 12. SCA is registered to do business in California and, in public filings with  
12 the California Secretary of State represents that it has a regular and established place of  
13 business for its chief financial officer, Takumi Sai, located at 10232 W. Washington  
14 Blvd., Culver City, California 90232. On information and belief, SCA employs  
15 hundreds of people in this District who work in regular and established places of  
16 business in this District. Further, SCA's website advertises multiple jobs at its "Los  
17 Angeles" location. For example, as of January 25, 2022, the SCA website had a  
18 posting stating: "Sony Corporation of America is seeking a Strategic Initiatives  
19 Manager to join their team located in San Diego, CA or Los Angeles, CA." Further,  
20 Sony Corporate Services, d/b/a Sony Aviation, is managed by SCA, and has a regular  
21 and established place of business at 6201 W Imperial Highway, Los Angeles, CA  
22 90045.

23 13. SIEL has regular and established places of business in this District,  
24 including at 6080 Center Dr., Los Angeles, California 90045. On information and  
25 belief, SIEL also employs hundreds of people in this District as revealed by its  
26 officers' and employees' online statements, including LinkedIn data. SIEL's website  
27 advertises multiple jobs at its "Los Angeles," "Burbank," and "Aliso Viejo" locations  
28 that are regular and established places of SIE business in this District. For example,

1 SIEL is currently hiring an audio project manager, sound designer, business analyst,  
2 human resources business partner, operations engineer, product managers, and various  
3 interns for its Los Angeles location. On information and belief, SIEL also has regular  
4 and established places of business in this District at 13031 W Jefferson Blvd, Los  
5 Angeles, CA 90094; 612 Hampton Drive, Venice, CA 90291 (according to the Office  
6 of Finance, City of Los Angeles); as well as locations at 2255 N Ontario St #550,  
7 Burbank, CA 91504, and 65 Enterprise STE 200, Aliso Viejo, CA 92656.

8 14. Joinder of the Defendants in this action is proper pursuant to 35 U.S.C.  
9 § 299. As alleged in more detail below, the allegations of infringement against the  
10 Defendants arise out of the same series of occurrences relating to the making, using,  
11 importing into the United States, offering for sale, or selling of the same accused  
12 products and/or practicing of the same methods, and questions of fact common to each  
13 Defendant will arise in this action.

14 **THE INVENTORS AND THEIR PATENTED INVENTIONS**

15 15. Dr. Mark F. Bocko and Dr. Zeljko Ignjatovic are the inventors of U.S.  
16 Patent No. 7,289,961 (the “Asserted Patent”).

17 16. Dr. Bocko is a professor of electrical and computer engineering and  
18 physics at the University of Rochester. He is currently the chair of the Audio and  
19 Music Engineering program at the University of Rochester.

20 17. Dr. Ignjatovic is an associate professor of electrical and computer  
21 engineering at the University of Rochester.

22 18. MZ Audio owns the Asserted Patent by assignment from Dr. Bocko and  
23 Dr. Ignjatovic. The Asserted Patent was filed as Application No. 10/870,685 on June  
24 18, 2004, issued as a patent on October 30, 2007, and claims priority to provisional  
25 application No. 60/479,438 filed on June 19, 2003. A true and correct copy of the  
26 Asserted Patent is attached hereto as **Exhibit A**.

27 19. The Asserted Patent is entitled “Data Hiding Via Phase Manipulation of  
28 Audio Signals” and relates generally to a method and system for changing the phase of

1 an audio tone to embed data (watermark), and a method and system of extracting the  
2 embedded data (watermark) by identifying the phase change.

3 20. A watermark is data that is embedded in a media or document file that  
4 serves to identify the integrity, the origin or the intended recipient of the host data file.  
5 One attribute of watermarks is that they may be perceptible or imperceptible. A  
6 watermark also may be robust, fragile, or semi-fragile. The data capacity of a  
7 watermark is a further attribute. Trade-offs among these three properties are possible,  
8 and each type of watermark is tailored for specific use. For example, robust  
9 watermarks are useful for establishing ownership of data, whereas fragile watermarks  
10 are useful for verifying the authenticity of data.

11 21. Steganography literally means “covered writing” and is closely related to  
12 watermarking, sharing many of the attributes and techniques of watermarking.  
13 Steganography works by embedding hidden messages within other, seemingly  
14 innocuous and overt messages, so that the visible innocuous messages will not arouse  
15 the suspicion of those wishing to intercept the embedded messages.

16 22. As a basic example, a message can be embedded in a digital bitmap image  
17 in the following manner. In each byte of the bitmap image, the least significant bit is  
18 discarded and replaced by a bit of the message to be hidden. While the colors of the  
19 bitmap image will be altered, the alteration of colors will typically be subtle enough  
20 that general observers will not notice. But the intended recipient can reconstruct the  
21 hidden message by extracting the least significant bit of each byte in the transmitted  
22 image. If the bitmap image has eight-bit color depth (256 colors), and the message to  
23 be hidden is a text message with eight-bit text encoding, then each letter of the text  
24 message can be encoded in, and extracted from, eight pixels of the bitmap image.

25 23. The field of steganography is receiving a good deal of attention due to  
26 interest in covert communication via the Internet, as well as other channels, and data  
27 hiding in information systems security applications. The single most important  
28



1 requirement of a steganographic method is that it be invisible to all but the intended  
2 recipient of the message.

3 24. Copy protection—also known as content protection, copy prevention, and  
4 copy restriction—describes measures to enforce copyright by preventing the  
5 unauthorized reproduction of data in the form of software, films, music, and other  
6 media.

7 25. Steganography in digital audio signals is especially challenging due to the  
8 acuity and complexity of the human auditory system. Besides having a wide dynamic  
9 range and a fairly small differential range, the human auditory system is unable to  
10 perceive absolute monaural phase, except in certain contrived situations.

### 11 **Failures of Prior Art Audio Watermarking Technology**

12 26. Before MZ Audio’s patented inventions, two companies, Verance and  
13 Digimarc, introduced prior art schemes for watermarking of audio signals. Ex. A, 2:34-  
14 36.

#### 15 Verance Corporation’s Prior Art Technology Failed

16 27. Verance provided software packages to companies interested in  
17 controlling the use of their copyrighted digital audio content, but the major application  
18 is in broadcast monitoring and verification. For that application, hidden tags are  
19 inserted into digital files for TV and radio commercials, programs and music, and a  
20 service is provided which monitors all airplay in all major US media markets so that  
21 reports can be provided to the advertisers and copyright owners. Ex. A, 2:39-47.

22 28. In 1999, Verance was selected to provide a worldwide industry standard  
23 for copy-protected DVD audio and the Secure Digital Music Initiative (“SDMI”), and  
24 was adopted by the 4C Entity, a consortium of technology companies committed to  
25 “protecting entertainment content when recorded to physical media.” Verance’s audio  
26 watermarking technology was intended to embed inaudible yet identifiable digital  
27 codes into an audio waveform. The audio watermarks are expected to carry detailed  
28 information associated with the audio and audio-visual content for such purposes as



1 monitoring and tracking its distribution and use, as well as controlling access to and  
2 usage of the content. Embedded watermarks travel with the audio and audiovisual  
3 content wherever it goes, and are highly resistant to even the most sophisticated  
4 attempts to remove them. Ex. A, 2:48-62.

5 29. During the late 1990s and early 2000s, with the widespread success of the  
6 MP3 file format, the music and entertainment industries were rattled by sites like  
7 Napster, which permitted free, unfettered swapping of valuable copyrighted music  
8 files.

9 30. In response, the Recording Industry Association of America (RIAA)—an  
10 entertainment industry trade organization created to protect its members’ interests,  
11 including their interests in preventing the unauthorized sharing of their media assets—  
12 formed the SDMI.

13 31. SDMI, a working group comprised of many businesses and organizations  
14 with significant interests in the future of digital music—including SPE and Sony  
15 Music Entertainment Inc.—set out to develop open technology specifications that  
16 protected the playing, storage, and distribution of digital music.

17 32. SDMI’s strategy involved two stages. The first stage was to implement a  
18 secure digital watermarking scheme, which would allow music to be tagged with a  
19 secure watermark that was difficult to remove from the source audio without damaging  
20 it. The second was to ensure that SDMI-compliant players would not play SDMI-  
21 tagged music that was not authorized for that device.

22 33. The importance of SDMI’s mission was not lost on Sony. Specifically, in  
23 August 2000, SPE’s then Senior VP Steve Heckler gave a speech to attendees of the  
24 Americas Conference on Information Systems—where he all but declared that if the  
25 RIAA’s SDMI did not stop unauthorized copying of digital content, Sony certainly  
26 would:

27 The industry will take whatever steps it needs to protect itself and protect  
28 its revenue streams . . . It will not lose that revenue stream, no matter what  
. . . Sony is going to take aggressive steps to stop this. We will develop

1 technology that transcends the individual user. We will firewall Napster at  
2 source [sic]—we will block it at your cable company. We will block it at  
3 your phone company. We will block it at your ISP. We will firewall it at  
your PC... These strategies are being aggressively pursued because there  
is simply too much at stake.

4 See [https://www.theregister.com/2000/08/23/we\\_will\\_block\\_napster/](https://www.theregister.com/2000/08/23/we_will_block_napster/).

5 34. A key part of SDMI’s strategy included demonstrating that the watermark  
6 could not be detected by third parties so they could not remove it from the audio  
7 content.

8 35. However, the problem with Verance’s audio watermarking technology  
9 that SDMI selected for copyright protection was that it could be hacked. Ex. A, 2:63-  
10 64.

11 36. As part of the process of ratifying the technology, the SDMI announced a  
12 challenge with their “Open Letter to the Digital Community” on September 6, 2000.  
13 The letter invited hackers, cryptologists, and others to detect and remove the  
14 watermark from some sample pieces of music.

15 37. The ‘hack SDMI’ challenge resulted in the identification and removal of  
16 four of SDMI’s watermarking technologies by a group of researchers from Princeton  
17 University, Rice University and the Xerox Palo Alto Research Centers.

18 38. The SDMI challenge “demonstrated that the watermark data can be  
19 detected and removed by hackers who were able to discover the key by applying  
20 general signal process analysis.” Ex. A, 2:64-67. “The technology has not been  
21 accepted by the industry since its announcement in 1999.” *Id.*, 3:2-3.

22 Digimarc Corporation’s Prior Art Technology Failed

23 39. Digimarc was founded in 1995 with a focus on deterring counterfeiting  
24 and piracy of media content through “digital watermarking,” primarily for images and  
25 video. Digimarc did not have a significant business in audio watermarking at that time.  
26 However, in the late 1990s, Digimarc competed in an open, competitive bid process by  
27 the DVD Copy Control Association (DVD-CCA) to protect movies from piracy. “The  
28 DVD-CCA includes the leading companies from the motion picture, computer, and

1 consumer electronics industries. The DVD-CCA decided on Aug. 1, 2002, that the  
2 offered technologies from Digimarc and its competitors were inadequate. An interim  
3 solution was announced by the DVD-CCA on Sep. 15, 2003.” Ex. A, 3:4-24. The  
4 interim DVD-CCA solution is no longer in use.

#### 5 Other Prior Art Copy Protection Technologies

6 40. An alternative data protection technique, as described in U.S. Pat. No.  
7 6,539,475 (assigned to NEC Corp.), “has a trigger signal embedded in the data. If the  
8 embedded trigger mark is present, the data is considered to be a scrambled copy. The  
9 device then descrambles the input data if it detects a trigger signal. In the case of an  
10 unauthorized copy that contains a trigger signal with unscrambled data, the  
11 descrambler would render the data useless.” Ex. A, 3:25-34.

12 41. “The principal weakness of this technology lies in the requirement to  
13 remove the protection before the data can be used. If an authorized person is able to  
14 insert the recording device after the descrambling, an unprotected and descrambled  
15 copy of the data can be made.” Ex. A, 3:34-39.

16 42. In another copy protection scheme, U.S. Pat. No. 6,684,199 (assigned to  
17 the Recording Industry Association of America), discloses a system that authenticates  
18 data by introducing an authentication key in the form of a predetermined error. “The  
19 purpose is to prevent piracy through unauthorized access and unauthorized copying of  
20 the data stored on the media disc. While it is one of the few techniques in which the  
21 embedded watermark data survives when the media is converted between digital and  
22 analog forms, it remains vulnerable to signal processing analysis by hackers for  
23 watermark detection, removal, and/or alteration.” Ex. A, 3:40-47.

#### 24 **MZ Audio’s Patented Inventions Overcame Prior Art Technology Failures**

25 43. Given their background, research interests in audio engineering and data  
26 protection, and academic environment at the University of Rochester, which houses the  
27 Eastman School of Music—one of the world’s premiere music schools—Dr. Bocko  
28

1 and Dr. Ignjatovic were closely aware of the technological defects exposed by SDMI's  
2 hackers challenge and created novel inventions to overcome those defects.

3 44. In addition, to further develop the inventors' new technology, Dr. Bocko  
4 successfully applied for and received a research grant from the U.S. Air Force  
5 Research Laboratory ("AFRL"). Under the grant from AFRL and in connection with  
6 their research, Dr. Bocko and Dr. Ignjatovic continued to work closely together to  
7 further develop their inventions, including potential military applications.

8 45. "Naturally occurring audio signals such as music or voice contain a  
9 fundamental frequency and a spectrum of overtones with well-defined relative phases.  
10 When the phases of the overtones are modulated to create a composite waveform  
11 different from the original, the difference will not be easily detected. Thus, the  
12 manipulation of the phases of the harmonics in an overtone spectrum of voice or music  
13 may be exploited as a channel for the transmission of hidden data." Ex. A, 4:14-21.

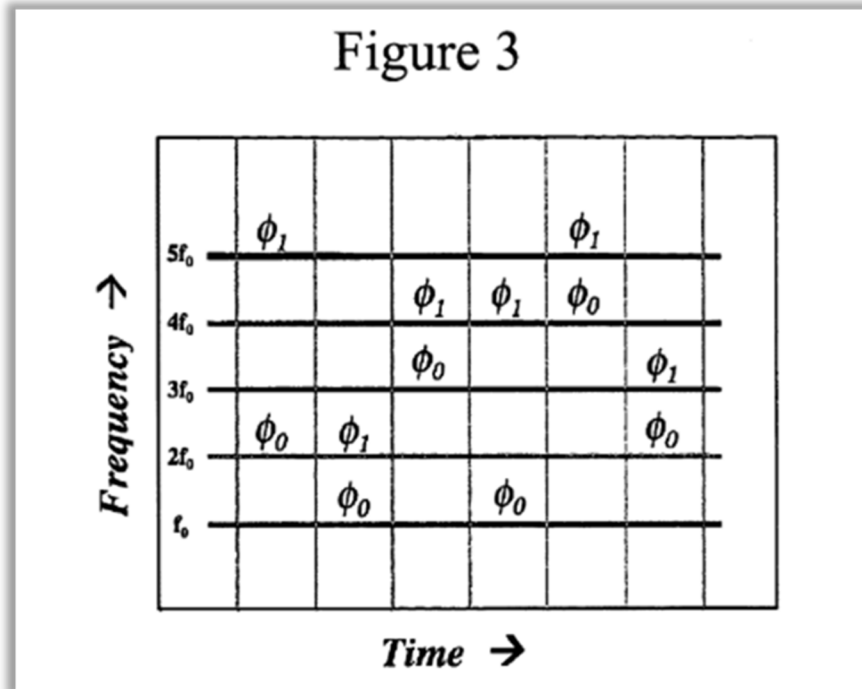
14 46. Overcoming the technical failures of the prior art, the inventions  
15 described and claimed in the Asserted Patent are directed to a technique in which the  
16 phase of certain chosen components of the host audio signal is manipulated.

17 47. Specifically, the inventors recognized the fact that these phases are  
18 apparently random presents an opportunity to replace the phase in the original sound  
19 file with any pseudo-random sequence in which one may embed hidden data.

20 48. According to the Asserted Patent, data is embedded in an audio signal for  
21 watermarking, steganography, or other purposes. The audio signal is divided into time  
22 frames. In each time frame, the relative phases of one or more frequency components  
23 are shifted to represent the data to be embedded. In one embodiment, two frequency  
24 components are selected according to a pseudo-random sequence, and their relative  
25 phase is shifted. In another embodiment, the phases of one or more overtones relative  
26 to the fundamental tone are quantized.

27 49. In one embodiment of the invention in the Asserted Patent, illustrated  
28 below, during each time frame one selects a pair (or more) of frequency components of

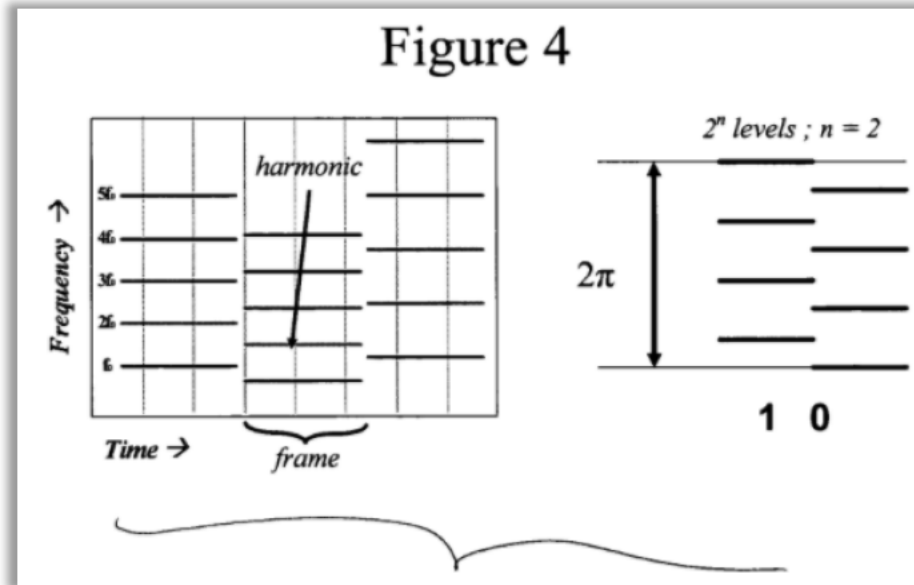
1 the spectrum and re-assigns their relative phases. The choice of spectral components  
2 and the selected phase shift can be chosen according to a pseudo-random sequence  
3 known only to the sender and receiver. To decode, one must compute the phase of the  
4 spectrum and correlate it with the known pseudo-random carrier sequence.



17 See Ex. A, Fig 3.

18 50. More specifically, one embodiment of the inventions of the Asserted  
19 Patent relates to a phase encoding scheme in which information is inserted as the  
20 relative phase of a pair of partials  $\phi_0$ ,  $\phi_1$  in the sound spectrum. In each time frame a  
21 new pair of partials may be chosen according to a pseudo-random sequence known  
22 only to the sender and receiver. The relative phase between the two chosen spectral  
23 components is then modified according to a pseudo-random sequence onto which the  
24 hidden message is encoded.

25 51. Another embodiment of the inventions of the Asserted Patent, called the  
26 Relative Phase Quantization Encoding Scheme or the Quantization Index Modulation  
27 (QIM) scheme, is illustrated below.



See Ex. A, Fig 4.

52. In this embodiment, the following steps are employed. First, one computes the spectrum of a frame of audio data, then selects an apparent fundamental tone and its series of overtones as shown in the left plot of the figure above. Then, two of the overtones in the selected series are “relative phase quantized” according to one of two quantization scales, as shown on the right. The choice of quantization levels indicates a “1” or “0” datum. The relative phase-quantized spectrum is then inversely transformed to convert back to the time domain. This embodiment uses a variable set of phase quantization steps.

53. The inventions of the Asserted Patent have the advantage over prior art of being undetectable and robust to blind signal processing attacks and of being uniquely robust to digital to analog conversion processing.

54. While the prior art technologies for audio watermarking were susceptible to hacking, the inventions of the Asserted Patent involve application of the watermark to the audio channel in a way that resists hacking. For example, because tampering with the audio watermarking technology of the Asserted Patent would require detection and further manipulation of every intentionally-introduced phase shift against a complex backdrop of apparently random phase relationships among the partials—and

1 doing so would be difficult—the technology of the Asserted Patent remains  
2 undetectable and resistant to hacking.

3 55. Unlike the prior art technology which remained vulnerable to signal  
4 processing analysis by hackers, the inventions of the Asserted Patent allow the phase  
5 manipulation, and thus the hidden data such as a watermark, to be detected by a  
6 receiver with the proper “key.” Without the key, the hidden data is undetectable, both  
7 aurally and via blind digital signal processing attacks.

8 56. While most of the prior art technologies did not survive conversion from  
9 digital to analog, the inventions of the Asserted Patent allow a robust data recovery  
10 after digital-to-analog and back to digital conversion, even if the audio quality has  
11 been significantly degraded in the process. As the inventors disclosed, their “invention  
12 has the advantage over [then-]existing Verance algorithms of being undetectable and  
13 robust to blind signal processing attacks and of being uniquely robust to digital to  
14 analog conversion processing. The present invention can be used to watermark movies  
15 by applying the watermark to the audio channel in such a way as to resist detection or  
16 tampering.” Ex. A, 4:31-37.

17 **OVERVIEW OF SONY’S INFRINGEMENT OF THE ASSERTED PATENT**

18 57. Sony is a global technology company engaged in the coordinated  
19 development, design, production, manufacture, and sale of game and network services,  
20 music, motion pictures, electronics products and solutions, imaging and sensing  
21 solutions, financial services, and other products and services. Sony operates as the  
22 world’s largest video game console company and the largest video game publisher, and  
23 is also one of the world’s largest film studios.

24 58. SCA is an indirect, wholly-owned subsidiary of SCGJ and serves as  
25 Sony’s United States headquarters. SCA manages Sony’s United States-based business  
26  
27  
28



1 and recorded consolidated annual sales of approximately \$76.67 billion USD for the  
2 fiscal year ending March 31, 2020. SCA employs approximately 114,400 people.<sup>1</sup>

3 59. SPE is a subsidiary of SCA and is the television and film  
4 production/distribution unit of Sony. For example, SPE acquires, produces, and  
5 distributes motion pictures, television programs, and recorded video, including film  
6 franchises such as Spider-Man, The Karate Kid, Ghostbusters, Men in Black, and Bad  
7 Boys.

8 60. SIEL is a subsidiary of SCA and is Sony's video game and digital  
9 entertainment arm. SIEL oversees the research and development, production, and sales  
10 of the hardware and software for Sony's PlayStation video game systems. SIEL also  
11 develops and publishes video game titles.

12 61. SEI is a subsidiary of SCA and provides audio-visual products, such as  
13 televisions, Blu-ray and DVD players, projectors, home theater products, still and  
14 video cameras, portable audio, smartphones, and mobile entertainment devices.

15 62. On information and belief, SPE, SIEL, SEI, and SCA act as the agents of  
16 SGCJ with respect to Sony's infringement of MZ Audio's Asserted Patent.

17 63. On information and belief, SGCJ controls and receives financial benefits  
18 from SPE, SIEL, SEI, and SCA resulting from Sony's infringement of the Asserted  
19 Patent. For example, SGCJ, SCA, SPE, SEI, and SIEL file consolidated financial  
20 statements and consolidated balance sheets.<sup>2</sup>

21 64. SGCJ publicly represents that its "principal U.S. businesses include Sony  
22 Electronics Inc., Sony Interactive Entertainment LLC., Sony Pictures Entertainment  
23 Inc., Sony Music Entertainment and Sony Music Publishing."<sup>3</sup> SGCJ describes  
24 Pictures, Electronics Products and Solutions, and Game and Network Services as  
25

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26 <sup>1</sup> See [https://www.sony.com/en\\_us/SCA/who-we-are/overview.html](https://www.sony.com/en_us/SCA/who-we-are/overview.html).

27 <sup>2</sup> See [https://www.sony.com/en/SonyInfo/IR/library/FY2020\\_20F\\_PDF.pdf](https://www.sony.com/en/SonyInfo/IR/library/FY2020_20F_PDF.pdf).

28 <sup>3</sup> See [https://www.sony.com/en\\_us/SCA/who-we-are/overview.html](https://www.sony.com/en_us/SCA/who-we-are/overview.html).

1 “segments” of SG CJ.<sup>4</sup> SG CJ has announced that its “U.S. subsidiaries are responsible  
2 for U.S. sales.” *See Solas OLED Ltd. v. LG Display Co., LTD, et al.*, No. 6:19-cv-  
3 00236, Dkt. No. 107 at 4 (W.D. Tex. Sept. 10, 2020) (attached as **Exhibit B**).

4 65. On information and belief, SG CJ directed and controlled the actions of  
5 SCA, SPE, SIEL, and SEI as relating to Sony’s strategy for the manufacture and sales  
6 of the infringing products and performance of infringing methods, and SG CJ has  
7 participated in the management of SCA, SPE’s, SIEL’s, and SEI’s manufacture and  
8 sales of the accused products and performance of the claimed methods.

9 66. For example, on information and belief, SG CJ directed and controlled a  
10 Sony-wide strategy for Sony to adopt, use, and deploy devices and methods that  
11 infringe MZ Audio’s Asserted Patent—including making decisions as to which Blu-  
12 ray content protection technology to use and how to use it within Sony—particularly  
13 where disagreements emerged between its wholly-owned subsidiaries like SPE (which  
14 creates content it wanted protected) and SEI/SIEL (which makes devices that play, and  
15 thus must protect, SPE’s content). On information and belief, SG CJ chose to adopt the  
16 infringing technology and required its wholly-owned entities to coordinate and work  
17 together to implement the infringing technology.

18 67. A few years later, around 2013 when SG CJ sponsored the development of  
19 the infringing FMP-X devices—originally called F1 to reflect SG CJ’s strategy of  
20 “Four K by One Sony”—it assembled and directed a global cross-company team  
21 (including SPE, SIEL, and SEI) to ensure company-wide alignment and common  
22 understanding of phase one service planning. On information and belief, members of  
23 the global 4K by One Sony team included personnel from SG CJ, SCA, SEI, and SPE.  
24 Such planning included establishing and coordinating efforts and workflows amongst  
25

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26  
27 <sup>4</sup> *See*

28 [https://www.sony.com/en/SonyInfo/IR/library/download/sony\\_group\\_summary\\_E.pdf](https://www.sony.com/en/SonyInfo/IR/library/download/sony_group_summary_E.pdf).

1 Sony entities for embedding and detecting the infringing watermark technology at  
2 issue here to block playback of illegally copied content.

3 68. On information and belief, SPE, SIEL, and SEI make, offer to sell, sell,  
4 and distribute the infringing products and practice the claimed methods in the United  
5 States and in this District on behalf of SGCJ. On information and belief, SGCJ, SPE,  
6 SIEL, SEI, and SCA derive substantial revenue from sales of the accused products and  
7 performance of the claimed methods in the United States by SPE, SIEL, and SEI.

8 **Sony's Leadership Role in Promoting and Adopting the Infringing Technology**

9 69. Sony is one of the world's largest producers of copyrighted audio and  
10 visual content. When distribution and peer-to-peer sharing of unauthorized music by  
11 entities such as Napster began, Sony became intimately aware of the potential losses to  
12 revenue streams resulting from unprotected music content.

13 70. Based on Sony's wide-ranging investments in production and distribution  
14 of copyrighted video and audio data, Sony has long been a proponent of technologies  
15 aimed at copy protection for such data.

16 71. For example, with respect to pirated audio content from Napster and  
17 similar entities, as early as August 2000, SPE's senior VP Steve Heckler stated:

18 The industry will take whatever steps it needs to protect itself and protect  
19 its revenue streams . . . It will not lose that revenue stream, no matter what  
20 . . . Sony is going to take aggressive steps to stop this. We will develop  
21 technology that transcends the individual user. We will firewall Napster at  
22 source – we will block it at your cable company. We will block it at your  
23 phone company. We will block it at your ISP. We will firewall it at your  
24 PC... These strategies are being aggressively pursued because there is  
25 simply too much at stake.

26 See [https://www.theregister.com/2000/08/23/we\\_will\\_block\\_napster/](https://www.theregister.com/2000/08/23/we_will_block_napster/).

27 72. Around the same time, Sony was separately developing Blu-ray Disc  
28 technology to replace the DVD format. The main application for which Sony was  
developing the Blu-ray Disc format was as a medium for high-definition video  
material like full-length movies and video games. Sony created the first Blu-ray Disc  
prototypes in October 2000.

1 73. Based on Sony’s leadership role in developing Blu-ray technology, it  
2 formed a consortium of nine leading electronic companies, including Sony, called  
3 “Blue-ray Disc Founder Group” of the Blu-ray Disc Association (“BDA”) in February  
4 2002. BDA is the Sony-initiated industry consortium that developed and licenses Blu-  
5 ray Disc technology and is responsible for establishing format standards and promoting  
6 business opportunities for Blu-ray Disc. Sony released the first consumer Blu-ray Disc  
7 player in April 2003 in Japan only. No movies were released for this player because  
8 movies studios—like SPE—refused to make and release content for such players  
9 unless and until Blu-ray Disc players had suitable digital rights management content  
10 protection.

11 74. Blu-ray Disc players appeared in the U.S. and globally in 2006. The first  
12 six Blu-ray Discs titles were released on June 20, 2006, and 5 of the 6 were released by  
13 Sony: *50 First Dates*, *The Fifth Element*, *Hitch*, *House of Flying Daggers*,  
14 *Underworld: Evolution*, *xXx* (all Sony), as well as MGM’s *The Terminator*.

15 75. Sony’s PlayStation 3 (“PS3”) included a Blu-ray Disc player and was  
16 released in November 2006. It was the first dedicated game device with a Blu-ray Disc  
17 player.

18 76. Given Sony’s first-hand experience with losses due to unauthorized use of  
19 its music content, Sony also had a substantial interest in minimizing such losses from  
20 pirated or bootlegged film content from the new Blu-ray Disc technology format.

21 77. To ensure interoperability of Blu-ray Discs and devices, various  
22 specifications and standards were developed and adopted. One of those specifications  
23 is the Advance Access Content System (“AACCS”)—a specification for managing  
24 content stored on the next generation of prerecorded and recorded optical media for  
25 consumer use. AACCS’s technology was intended to offer a technological protection  
26 mechanism for content made available on Blu-ray Discs.

27 78. The AACCS Licensing Administrator (“AACCS LA”) is a cross-industry  
28 consortium that was formed to develop, promote, and license AACCS technology to

1 content providers, content aggregators, and device manufacturers. The AACCS LA  
2 founders consist of a small number of leading technology companies, including Sony,  
3 IBM, Intel, Microsoft, Panasonic, Disney, Toshiba, and Warner Bros.

4 79. Sony actively participated in AACCS legal and business working groups,  
5 which influenced and guided AACCS policy and strategy. On information and belief,  
6 Sony's leadership in AACCS included monthly meetings and multiple hours of phone  
7 calls per week.

8 80. In 2009, based at least in part on Sony's advocacy as a creator of the Blu-  
9 ray Disc format, and as the only founder of AACCS LA that both owns film studios as  
10 content creator and also owns manufacturers of content-playing devices—and based in  
11 part on Sony's early adoption and use of the technology itself—AACCS LA adopted  
12 copy protection technology called Cinavia, which was publicly released by Verance  
13 Corporation long after the date of the inventions claimed in MZ Audio's Asserted  
14 Patent and adopted by Sony, which became an evangelist and promoter of the  
15 technology.

### 16 **Press Releases / Announcements**

#### 17 **AACCS Issues Final Agreements, Enabling Commercial Deployment of Cinavia in Blu-ray** 18 **Disc Players**

19 **June 5, 2009** SAN DIEGO, CA – AACCS LA, LLC today issued final technical specifications and license  
20 agreements for their content protection solution for the Blu-ray Disc format, enabling consumer electronics  
21 manufacturers and computer software vendors to immediately begin including Verance's Cinavia technology  
in Blu-ray Disc players. Cinavia employs Verance's audio watermark technology to extend the existing  
content security architecture for Blu-ray Disc to protect against the use of unauthorized copies of commercial  
movies, such as those which originated from in-theater camcording or "ripped" DVDs.

22 See Press Releases / Announcements  
23 ([https://web.archive.org/web/20091009025320/http://www.verance.com/AdminSavR/news/news\\_item.php?news\\_id=42](https://web.archive.org/web/20091009025320/http://www.verance.com/AdminSavR/news/news_item.php?news_id=42)).

24 81. Cinavia employs a digital watermark into the audio signal of audio  
25 recordings in audiovisual content, enabling copy protection solutions for content  
26 owners.

1 82. When media with the watermark is played back on a system with Cinavia  
2 detection, the system's firmware will detect the media's watermark and check that the  
3 media is authorized to play on the device. If the media is not authorized (such as in the  
4 case of a pirated or bootlegged copy of the media), a message is displayed to the user  
5 stating that the media is not authorized for playback on the device.

6 83. Sony was not only an early first adopter and evangelist for widespread  
7 adoption and use of the Cinavia technology—Sony and Verance worked so closely  
8 together on the technology and its promotion that Cinavia created a revolving door  
9 between Sony and Verance for employees and senior executives whereby Sony has  
10 employed multiple former Verance executives, and Verance leadership has similarly  
11 included a number of former Sony executives. For example,

- 12 • **Mitch Singer** served as SPE's chief digital strategy officer from 1991-2014 and,  
13 for at least part of that time, as SPE's chief technology officer as well. From 2008,  
14 Mr. Singer also served as President of the Digital Entertainment Content Ecosystem  
15 ("DECE")—a consortium of companies involved in the digital distribution of  
16 digital content, where he advocated for the use of Cinavia technology for 4K digital  
17 content and devices. Mr. Singer has stated that he first became aware of Cinavia  
18 during its early development stage, when he was CTO of Sony Pictures. When Mr.  
19 Singer left Sony in 2014, he was named Special Advisory, Industry Affairs at  
20 Verance, where he has also served as a consultant because, he has stated, he so  
21 strongly believes in the technology. Singer, whose role at Sony included  
22 responsibility for anti-digital theft and digital rights management, has also stated  
23 publicly: "At Sony Pictures, I saw firsthand how the Cinavia content protection  
24 technology drives additional sales by changing consumer viewing habits from  
25 piracy to purchase."
- 26 • **Don Eklund**, former EVP of Sony Pictures Technology for SPE, left Sony after 24  
27 years to become Verance's Vice President of Business Development for nearly 3  
28 years (2012-2015), before subsequently returning to Sony in 2015 to serve as



1 SCA's Senior Vice President of New Formats and then as SPE's EVP Chief  
2 Technology Officer starting in 2017.

- 3 • **Richard Glosser**, former President of Columbia TriStar Interactive, and EVP,  
4 Sony Online Entertainment (both for SPE) for more than 11 years, became Head of  
5 Business Development at Verance in 2016 and continues in that role today.
- 6 • **Scott Levine**, Verance's former VP of Business Development for more than 2  
7 years, later served as Sony Music Entertainment's SVP of Corporate Development.
- 8 • **Hiroshi Tobita**, former Assistant Manager (2002-2006), and Business  
9 Development Manager at SGCJ (then "Sony Corporation") for more than 6 years  
10 (2008-2015), and also serving as a Director of Sony Computer Entertainment Inc.  
11 (2009-2015), left Sony to serve as Verance's Country Manager in Japan.
- 12 • **Jeffrey Persek**, served on Verance's Product Team as Technical Services Analyst /  
13 Product Tracking Specialist (2012-2014), where he performed IP Protection by  
14 monitoring protected media across multiple networks for security threats and  
15 product issues, and escalated viable threats to management. Mr. Persek left Verance  
16 for SPE directly to serve on SPE's Product Team as a Technical Operations  
17 Specialist and Product Manager (2014-2017).

18 84. Sony has widely advocated for the use of Cinavia and has adopted  
19 Cinavia content protection across the spectrum of its content and devices, even before  
20 Cinavia was required for Blu-ray devices. Sony's current and/or former executives,  
21 including at least Mitch Singer, have stated publicly that before Sony adopted and  
22 promoted Cinavia technology, one of the obstacles to such content protection was that  
23 voluntary detection by players of content was resisted because device manufacturers  
24 did not care if their devices were used to play unauthorized content. In fact, many  
25 device makers believed it gave them a commercial advantage with motion picture  
26 content because it was becoming easy to find on P2P sites, torrents, etc. Further,  
27 studios that create content did not have direct deals in place with device manufacturers  
28 necessary for such content protection. That changed when Sony showed the way with



1 Sony producing both the content protected with Cinavia watermarks, as well as the  
2 players that could protect such content with detectors of those watermarks.

3 85. In particular, Cinavia was first introduced as an optional component in  
4 Blu-ray Disc players and recorders in July 2009, and Sony was the earliest first  
5 adopter.

6 86. In November 2009, Sony released PS3 firmware update v3.10, which  
7 included Cinavia content protection.

8 87. As another example, Cinavia was identified as a required component of  
9 next-generation video services in MovieLabs' guidelines for 4K Ultra-HD content  
10 protection and has been integrated into Sony's 4K Ultra-HD media players.

11 88. Sony's theatrical soundtracks, Blu-ray Discs, and related media ("Sony's  
12 Media Content") utilize Cinavia content protection to prevent playback of  
13 unauthorized Sony content. For example, there are almost 2,000 Sony-produced Blu-  
14 ray titles currently available.

15 89. In 2010, the public began to become aware of the content protection  
16 provided by Cinavia when the movie *The Wolfman* was released on February 12.  
17 Unauthorized copies of the film—protected by Cinavia—would not play correctly,  
18 particularly on the PS3.

19 90. Cinavia has been mandatory for all new Blu-ray players to receive  
20 certification since 2012. It is likewise an industry requirement for UHD/4K players.  
21 The Cinavia technology has also been integrated into consumer electronics devices,  
22 software players, and components.

23 91. On information and belief, all Sony Blu-ray Disc players sold within the  
24 last six years, including Sony game and entertainment consoles, as well as standalone  
25 Blu-ray Disc players, utilize Cinavia content protection to prevent playback of  
26 unauthorized content.

### **Sony's Knowledge of the Asserted Patent**

1  
2 92. On information and belief, Sony has long been aware of MZ Audio's  
3 Asserted Patent and its infringement of that patent.

4 93. In particular, at least since August 2010, MZ Audio's Asserted Patent has  
5 been discussed or referenced repeatedly and on many different sites and forums that  
6 Sony routinely monitors. For example, on or around August 2010, users of the internet  
7 forum RedFox disclosed the Asserted Patent as being related to the Cinavia  
8 technology, and the same information was reposted in other forums, including  
9 Doom9's forum for DVD technology, and AVSForum..

10 94. In addition, since January 2013 and every day thereafter including to this  
11 day, the Asserted Patent has been listed on Cinavia's Wikipedia page, and it is the only  
12 non-Verance patent identified as pertinent to the accused technology. Further, the  
13 Asserted Patent was identified on the Talk\_Cinavia Wikiwand in September 2012, and  
14 was identified as an apparent Cinavia patent.

15 95. Sony conducts routine monitoring of internet forums and sites for  
16 potential acts of piracy of Sony's Media Content. Sony, as an AACS founder, has also  
17 participated in and been informed of anti-piracy actions taken against certain sites or  
18 companies such as DVDFab, DVD Ranger, and SlySoft (a.k.a., RedFox) who have  
19 been attempting for years to hack Cinavia and disable its content protection ability. For  
20 example, SlySoft/RedFox was known to Sony as one of the most prominent and  
21 notorious hacker groups working to defeat the Cinavia technology. On information and  
22 belief, Sony routinely monitors forums like RedFox to not only identify and eliminate  
23 potential acts of piracy but to also gauge publicity regarding Sony's anti-piracy efforts  
24 related to Cinavia.

25 96. In addition, Verance monitors the same sites and forums, and would  
26 likewise have taken note of references to the Asserted Patent in such forums and other  
27 forums where the Asserted Patent has been associated with Cinavia as described  
28 above. Based on the revolving door between Sony and Verance for senior executives

1 as established, supra, on information and belief, Sony gained knowledge of the  
2 Asserted Patent at least from Verance, or while its executives were at Verance and then  
3 returned to Sony.

4 97. Because the Asserted Patent has been openly associated with Cinavia  
5 technology in several forums—including those Sony regularly monitors and is likely to  
6 monitor—Sony has had knowledge of the Asserted Patent and its infringement or has  
7 been willfully blind to the same prior to the filing of this Complaint.

8 98. Sony has also had detailed knowledge of its infringement since the filing  
9 of a voluntarily dismissed complaint alleging infringement of the Asserted Patent in  
10 *MZ Audio Sciences v. Sony Group Corp. (Japan), et al.*, No. 1:21-cv-01663 (D. Del.  
11 Nov. 24, 2021), where Sony’s counsel asserted that venue is improper for certain  
12 infringing Sony entities, and refused to stipulate to proceeding in Delaware where most  
13 of its separately incorporated U.S. entities chose to form. As a result, MZ Audio files  
14 in this District where venue is not only proper for all of the infringing Sony  
15 Defendants—it is Sony’s global hub for the content it produces—and for the content it  
16 protects through its infringement of the Asserted Patent.

17 **COUNT I**

18 **(DIRECT INFRINGEMENT OF U.S. PATENT NO. 7,289,961)**

19 99. Plaintiff re-alleges and incorporates by reference the allegations in the  
20 foregoing paragraphs as if fully set forth herein.

21 100. Plaintiff is informed and believes, and on that basis alleges, that Sony has  
22 directly infringed and is currently directly infringing one or more claims of the  
23 Asserted Patent, in violation of 35 U.S.C. § 271(a). Exemplary claims of the Asserted  
24 Patent are set forth below but Plaintiff’s claims in this action, and Sony’s infringement,  
25 are not limited to these exemplary claims.

26 **A. Sony’s Direct Infringement of Device Claim 9**

27 101. Sony’s Blu-ray players and PlayStations are devices that extract  
28 embedded data from an audio signal using the Cinavia Detector technology. Sony

1 makes, uses, sells, offers to sell, and/or imports within this District and elsewhere in  
2 the United States, infringing Blu-ray media players and PlayStations (the “Infringing  
3 Players”).

4 102. Sony’s Infringing Players include, without limitation, all Sony devices  
5 capable of playing Blu-ray, including but not limited to the following exemplary Blu-  
6 ray media players and PlayStations, as well as comparable models that operate as  
7 described in the Infringement Count:

- 8 • UBP-X700/M - 4K Ultra HD Blu-ray™ Player with Dolby Atmos®,  
9 HDR, Wi-Fi for Streaming Video, and HDMI Cable;
- 10 • UBP-X700 - 4K Ultra HD Blu-ray™ Player with Dolby Atmos®, HDR,  
11 and Wi-Fi for Streaming Video;
- 12 • BDP-S3700 - Blu-ray™ Player with Built-in Wi-Fi;
- 13 • BDP-S1700 - Blu-ray™ Player with Wired Streaming;
- 14 • UBP-X800M2 - 4K Ultra HD Blu-ray™ Player with Dolby Atmos®,  
15 HDR, and Wi-Fi for Streaming Video;
- 16 • BDP-S6700 - Blu-ray™ Player with 4K Upscaling and Wi/Fi for  
17 Streaming Video;
- 18 • BDP-BX370 Blu-ray Disc Player with built-in Wi-Fi and HDMI cable;
- 19 • UBP-X1100ES 4K UHD Home Theater Streaming Blu-ray Player with  
20 HDR;
- 21 • FMP-X1 4K Ultra HD Media Player;
- 22 • FMP-X10 Ultra HD Media Player;
- 23 • All PlayStation 3 models, including CECHxxx;
- 24 • All PlayStation 3 Super Slim models, including CECH-40xxA, CECH-  
25 42xxA, CECH-43xxA, CECH-40xxB, CECH-42xxB, CECH-40xxC,  
26 CECH-42xxC, and CECH-43xxC;
- 27 • All PlayStation 4 models, including CUH-10xx, CUH-11xx and CUH-  
28 12xx;

- 1 • All PlayStation 4 Slim models, including CUH-20xx;
- 2 • All PlayStation 4 Pro models, including CUH-70xx;
- 3 • All PlayStation 5 models, including CFI-1xxxx, CFI-1015A, CFI-1015B,
- 4 CFI-1018A, and CFI-11xxx.

5 103. Sony has infringed and is currently infringing literally and/or under the  
6 doctrine of equivalents, by, among other things, making, using, offering for sale,  
7 selling, and/or importing in the United States, without license or authority, infringing  
8 products, including without limitation Sony's Infringing Players and related products  
9 and/or processes falling within the scope of one or more claims of the Asserted Patent,  
10 including Claim 9, reproduced below:

11 9. A device for extracting embedded data from an audio signal, the device  
12 comprising:  
13 an input for receiving the audio signal;  
14 a processor, in communication with the input, for:  
15 (a) dividing the audio signal into a plurality of time frames and, in each  
16 time frame, a plurality of frequency components;  
17 (b) in each of at least some of the plurality of time frames, selecting at  
18 least two of the plurality of frequency components;  
19 (c) determining a phase shift which has been applied to at least one of the  
20 plurality of frequency components in accordance with the embedded data;  
21 and  
22 (d) from the phase shift determined in step (c), extracting the embedded  
23 data; and  
24 an output for outputting the embedded data, wherein the processor  
25 preforms step (b) by selecting a fundamental tone and at least one  
26 overtone.

27 104. Sony's acts of making, using, offering for sale, selling, and/or importing  
28 infringing products, including but not limited to their Infringing Players and related

1 products and/or processes satisfy, literally or under the doctrine of equivalents, each  
2 and every claim limitation of the Asserted Patent, including but not limited to  
3 limitations of claim 9.

4 105. Specifically, Sony’s Infringing Players (sold by at least SIEL and SEI) are  
5 Cinavia-enabled devices for extracting embedded data from an audio signal,  
6 comprising (1) an input for receiving the audio signal; (2) a processor, in  
7 communication with the input, for: (3) dividing the audio signal into a plurality of time  
8 frames and, in each time frame, a plurality of frequency components; (4) in each of at  
9 least some of the time frames, selecting at least two frequency components, including  
10 selecting a fundamental tone and at least one overtone; (5) determining a phase shift of  
11 at least one of the frequency components; (6) extracting the embedded data determined  
12 from the phase shift; and (7) an output for outputting the embedded data.

13 106. Sony’s Infringing Players meet each and every limitation of Claim 9.  
14 Sony’s BDP-S6700 Blu-ray Player (“BDP-S6700”) and PlayStation 4 (“PS4”) are  
15 representative of Sony’s Infringing Players.

16 107. In accordance with Cinavia specifications and BDA and AACCS  
17 agreements, licenses, and rules, a watermark is embedded in the audio signal of media  
18 content. Sony’s Infringing Players, as described below, detect, extract and decode the  
19 embedded watermark, enabling the Infringing Players to stop unauthorized use of  
20 media content.

1 108. Sony's Infringing Players are devices that extract embedded data from an  
2 audio signal. Screenshots of representative Sony Infringing Players are below,  
3 including Sony's BDP-S6700 and PS4, respectively.



10 See BDP-S6700 Blu-ray Player with 4K Upscaling and Wi-Fi for Streaming Video  
11 (<https://electronics.sony.com/tv-video/Blu-ray-dvd-players/Blu-ray/p/bdps6700>).



22 See Buy PlayStation®4 1TB Console ([https://www.playstation.com/en-us/ps4/buy-](https://www.playstation.com/en-us/ps4/buy-ps4/)  
23 [ps4/](https://www.playstation.com/en-us/ps4/buy-ps4/)).



1 109. Sony’s Infringing Players utilize Cinavia technology to extract embedded  
2 data from an audio signal.

3 **Cinavia Notice**

4 This product uses Cinavia technology to limit  
5 the use of unauthorized copies of some  
6 commercially-produced film and videos and  
7 their soundtracks. When a prohibited use of an  
8 unauthorized copy is detected, a message will  
9 be displayed and playback or copying will be  
10 interrupted.

11 See SONY Blu-ray Disc™ / DVD Player Operating Instructions (“Operating  
12 Instructions”) at 6  
13 ([https://www.sony.com/electronics/support/res/manuals/4579/42aa85036c579891f1d8  
14 83848c9f88f1/45796691M.pdf](https://www.sony.com/electronics/support/res/manuals/4579/42aa85036c579891f1d883848c9f88f1/45796691M.pdf)).

15 Cinavia Notice

16 This product uses Cinavia technology to limit the use of unauthorized copies of some  
17 commercially-produced film and videos and their soundtracks. When a prohibited use of an  
18 unauthorized copy is detected, a message will be displayed and playback or copying will be  
19 interrupted.

20 See PlayStation®4 User’s Guide, Intellectual Property Notices  
21 (<https://manuals.playstation.net/document/en/ps4/others/notices.html>).

22 110. Sony’s Infringing Players contain and use Cinavia Detectors to extract the  
23 watermark from the audio signal embedded in media content.

24 **3.3 Detector**

25 The Cinavia Detector performs the function of analyzing audio signals, identifying the presence of Watermarks, and  
26 determining the value of Copy Management Payloads embedded within them. Detectors are included in Integrated  
27 Products that employ Cinavia to identify unauthorized uses of specific instances of audiovisual content and enable  
28 the enactment of associated Device Responses. Detectors are also used in devices used in content production and  
distribution environments to verify that content has been properly embedded.

29 See **Exhibit D**, Cinavia System Specification, Ver. 1.3 (October 1, 2011) (“Cinavia  
30 System Specification) at Section 3.3; *see also*, **Exhibit C**, Cinavia System  
Specification, Ver. 1.2 (April 30, 2009) at Section 3.3.

**3.3.1 Detector Integration**

The Detector is applied to all channels of audio content as they are output from the product. A continuous mode of operation is provided, in which detection is applied continuously throughout the content, as well as an intermittent mode, wherein detection is applied to randomly selected portions of the content only.

In intermittent mode, the Detector indicates on an ongoing basis which time periods of content must be screened. In the case of Unmarked Content or authorized uses of Marked Content, the Detector is typically applied to approximately 10% of the content. The Detector may be applied to longer portions of the content to fully identify the Copy Management Payload and determine whether the use meets the conditions for a Product Response.

See Ex. D, Cinavia System Specification at Section 3.3.1.

111. Sony’s Infringing Players include an input for receiving the audio signal.

For example, Sony’s Infringing Players support the Blu-ray Disc format:

Playable discs	
<b>Blu-ray Disc</b> <sup>*1</sup>	BD-ROM BD-R <sup>*2</sup> /BD-RE <sup>*2</sup>
<b>DVD</b> <sup>*3</sup>	DVD-ROM DVD-R/DVD-RW DVD+R/DVD+RW
<b>CD</b> <sup>*3</sup>	CD-DA (Music CD) CD-ROM CD-R/CD-RW Super Audio CD

See Operating Instructions at 40.

**Supported disc formats**

Insert the disc, and then select the content from the content area. Your PS4™ system must enable the disc playback feature over the Internet, one time only, before you can play any BDs or DVDs. After this feature is enabled, your PS4™ system doesn't have to connect to the Internet to play BDs or DVDs.

- Blu-ray Disc
  - BD-ROM<sup>\*1</sup>
  - BD-R/RE (BD-RE, BDMV)
- DVD
  - DVD-ROM
  - DVD-R/RW<sup>\*2</sup> (video mode, VR mode<sup>\*3</sup>)
  - DVD+R/RW<sup>\*2</sup>

See PlayStation®4 User’s Guide, Supported disc formats (<https://manuals.playstation.net/document/en/ps4/videos/videodisc.html>).

112. Further, Sony’s Infringing Players support various file formats or codecs for reading audio and video data from the associated Blu-ray Discs or streaming media:

**Playable types of files**


**Video**

Codec	Container	Extension	With Audio
MPEG-1 Video <sup>*1</sup>	PS	.mpg, .mpeg	Dolby Digital, DTS, LPCM, MPEG
	MKV	.mkv	Dolby Digital, LPCM, AAC, MP3, Vorbis
MPEG-2 Video <sup>*2</sup>	PS <sup>*3</sup>	.mpg, .mpeg	Dolby Digital, DTS, LPCM, MPEG
	TS <sup>*4</sup>	.m2ts, .mts	Dolby Digital, DTS, LPCM, MPEG, AAC
	MKV <sup>*1</sup>	.mkv	Dolby Digital, LPCM, AAC, MP3, Vorbis
Xvid	AVI	.avi	Dolby Digital, LPCM, WMA9, MP3
	MKV	.mkv	Dolby Digital, LPCM, AAC, MP3, Vorbis
MPEG4/AVC <sup>*5</sup>	MKV <sup>*1</sup>	.mkv	Dolby Digital, LPCM, AAC, MP3, Vorbis
	MP4 <sup>*1</sup>	.mp4, .m4v	AAC
	TS <sup>*1</sup>	.m2ts, .mts	Dolby Digital, DTS, LPCM, MPEG, AAC
	Quick Time <sup>*6</sup>	.mov	Dolby Digital, LPCM, AAC, MP3
	FLV <sup>*6</sup>	.flv, .f4v	LPCM, AAC, MP3
	3gpp/3gpp2 <sup>*6</sup>	.3gp, .3g2, .3gpp, .3gp2	AAC
VC1 <sup>*1</sup>	TS	.m2ts, .mts	Dolby Digital, DTS, LPCM, MPEG, AAC
	MKV	.mkv	Dolby Digital, LPCM, AAC, MP3, Vorbis
WMV9 <sup>*1*7</sup>	ASF	.wmv, .asf	WMA9, WMA 10 Pro
	MKV	.mkv	Dolby Digital, LPCM, AAC, MP3, Vorbis
Motion JPEG <sup>*6</sup>	Quick Time	.mov	Dolby Digital, LPCM, AAC, MP3
	AVI	.avi	Dolby Digital, LPCM, AAC, MP3

Format
AVCHD (Ver.2.0) <sup>*1*8*9*10</sup>

See Operating Instructions at 41; *see also id.* at 42.

### Supported file formats

Use  (Media Player) to enjoy videos, photos, and music saved on USB storage devices and media servers. You can play these types of files:

#### Videos

When using a USB storage device, your video files need to be in a folder for your PS4™ system to recognize them. You can view video recorded by a 360-degree omnidirectional camera (in equirectangular video format) on your PS VR. Press the OPTIONS button, and then select [VR Mode].

- MKV
  - Video: H.264/MPEG-4 AVC High Profile Level 4.2
  - Audio: MP3, AAC LC, AC-3 (Dolby Digital)
- AVI
  - Video: MPEG4 ASP, H.264/MPEG-4 AVC High Profile Level 4.2
  - Audio: MP3, AAC LC, AC-3 (Dolby Digital)
- MP4
  - Video: H.264/MPEG-4 AVC High Profile Level 4.2, H.264/MPEG-4 AVC High Profile Level 5.2 (PlayStation®4 Pro only)
  - Audio: AAC LC, AC-3 (Dolby Digital), LPCM
- MPEG-2 PS
  - Video: MPEG2 Visual
  - Audio: MP2 (MPEG2 Audio Layer 2), MP3, AAC LC, AC-3 (Dolby Digital), LPCM
- MPEG-2 TS
  - Video: H.264/MPEG-4 AVC High Profile Level 4.2, MPEG2 Visual
  - Audio: MP2 (MPEG2 Audio Layer 2), AAC LC, AC-3 (Dolby Digital)
- AVCHD (.m2ts, .mts)
- XAVC S™ (.mp4)

#### Photos

When using a USB storage device, your photo files need to be in a folder for your PS4™ system to recognize them. You can view photos captured by a 360-degree omnidirectional camera (in equirectangular image format) on your PS VR. Press the OPTIONS button, and then select [VR Mode].

- JPEG (DCF 2.0/Exif 2.21 compliant)
- BMP
- PNG

#### Music

When using a USB storage device, your music files need to be in a folder named "Music" for your PS4™ system to recognize them. Using DSEE HX™, you can listen to certain audio files (such as MP3) in high-resolution audio. When playing background music, participating in a party, or using the text-to-speech feature, however, audio output is in 48 kHz.

- FLAC
- MP3
- AAC (M4A)

See PlayStation®4 User's Guide, Supported file formats ([https://manuals.playstation.net/document/en/ps4/videos/mp\\_format\\_v.html](https://manuals.playstation.net/document/en/ps4/videos/mp_format_v.html)).

113. Sony's Infringing Players include a processor, in communication with the input:

This Sony Blu-ray player is one of the more feature-rich options available, and it's also relatively affordable. The BDP-S6700 has a dual-core processor, as well as dual-band Wi-Fi for a speedy wireless connection. Everything loads extremely quickly, with a Quick Start mode and Fast Loading to get Blu-ray discs playing almost instantly (in around 30 seconds from when you close the tray).

1 See The 8 Best Blu-ray and Ultra HD Blu-ray Players of 2021, Lifewire  
2 (<https://www.lifewire.com/best-Blu-ray-players-1846400>).

3	<b>Product name</b>	PlayStation®4
4	<b>Product code</b>	CUH-2000 series
5	<b>Main processor</b>	Single-chip custom processor
6		CPU : x86-64 AMD "Jaguar", 8 cores
7		GPU : 1.84 TFLOPS, AMD Radeon™ based graphics engine
8		

9 See Tech Specs, PS4 (<https://www.playstation.com/en-us/ps4/tech-specs/>).

10 114. Moreover, the processors of Sony's Infringing Players utilize Cinavia  
11 technology to extract data from the audio signal received by the input:

12 To facilitate Blu-ray component and player manufacturers with the successful and timely integration of  
13 Cinavia technology with their products, Verance is offering a line of ready-to-use object-code libraries  
14 ("Cinavia Finished Detectors") that implement the Cinavia Detector Specification. This enables Cinavia  
15 Finished Detector customers to reduce their engineering effort, product costs, and time-to-market.

16 Cinavia Finished Detectors have been certified by Verance to comply with the requirements of the Cinavia  
17 Detector specifications. There is no need for additional detector compliance validation or optimization, no  
18 source code to maintain and protect, and no requirement for specialized watermark technology or digital  
19 signal processing (DSP) expertise. Software robustness (i.e., tamper resistance) technology is not included,  
20 and must be applied to products including Finished Detectors prior to sale.

21 For information on obtaining a Finished Detector customized to your SoC or DSP, including custom platforms  
22 and projects, [contact Verance](#).

23 See Cinavia Finished Detectors for Embedded Platforms

24 ([https://web.archive.org/web/20100614004112/http://www.verance.com/products/av\\_fd  
25 \\_program.php](https://web.archive.org/web/20100614004112/http://www.verance.com/products/av_fd_program.php)).

26 115. The processors of Sony's Infringing Players divide the audio signal into a  
27 plurality of time frames. The Cinavia watermark payload is repeated throughout the  
28 audio, so that processors of Infringing Players can detect it in a short time from among  
the plurality of time frames.



### 3.1.2 Capacity

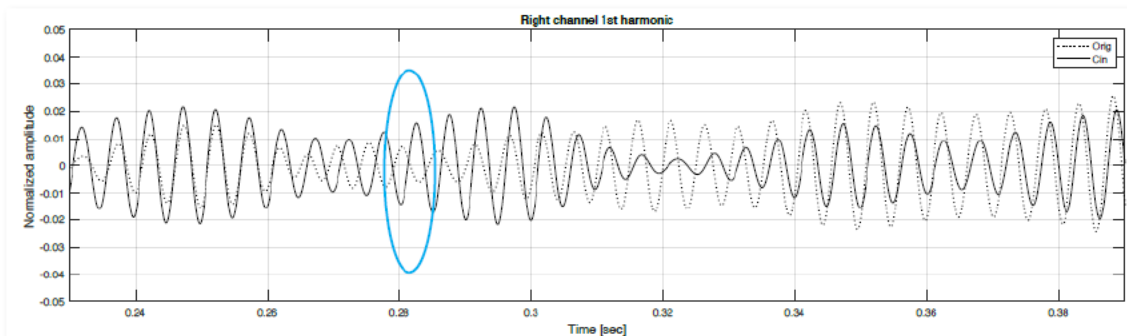
Watermarks are embedded continuously throughout the duration of the content.

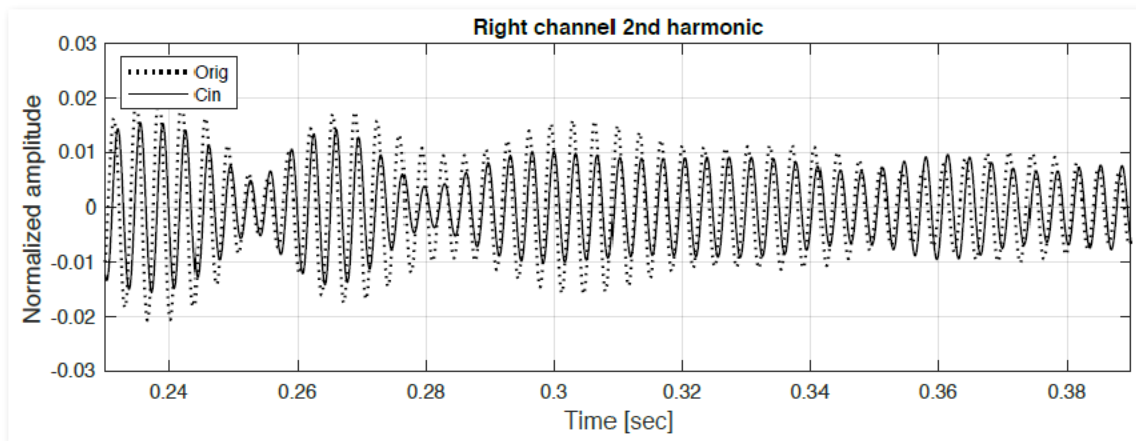
The Cinavia Copy Management Payload contains 8-bits of data, divided among three data fields: the Copy Management Field, the AACs Flag, and the Reserved Field. The Copy Management Field employs four bits to encode a Copy Management State, as discussed above. The AACs Flag employs one bit to indicate whether the content was embedded in accordance with licensing requirements, compliance rules, and specifications established by AACs LA, LLC. The Reserved Field employs the remaining 3 bits and is unused.

The Copy Management Payload is embedded repeatedly throughout Marked Content and can be recovered completely from segments as short as five seconds. The use of all Copy Management Payload fields in Marked Content is mandatory. In the event that multiple Watermarks are embedded within the same content (for example if the Embedder function is applied to the same content more than once in series), the Copy Management Payload associated with both Watermarks will typically remain detectable.

See Ex. D, Cinavia System Specification at Section 3.1.2.

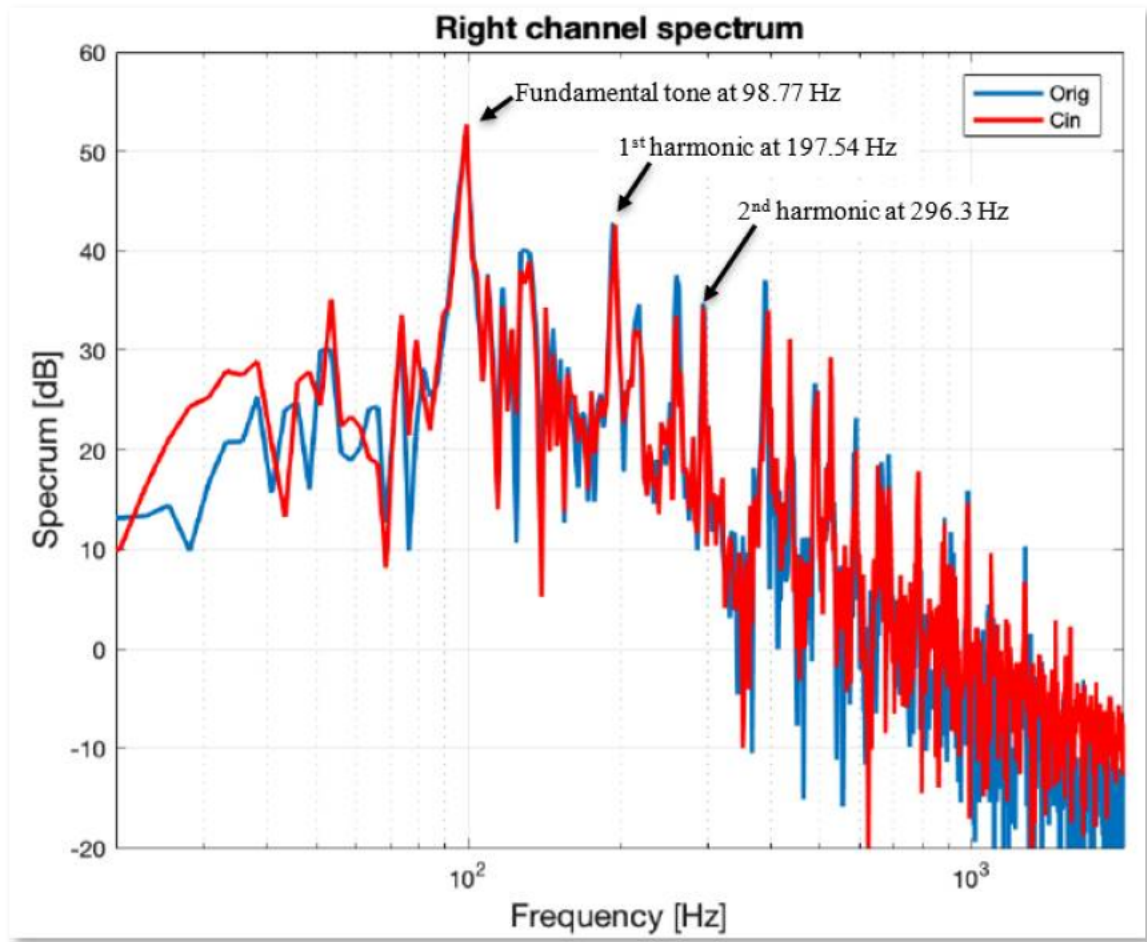
116. Further, comparisons between audio tracks from a movie on a Sony-released Blu-ray Disc with Cinavia watermarking, and the same audio tracks without Cinavia watermarks, reveals that audio watermarked with Cinavia technology exhibits a conspicuous modification in a plurality of frequency components in a time frame, specifically a modification in the phase between a fundamental frequency and one or more harmonic frequencies. For example, in the comparative time waveform graph below, the harmonic at 197.54 Hz shows a phase change of approximately  $\pi$  radians at around 0.281 seconds between the harmonics in the watermark-free (“Orig”) and watermarked (“Cin”) versions. In contrast, the second harmonic at 296.3 Hz is held at a phase difference of approximately 0 radians. These conspicuous and selective phase shifts appear throughout audio watermarked with Cinavia technology.





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9 117. In order to detect or decode such phase shifts, processors of Sony's  
10 Infringing Players divide a time frame into a plurality of frequency components,  
11 selecting a fundamental tone and at least one overtone as shown in the figure on the  
12 following page. That figure depicts the magnitude spectrum overlay of audio  
13 waveforms. The red line ("Cin") represents a waveform from a Sony Blu-ray Disc  
14 movie with a Cinavia watermark embedded in the audio signal. The blue line ("Orig")  
15 represents a waveform from the same movie without the watermark.  
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118. In order to detect such phase shifts between a fundamental and a harmonic frequency, processors of Sony's Infringing Players select at least two of the plurality of frequency components in each of at least some of the plurality of time frames, and determine a phase shift (e.g., a shift to  $\pi$  radians or to 0 radians) which has been applied to at least one of the plurality of frequency components in accordance with the embedded data, to retrieve the embedded data from the watermark to apply content use policies.

### 3 System Architecture

Cinavia employs an Embedder to insert a Watermark containing the Copy Management Payload into the audio portion of audiovisual content prior to its distribution to consumers. The Marked Content can be distributed through any means (although certain configurations of the Watermark can only be distributed in limited ways) and may ultimately be used on Integrated Products and Media Receivers that incorporate the Detector. The Detector enables those products to retrieve the information contained within the Watermark and apply content use policies in accordance with an applicable Supported Specification. The Cinavia system architecture is illustrated in Figure 2. In this example, Integrated Products incorporate Cinavia Detectors and content shown with a water droplet carry the Cinavia watermark.

To facilitate the harmonization of usage policies across multiple platforms, the Cinavia Copy Management Payload includes a common set of Copy Management States that describe the intended authorized uses or use limitations on the content and a common set of policies for their interpretation and response by Integrated Products and Media Receivers.

See Ex. D, Cinavia System Specification at Section 3.

119. The processors of Sony’s Infringing Players extract the embedded data from the audio watermark. The conspicuous phase-shifting observed in the audio shows that Sony’s Infringing Players determine the phase shift in the audio signal to retrieve or extract the embedded data (e.g.,  $0 = 0$ ,  $1 = \pi$ ) in the watermark. See *id.*; see also:

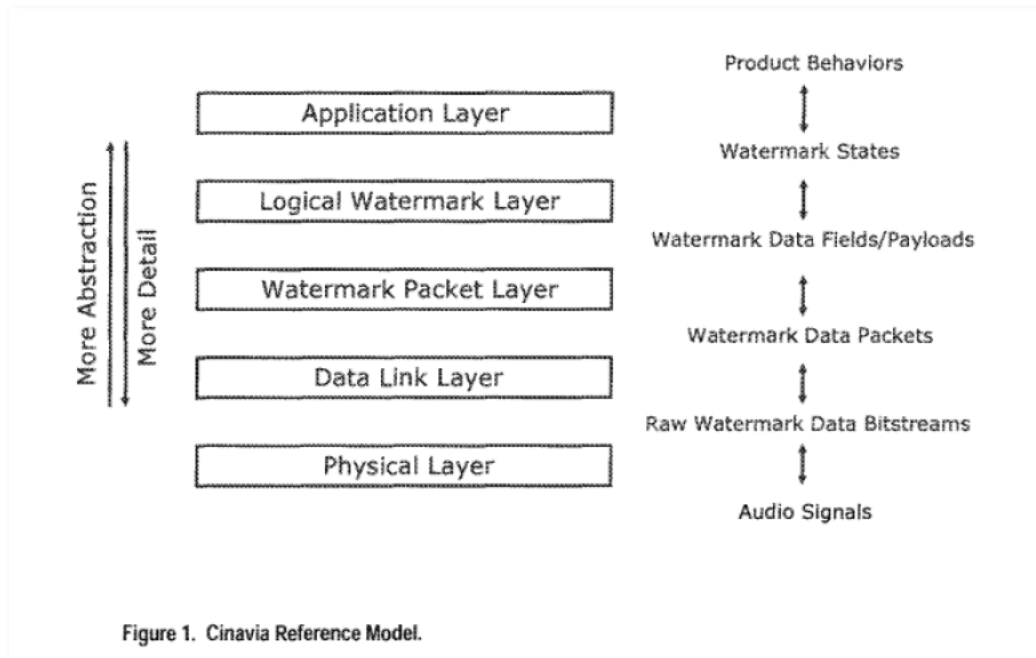


Figure 1. Cinavia Reference Model.

See Ex. D, Cinavia System Specification at Section 1 and Figure 1.

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**3.1.2 Capacity**

Watermarks are embedded continuously throughout the duration of the content.

The Cinavia Copy Management Payload contains 8-bits of data, divided among three data fields: the Copy Management Field, the AACCS Flag, and the Reserved Field. The Copy Management Field employs four bits to encode a Copy Management State, as discussed above. The AACCS Flag employs one bit to indicate whether the content was embedded in accordance with licensing requirements, compliance rules, and specifications established by AACCS LA, LLC. The Reserved Field employs the remaining 3 bits and is unused.

The Copy Management Payload is embedded repeatedly throughout Marked Content and can be recovered completely from segments as short as five seconds. The use of all Copy Management Payload fields in Marked Content is mandatory. In the event that multiple Watermarks are embedded within the same content (for example if the Embedder is applied to the same content more than once in series), the Copy Management Payload associated with both Watermarks will typically remain detectable.

8 See Ex. D, Cinavia System Specification at Section 3.1.2.

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10 120. Sony's Infringing Players are integrated products and/or media receivers  
11 with Cinavia detectors for extracting embedded watermarks and an output for  
12 outputting the embedded data, which the Players then use to determine if they are  
13 authorized to play the watermarked content. In particular, the detectors of Sony's  
14 Infringing Players analyze audio signals, identify the presence of watermarks,  
15 determine the value of the Copy Management Payloads, and output the details of Copy  
16 Management Payloads found so the Players can apply playback content control  
17 policies based on the output.

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**3 System Architecture**

Cinavia employs an Embedder to insert a Watermark containing the Copy Management Payload into the audio portion of audiovisual content prior to its distribution to consumers. The Marked Content can be distributed through any means (although certain configurations of the Watermark can only be distributed in limited ways) and may ultimately be used on Integrated Products and Media Receivers that incorporate the Detector. The Detector enables those products to retrieve the information contained within the Watermark and apply content use policies in accordance with an applicable Supported Specification. The Cinavia system architecture is illustrated in Figure 2. In this example, Integrated Products incorporate Cinavia Detectors and content shown with a water droplet carry the Cinavia watermark.

To facilitate the harmonization of usage policies across multiple platforms, the Cinavia Copy Management Payload includes a common set of Copy Management States that describe the intended authorized uses or use limitations on the content and a common set of policies for their interpretation and response by Integrated Products and Media Receivers.

25 See Ex. D, Cinavia System Specification at 2.  
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1 **3.1.3.2 Certainty**

2 When the Detector identifies and reports the value of the Copy Management Payload within Marked Content, it does  
3 so with a very high degree of certainty. The probability of the Detector reporting the presence of a Copy  
4 Management Payload value that was not actually embedded in the content (“false detection”) is designed to be  
below  $10^{-12}$  per 15 seconds of content, which is less than one occurrence per hour of operation of over 4 trillion  
independent Detectors.

5 See Ex. D, Cinavia System Specification at 6.

6 **3.3 Detector**

7 The Cinavia Detector performs the function of analyzing audio signals, identifying the presence of Watermarks, and  
8 determining the value of Copy Management Payloads embedded within them. Detectors are included in Integrated  
9 Products and Media Receivers that employ Cinavia to identify unauthorized uses of specific instances of audiovisual  
content and enable the enactment of associated Product Responses. Detectors are also used in products used in  
content production and distribution environments to verify that content has been properly embedded.

10 **3.3.1 Detector Integration**

11 The Detector is applied to all channels of audio content as they are output from the product. A continuous mode of  
12 operation is provided, in which detection is applied continuously throughout the content, as well as an intermittent  
mode, wherein detection is applied to randomly selected portions of the content only.

13 In intermittent mode, the Detector indicates on an ongoing basis which time periods of content must be screened. In  
14 the case of Unmarked Content or authorized uses of Marked Content, the Detector is typically applied to  
approximately 10% of the content. The Detector may be applied to longer portions of the content to fully identify  
the Copy Management Payload and determine whether the use meets the conditions for a Product Response.

15 Integrated Products and Media Receivers must configure the Detector with information including a list of Copy  
16 Management States that are subject to enforcement in the content given its Authorized Credentials. Audio must be  
provided to the Detector in unencrypted Linear PCM format. The Detector notifies the product when the response  
conditions associated with enforceable Copy Management Payload values present in content have been fulfilled.

17 **3.3.2 Detector Products**

18 The following Cinavia Detector Products are available for use in consumer products and professional applications:

- 19 • **Detector Reference SDK (DREF):** ANSI C Software Development Kit for Detector Development.
- 20 • **Finished Detector for Windows (FD-Win):** Finished detector for Intel-based computers running the  
Windows operating system.
- 21 • **Finished Detector for ARM (FD-ARM):** Finished detector for Arm A9-based systems-on-chip.

22 See Ex. D, Cinavia System Specification at 7.

23 **4 Glossary**

24 **Copy Management Payload:** The data area within the Cinavia Watermark that encodes the data related to copy  
management functions, including the Copy Management State and the AACCS Flag.

25 **Detector:** The function of the same name combined with a System Integration Layer to facilitate the integration of  
the Detector function within an Integrated Product or Media Receiver, as designated in the Cinavia Detector  
Specification.

26 **Product Response:** The behavior an Integrated Product or Media Receiver is required to exhibit based on  
27 unauthorized uses of Marked Content.



1 **Integrated Product:** A consumer device or product that includes the Detector in accordance with the Cinavia  
2 Detector Specification, any applicable Cinavia Integrated Product Specifications, and the AACCS Compliance Rules.

3 **Marked Content:** Content that includes audio containing Watermarks.

4 **Media Receiver:** A hardware product (or a combination of hardware products, or a combination of hardware and  
5 software products) that includes the Detector in accordance with the Cinavia Detector Specification, any applicable  
6 Cinavia Media Receiver Specifications, and the compliance rules defined by Supported Specifications.

7 **PCM Audio:** Digital audio waveform stored in PCM (Pulse Code Modulation) format.

8 **Supported Specification:** Specifications other than the Cinavia Specification that relate to how certain classes of  
9 Integrated Products and Media Receivers use the Cinavia technology, such as where and how they should  
10 incorporate a Detector, what uses of content are subject to Cinavia detection, and what the products should do when  
11 they encounter particular states of the Cinavia Copy Management Payload.

12 **Unmarked Content:** Content that does not include audio containing Watermarks.

13 **VCMS/AV:** The Verance Copy Management System for Audiovisual Content. An audio watermark-based  
14 technology for audiovisual content protection that is now named Cinavia.

15 **Verify (or Verification or Verifying):** The process of checking for the presence or absence of Watermarks and  
16 reporting the details of any Copy Management Payloads found in through the use of a Verifier Product.

17 **Verifier Product:** An end-user product that enables the process of Verification in commercial environments.  
18 Besides Verification, Verifier Products provide important features, such as audio interfacing, configuration, control,  
19 and activity logging.

20 **Watermark:** The embodiment of one or more data payloads within audio content.

21 See Ex. D, Cinavia System Specification at 7.

22 121. In addition to Sony's Infringing Players (sold by at least SIEL and SEI),  
23 SPE directly infringes claim 9. On information and belief, following embedding of  
24 data, SPE or its agents use a file-based or real-time Cinavia verifier on a host CPU  
25 platform to check for the presence of the Cinavia watermark.<sup>5</sup> Verification is used to  
26 ensure that embedding has been carried out successfully.

27 122. The verifier provides a number of configurable audible and visible alarms  
28 for various combinations of copy management states. For example, before mastering,  
the presence of Cinavia watermarks in the audio would be considered an alarm  
condition, whereas after an embedding session, the absence of watermarks would be

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<sup>5</sup> See, e.g., Dean Angelico et al., *Workflows for Embedding Content Protection Watermarks in Theatrical Soundtracks* 4-6 (2010) (attached as **Exhibit F**); Ex. D, Cinavia System Specification at 2, 6-8.

1 considered an error. The verifier provides a means to configure through its user  
2 interface alarms for such conditions.<sup>6</sup>

3 123. SPE's use of verification devices meets each and every limitation of  
4 Claim 9. SPE or its agents use Cinavia-enabled devices for extracting embedded data  
5 from an audio signal, comprising (1) an input for receiving the audio signal; (2) a  
6 processor, in communication with the input, for: (3) dividing the audio signal into a  
7 plurality of time frames and, in each time frame, a plurality of frequency components;  
8 (4) in each of at least some of the time frames, selecting at least two frequency  
9 components, including selecting a fundamental tone and at least one overtone; (5)  
10 determining a phase shift of at least one of the frequency components; (6) extracting  
11 the embedded data determined from the phase shift; and (7) an output for outputting  
12 the embedded data.

13 **B. Sony's Direct Infringement of Method Claim 1**

14 124. Sony has infringed and is currently infringing literally and/or under the  
15 doctrine of equivalents, by, among other things, itself practicing, or using agents at its  
16 direction and control to practice, without license or authority in the U.S., one or more  
17 method claims of the Asserted Patent, including at least Claim 1, reproduced below:

- 18 1. A method for embedding data in an audio signal, the method  
19 comprising:  
20 (a) dividing the audio signal into a plurality of time frames and, in each  
21 time frame, a plurality of frequency components;  
22 (b) in each of at least some of the plurality of time frames, selecting at  
23 least two of the plurality of frequency components; and  
24 (c) altering a phase of at least one of the plurality of frequency  
25 components in accordance with the data to be embedded, wherein:  
26

27 \_\_\_\_\_  
28 <sup>6</sup> See *id.* at 5.

1 step (b) comprises selecting a fundamental tone and at least one overtone;  
2 and  
3 step (c) comprises quantizing a phase difference of the at least one  
4 overtone relative to the fundamental tone to embed at least one bit of  
5 the data to be embedded.

6 125. Sony directly infringes Claim 1 by performing each step of the method  
7 itself, or by third parties under its direction and control by conditioning a benefit upon  
8 performance of a step or steps of the claimed method such that the performance of  
9 such any such method steps is attributable to Sony, including without limitation based  
10 on Sony's instructions and requirements to embed data in audio signals as claimed in  
11 Claim 1 of the Asserted Patents and in conformance with the Cinavia specifications for  
12 embedding data in the audio signal of Sony's Media Content.

13 126. For example, SPE's production of Sony's Media Content includes  
14 embedding data in an audio signal, the method for embedding comprising: (1) dividing  
15 the audio signal into a plurality of time frames and, in each time frame, a plurality of  
16 frequency components; (2) in at least some of the time frames, selecting at least two  
17 frequency components, including selecting a fundamental tone and at least one  
18 overtone; and (3) altering the phase of at least one of the frequency components within  
19 a time frame by quantizing a phase difference of the overtone relative to the  
20 fundamental tone for embedding data.

21 127. For example, in accordance with Cinavia specifications and AACCS  
22 agreements, licenses, and rules, SPE embeds the audio signal of Sony's Media Content  
23 with an audio watermark.

24 2.12 "Audio Watermark" means the audio watermark described in the Cinavia  
25 Specifications where such audio watermark contains the AACCS Trusted Source State  
26 and/or the AACCS No Home Use State.

27 See **Exhibit E**, AACCS Adopter Agreement, Exhibit E – Compliance Rules  
28 (“Compliance Rules”) (November 15, 2012) at E-3.



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2 2.16 “Cinavia Specifications” means all documents necessary to implement the  
3 Cinavia™ audio watermark as provided by Verance Corporation. Such documents  
4 include, but are not limited to, the Cinavia™ Integrated Product Specification, the  
Cinavia™ System Specification, and the Cinavia™ Detector Specification.

5 See Ex. E, Compliance Rules at E-4.

6 128. SPE uses Cinavia Embedders and/or equivalent tools to insert the  
7 watermark into the audio signal of Sony’s Media Content.

8 **3.2 Embedder**

9 Cinavia Embedders are used during content production and distribution to insert Watermarks in the audio portion of  
10 audiovisual content. Watermark Embedders are incorporated within Embedder Products, which provide additional  
functions, including embedder configuration, audio interfacing, and activity logging.

11 See Ex. D, Cinavia System Specification at Section 3.2.

12  
13 **3.2.2 Embedding and Verification Products**

The following commercial Embedding and Verification Products are available for content production environments:

- 14 • **Cinavia Embedder for Mac Desktop (DTE):** GUI desktop application for embedding and verifying  
15 Cinavia watermarks in files.  
16 • **Cinavia Embedder for PC/Mac Command Line (CLE):** Console command line application for  
17 embedding and verifying Cinavia watermarks in files.  
18 • **Cinavia Verifier for PC/Mac Desktop (DTV):** GUI desktop application for verifying Cinavia watermarks  
19 in audio files and streams.  
20 • **Cinavia Verifier Plug-in for EclipseSuite (CIV):** Plug-in resource invoked from the EclipseSuite  
application (<http://www.eclipsedata.com>) for verifying Cinavia watermarks within optical disc images.  
21 • **Cinavia Verifier for Pro Tools® (CV-PT):** Plug-in resource invoked from the Pro Tools application  
(<http://www.avid.com/US/products/Pro-Tools-Software>) for verifying Cinavia watermarks within streams.

22 Additional information on these products is available from Verance Corporation.

23 See Ex. D, Cinavia System Specification at Section 3.2.2.

24 **Tools for Embedding and Verifying**

25 Cinavia employs an embedder to insert the watermark containing the Copy Management State  
26 into the audio portion of audiovisual content prior to its presentation or distribution to  
consumers. A verifier is used to check for the presence of the Cinavia watermark and provides a  
report if any Copy Management States are found. Both Cinavia embedders and verifiers are  
available for use in either filed-based or real-time post-production workflows and run on a  
variety of host CPU platforms.

27 See also Ex. F at 4.  
28

1 129. To embed the watermark into the audio signal of Sony’s Media Content,  
2 SPE uses embedders to divide the audio signal into a plurality of time frames. The  
3 Cinavia watermark payload is repeatedly embedded throughout the audio so that it can  
4 be detected in a short time from among the plurality of time frames.

5 **3.1.2 Capacity**

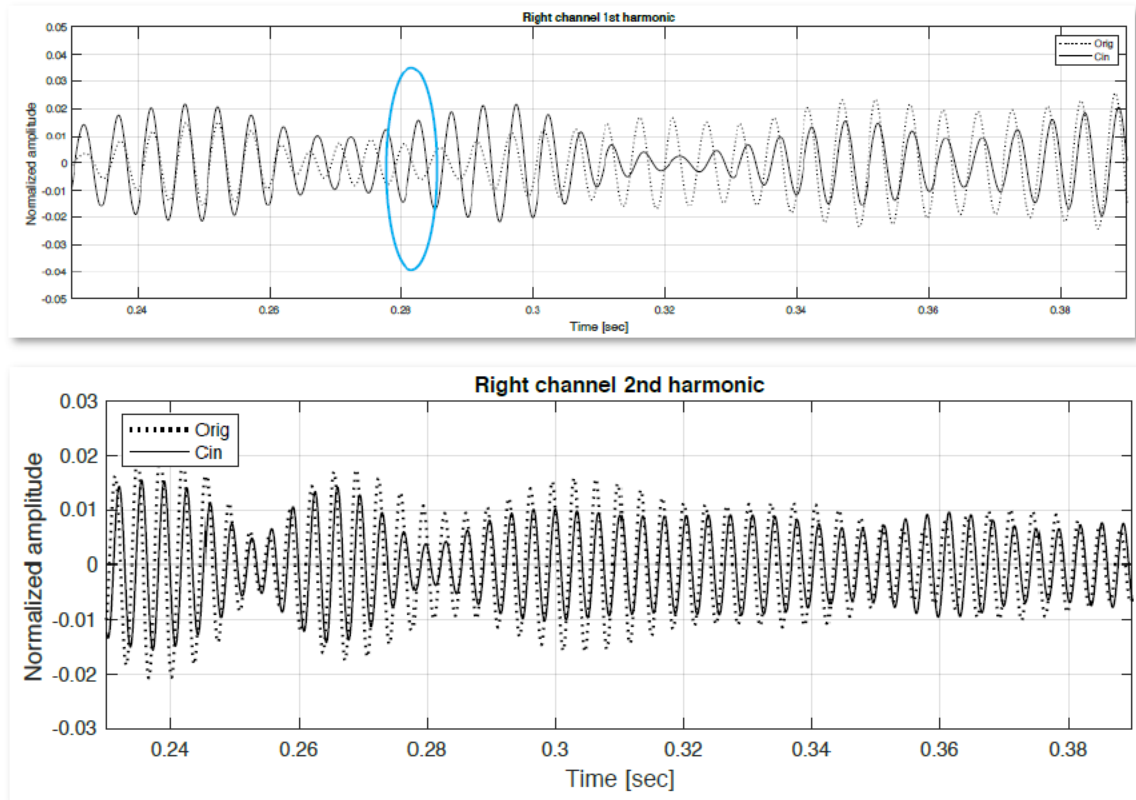
6 Watermarks are embedded continuously throughout the duration of the content.

7 The Cinavia Copy Management Payload contains 8-bits of data, divided among three data fields: the Copy  
8 Management Field, the AACs Flag, and the Reserved Field. The Copy Management Field employs four bits to  
9 encode a Copy Management State, as discussed above. The AACs Flag employs one bit to indicate whether the  
10 content was embedded in accordance with licensing requirements, compliance rules, and specifications established  
11 by AACs LA, LLC. The Reserved Field employs the remaining 3 bits and is unused.

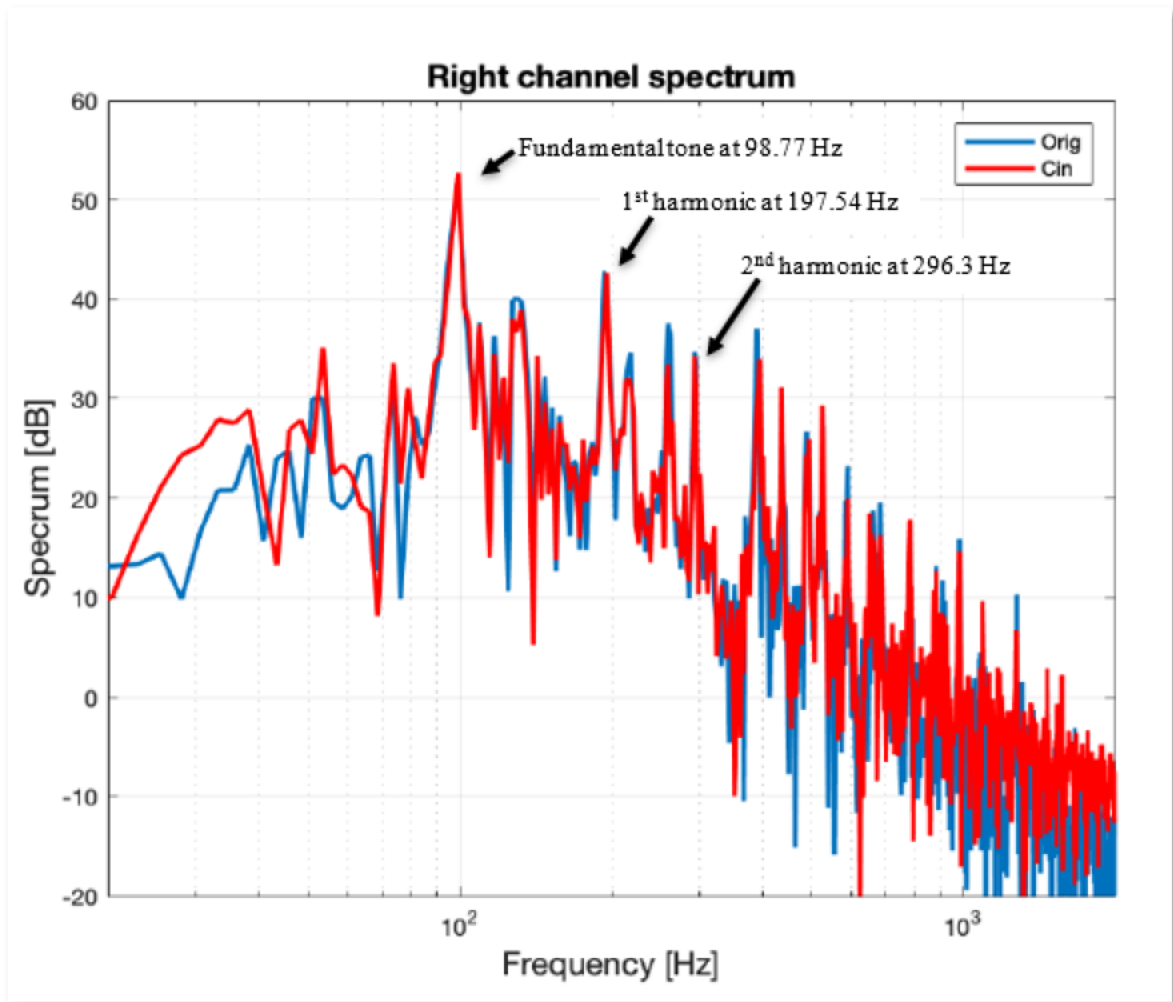
12 The Copy Management Payload is embedded repeatedly throughout Marked Content and can be recovered  
13 completely from segments as short as five seconds. The use of all Copy Management Payload fields in Marked  
14 Content is mandatory. In the event that multiple Watermarks are embedded within the same content (for example if  
15 the Embedder function is applied to the same content more than once in series), the Copy Management Payload  
16 associated with both Watermarks will typically remain detectable.

17 *See* Ex. D, Cinavia System Specification at Section 3.1.2.

18 130. Further, comparisons between audio tracks from a movie on a Sony-  
19 released Blu-ray Disc with Cinavia watermarking, and the same audio tracks without  
20 Cinavia watermarks, reveals that audio watermarked with Cinavia technology exhibits  
21 a conspicuous modification in a plurality of frequency components in a time frame,  
22 specifically a modification in the phase between a fundamental frequency and one or  
23 more harmonic frequencies. For example, in the comparative time waveform graph  
24 below, the harmonic at 197.54 Hz shows a phase change of approximately  $\pi$  radians at  
25 around 0.281 seconds between the harmonics in the watermark-free (“Orig”) and  
26 watermarked (“Cin”) versions. In contrast, the second harmonic at 296.3 Hz is held at  
27 a phase difference of approximately 0 radians. These conspicuous and selective phase  
28 shifts appear throughout audio watermarked with Cinavia technology.



131. To embed or encode such phase shifts, SPE’s production of Sony’s Media Content divides a time frame into a plurality of frequency components, selecting a fundamental tone and at least one overtone as shown in the figure on the following page. That figure depicts the magnitude spectrum overlay of audio waveforms. The red line (“Cin”) represents a waveform from a Sony Blu-ray Disc movie with a Cinavia watermark embedded in the audio signal. The blue line (“Orig”) represents a waveform from the same movie without the watermark.



132. In order to embed such phase shifts between a fundamental and a harmonic frequency, SPE's process selects at least two of the plurality of frequency components in each of at least some of the plurality of time frames, and alters a phase of at least one of the plurality of frequency components (e.g. an alteration to  $\pi$  radian or to 0 radians) in accordance with the data to be embedded.



### 3 System Architecture

Cinavia employs an Embedder to insert a Watermark containing the Copy Management Payload into the audio portion of audiovisual content prior to its distribution to consumers. The Marked Content can be distributed through any means (although certain configurations of the Watermark can only be distributed in limited ways) and may ultimately be used on Integrated Products and Media Receivers that incorporate the Detector. The Detector enables those products to retrieve the information contained within the Watermark and apply content use policies in accordance with an applicable Supported Specification. The Cinavia system architecture is illustrated in Figure 2. In this example, Integrated Products incorporate Cinavia Detectors and content shown with a water droplet carry the Cinavia watermark.

To facilitate the harmonization of usage policies across multiple platforms, the Cinavia Copy Management Payload includes a common set of Copy Management States that describe the intended authorized uses or use limitations on the content and a common set of policies for their interpretation and response by Integrated Products and Media Receivers.

See Ex. D, Cinavia System Specification at Section 3.

133. Further, SPE uses embedders to alter the audio signal of Sony’s Media Content and embed such alterations into the audio watermark. The conspicuous phase-shifting observed in the audio shows that SPE’s embedders alter the phase in the audio signal to embed data (e.g.,  $0 = 0$ ,  $1 = \pi$ ) in the watermark. See *id.*; see also:

The scope of the Cinavia specification can be understood through the reference model illustrated in Figure 1. A hierarchy of five layers of abstraction are provided (Physical, Data Link, Watermark Packet, Logical Watermark, and Application), each encompassing a different aspect of Cinavia system behavior. Each layer in the hierarchy defines the functional relationship between two data elements of the system (Audio Signals, Raw Watermark Data Bitstreams, Watermark Data Packets, Watermark Data Fields/Payloads, Watermark States, and Product Behaviors).

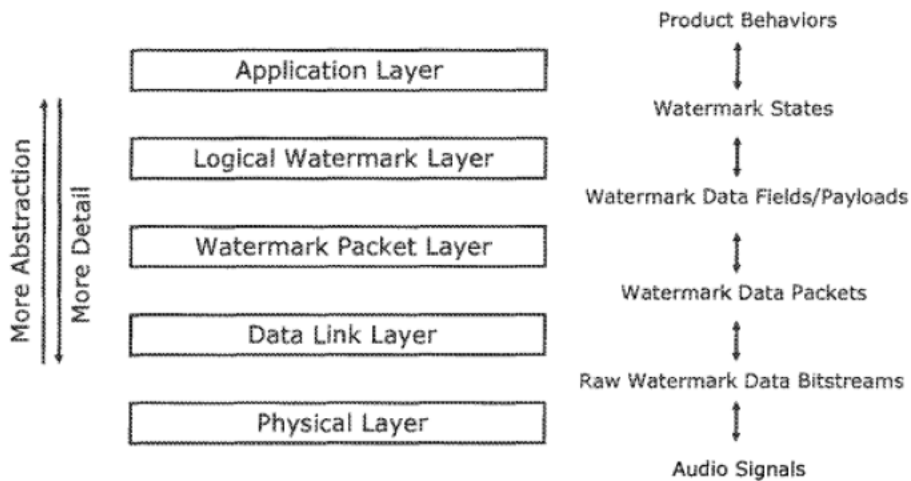


Figure 1. Cinavia Reference Model.

See Ex. D, Cinavia System Specification at Section 1 and Figure 1.

1 134. As a result of the phase shift of the harmonic or overtone, at least one bit  
2 of data is embedded as a watermark in the audio signal of Sony's Media Content. For  
3 example, the watermark is represented by the phase shift of the first harmonic, referred  
4 to as quantization (e.g.,  $0 = 0$ ,  $1 = \pi$ ), which involves at least one bit of data.

### 5 **3.1.2 Capacity**

6 Watermarks are embedded continuously throughout the duration of the content.

7 The Cinavia Copy Management Payload contains 8-bits of data, divided among three data fields: the Copy  
8 Management Field, the AACCS Flag, and the Reserved Field. The Copy Management Field employs four bits to  
9 encode a Copy Management State, as discussed above. The AACCS Flag employs one bit to indicate whether the  
10 content was embedded in accordance with licensing requirements, compliance rules, and specifications established  
11 by AACCS LA, LLC. The Reserved Field employs the remaining 3 bits and is unused.

12 The Copy Management Payload is embedded repeatedly throughout Marked Content and can be recovered  
13 completely from segments as short as five seconds. The use of all Copy Management Payload fields in Marked  
14 Content is mandatory. In the event that multiple Watermarks are embedded within the same content (for example if  
15 the Embedder function is applied to the same content more than once in series), the Copy Management Payload  
16 associated with both Watermarks will typically remain detectable.

17 *See Ex. D, Cinavia System Specification at Section 3.1.2.*

18 135. Sony's Media Content is produced by altering a phase of at least one of  
19 the plurality of frequency components in accordance with the data to be embedded by  
20 (1) selecting a fundamental tone and at least one overtone and (2) quantizing the phase  
21 difference of the at least one overtone relative to the fundamental tone to embed at  
22 least one bit of the data to be embedded. For example, as explained above, SPE uses  
23 embedders to select a fundamental tone and a harmonic of that fundamental tone—  
24 which is an overtone—for applying a phase shift to the harmonic to embed data in the  
25 audio signal thereby creating the watermark.

26 136. As a result of Sony's direct infringement of the Asserted Patent, MZ  
27 Audio has been injured by Sony's unauthorized use of MZ Audio's patented  
28 intellectual property.

137. MZ Audio seeks monetary damages in an amount adequate to compensate  
for Sony's infringement, but in no event less than a reasonable royalty for the use  
made of the invention by Sony, together with interest and costs as fixed by the Court,

1 and MZ Audio will continue to suffer damages in the future unless Sony’s infringing  
2 activities are enjoined by this Court.

3 138. Unless a permanent injunction is issued enjoining Sony and their agents,  
4 servants, employees, representatives, affiliates, and all others acting or in active  
5 concert therewith from infringing the Asserted Patent, MZ Audio will be greatly and  
6 irreparably harmed.

7 **COUNT II**

8 **(INDIRECT INFRINGEMENT OF U.S. PATENT NO. 7,289,961)**

9 139. Plaintiff incorporates herein by reference the allegations set forth in  
10 paragraphs 1 through 98 of this Complaint as though fully set forth herein.

11 140. The Sony Defendants have infringed indirectly and continue to infringe  
12 indirectly the one or more claims of the Asserted Patent, including at least Claim 1, by  
13 active inducement under 35 U.S.C. § 271(b).

14 141. On information and belief, Sony had knowledge of the Asserted Patent as  
15 set forth above or, alternatively, no later than the date of this action. Sony has  
16 committed, and continues to commit, affirmative acts to encourage infringement with  
17 the intent that inducing acts would cause infringement or has been willfully blind to  
18 the possibility that their inducing acts would cause infringement by Third-Party  
19 Content Creators, including other movie studios (such as Universal Pictures,  
20 Paramount Pictures, etc.). Specifically, by integrating Cinavia detectors in Sony Blu-  
21 ray Disc players and other players, and advertising and promoting the benefits of  
22 content protection enabled by such Sony players, the Sony Defendants, including at  
23 least SGCJ, SCA, SEI, and SIEL induce Third-Party Content Creators to embed their  
24 media content with watermarks by embedding data in an audio signal using the method  
25 disclosed in Claim 1.



1 142. For example, Sony advertises and markets the fact that its Blu-ray Disc  
2 players incorporate Cinavia detectors.<sup>7</sup> Sony also provides firmware upgrades to such  
3 Sony players for their detectors, which further induces Third-Party Content Creators to  
4 embed their media content for such Sony players to use the method claimed in Claim 1  
5 of the Asserted Patent.<sup>8</sup>

6 143. As another example, Sony has widely advocated for the use of Cinavia  
7 and has adopted Cinavia content protection across the spectrum of its content and  
8 devices. Indeed, as a leader in the Blu-ray Disc format, as a founder of the AACCS LA,  
9 and as the first early adopter of Cinavia technology—Sony was influential in the  
10 adoption of Cinavia by Third-Party Content Creators, including other studios, and  
11 other members of AACCS LA. Sony actively participated in AACCS legal and business  
12 working groups, and influenced and guided AACCS policy and strategy.

13 144. Based on Sony's inducing acts, to enable playing of media content on  
14 Sony's Cinavia-enabled players, Third-Party Content Creators directly infringe by  
15 embedding data in an audio signal as claimed in Claim 1 that can be detected with  
16 Sony players. Specifically, the Third-Party Content Creators directly infringe the  
17 Claim 1 method for embedding comprising: (1) dividing the audio signal into a  
18 plurality of time frames and, in each time frame, a plurality of frequency components;  
19 (2) in at least some of the time frames, selecting at least two frequency components,  
20 including selecting a fundamental tone and at least one overtone; and (3) altering the  
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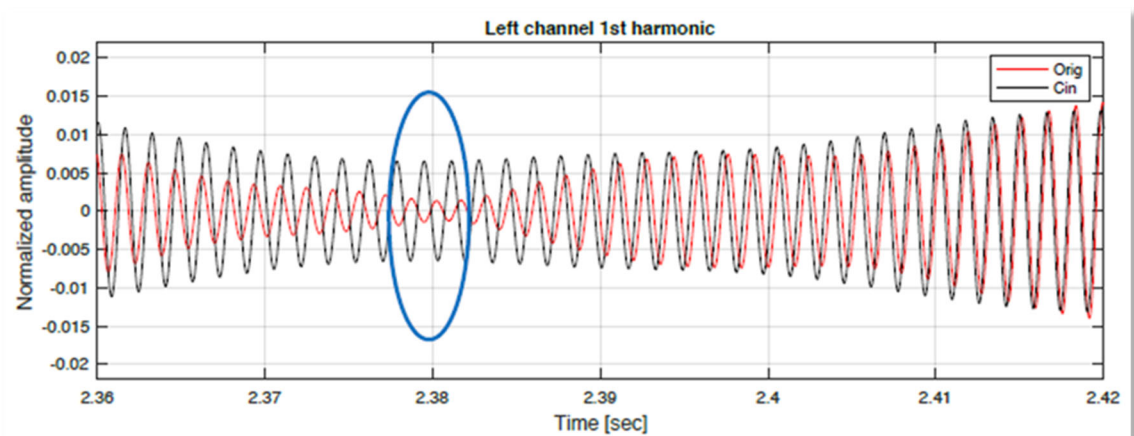
22  
23 <sup>7</sup> See **Exhibit G** [What is the Cinavia technology?  
24 ([https://www.sony.com/electronics/support/home-video-blu-ray-disc-players-  
26 recorders/articles/00017948](https://www.sony.com/electronics/support/home-video-blu-ray-disc-players-<br/>25 recorders/articles/00017948))].

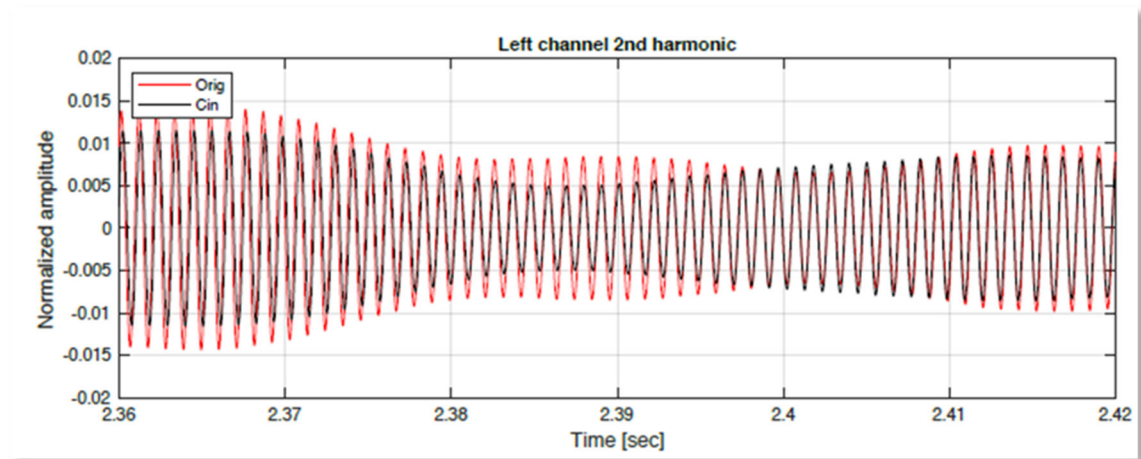
26 <sup>8</sup> See, **Exhibit H**. [Blu-ray Disc Player Firmware Upgrade  
27 ([https://www.sony.com/electronics/support/home-video-blu-ray-disc-players-  
29 recorders/downloads/W0010188](https://www.sony.com/electronics/support/home-video-blu-ray-disc-players-<br/>28 recorders/downloads/W0010188))].

1 phase of at least one of the frequency components within a time frame by quantizing a  
2 phase difference of the overtone relative to the fundamental tone for embedding data.

3 145. In particular, Sony induces Third-Party Content Creators to embed their  
4 media content using the method of Claim 1, as described supra, paragraphs 127-129,  
5 132-134.

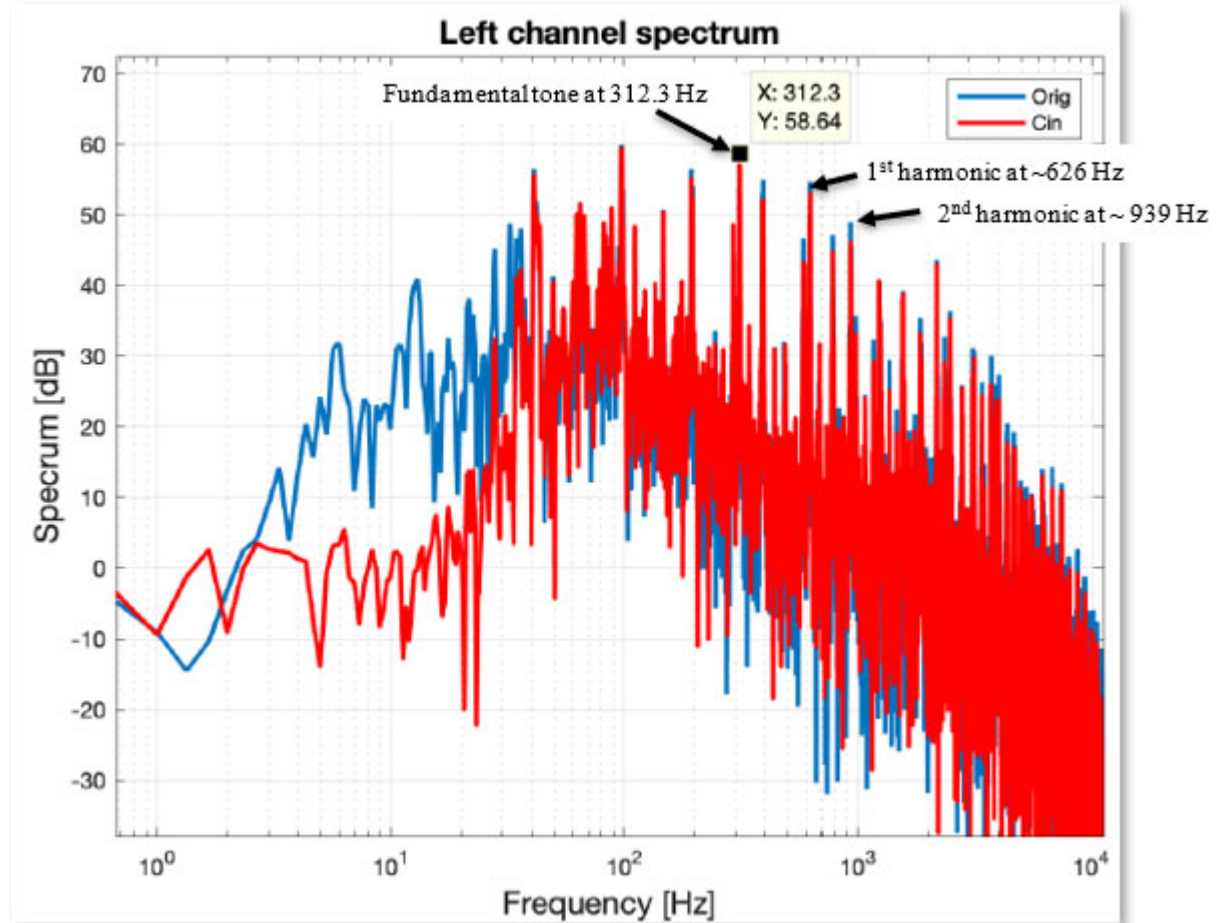
6 146. Further, a comparison between audio tracks from a movie on a Third-  
7 Party Content Creator-released Blu-ray Disc with Cinavia watermarking, and the same  
8 audio track without such watermarks, reveals that Third-Party Content Creator audio  
9 that is watermarked with Cinavia technology exhibits the same kind of conspicuous  
10 modification in a plurality of frequency components in a time frame, specifically a  
11 modification in the phase between a fundamental frequency and one or more harmonic  
12 frequencies, as seen in the Sony-produced audio with Cinavia in paragraph 130. For  
13 example, in the Third-Party Content comparative time waveform graph below, the  
14 harmonic at 626 Hz shows a phase change of approximately  $\pi$  radians at around 2.38  
15 seconds between the harmonics in the watermark-free (“Orig”) and watermarked  
16 (“Cin”) versions. In contrast, the second harmonic at 939 Hz is held at a phase  
17 difference of approximately 0 radians. These conspicuous and selective phase shifts  
18 appear throughout audio watermarked with Cinavia technology.





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147. To embed or encode such phase shifts, Third-Party Content Creators’ production of their media content divides a time frame into a plurality of frequency components, selecting a fundamental tone and at least one overtone as shown in the figure on the following page. That figure depicts the magnitude spectrum overlay of audio waveforms from the same Third-Party movie as the figures above. The red line (“Cin”) represents a waveform from a Third-Party Blu-ray Disc movie audio track with a Cinavia watermark embedded in the audio signal. The blue line (“Orig”) represents a waveform from the same audio track without the watermark.



17 148. As a result of the Sony Defendants’ indirect infringement of the Asserted  
18 Patent, Plaintiff has been injured by Sony’s inducement of Third-Party Content  
19 Creators’ unauthorized use of Plaintiff’s intellectual property.

20 149. MZ Audio seeks monetary damages in an amount adequate to compensate  
21 for Sony’s infringement, but in no event less than a reasonable royalty for the use  
22 made of the invention by Sony, together with interest and costs as fixed by the Court,  
23 and MZ Audio will continue to suffer future damages unless Sony’s infringing  
24 activities are enjoined by this Court.

25 150. Unless a permanent injunction is issued enjoining Sony and their agents,  
26 servants, employees, representatives, affiliates, and all others acting or in active  
27 concert therewith from infringing the Asserted Patent, MZ Audio will be greatly and  
28 irreparably harmed.

**PRAYER FOR RELIEF**

1  
2 1. Plaintiff prays for the following relief:

3 2. A judgment that Defendants have infringed one or more claims of the  
4 Asserted Patent;

5 3. A permanent injunction enjoining Defendants and their officers, directors,  
6 agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and  
7 all others acting in active concert or participation with Defendants, from infringing the  
8 Asserted Patent;

9 4. An award of damages resulting from Defendants' acts of infringement in  
10 accordance with 35 U.S.C. § 284;

11 5. A judgment and order finding Defendants' infringement willful, and  
12 awarding enhance damages in an amount to be determined by the Court up to three-  
13 times damages awarded;

14 6. A judgment and order finding that this is an exceptional case within the  
15 meaning of 35 U.S.C. § 285 and awarding to Plaintiff its reasonable attorneys' fees  
16 against Defendants;

17 7. A judgment and order requiring Defendants to provide accountings and to  
18 pay supplemental damages to Plaintiff;

19 8. An award of costs and prejudgment and post-judgment interest; and

20 9. Any and all other relief to which Plaintiff may show itself to be entitled.  
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1 Dated: February 8, 2022

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**JURY DEMAND**

Pursuant to Rule 38(b) of the Federal Rules of Civil Procedure, Plaintiff MZ Audio Sciences, LLC hereby demands a trial by jury of all issues so triable.

Dated: February 8, 2022

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