

**UNITED STATES DISTRICT COURT  
WESTERN DISTRICT OF TEXAS  
WACO DIVISION**

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ACQIS LLC,  
a Texas limited liability company,

Plaintiff,

v.

SONY GROUP CORPORATION,  
a Japanese corporation,  
SONY INTERACTIVE ENTERTAINMENT  
INC., a Japanese corporation,  
SONY INTERACTIVE ENTERTAINMENT  
LLC, a California limited liability company.

Defendants.

Civil Action No. 6:22-cv-386

**JURY TRIAL DEMANDED**

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**COMPLAINT FOR PATENT INFRINGEMENT**

Plaintiff ACQIS LLC (“Plaintiff” or “ACQIS”), by its attorneys, hereby alleges patent infringement against Defendants Sony Group Corporation, Sony Interactive Entertainment Inc., and Sony Interactive Entertainment LLC (collectively, “Sony” or “Defendants”), as follows:

**INTRODUCTION**

1. This is an action for patent infringement under the Patent Laws of the United States, 35 U.S.C. § 1 *et seq.* ACQIS alleges that Sony has infringed, directly and/or indirectly, five ACQIS patents: U.S. Patent Nos. 9,529,768 (“768 patent”), 9,703,750 (“750 patent”), 8,977,797 (“797 patent”), RE44,654 (“654 patent”), and RE45,140 (“140 patent”) (collectively, the “ACQIS Patents”), copies of which are attached hereto as Exhibits 1-5, respectively.

2. The ACQIS Patents cover foundational computing technologies that utilize low voltage differential signaling (LVDS) as a physical transmission medium for serial data transfer in PCI and/or USB bus transactions, or recited portions thereof, as used in PCI Express (PCIe) and/or USB 3.x,<sup>1</sup> to facilitate fast, serial data transfer while reducing power consumption and susceptibility to noise, as compared to prior art systems.

3. Sony has infringed the ACQIS Patents, directly and indirectly, by: (1) making, using, selling, offering for sale, and/or importing into the United States, Sony video game consoles that include infringing PCIe and/or USB 3.x functionality; (2) practicing the claimed methods of the ACQIS Patents in the United States by manufacturing and/or testing Sony video game consoles that include the claimed PCIe and/or USB 3.x functionality; (3) importing into the United States and/or selling in the United States Sony video game consoles made abroad using ACQIS's patented processes; and (4) inducing third parties to use, sell, offer for sale, and/or import into the United States, Sony video game consoles that include infringing PCIe and/or USB 3.x functionality, with knowledge of the ACQIS Patents and of the third parties' infringement resulting therefrom.

4. ACQIS seeks damages and other relief for Sony's infringement of the ACQIS Patents.

### **THE PARTIES**

5. Plaintiff ACQIS LLC is a limited liability company organized and existing under the laws of the State of Texas, with offices at 411 Interchange Street, McKinney, Texas 75071. A related entity, ACQIS Technology, Inc., is a corporation organized under the laws of the State of

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<sup>1</sup> As used herein, "USB 3.x" refers to USB 3.0 and subsequent versions, including USB 3.1, USB 3.2, and any other subsequent versions.

Delaware, having its principal place of business at 1503 Grant Road, Suite 100, Mountain View, California 94040. ACQIS LLC is operated from California, where its President, Dr. William Chu, resides. Dr. Chu is also the Chief Executive Officer of ACQIS Technology, Inc.

6. Defendant Sony Group Corporation is a corporation organized and existing under the laws of Japan with its principal executive offices at 1-7-1 Konan Minato-ku, Tokyo, 108-0075 Japan.

7. Defendant Sony Interactive Entertainment Inc. is a corporation organized and existing under the laws of Japan with its principal place of business at 1-7-1 Konan Minato-ku, Tokyo, 108-0075 Japan. Defendant Sony Interactive Entertainment Inc. is also organized and existing under the laws of the state of Delaware. Defendant Sony Interactive Entertainment Inc. can be served with process through its registered agent Corporation Service Company, 251 Little Falls Drive, Wilmington, DE 19808. On information and belief, Sony Interactive Entertainment Inc. is a subsidiary of Sony Group Corporation.

8. Defendant Sony Interactive Entertainment LLC is a limited liability company organized and existing under the laws of the state of California, with offices at 2207 Bridgepoint Parkway, San Mateo, California 94404, and has regular and established places of business in this District, including, on information and belief, at least at 5000 Plaza on the Lake, Suite 350, Austin, Texas 78746. Sony Interactive Entertainment LLC is registered to do business in Texas and may be served via its registered agent at Corporation Service Company, located at 211 E 7th Street, Suite 620, Austin, Texas 78701. On information and belief, Sony Interactive Entertainment LLC is a subsidiary of Sony Interactive Entertainment Inc.

9. Defendants have authorized sellers and sales representatives that offer and sell products pertinent to this Complaint throughout the State of Texas, including in this District and

to consumers throughout this District, such as: Best Buy, 4627 Jack Kultgen Expressway, Waco, Texas 76706; GameStop, 1428 Wooded Acres Drive, Suite 204, Waco, Texas 76710; Best Buy, 4970 W Highway 290, Austin, Texas 78735; GameStop, 5601 Brodie Lane, Suite 990, Austin, Texas 78745.

### **JURISDICTION AND VENUE**

10. This is an action for patent infringement under the patent laws of the United States, 35 U.S.C. § 101 *et seq.*

11. This Court has subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

12. This Court has specific and personal jurisdiction over the Defendants consistent with the requirements of the Due Process Clause of the United States Constitution and the Texas Long Arm Statute. On information and belief, Sony has sufficient minimum contacts with the forum because Sony transacts substantial business in the State of Texas and in this District. On information and belief, based on LinkedIn listings, Sony has employees at locations throughout this district, working in areas such as project management, engineering, and data management for its video game consoles. Further, on information and belief, Sony has purposefully manufactured and/or distributed Sony video game consoles that infringe the ACQIS Patents, or that were made abroad using patented processes claimed in the ACQIS Patents, through established distribution channels with the expectation that those products would be sold in the United States, the State of Texas, and in this District. Further, Sony has (itself and/or through the activities of subsidiaries, affiliates, or intermediaries) committed acts of patent infringement in the United States, the State of Texas and this District, including by making, using, offering to sell, and/or selling infringing Sony video game consoles in the United States, the State of Texas,

and this District; importing and/or selling infringing Sony video game consoles, and/or Sony video game consoles made abroad using ACQIS's patented processes, into the United States for sale in the State of Texas and this District; and/or inducing others to commit acts of patent infringement in the United States, the State of Texas, and this District. Accordingly, Sony has established minimum contacts within the forum and purposefully availed itself of the benefits of Texas, and the exercise of personal jurisdiction over Sony would not offend traditional notions of fair play and substantial justice.

13. Venue is proper in this District pursuant to 28 U.S.C. §§ 1400(b) and 1391(b) and (c) because Sony is subject to personal jurisdiction in this District and has committed acts of patent infringement in this District. Sony has a regular and established place of business, including at least 5000 Plaza on the Lake, Suite 350, Austin, Texas 78746, and on information belief based on a local job posting on LinkedIn for "Manager, Data Center Logistics," a data center located in this District. Sony also has employees in this District. Sony, through its own acts, makes, uses, sells, and/or offers to sell infringing products within this District, regularly does and solicits business in this District, and has the requisite minimum contacts with the District such that this venue is a fair and reasonable one.

## **FACTUAL BACKGROUND**

### **I. The ACQIS Patents**

14. Plaintiff ACQIS solely owns all rights, titles, and interests in and to the ACQIS Patents, including the exclusive rights to bring suit with respect to any infringement thereof.

15. The '768 patent, entitled "Computer System Including CPU or Peripheral Bridge Directly Connected to a Low Voltage Differential Signal Channel that Communicates Serial Bits of a Peripheral Component Interconnect Bus Transaction in Opposite Directions," was duly and

legally issued on December 27, 2016, from a patent application filed March 13, 2014, with William W.Y. Chu as the sole named inventor. The '768 patent claims priority to U.S. Provisional Patent Application No. 60/134,122, filed on May 14, 1999.

16. The '750 patent, entitled "Computer System Including CPU or Peripheral Bridge Directly Connected to a Low Voltage Differential Signal Channel that Communicates Serial Bits of a Peripheral Component Interconnect Bus Transaction in Opposite Directions," was duly and legally issued on July 11, 2017, from a patent application filed October 9, 2014, with William W.Y. Chu as the sole named inventor. The '750 patent claims priority to U.S. Provisional Patent Application No. 60/134,122, filed on May 14, 1999.

17. The '797 patent, entitled "Method of Improving Peripheral Component Interface Communications Utilizing a Low Voltage Differential Signal Channel," was duly and legally issued on March 10, 2015, from a patent application filed October 10, 2012, with William W.Y. Chu as the sole named inventor. The '797 patent claims priority to U.S. Provisional Patent Application No. 60/134,122, filed on May 14, 1999.

18. The '654 patent, entitled "Data Security Method and Device for Computer Modules," was duly and legally issued on December 17, 2013, from a reissue application filed October 10, 2012, with William W.Y. Chu as the sole named inventor. The '654 patent is a reissue of U.S. Patent No. 6,643,777, which issued on November 4, 2003, from a patent application filed May 14, 1999. The '654 patent claims priority to U.S. Patent Application No. 09/312,199, filed on May 14, 1999.

19. The '140 patent, entitled "Data Security Method and Device for Computer Modules," was duly and legally issued on September 16, 2014, from a reissue application filed December 17, 2013, with William W.Y. Chu as the sole named inventor. The '140 patent is a

reissue of U.S. Patent No. 6,643,777, which issued on November 4, 2003, from a patent application filed May 14, 1999. The '140 patent claims priority to U.S. Patent Application No. 09/312,199, filed on May 14, 1999.

20. Each of the ACQIS Patents is valid and enforceable.

21. Defendants have never been authorized to practice the ACQIS Patents.

22. The inventions recited in the ACQIS Patents enabled Sony to offer superior video game consoles, including faster, more efficient, and more reliable video game consoles.

23. The ACQIS Patents are owned by ACQIS LLC and form a part of ACQIS LLC's high-speed computing technology portfolio.

24. ACQIS's patent portfolio, and the ACQIS Patents specifically, have been the subject of numerous proceedings before the USPTO and have been asserted in litigation.

25. ACQIS's patent portfolio has been asserted in litigation against technology companies such as Samsung, IBM, Dell, HP, Sun Microsystems/Oracle, NEC, Fujitsu, Huawei, Hitachi, Ericsson, and Alcatel-Lucent.

26. As a result of ACQIS's litigation-based enforcement efforts, ACQIS's patent portfolio has been extensively licensed to some of the world's largest technology companies.

27. The ACQIS Patents have also survived numerous attacks before the USPTO. The claims of each of the ACQIS Patents have been challenged in *inter partes* review before the Patent Trial and Appeal Board (PTAB) several times by multiple petitioners, including Samsung and Intel. In each of these challenges, the PTAB denied institution of *inter partes* review, finding that none of the petitioners had demonstrated a reasonable likelihood that the ACQIS Patents are invalid.

## II. The Inventor

28. William W.Y. Chu is the sole inventor on the ACQIS Patents.

29. Dr. Chu is a named inventor of approximately 41 U.S. Patents spanning multiple decades.

30. Dr. Chu has been an innovator in the computing industry since the 1970s. After receiving his Ph.D. in electrical engineering in 1976 from the University of California, Berkeley, Dr. Chu worked in semiconductor design, first for American Microsystems, Inc. (1976-1977), then for Zilog, Inc. (1977-1982).

31. In 1982, Dr. Chu founded his first company, Verticom, Inc. Verticom's business was focused on innovation relating to the transmission of video over telephone lines. Verticom's business also included development of graphics products for the PC computer-aided design (CAD) market. Verticom's success led to an initial public offering in 1987, with Verticom's stock listed on the NASDAQ exchange. Verticom was acquired by Western Digital in 1988.

32. Dr. Chu then worked for Western Digital Imaging, Inc. from 1988 to 1991 as Vice President of Engineering, leading a large team in the desktop and portable graphics chip division. In the course of his work at Western Digital, Dr. Chu in 1988 started the company's portable graphics chip business, which became #1 in the portable graphics chip market by 1991. Dr. Chu also led Western Digital to achieve the #1 market share in the PC graphics market in 1990.

33. Dr. Chu then worked for Acumos, Inc. from 1991-1992 as a Vice President managing engineering for computer graphics chip development. Acumos was acquired by Cirrus Logic, Inc. in 1992.

34. Dr. Chu then worked for Cirrus Logic from 1992 to 1997, first as a General



Manager in the Desktop Graphics Division and later as Co-President of the Graphics Chip Business Unit. During Dr. Chu's time at Cirrus Logic, the company achieved #1 market share in the PC graphics chip market.

35. Dr. Chu founded his second company, ACQIS Technology, Inc. in 1998. His goal was to build a small, lightweight portable computer module that could be interchangeably plugged into different peripheral consoles for different use scenarios. In the course of working to develop such products, Dr. Chu worked extensively to solve interconnection problems between computer modules and peripheral consoles. He recognized that such interconnections needed to be sufficiently versatile to connect the core computing and graphics system to different types of peripheral devices, and also needed to be low-power, high-performance, and extendable to even higher performance to accommodate future computing advancements. He also recognized the necessity of mating connectors with low pin counts. The ACQIS Patents and their underlying innovations stem from Dr. Chu's foundational product development work at ACQIS.

### **III. Sony**

36. Sony is a global leader in the video gaming industry. Sony makes and sells the PlayStation brand of video game consoles. Sony designs, manufactures, uses, offers for sale, sells, and/or imports into the United States—including into the Western District of Texas—billions of dollars of video game consoles every year.

37. On information and belief, Sony's sales of PlayStation gaming hardware generated approximately \$4.96 billion in global revenue in 2020, a significant portion of which is attributable to sales in the United States.

### **IV. Sony's Direct Infringement and Accused Instrumentalities**

38. Sony has directly infringed, pursuant to 35 U.S.C. §§ 271(a) and (g), as

applicable, one or more claims of each of the ACQIS Patents (as further specified below as to each of the ACQIS Patents, in Counts I-V) by: (1) making, using, offering to sell, selling within the United States, and/or importing into the United States, Sony video game consoles that include infringing PCIe and/or USB 3.x functionality; (2) practicing the claimed methods of the ACQIS Patents in the United States by manufacturing and/or testing Sony video game consoles that include the claimed PCIe and/or USB 3.x functionality; and (3) importing into the United States and/or selling into the United States Sony video game consoles made abroad using ACQIS's patented processes. The products that ACQIS accuses of infringing the ACQIS Patents are collectively referred to herein as the "Accused Instrumentalities."

39. On information and belief, Sony has manufactured and/or tested Accused Instrumentalities abroad and sold and/or imported Accused Instrumentalities into the United States. On information and belief, Sony has imported into the United States and/or sold in the United States products made abroad using ACQIS's patented processes.

40. The Accused Instrumentalities include Sony video game consoles that incorporate the claimed inventions, including infringing implementations of PCIe and/or USB 3.x as described herein.

41. The Accused Instrumentalities include products made, used, offered for sale, sold within the United States, and/or imported into the United States at least since ACQIS provided actual notice of infringement on or around May 15, 2018, as discussed herein, through expiration of the ACQIS Patents. The Accused Instrumentalities also include products used to perform the claimed methods of the ACQIS Patents within the last six years from the date of this Complaint, through expiration of the ACQIS Patents, and in the same time period, products made abroad using ACQIS's claimed processes and sold and/or imported into the United States.

42. The claims of the ACQIS Patents relate generally to, *inter alia*, the use of one or more LVDS channels for serial data transfer in PCI and/or USB bus transactions, or recited portions thereof, as used in PCIe and USB 3.x, respectively. The inventions of the ACQIS Patents “advantageously use[] an LVDS channel for the hereto unused purpose of interfacing PCI or PCI-like buses.” ’768 at 6:1-3.

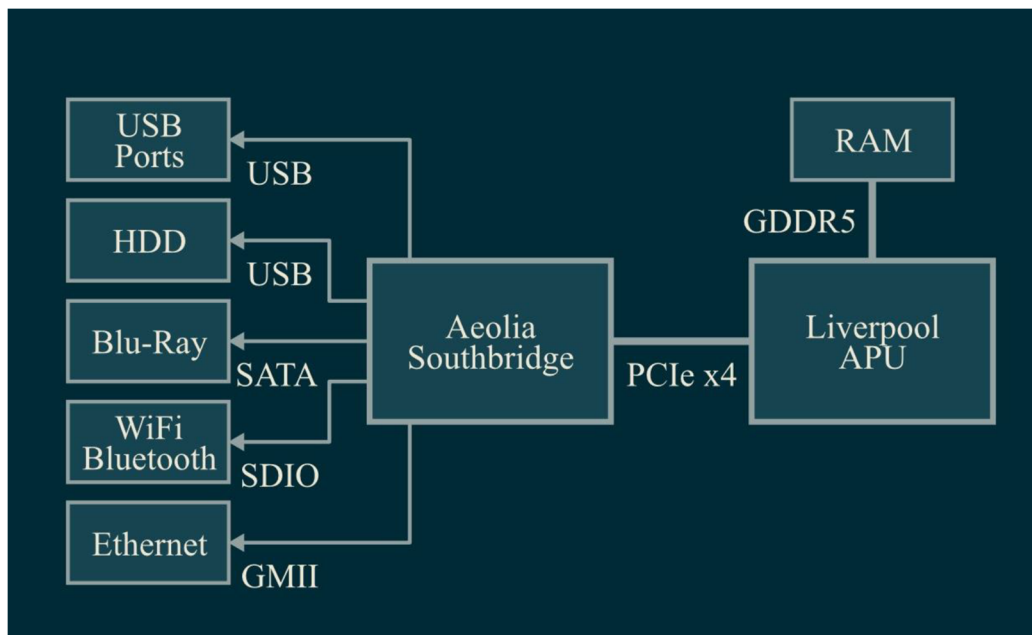
**V. ACQIS Provided Actual Notice to Sony**

43. ACQIS provided actual notice, pursuant to 35 U.S.C. § 287(a), of all of the ACQIS Patents and the infringement alleged herein on or around May 16, 2018, when ACQIS sent a notice letter dated May 15, 2018 to Sony Interactive Entertainment LLC. FedEx tracking information confirms that Sony Interactive Entertainment LLC received ACQIS’s May 15, 2018 letter on May 18, 2018. In that letter, ACQIS identified all of the ACQIS Patents and described the applicability of the ACQIS Patents to PCI Express, USB 3.0, and other technologies, further identifying “[Sony’s] branded console product PlayStation 4 series.” These PlayStation 4 products are included in the Accused Instrumentalities.

44. ACQIS’s May 15, 2018 letter invited Sony to discuss potential licensing arrangements for the ACQIS portfolio, including the ACQIS Patents, and described the enforcement history of ACQIS’s portfolio, identifying previous litigation of patents related to the ACQIS Patents, including a jury verdict against IBM. ACQIS’s litigation-based enforcement of its portfolio is also a matter of public record.

45. After receiving ACQIS’s notice letter, Sony engaged with ACQIS, and ACQIS provided detailed allegations of infringement relating to PlayStation 4 video game consoles. Sony invited ACQIS to meet with Sony personnel to discuss Sony’s infringement of the ACQIS patents. Sony and ACQIS met for discussions on August 15, 2018 and September 26, 2018. At

the September 26, 2018 meeting, ACQIS provided to Sony a list of infringed claims—identifying, *inter alia*, specific claims from all of the ACQIS Patents asserted herein—stating, “Sony PS4 Game Console Product Family infringes at least the following claims in ACQIS LLC patents,” and also provided PlayStation 4 infringement charts for the ’750 patent, the ’797 patent, and one additional ACQIS patent, U.S. Patent No. 8,626,977. These infringement charts listed specific claims from each patent, identified “PS4,” “PS4 Slim,” and “PS4 Pro” models, and set forth element-by-element evidence of infringement. The presentation relating to the ’750 patent included the image below to demonstrate the use of PCIe for connecting the processor chip and the southbridge. After the September 2018 meeting, Sony continued to make and sell the video game consoles identified in ACQIS’s letter. Upon receiving actual notice, Sony chose not to cease infringement or offer to compensate ACQIS in exchange for a license to the ACQIS Patents. At the very least, Sony chose not to investigate ACQIS’s infringement allegations further and remained willfully blind to its own infringement and the infringement that it was inducing others to commit.



<https://www.youtube.com/watch?v=-AoHGJ1g9aM>.

46. Sony's choice to continue making, selling, and importing infringing Accused Instrumentalities in view of the infringement allegations set forth in ACQIS's May 15, 2018 notice letter, and in the materials provided to Sony on September 26, 2018, is deliberate and egregious. Sony has thus willfully infringed the ACQIS Patents since at least May 18, 2018.

## **VI. Sony's Indirect Infringement**

47. Sony has indirectly infringed the ACQIS Patents by inducing infringement by others, such as importers, resellers, customers, and end users under 35 U.S.C. § 271(b) in this District and elsewhere in the United States and the State of Texas.

48. Specifically, Sony has induced others' direct infringement of the ACQIS Patents by selling Accused Instrumentalities to third-party customers, such as retailers, who then directly infringed by using, offering to sell, selling within the United States, and/or importing into the United States those Accused Instrumentalities, which infringed the ACQIS Patents.

49. On information and belief, Sony actively promoted the Accused Instrumentalities for the U.S. market. For example, on information and belief, for every one of Sony's Accused Instrumentalities sold in the United States, Sony pursued and obtained approval from U.S. and state regulatory agencies, such as the United States Federal Communications Commission, to allow sales of such Accused Instrumentalities in the United States.

50. Sony knew that its customers would sell infringing Accused Instrumentalities in the United States or cause Accused Instrumentalities to be sold in the United States—or deliberately avoided learning of the infringing circumstances so as to be willfully blind to the infringement that was induced—and Sony specifically intended its customers to purchase those Accused Instrumentalities from Sony and sell the Accused Instrumentalities in the United States or cause Accused Instrumentalities to be sold in the United States. Sony's direct and indirect

purchasers directly infringed the ACQIS Patents by importing such Accused Instrumentalities into the United States, selling such Accused Instrumentalities in the United States, and using such Accused Instrumentalities in the United States.

51. Sony has further induced others' direct infringement of the ACQIS Patents by providing instruction and direction to end users, such as consumers, about how to use the Accused Instrumentalities such that those end users used the Accused Instrumentalities and directly infringed the ACQIS Patents. Sony had knowledge that end users would use Accused Instrumentalities in the manner directed by Sony and specifically intended that end users would perform such uses in the United States. Such infringing uses occurred upon operation of the Accused Instrumentalities in their normal, intended manner without any specific action of the end user other than turning on the product. That is, Sony configured the Accused Instrumentalities in such a way as to induce infringement by end users upon any use of those Accused Instrumentalities. For example, on information and belief, Sony instructed end users regarding the powering on and use of the PlayStation 4 Slim such that upon any use, the PlayStation 4 Slim would convey address and data bits of a PCI bus transaction between the CPU and the PCIe-connected southbridge. [https://manuals.playstation.net/document/pdf/CUH-2215A-5.5\\_1.pdf](https://manuals.playstation.net/document/pdf/CUH-2215A-5.5_1.pdf); *see also, e.g.*, <https://www.playstation.com/en-us/support/hardware/ps5-usb-ports-guide/>.

52. Sony has induced others' direct infringement despite actual notice that the Accused Instrumentalities infringed the ACQIS Patents, as set forth herein. Sony therefore has caused its purchasers and end users to directly infringe the ACQIS Patents with knowledge of the ACQIS Patents and specific intent that the purchasers and end users would directly infringe, or deliberately avoided learning of the infringing circumstances so as to be willfully blind to the

infringement that was induced.

53. Sony derived significant revenue by selling products, including the Accused Instrumentalities, to third parties who directly infringed one or more claims of the ACQIS Patents. Sony had worldwide sales of PlayStation gaming hardware of approximately \$4.96 billion in 2020.

54. The above-described acts of indirect infringement committed by Sony have caused injury and damage to Plaintiff ACQIS.

**COUNT I: INFRINGEMENT OF U.S. PATENT NO. 9,529,768**

55. The allegations set forth in paragraphs 1 through 54 of this Complaint are incorporated by reference as though fully set forth herein.

56. Pursuant to 35 U.S.C. § 282, the '768 patent is presumed valid.

57. Sony has directly infringed one or more claims of the '768 patent in violation of 35 U.S.C. § 271.

58. The Accused Instrumentalities directly infringed at least claim 1 of the '768 patent at least in the manner described below. Plaintiff's allegations of infringement are not limited to claim 1, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

59. Paragraphs 61-72 describe the manner in which the Accused Instrumentalities infringed claim 1 of the '768 patent, by way of the exemplary PlayStation 4 Slim console.

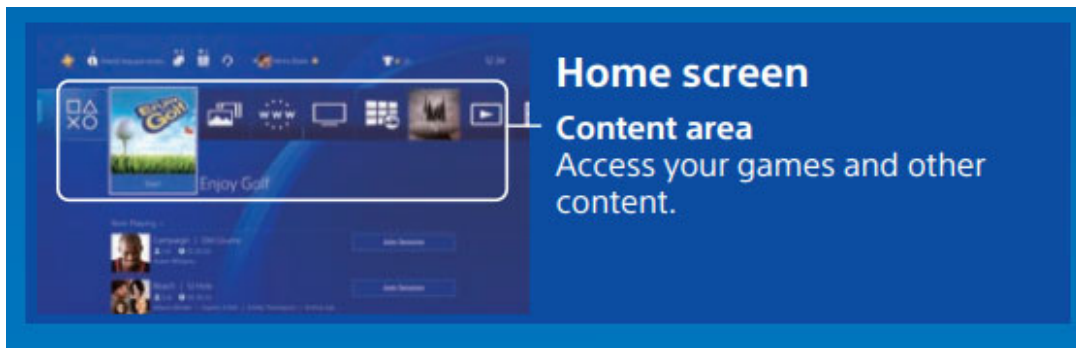
60. On information and belief, the Accused Instrumentalities are in relevant part substantially similar to the exemplary PlayStation 4 Slim console, in particular with regard to the manner in which the Accused Instrumentalities utilize PCIe and/or USB 3.x functionality for connecting internal components and/or providing USB 3.x ports. Paragraphs 61-72 are thus

illustrative of the manner in which each of the Accused Instrumentalities infringed.

61. The PlayStation 4 Slim console is a computer running the Orbis OS, a modified version of FreeBSD 9.0, as its operating system.<sup>2</sup>



<https://direct.playstation.com/en-us/consoles/console/playstation4-1tb-console.3003348>.



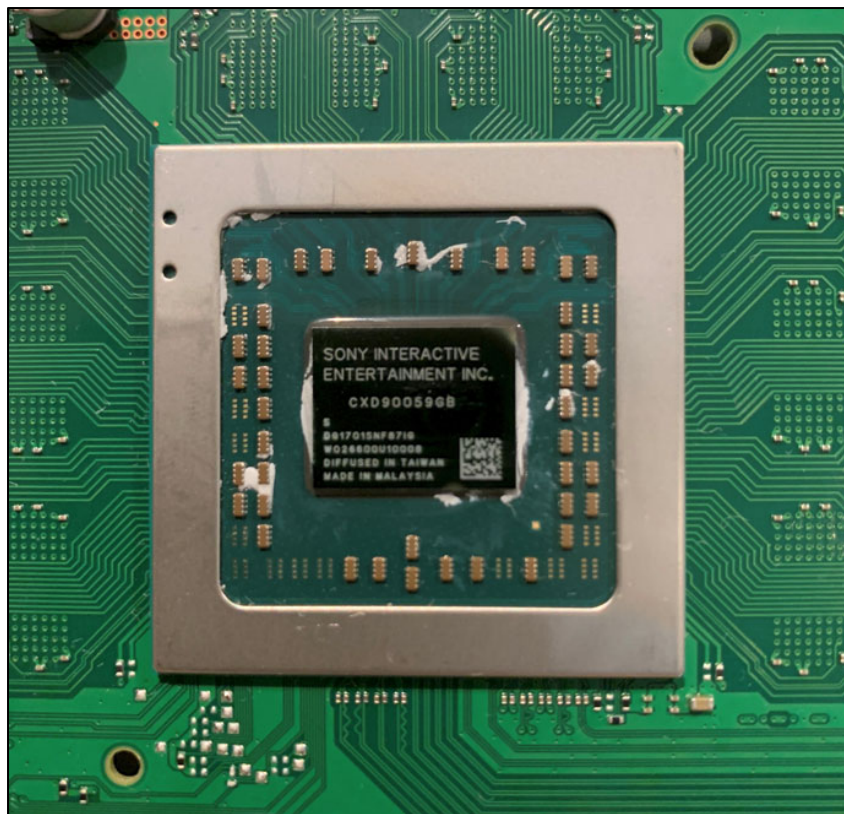
[https://manuals.playstation.net/document/pdf/CUH-2215A-5.5\\_1.pdf](https://manuals.playstation.net/document/pdf/CUH-2215A-5.5_1.pdf).

62. The PlayStation 4 Slim console contains an integrated central processing unit, interface controller and Phase-Locked Loop (PLL) clock circuitry in a single chip, i.e., the Sony Interactive Entertainment Inc. CXD90059GB processor.

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<sup>2</sup> See <https://www.extremetech.com/gaming/159476-ps4-runs-orbis-os-a-modified-version-of-freebsd-thats-similar-to-linux>.

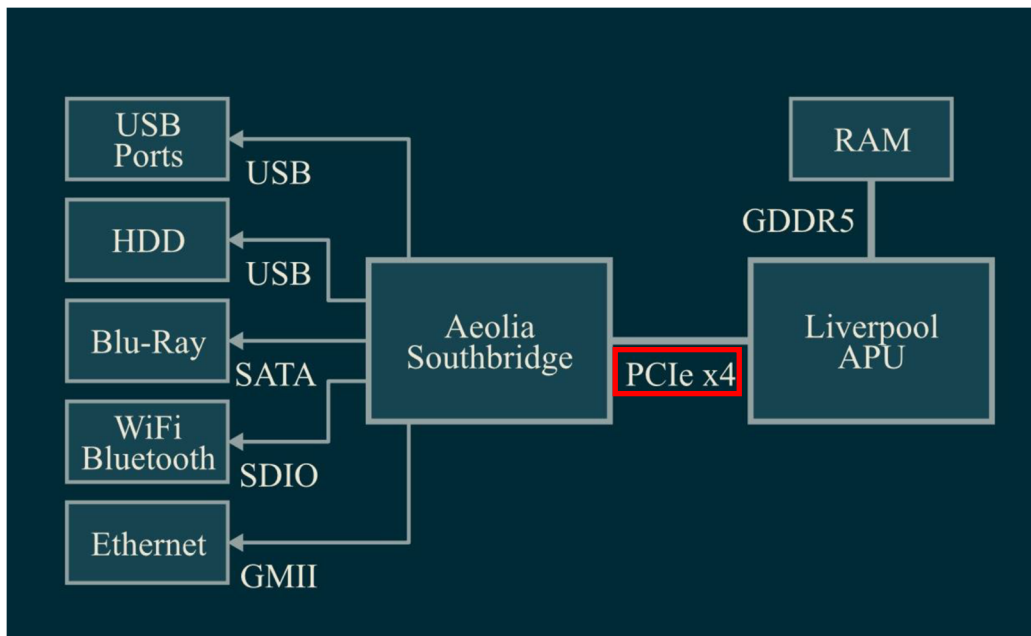




Teardown photograph of CXD90059GB processor from PlayStation 4 Slim.

63. The Sony CXD90059GB processor includes an octa-core CPU and GPU integrated on a single chip. *See* <https://www.playstation.com/en-us/ps4/tech-specs/>.

64. The Sony CXD90059GB processor contains an interface controller on the same chip as the CPU. The Sony CXD90059GB processor includes a x4 PCIe interface on-chip.



<https://www.youtube.com/watch?v=-AoHGJ1g9aM> (annotations added).

65. Because the Sony CXD90059GB processor supports on-chip PCIe, it necessarily contains one or more logic blocks to implement the PCIe functionality, i.e., a PCIe controller and related circuitry found in the Physical Layer (PHY). The Sony CXD90059GB processor also includes PLL clock circuitry, including at least in the PHY(s) associated with the PCIe controller(s). The PCIe controller and PHY logic blocks are, and/or are part of, an “interface controller.”

66. The Sony CXD90059GB processor found in the PlayStation 4 Slim console, which includes the integrated CPU, interface controller and PLL clock circuitry, has a first LVDS channel directly extending from the interface controller.

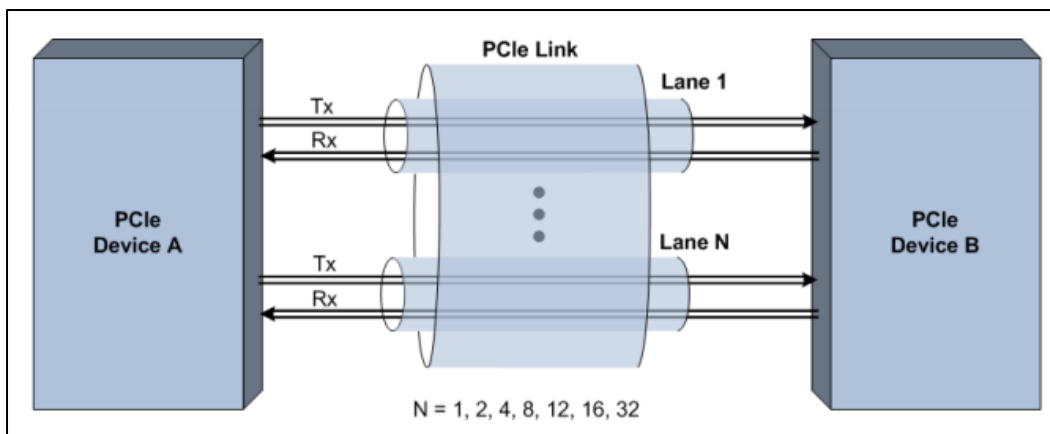
67. The PlayStation 4 Slim uses the Sony CXD90059GB processor’s on-chip PCIe I/O for directly connecting the southbridge to the processor chip in a four-lane PCIe configuration, as shown in paragraph 64 above. The southbridge in the PlayStation 4 Slim is the Sony CXD90042GG, shown below.



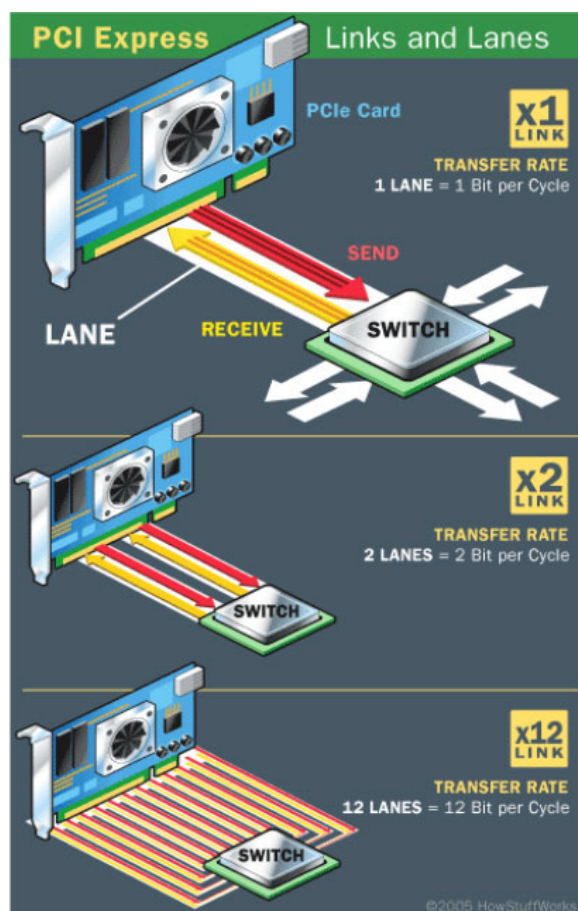
Teardown photograph of CXD90042GG southbridge from PlayStation 4 Slim.

68. This PCIe interface has an LVDS channel directly extending from the interface controller that conveys address and data bits of a PCI bus transaction in a serial form.

69. This LVDS channel comprises a first unidirectional, differential signal pair to convey data in a first direction and a second unidirectional, differential signal pair to convey data in a second, opposite direction. As shown in the exemplary PCIe illustrations below, each lane in a PCIe implementation contains a first unidirectional, differential signal pair to convey data in a first direction (i.e., the Tx pairs in the upper illustration and the signal pairs in red in the lower illustration) and a second unidirectional, differential signal pair to convey data in a second, opposite direction (i.e., the Rx signal pairs in the upper illustration and the signal pairs in yellow in the lower illustration).



*Silicon Labs AN562, PCI Express 3.1 Jitter Requirements (Rev. 0.2 11/15)* (available at <https://www.silabs.com/documents/public/application-notes/AN562.pdf>), at 2.



<https://computer.howstuffworks.com/pci-express.htm>.

70. The data that is transmitted in a serial PCIe bus transaction by the LVDS channel includes address and data bits of a PCI bus transaction. The transaction layer packets (TLPs)

used for PCIe data transmission include both address and data bits of a PCI bus transaction.

### **The Address Element**

The address elements of the TLP provide the address to select specific bytes within the memory and I/O address spaces. The address elements also provide the ID Routing and the register address to select the specific bytes of the configuration register block in the configuration address space. Finally, address elements also provide the ID and Implied Routing for the message address space.

*Header field of TLP contains:*

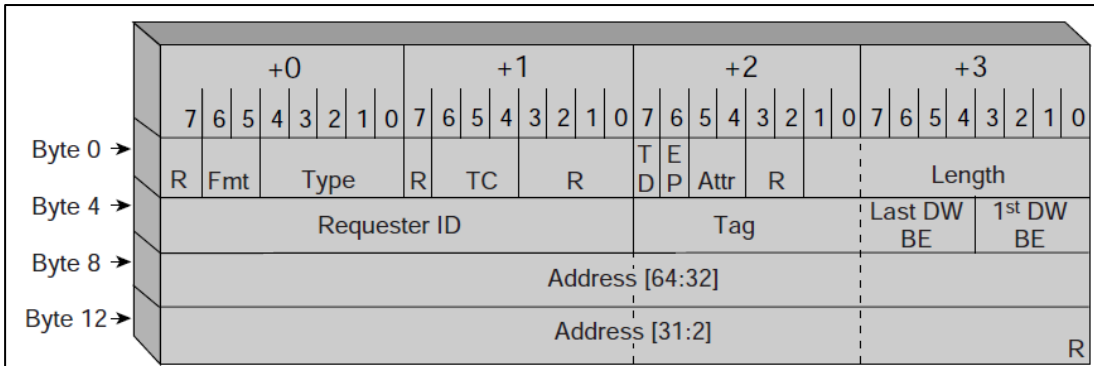
**ADDRESS:** The “typical” address bits for memory and I/O address space. The address can also be used in message vendor-defined transaction packets.

*The Complete PCI Express Reference, Intel Press (2003), at 218.*

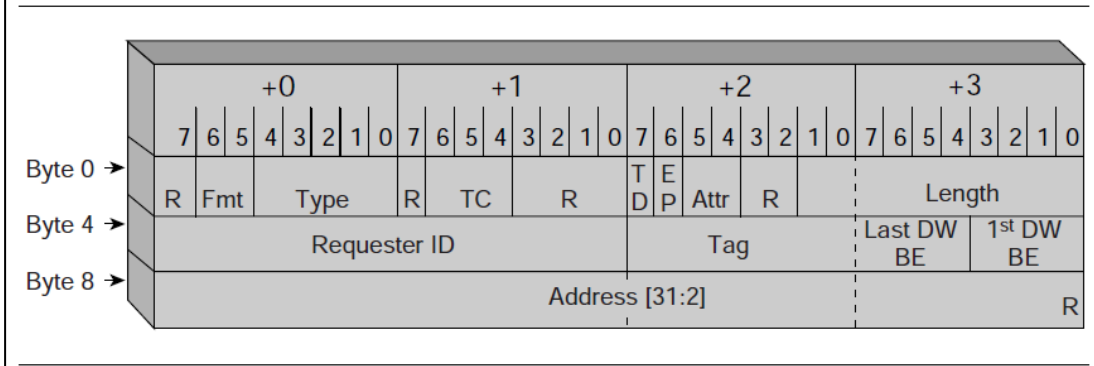
### **The Data Element**

The data element of the transaction packet provides the actual data being accessed.

*The Complete PCI Express Reference, Intel Press (2003), at 220.*



**Figure 6.4** 64-bit Address Memory Request Header

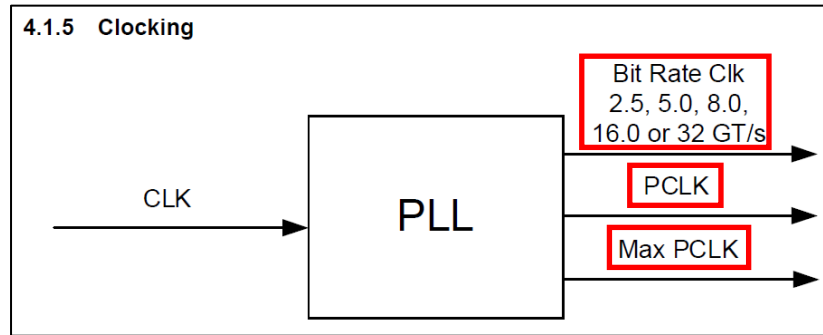


**Figure 6.5** 32-bit Address Memory Request Header

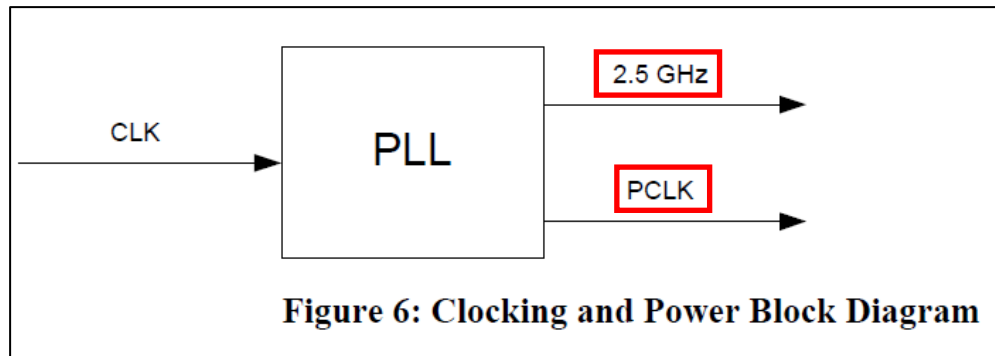
*Introduction to PCI Express – A Hardware and Software Developers Guide*, Intel Press (2003), at 100.

71. The PHY in the Sony CXD90059GB processor includes PLL clock circuitry. The PHY contains at least one PLL and likely contains multiple PLLs. Within the PHY Interface for the PCI Express Architecture (PIPE), the PLL clock circuitry generates at least two clocks at different frequencies. One frequency is used as a bitrate clock (2.5 GHz – 32 GHz, depending on the PCIe transfer rates supported; PCIe 3.x supports 8 GT/s, and PCIe 2.x supports 5 GT/s), and the other is for the PIPE interface to the rest of the PCIe controller, i.e., PCLK (or pipe\_clock) at 125 MHz or 250 MHz. Additionally, the PLL clock circuitry may generate a third clock frequency which is the bitrate clock divided by 10, i.e., bit rate clk / 10. Thus, the PLL clock circuitry generates different clock frequencies, which are used to convey the PCI bus transactions

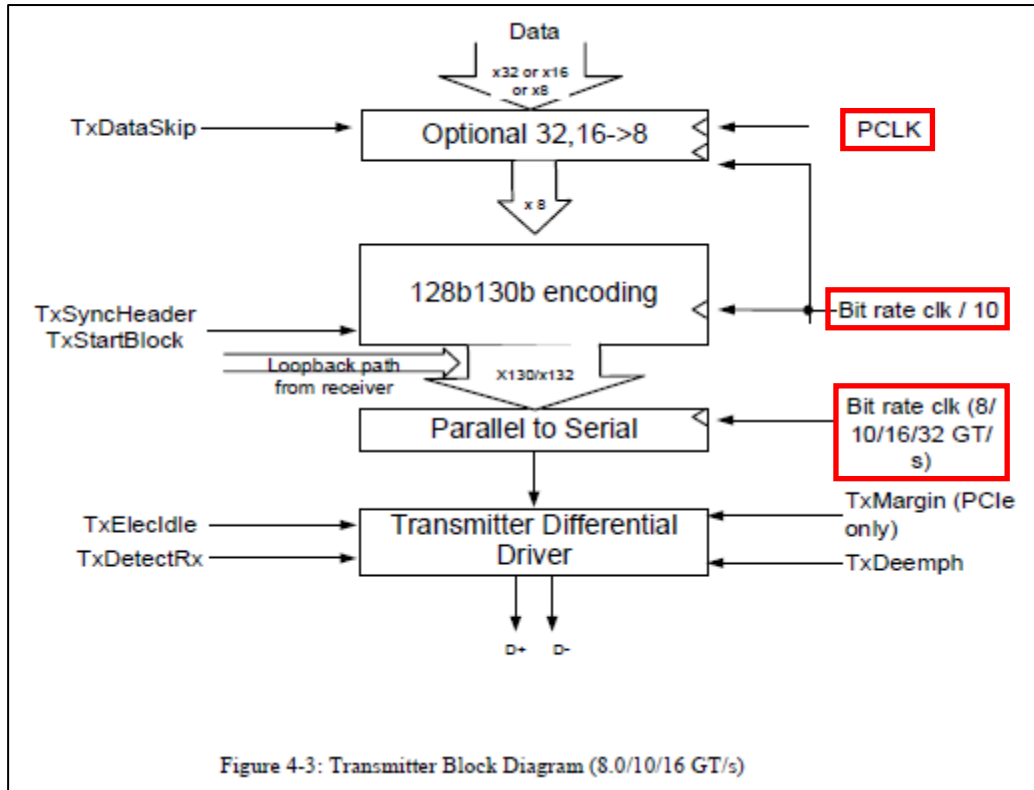
through the LVDS channel.



*PHY Interface for the PCI Express, SATA, USB 3.1, DisplayPort, and Converged IO Architectures, Version 5.1 (2018)* (available at <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/phy-interface-pci-express-sata-usb30-architectures-3.1.pdf>), at 32 (annotations added).

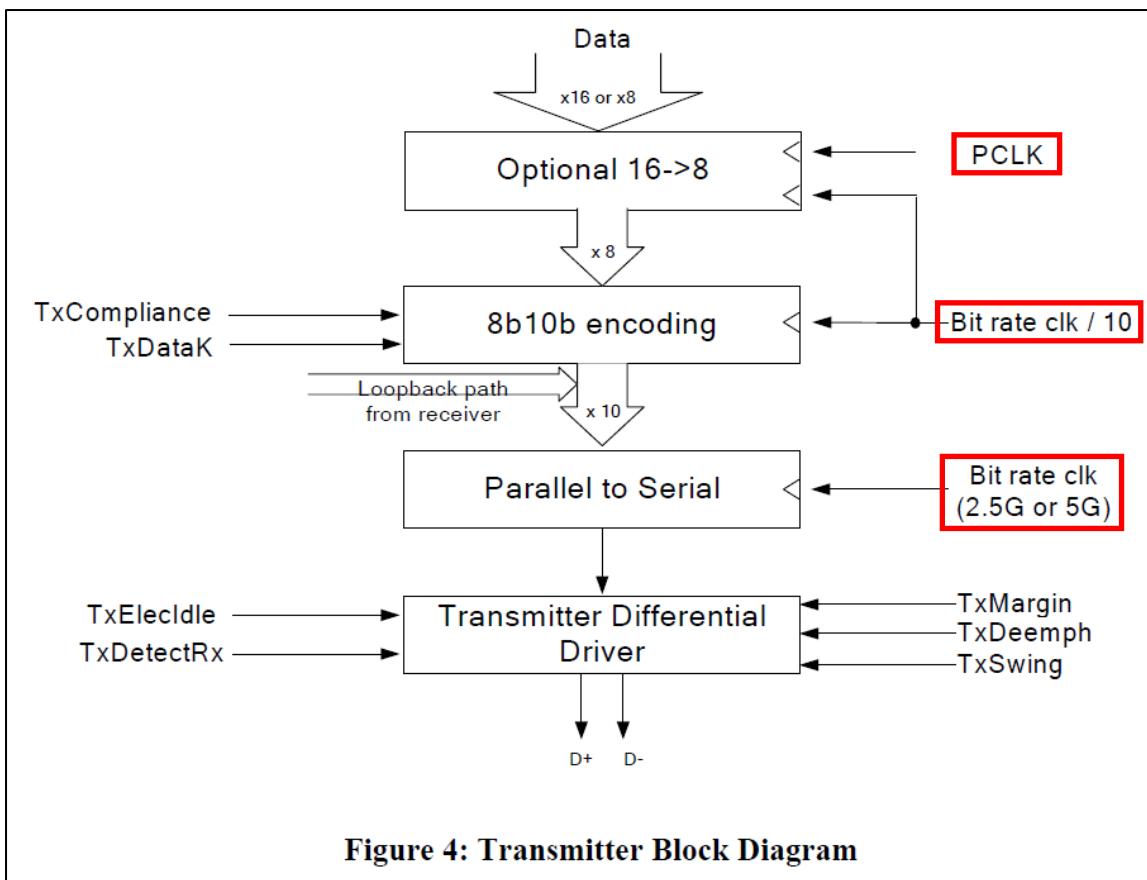


*PHY Interface for the PCI Express Architecture, Version 2.00 (2007)* (available at [http://www.applistar.com/wp-content/uploads/apps/pipe2\\_00.pdf](http://www.applistar.com/wp-content/uploads/apps/pipe2_00.pdf)), at 11 (annotations added).

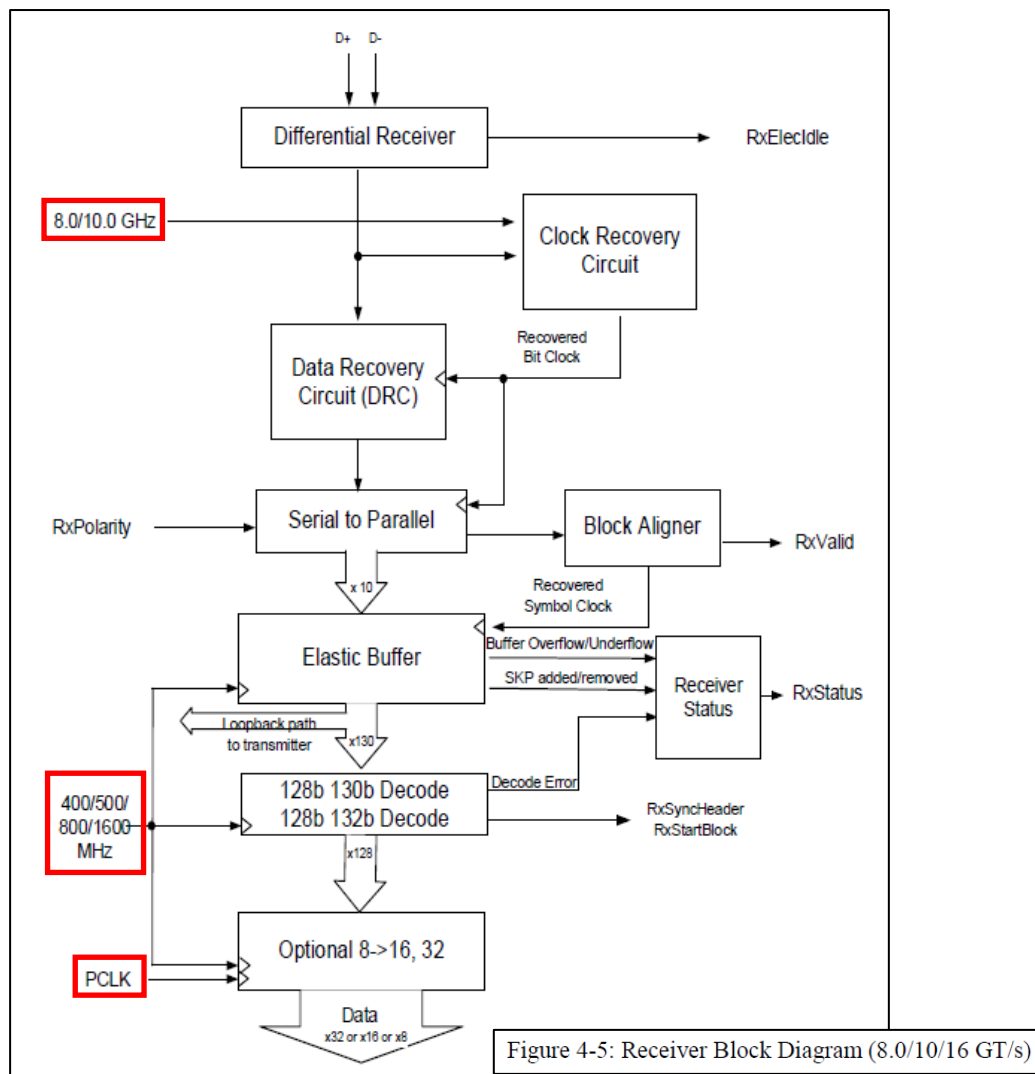


*PHY Interface for the PCI Express, SATA, USB 3.1, DisplayPort, and Converged IO Architectures, Version 5.1 (2018)* (available at <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/phy-interface-pci-express-sata-usb30-architectures-3.1.pdf>), at 29 (annotations added).

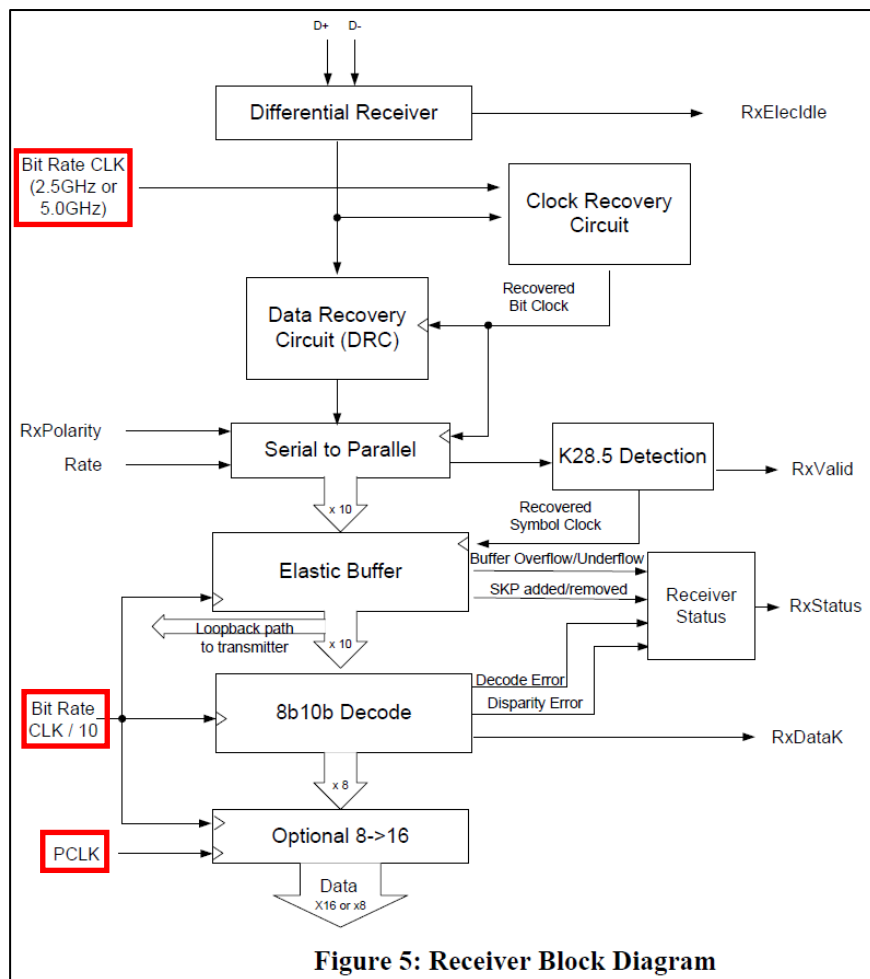




*PHY Interface for the PCI Express Architecture, Version 2.00 (2007) (available at [http://www.applistar.com/wp-content/uploads/apps/pipe2\\_00.pdf](http://www.applistar.com/wp-content/uploads/apps/pipe2_00.pdf)), at 10 (annotations added).*



*PHY Interface for the PCI Express, SATA, USB 3.1, DisplayPort, and Converged IO Architectures, Version 5.1 (2018) (available at <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/phy-interface-pci-express-sata-usb30-architectures-3.1.pdf>), at 31-32 (annotations added).*



*PHY Interface for the PCI Express Architecture, Version 2.00 (2007) (available at [http://www.applistar.com/wp-content/uploads/apps/pipe2\\_00.pdf](http://www.applistar.com/wp-content/uploads/apps/pipe2_00.pdf)), at 11 (annotations added).*

**Table 6-18. External Input Signals**

Name	Active Level	Description	Relevant Protocols
CLK	Edge	This differential Input is used to generate the bit-rate clock for the PHY transmitter and receiver. Specs for this clock signal (frequency, jitter, ...) are implementation dependent and must be specified for each implementation. This clock may have a spread spectrum modulation.	PCIe, SATA, USB, DisplayPort, Converged IO
PCLK	Rising Edge	<i>This signal is relevant for "PCLK as PHY Input" mode only.</i>  All data movement across the parallel interface is synchronized to this clock. This clock operates at a frequency set by <i>PCLK Rate</i> . The rising edge of the clock is the reference for all signals. Spread spectrum modulation on this clock is allowed.	PCIe, SATA, USB, DisplayPort, Converged IO

*PHY Interface for the PCI Express, SATA, USB 3.1, DisplayPort, and Converged IO Architectures*, Version 5.1 (2018) (available at <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/phy-interface-pci-express-sata-usb30-architectures-3.1.pdf>), at 77.

Name	Direction	Active Level	Description
CLK	Input	Edge	This Input is used to generate the bit-rate clock for the PHY transmitter and receiver. Specs for this clock signal (frequency, jitter, ...) are implementation dependent and must be specified for each implementation. This clock may have a spread spectrum modulation.
PCLK	Output	Rising Edge	Parallel interface data clock. All data movement across the parallel interface is synchronized to this clock. This clock operates at 125MHz, 250MHz, or 500 MHz depending on the <i>Rate</i> control input and the data interface width. The rising edge of the clock is the reference for all signals. Spread spectrum modulation on this clock is allowed.

*PHY Interface for the PCI Express Architecture*, Version 2.00 (2007) (available at [http://www.applistar.com/wp-content/uploads/apps/pipe2\\_00.pdf](http://www.applistar.com/wp-content/uploads/apps/pipe2_00.pdf)), at 16.

72. The PLL clock circuitry in the PCIe PHY in the Sony CXD90059GB processor also generates different clock frequencies based on PCIe version and the associated data transfer rate. The PLL clock circuitry, e.g., the transmit (TX) PLL, multiplies the reference clock

frequency to achieve the desired data rate.

### **3. Refclk and Clocking Architectures**

An external clock reference clock (Refclk) is required for transmitting data between two PCIe devices. A Refclk frequency of 100 MHz  $\pm$ 300 ppm is specified for all three line rates (2.5 Gbps, 5.0 Gbps, 8.0 Gbps). The burden has been placed on the TX PLL to multiply the 100 MHz Refclk frequency to the desired data rate. Although the Refclk frequency has remained the same, the jitter performance requirements of the Refclk have improved to support the higher data rates prevalent with PCI Express 2.1 and 3.1. We will look at the Refclk jitter requirements in the following sections.

*Silicon Labs AN562, PCI Express 3.1 Jitter Requirements (Rev. 0.2 11/15)* (available at <https://www.silabs.com/documents/public/application-notes/AN562.pdf>), at 3.

73. Sony had actual notice pursuant to 35 U.S.C. § 287(a) of the '768 patent and the infringement alleged herein as of on or around May 18, 2018, when it received ACQIS's notice letter. Paragraphs 43-46 above are incorporated herein by reference.

74. Sony has indirectly infringed the '768 patent by actively inducing the direct infringement of others of the '768 patent, in the United States, the State of Texas, and the Western District of Texas.

75. Sony has induced, through affirmative acts, its customers and other third parties, such as retailers and end users, to directly infringe the '768 patent by using, offering to sell, selling within the United States, and/or importing into the United States those Accused Instrumentalities, which infringed the '768 patent.

76. On information and belief, Sony actively promoted the Accused Instrumentalities for the U.S. market. For example, on information and belief, for every one of Sony's Accused Instrumentalities sold in the United States, Sony pursued and obtained approval from U.S. and state regulatory agencies, such as the United States Federal Communications Commission, to allow sales of such Accused Instrumentalities in the United States.

77. Sony knew that its customers would sell infringing Accused Instrumentalities in the United States or cause Accused Instrumentalities to be sold in the United States, and Sony

specifically intended its customers to purchase those Accused Instrumentalities from Sony and sell the Accused Instrumentalities in the United States or cause Accused Instrumentalities to be sold in the United States. Sony's direct and indirect purchasers directly infringed the '768 patent by importing such Accused Instrumentalities into the United States, selling such Accused Instrumentalities in the United States, and using such Accused Instrumentalities in the United States.

78. Sony further induced others' direct infringement of the '768 patent by providing instruction and direction to end users, such as consumers, about how to use the Accused Instrumentalities such that those end users used the Accused Instrumentalities and directly infringed the '768 patent. Sony had knowledge that end users would use Accused Instrumentalities in the manner directed by Sony and specifically intended that end users would perform such uses in the United States. Such infringing uses occurred upon operation of the Accused Instrumentalities in their normal, intended manner without any specific action of the end user other than turning on the product. That is, Sony configured the Accused Instrumentalities in such a way as to induce infringement by end users upon any use of those Accused Instrumentalities. For example, on information and belief, Sony instructed end users regarding the powering on and use of the PlayStation 4 Slim such that upon any use, the PlayStation 4 Slim would convey address and data bits of a PCI bus transaction between the CPU and the PCIe-connected southbridge. [https://manuals.playstation.net/document/pdf/CUH-2215A-5.5\\_1.pdf](https://manuals.playstation.net/document/pdf/CUH-2215A-5.5_1.pdf); *see also, e.g.*, <https://www.playstation.com/en-us/support/hardware/ps5-usb-ports-guide/>.

79. Sony has induced others' direct infringement despite actual notice that the Accused Instrumentalities infringed the '768 patent. As of at least May 18, 2018, Sony knew that

the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

80. The above-described acts of infringement committed by Sony have caused injury and damage to ACQIS.

81. Sony’s acts of infringement as described above have been willful.

82. ACQIS is entitled to recover damages sustained as a result of Sony’s wrongful acts in an amount subject to proof at trial, but in no event less than a reasonable royalty.

**COUNT II: INFRINGEMENT OF U.S. PATENT NO. 9,703,750**

83. The allegations set forth in paragraphs 1 through 54 of this Complaint are incorporated by reference as though fully set forth herein.

84. Pursuant to 35 U.S.C. § 282, the ’750 patent is presumed valid.

85. Sony has directly infringed one or more claims of the ’750 patent in violation of 35 U.S.C. § 271.

86. The Accused Instrumentalities directly infringed at least claim 1 of the ’750 patent at least in the manner described below. Plaintiff’s allegations of infringement are not limited to claim 1, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

87. Paragraphs 89-97 describe the manner in which the Accused Instrumentalities infringed claim 1 of the ’750 patent, by way of the exemplary PlayStation 4 Slim console.

88. On information and belief, the Accused Instrumentalities are in relevant part

substantially similar to the exemplary PlayStation 4 Slim console, in particular with regard to the manner in which the Accused Instrumentalities utilize PCIe and/or USB 3.x functionality for connecting internal components and/or providing USB 3.x ports. Paragraphs 89-97 are thus illustrative of the manner in which each of the Accused Instrumentalities infringed.

89. The PlayStation 4 Slim console is a computer running the Orbis OS. Paragraph 61 above is incorporated herein by reference.

90. The PlayStation 4 Slim console contains an integrated central processing unit and interface controller in a single chip, i.e., a Sony CXD90059GB processor. The Sony CXD90059GB processor contains an interface controller on the same chip as the CPU that provides a x4 PCIe interface on-chip. Because the Sony CXD90059GB processor supports on-chip PCIe, it necessarily contains one or more logic blocks to implement the PCIe functionality, i.e., a PCIe controller and related circuitry found in the Physical Layer (PHY). This logic block (or plurality of logic blocks) is, and/or is part of, an “interface controller.” Paragraphs 62-65 above are incorporated herein by reference.

91. The Sony CXD90059GB processor also contains a memory controller with I/O. *See, e.g.,* [https://www.psdevwiki.com/ps4/File:Simplified\\_view\\_of\\_PS4\\_architecture.png](https://www.psdevwiki.com/ps4/File:Simplified_view_of_PS4_architecture.png).

92. The Sony CXD90059GB processor found in the PlayStation 4 Slim, which includes the integrated CPU and interface controller, has a first LVDS channel directly extending from the interface controller.

93. The PlayStation 4 Slim uses the Sony CXD90059GB processor’s on-chip PCIe I/O for directly connecting the Sony CXD90042GG southbridge to the processor chip in a four-lane PCIe configuration. Paragraphs 66-67 above are incorporated herein by reference.

94. This PCIe interface has an LVDS channel directly extending from the interface



controller that conveys address bits, data bits, and byte enable information of a PCI bus transaction in a serial bit stream.

95. This LVDS channel comprises a first unidirectional, differential signal pair to convey data in a first direction and a second unidirectional, differential signal pair to convey data in a second, opposite direction. Each lane in a PCIe implementation contains a first unidirectional, differential signal pair to convey data in a first direction and a second unidirectional, differential signal pair to convey data in a second direction. Paragraph 69 above is incorporated herein by reference.

96. The data that is transmitted in a serial PCIe bus transaction by the LVDS channel includes address bits, data bits, and byte enable information bits of a PCI bus transaction. The transaction layer packets (TLPs) used for PCIe data transmission include both address and data bits as well as byte enable (“BE”) information bits of a PCI bus transaction.

#### **The Address Element**

The address elements of the TLP provide the address to select specific bytes within the memory and I/O address spaces. The address elements also provide the ID Routing and the register address to select the specific bytes of the configuration register block in the configuration address space. Finally, address elements also provide the ID and Implied Routing for the message address space.

*Header field of TLP contains:*

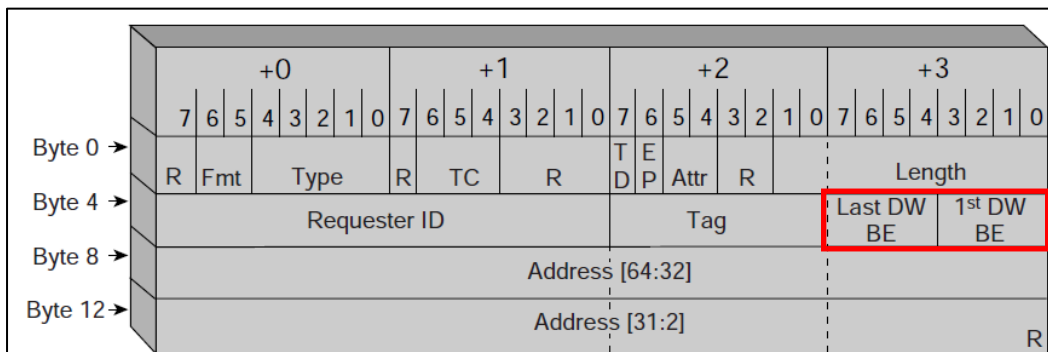
**ADDRESS:** The “typical” address bits for memory and I/O address space. The address can also be used in message vendor-defined transaction packets.

*The Complete PCI Express Reference, Intel Press (2003), at 218.*

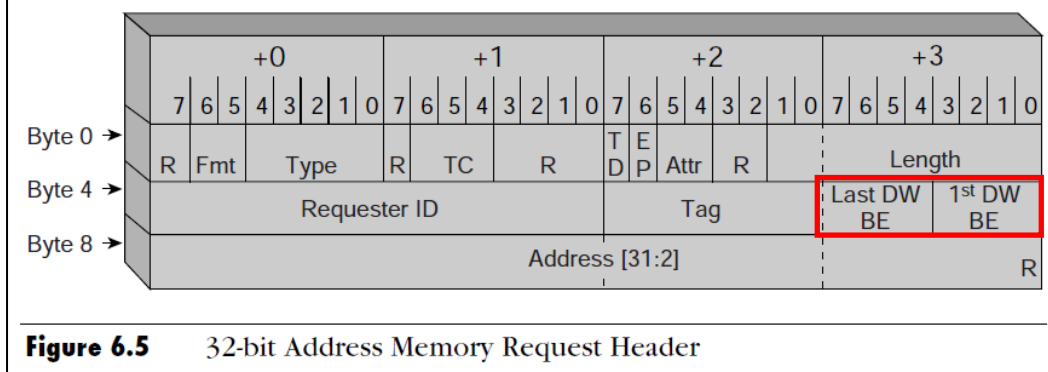
#### **The Data Element**

The data element of the transaction packet provides the actual data being accessed.

*The Complete PCI Express Reference*, Intel Press (2003), at 220.



**Figure 6.4** 64-bit Address Memory Request Header

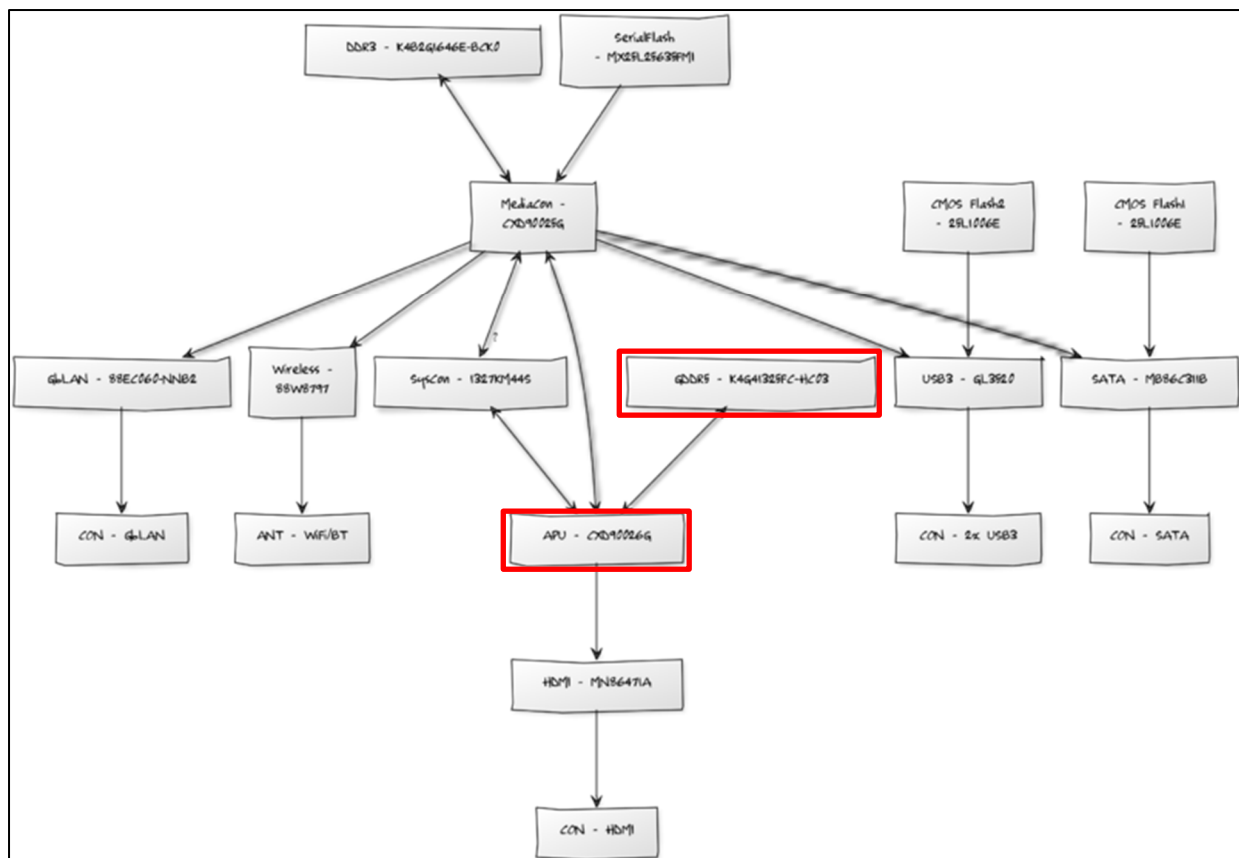


**Figure 6.5** 32-bit Address Memory Request Header

*Introduction to PCI Express – A Hardware and Software Developers Guide*, Intel Press (2003), at 100 (annotations added, indicating byte enable information bits).

97. The PlayStation 4 Slim contains a system memory, i.e., 8 GB of GDDR5 DRAM,<sup>3</sup> which is directly coupled to the integrated central processing unit and interface controller of the Sony CXD90059GB processor. The Sony CXD90059GB processor contains a memory controller with I/O, to which the DRAM is directly coupled. *See, e.g.*, [https://www.psdevwiki.com/ps4/File:Simplified\\_view\\_of\\_PS4\\_architecture.png](https://www.psdevwiki.com/ps4/File:Simplified_view_of_PS4_architecture.png).

<sup>3</sup> See <https://www.playstation.com/en-us/ps4/tech-specs/>.



[https://www.psdevwiki.com/ps4/File:PS4\\_-\\_SAA-001\\_diagram.png](https://www.psdevwiki.com/ps4/File:PS4_-_SAA-001_diagram.png) (annotations added).

98. Sony had actual notice pursuant to 35 U.S.C. § 287(a) of the '750 patent and the infringement alleged herein as of on or around May 18, 2018, when it received ACQIS's notice letter. Paragraphs 43-46 above are incorporated herein by reference.

99. Sony has indirectly infringed the '750 patent by actively inducing the direct infringement of others of the '750 patent, in the United States, the State of Texas, and the Western District of Texas.

100. Sony has induced, through affirmative acts, its customers and other third parties, such as retailers and end users, to directly infringe the '750 patent by using, offering to sell, selling within the United States, and/or importing into the United States those Accused Instrumentalities, which infringed the '750 patent.

101. On information and belief, Sony actively promoted the Accused Instrumentalities for the U.S. market. For example, on information and belief, for every one of Sony's Accused Instrumentalities sold in the United States, Sony pursued and obtained approval from U.S. and state regulatory agencies, such as the United States Federal Communications Commission, to allow sales of such Accused Instrumentalities in the United States.

102. Sony knew that its customers would sell infringing Accused Instrumentalities in the United States or cause Accused Instrumentalities to be sold in the United States, and Sony specifically intended its customers to purchase those Accused Instrumentalities from Sony and sell the Accused Instrumentalities in the United States or cause Accused Instrumentalities to be sold in the United States. Sony's direct and indirect purchasers directly infringed the '750 patent by importing such Accused Instrumentalities into the United States, selling such Accused Instrumentalities in the United States, and using such Accused Instrumentalities in the United States.

103. Sony further induced others' direct infringement of the '750 patent by providing instruction and direction to end users, such as consumers, about how to use the Accused Instrumentalities such that those end users used the Accused Instrumentalities and directly infringed the '750 patent. Sony had knowledge that end users would use Accused Instrumentalities in the manner directed by Sony and specifically intended that end users would perform such uses in the United States. Such infringing uses occurred upon operation of the Accused Instrumentalities in their normal, intended manner without any specific action of the end user other than turning on the product. That is, Sony configured the Accused Instrumentalities in such a way as to induce infringement by end users upon any use of those Accused Instrumentalities. For example, on information and belief, Sony instructed end users

regarding the powering on and use of the PlayStation 4 Slim such that upon any use, the PlayStation 4 Slim would convey address bits, data bits, and byte enable information bits of a PCI bus transaction between the CPU and the PCIe-connected southbridge.

[https://manuals.playstation.net/document/pdf/CUH-2215A-5.5\\_1.pdf](https://manuals.playstation.net/document/pdf/CUH-2215A-5.5_1.pdf); *see also, e.g.*,

<https://www.playstation.com/en-us/support/hardware/ps5-usb-ports-guide/>.

104. Sony has induced others' direct infringement despite actual notice that the Accused Instrumentalities infringed the '750 patent. As of at least May 18, 2018, Sony knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

105. The above-described acts of infringement committed by Sony have caused injury and damage to ACQIS.

106. Sony's acts of infringement as described above have been willful.

107. ACQIS is entitled to recover damages sustained as a result of Sony's wrongful acts in an amount subject to proof at trial, but in no event less than a reasonable royalty.

### **COUNT III: INFRINGEMENT OF U.S. PATENT NO. 8,977,797**

108. The allegations set forth in paragraphs 1 through 54 of this Complaint are incorporated by reference as though fully set forth herein.

109. Pursuant to 35 U.S.C. § 282, the '797 patent is presumed valid.

110. Sony has directly infringed one or more claims of the '797 patent in violation of 35 U.S.C. § 271(a) at least when manufacturing and/or testing the Accused Instrumentalities in

the United States and 35 U.S.C. § 271(g) when importing into the United States and/or selling in the United States products made abroad using the claimed '797 methods.

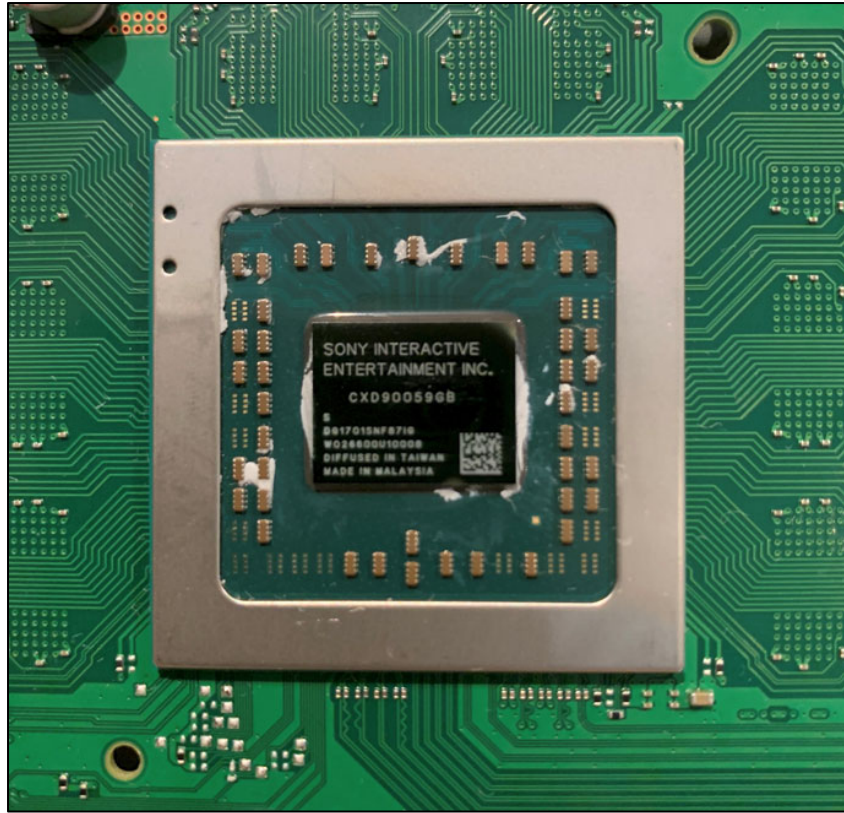
111. Sony has infringed at least claim 14 of the '797 patent at least in the manner described below. Plaintiff's allegations of infringement are not limited to claim 14, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

112. Paragraphs 114-124 describe the manner in which Sony has infringed claim 14 of the '797 patent, at least when manufacturing and/or testing in the United States Accused Instrumentalities, as exemplified by the PlayStation 4 Slim console, and/or when importing into the United States and/or selling in the United States Accused Instrumentalities made abroad using the claimed process.

113. On information and belief, the Accused Instrumentalities are in relevant part substantially similar to the exemplary PlayStation 4 Slim console, in particular with regard to the manner in which the Accused Instrumentalities utilize PCIe and/or USB 3.x functionality for connecting internal components and/or providing USB 3.x ports. Paragraphs 114-124 are thus illustrative of the manner in which Sony has infringed the claims of the '797 patent as to each of the Accused Instrumentalities.

114. The PlayStation 4 Slim console is a computer running the Orbis OS. Paragraph 61 above is incorporated herein by reference.

115. The PlayStation 4 Slim contains a CPU mounted on a circuit board, i.e., a Sony CXD90059GB processor.



Teardown photograph of the PlayStation 4 Slim showing the CPU mounted on a standard motherboard.

116. At least in manufacturing the Accused Instrumentalities, including the Sony PlayStation 4 Slim, Sony has connected an LVDS channel directly to the CPU on the motherboard, the LVDS channel comprising two unidirectional, serial channels that transmit data in opposite directions. As discussed above, the Sony CXD90059GB processor includes a four-lane PCIe interface. Paragraphs 62-65 above are incorporated herein by reference.

117. The PlayStation 4 Slim uses the Sony CXD90059GB processor's on-chip PCIe I/O for directly connecting the Sony CXD90042GG southbridge to the processor chip in a four-lane PCIe configuration. Paragraphs 66-67 above are incorporated herein by reference.

118. The Sony CXD90059GB processor contains one or more logic blocks to implement the PCIe functionality, i.e., a PCIe controller and related circuitry found in the

Physical Layer (PHY). The PCIe controller has an associated PHY connected to it via the PIPE interface.

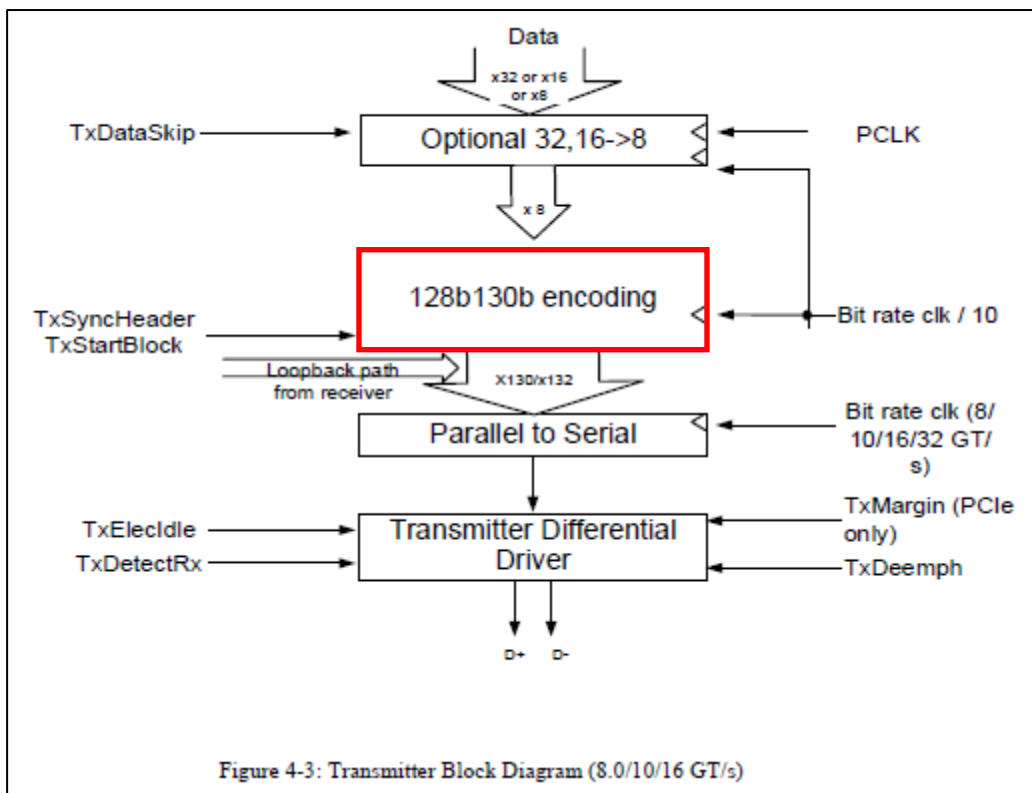
119. This PCIe interface used in the PlayStation 4 Slim for connecting the southbridge to the CPU, as described above, has an LVDS channel directly connected to the CPU on the motherboard.

120. This PCIe LVDS channel comprises two unidirectional, serial channels that transmit data in opposite directions. Paragraph 69 above is incorporated herein by reference.

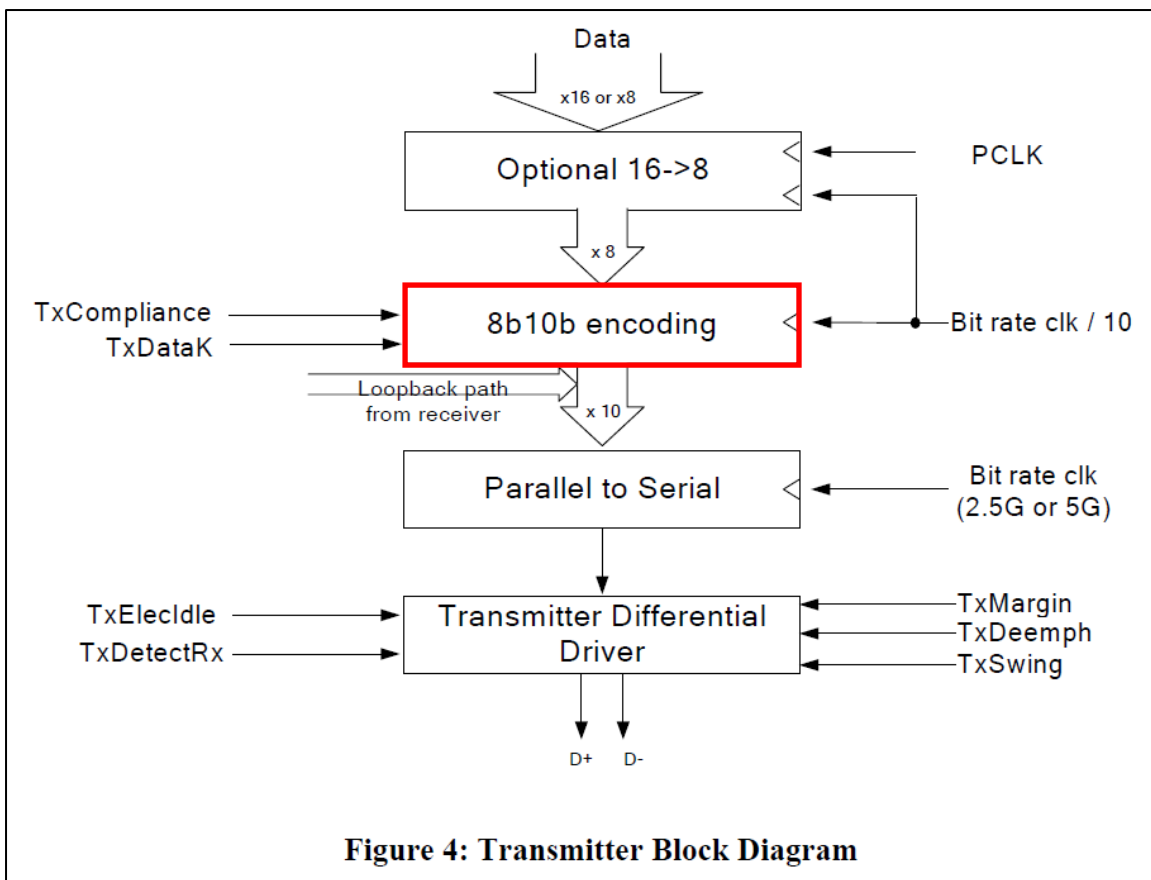
121. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has increased data throughput of the serial channels by providing each channel with multiple pairs of differential signal lines. The PlayStation 4 Slim uses four PCIe lanes to connect the southbridge to the processor chip. Paragraphs 66-67 above are incorporated herein by reference.

122. At least in manufacturing and/or testing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has conveyed encoded address and data bits of a Peripheral Component Interconnect (PCI) bus transaction in serial form over the serial channels to preserve the PCI bus transaction. The data that is transmitted in a serial PCIe bus transaction by the LVDS channel includes encoded address and data bits of a PCI bus transaction. The transaction layer packets (TLPs) used for PCIe data transmission include both address and data bits of a PCI bus transaction. Paragraph 70 above is incorporated herein by reference. The address and data bits are encoded via symbol encoding before being transmitted.





*PHY Interface for the PCI Express, SATA, USB 3.1, DisplayPort, and Converged IO Architectures, Version 5.1 (2018)* (available at <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/phy-interface-pci-express-sata-usb30-architectures-3.1.pdf>), at 29 (annotations added).



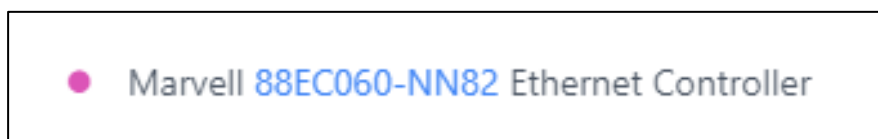
*PHY Interface for the PCI Express Architecture, Version 2.00 (2007) (available at [http://www.applistar.com/wp-content/uploads/apps/pipe2\\_00.pdf](http://www.applistar.com/wp-content/uploads/apps/pipe2_00.pdf)), at 10 (annotations added).*

123. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has coupled the CPU to a peripheral device attached to the motherboard through the LVDS channel. As discussed above, the PlayStation 4 Slim uses the on-chip PCIe interface of the Sony CXD90059GB processor and its LVDS channel to couple the CPU to the Sony CXD90042GG southbridge.

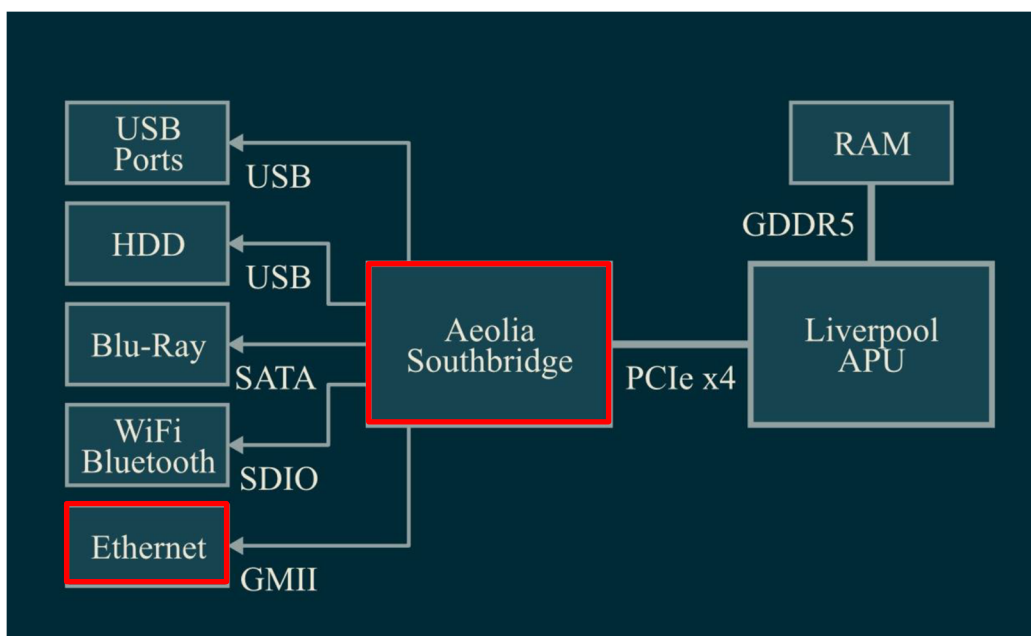
124. The PlayStation 4 Slim in turn uses the multi-lane PCIe-connected southbridge to connect to various peripheral devices to the CPU, including the Marvell 88EC060-NN82 Ethernet controller or similar Ethernet controller, as shown below. The PlayStation 4 Slim thus uses the Sony CXD90059GB processor's on-chip PCIe I/O for connecting the Ethernet controller to the CPU in a multi-lane PCIe configuration.

<b>Networking</b>	Ethernet (10BASE-T, 100BASE-TX, 1000BASE-T) x1
	IEEE 802.11 a/b/g/n/ac
	Bluetooth®v4.0

<https://www.playstation.com/en-us/ps4/tech-specs/>.



<https://www.ifixit.com/Teardown/PlayStation+4+Teardown/19493>.



<https://www.youtube.com/watch?v=-AoHGJ1g9aM> (annotations added).

125. Sony had actual notice pursuant to 35 U.S.C. § 287(a) of the '797 patent and the infringement alleged herein as of on or around May 18, 2018, when it received ACQIS's notice letter. Paragraphs 43-46 above are incorporated herein by reference.

126. Sony has indirectly infringed the '797 patent by actively inducing the direct infringement of others of the '797 patent, in the United States, the State of Texas, and the Western District of Texas.

127. Sony has induced, through affirmative acts, its customers and other third parties to directly infringe the '797 patent. Sony induced others' direct infringement of the '797 patent by selling Accused Instrumentalities to third-party customers who then directly infringed by performing the claimed methods in the United States using the Accused Instrumentalities and/or importing into the United States or selling in the United States Accused Instrumentalities made abroad using the claimed process.

128. On information and belief, Sony actively promoted the Accused Instrumentalities for the U.S. market. For example, on information and belief, for every one of Sony's Accused Instrumentalities sold in the United States, Sony pursued and obtained approval from U.S. and state regulatory agencies, such as the United States Federal Communications Commission, to allow sales of such Accused Instrumentalities in the United States.

129. Sony knew that its customers would use the Accused Instrumentalities to perform the claimed methods in the United States, and Sony specifically intended its customers to use those Accused Instrumentalities to perform the claimed methods in the United States. Sony's direct and indirect purchasers directly infringed the '797 patent by using the Accused Instrumentalities to perform the claimed methods in the United States.

130. Sony further induced others' direct infringement of the '797 patent by providing instruction and direction to end users, such as consumers, about how to use the Accused Instrumentalities to perform the claimed methods in the United States, such that those end users directly infringed the '797 patent. Sony had knowledge that end users would use Accused Instrumentalities in the manner directed by Sony and specifically intended that end users would perform such uses in the United States. For example, on information and belief, Sony instructed end users regarding the powering on and use of the PlayStation 4 Slim such that upon any use,

the PlayStation 4 Slim would convey encoded address and data bits of a PCI bus transaction between the CPU and the PCIe-connected southbridge.

[https://manuals.playstation.net/document/pdf/CUH-2215A-5.5\\_1.pdf](https://manuals.playstation.net/document/pdf/CUH-2215A-5.5_1.pdf); *see also, e.g.*,

<https://www.playstation.com/en-us/support/hardware/ps5-usb-ports-guide/>.

131. Sony has induced others' direct infringement despite actual notice that the Accused Instrumentalities infringed the '797 patent. As of at least May 18, 2018, Sony knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

132. The above-described acts of infringement committed by Sony have caused injury and damage to ACQIS.

133. Sony's acts of infringement as described above have been willful.

134. ACQIS is entitled to recover damages sustained as a result of Sony's wrongful acts in an amount subject to proof at trial, but in no event less than a reasonable royalty.

#### **COUNT IV: INFRINGEMENT OF U.S. PATENT NO. RE44,654**

135. The allegations set forth in paragraphs 1 through 54 of this Complaint are incorporated by reference as though fully set forth herein.

136. Pursuant to 35 U.S.C. § 282, the '654 patent is presumed valid.

137. Sony has directly infringed one or more claims of the '654 patent in violation of 35 U.S.C. § 271(a) at least when manufacturing and/or testing the Accused Instrumentalities in the United States and 35 U.S.C. § 271(g) when importing into the United States and/or selling in

the United States products made abroad using the claimed '654 methods.

138. Sony has infringed at least claim 20 of the '654 patent at least in the manner described below. Plaintiff's allegations of infringement are not limited to claim 20, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

139. Paragraphs 141-150 describe the manner in which Sony has infringed claim 20 of the '654 patent, at least when manufacturing and/or testing in the United States Accused Instrumentalities, as exemplified by the PlayStation 4 Slim console, and/or when importing into the United States and/or selling in the United States Accused Instrumentalities made abroad using the claimed process.

140. On information and belief, the Accused Instrumentalities are in relevant part substantially similar to the exemplary PlayStation 4 Slim console, in particular with regard to the manner in which the Accused Instrumentalities utilize PCIe and/or USB 3.x functionality for connecting internal components and/or providing USB 3.x ports. Paragraphs 141-150 are thus illustrative of the manner in which Sony has infringed the claims of the '654 patent as to each of the Accused Instrumentalities.

141. Sony has practiced claim 20's method of increasing external data communication speed of a computer at least when manufacturing and/or testing the Accused Instrumentalities in the United States and/or when importing into the United States and/or selling in the United States products made abroad using the claimed process.

142. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has provided an integrated CPU and graphics controller on a printed circuit board of a computer. As discussed above in paragraphs 62-64, which are incorporated herein by

reference, the PlayStation 4 Slim contains a Sony CXD90059GB processor. The Sony CXD90059GB processor contains an integrated octa-core CPU and GPU/graphics controller on a single chip. The Sony CXD90059GB processor is mounted to a standard printed circuit board.

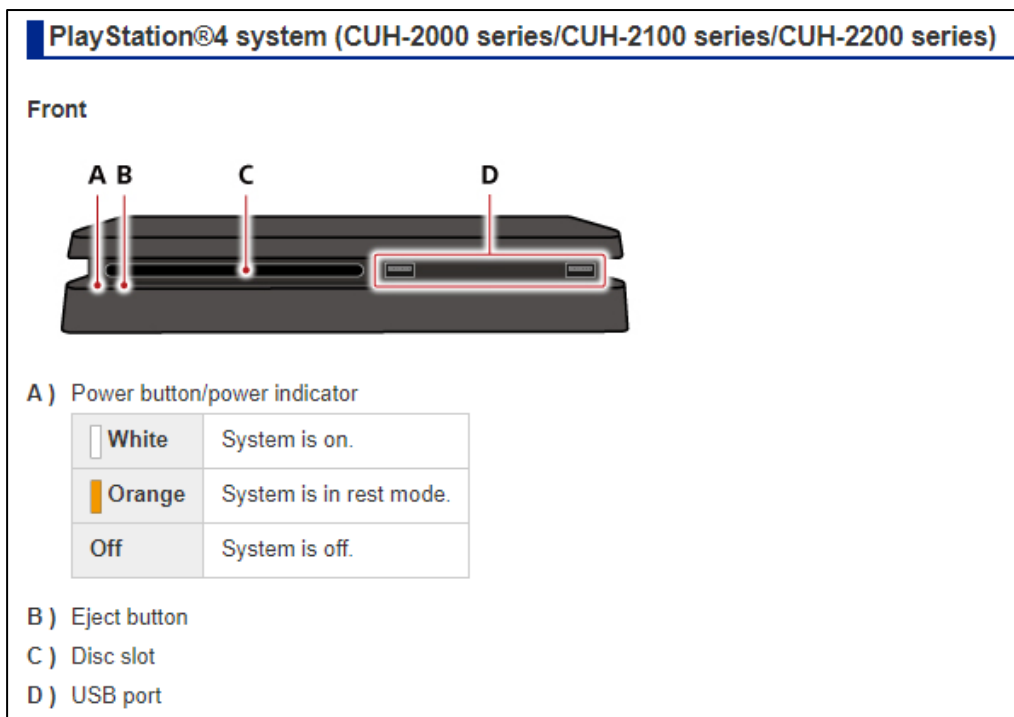
Paragraph 115 above is incorporated herein by reference.

143. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has connected a first LVDS channel directly to the integrated CPU and graphics controller, and the first LVDS channel comprises two unidirectional, serial channels that transmit data in opposite directions. As discussed above, the Sony CXD90059GB processor includes a x4 PCIe interface on-chip. Paragraphs 62-65 above are incorporated herein by reference.

144. This PCIe interface used in the PlayStation 4 Slim for connecting the southbridge to the CPU, as described above, has an LVDS channel directly connected to the integrated CPU and graphics controller.

145. This PCIe LVDS channel comprises two unidirectional, serial channels that transmit data in opposite directions. Paragraph 69 above is incorporated herein by reference.

146. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has provided a connector for the computer that connects to a console. The PlayStation 4 Slim includes a connector that connects to a console, i.e., at least two USB 3.1 ports, each of which can be used to connect to a console, e.g., a mass storage device.



[https://manuals.playstation.net/document/en/ps4/basic/pn\\_2000.html](https://manuals.playstation.net/document/en/ps4/basic/pn_2000.html).

<b>Product name</b>	PlayStation®4
<b>Product code</b>	CUH-2000 series

<b>Input/ Output</b>	Super-Speed USB (USB 3.1 Gen1) port × 2 AUX port × 1
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<https://www.playstation.com/en-us/ps4/tech-specs/>.

147. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has provided a second LVDS channel to couple to the console through the connector, i.e., each USB 3.1 port, the second LVDS channel comprising two unidirectional, serial channels that transmit data in opposite directions.

148. Each USB 3.1 port in the PlayStation 4 Slim utilizes one of the USB 3.x



interfaces on the southbridge in the PlayStation 4. Each USB 3.1 I/O has an LVDS channel that conveys Universal Serial Bus (USB) protocol data.

149. Each USB 3.1 LVDS channel comprises a first unidirectional, differential signal pair to convey data in a first direction and a second unidirectional, differential signal pair to convey data in a second, opposite direction. USB 3.x uses differential signaling and at least two unidirectional channels, allowing simultaneous bidirectional data flow. Each lane has four wires, i.e., one signal pair to transmit data in one direction, and another signal pair to transmit data in the opposite direction.

<b>3.1.4 USB 3.0 Architecture Summary</b>		
USB 3.0 is a dual-bus architecture that incorporates USB 2.0 and a SuperSpeed bus. Table 3-1 summarizes the key architectural differences between SuperSpeed USB and USB 2.0.		
<b>Table 3-1. Comparing SuperSpeed to USB 2.0</b>		
<b>Characteristic</b>	<b>SuperSpeed USB</b>	<b>USB 2.0</b>
Data Rate	SuperSpeed (5.0 Gbps)	low-speed (1.5 Mbps), full-speed (12 Mbps), and high-speed (480 Mbps)
Data Interface	Dual-simplex, four-wire differential signaling separate from USB 2.0 signaling Simultaneous bi-directional data flows	Half-duplex two-wire differential signaling Unidirectional data flow with negotiated directional bus transitions

*Universal Serial Bus 3.0 Specification*, Rev. 1.0 (Nov. 12, 2008), at page 3-3 (annotations added).

150. At least in manufacturing and/or testing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has enabled Universal Serial Bus (USB) protocol data to be conveyed over the second LVDS channel. Specifically, the PlayStation 4 Slim allows USB protocol data to be conveyed over the second LVDS channel coupled to each USB 3.1 connector, i.e., each USB 3.1 LVDS channel.

151. Sony had actual notice pursuant to 35 U.S.C. § 287(a) of the '654 patent and the infringement alleged herein as of on or around May 18, 2018, when it received ACQIS's notice letter. Paragraphs 43-46 above are incorporated herein by reference.

152. Sony has indirectly infringed the '654 patent by actively inducing the direct infringement of others of the '654 patent, in the United States, the State of Texas, and the Western District of Texas.

153. Sony has induced, through affirmative acts, its customers and other third parties to directly infringe the '654 patent. Sony induced others' direct infringement of the '654 patent by selling Accused Instrumentalities to third-party customers who then directly infringed by performing the claimed methods in the United States using the Accused Instrumentalities and/or importing into the United States or selling in the United States Accused Instrumentalities made abroad using the claimed process.

154. On information and belief, Sony actively promoted the Accused Instrumentalities for the U.S. market. For example, on information and belief, for every one of Sony's Accused Instrumentalities sold in the United States, Sony pursued and obtained approval from U.S. and state regulatory agencies, such as the United States Federal Communications Commission, to allow sales of such Accused Instrumentalities in the United States.

155. Sony knew that its customers would use the Accused Instrumentalities to perform the claimed methods in the United States, and Sony specifically intended its customers to use those Accused Instrumentalities to perform the claimed methods in the United States. Sony's direct and indirect purchasers directly infringed the '654 patent by using the Accused Instrumentalities to perform the claimed methods in the United States.

156. Sony further induced others' direct infringement of the '654 patent by providing instruction and direction to end users, such as consumers, about how to use the Accused Instrumentalities to perform the claimed methods in the United States, such that those end users directly infringed the '654 patent. Sony had knowledge that end users would use Accused

Instrumentalities in the manner directed by Sony and specifically intended that end users would perform such uses in the United States. For example, on information and belief, Sony instructed end users regarding the powering on and use of the PlayStation 4 Slim such that upon any use, the PlayStation 4 Slim would convey address and data bits of a PCI bus transaction between the CPU and the PCIe-connected southbridge. [https://manuals.playstation.net/document/pdf/CUH-2215A-5.5\\_1.pdf](https://manuals.playstation.net/document/pdf/CUH-2215A-5.5_1.pdf); *see also, e.g.*, <https://www.playstation.com/en-us/support/hardware/ps5-usb-ports-guide/>.

157. Sony has induced others' direct infringement despite actual notice that the Accused Instrumentalities infringed the '654 patent. As of at least May 18, 2018, Sony knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the infringement that was induced.

158. The above-described acts of infringement committed by Sony have caused injury and damage to ACQIS.

159. Sony's acts of infringement as described above have been willful.

160. ACQIS is entitled to recover damages sustained as a result of Sony's wrongful acts in an amount subject to proof at trial, but in no event less than a reasonable royalty.

**COUNT V: INFRINGEMENT OF U.S. PATENT NO. RE45,140**

161. The allegations set forth in paragraphs 1 through 54 of this Complaint are incorporated by reference as though fully set forth herein.

162. Pursuant to 35 U.S.C. § 282, the '140 patent is presumed valid.

163. Sony has directly infringed one or more claims of the '140 patent in violation of 35 U.S.C. § 271(a) at least when manufacturing and/or testing the Accused Instrumentalities in the United States and 35 U.S.C. § 271(g) when importing into the United States and/or selling in the United States products made abroad using the claimed '140 methods.

164. Sony has infringed at least claim 35 of the '140 patent at least in the manner described below. Plaintiff's allegations of infringement are not limited to claim 35, and additional infringed claims will be identified and disclosed through discovery and infringement contentions.

165. Paragraphs 167-178 describe the manner in which Sony has infringed claim 35 of the '140 patent, at least when manufacturing and/or testing in the United States Accused Instrumentalities, as exemplified by the PlayStation 4 Slim console, and/or when importing into the United States and/or selling in the United States Accused Instrumentalities made abroad using the claimed process.

166. On information and belief, the Accused Instrumentalities are in relevant part substantially similar to the exemplary PlayStation 4 Slim console, in particular with regard to the manner in which the Accused Instrumentalities utilize PCIe and/or USB 3.x functionality for connecting internal components and/or providing USB 3.x ports. Paragraphs 167-178 are thus illustrative of the manner in which Sony has infringed the claims of the '140 patent as to each of the Accused Instrumentalities.

167. Sony has practiced claim 35's method of improving performance of a computer at least when manufacturing the Accused Instrumentalities in the United States and/or when importing into the United States and/or selling in the United States products made abroad using the claimed process.

168. The PlayStation 4 Slim console is a computer running the Orbis OS. Paragraph 61 above is incorporated herein by reference.

169. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has obtained an integrated Central Processing Unit (CPU) and graphics controller in a single chip. As discussed above in paragraphs 62-64, which are incorporated herein by reference, the PlayStation 4 Slim contains a Sony CXD90059GB processor. The Sony CXD90059GB processor contains an integrated octa-core CPU and graphics controller/GPU in a single chip.

170. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has connected a first Low Voltage Differential Signal (LVDS) channel directly to the integrated CPU and graphics controller, and the first LVDS channel comprises two unidirectional, serial bit channels that transmit data in opposite directions. As discussed above, the Sony CXD90059GB processor includes a x4 PCIe interface on-chip. Paragraphs 62-65 above are incorporated herein by reference.

171. The PlayStation 4 Slim uses the Sony CXD90059GB processor's on-chip PCIe I/O for directly connecting the Sony CXD90042GG southbridge to the processor chip in a four-lane PCIe configuration. Paragraphs 66-67 above are incorporated herein by reference.

172. This PCIe interface has an LVDS channel directly connected to the integrated CPU and graphics controller.

173. This PCIe LVDS channel comprises two unidirectional, serial bit channels that transmit data in opposite directions. Paragraph 69 above is incorporated herein by reference.

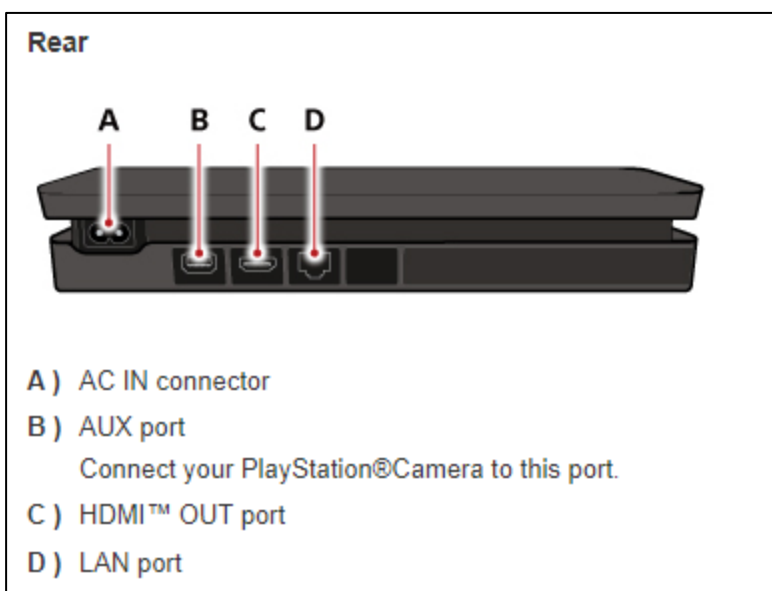
174. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has connected a differential signal channel directly to the integrated CPU and

graphics controller to output video data. The Sony CXD90059GB processor in the PlayStation 4 Slim is connected directly to a differential signal channel and is capable of outputting video data through the differential signal channel via HDMI.

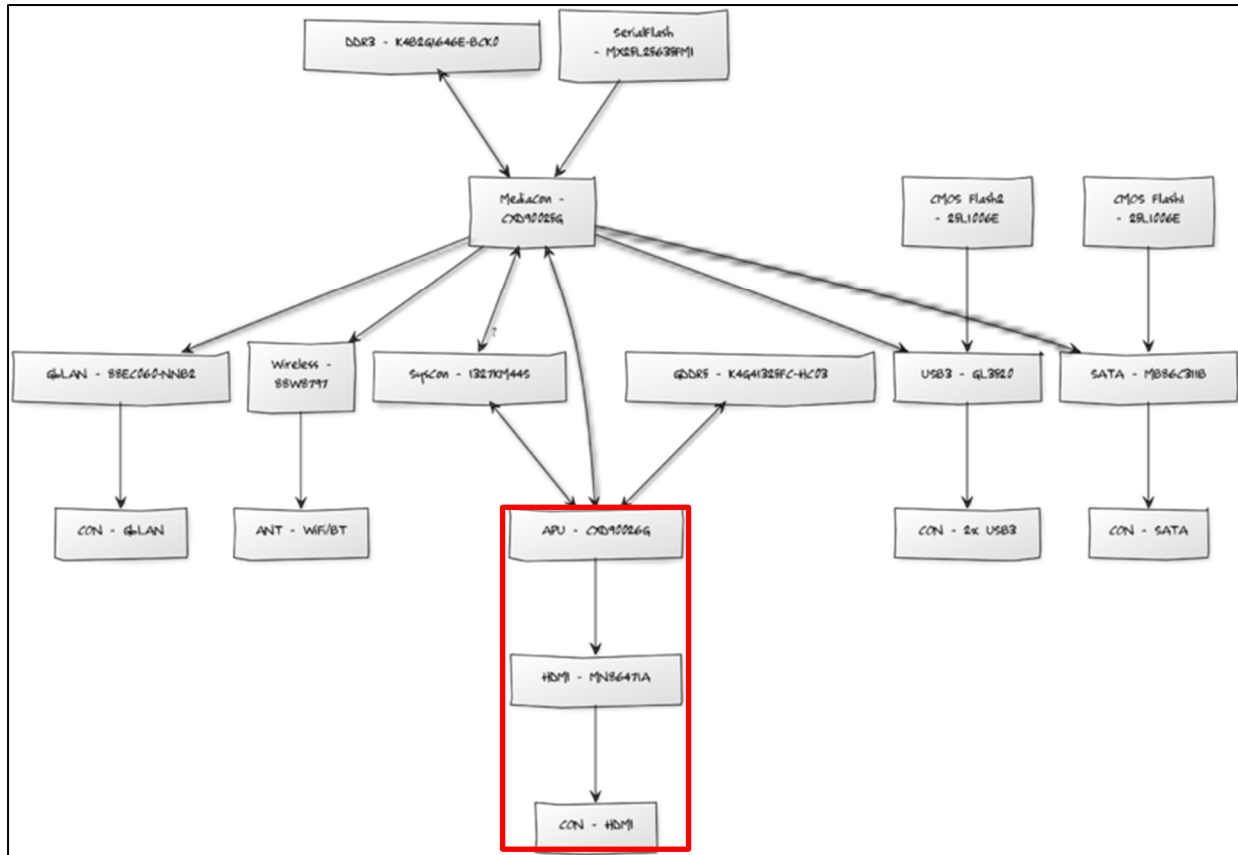
<b>Product name</b>	PlayStation®4
<b>Product code</b>	CUH-2000 series

<b>AV output</b>	HDMI™ out port (HDR output supported)
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<https://www.playstation.com/en-us/ps4/tech-specs/>.



[https://manuals.playstation.net/document/en/ps4/basic/pn\\_2000.html](https://manuals.playstation.net/document/en/ps4/basic/pn_2000.html).



[https://www.psdevwiki.com/ps4/File:PS4\\_-\\_SAA-001\\_diagram.png](https://www.psdevwiki.com/ps4/File:PS4_-_SAA-001_diagram.png) (annotations added).

175. The HDMI channel uses differential signaling.

**1.1 Purpose and Scope**

This document constitutes the specification for the High-Definition Multimedia Interface (HDMI), version 1.3a.

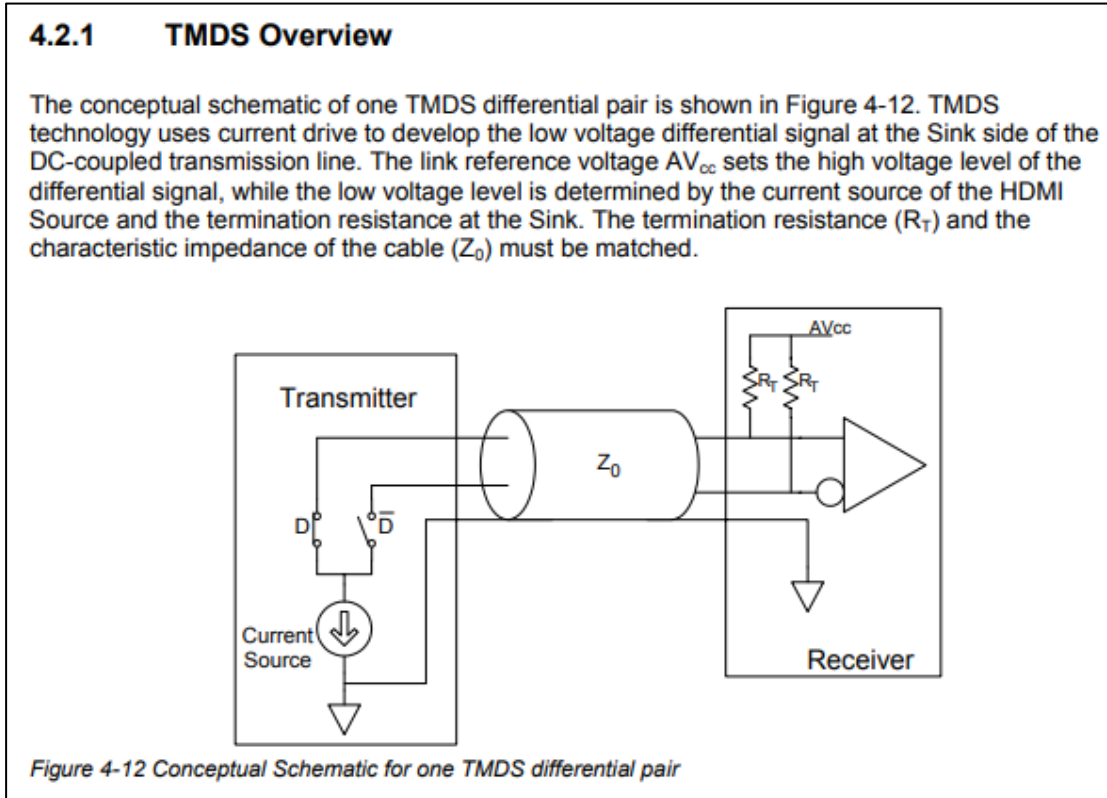
The High-Definition Multimedia Interface is provided for transmitting digital television audiovisual signals from DVD players, set-top boxes and other audiovisual sources to television sets, projectors and other video displays.

HDMI can carry high quality multi-channel audio data and can carry all standard and high-definition consumer electronics video formats. Content protection technology is available.

HDMI can also carry control and status information in both directions.

This specification completely describes the interface such that one could implement a complete transmission and interconnect solution or any portion of the interface. The underlying Transition Minimized Differential Signaling (TMDS)-based protocol and associated electrical signaling is described in detail. The mechanical specification of the connector and the signal placement within the connector are described.

*High-Definition Multimedia Interface, Specification Version 1.3a (Nov. 10, 2006), at 1.*



*Id.* at 38.

176. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has provided a connector for the computer for connection to an external peripheral. The PlayStation 4 Slim includes a connector, i.e., at least two USB 3.1 ports, each of which can be used to connect to an external peripheral, e.g., a mass storage device. Paragraphs 146-148 above are incorporated herein by reference.

177. At least in manufacturing the Accused Instrumentalities, including the PlayStation 4 Slim, Sony has provided a second LVDS channel to couple to the connector, the second LVDS channel comprising two unidirectional, serial bit channels that transmit data in opposite directions. Each USB 3.1 port in the PlayStation 4 Slim utilizes one of the USB 3.x interfaces on the southbridge in the PlayStation 4. Each USB 3.1 I/O has an LVDS channel comprising two



unidirectional, serial bit channels that transmit data in opposite directions. Paragraphs 146-149 are incorporated herein by reference.

178. Each USB 3.1 LVDS channel comprises two unidirectional, serial bit channels that transmit data in opposite directions. USB 3.x uses differential signaling and at least two unidirectional channels, allowing simultaneous bidirectional data flow. Each lane has four wires, i.e., one signal pair to transmit data in one direction, and another signal pair to transmit data in the opposite direction. Paragraph 149 is incorporated herein by reference.

179. Sony had actual notice pursuant to 35 U.S.C. § 287(a) of the '140 patent and the infringement alleged herein as of on or around May 18, 2018, when it received ACQIS's notice letter. Paragraphs 43-46 above are incorporated herein by reference.

180. Sony has indirectly infringed the '140 patent by actively inducing the direct infringement of others of the '140 patent, in the United States, the State of Texas, and the Western District of Texas.

181. Sony has induced, through affirmative acts, its customers and other third parties to directly infringe the '140 patent. Sony induced others' direct infringement of the '140 patent by selling Accused Instrumentalities to third-party customers who then directly infringed by performing the claimed methods in the United States using the Accused Instrumentalities and/or importing into the United States or selling in the United States Accused Instrumentalities made abroad using the claimed process.

182. On information and belief, Sony actively promoted the Accused Instrumentalities for the U.S. market. For example, on information and belief, for every one of Sony's Accused Instrumentalities sold in the United States, Sony pursued and obtained approval from U.S. and state regulatory agencies, such as the United States Federal Communications Commission, to

allow sales of such Accused Instrumentalities in the United States.

183. Sony knew that its customers would use the Accused Instrumentalities to perform the claimed methods in the United States, and Sony specifically intended its customers to use those Accused Instrumentalities to perform the claimed methods in the United States. Sony's direct and indirect purchasers directly infringed the '140 patent by using the Accused Instrumentalities to perform the claimed methods in the United States.

184. Sony further induced others' direct infringement of the '140 patent by providing instruction and direction to end users, such as consumers, about how to use the Accused Instrumentalities to perform the claimed methods in the United States, such that those end users directly infringed the '140 patent. Sony had knowledge that end users would use Accused Instrumentalities in the manner directed by Sony and specifically intended that end users would perform such uses in the United States. For example, on information and belief, Sony instructed end users regarding the powering on and use of the PlayStation 4 Slim such that upon any use, the PlayStation 4 Slim would convey address and data bits of a PCI bus transaction between the CPU and the PCIe-connected southbridge. [https://manuals.playstation.net/document/pdf/CUH-2215A-5.5\\_1.pdf](https://manuals.playstation.net/document/pdf/CUH-2215A-5.5_1.pdf); *see also, e.g.*, <https://www.playstation.com/en-us/support/hardware/ps5-usb-ports-guide/>.

185. Sony has induced others' direct infringement despite actual notice that the Accused Instrumentalities infringed the '140 patent. As of at least May 18, 2018, Sony knew that the induced conduct would constitute infringement—and intended that infringement at the time of committing the aforementioned affirmative acts, such that the acts and conduct have been committed with the specific intent to induce infringement—or deliberately avoided learning of the infringing circumstances at the time of committing these acts so as to be willfully blind to the

infringement that was induced.

186. The above-described acts of infringement committed by Sony have caused injury and damage to ACQIS.

187. Sony's acts of infringement as described above have been willful.

188. ACQIS is entitled to recover damages sustained as a result of Sony's wrongful acts in an amount subject to proof at trial, but in no event less than a reasonable royalty.

### **JURY TRIAL DEMANDED**

189. ACQIS LLC hereby demands a trial by jury on all claims and issues so triable.

### **PRAYER FOR RELIEF**

WHEREFORE, Plaintiff ACQIS respectfully requests that this Court:

A. Enter judgment that Defendants have infringed one or more claims of each of the ACQIS Patents, and that such infringement was willful;

B. Enter an order, pursuant to 35 U.S.C. § 284, awarding to Plaintiff ACQIS monetary relief in an amount adequate to compensate for Defendants' infringement of the ACQIS Patents, in an amount to be determined at trial, but not less than a reasonable royalty, as well as pre- and post-judgment interest and costs and enhanced damages for Defendants' willful infringement of the ACQIS Patents;

C. Enter an order, pursuant to 35 U.S.C. § 285, declaring this to be an exceptional case and thereby awarding to Plaintiff ACQIS its reasonable attorneys' fees; and

D. Enter an order awarding to Plaintiff ACQIS such other and further relief, whether at law or in equity, that this Court deems just, equitable, and proper.

Dated: April 14, 2022

Respectfully submitted,

By: /s/ Ronald J. Schutz w/permission Andrea L. Fair

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