

IN THE UNITED STATES DISTRICT COURT  
FOR THE WESTERN DISTRICT OF TEXAS  
WACO DIVISION

GPU++, LLC,	)	
	)	
Plaintiff,	)	
	)	
v.	)	
	)	
QUALCOMM INCORPORATED;	)	Civil Action No. 6:19-CV-474
QUALCOMM TECHNOLOGIES, INC.,	)	
	)	<b>JURY TRIAL DEMANDED</b>
Defendants.	)	
	)	
	)	
	)	

**COMPLAINT**

Plaintiff GPU++, LLC (“Plaintiff”), by its attorneys, demands a trial by jury on all issues so triable and for its complaint against Qualcomm Incorporated and Qualcomm Technologies, Inc. (collectively, “Defendants”) alleges as follows:

**NATURE OF THE ACTION**

1. This is a civil action for patent infringement under the patent laws of the United States, Title 35, United States Code, Section 271, *et seq.*, involving United States Patent No. 8,988,441 (Exhibit A, “’441 patent”) and seeking damages and injunctive relief as provided in 35 U.S.C. §§ 281 and 283-285.

**THE PARTIES**

2. Plaintiff is a California limited liability company with a principal place of business at 650-B Fremont Avenue #137, Los Altos, CA 94024. Plaintiff is the owner by assignment of the ’441 patent.

3. On information and belief, Qualcomm Incorporated is a corporation organized

and existing under the laws of the State of Delaware, having a principal place of business at 5775 Morehouse Dr., San Diego, California, 92121.

4. On information and belief, Qualcomm Technologies, Inc. is a wholly-owned subsidiary of Qualcomm Incorporated, and is a corporation organized and existing under the laws of the State of Delaware, having a principal place of business at 5775 Morehouse Dr., San Diego, California, 92121.

#### **JURISDICTION AND VENUE**

5. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

6. On information and belief, jurisdiction and venue for this action are proper in this Judicial District.

7. This Court has personal jurisdiction over Defendants at least because they (i) have a regular and established place of business in the State of Texas and this Judicial District; (ii) have purposefully availed themselves of the rights and benefits of the laws of the State of Texas and this Judicial District; (iii) have done and are doing substantial business in the State of Texas and this Judicial District, directly or through intermediaries, both generally and, on information and belief, with respect to the allegations in this Complaint, including their one or more acts of infringement in the State of Texas and this Judicial District; (iv) maintain continuous and systematic contacts in the State of Texas and this Judicial District; (v) and/or place products alleged to be infringing in this Complaint in the stream of commerce with awareness that those products are sold and offered for sale in the State of Texas and this Judicial District.

8. Venue is proper in this Judicial District as to Defendants under 28 U.S.C. § 1400(b) at least because they have committed acts of infringement and have a regular and

established place of business in this Judicial District.

**JOINDER**

9. Joinder is proper under at least Federal Rule of Civil Procedure 20 and 35 U.S.C. § 299 at least because Defendants' infringing conduct alleged herein arises out of the same transaction, occurrence, or series of transactions or occurrences relating to the making, using, importing into the United States, offering for sale, or selling of the same accused product or process, and questions of fact common to all Defendants will arise in this action.

**THE PATENT-IN-SUIT**

10. Plaintiff is the lawful owner of all right, title, and interest in United States Patent No. 8,988,441 entitled "RECONFIGURABLE 3D GRAPHICS PROCESSOR" ("441 patent"), including the right to sue and to recover for infringement thereof. A copy of the '441 patent is attached hereto as Exhibit A, which was duly and legally issued on March 24, 2015, naming Edward A. Hutchins as the inventor.

11. The '441 patent has 20 claims: 3 independent claims and 17 dependent claims.

12. The '441 patent presented a new reconfigurable 3D graphics processing unit ("GPU") that improved upon prior GPUs. The reconfigurable 3D GPU of the '441 patent is capable of operating in either or both of two GPU operating modes – a direct rasterizing mode (i.e., direct-rendering mode) or a tiling mode (i.e., binning mode) – to process a sequence of drawing commands received from a processing unit. In one example, the reconfigurable 3D GPU of the '441 patent comprises, *inter alia*, a central processing unit ("CPU"), a pipeline configuration manager, a triangle rasterizer, and a binning engine. In this example, the pipeline configuration manager can select between one or a combination of the two modes of operation. The pipeline configuration manager can either direct incoming graphical drawing commands to

the binning engine when operating in tiling mode, or it can direct commands to the triangle rasterizer when operating in direct rasterizing mode. One embodiment of the reconfigurable 3D GPU of the '441 patent is shown in FIG. 3, reproduced below.

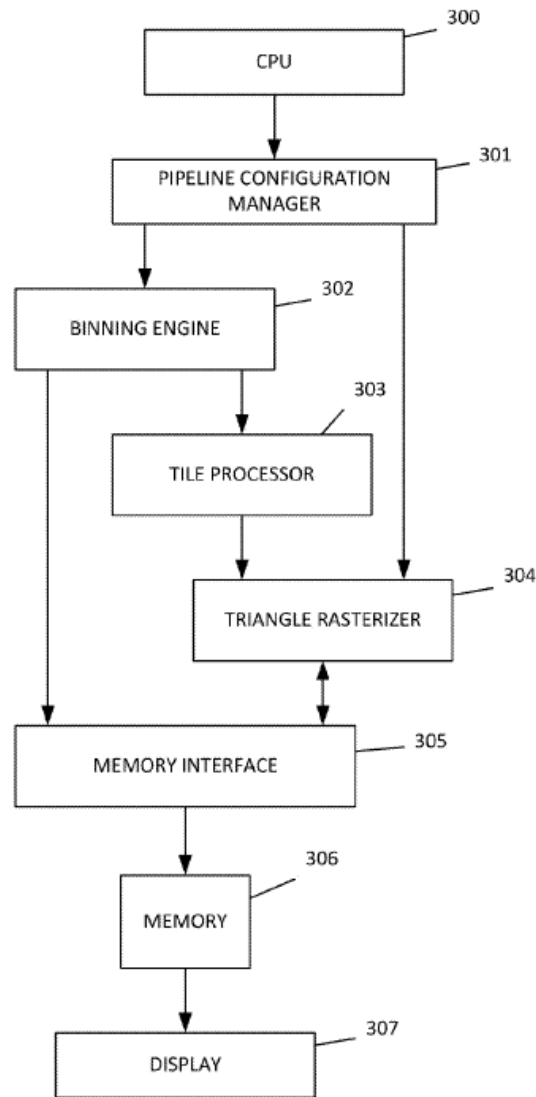


FIG. 3

13. The claims of the '441 patent, including claim 1 (reproduced below), recite at least these inventive concepts of the '441 patent.

1. A graphics processor, comprising:

a pipeline configuration manager;

a rasterizer coupled to the pipeline configuration manager; and

a memory coupled to the rasterizer;

wherein the pipeline configuration manager is capable of configuring the graphics processor to operate in a direct rasterizing mode or a tiling mode to process a sequence of drawing commands received from a processing unit; and

wherein the pipeline configuration manager is capable of selecting one of the direct rasterizing mode or the tiling mode prior to rendering a frame.

(Exhibit A, '441 patent at claim 1.) The subject matter described and claimed by the '441 patent, including the reconfigurable 3D GPU of claim 1, was an improvement in computer functionality, performance, and efficiency and was novel and not well-understood, routine, or conventional at the time of the '441 patent.

14. On information and belief, Defendants had knowledge of the '441 patent, including at least as of August 14, 2019, the date of receiving a letter from Plaintiff putting Defendants on notice of the '441 patent and Defendants' infringement of the '441 patent, and at least as of the date of this Complaint.

#### **BACKGROUND OF DEFENDANTS' INFRINGING CONDUCT**

15. On information and belief, Defendants are semiconductor and telecommunications equipment companies that make, use, sell, offer for sale, and/or import, or have otherwise made, used, sold, offered for sale, and/or imported systems-on-a-chip ("SOC") having GPUs, including the Snapdragon family of SOCs containing at least the Adreno series of GPUs with FlexRender technology or similar functionality.

16. On information and belief, Defendants' products that infringe the '441 patent (collectively, "Accused Products") include SOCs having at least the following GPUs: Adreno 3x GPUs, including at least Adreno 320 and Adreno 330; Adreno 4x GPUs, including at least

Adreno 405, Adreno 418, Adreno 420, and Adreno 430; and Adreno 5x GPUs, including at least Adreno 504, Adreno 505, Adreno 506, Adreno 508, Adreno 509, Adreno 510, Adreno 512, Adreno 530, and Adreno 540. (See Exhibit B, “Qualcomm Adreno Vulkan Developer Guide” (August 8, 2017) (publicly available at [https://developer.qualcomm.com/qfile/34706/80-nb295-7\\_a-adreno\\_vulkan\\_developer\\_guide.pdf](https://developer.qualcomm.com/qfile/34706/80-nb295-7_a-adreno_vulkan_developer_guide.pdf) (last visited August 14, 2019)) at 14 (“QTI introduced its new FlexRender solution as part of Adreno 3x, 4x, and 5x.”).) On information and belief, Defendants’ Accused Products further include SOCs having any GPU with FlexRender technology or similar functionality.

17. Defendants infringed and continue to infringe the ’441 patent by making, using, selling, offering to sell, and/or importing, without license or authority, the Accused Products as alleged herein.

18. Defendants market, advertise, offer for sale, and/or otherwise promote their Accused Products and, on information and belief, do so to induce, encourage, instruct, and aid one or more persons in the United States to make, use, sell, and/or offer to sell their Accused Products. For example, Defendants publish and distribute developer guides, such as the “Qualcomm Adreno Vulkan Developer Guide” (August 8, 2017) (publicly available at [https://developer.qualcomm.com/qfile/34706/80-nb295-7\\_a-adreno\\_vulkan\\_developer\\_guide.pdf](https://developer.qualcomm.com/qfile/34706/80-nb295-7_a-adreno_vulkan_developer_guide.pdf) (last visited August 14, 2019)), whose stated purpose is to provide “a guide for developing and optimizing [applications] on platforms containing Qualcomm Adreno GPUs.” (Exhibit B at 8.) Therein, Defendants describe their use of FlexRender technology as part of the Adreno series of GPUs:

**FlexRender™ (hybrid deferred and direct rendering mode)**

QTI introduced its new FlexRender solution as part of Adreno 3x, 4x, and 5x. FlexRender refers to the ability of the GPU to switch between indirect rendering

(binning or deferred rendering) and direct rendering to the frame buffer.

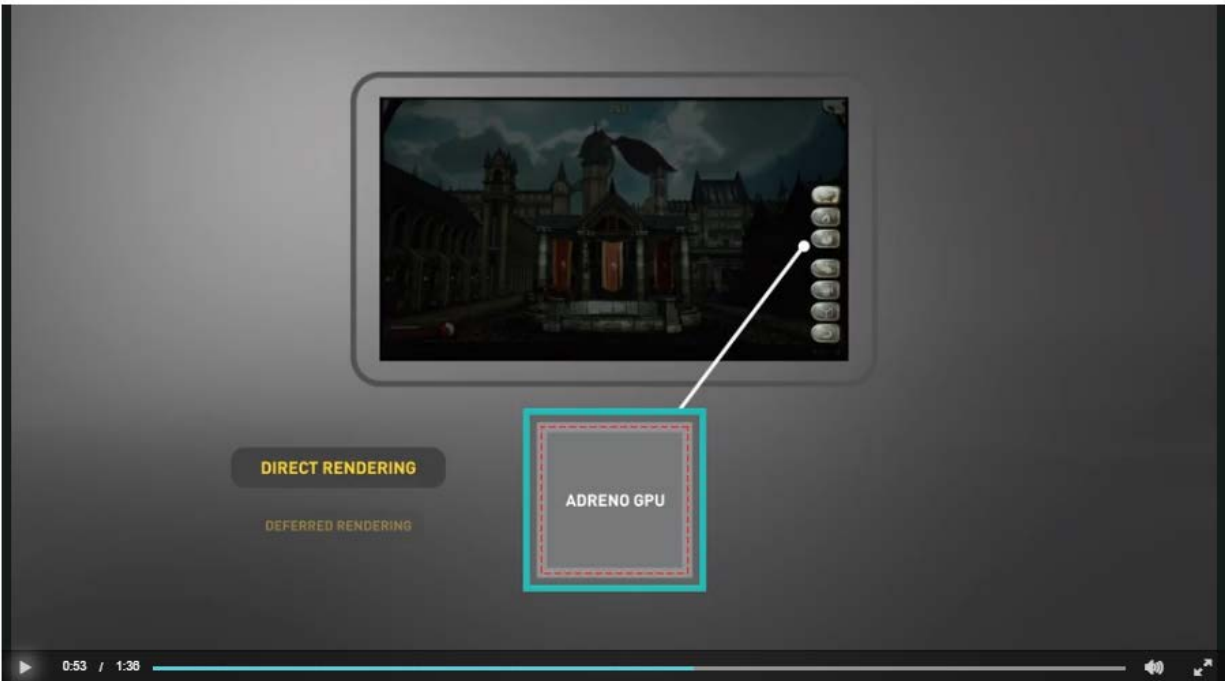
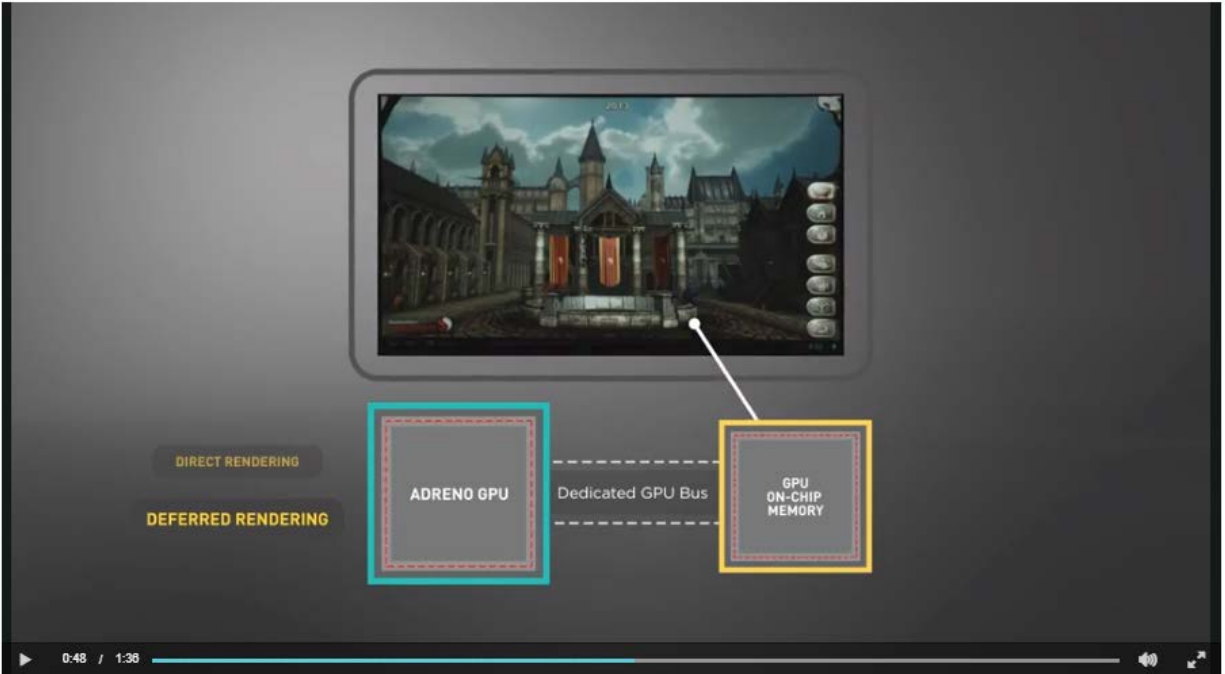
There are advantages to both the direct and deferred rendering modes. The Adreno 3x, 4x, and 5x GPUs were designed to maximize performance by switching between the two modes in a dynamic fashion. This works by the GPU analyzing the rendering for a given render target and selecting the mode automatically.

(Exhibit B at 14-15.)

19. Defendants also market, advertise, offer for sale, and/or otherwise promote their Accused Products on their website. For example, Defendants published an informational and promotional video titled “FlexRender” on March 21, 2013, which provides information on the operation of Defendants’ Accused Products. (<https://www.qualcomm.com/videos/flexrender> (last visited August 14, 2019).) Defendants’ video states:

FlexRender delivers efficient graphics processing through dynamically switching between direct and deferred rendering modes. Direct rendering mode is when the GPU immediately renders graphics directly to the display regardless of the complexity of the objects within the scene. Deferred rendering mode uses buffering and fast on-chip memory to render in tiles and then merge them to the display.

(*Id.* at 8 seconds through 30 seconds.) Screenshots of Defendants’ informational and promotional video, reproduced below, illustrate the Accused Products switching between deferred- and direct- rendering modes:



(*Id.* at 48 and 53 seconds.)

20. Defendants’ video further touts the benefits of using the Accused Products: “FlexRendering technology has the ability to determine which mode will be more efficient for a given task and switch between the two modes on the fly, resulting in better overall performance



and improved power efficiency.” (*Id.* at 47 seconds through 59 seconds; *see also id.* at 1 minute 14 seconds through 1 minute 17 seconds (“maximizing performance, minimizing power consumption”).)

**BACKGROUND OF DEFENDANTS’ KNOWLEDGE OF THE INVENTIONS  
DESCRIBED AND CLAIMED IN THE ’441 PATENT**

21. On information and belief, Defendants have had knowledge of the ’441 patent and the inventions described and claimed therein since at least around January 11, 2011. On or about that date, the inventor of the ’441 patent, Mr. Edward Hutchins, attended a meeting at Defendants’ offices and presented to Defendants his inventive concept of a new reconfigurable 3D GPU capable of operating in either or both of a direct rasterizing mode (i.e., direct-rendering mode) or a tiling mode (i.e., binning mode). On information and belief, both Mr. Hutchins and Defendants understood the January 2011 meeting was confidential, and that any information disclosed by Mr. Hutchins to Defendants would remain confidential.

22. The January 2011 meeting between Mr. Hutchins and Defendants did not result in any business investment by Defendants or business relationship. About one month later on February 10, 2011, Mr. Hutchins filed U.S. Provisional Application No. 61/462,985, to which the ’441 patent claims priority. (Exhibit A, ’441 patent at (60).)

23. Later in 2011, the same year as the January 2011 meeting between Mr. Hutchins and Defendants, on or about November 30, 2011, Defendants filed U.S. Provisional Application No. 61/565,397 entitled “Switching Between Direct Rendering and Binning in Graphics Processing.” On information and belief, Defendants’ U.S. Provisional Application No. 61/565,397 disclosed Mr. Hutchins’ invention he presented to Defendants and described and claimed in the ’441 patent. On information and belief, among the many patent applications filed by Defendants, Defendants’ U.S. Provisional Application No. 61/565,397 was the first to

disclose a reconfigurable 3D GPU capable of operating in either or both of a direct rasterizing mode (i.e., direct-rendering mode) or a tiling mode (i.e., binning mode).

24. On information and belief, Defendants also learned of the '441 patent, and the inventions described and claimed therein, during prosecution of several of Defendants' patent applications before the United States Patent and Trademark Office ("USPTO").

25. On information and belief, Defendants also learned of the '441 patent, and the inventions described and claimed therein, during prosecution of Defendants' U.S. Application No. 13/553,709 entitled "Hardware Switching Between Direct Rendering and Binning in Graphics Processing," which claims priority to Defendants' U.S. Provisional Application No. 61/565,397 filed after the January 2011 meeting. On at least May 10, 2016, during prosecution of Defendants' U.S. Application No. 13/553,709, the USPTO cited U.S. Publication No. 2012/0206447 (published on August 16, 2012), which is the prior publication of the patent application that issued as the '441 patent. (Exhibit A, '441 patent at (65).) In particular, the USPTO rejected several pending claims of Defendants' U.S. Application No. 13/553,709 as unpatentable for being obvious over U.S. Publication No. 2012/0206447 and another published patent application. On July 29, 2016, Defendants acknowledged U.S. Publication No. 2012/0206447 and made arguments purporting to distinguish it from several pending claims of Defendants' U.S. Application No. 13/553,709.

26. On information and belief, Defendants also learned of the '441 patent, and the inventions described and claimed therein, during prosecution of Defendants' U.S. Application No. 13/841,584 entitled "Tile-Based Rendering." On at least April 13, 2015, during prosecution of Defendants' U.S. Application No. 13/841,584, the USPTO cited U.S. Publication No. 2012/0206447 (published on August 16, 2012), which is the prior publication of the patent

application that issued as the '441 patent. (Exhibit A, '441 patent at (65).) In particular, the USPTO rejected several pending claims of Defendants' U.S. Application No. 13/841,584 as unpatentable for being anticipated by U.S. Publication No. 2012/0206447 or obvious over U.S. Publication No. 2012/0206447 and another published patent application. On July 13, 2015, Defendants acknowledged U.S. Publication No. 2012/0206447 and made arguments purporting to distinguish it from several pending claims of Defendants' U.S. Application No. 13/841,584. On July 23, 2015, the USPTO again rejected several pending claims of Defendants' U.S. Application No. 13/841,584 as unpatentable for being anticipated by U.S. Publication No. 2012/0206447 or obvious over U.S. Publication No. 2012/0206447 and another published patent application. On July 19, 2016, the USPTO issued a Notice of Allowance and again identified U.S. Publication No. 2012/0206447.

27. On August 13, 2019, Plaintiff sent Defendants a letter specifically charging Defendants with infringement of the '441 patent at least for their making, using, offering for sale, selling, and/or importing the Accused Products. Defendants received this letter on August 14, 2019. A true and correct copy of this letter is attached as Exhibit C.

**COUNT I – INFRINGEMENT OF U.S. PATENT NO. 8,988,441**

28. Plaintiff incorporates by reference the allegations contained in paragraphs 1 to 27 above.

29. On information and belief, Defendants have made, used, offered for sale, sold, and/or imported products, including at least the Accused Products, that infringe, either literally or under the doctrine of equivalents, one or more claims of the '441 patent in violation of 35 U.S.C. § 271(a), including claim 1.

30. On information and belief, the Accused Products comprise a graphics processor, a

pipeline configuration manager, a rasterizer coupled to the pipeline configuration manager, and a memory coupled to the rasterizer, wherein the pipeline configuration manager is capable of configuring the graphics processor to operate in a direct rasterizing mode or a tiling mode to process a sequence of drawing commands received from a processing unit, and wherein the pipeline configuration manager is capable of selecting one of the direct rasterizing mode or the tiling mode prior to rendering a frame.

31. On information and belief, with knowledge of the '441 patent, Defendants have actively induced and continue to induce the direct infringement of one or more claims of the '441 patent, including claim 1, in violation of 35 U.S.C. § 271(b) by their customers and/or end users of their products, including at least the Accused Products, by selling, providing support for, providing instructions for use of, and/or otherwise encouraging their customers and/or end-users to directly infringe, either literally and/or under the doctrine of equivalents, one or more claims of the '441 patent, including claim 1, with the intent to encourage those customers and/or end users to infringe the '441 patent.

32. By way of example, on information and belief, Defendants actively induce infringement of the '441 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users who test, operate, and use Defendants' products, including at least the Accused Products, to make, use, sell, and/or offer to sell Defendants' products, including at least the Accused Products, in a manner that infringes at least one claim of the '441 patent, including claim 1. For example, as described above, Defendants actively market, advertise, offer for sale, and/or otherwise promote their Accused Products by publishing and distributing developer guides, such as the "Qualcomm Adreno Vulkan Developer Guide" (August 8, 2017) (publicly available at <https://developer.qualcomm.com/qfile/34706/80->

[nb295-7 a-adreno\\_vulkan\\_developer\\_guide.pdf](#) (last visited August 14, 2019)), which instruct and encourage developers to use the Accused Products to, e.g., “optimiz[e applications] on platforms containing Qualcomm Adreno GPUs.” (Exhibit B at 8.) As described above, Defendants also actively market, advertise, offer for sale, and/or otherwise promote their Accused Products by publishing informational and promotional videos on their website, including the informational and promotional video titled “FlexRender,” which touts, among other things, the benefits the Accused Products, e.g., “better overall performance and improved power efficiency. (See <https://www.qualcomm.com/videos/flexrender> (last visited August 14, 2019) at 47 seconds through 59 seconds.)

33. On information and belief, with knowledge of the '441 patent, Defendants also contribute to the infringement of one or more claims of the '441 patent in violation of 35 U.S.C. § 271(c), including claim 1, by making, using, offering to sell or selling and/or importing a patented component or material constituting a material part of the invention, including at least the Accused Products, knowing the same to be especially made or especially adapted for use in an infringement and not a staple article or commodity of commerce suitable for substantial non-infringing use. This is evidenced by, among other things, the design, configuration, and functionality of Defendants' Accused Products, which are especially made or especially adapted for use in an infringement of the '441 patent when used for their normal and intended purpose. This is also evidenced by, among other things, Defendants' informational and promotional materials described above, which describe the normal use and intended purpose of the Accused Products and demonstrate that the Accused Products are especially made or especially adapted for a use that infringes the '441 patent.

34. On information and belief, as a result of Defendants' inducement of, and/or

contribution to, infringement, their customers and/or end users made, used, sold, or offered for sale, and continue to make, use, sell, or offer to sell, Defendants' products, including the Accused Products, in ways that directly infringe one or more claims of the '441 patent, including claim 1. On information and belief, Defendants had actual knowledge of their customers' and/or end users' direct infringement at least by virtue of their sales, instruction, and/or otherwise promotion of Defendants' products, including the Accused Products, at least as of August 14, 2019, the date of receiving a letter from Plaintiff putting Defendants on notice of the '441 patent and Defendants' infringement of the '441 patent, and at least as of the date of this Complaint.

35. On information and belief, with knowledge of the '441 patent, Defendants have willfully, deliberately, and intentionally infringed the '441 patent, and continue to willfully, deliberately, and intentionally infringe the '441 patent. On information and belief, Defendants had actual knowledge of the '441 patent and Defendants' infringement of the '441 patent at least as of August 14, 2019, the date of receiving a letter from Plaintiff putting Defendants on notice of the '441 patent and Defendants' infringement of the '441 patent, and at least as of the date of this Complaint. On information and belief, after acquiring that knowledge, Defendants directly and indirectly infringed the '441 patent as set forth above. On information and belief, Defendants knew or should have known that their conduct amounted to infringement of the '441 patent at least because Plaintiff notified Defendants of the '441 patent and their infringement of the '441 patent at least as of August 14, 2019, the date of receiving a letter from Plaintiff putting Defendants on notice of the '441 patent and Defendants' infringement of the '441 patent, and at least as of the date of this Complaint.

36. On information and belief, Defendants will continue to infringe the '441 patent unless and until they are enjoined by this Court. Defendants, by way of their infringing

activities, have caused and continue to cause Plaintiff to suffer damages in an amount to be determined, and have caused and are causing Plaintiff irreparable harm. Plaintiff has no adequate remedy at law against Defendants' acts of infringement and, unless they are enjoined from their infringement of the '441 patent, Plaintiff will continue to suffer irreparable harm.

37. Plaintiff is entitled to recover from Defendants damages at least in an amount adequate to compensate for their infringement of the '441 patent, which amount has yet to be determined, together with interest and costs fixed by the Court.

**PRAYER FOR RELIEF**

WHEREFORE, Plaintiff GPU++, LLC requests that the Court enter judgment for Plaintiff and against Defendants Qualcomm, Incorporated and Qualcomm Technologies, Inc. and enter the following relief:

- A. A judgment that Defendants infringe the '441 patent;
- B. A preliminary and permanent injunction restraining and enjoining Defendants, their officers, partners, agents, servants, employees, parents, subsidiaries, divisions, affiliate corporations, joint ventures, other related business entities and all other persons acting in concert, participation, or in privity with them, and their successors and assigns, from infringing the '441 patent;
- C. An award of damages to Plaintiff arising from Defendants' past and continuing infringement up until the date Defendants are finally and permanently enjoined from further infringement, including compensatory damages;
- D. A determination that Defendants' infringement of the '441 patent has been willful, and an award of treble damages to Plaintiff pursuant to 35 U.S.C. § 284;
- E. A determination that this is an exceptional case and awarding Plaintiff's

attorneys' fees pursuant to 35 U.S.C. § 285;

- F. An order awarding Plaintiff costs and expenses in this action;
- G. An order awarding Plaintiff pre- and post-judgment interest on its damages; and
- H. Such other and further relief in law or in equity as this Court deems just and proper.

**JURY DEMAND**

Plaintiff respectfully requests a jury trial on all issues so triable.

Respectfully submitted,

*/s/ Charles Ainsworth*

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