IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

CARNEGIE MELLON UNIVERSITY,	)	
	)	
Plaintiff,	)	
v.	)	Civil Action No. 2:09-cv-00290-NBF
	)	
MARVELL TECHNOLOGY GROUP, LTD., and MARVELL SEMICONDUCTOR, INC.,	)	
	)	
Defendants.	)	

PLAINTIFF CARNEGIE MELLON UNIVERSITY'S MEMORANDUM IN SUPPORT OF ITS MOTION FOR A FINDING OF WILLFUL INFRINGEMENT AND ENHANCED DAMAGES

I. INTRODUCTION

CMU proved a classic case of willful infringement. A diligent jury[1] found that CMU proved that: (1) Marvell infringed CMU's valid patents; (2) Marvell had actual knowledge of CMU's patents while infringing; (3) Marvell had no objectively reasonable defenses to CMU's claim of infringement; and (4) knew or should have known that it was infringing. Dkt. 762. The evidence clearly and convincingly establishes that Marvell's infringement was both objectively and subjectively willful; and this Court should so find. *See Bard Peripheral Vascular, Inc. v. W.L. Gore & Assocs., Inc.*, 682 F.3d 1003, 1005 (Fed. Cir. 2012); *In re Seagate Tech. LLC*, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (*en banc*).

Pursuant to 35 U.S.C. §284, this Court also should enhance the compensatory damages awarded to CMU. Application of the *Read* factors demonstrates that enhancement is necessary and appropriate here to deter and punish Marvell for intentionally disregarding CMU's patent rights.[2] Marvell has been willfully infringing CMU's patents for more than a decade, and it and its founders have reaped enormous profits from this misconduct. Furthermore, Marvell's willful infringement was not the accidental product of a rogue group of engineers. Marvell's senior executives and in-house counsel were aware of CMU's patents before Marvell built a single infringing chip, and its CTO (Pantas Sutardja) and General Counsel were similarly aware no later than August 2003. Given the evidence of Marvell's pervasive disrespect for CMU's patent rights, the statutory policies of deterrence and punishment will be served only with a substantial enhancement of the otherwise compensatory award.

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[1] The Court and Marvell repeatedly acknowledged the jury's diligence. 12/21/12 Tr. at 8:25 – 9:8 ("[T]his jury I think we've all observed is very diligent."); *id.* at 17:9 – 24 ("[A]s Mr. Madison argued, they [the jurors] have been more than attentive."); 12/12/12 Tr. at 236:10-11 ("From what I saw, the jury is taking copious notes."); 12/13/12 Tr. at 84:4-8 ("I can tell you, though, the jury has been listening very intently. One of the jurors has written so many notes he need more steno pads.") *see also* 12/21/12 Tr. at 133:17-20; 12/26/12 Tr. at 11:19-23.

[2] *See Read Corp. v. Portec, Inc.*, 970 F.2d 816, 826 (Fed. Cir. 1992) *abrogated on other grounds by Markman v. Westview Instruments, Inc.,* 52 F.3d 967, 975 (Fed.Cir.1995) (en banc).

II. FACTUAL BACKGROUND

A. Despite Knowledge of CMU's Patents, Marvell Infringed Without Investigating Their Scope

Marvell's blatant disregard of CMU's patent rights began no later than January 2002, shortly after Mr. Burd completed his "sub-optimal media noise detector based on Kavcic model," which he called a "KavcicPP" in December 2001. P-279; 12/3/12 Tr. at 56:18 – 57:24.[3] Mr. Burd warned Marvell executives twice—first on January 3 and again on January 4, 2002—that "Kavcic's detection scheme" was covered by a CMU patent. *See* P-280 (Jan. 3 Burd email to Nersi Nazari and Toai Doan); P-283 (Jan. 4 Burd email to Toai Doan, Nersi Nazari, and Ke Han); *see also*12/3/2012 Tr. at 65:14 – 67:21, 71:13 – 74:11.[4]

Marvell presented no evidence whatsoever that it did anything to assess the risk posed by CMU's patents in response to Mr. Burd's warnings. For example, despite knowing that "the invention is in the claims" Burd continued his work on the MNP (aka, the "KavcicPP") without even bothering to read the claims of CMU's patents. 12/17/12 Tr. at 167:6-174:9. After receiving Mr. Burd's second warning, Mr. Doan (Mr. Burd's boss) did not obtain, let alone read, the CMU patents. JX-D-1 at 2-3. A year later, Mr. Doan learned that his engineers discussed using "***the original structure that Kavcic proposed in his paper***" to enhance the MNP (P-366), but even that did not move him to action. Instead he testified that he did not "have any particular feeling about Kavcic's patent" and he still saw no need to review the patent or consult counsel. JX-D-1 at 5-6.

Similarly, Dr. Wu was well aware of patent rights before Marvell began infringing,[5] but

[3] *See also* P-196 at pp 893 - 904 (Burd's December, 2001 lab notebook includes notes about a "media noise detector" and the "Kavcic model," as well as his "simplified Kavcic PP," which is a block diagram of what became the Marvell MNP-type chips, and included a detailed FIR circuit layout and branch metric ("BM") equation).

[4] The jury specifically determined that Marvell knew of the '180 and '839 Patents prior to this lawsuit. Dkt. 762 at Questions 19, 22. Mr. Doan was Marvell's Vice-President of Read Channel Development and Nersi Nazari was a Marvell vice president. JX-D-1 at 1; 12/17/12 Tr. 166:14 – 167:3.

[5] *See* 12/13/12 Tr. at 6:11 – 6:13 (awareness of patent system as student); *id.* at 18:15 – 18:22 (IP orientation at Quantum); *id.* at 22:16 – 22:25 (IP orientation at Marvell in 1999); *id.* at 30:21 – 31:7 (work on patentable inventions in between 1999 and 2001). *See also id.* at 43:3 – 44:20, 66:9 – 67:25 (When Dr. Wu came across Dr. Kavcic's papers he had already filed his first patent but he did not "even think about checking with the Patent Office

he never looked at the file histories of CMU's patents. *See* 12/13/12 Tr. at 73:5 – 73:18. Although Dr. Wu claims to have discussed CMU's patents with counsel in the context of determining the patentability of his own invention,[6] that claim actually exacerbates Marvell's culpability as it confirms that Marvell was well aware of CMU's patents but proceeded despite the risk.[7] Marvell offered no evidence that its counsel ever considered whether CMU's patents covered the MNP. *See* Dkt. 753 at 2-3. The only argument that Marvell could muster is that its MNP design was patentable over CMU's patents, but as every patent lawyer (and likely the prolific inventors at Marvell) knows, separate patentability does not bear on infringement.[8]

Even the most senior Marvell executives were aware of CMU's patents. In August 2003, shortly after Marvell had first achieved volume production of its MNP products,[9] CMU sent separate letters to Marvell's CTO, Dr. Pantas Sutardja, and to its General Counsel, Matthew Gloss, regarding its patents.[10] Marvell never responded. 12/7/12 Tr. at 164-165; *see also* 12/11/12 Tr. at 90:14 – 91:6. Nor did Marvell proffer any evidence that it bothered then to investigate whether it was using CMU's patented technology.

The foregoing facts alone make an extraordinarily strong willfulness case, but there is more. In 2004, Marvell's customer Fujitsu inquired in writing about the CMU Patents:

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that there might be a patent that went with the paper.").

[6] *See* 12/13/12 Tr. at 67:14 – 67:25; *see also* 12/11/12 Tr. at 323:9-24; 12/12/12 at 90:1 – 90:15.

[7] Dr. Wu claimed to have reviewed the first CMU patent with Marvell's in-house counsel, Eric Janofsky. 12/11/12 Tr. at 323:9 – 323:24.; P-953 (Marvell's privilege log refers only to communications with counsel related to patent prosecution); 12/17/12 Tr at 25:2 – 31:14. Marvell, however, unequivocally and repeatedly represented that Marvell would ***not*** assert the opinion of counsel defense, *see* Ex. 4 at 77 (8/27/2010 Tr.); Dkt. 723 at 2-5; Dkt. 753 at 2, so this consultation is not a viable defense to willfulness. ("Ex. __" herein refers to the Declaration of Mark G. Knedeisen in Support of Plaintiff Carnegie Mellon University's Motion for Judgment of Willful Infringement and Enhanced Damages, filed herewith.).

[8] *See* 10/17/12 Tr. at 18:1-3 (Marvell's counsel acknowledged the same: "Well, look, we don't infringe – and we're not going to say this to the jury – we don't infringe because we have our own patents that we practice.").

[9] 12/7/12 at 164:7 – 24 (Marvell's first MNP products reached volume production (1 million units sold) in June 2003, approximately two months before CMU's letters to Marvell); *see also* 12/4/12 Tr. at 239:13– 243:18 (volume production of Marvell's first MNP chips began in approximately June 2003); P-DEMO 20 (showing volume production, date of "1 Million Unit" shipped, for 44 accused chip programs).

[10] P-422; P-431; 11/30/12 Tr. at 120:2 – 121:7; 12/5/12 Tr. at 143:20 – 145:16; 12/12/12 Tr. at 286:10 – 286:24.

> Since it seems that these patents might be related to read channel, ***we would like to know, by the end of November, your opinion re garding relationship between CMU's Patents and the above Marvell's lead [sic] channel*** [5575M and 7500M] ***and the s pecific grounds/reasons for such opinion.***

P-477 (emphasis added). Again, Marvell offered nothing to show that it addressed Fujitsu's concerns. To the contrary, Dr. Armstrong[11] testified that he did not know whether anyone at Marvell communicated back to Fujitsu in response to its request for an opinion, and Marvell confirmed that a search for a written response came up empty. JX-C at 12-13.[12]

At least eight Marvell executives and employees (including two in-house attorneys) knew of CMU's patents, but Marvell offered nothing to show that it took seriously the infringement risk that they presented. Marvell's failure to even evaluate that risk violated its own IP policy, which requires that "[a]ny information we might get about patents, either externally or internally, ***the policy would be to send that to legal and to have legal analyze the patent and determine what the appropriate next step would be***." JX-C at 9-10 (emphasis added).

B. Marvell Knowingly Copied the CMU Patents

Marvell's own internal documents demonstrate, and the testimony of CMU's expert confirms,[13] that Marvell repeatedly copied CMU's patents. The first two episodes of copying occurred as Marvell developed its MNP circuit. The third occurred when Marvell developed its NLD circuit.

Marvell first implemented the optimal Kavcic detector in a simulator. *See* P-93 (KavcicViterbi code). Dr. McLaughlin confirmed that Marvell's KavcicViterbi simulator code—which Marvell uses as the gold standard for its benchmarking—implements the asserted

[11] Dr. Armstrong was Marvell's 30(b)(6) witness on its communications with customers. 12/4/12 Tr. at 7:13-11:19.

[12] Marvell's failure to proffer evidence of an affirmative response to Fujitsu is particularly telling in light of Dr. Armstrong's admission that: "The response to a letter like this would have been to forward it to legal and have legal determine the appropriate action." JX-C at 13

[13] Dr. McLaughlin mapped the claims of CMU's patents to Marvell's MNP and NLD products and corresponding simulators and in conjunction therewith concluded that Marvell copied the papers of Drs. Kavcic and Moura knowing that the CMU patents followed those papers. 12/3/12 Tr. at 81:16 – 82:18; *id.* at 86:7 – 86:11 (the simplified Kavcic PP, which Mr. Burd copied from Kavcic-Moura papers, "served as the basis for the MNP"); *see also id.* at 106:13-106:24.

claims of the patents. *See* 12/3/12 Tr. at 54:18 – 55:11; *id.* at 171:25 – 175:14. Mr. Burd corroborated Dr. McLaughlin's testimony; he conceded that the code for the "KavcicViterbi.cpp class, written by engineers in Marvell, . . . contains the implementation, as understood by our architecture team, of the ***IP which is taught in Professor Kavcic's papers, and consequently in his patent***." 12/3/12 Tr. at 167. Similarly, Dr. Wu testified that the "Kavcic Viterbi is a simulator that simulates the method proposed by Dr. Kavcic in his paper. . . . So we use that simulator to benchmark our own development." 12/11/12 Tr at 302:3 – 16.

A few months after he began studying the Kavcic model, Burd prepared a "preliminary write up" of the "KavcicPP" detector titled "Detection in the Presence of Media Noise," which cites to the work of Drs. Kavcic and Moura. P-280;[14] 12/3/12 Tr. at 65:14 – 67:10. Dr. McLaughlin testified that this "KavcicPP" write up describes Marvell's MNP circuit and that the simplified Kavcic PP was the "basis" for the MNP.[15] The evidence shows that the paper that Mr. Burd cited in his MNP write-up for the MNP is "virtually identical to what's described in the CMU patents."[16] Not only did both of the inventors confirm Dr. McLaughlin's testimony on this point,[17] but so did Mr. Burd. *See* 12/3/12 Tr. at 76:25 – 77:15. More importantly, Dr. McLaughlin testified that Marvell's MNP circuit is a "***cut and paste***" of Figure 3-B from CMU's

[14] The email transmitting the write-up also contains Mr. Burd's first warning about CMU's patents. *See* P-280; 12/3/12 Tr. at 73:13 -74:24. The block diagram of the MNP on page 3 of this write up is the same block diagram labeled as "simplified Kavcic PP" on page 12 of his lab notebook. *Compare* P-280 *with* P-196.

[15] 12/3/12 Tr. at 66:15 – 67:21; *see also id.* at 72:15 – 73:12 (diagram of the "media noise detector" in Burd's write up (P-280) is the same as the "KavcicPP" diagram in Burd's lab notebook); *id.* at 85:11 – 86:11 (both the Kavcic PP diagram on page 897 of P-196 and the Simplified Kavcic PP diagram on page 900 of P-196 appear on page 3 of the P-280 (the MNP write-up) and the simplified Kavcic PP is the same as the media noise detector in Fig. 2 of P-280 and served as the "basis for the MNP."). *See also* P-DEMO 7 at 17, 23. *See also* 12/11/12 Tr at 302:3 – 302:16 (Zining Wu testifying: "Kavcic PP actually means MNP.")

[16] *Id.* at 66:15 – 67:21; *id.* at 77:20 - 78:18 ("'180 Equation 13, is actually the exact same Equation 13 in the 1998 papers," and Fig. 3B from the'180 patent shows the FIR filter described in P-169); *id.* at 78:21 – 79:10 (Equation 13 in the patent is also in P-183); P-183 (2000 IEEE paper); P-169 (1998 IEEE Paper). *See also* P-DEMO-7 at 30 – 33 (demonstrating to the jury that the equations in P-169 and P-183 are in the '180 Patent).

[17] *See* 11/29/2012 Tr. at 68:16 – 69:17 (Dr. Moura testifying that the FIR filter implementation of the 2000 paper is in the patents); 11/30/12 Tr. at 154:15 – 154:25 (Dr. Kavcic testified that "[w]hat is described in this article is exactly the methods of the patents."); *id.* at 155:5 – 158:11 (Dr. Kavcic testified that equation 19 in the article is equation 13 in the '180 patent, "[s]o what is described in this paper is exactly the same content that was described in the patent.").

patents. 12/3/12 Tr. at 106:8 –24 ("[O]ne of the very first things I noticed is when you look right here, when you look right here [P-295 at 22], sure enough, my first reaction is that's a cut and paste of Figure 3-B from the patent; boom, it's right in there.").[18]

Marvell copied CMU's work for the third time when it developed its NLD-type chips. Again, Marvell's internal documents betray any claim of independent development. Concerning the development of the NLD (an "MNP enhancement"), Dr. Wu wrote: "Greg and I discussed the approach of using a different noise whitening filter for each branch. It turns out to be ***the original structure that Kavcic proposed in his paper***." P-366; 12/3/12 Tr. at 134:19 – 135:15. Indeed, Dr. McLaughlin confirmed that the NLD does, in fact, use the "original structure proposed in [Kavcic's] paper." *Id.* at 136:1 – 137:4; *see also* P-596 (NLD Application Note states that "NLD has noise whitening built into the branch metric (BM) calculation.").

C. Marvell Had No Objectively Reasonable Defenses

1. Marvell Deliberately Ignored its Own IP Policy and the Risk Posed By CMU Patents for Years Despite Copying CMU's Invention

The jury unanimously found that Marvell lacked an objectively reasonable defense to CMU's claims of infringement of '180 and '839 Patents and knew or should have known that it was infringing. Dkt. 762 at Questions 19-24. As to Marvell's pre-litigation conduct, the jury's findings are supported by the overwhelming evidence discussed above. As CMU demonstrates below, Marvell's lack of any objectively reasonable pre-litigation defense is all that it needed to satisfy the *Bard* test for willfulness, but Marvell's litigation defenses reinforce that conclusion.

2. Marvell's Litigation-Inspired Non-Infringement Defenses Contradicted Its Own Documents And Sworn Testimony

It is not surprising that the jury unanimously found that Marvell chips and simulators directly and indirectly infringe CMU's patents. Dr. McLaughlin carefully and thoroughly mapped Marvell's infringement and copying,[19] and Marvell did nothing to undercut his opinions

[18] P-295; *see also* P-DEMO-7 at slide 47.

[19] *See generally* Brief in Opposition to Marvell's Motion for Judgment as a Matter of Law on Non-Infringement (Dkt. 729).

on cross examination.[20] Perhaps the most compelling evidence of infringement, however, came from Marvell's own internal files and the mouths of its own witnesses.

Marvell's non-infringement arguments for its MNP-type chips were squarely at odds with Marvell documents and prior sworn testimony of Marvell's trial witnesses. Specifically, Marvell claimed that the post-processor was not a detector,[21] did not compute branch metrics[22] and did not have a trellis[23] as required by the asserted claims. But, the evidence showed:

- Specifications that Marvell gives to its customers expressly describe the MNP as "an advanced ***post-processing*** adaptive ***detector*** . . . ." P-472 at 114 (emphasis added), P-Demo 7 at 53.
- Marvell's "official" and "accurate" MNP specification, P-295,[24] is titled "Media Noise ***Detector*** Design Review," (p. 1 (emphasis added)) and shows the MNP inside a block labeled "detector" (p. 17). It also describes the computation of branch metric ("BM") values by the non-linear filters. *Id.* at 21-22.[25]
- Dr. Wu admitted (initially) that the MNP practices claim 1 of Marvell's '585 patent (DX-266) (*see* Tr. 12/12/12 at 66), which expressly includes a "post-processor" as part of the "detector." Further, the "post-processor" computes "path metrics" (DX-

[20] Tellingly, Marvell's first cross-examination of Dr. McLaughlin included extended questioning unrelated to Dr. McLaughlin's infringement analysis, *see e.g.*,12/3/12 Tr. at 232-42 (examination about validity), *id.* at 228-31 (cross-examination about simulators in general and hypothetical patents), and covered irrelevant matters such as how the technology in a digital watch compared to that of NASA's moon landing, *id.* at 215-16; how courts approach claim construction, *id.* at 221-23; and how many claims a patent can have and typically does have, *id.* at 224-25; *see also* Dkt. 691 at 7-9. Moreover, Marvell's counsel so badly misread Marvell's core circuit diagrams that Dr. McLaughlin was forced to explain to Marvell's counsel that "I'm afraid you have maybe no idea how this works," and "I'm afraid you don't know what this circuit does." 12/3/12 Tr. at 270-273; *see also id.* at 264-65.

[21] *See e.g.*, 12/12/12 Tr. at 53:4-11 (post-processor is not a detector); 12/13/12 Tr. at 241-4242 (Dr. Blahut testifying that the MNP is a post-processor that is not a detector.)

[22] Mr. Burd testified the MNP does not compute branch metric values. 12/17/12 Tr. at 141:13-25. Dr. Wu testified that the MNP does not use branch metrics or path metric. 12/12/12 Tr. at 53:4-9. Echoing their testimony, Dr. Blahut testified: "I believe Professor McLaughlin failed to actually study the details of this circuit to see what it does, because it does not compute anything like a branch metric," and that "the statement that we computed a path metric is not true." 12/13/12 Tr. at 250:1-5, 254:18-19; *see also id.* at 254:22-23 (Dr. Blahut testifying that the MNP "does not compute a path metric.") (emphasis added).

[23] *See e.g.*, 12/11/12 Tr. at 301:14-15 ("[T]here's no trellis in the MNP."); 12/17/12 at 140:22-141:2 (same).

[24] *See e.g.,* Tr. 12/12/12 at 53-54 (Dr. Wu testifying that P-295 is "official" and "accurate"). When he was cross-examined regarding exhibit P-295 and its description of the MNP, Dr. Wu conceded: "So it's a detector." *Id.* at 55.

[25] *See* 12/17/12 Tr. at 157:8 -159:19 (regarding P-295, Mr. Burd testified that "BM stands for branch metrics. . . ."); *see also* 12/12/12 Tr. at 53:24 – 57:2 (Dr. Wu also testified regarding P-295 that "BM" stands for branch metric).

266 at col. 5:11), and "BM" (branch metric) values using a "non-linear Viterbi Branch Metric (BM)." DX-266 at col. 3:1-64.

- Mr. Burd's lab notebook includes a "BM" (branch metric) function to describe the MNP's non-linear filter. *See* P-196 at MSI 55528904.
- Dr. Song's internal presentation described the MNP as a "partial nonlinear ***detector,***" P-770 at 32 (emphasis added), P-Demo 7 at 52; *see also id.* at 4, and explained and graphically showed that the MNP "calculate[s] nonlinear BMs and PMs" *id.* at 29, using a trellis. *See id.* at 28.
- Mr. Burd's MNP simulator code (named "KavcicPP") computes values for variables named "BMVit" and "BMAlt." *See* P-108 at ll. 131 and 287-288.

Instead of conceding these points, Marvell's witnesses unreasonably attempted to disavow Marvell's own documents:

- Despite admitting that "BM" in (the "official" and "accurate") P-295 means "branch metric" (*see* 12/17/12 Tr. at 157:8 -159:19),[26] Mr. Burd testified that in his simulator code (P-108) "BMVit" does not stand for "branch metrics Viterbi," and "BMAlt" does not stand for "branch metric for the alternate path." 12/17/12 at 176:11-178:21 ("This is just an intermediate variable. I could have called it anything I wanted to.")
- After claiming on direct that that Marvell's MNP does not compute path metrics, Dr. Wu admitted that the MNP practices claim 1 of the '585 patent. 12/12/12 Tr. at 53:4-9, 66:4-18. Claim 1 of the '585 patent, however, recites a "detector" containing a "non-linear post-processor" that computes "path metrics." DX-266, claim 1. When confronted with this contradiction, Dr. Wu reversed course and disavowed the '585 patent—the centerpiece of Marvell's willfulness defense—by testifying that claim 1 "is a pattern to teach other engineers in the field how to implement something close to us, but doesn't teach our exact implementation . . . ." 12/12/12 Tr. at 67:3 -10.[27]
- Dr. Blahut first admitted that Viterbi detectors "output[ ] a path through the trellis which has the smallest ***path metric***," that "a ***path metric*** is a sum of ***branch metrics***" and that "branch metric functions have to do with ***branches***, and ***branches*** occur in the ***trellis***." 12/13/12 Tr. at 268:11 – 269:10; 243:24 –244:2. On cross (and previously on direct), he had asserted that Marvell's MNP-type chips do ***not*** compute path metrics.[28] When later confronted with his own report directly to the contrary,[29]

[26] Dr. Wu likewise conceded that "BM," as used in exhibit P-295, stands for branch metric. Tr. 12/12/12 at 56.

[27] Dr. Wu also tried to disavow P-472 ("a ***specification*** for the users to understand how to use the chip") by claiming that it did not mean that an MNP is "a detector," but his only basis for that was the astounding assertion that a technical specification for Marvell's customers did not "***relat[e] to the specific of our internal design***." 12/12/12 Tr. at 58, 61 (emphasis added).

[28] *See* Tr. 12/13/12 at 244:7-9; *id.* at 247:20 -23 ("[T]here are no branches in the post processor."); *id.* at 248:17-18 ("There is no selection in the post-processor, because there are no branches."); *id.* at 249:22-23 ("There is no selection of a branch metric functions, because there are no branches."); *id.* at 250; *id.* at 254 (The accused MNP-type chips: "didn't compute either path individually. They didn't compute any branches individually. And so, the statement that we computed a path metric is not true . . . ."); id. at 269:23-270:3.

he first claimed that the report contained a "typo," 12/17/12 Tr. at 272:14-274:11, but eventually admitted that he (1) gave deposition testimony that the Marvell MNP-type chips ***do compute path metrics***, and (2) even identified the "path metric" computed in the MNP-type chips exactly as Dr. McLaughlin had described. *Id.* at 274:12-279:3. Further, on redirect, Dr. Blahut finally admitted that the MNP does compute the difference between two branch metrics, *id.* at 288:20-23, although without even attempting to square that testimony with his non-infringement opinion.

In light of the above, there was nothing objectively reasonable about Marvell's MNP non-infringement defenses.[30]

Marvell's non-infringement arguments concerning the NLD-type chips fare no better. For the NLD, Marvell's entire defense (its so-called "pre-processor" argument) was based on its assertion that each separate non-linear (noise whitening) filter that is associated with each branch metric computation circuit in the NLD is somehow outside of the branch metric computation process. *See e.g.* Tr. 12/13/12 at 255 (Dr. Blahut referring to the NLD's noise whitening filters as "the preprocessors part, portion of the chip"). Dr. McLaughlin's analysis debunked that position, *see* Dkt. 729 at 22-31, and confirmed the truth of the internal Marvell memo admitting that the NLD-type design "turn[ed] out to be the original structure that Kavcic proposed in his paper." P-366; *see also* Tr. 12/3/12 at 134-136. But, Marvell's own documents and 30(b)(6) testimony again undermined Marvell's pre-processor defense; for example:

- Dr. Song's "Nonlinear Viterbi Application Note" explicitly states that the "NLD has noise whitening built into the branch metric (BM) calculation." P-596.[31]
- When shown P-596, Mr. Burd, Marvell's 30(b)(6) designee on the NLD, admitted that each "***noise whitening filter***" (Marvell's so-called "pre-processor") "***is a parameter of branch metric function***," and further that the phrase "builds noise

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[29] *See* Dkt 717 at 3.

[30] As if the defenses that Marvell asserted at trial were not weak enough, it is important to note that Marvell's trial witnesses contradicted Marvell's preliminary non-infringement contentions (which it never amended). See Ex. 1 at Appx. C. Specifically, in its preliminary non-infringement contentions, Marvell admitted that

. Although Marvell's non-infringement contentions were not admitted at trial, the Court may consider them as part of the totality of the circumstances. *See Advanced Cardiovascular Sys. Inc. v. Medtronic, Inc.*, No. C-95-03577 DLJ, 2000 WL 34334584, at *16 (N.D. Cal. Mar. 31, 2000) *aff'd* 265 F.3d 1294, 1310-11 (Fed. Cir. 2001).

[31] As shown in P-563, Dr. Song is the author of Marvell's NLD specification.

whitening into branch metric calculation, would suggest that ***the noise whitening filter resides in the branch metric.***" 12/12/12 Tr. at 83-84, 99 (emphasis added).

- The term "preprocessor" does not appear anywhere in the NLD specification (P-563).

Apart from Dr. Wu's attempt to evade these documentary admissions by simply disagreeing with them,[32] Dr. Blahut sought to evade the plain meaning of Dr. Song's specification by stating that "those are his words not mine." Tr. 12/13/12 at 284. Marvell's NLD defense simply was not objectively reasonable.[33]

Finally, Marvell's arguments that the simulators did not infringe failed for all of the reasons set forth above. In addition, Marvell's own documents undercut its spurious argument that its simulators did not work on data from a real hard drive.[34] Marvell internal documents show that its simulators used actual wave forms captured from real hard disk drives. *See* P-527, 341; *see also* Tr. 12/3/12 at 174-176 (Dr. McLaughlin's testimony on this issue).

3. Marvell's Lone Invalidity Defense Was Baseless.

Despite pleading multiple invalidity defenses based on §§ 102, 103 and 112, and asserting sixteen different prior art references in its invalidity contentions (*see* Ex. 1 at 2-4), Marvell abandoned before or during trial every single invalidity defense except anticipation or obviousness based upon the Worstell patent. Even the Worstell patent, however, did not establish an objectively reasonable invalidity defense.[35]

At the outset, it is important to note that Dr. McLaughlin gave cogent, consistent and uncontradicted testimony that Worstell did not anticipate the asserted claims in CMU's patent

[32] For example, regarding exhibit P-596, the NLD application note drafted by Dr. Song, Dr. Wu first tried to defend the descriptions therein as accurate on a general level, but when confronted with Dr. Song's statement directly contradicting Marvell's new "pre-processor" argument, he ignored his own and Mr. Burd's prior deposition testimony regarding the same exhibit and described Dr. Song's explanation of the NLD as "a false statement." Tr. 12/12/12 at 81-84, 99.

[33] Dr. Blahut's admissions that nothing in the test for infringement depends upon "complexity" (12/13/12 Tr. at 279), and that "suboptimality doesn't enter into the [infringement] analysis at all…" repudiated Marvell's other non-infringement defenses. *Id.* at 282.

[34] *See* 12/17/12 Tr. at 134:19 – 136:9; D-Demo 1, at 56 (stating that the accused simulators do not infringe because they "process synthetic sequences of symbols" that are "artificially created (not sampled)").

[35] Marvell presented no evidence that it was aware of the Worstell patent prior to the filing of the lawsuit.

nor did it render those claims obvious.[36] He supported his latter opinions with uncontradicted testimony about secondary indicia of non-obviousness, including Mr. Worstell's own analysis of the Kavcic/Moura work. 12/18/12 Tr. at 70:15-73:8. Despite claiming that it would call Mr. Worstell to support its case (Marvell had submitted a lengthy declaration from him in connection with summary judgment proceedings, Dkt. 251 Ex. 12), Marvell failed to do so.

To overcome this strong evidence of validity with clear and convincing evidence of its own, Marvell relied exclusively upon the conclusory testimony of Dr. Proakis. His testimony confirms the unreasonableness of these Worstell-based defenses in at least three ways.

First, Dr. Proakis's testimony at trial that Worstell discloses a "set" of signal dependent branch metric functions[37] flatly contradicted his own November 11, 2011 sworn declaration where he said precisely the opposite. P-Demo 17 (also Dkt. 318-3) at ¶ 34("Worstell's 'further modified' branch metric is a 'single' branch metric function and not a 'set' of the branch metric functions."). On the basis of this contradictory sworn testimony alone, Dr. Proakis's invalidity opinion is objectively unreasonable.

Second, Dr. Proakis conceded on cross-examination that the Worstell patent did not, in fact, anticipate the asserted claims. Specifically, Dr. Proakis testified that the transition noise adjustment in Worstell's "further modified" branch metric is related to a "one over sigma squared" multiplier, which he asserts is different depending on whether the branch it is applied to is a "one" branch or a "zero" branch. *See id.* at 60-61 and 67-69; D-Demo 12-15. When

[36] Dr. McLaughlin testified to several differences between Worstell and the asserted claims of the CMU patents that Dr. Proakis never addressed. For example, consistent with the Court's construction of "signal dependent noise" ("media noise in the readback signal whose noise structure is attributable to ***a specific sequence of symbols*** (e.g. written symbols)" Dkt. 176 at 2), Dr. McLaughlin explained that the Kavcic invention "address[es] noise associated with ***a specific sequence of symbols, not just say one transition***." 12/18/12 Tr. at 54, and that Worstell's transition noise adjustment is "constant" for all of the "one" branches (and absent for the "zero" branches). Thus, Worstell's further modified metric does not "go towards a specific specified sequence of storage symbols." *Id.* at 66-68. Dr. Proakis never discussed the actual construction of "signal dependent noise" and made only conclusory statements arguing that Worstell's further modified metric addressed "signal dependent noise."

[37] 12/17/12 Tr. at 67:9-67:20("[T]he selecting step requires that there be a set of branch metric functions from which we select in order to take into account signal dependent noise. And that part, that element of this claim is actually disclosed at these Bs; the branch metrics are, in fact, set because these sigmas here are different for different branches.").

confronted on cross-examination with the fact that Worstell did not disclose the use of the "one over sigma squared" multiplier for the "zero" branches, Dr. Proakis repeatedly shouted that such an additional multiplier was "obvious." 12/17/12 Tr. at 94:5-95:9. By resorting to an obviousness argument, Dr. Proakis necessarily admitted that Worstell did not disclose a signal dependent branch metric function for the "zero" branches, thereby sinking any argument that Worstell anticipates the claims.

Third, with its anticipation defense undone by Dr. Proakis's own admissions, Marvell is left with an unsubstantiated obviousness opinion. Even assuming his description of Worstell was correct (it was not) and that his approach to applying Worstell to the asserted claims of the CMU patents was proper (it was not), Dr. Proakis did not explain why the person of ordinary skill would be motivated to modify Worstell to implement a set of signal dependent branch metric functions when Worstell himself did not suggest doing so (and in fact says precisely the opposite—including, e.g., his "***constant***"). DX-187 at col. 10:59-60. Nor did Dr. Proakis even attempt to address the secondary considerations of non-obviousness, ignoring his own prior admission that such considerations are a vital part of an obviousness analysis. *See* Tr. 12/17/12 at 76. For example, Dr. Proakis ignored Mr. Worstell's 1997 email in which he stated that Drs. Kavcic and Moura's work went beyond his. Tr. 12/17/12 at 97-98; P-161. Dr. Proakis also ignored the praise from Marvell's own witnesses.[38] Failure to address this critical aspect of the obviousness analysis is resounding proof of the objective unreasonableness of this defense, especially in light of all of its other deficiencies.

D. Marvell's Litigation Misconduct Was Pervasive

Facts regarding Marvell's litigation conduct are addressed in detail in the contemporaneously filed Memorandum in Support of CMU's Motion for Attorneys' Fees Pursuant to 35 U.S.C.

[38] *See e.g.*, P-Demo 7 at 107 (Drs. Kavcic's and Moura's papers were "the launching pad" for Marvell's research according to Mr. Burd); *Id.* at 109 (Marvell "continuously run[s] Kavcic algorithm to benchmark" according to Mr. Doan); *id.* at 110 (Kavcic is "considered to be, you know, on a leading edge, or on the cutting edge of a field" according to Mr. Burd); 12/17/12 Tr. at 138 (Marvell initially named the MNP "KavcicPP"); *see also* P-108 and P-368 (simulation code named after Dr. Kavcic); Tr. 12/11/12 at 302 (Dr. Wu testifying that Marvell's Kavcic Viterbi code was named after Dr. Kavcic because "we name that after those authors. It's a common practice.").

§ 285 ("Attorneys' Fees Memo"). CMU respectfully incorporates them by reference.

E. Marvell Does Not Plan to Stop Its Infringement

Marvell presented no evidence at trial that it ever attempted to design around CMU's patents. Furthermore, Marvell has no plans to stop its infringing conduct:

> Q. In connection with your work at Marvell, and as Marvell's designee on technology issues, are you aware of any plans by the company to stop production of read channel technology with non-linear Viterbi detectors in them?
> A. ***No, I am not***.

P-Demo 7 at 132; 12/3/12 Tr. at 194:2 – 195:3 (Dr. McLaughlin testified that Mr. Burd's testimony was not surprising because the accused technology is the optimum solution that needs to be in the chips). Marvell confirmed its plan to continue infringing by its post-trial SEC filing, which states that "there should be no disruption to their business or customers as a result of the verdict." Ex. 2 (Marvell Form 8-K, Dec. 26, 2012).

III. ARGUMENT

A. Infringement is Willful Where a Defendant Acted Despite An Objectively High Likelihood That Its Actions Constituted Infringement of A Valid Patent and It Knew or Should Have Known of that Objectively-Defined Risk

Marvell's infringement is willful because (1) it acted despite an objectively high likelihood that its actions constituted infringement of a valid patent and (2) the "objectively-defined risk . . . was either known or so obvious that it should have been known to [Marvell]." *Bard Peripheral Vascular, Inc. v. W.L. Gore & Assocs., Inc.*, 682 F.3d 1003, 1005 (Fed. Cir. 2012); *In re Seagate Tech. LLC*, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (*en banc*). The first prong of objective recklessness is a question of law for the Court, although here, certain underlying factual questions were submitted to the jury, which found in CMU's favor by clear and convincing evidence. *Bard,* 682 F.3d at 1005-08; *see also* Dkt. 601 at 3-4. The jury also found the second prong of subjective willfulness. *See* Dkt. 762.

1. The Court's Willfulness Determination Must Focus on Marvell's Prelitigation Conduct and Defenses

"[I]n ordinary circumstances, willfulness will depend on an infringer's ***prelitigation conduct***." *Seagate*, 497 F.3d at 1374 (emphasis added); *see also Univ. of Pittsburgh v. Varian Med. Sys., Inc.*, No. 08-01307, slip op. at 17, 38 (W.D. Pa. Dec. 30, 2011).[39] Thus, the Court's inquiry under the objective prong should focus on whether Marvell acted objectively recklessly ***at the time of infringement***. *i4i Ltd. P'ship v. Microsoft Corp.*, 670 F. Supp. 2d 568, 581-82 (E.D. Tex. 2009), *aff'd*, 598 F.3d 831, 860 (Fed. Cir. 2010); *CSB-Sys Int'l Inc. v. SAP Am., Inc.*, No. 10-2156, 2012 WL 1439059 at *4 (E.D. Pa. April 25, 2012).[40]

An infringer may avoid a finding of willfulness if it has an objectively reasonable defense ***at the time it began infringement***. *See Uniloc USA, Inc. v. Microsoft Corp.*, 632 F.3d 1292, 1310 (Fed. Cir. 2011); *CSB-System Int'l Inc. v. SAP Am., Inc.*, 10-2156, 2012 WL 1439059 at *9 n.7 (E.D. Pa. Apr. 25, 2012) ("To the extent defenses arise during the course of the proceeding that were not reasonably available at the time of the alleged infringement, an accused could not reasonably rely on them."); *i4i*, 670 F. Supp. 2d at 581 – 82.[41] Indeed, if this were not the law, then opinions of counsel obtained after commencement of infringing conduct would be a strong defense to claims of willfulness, and the law is settled that they are not.[42]

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[39] *See also Univ. of Pittsburgh v. Varian Med. Sys., Inc.*, No. 08-01307, 2012 U.S. Dist. LEXIS 90893, at *29 - 31 (W.D. Pa. June 29, 2012).

[40] *See also Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 725 F. Supp. 2d 474, 476-478, 480 (D. Del. 2010) ("The Court must examine the totality of the circumstances" and would "focus on the prelitigation conduct of the accused infringer in the first instance but must also taken into account whether the accused infringer maintained plausible or credible defenses to [ ] infringement and invalidity.").

[41] *See also Metso Minerals, Inc. v. Powerscreen Int'l Distrib. Ltd*., 833 F. Supp. 2d 282, 307 (E.D.N.Y. 2011) (despite finding obviousness defense not frivolous, denying renewed JMOL of no willfulness ***because defendants did not indicate they knew of the prior art at the time of infringement***).

[42] *See Seagate*, 497 F.3d at 1373-74 ("Because willful infringement in the main must find its basis in prelitigation conduct, communications of trial counsel have little, if any, relevance warranting their disclosure, ... Here, the opinions of Seagate's opinion counsel, received after suit was commenced, appear to be of similarly ***marginal value***. Although the reasoning contained in those opinions ultimately may preclude Seagate's conduct from being considered reckless if infringement is found, ***reliance on the opinions after litigation was commenced will likely be of little significance***.") (emphasis added); *Power Integrations,* 725 F. Supp. 2d at 478, 480.

Although there is a general rule "that the objective prong of *Seagate* ***tends*** not to be met where an accused infringer relies on a ***reasonable*** defense to a charge of infringement," *Bard*, 682 F.3d at 1005, simply asserting defenses at trial does not preclude a finding of objective recklessness because the reasonableness of those defenses needs to be determined "based on the record ultimately made in the infringement proceedings." *Bard*, 682 F.3d at 1008; *see also* Dkt. 601 at 4; *Fractus, S.A. v. Samsung Electronics Co.*, Ltd., 6:09-CV-203, 2012 WL 2505741, * 19 (E.D. Tex. June 28, 2012) ("However, the fact that Samsung presented several defenses at trial, including non-infringement and invalidity, does not mean the jury's willfulness finding lacks a sufficient evidentiary basis.") (*quoting i4i Ltd. Partnership v. Microsoft Corp.*, 598 F.3d 831, 860 (Fed. Cir. 2010)); *AIA Eng'g Ltd. v. Magotteaux Int'l S/A*, 3:09-CV-00255, 2012 WL 4442665, at *5 - *6 (M.D. Tenn. Sept. 21, 2012) ("Yet, ***the mere existence of a defense cannot preclude that possibility of an objectively high likelihood of infringement***. Indeed, those who knowingly infringe a patent presumably attempt to manufacture defenses, however contrived and unavailing they may prove.").[43]

2. Marvell's Conduct Was Objectively Reckless

Based on the jury's findings that, prior to the commencement of this lawsuit, Marvell acted with ***actual knowledge*** of the CMU patents and that Marvell had ***no objectively reasonable defense*** to infringement, the Court should find that Marvell's conduct satisfies the objective prong. *See* Dkt. 762 at Questions 19-24, Dkt 601 at 4 (adopting procedure whereby "the Court would resolve the legal question of objective recklessness" after the jury answered certain questions of fact.); *see also Bard*, 682 F.3d at 1007 (the judge remains the "final arbiter" of objective recklessness even when underlying questions of fact are sent to the jury).

In fact, the totality of the circumstances considered by courts confirms that Marvell's prelitigation conduction was objectively reckless. Those circumstances include: (1) acting

[43] Some courts have found that post-litigation defense are in fact completely irrelevant to the objective prong. *See i4i*, 670 F. Supp. 2d. at 581- 82.

despite knowledge of the patents;[44] (2) failure to obtain any opinion of counsel;[45] (3) copying;[46] (4) failure to investigate the scope of the patent (e.g., not reading the claims or file history);[47] and (5) failure to take any remedial action to avoid infringement.[48] Those circumstances all exist here:

- Marvell acted despite actual knowledge that it was using CMU's patents.
- Marvell did not obtain an opinion of counsel in violation of its policy of doing exactly that. (*see* JX-C at 9-10). In this case, Marvell's inaction is particularly egregious. The third time it was notified of CMU's patents was Fujitsu's specific request for an opinion concerning CMU's patents as applied to two of Marvell's accused read channel chips. (P-477). Marvell simply ignored Fujitsu's request.
- Marvell copied CMU's invention to develop its "must have," "critical" technology. P-320, 328. This case is analogous to *Power Integrations*, where copying was relevant to both the objective and subjective prongs because there was evidence that, prior to the filing of the action, defendant was aware of the patents, recognized their importance to the industry and described them as "key patents," had no objective reason to believe that the patents were invalid, and developed its products by copying and with little or no effort to ensure non-infringement, including not seeking any opinions of counsel. 725 F. Supp. 2d at 476-78, 480-81.
- Marvell failed to act as an objectively reasonable commercial actor with actual knowledge of the patents because it did not read the patent claims and file histories to form some opinion regarding infringement or validity (and thus assess the risk of acting) nor did it seek a legal opinion about same.

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[44] *Great Dane Ltd. P'ship v. Stoughton Trailers, LLC*, No. 3:08-89, 2011 WL 318092, at *4-5 (M.D. Ga. Jan. 28, 2011); *Krippelz v. Ford Motor Co.*, 670 F. Supp. 2d. 806, 809, 811 - 812 (N.D. Ill. 2009) *rev'd on other grounds* 667 F.3d 1261; *see also i4i*, 598 F.3d at 860.

[45] *Seagate*, 497 F.3d at 1369 ("[F]ailure to proffer any favorable advice, is not dispositive of the willfulness inquiry, [but] it is crucial to the analysis."); *Aspex Eyewear, Inc. v. Clariti Eyewear, Inc.*, 605 F.3d 1305, 1313 (Fed.Cir.2010); *Koninklijke Philips Elecs. N.V. v. Cinram Int'l, Inc.*, No. 08-0515, 2012 WL 4074419 at *5 n. 17 (S.D.N.Y. Aug. 23, 2012) (absence of advice implicates both objective and subjective prongs of *Seagate*);

[46] *Power Integrations,* 725 F. Supp. 2d at 480.

[47] *Goss*, 739 F. Supp.2d at 1126 (defendants were not objectively reckless where they obtained and reviewed the file history and formed conclusions regarding validity based on that review); *see also SunTiger, Inc. v. Scientific Research Funding Group*, 9 F. Supp.2d 601, 607 (E.D. Va. 1998).

[48] *i4i*, 598 F.3d at 860.

- Marvell took no remedial actions before (or during) this lawsuit.[49] Marvell's lack of intent to take any remedial actions prior to this litigation is confirmed by the evidence that even after this litigation commenced, it had and still has no plans to stop its infringement.

In sum, Marvell's conscious decision to ignore the CMU patents for more than seven years cannot be considered objectively reasonable.[50] But, if the foregoing were not enough, Marvell cannot point to anything in the record that reduces the culpability of its pre-litigation conduct. Marvell utterly failed to present any testimony or documentary evidence that it had any valid pre-litigation non-infringement or invalidity defenses. For example, Marvell presented no evidence whatsoever that it was even aware of the Worstell patent before this suit was commenced, let alone that it had analyzed it. Coupled with its brazen disregard for CMU's patents, Marvell's failure to have any objectively reasonable defenses at the time it began infringing is more than sufficient to satisfy the objective prong. *See CSB-System*, 2012 WL 1439059 at *9 n.7; *i4i*, 670 F. Supp. 2d at 581 – 82.

Should the Court consider Marvell's litigation defenses relevant to its determination of objective recklessness, the record also shows Marvell's non-infringement and validity defenses were not defenses upon which a "reasonable litigant could realistically expect" to succeed. *Bard*, 682 F.3d at 1008. After almost four years of litigation, trial revealed that Marvell had no real liability defenses. Marvell's non-infringement defenses were inherently flawed because they were: (1) based on renouncing "official" and "accurate" documents (including Marvell's own patent); (2) contradicted by prior sworn statements; (3) legally incorrect (Marvell's '585 patent[51], complexity[52] and suboptimality); and/or (4) were inconsistent with admissions by Marvell's

[49] Marvell's '585 patent is not, by Marvell's own admission, a defense to infringement. 11/17/12 Tr. at 18:1-3.

[50] CMU incorporates by reference its Opposition to Marvell's Rule 50(a) Motion for Judgment as a Matter of Law of No Willful Infringement (Dkt. 721).

[51] *See supra*, p 3, n. 8.

[52] *See* 10/17/12 Tr. at 18:16-22 (Marvell's counsel acknowledged that: "Again we're not coming in here and saying, well, we don't infringe because his patent is so complex and ours is simple. I mean that wouldn't be our ability to show non-infringement . . . .").

expert (complexity and suboptimality).[53] Furthermore, Marvell dropped all of its invalidity defenses except for those based upon the Worstell patent, and its untenable position on that single reference became more apparent as the litigation went on. Marvell could not have realistically expected to succeed on these defenses.

3. Marvell's Conduct was Subjectively Reckless

Having established that the Court should find Marvell's conduct to be objectively reckless, the subjective inquiry focuses on Marvell's state of mind. *Seagate*, 497 F.3d at 1371. Here, the jury unanimously found ***by clear and convincing evidence*** that Marvell actually knew or should have known that its actions would infringe Claim 2 of the '180 Patent and Claim 4 of the '839 Patent. Dkt. 762 at Questions 21, 24. This is precisely the test for subjective willfulness under *Seagate* and *Bard*. 682 F.3d at 1005 ("Once the 'threshold objective standard is satisfied, the patentee must also demonstrate that this objectively-defined risk . . . was either known or so obvious that it should have been known to the accused infringer.'"). The jury's finding is amply supported by evidence that Marvell copied CMU's patents but failed to take any actions to investigate whether it infringed or if the patents were invalid.

B. <u>The *Read* Factors Overwhelmingly Support Enhancing CMU's Damages Under § 284</u>

Pursuant to 35 U.S.C. §284, "the court may increase the damages up to three times the amount found or assessed." The purpose of enhancement is to deter and punish egregious conduct of the infringer as well as "protection of the integrity of the patent system." *Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc.*, 762 F. Supp. 2d 710, 719 (D. Del. 2011); *see also Whitserve, LLC v. Computer Packages, Inc.*, 694 F.3d 10, 37 (Fed. Cir. 2012).

The decision to enhance damages under § 284 is a two-step process: (1) a determination of the infringer's culpability; (2) a determination of whether and to what extent damages should be enhanced given then the totality of the circumstances. *Whitserve,* 694 F.3d at 37 (citing *Jurgens v. CBK, Ltd.*, 80 F.3d 1566, 1572 (Fed. Cir. 1996)). A finding of willfulness can satisfy

[53] *Supra*, p 10. n. 33.

the culpability requirement and "is, without doubt, sufficient to meet the first requirement to increase a compensatory damages award." *Bard*, 682 F.3d at 1005 (citing *Seagate*, 497 F.3d at 1368); *Whitserve,* 694 F.3d at 37. Indeed, where infringement is willful, as it is here, the Court must provide a rationale for ***not*** enhancing damages. *Jurgens,* 80 F.3d at 1572.

Where sufficient culpability exists, the *Read* factors guide the evaluation of the egregiousness of the infringer's conduct. *Spectralytics, Inc. v. Cordis Corp.*, 649 F.3d 1336, 1349 (Fed. Cir. 2011) (quoting *Read*, 970 F.2d at 826). The *Read* factors are: (1) whether the infringer deliberately copied the ideas or design of another; (2) whether the infringer, when he knew of the other's patent, investigated the patent and formed a good faith belief that it was invalid or that it was not infringed; (3) the infringer's behavior in the litigation; (4) the infringer's size and financial condition; (5) the closeness of the case; (6) the duration of the misconduct; (7) the remedial action by the infringer; (8) the infringer's motivation for harm; and (9) whether the infringer attempted to conceal its misconduct. *Id.* at 1348 (citing *Read*, 970 F.2d at 826-27).

Courts routinely enhance damages even when not all of the *Read* factors favor the patentee. *See e.g.*, *i4i*, 598 F.3d at 858 (Fed. Cir. 2010) *aff'd*, 131 S. Ct. 2238 (U.S. 2011); *Univ. of Pittsburgh v. Varian Med. Sys., Inc.,* 08CV1307, 2012 WL 1436569 (W.D. Pa. Apr. 25, 2012). As set forth below, the *Read* factors overwhelmingly support enhancing CMU's damages award to punish and deter Marvell's egregious pattern of infringing conduct.

1. Marvell Deliberately Copied the Kavcic-Moura Invention

Marvell deliberately copied CMU's patents multiple times. It copied the CMU patents when it created the simulator for the optimal Kavcic Viterbi detector; when it developed its Kavcic PP/MNP chips and simulators; and again when it developed the NLD. *See supra*, at pp 4-6. The first *Read* factor favors an award of enhanced damages.

2. Marvell Failed to Investigate the Scope of CMU's Patents and Had No Good Faith Belief Regarding Non-Infringement or Invalidity

The second *Read* factor—whether the infringer, when he learned of the patent,

investigated the patent and formed a good faith belief that it was invalid or that it was not infringed—weighs heavily in favor of enhancing CMU's damages. The best that Marvell could muster on this point was its argument that its '585 patent was issued over CMU's patents, but that fact does not bear upon infringement as a matter of law.[54] The lack of Marvell's good faith belief regarding validity and infringement is further supported by the jury's findings, ***supported by clear and convincing evidence***, that Marvell had no objectively reasonable defenses to infringement prior to the commencement of this action. *See* Dkt. 762 at Questions 20, 23.

3. Marvell's Litigation Conduct Favors an Award of Enhanced Damages

The third *Read* factor, Marvell's behavior as a party in this litigation, also favors an award of enhanced damages. Under this factor, enhanced damages are appropriate where a defendant engages in "litigation tactics . . . for the primary purpose of unnecessarily increasing the burden of this litigation…, e.g., filing motions of dubious merit; taking positions that caused [the plaintiff] to expend resources and later withdrawing those positions." *Joyal Products, Inc. v. Johnson Elec. N. Am., Inc.*, CIV. A. 04-5172 JAP, 2009 WL 512156, at *7 (D.N.J. Feb. 27, 2009); *Univ. of Pitt. v. Varian*, 2012 WL 1436569 at *4 (third *Read* factor favored enhancement where defendant "continually re-argued the Court's rulings, and attempted to delay the litigation with an extensive motion practice."). Marvell's defenses at trial were based on contradictory testimony and disavowing Marvell's contemporaneous documents and prior non-infringement and invalidity positions. Other instances of litigation conduct that support enhanced damages include those detailed in CMU's Attorneys' Fees Memo.

4. Marvell is a Large Publicly-Traded Corporation with Ample Assets and Revenue

Marvell is a large, publicly traded company that told investors the day after the jury's verdict that it believed "there should be no disruption to [its] business or customers as a result of the verdict." Ex. 2 (Form 8-K, Dec. 27, 2012) at 2. Marvell's total revenue from the sale of the accused chips exceeds $10.3 billion and its operating profit from those sales exceeds $5 billion.

[54] *See supra*, 3 n. 8.

See Dkt. 634, Ex. 1 at 3, 8.

Perhaps more importantly, during the nine months preceding trial, Marvell returned at least three-quarters of a billion dollars to shareholders by means of stock repurchases and a newly instituted dividend and still had almost $2 billion in cash and short term investments. *See* Ex. 3 (Form 10-Q, Nov. 29, 2012) at 5, 19.[55] Marvell's size and financial condition (at least as of the last public reports prior to the verdict) favor enhancing damages.[56]

5. This Was Not a Close Case

After four weeks of trial, the jury certainly did not believe that the case was a close one: it found for CMU on every question of infringement and validity and it awarded CMU every penny that it requested. *See* Dkt. 762; *see also SSL Servs., LLC v. Citrix Sys*., 2012 U.S. Dist. LEXIS 132364, 15-16, 2012 WL 4092449 (E.D. Tex. Sept. 17, 2012) (the jury's findings of willful infringement and validity and its award of "the precise amount presented to the jury by [plaintiff's] damages expert and asked for by [plaintiff] in its closing arguments," supported the court's conclusion that "this was not a close case.") *nCUBE Corp. v. SeaChange Int'l, Inc.*, 313 F. Supp. 2d 361, 390 (D. Del. 2004) *aff'd*, *nCube Corp. v. Seachange Int'l, Inc.*, 436 F.3d 1317 (Fed. Cir. 2006). The jury's findings here are amply supported in the record.

Nonetheless, CMU expects Marvell to continue to lean heavily upon the Court's statement in September 2011 that the first motion for summary judgment of invalidity presented a "close call." *See* Dkt. 306 at 1; Dkt. 486 at 4. Such an argument fails because the Court's summary judgment ruling neither "automatically prove[s] that an objectively reasonable defense has been raised," Dkt. 601 at 4, nor was it based on the complete record now before the Court. Here, the entire record on invalidity is particularly informative because the Court denied

[55] Marvell paid $67 million in dividends and "repurchased 57.3 million of its common shares for $676.5 million in cash during the nine months ended October 27, 2012 and 74.3 million of its common shares for $1.2 billion in cash during the nine months ended October 29, 2011."

[56] Marvell voluntary share repurchases and recent adoption of dividend payments should not weigh against CMU's motion for enhanced damages. CMU addresses this issue and the separate issue of the potential obstacles to collection that arises from Marvell's incorporation in Bermuda in its Motion for a Permanent Injunction, Post-Judgment Royalties, And Supplemental Damages.

Marvell's two subsequent motions for reconsideration and was led "inexorably" to conclude that there is a distinction between CMU's patents and Worstell. Dkt. 337 at 19; Dkt 423. Indeed, Dr. Proakis's trial testimony included a *de facto* admission of no anticipation and a demonstrably incomplete obviousness analysis that was premised on a clear misreading of the Worstell patent.

6. Marvell's Infringement Began in 2001 and Continues Today

The sixth *Read* factor is the duration of the misconduct. Marvell began infringing in March 2001 (*see* P-227) and continues to infringe today, *see* Ex. 2. With almost twelve years of unabated willful infringement, this factor weighs heavily in favor of enhancing damages. *Compare Power Integrations*, 762 F. Supp. 2d at 723 (this factor may weigh against enhancement where an infringer voluntarily stops infringing during the litigation, but "[i]t stands to reason that a higher multiplier may be appropriate where an infringer's conduct does not improve or actually worsens over time.").

7. Marvell Has Taken No Remedial Actions

Marvell presented no evidence of any attempt to "design around" CMU's patents either before or after this litigation commenced, and has no plans to stop its infringement. This factor supports an award of enhanced damages.

8. Motivation for Harm

Although CMU and Marvell are not direct competitors, a defendant that "infringe[s] without a good-faith belief that the patent was invalid shows a motivation for harm." *Floe Int'l, Inc. v. Newmans' Mfg. Inc.*, Civ. No. 04-5120, 2006 WL 2472112 at *5-6 (D. Minn. Aug. 23, 2006). Here, Marvell took no steps to investigate CMU's Patents before this litigation and has made no effort to remedy its infringement since CMU sued. This factor favors enhancement.

9. Marvell Concealed Its Infringement

The last *Read* factor—whether the infringer attempted to conceal its misconduct—also favors CMU. At least one court has held that assertion of "numerous and unreasonable defenses and theories of non-infringement" suggest an attempt to conceal infringement. *AIA Eng'g Ltd.*, 2012 WL 4442665, at *7. Here, Marvell's attempt to conceal its infringement is not only

evidenced by its reliance on unreasonable litigation defenses (almost all of which it abandoned), but also by at least four other actions taken to conceal its misconduct from CMU:

1. Marvell ignored CMU's 2003 letters even though they were directed to Marvell's CTO and its General Counsel approximately two months after Marvell's first MNP products reached volume production.

2. Marvell did not respond to Fujitsu's 2004 letter, thereby ensuring its infringement remained a secret in the industry and limiting the CMU's opportunities to learn about the infringement from others.[57]

3. Dr. Wu never disclosed to Dr. Kavcic (or CMU for that matter) Marvell's reliance upon his work, despite several personal interactions with him. Dr. Wu, who was intimately involved with the development of the infringing circuits, knew and had personally interacted with Dr. Kavcic over the years but never once told him about Marvell's use of and reference to his work or what was in Marvell's circuits; stating "why should I." 12/12/12 Tr. at 63:22 - 64:11.

4. Marvell "disassociated" Dr. Kavcic's name from its MNP technology by renaming the Kavcic PP (and associated simulation code files) "MNP." P-368; 12/3/12 Tr. at 79:13 – 81:15. Dr. Wu testified that "Kavcic PP actually means media noise post processor" and Marvell initially "used the KavcicPP name," but it changed the name to MNP "[l]ater, when MNP product started to roll out, more people are involved in the simulation." 12/11/12 Tr. at 307:3 – 308:2; *see also* 12/12/12 Tr. at 31:11 – 32:25. The timing of this name change (in January 2003) is significant because it was shortly after Marvell had started shipping MNP-type engineering

[57] The very nature of Marvell's infringing chips made it easy for Marvell to conceal its infringement because, as both Marvell and CMU witnesses testified, it is impossible to determine whether circuits implement the Kavcic detector in a chip just by looking at it or even by opening it up. 12/12/12 Tr. at 61:16 – 64:11 (Dr. Wu testified that details of Marvell's designs are a "state secret" like the formula for 'Coca-Cola,' and to "understand how the circuit's implemented, the implementation detail, . . . you do need to talk to our people." "); *see also* 12/3/12 Tr. at 137:8 – 13 (Dr. McLaughlin testified that "not even with a microscope, if you really looked all the way down, you couldn't determine how it worked."); 12/4/12 Tr. at 64:18 – 64:25 (Dr. Bajorek testified that a chip is so complicated that "not even the CIA could reverse engineer a chip to figure out what was in it.") *see also* 12/11/12 Tr. at 94:23 – 95:25 (Dr. Surtadja testified that Marvell, in particular, keeps its designs secret and does not even share the details of its designs with its customers).

samples to its customers. *See* 12/4/12 Tr. at 198:24 – 199:5, 208:5 – 20, 211:3 – 10, 214:16 – 25, 233:1 – 5.[58] Notably, despite the name change, engineers could "continue to use the old set up" because there was "no functional difference between the old and new codes." P-368[59]; 12/12/12 Tr. at 33:13- 34:14.

C. The Court Should Exercise Its Discretion and Substantially Enhance CMU's Damages

Section 284 gives the Court discretion to enhance damages "up to" treble the amount awarded by the jury. *See* 35 U.S.C. § 284. The touchstone for enhancing damages is "the infringer's level of culpability," and a court's discretion is typically further guided by the underlying statutory policies of deterrence and punishment of the infringer. *Power Integrations*, 762 F. Supp.2d at 719 (citing *Jurgens*, 80 F.3d 1566); *In re Hayes Microcomputer Products, Inc. Patent Litig.*, 766 F. Supp. 818, 826 (N.D. Cal. 1991) *aff'd,* 982 F.2d 1527 (Fed. Cir. 1992).[60]

Here, given Marvell's brazen and continuing conduct, it would be appropriate to simply treble the compensatory damages awarded by the jury. Many courts do exactly that and award treble damages without further analysis regarding the size of the enhancement. *See, e.g., Johns Hopkins Univ. v. CellPro, Inc.*, 152 F.3d 1342, 1365 (Fed. Cir. 1998) (no abuse of discretion where court trebled damages despite defendant's argument the closeness of the case weighed in its favor); *SRI Int'l, Inc.*, 127 F.3d at 1469 (trebling damages not abuse of discretion even though defendant's independent development of the infringing device was a potentially mitigating factor); *Joyal Products, Inc. v. Johnson Elec. N. Am., Inc.*, CIV. A. 04-5172 JAP, 2009 WL 512156, at *9 (D.N.J. Feb. 27, 2009) *aff'd*, 335 F. App'x 48 (Fed. Cir. 2009); *Air Vent, Inc. v. Vent Right Corp.*, 2011 U.S. Dist. LEXIS 36328, at *12 (W.D. Pa. Apr. 4, 2011).

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[58] *See also* P-DEMO 20; P-DEMO 13 at Chart 5 (showing MNP shipments in early 2003); *id.* at Chart 22 (showing shipments of Marvell Read Channel families with MNP in late 2002/early 2003); *id.* at Chart 23 (P-DEMO 13) (showing shipments of Marvell SOCs with MNP in early 2003); *id.* at Chart 26 (P-DEMO 13) (Marvell shipments of 88C5575M (MNP-type) began in October 2002).

[59] *See also* P-DEMO-7 at slides 34 – 36.

[60] *See also SRI Int'l, Inc. v. Advanced Tech. Laboratories, Inc*., 127 F.3d 1462, 1464 (Fed. Cir. 1997) (discussing the legislative policy of enhanced patent damages).

Although other courts have awarded less than treble damages, they cite various mitigating factors not present in this case when they do so. Those mitigating circumstances include a less-than-egregious degree of willfulness, acceptable litigation conduct, or other *Read* factors favoring the infringer (e.g., taking remedial measures, no copying, or no attempt to conceal), and courts have used them to justify doubling (rather than tripling) damages. *See*, *e.g.*, *AIA Eng'g Ltd.*, 2012 WL 4442665, at *8; *Metso Minerals, Inc. v. Powerscreen Int'l Distribution Ltd.*, 833 F. Supp. 2d 333, 341 (E.D.N.Y. 2011); *Power Integrations*, 762 F. Supp.2d at 724-26; *Crucible, Inc. v. Stora Kopparbergs Bergslags AB*, 701 F. Supp. 1157, 1164 (W.D. Pa. 1988).[61] No such arguments are available to Marvell here.[62]

CMU, however, recognizes that the Court may consider the size of the compensatory award in determining the amount of enhanced damages, even though Marvell and its founders have reaped enormous benefits from the infringing conduct.[63] In fact, this Court has found it appropriate to only double damages where infringement is willful and the *Read* factors favor enhancement but the damages award is "undeniably substantial." *Muniauction, Inc. v. Thomson*

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[61] *See also Hoechst Celanese Corp. v. BP Chemicals Ltd.*, 846 F. Supp. 542, 549 (S.D. Tex. 1994) *aff'd*, 78 F.3d 1575 (Fed. Cir. 1996) (double damages where willfulness was "closest question at trial"); *Schering Corp. v. Precision-Cosmet Co.*, Inc., 614 F. Supp. 1368, 1382-83 (D. Del. 1985) (doubling rather than trebling damages because: (1) defendant independently developed its product rather than copying it; (2) it litigated in good faith by developing a bona fide invalidity defense; (3) jury award of damages was "on the high side. . . .")..

[62] Other courts, citing similar mitigating factors, exercise their discretion to enhance damages by using alternative metrics such as a specific dollar sum or percentage increase. *See*, *e.g.*, *i4i*, 670 F. Supp.2d at 596 *aff'd* 598 F.3d at 858-59 (awarding $40 million in enhanced damages); *SSL Servs., LLC v. Citrix Sys.*, No. 2:08-cv-158-JRG, 2012 U.S. Dist. LEXIS 132364, at *18 (E.D. Tex. Sept. 17, 2012) (increasing award by 50 % ($5 million) where only four *Read* factors favored enhancement); *Kowalski v. Mommy Gina Tuna Res.*, No. 05-00679-BMK, 2009 U.S. Dist. LEXIS 26127, at *11-*12 (D. Hi. Mar. 30, 2009) (enhancement of 30 % sufficient to deter and punish infringer's conduct where two *Read* factors weighed against enhancement and four *Read* factors were neutral); *Advanced Cardiovascular Sys.,* 2000 WL 34334583 at *16 (30% enhancement where the conduct of defendant was willful, but not undertaken in bad faith).

[63] The $1.17 billion award by the jury is supported by ample, indeed largely uncontradicted evidence that Marvell copied CMU's inventions so that it could implement this "must have" and "industry standard" technology into its chips at a point in time when doing so was a matter of life or death for Marvell. *E.g.*, 12/4/12 Tr. at 66:24-67:4, 73:5-24. To award CMU only $.50 per chip as ***compensatory*** damages was more than reasonable because that amount still allowed Marvell to retain billions in profits—profits that it would not have made had it not infringed. The amount of the award is large because Marvell willfully infringed for more than a decade, not because the rate sought by CMU, and awarded by the jury, is too high. The Court's ruling on enhanced damages also must take these facts into account.

Corp., 502 F. Supp. 2d 477, 487 (W.D. Pa. 2007) *rev'd on other grounds*, 532 F.3d 1318 (Fed. Cir. 2008); *Univ. of Pitt. v. Varian*, 2012 WL 1436569 at *7.[64] In *Muniauction*, the jury awarded the maximum amount of damages requested by the plaintiff. 502 F. Supp. 2d at 487. Acknowledging that "[a]lthough not punitive, the jury verdict is undeniably substantial," court chose to double (instead of treble) the damages award. *Id.* ("The award is significant, in its own right. However, we do not consider the compensatory damages award to evidence the jury's desire to punish defendants.").

Given that Marvell's unabated infringement is the epitome of willfulness and that ***all*** of the *Read* factors weigh in favor of enhancement, the Court has good grounds to treble damages in order to deter and punish Marvell. Nonetheless, CMU recognizes that the Court has considerable discretion in deciding this issue. Should the Court choose to not treble the compensatory damage award, the Court may choose to double the award or could award a specific sum based upon several possibilities, including: (1) the royalties accrued before CMU filed suit ($554,440,004), reflecting Marvell's utter inability to justify its pre-suit conduct; or (2) the royalties accrued after CMU filed suit ($614,590,268),[65] reflecting its continued infringement in the face of CMU's specific claim of infringement and the lack of legitimate defenses, *see, e.g.*, *Power Integrations*, 762 F. Supp.2d at 724-26 (discussing enhancing damages by less than a full trebling where the defendant stops its infringing conduct during litigation: "[i]t stands to reason that a higher multiplier may be appropriate where an infringer's conduct does not improve or actually worsens over time."). CMU is entitled to enhanced damages in this case, and that enhancement should be substantial.

CMU also respectfully requests that, should the Court decide not to treble the $1.17 billion compensatory award due to its size, the Court reserve the right to revisit that decision in the unlikely event that Marvell succeeds on any of its inevitable motions to reduce the

[64] *See also Construction Tech. Inc. v. Lockformer Co.*, 20 USPQ.2d 1940, 1944 (S.D.N.Y. 1991) ("Given the size of the jury's award and the fact that the plaintiff has also been awarded punitive damages with respect to other aspects of the defendant's conduct in this case . . . . it is appropriate to double rather than treble the actual damages . . . .").

[65] *See* 12/10/12 Tr. at 163:20-164:11, 171:18-172:11.

compensatory damages awarded to CMU or on its appeal.

IV. CONCLUSION

For the foregoing reasons, CMU respectfully requests that the Court (1) rule that Marvell's infringement was both objectively and subjectively willful, and (2) enhance CMU's damages in order to deter and punish Marvell's unabated willful infringement. A proposed order with findings of fact is attached to CMU's motion.

Respectfully submitted,

Dated: February 11, 2013

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CERTIFICATE OF SERVICE

I hereby certify that on February 11, 2013 the foregoing was filed electronically. Notice of this filing will be sent to all parties by operation of the Court's electronic filing system. Parties may access this filing through the Court's system.

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