UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN JOSE DIVISION

HTC CORPORATION AND HTC AMERICA, INC., Plaintiffs, v. TECHNOLOGY PROPERTIES LIMITED, et al., Defendants.	Case No. 5:08-cv-00882-PSG **ORDER DENYING PLAINTIFFS' RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW** **(Re: Docket No. 671)**

In this patent infringement suit, a jury found that the Plaintiffs in this action, HTC Corporation and HTC America, Inc. infringed a lone patent owned by Defendants Technology Properties Limited, Patriot Scientific Corporation, and Alliacense Limited (collectively, "TPL"). HTC now renews its motion for judgment as a matter of law pursuant to Fed. R. Civ. P. 50(b), arguing that no reasonable jury could have found that HTC infringes any asserted claim of U.S. Patent No. 5,809,336 ("the '336 patent). TPL opposes. The parties appeared for a hearing. After considering their oral arguments and those in the papers, the court DENIES HTC's motion.

I. BACKGROUND

Technology Properties Limited and Alliacense, Limited are California corporations with their principal place of business in Cupertino, California; Patriot Scientific Corporation is a Delaware corporation with its principal place of business in Carlsbad, California. These defendants – Technology Properties Limited, Alliacense, and Patriot (collectively "TPL") – claim ownership of a family of related microprocessor patents. TPL refers to those patents as the Moore Microprocessor Portfolio patents ("MMP patents"), in recognition of co-inventor Charles Moore's contributions.

A. The Long, Winding Road To Trial

HTC filed this suit on February 8, 2008, seeking a judicial declaration that four of the MMP patents – U.S. Patent Nos. 5,809,336 ("the '336 patent"), 5,784,584 ("the '584 patent"), 5,440,749 ("the '749 patent"), and 6,598,148 ("the '148 patent") – are invalid and/or not infringed.[1] TPL counterclaimed for infringement of the '336, '749, '148, and '890 patents on November 21, 2008.[2] On April 25, 2008, TPL filed two complaints in the Eastern District of Texas against HTC alleging infringement of the four patents at issue in the pending declaratory judgment action.[3] On June 4, 2008, TPL filed additional patent infringement actions against HTC in the Eastern District of Texas asserting U.S. Patent No. 5,530,890 ("the '890 patent").[4] On July 10, 2008, HTC amended its complaint before this court, adding claims for declaratory relief with respect to the '890 patent.[5] On February 23, 2009 the parallel Texas litigation was dismissed without prejudice following Judge Fogel's decision to deny TPL's Motion to Dismiss, or in the Alternative, to

[1] *See* Docket No. 1.

[2] *See* Docket No. 60 at 6-8.

[3] *See* Docket No. 16 at 3.

[4] *See* Docket No. 35 at 5.

[5] *See* Docket No. 34.

Transfer Venue in the California action.[6] On March 25, 2010, the court accepted the parties' stipulation to dismiss the '584 patent from this litigation.[7] On August 24, 2012, Technology Properties Limited, Patriot, and Phoenix Digital Solutions initiated an International Trade Commission investigation regarding HTC's alleged infringement of the '336 patent.[8] On July 17, 2013, the court accepted the parties' stipulation to dismiss the '148 and '749 patents from this litigation.[9] On September 19, 2013, the court accepted the parties stipulation to dismiss all claims relating to the '890 patent from this litigation.[10]

In sum, only the '336 patent was considered by the jury at trial.

B. The '336 Patent

The '336 patent issued on September 15, 1998, and describes a microprocessor with an internal variable speed clock, or oscillator, that drives the processor's central processing unit ("CPU").[11] Traditional microprocessors use external, fixed speed crystals to clock the CPU.[12] A CPU's maximum possible processing capacity depends on process, voltage, and temperature

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[6] *See* Docket Nos. 49 (denying motion to dismiss, to transfer venue, and to stay) and 88 (granting motion for leave to file motion for reconsideration and denying motion for reconsideration).

[7] *See* Docket No. 152.

[8] *See* Docket No. 561-1. Claims 1, 6, 7, 9-11, and 13-16 were asserted in the investigation. On September 6, 2013, Administrative Law Judge James Gildea issued an Initial Determination from in the ITC proceeding holding that HTC did not violate Section 337 of the Tariff Act of 1930. *See id.*

[9] *See* Docket No. 462.

[10] *See* Docket No. 594.

[11] *See* Docket No. 393-3 at 1 ("A high performance, low cost microprocessor system having a variable speed system clock is disclosed herein. The microprocessor system includes an integrated circuit having a Central processing unit and a ring oscillator variable speed system clock for clocking the microprocessor.").

[12] *See id.* at 17:12-14 ("Most microprocessors derive all system timing from a single clock. The disadvantage is that different parts of the system can slow all operations.").

("PVT parameters").[13] An external clock must therefore set the timing of the CPU to suboptimal PVT conditions, resulting in waste of the CPU's processing speed under optimal conditions. The internal, variable clock described in the '336 patent claims real-time adjustment of the timing of the CPU by placing the clock on the chip itself. Thus, the CPU can perform optimally under any set of parameters.[14] The microprocessor nevertheless requires a second external clock because devices other than the CPU do not operate at variable speed.[15]

Independent claim 6 provides:

A microprocessor system comprising:

> a central processing unit disposed upon an integrated circuit substrate, said central processing unit operating at a processing frequency and being constructed of a first plurality of electronic devices;
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> an entire oscillator disposed upon said integrated circuit substrate and connected to said central processing unit, said oscillator clocking said central processing unit at a clock rate and being constructed of a second plurality of electronic devices, thus varying the processing frequency of said first plurality of electronic devices and the clock rate of said second plurality of electronic devices in the same way as a function of parameter variation in one or more fabrication or operational parameters associated with said integrated circuit substrate, thereby enabling said processing frequency to track said clock rate in response to said parameter variation; an on-chip input/output interface, connected between said central processing unit and an off-chip external memory bus, for facilitating exchanging coupling control signals, addresses and data with said central processing unit; and

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[13] *See id.* at 17:21-22 ("Speed may vary by a factor of four depending upon temperature, voltage, and process.").

[14] *See id.* at 17:32-34 ("By decoupling the variable speed of the CPU 70 from the fixed speed of the I/O interface 432, optimum performance can be achieved by each.").

[15] *See id.* at 44-53 ("The designer of a high speed microprocessor must produce a product which operate over wide temperature ranges, wide voltage swings, and wide variations in semiconductor processing. Temperature, voltage, and process all affect transistor propagation delays. Traditional CPU designs are done so that with the worse case of the three parameters, the circuit will function at the rated clock speed. The result are designs that must be clocked a factor of two slower than their maximum theoretical performance, so they will operate properly in worse case conditions."); *id.* at 16:67-17:10 ("By deriving system timing from the ring oscillator 430, CPU 70 will always execute at the maximum frequency possible, but never too fast. For example, if the processing of a particular die is not good resulting in slow transistors, the latches and gates on the microprocessor 50 will operate slower than normal. Since the microprocessor 50 ring oscillator clock 430 is made from the same transistors on the same die as the latches and gates, it too will operate slower (oscillating at a lower frequency), providing compensation which allows the rest of the chip's logic to operate properly.").

> an off-chip external clock, independent of said oscillator, connected to said input/output interface wherein said off-chip external clock is operative at a frequency independent of a clock frequency of said oscillator and wherein a clock signal from said off-chip external clock originates from a source other than said oscillator.[16]

C. The Verdict: HTC Infringes

A seven-day jury trial was held to consider whether HTC infringed the '336 patent.[17] At trial, HTC did not contest the validity of the '336 patent. HTC moved for judgment as a matter of law after the close of TPL's case.[18] After two days of deliberations, the jury found that HTC and its accused products literally infringed all asserted claims: 6, 7, 9, 13, 14, and 15.[19] As to damages, the jury made the following findings:

> 3. To the extent you have found that at least one claim of the '336 patent is infringed, what has TPL proven that it is entitled to as a reasonable royalty for infringement:
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> One-time (lump sum) payment of $958,560 for the life of the patent.[20]

Following the jury verdict HTC filed a renewed motion for judgment as a matter of law that its products do not infringe the '336 patent.[21]

II. LEGAL STANDARDS

Fed. R. Civ. P. 50(b) provides that, upon a renewed motion for judgment as a matter of law, the court may: (1) "allow judgment on the verdict, if the jury returned a verdict," (2) "order a new trial," or (3) "direct the entry of judgment as a matter of law." To grant a Rule 50(b) motion, the court must determine that "the evidence, construed in the light most favorable to the non-moving

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[16] Docket No. 393-3.

[17] *See* Docket No. 657.

[18] *See* Docket No. 647. HTC also moved for judgment as a matter of law as to willful infringement and damages. The jury returned a verdict that HTC's infringement was not willful. HTC has not renewed its motion for judgment as a matter of law on the issue of damages. *See* Docket No. 654 at 3-4.

[19] *See* Docket No. 654 at 2.

[20] *Id.* at 4.

[21] *See* Docket 671.

party, permits only one reasonable conclusion, and that conclusion is contrary to the jury's."[22] In other words, to set aside the verdict, there must be an absence of "substantial evidence" – meaning "relevant evidence that a reasonable mind would accept as adequate to support a conclusion" – to support the jury's verdict.[23] "Substantial evidence is more than a mere" scintilla;[24] it constitutes "such relevant evidence as reasonable minds might accept as adequate to support a conclusion even if it is possible to draw two inconsistent conclusions from the evidence."[25] In reviewing a motion for judgment as a matter of law, the court "must view the evidence in the light most favorable to the non-moving party and draw all reasonable inferences in its favor."[26] "In ruling on such a motion, the trial court may not weigh the evidence or assess the credibility of witnesses in determining whether substantial evidence exists to support the verdict."[27]

III. DISCUSSION

A. The Jury Considered Substantial Evidence that the Accused Products Involve An "Entire Oscillator"

HTC first disputes the sufficiency of evidence regarding practice of the "entire oscillator" limitation. The court addressed the term in its order granting-in-part summary judgment of

[22] *Callicrate v. Wadsworth Mfg.*, 427 F.3d 1361, 1366 (Fed. Cir. 2005) (*quoting Pavao v. Pagay*, 307 F.3d 915, 918 (9th Cir. 2002)) ("The Ninth Circuit upholds any jury verdict supported by substantial evidence.").

[23] *Id.*

[24] *Chisholm Bris. Farm Equip. Co. v. Int'l Harvester Co.*, 498 F.2d 1137, 1140 (9th Cir. 1974) (*quoting Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938)).

[25] *Landes Constr. Co. v. Royal Bank of Canada*, 833 F.2d 1365, 1371 (9th Cir. 1987).

[26] *Transbay Auto Serv., Inc. v. Chevron U.S.A., Inc.*, Case No. 3:09-cv-04932 SI, 2013 WL 496098, at *2 (N.D. Cal. Feb. 7, 2013) (*quoting Josephs v. Pacific Bell*, 443 F.3d 1050, 1062 (9th Cir. 2006) ("We must view the evidence in the light most favorable to the nonmoving party – here, Josephs, – and draw all reasonable inferences in that party's favor.")).

[27] *Id.* (citing *Mosesian v. Peat, Marwick, Mitchell & Co.*, 727 F.2d 873, 877 (9th Cir. 1984) ("Neither the district court nor this court may weigh the evidence or order a result it finds more reasonable if substantial evidence supports the jury verdict.")).

non-infringement and no willfulness.[28] The court explained:

> The court agrees with HTC that the disputed limitations are properly understood to exclude any external clock used to generate a signal.[29] Nevertheless, there remains a factual dispute whether HTC's products contain an on-chip ring oscillator that is self-generating and does not rely on an input control to determine its frequency. While HTC's expert says that the PLLs generate the clock, TPL's expert counters that the ring oscillators generate the clock and the PLLs merely buffer or fix the frequency.[30] This is a classic factual question that requires a trial to answer.[31]

HTC argues that the record at trial was uncontroverted that the ring oscillator in all accused HTC products is a phase locked loop ("PLL") and that the frequency output from the PLL is used to clock the CPU in the accused products. In particular, the frequency generated by that PLL relies on an off-chip crystal to set the frequency which is used to clock the CPU. The court's construction teaches that if an off chip crystal is used to clock the CPU, then the accused products fall outside of the claims. Because this was the factual predicate under which the trial was held and all of the evidence at trial demonstrates the PLLs in the accused products necessarily reference an off-chip signal in order to set the frequency to clock the CPU, no reasonable jury could find infringement. At bottom, the evidence was undisputed that the signal that is used to clock the CPU cannot exist but for the existence of the off chip crystal's input – there is nothing to clock the CPU if the off chip crystal is not referenced.

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[28] *See* Docket No. 585.

[29] The patentee's arguments traversing the prior art narrowed the claims. *See Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 740 (2002) ("A patentee's decision to narrow his claims through amendment may be presumed to be a general disclaimer of the territory between the original claim and the amended claim."); *cf. Saeilo Inc. v. Colt's Mfg. Co.*, 26 F. App'x 966, 973 (Fed. Cir. 2002) ("Where an amendment narrows the scope of a claim for a reason related to the statutory requirements for patentability, prosecution history estoppel acts as a complete bar to the application of the doctrine of equivalents to the amended claim element.").

[30] *Compare* Docket No. 457 at 16 ("the oscillators in the accused products indisputably rely on an external crystal or clock generator to clock" the CPU), *with* Docket No. 470 at 14 ("Each HTC product includes a CPU/system clock – a ***ring oscillator*** within a PLL – that ***generates*** a clock signal ***on its own***, as long as it has a power supply.") (emphasis in original).

[31] Docket No. 585 at 11.

TPL counters that HTC failed to preserve the issue, and that in any event there was sufficient evidence that even if the external crystal can be used to regulate frequency clocking the CPU that is separate and distinct from the generation of the clock. TPL points to testimony from its expert, Dr. Oklobdzija, that because one could remove the crystal and still see a signal, even though that was not how the accused products operate, that suggested to him, an expert in the field, that the crystal was not being used to generate the signal.[32] Oklobdzija also opined that no off-chip crystal is relied upon to generate a clock signal.[33] Even HTC's own expert opined that the external crystal clocks were used in HTC phones as reference signals, not to actually generate the on-chip clock signal itself.[34]

As an initial matter, the court is satisfied that HTC's arguments regarding the meaning of "entire oscillator" were preserved. After the court issued its order denying HTC's motion for summary judgment of non-infringement, HTC filed a motion requesting that the court adopt a jury instruction incorporating a construction of "entire oscillator" consistent with the order. In particular, HTC asked the court to adopt a construction that included two sentences: (1) a first sentence stating that the limitation is "not satisfied by an accused system that uses any external clock to generate a signal," and (2) a second sentence specifying, among other things, that an accused product can infringe only if it "does not rely on an input control to determine its frequency."[35] The court held a hearing on HTC's motion and issued an order adopting a

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[32] *See* Docket No. 641, Trial Tr. at 565:15-19 ("The ring oscillator generates the clock regardless, and it will continue to generate the clock even when you disconnect this, the crystal.").

[33] *See id.*, Trial Tr. at 565:22-25 ("Q: Does any on-chip component rely on the off-chip crystal to generate a clock signal? A: No.").

[34] *See* Docket No. 643, Trial Tr. at 1019:23-1020:3 ("Q: And have you heard of the term "Crystal Clock," or "Crystal Oscillator"? A: Yeah. Crystal Oscillator is a component that you put a voltage on the component and then it starts oscillating at a fixed frequency. It's also part of a PLL. It feeds a PLL and makes sure that the PLL has a reference signal.").

[35] Docket No. 590 at 2:19-23; *see also* Docket No. 604 (citing the intrinsic record).

construction of "entire oscillator" based on a modified version of the first sentence of HTC's proposal. The court chose not to adopt the second sentence of HTC's proposal and informed the parties that it would instruct the jury in accordance with its construction.[36]

HTC raised this issue again with the court on the day before closing arguments in the context of jury instructions on the construction of "entire oscillator." During the jury instruction conference with the court, after taking up the jury instruction on claim construction, counsel for HTC asked the court to confirm that HTC's earlier objections and arguments with respect to its proposed two-sentence construction of "entire oscillator" had been preserved for the record. The court confirmed that they were.

> Mr. Weinstein:
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> I just want to make sure, we understand you -- we had extensive argument about the entire oscillator term. We had a hearing prior to the trial and I just wanted to make sure that the objections that we had regarding the two sentences that we wanted are still preserved.
>
> The court:
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> They are preserved, absolutely.[37]

Second, HTC's pre-verdict JMOL motion fully raised the argument that the accused HTC products do not infringe because the oscillator in the accused HTC products relies on an input control to determine its frequency.[38] HTC's pre-verdict motion specifically argued, for example, that the "entire oscillator" limitation was not satisfied because "the output frequency of the on-chip clock is expressly calculated, in each instance, based on the input frequency provided by the external clock."[39] HTC's motion explained in detail how the frequency of the on-chip oscillator

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[36] *See* Docket No. 607 at 1.

[37] Docket No. 695-2, Ex. 16 at 1456:16-21.

[38] *See* Docket No. 647 at 4-6.

[39] *Id.* at 6.

was based on a formula that expressly relies on the frequency input from the external clock, including specific citations to the evidentiary record at trial.[40]

This was sufficient.[41]

As for the merits of the dispute, Oklobdzija took the stand and offered expert testimony that, after considering the accused products, his opinion was that the CPU was clocked by an on-chip crystal. He emphasized that a ring oscillator in an HTC accused product does not use an external crystal/clock to generate a clock signal used by the CPU. In particular, he repeatedly clarified that a ring oscillator generates a clock signal on its own, without relying on external crystals.[42] HTC's technical expert, Mr. Gafford, also admitted that it is the ring oscillator that generates the clock signal for the CPU.[43] Gafford further admits that the external crystal is not used to generate the signal. Rather, its clock is used only to compare with the phase of the ring oscillator's already generated clock signal that has been steeply divided by the frequency divider.[44] As Oklobdzija explained, the ring oscillator generates a very high frequency clock signal on its

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[40] *See id.* at 4-6.

[41] *See C.B. v. City of Sonora*, 730 F.3d 816, 824 n.5 (9th Cir. 2013) (citing *EEOC v. Go Daddy Software, Inc.*, 581 F.3d 951, 961 (9th Cir. 2009)) (In the Ninth Circuit, "Rule 50(b) 'may be satisfied by an ambiguous or inartfully made motion under Rule 50(a),' and it is given a 'liberal interpretation' to avoid overly harsh results."); *W. Union Co. v. MoneyGram Payment Sys., Inc.*, 626 F.3d 1361, 1367 (Fed. Cir. 2010) (*quoting Blackboard, Inc. v. Desire2Learn, Inc.*, 574 F.3d 1371, 1379-80 (Fed. Cir. 2009) (holding that even "a cursory motion suffices to preserve an issue on JMOL so long as it 'serves the purposes of Rule 50(a), i.e., to alert the court to the party's legal position and to put the opposing party on notice of the moving party's position as to the insufficiency of the evidence.'").

[42] *See* Docket No. 641, Trial Tr. at 565:15-19 ("The ring oscillator generates the clock regardless, and it will continue to generate the clock even when you disconnect this, this crystal."); Trial Tr. 565:22-25 ("Q: Does any on-chip component rely on the off-chip crystal to generate a clock signal? A: No.").

[43] *See* Docket No. 684, Trial Tr. at 1364:18-22 ("Q: So you've got a 2.0 gigahertz clock signal generated by the ring oscillator that's clocking the CPU, and you divide by 100, and that's what this circuitry actually does; correct? A: Yes.").

[44] *See id.*, Trial Tr. at 1364:18-1365:1 ("Q: [The 2.0-gigahertz clock signal generated by the ring oscillator is divided by 100] [t]o get a 20 megahertz signal so that you can do edge matching with the external reference crystal signal in the phase detector, correct? A: Yes.").

own, which must then be divided to obtain a lower frequency so that its phase can be compared to the phase of the external reference.[45] After that, the PLL can make adjustments to the analog voltage/current provided to the ring oscillator to regulate – but not to generate – its frequency.[46]

Even if Oklobdzija's positions were later undermined by other evidence to a degree or diminished through cross-examination, his expert testimony as corroborated by other experts provides sufficient substantial evidence as required under Rule 50(b).

B. The Jury Considered Substantial Evidence of Variation of the Processing Frequency and Entire Oscillator as a Function of PVT

HTC next argues that no reasonable jury could have found infringement because TPL did not provide substantial evidence that the processing frequency of the CPU and entire oscillator "varied as a function of process, voltage, or temperature." In support, HTC claims the accused products "are designed to maintain the target frequency across PVT variations."[47] What's more, none "of the formulae for any Qualcomm, TI or Samsung chip recites any fabrication or operational parameter variation as playing any role in the determination of the PLL output

[45] *See* Docket No. 641, Trial Tr. at 569:2-18 ("Q: Where is the digital to analog converter here? A: It says DAC. DAC means digital to analog converter, the component here (indicating). So this output operation to extend the digital signal to DAC, this DAC just makes the plain voltage out (indicating), this voltage which comes from here (indicating), and produces this voltage which will smoothly move this one in the range we want it to oscillate (indicating). Now, let me go back just one second. This is a divider (indicating), and this is a comparator (indicating). This is what is called a phase detector (indicating). Here is the reference (indicating). This reference is compared with the divided signal here, and what it does is, you can see the switches, it either moves this voltage up or down. These capacitors have been charged and they filter that voltage so it's not jumping up and down, so it's smooth, that voltage, okay, when connected.").

[46] *See id.* at 569:19-22 ("And in this case this is disconnected, but when connected, it's converted into a current some with what digital PLL does, or digital output, same thing, voltage, and it will adjust this VCO, voltage control oscillator, ring oscillator.").

[47] Docket No. 643, Trial Tr. at 1062:2-3 ("Regarding PLL's, I can tell you that PLL's are designed to maintain the target frequency across PVT variations."); Docket No. 640, Trial Tr. at 359:2-8 ("Q: Is the output frequency from the DPLL stable? A: That is part of the specification. In other words, the outer clock is always known to have a known value within a tight range. That's how the specification on the PLL is developed. So yes, the answer is correct, it's stable, it's a known value.").

frequency. The accused HTC products, therefore, do not meet the "varying" limitations as a matter of law."[48]

Again, the court finds substantial evidence supports the jury's verdict. Gafford, HTC's expert, testified that the processing frequency of the CPU and the clock rate of the on-chip oscillator must always vary in the same way.[49] Because the claim limitation is disjunctive, TPL needed to show only that such variation is a function of at least one parameter among the several fabrication or operational parameters (e.g., voltage and temperature). With respect to at least the process / fabrication parameters, TPL met its burden. Process parameters vary from chip to chip because, as Gafford testified, process parameters are the same for components of the same chip, such as the CPU and the on-chip oscillator in each HTC accused product.[50] Gafford also admitted that such process variation between chips results in variation between chips in processing frequency and the associated clock rate.[51]

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[48] Docket No. 671 at 8.

[49] *See* Docket No. 684, Trial Tr. at 1387:13-1388:1 ("Q: Let me ask you this: the processing frequency of the CPU and the clock rate of the entire oscillator must always vary together; right? A: Yes, they must vary in the same way. Q: They all – they must always vary in the same way, and the reason is that the CPU gets its processing frequency from the clock rate of the entire oscillator; right? A: I believe that's the way—I believe that's how everyone has agreed we're interpreting this element. Q: Okay. Like Dr. Oklobdzija's analogy, if I'm the entire oscillator and you're the CPU and we're shaking hands and I'm moving my hand at two hertz, your hand is also moving at two hertz; correct?

[50] *See id.*, Trial Tr. at 1394:8-11 ("Q: Now, Variations in fabrication parameters, again, are from chip to chip. They're not in the same chip during operation; right? A: Yes."); Trial Tr. at 1393:16-23 ("Q: Now, you also recognized that there have to be process variations among the chips in the HTC accused products; right? A: Yes. Q: Because process variation is endemic to silicon production; correct? A: Yes. Q: You can't get away from it; right? A: Yes.)".

[51] *See id.*, Trial Tr. at 1390:2-11 ("Q: But when we're talking about fabrication variations, those are variations from chip to chip; right? A: Yes. Q: So some chips will have the ability to run faster and some chips will only be able to run at slower speeds; right? A: That's right. Q: And that's why we have a binning step in manufacturing chips; correct? A: As to its effect on the CPU speed, yes, that is what binning does."); Trial Tr. at 1394:8-11 ("Q: Now, Variations in fabrication parameters, again, are from chip to chip. They're not in the same chip during operation; right? A: Yes.").

Evidence of process variation, and therefore processing frequency and clock rate variation, between chips, was shown in all HTC accused products. Qualcomm's representative, Sina Dena, testified, for example, that for the same chip design, Qualcomm separates chips with higher clock speeds at the "high end" or "fast corner of the process," from chips with lower clock speeds at the "slower corner of the process" -- a practice called binning.[52] Qualcomm assigns different product names or designations to chips in different bins even though they have the "same design."[53] In fact, "the higher speed bin products will have potentially a different frequency plan."[54] Qualcomm charges more for such chips.[55] Gafford confirmed that "there have to be process variations among

[52] *See* Docket No. 643, Trial Tr. at 1083:5-14 ("The court: The next question has to do with binning. We've heard much discussion in this trial about binning. When you were describing binning earlier during your testimony, were you referring to binning of a single or common IC design? The witness: Yes. Basically it's – it's – it's the same design which performs, can take higher clock speeds at the high end of the process, at the fast corner of the process and versus, you know, lower clock speed at the slower corner of the process.")

[53] *See id.*, Trial Tr. at 1083:5-14 ("The court: The next question has to do with binning. We've heard much discussion in this trial about binning. When you were describing binning earlier during your testimony, were you referring to binning of a single or common IC design? The witness: Yes. Basically it's – it's – it's the same design which performs, can take higher clock speeds at the high end of the process, at the fast corner of the process and versus, you know, lower clock speed at the slower corner of the process."); Trial Tr. at 1064:14-24 ("Q: Okay. Understood so you change the PLL based on the speed bin that the chip goes in; right? A: Right. And the chips usually are going to have a different identification when they are at the higher speed versus the one that – Q: And I think you called these premium chips, the faster ones, right? A: I don't know if it's premium, but the marketing group. Q: But you're able to charge more money for those chips; right? A: Yes."); 1083:22-23 ("Now, usually when the binning is done, either product name is changed or there is some sort of designation that goes.").

[54] *See id.*, Trial Tr. at 1083:22-1084:5. ("Now, usually when the binning is done, either product name is changed or there is some sort of designation that goes. So it's -- even though you might call it the same design, the higher speed bin products will have potentially a different frequency plan, and it's very simple to manage with a single release of software that we do for these chips. Basically the software reads the fuse space, finds it, okay, this is a faster device, so I'm going to change my PLL plan to a different setting for this particular device.").

[55] *See id.*, Trial Tr. at 1064:10-24 ("A: Now, is there a market for 1.2 Gigahertz? Sure, there is if you do that. So we have a premium for the fast corner process devices, and then the frequency plan, the PLL plan is going to change for that particular group of devices. Q: Okay. Understood so you change the PLL based on the speed bin that the chip goes in; right? A: Right. And the chips usually are going to have a different identification when they are at the higher speed versus the one that – Q: And I think you called these premium chips, the faster ones, right? A: I don't know if it's premium, but the marketing group. Q: But you're able to charge more money for those chips; right? A: Yes.").

the chips in the HTC accused products," "because process variation is endemic to silicon production."[56]

As to the formulae cited by HTC, they merely show how the ring oscillator uses the external crystal clock as a reference, not how the ring oscillator actually generates the clock signal. HTC's own witness, Mr. Fichter, testified that the external crystal clock in the HTC phones serves merely as a reference signal.[57] Dena confirmed that this crystal functions as a reference for the Qualcomm chips used in the HTC phones.[58] Dr. Haroun, a corporate representative from Texas Instruments, also confirmed that the external crystal clock functions as a reference for the TI chips used in the HTC phones.[59] Because the external crystal serves merely as a reference, if that crystal

[56] *See* Docket No. 684, Trial Tr. at 1393:16-23 ("Q: Now, you also recognized that there have to be process variations among the chips in the HTC accused products; right? A: Yes. Q: Because process variation is endemic to silicon production; correct? A: Yes. Q: You can't get away from it; right? A: Yes.)".

[57] *See* Docket No. 643, Trial Tr. at 1019:23-1020:3 ("Q: And have you heard of the term "Crystal Clock," or "Crystal Oscillator"? A: Yeah. Crystal Oscillator is a component that you put a voltage on the component and then it starts oscillating at a fixed frequency. It's also part of a PLL. It feeds a PLL and makes sure that the PLL has a reference signal.").

[58] *See id.*, Trial Tr. at 1044:2-12 ("Q: And at a high level, what is the purpose of a phase lock loop? A: Phase lock loop is used to provide a fixed target frequency clock signal. Q: And generally how is that achieved? A: In the Qualcomm family of chips, basically there's a fixed reference input clock that comes to a box, phase lock loop. There are elements that go into it, we call them L, M, N, different parameters, and the output frequency of the phase lock loop would be a mathematical formula of those elements multiplied by the input reference clock frequency."), Trial Tr. at 1048:10-15 ("Q: Okay. Now, one more last question about this. This TCXO right here, is that a -- what type of signal is that (indicating)? A: It's what you call a reference clock signal fixed at 19.2 and it's extremely important for PLL operation for this signal to be fixed across variation and temperatures (indicating).").

[59] Docket No. 640, Trial Tr. at 350:14-17 ("Q: Now, all of the – now, all of the OMAP chips use PLL's with -- that have a reference signal from an external clock; correct? A: That is correct."). In fact, Dr. Haroun admitted that only the ring oscillator in the TI chips could create or generate the high frequency used to clock the CPU. *Id.* at Trial Tr. at 353:23-354:3 ("Q: Okay. Let me clarify it this way: there's no other portion in the PLL besides the ring osciallator that can create a frequency that's so much higher than the external crystal; correct? A: That is correct. That is where it's -- where the extra edges are generated, yes.").

is disconnected, the ring oscillator will still be able to generate a clock signal.[60] HTC's focus on the formulae therefore ignores the fact that differently binned chips – even if they have the same design – are set to run at different frequencies and sold for different prices.

In sum, substantial evidence supports the jury's infringement verdict.

IT IS SO ORDERED.

Dated: January 21, 2014

PAUL S. GREWAL
United States Magistrate Judge

[60] *See* Docket No. 641, Trial Tr. at 567:8-22 ("Q: So the ring oscillator will still run if you disconnect the crystal? A: Yes, because crystal is not essential to generate the clock. Crystal is not needed to generate the clock.")