IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

COMPLETE GENOMICS, INC., Plaintiff, v. ILLUMINA, INC., Defendant.	C.A. No. 19-970-MN
ILLUMINA, INC. and ILLUMINA CAMBRIDGE LTD., Counterclaim-Plaintiffs. v. COMPLETE GENOMICS, INC., BGI AMERICAS CORP., and MGI AMERICAS INC., Counterclaim-Defendants.	

DEFENDANT'S OPENING POST-TRIAL BRIEF IN SUPPORT OF ITS MOTIONS FOR JUDGMENT AS A MATTER OF LAW AND A NEW TRIAL

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I. INTRODUCTION

The enormous verdict in this case deserves to be overturned both because the jury's liability finding is unsustainable and the size of the damage award is indefensible. Post-trial motions are critical to protect against exactly such jury trial outcomes.

The literal infringement finding definitively conflicts with this Court's claim construction and thus is legally untenable. At BGI's insistence, the Court construed BGI's claims to require a "very binary" approach to a two channel sequencing system. There is either signal or the ***absence*** of signal detected in the channel. For one base-type there is an absence of signal detected in both channels, for two other base-types there is one channel with signal detected and the other with signal absent, and for the fourth base-type there is signal detected in both channels.

As agreed by all, in Illumina's two channel sequencers, light is detected and used in ***both*** channels for the C and T bases. But for those bases the Court's claim construction requires an "absence" of signal detected in one of the two channels. BGI's trial argument was a poorly-disguised DOE theory that this second channel signal was relatively small and thus "noise" to be disregarded. But BGI was barred from presenting a DOE theory, and the Court's construction does not include exceptions for allegedly small signals—all that is required is that signal be detected. BGI's expert admitted the second channel is routinely used to make base calls and can be determinative of the base call, proving it is not "absent." The jury's liability finding should be reversed for this reason alone.

BGI's overreaching damages theory, adopted wholesale by the jury, was likewise legally infirm for a host of reasons. For example, BGI's damages expert Dr. Kearl promoted a royalty theory infected by unsupportable assumptions. Dr. Kearl testified that Illumina would have had to provide 40% more sequencers for free merely to compensate for the value of BGI's patents. He predicated this "cost-saving" theory on the assumption that the claimed inventions were

themselves responsible for making Illumina sequencers "twice as fast." Yet, he admitted he had no idea whether that was correct, because he did not really understand the patent claims in this case, or even patents generally. The Illumina document he relied-upon explained the "twice as fast" improvement was due to ***Illumina's*** improvements to its chemistry, including improved enzymes, patented flow cells, and more. Because those are Illumina contributions, BGI was legally required to apportion, which it failed to do.

BGI's damages theory for foreign sales suffered from an additional, glaring legal problem. Essentially, BGI argued that Illumina's single test run in the US was worth $165,000, amounting to an 18% royalty for foreign sales. Under Federal Circuit law, the internal use shown in this record such as product testing cannot support a royalty on otherwise non-infringing product sales.

Even if this Court were to overlook these errors, Illumina believes a new trial is warranted because, with all respect, this Court's severe time-sanction against Illumina was unjustified and unfairly prejudicial. The parties agreed without qualification that Bob Kain's testimony would be completed by April 29 to accommodate his schedule. Illumina reminded BGI consistently that per BGI's agreement Mr. Kain would need to complete his testimony by April 28. Nevertheless, on April 28 BGI suddenly refused to allow Mr. Kain to be called out of turn even though it had agreed to his departure and he had relied on that agreement. There was no fair basis for this refusal—which is a common scheduling accommodation of the type Illumina extended to Dr. Drmanac only days earlier. The Court sanctioned Illumina four hours of time and awarded BGI more time. This caused Illumina to truncate examinations and drop witnesses. BGI exploited this by continually reminding the jury of the missing witnesses. The Court's later restoration of some time, while appreciated, could not repair the damage.

These and more problems with the verdict warrant reversal and, at a minimum, a new trial.

II. ARGUMENT

The Court should grant JMOL under FRCP 50(b) or, in the alternative, a new trial under FRCP 59 for the reasons set forth below and as supported by the evidence in Illumina's closing slides. *See* Ex. 5.

A. Illumina Products Do Not Infringe The '132/'473 Patents Because They Do Not Identify Bases By Absence Of Signal As Required By The Court's Claim Construction

BGI's infringement theory fails legally because it requires that Illumina's products identify a T nucleotide by presence of a first signal and absence of second signal, and vice-versa for a C nucleotide. *See* Tr. at 728:6-19; *see also* Ex. 2 at 104:14-16 (BGI: "claim 1 tells you all you're doing is detecting the presence or absence, presence or absence is ***very binary***").[1] BGI's expert, Dr. Pachter, admitted that Illumina uses a fundamentally different approach that relies on ***both*** the first and second fluorescent signal for all base-calls.

BGI thus flouted the Court's construction for "first/second fluorescent signal" by mischaracterizing as "noise" bona fide light emissions that, though smaller than others, are nonetheless undisputedly ***used*** for base calling. BGI's infringement theory that allegedly smaller signals could be disregarded as "noise" was a DOE theory presented *sub silentio.* Yet, BGI was precluded from relying on the DOE. *See* D.I. 303-1, Ex. 1 at 59-60.

Because there was no material dispute at trial about how Illumina's products work, and because BGI's theory failed to apply the Court's construction properly, the infringement verdict must be reversed. *See, e.g.*, *Duncan Parking Technologies v. IPs Group,* 914 F.3d 1347 (Fed. Cir. 2019) (because the parties did not disagree how the products worked, literal infringement

[1] All emphasis supplied throughout this brief unless otherwise noted.

collapses into claim construction and can be decided as a matter of law).

1. Illumina's Products Detect Both First And Second Fluorescent Signals To Call Bases Which Conflicts With The Court's Claim Construction

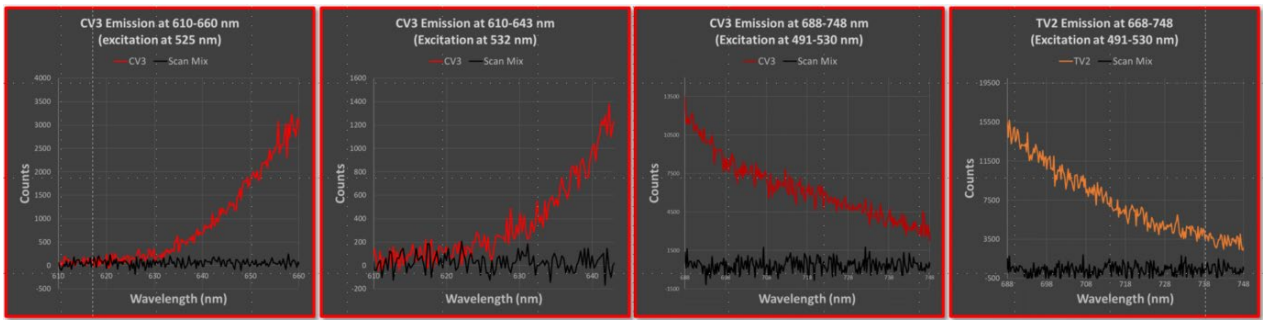
The Court construed "first/second fluorescent signal" to mean "light emitted by a fluorescent molecule or molecules that is detected within a defined wavelength range." BGI's expert, Dr. Pachter, confirmed that this includes "actual light emitted" regardless of its intensity or the number of photons detected. *Id.* at 752:6-13, 770:17-23, 824:8-17.

The Court's construction for "signal" was BGI's proposal, supported by its admission that "signal" versus "absence of signal" is "binary," without regard to "intensity" and that "***anything*** that they can see in their tunnel registers as a signal." Ex. 2 at 70:19-21 ("it really doesn't matter at least for this claim on the signal whether they have the same intensity or not, ***the signal is binary, it's just off and on***."); *id.* at 67:15-24 ("You have ***a camera*** or a detector. And those detectors basically have like tunnel vision. They see certain things and they don't see others. And ***anything that they can see in their tunnel registers as a signal***."); *id*. at 84:3-16 (similar); D.I. 104 at 56 (The "specification also captures the ***binary*** nature of the term 'signal' in describing certain embodiments, in which 'either a signal is detected or not.'").

As BGI insisted, light is not excluded from the scope of "signal" simply because it is not as strong as light detected in a different channel; so long as a fluorophore emits light that is detected in a defined wavelength range, that light constitutes "signal." D.I. 104 at 54 (BGI: The "term 'signal' is used in the claimed method not to indicate a specific intensity or wavelength, but in a ***binary*** fashion, in which a signal is either present or absent."). It is undisputed that in the accused products the C and T nucleotides emit "signal" in ***both*** wavelength ranges that BGI identified as corresponding to the first and second fluorescent signals.

Illumina's expert, Dr. Czymmek, proved this experimentally. *See generally* Tr. at

1225:21-1227:20, 1231:2-1242:9. Dr. Czymmek's spectral data proved the existence of actual signals in the graphs below that show smooth trends above the true noise (the black lines):



DDX13.93

Despite testifying for roughly six hours, BGI's expert did not address Dr. Czymmek's evidence or identify contrary experiments of his own. *Id.* at 717:21-718:4, 718:8-10, 718:17-23, 719:18-23.. Illumina's other expert, Dr. Mason, likewise proved that during actual sequencing runs there is signal from the C nucleotides observed in ***both*** channels. *See id.* at 1264:21-1266:16. Both signals moved the centroid of the C (not the spread around the center). *Id.* This changes what falls within the C base-call cloud, and consequently influences many base calls. *Id.* Dr. Pachter never mentioned this proof either and BGI did not bother to cross-examine Dr. Mason on it.

Ultimately, BGI did not deny that in Illumina's products the T and C nucleotides emit light in both of the ranges that allegedly correspond to the first and second defined wavelength ranges. When shown Dr. Czymmek's data, Dr. Pachter ***validated*** Dr. Czymmek's conclusions, testifying for instance that the T nucleotides in the NextSeq500 products emit light above 688 nanometers, where, if the claims were satisfied, BGI's infringement theory required there would be no signal:

> Q. Let's be clear, you don't dispute that the T nucleotide that's labeled with the 550S0 dye with it absorbing in the 491 to 530 wavelength range will emit some light in the range above 688 nanometers, you don't dispute that, do you?
>
> A. No, I don't dispute that, the experiment shows that to be the case.

Id. at 759:6-12; *see also id.* at 750:22-751:4 (agreeing there is light emission in 688-748 nm).

BGI instead argued vaguely that the light emissions in the second wavelength range should be disregarded as being too small relative to the light in the other wavelength range. In cross-examining Dr. Czymmek, for instance, BGI alleged that the signal he identified should be disregarded as "noise" because it was small compared to other signal that was "through the ceiling." *Id.* at 1256:5-14; *see also id.* at 1255:4-1256:4. Likewise, counsel for BGI gestured with his hands at the floor, arguing that "the little, little bitty line over here and the area under that little bitty line" is ***equivalent*** to an absence of signal because it was smaller than other signal that was allegedly at the "ceiling." *Id.* at 1449:14-1450:1. With BGI's "noise" argument wearing a different costume, Dr. Pachter argued that second-channel signals should be disregarded as "leakage" that is "not interesting." *See id.* at 580:12-22, 750:22-751:4. While Dr. Pachter might not find that light to be interesting, Illumina's systems do: they rely on that light to make base calls. Further, BGI's assertions are all legally irrelevant because the Court's construction (as described by BGI) includes no minimum intensity or number of photons and does not exclude "leakage" or light that BGI deems "not interesting." *See, e.g.*, *id.* at 580:12-22, 770:17-771:21.

Unable to openly present a true DOE theory, BGI simply refused to apply the very construction that the Court adopted at its behest. Dr. Pachter contended that the images of light that come from the fluorophores are ***not*** actually the recording of "signal" because "signal" is different from the light measured from the fluorophore:

> Q. So for you signal is not the same thing as light emitted by a fluorophore, right?
> A. It's not that it's for me or not for me, in the system the way it is working is that there is, there is a difference between what is being determined to be the signal and just all the light that's coming off of – all the light that's being measured.

Id. at 766:24-767:5, 825:1-7; *see also id.* at 563:8-11 ("Q. And if there is light detected but the

channel is considered off, what is that light that's detected, how if at all does that relate to noise? A. So that light, that's the noise."); *id.* at 762:21-763:3 (actual light emitted by the AV4 fluorophore in the defined wavelength range 688-748 would be "noise" not "signal").

BGI's trial argument that an arbitrary portion of "all the light that's being measured" from the fluorophores is not "signal" but rather "noise" because it is supposedly small was an artifice to sidestep the Court's construction and, ultimately, the undeniable light emissions that negated BGI's infringement case. A fundamental problem with BGI's approach is that what it calls "noise" has all of the properties of the court's definition of fluorescent signal – namely, light undisputedly emitted by a fluorescent molecule and detected by the camera within the wavelength range defined by the camera's filters. The Court's claim construction allows no such distinction between "light" and "noise." Dr. Pachter's infringement theory is therefore entitled to no weight because it conflicts with the Court's construction. *See, e.g.*, *Duncan Parking Techs., Inc. v. IPS Grp., Inc.*, 914 F.3d 1347, 1363 (Fed. Cir. 2019) ("Here, Dr. Rosing's opinion that the Liberty Meter's keypad may comprise a portion of the cover panel is clearly foreclosed by the district court's claim construction. In such a situation, the district court is not obligated to credit an expert's testimony.").

2. Illumina's Products Use Both First And Second Fluorescent Signals To Identify All Nucleotides

Not only was it undisputed that one or more of the T and C nucleotides in Illumina's products emit both first and second fluorescent signals that are measured, it was undisputed that in Illumina's products ***every*** nucleotide type is identified based on both a first ***and*** second fluorescent signal.

John Vieceli, the author of Illumina's software, explained that nucleotides in Illumina's system are identified by assigning clusters to one of four populations through a probabilistic

calculation that uses ***both*** signals from ***every*** nucleotide in a region of the Illumina flow cell. *See* Tr. at 1201:9-1213:17. As Dr. Vieceli explained, Illumina's products do not use the binary approach based on the presence/absence algorithm that appears in BGI's claims. *See id.* 1211:3-1213:17. BGI's brief cross-examination of Dr. Vieceli never challenged any relevant aspect of his testimony. *Id.* at 1213:23-1217:20.

This is unsurprising because BGI does not actually disagree with anything Dr. Vieceli said. Just like Dr. Vieceli, Dr. Pachter confirmed that in Illumina's products, basecalls are made by assigning clusters to one of four clusters (or "clouds") based on a maximum probability. *Id.* at 743:8-745:19. He likewise confirmed that the assignment is made based on ***both*** first and second fluorescent signals from ***all*** the clusters in the tile of the flow cell:

> Q. Just to be clear the probability that ***any cluster belongs to a particular cloud depends in part on both the values of both the red and green channels*** and also the noise in the [Gaussian], right?
> A. Yeah, I think that's what I just said.
>
> * * *
>
> Q. Isn't it here that the reason the process works well is because you're estimating the mean of [Gaussian], you're estimating the means of [Gaussian], isn't that true that that's why it works well?
> A. ***This is a good algorithm and by virtue of using the intensities in both channels***, it gives you some leverage and power to figure out how to do these assignments well.
>
> * * *
>
> Q. And whether a particular cluster on the flow cell is assigned to a particular centroid, and has ***given a particular base call depends on the intensities received for all of the other clusters in the tile***, correct?
> A. Right. As I said now, the process is iterative and using all of this information together.
> Q. Whether you say all this information, ***you mean the intensities received for all of the other clusters in the tile***, right?
> A. Right, that's what you're seeing here, each dot, you have intensities ***in the red and the green channels***.

Id. at 747:2-6, 746:12-18, 747:10-20.

As another example, with respect to the T nucleotides, which are supposedly distinguished

from the G nucleotides based on the first fluorescent signal, Dr. Pachter admitted that they are assigned to a cloud (*i.e.*, the "black" cloud) using not just the first signal but also the second signal and also the signals from all the other clusters (*i.e.* "dots"):

> Q. Your opinion is that the G and the T nucleotides are distinguished from one another on the bases of the signal in the green channel, yes or no.
>
> A. That is not a yes or no question, sir, because, you know, you can't just decide what possible answers are the question. I don't think this is a multiple choice exam. This is not a yes or no question.
> ***The – the determination of those dots going in into the black involves the signal in if first channel but also the second and also all the other dots.***
> And so, you keep asking me – you're asking me in this case a yes to which, you know, I just can't give a yes or no answer like that. You know, this is an instance of the use of the EM algorithm. And than it's one I'm familiar with. It's usually taught in graduate classes in computational biology or in statistic. I can't – you know, it's – I can't give a complete answer and a truthful answer to your question by saying yes and no, I can't in this case. I really am trying to answer your questions to the best of my ability.

Id. at 734:25-735:18. Rather than using the binary presence/absence algorithm in the claims, Dr. Pachter admitted that signals from both channels for all the clusters is used to make base-calls in Illumina's products. That precludes an infringement finding.

As yet another example, even for the unlabeled G nucleotides, Dr. Pachter confirmed that they are identified not by the absence of signal, as the claims require, but actually "in the context of the intensities in both the channels":

> Q. Sure. Under your theory, the clusters on the flow cell with the G nucleotides can be distinguished from the clusters with the C nucleotides on the bases of the signal in the red channel, right?
>
> A. So, again, it's the false dichotomy it's not real, what's happening. Again, while ***the determination of G is being made in the context of the intensities in both the channels***.

Id. at 741:21-742:3. Dr. Pachter confirmed repeatedly that the accused products assign nucleotides using the signals from all the clusters, which necessarily entails the use of both first and second signal. *See, e.g.*, *id*. at 742:12-20, 745:8-19, 746:3-8. Because the Illumina products identify nucleotides using ***both*** signals from all the clusters, they cannot possibly be performing

the claimed method of identifying T and C nucleotides based on ***absence*** of signal from an individual nucleotide. JMOL is thus warranted.

Moreover, Dr. Pachter admitted that certain G and C nucleotides had the same intensity in the "second signal" channel, where BGI says there should be signal for C but not G. *See id*. at 742:21-744:7. That Illumina's system nonetheless identifies one nucleotide as C and the other as G shows that Illumina's systems do not use the simple binary approach of the claims that distinguishes nucleotides based on a single signal channel. Rather, they make basecalls based on the light from ***both*** channels taken together.

BGI cannot escape these admissions by merely relabeling "signal" as "noise." The light that BGI discounts as "noise" has none of the characteristics of noise. It is not random. It shows a smooth trend as a function of wavelength, and represents actual fluorescence from a molecule (label) attached to the properly incorporated nucleotide. Further, this alleged "noise" is actually ***used*** to make base calls in Illumina's products, as Dr. Pachter confirmed:

> Q. ***That noise is being used to make the assignment, right***?
> A. ***That's correct***, because when you have a profile of the noise, you're figuring out, the way it's being used – it's basically telling you how to measure the distance from those clusters, from those points, to the blue and the green respectively.

Id. at 744:1-7. As Dr. Pachter explained, "the signal is used, but so is the noise. And that's what really makes the difference in the [base-call] determination here, it seems." *Id.* at 740:12-741:4.

Given how different the Illumina products are from the claims, BGI not only needed to disregard the Court's construction and its own description of the claims during the claim construction proceedings, but also distort its claims in other extreme ways. In the claims, the "signal" is used to identify the bases, such that the signal must necessarily and logically be collected ***before*** the bases are identified. *See, e.g.*, JTX001 at 49:49-67; JTX002 at 60:1-33. Dr.

Pachter would not agree to this straight-forward claim understanding. *See* Tr. at 772:24-774:12.

According to Dr. Pachter, the determination of what light qualifies as "signal" is made as a ***consequence*** of the basecall, rather than a precursor to it. *Id.* at 734:7-11 ("…dots are being assigned on the bases [sic] of intensities in both red and green but not on the bases [sic] of signal because when you're an actual T nucleotide once you have determined you're, say black, there was only signal in that axis and everything else is noise…"); *id.* at 857:15-16 ("the basecall is a determination of the signal…").[2] The disconnect between Dr. Pachter's interpretation of the claim and the Court's claim construction is illustrated by Dr. Pachter's premise that what constitutes a "signal" is not defined by the light actually emitted and detected at a position/site (as required by the court's claim construction), but rather will change if the base call is changed, even if modified by post-sequencing comparisons to non-sequencing data ("alignment"). *Id.* at 855:4-13, 852:13-18, 853:7-13.

Thus, Dr. Pachter argued that the claimed invention uses an "iterative" approach in which the light that is detected is separated out into "signal" and "noise" based on momentary and potentially inaccurate assumptions about the basecall:

> So you know, it's – I think I used this – I'm just trying to be accurate, I think I used this phrase in my direct about the chicken and egg, and its just how it's done. And it's an iterative process, the way the – you're going back and forth and you're not, it's not like a temporal thing, so you're simultaneously figuring out what the signal actually is, which it talks about in the system, to also figuring out the noise component, while trying to figure out the base call. You assume at any moment that you know the base calls, even recognizing that they may not be accurate, and then you use them to figure out what the noise was and what the signal was. Then you go accept that as the truth knowing you probably don't have it right and you

[2] The specification, like the court's claim construction, does not limit "signal" in this manner. *See, e.g.*, Ex. 4 at 64:12-1 (incorporated by reference into the '132 (39:7-22) and '473 (48:2-36) patents in its entirety "for all purposes and particularly for all…methods of detecting sequencing probes," which application refers to "signals" at a spot from probes that do not correspond to the base called at the spot"); *see also id.* at 32:15 et seq. (describing "signals" are "detected" by any number of types of camera systems, separate from sequence analysis).

> go back and try to figure out the base calls. So you go through this iterative process, that's how it works.

Id. at 773:21-774:12.[3] This mumbo-jumbo testimony is nonsense and describes a method that bears no resemblance to the binary presence/absence algorithm in the claims. BGI's radical distortion of its claims to support its infringement theory proves it is baseless and that JMOL is warranted.

B. Illumina Products Do Not Infringe The '473 Patent Because They Do Not Detect Individual Wavelengths

The claims of the '473 patent require the step of "measuring the intensity of a fluorescence signal at the first ***wavelength*** and the intensity of a fluorescence signal at the second ***wavelength***." JTX002 at 60:1-3. The claims require that the signals from these two individual wavelengths (not ranges) identify the nucleotide types. *See id.* at 60:9-33. The Court was explicit that "wavelength" does not mean "range": on "its face the meaning of first/second wavelength is an individual wavelength, not a range of wavelengths." *Id*. at 112:19-20; 113:4-5 ("I will also not construe wavelength to mean range.").

Illumina's products only measure an "aggregate" signal over a range of wavelengths, not the intensity at any individual wavelength as recited in (c)(3). *See, e.g.*, *id.* at 828:19-829:9-10, 829:13-832:1, 832:5-22, 833:1-834:13,1237:15-1238:16, 1270:7-1275:15; *see also* JTX-2 at 60:1-3. BGI's expert also admitted that Illumina's products detect over a "range" of wavelengths.

[3] According to Dr. Pachter, "the base call is a determination of the signal." Tr. at 857:4-16; *see also* 853:19-854:1. To the extent BGI contends that the RTA software in Illumina's products detects the true "signal" by actually making the final basecall, such a theory is without merit. In the claims, the basecall is made based on the "signal," which is light emitted by a fluorophore that is detected in a defined wavelength range. The "signal" is a pre-requisite to the basecall and the signal and basecall cannot be one and the same. As Dr. Pachter confirmed, the RTA software in Illumina's products that makes the basecalls based on the signal is not itself a camera that detects light and thus cannot be a component that measures "signal." *Id.* at 825:8-19.

See Tr. at 828:1-7. Thus, Illumina products do not infringe because they do not measure the intensity of a fluorescence signal at any ***individual*** wavelength. Even if one could wrongly say that an individual wavelength is measured, that individual wavelength is not what results in the base call, because its ***individual*** presence/absence is not detected by the camera or any other component of Illumina's systems, which is also required by (c)(3)(i)-(iv). *See* JTX-2 at 60:9-33.

BGI's sole response is to rely on the transitional phrase "comprising." Measuring a "range" of wavelengths, BGI says, necessarily entails measurement of individual wavelengths within the "range." *See* Tr. at 1881:13-1882:11. This theory renders the Court's construction superfluous. It is also logically and legally flawed. "'Comprising' is not a weasel word with which to abrogate claim limitations." *Spectrum Int'l, Inc. v. Sterilite Corp.*, 164 F.3d 1372, 1380 (Fed. Cir. 1998); *see also Dippin' Dots, Inc. v. Mosey*, 476 F.3d 1337, 1343 (Fed. Cir. 2007) ("The presumption raised by the term ***'comprising' does not reach into each of the six steps to render every word and phrase therein open-ended***—especially where, as here, the patentee has narrowly defined the claim term it now seeks to have broadened.").

Because Illumina's products do not generate information about the intensity at any "individual wavelength," there is no infringement as a matter of law because the transitional phrase "comprising" does not reach into this claim step and negate its requirements.

C. JMOL On Willfulness Is Warranted

To the extent BGI argued willfulness at trial, the ***sole*** evidence of an intent to infringe was an Illumina interrogatory response stating that one Illumina attorney learned of the '132 patent in February 2016 and that Illumina learned of the '473 patent when it was added to this case in June 2020. *See* Tr. at 699:14-700:8. While BGI asserted that Illumina's willfulness started in December 2015, it did not even show Illumina's knowledge of the '132 patent before February 2016 or the '473 patent before June 2020. The evidence at trial cannot support the willfulness

verdict as a matter of law. *See SRI Int'l, Inc. v. Cisco Sys., Inc.*, 930 F.3d 1295, 1309 (Fed. Cir. 2019) (vacating award of enhanced damages where "the jury's verdict of willful infringement before May 8, 2012 is not supported by substantial evidence"); *BASF Plant Sci., LP v. Commonwealth Sci. & Indus. Rsch. Organisation*, 28 F.4th 1247, 1274–75 (Fed. Cir. 2022); *Sprint Commc'ns Co. L.P. v. Cequel Commc'ns, LLC*, No. CV 18-1752-RGA, 2022 WL 421336 (D. Del. Jan. 13, 2022). The evidence on willfulness at trial was so thin that BGI did not even bother to mention it in closing. Because there was not substantial evidence to support the willfulness verdict, it should now be reversed.

D. The Jury's Award Of $333,801,990 In Royalties Is Unsupported And Excessive

The jury awarded BGI $333,801,990 in damages. D.I. 407 at 9. This award is predicated upon the jury's reliance, to the dollar, on the faulty opinions of BGI's damages expert, Dr. Kearl. Tr. at 900:18-20. JMOL is thus warranted or, in the alternative, a new trial. *See Promega Corp. v. Life Technologies Corp.*, 875 F.3d 651, 662-63 (Fed. Cir. 2017) (affirming JMOL); *Exmark Mfg. Co. Inc. v. Briggs & Stratton Power Prod. Grp., LLC*, 879 F.3d 1332, 1351 (Fed. Cir. 2018) (vacating damages award and remanding for new trial if necessary); *Enplas Display Device Corp. v. Seoul Semiconductor Co., Ltd.,* 909 F.3d 398, 412 (Fed. Cir. 2018) (vacating damages award and remanding for further proceedings); *Omega Pats., LLC v. CalAmp Corp.*, 13 F.4th 1361, 1377–78 (Fed. Cir. 2021) (vacating damages award and remanding for new trial).

Dr. Kearl's damages theory was based on several categories of alleged cost savings. But for each category, BGI failed to prove that the alleged cost savings in Illumina's products are actually attributable to the claimed inventions. *Id*. at 1498:17-22. BGI legally must "'give evidence tending to separate or apportion the [infringer]'s profits and the patentee's damages between the patented feature and the unpatented features, and such evidence must be reliable and

tangible, and not conjectural or speculative.'" *Finjan, Inc. v. Blue Coat Sys., Inc.*, 879 F.3d 1299, 1310 (Fed. Cir. 2018).

1. BGI's Alleged Indirect Cost Savings Are Unsupported and Excessive

Dr. Kearl calculated $248,309,211 for alleged indirect cost savings based on the assumption that Illumina would have had to provide 40% more sequencers of the four-channel variety to give the same sequencing capacity to customers as it does with its two-channel sequencers. Tr. at 894:17-895:19. This ~$248 million more than quadrupled the damages calculation based the alleged actual (direct) cost savings for sequencers due to two-channel sequencing. *Id.* at 888:7-9. This $248 million calculation started with the faulty ***assumption*** by Dr. Kearl that Illumina's two-channel sequencers were twice as fast at imaging as a corresponding four-channel sequencer. *Id.* at 896:22-897:8, 909:5-9. BGI failed to establish any basis for this assumption. Moreover, to reach the 40% more sequencing figure, Dr. Kearl further assumed that BGI's ***claimed inventions*** themselves made imaging twice as fast. *Id*. at 909:5-9. But this assumption fundamentally fails to apportion for Illumina's contributions to the "twice as fast" imaging speed improvement.

Dr. Kearl failed to acknowledge—much less evaluate and account for—Illumina's contributions to the "twice as fast" improvement at the heart of his damages theory. On cross examination, he admitted that it was ***Illumina's*** two color technology that caused the "twice as fast" improvement. *Id.* at 909:10-14 ("Q [T]he [documents] you showed said that ***Illumina's two color technology*** made imaging twice as fast; correct? A. Correct."). Dr. Kearl then retreated from the assumption at the core of his damages opinion by admitting he did not even ***evaluate*** what was covered by the patent claims to consider the value the patents added relative to the value of Illumina's technology:

Q. So when you read the two patents, did you look to see ***if they had added***

> ***value*** to Illumina in terms of coming up with those complicated base calling algorithms and the spray charts and the clusters with the lawn and all that?
>
> A. No, and I just said, I am not an expert on reading patents, and patents are written in their own particular way. I read through the patents to try to get a sense of what the patent said. ***But I'm not in a position to evaluate the claims and so forth of the patent.***

Id. at 912:7-15. Dr. Kearl admitted that he did not actually know what contributed to the imaging speed improvements in Illumina's sequencers or whether it was attributable to cameras, software, or laser power in Illumina's two color technology, and thus he could not have properly analyzed whether BGI's claimed inventions exclusively caused the imaging to be "twice as fast." *Id.* at 918:11-919:6. Because Dr. Kearl assumed BGI's claimed invention alone made imaging in the Illumina sequencers "twice as fast," but did not have a basis for that critical assumption, there was a total failure to apportion Illumina's contribution to it. Instead, Dr. Kearl, and consequently the jury in reliance upon him, allocated all that value to BGI without substantial evidence in support.

Dr. Kearl's heavy reliance on an Illumina presentation (PTX941-10) referencing the "twice as fast" improvement to imaging speed does not discharge BGI's legal obligation to prove that this feature was exclusively attributable to the claimed invention. To the contrary, the purpose of the Illumina presentation is to show that the reference to "twice as fast" imaging is attributable to ***Illumina's*** innovation, expressly including its "optimization" of its 2-channel SBS chemistry. PTX941-10. The very next page of the presentation states that the "2-channel SBS chemistry" causing the "twice as fast" imaging speed improvement included "optimized polymerase [enzyme]", "patterned flow cells" and "reengineered 2 channel SBS." PTX941-11. There is no plausible argument—and certainly no record proof—that such innovations are part of BGI's claimed inventions. Moreover, no witness tried to establish that the 2-channel SBS chemistry optimizations included in the Illumina sequencers as set forth in PTX941 are exclusively the product of the claimed inventions. As Dr. Pachter testified, a four-channel sequencer could be

made to be just as fast (and good) as a claimed two-channel sequencer. *See* Tr. at 708:16-19, 861:9-14. BGI was thus required to apportion the value of Illumina's contributions to the "twice as fast" improvement but failed to do so.

Dr. Kearl's assumption that Illumina would provide 40% more sequencers for the same price rather than just adding two cameras to obtain the same speed benefit is likewise unsupported and thus improper. While Dr. Pachter suggested, at times, that four-channel sequencers are not an acceptable non-infringing alternative to two-channel sequencing in 2022, he was unable to pinpoint any date at which this allegedly became true. *Id*. at 841:7-19, 842:10-16, 843:13-844:10, 847:18-4. Moreover, the date of the hypothetical negotiation was not 2022, but December 2015. *Id.* at 874:6-12, 906:12-15. Dr. Pachter's testimony about the lack of an alternative is thus legally irrelevant.

In addition to being based on the faulty "twice as fast assumption," Dr. Kearl's $248 million opinion relies on other unsupported assumptions. BGI's follow-on assumption that ***every*** customer (or even what portion of customers) would have demanded 40% additional sequencers for free is unsupported. *Id.* at 1498:23-1499:6. This treats customer demand for sequencing power as immune to what is available in the marketplace and ignores the actual needs of the customers for sequencing power. There is no showing that customers would have had meaningful alternatives to demand exactly the same amount of sequencing power if there were no two-color Illumina sequencers; Dr. Kearl testified that he did not even know what other options a customer would have. *Id.* at 927:24-928:5.

Dr. Kearl further assumes that Illumina's customers need the 40% more sequencers because they operate (or desire to operate) their sequencers at maximum capacity ***twenty-four hours a day*** and thus extra sequencers were the only way to meet their needs:

> Q. How does this result in a financial benefit to Illumina?
> A. When Illumina's customers bought two-channel sequencers, they expected to be able to do, this simple example, twenty-four runs a day and if Illumina had not been able to use two-channel sequencers but had to use four-channel sequencers, ***it would have had to provide two devices each doing twenty-four hours for the same as the two channel***, because that's the value, or the value proposition that the customers got when they bought it….

Id. at 894:3-12. BGI, however, presented no evidence that Illumina's customers ever operate their sequencers twenty-four hours a day or have such expectations when purchasing the sequencers.

There is no basis to conclude that all of Illumina's customers seek, use, or need the maximum productivity from the two color sequencers it sold. Mr. Kraushaar— a customer from Baylor University—testified via deposition that in a "given month," Baylor only performs "between three and six" sequencing runs on each of its Illumina two-channel sequencers. *Id.* at 452:3-8. The only evidence of record thus establishes that it is unreasonable to assume all of Illumina's customers would demand the maximum sequencing power that they received from Illumina's two color sequencers in an alternative sequencer. In short, no reasonable jury could conclude that Illumina would provide its customers with 40% additional four-channel instruments at no cost as required by Dr. Kearl's damages theory adopted by the jury given that there is no reason to believe those customer's need it or had no alternative to Illumina to obtain it.

Dr. Kearl's speed-based assumption is particularly inapplicable to his opinion for reagents. Even if Dr. Kearl's (incorrect) opinion that customers would demand the ***same*** amount of sequencing were true (*id* at 894:3-16), there is no reason in logic or evidence why they would need ***more*** free reagents to perform the ***same*** amount of sequencing. BGI never explained why the same amount of sequencing would not use the ***same*** amount of reagents.

2. BGI's Alleged Direct Cost Savings Are Unsupported And Excessive

Dr. Kearl calculated $69,569,889 for alleged direct cost savings, of which $55,038,707 was

for sequencers. *Id.* at 887:25-888:6, 891:7-9. BGI's theory of cost savings for sequencers assumes a 9.7% reduction in costs for all accused Illumina sequencers. *Id*. at 886:18-887:4. BGI's attempt to prove this is plagued by *ipse dixit*, supposition, and speculation.

The "9.7%" figure is based on a savings estimate of $30,000. This is from a 2014 document[4] that estimated cost savings of $20,000 to $30,000. Dr. Kearl then took that savings estimate as a percent of his assessment of the actual cost of the NovaSeq instrument released in 2017, three years later. Dr. Kearl offered no justification for selecting the top of the range. *Id.* at 929:9-13 ("30,000 is in the range"). Dr. Kearl did not know whether the cost data related to an actual released product. *Id.* at 932:11-19. Nor did Dr. Kearl know what equipment would have been removed from what instrument to reduce costs or how the savings would have been achieved. *Id.* at 931:22-932:2.

It is unreasonable to compare a 2014 savings estimate with the actual cost of a different sequencer that did not even exist in 2014 and was finalized and released three years later. Dr. Kearl applied the 9.7% figure calculated for the NovaSeq instrument to ***all*** accused products without accounting for differences among the various instruments as to how the two channel sequencing might result in savings. *Id.* at 1495:11-1496:1. BGI failed to meet its burden to prove that the claimed inventions resulted in a 9.7% reduction in cost for any accused product.

3. BGI's Inclusion Of Library Kits In Its Royalty Base Is Improper

The jury awarded $15,922,881 for Illumina's library preparation kits based on a 5.15% royalty rate. *Id*. at 900:11-17. It is undisputed that Illumina's library kits are used with un-accused products and that Illumina does not divide its library kit revenues by four-channel versus

[4] The 2014 document was titled "HiSeq 4000 Update" (PTX-76.5), and Dr. Kearl acknowledged that the HiSeq is not an accused product. Tr. at 930:6-14. Dr. Pachter likewise confirmed that the HiSeq 4000 was a four channel instrument. *Id.* at 612:23-25.

two-channel. *Id*. at 898:15-899:7. The 5.15% royalty figure is based on alleged direct and indirect cost savings in the United States for sequencers and reagents discussed above. *Id*. at 899:16-24. As discussed above, the use of indirect savings was unsupportable, so infects the library prep kit with the same error. BGI failed to offer substantial evidence why Illumina would have paid ***any*** amount of royalty in a hypothetical negotiation for library kits, which do not benefit from the asserted patents and are applied in the same manner on un-accused products as they are on the accused ones.

4. Dr. Kearl's 100-0 Split Of The Quantified Benefits In BGI's Favor Is Arbitrary

Of the $333,801,990 royalty base calculated by BGI's economic expert, Dr. Kearl allocated 100% of the alleged, quantified benefits of the asserted claims to BGI at a hypothetical negotiation. Even if that value was totally attributable to BGI, there is no good reason Illumina would have accepted such a division of benefits.

E. Foreign Damages Were Improper

BGI seeks a $124,544,870 royalty based on foreign instrument sales. *Id.* at 895:20-25 (seeking $101,947,752 in royalties for foreign sales); *id.* at 888:7-12 (seeking a further $22,597,118). The effective royalty rate is more than 18%. PTX-1632; *see* Tr. at 938:6-13.

BGI's foreign damages theory was that Illumina should pay for its cost-savings if it had to give foreign customers an extra 40% sequencers for free because it commits an act of infringement by testing its sequencers in the US. *See* Tr. at 693:22-694:7 ("when it's doing its final instrument tests"); *id.* at 940:15-24. But the Federal Circuit recently rejected a similar royalty theory. In *Packet Intelligence LLC v. NetScout Sys., Inc.*, 965 F.3d 1299, 1315 (Fed. Cir. 2020), the plaintiff was awarded royalties calculated on product sales for which damages could not be recovered under § 287 for lack of marking. The plaintiff's theory was that "internal testing, customer support,

and customer training" infringed method claims unaffected by the marking statute and that those infringements "drove" the sales forming the royalty base. *Id.* The Federal Circuit held the defendant was entitled to JMOL and struck down the award, holding that the "damages base was not tailored to any alleged internal use of the claimed methods." *Id.* The Court explained that, "[e]ven if" the defendant's internal use "of the patented method drove sales for the [accused] products, that fact would only justify instances of internal use being counted as part of the royalty base." *Id.* But the plaintiff was "barred from recovering damages" for the pre-suit sales, and the Court held that the plaintiff "cannot circumvent § 287 and include those products in its royalty base simply by arguing that…infringement of related method claims drove sales." *Id.*

Illumina is entitled to JMOL under *Packet Intelligence*. On this record, Illumina's foreign sales or the benefit to customers of those sales cannot themselves be part of the royalty base. *Brown v. Duchesne*, 60 U.S. 183, 195 (1857) ("[U]se…outside of the jurisdiction of the United States is not an infringement," and the patent holder "has no claim to any compensation for the profit or advantage the party may derive from it."). "The presumption that United States law governs domestically but does not rule the world applies with particular force in patent law." *Microsoft Corp. v. AT&T Corp.*, 550 U.S. 437, 454-455 (2007). BGI's attempt to reach foreign sales via a manufacturer's internal uses here is no better than the plaintiff's attempt in *Packet Intelligence* to reach sales when it did not mark properly under §287. *Enplas Display Device Corp. v. Seoul Semiconductor Co., Ltd.*, 909 F.3d 398, 411 (Fed. Cir. 2018) ("A reasonable royalty 'cannot include activities that do not constitute patent infringement.'").

The legal insufficiency of BGI's foreign damages theory is particularly glaring, even gnoring *Packet Intelligence*. BGI failed to introduce evidence establishing that domestic testing is even a proximate cause of the added value (faster sequencing) that is the basis for the claimed

royalty. There is a complete disconnect between BGI's infringement allegation (domestic testing) and its damages theory (that two-channel sequencing is faster). Testing simply confirms that the device works; it is unrelated to the sequencing-capacity maximization at the heart of Dr. Kearl's damages theory. Yet, BGI's foreign royalty rate (~$165,000 per test) is almost identical to the domestic royalty rate. Even if there were no such disconnect, under Federal Circuit precedent, "the entirely extraterritorial production, use, or sale of an invention patented in the United States is an independent, intervening act that, under almost all circumstances, cuts off the chain of causation initiated by an act of domestic infringement" under § 271(a). *See, e.g.*, *Power Integrations v. Fairchild Semiconductor*, 711 F.3d 1348, 1371-72 (Fed. Cir. 2013). In *Carnegie Mellon University v. Marvell Technology Group, Ltd.*, 807 F.3d 1283 (Fed. Cir. 2015) ("*CMU*"), the Federal Circuit announced a narrow exception to that rule. Yet here, BGI disclaimed any need to comply with the *CMU* exception (and its failure to make a *CMU* argument without the *CMU* instruction was legal error too) and regardless their damages theory is precluded by *Packet Intelligence* as a matter of law.

F. The Court's Trial-Time Sanction Warrants A New Trial

By its April 29 order, the Court sanctioned Illumina four hours of trial time because Robert Kain was unable to testify on April 29 due to a longstanding prior commitment. *See* Tr. at 1081:9-19. This sanction was unjustified and unduly prejudicial, and a new trial is warranted.

1. Factual Background

On March 7, 2022, less than two months before trial, the Court delayed trial, creating conflicts including for Mr. Kain. Illumina promptly informed the Court. *See* D.I. 358. Illumina informed the Court on April 1, 2022 that the new trial date continued to present conflicts for the witness, and respectfully requested "that the Court make reasonable accommodations to address these conflicts." D.I. 364.

Illumina then raised the topic at the pre-trial conference and reached out to BGI to seek agreement regarding the trial conflicts and in particular Mr. Kain. BGI agreed that Mr. Kain would complete his trial testimony on April 28:

> Per our previous discussions and the representations made to the Court at the pre-trial conference, we are memorializing the parties' agreement that Mr. Kain's trial testimony will need to be completed by the end of the trial day on Thursday, April 28, and that Dr. Prowse will testify with respect to BGI's affirmative case and Illumina's affirmative case on Tuesday, May 3.

Ex. 3.

On the morning of April 27, Illumina reminded the Court that the order of witnesses may need to be adjusted due to Mr. Kain's agreed-upon departure on April 28:

> MR. WALTER: One more add on for Mr. Kain, ***he's the witness who has to leave by tomorrow***, and so, we may just start with him today, depending on where we are at in the schedule. So just to put it on the Court's radar, he may start today ahead of Susan.
> THE COURT: You have to tell them.
> MR. WALTER: We will, we did inform them.
> THE COURT: You don't have to tell me.
> MR. WALTER: They have been informed of that possibility.

Tr. at 522:11-15. The Court appreciated on April 27 that Dr. Kain would need to leave after April 28 because it acknowledged that it needed to expeditiously resolve objections on documents for use with his examination given everyone knew he was leaving on April 28. *Id.* at 657:7-8 ("THE COURT: I don't know, Mr. Kain is the one who has to leave so we got to do it.").

One the morning of April 28, Illumina informed the Court that Mr. Kain would be testifying after BGI's expert, Dr. Lior Pachter, so that Mr. Kain's testimony could be completed that day as had been agreed upon:

> MR. REINES: Your Honor, I'm going to leave that to Ms. Sawyer, but I did want to address one process thing. Thank you very much. One I want to get it said out of the way is we are going to call Mr. Kain after this –
> THE COURT: You want to make him first.
> MR. REINES: Yes.
> THE COURT: Got it.

Id. at 813:8-14.

After Dr. Pachter finished his testimony, however, BGI inexplicably refused to let Mr. Kain take the stand, instead insisting that its damages expert, Dr. Kearl, would need to testify first:

MR. REINES:	Your Honor, pursuant to the discussion this morning, we're going to call Bob Kain.
MR. BILSKER:	No.
MR. REINES:	Who has to leave today.
THE COURT:	I'm sorry.
MR. BILSKER:	No.
THE COURT:	I thought what we decided was that you were going to call him as your first witness so they still have Mr. Kearl.
MR. REINES:	No, I think maybe a side-bar, but he needs to leave today when this trial date moved and there was agreement with everybody that he would be complete Thursday.
THE COURT:	Alright.
MR. REINES:	And I thought I clarified this this morning.
MS. KRAMAN:	There is no question he'll testify today, Your Honor.
THE COURT:	He will testify today. But not before they finish their case. That's what I understood this morning when we were talking.

Id. at 862:16-863:11. After Dr. Kearl's testimony was complete, Mr. Kain took the stand, but there was insufficient time for him to complete his testimony on April 28.[5] At the conclusion of the trial day, Mr. Kain traveled to California to attend to his previous commitment and was unable to continue his testimony on April 29. The Court then sanctioned Illumina.

2. The Court's Sanction Was Unjustified

Illumina respectfully submits that the Court's sanctioning of Illumina was unjustified

[5] Mr. Kain's direct examination took approximately two and a half hours, during which time he covered the conception and reduction to practice of his invention, as well as extensive evidence of diligence over a two-and-a-half year time period. This testimony was interposed with consistent speaking objections as well as a lengthy side-bar addressing an objection that BGI failed to raise under the appropriate procedures, which added significant time to an efficient examination under the circumstances. By contrast, BGI's expert on infringement, Dr. Pachter, was examined by BGI for over 5 hours. The fact that there was insufficient time to complete Mr. Kain's examination was not due to inefficiency by Illumina.

because the absence of Mr. Kain on April 29 was the fault of BGI, not Illumina. As documented above, the parties had agreed that Mr. Kain's trial testimony would be complete on April 28 in view of his prior commitment and everyone knew it and had agreed.

By refusing to permit Mr. Kain to testify until the afternoon of April 28, however, BGI breached this agreement and intentionally created the circumstances that prevented Mr. Kain from completing his testimony on April 28. The sole rationale BGI has provided for its refusal to let Mr. Kain testify was that its damages expert, Dr. Kearl, needed to present his inflated damages figure before Mr. Kain testified. Yet, there is no principled reason why Dr. Kearl needed to testify before Mr. Kain and, more importantly, BGI had agreed that Mr. Kain would complete his testimony by April 28. By contrast, Illumina agreed to complete Dr. Drmanac's testimony from its case during BGI's case to accommodate his need to leave Delaware for prior commitments.

3. The Court's Sanction Was Unduly Prejudicial

The Court's four-hour sanction was highly prejudicial and disproportionate. The severe time constraints caused by the sanction prevented Illumina from presenting important evidence:

- Illumina could not call Illumina scientist Wenyi Feng who would have corroborated diligence and who Illumina's damages expert relied upon and would have testified regarding topics related to damages. During trial, BGI amplified this prejudice by repeatedly remarking to the jury that Dr. Feng did not testify at trial. *See, e.g.*, Tr. at 1527:11-15, 1914:12-19.
- Illumina could not call the named inventor on its ascorbic acid patents, Dr. Milan Fedurco, who would have explained to the jury the importance of his invention. The jury ultimately invalidated Illumina's patents.
- Illumina could not call Susan Tousi, Illumina's Chief Commercial Officer, who would have presented important testimony related to *inter alia* damages, including to undermine the key assumption behind BGI's damages claim that Illumina's products were twice as fast due to the alleged inventions or that all of the commercial value of the patents should be given to BGI given that Illumina itself has several patents that were necessary for a commercial implementation of two-channel chemistry..
- Illumina was forced to present severely truncated direct examinations, including for instance of Dr. Christopher Mason, who is Illumina's primary

> expert on non-infringement, written description, enablement, and § 102(g). BGI amplified the prejudice before the jury by characterizing Dr. Mason's testimony as a "tornado" and remarking on the fact that he did not testify regarding secondary considerations. *Id.* at 1445:11-14, 1446:21-25.

The "court must ensure that it allocates trial time evenhandedly." *Duquesne Light Co. v. Westinghouse Elec. Corp.*, 66 F.3d 604, 609-611 (3d Cir. 1995). In this case, trial time was unfairly allocated and a new trial is warranted.

G. The Court's Erroneous Diligence Instruction Warrants A New Trial

Illumina established at trial that BGI's asserted patents are invalid pursuant to § 102(g) in view of Mr. Bob Kain's diligent prior work. *See, e.g.*, Tr. 964:7-10, 966:12-21, 964:1-15, 970:23-1006:4. A major part of BGI's response was to argue that work outside the United States did not qualify to prove diligence. *See, e.g.*, *id.* at 1006:7-10 ("Your Honor, objection, relevance. This is a group outside the United States, so from a substantive point not relevant to the issues that we know are at issue").

The Court initially overruled BGI's objections to the introduction of foreign diligence evidence. *See id.* at 1012:4-9. But, at the charge conference, the Court reversed itself without explanation. *Id.* at 1774:6-25. The Court instructed the jury that "[c]onception, reduction to practice and diligence must occur in the United States." Dkt. 404 at 22; *see also* Tr. at 1839:5-6; 1774:2-5. This instruction was incorrect. "When a jury instruction is erroneous, a new trial is warranted unless such error is harmless." *Harvey v. Plains Twp. Police Dep't*, 635 F.3d 606, 612 (3d Cir. 2011).

1. Diligence Under § 102(g) Does Not Include A Territorial Limit

The sole Federal Circuit case addressing the import of foreign diligence is *Apotex USA, Inc. v. Merck & Co.*, 254 F.3d 1031, 1036 (Fed. Cir. 2001). There, the Federal Circuit held that the language "in this country" in § 102(g)(2) only modifies the verb "made," "but not the

'abandoned, suppressed, or concealed' clause that follows it." *Apotex*, 254 F.3d 1031, 1036. The "purpose of the diligence requirement is to show that the invention was not abandoned or set aside." *ATI Techs. ULC v. Iancu*, 920 F.3d 1362, 1373 (Fed. Cir. 2019); *see also Perfect Surgical Techniques, Inc. v. Olympus Am., Inc.*, 841 F.3d 1004, 1009 (Fed. Cir. 2016) (the "point of the diligence analysis…is to assure that, in light of the evidence as a whole, the invention was not abandoned or not unreasonably delayed"). Given *Apotex*'s holding that "in this country" does not apply to abandonment, it also does not apply to diligence.

BGI relied on *Scott v. Koyama*, 281 F.3d 1243, 1245 (Fed. Cir. 2002), a case that never even addressed whether § 102(g) requires diligence in the United States. *Scott* states that "activity outside the United States is not relevant to priority beyond establishing an effective filing date under 35 U.S.C. § 119." But this was based solely on a pre-1996 version of 35 U.S.C. § 104. *Id.* at 1245. *Scott* does not justify the Court's erroneous jury instruction imposing a territorial limit to the evidence needed to show diligence.

2. The Court's Jury Instruction Prejudiced Illumina And Was Not Harmless

While an erroneous instruction does not warrant a new trial if it was "highly probable" that it did not impact the outcome, the exact opposite is the case here. BGI made alleged lack of diligence in the United States a central theme of its rebuttal to Illumina's § 102(g) case. *See, e.g.*, Tr. at 1612:3-6, 1621:9-19; 1891:6-13. Based on the Court's improper instruction and BGI's arguments, there is a serious risk the jury would have improperly discounted as irrelevant work performed outside of the United States, including key documents establishing diligence involving individuals based in the UK. *See, e.g.*, *id*. at 1096:9-13; DTX 811; Tr. at 1612:10-19; DTX1053; Tr. at 1612:3-6; DTX1091; DTX862-004; Tr. at 1621:9-19; DTX1071; DTX1656.

H. Illumina Products Do Not Infringe The '132 Patent Because They Use More

Than Four Labels

Properly construed, the term "first/second fluorescent signal" should be understood to refer to signals arising from a first/second label, such that the claims use fewer than four labels to identify the four nucleotide types. *See generally* D.I. 104 at 48-54, 59-63. Under this construction, there can be no infringement because the accused products use more than four labels. *See, e.g.*, Tr. at 723:9-725:23.

The specification states that the "invention" itself uses fewer labels than the number of nucleotides to be identified, which is four. *See* JTX001 at Abstract, 9:5-9, 9:51-62, 18:51-55, 26:13-15, 26:30-33. This definitive description of the "invention" limits the claim. *See, e.g.*, *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1308 (Fed. Cir. 2007) ("When a patent thus describes the features of the 'present invention' as a whole, this description limits the scope of the invention."). During prosecution, BGI convinced the Examiner to allow the claims because they "require a 2-color scheme wherein the first and second nucleotides comprise first and second labels, respectively, and the third nucleotides comprise both the first and second labels." D.I. 106-1, Ex. 11. This was the basis for allowance. *See also* D.I. 106-1, Ex. 12 at 2. On this basis, JMOL of non-infringement of the '132 patent is warranted.

I. The '132 Patent Does Not Describe The Use Of More Than Four Labels

The Court construed the '132 patent claims to cover the use of four or more labels. *See* D.I. 104 at 60, D.I. 221 at 10-11. But a patentee cannot claim more broadly than what is described. *ICU Med., Inc. v. Alaris Med. Sys., Inc.*, 558 F.3d 1368, 1378 (Fed. Cir. 2009). There is no written description for the claims as construed to cover the use of four or more labels.

BGI's validity expert, Dr. Metzker pointed only to a brief passage that describes a scheme where ***all four*** nucleotides are labeled with two colors, but the '132 patent claims require the fourth nucleotide to be ***unlabeled***. *See* JTX-1 at 34:30-32 ("the A probe is labeled with Cl, the T probe

is labeled with Cl+, the C probe is labeled with C2 and the G probe is labeled with C2+"); *id.* at 49:63-67. Moreover, this embodiment uses only two labels (C1 and C2) that are detected with different intensities. *See* JTX-1 at 33:9-13. Thus, it reinforces that the patent describes only the use of fewer than four labels. JMOL of no written description is thus warranted.

J. The BGI Patents Do Not Describe Or Enable Two-Channel SBS

Both the '132 and '473 patents claim methods to perform sequencing-by-synthesis through the detection of two fluorescent signals (*i.e.*, "two-channel SBS"). The BGI inventors were not in possession of two-channel SBS and did not enable the skilled artisan to perform this technique.

While BGI's patents claim two-color SBS, they are fundamentally about a wholly different technology: sequencing-by-ligation. The specification discloses almost exclusively sequencing-by-ligation techniques. *See, e.g.*, Tr. at 1276:2-14. The provisional application and issued patent each discuss ligation over 100 times, but mention SBS less than a dozen times. *See id*. at 1653:24-1654:9, 1654:15-25. The claims BGI originally filed were solely sequencing-by-ligation claims. *See id*. at 1662:3-5. Only after Illumina released its commercial products did BGI start claiming SBS methods. *Id*. at 1646:16-20; *see Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1330 (Fed. Cir. 2003) ("The purpose of the written description requirement is to prevent an applicant from later asserting that he invented that which he did not….").

When it comes to the claimed two-color SBS invention, the BGI patents offer zero guidance. There are no working examples. *See id*. at 1466:5-8. The minimal references to SBS focus on pyrosequencing, an approach that is undisputedly incompatible with 2-channel SBS. *See* JTX-006.0029; Tr. at 356:18-357:9, 1278:16-1279:6, 1663:22-1664:3, 1462:7-18. There are no teachings regarding the complex bioinformatics, algorithms, or software necessary to make base calls in a two-channel SBS system. *See id*. at 1464:2-6. As Dr. Mason explained, these algorithms are critical because two-channel SBS utilizes an unlabeled nucleotide that emits no

signal. *See id*. at 1286:25-1287:10. When discussing their own development of two-channel SBS, BGI's corporate representative acknowledged that base calling algorithms were a "major challenge[] if you're trying to go from a four-color to a two-color system." *Id*. at 1171:19-22. He also admitted that algorithms capable of making base calls using only two colors were not routine, even after Illumina introduced its two-color sequencers in 2014. *See id*. at 1171:3-9. As Dr. Xu testified, it was not until 2015 that BGI had developed the complex algorithms they needed for two-color SBS, none of which are mentioned in the BGI patents. *Id.* at 1288:6-1290:2.

The lack of disclosure makes sense given the lack of SBS experience of the inventor, Dr. Radoje Drmanac. He testified that he had not performed SBS experiments or two color experiments at all until 2011, three years after the priority date. *See id*. at 320:3-7, 290:17-291:6, 296:17-297:3. Dr. Drmanac did not even know if two-color would work with his own ligation technology, let alone SBS. *See id*. at 301:8-18. When BGI finally decided to implement 2-channel SBS after Illumina released its own 2-channel products, BGI reverse engineered and copied every last detail of Illumina's products and patent filings. *See id.* at 1926:5-1929:25, 1962:4-1963:22, 1967:15-1968:4; DDX13.18-34, 188-193, 216-19; 1178:18-22.

K. In The Alternative, Illumina Seeks A New Trial

A new trial may be granted when "the jury's verdict is against the clear weight of the evidence and a new trial is necessary to prevent a miscarriage of justice." *TRUSTID, Inc. v. Next Caller, Inc.*, CA No. 18-172 (MN) (D. Del. Jan. 5, 2022). For each of the reasons identified above why the evidence insufficient under FRCP 50, if the Court does not grant JMOL, it should grant a new trial because the verdict is against the clear weight of the evidence and a new trial is warranted out of fairness.

III. CONCLUSION

The Court should grant judgment as a matter of law and a new trial.

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Respectfully submitted,

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