#### UNITED STATES INTERNATIONAL TRADE COMMISSION

Washington, D.C.

In the Matter of

CERTAIN POLYCRYSTALLINE DIAMOND COMPACTS AND ARTICLES CONTAINING SAME Inv. No. 337-TA-1236

# INITIAL DETERMINATION ON VIOLATION OF SECTION 337 AND RECOMMENDED DETERMINATION ON REMEDY AND BOND

Administrative Law Judge Cameron Elliot

(March 3, 2022)

Pursuant to the Notice of Investigation and Rule 210.42(a) of the Rules of Practice and Procedure of the United States International Trade Commission, this is my Initial Determination in the matter of *Certain Polycrystalline Diamond Compacts And Articles Containing Same*, Investigation No. 337-TA-1236.

		TABLE OF CONTENTS	Page
I.	INT	RODUCTION	1
	A.	Procedural Background	1
	В.	The Parties	3
	C.	The Asserted Patents and Claims	4
		1. U.S. Patent No. 10,507,565	4
		2. U.S. Patent No. 10,508,502	5
		3. U.S. Patent No. 8,616,306	6
	D.	Overview of the Technology	7
	E.	Products at Issue	10
		1. The Accused Products	10
		2. Domestic Industry Products	11
II.	STA	NDARDS OF LAW	11
	A.	Standing	11
	B.	Claim Construction	12
	C.	Infringement	15
	D.	Domestic Industry	17
		1. Technical Prong	18
		2. Economic Prong	19
	E.	Invalidity	19
		1. Patent Eligibility Under 35 U.S.C. §101	19
		2. 35 U.S.C. § 102	21
		3. 35 U.S.C. § 103	21
		4. 35 U.S.C. § 112	24
III.	STA	NDING, IMPORTATION, AND JURISDICTION	24
IV.	TEC	CHNICAL TESTING OF ACCUSED AND DI PRODUCTS	25
	A.	Average Electrical Conductivity	27
	B.	PDC Selection for Destructive Tests	31
	C.	G-Ratio and Thermal Stability	33
	D.	. Other Parameters and Protocols	37
V.	SF I	DIAMOND'S REDESIGNED	39
VI.	LEV	EL OF ORDINARY SKILL IN THE ART	43

VII.	<b>U.S.</b> ]	PATEN	<b>T NO.</b> 1	10,507,565
	A.	Repre	sentativ	e Products46
	B.	Asser	ted Clain	ms of the 565 Patent53
	C.	Infrin	gement.	55
		1.	Claim	155
			a.	[565.1.a] A polycrystalline diamond compact, comprising:56
			b.	[565.1.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:
			c.	[565.1.c] a plurality of diamond grains directly bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 µm or less;
			d.	[565.1.d] a catalyst occupying at least a portion of the interstitial regions;
			e.	[565.1.e] wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe or more;57
			f.	[565.1.f] wherein the unleached portion of the polycrystalline diamond table of exhibits an average electrical conductivity of less than about 1200 S/m; and
			g.	[565.1.g] wherein the unleached portion of the polycrystalline diamond table exhibits a Gratio of at least about $4.0 \times 10^6$ ; and58
			h.	[565.1.h] a substrate bonded to the polycrystalline diamond table
		2.	Claim	18:58
			a.	[565.18.a] A polycrystalline diamond compact, comprising:58
			b.	[565.18.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:59
			c.	[565.18.c] a plurality of diamond grains directly bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 30 µm or less;
			d.	[565.18.d] a catalyst occupying at least a portion of the interstitial regions;

			e.	[565.18.e] wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe to about 175 Oe;	.59
			f.	[565.18.f] wherein the unleached portion of the polycrystalline diamond table exhibits an average electrical conductivity of less than about 1200 S/m; and,	.60
			g.	[565.18.g] wherein the unleached portion of the polycrystalline diamond table exhibits a thermal stability, as determined by distance cut, prior to failure in a vertical lathe test, of at least about 1300 m.	.60
		3.	Other A	Accused Products and Dependent Claims	.60
		4.	Doctri	ne of Equivalents and Indirect Infringement	66
VIII.	U.S. P	PATEN	T NO. 1	0,508,502	66
	A.	The A	sserted (	Claims of the 502 Patent	.66
	B.	Infring	gement		.67
		1.	Claim	1	.68
			a.	[502.1.a] A polycrystalline diamond compact, comprising:	68
			b.	[502.1.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:	.68
			c.	[502.1.c] a plurality of diamond grains bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 $\mu$ m or less; and	.69
			d.	[502.1.d] a catalyst including cobalt, the catalyst occupying at least a portion of the interstitial regions;	.69
			e.	[502.1.e] wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe to about 250 Oe;	.69
			f.	[502.1.f] wherein the unleached portion of the polycrystalline diamond table exhibits a specific permeability less than about 0.10 G·cm3/g·Oe; and	.69
			g.	[502.1.g] a substrate bonded to the polycrystalline diamond table along an interfacial surface, the interfacial surface exhibiting a substantially planar topography;	.69

			h.	[502.1.h] wherein a lateral dimension of the polycrystalline diamond table is about 0.8 cm to about 1.9 cm.	.70
		2.	Claim	15	.70
			a.	[502.15.a] A polycrystalline diamond compact, comprising:	.70
			b.	[502.15.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:	.70
			c.	[502.15.c] a plurality of diamond grains bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 $\mu m$ or less; and	.71
			d.	[502.15.d] a catalyst including cobalt, the catalyst occupying at least a portion of the interstitial regions;	.71
			e.	[502.15.e] wherein the unleached portion of the polycrystalline diamond table exhibits: a coercivity of about 115 Oe to about 250 Oe;	.71
			f.	[502.15.f] a specific magnetic saturation of about 10 Gcm³/g to about 15 Gcm³/g; and	.71
			g.	[502.15.g] a thermal stability, as determined by a distance cut, prior to failure in a vertical lathe test, of about 1300 m to about 3950 m;	.72
			h.	[502.15.h] wherein a lateral dimension of the polycrystalline diamond table is about 0.8 cm or more	.72
		3.	Other A	Accused Products and Dependent Claims	.72
		4.	Doctri	ne of Equivalents and Indirect Infringement	.76
IX.	U.S. P	ATEN	Γ NO. 8	5,616,306	<b>76</b>
	A.	The As	sserted (	Claim of the 306 Patent	.77
	B.				
		1.	[306.13	5.a] A polycrystalline diamond compact, comprising:	.77
		2.	[306.13	5.b] a substrate; and	.77
		3.	polycry second diamor	5.c] a polycrystalline diamond table including a first ystalline diamond layer bonded to the substrate and at least a polycrystalline diamond layer, the second polycrystalline and layer exhibiting a second average diamond grain size that is an a first average diamond grain size of the first polycrystalline	

			diamond layer, at least an un-leached portion of the polycrystalline diamond table including:	
		4.	[306.15.d] a plurality of diamond grains defining a plurality of interstitial regions;	
		5.	[306.15.e] a metal-solvent catalyst occupying at least a portion of the plurality of interstitial regions; and	
		6.	[306.15.f] wherein the plurality of diamond grains and the metal-solven catalyst collectively exhibit a coercivity of about 115 Oe or more and a specific magnetic saturation of about 15 Gcm <sup>3</sup> /g or less	a
		7.	Other Accused Products	85
		8.	Doctrine of Equivalents and Indirect Infringement	88
Χ.	DOM	IESTIC	C INDUSTRY TECHNICAL PRONG	88
	A.	The 5	65 Patent	90
	В.	The 5	02 Patent	91
	C.	The 3	06 Patent	92
XI.	VAL	IDITY.		92
	A.	Inhere	ency	92
	В.		65 Patent	
		1.	Priority Date Under 35 U.S.C. § 120	
		2.	Patent Eligibility Under 35 U.S.C. § 101	
			a. Alice Step 1	101
			b. Alice Step 2	107
		3.	Anticipation and Obviousness Under 35 U.S.C. §§ 102 and 103	110
			a.	110
			b. Mercury and Mars PDCs	110
			c. Other Prior Art	117
			Obviousness	121
			d. Secondary Considerations of Non-Obviousness	122
			e. Summary	127
		4.	Other Issues Related to Obviousness	127
		5.	35 U.S.C. § 112	129
			a. Enablement	129

			b. Written Description	130
			c. Indefiniteness	130
	C.	The 5	502 Patent	134
		1.	Patent Eligibility Under 35 U.S.C. § 101	134
		2.	Anticipation and Obviousness Under 35 U.S.C. §§ 102 and	103135
		3.	35 U.S.C. § 112	136
	D.	The 3	306 Patent	137
		1.	Priority Date Under 35 U.S.C. § 120	137
		2.	Patent Eligibility Under 35 U.S.C. § 101	140
		3.	Anticipation and Obviousness Under 35 U.S.C. §§ 102 and	103141
		4.	35 U.S.C. § 112	141
XII.	DOM	ESTIC	C INDUSTRY - ECONOMIC PRONG	142
	A.	Quali	fying Expenditures	145
		1.	Subsection (A) - Plant and Equipment	145
		2.	Subsection (B) - Labor or Capital	150
		3.	Subsection (C) - Exploitation [of the patents], including eresearch and development, or licensing	0
	B.	"Sign	nificant" or "Substantial"	155
XIII.	CON	CLUSI	IONS OF LAW	158
	A.		sserted claims of U.S. Patent Nos. 10,507,565, 10,108,502, and afringed by at least one Accused Product	
	B.		sserted claims of U.S. Patent Nos. 10,507,565, 10,108,502, and evalid	
	C.	Excep	pt for the invalidity of the asserted claims, a domestic industrying of 19 U.S.C. § 1337 exists	y within the
XIV.	RECO	OMME	ENDED DETERMINATION ON REMEDY AND BOND.	158
	A.	Limit	ted Exclusion Order	160
	B.	Cease	e and Desist Order	160
	C.	Bond		161
	D.	Public	c Interest	162
XV.	INITI	AL DE	ETERMINATION AND ORDER	162

## TABLE OF ABBREVIATIONS

CDX	Complainant's Demonstrative Exhibit
CIB	Complainant's Initial Post-Hearing Brief
СРВ	Complainant's Pre-Hearing Brief
CPX	Complainant's Physical Exhibit
CRB	Complainant's Reply Post-Hearing Brief
CX	Complainant's Exhibit
Tr.	Hearing or Deposition Transcript
JX	Joint Exhibit
RDX	Respondents' Demonstrative Exhibit
RIB	Respondents' Initial Post-Hearing Brief
RPB	Respondents' Pre-Hearing Brief
RPX	Respondents' Physical Exhibit
RRB	Respondents' Reply Post-Hearing Brief
RX	Respondents' Exhibit

#### I. INTRODUCTION

## A. Procedural Background

Complainant US Synthetic ("USS" or "Complainant") filed the complaint underlying this investigation on November 20, 2020. EDIS Doc. ID 725983 (November 20, 2020). The Commission instituted the investigation on December 21, 2020. 85 Fed. Reg. 85661 (December 29, 2020). The complaint identified as Respondents: SF Diamond Co., Ltd., and SF Diamond USA, Inc. (collectively, "SF Diamond" or "SF Diamond Respondents"); Element Six Abrasives Holdings Ltd., Element Six Global Innovation Centre, Element Six GmbH, Element Six Limited, Element Six Production (Ptv) Limited, Element Six Hard Materials (Wuxi) Co. Limited, Element Six Trading (Shanghai) Co., Element Six Technologies US Corporation, Element Six US Corporation, ServSix US, and Synergy Materials Technology Limited (collectively, "Element Six" or "Element Six Respondents"); Iljin Diamond Co., Ltd., Iljin Holdings Co., Ltd., Iljin USA Inc., Iljin Europe GmbH, Iljin Japan Co., and Ltd., Iljin China Co., Ltd. (collectively, "Iljin" or "Iljin Respondents"); Henan Jingrui New Material Technology Co., Ltd. ("Jingrui"); Zhenzghou New Asia Superhard Materials Composite Co., Ltd., and International Diamond Services, Inc. ("IDS") (collectively, "New Asia" or "New Asia Respondents"); CR Gems Superabrasives Co., Ltd. ("CR Gems"); FIDC Beijing Fortune International Diamond ("FIDC"); Fujian Wanlong Superhard Material Technology Co., Ltd. ("Wanlong"); Zhujau Juxin Technology ("Juxin")<sup>1</sup>; and Shenzhen Haimingrun Superhard Materials Co., Ltd. ("Haimingrun") (together, "the Respondents").

By publication of a notice in the *Federal Register* on December 29, 2020, the U.S. International Trade Commission commenced an investigation into:

whether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation, or the sale within the

On February 8, 2021 Guangdong Juxin Materials Technology Co., Inc. was substituted in place of Zhuhai Juxin Technology. Order No. 8.

United States after importation of certain products identified in paragraph (2) by reason of infringement of one or more of claims 34, 38, and 39 of the '274 patent; claims 1, 2, 4, 8-11, 15-17, and 19-21 of the '502 patent; claims 1, 2, 4-8, and 15-17 of the '881 patent; claims 1-11, 13-15, 18-20, and 22-24 of the '565 patent; and claims 15, 20, and 21 of the '306 patent, and whether an industry in the United States exists as required by subsection (a)(2) of section 337;

(2) Pursuant to section 210.10(b)(1) of the Commission's Rules of Practice and Procedure, 19 C.F.R. 210.10(b)(1), the plain language description of the accused products or category of accused products, which defines the scope of the investigation, is "polycrystalline diamond compacts (PDC), PDC cutters, drill bits including PDC cutters, and PDC bearings and bearing elements"

85 Fed. Reg. 85661 (December 29, 2020).

On February 4, 2021 the target date for completion of the investigation was set as May 20, 2022. Order No. 7. In that same order, I set a *Markman* hearing date of April 27-28, 2021 and an evidentiary hearing date of October 18-22, 2021. Order No. 7. The Commission did not review the ID. EDIS Doc. ID 734617. On December 27, 2021, I entered a non-final ID revising the target date to June 20, 2022. Order No. 58. The Commission did not review the ID. EDIS Doc. ID 760865. On February 7, 2022, I entered a non-final ID revising the target date to July 11, 2022. Order No. 59. The Commission did not review the ID. EDIS Doc. ID 764274.

On April 27, 2021 a technology tutorial and *Markman* hearing was held. On May 24, 2021 Order No. 23 issued, which construed certain claim terms of the patents at issue ("*Markman* Order").

Over the course of the investigation USS moved to terminate the investigation as to various respondents. All of the motions were granted by non-final initial determinations, and the Commission did not review these non-final ID's. *See* Orders 6, 8, 10, and 16, and Commission decisions not to review, EDIS Doc. Nos. 734202, 735063, 736970, and 740016, respectively. Thus, the only remaining respondents are the Iljin, SF Diamond, New Asia, Haimingrun, Juxin, IDS, CR Gems, Jingrui, and Wanlong Respondents.

Similarly, USS moved for partial termination of the investigation with respect to certain asserted patents and claims. All the motions were granted by non-final IDs, and the Commission did not review them. *See* Orders 26, 32, and 57, and Commission decisions not to review, EDIS Doc. Nos. 749386, 750012, and 755933, respectively. The remaining asserted patents and claims are: U.S. Patent No. 10,507,565 ("the 565 patent"), claims 1, 2, 4, 6, 18; U.S. Patent No. 10,508,502 ("the 502 patent"), claims 1, 2, 11, 15, 21; and U.S. Patent No. 8,616,306 ("the 306 patent"), claim 15.

The evidentiary hearing took place as scheduled, during the week of October 18-22, 2021, and pursuant to the procedural schedule, the parties submitted initial and reply post-hearing briefs on November 5, 2021 and November 17, 2021, respectively. On October 22, 2021 USS filed a motion to strike the testimony of fact witness Jun Heng. *See* Motion (1236-056). That motion is resolved by this initial determination, and no other motions remain pending.

#### **B.** The Parties

Complainant US Synthetic is a United States corporation, organized and existing under the laws of the State of Delaware, with a principal place of business at 1260 South 1600 West, Orem, Utah. Complaint, ¶ 11.

There are nine groups of Respondents:

Iljin: Iljin Diamond Co., Ltd. is a corporation existing under the laws of the Republic of Korea, having a principal place of business in Seoul, Korea. Iljin USA Inc. is a related corporation existing under the laws of Texas and having a place of business in Houston. Other related Iljin entities which have been named as Respondents include Iljin Holdings Co., Ltd., Iljin Europe GmbH, Iljin Japan Co., Ltd., and Iljin China Co., Ltd. RIB at 8.

**SF Diamond**: SF Diamond Co., Ltd. is a corporation existing under the laws of China, with a principal place of business in Zhengzhou, China. Its subsidiary is SF Diamond USA, Inc. existing under the laws of Texas, having a principal place of business at 25519 Oakhurst Dr., Spring, Texas 77386. RIB at 8.

**New Asia**: Zhengzhou New Asia Superhard Materials Composite Co., Ltd. is a corporation existing under the laws of China, with a principal place of business in Zhengzhou, China. *Id.* 

**Haimingrun**: Shenzhen Haimingrun Superhard Materials Co., Ltd. is a corporation existing under the laws of China, with a principal place of business in Guangdong, China. *Id*.

**Juxin**: Guangdong Juxin New Materials Technology Co., Ltd. is a corporation existing under the laws of China, with a principal place of business in Zhuhai, China. *Id*.

**IDS**: International Diamond Services, Inc. is a corporation existing under the laws of Texas with a principal place of business at 283 Lockhaven Dr., Suite 300 Houston, Texas 77073. *Id.* IDS is a distributor for New Asia. CIB at 7.

**CR Gems**: CR Gems Superabrasives Co., Ltd. is a corporation existing under the law of China, with a principal place of business in Shanghai, China. *Id*.

**Jingrui**: Henan Jingrui New Material Technology Co., Ltd. is a corporation existing under the law of China, with a principal place of business in Henan, China. *Id*.

**Wanlong**: Fujian Wanlong Superhard Material Technology Co., Ltd. is a corporation existing under the law of China, with a principal place of business in Fujian, China. *Id.* at 9.

#### C. The Asserted Patents and Claims

#### 1. U.S. Patent No. 10,507,565

The 565 patent (JX-0002) was filed on March 24, 2016, issued on December 17, 2019, and is entitled "Polycrystalline Diamond, Polycrystalline Diamond Compacts, Methods Of Making Same, and Applications." The 565 patent claims priority to, and is a continuation of, U.S. patent

application Ser. No. 13/486,578 filed on June 1, 2012, which is a continuation-in-part of U.S. patent application Ser. No. 12/858,906 filed on August 18, 2010, which is a divisional of U.S. patent application Ser. No. 12/244,960 filed on October 3, 2008 (now U.S. Pat. No. 7,866,418, hereinafter "418 patent"). *See* JX-0002 (565 patent) at cover page, ¶ 60. The 565 patent is assigned on its face to USS. *Id.* at ¶ 73. The 565 patent generally relates to polycrystalline diamond compacts ("PDCs"), sometimes referred to as "cutters," "exhibiting enhanced diamond-to-diamond bonding and related PDCs, rotary drill bits, and methods of fabrication." *Id.* at 2:27-29.

In one embodiment, a PDC includes a polycrystalline diamond ("PCD") table bonded to a substrate. At least a portion of the PCD table includes a plurality of diamond grains defining a plurality of interstitial regions. The plurality of interstitial regions includes a metal-solvent catalyst. The plurality of diamond grains exhibit an average grain size of about 30 µm or less. The plurality of diamond grains and the metal-solvent catalyst collectively exhibit an average electrical conductivity of less than about 1200 S/m. Other embodiments are directed to PCDs, employing such PCDs, methods of forming PCDs and PDCs, and various applications in rotary drill bits, bearing apparatuses, and wire-drawing dies. *See generally* JX-0002 at Abstract.

#### 2. U.S. Patent No. 10,508,502

The 502 patent (JX-0003) issued on December 17, 2019 from an application filed on March 19, 2019. The 502 patent is entitled "Polycrystalline Diamond Compact," and is assigned on its face to USS. JX-0003 at ¶ 73. The 502 patent was filed on March 19, 2019, and claims priority to, and is a continuation of, U.S. application Ser. No. 13/789,099 filed on March 7, 2013, which is a continuation of U.S. application Ser. No. 13/623,764 filed on September 20, 2012 (now U.S. Pat. No. 8,616,306 issued on December 31, 2013), which is a continuation of U.S. patent application Ser. No. 12/690,998 filed on January 21, 2010 (now U.S. Pat. No. 8,297,382 issued on October

30, 2012), which is a continuation-in-part of U.S. patent application Ser. No. 12/244,960 filed on October 3, 2008 (the 418 patent). JX-0003 at ¶ 63.

#### 3. U.S. Patent No. 8,616,306

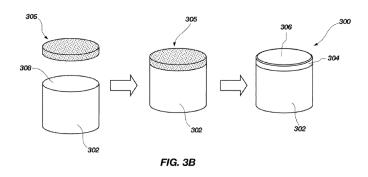
The 306 patent (JX-0001) issued on December 31, 2013 from an application filed on September 20, 2012. The 306 patent is entitled "Polycrystalline Diamond Compacts, Method of Fabricating Same, And Various Applications" and is assigned on its face to USS. JX-0001 at ¶ 73. The 306 patent claims priority to and is a continuation of U.S. patent application Ser. No. 12/690,998 filed on January 21, 2010, which is a continuation-in-part of U.S. patent application Ser. No. 12/244,960 filed on October 3, 2008 (the 418 patent). JX-0001 at ¶ 63. The 502 patent is therefore the "grandchild," via continuation applications, of the 306 patent. These two patents generally relate to polycrystalline diamond compacts and, more specifically, to polycrystalline diamond compacts that include a first polycrystalline diamond layer bonded to the substrate and at least a second polycrystalline diamond layer. At least an un-leached portion of the polycrystalline diamond table includes a plurality of diamond grains defining a plurality of interstitial regions and a metal-solvent catalyst occupying at least a portion of the plurality of interstitial regions. The plurality of diamond grains and the metal-solvent catalyst collectively exhibit a coercivity of about 115 Oe or more and a specific magnetic saturation of about 15 G·cm<sup>3</sup>/g or less. The second polycrystalline diamond layer exhibits a second average diamond grain size that is less than a first average diamond grain size of the first polycrystalline diamond layer and/or the first polycrystalline diamond layer includes a tungsten-containing material therein. See JX-0001 at Abstract.

The following claims ("asserted claims") have been asserted against Respondents in this investigation, with the independent claims in **bold**:

Patent	Claims	
'565 patent	1, 2, 4, 6, 18	
'502 patent	<b>1</b> , 2, 11, <b>15</b> , 21	
'306 patent	15	

## D. Overview of the Technology

All of the asserted patents are directed to PDCs, which are generally cylindrical as shown, for example, in Fig. 3B of the 502 patent:



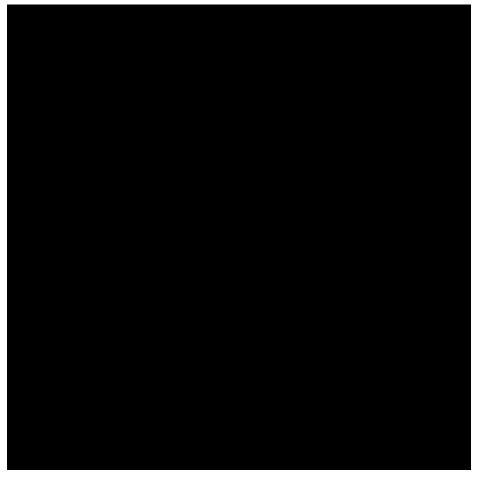
JX-0002 (565 patent) at Fig. 3B.

The PDC can include a diamond, or PCD, table (305), and a substrate (302), which is often made from a cemented hard metal composite, like cobalt-cemented tungsten carbide. JX-0002 (565 patent) at 10:44-45. The PDC may be fabricated by placing the substrate into a cartridge with a volume of diamond particles next to the substrate. *Id.* at 1:42-46. The cartridge may be loaded into a press that creates high-pressure and high-temperature conditions. *Id.* at 1:45-46. The substrate and diamond particles are processed under the high-pressure and high-temperature conditions in the presence of a metal-solvent catalyst material (which may be the same cobalt found in the tungsten carbide substrate) that causes the diamond particles to bond to one another, creating a polycrystalline diamond table that is bonded to the substrate. *Id.* at 1:46-54.

According to the asserted patents, the disclosed PDCs have "enhanced diamond-to-diamond bonding," which results in the polycrystalline diamond having a relatively lower metal-solvent catalyst content, a higher coercivity, a lower specific magnetic saturation, and/or a lower specific permeability. *Id.* at 4:41-49. USS states that with higher diamond-to-diamond bonding, the claimed PDC exhibits a higher density of sintered diamond grains and a lower density of material overall because there is less cobalt present. CIB at 8. A PDC with higher diamond-to-diamond bonding allows "wear parts," such as drill bits, to last longer and perform better in high-abrasion applications, such as earth-boring. JX-0002 (502 patent) at 4:41-49. Thus, drill operators do not have to remove or replace the drill bit as frequently. *Id.* at 1:26-41. USS asserts that the PDCs described in the asserted patents "differ from other so-called 'HPHT' (High Pressure High Temperature) products because other products do not exhibit the unique combination of claimed properties." CIB at 7.

The PCD tables described in the asserted patents are formed in a high-pressure/high-temperature process at a cell pressure of at least 7.5 GPa, and exhibit one or more characteristics such as certain values of average electrical conductivity, coercivity, specific magnetic saturation, and/or specific permeability. The asserted patents state that there is a connection or correlation between high pressure and high temperature processing conditions and the characteristics of the PCD table. For example, the method of fabricating PCD is disclosed as subjecting a cell assembly comprising a plurality of diamond particles of about 30 µm or less and a metal-solvent catalyst to a temperature of at least about 1000° Celsius and a pressure in the pressure transmitting medium of at least about 7.5 GPa. *See* JX-0002 (565 patent) at 2:27-52.

The press that creates HPHT conditions comprises six "punches," or pistons, that squeeze each of the six sides of a cubic container of raw material:



See CDX-0001C.6; Tr. (German) at 433:16-434:2. The press uses hydraulics to generate the needed pressure, and the hydraulic pressure within the press itself is called "line pressure." See Tr. (German) at 433:16-434:2. The pressure generated inside the cube, where the sintering occurs, is called "cell pressure." See id. at 434:3-9.

## For materials subject to HPHT processing:

as the sintering cell pressure employed during the HPHT process used to fabricate such PCD is moved further into the diamond-stable region away from the graphite-diamond equilibrium line, the rate of nucleation and growth of diamond increases. Such increased nucleation and growth of diamond between diamond particles (for a given diamond particle formulation) may result in PCD being formed exhibiting a relatively lower metal-solvent catalyst content with an associated relatively low average electrical conductivity, a higher coercivity, a lower specific magnetic saturation, and/or a lower specific permeability (i.e., the ratio of specific magnetic saturation to coercivity) than PCD formed at a lower sintering pressure.

JX-0002 (565 patent) at 4:37-49. Another method for achieving lower metal-solvent catalyst content is "leaching," where the PCD table is treated with "acid used to remove the surface cobalt." Tr. (German) at 128:14-129:21; *see* JX-0002 (565 patent) at 14:51-64.

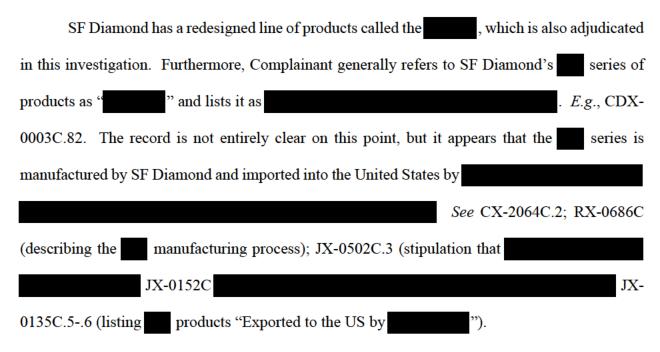
## E. Products at Issue

## 1. The Accused Products

The following product lines are alleged to infringe the asserted claims of the asserted patents:

	Infringing	Asserted Claims Practiced			
Party	Product Series	'565	'502	′306	
Iljin	UP8N	1, 2, 4	1, 2, 11		
	UP9N	1, 2, 4, 6, 18	1, 2, 11		
		1, 2, 4, 6	1, 2, 11	15	
SF			1, 2, 11	15	
Diamond			1, 2, 11	15	
		1, 2, 4	1, 2, 11	15	
			1, 2, 11	15	
		1, 2, 4, 18	1, 2, 11, 15, 21	15	
-		1, 2, 4	1, 2, 11		
		1, 2, 4, 6	1, 2, 11	15	
			1, 2, 11		
			1. 2, 11		
			1, 2, 11		
			1, 2, 11	15	
			1, 2, 11	15	
Jingrui	R11A	1, 2, 4, 6, 18	1, 2, 11, 15, 21		
	R22	1, 2, 4, 6, 18	1, 2, 11, 15, 21		
Wanlong	ZT2-B	1, 2, 4, 6, 18	15	4	
	ZTA-B	1, 2, 4, 18	15		
	RPA-B	1, 2, 4, 6, 18	15		
	RP2-B	1, 2, 4, 6, 18	15		
CR Gems*	GPCD-CRM	1, 2. 4, 6	1, 11		
	GPCD- My69	1, 2, 4, 6	1, 11		

CDX-0003C.82.



## 2. Domestic Industry Products

USS further provides a chart that summarizes the DI Products that are alleged to practice the asserted claims of the asserted patents:

Party	Product	Asserted Claims Practiced			
		565	502	306	
USS					

CIB at 10-11.

#### II. STANDARDS OF LAW

#### A. Standing

Commission Rule 210.12 requires that in intellectual property-based investigations "at least one complainant is the owner or exclusive licensee of the subject intellectual property." 19 C.F.R. § 210.12(a)(7); see also IpVenture, Inc. v. ProStar Computer, Inc., 503 F.3d 1324, 1325 (Fed. Cir. 2007) (the only entity(ies) that can enforce the rights protected by a patent is the

entity(ies) that owns or controls all substantial rights in that patent). Standing is ordinarily a question of law, which may rest on underlying findings of jurisdictional fact. *Abraxis Bioscience*, *Inc. v. Navinta LLC*, 625 F.3d 1359, 1363-64 (Fed. Cir. 2010).

#### **B.** Claim Construction

"The construction of claims is simply a way of elaborating the normally terse claim language in order to understand and explain, but not to change, the scope of the claims." *Embrex, Inc. v. Serv. Eng'g Corp.*, 216 F.3d 1343, 1347 (Fed. Cir. 2000). Although most of the disputed claim terms were construed in the *Markman* Order, some of the issues presented below are only resolvable with additional claim construction.

Claim construction focuses on the intrinsic evidence, which consists of the claims themselves, the specification, and the prosecution history. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc); *see also Markman v. Westview Instr., Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc). As the Federal Circuit in *Phillips* explained, courts must analyze each of these components to determine the "ordinary and customary meaning of a claim term" as understood by a person of ordinary skill in art at the time of the invention. 415 F.3d at 1313. "Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language." *Bell Atl. Network Servs., Inc. v. Covad Commc'ns Grp., Inc.*, 262 F.3d 1258, 1267 (Fed. Cir. 2001).

"It is a 'bedrock principle' of patent law that 'the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips*, 415 F.3d at 1312 (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1115 (Fed. Cir. 2004)). "Quite apart from the written description and the prosecution history, the claims themselves provide substantial guidance as to the meaning of particular claims terms." *Id.* at 1314;

see Interactive Gift Express, Inc. v. Compuserve Inc., 256 F.3d 1323, 1331 (Fed. Cir. 2001) ("In construing claims, the analytical focus must begin and remain centered on the language of the claims themselves, for it is that language that the patentee chose to use to 'particularly point [] out and distinctly claim [] the subject matter which the patentee regards as his invention."). The context in which a term is used in an asserted claim can be "highly instructive." Phillips, 415 F.3d at 1314. Additionally, other claims in the same patent, asserted or unasserted, may also provide guidance as to the meaning of a claim term. Id. "Courts do not rewrite claims; instead, we give effect to the terms chosen by the patentee." K-2 Corp. v. Salomon S.A., 191 F.3d 1356, 1364 (Fed. Cir. 1999). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually it is dispositive; it is the single best guide to the meaning of a disputed term." Phillips, 415 F.3d at 1315 (quoting Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996)). "[T]he specification may reveal a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess. In such cases, the inventor's lexicography governs." Id. at 1316.

In addition to the claims and the specification, the prosecution history should be examined, if in evidence. *Phillips*, 415 F.3d at 1317; *see Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004). The prosecution history can "often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." *Phillips*, 415 F.3d at 1317; *see Chimie v. PPG Indus. Inc.*, 402 F.3d 1371, 1384 (Fed. Cir. 2005) ("The purpose of consulting the prosecution history in construing a claim is to exclude any interpretation that was disclaimed during prosecution.").

When the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence (i.e., all evidence external to the patent and the prosecution history, including dictionaries, inventor testimony, expert testimony, and learned treatises) may be considered. *Phillips*, 415 F.3d at 1317. Extrinsic evidence is generally viewed as less reliable than the patent itself and its prosecution history in determining how to define claim terms. *Id.* "The court may receive extrinsic evidence to educate itself about the invention and the relevant technology, but the court may not use extrinsic evidence to arrive at a claim construction that is clearly at odds with the construction mandated by the intrinsic evidence." *Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 977 (Fed. Cir. 1999).

The construction of a claim term is generally guided by its ordinary meaning. However, courts may deviate from the ordinary meaning when: (1) "the intrinsic evidence shows that the patentee distinguished that term from prior art on the basis of a particular embodiment, expressly disclaimed subject matter, or described a particular embodiment as important to the invention;" or (2) "the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history." *Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1329 (Fed. Cir. 2009); *see GE Lighting Sols.*, *LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014) ("the specification and prosecution history only compel departure from the plain meaning in two instances: lexicography and disavowal."); *Omega Eng'g, Inc, v. Raytek Corp.*, 334 F.3d 1314, 1324 (Fed. Cir. 2003) ("[W]here the patentee has unequivocally disavowed a certain meaning to obtain his patent, the doctrine of prosecution disclaimer attaches and narrows the ordinary meaning of the claim congruent with the scope of the surrender."); *Rheox, Inc. v. Entact, Inc.*, 276 F.3d 1319, 1325 (Fed. Cir. 2002) ("The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during

prosecution."). Nevertheless, there is a "heavy presumption that a claim term carries its ordinary and customary meaning." *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002) (citations omitted). The standard for deviating from the plain and ordinary meaning is "exacting" and requires "a clear and unmistakable disclaimer." *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1366-67 (Fed. Cir. 2012); *see Epistar Corp. v. Int'l Trade Comm'n*, 566 F.3d 1321, 1334 (Fed. Cir. 2009) (requiring "expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope" to deviate from the ordinary meaning) (citation omitted).

#### C. Infringement

"An infringement analysis entails two steps. The first step is determining the meaning and scope of the patent claims asserted to be infringed. The second step is comparing the properly construed claims to the device accused of infringing." *Markman*, 52 F.3d at 976. A patentee may prove infringement either literally or under the doctrine of equivalents, and infringement of either sort must be proven by a preponderance of the evidence. *SmithKline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 889 (Fed. Cir. 1988). The preponderance of the evidence standard "requires proving that infringement was more likely than not to have occurred." *Warner-Lambert Co. v. Teva Pharm. USA, Inc.*, 418 F.3d 1326, 1341 n.15 (Fed. Cir. 2005).

Literal infringement is a question of fact. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1332 (Fed. Cir. 2008). "To establish literal infringement, every limitation set forth in a claim must be found in an accused product, exactly." *Microsoft Corp. v. GeoTag, Inc.*, 817 F.3d 1305, 1313 (Fed. Cir. 2016) (quoting *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1575 (Fed. Cir. 1995). If any claim limitation is absent, there is no literal infringement of that claim as a matter of law. *Bayer AG v. Elan Pharm. Research Corp.*, 212 F.3d 1241, 1247 (Fed. Cir. 2000).

One rubric for evaluating the doctrine of equivalents is the function-way-result test. Under this test, the accused feature is equivalent to the claim limitation when "it performs substantially the same function in substantially the same way to obtain the same result." *Duncan Parking Techs., Inc. v. IPS Grp., Inc.*, 914 F.3d 1347, 1362 (Fed. Cir. 2019) (quoting *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.*, 339 U.S. 605, 608 (1950)). Another test is known as the insubstantial differences test, where "[a]n element in the accused device is equivalent to a claim limitation if the only differences between the two are insubstantial." *Voda v. Gordia Corp.*, 536 F.3d 1311, 1139 (Fed. Cir. 2008). The Supreme Court has further instructed that "the proper time for evaluating equivalency . . . is at the time of infringement, not at the time the patent was issued." *Warner-Jenkinson Co., Inc. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 37 (1997).

In addition to direct infringement, Section 271 of the Patent Act defines two categories of indirect infringement, inducement of infringement and contributory infringement. 35 U.S.C. § 271. For indirect infringement violations under Section 337, the direct infringement element may occur after importation, so long as all the other elements of indirect infringement are met at the time of importation. *See Certain Vision-Based Driver Assistance System Cameras and Components Thereof*, Inv. No. 337-TA-907, Comm'n Op. at 19 (Dec. 1, 2015) (citing *Suprema, Inc. v. Int'l Trade Comm'n*, 796 F.3d 1338, 1348 (Fed. Cir. 2015)). It is well settled that "[a]bsent direct infringement of the patent claims, there can be neither contributory infringement ... nor inducement of infringement." *Met–Coil Sys. Corp. v. Korners Unltd., Inc.*, 803 F.2d 684, 687 (Fed.Cir.1986) (citations omitted).

As to the first category, "[w]hoever actively induces infringement of a patent shall be liable as an infringer." 35 U.S.C. § 271(b); *see DSU Med. Corp. v. JMS Co.*, 471 F.3d 1293, 1305 (Fed. Cir. 2006) (en banc) ("To establish liability under section 271(b), a patent holder must prove that

once the defendants knew of the patent, they actively and knowingly aided and abetted another's direct infringement.") (citations omitted). "The mere knowledge of possible infringement by others does not amount to inducement; specific intent and action to induce infringement must be proven." *Id.* (citations omitted). A defendant's belief regarding patent validity is not a defense to a claim of induced infringement. *Commil USA, LLC v. Cisco Sys., Inc.*, 135 S. Ct. 1920 (2015). A defendant's willful blindness on the question of infringement will satisfy the knowledge requirement. *Global-Tech Appliances, Inc. v. SEB S.A.*, 563 U.S. 754, 765, 768-771 (2011).

As to the second category, "a party who sells a component with knowledge that the component is especially designed for use in a patented invention, and is not a staple article of commerce suitable for substantial noninfringing use, is liable as a contributory infringer." Wordtech Sys., Inc. v. Integrated Networks Solutions, Inc., 609 F.3d 1308, 1316 (Fed. Cir. 2010). Contributory infringement is premised upon a finding that: (1) the entity sells, offers to sell, or imports into the United States a component of a product; (2) the component has no substantial non-infringing use; (3) the component constitutes a material part of the claimed invention; (4) the entity was aware of the patent and knew that the product may be covered by a claim of the patent; and (5) the use of the component in the product directly infringes the claim. See Certain Gaming & Entm't Consoles, Related Software, & Components Thereof, Inv. No. 337-TA-752, Final Initial Remand Determination at 8 (Mar. 22, 2013). As with inducement, willful blindness on the question of infringement will satisfy the knowledge requirement. Global-Tech, 563 U.S. at 765, 768-771.

#### **D.** Domestic Industry

In an investigation based on a claim of patent infringement, Section 337 requires that an industry in the United States, relating to the articles protected by the patent, exist or be in the

process of being established. 19 U.S.C. § 1337(a)(2). Under Commission precedent, the domestic industry requirement has been divided into (i) a "technical prong" (which requires articles covered by the asserted patent) and (ii) an "economic prong" (which requires certain levels of activity with respect to the protected articles or patent itself). *See Certain Video Game Systems and Controllers*, Inv. No. 337-TA-743, Comm'n Op. at 6-7 (April 14, 2011).

## 1. Technical Prong

The technical prong of the domestic industry requirement is satisfied when the complainant establishes that it is practicing or exploiting valid claims of the patents at issue. See 19 U.S.C. §§ 1337 (a)(2), (3); Certain Microsphere Adhesives, Process for Making Same and Prods. Containing Same, Including Self-Stick Repositionable Notes, Inv. No. 337-TA-366, Comm'n Op. at 8 (U.S.I.T.C. Jan. 16, 1996). "In order to satisfy the technical prong of the domestic industry requirement, it is sufficient to show that the domestic industry practices any claim of that patent, not necessarily an asserted claim of that patent." Certain Ammonium Octamolybdate Isomers, Inv. No. 337-TA-477, Comm'n Op. at 55 (U.S.I.T.C. Aug. 28, 2003). Historically, the Commission permits the complainant's products, and those of its licensees, to be considered for technical prong purposes. See Certain Magnetic Tape Cartridges and Components Thereof, Inv. No. 337-TA-1058, Comm'n Op. at 28-29 (April 9, 2019).

The test for claim coverage for the purposes of the technical prong of the domestic industry requirement is the same as that for infringement. *See Alloc, Inc. v. Int'l Trade Comm'n*, 342 F.3d 1361, 1375 (Fed. Cir. 2003). As with infringement, the technical prong of the domestic industry can be satisfied either literally or under the doctrine of equivalents. *Certain Dynamic Sequential Gradient Devices and Component Parts Thereof*, Inv. No. 337-TA-335, ID at 44, Pub. No. 2575 (U.S.I.T.C. May 15, 1992). In short, the patentee must establish by a preponderance of the evidence that the domestic product practices one or more claims of the patent.

#### 2. Economic Prong

The "economic prong" of the domestic industry requirement is satisfied when there exists in the United States, in connection with products practicing at least one claim of the patent at issue: (A) significant investment in plant and equipment; (B) significant employment of labor or capital; or (C) substantial investment in its exploitation, including engineering, research and development, and licensing. 19 U.S.C. § 1337(a)(3). Establishment of the "economic prong" is not dependent on any "minimum monetary expenditure" and there is no need for complainant "to define the industry itself in absolute mathematical terms." Certain Stringed Musical Instruments and Components Thereof, Inv. No. 337-TA-586, Comm'n Op. at 25-26 (May 16, 2008). However, a complainant must substantiate the significance of its activities with respect to the articles protected by the patent. Certain Printing and Imaging Devices and Components Thereof, Inv. No. 337-TA-690, Comm'n Op. at 30 (Feb. 17, 2011). Further, a complainant can show that its activities are significant by showing how those activities are important to the articles protected by the patent in the context of the company's operations, the marketplace, or the industry in question. *Id.* at 27-28. That significance, however, must be shown in a quantitative context. Lelo Inc. v. Int'l Trade Comm'n, 786 F.3d 879, 886 (Fed. Cir. 2015). The word "significant' denote[s] an assessment of the *relative* importance of the domestic activities." *Id.* at 883-4 (internal citation omitted) (emphasis added). In general, "[t]he purpose of the domestic industry requirement is to prevent the ITC from becoming a forum for resolving disputes brought by foreign complainants whose only connection with the United States is ownership of a U.S. patent." Certain Battery-Powered Ride-On Toy Vehicles, Inv. No. 337-TA-314, USITC Pub. No. 2420, Initial Determination at 21 (Aug. 1991).

#### E. Invalidity

#### 1. Patent Eligibility Under 35 U.S.C. §101

35 U.S.C. § 101 provides that "[w]hoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor." In defining exactly what is patentable subject matter, the Supreme Court has held that abstract ideas form the "basic tools of scientific and technological work" and are therefore unpatentable subject matter under 35 U.S.C. § 101. Alice Corp. v. CLS Bank Int'l, 573 U.S. 208, 216 (2014). The Supreme Court provided a two-part test for assessing patent eligibility under Section 101. First, a court must determine whether the claims are directed to a patentineligible concept. *Id.* at 217. If not, the inventions are patent-eligible, and the inquiry ends. Enfish, LLC v. Microsoft Corp., 822 F.3d 1327, 1339 (Fed. Cir. 2016). If the claims are directed to a patent-ineligible concept, the court must then "consider the elements of each claim both individually and as an ordered combination to determine whether the additional elements transform the nature of the claim into a patent eligible application." Alice, 573 U.S. at 217-218. Claims are patent-eligible under step two if they contain limitations that "involve more than performance of well-understood, routine, and conventional activities previously known to the industry." Berkheimer v. HP Inc., 881 F.3d 1360, 1367 (Fed. Cir. 2018).

At step one, courts examine the claims to determine whether their "character as a whole," or their "focus," is an abstract idea. *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016). The key inquiry is whether the claims recite "a specific means or method that improves the relevant technology" or are 'directed to a result or effect that itself is the abstract idea and merely invoke generic processes and machinery." *Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229, 1241 (Fed. Cir. 2016).

If the claims at issue are directed to a patent-ineligible concept, step two requires that the claim elements be scrutinized "both individually and 'as an ordered combination' to determine

whether the additional elements 'transform the nature of the claim' into a patent-eligible application." *Enfish.* 822 F.3d at 1354 (quoting *Alice*, 573 U.S. at 217). What is required to establish eligibility, under both steps one and two, is an element of technological innovation that amounts to more than the abstract idea itself; a patentee may be required to present "an arguably inventive set of components or methods." *Electric Power*, 830 F.3d at 1355.

#### 2. 35 U.S.C. § 102

Pursuant to 35 U.S.C. § 102, a patent claim is invalid as anticipated if:

- (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant [or]
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States.

35 U.S.C. § 102 (pre-AIA). "A patent is invalid for anticipation if a single prior art reference discloses each and every limitation of the claimed invention. Moreover, a prior art reference may anticipate without disclosing a feature of the claimed invention if that missing characteristic is necessarily present, or inherent, in the single anticipating reference." *Schering Corp. v. Geneva Pharm., Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003) (citations omitted); *see Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1354 (Fed. Cir. 2012). "A century-old axiom of patent law holds that a product 'which would literally infringe if later in time anticipates if earlier." *Upsher-Smith Labs., Inc. v. Pamlab, L.L.C.*, 412 F.3d 1319, 1322 (Fed. Cir. 2005) (quoting *Schering Corp.*, 339 F.3d at 1322). Anticipation, and all other grounds of patent invalidity, must be proved by clear and convincing evidence. *Microsoft Corp. v. 141 Ltd. P'ship*, 564 U.S. 91, 95, (2011).

#### 3. 35 U.S.C. § 103

Section 103 of the Patent Act states:

A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

35 U.S.C. § 103(a) (pre-AIA). "Obviousness is a question of law based on underlying questions of fact." *Scanner Techs. Corp. v. ICOS Vision Sys. Corp. N.V.*, 528 F.3d 1365, 1379 (Fed. Cir. 2008). The underlying factual determinations include: "(1) the scope and content of the prior art, (2) the level of ordinary skill in the art, (3) the differences between the claimed invention and the prior art, and (4) objective indicia of non-obviousness." *Id.* (citing *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966)). These factual determinations are often referred to as the "Graham factors."

A critical inquiry in determining the differences between the claimed invention and the prior art is whether there is a reason to combine the prior art references. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418-21 (2007). In *KSR*, the Supreme Court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does," using a flexible analysis:

Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue . . .. As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.

*Id.* at 418.

Since *KSR*, the Federal Circuit has announced that, where a patent challenger contends that a patent is invalid for obviousness based on a combination of prior art references, "the burden falls

on the patent challenger to show by clear and convincing evidence that a person of ordinary skill in the art would have had reason to attempt to make the composition or device . . . and would have had a reasonable expectation of success in doing so." *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1360 (Fed. Cir. 2007); *see KSR*, 550 U.S. at 399 ("The proper question was whether a pedal designer of ordinary skill in the art, facing the wide range of needs created by developments in the field, would have seen an obvious benefit to upgrading Asano with a sensor."). In addition to demonstrating that a reason exists to combine prior art references, the challenger must demonstrate that the combination of prior art references discloses all of the limitations of the claims. *Hearing Components, Inc. v. Shure Inc.*, 600 F.3d 1357, 1373-4 (Fed. Cir. 2010) (abrogated on other grounds by *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S.Ct. 2120 (2014)) (upholding finding of non-obviousness based on the fact that there was substantial evidence that the asserted combination of references failed to disclose a claim limitation); *Velander v. Garner*, 348 F.3d 1359, 1363 (Fed. Cir. 2003) (explaining that a requirement for a finding of obviousness is that "all the elements of an invention are found in a combination of prior art references").

An obviousness determination should also include a consideration of "secondary considerations," that is, "commercial success, long felt but unsolved needs, failure of others, etc.," which shed light on "the circumstances surrounding the origin of the subject matter sought to be patented." *Graham*, 338 U.S. at 17-18. "For [such] objective evidence to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the claimed invention." *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995); *see Merck & Cie v. Gnosis S.P.A.*, 808 F.3d 829, 837 (Fed. Cir. 2015). "Where the offered secondary consideration actually results from something other than what is both claimed and novel in the claim, there is no nexus

to the merits of the claimed invention." *In re Huai-Hung Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011); *see Apple Inc. v. Samsung Elecs. Co., Ltd.*, 839 F.3d 1034, 1054-1056 (Fed. Cir. 2016).

#### 4. 35 U.S.C. § 112

Pursuant to 35 U.S.C. § 112 (pre-AIA), a patent claim is invalid for lack of written description if the patent's specification fails to "reasonably convey[] to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). "[T]he test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art" (*id.*), and "the level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology" (*id.* (citing *Capon v. Eshar*, 418 F.3d 1349, 1357-58 (Fed. Cir. 2005))).

Additionally, under 35 U.S.C. § 112, a patent claim is invalid for indefiniteness if "its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2124 (2014). Overall, "the written description is *key* to determining whether a term of degree is indefinite." *Guangdong Alison Hi-Tech Co. v. Int'l Trade Comm'n*, 936 F.3d 1353, 1361 (Fed. Cir. 2019) (citing *Sonix Tech. Co. v. Publ'ns Int'l, Ltd.*, 844 F.3d 1370, 1378 (Fed. Cir. 2017)) (emphasis in original).

## III. STANDING, IMPORTATION, AND JURISDICTION

The Iljin, Jingrui, Wanlong, and CR Gems Respondents stipulate that they have imported into and sold their Accused Products in the United States. *See* CX-0132C; CX-0133C; CX-0134C. The evidence establishes that New Asia makes PDCs and imports and sells them to at least its United States distributor IDS. *See* CX-0085.2; *see also* JX-0133C.11-.14, .40-.41; JX-0424C at 38:17-42:15. IDS stipulated that it has imported into and sold Accused Products in the United

States. JX-0501C. Haimingrun imported into and sold Accused Products in the United States. *See* JX-0130C.11-.14, .44-.46; JX-0432C at 26:21-28:18. Juxin imported into and sold Accused Products in the United States. *See* JX-0481C at 76:21-83:11; JX-0274C; JX-0275C; JX-0299C; CX-2242C.2; JX-0487C. And SF Diamond imported into and sold Accused Products in the United States. *See* CX-0343C.2-.20, .72-.73.

The Commission therefore has *in rem* jurisdiction, and subject matter jurisdiction exists because USS alleges that Respondents have engaged in unlawful and unfair acts in conjunction with the importation, sale for importation, and/or sale after importation of articles into the United States. *See Certain Ammonium Octamolybdate Isomers*, Inv. No. 337-TA-477, Comm'n Op. at 15-16 (Jan. 5, 2004). The patents in suit are assigned on their faces to USS, so standing also exists, and personal jurisdiction exists because Respondents have appeared and participated in this investigation.

#### IV. TECHNICAL TESTING OF ACCUSED AND DI PRODUCTS

A significant issue pertains to the testing protocols used by USS' expert, Dr. German, to determine whether the Accused Products infringe and the DI Products practice the asserted patents. All of the asserted patents recite a PDC and a PCD table, and the claims in suit all recite combinations and ranges of properties of the table, such as diamond grain size, coercivity, magnetic saturation, electrical conductivity, G-Ratio, and thermal stability. *E.g.*, 565 patent at cl.

1. In order to evaluate both the Accused and DI Products, many such products were tested for these properties. Accordingly, the testing protocols are at the heart of this aspect of the investigation.

As an initial matter, Respondents argue that Dr. German "has no testing experience with PDCs" and thus, his testing is not reliable and is too inaccurate to show infringement. RIB at 21. Specifically, Respondents allege that Dr. German never conducted magnetic testing, electrical

testing, or vertical turret lathe ("VTL") testing prior to this investigation, and he never used a metal content imaging ("MCI") device or VTL to test PDCs prior to this investigation. *Id.* (citing Tr. (German) at 333:2-24). Furthermore, Respondents assert that Dr. German adopted the same testing protocol for magnetic testing, electrical testing, and wear testing that had been previously used by USS, and "even though Dr. German watched some of the testing remotely, he was unfamiliar with certain aspects of the testing protocols, and, for some tests, had the wrong impression about how they were performed." *Id.* (citing Tr. (German) at 340:5-13). Thus, Respondents argue, "Dr. German's testimony regarding infringement is of minimal value." *Id.* 

These arguments lack merit. Dr. German is a "respected material scientist," as even Respondents concede. RIB at 21. He has been working with PDCs since the 1990s. *See* Tr. (German) at 113:4-21. His expertise in manufacturing, testing, and characterizing cemented carbides – that is, the substrate to which the PCD table bonds in the Accused and DI Products – readily translates to testing and characterizing PDCs. *See* Tr. (German) at 431:15-433:15. One of the pieces of test equipment used (and specified in the patents), the Koerzimat, is "probably the most popular commercial unit" for measuring magnetic saturation and coercivity in cemented carbides, and Dr. German had one in his own laboratory. Tr. (German) at 338:14-23; JX-0002 (565 patent) at 5:56-60. On certain points, Respondents' experts agreed with Dr. German's analysis and testing. *See* Tr. (Bellin) at 1094:13-1095:2 (Mr. Bellin's testimony agreeing with Dr. German on VTL testing issues)).

And Dr. German clearly was very involved in each step of the testing performed on the Accused and DI Products. He testified that he monitored the "very large number of test results coming in," bringing any "concerns and questions" to his three testing technicians, each of whom he checked in with "at 9:00 o'clock every morning." Tr. (German) at 126:18-127:20. Moreover,

it was reasonable for Dr. German to not be physically present for most of the testing due to the pandemic, and the Protective Order in this case was modified to allow "all parties to conduct testing of certain polycrystalline diamond compact ('PDC') samples produced as confidential business information ('CBI') in this investigation using in-house technicians employed by the parties." Order No. 13 (emphasis added).

As for the work itself, Dr. German supervised the testing of "hundreds of samples of Accused and Domestic Industry ('DI') products for characteristics recited in the Asserted Claims." CIB at 11 (citing Tr. (German) at 126:18-127:20). Some of the testing protocols and parameters are specified in the patents. *E.g.*, JX-0002 (565 patent) at 7:1-15 (listing specific test material, size, and rotary speed). Dr. German otherwise created four protocols to test the various products:

Protocol	Description			
A	Used to test unleached samples with a diameter of approximately 16 mm (CX-0379C)			
В	Used to test unleached samples with a diameter other than approximately 16 mm (CX-0380C)			
С	Used to test leached samples of any size (CX-0381C)			
D	Used across Accused and DI products to determine whether sample PDCs exhibited a vertical cobalt gradient (CX-0382C)			

See Tr. (German) at 129:22-130:6; CDX-0003C.17. These protocols were created by Dr. German, not by USS, and involved modification of USS' pre-suit testing procedures. See Tr. (German) at 130:7-18. Although some of the specific steps in the protocols were not modified, overall the protocols were clearly the result of Dr. German's independent judgment. E.g., CX-0379C; see RIB at 21.

#### A. Average Electrical Conductivity

The first test performed after receipt and initial processing of each 16 millimeter-diameter Accused Product was measurement of average electrical conductivity using the MCI machine. *See* 

Tr. (German) at 135:10-139:2. The basic procedure for use of that machine was developed by personnel at USS and the Worcester Polytechnic Institute. See CX-0385C, CX-0394. Dr. German used glass bead blasting to clean the surface of the PCD to prepare for the MCI testing. See Tr. (German) at 136:4-8. Glass bead blasting cleans surface films without damaging the diamond surface of the cutter. Id. at 136:9-16. While Respondents criticize this procedure because it allegedly "alter[ed] the surface" (RIB at 25), both Dr. German and Respondents' expert, Mr. Federico Bellin, testified that bead blasting is a "well known" technique for cleaning PCD surfaces, while "not removing anything from the surface other than . . . surface films, if they existed." Tr. (German) at 136:9-137:2; Tr. (Bellin) 1060:24-1061:6 ("diamond is too hard" for bead blasting to alter the surface of a diamond table). Respondents also criticize Dr. German for "fail[ing] to use conductive grease to improve contact between the pins [of the MCI device] and the PDC." RIB at 25. However, the patents teach that using grease is optional, and Dr. German found it to be both unnecessary, because of the design of the pins, and needlessly time consuming, because the grease was difficult to clean up. See JX-0002 (565 patent) at 11:49-53; Tr. (German) at 360:10-19, 423:8-424:2.

Respondents argue that use of the MCI apparatus, which uses a circular 120-pin sensor array instead of the hexagonal 121-pin sensor array described in the asserted patents, was not appropriate. *See* RIB at 24. However, the 565 patent teaches that the sensor assembly, which is shown in Fig. 5 of the patent, is not the only required type of assembly, and "other sensor-assembly configurations may be used, e.g., for PDC samples having a different size and/or a different configuration." JX-0002 at 11:18-24.

Respondents further argue that the reported results for average electrical conductivity are unreliable in general because the measurements "demonstrated that the different samples of each

product had widely varying conductivity measurements – including measurements both inside and outside the claimed ranges for most products." RIB at 24. However, the possibility that the MCI device was the source of significant measurement-to-measurement variance was ruled out by having a technician perform five repeat tests on the same sample by removing it and replacing it after each measurement. *See* Tr. (German) at 139:9-25. The average conductivity for these five measurements was around

See id. Moreover, Dr. German had the technicians keep a control cutter and measure the conductivity of the same cutter every day before taking conductivity measurements, which showed that the device was not drifting over time. See id.; CX-0422C. The "standard error" of these measurements was also "around of measured value." Tr. (German) at 140:1-5. Thus, as Dr. German concluded, the observed variation in the tested products was due to differences between the samples themselves, rather than to the device. Id. at 140:6-14.

Respondents nonetheless argue that the results obtained from the MCI device "lacked precision and accuracy in order to evaluate infringement of the electrical conductivity limitation." RIB at 25. Specifically, Respondents argue that "the MCI device gets less and less precise as the number of data readings decreases," as shown in a scatter plot of average electrical conductivity measurements:



Id.; see Tr. (Schaefer) at 884:16-887:18; RDX-0002C.166.

Some background is in order. The MCI machine operates by pressing 120 pins across the top surface of a PDC and two probes onto the cemented carbide substrate. *See* Tr. (German) at 138:2-18. Direct current is then applied between one top pin and one of the two probes, and voltage, and thereby resistance, is measured at two intermediate contact points, for a total of four contact points. *See id.*; CX-0394.3. Resistance is measured many times, using different combinations of contact points, with "potentially" thousands of such combinations. Tr. (German) at 355:11-13; *see* CX-0394.3. The average conductivity, in Siemens per meter ("S/m"), is then calculated using the known geometry of each PDC and an algorithm described in the technical literature. *See* CX-0394; Tr. (German) at 137:10-17.

The calculation does not rely on all measurements, however. A measurement is rejected when (1) the resistance exceeds a threshold, because it is assumed that that measurement involved a lack of pin contact, and (2) when the resistance is significantly different with a reversed DC voltage but the same combination of contact points. *See* Tr. (German) at 361:10-18.

Nonetheless, in view of the large number of contact points covering essentially the entire top surface of the PDC, the resulting conductivity calculation represents an actual average, even when some measurements are rejected; Respondents criticisms of this measurement technique are therefore unpersuasive. *See* RIB at 22-23.

Moreover, the significance of the scatter plot is unclear. Each PDC's averaged set of measurements is plotted as an individual dot, with the number of measurements (or "data readings") on the x-axis and the calculated conductivity on the y-axis. See Tr. (Schaefer) at 885:10-887:18. Respondents' expert, Dr. Dale Schaefer, explains that the plot shows 80 points, representing eight different products with ten tested samples each. See id. The plot does not identify which plotted point corresponds to which PDC, however, so it is generally difficult to extract any meaningful information from it. See RDX-0002C.166. Dr. Schaefer identified the ten plotted samples of one product, UP8N, which are indeed "scattered all over the place," to support his opinion that the MCI data is too inaccurate and imprecise to demonstrate infringement. Tr. (Schaefer) at 886:21; see RDX-0002C.165-.168. But as noted, the daily standard testing Dr. German employed establishes that any variation in calculated averages between samples of the same product was product-related, not MCI-related. See Tr. (German) at 139:9-25; cf. Tr. (Schaefer) at 886:24-25 ("you can't associate that scatter with differences in the sample[s]"). Nor does Dr. Schaefer analyze any other products, so it cannot be concluded that Dr. German "distort[ed] the data by exploiting the imprecision of his data." *Id.* at 887:17-18.

On balance, then, USS' electrical conductivity testing was sufficiently reliable.

# **B. PDC Selection for Destructive Tests**

Average electrical conductivity is a nondestructive test, and was performed on every sample tested under Protocol A. CIB at 17. Most of the remaining tests are destructive, and Dr.

German accordingly instructed the technicians to select a limited set of samples – three initially – exhibiting the lowest measured average electrical conductivity for these tests. *See* Tr. (German) at 141:7-14; CX-0379C.2. A fourth sample having the next lowest average electrical conductivity was chosen for thermal stability testing. *See* Tr. (German) at 158:4-23; CX-0379C.3. And a fifth sample, selected without regard to average electrical conductivity, was used to test interface geometry. *See* Tr. (German) at 162:22-164:3; CX-0379C.3.

Respondents argue that the selection of the three samples having the lowest average electrical conductivity was "biased" (RIB at 19-22, 25-26), and that Dr. German's protocols depend "on one unreliably measured value (out of either 5 or 10 measurements)" (id. at 25). But the three selected samples were simply the ones most likely to fall within the claimed electrical conductivity range; Dr. German did not alter any test results. There is no requirement that the samples must all meet the claim limitations, or that a hypothetical average sample meet the claim limitations. See Bell Commc'ns Rsch., Inc. v. Vitalink Commc'ns Corp., 55 F.3d 615, 622-23 (Fed. Cir. 1995) ("[A]n accused product that sometimes, but not always, embodies a claimed method nonetheless infringes."); Paper Converting Mach. Co. v. Magna–Graphics Corp., 745 F.2d 11, 20 (Fed. Cir. 1984) ("[I]mperfect practice of an invention does not avoid infringement."). And for the same reason, it is irrelevant that the three samples most likely to satisfy the claimed electrical conductivity limitation are also most likely to satisfy the claimed magnetic limitations (because a PDC's electrical and magnetic characteristics are related to the interstitial cobalt concentration). See RIB at 26 (citing Tr. (Schaefer) at 887:24-889:4. Moreover, the selection of three samples having the lowest conductivity only applied to the 16 mm PDCs, because the MCI device's pins are configured to test that size. See Tr. (German) at 165:15-166:13. Dr. German selected 13 mm samples for destructive testing at random. *Id.*; see CX-0380C.1.

On balance, then, the selection of PDCs for destructive testing was not biased and did not result in unreliable results.

# C. G-Ratio and Thermal Stability

"G-Ratio is defined, both in the patents, and in the understanding of the art, as 'the ratio of the volume of workpiece cut to the volume of PCD worn away during the cutting process." RIB at 119; *see*, *e.g.*, JX-0002 (565 patent) at 7:2-4; Tr. (German) at 141:20-24; 1048:15-18; 1119:7-14. The 565 patent specification provides:

An example of suitable parameters that may be used to determine a G-Ratio of the PCD are a depth of cut for the PCD cutting element of about 0.254 mm, a back rake angle for the PCD cutting element of about 20 degrees, an in-feed for the PCD cutting element of about 6.35 mm/rev, a rotary speed of the workpiece to be cut of about 101 rpm, and the workpiece may be made from Barre granite having a 914 mm outer diameter and a 254 mm inner diameter. During the G-Ratio test, the workpiece is cooled with a coolant, such as water.

JX-0002 (565 patent) at 7:6-15. All of these parameters apply to use of a VTL:



See CDX-0003C.29, .36.

The determination of whether, in the context of "unleached portion of the polycrystalline diamond table," the term G-Ratio is indefinite was left to be analyzed after the evidentiary hearing,

because during the *Markman* process Respondents raised a number of factors that allegedly affect G-Ratio on which the intrinsic evidence associated with the 565 patent is seemingly silent. *Markman* Order at 33. Respondents' specific indefiniteness arguments are addressed below in connection with invalidity; however, Respondents also argue that the alleged lack of teaching regarding this term in the patents leaves so much leeway in designing a practical G-Ratio test that the test results are excessively variable and unreliable, and thus cannot show infringement. RIB at 26-27.

As noted, some test parameters (e.g., back rake angle, in-feed rate, workpiece of Barre granite) are taught in the 565 patent. *See* JX-0002 (565 patent) at 7:6-15. Beyond the disclosed parameters, Respondents' principal objection centers on the number of passes, or full revolutions the PDC makes, for the wet VTL test, which entails flooding the cutting surface with a coolant such as water. *See* RIB at 27; Tr. (German) at 415:25-418:6. The result is that a portion of the PCD table (and of the cutting surface) is worn away during the test, which plainly varies depending on the number of revolutions the PDC completes. *See* Tr. (German) at 415:25-418:6. Dr. German chose 50 passes based on a review of the literature, which showed that too few passes resulted in "transient" effects, and too many passes resulted in wearing through the PCD table to the softer cemented carbide substrate. Tr. (German) at 144:16-146:13. One report Dr. German relied on resulted from testing by the Iljin Respondents, and



See id.; CDX-0003C.34 (

); see also CDX-0003C.32-.33.

Respondents nevertheless argue that Dr. German's use of 50 passes is not an industry standard, and that different VTL operators may use other than 50 passes. *See* RIB at 124; Tr. (German) at 349:6-9; RX-0232.0002-.0004; RX-0234.0003. But the Iljin Respondents' test,

See CX-0003C.34; Tr. (German) at

146:12-13. There is evidence that one tested PDC possessed significant variability in G-Ratio across samples at a consistent number of 50 passes, but even Respondents' expert testified that this PDC's results displayed "a huge array of variability" in G-Ratio, in contrast to similarly tested PDCs, which only displayed "a degree of variability." Tr. (Cook) at 1146:23-1147:2 (citing RX-0627C.4). There is also evidence of variability in G-Ratio across samples of Accused and DI Products, but it is not clear that this variability is caused by the nature of VTL testing itself rather than variability in individual samples. *See* CX-0383C.

As to thermal stability, the PDCs were tested by measuring the distance cut in a workpiece prior to failure, without using coolant (i.e., "dry"), in a VTL test, using the protocol recited in the patents. Tr. (German) at 158:4-19; *see* CDX-0003C.50-.54; JX-0003 (502 patent) at 6:22-34. The samples were mounted in a ceramic-lined fixture to ensure thermal isolation and tested to "catastrophic failure," which in the dry VTL context Dr. German understood to mean "the breakdown of the diamond into graphite." Tr. (German) at 159:13-23, 160:17-22; *see* CDX-0003C.53; CX-7326C.

Thus, when catastrophic failure was observed, the VTL test was stopped and the distance cut into the workpiece prior to failure was measured. *See* Tr. (German) at 158:24-161:20.

Respondents contend that this test protocol is "not reliable." RIB at 27. They first suggest that the patent claims require "failure," as opposed to "catastrophic failure," and that these "two metrics are not equivalent." *Id.* It is not clear whether this argument implicates claim construction; if so, it is not persuasive because the only embodiment of "failure" disclosed in the specifications is "catastrophic failure." *See* JX-0002 at 7:26, cl. 18; JX-0003 at 6:24, cl. 15. And if the argument does not implicate claim construction, and instead raises a dispute over how a skilled artisan would establish the existence of "catastrophic failure," at best Respondents have shown that there are "several" ways to establish it. Tr. (Cook) at 1150:5-18. Respondents' expert identifies these several ways with essentially no explanation for why any are superior to graphitization, so this argument, too, is unpersuasive. *See id.* Respondents also argue that USS "inflated the [measured] thermal stability values," citing to their expert's testimony, but their expert does not actually opine that the thermal stability values are inflated, nor does he explain how they might be so inflated. RIB at 27 (citing Tr. (Cook) at 1150:2-18). Presumably the argument is that distance cut by a PDC

before graphitization is longer than distance cut before one of the "several" other possible failure criteria are satisfied, but Respondents cite no evidence proving that. *See* RIB at 27.

On balance, therefore, Dr. German's measurements of G-Ratio and thermal stability are reliable.

#### D. . Other Parameters and Protocols

Some claims in suit require either a measurement or a comparison of average diamond grain size. *E.g.*, JX-0002 (565 patent) at cl. 1. Evaluation of this involved cutting cross-sections of samples and examining them using a scanning electron microscope ("SEM"). Tr. (German) at 164:4-24, 233:21-234:22; CDX-0003C.64-.65 (showing a sample half-cut). Where the claimed average grain size was numeric, the size measurement was performed according to the line-intercept method of ASTM E-112 using an electron back-scatter diffraction ("EBSD") apparatus. Tr. (German) at 150:14-154:1; CDX-0003C.38-.42.; CX-3993C; CX-4028C. Respondents apparently do not raise any objection to this testing separately from the objections addressed above. Where the required average grain size was only comparative, however, as in claim 15 of the 306 patent, grain size was evaluated differently; the reliability of this evaluation is disputed and is discussed in greater detail below in connection with the 306 patent (as is an explanation of EBSD).

Various claims recite certain magnetic properties, namely, specific magnetic saturation, coercivity, and specific permeability. *E.g.*, JX-0003 (502 patent) at cl. 2. Specific magnetic saturation is the measure of "how much [a material] couples to the magnetic field" in which the material is immersed, and its units as specified in the patents are magnetic field strength (in Gauss, or "G") divided by mass density (gram/cm³), or "Gcm³/g." Tr. (German) at 154:18-155:11, 211:16-23; JX-0003 (502 patent) at 2:26-27. Coercivity is the magnetic field strength, measured in Oersteds ("Oe"), needed to "revert" a material's magnetization from saturation to zero. *See* 

Markman Order at 27; Tr. (German) at 154:18-155:11. Specific permeability is the ratio of magnetic saturation to coercivity, with units of "G-cm³/gOe." See Markman Order at 29. The measurements of these parameters were performed after the PCD was removed from the substrate. See Tr. (German) at 154:13-155:11. As specified in the patents, a Koerzimat CS 1.096 was used to measure the specific magnetic saturation pursuant to ASTM B886-03 (2008), and coercivity pursuant to ASTM B887-03 (2008). Id. at 154:13-156:23; CDX-0003C.45; CX-7327C (image of Koerzimat); JX-0003 (502 patent) at 5:8-19 (patent instructions). Dr. German had the Koerzimat calibrated before testing began. See Tr. (German) at 156:6-9. Respondents apparently do not raise any objection to this testing separately from the objections addressed above.

A sample of each Accused and DI Product was selected for planarity analysis, and the substrate of each sample was removed and the diamond table was placed with the face formerly interfacing with the substrate facing up for scanning by the electron microscope. *See* Tr. (German) at 162:22-164:3; CDX-0003C.59-.60; CX-7178C; CX-7333C. The interface geometry of each sample was scanned using a Keyence VR-3100, a device Dr. German has in his own laboratory, and the full 3D scan allowed for the calculation of the surface area of the interface. *See* Tr. (German) at 150:7-12, 163:12-164:24; CDX-0003C.61-.62 (showing Keyence and sample 3D scan); CX-7333C. In accordance with the claim construction of "substantially planar topography," Dr. German divided the area of a theoretical circle with the same diameter as the PCD sample by the measured surface area of the PCD interface to determine planarity ratio. *See* Tr. (German) at 163:12-164:3 (noting a measured planarity ratio of 0.747 for sample BCCCC.05); *Markman* Order at 39-40. Respondents do not raise an objection to this test protocol.

Once the above tests were performed, the isolated diamond tables were sent to NSL Analytical, an accredited lab in Cleveland, Ohio, to test for cobalt content. *See* Tr. (German) at

156:25-157:22. NSL Analytical measured cobalt by weight percent using standards traceable to the National Institute of Standards and Technology. *Id.*; CDX-0003C.49; CX-7107C.1 (showing the test result for sample BAAAA.02). Respondents do not raise an objection to this testing.

Protocol B was used for PDCs with diameters other than 16 millimeters, and differed from Protocol A only in that the average electrical conductivity test described above was not performed (because the MCI machine is not designed for other than 16 millimeter PDCs). *See* Tr. (German) at 165:15-166:13. Protocol C was used in testing leached cutters for purposes now relevant to patents which have been withdrawn from this investigation. *See id.*; CX-0381C. Protocol D was used to determine cobalt concentration, because of a concern that leaching a PDC might produce a non-uniform concentration, or cobalt gradient, thereby changing the characteristics of even the unleached portion of the PDC. *See* Tr. (German) at 166:14-169:13; CDX-0003C.68-.69. ; CX-0374C.228; CDX-0003C.70-.71; CX-0374C.229; CDX-0003C.69, .71. Protocol D is discussed in greater detail below in connection with representativeness. Respondents raise no objections to these protocols other than those addressed elsewhere.

# V. SF DIAMOND'S REDESIGNED

As noted, SF Diamond alleges that it designed, implemented, and imported certain PDCs, designated the that are "properly within the scope of this Investigation." RIB at 29.

USS argues that the products should not be adjudicated. CIB at 31.

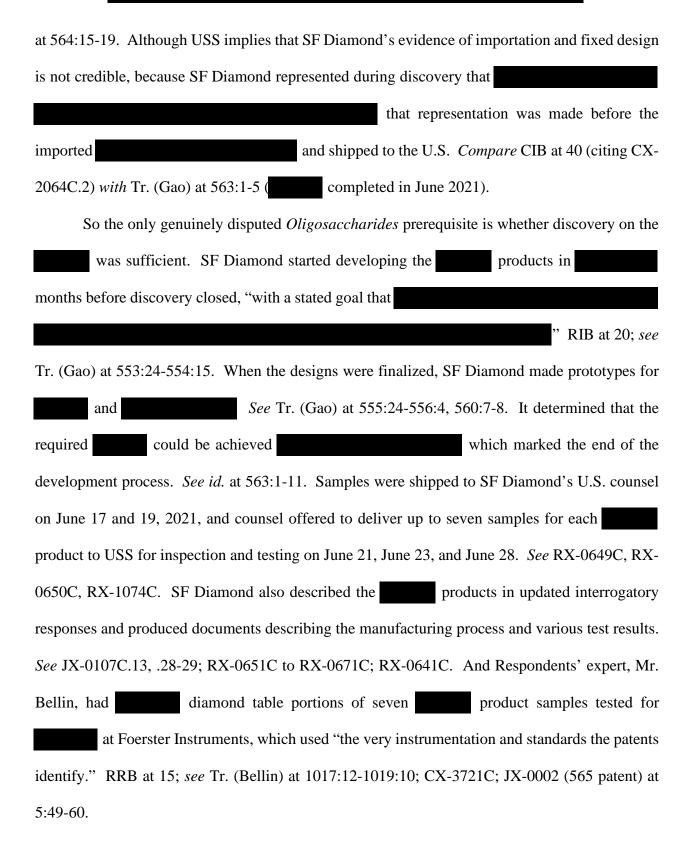
The Commission has held:

[T]hat the test for determining whether a respondent has met its burden for adjudication of a redesigned or alternative product includes four factors: (1) whether the product is within the scope of the investigation; (2) whether it has been imported; (3) whether it is sufficiently fixed in design; and (4) whether it has been sufficiently disclosed by respondent during discovery. *See Two-Way Radio*, 2018 WL 8648379 at \*13-14.

Certain Human Milk Oligosaccharides and Methods of Producing the Same, Inv. No. 337-TA-1120, Comm'n Op. at 18 (June 8, 2020) ("Oligosaccharides"), aff'd sub nom. Jennewein Biotechnologie GMBH v. ITC, No. 20-2220, 2021 WL 4250784 (Sep. 17, 2021). The Commission clarified that it has a standing "policy in favor of adjudicating redesigns to prevent subsequent and potentially burdensome proceedings that could have been resolved in the first instance in the original Commission investigation" (id.) and, despite factor (2) in the excerpt above, redesigns do not actually need to be imported at all (id. at 18 n.21). But see Certain Dental and Orthodontic Scanners and Software, Inv. No. 337-TA-1144, Comm'n Op. at 8 (Dec. 3, 2020) (confirming "affirmative" evidence of importation is necessary for an accused product)). As an example of the flexibility on this issue, the Commission held in Oligosaccharides that two documents produced during fact discovery (and one, a patent application containing no reference to the redesigned product name) qualified as "sufficient" discovery under factor (4). See Oligosaccharides at 14-15, 20-23. As another example, evidence of actual importation outweighed a request for admission ("RFA") response that importation had not occurred. See id. at 15, 20.

As PDCs made by SF Diamond, the articles plainly fall within the scope of the investigation, and USS does not assert otherwise. *See* CIB at 31. USS instead asserts that the products do not meet the other criteria enumerated by the Commission: (1) importation; (2) sufficiently fixed design; and (3) sufficient disclosure during discovery. *See id.* The record shows that about products have been imported, and USS concedes that at least one such product was shipped to SF Diamond's domestic counsel from overseas. *See* Tr. (Gao) at 564:20-24; CIB at 40. The record also shows that development of all seven A-Series products

SF Diamond has made no further changes to these products' design, and it has "no intention" of making any such changes. Tr. (Gao)



Clearly, the discovery involving the was much more fulsome than the discovery at issue in Oligosaccharides. USS nonetheless advances three arguments against a finding of sufficiency. First, USS argues that the Foerster Instruments test data, on which Mr. Bellin relied in concluding that the products did not infringe because was "withheld, altered, or erased." CIB at 32-35. Even accepting this as true, it only detracts slightly from the sufficiency of the discovery, because, as noted, the discovery was otherwise generous and samples were offered to USS for USS' own inspection and testing. Furthermore, it is not clear that the test results were altered; the allegedly suspicious evidence could easily have some innocent explanation, but the person who seemingly could explain it (Mr. Steven Webb) was not called to testify by any party. See CIB at 35. And Mr. Bellin did not "withdr[a]w his support for Respondents' position" when the discrepancies were pointed out to him. Id. Instead he agreed with examining counsel that he "reconsider[ed] [his] conclusion" on infringement, without stating his reconsidered opinion or other explanation. Tr. (Bellin) at 1068:21-24.

Third, USS argues that the first batch of offered samples were not produced until one week before the end of fact discovery, which did not give USS time to properly test them. *See* CIB at 37-39. USS has indeed presented substantial evidence that it would not have been able to fully test the samples in a reasonable amount of time. *See generally id*. For example,

Tr. (Bellin) at 960:17-961:2). At that rate, it would have taken Dr. German seven weeks to test the 35 samples, which is unreasonable in view of the discovery schedule, particularly the fact that initial expert reports were due about four weeks after SF Diamond produced the samples. *See* Order No. 37 at 10. But such evidence is ultimately irrelevant, because USS did not respond to SF Diamond's offers to inspect, did not request additional time for testing, did not move to supplement its contentions, and otherwise did essentially nothing to make its case that the infringe the asserted claims. *See id.* at 10, 12. Even if USS lacked the time to test every sample, it could have tested some in time for Dr. German to incorporate the results into his expert report, but it did not even do that.

USS thus failed to avail itself of the opportunity to develop its infringement case for even a single product. The remaining discovery – which, of course, largely comes from SF Diamond – amply exceeds any threshold established by *Oligosaccharides*, so the fourth criterion under that case is satisfied. Accordingly, the prerequisites to adjudication have all been established, and the products will be adjudicated.

## VI. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art is the same for all three patents. *See Markman* Order at 8. Specifically:

a person of ordinary skill in the art at the time of the invention would have had a bachelor's degree in physics, chemistry, materials science, metallurgical engineering, or an associated engineering field, with five years' experience in the design, manufacturing, and analysis of polycrystalline diamond compacts, with relevant experience substituting for education and vice versa.

Id.

On January 21, 2022, the United States Court of Appeals for the Federal Circuit decided *Kyocera Senco Industrial Tools Inc. v. ITC*, 22 F.4th 1369 (Jan. 21, 2022). In that case, experience in "power[ed] nailer design" was required to qualify as a skilled artisan. *Id.* at 1376. One of the complainant's experts, Dr. John Pratt, lacked such experience. *See id.* The Federal Circuit held that "[b]ecause Dr. Pratt lacked ordinary skill in the art," none of his testimony should have been admitted. *Id.* 

The parties were directed to brief the effect of *Kyocera* on this investigation. *See* Order No. 59 (Jan. 24, 2022). The relevant order observed that Respondents had raised an issue with respect to Dr. German "similar" to what had been raised in *Kyocera*, but otherwise did not suggest any possible relief. *Id.* (citing RIB at 21). The parties filed the requested briefs on January 31, 2022. *See* EDIS Doc. ID No. 761897 ("USS *Kyocera* Br."); EDIS Doc. ID No. 761952 ("Resp. *Kyocera* Br.").

Respondents request that Dr. German's testimony be excluded or accorded no weight on five particular issues. *See* Resp. *Kyocera* Br. at 5. They contend that Dr. German "has no PDC experience" and "is not a POSA," and more specifically that he lacks experience in PDC "analysis." *Id.* at 2-3, 5. Although they also reiterate that he lacks experience in PDC testing, "DDC "testing," as opposed to "analysis," is not required under the definition of a skilled artisan. *See id.*; *Markman* Order at 8.

As for weight, *Kyocera* says nothing about how to credit an expert's testimony. Under *Kyocera*, the question presented is instead binary: either an expert's testimony is admitted or it is excluded. How much weight to accord an expert's testimony, if that testimony is admitted, is determined by other precedent and by the record as a whole. So *Kyocera* does not alone offer a basis for disregarding an expert's testimony.

As for exclusion, Dr. German has a bachelor's in materials science and engineering, a master's in metallurgical engineering, and a doctorate in mechanical engineering "with materials option." Tr. (German) at 109:22-110:3. His experience with PDCs in particular (as opposed to other sintered products) began in the late 1990's when working with Smith, which is now part of Schlumberger. *See id.* at 113:4-21. For Smith he worked on thermal fatigue associated with drilling operations, as well as "rapid prototyping." *Id.* He has also consulted on several projects for Element Six, formerly a respondent in this investigation, and taught a course for that company in 2020, and he characterizes his work for them as "pretty much continuously involved." *Id.* 

Again, the definition of a skilled artisan here has three components, education, experience, and substitutional flexibility; this last component was notably absent from the definition in *Kyocera*. *See Markman* Order at 8; *Kyocera*, 22 F.4th at 1376. Dr. German's education amply exceeds the minimum, so it can substitute for experience. His PDC-related experience includes working on thermal fatigue, which would seem to implicate analysis, rapid prototyping, which would seem to implicate at least design and manufacturing, and several projects of an unidentified nature (but presumably related broadly to engineering) for Element Six, a PDC manufacturer. Even assuming that his experience falls short of the requisite for a skilled artisan, his combination of education and experience clearly meets the requirements. And although he did not disagree with my comment that he "had a lot of experience with cemented carbides" but not "so much experience with polycrystalline diamond," he nonetheless testified that he met the required level of skill. *See* Tr. (German) at 114:1-3, 431:3-14.

So Dr. German's testimony will not be excluded. Respondents seek no other relief, and USS seeks no relief at all, so no relief under *Kyocera* will be granted. *See generally* USS *Kyocera* Br.; Resp. *Kyocera* Br.

#### VII. U.S. PATENT NO. 10,507,565

# A. Representative Products

An issue central to infringement, for all patents and all claims, is representativeness. The Respondents each make and import a number of different PDC products from China and South Korea into the United States. CIB at 1. The Wanlong and Jingrui Respondents agreed to designate one of their products, the ZT2-B for Wanlong and the R22 1613 for Jingrui, as representative of certain other products. *See* JX-0503C. CR Gems stipulated regarding infringement as to three products: SY-01, GPCD-MY69, and GPCD-CRM. *See* JX-0500C. The remaining manufacturer Respondents, SF Diamond, Iljin, New Asia, Juxin, and Haimingrun, did not agree to any representative products. *See* CIB at 48.

Dr. German testified that most of the accused products are defined in "Product Series" comprising PDCs of varying sizes that are manufactured "with essentially identical manufacturing conditions." Tr. (German) at 253:21-254:10; CDX-0003C.242-244. Dr. German further testified that if two PDCs "are made in the same way, but just simply different in diameter, the intrinsic kind of properties that we're dealing with, but the material properties like average grain size are going to be the same, in spite of the change from cutter diameter." Tr. (German) at 253:15-254:10. That is, "if the sintering time is similar, the sintering pressure is similar, if the particle makeup is similar, and the substrate is similar, then we're looking at really a similar product that may be just different dimensions." *Id.* at 254:23-256:22. Most of the individual Accused Products Dr. German opined were representative were size 1613 models, i.e., 16 millimeters wide by 13 millimeters high:

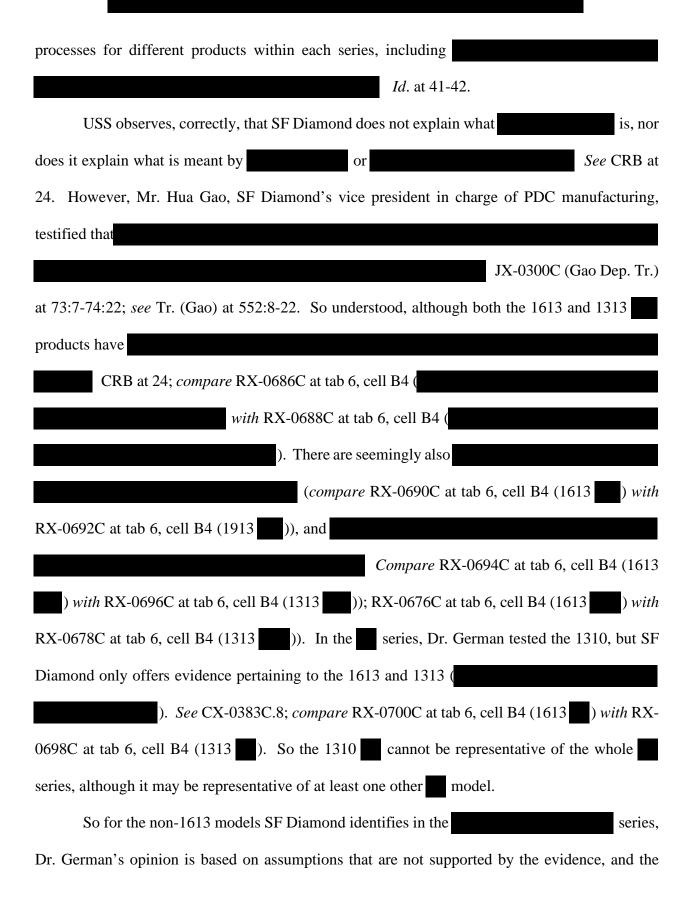
Party	Tested Product	Infringing Product Series	Claims Addressed by Representative Produ Analysis		
			′565	′502	′306
lljin	UP8N 1613	UP8N	1	1	
ljin	UP9N 1613	UP9N	1	1	
New Asia / IDS			1	1	15
SF Diamond	1613		1	1	15
	613/		1	1	15
SF Diamond	SIA 1613			1	15
SF Diamond	ETP 1613		1	1	15
SF Diamond	GP 1310			1	15
Haimingrun			1	1	
Haimingrun	888		1	1	15
Haimingrun				1	
Juxin				1	15
Juxin				1	
Juxin				1	15
Juxin	-U-			1	15

See CDX-0003C.248; Tr. (Bertagnolli) at 106:23-107:23.

Each of the Respondents for which Dr. German's representative assertions applies raised a number of objections. *See* RIB at 41-45. Respondents also elicited expert testimony from Dr. Schaefer on the subject. *See* Tr. (Schaefer) at 892:18-897:9. However, as relevant here Dr. Schaefer's testimony is not especially helpful, and is most probative on the question of how chamfer (the bevel formed at the edge of the diamond table) affects electrical and magnetic properties. *See id.* at 893:23-894:22; RDX-0002C.187-.188. But Respondents do not assert that chamfer makes a difference to representativeness, and do not otherwise rely on Dr. Schaefer's testimony. *See* RIB at 41-45. So Dr. Schaefer's testimony on this issue is accorded little weight.

## 1. SF Diamond Products

SF Diamond manufactures the largest variety of Accused Products, totaling approximately 63 models across five product series: (8 models), (14 models), (3 models), (35 models), and (3 models). See CDX-0003C.248; see generally JX-0135C. SF Diamond argues that Dr. German's assumptions that the products within each series all have the same manufacturing parameters are misplaced, and the documents on which he relies "in making his assumptions show the opposite." RIB at 41. SF Diamond lists differences in the manufacturing



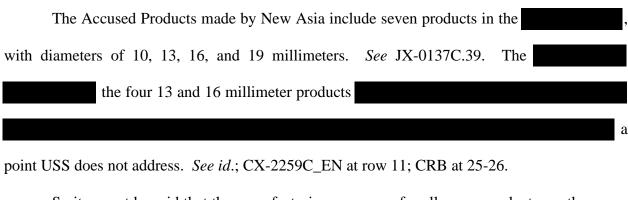
1613 samples cannot be considered representative of them. Nor can the 1310 be considered representative of any other model in the series. Otherwise, Dr. German's opinion stands unrebutted, and the 1613 samples he analyzed are representative of the other Accused Products in their respective series made by SF Diamond. *See generally* JX-0135C.

# 2. Iljin Products

The Accused Products made by Iljin include 12 products in the UP8N series and three in the UP9N series. See JX-0502C.3. Iljin initially produced discovery stating that all these products are manufactured with a maximum sintering pressure of " " (JX-0131C.11), but later clarified that Iliin "has not measured the maximum sintering pressure" for PDCs other than (JX-0131C.12). See JX-0142C (Park Dep. Tr.) at 85:20-87:2. So there is no evidence of what the maximum sintering pressure is for at least See JX-0131C.10; JX-0502C.3. USS argues that CX-7404C demonstrates CRB at 25. Otherwise, the manufacturing processes for the relevant Iliin PDCs ( See JX-0131C.10. Iljin admits that its 16 millimeter UP8N and UP9N products are made using the RIB at 43. Mr. Baegun Park, a manager of Iljin's PDC team, testified that the sintering parameters for products made See JX-0142C (Park Dep. Tr.) at 26:9-14, 151:11-152:2. And Iljin also appears to admit that the ' See RIB at 43.

So for those five models that are not clearly 16 millimeters in diameter, Dr. German's opinion is based on assumptions that are not supported by the evidence, and the 1613 samples cannot be considered representative of them. Otherwise, Dr. German's opinion stands unrebutted, and the 1613 samples are representative of the ten remaining Accused Products made by Iljin.

#### 3. New Asia Products

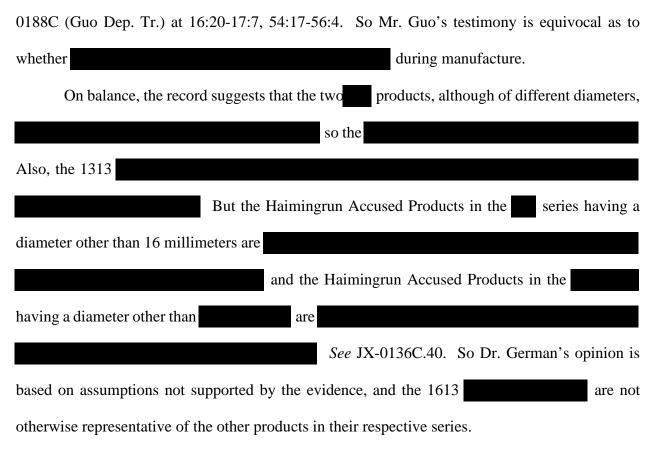


So it cannot be said that the manufacturing processes for all seven products are the same, and Dr. German's opinion is based on assumptions that are not supported by the evidence. The

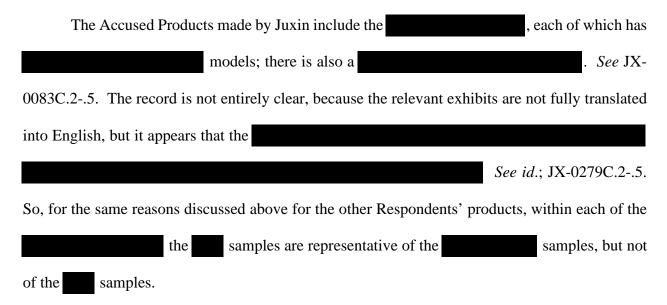
1613 are therefore representative of the but not of the

## 4. Haimingrun Products

The Accused Products made by Haimingrun include two products, two products, and five products. See JX-0136C.40. The but the other products are each made with a different and the is also made with a from that of the other eight Accused Products. Id. Although Mr. Dameng Guo, Haimingrun's vice president in charge of research and development, testified that



#### 5. Juxin Products



#### 6. Unleached PDCs Relative to Unleached Portions of Leached PDCs

Dr. German also opined that although he based his infringement analysis on testing of unleached PDCs, "if [a PDC] is infringing in the unleached condition, even [if an identical PDC]

is leached, one would assume that the unleached portion of that [PDC] is infringing." Tr. (German at 251:9-252:4. He therefore had testing conducted pursuant to Protocol D, where the PDC is cut to access its cross-section, examined using a scanning electronic microscope, and tested for cobalt concentration using a functionality of the microscope called "energy dispersive spectroscopy." *Id.* at 164:9-16, 166:14-167:7. Based on these tests, Dr. German opined that there was no "significant" cobalt gradient throughout the depth of the tested PDCs, for both single-layer and multilayer samples, and thus, the unleached portion of a PDC is representative of the fully unleached PDC before it was leached. Tr. (German) at 309:7-312:10; *see* CDX-0003C.253-.254.

Inasmuch as Respondents argue that Dr. German's "infringement analysis was based on the [faulty] premise that identifying one sample out of the five or ten that was tested was sufficient," that argument is not accepted for the reasons discussed above. RIB at 45 (citing Tr. (German) at 386:4-21, 141:7-14). Otherwise, Respondents advance three leaching-related representativeness arguments, and support those arguments with the testimony of Dr. Schaefer, whose opinion on this issue is more probative than it is on representativeness in general. *See* RIB at 45-47 (citing Tr. (Schaefer) at 894:21-897:9).

First, Respondents argue that Dr. German's testing shows the cobalt content of the PDCs is not homogeneous, that is, it varies with depth from the surface, especially in multilayered PDCs with varying diamond grain size. *See* RIB at 45. Even accepting Dr. Schaefer's characterization of the cobalt concentration as "USS correctly notes that his opinion is based on analysis of a PDC not accused of infringement. *See* RIB at 45-46 (citing RX-0617, RX-0618); Tr. (Schaefer) at 896:11-25 (citing RDX-0002C.191); CRB at 27 (citing CX-0383C.2, .8). Moreover, even as to Accused Products, Dr. Schaefer does not clearly explain how the makes a difference to the representativeness analysis. *See* Tr.

(Schaefer) at 894:9-896:10; CX-3903C (

). And again, Dr. German opined that the cobalt gradient is not "significant," and Dr. Schaefer's opinion is not clearly inconsistent with that. Tr. (German) at 309:7-312:10.

Second, Respondents argue that because leaching depth may vary across the surface of the diamond table, may be larger at the sides of the cutter, and may form an irregular interface between leached and unleached regions, "the resulting unleached portion that would remain would have an uneven working surface, a smaller surface area, a smaller thickness of the diamond table, and differently shaped and angled edges than the original leached." RIB at 46. Again, though, Respondents rely on analysis of a PDC that is not an Accused Product (an Iljin K5 model). *See* RDX-0002C.189, RX-0620C.11-.12. And Dr. Schaefer admitted on cross examination that the Iljin K5 example he used to illustrate his point was not necessarily characteristic of the Accused Products. *See* Tr. (Schaefer) at 946:7-24.

Third, Respondents argue that for a multilayer PDC, leaching affects the top layer differently than it affects layers closer to the substrate, and thus, the unleached portion is "compositionally different" from the unleached version of the entire cutter. RIB at 47. This would be relevant if the entire top layer of an Accused Product were leached, but there is no evidence this is the case. *See* CRB at 28. Moreover, the claims have not been construed to require that an "unleached portion" must correspond exactly to an entire unleached layer. *See Markman* Order at 22-24.

Overall, therefore, Dr. German's opinion, to the effect that an unleached Accused Product is representative of the unleached portion of a leached Accused Product, is credible.

#### B. Asserted Claims of the 565 Patent

Claims 1, 2, 4, 6, and 18 of the 565 patent remain at issue in this investigation, either through allegations of infringement or of domestic industry. These claims are:

- 1. A polycrystalline diamond compact, comprising:
- a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:
- a plurality of diamond grains directly bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 µm or less;
- a catalyst occupying at least a portion of the interstitial regions;
- wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe or more;
- wherein the unleached portion of the polycrystalline diamond table of exhibits an average electrical conductivity of less than about 1200 S/m; and
- wherein the unleached portion of the polycrystalline diamond table exhibits a  $G_{ratio}$  of at least about 4.0x 10<sup>6</sup>; and
- a substrate bonded to the polycrystalline diamond table.
- 2. The polycrystalline diamond compact of claim 1 wherein the coercivity is about 115 Oe to about 250 Oe.
- 4. The polycrystalline diamond compact of claim 1 wherein the unleached portion of the polycrystalline diamond table exhibits a specific magnetic saturation of about 15 G·cm3/g or less.
- 6. The polycrystalline diamond compact of claim 1 wherein the average electrical conductivity is about 25 S/m to about 1000 S/m.
- 18. A polycrystalline diamond compact, comprising:
- a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:
- a plurality of diamond grains directly bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 30 µm or less;
- a catalyst occupying at least a portion of the interstitial regions;
- wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe to about 175 Oe;
- wherein the unleached portion of the polycrystalline diamond table exhibits an average electrical conductivity of less than about 1200 S/m; and
- wherein the unleached portion of the polycrystalline diamond table exhibits a thermal stability, as determined by distance cut, prior to failure in a vertical lathe test, of at least about 1300 m.

JX-0002 (565 patent). To summarize:

Claim #	<b>Depends</b> from	Grain Size	Coercivity	Specific Magnetic Saturation	Average Electrical Conductivity	G-Ratio	Thermal Stability
1	Ind.	< 50	>115		< 1200	$>4 \times 10^6$	
2	1	< 50	115 - 250		< 1200	$>4 \times 10^6$	
4	1	< 50	>115	< 15	< 1200	$>4 \times 10^6$	
6	1	< 50	>115		25 – 1000	$>4 \times 10^6$	
18	Ind.	< 30	115 - 175		< 1200		>1300

RIB at 19.

# C. Infringement

Except for two groups of Accused Products, the SF Diamond and the Iljin UP8N and UP9N, Respondents do not contest the evidence of infringement beyond the points outlined above. *See* RIB at 33-35. USS does not present any case for infringement of the Diamond has presented evidence that

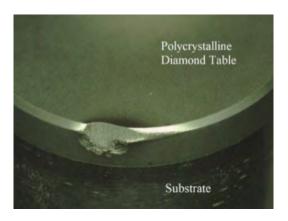
See RX-0622C.8, RX-0651C through RX-0671C; Tr. (Bellin) at 1019:11-1020:6. So the SF Diamond products do not infringe any claim of the 565 patent.

USS otherwise offers Dr. German's opinion combined with his test results as proof of infringement. *E.g.*, CIB at 41-44. Dr. German tested hundreds of accused products, however, and to discuss each individual product would be unnecessarily burdensome. Dr. German's results for all products tested (including ones not accused of infringement) are given in Exhibits CX-3894C to CX-7404C, and CX-0383C summarizes them in tabular form. Because of this voluminous data, USS provides an element-by-element infringement analysis only of independent claims 1 and 18, using Iljin's 1613 UP8N and as the representative products, with shorthand identifiers for each element. *See* CIB at 41-47.

#### 1. Claim 1

# a. [565.1.a] A polycrystalline diamond compact, comprising:

The 1613 UP8N is a compact of PCD and a substrate. CX-7354C. Dr. German explained that "the diamond is attached to the substrate so it's a PDC." Tr. (German) at 181:9-14; CDX-0003C.87. This is readily seen in an image of the PDC after wear testing:



See CX-7354C.

# b. [565.1.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:

The 1613 UP8N contains a polycrystalline diamond table with at least an unleached portion, as construed (*see Markman* Order at 24), because a portion of the PCD table of the 1613 UP8N is substantially unaffected by leaching (*see* CX-7219C). Pointing to an SEM cross-section of the UP8N, Dr. German explained that "the cobalt regions are glowing white. The diamond is black . . . [i]t's unleached and it's polycrystalline." Tr. (German) at 181:24-182:21 (citing CX-7219C); CDX-0003C.88.

c. [565.1.c] a plurality of diamond grains directly bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 µm or less;

Dr. German testified that the unleached portion is "directly bonded diamond-to-diamond, evidenced in the EBSD image cross-section." Tr. (German) at 182:24-183:6 (citing CX-7345C). Dr. German further stated that the average grain size analysis he performed yielded "

micrometers as the average grain size" for the plurality of diamond grains he analyzed under EBSD. *Id.* at 183:7-12 (citing CX-7217C). The red ovals apparently indicate the diamond-to-diamond bonds:



See CX-7345C.

# d. [565.1.d] a catalyst occupying at least a portion of the interstitial regions;

NSL Analytical reported a cobalt weight of approximately for sample BAAAA.02, which corresponds to a UP8N sample. *See* CX-7107C; CX-0383C.2. And Dr. German testified that the electron microscope image of a cross-section of a UP8N sample shows that the cobalt occupies the interstitial regions between the diamond grains. *See* Tr. (German) at 185:20-186:7; CX-7219C.

# e. [565.1.e] wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe or more;

The unleached portion of sample BAAAA.02 exhibited a coercivity of Oe, and the other two UP8N samples tested exhibited coercivities of See Tr. (German) at 186:8-13 (citing CX-4455C); CX-0383C.2. And Iljin has offered evidence that it had one UP8N sample tested, with a result of See RX-0888C.1.

f. [565.1.f] wherein the unleached portion of the polycrystalline diamond table of exhibits an average electrical conductivity of less than about 1200 S/m; and

The unleached portion of sample BAAAA.02 exhibited an average electrical conductivity of and the other two UP8N samples selected for destructive testing exhibited average conductivities of See Tr. (German) at 186:17-23 (citing CX-4464C); CX-0383C.2. Admittedly, the ten tested UP8N samples have average electrical conductivity that is "scattered all over the place." Tr. (Schaefer) at 886:21. Nonetheless, UP8N samples tested for any purpose exhibited average electrical conductivity of less than 1200 S/m. See CX-0383C.2. So while it is true that such evidence does not prove that "each of the Iljin products meet the electrical conductivity" limitation of claim 1, it does show that the tested UP8N samples do. RIB at 35.

g. [565.1.g] wherein the unleached portion of the polycrystalline diamond table exhibits a Gratio of at least about  $4.0 \times 10^6$ ; and

The unleached portion of sample BAAAA.02 exhibited a G-Ratio of and the other two UP8N samples selected for destructive testing exhibited G-Ratios of and See Tr. (German) at 187:2-13 (citing CX-4569C); CX-0383C.2.

h. [565.1.h] a substrate bonded to the polycrystalline diamond table.

The 1613 UP8N has a substrate bonded to the PCD table; as Dr. German noted, "the bonding is, I think, relatively evident by the fact that it survived that [G-Ratio] test without coming apart." Tr. (German) at 187:17-188:1.

#### 2. Claim 18:

a. [565.18.a] A polycrystalline diamond compact, comprising:

The 1613 is a compact of PCD and a substrate. *See* CX-7373C. Dr. German explained that Exhibit CX-7373C is a "picture of the substrate bonded to the diamond table, so it is a polycrystalline diamond compact." Tr. (German) at 202:14-19.

b. [565.18.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:

Dr. German explained that Exhibit CX-7288C demonstrates a portion of the polycrystalline diamond table of the 1613 that is substantially unaffected by leaching. Tr. (German) at 202:20-203:5. Pointing to CX-7288C, he noted "the image here shows the diamond grains that are dark [and] the specks of white are then the cobalt inclusions." *Id*.

c. [565.18.c] a plurality of diamond grains directly bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 30 µm or less;

Dr. German testified that "[t]he EBSD data is giving us the image that shows the diamond bonding." Tr. (German) at 203:6-16 (citing CX-7378C). He further testified that he obtained a "measured intercept average grain size" of 5.059 micrometers for "the plurality of grains" chosen for analysis under EBSD. Tr. (German) at 203:6-25.

d. [565.18.d] a catalyst occupying at least a portion of the interstitial regions;

NSL Analytical reported a cobalt weight of approximately 8.68% for sample BXXXX.02, which corresponds to an sample. *See* CX-7116C.4; CX-0383C.6. And Dr. German testified that the electron microscope image of a cross-section of the sample shows that the cobalt occupies the interstitial regions between the diamond grains. *See* Tr. (German) at 204:1-7; CX-7288C.

e. [565.18.e] wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe to about 175 Oe;

The unleached portion of sample BXXXX.02 exhibited a coercivity of 170.6 Oe, and the other two samples tested exhibited coercivities of 173.9 Oe and 186.8 Oe. *See* Tr. (German) at 204:22-205:1; CX-6912C; CX-0383C.6. Iljin has offered evidence that it tested one UP8N sample and one UP9N sample, with resulting coercivities of respectively. *See* RIB at 35 (citing RX-0888C.1). Even accepting such evidence, however, at least two samples exhibited coercivities ranging from 161.9 Oe (sample BBBBB.07) to 173.9 Oe (sample BXXXX.07). *See* CX-0383C.2-.3, .6. Moreover, Iljin's evidence is not as reliable as USS', both because USS tested more samples, and because Dr. German calibrated his equipment while it is unclear whether the testing laboratory Iljin retained did so. *See* Tr. (German) at 156:6-9; Tr. (Schaefer) at 939:17-942:9.

f. [565.18.f] wherein the unleached portion of the polycrystalline diamond table exhibits an average electrical conductivity of less than about 1200 S/m; and,

The unleached portion of sample BXXXX.02 exhibited an average electrical conductivity of 904 S/m, and the other two samples selected for destructive testing exhibited average conductivities of 959 S/m and 1011 S/m. *See* Tr. (German) at 205:5-9; CX-6924C; CX-0383C.6. And five out of the ten samples tested for any purpose exhibited average electrical conductivity of less than 1200 S/m. *See* CX-0383C.6.

g. [565.18.g] wherein the unleached portion of the polycrystalline diamond table exhibits a thermal stability, as determined by distance cut, prior to failure in a vertical lathe test, of at least about 1300 m.

Dr. German testified that the unleached portion of sample BXXXX.05 exhibited a thermal stability, as determined by distance cut, prior to failure in a vertical lathe test, of 3460 m. *See* Tr. (German) at 205:10-21; CX-6905C.

#### 3. Other Accused Products and Dependent Claims

Dr. German testified that he used the same test procedures and applied his analysis of the test results consistently against each product he tested. *See* Tr. (German) at 173:12-174:9, 175:3-176:14, 188:18-189:21. USS prepared a tabular summary of some of Dr. German's testing. *See* CIB at 47. An entry of "3/3," for instance, means that out of three samples tested for a given element, all three were found to be within the claimed range. *Id.* An empty entry means that the given product was not accused under a claim with the given claim parameter:

			Average Grain Size	Coercivity	Average Electrical Conductivity	G-Ratio	Thermal Stability
			about 50 µm or less	about 115 Oe or more	less than about 1200 S/m	at least about $4.0 \times 10^6$	at least about 1300 m
Iljin	UP8N	BAAAA					
	UP9N	BBBBB					
		BCCCC	3/3	3/3	10/10	3/3	
SF Diamond		BEEEE	3/3	3/3	10/10	3/3	
		BXXXX	3/3	3/3	5/10	3/3	1/1
	ũ	BLLLL	3/3	3/3	9/10	3/3	
		винин	3/3	3/3	9/10	3/3	
Jingrui	R22	BGGGG	3/3	3/3	10/10	3/3	1/1
Wanlong	ZT2-B	ВШП	3/3	3/3	5/5	3/3	1/1

See also CDX-0003C.78; CX-0383C.

USS did not separately discuss the infringement of dependent claims 2, 4 and 6. However, USS presented a table that "summarizes each Accused Product, a citation to the transcript wherein Dr. German discussed the Accused Product and the claims it infringes [including the dependent claims], as well the demonstratives Dr. German used to summarize evidence that he used to determine that the given Accused Product infringed the claim." CIB at 47-48.

Respondent	Product	'565 Claim	10.18 Transcript	Demonstratives
Iljin	UP8N	1	181:2-188:17	CDX-0003C.86-98
		2,4	190:23-191:17	CDX-0003C.100
	UP9N	1	190:1-190:22	CDX-0003C.99
		2,4,6	190:23-191:17	CDX-0003C.100
		18	205:23-206:10	CDX-0003C.137
	1	1	192:1-192:23	CDX-0003C.102
	1 - 1 - 1 - 1	2,4	193:7-193:16	CDX-0003C.104
		18	202:5-205:21	CDX-0003C.126-135
SF Diamond		1	192:24-193:6	CDX-0003C.103
		2,4,6	193:7-193:13,	CDX-0003C.104
			193:17-193:19	
		1	193:24-194:17	CDX-0003C.106
		2,4,6	194:18-194:22	CDX-0003C.107
		1	195:2-195:20	CDX-0003C.109
		2,4	196:7-196:12	CDX-0003C.111
		1	195:21-196:6	CDX-0003C.110
		2,4,6	196:7-196:12	CDX-0003C.111
Jingrui	R22	1	196:13-197:6	CDX-0003C.113
		2,4,6	197:7-197:10	CDX-0003C.114
		18	206:11-206:20	CDX-0003C.139
Wanlong	ZT2-B	1	197:11-198:13	CDX-0003C.116
		2,4,6	198:14-198:16	CDX-0003C.117
		18	206:21-207:7	CDX-0003C.141

## See also CX-0383C.

Certain details should be noted. First, although Dr. German opined that the SF Diamond samples were representative of the entire series (an opinion partly rejected above), his testing showed that only one out of ten 1613 samples infringed claim 1. See CDX-0003C.248; CX-0383C.8 (sample BWWWW.02, exhibiting average electrical conductivity of 1136 S/m). Apparently, therefore, the only SF Diamond series USS now accuses of infringing the series, and only as to claims 1, 2, 4, and possibly 6. Compare CIB at 47-48 (accusing of infringing claims 1, 2, 4, and 6) with CDX-0003C.82 (accusing of infringing only claims 1, 2, and 4). In fact, the three tested samples satisfied the requirements of claims 1, 2, and 4, and eight of ten samples satisfied claim 6's requirement that average electrical

conductivity be between 25 and 1000 S/m. *See* CX-0383C.3. Assuming USS still accuses SF Diamond's series of infringing claim 6, therefore, USS has proven such infringement.

UP9N samples exhibited Iljin UP8N samples and Second, average electrical conductivity of less than 1200 S/m, and otherwise all satisfied the limitations of both claims 1 and 2. Claim 6 requires that average electrical conductivity be between 25 and 1000 S/m, and this was satisfied by UP9N samples (USS evidently no longer accuses UP8N of infringing claim 6). See CX-0383C.2-.3. Claim 4 additionally requires a specific magnetic saturation of less than 15 Gcm<sup>3</sup>/g, and Dr. German's testing showed that UP8N and UP9N samples met that requirement. See id. Iljin has offered evidence that it tested one sample of each product, and that both exhibited specific magnetic saturation exceeding 15 Gcm<sup>3</sup>/g. See RIB at 35 (citing JX-0130C.29). The samples Iljin tested had chamfers while the samples USS tested had chamfers, however, and Dr. Schaefer explained that the difference in chamfer explains the difference in measured magnetic saturation. See JX-0130C.29; Tr. (Schaefer) at 893:23-894:22. Moreover, except for a disclosure in a discovery response the evidence of Iljin's testing is missing from the record. See JX-0130C.29. So although Iljin's testing does suggest that geometry affects magnetic saturation measurement, it does not undermine the conclusion that USS has shown infringement of claim 4 by the tested UP8N and UP9N samples, and by the other products for which they are representative.

Third, although Respondents do not otherwise challenge the USS infringement evidence, broadly speaking the remaining tested products satisfied the claims USS accuses them of infringing. *See generally* CX-0383C. Specifically:

- All tested samples of the satisfied the requirements of claims 1, 2, and 6, and two of the three tested samples satisfied the specific magnetic saturation limitation of claim 4. *See* CX-0383C.3.
- All tested samples of the satisfied the requirements of claims 1, 2, and 4, except for one sample of each that exhibited an average electrical conductivity above 1200 S/m, and seven out of ten S18 samples exhibited average electrical conductivities within the range required by claim 6. *See* CX-0383C.3-.4.
- All tested samples of the Jingrui R22 product (which Jingrui stipulated was representative of the R11A product) satisfied the requirements of claims 1, 2, 4, 6, and 18. *See* CX-0383C.3; JX-0503C.3.
- All tested samples of the Wanlong ZT2-B product satisfied the requirements of claims 1, 2, 4, 6, and 18. *See* CX-0383C.4. Wanlong stipulated that the ZT2-B product is representative of the ZTA, RP2, and RPA products, but Dr. German tested them anyway. *See id.*; JX-0503C.3. The stipulation is accepted, although testing showed that the RP2 product did not infringe any claim, because all tested samples exhibited an average electrical conductivity above 1200 S/m. *See* CX-0383C.5. The testing also showed that the ZTA product satisfied the requirements of claims 1, 2, 4, and 18, except only five out of ten tested samples exhibited an average electrical conductivity below 1200 S/m. *See id.* All tested samples of the RPA product, however, satisfied all limitations of claims 1, 2, 4, 6, and 18. *See id.*
- CR Gems stipulated to infringement of claims 1, 2, 4, and 6 by its GPCD-MY69 and GPCD-CRM products. *See* JX-0500C. This stipulation is accepted, although Dr. German's testing suggests that claim 4 is probably not infringed. *See* CX-0383C.4-.6.

In summary, USS has proven infringement of the claims of the 565 patent by certain Accused Products, as well as by those Accused Products as to which representativeness applies. With two exceptions, the infringing Accused Products (and, for Jingrui and Wanlong, the Accused Products as to which representativeness applies) are accurately listed in the demonstrative Dr. German prepared:

Party	Infringing Product Series	Asserted Claims Practiced				
		'565	′502	′306		
Iljin	UP8N	1, 2, 4	1, 2, 11			
	UP9N	1, 2, 4, 6, 18	1, 2, 11			
		1, 2, 4, 6	1, 2, 11	15		
SF			1, 2, 11	15		
Diamond	İ		1, 2, 11	15		
	i i	1, 2, 4	1, 2, 11	15		
			1, 2, 11	15		
		1, 2, 4, 18	1, 2, 11, 15, 21	15		
		1, 2, 4	1, 2, 11			
		1, 2, 4, 6	1, 2, 11	15		
			1, 2, 11			
		1	1. 2, 11			
		-	1, 2, 11	1 =		
			1, 2, 11	15		
			1, 2, 11	15		
Jingrui	R11A	1, 2, 4, 6, 18	1, 2, 11, 15, 21			
	R22	1, 2, 4, 6, 18	1, 2, 11, 15, 21			
Wanlong	ZT2-B	1, 2, 4, 6, 18	15			
	ZTA-B	1, 2, 4, 18	15			
	RPA-B	1, 2, 4, 6, 18	15			
	RP2-B	1, 2, 4, 6, 18	15			
CR Gems*	GPCD-CRM	1, 2. 4, 6	1, 11	1 :		
	GPCD- My69	1, 2, 4, 6	1, 11			

CDX-0003C.82. The exceptions, as noted, are the SF Diamond which infringes claim 6, and the Wanlong RP2, which does not infringe any claim (although Wanlong stipulated that it does by virtue of representativeness).

## 4. Doctrine of Equivalents and Indirect Infringement

USS does not allege that any Accused Product infringes the 565 patent under the doctrine of equivalents or under any theory of indirect infringement. *See generally* CIB at 40-56.

### VIII. U.S. PATENT NO. 10,508,502

Many of the same issues presented and resolved in connection with the 565 patent are also raised or implicated in connection with the 502 patent (e.g., representativeness, the level of ordinary skill in the art and whether the experts satisfy it, and so forth), and need not be revisited.

#### A. The Asserted Claims of the 502 Patent

Claims 1, 2, 11, 15, and 21 of the 502 patent remain at issue in this investigation, either through allegations of infringement or of the domestic industry technical prong. CIB at 9. Claims 2 and 11 depend from independent claim 1, and claim 21 depends from independent claim 15:

- 1. A polycrystalline diamond compact, comprising:
- a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:
- a plurality of diamond grains bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 µm or less; and
- a catalyst including cobalt, the catalyst occupying at least a portion of the interstitial regions;
- wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe to 250 Oe;
- wherein the unleached portion of the polycrystalline diamond table exhibits a specific permeability less than about  $0.10 \text{ G} \cdot \text{cm}^3/\text{g} \cdot \text{Oe}$ ; and
- a substrate bonded to the polycrystalline diamond table along an interfacial surface, the interfacial surface exhibiting a substantially planar topography;
- wherein a lateral dimension of the polycrystalline diamond table is about 0.8 cm to about 1.9 cm.

- 2. The polycrystalline diamond compact of claim 1 wherein the unleached portion of the polycrystalline diamond table exhibits a specific magnetic saturation of about 15  $\text{G}\cdot\text{cm}^3/\text{g}$  or less.
- 11. The polycrystalline diamond compact of claim 1 wherein the lateral dimension of the polycrystalline diamond table is about 1.3 cm to about 1.9 cm.
- 15. A polycrystalline diamond compact, comprising:
- a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:
- a plurality of diamond grains bonded together via diamond-to-diamond bonding to define defining interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 µm or less; and
- a catalyst including cobalt, the catalyst occupying at least a portion of the interstitial regions;

wherein the unleached portion of the polycrystalline diamond table exhibits:

- a coercivity of about 115 Oe to about 250 Oe;
- a specific magnetic saturation of about 10 G·cm3/g to about 15 G·cm3/g; and
- a thermal stability, as determined by a distance cut, prior to failure in a vertical lathe test, of about 1300 m to about 3950 m;
- wherein a lateral dimension of the polycrystalline diamond table is about 0.8 cm or more.
- 21. The polycrystalline diamond compact of claim 15 wherein the unleached portion of the polycrystalline diamond table exhibits a specific permeability less than about 0.10 G·cm<sup>3</sup>/g·Oe.

### JX-0003 (502 patent). To summarize:

Claim #	Depends from	Grain Size	Coercivity	Magnetic Saturation	Specific Permeability	Thermal Stability	Lateral	Substantially Planar
1	Ind.	< 50	115 - 250		< 0.10		0.8 - 1.9	Y
2	1	< 50	115 - 250	<15	< 0.10		0.8 - 1.9	Y
11	1	< 50	115 - 250		< 0.10	i haran Ari	1.3 - 1.9	Y
15	Ind.	< 50	115 - 250	10 - 15		1300 - 3950	>0.8	
21	15	< 50	115 - 250	10 - 15	< 0.10	1300 - 3950	>0.8	

RIB at 133.

## B. Infringement

As with the 565 patent, USS chose to discuss one product as representative in presenting its detailed infringement analysis. For the 502 patent, claim 1, USS used the as the representative product, and for claim 15, the Jingrui 1613 R22. Again, Dr. German's test results for all products tested is given in Exhibits CX-3894C to CX-7404C, and summarized in CX-0383C, and SF Diamond's products do not infringe any claim because the is not met. *See* RX-0622C.8. Iljin repeats its arguments regarding the magnetic properties of its UP8N and UP9N products, and those arguments are again rejected. *See* RIB at 134. In particular, the specific permeability values are reliable because specific permeability is simply the ratio of magnetic saturation to coercivity, the measurements of which are themselves reliable. And similar to the 565 patent, USS annotates the independent claims with limitation identifiers.

#### 1. Claim 1

#### a. [502.1.a] A polycrystalline diamond compact, comprising:

Dr. German testified that CDX-0003C.147 contains a photo of a undergone G-Ratio testing, and shows "a polycrystalline diamond table sitting above the substrate below, so the combination of the two makes for a PDC." Tr. (German) at 208:21-209:3; CX-7380C.

# b. [502.1.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:

Dr. German testified that the photo and enlargements incorporated into CDX-0003C.148 show that "progressively higher and higher we can see that there's multiple grains of diamond and that the interstitial spaces exist between them." Tr. (German) at 209:4-9; *see* CX-7239C. And is not leached, so substantially all of the diamond table is unleached. *See* JX-0137C.35.

c. [502.1.c] a plurality of diamond grains bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50  $\mu$ m or less; and

As with the corresponding element of the 565 patent, Dr. German annotated the electron microscope image by adding red circles to outline the bond-to-bond areas. *See* Tr. (German) at 209:10-17; CX-7370C. Dr. German further testified that the average grain size is 4.5 micrometers. *See id.* at 209:18-21; CX-7240C.

d. [502.1.d] a catalyst including cobalt, the catalyst occupying at least a portion of the interstitial regions;

NSL Analytical reported a cobalt weight of 10.2% for sample BCCCC.07, which corresponds to See Tr. (German) at 211:2-11; CX-7105C.3; CX-0383C.3. Dr. German testified that the cobalt is located in the interstitial regions. See Tr. (German) at 211:2-11; CX-7239C.

e. [502.1.e] wherein the unleached portion of the polycrystalline diamond table exhibits a coercivity of about 115 Oe to about 250 Oe;

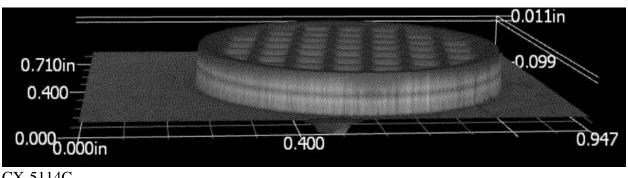
Dr. German's test results showed that the unleached portion of sample BCCCC.07 exhibited a coercivity of 157.5 Oe. *See* Tr. (German) at 211:12-15; CX-5116C.

f. [502.1.f] wherein the unleached portion of the polycrystalline diamond table exhibits a specific permeability less than about 0.10 G·cm3/g·Oe; and

Dr. German testified that the unleached portion of sample BCCCC.07 exhibited a specific magnetic saturation of 13.13 Gcm<sup>3</sup>/g. *See* Tr. (German) at 211:16-23; CX-5116C. As noted, specific permeability is specific magnetic saturation divided by coercivity, and the resulting value for the is 0.083 Gcm<sup>3</sup>/gOe. *See* Tr. (German) at 211:16-23.

g. [502.1.g] a substrate bonded to the polycrystalline diamond table along an interfacial surface, the interfacial surface exhibiting a substantially planar topography;

The term "substantially planar" has been construed to mean a surface having a "planarity ratio" ("the surface area 'in the absence of the plurality of protrusions . . . ' divided by the surface area 'with the protrusions'") greater than or equal to 0.600. See Markman Order at 36-41. Dr. German applied this construction and measured the planarity ratio of the interfacial surface (i.e., BCCCC.05 to be approximately 0.747. where the PCD bonds to the substrate) of See Tr. (German) at 211:24-213:4; CX-0383C.3; CX-5114C. Dr. German testified regarding the "waffle-like structure" of the underside of the PCD:



CX-5114C.

h. [502.1.h] wherein a lateral dimension of the polycrystalline diamond table is about 0.8 cm to about 1.9 cm.

Dr. German measured the lateral dimension of the polycrystalline diamond table of sample BCCCC.07 to be 1.59 cm. See Tr. (German) at 213:5-20; CX-0383C.3.

#### 2. Claim 15

[502.15.a] A polycrystalline diamond compact, comprising: a.

Dr. German testified that CDX-0003C.193 incorporates an image of a Jingrui 1613 R22 PDC "after the G-ratio test that is showing it is a polycrystalline diamond compact." Tr. (German) at 225:12-18; CX-7357C.

> b. [502.15.b] a polycrystalline diamond table, at least an unleached portion of the polycrystalline diamond table including:

Dr. German testified that a portion of the polycrystalline diamond table of the 1613 R22 shows "the diamond bonding in the EBSD image with the interstitial spaces defined in between the diamond grains, which are black here." Tr. (German) at 225:19-25; CX-7251C. And Jingrui confirmed that the R22 samples sold in the United States are unleached, so substantially all of the diamond table is unleached. *See* JX-0125C.7.

c. [502.15.c] a plurality of diamond grains bonded together via diamond-to-diamond bonding to define interstitial regions, the plurality of diamond grains exhibiting an average grain size of about 50 µm or less; and

Dr. German testified that he measured the average grain size of the top (and only) layer of the 1613 R22 sample BGGGG.02 to be about 4.8 micrometers. *See* Tr. (German) at 225:19-226:9; CX-7249C. He also testified that the diamond grains are directly bonded together via diamond-to-diamond bonding to define interstitial regions. *See* Tr. (German) at 225:19-226:9; CX-7362C.

d. [502.15.d] a catalyst including cobalt, the catalyst occupying at least a portion of the interstitial regions;

NSL Analytical reported a cobalt weight of 8.8% for sample BGGGG.02, and Dr. German testified that the cobalt is in the interstitial regions. *See* Tr. (German) at 226:10-21; CX-7108C; CX-7251C. Sample BGGGG.04 of the 1613 R22 also exhibited greater than trace amounts of cobalt. *See* CX-3917C.

e. [502.15.e] wherein the unleached portion of the polycrystalline diamond table exhibits: a coercivity of about 115 Oe to about 250 Oe;

Dr. German's tests revealed that the unleached portion of sample BGGGG.02 exhibited a coercivity of 162.1 Oe. *See* Tr. (German) at 226:22-227:1; CX-5516C.

f. [502.15.f] a specific magnetic saturation of about 10 Gcm<sup>3</sup>/g to about 15 Gcm<sup>3</sup>/g; and

Dr. German's tests also showed that the unleached portion of sample BGGGG.02 exhibited a specific magnetic saturation of 12.58 Gcm<sup>3</sup>/g. *See* Tr. (German) at 227:2-6; CX-5516C.

g. [502.15.g] a thermal stability, as determined by a distance cut, prior to failure in a vertical lathe test, of about 1300 m to about 3950 m;

Dr. German's tests showed that the unleached portion of sample BGGGG.09 exhibited a thermal stability of 2203 m. *See* Tr. (German) at 227:7-12; CX-5509C.

h. [502.15.h] wherein a lateral dimension of the polycrystalline diamond table is about 0.8 cm or more.

Dr. German testified that he determined that sample BGGGG.02 had a lateral dimension of 15.93 millimeter, or 1.59 cm. *See* Tr. (German) at 227:13-17.

## 3. Other Accused Products and Dependent Claims

As with the 565 patent, USS prepared a tabular summary of some of Dr. German's testing:

		Parame ter	Average Grain Size	Coercivity	Specific Permeabili ty	Lateral Dimension	Specific Magneti c Saturati	Thermal Stability
		Range	about 50 µm or less	about 115 Oe to about 250 Oe	less than about 0.10 G·cm³/g· Oe	about 0.8 cm or more	about 10 G·cm³/g to about 15 G·cm³/g	about 1300 m to about 3950 m
Titte.	UP8N	BAAA A						
Iljin	UP9N	BBBBB						
			3/3	3/3	3/3	10/10		
SF Diamon		BWW WW	3/3	3/3	3/3	10/10		
		BVVV V	3/3	3/3	3/3	10/10		
d		BEEEE	3/3	3/3	3/3	6/6		
		BBBBE	3/3	3/3	3/3	5/5		
		BXXX X	3/3	3/3	3/3	10/10	3/3	1/1
		BLLLL	3/3	3/3	3/3	10/10		
		ВННН Н	3/3	3/3	3/3	10/10		
		BBBBG	3/3	3/3	2/3	5/5		
		BMMM M	3/3	3/3	3/3	10/10		
		BBBBC	3/3	3/3	3/3	10/10		
		BPPPP	3/3	3/3	3/3	10/10		
		BYYY Y	3/3	3/3	3/3	10/10		
Jingrui	R22	BGGG G	3/3	3/3	3/3	10/10	3/3	1/1
Wanlon g	ZT2-B	ВІШ	3/3	3/3		5/5	3/3	1/1

See CIB at 129-30; CDX-0003C.77; CX-0383C.

USS did not separately discuss the infringement of dependent claims 2, 11, and 21. However, USS presented a table that "summarizes each Accused Product, a citation to the transcript wherein Dr. German discussed the Accused Product and the claims it infringes

[including the dependent claims], as well the demonstratives Dr. German used to summarize evidence that he used to determine that the given Accused Product infringed the claim."

Respondent	Product	'502 Claim	10.18 Transcript	Demonstratives
		1	208:22-214:2	CDX-0003C.147-159
	1 - 2 - 2 - 2 - 2	2,11	214:3-214:14	CDX-0003C.160
Iljin	UP8N	1	214:15-215:7	CDX-0003C.162
	2.00	2,11	215:15-215:24	CDX-0003C.164
	UP9N	1	215:8-215:14	CDX-0003C.163
		2,11	215:15-215:24	CDX-0003C.164
		1	216:3-216:22	CDX-0003C.166
	7	2,11	218:18-219:1	CDX-0003C.171
		15	228:19-228:25	CDX-0003C.206
		21	229:1-229:4	CDX-0003C.207
SF Diamond		1	216:23-217:8	CDX-0003C.167
		2,11	218:18-219:1	CDX-0003C.171
		1	217:9-217:16	CDX-0003C.168
		2,11	218:18-219:1	CDX-0003C.171
		1	217:18-218:4	CDX-0003C.169
		2,11	218:18-219:1	CDX-0003C.171
		1	218:5-218:17	CDX-0003C.170
		2,11	218:18-219:1	CDX-0003C.171
		1	219:5-219:13	CDX-0003C.173
		2,11	220:3-220:9	CDX-0003C.176
		1	219:14-219:22	CDX-0003C.174
		2,11	220:3-220:9	CDX-0003C.176
		1	219:23-220:2	CDX-0003C.175
		2,11	220:3-220:9	CDX-0003C.176
		1	220:13-221:21	CDX-0003C.178
		2,11	222:18-222:20	CDX-0003C.182
		1	221:22-221:25	CDX-0003C.179
		2,11	222:18-222:20	CDX-0003C.182
		1	222:2-222:8	CDX-0003C.180
		2,11	222:18-222:20	CDX-0003C.182
	C2	1	222:9-222:17	CDX-0003C.181
		2,11	222:18-222:20	CDX-0003C.182
Jingrui	R22	1	222:23-223:3	CDX-0003C.184
		2.11	223:4-223:9	CDX-0003C.185
		15	225:12-228:13	CDX-0003C.183
			4 17 0 17 1 114 1 7 4	
	7770.77	21	228:14-228:18	CDX-0003C.204
Wanlong	ZT2-B	15	229:5-229:12	CDX-0003C.209

See CIB at 131-132.

Certain details should be noted. First, one of three tested exceeded the specific magnetic saturation of claim 2, although the other two were within the range,

so infringement has still been proven. See CX-0383C.3. Second, although infringement is still proven, only one sample of the (sample BBBBC-2) was tested for magnetic properties, not three, at least as summarized in CX-0383C. Compare CIB at 129 with CX-0383C.8. Third, all tested samples of the Jingrui R22 product (which Jingrui stipulated was representative of the R11A product, and it is therefore assumed that the R11A is also an Accused Product although not listed as such) satisfied the requirements of claims 1, 2, 11, 15, and 21. See CX-0383C.3; JX-0503C.3; CIB at 132. This stipulation is accepted, although Dr. German's testing suggests that the R11A may possess a specific permeability in excess of 0.10 Gcm<sup>3</sup>/gmOe. See CX-0383C.3. Fourth, along similar lines, all tested samples of the Wanlong ZT2-B product satisfied the requirements of claim 15, and Wanlong stipulated that the ZT2-B product is representative of the ZTA, RP2, and RPA products. See CX-0383C.4; JX-0503C.3. The stipulation is accepted, although testing showed that the RP2 product did not infringe claim 15 because its thermal stability was less than 1300 m. See CX-0383C.5. Lastly, CR Gems stipulated to infringement of claims 1 and 11 by its GPCD-MY69 and GPCD-CRM products, and with good reason, because Dr. German's testing showed they both infringed claims 1 and 11. See JX-0500C; CX-0383C.4-.6.

In summary, USS has proven infringement of the claims of the 502 patent by certain Accused Products, as well as by those Accused Products as to which representativeness applies. A thorough review of CX-0383C demonstrates that the infringing Accused Products (and, for Jingrui and Wanlong, the Accused Products as to which representativeness applies) are accurately listed in the demonstrative Dr. German prepared:

Party	Infringing Product Series	Asserted Claims Practiced				
		'565	′502	′306		
Iljin	UP8N	1, 2, 4	1, 2, 11			
	UP9N	1, 2, 4, 6, 18	1, 2, 11			
		1, 2, 4, 6	1, 2, 11	15		
SF			1, 2, 11	15		
Diamond			1, 2, 11	15		
		1, 2, 4	1, 2, 11	15		
			1, 2, 11	15		
		1, 2, 4, 18	1, 2, 11, 15, 21	15		
		1, 2, 4	1, 2, 11			
		1, 2, 4, 6	1, 2, 11	15		
			1, 2, 11			
			1. 2, 11			
			1, 2, 11			
			1, 2, 11	15		
			1, 2, 11	15		
Jingrui	R11A	1, 2, 4, 6, 18	1, 2, 11, 15, 21			
	R22	1, 2, 4, 6, 18	1, 2, 11, 15, 21			
Wanlong	ZT2-B	1, 2, 4, 6, 18	15			
	ZTA-B	1, 2, 4, 18	15			
	RPA-B	1, 2, 4, 6, 18	15			
	RP2-B	1, 2, 4, 6, 18	15			
CR Gems*	GPCD-CRM	1, 2. 4, 6	1, 11			
	GPCD- My69	1, 2, 4, 6	1, 11			

CDX-0003C.82.

## 4. Doctrine of Equivalents and Indirect Infringement

USS does not allege that any accused product infringes the 502 patent under the doctrine of equivalents or under any theory of indirect infringement. *See* CIB at 123-32.

## IX. U.S. PATENT NO. 8,616,306

Again, many of the same issues presented and resolved in connection with the 565 and 502 patents are also raised or implicated in connection with the 306 patent (e.g., representativeness,