IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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FUJIFILM Corporation
Petitioner
v.

Sony Corporation
Patent Owner

———————

Patent No. 7,029,774

———————

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,029,774

UNDER 35 U.S.C. § 311, 37 C.F.R. §§ 42.100 *ET SEQ.* (GROUNDS 3-5)

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I. OVERVIEW OF CHALLENGE

FUJIFILM Corporation ("Petitioner") petitions for *inter partes* review of claims 1-11 and 15-20 of US Patent No. 7,029,774 ("the '774 Patent"), assigned to Sony Corporation ("Patent Owner").

II. BACKGROUND OF THE TECHNOLOGY

Magnetic tape has been a medium for audio cassettes, video tapes, and data recordings for decades and persists as a popular choice for long-term data storage due to its lower cost and superior durability. *See* Ex. 1001 at 1:16-20; Ex. 1006 at [0002]; Ex. 1003 ¶66.

A. Magnetic Tape Composition

Magnetic tape typically comprises layers coated on the surface of a supporting substrate. *See* Ex. 1004 at Abstract; Ex. 1003 ¶67. One side of the tape consists of a magnetic layer for recording data, and optionally includes a non-magnetic layer underneath. *See* Ex. 1010 at 2:61-65; Ex. 1003 ¶67. A recording head is run across this magnetic "front" side, or magnetic surface, to read or write to the tape. Ex. 1003 ¶67. The "back" side of the tape consists of a backside coating layer (also referred to as a backcoat layer) on the substrate. *See, e.g.,* Ex. 1004 at 1:16-32; Ex. 1003 ¶67. Figure 1 below shows these layers in a cross-sectional view of magnetic tape.

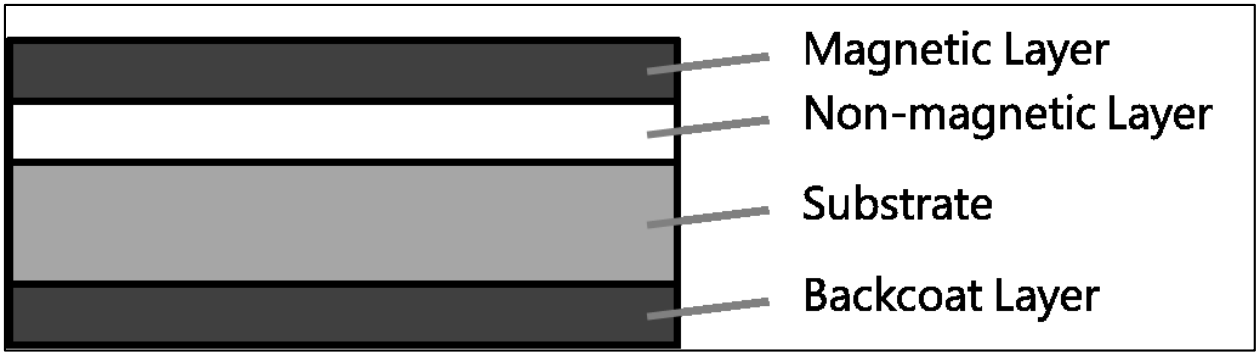

Figure 1: Cross-Section View of Tape (Ex. 1003 ¶67 Figure 1)

The backcoat, or backside coating, protects the tape when it is wound and reduces overall friction when the tape is in use. *See* Ex. 1004 at 1:21-31; Ex. 1003 ¶68. The backcoat generally consists of non-magnetic particles, such as carbon black, suspended in a binder. *See* Ex. 1004 at 1:33-34, 6:56-57; Ex. 1009 at 2:45-57; Ex. 1010 at 6:32-33; Ex. 1003 ¶68.

B. Embossment of the Magnetic Surface

Magnetic recording tape is stored on reels. Ex. 1003 ¶69. When wound around a reel, each "winding" of the tape is stacked on top of another winding, with the backcoat surface of one winding superposed onto the magnetic layer of the previous winding. *See* Ex. 1005 at [0014]; Ex. 1003 ¶69.

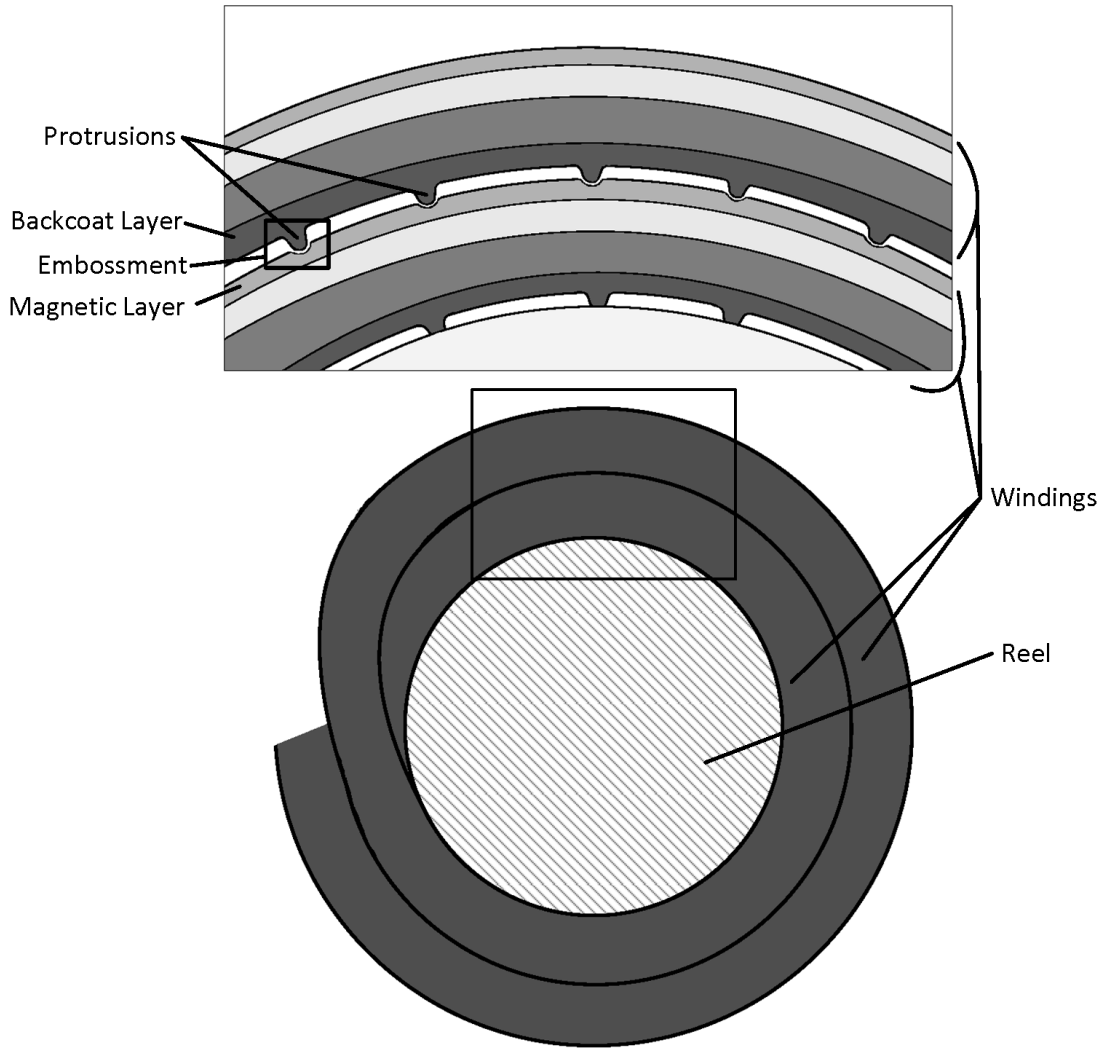

Figure 2: Cross-Section View of Wound Reel of Magnetic Tape (Ex. 1003 ¶69 Figure 2)

Due to this contact, peaks or protrusions on the backcoat layer can impress pits into the front surface of the magnetic layer, causing deformations and potential data errors in the magnetic layer. Ex. 1004 at 5:57-59; Ex. 1010 at 4:4-7; Ex. 1003 ¶70. This process is widely recognized in the art and referred to as "embossment," "transfer," "imprint," or "show-through." *See* Ex. 1004 at 4:67-5:3 ("using too many backside particles has been known to cause undesired performance

problems, e.g. increased bit error rate due to ***embossing*** of the magnetic layer"); Ex. 1009 at 1:49-54 ("protrusions on a backcoat layer cause pits (called '***transfer***') on a magnetic layer surface because the protrusions bite into the magnetic layer surface when the backcoat layer and the magnetic layer are superposed"); Ex. 1005 at [0015] ("if there are excessively large protrusions on the back coat surface, the protrusion shape can ***imprint*** itself on the magnetic layer"); Ex. 1006 at [0003] ("the so-called '***show-through***' wherein the back coat layer and the magnetic layer will be in pressure contact with each other"); Ex. 1003 ¶70.

The transfer of protrusions—even small ones—from the backcoat to the magnetic layer can reduce the performance of the magnetic layer, causing potential bit errors or reduced signal-to-noise ratio. *See* Ex. 1004 at 5:1-3; Ex. 1003 ¶71. Embossments may also cause a decreased output rate or even loss of signal. Ex. 1009 at 1:55-57; Ex. 1003 ¶71. Furthermore, embossments may substantially reduce the magnetic layer's coating film strength, increasing vulnerability to coating film tears. Ex. 1005 at [0015]; Ex. 1003 ¶71.

C. The Prior Art Taught Reduced Backside Protrusions.

It was also known in the art that a rougher surface, e.g., a surface with large or frequent protrusions, resulted in a greater amount of embossment. Ex. 1005 at [0015] ("if there are ***excessively large protrusions*** on the back coat surface, the protrusion shape can imprint itself on the magnetic layer"); Ex. 1012 at [0176]

("the surface of the backcoat layer becomes coarse and thus the surface roughness of the backcoat layer may be transferred to the reverse side of the magnetic layer (embossing)"); Ex. 1013 at 2, ll. 22-23 ("if the surface of the backside coating layer is too rough, the backside coating layer tends to damage the smooth surface of the magnetic layer"); Ex. 1003 ¶72. Smaller peaks meant smaller embossments on the magnetic surface, and fewer peaks meant fewer embossments. Ex. 1003 ¶72; Ex. 1015 at [0044] ("it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer").

One method for reducing backside protrusions was to use increase the weight ratio of fine- to coarse-grain carbon black particles used in the backcoat layer. Ex. 1003 ¶73. For example, Ex. 1013 ("Abe") recognized that in order to provide a "smooth surface, thus minimizing the tendency of the backside coating layer to damage the magnetic layer," a "relatively large amount" of fine-grain carbon black would be required in the backcoat layer. Ex. 1013 at 3, ll. 10, 15-16, 21-23 (defining a "smooth surface" for minimizing damage to the magnetic layer as a surface with "a centerline average roughness of 30 nm or less"); Ex. 1003 ¶73. The prior art taught that using weight ratios of fine- to coarse-grain particles between 70/30 to 99.9/0.1, would lead to less embossment. Ex. 1013 at 3, ll. 21-28 ("in order to provide backside coating layers having a centerline average

roughnesses of 30 nm or less, it is preferred to use a relatively large amount of finely divided carbon black particles having a particle size in the range from 10 to 30 nm … [f]urther, in order to provide backside coating layers having a surface density of 2% or less of projections having a particle size of 100 nm or more, it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"); Ex. 1003 ¶73. Magnetic tape having such backside formulations were known in the art. *See* Ex. 1013 at 4, ll. 6-24 (Table 1) (using 99 parts of 20 nm to 1 part 350 nm carbon black particles); Ex. 1017 at [0119] (using 100 parts of 17 nm to 3 parts 270 nm carbon black particles); Ex. 1011 at 7:12-10:43 (Table 1) (showing example embodiments of "backing layers" with "a fine-particle/coarse particle ratio" between 80/20 and 100/0); Ex. 1003 ¶73.

Reducing large backside protrusions—which the prior art taught as a solution for embossment—would have also changed the surface roughness properties of the backside surface. Ex. 1003 ¶82. For example, the average height of the peaks (e.g., the peak height mean) would have been reduced. *Id.* Similarly, the average peak-to-valley separation would have been smaller. *Id.*

The third and fourth moments of a distribution can also be used to describe a surface topography. *Id.* ¶83. The third moment is known as "skew," and the fourth moment "kurtosis." *Id.* ¶83. By definition, a Gaussian distribution has a skew of 0

and a kurtosis of 3. *Id.* ¶83; Ex. 1014 at 4:28-29. A reduction in backside protrusions would have led to lower skew and kurtosis for the back surface of the tape. *See* Ex. 1003 ¶83.

III. OVERVIEW OF THE '774 PATENT

The '774 Patent recognizes a problem with the "[t]ypical backsides" of magnetic tape, which "include carbon black … having particle sizes configured to form a smooth background with some larger particles dispersed therein[.]" Ex. 1001 at 1:47-51; Ex. 1003 ¶84. The '774 Patent alleges that, because the prior art backcoat included particles of two different sizes, its surface roughness had a bimodal distribution reflecting the smooth background of the smaller carbon black particles, in one mode, and the peaks created by the larger particles, in another. *See* Ex. 1001 at 2:1-12; Ex. 1003 ¶84. "The bimodal roughness of the backside surface 18 defines a plurality of peaks 20 and valleys 22." Ex. 1001 at 2:5-7; Ex. 1003 ¶84.

While the use of large particles had some benefits—it "generally improve[d] durability and frictional characteristics of the backside during manufacturing and use"—it also led to the problem of "embossment." Ex. 1001 at 1:47-51, 2:17-24; Ex. 1003 ¶85. "Embossment," as used in the '774 Patent, describes a problem when tape is wound: "the interaction between the peaks 20 of the second winding 14 and the front surface 16 of the first winding 12 causes the peaks 20 to be imprinted or otherwise transmitted to the front surface 16 of the first winding 12."

Ex. 1001 at 2:17-21; Ex. 1003 ¶85. "The imprints, pits, or embossments defined in the front surface 16 can damage the recording characteristics of the magnetic recording tape 10." Ex. 1001 at 2:21-24; Ex. 1003 ¶85. The '774 Patent is directed to a magnetic recording medium with a backside surface "configured to decrease pitting or embossment of a recording surface of the magnetic recording medium." Ex. 1001 at 1:10-12; Ex. 1003 ¶85.

A. Summary of the Alleged Invention

To address the embossment problem, the '774 Patent proposes using relatively uniform carbon black of a diameter between 10-30 nm. Ex. 1001 at 5:22-26 ("the carbon black particles of the backside 36 are substantially uniform in size. In one embodiment, the carbon black particles … [have] average particle size from about 10 nm to about 30 nm[.]"); Ex. 1003 ¶86. The '774 Patent explains that the magnetic tape of the invention is "configured to provide a relatively random backside surface," as compared with the "typical bimodal backside surface common in the prior art." *See* Ex. 1001 at 5:18-21 (citations omitted); Ex. 1003 ¶86. The resultant backside surface from the '774 Patent has fewer large protrusions, as illustrated by Figs. 1 (describing the prior art) and 3 (showing the alleged invention) below. Ex. 1003 ¶87; *see* Ex. 1001, Figs. 1, 3:

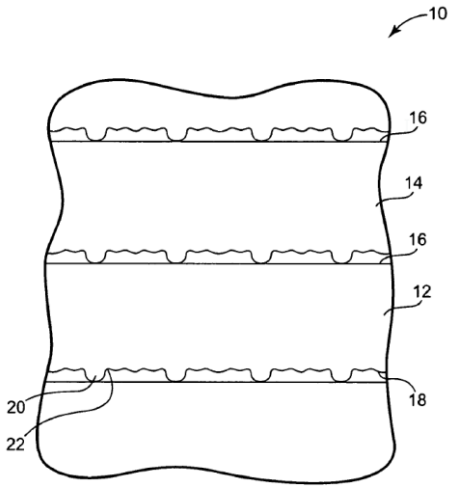

Fig. 1
(PRIOR ART)

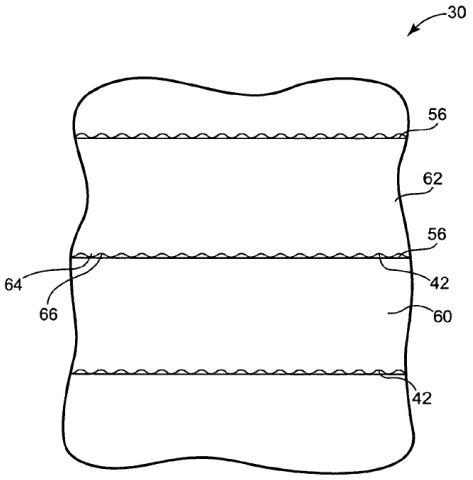

Fig. 3

B. Summary of the Claimed Subject Matter

The '774 Patent claims are directed to measurements of physical and recording characteristics of tape with reduced backside protrusions, which allegedly results from the use of uniform, fine-grain carbon black in the backcoat layer as compared with bimodal coatings having fine-grain and large, coarse particles. Ex. 1001 at 9:14-21, 12:50-14:41; Ex. 1003 ¶91. The claims recite statistical measures of the surface roughness of the backside of the tape that can be applied to a wide range of magnetic tapes, including for example (a) skew, (b) kurtosis, (c) peak height mean, (d) peak-to-valley roughness, and (e) plateau ratio. *Id.* Some dependent claims recite measurements of the recording properties of the magnetic tape, including skirt signal-to-noise ratio and small error rate. *Id.*

The '774 Patent discloses that the claimed statistical measurements are

achieved by its embodiments—i.e., Examples 1 and 2 which include the allegedly novel use of fine-grain carbon black of 10-24 nm diameter—but not the Comparative Examples, which, also contain large backside particles of size 270 nm and greater. Ex. 1003 ¶92; *see* Ex. 1001 at 10:1-14 (Table 1):

TABLE 1

	Surface Measurement Parameters				
Example	Skew (R_{sk})	Peak Mean Height (R_{pm})	Peak-to-Valley Roughness (R_z)	Plateau Ratio (R_{pm}/R_z)	Kurtosis (R_{ku})
1	0.30	177 nm	291 nm	0.61	3.4
2	0.40	172 nm	276 nm	0.62	3.5
C1	0.53	234 nm	346 nm	0.68	4.3
C2	0.80	327 nm	449 nm	0.73	5.6
C3	0.90	369 nm	515 nm	0.72	5.2
C4	0.89	482 nm	675 nm	0.71	5.2

The measurement ranges claimed by the '774 Patent are exceptionally broad. Ex. 1018 ¶62. A large number of prior art tapes in the 2003–2005 timeframe likely fell in the scope of the claims, given their breadth. *See id.* For example, the recited skew and kurtosis ranges encompass almost any surface with basic Gaussian distribution of asperity heights, which by definition has a skew of 0 and kurtosis of 3. *Id.* Many natural and random processes result in a surface topography with an asperity height distribution that is approximately Gaussian, thus the claimed ranges encompass a broad swath of prior art tapes with a distribution of asperity heights that is relatively close to Gaussian—amongst many other surfaces. *Id.* Indeed, as

shown in Ground 4 below, the claimed ranges even encompass the bimodal backcoats that the '774 Patent admits were known in the art. *See* Ex. 1001 at 1:47-51, FIG. 1.

IV. SUMMARY OF PRIOR ART AND GROUNDS

None of the references relied upon by this Petition were presented to the USPTO during prosecution. *See* Ex. 1002 at 6.

A. Publications Relied Upon

Exhibit 1015—U.S. Patent Application Publication No. 2003/0054203 to Ishikawa et al. ("Ishikawa") was published March 20, 2003 and qualifies as prior art under at least 35 U.S.C. § 102(a) and (b). Ishikawa teaches that for a magnetic tape, "it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer 5 from being transferred to the magnetic layer while the tape is wound." Ex. 1015 at [0044]. To achieve this goal, "the backcoating layer 5 preferably has . . . a 10 point mean roughness Rz of 40 to 250 nm, particularly 50 to 200 nm." *Id.*

Exhibit 1017—Japanese Patent Publication No. JP2003-036520 to Aonuma ("Aonuma") was published February 7, 2003 and is prior art under at least §102(a) and (b). Ex. 1017 at 1. A translation has been provided. Aonuma teaches a magnetic tape with both fine-grain and coarse particles in its back-coat layer. *See* Ex. 1017 at [0119].

Exhibit 1013—European Patent Application Publication No. EP0494793A1 ("Abe") was published July 15, 1992 and is prior art under at least § 102(a) and (b). Ex. 1013 at 1. Abe teaches using carbon black particles in an "improved magnetic recording media comprising novel backside coating layers having excellent tracking, friction, and smoothness characteristics … the projections [on the backside coating] have a size and surface density such that the surface of the backside coating layer has a rough texture for minimizing air entrapment during tape transport, yet is smooth enough such that the backside coating layer has less of a tendency to damage the magnetic layer." Ex. 1013 at 2, ll. 46-55.

B. Grounds

Petitioner requests cancellation of the challenged claims on the following grounds:

– **GROUND 3**:[1] Claims 15 and 17 are anticipated under § 102 by Ishikawa.

– **GROUND 4:** Claims 1-11 and 15-20 are obvious under § 103 by Aonuma.

– **GROUND 5:** Claims 1-11 and 15-20 are obvious under § 103 by Aonuma in view of Abe.

V. CLAIM CONSTRUCTION

Pursuant to § 42.100(b), and solely for purposes of this review, Petitioner

[1] This Petition intentionally begins its numbering with Ground 3.

construes the claim language such that claim terms are given their broadest reasonable interpretation ("BRI").[2] For terms not specifically listed below, Petitioner interprets them for purposes of this review in accordance with their plain and ordinary meaning under the required BRI standard.

A. Level of Skill in the Art

A person of ordinary skill in the art ("POSITA") would have had (a) a bachelor's degree in materials science, electrical engineering, mechanical engineering, chemistry, or a closely related field, and at least five years of experience—either in industry or academic research—relating to magnetic tape, or (b) a master's degree or higher in materials science, electrical engineering, mechanical engineering, chemistry, or a closely related field, and at least three years of experience—either in industry or academic research—relating to magnetic tape. Ex. 1003 ¶65; Ex. 1018 ¶60. A person with less education but more relevant practical experience, or more relevant education but less practical experience, may also meet this standard. *Id.*

B. "skew"

Under BRI, a person of ordinary skill in the art would have understood this

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[2] Petitioner reserves the right to seek a different claim construction in other litigation.

term, used in claims 1, 16, and 20, to at least include "an R_{sk} measurement from an optical interferometer trace." Ex. 1018 ¶65; Ex. 1003 ¶100. The specification expressly states that "the values used throughout this application were measured using a Wyko® Optical Interferometer" including "skew," and further defines "Skew" as a measurement of "R_{sk}." Ex. 1001 at 8:2-12; 8:13-15; Ex. 1018 ¶65; Ex. 1003 ¶100.

A POSITA would have recognized that optical interferometers, including Wyko® brand ones, can be configured to display R_{sk} measurements, and that such R_{sk} measurements were consistent with the understanding of R_{sk} in the field. Ex. 1018 ¶66; Ex. 1003 ¶101. R_{sk} is a term of art referring to the third moment of a surface topography distribution sampled over a trace (i.e., line) along the surface, e.g.:

$$Rsk = \frac{1}{Rq^3}\left[\frac{1}{lr}\int_0^{lr} Z^3(x)\,dx\right]$$

See Ex. 1018 ¶¶66-67; Ex. 1016 ("ISO 4287") at 22 (calculating "within a sampling length" in a single x dimension);[3] Ex. 1003 ¶101. The ISO 4287 *Rsk*

[3] For decades, ISO has been one of the preeminent standards bodies in the world, and its standards were widely referred to in the industry. Ex. 1018 ¶66. Exhibit

description corresponds with the R_{sk} measurement taken by optical interferometers, including Wyko® and Zygo® brands. Ex. 1018 ¶67; Ex. 1003 ¶101.

ISO 4287 illustrates the surface profile being measured as the "profile that results from the intersection of the real surface by a specified plane." Ex. 1018 ¶67; Ex. 1003 ¶101; Ex. 1016 at 11, 22, Figure 2:

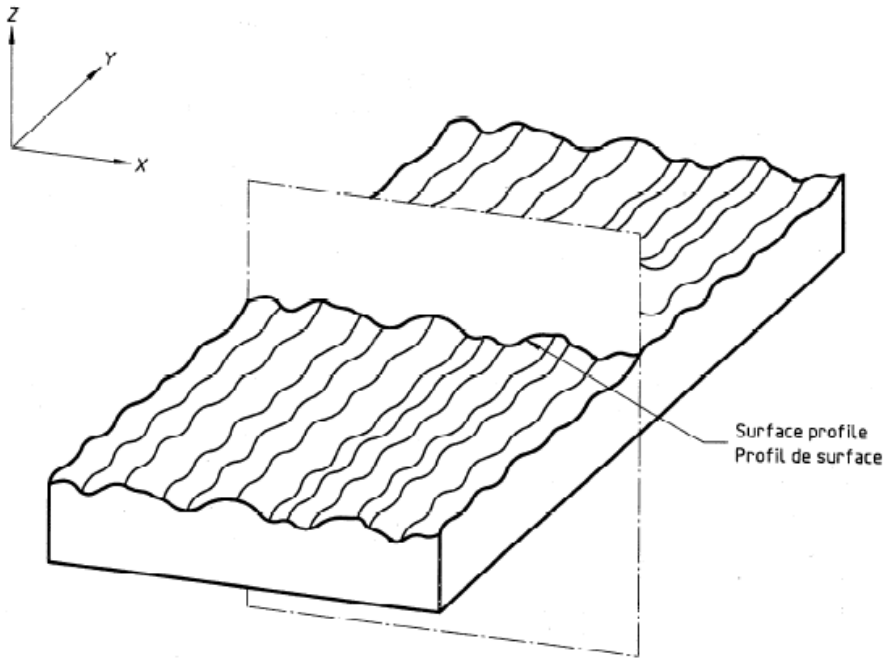


Figure 2 — Surface profile
Figure 2 — Profil de surface

1016 is a copy of ISO 4287, which was published April 1, 1997 and was publicly available at least by the second half of 2004. Ex. 1018 ¶68; Ex. 1020 ¶36. Additionally, being over 20 years old, it may be authenticated under the Ancient Documents rule. Ex. 1018 ¶68 (describing authenticity of Ex. 1016); Fed. R. Evid. 901.

C. "kurtosis"

Under BRI, a person of ordinary skill in the art would have understood this term, used in claims 1, 7, and 20, to at least include "an R_{ku} measurement from an optical interferometer trace." Ex. 1018 ¶69; Ex. 1003 ¶102. The specification expressly states that "the values used throughout this application were measured using a Wyko® Optical Interferometer" including "kurtosis" and further defines "Kurtosis" as a measurement of "R_{ku}." Ex. 1001 at 8:2-12, 8:65; Ex. 1018 ¶69; Ex. 1003 ¶102.

A POSITA would have recognized that optical interferometers, including Wyko® brand ones, can be configured to display R_{ku} measurements, and that such R_{ku} measurements were consistent with the understanding of R_{ku} in the field. Ex. 1018 ¶70; Ex. 1003 ¶103. R_{ku} is a term of art referring to the fourth moment of a surface topography distribution sampled over a trace along the surface, e.g.:

$$Rku = \frac{1}{Rq^4}\left[\frac{1}{lr}\int_0^{lr} Z^4(x)\,dx\right]$$

See Ex. 1018 ¶¶70-71; Ex. 1016 at 22 (calculating "within a sampling length" in a single x dimension), 11 (defining surface profile), Figure 2. The ISO 4287 *Rku* description corresponds with the R_{ku} measurement taken by optical interferometers, including Wyko® and Zygo® brands. Ex. 1018 ¶71; Ex. 1003 ¶103.

D. "peak height mean"

A POSITA would have understood this term, used in claims 3, 15 and 20, to at least include "an R_{pm} measurement from an optical interferometer trace." Ex. 1018 ¶72; Ex. 1003 ¶104. The specification states "the values used throughout this application were measured using a Wyko® Optical Interferometer," including "peak height mean," and further defines "Peak Height Mean" as a measurement of "R_{pm}." Ex. 1001 at 8:2-12, 8:30; Ex. 1018 ¶72; Ex. 1003 ¶104.

A POSITA would have recognized that optical interferometers, including Wyko® brand optical interferometers, can be configured to display R_{pm} measurements, and that such R_{pm} measurements were consistent with the understanding of R_{pm} in the field. Ex. 1018 ¶73; Ex. 1003 ¶105. R_{pm} is a term of art referring to the mean height of peaks along a trace. Ex. 1018 ¶73; Ex. 1003 ¶105.

Though claims 3, 15 and 20 do not expressly state units, a POSITA would have understood this term to refer to nm because of the extremely smooth finish of the tape front and back surface; this is consistent with the language of dependent claim 3 ("[T]he backside surface has a peak height mean less than about 200 nm") as well as the specification. Ex. 1001 at 8:36-37 ("In one embodiment, the peak height mean of the magnetic recording medium 30 is less than about 200 nm."); Ex. 1018 ¶74; Ex. 1003 ¶106. Table 1 of the '774 Patent discloses a "Peak Mean Height (R_{pm})," measured in nm, which a person of ordinary skill in the art would

have understood to also mean a "peak height mean." Ex. 1001 at 10:7-8 (Table 1); Ex. 1018 ¶74; Ex. 1003 ¶106.

E. "peak-to-valley roughness"

A POSITA would have understood this term, used in claims 4, 5, 15, 17, and 20, to at least include "an R_z measurement from an optical interferometer trace." Ex. 1018 ¶75; Ex. 1003 ¶107. The specification states "the values used throughout this application were measured using a Wyko® Optical Interferometer," including "peak-to-valley roughness," and further defines "Peak-to-Valley Roughness" as a measurement of "R_z." Ex. 1001 at 8:2-12, 8:38-40; Ex. 1018 ¶75; Ex. 1003 ¶107.

A POSITA would have recognized that optical interferometers, including Wyko® brand optical interferometers, can be configured to display R_z measurements, and that such R_z measurements were consistent with the understanding of R_z in the field. Ex. 1018 ¶76; Ex. 1003 ¶108. R_z is a term of art measuring peak-to-valley separations along a trace. Ex. 1018 ¶76; Ex. 1003 ¶108; *see* Ex. 1016 at 11 (defining surface profile), 20 (discussing *Rz*), Figure 2. The ISO 4287 definition for *Rz* corresponds with the R_z measurement taken by optical interferometers, including Wyko® and Zygo® brands. Ex. 1018 ¶76; Ex. 1003 ¶108.

F. "plateau ratio"

A POSITA would have understood this term, used in claim 6, to at least

include "a ratio of $\frac{R_{pm}}{R_z}$ measurements, where R_{pm} is peak height mean and R_z is peak-to-valley roughness." Ex. 1003 ¶109. The specification provides this definition explicitly. Ex. 1001 at 8:55-57; Ex. 1018 ¶77; Ex. 1003 ¶109.

G. "the backside surface having a skew less than about 0.5"; "the backside surface having ... a kurtosis less than about 4.0"; "the backside surface has a peak height mean less than about 200 nm"; "the backside surface has a peak-to-valley roughness less than about 325 nm"; "the backside surface has a plateau ratio of less than or equal to about 0.65"

Under BRI, a POSITA would have understood "skew," "kurtosis," "peak height mean," "peak-to-valley roughness," and "plateau ratio" to at least include, respectively, an "R_{sk}," "R_{ku}," "R_{pm}," "R_z," or "R_{pm}/R_z" measurement from an optical interferometer trace. *See supra* Sections V.B-F; Ex. 1003 ¶110. Thus, a POSITA would have understood these broader elements, under BRI, to be satisfied by "at least one" such measurement for each recited range:

- "the backside surface having at least one R_{sk} measurement less than about 0.5";
- "the backside surface having at least one R_{ku} measurement less than about 4.0";
- "the backside surface has at least one R_{pm} measurement less than about 200 nm";
- "the backside surface has at least one R_z measurement less than about

325 nm";

- "the backside surface has at least one R_{pm}/R_z ratio of less than or equal to about 0.65," i.e., "the backside surface has a ratio of at least one measurement of R_{pm} divided by at least one measurement of R_z less than or equal to about 0.65."

Ex. 1018 ¶78; Ex. 1003 ¶110; *see supra* Sections V.B-F.

The claim limitation "a," without more, merely requires "at least one." *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000). Here, the claims do not recite an average of multiple measurements, state that all measurements must be within their respective ranges, or specify any particular number of measurements that must be taken. *See* Ex. 1001 at 12:50-14:41; Ex. 1018 ¶79; Ex. 1003 ¶111. Instead, the '774 Patent simply describes each measurement using their respective R-notation measurements and recites "the backside surface having **a** [measurement] less than about [the claimed value]." *See* Ex. 1001 at 12:50-14:41 (emphasis added); Ex. 1018 ¶79; Ex. 1003 ¶111; *supra* Sections V.B-F. Under BRI, a POSITA would have understood this claim language to be satisfied if the backside surface has at least one R_{sk}, R_{ku}, R_{pm}, R_z, or R_{pm}/R_z measurement falling within the respectively claimed ranges. *See supra* Sections V.B-F; Ex. 1018 ¶79; Ex. 1003 ¶111.

VI. A REASONABLE LIKELIHOOD EXISTS THAT THE CHALLENGED CLAIMS ARE UNPATENTABLE.

Pursuant to §§42.22 and 42.104(b), the challenged claims are unpatentable as set forth below.

A. Ground 3: Claims 15 and 17 Are Anticipated by Ishikawa

Ishikawa discloses a magnetic tape with backside peak height mean and peak-to-valley roughness in the ranges recited by claims 15 and 17. Ex. 1003 ¶210. Ishikawa's "backcoating layer" contains fine particles dispersed in the binder. Ex. 1015 at Abstract; Ex. 1003 ¶210. Ishikawa teaches that "it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer." Ex. 1015 at [0044]; Ex. 1003 ¶210.

1. Claim 15

(i) "A magnetic recording medium comprising:"

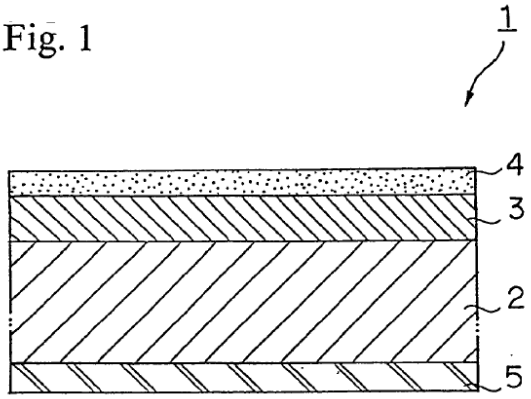
To the extent the preamble is a limitation, it is taught by Ishikawa. Ex. 1003 ¶211. Ishikawa discloses a "magnetic tape having an increased recording capacity for use as a medium for data backup." Ex. 1015 at [0002]; *see also id.* at [0001] ("The present invention relates to magnetic tape"); [0017] ("Magnetic tape 1 of the embodiment shown in FIG. 1"); Ex. 1003 ¶211.

(ii) "a substrate defining a first surface and a second surface opposite the first surface"

Ishikawa discloses this limitation. Ex. 1003 ¶212. Ishikawa provides a figure

depicting a cross-section of a magnetic tape, with a "substrate 2" having, on one side, "an intermediate layer 3 and a magnetic layer 4," and "on the other side a backcoating layer 5." *See* Ex. 1015 at [0017]; Fig. 1; Ex. 1003 ¶212.

Fig. 1



A POSITA would have understood that the two "sides" discussed in Ishikawa refer to the two surfaces of magnetic tape (front and back). Ex. 1003 ¶212. Ishikawa thus teaches a first surface upon which the intermediate layer 3 and magnetic layer 4 are placed, and a second surface upon which the backcoating layer 5 is placed. *Id.*

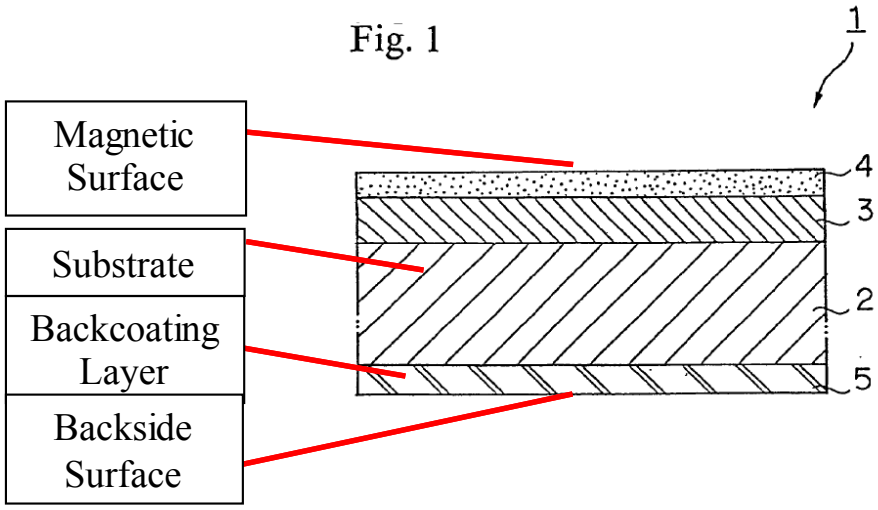
(iii) "a magnetic side coated on the first surface of the substrate and defining a recording surface"

Ishikawa Fig. 1 depicts a cross-section of a magnetic tape, with a "substrate 2" having, on one side, "an intermediate layer 3 and a magnetic layer 4." Ex. 1015 at [0017]; Fig. 1; Ex. 1003 ¶213. The magnetic layer defines a recording surface. *See* Ex. 1015 at [0018] ("The magnetic layer 4 has a plurality of data tracks . . . On use, a head unit . . . . is moved across the magnetic tape 1, switching among data

tracks, to record or reproduce data"); Ex. 1003 ¶213.

(iv) "a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate"

Ishikawa discloses this element. Ex. 1003 ¶214. Ishikawa discloses that "substrate 2 has on the other side a backcoating layer." Ex. 1015 at [0017]; Ex. 1003 ¶214. Ishikawa Fig. 1 shows that that the backcoating layer 5 is the back surface of the tape. *See* Ex. 1015 at Fig. 1:



Ex. 1003 ¶214.

Ishikawa further discloses that "it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer 5 from being transferred to the magnetic layer while the tape is wound." Ex. 1015 at [0044]; Ex. 1003 ¶215. Thus, Ishikawa's backcoating layer prevents protrusions on the back surface from imprinting on to the front side magnetic layer. *See id.* As a

POSITA would have understood, Ishikawa's backcoating layer is a backside coating configured to prevent embossment on the recording surface caused by the surface profile of the back surface. Ex. 1003 ¶215.

(v) "the backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm"

The backcoating layer of Ishikawa's magnetic tape "preferably has … a 10 point mean roughness Rz of 40 to 250 nm, particularly 50 to 200 nm." Ex. 1015 at [0044]; Ex. 1003 ¶216. All examples of tape made according to Ishikawa's teachings feature a peak-to-valley roughness (Rz) less than 87 nm. *See* Ex. 1015 at 11, Table 1:

TABLE 1

		Backcoating Layer						
	Reproduction Output (dB)	Ra (nm)	Rz (nm)	Dynamic Friction Coefficient	Surface Resistivity (Ω/□)	Void Diameter (nm)	Void Volume (%)	P/B Ratio
Ex. 1	+0.6	11	85	0.21	4.2×10^6	5.6	28	5.05
Ex. 2	+0.3	9.4	58	0.42	5.1×10^6	4.7	27	5.05
Ex. 3	+0.4	8.6	81	0.28	7.3×10^9	5.2	32	5.05
Ex. 4	+0.2	9.1	71	0.26	4.7×10^9	6.6	26	5.05
Ex. 5	+0.3	10	87	0.23	4.6×10^6	6.0	28	5.03

see also Ex. 1003 ¶216. Thus, Ishikawa discloses several tapes (Examples 1-5) with "a peak-to-valley roughness of less than about 325 nm." *See id*.

Ishikawa's backcoating layer surface inherently has "a peak height mean less than about 200 [nm]." Ex. 1003 ¶217. While Ishikawa does not explicitly disclose measurements of peak mean height, a POSITA would have understood

that a peak height mean (which measures the average value of all peaks above a standard plane) must inherently be less than a peak-to-valley roughness, i.e., R_z (which is an average of the largest peak-to-valley separations). *Id.*; *see* Ex. 1001 at 8:37-40 ("Peak-to-Valley Roughness (Rz) is an average maximum profile of the ten greatest peak-to-valley separations in the evaluation area"). A peak-to-valley roughness accounts for both the height of peaks and the depth of valleys. *See* Ex. 1015 at [0049]-[0050] ("$Rz = \frac{|Yp1+Yp2+Yp3+Yp4+Yp5| + |Yv1+Yv2+Yv3+Yv4+Yv5|}{5}$ wherein Yp1, Yp2, Yp3, Yp4, and Yp5 are heights of the five highest peaks within the sampled section … and Yv1, Yv2, Yv3, Yv4, and Yv5 are height[s] of the five lowest valleys within the sampled section"); Ex. 1001 at 8:38-40 ("Peak-to-Valley Roughness (Rz) is an average maximum profile of the ten greatest peak-to-valley separations in the evaluation area"); Ex. 1003 ¶217. Meanwhile, the peak height mean accounts only for the height of peaks. *See* Ex. 1001 at 8:30-37; Ex. 1003 ¶217. Therefore, a surface with a peak-to-valley roughness (Rz) of less than 200 nm must necessarily have a peak height mean (Rpm) of less than 200 nm as well. Ex. 1003 ¶217. As Ishikawa's backcoating layer surface has a peak-to-valley roughness (R_z) of 87 nm or less, the backside surface must necessarily have a peak height mean (R_{pm}) of 87 nm or less, which is within the claimed range. *Id.*

For at least these reasons, claim 15 is anticipated by Ishikawa. Ex. 1003 ¶218.

2. Claim 17

(i) "The magnetic recording medium according to claim 15, wherein the peak-to-valley roughness is less than about 300 nm."

Ishikawa anticipates claim 15. *See supra* Section VI.A.1; Ex. 1003 ¶¶219, 211-218. Ishikawa also discloses magnetic tapes with a backcoating layer surface peak-to-valley roughness less than 87 nm, which falls in the recited range. *See supra* Section VI.A.1; Ex. 1015 at 11, Table 1, Table 1; Ex. 1003 ¶¶219, 216. Ishikawa Examples 1-5 all have an Rz less than 87 nm. *See id*. Thus, claim 17 is anticipated by Ishikawa. Ex. 1003 ¶216.

B. Ground 4: Claims 1-11, and 15-20 Are Obvious Over Aonuma

The '774 Patent attempts to claim broad measurements of surface roughness, regardless of manufacturing process, encompassing even tapes with bimodal backside coatings—the same type of tape that the '774 Patent admits was prior art. *See* Ex. 1001 at 5:20-21; Ex. 1003 ¶220. Aonuma, for example, disclosed manufacturing processes for tape with a bimodal backside coating having large and small carbon black particles. *Id.*; *see* Ex. 1017 at [0119]. A POSITA would have found it obvious to produce tape based on Aonuma's teachings with surface characteristics in the measurement ranges claimed by the '774 Patent. Ex. 1003 ¶220.

Thus, the alleged invention is simply a combination of familiar elements (known magnetic tape formulations and known surface roughness measurements)

according to known methods (magnetic tape production techniques taught in the art) yielding a predictable result (the backside coating surface exhibiting the claimed surface roughness properties). Ex. 1003 ¶221. The '774 Patent merely attempts to claim characteristics of magnetic tape that already existed in the prior art. *See id.*

1. Replication of Aonuma

Three tape samples (A, B, and C) were manufactured by a Fujifilm employee Mr. Norihito Kasada following the back-coat layer formulation and process described in Aonuma. *See* Ex. 1019 ¶¶4-8; Ex. 1003 ¶222. Following Aonuma's teachings, a back-coat layer coating material was prepared for each of the tape samples for coating and drying on an aramid substrate sheet. *See* Ex. 1019 ¶6; Ex. 1017 at [0123]; Ex. 1003 ¶222. Tape Sample A was made using a back-coat layer coating material matching Aonuma's formulation. *See* Ex. 1019 ¶4; Ex. 1017 at [0119]; Ex. 1003 ¶222. Though Aonuma taught a calendering step for reducing surface roughness (Ex. 1017 at [0123]; Ex. 1003 ¶222), Tape Sample A was not calendered (Ex. 1019 ¶6). For Tape Sample B, a back-coat layer with a varied concentration of the solvents was used. *See* Ex. 1019 ¶7. This was changed to accommodate the manufacturing equipment available. Ex. 1019 ¶¶6-7; Ex. 1003 ¶222. As described further below, changing the concentration of solvents used in this way, to accommodate manufacturing equipment, would have been known and

obvious to a POSITA. Ex. 1003 ¶222. Tape Sample C was made using the same formulation as Tape Sample B, but calendered according to the procedure taught by Aonuma. *See* Ex. 1019 ¶8; Ex. 1017 at [0123]; Ex. 1003 ¶222.

Calendering is a process where tape is passed between rollers. *See* Ex. 1017 at [0109]; Ex. 1003 ¶223. The rollers apply pressure to the tape, which generally makes the surface of the tape smoother. Ex. 1003 ¶223. In other words, calendering flattens or reduces protrusions in the backside coating, thereby reducing the surface roughness of the backside coating. *Id.* Calendering was commonly used in the magnetic tape industry, and a POSITA would have understood the calendering process and its effect on backside coating surface roughness. *Id.* A POSITA would have understood that a smoother surface with fewer protrusions would have had lower skew, kurtosis, peak height mean, and peak-to-valley roughness. *Id.*

Tape Sample A is a sample of magnetic tape with an aramid substrate with a thickness of 4.4 μm. Ex. 1019 ¶4; Ex. 1003 ¶224. Tape Sample A was made using a back-coat layer coating material matching Aonuma's formulation, reproduced below:

Component	**Weight by Part**
BP-800 carbon black particles from Cabot Corp. (average particle diameter: 17 nm)	100
Thermal black carbon black particles from Cancarb Ltd. (average particle	3

diameter: 270 nm)	
α-alumina HIT55 (HIT55/MR110/MEK - 5/1/4 parts individual dispersion)	0.5
Nitrocellulose resin	108
Polyurethane resin	15
Polyisocyanate	40
Polyester resin	5
Dispersing agent: copper oleate	4
copper phthalocyanine	4
barium sulfate	5
Methyl Ethyl Ketone (MEK)	2200
Butyl Acetate	300
Toluene	600

Ex. 1019 ¶4; Ex. 1003 ¶224; *see* Ex. 1017 at [0119].

Tape Sample A was filtered, coated, and dried with a back-coat layer thickness of 0.5 μm, the same as disclosed in Aonuma. Ex. 1019 ¶¶5-6; Ex. 1017 at [0123]; Ex. 1003 ¶225. Aonuma teaches calendering the dried tape at a roll temperature of 90 °C and a linear pressure of 2940 N/cm after coating and drying onto the substrate. Ex. 1017 at [0123]; Ex. 1003 ¶225. However, Tape Sample A was not calendered after coating and drying onto the substrate because of limitations in the equipment available. Ex. 1019 ¶7; Ex. 1003 ¶225. A POSITA would have understood that, had calendering been applied, it would have generally made Tape Sample A smoother (less rough). Ex. 1003 ¶225. Thus, as a POSITA would have understood, Tape Sample A would have had fewer protrusions—thus lower skew, kurtosis, peak height mean, and peak-to-valley roughness—if it had

been calendered. *Id*.

Tape Sample B uses a back-coat layer coating material that differs from the Aonuma formulation only with respect to the amounts of the solvents used (methyl ethyl ketone, butyl acetate, and toluene). *See* Ex. 1019 ¶7; Ex. 1017 at [0119]; Ex. 1003 ¶226. The change in back-coat layer coating material concentration was to make the coating process more suitable with the available coater. Ex. 1019 ¶7. This concentration change would have been obvious to a POSITA. *See infra* Section VI.B.4 ("Third" Subsection); Ex. 1003 ¶226. Tape Sample B was not calendered. Ex. 1019 ¶7; Ex. 1003 ¶226.

Tape Sample C uses a back-coat layer coating material with the same concentration as Tape Sample B. Ex. 1019 ¶8; Ex. 1003 ¶227. Tape Sample C was calendered at a roll temperature of 90 °C and a linear pressure of 2940 N/cm (Ex. 1019 ¶8), the same as described in Aonuma. Ex. 1017 at [0123]; Ex. 1003 ¶227. Because a POSITA would have found it obvious to manufacture the back-coat layer of Tape Sample B, and because Aonuma teaches the calendering process used for Tape Sample C, a POSITA would have found it obvious to manufacture the back-coat layer of Tape Sample C. Ex. 1003 ¶227. As discussed above, a POSITA would have understood that the calendering step would have generally *lowered* the values of skew, kurtosis, peak-to-valley roughness, and peak height mean compared to an un-calendered back-coat layer by reducing the prevalence of

protrusions on the back-coat layer surface. *Id.*

Also, a POSITA would have understood that the presence of a magnetic layer or its properties would not have affected the surface profile of the back-coat layer with respect to the claimed measurements of skew, kurtosis, peak-to-valley roughness, peak height mean, and plateau ratio. *Id.* ¶228. Thus the magnetic layer of Tape Samples A, B, and C would not have had a substantial impact on the surface roughness measurements of the back-coat layer of those tape samples. *Id.* The '774 Patent provides examples of backside coatings having the claimed properties without defining any particular composition or characterization of the magnetic layer. *See e.g.,* Ex. 1001 at 4:11-31, 10:18-60; Ex. 1003 ¶228.

2. Surface Roughness Measurements

Mr. Kasada labeled Tape Samples A, B, and C as "③," ①," and "②," respectively, and shipped the samples to Dr. Bart Raeymaekers for measurement. Ex. 1019 ¶10; Ex. 1018 ¶¶80-82; Ex. 1003 ¶229. Dr. Raeymaekers performed a blind test to measure the surface characteristics of the three tape samples. Ex. 1018 ¶82; Ex. 1003 ¶229. He was not informed of, or otherwise made aware of, the existence of any manufacturing differences between the three tape samples prior to performing the measurements as described. Ex. 1018 ¶82; Ex. 1003 ¶229. This blind test ensured that Dr. Raeymaekers' results would not be subject to bias. Ex. 1003 ¶229.

The '774 Patent states that "the backside surface 42 is analyzed to determine the surface measurement parameters using a Wyko® Optical Profiler manufactured by Veeco Instruments, Inc. of Tucson, Ariz., *or other suitable device*." *See* Ex. 1001 at 8:2-9 (emphasis added). Dr. Raeymaekers used a Zygo white light interferometer to measure the surface characteristics of the replication tape samples. Ex. 1018 ¶83. There is no significant difference in surface measurements between a Zygo optical interferometer and the WYKO optical profiler as disclosed in the '774 Patent. *Id.*; Ex. 1003 ¶230. "WYKO" and "Zygo" are brands that both provide white light interferometers, which operate based on the same physical principles and measurement methodology regardless of brand name. Ex. 1003 ¶230; Ex. 1018 ¶83. WYKO and Zygo optical profilers can similarly be configured to report R_{sk}, R_{ku}, R_{pm}, and R_z, measurements—this is regarded as a standard measurement procedure that is commonly used in the field of magnetic tape. Ex. 1018 ¶83.

Dr. Raeymaekers used an evaluation window of (W = 340 μm, L = 450 μm), which was a typical for evaluating tape of this sort. Ex. 1018 ¶85; Ex. 1003 ¶231. He took measurements at up to 3 window locations for each tape sample. *Id.* At each location, the optical profiler applied a trace measurement of the surface topography across the middle of the window of the testing field, in the tape lengthwise direction, and reported measurements for R_{sk}, R_{ku}, R_{pm}, and R_z. Ex.

1018 ¶85; Ex. 1003 ¶231. Dr. Raeymaekers then calculated plateau ratio for that location as $\frac{R_{pm}}{R_z}$. *Id.* The below table contains measurements obtained by Dr. Raeymaekers using his Zygo optical interferometer, paired with the corresponding original labels (Samples A-C) from Mr. Kasada's declaration. *See* Ex. 1018 ¶86; Ex. 1019 ¶¶4-8, 10; Ex. 1003 ¶231:

Table 1

	Sample A			Sample B		Sample C		
Location	**1**	**2**	**3**	**1**	**2**	**1**	**2**	**3**
Skew (R_{sk})	4.44	0.42	5.59	0.4	0.3	0.32	0.24	-0.03
Kurtosis (R_{ku})	72.07	3.46	70.89	2.91	3.39	3.3	3.51	2.52
Peak Height Mean (R_{pm}) (nm)	61	20	45	13	13	13	15	14
Peak-to-Valley Roughness (R_z) (nm)	106	34	59	25	26	25	28	25
Plateau Ratio	0.58	0.59	0.76	0.52	0.5	0.52	0.54	0.56

3. Tape Samples A, B, and C Satisfy the Claimed Measurements.

Under BRI, each of the surface topography measurements recited in the claims of the '774 Patent are met by each of Tape Samples 1-3. Ex. 1018 ¶¶87, 93; Ex. 1003 ¶232.

Skew. Several claims recite "the backside surface having a skew less than about 0.5." This is satisfied by all three tape samples, each of which had at least one R_{sk} measurement of less than 0.5 from an optical interferometer trace. *See*

supra Table 1 (Sample A Location 2, Sample B Locations 1-2, Sample C Locations 1-3); Ex. 1018 ¶87; Ex. 1003 ¶233.[4]

Kurtosis. Several claims recite "the backside surface having … a kurtosis less than about 4.0." This is satisfied by all three tape samples, each of which had at least one R_{ku} measurement of less than 4.0 from an optical interferometer trace. *See supra* Table 1 (Sample A Location 2, Sample B Locations 1-2, Sample C Locations 1-3); Ex. 1018 ¶88; Ex. 1003 ¶234.[5] Some claims further recite "the kurtosis value is less than or equal to about 3.7." This is met by the same measurements from all three samples. *See id.*

Peak Height Mean. Several claims recite "the backside surface has a peak height mean less than about 200 nm." This is satisfied by all three tape samples, each of which had at least one R_{pm} measurement of less than 200 nm from an optical interferometer trace. *See supra* Table 1 (all measurements for all Tape Samples); Ex. 1018 ¶89; Ex. 1003 ¶235.

Peak-to-Valley Roughness. Several claims recite "the backside surface has

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[4] Tape Sample A had outlier measurements at Locations 1 and 3. Ex. 1018 ¶92. Regardless, Sample A had "at least one" measurement in the claimed range (Location 2) and thus satisfies this claim element. Ex. 1018 ¶¶87-88, 92.

[5] *See supra* n. 4.

a peak-to-valley roughness less than about 325 nm." This is satisfied by all three tape samples, each of which had at least one R_z measurement of less than 325 nm from an optical interferometer trace. *See supra* Table 1 (all measurements for all Tape Samples displaying R_z measurements between 25-106 nm); Ex. 1018 ¶90; Ex. 1003 ¶236. Other claims further recite "the peak-to-valley roughness is less than about 300 nm." This limitation is met by all measurements for all Tape Samples. *See id.*

Plateau Ratio. Several claims recite the element "the backside surface has a plateau ratio of less than or equal to about 0.65." This is satisfied by all three tape samples, each of which had at least one R_{pm}/R_z ratio of less than or equal to about 0.65, i.e., a ratio of at least one measurement of R_{pm} divided by at least one measurement of R_z less than or equal to about 0.65. *See supra* Table 1 (Sample A Locations 1-2, Sample B Locations 1-2, Sample C Locations 1-3); Ex. 1018 ¶91; Ex. 1003 ¶237.

4. Aonuma Supports Four Independent Bases for Obviousness.

Tape Samples A, B, and C were produced based on the Aonuma's teachings. *See supra* Section VI.B.1; Ex. 1003 ¶¶222-228, 238. Each discloses the claimed measurements. *See supra* Section VI.B.3; Ex. 1003 ¶¶232-237, 238. Thus, Aonuma provides four independent reasons why a tape with the measurements claimed by the '774 Patent would have been obvious. Ex. 1003 ¶238.

First, a POSITA would have found it obvious based on Aonuma's teachings to produce a tape such as Sample A, which satisfies the claimed measurements. *See supra* Section VI.B.3; Ex. 1003 ¶¶239, 232-237.

Second, Tape Sample A was created based on Aonuma's teachings but was not calendered. *See* Ex. 1017 at [0119]; Ex. 1019 ¶¶4-6; Ex. 1003 ¶240. A POSITA would have understood that calendering, as taught by Aonuma, would have generally smoothed the back-coat layer by reducing the height of protrusions. Ex. 1003 ¶240. A POSITA would have further understood that reducing the height of protrusions would generally result in smoother surface characteristics, i.e., lower skew, kurtosis, peak height mean, peak-to-valley roughness, and plateau ratio. Ex. 1003 ¶240.

This is confirmed by Tape Samples B and C, which illustrate the impact of calendering: the samples have the same formulation, but while Sample C was calendered, Sample B was not. Ex. 1003 ¶240; Ex. 1019 ¶¶7-8. Measurements for Samples B and C were all within the claimed ranges. Ex. 1003 ¶240.

This fact—that reduced protrusions result in lower skew, kurtosis, etc.—is further confirmed by the '774 Patent. *See* Ex. 1001 at 8:20-23 ("it is generally desirable to decrease positive skew by decreasing the predominance of high peaks, and, consequently, decreasing the number and/or size of pits or embossments"), 8:33-34 ("a low peak height mean indicates that few large peaks are present"),

8:40-51 (describing peak-to-valley roughness as involving "measuring the distance from the top of a peak to the bottom of an adjacent valley" and that smaller peaks "generally decreases the peak-to-valley roughness"), 9:2-7 ("In general, for relatively spiky surfaces, kurtosis is greater than three; for wavy surfaces, kurtosis is less than three; and for perfectly random surfaces, kurtosis is generally equal to three."); Ex. 1003 ¶241. The claimed measurements are therefore obvious over Aonuma because, as demonstrated by Sample A in light of Samples B and C, Aonuma teaches a calendered magnetic tape that satisfies the claim elements for skew, kurtosis, peak height mean, peak-to-valley roughness, and plateau ratio. *See supra* Section VI.B.3; Ex. 1003 ¶¶241, 232-237.

Third, it would have been obvious to a POSITA to manufacture a tape such as Tape Sample B based on the formulation disclosed by Aonuma by changing the concentration of the solvents in the back-coat layer coating material. *See* Ex. 1019 ¶8; Ex. 1003 ¶242. This change in concentration was known in the art, and a POSITA would have understood how to use different solvents and concentrations to accommodate available equipment and coating conditions. *Id.* Aonuma itself teaches varying the liquid concentration of the back-coat layer coating material. *See* Ex. 1017 at [0095] ("the lubricant is typically added in an amount within the range of 0.5 to 5 mass parts per 100 mass parts of binder."); Ex. 1003 ¶242. Ishikawa describes "varying the amount of the solvent" to adjust "the viscosity of

the backcoating composition" as needed. Ex. 1015 at [0119]; Ex. 1003 ¶242. "The solvent is preferably used in such an amount that the backcoating composition may have a solids content of 10 to 50% by weight, particularly 20 to 40% by weight." Ex. 1015 at [0063]. Similarly, Ishii teaches a backcoating composition including solid components dispersed in a solvent with the solvent varying in amount from 300 to 1500 parts by weight per 100 parts by weight of a binder. Ex. 1010 at 7:17-24; Ex. 1003 ¶242.

A POSITA would have known how to vary the solvent ratio—this was commonly performed in the magnetic tape industry to accommodate manufacturing choices and available equipment. *See* Ex. 1012 at [0018]; Ex. 1003 ¶243. The coating equipment used by Mr. Kasada existed in the 2003–2005 timeframe; it, along with other equipment in that timeframe, required this type of variation in solvent ratio. Ex. 1019 ¶7. Thus, a POSITA would have been motivated to, and found it obvious to make the back-coat layer coating material concentration thicker by changing the solvent ratio because such changes could help optimize tape for equipment in the 2003–2005 timeframe. Ex. 1003 ¶243. Therefore, a POSITA would have found it obvious to manufacture a back-coat layer having the composition of Tape Sample B based on Aonuma's teachings. Ex. 1003 ¶243.

Furthermore, a POSITA would have found the manufacture of Tape Sample

B obvious because they would have understood that varying the solvent concentration affected the drying speed of the back-coat layer coating material. Ex. 1003 ¶244. A POSITA would have understood that a thicker composition (i.e., a higher concentration of solid components) causes the solvent to evaporate more slowly, in turn causing the back-coat layer to be more compact, with fewer voids, and thus smoother. *Id.* Numerous prior art references teach the advantages of smoother backside coatings with reduced protrusions. *See, e.g.*, Ex. 1015 at [0044] ("it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer"); Ex. 1013 at 2, ll. 22-23 ("if the surface of the backside coating layer is too rough, the backside coating layer tends to damage the smooth surface of the magnetic layer"); Ex. 1003 ¶244.

Thus, a POSITA would have been motivated to use a formulation such as that from Tape Sample B with a higher concentration of solid components per weight when compared to the formulation taught by Aonuma and used for Tape Sample A. *See* Ex. 1019 ¶7, 4; Ex. 1003 ¶245. A POSITA would have understood, based on Aonuma's teachings and techniques common in the art, that a smoother surface could have been created by decreasing the amounts of solvents used to increase the concentration of solid components. *See* Ex. 1019 ¶7, 4; Ex. 1003 ¶245. Furthermore, the need for calendering to achieve a smooth surface would have

been reduced. Ex. 1003 ¶245. Thus a POSITA would have been motivated and found it obvious to manufacture a back-coat layer having the composition of Tape Sample B based on Aonuma's teachings. *Id.* Sample B has the claimed measurements. *See supra* Section VI.B.3; Ex. 1003 ¶¶245, 232-237.

Fourth, it would have been further obvious to a POSITA to manufacture Tape Sample C. Ex. 1003 ¶246. Sample C is merely a tape made using the same formulation as Sample B, but calendered according the procedure taught by Aonuma. *Id.* ¶¶246, 227-228. A POSITA would have been motivated to, and found it obvious to, produce a tape such as Sample B, and to calender that tape as taught by Aonuma, resulting in Sample C. Ex. 1003 ¶246. This variation of Aonuma, obvious to a POSITA, would have had the claimed characteristics. *Id.* ¶¶246, 232-237; *see supra* Section VI.B.3.

5. Claim 1

(i) "A magnetic recording medium comprising:"

To the extent the preamble is a limitation, it is taught by Aonuma. Ex. 1003 ¶247. Aonuma teaches a "magnetic recording medium according to the present invention[.]" Ex. 1017 at [0086]; Ex. 1003 ¶247.

(ii) "a substrate defining a first surface and a second surface opposite the first surface"

Aonuma discloses "a back-coat layer on a plane of [a] nonmagnetic substrate opposite the plane, on which the magnetic layer or the nonmagnetic layer and the

magnetic layer will be provided." Ex. 1017 at [0086]. A POSITA would have understood that the two "planes" of the support in Aonuma refer to two surfaces; a first surface upon which the non-magnetic layer and magnetic layer are placed, and a second surface upon which the back-coat layer is placed. *Id.*; Ex. 1003 ¶248.

(iii) "a magnetic side formed over the first surface of the substrate and defining a recording surface"

Aonuma discloses this claim element. Ex. 1003 ¶249. Aonuma provides a "magnetic recording medium that comprises the following layer(s) on at least one plane of a nonmagnetic substrate: A magnetic layer containing a ferromagnetic powder and a binder; or A nonmagnetic layer containing a nonmagnetic powder and a binder as well as a magnetic layer containing a ferromagnetic powder and a binder in the order given[.]" Ex. 1017 at [0009]. For magnetic tape, the magnetic layer is the recording surface, and a POSITA would have understood that to be true. *See* Ex. 1017 at [0001-0002] ("the present invention pertains to a coated-type of a magnetic recording medium comprising a magnetic layer, which if formed by coating, on a substrate, a magnetic coating material that contains a ferromagnetic powder and a binder... the ferromagnetic metal powder and hexagonal ferrite are known to have superior high-density recording characteristics."); Ex. 1003 ¶249.

(iv) "a backside coated on the second surface of the substrate and configured to decrease embossment of the recording surface, the backside defining a backside surface opposite the substrate,"

Aonuma discloses this claim element. Ex. 1003 ¶250. Aonuma discloses "a back-coat layer on a plane of the nonmagnetic substrate opposite the plane, on which the magnetic layer or the nonmagnetic layer and the magnetic layer will be provided." Ex. 1017 at [0086]. A POSITA would have understood the "back-coat layer" to be synonymous with the recited "backside" or a "backside coating." Ex. 1003 ¶250.

Aonuma teaches magnetic tape having surface characteristics (e.g., skew, peak height mean, peak-to-valley roughness, plateau ratio, and kurtosis) in the ranges recited by the '774 Patent. *See supra* Section VI.B.3, VI.B.4; Ex. 1003 ¶¶251, 232-237. The '774 Patent confirms that a tape having a backcoat with such characteristics is "configured to decrease embossment of the recording surface." *See* Ex. 1001 at 2:38-67 ("The backside is coated on the second surface of the substrate and is ***configured to decrease embossment of the recording surface***. … The backside surface has a skew less than about 0.5 and a kurtosis less than about 4.0 … a peak-to-valley roughness less than about 325 nm … a peak height mean less than about 200 nm."); Ex. 1003 ¶251.

It was also known in the prior art that a smoother backside could be used to prevent embossment. *See, e.g.,* Ex. 1015 at [0044] ("it is preferred for the

backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer"); Ex. 1003 ¶252.

Furthermore, Aonuma discloses that one objective of the invention was "to achieve further smoothening of the magnetic layer." Ex. 1017 at [0006]; Ex. 1003 ¶253. The magnetic recording medium of Aonuma was coated "with a thin magnetic layer," (Ex. 1017 at [0008]) so POSITA would have been motivated to create a tape with a smooth back-coat layer because a thin magnetic layer would have been more susceptible to damage from embossment from a rough back-coat layer. *See* Ex. 1017 at [0006] ("[I]t was discovered that the magnetic pinholes tend to increase as the magnetic layer becomes thinner. Magnetic pinholes act as sources of DC noise and are therefore unwanted for magnetic recording[.]"); Ex. 1003 ¶253. A POSITA would have known that one method to increase smoothness in the magnetic layer was to prevent embossment of protrusions on the backside coating to the magnetic layer. *See supra* Sections II.B-C; Ex. 1003 ¶¶253, 72-73. Thus, Aonuma's back-coat layer is configured to prevent embossment of the recording surface. Ex. 1003 ¶253.

(v) "the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0"

Samples A, B, and C satisfy this element under BRI. *See supra* Section VI.B.3; Ex. 1003 ¶¶254, 232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed skew and kurtosis measurements would have

been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶254, 238-246.

6. Claim 2

(i) "The magnetic recording medium of claim 1, wherein the magnetic side includes at least one layer, and the at least one layer includes a magnetic recording layer."

Aonuma discloses the additional limitations of claim 2. Ex. 1003 ¶255. Aonuma teaches a "magnetic recording medium that comprises the following layer(s) on at least one plane of a nonmagnetic substrate: A magnetic layer containing a ferromagnetic powder and a binder; or A nonmagnetic layer containing a nonmagnetic powder and a binder as well as a magnetic layer containing a ferromagnetic powder and a binder in the order given." Ex. 1017 at [0009]. This satisfies the element of "the magnetic side includ[ing] at least one layer." Ex. 1003 ¶255. Furthermore, the magnetic layer would have been understood to be a magnetic recording layer. See Ex. 1017 at [0001-0002]; Ex. 1003 ¶255. Additionally, a POSITA would have understood that the magnetic layer of a magnetic tape is necessarily used as a recording surface. Ex. 1003 ¶¶255, 67-68. Therefore, Aonuma renders obvious claim 2. Ex. 1003 ¶255.

7. Claims 3-7

Claims 3-7 of the '774 Patent depend on claim 1 and recite additional measurements of the backside surface: "a peak height mean less than about 200 nm" (claim 3), "a peak-to-valley roughness less than about 325 nm" (claim 4), "a

peak-to-valley roughness less than 300 nm" (claim 5), "a plateau ratio less than or equal to about 0.65" (claim 6), and "a kurtosis value less than or equal to about 3.7" (claim 7). Aonuma renders each of these claims obvious. Ex. 1003 ¶¶256-257.

Each replication tape (Sample A, B, and C) satisfies each of these claimed measurements. *See supra* Section VI.B.3; Ex. 1003 ¶¶257, 232-237. Thus, Aonuma's teachings provide four independent reasons why each of measurements recited in claims 3-7 would have been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶257, 238-246.

8. Claim 15

Claim 15 is identical to claim 1 with the exception of its last claim limitation. Ex. 1003 ¶258. As discussed above, the other claim limitations are obvious in view of Aonuma. *See supra* Sections VI.B.5; Ex. 1003 ¶¶258, 247-253. The last element is also disclosed. Ex. 1003 ¶258.

(i) "the backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm."

Samples A, B, and C satisfy these claimed measurements under BRI. *See supra* Section VI.B.3; Ex. 1003 ¶¶258, 232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶258, 238-246.

9. Claims 16-17

Claims 16 and 17 depend on claim 15 and additionally recite "a skew less

than about 0.5" (claim 16) and "a peak-to-valley roughness less than about 300 nm" (claim 17). Samples A, B, and C satisfy these claimed measurements under BRI. *See supra* Section VI.B.3; Ex. 1003 ¶¶260, 232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶260, 238-246.

10. Claim 20

Claim 20 is identical to claim 1 with the exception of its last claim limitation. Ex. 1003 ¶261. As discussed above, the other claim limitations are obvious in view of Aonuma. *See supra* Sections VI.B.5; Ex. 1003 ¶¶261, 247-253. The last element is also disclosed. Ex. 1003 ¶262.

(i) "the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0, a peak height mean of less than about 200, and a peak-to-valley roughness less than about 325 nm"

Samples A, B, and C satisfy these claimed measurements under BRI. *See supra* Section VI.B.3; Ex. 1003 ¶¶262, 232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶262, 238-246.

11. Claims 8-11, 18, 19

Claims 8 and 9 depend on claim 1 and further recite elements directed to skirt signal-to-noise ratio ("SkSNR") measurements: "a skirt signal-to-noise ratio

of greater than about 0.2 relative dB along a substantial entirety of a total length of the magnetic recording medium" (claim 8) and "wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any second location along the total length of the magnetic recording medium by less than about 0.5 dB" (claim 9). Claims 10 and 11 depend on claim 1 and further recite small error rate measurements: "a small error rate of less than about 0.5 errors/m along a substantial entirety of a total length of the magnetic recording medium" (claim 10) and "wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m" (claim 11). Aonuma renders these claims obvious. Ex. 1003 ¶263.

The SkSNR and small error rate parameters disclosed by the '774 Patent are the obvious consequences of a back-coat layer with the characteristics of claim 20. *Id.* ¶264. The '774 Patent does not disclose any particular technique for reducing SkSNR or small error rate; instead, the '774 Patent simply discloses these parameters as measurements from tapes having the structure of claim 20 (i.e., skew, peak height mean, peak-to-valley roughness, plateau ratio, and kurtosis in the claimed ranges). *See* Ex. 1001 at 10:1-15 (Table 1 disclosing structural

differences between embodiments and prior art), 11:57-12:49 (disclosing SkSNR and small error rate measurements for embodiments); Ex. 1003 ¶264.

The '774 Patent states that its SkSNR and small error rate measurements are merely "additional benefits of the magnetic recording tape of Example 1 [the first embodiment] versus the magnetic recording tape of Comparative Example C4." *See* Ex. 1001 at 11:57-60, 12:34-38; Ex. 1003 ¶265. The '774 Patent does not describe how these "benefits" are achieved other than by reference to using a magnetic recording medium that has the claimed surface roughness characteristics. *See* Ex. 1001 at 12:13-17 ("Since it is desirable to decrease the occurrence of small errors, a magnetic recording medium formed in a similar manner as for Example 1 [exhibiting the claimed surface measurements] is, therefore, believed to be more reliable than a magnetic recording medium formed similar to Comparative Example 4 [not exhibiting the claimed surface measurements]."); Ex. 1003 ¶265.

Aonuma teaches a magnetic recording medium having the structure of claim 20. *See supra*, Section VI.B.10; Ex. 1003 ¶¶266, 261-262. Thus, Aonuma renders claims 8-11 obvious as well. Ex. 1003 ¶266. It would have been obvious to a POSITA that Aonuma teaches a magnetic tape with the SkSNR measurements recited in claims 8 and 9 and the small error rate measurements recited in claims 10 and 11. *Id.*

Claim 18 is identical to claim 9, aside from its dependency on a different

independent claim (claim 15). Ex. 1003 ¶267. Aonuma teaches the limitations recited in claims 18 and 9. Ex. 1003 ¶267. Aonuma further teaches the elements of claim 15, on which claim 18 depends. *See supra* Section VI.B.8; Ex. 1003 ¶¶267, 258. Thus, Aonuma renders claim 18 obvious. Ex. 1003 ¶267.

Claim 19 is identical to claim 11, aside from its dependency on a different independent claim (claim 15). Ex. 1003 ¶268. Aonuma teaches the limitations recited in claims 19 and 11. Ex. 1003 ¶268. Aonuma further teaches the elements of claim 15, on which claim 19 depends. *See supra* Section VI.B.8; Ex. 1003 ¶¶268, 258. Thus, Aonuma renders claim 19 obvious. Ex. 1003 ¶268.

C. Ground 5: Claims 1-11 and 15-20 Are Obvious Over Aonuma in View of Abe

Aonuma teaches a magnetic tape with a bimodal backcoat (with both fine-grain and coarse-grain carbon black particles) whose surface characteristics fall in the recited ranges of the challenged claims. *See supra* Sections VI.B.3-4; Ex. 1003 ¶¶269, 232-237. Abe's additional teachings further confirm that Aonuma's backcoat is configured to prevent embossment. Ex. 1003 ¶269.

Abe further teaches a magnetic recording medium with a backcoat that uses two different sizes of carbon black, where the backcoat is "smooth enough such that the backside coating layer has less of a tendency to damage the magnetic layer relative to previously known backside coating layers comprising two different kinds of carbon black particles." Ex. 1013 at 2, ll. 54-56; Ex. 1003 ¶270. Abe

teaches that embossment can be prevented using particular ratios of the two sizes of carbon black particles. Ex. 1013 at 3, ll. 21-28 ("[I]n order to provide backside coating layers having a centerline average roughnesses of 30 nm or less [to provide a smooth surface], it is preferred to use a relatively large amount of finely divided carbon black particles having a particle size in the range from 10 to 30 nm … in order to provide backside coating layers having a surface density of 2% or less of projections having a particle size of 100 nm or more, it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"); Ex. 1003 ¶270. Abe teaches example embodiments with a range of weight ratios for fine- and coarse-grain carbon black particles, along with corresponding measurements for centerline average roughness, surface density of projections having a height of 30nm or more, and surface density of projections having a height of 100nm or more. Ex. 1003 ¶270; *see* Ex. 1013 at 3, ll. 9-14; *id.* at 6 (Table 2):

		Application Example				
		1	2	3	4	5
Carbon black (average particle size, 20 nm)	(wt%)	99	99	98	95	99.6
Carbon black (average particle size, 350 nm)	(wt%)	1	1	2	5	0.4
Titanium Oxide (average particle size, 70 nm)	(wt%)	0	0	0	0	0
Thickness of backside coating layer	(μm)	0.66	0.70	0.68	0.70	0.62
Centerline average roughness of backside coating layer	(nm)	17	16	14	18	10
Surface density of projections in backside coating layer	30 nm or more (%)	8.3	3.5	6.0	9.0	2.1
	100 nm or more (%)	0.3	0.2	0.4	0.9	0.1
Gravity friction coefficient of backside coating layer after 200 passes		0.16	0.24	0.18	0.18	0.17
Drop-out	(number)	11	10	15	13	10
Noise	(dB)	0	0	0	0.5	0

Abe teaches that embossment can be prevented using formulations with coarse particles forming less than 5% of the backside coating. Ex. 1013 at 6 (Table 2); Ex. 1003 ¶271. Aonuma's backcoat formulation uses 2.9% coarse particles: Aonuma teaches a backcoat with 100 parts fine-grain carbon black and 3 parts coarse-grain carbon black, which corresponds to a percentage ratio of 97.1/2.9. *See* Ex. 1017 at [0119]; Ex. 1003 ¶271.

Therefore, a POSITA would have found it obvious, based on the combined teachings of Aonuma and Abe, that Aonuma taught a magnetic recording medium with a reduced number of large peaks (as confirmed by the surface measurement

data for the Aonuma tape) and a backside configured to prevent embossment (as confirmed by Abe). Ex. 1013 at 3, ll. 15-28; Ex. 1003 ¶272. The measured surface characteristics from Aonuma, with its use of two sizes of carbon black particles, reflect Abe's teachings for adjusting the weight ratio of fine- and coarse-grain carbon black to prevent embossment. Ex. 1003 ¶272.

1. Motivations to Combine

A POSITA would have been motivated to combine Aonuma with Abe for a number of reasons, including the fact that both references were directed to the same solution in the same field of art. Ex. 1003 ¶273. Both references taught the use of fine-grain and coarse-grain carbon black, with a higher proportion of the fine-grain carbon black, and both addressed the formation of protrusions on the backcoat surface. *See* Ex. 1017 at [0119] (using 100 parts fine-grain and 3 parts coarse-grain, a percentage ratio of 97.1/2.9); *id.* at [0087] ("a coarse-powder carbon black … forms minute projections on the surface of the back-cat layer"); Ex. 1013 at 3, ll. 27-28 ("it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"); *id.* at 2, ll. 51-52 ("[u]se of the two kinds of carbon black particles introduces a plurality of projections into an otherwise smooth surface"); Ex. 1003 ¶273. Abe further discloses that its preferred weight ratio range of carbon black particles (a range that includes the formulation in Aonuma) meets a goal of

providing "a backside coating layer with a smooth surface, thus minimizing the tendency of the backside coating layer to damage the magnetic layer." Ex. 1013 at 3, ll. 15-16, 25-28; Ex. 1003 ¶273.

Therefore, a POSITA would have been motivated to create a magnetic recording medium with the backcoat layer disclosed in Aonuma, reinforced by Abe's teaching that the weight ratio of carbon black particles in Aonuma would have provided a backcoat layer with a smooth surface for preventing embossment. Ex. 1003 ¶274. Such a combination would have taught a magnetic tape having the claimed properties of the '774 Patent. *See supra* Sections VI.B.3-4; Ex. 1003 ¶274.

2. *KSR* Factors

The alleged invention is simply a combination of familiar elements (backside coating on a magnetic tape using two sizes of carbon black particles) according to known methods (using a relatively high ratio of fine-grain to coarse-grain carbon black particles) to yield predictable results (minimizing damage to the magnetic layer caused by protrusions on the backcoat layer). *See KSR*, 550 U.S. at 417; Ex. 1003 ¶275; Ex. 1017 at [0086] ("it is preferable to use a fine-powder carbon black with a mean grain size of 10 to 30 nm but preferably 10 to 20 nm, and a coarse-powder carbon black with a mean grain size of 150 to 300 nm but preferably 230 to 300 nm"); Ex. 1013 at 3, ll. 27-28 ("it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles

is in the range from 99.9/0.1 to 70/30"); *id.* at 3, ll. 15-16 (the specified weight ratio provides a characteristic to provide "a backside coating layer with a smooth surface, thus minimizing the tendency of the backside coating layer to damage the magnetic layer").

It was well known in the art that embossment could be prevented using specific weight ratios of fine-grain and coarse-grain carbon black particles in the backcoat layer. *See* Ex. 1013 at 3, ll. 9-28; Ex. 1003 ¶276. Indeed, the '774 Patent admits that bimodal backcoat layers with both large and small carbon black particles were known in the art. *See* Ex. 1001 at 1:47-53, FIG. 1; Ex. 1003 ¶276. However, despite its efforts to distinguish the bimodal art (*see* Ex. 1001 at 10:1-14, 11:12-20, 11:39-55, FIGS. 1, 3), the '774 Patent recites broad claim ranges of surface topography measurements that encompass prior art tapes regardless of whether they were limited to fine-grain carbon black or whether they used the bimodal backcoats that the '774 Patent admits were prior art (*see supra* Section VI.B; Ex. 1003 ¶¶276, 220). In short, bimodal backcoat layers were known in the art and known to be capable of preventing embossment. Ex. 1003 ¶276. Thus, the problem and solution of the '774 Patent were known in the art, and there is nothing novel or non-obvious about claiming measurements of known processes. *Id.*

3. Claim 1

(i) "A magnetic recording medium"

Aonuma teaches this element. *See supra* Section VI.B.5.i; Ex. 1017 at [0086]; Ex. 1003 ¶¶277, 247. Abe is also directed to "magnetic recording media." *See* Ex. 1013 at 2, ll. 3-6; Ex. 1003 ¶277.

(ii) "a substrate defining a first surface and a second surface opposite the first surface"

Aonuma discloses this element. *See supra* Section VI.B.5.ii; Ex. 1003 ¶¶278, 248. It is further taught by Abe. Ex. 1013 at 2, ll. 10-13 ("Magnetic recording tapes generally comprise a magnetic layer obtained from a magnetic layer coating, metallic vapor deposition or the like provided on one surface of a non-magnetic substrate such as polyester films. Magnetic recording tapes may also comprise a backside coating layer[] comprising carbon black particles dispersed and bound in a binder provided on the other surface of the substrate"); Ex. 1003 ¶278.

(iii) "a magnetic side formed over the first surface of the substrate and defining a recording surface"

Aonuma discloses this element. *See supra* Section VI.B.5.iii; Ex. 1003 ¶¶279, 249. It is further taught by Abe. Ex. 1013 at 2, ll. 10-12; *see id.* at 2, ll. 16 ("the surface of a magnetic layer is typically smoothly finished in order to improve output sensitivity"); Ex. 1003 ¶279.

(iv) "a backside coated on the second surface of the substrate and configured to decrease embossment of the recording surface, the backside defining a backside surface opposite the substrate,"

Aonuma discloses this element. *See supra* Section VI.B.5.iv; Ex. 1003 ¶¶280, 250-253. The backside layer of Aonuma is configured to prevent embossment. *Id.* Abe further confirms that a backside layer such as that disclosed in Aonuma (with a fine/coarse carbon black weight ratio of 97.1/2.9) would have resulted in "a backside coating layer with a smooth surface, thus minimizing the tendency of the backside coating layer to damage the magnetic layer." Ex. 1013 at 3, ll. 15-16; *see id.* at 3, ll. 27-28 ("it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"); *id.* at 2, ll. 12-13 ("Magnetic recording tapes may also comprise a backside coating layer[] comprising carbon black particles dispersed and bound in a binder provided on the other surface of the substrate"); Ex. 1003 ¶280.

(v) "the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0"

Aonuma teaches this element, as illustrated by Tape Samples A, B, and C. *See supra* Section VI.B.5.v, VI.B.3; Ex. 1003 ¶¶281, 254. Aonuma's teachings provide four independent reasons why the claimed skew and kurtosis measurements would have been obvious to a POSITA. *See supra* Section VI.B.4;

281, 238-246. Thus a POSITA would have found this element obvious based on Aonuma's teachings and further obvious in light of Abe's teachings. Ex. 1003 ¶281.

4. Claim 2

(vi) "The magnetic recording medium of claim 1, wherein the magnetic side includes at least one layer, and the at least one layer includes a magnetic recording layer."

Aonuma discloses the limitations of claim 2. *See supra* Section VI.B.6; Ex. 1003 ¶¶282, 255. Abe also teaches claim 2. Ex. 1003 ¶282. Abe teaches "a magnetic layer obtained from a magnetic layer coating, metallic vapor deposition or the like provided on one surface of a non-magnetic substrate." Ex. 1013 at 2:10-11. A POSITA would have understood that the magnetic layer of a magnetic tape is used as a recording surface. Ex. 1003 ¶282. Therefore, the combination of Aonuma and Abe renders obvious claim 2. *Id.*

5. Claims 3-7

Claims 3-7 of the '774 Patent depend on claim 1 and recite additional measurements of the backside surface: "a peak height mean less than about 200 nm" (claim 3), "a peak-to-valley roughness less than about 325 nm" (claim 4), "a peak-to-valley roughness less than 300 nm" (claim 5), "a plateau ratio less than or equal to about 0.65" (claim 6), and "a kurtosis value less than or equal to about 3.7" (claim 7). As discussed above, Aonuma renders each of these claims obvious.

Supra Section VI.B.7. Ex. 1003 ¶¶283, 256-257.

A POSITA would have understood that Abe further teaches that Aonuma's ratio of fine- and coarse-grain carbon black particles in the range for the prevention of embossment. Ex. 1003 ¶284. This is confirmed by tape samples A, B, and C, which reflect Aonuma's teachings. *See* Ex. 1013 at 3, ll. 15-16; 27-28; Ex. 1003 ¶284. Thus, claims 3-7 are rendered obvious by the combination of Aonuma and Abe. Ex. 1003 ¶284.

6. Claim 15

Claim 15 is identical to claim 1 with the exception of its last claim limitation. Ex. 1003 ¶285. As discussed above, the other claim limitations are obvious over Aonuma and Abe. *See supra* Section VI.C.3; Ex. 1003 ¶¶285, 277-280. The last element is also disclosed by the Aonuma-Abe combination. Ex. 1003 ¶285.

(i) "the backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm."

Aonuma discloses this claim element. *Supra* Section VI.B.8.i. Samples A, B, and C of Aonuma satisfy these claimed measurements under BRI. *See supra* Section VI.B.3; Ex. 1003 ¶¶286, 232-237. Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶286, 238-246. Thus, a POSITA

would have understood that the Aonuma-Abe combination would render obvious claim 15. Ex. 1003 ¶286.

7. Claims 16-17

Claims 16 and 17 depend on claim 15 and additionally recite "a skew less than about 0.5" (claim 16) and "a peak-to-valley roughness less than about 300 nm" (claim 17). As discussed above, Aonuma renders these claim elements obvious. *Supra* Section VI.B.9; Ex. 1003 ¶¶287, 259-260. Samples A, B, and C satisfy these claimed measurements under BRI. *See supra* Section VI.B.3; Ex. 1003 ¶¶287, 232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶287, 238-246. Thus, a POSITA would have understood that the Aonuma-Abe combination would render obvious claims 16-17. Ex. 1003 ¶287.

8. Claim 20

Claim 20 is identical to claim 1 with the exception of its last claim limitation. Ex. 1003 ¶288. As discussed above, the other claim limitations are obvious in view of Aonuma and Abe. *See supra* Sections VI.C.3; Ex. 1003 ¶¶288, 277-280. The last element is also disclosed by the Aonuma-Abe combination. Ex. 1003 ¶288.

(ii) "the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0, a peak

height mean of less than about 200, and a peak-to-valley roughness less than about 325 nm"

Aonuma discloses this claim element. *Supra* Section VI.B.10.i; Ex. 1003 ¶¶288, 261-262. Samples A, B, and C of Aonuma satisfy these claimed measurements under BRI. *See supra* Section VI.B.3; Ex. 1003 ¶¶288, 232-237. Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a POSITA. *See supra* Section VI.B.4; Ex. 1003 ¶¶288, 238-246. Thus, a POSITA would have understood that the Aonuma-Abe combination would render obvious claim 20. Ex. 1003 ¶288.

9. Claims 8-11, 18, 19

Claims 8 and 9 depend on claim 1 and further recite elements directed to SkSNR measurements. *See supra* Section VI.B.11; Ex. 1003 ¶¶289, 263. The recited SkSNR measurements are the obvious consequences of a back-coat layer with the characteristics of claim 20. *See id.* Claims 10 and 11 depend on claim 1 and further recite elements directed to small error rate measurements. *See id.* The recited small error rate measurements are the obvious consequences of a back-coat layer with the characteristics of claim 20. *See id.*

The combination of Aonuma and Abe teach a magnetic recording tape having the structure of claim 20, including the surface topology characteristics that allegedly result in the recited SkSNR and small error rate measurements. *See supra*, Section VI.C.8; Section VI.B.11; Ex. 1003 ¶¶290, 288. Thus, the

combination renders claims 8-11 obvious. Ex. 1003 ¶290. It would have been obvious to a POSITA that the combination of Aonuma and Abe teaches a magnetic tape with the SkSNR measurements recited in claims 8-9 and the small error rate measurements recited in claims 10-11. *Id.*

Furthermore, Abe teaches that Aonuma's ratio of coarse- and fine-grain carbon black particles is particularly suited for preventing embossment. *See supra* Section VI.C.3.iv; Ex. 1003 ¶¶291, 271-272, 280. A POSITA would have understood—as a basic principle of engineering that was widely known in the magnetic tape industry—that embossment increases noise and thus decreasing the amount of embossment caused by protrusions decreases the amount of noise. *See* Ex. 1005 at [0014]-[0015]; Ex. 1003 ¶291. Since the signal-to-noise ratio is, by definition, the ratio of a signal (in the magnetic tape context, it typically refers to the magnetically recorded signal) to noise, a decrease in noise leads to an increase in the signal-to-noise ratio. Ex. 1003 ¶291. A POSITA would have understood this principle and found it obvious that the reduced noise achieved by Aonuma's teachings—as further confirmed by Abe—would have directly led to a corresponding increase in SkSNR. *Id.*

Similarly, a POSITA would have understood—as a basic principle of engineering that was widely known in the magnetic tape industry—that noise cases errors and thus lower noise leads to a lower error rate. Ex. 1003 ¶292. Because the

combination of Aonuma and Abe teaches reduced embossment and noise, it would have been obvious to a POSITA that their combined teachings would have also led to a corresponding decrease in the small error rate. *Id.*

Additionally, by teaching a backcoat with fewer protrusions, the combination of Aonuma and Abe teach a smoother and more regular backcoat. *Id.* ¶293. As a POSITA would have recognized, measurements from such a backcoat would have been more consistent across different portions of the tape because the irregularities and noise caused by embossment would have been decreased. *Id.* For tape based tape on Aonuma's teachings, measurements taken at different locations along the length of tape would have been relatively similar, and thus the relative difference between those measurements (as measured in decibels) would have been small. *Id.* These are general engineering principles that a POSITA would have understood. *Id.*

The '774 Patent confirms this fact: "The decreased surface measurement values lead to a decrease in the number and/or level of pits or embossments formed in adjacent layers of tape, ***therefore, also decreasing the errors and increasing the signal-to-noise ratios of the magnetic recording mediums***." Ex. 1001 at 9:62-67 (emphasis added); Ex. 1003 ¶294. "Accordingly, by decreasing the number and/or prominence of pits or embossments, the signal-to-noise ratio, such as the skirt signal-to-noise ratio, is increased and errors, such as the small errors, are decreased

with respect to other magnetic recording mediums[.] Similarly, in one embodiment, variations in the skirt signal-to-noise ratio and small errors are also limited along the total length of the magnetic recording medium." Ex. 1001 at 9:29-37.

Thus, the '774 Patent admits that the claimed SkSNR and small error rate measurements are the consequence of a magnetic tape with reduced transfer of protrusions from the backside coating to the magnetic layer. *See* Ex. 1001 at 9:29-37, 9:62-67; Ex. 1003 ¶295. The combination of Aonuma and Abe teaches magnetic tape with a backcoat configured to reduce such transfer. *See supra* Sections VI.C, VI.C.1-2; Ex. 1003 ¶295, 280. Thus, a POSITA would have found the claimed SkSNR and small error rate measurements of claims 8-11 obvious in light of the combined teachings of Aonuma and Abe. Ex. 1003 ¶295.

Claim 18 is identical to claim 9, aside from its dependency on a different independent claim (claim 15). Ex. 1003 ¶296. The combination of Aonuma and Abe teaches the limitations recited in claims 18 and 9. *Id.* The combination further teaches the elements of claim 15, on which claim 18 depends. *See supra* Section VI.C.6; Ex. 1003 ¶¶296, 285-286. Thus, Aonuma in view of Abe renders claim 18 obvious. Ex. 1003 ¶296.

Claim 19 is identical to claim 11, aside from its dependency on a different independent claim (claim 15). Ex. 1003 ¶297. The combination of Aonuma and

Abe teaches the limitations recited in claims 19 and 11. Ex. 1003 ¶297. The combination further teaches the elements of claim 15, on which claim 19 depends. *See supra* Section VI.C.6; Ex. 1003 ¶¶297, 285-286. Thus, Aonuma in view of Abe renders claim 19 obvious. Ex. 1003 ¶297.

VII. MANDATORY NOTICES, STANDING, AND FEES

Real Parties in Interest: FUJIFILM Corporation, FUJIFILM Holdings Corporation, FUJIFILM Holdings America Corporation, and FUJIFILM Recording Media U.S.A., Inc. are the real parties in interest to this petition.

Related Matters: Sony Corporation, *et al.* v. FUJIFILM Holdings Corporation, *et al.,* No. 1:16-cv-05988 (SDNY); Petition for Inter Partes Review of U.S. Patent No. 7,029,774 Under 35 U.S.C. § 311, 37 C.F.R. §§ 42.100 *et seq.* (Grounds 1-2), IPR No. to be assigned.

Lead Counsel and Request for Authorization: Pursuant to 37 C.F.R. §§ 42.8(b)(3) and 42.10(a), Petitioner designates the following: Lead Counsel is Eliot D. Williams (Reg. No. 50,822) of Baker Botts L.L.P.; Back-up Counsel is Jeffrey Liang (Reg. No. 69,043) of Baker Botts L.L.P.

Service Information: Service information is as follows: Baker Botts L.L.P., 1001 Page Mill Road, Building One, Suite 200, Palo Alto, CA 94304; Tel. (650) 739-7500; Fax (650) 739-7609. Petitioner consents to service by electronic mail at

eliot.williams@bakerbotts.com and jeffrey.liang@bakerbotts.com. A Power of Attorney is filed concurrently herewith under 37 C.F.R. § 42.10(b).

Grounds for Standing: Petitioner certifies under 37 C.F.R. § 42.104(a) that the '774 Patent is available for *inter partes* review. Petitioner and real-parties-in-interest are not barred or estopped from requesting *inter partes* review of any claim of the '774 Patent on the grounds set forth herein.

Fees: The Office is authorized to charge fees for this Petition to Deposit Account No. 02-0384, Ref. 070103.0332.

VIII. CONCLUSION

Accordingly, Petitioner requests institution of an *inter partes* review of the '774 Patent.

April 11, 2017

Respectfully,

/Eliot D. Williams/
Eliot D. Williams
Reg. No. 50,822

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition, exclusive of the exempted portions as provided in 37 C.F.R. § 42.24(a), contains no more than 13,747 words and therefore complies with the type-volume limitations of 37 C.F.R. § 42.24(a).

April 11, 2017

/Eliot D. Williams/
Eliot D. Williams

CERTIFICATE OF SERVICE ON PATENT OWNER UNDER 37 C.F.R. § 42.105

Pursuant to 37 C.F.R. § 42.105, the undersigned certifies that on the 11th day of April 2017, a complete and entire copy of this Petition for *Inter Partes* Review under 35 U.S.C. § 311 and 37 C.F.R. § 42.104, and all supporting exhibits were provided via Priority Mail Express or by means at least as fast and reliable as Priority Mail Express, postage prepaid, to the Patent Owner and its known representatives by serving the correspondence address of record for the '774 Patent holder and the patent holder's counsel:

Eric D. Levinson
Imation Corp.
Legal Affairs
P.O. Box 64898
ST. Paul, MN 55164-0898

Roxana A. Sullivan
Dennemeyer & Co., L.L.C.
181 W. Madison St., Suite 4500
Chicago, IL 60602

Edward J. DeFranco
Quinn Emanuel, Urquhart & Sullivan, LLP
51 Madison Avenue, 22nd Floor
New York, New York 10010

Respectfully submitted,
BAKER BOTTS L.L.P

/Eliot D. Williams/

Eliot D. Williams
Reg. No. 50,822
1001 Page Mill Road
Building One, Suite 200
Palo Alto, CA 94304
Phone: (650) 739-7511
Facsimile: (650) 739-7611
eliot.williams@bakerbotts.com

Jeffrey Liang
Reg. No. 69,043
1001 Page Mill Road
Building One, Suite 200
Palo Alto, CA 94304
Phone: (650) 739-7542
Facsimile: (650) 739-7611
jeffrey.liang@bakerbotts.com

ATTORNEYS FOR PETITIONER FUJIFILM CORPORATION.