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

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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)

TABLE OF CONTENTS

PETITIONER'S LIST OF EXHIBITS

Ex.	Description
1001	U.S. Patent No. 7,029,774 ("the '774 Patent")
1002	File History for U.S. Patent No. 7,029,774
1003	Declaration of Ryosuke Isobe
1004	U.S. Patent 5,607,747 ("Law")
1005	Japanese Patent Publication JP2003-317228 ("Sasaki")
1006	Japanese Patent Publication JPH10-214414 ("Naoe")
1007	U.S. Patent 5,686,013 ("Rustad")
1008	U.S. Patent 4,837,082 ("Harrell")
1009	U.S. Patent 7,056,607 ("Zinbo")
1010	U.S. Patent 6,103,365 ("Ishii")
1011	U.S. Patent 5,208,091 ("Yanagita")
1012	U.S. Patent Publication No. 2004/0089564 ("Kuse")
1013	EP Patent Application Publication No. 0494793A1 ("Abe")
1014	U.S. Patent 6,007,896 ("Bhushan")
1015	U.S. Patent Publication No. 2003/0054203 ("Ishikawa")

I. OVERVIEW OF CHALLENGE

FUJIFILM Corporation ("Petitioner") petitions for *inter partes* review of claims 1-13 and 15-20 of US Patent No. 7,029,774 ("the '774 Patent"), assigned to Sony Corporation ("Patent Owner").

A. Publications Relied Upon

Exhibit 1004—U.S. Patent No. 5,607,747 to Law et al. ("Law") is a U.S. Patent that issued March 4, 1997 and qualifies as prior art under at least 35 U.S.C. § 102(a) and (b). *See infra*, Section IV.

Exhibit 1005—Japanese Patent Publication No. JP2003-317228 to Sasaki ("Sasaki") published November 7, 2003 and is prior art under at least § 102 (a) and (b). *See infra*, Section IV. A translation has been provided.

B. Grounds

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

– **GROUND 1**: Claims 1-12 and 15-20 are anticipated under § 102 by Law.

– **GROUND 2**: Claims 1-13 and 15-20 are obvious under § 103 by Law in view of Sasaki.

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, e.g.*, 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.

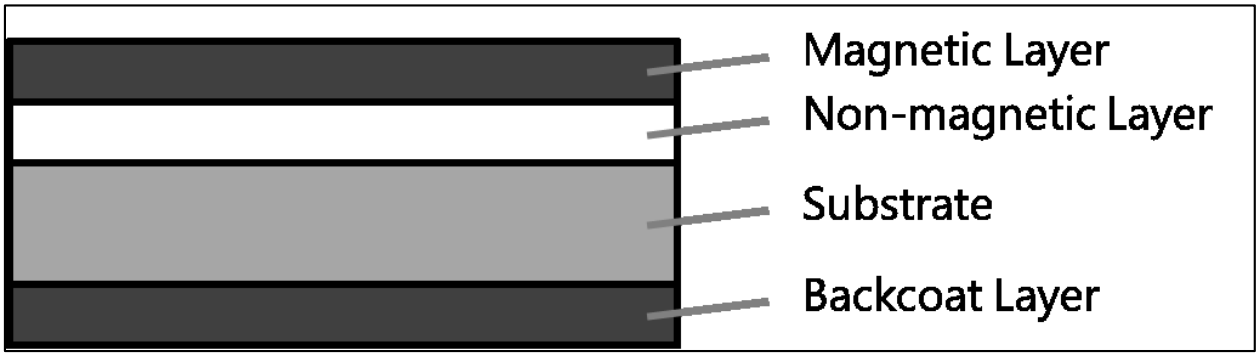

Figure 1: Cross-Section View of Tape (Ex. 1003 ¶67 Figure 1)

The backcoat, or backside coating, protects the tape when it is wound and also reduces overall friction when the tape is in use. *See, e.g.*, 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 e.g.,* 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.

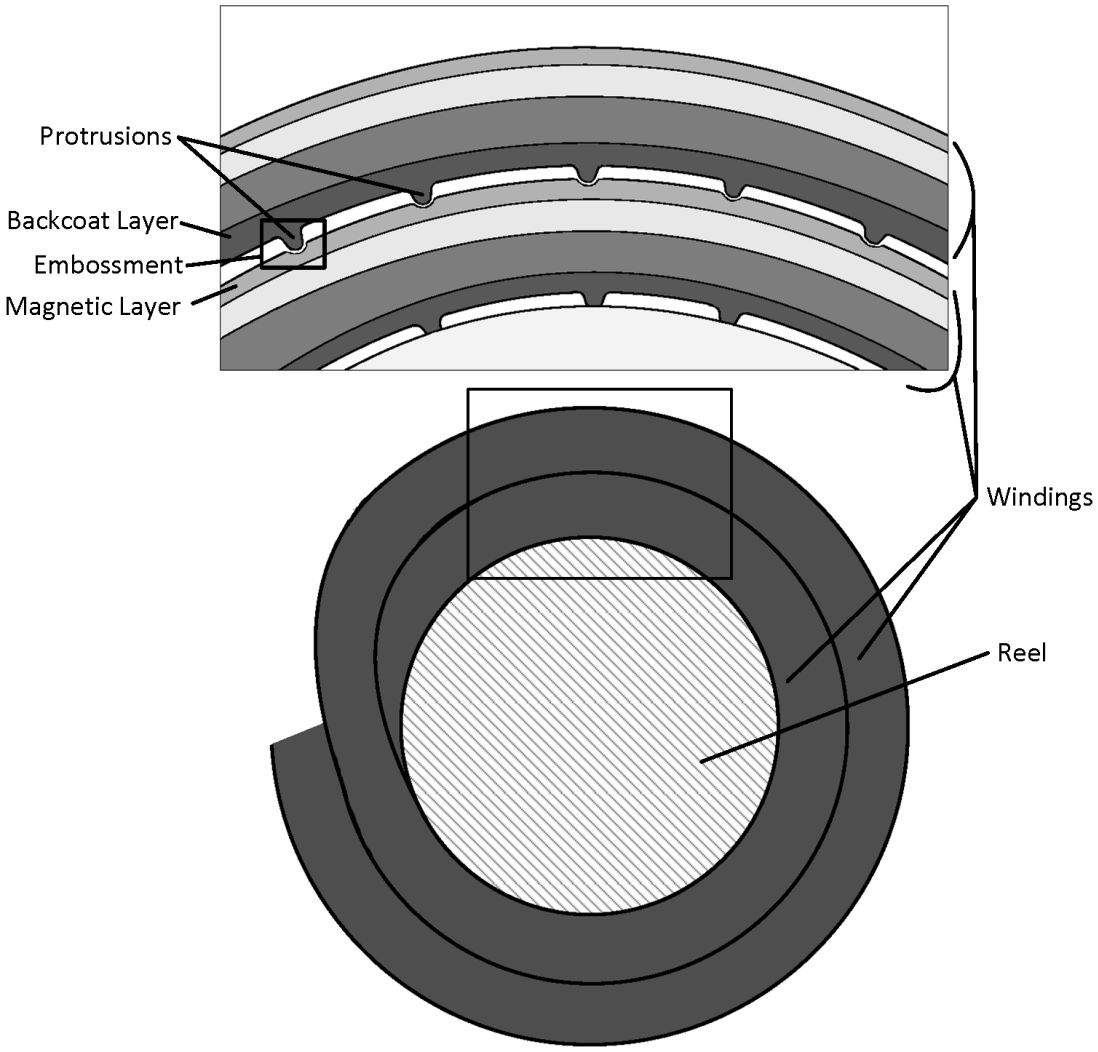

Figure 2: Cross-Section View of Wound Reel of Magnetic Tape (Ex. 1003 ¶69 Figure 2)

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. Reducing Large Protrusions to Address Embossment

It was 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. As was widely known in the art, 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").

D. Fine-Grain Carbon Black

The prior art recognized that the embossment problem could be alleviated by the use of uniform, fine-grain carbon black particles in the backcoat layer. *See* Ex. 1009 at 3:63-4:3 ("The use of a carbon black of uniform particle distribution and cluster size distribution results in protrusions of uniform height being present on

the surface of the backcoat layer. When the mean primary particle size of the carbon black contained in the backcoat layer falls within the aforementioned range [10-150 nm], a backcoat layer having good surface smoothness, high coating strength, and low surface resistivity is obtained."); Ex. 1006 at [0010] ("In order to make sure that the unevenness of the back coat layer will not show through the magnetic layer, the particle size of the carbon black will be preferable to be 0.3 μm or less. The particularly preferable particle size will be 0.01 ~ 0.1 μm"); Ex. 1010 at 7:8-10 ("For ease of [mean roughness] control, it is preferred to use carbon black having a primary particle size of 15 to 80 nm, particularly 17 to 40 nm."); Ex. 1003 ¶74. This led to a smoother backside surface as compared to formulations that included a mixture of fine-grain particles and large particles. *See* Ex. 1011 at 8:12-9:43 (Table 1) (comparing surface protrusions for various mixtures of fine particles of carbon black and coarse particles of zinc oxide); Ex. 1013 at 6 (Table 2) (comparing surface density of large protrusions for mixtures of fine particles of carbon black and coarse particles of carbon black where mixtures containing higher concentrations of coarse particles contain more protrusions); Ex. 1003 ¶74.

Using fine-grain carbon black created a smoother surface with fewer sharp peaks (i.e. spikes or sharp protrusions) compared to a backcoat created with both fine-grain and coarse-grain carbon black, thus preventing embossment. *See* Ex. 1013 at 6 (Table 2); Ex. 1005 at [0129] (Table 1); Ex. 1003 ¶75. By reducing the

number of sharp peaks, the surface roughness of the backcoat becomes closer to a random distribution (e.g., corresponding to a normal or Gaussian distribution). Ex. 1003 ¶75. Thus the prior art recognized that embossment could be prevented if large carbon black particles were omitted and relatively uniform, fine-grain carbon black was used instead. *Id.*

Numerous references recognized this problem and taught the same solution. For example, in Sasaki, reducing the prevalence of large protrusions (i.e., spikes) on the backcoat, improved the performance of the tape, and reduced damage. Ex. 1005 at [0016] ("[I]t is necessary to create a back coat that reduces protrusion imprinting upon the magnetic layer during long-term storage"); Ex. 1003 ¶76. Ex. 1006 ("Naoe") notes the same problem and teaches a backcoat layer with the same solution as the '774 Patent of using uniform fine-grain carbon black particles. Ex. 1006 at [0003] ("if the surface of the back coat layer was roughened … the so-called 'show-through' wherein the back coat layer and the magnetic layer will be in pressure contact with each other, the unevenness of the back coat layer would show through the magnetic layer"); [0010] ("to make sure that the unevenness of the back coat layer will not show through the magnetic layer … [t]he particularly preferable particle size will be 0.01 ~ 0.1 μm"); Ex. 1003 ¶76.

Ex. 1009 ("Zinbo") notes that "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 surface are superposed[.]" Ex. 1009 at 1:50-53; Ex. 1003 ¶77. Zinbo teaches "[t]he use of a carbon black of uniform particle distribution and cluster size distribution" including embodiments of backcoat layers containing only carbon black particles with a mean particle diameter of 17 nm. *See id.* at 3:63-3:66, 21:10-24; Ex. 1003 ¶77.

Ex. 1010 ("Ishii") notes that "[w]hen the magnetic tape is wound, the surface profile of the backcoating layer are transferred to the surface of the magnetic layer to impair the surface smoothness of the magnetic layer." Ex. 1010 at 4:4-7; Ex. 1003 ¶78. Ishii recognized that the size of backcoat carbon black particles provided a means for controlling the backside roughness. *See id.* at 6:1-4 ("Means for controlling the [mean roughness] within the above range includes adjustment of the particle size of various particles to be contained in the backcoating layer 5, especially carbon black particles"); Ex. 1003 ¶78. In particular, "it is preferred to use carbon black having a primary particle size of 15 to 80 nm, particularly 17 to 40 nm." Ex. 1010 at 7:8-10; Ex. 1003 ¶78. These examples "undergo little transfer of the surface profile of the backcoating layer." Ex. 1010 at 16:2-3; Ex. 1003 ¶78.

E. The Statistical Consequences of Using Fine-Grain Carbon Black

Numerous prior art references teach the use of fine-grain carbon black with

particles of approximately uniform size. *See supra* Section II.D; Ex. 1003 ¶79. These teachings eliminated the use of large particles in the backside coating, which the prior art recognized as a cause of embossment. *See id.* By removing these large particles, the prior art reduced the prevalence of peaks, i.e., spikes, on the backside surface. *See, e.g.,* Ex. 1005 at [0092], [0129] (Table 1); Ex. 1013 at 6 (Table 2); Ex. 1003 ¶79. A consequence of reduced peaks, as was commonly known in the art, would have been a reduction in several statistical measures of those peaks. Ex. 1003 ¶79. For example, the average height of those peaks (e.g., the peak height mean) would have been reduced. *Id.* Similarly, the average peak-to-valley separation would have been smaller. *Id*.

Another consequence of a backcoat using uniform carbon black particles would have been an approximately Gaussian roughness distribution. Ex. 1003 ¶80. Under standard principles of probability such as the central limit theorem, random processes of this sort tend to result in Gaussian distributions, i.e., a bell curve. *Id.* In statistics, the "moments" of a random variable are often used to characterize the statistical distribution. *Id.* Most commonly, this includes the first moment (the mean or average) and the second moment (the variance or square root of the standard deviation). *Id*.

The third and fourth moments can also be used. Ex. 1003 ¶81. The third moment is known as "skew," and the fourth moment "kurtosis." *Id.* By definition,

a Gaussian distribution has a skew of 0 and a kurtosis of 3. *Id.* A POSITA would have known that kurtosis is normalized so that "a truly Gaussian surface generally has a kurtosis value of three." *See* Ex. 1014 at 4:28-29; Ex. 1003 ¶81. Thus, a corollary of the prior art teachings regarding the use of fine-grain, uniformly-sized carbon black would have included a surface roughness that approached a skew of 0 and a kurtosis of 3. Ex. 1003 ¶81.

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 alleged invention uses carbon black particles in the backside layer that are "substantially uniform in size." Ex. 1001 at 5:22-23; Ex. 1003 ¶86.

This use of fine-grain carbon black, and the elimination of large backside particles, is illustrated by Figs. 1 (describing the prior art) and 3 (showing the alleged invention) below. *See* Ex. 1003 ¶87; Ex. 1001, Figs. 1, 3:

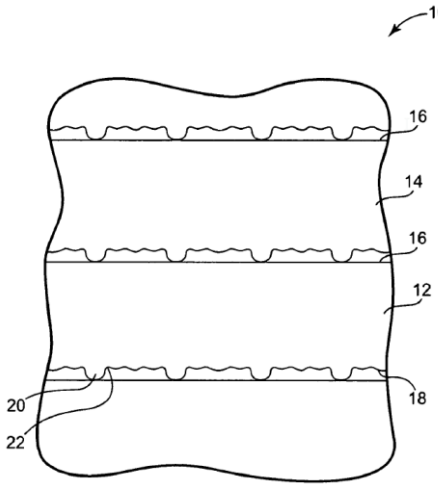

Fig. 1
(PRIOR ART)

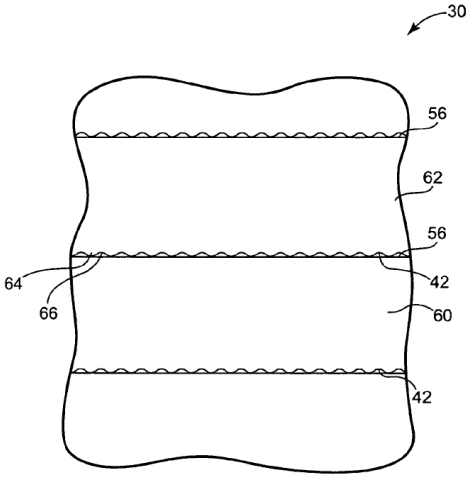

Fig. 3

The '774 Patent achieves its alleged invention through its use of relatively uniform carbon black particles of less than 30 nm in the backcoat. Ex. 1003 ¶88. Both of its embodiments (Examples 1 and 2) use nearly identical backside formulations as the "Comparative Examples," with the notable exception of backside particles, which are 10-24 nm (carbon black) for the embodiments and 270 nm or greater for the comparative examples. *See* Ex. 1001 at 10:18-11:47; Ex. 1003 ¶88. The disclosed compositions for these examples are shown below in terms of percent weight. *See* Ex. 1003 ¶88; Ex. 1001 at 10:19-11:47.

Backcoat Components	**Ex. 1**	**Ex. 2**	**Comp. Ex. C1**	**Comp Ex. C2**
Filler (Titanium dioxide)	10.6%	11.2%	11.1%	11%

Wear Particles (alumina)	2.2%	2.3%	2.2%	2.3%
Dispersant for pigments	2.0%	2.1%	2.1%	2.1%
Hard binder	22.2%	22.5%	22.5%	22.5%
Soft binder	14.8%	14.9%	14.9%	14.9%
Activator	15.2%	10.2%	10.2%	10.2%
Carbon Black (15nm)	8.3%			
Carbon Black (24nm)	24.7%	36.8%	36.7%	36%
Carbon Black (270 nm)				1%
Silica (700 nm)			0.2%	

The '774 Patent does not disclose any specifics for other aspects of tape manufacturing, such as tape thickness, magnetic orientation, or calendering parameters. *See generally* Ex. 1001; Ex. 1003 ¶89. The '774 Patent only discloses one distinguishing factor between its embodiments (Examples 1 and 2) and the comparative examples of the prior art: the use of fine-grain carbon black of less than 30 nm diameter. *See id.*

However, the use of fine-grain carbon black in the backside coating was already known in the art as a solution to embossment. *See supra* Section II.D; Ex. 1010 at 7:8-10 ("[f]or ease of [mean roughness] control, it is preferred to use carbon black having a primary particle size of 15 to 80 nm, ***particularly 17 to 40 nm***") (emphasis added); Ex. 1005 at [0058] ("Carbon black may be a combination of fine particle carbon black with a mean particle size of 10 to 50nm and medium particle carbon black ... or, ***preferably made up entirely of the fine particle carbon black***") (emphasis added); Ex. 1003 ¶90. Years before the '774 Patent was filed, prior art magnetic tape already featured backcoat layers containing carbon black

only of a single size below 30 nm. *See, e.g.,* Ex. 1009 at 21:10-24 (using only ***17 nm*** carbon black particles); Ex. 1010 at 13:26-39 (backcoat chart) (using only ***18 nm*** carbon black particles); Ex. 1011 at 6:38-40 (describing use of carbon black particles with diameter of 0.03 μm (30 nm)), Table 1 (example where ***only 30 nm carbon black*** is used); Ex. 1012 at [0225] (using ***only 25 nm carbon black*** particles in backcoat layer); Ex. 1003 ¶90.

B. Summary of the Claimed Subject Matter

The independent claims of the '774 Patent do not recite a particular manufacturing method or composition of magnetic tape. Ex. 1003 ¶91. Instead, the claims are directed to measurements of physical and recording characteristics of tape that allegedly result from the use of uniform, fine-grain carbon black in the backcoat layer. 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 use fine-grain carbon black of 10-24 nm diameter—but not the Comparative Examples, which, as

explained above, contain large backside particles of size 270 nm and greater. Ex. 1003 ¶92; 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

Rather than claim the alleged invention or any particular method for manufacturing magnetic tape, the '774 Patent attempts to claim the end result of its disclosed manufacturing method, i.e., the ranges of surface roughness measurements that allegedly result from the use of fine-grain carbon black on the backside coating. *See* Ex. 1001 at 12:51-14:41; Ex. 1003 ¶93. While these claimed measurements were not expressly disclosed in some of the prior art, the underlying magnetic tape compositions—including the use of fine-grain carbon black—were well known in the art. *See supra* Section II.D; Ex. 1003 ¶¶72-78, 93. According to the '774 Patent, these prior art compositions would have resulted in the measurements that it claims. *See* Ex. 1001 at 10:1-14 (Table 1); 10:18-11:47 (describing composition of Examples 1 and 2 and Comparative Examples C1 and

C2); Ex. 1003 ¶93.

IV. SUMMARY OF PRIOR ART

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

Law is directed to a magnetic recording medium composed of a support with two major surfaces, a magnetic layer on one surface and a backside coating on the other. Ex. 1004 at 2:47-52; Ex. 1003 ¶114. The backside coating comprises substantially the same components as the '774 Patent. *See* Ex. 1004 at 8:34-10:42 (Table 1); Ex. 1003 ¶114; *see infra* Section VI.A. These components include 30 nm carbon black. *Id.* Law teaches that a tape comprising fine-grain, uniform carbon black may exhibit various improved running properties. *See* Ex. 1004 at 2:38-44; Ex. 1003 ¶114.

Law issued March 4, 1997, which is more than one year prior to the filing date of the '774 Patent. *See* Ex. 1004 at [45]. Law qualifies as prior art under at least §102(a) and (b).

Sasaki teaches that "excessively large protrusions" on the surface of the backcoat applied to a magnetic tape substrate may cause damage to the magnetic layer's surface. Ex. 1005 at [0014]; Ex. 1003 ¶116. These protrusions may imprint onto the magnetic layer during production, storage, or use, causing reduced performance characteristics. Ex. 1005 at [0014]; Ex. 1003 ¶116. As one way to

reduce the size and frequency of large protrusions, Sasaki teaches the use of carbon black, "preferably made up entirely of the fine particle [10 to 50 nm] carbon black." Ex. 1005 at [0058]; Ex. 1003 ¶116.

Sasaki was published November 7, 2003, which is more than one year prior to the filing date of the '774 Patent. S*ee* Ex. 1005 at 1. Sasaki qualifies as prior art under at least §102(a) and (b).

V. CLAIM CONSTRUCTION

Pursuant to § 42.100(b), and solely for purposes of this review, Petitioner construes the claim language such that claim terms are given their broadest reasonable interpretation ("BRI").[1] For the purposes of the Grounds presented in this Petition, Petitioner does not believe any explicit constructions are necessary, and has applied the plain and ordinary meaning in view of BRI and the description in the '774 Patent. Ex. 1003 ¶98.

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

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

(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. A person with less education but more relevant practical experience, or more relevant education but less practical experience, may also meet this standard. *Id.*

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 1: Claims 1-12 and 15-20 are Anticipated by Law

It is well-established that when "the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product." *In re Best*, 562 F.2d 1252, 1255 (CCPA 1977); *see also* M.P.E.P. § 2112.01(1) ("Where the claimed and prior art products are identical or substantially identical in structure or composition… a prima facie case of either anticipation or obviousness has been established."). Furthermore, "when the PTO shows sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not." *In re*

Spada, 911 F.2d 705, 709 (Fed. Cir. 1990); *In re Schreiber,* 128 F.3d 1473, 1478 (Fed. Cir. 1997) ("choosing to define an element functionally, *i.e.*, by what it does, carries with it a risk. … 'where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on.'") (quoting *In re Swinehart*, 439 F.2d 210, 212 (CCPA 1971)); *Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 782, (Fed. Cir. 1985) (composition claim reciting a newly discovered property of an old alloy did not satisfy section 102 because the alloy itself was not new); *see also SemiLEDs Corp. v. Cree, Inc.*, Appeal 2015-1441, Reexam. Control No. 95/001,627 (PTAB May 21, 2015) (citing *In re Spada*, 911 F.2d 705, 709 (Fed. Cir. 1990)).[2]

The '774 Patent includes claim elements directed to particular measurements of the surface roughness of tape, e.g., skew, kurtosis, peak height mean, peak-to-

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[2] This approach has been reinforced by a number of Federal Circuit and district court cases. *See, e.g.*, *In re Jung*, 637 F.3d 1356, 1362 (Fed. Cir. 2011); *In re Ludtke*, 441 F.2d 660, 169 USPQ 563 (CCPA 1971); *Northam Warren Corp. v. D. F. Newfield Co.*, 7 F. Supp. 773, 22 USPQ 313 (E.D.N.Y. 1934).

valley roughness, and plateau ratio. *Supra* Section III.B; Ex. 1003 ¶124. According to the '774 Patent, these measurements result from the use of carbon black particles with diameter of 30 nm or less: its two embodiments (Examples 1-2) both use backcoat carbon black particles between 15-24 nm, in contrast to the "comparative examples," which include carbon black particles of 270 nm or silica particles of 700 nm in the backcoat. *See* Ex. 1001 at 10:46-52; 11:12-16; 11:39-43; Ex. 1003 ¶124. The '774 Patent does not disclose any other distinguishing factor between its examples and the comparative examples. *See id.* at 10:18-11:55; Ex. 1003 ¶124. The '774 Patent does, however, contrast the surface roughness measurements of its embodiments with the comparative examples: the '774 Patent's embodiments (Examples 1 and 2) both purportedly possess the claimed measurements, while the comparative examples (C1–C4) do not. *See* Ex. 1003 ¶124; Ex. 1001 at 10:1-14 (Table 1) (annotated):

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})
Within claimed ranges	1	0.30	177 nm	291 nm	0.61	3.4
	2	0.40	172 nm	276 nm	0.62	3.5
Outside claimed ranges	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

As stated in the '774 Patent, the differences between the surface measurements for its embodiments (Examples 1-2) and Comparative Examples are due to the absence of large backside particles. Ex. 1003 ¶124. The '774 Patent states that "Examples 1 and 2 are example magnetic recording mediums with similarly sized carbon black particles that do not generally include carbon black textured particles." Ex. 1001 at 10:52-55; Ex. 1003 ¶124. By contrast, Comparative Example C1 includes "silica texture particles having a primary size of about 700 nm. Accordingly, use of the silica texture particles increases the height of peaks formed in the resultant magnetic tape medium, which as seen in Table 1 generally leads to increased surface parameter measurements as compared to Examples 1 and 2." Ex. 1001 at 11:15-20; Ex. 1003 ¶124. Comparative Example C2 includes about 1.0 percent per unit weight of large (270 nm) carbon black particles for texture; "[a]ccordingly, use of the carbon black texture particles increases the height of peaks and other surface measurement parameters of the resultant magnetic tape medium, which generally lead to higher rates of and more pronounced embossments." Ex. 1001 at 11:39-47; Ex. 1003 ¶124. Comparative Examples C3 and C4 contain higher proportions of 270 nm carbon black particles, "[a]s such, Comparative Examples C3 and C4 generally further increase the number of peaks as opposed to Comparative Example C2." Ex. 1001 at 11:53-55; Ex. 1003 ¶124. In short, the '774 Patent attributes the lower surface measurement

parameters of its embodiments ("Skew (R_{sk})," "Peak Mean Height (R_{pm})," "Peak-to-Valley Roughness (R_z)," "Plateau Ratio (R_{pm}/R_z)," "Kurtosis (R_{ku})") to the use of fine-grain carbon black without large silica or carbon black particles. Ex. 1001 at 10:46-55, 11:15-20, 11:40-47, 11:53-55; Ex. 1003 ¶124.

Law teaches a substantially identical backcoat formulation and structure compared to Examples 1-2 of the '774 Patent and establishes a prima facie case of anticipation based on its inherent disclosure of the claimed characteristics. *See Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1); Ex. 1003 ¶125. First, Law recognizes the same embossment problem as the '774 Patent (*see* Ex. 1004 at 6:37-39), identifies the same cause ("protruding particles," *see id.*), and discloses the same structure of fine-grain, uniformly-sized carbon black backcoat particles that allegedly results in the claimed measurements (Ex. 1004 at 8:67-10:10 ("Vulcan XC-72 Carbon black from Cabot Corporation (30 nm)")). Law further teaches a magnetic tape with a structure and composition that is substantially identical to that of the '774 Patent, as summarized in the below table. Ex. 1003 ¶125.

Backcoat Components	'774 Ex. 1	'774 Ex. 2	Law Sample 5
Filler	10.6%	11.2%	8.00%[3]
Wear Particles	2.2%	2.3%	9.05%
Dispersant for pigments	2.0%	2.1%	2.41%[4]

[3] Law uses "X-60 ZEEOSPHERES" that are ceramic composites of silica, aluminum oxide, alpha-iron oxide, and titanium dioxide. *See* Ex. 1004 at 4:33-44; Ex. 1003 ¶125 n. 2.

[4] Law uses 0.16 parts Emcol Phosphate, 0.16 parts phosphorylated polyoxyalkyl polyol, and 2.09 parts lecithin. Ex. 1004 at 7:33-10:42 (Table I) (Sample 5). These are all examples of dispersants. *See, e.g.*, Ex. 1003 ¶125 n. 3; Ex. 1001 at 6:39-43 ("[d]ispersions for forming the backside 36 may further comprise one or more wetting agents. Useful wetting agents include lecithin, emcol acetate, phosphorylated polyoxyalkyl polyols"); Ex. 1007 at 14:19-23 ("[e]xamples of wetting [a]gents suitable for dispersing the carbon black include Emcol Phosphate, Emcol Acetate, phosphorylated polyoxyalkyl polyols… and the like. Lecithin is most preferred.").

Backcoat Components	'774 Ex. 1	'774 Ex. 2	Law Sample 5
Hard binder	22.2%	22.5%	14.24%[5]
Soft binder	14.8%	14.9%	14.3%[6]
Activators	15.2%	10.2%	15.83%[7]

[5] Law uses 4.27 parts "VAGH vinyl chloride resin" and 9.97 parts "styrene-allyl alcohol copolymer. Ex. 1004 at 7:33-10:42 (Table I) (Sample 5). Both are examples of "hard" components of a binder. *See, e.g.,* Ex. 1003 ¶125 n. 4; Ex. 1008 at 11:16-21 (describing example magnetic recording medium using as hard binder resins "a vinyl chloride/vinyl alcohol/vinyl acetate copolymer available from Union Carbide as VAGH" and "[styrene]/allyl alcohol copolymer").

[6] Law uses 14.3 parts "[h]ydroxy-functional polyurethane," which a POSITA would have known to be a "soft" component of a binder. *See, e.g.,* Ex. 1008 at 5:17-22 ("it is preferred to use an additional cobinder polymer or resin… to contribute a soft component to the polymeric binder matrix… Examples of suitable cobinder resins include multi-hydroxy-functional polyurethanes"); Ex. 1003 ¶125 n. 5.

[7] Law uses 15 parts polyisocyanate and 0.83 parts "ADMA-[]6 alkyl-dimethylamine [catalyst]." The '774 Patent describes an "activator" as being a "crosslinking agent." Ex. 1001 at 6:57-58. Polyisocyanate is a well-known crosslinking agent. *See, e.g.*, Ex. 1003 ¶125 n.6; Ex. 1007 at 2:33-38 (describing "polyisocyanate crosslinking agents"); Ex. 1008 at 5:2-3 ("[e]xamples of suitable

Backcoat Components	'774 Ex. 1	'774 Ex. 2	Law Sample 5
Carbon Black (30 nm or smaller diameter)	33.0[8]%	36.8%	36.2%

See Ex. 1001 at 10:19-11:55; Ex. 1004 at 7:33-10:42 (Table 1); Ex. 1003 ¶125.

Though the formulations have slight variance in the percentages of some components, the '774 Patent does not attribute any particular significance to these features (e.g., amounts of wear particles, hard binders, and activators used) and admits that unclaimed "comparative" examples have similar formulations for these features. *See supra* Sections III.A, III.B; Ex. 1001 at 11:27-31 ("The backsides of Comparative Examples C2-C4 are each formed with similar amounts of… filler particles… wear particles, a dispersant for pigments, a hard binder, a soft binder, and an activator as described with respect to Examples 1 and 2."); Ex. 1003 ¶126.

The '774 Patent differentiates the embodiments of the alleged invention

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crosslinkers include polyisocyanates"). Alkyldimethylamine is a tertiary amine that may be used as a catalyst for aiding the crosslinking reaction. Ex. 1007 at 12:50-53 ("a catalyst, e.g. dibutyltin dilaurate or a tertiary amine, may also be added in suitable catalytic amounts in order to facilitate this crosslinking reaction").

[8] Example 1 uses 8.3% carbon black with 15 nm diameter, and 24.7% with 24 nm, for a total of 33% carbon black with diameters of less than 30 nm. Ex. 1001 at 10:46-50.

from the non-inventive comparative examples by use of a backside coating with fine-grain, relatively uniform carbon black. Ex. 1001 at 11:12-20, 11:43-55 ("use of the [large size] carbon black texture particles increases the height of the peaks… which generally lead to… more pronounced embossments"); Ex. 1003 ¶127. This is disclosed by Law. Ex. 1004 at 8:67-10:10 (Table 1); Ex. 1003 ¶127. Law discloses a substantially identical structure as the '774 Patent Examples 1 and 2 and thus establishes a prima facie case of anticipation based on its inherent disclosure of the claimed characteristics. *See Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1); Ex. 1003 ¶127.

Additionally, the disclosed methods of manufacturing the example tape in Law are similar to the methods recited in the '774 Patent for coating and calendering the backside coating on a magnetic tape. Ex. 1003 ¶128. Examples 1 and 2 of the '774 Patent do not require any particular methods of manufacture, beyond specifying that "[a] backside is layered on a bottom surface of the PEN substrate." Ex. 1001 at 10:21-22; Ex. 1003 ¶128. The '774 Patent does generally describe methods of manufacturing magnetic tape, which are substantially identical to the methods used for Example 1 of Law:

Manufacturing Method	**'774 Patent**	**Law**
Coating and Drying	"The substrate 32 is coated with the backside 36 material on the lower side 40 of substrate 32, and the backside	"After all charges for each backside dispersion were added and thoroughly mixed, each dispersion was coated

	36 is dried, typically using conventional ovens." Ex. 1001 at 7:8-11.	onto a support which was passed through an oven at a temperature of approximately 180° F." Ex. 1004 at 8:23-26.
Calendering	"According to one embodiment, called compliant-on-steel (COS), in-line calendering uses one or more in-line nip stations…." Ex. 1001 at 7:31-33. "Alternatively, the in-line calendering is 'steel-on-steel' (SOS)…" Ex. 1001 at 7:43-44.	"The tape was then calendered at a temperature of between 85° and 110° F., and a pressure of between 950 and 1200 pli." Ex. 1004 at 8:30-32.

Ex. 1003 ¶128.

1. Claim 1

(i) A magnetic recording medium comprising:

To the extent the preamble is a limitation, it is taught by Law. Law discloses "***a magnetic recording medium*** having a support with two major surfaces[.]" Ex. 1004 at 2:47-52; Ex. 1003 ¶129.

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

Law teaches this limitation. Law discloses that the substrate ("support material") of the magnetic recording medium has "a support with two major surfaces[.]" Ex. 1004 at 2:48; Ex. 1003 ¶130. Furthermore, the substrate ("support materials") disclosed by Law is composed of the same materials as the '774 Patent. *See* Ex. 1004 at 2:67-3:3 ("Examples of suitable support materials are polymers such as polyethylene terephthalate (PET), polyimide, and polyethylene naphthalate

(PEN); or any other suitable material."); Ex. 1001 at 3:66-4:6 ("Examples of substrate materials useful for the magnetic recording medium 30 include polyesters such as polyethylene terephthalate (PET), polyethylene naphthalate (PEN), a mixture of polyethylene terephthalate and polyethylene naphthalate; polyolefins (e.g., polypropylene); cellulose derivatives; polyamides; and polyimides. In one example, polyethylene terephthalate or polyethylene naphthalate is preferably employed as the substrate 32"); Ex. 1003 ¶130.

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

Law teaches this limitation. Law discloses that "[o]ne major surface of the support is coated with a magnetic layer." Ex. 1004 at 2:61-64; Ex. 1003 ¶131. For magnetic tape, the magnetic layer is the recording surface, and a POSITA would have understood that to be true. *See* Ex. 1004 at 1:16-19 ("Magnetic recording media such as audio and video magnetic recording tapes and computer cartridge tapes are constructed of a magnetic recording layer provided on a nonmagnetic support."); Ex. 1003 ¶131.

(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, the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0.

Law discloses that the magnetic recording medium has "a backside coating

provided on the other major surface of the support." Ex. 1004 at 2:50-51; Ex. 1003 ¶132. Law addresses improved running properties of magnetic tape. *See* Ex. 1004 at 1:21-31; Ex. 1003 ¶132. Law teaches a reduction in the protrusions from the backside coating that could cause embossment. *See* Ex. 1004 at 6:37-39 ("The protruding particles can cause embossing of a magnetic recording tape's magnetic coating, or can transfer to the magnetic coating"); Ex. 1003 ¶132. Thus, Law's backside coating is configured to prevent embossment of the recording surface. Ex. 1003 ¶132. Moreover, Law's backside coating is configured to prevent embossment by the same structure described in the '774 Patent of "substantially uniform" carbon black particles that are within the range of "from about 10 nm to about 30 nm." *See* Ex. 1001 at 5:21-26; Ex. 1004 at 7:33-10:42 (Table 1); Ex. 1003 ¶132.

While Law does not expressly disclose skew or kurtosis values for its backside surface roughness, Law discloses a substantially identical structure made using a substantially identical method as that of the '774 Patent. *See supra* Section VI.A; Ex. 1003 ¶¶ 124-128, 133. Moreover, Law discloses that the structure is composed of the same material (small-sized carbon black particles) that provides the purportedly inventive property according to the '774 Patent. *See id*. Therefore, Law inherently discloses "a backside surface with a skew less than about 0.5 and a kurtosis less than about 4.0." *See Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1)

(improper to claim "unknown property which is inherently present in the prior art"); Ex. 1003 ¶133.

2. 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.

Law discloses all elements of claim 1. *See supra* Section VI.A.1; Ex. 1003 ¶135. Law further discloses the elements of claim 2. Law discloses that the support has two major surfaces. Ex. 1004 at 2:48; Ex. 1003 ¶135. "One major surface of the support is coated with a magnetic layer and the other major surface is coated with a backside coating." Ex. 1004 at 2:61-64; Ex. 1003 ¶135. Therefore, the magnetic side includes the magnetic layer. Ex. 1003 ¶135. This satisfies the element of "the magnetic side includ[ing] at least one layer." *Id.* Furthermore, the magnetic layer would have been understood to be a magnetic recording layer. *See* Ex. 1004 at 1:16-19 ("Magnetic recording media such as audio and video magnetic recording tapes and computer cartridge tapes are constructed of a magnetic recording layer provided on a nonmagnetic support."); Ex. 1003 ¶135. Additionally, a POSITA would have understood that the magnetic layer of a magnetic tape is necessarily used as a recording surface. *See supra* Section II.A. Therefore, Law anticipates claim 2. Ex. 1003 ¶135.

3. Claims 3-7

These claims recite measurements of the backside surface of the "magnetic recording medium," including "peak height mean less than about 200 nm" (claim 3), "peak-to-valley roughness less than about 325 nm" (claim 4), "peak-to-valley roughness less than 300 nm" (claim 5), "plateau ratio less than or equal to about 0.65" (claim 6), "kurtosis value less than or equal to about 3.7" (claim 7).

While Law does not expressly disclose peak height mean, peak-to-valley roughness, or plateau ratio for its backside surface, Law discloses all elements of claim 1 (*see supra* Section VI.A.1) and a substantially identical structure made using a substantially identical method composed of substantially identical materials as the embodiments of the '774 Patent that allegedly possess the claimed measurements (*see supra* Section VI.A). Ex. 1003 ¶137. Therefore, Law provides a prima facie case for the inherent disclosure of the recited measurements of claims 3-7. *See Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1); Ex. 1003 ¶137.

4. Claims 8-11

These claims recite measurements of the recording properties of the "magnetic recording medium," including "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), "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), "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), "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).

As discussed above, Law anticipates claim 1. *See supra* Section VI.A.1; Ex. 1003 ¶139. A POSITA would have understood, as basic principles of engineering that were widely known in the magnetic tape industry, that skirt signal-to-noise and small error rate are measurements of the recording ability of magnetic tape, and improvements to both are a direct consequence of decreasing the number of protrusions on the backside surface. Ex. 1003 ¶139. A person of ordinary skill in the art would have understood preventing embossment leads to an increase in the signal-to-noise ratio and a decrease in the small error rate. *See id.* The '774 Patent confirms this fact: "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; Ex. 1003 ¶139. The claimed skirt signal-to-noise ratio and small error rate, and the claimed reduced variation of the skirt signal-to-noise ratio and small error rate, are therefore merely the result of a backcoat layer with smoother surface characteristics. *See* Ex. 1001 at 9:28-33; Ex. 1003 ¶139. This was commonly known in the prior art. *See* Ex. 1003 ¶139; Ex. 1009 at 1:54-57 ("[w]hen the linear recording density is high and the track is narrow, this 'transfer' results not only in decreased output, but also in lost signal"); Ex. 1011 at 2:12-14 ("the characteristics, i.e., the video output or RF output, of the magnetic layer are seriously affected when the imprint is received from the backing layer"); Ex. 1013 at 2:22-25 ("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 … those electromagnetic properties of the tape which depend upon the smoothness of the magnetic layer, e.g., the signal to noise ratio, sensitivity, maximum output level, and the like, tend to deteriorate").

While Law does not expressly disclose skirt signal-to-noise ratio or small error rate values for its magnetic tape, Law discloses a backcoat layer with smoother surface characteristics. Ex. 1003 ¶139. Law discloses all elements of claim 1 (*See supra* Section VI.A.1, Ex. 1003 ¶¶129-134) and a substantially identical structure made using a substantially identical method as the embodiments

of the '774 Patent that allegedly possess the claimed surface measurements (s*ee supra* Section VI.A). Therefore, Law provides a prima facie case for the inherent disclosure of the recited measurements of claims 8-11. *See Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1); Ex. 1003 ¶139.

5. Claim 12

(i) The magnetic recording medium of claim 1, wherein the backside includes a plurality of carbon black particles having an average size less than or equal to 30 nm.

Law discloses all elements of claim 1. *See supra* Section VI.A.1. Furthermore, Law teaches a backside including carbon black particles having an average size less than or equal to 30 nm. Ex. 1004 at 8:67-10:42 (Table 1) ("Vulcan XC-72 Carbon black from Cabot Corporation (30 nm)"); Ex. 1003 ¶140. Therefore, Law anticipates claim 12.

6. Claim 15

(i) A magnetic recording medium comprising:

To the extent the preamble is a limitation, it is taught by Law. *Supra* Section VI.A.1.i; Ex. 1003 ¶141.

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

Law teaches this limitation. *Supra* Section VI.A.1.ii; Ex. 1003 ¶142.

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

Law teaches this limitation. *Supra* Section VI.A.1.iii; Ex. 1003 ¶143.

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

Law teaches a backside configured to decrease the embossment of the recording surface. *See supra* Section VI.A.1.iv; Ex. 1003 ¶144. Law provides a prima facie case for the inherent disclosure of a "backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm." *See supra* Section VI.A.3; *Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1); Ex. 1003 ¶¶124-128, 136-137, 146.

7. Claims 16-17

These claims recite measurements of the backside surface of the "magnetic recording medium," including "skew less than about 0.5" (claim 16) and "peak-to-valley roughness less than about 300 nm" (claim 17).

While Law does not express disclose skew or peak-to-valley roughness measurements for its backside surface, Law provides a prima facie case for the inherent disclosure of a skew less than about 0.5 and peak-to-valley roughness less than about 300 nm. *See supra* Sections VI.A.1.iv, VI.A.3; *Best*, 562 F.2d at 1255;

M.P.E.P. § 2112.01(1); Ex. 1003 ¶148.

8. Claims 18-19

These claims depend on claim 15 and recite measurements of the recording properties of the "magnetic recording medium," including variance in skirt signal-to-noise ratio and variance in small error rate. *See supra* Section VI.A.4.

As discussed above, Law anticipates claim 15. As also discussed above, a reduced variation of the skirt signal-to-noise ratio and small error rate along the tape are merely the result of a backside surface with smoother surface characteristics; a POSITA would have understood, and the '774 Patent confirms, this fact. Ex. 1001 at 9:29-37; Ex. 1003 ¶150; *see supra* Section VI.A.4. While Law does not expressly disclose skirt signal-to-noise ratio or small error rate values for its magnetic tape, Law provides a prima facie case for the inherent disclosure of the recited skirt signal-to-noise and small error rate measurements. *See supra* Section VI.A.4; *Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1); Ex. 1003 ¶¶ 124-128, 138-139, 150.

9. Claim 20

(i) A magnetic recording medium comprising:

To the extent the preamble is a limitation, it is taught by Law. *Supra* Section VI.A.1.i; Ex. 1003 ¶151.

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

Law teaches this limitation. *Supra* Section VI.A.1.ii; Ex. 1003 ¶152.

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

Law teaches this limitation. *Supra* Section VI.A.1.iii; Ex. 1003 ¶153.

(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, the backside surface having a skew less than about 0.5, 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.

Law teaches a backside configured to decrease the embossment of the recording surface. *See supra* Section VI.A.1.iv; Ex. 1003 ¶¶ 124-128; 154-156. While Law does not expressly disclose skew, kurtosis, peak height mean, or peak-to-valley roughness values for its backside surface roughness, Law provides a prima facie case for the inherent disclosure of these recited measurements. *See supra* Sections VI.A.1.iv; VI.A.3; Ex. 1003 ¶155; *see Best*, 562 F.2d at 1255; M.P.E.P. § 2112.01(1).

B. Ground 2: Claims 1-13 and 15-20 are Obvious Over Law in View of Sasaki

To the extent Law does not inherently disclose the surface roughness measurements claimed by the '774 Patent, those elements would have been obvious to a POSITA based on the combination of Law and Sasaki. Ex. 1003 ¶157.

Law teaches a magnetic tape with the same structure that the '774 Patent alleges to result in the claimed properties. *See supra* Section VI.A. Sasaki further teaches that the use of fine-grain, uniformly-sized carbon black particles in the backside coating would prevent embossment by removing the large backside particles that created protrusions on the surface. Ex. 1005 at [0130] ("For examples 1, 2, 3, and 4 where the backing layer used a fine carbon black with a mean particle size of 20 to 70nm, the backing layer's protrusion distribution was: 20 to 40nm – 1.2/μm² 40 to 80nm – 0.4/μm² 80 to 100nm – 0.02/μm² Over 100nm – None. In these samples there was almost no sign of backing layer protrusions imprinting on to the magnetic layer after storage"); Ex. 1003 ¶157. Thus, a POSITA would have found it obvious to produce the magnetic tape taught by Law and recognize, based on Sasaki's teachings, that the resulting tape would have had the claimed measurements of the '774 Patent that allegedly prevent embossment in the same way. Ex. 1003 ¶157.

According to the '774 Patent, the use of carbon black with particle size of less than 30 nm results in the claimed statistical measurements in the embodiments of the alleged invention. *See supra* Sections III.A-B; Ex. 1001 at 10:1-11:20 (comparing Examples 1 and 2 with Comparative Example 1); Ex. 1003 ¶158. Law and Sasaki teach the use of fine-grain particles of relatively uniform size for the backside coating. Ex. 1003 ¶158. Indeed, Law teaches a substantially identical

formulation for producing magnetic tape as the '774 Patent Examples 1 and 2, which allegedly results in the physical characteristics claimed by the '774 Patent. *See supra* Section VI.A. Sasaki further teaches that fine-grain carbon black can prevent embossment. Ex. 1005 at [0130] ("[i]n [samples with 20-70 nm carbon black] there was almost no sign of backing layer protrusions imprinting on to the magnetic layer after storage"); Ex. 1003 ¶158. To that end, Sasaki teaches the use of 20 nm carbon black powder in the backcoat layer, which reduces size and prevalence of protrusions in the backcoat layer. Ex. 1005 at [0092], [0129] (Table 1); Ex. 1003 ¶158. Therefore, a POSITA would have found it obvious, following the teachings of Law and Sasaki, to produce a magnetic tape with the claimed physical characteristics. *See* Ex. 1003 ¶158.

Moreover, a POSITA would have understood that the claimed measurements are based on the size and distribution of projections on the backside coating, which could be controlled at least partly through controlling the size of carbon black particles. *See, e.g.,* Ex. 1009 at 6:38-42 (controlling the height of protrusions as one step of controlling the "biting" effect); Ex. 1010 at 6:1-5 (controlling mean roughness by controlling size of particles, especially carbon black); Ex. 1013 at 3:25-28; Ex. 1003 ¶159. Notably, the '774 Patent does not teach any particular manufacturing steps are necessary to enable its claims, other than the use of fine-grain carbon black. Ex. 1003 ¶159; *see supra* Sections III.A-B.

To the extent Law and Sasaki do not disclose the measurements recited by the '774 Patent, a POSITA would have found it obvious to produce a tape with the claimed characteristics based on the combined teachings of Law and Sasaki because they teach the same problem as the '774 Patent, the same solution proposed by the '774 Patent, and the same formulation for producing the tape that the '774 Patent alleges has the claimed characteristics. Ex. 1003 ¶160.

1. Motivations to Combine

A POSITA would have been motivated to combine Law with Sasaki because (1) both references dealt with the same problem in magnetic tape, namely backside protrusions embossing/transferring depressions to the front-side magnetic surface, and (2) both references taught the use of fine-grain, uniformly-sized carbon black particles. *See* Ex. 1004 at 9:1-10:42 (Table 1 teaching backside coating containing only 30 nm carbon black particles); Ex. 1005 at [0092]; Ex. 1003 ¶161.

Both Sasaki and Law are directed to methods of manufacturing magnetic tape, and in particular discuss methods of producing a backside coating. Ex. 1005 at [0001], [0021]; Ex. 1004 at 1:9-12; Ex. 1003 ¶162. Law notes that "[t]he roughness of a backside coating has been found to be a major factor in affecting the frictional and running properties of a magnetic recording medium." Ex. 1004 at 5:49-51; Ex. 1003 ¶162. Similarly, Sasaki notes "Investigation into the causes of [scratch shaped damage to the magnetic layer's surface] revealed that excessively

large protrusions on the surface of the back coat applied to the non-magnetic substrate were responsible." Ex. 1005 at [0013]; Ex. 1003 ¶162.

Both references discuss the need to ensure that the backside coating is not too rough in order to prevent embossing on the magnetic layer or otherwise causing damage. *See* Ex. 1004 at 5:51-58 ("too rough of a backside coating can cause a new set of problems. For instance, a rough backside might cause defects in the magnetic side of the medium due to embossing"); Ex 1005 at [0008], [0014]-[0015] ("if there are excessively large protrusions on the back coat surface, the protrusion shape can imprint itself on the magnetic layer during the heat treatment phase of magnetic tape production or during long-term storage wound up around a tape reel, causing electromagnetic transfer properties to fall."); Ex. 1003 ¶163. Each reference teaches the use of fine-grain, uniformly-sized carbon black as a way to avoid too rough a backside coating. Ex. 1005 at [0092], [0129] (Table 1) (Example 1); Ex. 1004 at 7:67-10:7 (Table 1) (Sample 5); Ex. 1003 ¶163.

Therefore, a POSITA would have been motivated to create a backside coating using the composition in Law, with the reinforcing teaching from Sasaki that the use of uniformly-sized fine-grain carbon black particles would reduce the prevalence of large peaks on the backside surface. Ex. 1003 ¶164. Such a combination would result in a magnetic tape having the structure made using a substantially identical method similar to the embodiments described in the '774

Patent as meeting the claim requirements, meaning that the magnetic tape would have the claimed properties. *See supra* Section VI.A.1; Ex. 1003 ¶¶124-128, 132-133, 154-155, 164.

2. *KSR* Factors

"[W]hen a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). The alleged invention is simply a combination of familiar elements (backside coating on a magnetic tape using single-size carbon black particles) according to known methods (adding small-sized carbon black particles to a binder medium and coating the resulting mixture onto the substrate) to yield predictable results (reducing the prevalence of large protrusions on the backside surface). Ex. 1003 ¶165; *see* Ex. 1005 at [0058] ("Carbon black may be a combination of fine particle carbon black with a mean particle size of 10 to 50nm, and medium particle carbon black with a mean particle size of 60 to 100nm, or, *preferably made up entirely of the fine particle carbon black*.") (emphasis supplied); Ex. 1005 at [0025] ("Invention related magnetic recording medium 100 and its non-magnetic substrate 101 is coated on the opposite surface of the surface described above with a back coat coating mixture of carbon black, binding agent, and solvent to form back coat 104."); Ex. 1004 at 9:1-

10:42 (Table 1) (showing use of only 30 nm carbon black); Ex. 1005 at [0019]-[0020] ("non-magnetic back coat applied to the opposite side, and said back coat surface has protrusion sizes and distribution matching the following specifications: Protrusions of 20nm to 40nm: 1.2 protrusions per μm²[;] Protrusions of 40nm to 80nm: 0.4 protrusions per μm²[;] Protrusions of 80nm to 100nm: 0.02 protrusions per μm²[;] Protrusions over 100nm: None").

Adding carbon black in the backside coating of a magnetic tape was well-known in the art, and the use of single-size carbon black particles less than 30 nm in diameter to help control the size and number of backside peaks was also well-known by 2005. *See supra* Sections II.A-D; Ex. 1003 ¶¶72-78, 166. The results of this combination, the alleged novelty of the invention—improved surface characteristics due to controlled size and number of backside peaks—was similarly well-known in the art. *See e.g.,* Ex. 1013 at 3:21-23; Ex. 1011 at 8:12-9:44; Ex. 1006 at [0010]; Ex. 1005 at [0129]-[0133]; Ex. 1004 at 5:59-67; Ex. 1003 ¶166. In short, the problem and solution of the '774 Patent were known in the art, and there is nothing novel or non-obvious about claiming measurements that result from known processes. Ex. 1003 ¶166.

3. Claim 1

(i) A magnetic recording medium comprising:

To the extent the preamble is a limitation, Law discloses this element. *See*

supra Section VI.A.1.i. It is further obvious based on Sasaki's teachings. Ex. 1005 at [0001] ("The present invention relates to magnetic recording mediums such as magnetic tape."); Ex. 1003 ¶167.

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

Law discloses this element. *See supra* Section VI.A.1.ii. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("On a magnetic recording medium composed of a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface, and a back coat on the opposite surface[.]"); Ex. 1003 ¶168.

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

Law discloses this element. *See supra* Section VI.A.1.iii. It is further obvious based on Sasaki's teachings. Ex. 1005 at [Abstract] ("a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface"); [0024] ("The surface with upper magnetic layer 103, the recording layer is a multi-layer coating film layer."); Ex. 1003 ¶169. A POSITA would have understood that the magnetic layer would include the recording surface of the magnetic tape. Ex. 1003 ¶169.

(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, the

backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0.

Law discloses this element. *See supra* Section VI.A.1.iv. It is further obvious based on Sasaki's teachings. Ex. 1003 ¶170. Sasaki teaches the reduction of protrusions, i.e., peaks, on the backside. *See* Ex. 1005 at [0016] ("[T]o improve the quality of magnetic tape used in linear format recording and retrieval systems … it is necessary to create a back coat that reduces protrusion imprinting upon the magnetic layer"); [0019] ("Created to achieve the objectives articulated above, this invention is a magnetic recording medium consisting of … a non-magnetic back coat applied to the opposite side, and said back coat surface has protrusion sizes and distribution matching the following specifications…"); Ex. 1003 ¶170. As would have been understood by a POSITA, a reduction of protrusions would have naturally led to a backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0, and a POSITA would have found it obvious, when applying Sasaki's teachings to Law, to create a tape with such measurements. Ex. 1003 ¶170.

The '774 Patent admits that skew and kurtosis are measures of the degree to which the prevalence of peaks on the backside surface are reduced. Ex. 1001 at 8:20-23 ("[w]ith regard to magnetic recording medium 30, 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"); Ex.

1003 ¶171. The prevalence of peaks on the backside surface (and therefore skew) can be reduced by using only uniformly-sized, fine carbon black particles. Ex. 1001 at 5:22-38 ("since the large particles are generally not utilized in the backside 36, the backside surface 42 generally decreases the number and/or predominance of any pits or embossments formed in recording surface 56"); Ex. 1003 ¶171. By reducing the number of peaks, the overall surface may become closer to a Gaussian distribution, which by definition has a skew of zero. *See, e.g.*, Ex. 1003 ¶171; Ex. 1014 at 5:35-36; Fig. 2A:

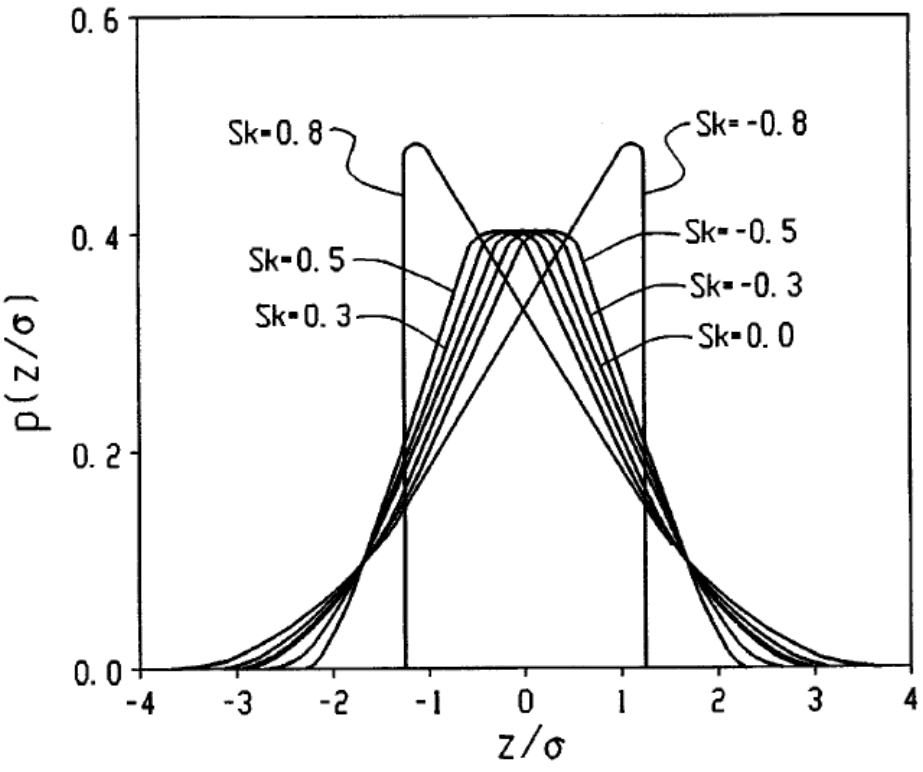

Fig. 2A

A greater prevalence of peaks would cause the distribution to shift to the left (as

there are more points below the mean due to the relatively higher number of peaks that raise the mean), and increase skew. *See* Ex. 1014 at Fig. 2A; Ex. 1003 ¶171.

Likewise, the '774 Patent admits that the claimed kurtosis measurement is merely the result of removing large protrusions from the backside surface. Ex. 1003 ¶172. As admitted by the '774 Patent, kurtosis is "a measure of the distribution of spikes above and below the mean line of the backside surface 42 and generally indicates the randomness of the surface." Ex. 1001 at 8:65-67; Ex. 1003 ¶172. "[F]or 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. 1001 at 9:2-5. Because a random surface would contain less extreme peaks and valleys, a surface approaching a "truly Gaussian surface" is desired. Ex. 1001 at 9:6-10; *see also* Ex. 1014 at 4:17-32; Ex. 1003 ¶172. As shown by the example figure below, a higher kurtosis indicates a narrower distribution curve, meaning that there are relatively fewer values near the mean (and therefore, more values that are peaks or valleys):

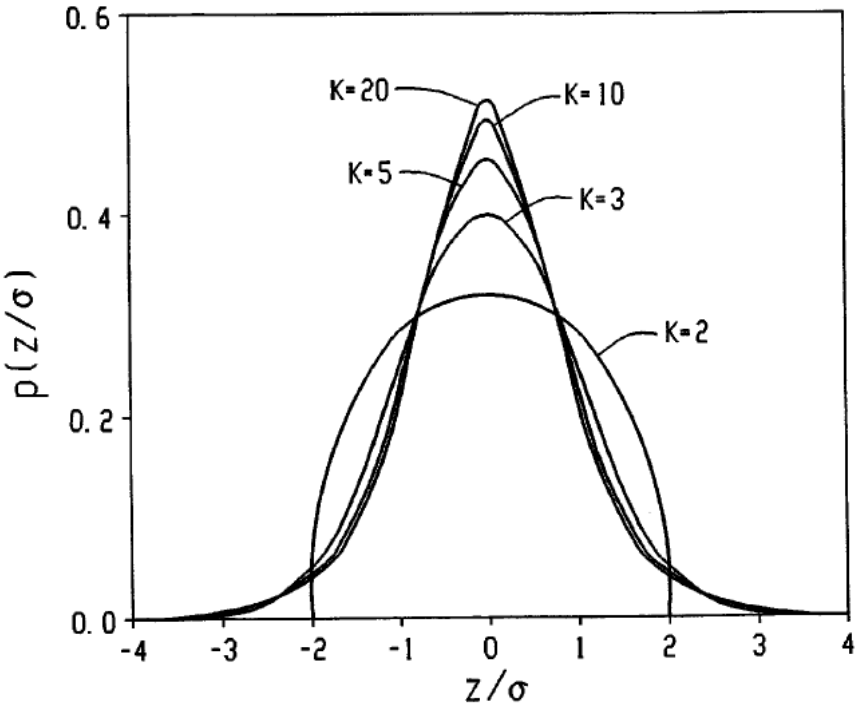

Fig. 2B

Ex. 1014 at Fig. 2B; Ex. 1003 ¶172. Therefore, the '774 Patent admits that a reduction of backside protrusions would naturally result in a kurtosis of less than 4.0. Ex. 1014 at 5:35-36; Ex. 1003 ¶172.

Furthermore, a POSITA would have understood that Sasaki's teachings of 20 nm carbon black for the backcoat, when applied to the magnetic tape taught by Law, would have eliminated large protrusions (caused by larger particles). Ex. 1003 ¶173. Sasaki and Law would have thus led to a backside coating with a surface roughness following a Gaussian distribution, i.e., a backside coating with a "Gaussian surface roughness." *Id.* When relatively large and small particles are both used for the backside coating, the result will have a bi-modal surface

roughness distribution reflecting the two different particle sizes. *See supra* Section VI.B; *See* Ex. 1001 at 5:18-23; Ex. 1005 at [0129] (Table 1) (comparative examples with two different-size carbon black particles); Ex. 1013 at 6:5-55 (Table 2); Ex. 1003 ¶173. However, when only fine-grain, uniformly-sized particles are used, the result will have an approximately Gaussian distribution, i.e., normal distribution, because (a) the surface roughness would reflect the distribution of a single-sized particle, and (b) the probability distribution of a ***random*** variable will generally be Gaussian. Ex. 1003 ¶173. By definition, a Gaussian distribution has a skew of 0 and a kurtosis of 3. *See supra* Section II.E; Ex. 1001 at 9:5-7; Ex. 1014 at 5:35-36, Figs. 2A, 2B; Ex. 1003 ¶173.

As the frequency of large protrusions is reduced, the skew of the backcoat surface approaches 0 and the kurtosis becomes closer to 3. Ex. 1003 ¶174. Thus, a POSITA would have found it obvious to create magnetic tape according to Law's formulation, and reducing the prevalence of backside peaks and embossment per Sasaki's teachings, resulting in a magnetic tape with a backside surface roughness with skew less than about 0.5 and a kurtosis less than 4.0. *Id*.

4. 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.

Law discloses this element. *See supra* Section VI.A.2. It is further obvious

based on Sasaki's teachings. Ex. 1005 at [Abstract] ("On a magnetic recording medium composed of a non-magnetic substrate, with a magnetic layer applied over a non-magnetic layer on one surface, and a back coat on the opposite surface[.]"); Ex. 1003 ¶176.

5. Claim 3

(i) The magnetic recording medium of claim 1, wherein the backside surface has a peak height mean less than about 200 nm.

Law discloses this element. *See supra* Section VI.A.3. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* Section VI.B.3. The claimed value for peak height mean is a further consequence of reducing the number of relatively large peaks. Ex. 1003 ¶177. "Peak Height Mean (R_{pm}) refers to the mean height of the peaks 42 extending above a standard plane of backside surface 42 over the length of the magnetic recording medium 30. In this respect, a low peak height mean indicates that few large peaks are present, which generally translates to fewer embossments being formed in the recording surface[.]" Ex. 1001 at 8:30-35; Ex. 1003 ¶177.

A POSITA reading Law in view of Sasaki would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* Section VI.B; Ex. 1003 ¶¶170-174, 178. Furthermore,

Sasaki teaches that large protrusions result in unwanted embossment (imprints). Ex. 1005 at [0015]; Ex. 1003 ¶178. Sasaki also teaches a backcoat surface with ***zero*** protrusions over 100nm. Ex. 1005 at [0020]; Ex. 1003 ¶178. Thus, a POSITA would have found it obvious to have a magnetic tape following the teachings of Law and Sasaki with a reduced peak height mean of less than 200 nm because Sasaki teaches the reduction of surface protrusions. Ex. 1003 ¶178.

6. Claims 4-5

These claims recite measurements of the backside surface of the "magnetic recording medium," including peak-to-valley roughness "less than about 325 nm" and "less than about 300 nm." Law discloses these elements. *See supra* Section VI.A.3. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* Section VI.B.3.

The claimed values for peak-to-valley roughness are further consequences of reducing the number of relatively large peaks. Ex. 1003 ¶180. Peak-to-valley roughness describes a measure of the height difference between a peak and an adjacent valley. Ex. 1001 at 8:38-42; Ex. 1003 ¶180. The '774 Patent is clear that the claimed value of peak-to-valley roughness is a direct consequence of the smaller, less extreme peaks. Ex. 1001 at 8:47-51 ("Since the peaks 64 defined by the magnetic recording medium 30 generally are smaller than prior art peaks, the magnetic recording medium 30 generally decreases the peak-to-valley roughness

of the magnetic recording medium 30."); Ex. 1003 ¶180.

A POSITA would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* Section VI.B; Ex. 1003 ¶170-174, 181. Furthermore, Sasaki teaches that large protrusions result in unwanted embossment (imprints). Ex. 1005 at [0015]; Ex. 1003 ¶181. Sasaki also teaches that preventing embossment would improve the overall quality of magnetic tape. *See* Ex. 1005 at [0016]; Ex. 1003 ¶181. Peak-to-valley roughness is a measure of the difference between a peak and an adjacent valley. Ex. 1003 ¶181. Reducing the height of peaks (protrusions) would reduce this characteristic. *See* Ex. 1001 at 8:46-51. Thus, a POSITA would have found it obvious that the magnetic tape of Law combined with Sasaki's teachings would have a reduced peak-to-valley roughness of less than 300 nm. Ex. 1003 ¶181.

7. Claim 6

(i) The magnetic recording medium of claim 1, wherein the backside surface has a plateau ratio of less than or equal to about 0.65.

The combination of Law and Sasaki discloses all elements of claim 1. *See supra* Section VI.B.3. The additional elements of claim 6 are disclosed by Law (*see supra* Section VI.A.3) and further rendered obvious by Law in view of Sasaki's teachings (*see* Ex. 1005 at [0016], [0019]). Ex. 1003 ¶182. Sasaki teaches

that large protrusions on the backcoat can be reduced by removing the large particles that cause them. *See* Ex. 1005 at [0016], [0019], [0129]; Ex. 1003 ¶182.

The '774 Patent admits that "a low plateau ratio generally indicates that the peaks 64 are more rounded or plateau-like as opposed to high plateau ratio, which generally indicates that the peaks 64 are more spike-like in appearance." Ex. 1001 at 8:57-61; Ex. 1003 ¶183. Therefore, a POSITA would have understood that removing spikes, i.e., large protrusions, from the backcoat surface, as Law and Sasaki teach, would have reduced the plateau ratio. Ex. 1003 ¶183. In particular, Sasaki teaches that protrusions of 80 nm and higher can be eliminated by using a backcoat with uniformly-sized 20 nm carbon black particles. *See* Ex. 1005 at [0129] (Table 1); Ex. 1003 ¶183. As a POSITA would have understood, eliminating the sharper protrusions results in a backcoat with more rounded, plateau-like peaks, compared to the spikes of 80 nm and taller seen with Sasaki's comparative examples. *See id.*

Using the magnetic tape disclosed in Law would have inherently resulted in a plateau ratio less than or equal to 0.65. *See supra* Section VI.A.3; Ex. 1003 ¶¶ 136-137, 184. To the extent it is not inherent, a POSITA would have found it obvious according to the teachings of Law and Sasaki. Ex. 1003 ¶184.

8. Claim 7

(i) The magnetic recording medium of claim 1, wherein the kurtosis value is less than or equal to about 3.7.

Law discloses this element. *See supra* Section VI.A.3. It is further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]; Ex. 1003 ¶185. The combination of Law and Sasaki discloses all elements of claim 1. *See supra* Section VI.B.3. A POSITA reading Law in view of Sasaki would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* Section VI.B; Ex. 1003 ¶¶170-176, 185.

A POSITA would have known that a Gaussian surface roughness is characterized by a kurtosis of 3, and that as the frequency of large protrusions is reduced, the kurtosis of the backcoat surface becomes closer to 3. *See supra* Section VI.B.3.iv; Ex. 1014 at 5:17-22; Ex. 1003 ¶79-81, 186. Sasaki teaches the reduction of protrusions through the use of fine-grain, uniformly-sized carbon black. *See supra* Section VI.B. Thus, a POSITA would have found it obvious to produce a magnetic tape according to Law and Sasaki with an approximately Gaussian surface roughness distribution having a kurtosis measurement less than or equal to about 3.7. Ex. 1003 ¶186.

9. Claims 8-11

These claims recite measurements of the recording properties of the

"magnetic recording medium," including skirt signal-to-noise ratio (claim 8), a limit to the variance of skirt signal-to-noise ratio along the length of the tape (claim 9), small error rate (claim 10), and a limit to the variance of the small error rate along the length of the tape (claim 11).

Law discloses all of these elements. *See supra* Section VI.A.4. They are further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]; Ex. 1003 ¶188. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* Section VI.B.3. A POSITA reading Law in view of Sasaki would have understood that the magnetic tape of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* Section VI.B; Ex. 1003 ¶188. Therefore, Law in view of Sasaki provides a prima facie case for the inherent disclosure of a magnetic recording medium with a skirt signal-to-noise ratio greater than about 0.2 dB/m, a maximum variance between skirt signal-to-noise ratio measurements less than about 0.5 dB, a small error rate less than about 0.5 errors/m, and a maximum variance between small error rate measurements less than about 0.25 errors/m. Ex. 1003 ¶188.

A POSITA would have known that excessive protrusions can damage the magnetic layer of tape, negatively affecting the magnetic tape's recording abilities. *See* Ex. 1005 at [0014]-[0015]; Ex. 1003 ¶189. A POSITA would have understood,

as basic principles of engineering that were widely known in the magnetic tape industry, that skirt signal-to-noise and small error rate are measurements of the recording ability of magnetic tape, and improvements to both are a direct consequence of decreasing the number of protrusions on the backside surface. Ex. 1003 ¶189. A person of ordinary skill in the art would have understood preventing embossment leads to an increase in the signal-to-noise ratio and a decrease in the small error rate. *See id.* The '774 Patent confirms this fact: "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; Ex. 1003 ¶189. The claimed skirt signal-to-noise ratio and small error rate, and the claimed reduced variation of the skirt signal-to-noise ratio and small error rate, are therefore merely the result of a backcoat layer with smoother surface characteristics. See Ex. 1001 at 9:28-33. This was commonly known in the prior art. *See* Ex. 1003 ¶189; *supra* Section VI.A.4; Ex. 1009 at 1:54-57; Ex. 1011 at 2:12-14; Ex. 1013 at 2:22-25. Therefore, a POSITA would have known that by reducing large protrusions on the backcoat, the skirt signal-to-noise ratio and small error rates could be improved. Ex. 1003 ¶189.

Furthermore, because reducing large protrusions causes the backcoat surface to more closely approximate a Gaussian surface, and because a Gaussian surface would be more consistent along its length, a POSITA would have understood that the variance between measurements along the tape would also be reduced. *See supra* Section VI.B.3.iv; *see* Ex. 1014 at 4:55-5:10; Ex. 1003 ¶¶79-81, 139, 189. A POSITA would have found it obvious that the magnetic recording medium of Law in view of Sasaki would have a skirt signal-to-noise ratio greater than about 0.2 dB/m, a maximum variance between skirt signal-to-noise ratio measurements less than about 0.5 dB, a small error rate less than about 0.5 errors/m, and a maximum variance between small error rate measurements less than about 0.25 errors/m. Ex. 1003 ¶189.

10. Claim 12

(i) The magnetic recording medium of claim 1, wherein the backside includes a plurality of carbon black particles having an average size less than or equal to 30 nm.

Law discloses this element. *See supra* Section VI.A.5. Furthermore, the combination of Law and Sasaki discloses all elements of claim 1. *See supra* Section VI.B.3. Sasaki discloses carbon black particles of 20 nm. Ex. 1005 at [0092]; Ex. 1003 ¶190. Law discloses carbon black particles of 30 nm. Ex. 1004 at Table 1; Ex. 1003 ¶190.

11. Claim 13

(i) The magnetic recording medium of claim 12, wherein the plurality of carbon black particles have an average size less than or equal to 25 nm.

The combination of Law and Sasaki discloses all elements of claim 1. *See supra* Section VI.B.3. Sasaki discloses carbon black particles of 20 nm. Ex. 1005 at [0092]; Ex. 1003 ¶191. A POSITA would have recognized that Sasaki's use of 20 nm carbon black particles would have lead to the desirable outcome of reducing large protrusions; indeed, Sasaki teaches that its 20 nm particles provide improved reduction of large protrusions compared to the use of larger carbon black particles. *See* Ex. 1005 at [0129] (Table 1) (comparing outcomes with 20 nm, 35 nm, 70 nm, and a mixture of 20/60 nm carbon black particles); Ex. 1003 ¶191. Thus it would have been obvious for a POSITA to use the 20 nm carbon black particles found in Sasaki in a magnetic tape backcoat as described in Law, to further improve the reduction in large protrusions. Ex. 1003 ¶191.

12. Claim 15

(i) A magnetic recording medium comprising:

To the extent the preamble is a limitation, Law discloses this element. *See supra* Section VI.A.1.i. It is further obvious based on Sasaki's teachings. *See supra* Section VI.B.3.i; Ex. 1003 ¶192.

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

Law discloses this element. *See supra* Section VI.A.1.ii. It is further obvious based on Sasaki's teachings. *See supra* Section VI.B.3.ii; Ex. 1003 ¶193.

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

Law discloses this element. *See supra* Section VI.A.1.iii. It is further obvious based on Sasaki's teachings. *See supra* Section VI.B.3.iii; Ex. 1003 ¶194.

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

Law discloses this element. *See supra* Section VI.A.1.iv. It is further obvious based on Sasaki's teachings. *See supra* Section VI.B.3.iv. Sasaki teaches the reduction of protrusions, i.e., peaks on the backside. *See* Ex. 1005 at [0016], [0019]; Ex. 1003 ¶195. Thus, a POSITA would have found it obvious to create magnetic tape according to Law's formulation, and to further reduce the prevalence of peaks on the backside per the teachings of Sasaki. *Supra* Section VI.B.3.iv; Ex. 1003 ¶195. Reducing the size and frequency of peaks would reduce the peak height mean and peak-to-valley roughness of the backside surface. *Supra* Sections VI.B.5-VI.B.6; Ex. 1003 ¶¶177-181, 195.

A POSITA reading Law in view of Sasaki would have understood that the

magnetic tape structure of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the claimed characteristics. *See supra* Section VI.B; Ex. 1003 ¶¶170-173, 196.

Furthermore, a POSITA would have found it obvious that the magnetic tape according to the teaching of Law and Sasaki would have a peak height mean of less than 200 nm, and a peak-to-valley roughness less than about 325 nm because Sasaki teaches reduction of protrusions, creating a Gaussian surface roughness. *Supra* Sections VI.B.5-VI.B.6; Ex. 1003 ¶¶177-181, 197.

13. Claim 16

(i) The magnetic recording medium of claim 15, wherein the backside surface has a skew less than about 0.5.

Law discloses this element. *See supra* Section VI.A.7 The combination of Law and Sasaki discloses all elements of claim 15. *See supra* Section VI.B.12. Claim 16 is further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]; *see supra* Section VI.B.3.iv (claim 1); Ex. 1003 ¶¶170-184, 199.

14. Claim 17

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

Law discloses this element. *See supra* Section VI.A.7. Furthermore, the combination of Law and Sasaki discloses all elements of claim 15. *See supra* Section VI.B.12. Claim 17 is further obvious based on Sasaki's teachings. Ex.

1005 at [0016], [0019]; *supra* Section VI.B.6; Ex. 1003 ¶¶179-181, 200.

15. Claims 18-19

Law discloses these elements. *See supra* Section VI.A.8. The combination of Law and Sasaki discloses all elements of claim 15. *See supra* Section VI.B.12. A reduced variation of the skirt signal-to-noise ratio and small error rate along the tape are merely the result of a backside surface with smoother surface characteristics; a POSITA would have understood, and the '774 Patent confirms, this fact. Ex. 1001 at 9:29-37; Ex. 1003 ¶¶139, 202. Claims 18-19 are further obvious based on Sasaki's teachings. Ex. 1005 at [0016], [0019]; *supra* Section VI.B.9; Ex. 1003 ¶¶174-176, 202.

16. Claim 20

(i) A magnetic recording medium comprising:

To the extent the preamble is a limitation, Law discloses this element. *See supra* Section VI.A.1.i. It is further obvious based on Sasaki's teachings. *See supra* Section VI.B.3.i; Ex. 1003 ¶203.

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

Law discloses this element. *See supra* Section VI.A.1.ii. It is further obvious based on Sasaki's teachings. *See supra* Section VI.B.3.ii; Ex. 1003 ¶204.

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

Law discloses this element. *See supra* Section VI.A.1.iii. It is further

obvious based on Sasaki's teachings. *See supra* Section VI.B.3.iii; Ex. 1003 ¶205.

(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, the backside surface having a skew less than about 0.5, 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.

Law discloses this element. *See supra* Section VI.A.1.iv. It is further obvious based on Sasaki's teachings. *See supra* Section VI.B.3.iv. Sasaki teaches the reduction of protrusions, i.e., peaks on the backside. *See* Ex. 1005 at [0016], [0019]; Ex. 1003 ¶206. A POSITA would have found it obvious to create magnetic tape according to the formulation disclosed by Law, and to further reduce the prevalence of peaks on the backside per the teachings of Sasaki. *Supra* Sections VI.B.3.iv, III.A, II.C-D; Ex. 1003 ¶¶170-174, 206. Thus a POSITA would have found it obvious to have a backside surface with skew less than about 0.5, a kurtosis less than about 4.0, a peak height mean of less than 200 nm, and a peak-to-valley roughness less than about 325 nm because Sasaki teaches the reduction of protrusions, creating a Gaussian surface roughness. *Supra* Sections VI.B.3.iv, VI.B.5-VI.B.6; Ex. 1003 ¶¶170-174, 179-181, 206.

A POSITA reading Law in view of Sasaki would have understood that the magnetic tape structure of Law with 30 nm carbon black particles would result in reduced large protrusions on the backside surface, which would result in the

claimed characteristics. *See supra* Section VI.B; Ex. 1003 ¶¶157-159, 207. Therefore, a POSITA would have found it obvious that the magnetic tape of Law in view of Sasaki has surface characteristics including a skew "less than about 0.5", kurtosis "less than about 4.0", peak height mean "less than about 200 [nm]", and peak-to-valley roughness "less than about 325 nm." Ex. 1003 ¶207.

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 3-5), 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 13,775 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.