UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In Re:	U.S. Patent 7,029,774	:	Attorney Docket No. 070103.0332
Inventor:	James A. Greczyna	:	
Filed:	May 23, 2005	:	
Issued:	April 18, 2006	:	IPR No. Unassigned
Assignee:	Sony Corporation		

Title: Magnetic Recording Medium With Backside To Decrease Recording Surface Embossment

Mail Stop PATENT BOARD
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, Virginia 22313-1450

Submitted Electronically via the Patent Review Processing System

DECLARATION OF RYOSUKE ISOBE

I, Ryosuke Isobe, declare as follows:

1. My name is Ryosuke Isobe. I am an engineering project leader with R&D and manufacturing operations experience in the data storage industry and coating technologies. I have prepared this report as an expert witness retained by FUJIFILM Corporation. In this report I give my opinions as to whether certain claims of U.S. Patent No. 7,029,774 ("the '774 Patent") are invalid. I provide technical bases for these opinions as appropriate.

2. This report contains statements of my opinions formed to date and the bases and reasons for those opinions. I may offer additional opinions based on further review of materials in this case, including opinions and/or testimony of other expert witnesses. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein. For my efforts in connection with the preparation of this declaration I have been compensated at my standard rate for this type of consulting activity. My compensation is in no way contingent on the results of these or any other proceedings relating to the above-captioned patent.

I. Background and Qualifications

3. I have summarized in this section my educational background, career history, publications, and other relevant qualifications. My full curriculum vitae is attached as Appendix A to this report.

A. Educational Background

4. I received a Bachelor of Engineering in Environmental Chemistry from Chiba University, Chiba, Japan.

B. Career History

5. I have 30 years of experience working in the magnetic tape industry, including experience with coating technologies for magnetic tape, manufacturing methods, production of magnetic tape products, and development of new magnetic tape materials and magnetic tape drive systems. I first worked as an R&D Manager and research staff for Konica Corporation in Tokyo, Japan, from 1983 to 1995. At Konica, I worked on developing a dual-layer coating technology for magnetic tape which is the *de facto* standard coating technique for the magnetic tape industry. I am a named inventor on 21 issued U.S. Patents for my work at Konica, including 10 patents on the dual-layer coating technology. I also collaborated with Ampex in joint product development and technology transfers of coating technologies to Ampex.

6. From 1995 to 2003, I worked at Ampex ~ Quantegy Inc. in Opelika, AL. My roles at Ampex included Senior R&D Manager, Principal Chemist, Pilot Plant Manager, and Product Manager. My work involved establishing Ampex's OEM business to develop data storage tapes. I also collaborated with Imation

Corp. in joint product development and technology transfers of coating technologies to Imation.

7. From 2003 to 2009, I worked at Quantum Corporation in Boulder, CO as a Principal Media Engineer and Principal Chemist. My work involved developing advanced magnetic tapes for Quantum data storage tape drive products, including DLT and LTO. I worked closely with magnetic tape suppliers including Fujifilm, Maxell, Imation, Sony, and TDK and led development of media to meet Quantum's system requirements. I acted as media development leader for a joint product and technology development project with Hewlett-Packard. I was also Quantum's media representative to the LTO consortium which set standards for LTO products, and helped established the specifications for LTO-4 and LTO-5 media.

8. I then worked at Imation Corp. from 2009 to 2013 as a Project Manager and Senior Principal Engineer. My work at Imation included development of a new magnetic tape material that used Barium ferrite for a high-capacity data storage format tape.

C. Publications and Patents

9. I have been awarded over 25 U.S. patents, 8 European patents, and 44 Japanese patents. Most of these patents are directed to the field of magnetic tape,

and have been cited by competitors in the magnetic recording media industry, including Fujifilm, Hitachi Maxell, Sony, TDK, and Imation.

10. I have also contributed to the Recording Media Technology sections of two International Magnetic Tape Storage Roadmaps in 2009 and 2012 by the Information Storage Industry Consortium (INSIC), which provided guidance on the likely future development of magnetic recording media over the following ten years.

D. Materials and Other Information Considered

11. I have considered information from various sources in forming my opinions. I have reviewed and considered each of the exhibits listed in the attached Appendix B (Appendix of Exhibits) in forming my opinions.

II. Understanding of the Law

12. I have applied the following legal principles provided to me by counsel in arriving at the opinions set forth in this report.

A. Legal Standard for Prior Art

13. I understand that a patent or other publication must first qualify as prior art before it can be used to invalidate a patent claim.

14. I understand that a U.S. or foreign patent qualifies as prior art to a challenged patent if the date of issuance of the patent is prior to the invention of the challenged patent. I further understand that a printed publication, such as a book or an article published in a magazine or trade publication, qualifies as prior

art to a challenged patent under § 102(a) if the date of publication is prior to the invention of the challenged patent.

15. I understand that a U.S. or foreign patent qualifies as prior art to a challenged patent if the date of issuance of the patent is more than one year before the filing date of the challenged patent. I further understand that a printed publication, such as a book or an article published in a magazine or trade publication, constitutes prior art to a challenged patent under § 102(b) if the publication occurs more than one year before the filing date of the challenged patent.

16. I understand that a U.S. patent qualifies as prior art to the challenged patent under § 102(e)(2) if the application for that patent was filed in the United States before the invention of the challenged patent.

17. I understand that a publication of a U.S. patent application qualifies as prior art to the challenged patent under § 102(e)(1) if the application was filed in the United States before the invention of the challenged patent.

18. I understand that to qualify as prior art, a reference must contain an enabling disclosure that allows one of ordinary skill to practice the claims without undue experimentation.

19. I understand that documents and materials that qualify as prior art can be used to invalidate a patent claim as anticipated or as obvious.

B. Legal Standard for Anticipation

20. I understand that, once the claims of a patent have been properly construed, the second step in determining anticipation of a patent claim requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

21. I understand that a prior art reference "anticipates" a challenged claim, and thus renders the claim invalid, if all elements of the claim are disclosed in that prior art reference, either explicitly or inherently (i.e., necessarily present or implied).

22. I understand that a prior art product "inherently anticipates" a claimed product when the prior art product and claimed product are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes. A newly-discovered property of an old article may not be patentable if the article itself is not new.

23. I understand that a patent is anticipated if, before such person's invention thereof, the invention was made in this country by another inventor who had not abandoned, suppressed, or concealed it.

24. I have written this report with the understanding that in an *inter partes* review anticipation must be shown by a preponderance of the evidence.

C. Legal Standard for Obviousness

25. I have been instructed by counsel on the law regarding obviousness, and understand that even if a patent is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the pertinent art.

26. I understand that a person of ordinary skill in the art provides a reference point from which the prior art and claimed invention should be viewed. This reference point prevents a person of ordinary skill from using one's insight or hindsight in deciding whether a claim is obvious.

27. I also understand that an obviousness determination includes the consideration of various factors such as (1) the scope and content of the prior art, (2) the differences between the prior art and the challenged claims, (3) the level of ordinary skill in the pertinent art, and (4) the existence of secondary considerations such as commercial success, long-felt but unresolved needs, failure of others, etc.

28. I am informed that secondary indicia of non-obviousness may include (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success or lack of commercial success of processes covered by the patent; (3) unexpected results achieved by the invention; (4) praise of the invention by others skilled in the art; (5) taking of licenses under the patent

by others; and (6) deliberate copying of the invention. I also understand that there must be a relationship between any such secondary indicia and the invention. I further understand that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

29. I understand that an obviousness evaluation can be based on a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but other times the nexus linking two or more prior art references is simple common sense. I further understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

30. I understand that if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

31. I also understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I further understand that a person of ordinary skill in the art looking to overcome a problem will often be able to fit the

teachings of multiple publications together like pieces of a puzzle, although the prior art need not be like two puzzle pieces that must fit perfectly together. I understand that obviousness analysis therefore takes into account the inferences and creative steps that a person of ordinary skill in the art would employ under the circumstances.

32. I understand that a particular combination may be proven obvious by showing that it was obvious to try the combination. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp because the result is likely the product not of innovation but of ordinary skill and common sense.

33. I understand that the combination of familiar elements according to known methods may be proven obvious when it does no more than yield predictable results. When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, obviousness likely bars its patentability.

34. It is also my understanding that there are additional considerations that may be used as further guidance as to when a claim is obvious, including the following:

- the claimed invention is a simple substitution of one known element for another to obtain predictable results;
- the claimed invention uses known techniques to improve similar devices or methods in the same way;
- the claimed invention applies a known technique to a known device or method that is ready for improvement to yield predictable results; and
- there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims.

35. It is further my understanding that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill in the art, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

36. I understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

37. I understand that a person of ordinary skill could have combined two pieces of prior art or substituted one prior art element for another if the substitution can be made with predictable results, even if the swapped-in element is different

from the swapped-out element. In other words, the prior art need not be like two puzzle pieces that must fit together perfectly. The relevant question is whether prior art techniques are interoperable with respect to one another, such that that a person of skill would view them as a design choice, or whether a person of skill could apply prior art techniques into a new combined system.

38. In sum, my understanding is that prior art teachings are properly combined where a person of ordinary skill in the art having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

39. I have been informed and understand that the obviousness analysis requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

40. I have written this report with the understanding that in an *inter partes* review obviousness must be shown by a preponderance evidence.

D. Legal Standard for Claim Construction

41. I have been instructed by counsel on the law regarding claim construction and patent claims, and understand that a patent may include two types of claims, independent claims and dependent claims. An independent claim stands alone and includes only the limitations it recites. A dependent claim can depend from an independent claim or another dependent claim. I understand that a dependent claim includes all the limitations that it recites in addition to all of the limitations recited in the claim from which it depends.

42. It is my understanding that in proceedings before the P.T.A.B. the claims of an unexpired patent are to be given their broadest reasonable interpretation in light of the specification from the perspective of one of skill in the art. It is my further understanding that claim terms of an expired patent are given the meaning the term would have to a person of ordinary skill in the art at the time of the invention, in view of the specification and file history. I understand that the standard used for expired patents is similar to that used in district court litigation, and that this standard is sometimes referred to as the *Phillips* standard.

43. It is my understanding that the broadest reasonable interpretation of a claim term may be the same as or broader than the construction of a term under the *Phillips* standard, but it cannot be narrower.

44. In comparing the claims of the ’774 Patent to the prior art, I have carefully considered the ’774 Patent and its file history in light of the understanding of a person of skill at the time of the alleged invention.

45. I understand that to determine how a person of ordinary skill would understand a claim term, one should look to those sources available that show what a person of skill in the art would have understood disputed claim language to mean. Such sources include the words of the claims themselves, the remainder of the patent's specification, the prosecution history of the patent (all considered "intrinsic" evidence), and "extrinsic" evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.

46. I understand that, in construing a claim term, one looks primarily to the intrinsic patent evidence, including the words of the claims themselves, the remainder of the patent specification, and the prosecution history.

47. I understand that extrinsic evidence, which is evidence external to the patent and the prosecution history, may also be useful in interpreting patent claims when the intrinsic evidence itself is insufficient.

48. I understand that words or terms should be given their ordinary and accepted meaning unless it appears that the inventors were using them to mean something else. In making this determination, the claims, the patent specification, and the prosecution history are of paramount importance. Additionally, the

specification and prosecution history must be consulted to confirm whether the patentee has acted as its own lexicographer (i.e., provided its own special meaning to any disputed terms), or intentionally disclaimed, disavowed, or surrendered any claim scope.

49. I understand that the claims of a patent define the scope of the rights conferred by the patent. The claims particularly point out and distinctly claim the subject matter which the patentee regards as his invention. Because the patentee is required to define precisely what he claims his invention to be, it is improper to construe claims in a manner different from the plain import of the terms used consistent with the specification. Accordingly, a claim construction analysis must begin and remain centered on the claim language itself. Additionally, the context in which a term is used in the challenged claim can be highly instructive. Likewise, other claims of the patent in question, both challenged and non-challenged, can inform the meaning of a claim term. For example, because claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.

50. I understand that the claims of a patent define the purported invention. I understand that the purpose of claim construction is to understand how one

skilled in the art would have understood the claim terms at the time of the purported invention.

51. I understand that a person of ordinary skill in the art is deemed to read a claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. For this reason, the words of the claim must be interpreted in view of the entire specification. The specification is the primary basis for construing the claims and provides a safeguard such that correct constructions closely align with the specification. Ultimately, the interpretation to be given a term can only be determined and confirmed with a full understanding of what the inventors actually invented and intended to envelop with the claim as set forth in the patent itself.

52. I understand that it is improper to place too much emphasis on the ordinary meaning of the claim term without adequate grounding of that term within the context of the specification of the challenged patent. Hence, claim terms should not be broadly construed to encompass subject matter that, although technically within the broadest reading of the term, is not supported when the claims are read in light of the invention described in the specification. Put another way, claim terms are given their broadest reasonable interpretation that is consistent with the specification and the prosecution history. Art incorporated by reference or

otherwise cited during the prosecution history is also highly relevant in ascertaining the breadth of claim terms.

53. I understand that the role of the specification is to describe and enable the invention. In turn, the claims cannot be of broader scope than the invention that is set forth in the specification. Care must be taken lest word-by-word definition, removed from the context of the patent, leads to an overall result that departs significantly from the patented invention.

54. I understand that claim terms must be construed in a manner consistent with the context of the intrinsic record. In addition to consulting the specification, one should also consider the patent's prosecution history, if available. The prosecution file history provides evidence of how both the Patent Office and the inventors understood the terms of the patent, particularly in light of what was known in the prior art. Further, where the specification describes a claim term broadly, arguments and amendments made during prosecution may require a more narrow interpretation.

55. I understand that while intrinsic evidence is of primary importance, extrinsic evidence, e.g., all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises, can also be considered. For example, technical dictionaries may help one better understand the underlying technology and the way in which one of skill in the art

might use the claim terms. Extrinsic evidence should not be considered, however, divorced from the context of the intrinsic evidence. Evidence beyond the patent specification, prosecution history, and other claims in the patent should not be relied upon unless the claim language is ambiguous in light of these intrinsic sources. Furthermore, while extrinsic evidence can shed useful light on the relevant art, it is less significant than the intrinsic record in determining the legally operative meaning of claim language.

56. I understand that in general, a term or phrase found in the introductory words of the claim, the preamble of the claim, should be construed as a limitation if it recites essential structure or steps, or is necessary to give life, meaning, and vitality to the claim. Conversely, a preamble term or phrase is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. In making this distinction, one should review the entire patent to gain an understanding of what the inventors claim they actually invented and intended to encompass by the claims.

57. I understand that language in the preamble limits claim scope (i) if dependence on a preamble phrase for antecedent basis indicates a reliance on both the preamble and claim body to define the claimed invention; (ii) if reference to the preamble is necessary to understand limitations or terms in the claim body; or (iii)

if the preamble recites additional structure or steps that the specification identifies as important.

58. I understand that an indefinite article "a" or "an" in patent parlance carries the meaning of "one or more" in open-ended claims containing the transitional phrase "comprising." I understand that, unless the claim is specific as to the number of elements, the article "a" receives a singular interpretation only in rare circumstances when the patentee evinces a clear intent to so limit the article, and thus, under this conventional rule, the claim limitation "a," without more, requires "at least one."

E. Legal Standard for Priority Date

59. I further understand that the "priority date" of a patent is the date on which it is filed, or the date on which an earlier-filed patent application is filed if the patentee properly claims the benefit of priority to that earlier-filed patent application. I further understand the priority date is used to determine the filing date of a patent for purposes of determining whether a reference qualifies as prior art under § 102(b).

60. I understand that a patentee is permitted to claim the benefit of priority to an earlier-filed application as a continuation, divisional, or continuation-in-part application. In order to properly claim the benefit of priority as a continuation or divisional application, I understand that the later-filed application

cannot include any material that would constitute new matter. Further, I understand that to properly claim the benefit of priority as a continuation-in-part application, only those claims in the later-filed application that find adequate written description and enablement in the earlier-filed application are entitled to the earlier-filed application's priority date. It is my understanding that written description and enablement are two different requirements that must both be satisfied to properly claim the benefit of an earlier priority date. Further, it is my understanding that conclusive evidence that one requirement is met is not equally conclusive evidence that the other has been met.

61. I understand that under the first of these requirements, the claims of the later-filed application must be supported by adequate written description in the earlier-filed application. I understand that adequate written description will describe the claimed invention in sufficient detail that a person of ordinary skill in the art would conclude that the patentee was in possession of what is claimed in the later-filed application at the time of the earlier-filed application. It is my understanding that one factor to consider is whether the earlier-filed application puts the public in possession of what is claimed in the later-filed application.

62. I understand that adequate written description is evaluated on a claim-by-claim basis. It is also my understanding that each claim limitation must find

adequate support in the earlier-filed application for a claim in the later-filed application to properly claim the benefit of the earlier priority date.

63. I further understand that the earlier-filed application must enable the claims of the later-filed application. I understand that a particular claim is enabled if, when filed, the earlier-filed application contained sufficient information to enable a person of ordinary skill in the art to make and use the invention claimed in the later-filed application. It is my understanding that a claim is enabled if a person of ordinary skill in the art could practice the claimed invention without undue or unreasonable experimentation. I understand that a determination of whether the amount of experimentation is "undue" considers several factors, including:

- the quantity of experimentation required to make or use the invention;
- the amount of direction or guidance presented;
- the presence of working examples, if any;
- the nature of the invention;
- the state of the prior art;
- the level of a person of ordinary skill;
- the level of predictability in the art; and
- the breadth of the claims.

64. However, I also understand that none of these factors is determinative, and that other factors can be considered as well. I understand that enablement is

evaluated as of the filing date of the later-filed application, and that the claims of the later-filed application are evaluated on a claim-by-claim basis.

III. Level of Skill of One of Ordinary Skill in the Art

65. In determining the characteristics of a hypothetical person of ordinary skill in the art of the '774 Patent at the time of the claimed invention, I considered several things, including various prior art techniques relating to magnetic tape, the type of problems that such techniques gave rise to, and the rapidity with which innovations were made. I also considered the sophistication of the technologies involved, and the educational background and experience of those actively working in the field. I also considered the level of education that would be necessary to understand the '774 Patent. Finally, I placed myself back in the relevant period of time, and considered the academics, engineers, and graduate students that I had worked with in the field of materials science and magnetic tape. I came to the conclusion that the characteristics of a person of ordinary skill in the field of art of the '774 Patent would have been a person with (a) a bachelor's degree in materials science, electrical engineering, mechanical engineering, chemistry, or a closely related field, and at least five years of experience—either in industry or academic research—relating to magnetic tape, or (b) a master's degree or higher in materials science, electrical engineering, mechanical engineering, chemistry, or a closely related field, and at least three years of experience—either

in industry or academic research—relating to magnetic tape. A person with less education but more relevant practical experience, or more relevant education but less practical experience, may also meet this standard. I was a person of ordinary skill in the art at the time of the alleged invention of the '774 Patent.

IV. Technology Background

66. 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].

A. Magnetic Tape Composition

67. Magnetic tape typically comprises layers coated on the surface of a supporting substrate. *See, e.g.*, Ex. 1004 at Abstract. 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. A recording head is run across this magnetic "front" side, or magnetic surface, to read or write to the tape. 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. Figure 1 below shows these layers in a cross-sectional view of magnetic tape.

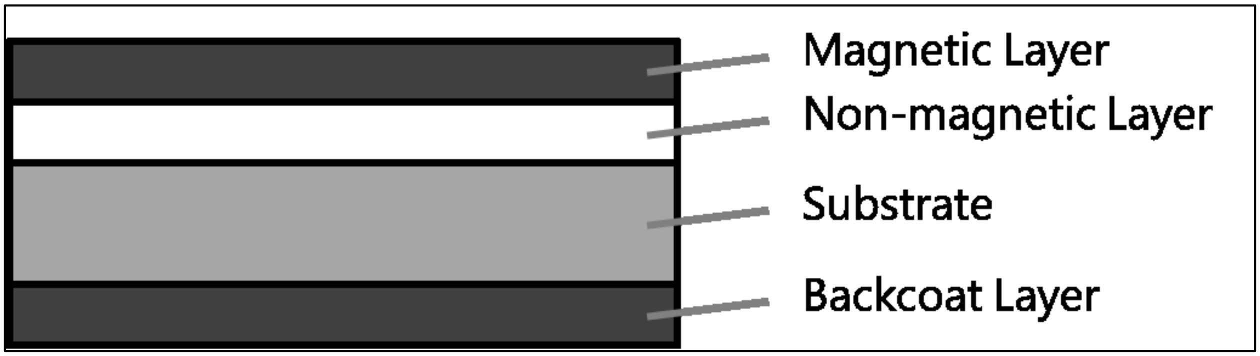


Figure 1: Cross-Section View of Tape

68. 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 ("[A] backside coating may be coated on the backside of the nonmagnetic support to provide a roughened, uneven surface and thereby reduce the coefficient of friction of the backside surface"). 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. The binder is usually a type of polymer, polyvinyl, or resin. *See e.g.,* Ex. 1004 at 3:23-30; Ex. 1009 at 11:24-27; Ex. 1010 at 6:34-42.

B. Embossment of the Magnetic Surface

69. Magnetic recording tape is stored on reels. 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 next previous winding. *See* Ex. 1005 at [0014].

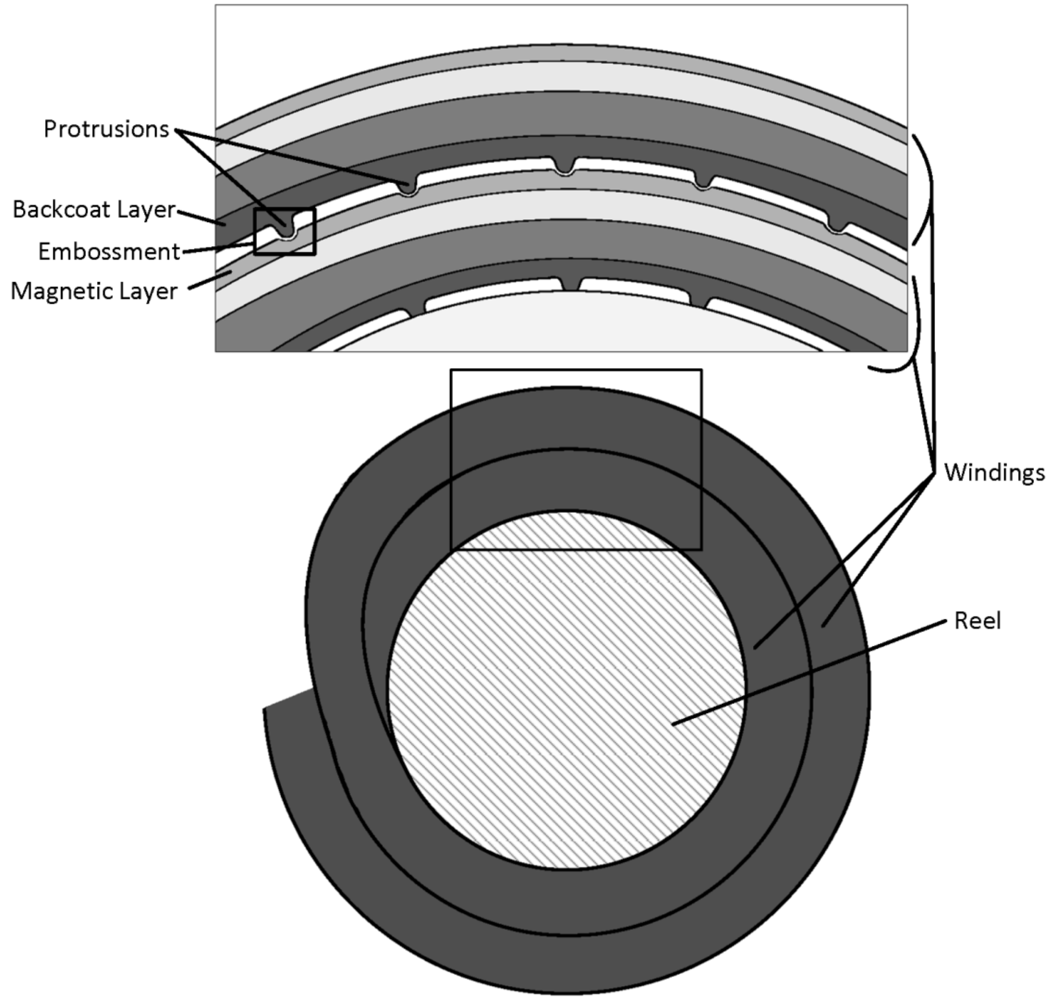


Figure 2: Cross-Section View of Wound Reel of Magnetic Tape

70. 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. This process is widely recognized in the art and referred to by many names, including "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. 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”).

71. 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. Embossments may also cause a decreased output rate or even loss of signal. Ex. 1009 at 1:55-57. Furthermore, embossments may substantially reduce the magnetic layer’s coating film strength, increasing vulnerability to coating film tears. Ex. 1005 at [0015].

C. Reducing Large Protrusions to Address Embossment

72. 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. 1015 at [0044] ("it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer"); Ex. 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"). As was widely known in the art, smaller peaks meant smaller embossments on the magnetic surface, and fewer peaks meant fewer embossments. 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").

73. One method for reducing backside protrusions was to use increase the weight ratio of fine- to coarse-grain carbon black particles used in the backcoat layer. For example, Ex. 1013 ("Abe") recognized that in order to provide a "smooth surface, thus minimizing the tendency of the backside coating layer to damage the magnetic layer," a "relatively large amount" of fine-grain carbon black would be required in the backcoat layer. Ex. 1013 at 3, ll. 10, 15-16, 21-23 (defining a "smooth surface" for minimizing damage to the magnetic layer as a

surface with "a centerline average roughness of 30 nm or less"). The prior art taught that using weight ratios of fine- to coarse-grain particles between 70/30 to 99.9/0.1, would prevent embossment. Ex. 1013 at 3, ll. 21-28 ("in order to provide backside coating layers having a centerline average roughnesses of 30 nm or less, it is preferred to use a relatively large amount of finely divided carbon black particles having a particle size in the range from 10 to 30 nm … [f]urther, in order to provide backside coating layers having a surface density of 2% or less of projections having a particle size of 100 nm or more, it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"). Magnetic tape having such backside formulations were known in the art. *See* Ex. 1013 at 4, ll. 6-24 (Table 1) (using 99 parts of 20 nm to 1 part 350 nm carbon black particles); Ex. 1017 at [0119] (using 100 parts of 17 nm to 3 parts 270 nm carbon black particles); Ex. 1011 at 7:12-10:43 (Table 1) (showing example embodiments of "backing layers" with "a fine-particle/coarse particle ratio" between 80/20 and 100/0).

D-E. (Reserved)

74-81. (These paragraph numbers were intentionally omitted)

F. Reduction of Large Protrusions can be Reflected by Surface Roughness Measurements

82. Reducing the large protrusions or peaks on the backcoat surface as discussed above in order to prevent embossment would have also resulted in a

change in the surface roughness properties of the backcoat surface. A consequence of reduced peaks would have been a reduction in several statistical measures of those peaks. For example, the average height of the peaks (e.g., the peak height mean) would have been reduced. Similarly, the average peak-to-valley separation would have been smaller.

83. The third and fourth moments of a distribution can also be used to describe a surface topography. The third moment is known as "skew," and the fourth moment "kurtosis." By definition, a Gaussian distribution has a skew of 0 and a kurtosis of 3. Ex. 1014 at 4:28-29. A reduction in backside protrusions would have led to lower skew and kurtosis for the back surface of the tape.

V. The '774 Patent

A. Summary of the '774 Patent

84. 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. 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 id.* at

2:1-12. “The bimodal roughness of the backside surface 18 defines a plurality of peaks 20 and valleys 22.” Ex. 1001 at 2:5-7.

85. 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.” *Id.* at 1:47-51, 2:17-24. “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.” *Id.* at 2:17-21. “The imprints, pits, or embossments defined in the front surface 16 can damage the recording characteristics of the magnetic recording tape 10.” *Id.* at 2:21-24. 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.

B. Summary of the Alleged Invention

86. To address the embossment problem, the ’774 Patent proposes using 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[.]”). 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). The alleged invention uses carbon black particles in the backside layer that are "substantially uniform in size." *Id.* at 5:22-23.

87. 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) of the '774 Patent below. *See* Ex. 1001, Figs. 1, 3:

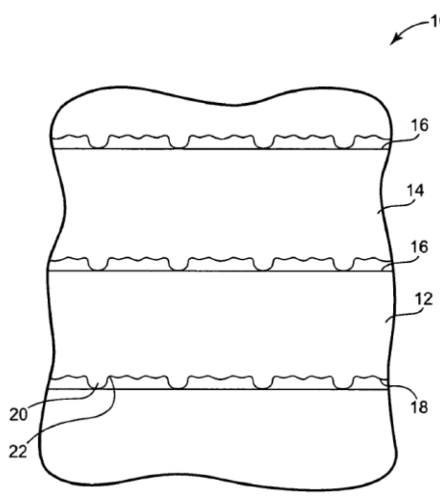


Fig. 1
(PRIOR ART)

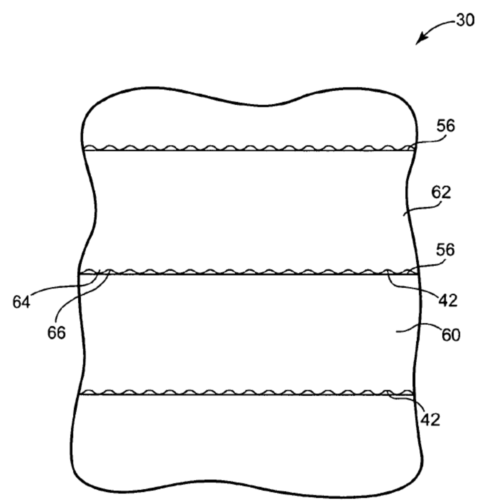


Fig. 3

88. The '774 Patent achieves its alleged invention through its use of relatively uniform carbon black particles of less than 30 nm in the backcoat. 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. The disclosed compositions for these examples are shown below in terms of percent weight. *See* 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%	

89. The ’774 Patent does not disclose any specifics for other aspects of tape manufacturing, such as dispersion quality, backcoat thickness, heat curing, winding tension, calendering, and substrate roughness. *See generally* Ex. 1001. 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.*

90. However, the use of fine-grain carbon black in the backside coating was already known in the art as a solution to embossment. Ex. 1010 at 7:1-10 (“[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). 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).

C. Summary of the Claimed Subject Matter

91. The independent claims of the '774 Patent do not recite a particular manufacturing method or composition of magnetic tape. 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 as compared with bimodal coatings having fine-grain and large, coarse particles. Ex. 1001 at 9:14-21, 12:50-14:41. 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*.

92. 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. *See* Ex. 1001 at 10:1-14 (Table 1):

TABLE 1

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

93. (This paragraph number was intentionally omitted.)

94. 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 12:51-14:41. 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* ¶¶72-73. 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).

D. ’774 Patent Claims

95. I understand that Petitioner is challenging the validity of claims 1-13 and 15-20 of the ’774 Patent in the Petition for *Inter Partes* Review. Claims 1, 15, and 20 are independent, while claims 2-13 depend on claim 1, and 16-19 depend on claim 15. These claims are set forth below:

(i) Claim 1

A magnetic recording medium comprising:

a substrate defining a first surface and a second surface opposite the first surface;

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

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.

(ii) Claim 2

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.

(iii) Claim 3

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

(iv) Claim 4

The magnetic recording medium of claim 1, wherein the backside surface has a peak-to-valley roughness less than about 325 nm.

(v) Claim 5

The magnetic recording medium of claim 4, wherein the peak-to-valley roughness is less than about 300 nm.

(vi) Claim 6

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

(vii) Claim 7

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

(viii) Claim 8

The magnetic recording medium of claim 1, wherein the magnetic recording medium has 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.

(ix) Claim 9

The magnetic recording medium of claim 1, wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any second location along the total length of the magnetic recording medium by less than about 0.5 dB.

(x) Claim 10

The magnetic recording medium of claim 1, wherein the magnetic recording medium has 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.

(xi) Claim 11

The magnetic recording medium of claim 1, wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m.

(xii) Claim 15

A magnetic recording medium comprising:

a substrate defining a first surface and a second surface opposite the first surface;

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

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 and a peak-to-valley roughness less than about 325 nm.

(xiii) Claim 16

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

(xiv) Claim 17

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

(xv) Claim 18

The magnetic recording medium of claim 15, wherein a first skirt signal-to-noise ratio measured at any first location along a total length of the magnetic recording medium varies from a second skirt signal-to-noise ratio measured at any second location along the total length of the magnetic recording medium by less than about 0.5 dB.

(xvi) Claim 19

The magnetic recording medium of claim 15, wherein a first small error rate measured at any first location along a total length of the magnetic recording medium varies from a second small error rate measured at any second location along the total length of the magnetic recording medium by less than about 0.25 error/m.

(xvii) Claim 20

A magnetic recording medium comprising:

a substrate defining a first surface and a second surface opposite the first surface;

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

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.

VI. The Challenged Claims

96. (This paragraph number was intentionally omitted.)

97. The ’774 Patent has 20 claims. Claims 1, 15, and 20 are independent. Claims 2-14, and 16-19 are dependent claims. I have considered invalidity with respect to claims 1-11, and 15-20.

VII. Claim Construction

98. (This paragraph number was intentionally omitted.)

99. For purposes of this *Inter Partes* Review I have considered the claim language, specification, and portions of the prosecution history, to determine the meaning of the claim language as it would have been understood by a person of ordinary skill in the art at the time of the invention.

A. “skew”

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

101. A person of ordinary skill in the art would have recognized that optical interferometers, including Wyko® brand ones, can be configured to display R_{sk} measurements, and that such R_{sk} measurements were consistent with the

understanding of R_{sk} in the field. Ex. 1018 ¶66. R_{sk} is a term of art referring to the third moment of a surface topography distribution sampled over a trace (i.e., line) along the surface, e.g.:

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

See id. ¶¶66-67; Ex. 1016 ("ISO 4287") at 22 (calculating "within a sampling length" in a single x dimension). The ISO 4287 R_{sk} description corresponds with the R_{sk} measurement taken by optical interferometers, including Wyko® and Zygo® brands. Ex. 1018 ¶67. ISO 4287 illustrates the surface profile being measured as the "profile that results from the intersection of the real surface by a specified plane." *Id.*; Ex. 1016 at 11, 22, Figure 2:

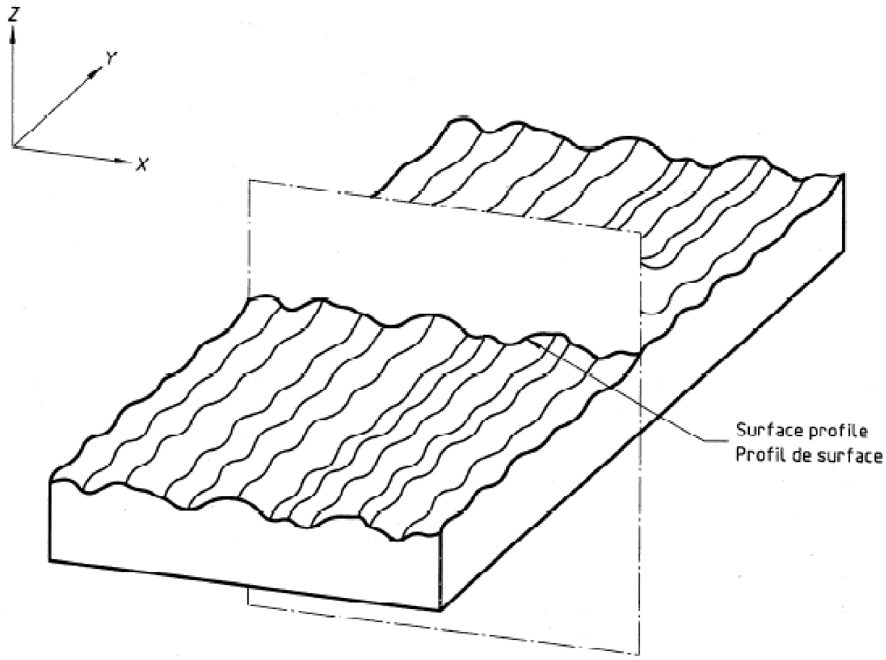


Figure 2 — Surface profile
Figure 2 — Profil de surface

B. "kurtosis"

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

103. A person of ordinary skill in the art would have recognized that optical interferometers, including Wyko® brand ones, can be configured to display R_{ku} measurements, and that such R_{ku} measurements were consistent with the

understanding of R_{ku} in the field. Ex. 1018 ¶70. R_{ku} is a term of art referring to the fourth moment of a surface topography distribution sampled over a trace along the surface, e.g.:

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

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

C. "peak height mean"

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

105. A person of ordinary skill in the art would have recognized that optical interferometers, including Wyko® brand optical interferometers, can be

configured to display Rpm measurements, and that such R_{pm} measurements were consistent with the understanding of R_{pm} in the field. Ex. 1018 ¶73. R_{pm} is a term of art referring to the mean height of peaks along a trace. *Id.*

106. Though claims 3, 15 and 20 do not expressly state units, a person of ordinary skill in the art would have understood this term to refer to nm because of the extremely smooth finish of the tape front and back surface; this is consistent with the language of dependent claim 3 ("[T]he backside surface has a peak height mean less than about 200 nm") as well as the specification. Ex. 1001 at 8:36-37 ("In one embodiment, the peak height mean of the magnetic recording medium 30 is less than about 200 nm."); Ex. 1018 ¶74. Table 1 of the '774 Patent discloses a "Peak Mean Height (Rpm)," measured in nm, which a person of ordinary skill in the art would have understood to also mean a "peak height mean." Ex. 1001 at 10:7-8 (Table 1); Ex. 1018 ¶74.

D. "peak-to-valley roughness"

107. A person of ordinary skill in the art would have understood the broadest reasonable interpretation of this term, used in claims 4, 5, 15, 17, and 20, to at least include "an R_z measurement from an optical interferometer trace." Ex. 1018 ¶75. The specification states "the values used throughout this application were measured using a Wyko® Optical Interferometer," including "peak-to-valley

roughness," and further defines "Peak-to-Valley Roughness" as a measurement of "R_z." Ex. 1001 at 8:2-12, 8:38-40; Ex. 1018 ¶75.

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

E. "plateau ratio"

109. A person of ordinary skill in the art would have understood the broadest reasonable interpretation of this term, used in claim 6, to at least include "a ratio of $\frac{R_{pm}}{R_z}$ measurements, where R_{pm} is peak height mean and R_z is peak-to-valley roughness." The specification provides this definition explicitly. Ex. 1001 at 8:55-57; Ex. 1018 ¶77.

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

110. Under the broadest reasonable interpretation, a person of ordinary skill in the art would have understood "skew," "kurtosis," "peak height mean," "peak-to-valley roughness," and "plateau ratio" to at least include, respectively, an "R_{sk}," "R_{ku}," "R_{pm}," "R_z," or "$\frac{R_{pm}}{R_z}$" measurement from an optical interferometer trace. *See supra* ¶¶100-109. Thus, a person of ordinary skill in the art would have understood these broader elements, under the broadest interpretation , to be satisfied by "at least one" such measurement for each recited range:

- the backside surface having at least one R_{sk} measurement less than about 0.5";
- "the backside surface having at least one R_{ku} measurement less than about 4.0";
- "the backside surface has at least one R_{pm} measurement less than about 200 nm";
- "the backside surface has at least one R_z measurement less than about 325 nm";
- "the backside surface has at least one R_{pm}/R_z ratio of less than or equal

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

Ex. 1018 ¶78; *see supra* ¶¶100-109.

111. It is my understanding that, in patent parlance, the claim limitation "a," without more, merely requires "at least one." *See supra* ¶58. Here, the claims do not recite an average of multiple measurements, state that all measurements must be within their respective ranges, or specify any particular number of measurements that must be taken. *See* Ex. 1001 at 12:50-14:41; Ex. 1018 ¶79. Instead, the '774 Patent simply describes each measurement using their respective R-notation measurements and recites "the backside surface having a [measurement] less than about [the claimed value]." *See* Ex. 1001 at 12:50-14:41 (emphasis added); Ex. 1018 ¶79; *supra* ¶¶100-109. Under the broadest reasonable interpretation , a person of ordinary skill in the art would have understood this claim language to be satisfied if the backside surface has at least one R_{sk}, R_{ku}, R_{pm}, R_z, or R_{pm}/R_z measurement falling within the respectively claimed ranges. *See supra* ¶¶100-109; Ex. 1018 ¶79.

VIII. Summary of the Prior Art

112. There are a number of patents and publications which constitute prior art to the '774 Patent. I have reviewed and considered the following prior art patent

and printed publications, which I believe were all publicly available prior to May 23, 2005, the earliest priority date claimed on the face of the ’774 Patent. A description of these references follows. None of these references were presented to the USPTO during prosecution. *See* Ex. 1002 at 6.

A-B. (Reserved)

113-117. (This paragraph number was intentionally omitted.)

C. Ishikawa

117. Ishikawa is U.S. Patent Application Publication No. 2003/0054203, filed June 13, 2002, and published March 20, 2003. Ex. 1015 at 1. Ishikawa qualifies as prior art under at least § 102(b), being a publication that was published more than one year prior to the filing date of the ’774 Patent.

118. Ishikawa teaches that for a magnetic tape, “it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer 5 from being transferred to the magnetic layer while the tape is wound.” Ex. 1015 at [0044]. To achieve this goal, “the backcoating layer 5 preferably has . . . a 10 point mean roughness Rz of 40 to 250 nm, particularly 50 to 200 nm.” *Id.*

D. Aonuma

119. Aonuma is a Japanese published patent application, Publication No. JP2003-036520, filed July 25, 2001, and published February 07, 2003. Ex. 1017 at

1. Aonuma qualifies as prior art under at least § 102(b), being a publication that was published more than one year prior to the filing date of the '774 Patent.

120. Aonuma teaches a magnetic recording medium comprising at least a magnetic coating applied to one side of a substrate and a backside coating applied to the opposite side. Ex. 1017 at [0009]. Aonuma teaches a particular formulation and method of manufacture for said magnetic recording medium. *Id.* at [0119], [0123].

E. Abe

121. Abe is a European Patent Application, Publication No. EP0494793A1, filed January 10, 1992 and published July 15, 1992. Ex. 1013 at 1. Abe qualifies under prior art under at least § 102(b), being a publication that was published more than one year prior to the filing date of the '774 Patent.

122. Abe teaches using carbon black particles in an "improved magnetic recording media comprising novel backside coating layers having excellent tracking, friction, and smoothness characteristics … the projections [on the backside coating] have a size and surface density such that the surface of the backside coating layer has a rough texture for minimizing air entrapment during tape transport, yet is smooth enough such that the backside coating layer has less of a tendency to damage the magnetic layer." Ex. 1013 at 2, ll. 46-55.

IX-X. (Reserved)

124-208. (Reserved)

XI. GROUND 3: Ishikawa Anticipates Claims 15 and 17 of the ’774 Patent

209. Independent Claim 15 of the ’774 Patent recites a magnetic recording medium with, among other elements, a backside coating that has “a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm.” Claim 15 does not require any particular structure for the backside coating of a magnetic tape to reach these measurements.

210. Ishikawa discloses a magnetic tape with backside peak height mean and peak-to-valley roughness in the ranges recited by claims 15 and 17. Ishikawa is directed to a magnetic tape with a “backcoating layer” that comprises a binder and fine particles dispersed in the binder. Ex. 1015 at Abstract. Ishikawa teaches that “it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer.” Ex. 1015 at [0044]. With this consideration, Ishikawa discloses that the backcoating layer preferably has “a 10 point mean roughness R_z of 40 to 250 nm, particularly 50 to 200 nm.” *Id.*

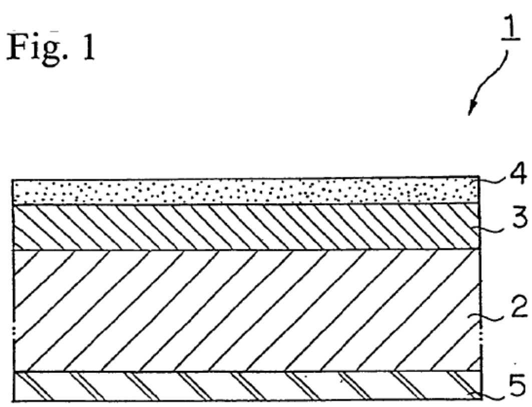
A. Ishikawa Anticipates Claim 15

211. The preamble of claim 15 recites “A magnetic recording medium comprising”. To the extent the preamble is a limitation, it is taught by Ishikawa. Ishikawa discloses a “***magnetic tape*** having an increased ***recording*** capacity for

use as a ***medium*** for data backup." Ex. 1015 at [0002] (emphasis added); *see also id.* at [0001] ("The present invention relates to magnetic tape"); [0017] ("Magnetic tape 1 of the embodiment shown in FIG. 1").

212. Ishikawa discloses "a substrate defining a first surface and a second surface opposite the first surface." Ishikawa provides a figure depicting a cross-section of a magnetic tape, with a "substrate 2" having, on one side, "an intermediate layer 3 and a magnetic layer 4," and "on the other side a backcoating layer 5." *See* Ex. 1015 at [0017]; Fig. 1:

Fig. 1



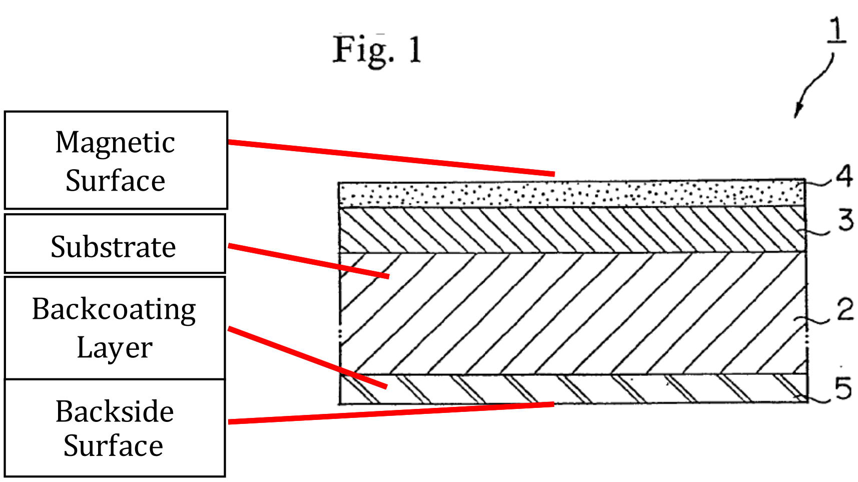
A person of ordinary skill in the art would have understood that the two "sides" discussed in Ishikawa refer to the two surfaces of magnetic tape (front and back). Ishikawa thus teaches a first surface upon which the intermediate layer 3 and magnetic layer 4 are placed, and a second surface upon which the backcoating layer 5 is placed.

213. The next element of claim 15 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Ishikawa discloses

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

214. The last element of claim 15 begins "a backside coated on the second surface of the substrate and configured to decrease the embossment of the recording surface, wherein the backside defines a backside surface opposite the substrate" Ishikawa discloses this claim element. Ishikawa discloses that "substrate 2 has on the other side a backcoating layer." Ex. 1015 at [0017]. Ishikawa Fig. 1 shows that the backcoating layer 5 is the back surface of the magnetic tape. *See id.* at Fig. 1:

Fig. 1



215. Ishikawa further discloses that "it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer 5 from being transferred to the magnetic layer while the tape is wound." *Id.* at [0044]. Thus, Ishikawa's backcoating layer prevents protrusions on the back surface from imprinting on to the front side magnetic layer. As a person of ordinary skill in the art would have understood, Ishikawa's backcoating layer is a backside coating configured to prevent embossment on the recording surface caused by the surface profile of the back surface.

216. The last element of claim 15 continues "the backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm." Ishikawa discloses this element. The backcoating layer of Ishikawa's magnetic tape "preferably has … a 10 point mean roughness Rz of 40 to 250 nm, particularly 50 to 200 nm." Ex. 1015 at [0044]. All examples of tape made according to Ishikawa's teachings feature a peak-to-valley roughness (Rz) less than 87 nm. *See* Ex. 1015 p. 11, Table 1:

TABLE 1

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

Thus Ishikawa discloses several tapes (Examples 1-5) with "a peak-to-valley roughness of less than about 325 nm." *See* Ex. 1015 p. 11, Table 1.

217. Ishikawa's backcoating layer surface inherently has "a peak height mean less than about 200 [nm]." While Ishikawa does not explicitly disclose measurements of peak mean height, a person of ordinary skill in the art would have understood that a peak height mean (which measures the average value of all peaks above a standard plane) must inherently be less than a peak-to-valley roughness, i.e., R_z (which is an average of the largest peak-to-valley separations). *See* Ex. 1001 at 8:37-40 ("Peak-to-Valley Roughness (Rz) is an average maximum profile of the ten greatest peak-to-valley separations in the evaluation area"). A peak-to-valley roughness accounts for both the height of peaks and the depth of valleys. *See* Ex. 1015 at [0049]-[0050] ("$Rz = \frac{|Yp1+Yp2+Yp3+Yp4+Yp5| + |Yv1+Yv2+Yv3+Yv4+Yv5|}{5}$ wherein Yp1, Yp2, Yp3, Yp4, and Yp5 are heights of the five highest peaks within the sampled section … and Yv1, Yv2, Yv3, Yv4, and Yv5 are height[s] of the five lowest valleys within the sampled section"); Ex. 1001 at 8:38-40 ("Peak-to-Valley Roughness (Rz) is an average maximum profile of the ten greatest peak-to-valley separations in the evaluation area"). Meanwhile, the peak height mean accounts only for the height of peaks. *See* Ex. 1001 at 8:30-37. Therefore, a surface with a peak-to-valley roughness (Rz) of less than 200 nm must necessarily have a peak height mean

(Rpm) of less than 200 nm as well. As Ishikawa's backcoating layer surface has a peak-to-valley roughness (R_z) of 87 nm or less, the backside surface must necessarily have a peak height mean (R_{pm}) of 87 nm or less, which is within the claimed range.

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

B. Ishikawa Anticipates Claim 17

219. Claim 17 recites "[t]he magnetic recording medium according to claim 15, wherein the peak-to-valley roughness is less than about 300 nm." As discussed above, Ishikawa anticipates claim 15. *See supra* ¶¶211-218. Ishikawa also discloses magnetic tapes with a backcoating layer surface peak-to-valley roughness less than 87 nm, which falls in the recited range. *See supra* ¶216; Ex. 1015 at 11, Table 1, Table 1. Ishikawa Examples 1-5 all have an Rz less than 87 nm. *See id*. Thus, claim 17 is anticipated by Ishikawa.

XII. GROUND 4: Aonuma Renders Claims 1-11 and 15-20 of the '774 Patent Obvious

220. The '774 Patent attempts to claim broad measurements of surface roughness regardless of manufacturing process that encompass even tapes with bimodal backside coatings, which the '774 Patent admits was prior art. Ex. 1001 at 5:20-21. Aonuma, for example, disclosed manufacturing processes for tape with a bimodal backside coating having large and small carbon black particles. *See* Ex. 1017 at [1019]. As explained in further detail below, a person of ordinary skill in

the art would have found it obvious to produce tape based on Aonuma's teachings with surface characteristics in the measurement ranges claimed by the '774 Patent.

221. The alleged invention is simply a combination of familiar elements (known magnetic tape formulations and known surface roughness measurements) according to known methods (magnetic tape production techniques taught in the art) yielding a predictable result (the backside coating surface exhibiting the claimed surface roughness properties). The '774 Patent merely attempts to claim characteristics of magnetic tape that already existed in the prior art.

A. Replication of Aonuma

222. I have reviewed the Declaration of Norihito Kasada regarding his manufacture of tape samples following the back-coat layer formulation and manufacturing process described in Aonuma. *See* Ex. 1019. Three tape samples were created: Tape Samples A, B, and C. *See id.* ¶¶4-8. Following Aonuma's teachings, Mr. Kasada states that for each of the tape samples, a back-coat layer coating material was prepared for coating and drying on an aramid substrate sheet (commercial brand: Mictron). *See* Ex. 1019 ¶6; Ex. 1017 at [0123]. Tape Sample A was made using a back-coat layer coating material matching Aonuma's formulation. *See* Ex. 1019 ¶4; Ex. 1017 at [0119]. Though Aonuma taught a calendering step for reducing surface roughness, Tape Sample A was not calendered. Ex. 1019 ¶6. For Tape Sample B, a back-coat layer coating material

with a varied concentration of the solvents was used. *See* Ex. 1019 ¶7. Mr. Kasada explains that this was changed to accommodate the manufacturing equipment available to him. Ex. 1019 ¶6-7. As described further below, changing the concentration of solvents used in this way, to accommodate manufacturing equipment, would have been known and obvious to a person of ordinary skill in the art. Tape Sample C was made using the same formulation as Tape Sample B, but calendered according to the procedure taught by Aonuma. *See* Ex. 1019 ¶8; Ex. 1017 at [0123].

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

224. **Tape Sample A** is a sample of magnetic tape with an aramid substrate with a thickness of 4.4 μm. Ex. 1019 ¶¶4, 6. Tape Sample A was made using a

back-coat layer coating material matching Aonuma's formulation. *See* Ex. 1019 ¶4; Ex. 1017 at [0119]. Mr. Kasada described this formulation in a table, which is reproduced below:

Component	Weight by Part
BP-800 carbon black particles from Cabot Corp. (average particle diameter: 17 nm)	100
Thermal black carbon black particles from Cancarb Ltd. (average particle diameter: 270 nm)	3
α-alumina HIT55 (HIT55/MR110/MEK - 5/1/4 parts individual dispersion)	0.5
Nitrocellulose resin	108
Polyurethane resin	15
Polyisocyanate	40
Polyester resin	5
Dispersing agent: copper oleate	4
copper phthalocyanine	4
barium sulfate	5
Methyl Ethyl Ketone (MEK)	2200
Butyl Acetate	300
Toluene	600

See Ex. 1019 ¶4.

225. Mr. Kasada notes that Tape Sample A was filtered, coated, and dried with a back-coat layer thickness of 0.5 μm, the same as disclosed in Aonuma. Ex. 1019 ¶¶5-6; Ex. 1017 at [0123]. Aonuma teaches calendering the dried tape at a roll temperature of 90 °C and a linear pressure of 2940 N/cm after coating and drying onto the substrate. Ex. 1017 at [0123]. However, Tape Sample A was not

calendered after coating and drying onto the substrate because of limitations in the equipment available to Mr. Kasada. *See* Ex. 1019 ¶6. A person of ordinary skill in the art would have understood that, had calendering been applied, it would have generally made Tape Sample A smoother (less rough). Thus, as a person of ordinary skill in the art would have understood, Tape Sample A would have had fewer protrusions—thus lower skew, kurtosis, peak height mean, and peak-to-valley roughness—if it had been calendered.

226. **Tape Sample B** uses a back-coat layer coating material that differs from the Aonuma formulation only with respect to the amounts of the solvents used (865 parts of methyl ethyl ketone, 308 parts of butyl acetate, and 469 parts of toluene). *See* Ex. 1019 ¶7; Ex. 1017 at [0119]. This changed the concentration from roughly 7.8% solids by weight to roughly 14.5% solids by weight. Mr. Kasada notes that the change in back-coat layer coating material concentration was to make the coating process more suitable with the available coater. Ex. 1019 ¶7. The concentration change would have been obvious to a person of ordinary skill in the art. *See infra* ¶¶242-245. Tape Sample B was not calendered. Ex. 1019 at ¶7.

227. **Tape Sample C** uses a back-coat layer coating material with the same concentration as Tape Sample B. Ex. 1019 ¶8. Mr. Kasada notes that Tape Sample C was calendered at a roll temperature of 90 °C and a linear pressure of 2940 N/cm (Ex. 1019 ¶8), the same as described in Aonuma. Ex. 1017 at [0123]. Because a

person of ordinary skill in the art would have known how to manufacture the back-coat layer of Tape Sample B, and because Aonuma teaches the calendering process used for Tape Sample C, a person of ordinary skill in the art would have known how to manufacture the back-coat layer of Tape Sample C. As discussed above, a person of ordinary skill in the art would have understood that the calendering step would have generally *lowered* the values of skew, kurtosis, peak-to-valley roughness, and peak height mean compared to an un-calendered back-coat layer by reducing the prevalence of protrusions on the back-coat layer surface.

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

B. Surface Roughness Measurements

229. I have also reviewed the Declaration of Dr. Bart Raeymaekers, who received the replication tape samples of Aonuma from Mr. Kasada. Ex. 1018 ¶80.

Dr. Raeymaekers describes a blind test that he performed to measure the surface characteristics of the three tape samples. *Id.* ¶82. He was not informed of, or otherwise made aware of, the existence of any manufacturing differences between the three tape samples prior to performing the measurements as described. *Id*. Mr. Kasada states that he placed numerical labels on the samples so that Sample A according to Mr. Kasada's Declaration corresponds to Sample 3 as received by Dr. Raeymaekers. Ex. 1019 ¶10. Similarly, Sample B corresponds to Sample 1 and Sample C corresponds to Sample 2. *Id.* This ensured that the results of the measurement would not be subject to bias or influence implied by the labelling.

230. The '774 Patent states that "the backside surface 42 is analyzed to determine the surface measurement parameters using a Wyko® Optical Profiler manufactured by Veeco Instruments, Inc. of Tucson, Ariz., *or other suitable device*." *See* Ex. 1001 at 8:2-9 (emphasis added). Dr. Raeymaekers used a Zygo optical surface profiler to measure the surface characteristics of the replication tape samples. Ex. 1018 ¶83. Dr. Raeymaekers notes that there is no significant difference in surface measurements between a Zygo optical profiler and a WYKO optical profiler as disclosed in the '774 Patent. *Id.* I agree with Dr. Raeymaekers. "WYKO" and "Zygo" are brands that both provide white light interferometers, which operate based on the same principles regardless of brand name.

231. Dr. Raeymaekers used an evaluation window of (W = 340 μm, L = 450 μm), which was a typical for evaluating tape of this sort. Ex. 1018 ¶85. He took measurements at up to 3 window locations for each tape sample. *Id.* At each location, the optical profiler applied a trace measurement of the surface topography across the middle of the window of the testing field, in the tape lengthwise direction, and reported measurements for R_{sk}, R_{ku}, R_{pm}, and R_z. *Id.* Dr. Raeymaekers then calculated plateau ratio for that location as $\frac{R_{pm}}{R_z}$. *Id.* In the below table, I took the data from Dr. Raeymaekers declaration and replaced his labels (samples 1-3) with the corresponding values from Mr. Kasada's declaration (samples A-C). *See* Ex. 1018 ¶86; Ex. 1019 at ¶4-8, 10:

Table 1: Tape Sample Measurements

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

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

232. Under the broadest reasonable interpretation, each of the surface topography measurements recited in the claims of the ’774 Patent are met by each of Tape Samples 1-3. Ex. 1018 ¶¶87, 93; *see supra* ¶231.

233. **Skew.** Several claims recite “the backside surface having a skew less than about 0.5.” This is satisfied by all three tape samples, each of which had at least one R_{sk} measurement of less than 0.5 from an optical interferometer trace. *See supra* Table 1 (Sample A Location 2, Sample B Locations 1-2, Sample C Locations 1-3); Ex. 1018 ¶87.[1]

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

---

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

[2] *See supra* n. 1.

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

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

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

D. Aonuma Supports Four Independent Bases for Obviousness

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

239. ***First***, a person of ordinary skill in the art would have found it obvious based on Aonuma's teachings to produce a tape such as Sample A, which satisfies the claimed measurements. *See supra* ¶¶232-237.

240. ***Second***, Tape Sample A was created based on Aonuma's teachings but was not calendered. *See* Ex. 1017 at [0119]; Ex. 1019 ¶¶4-6. A person of ordinary skill in the art would have understood that calendering, as taught by Aonuma, would have generally smoothed the back-coat layer by reducing the height of protrusions. A person of ordinary skill in the art would have further understood that reducing the height of protrusions would generally result in smoother surface characteristics, i.e., lower skew, kurtosis, peak height mean, peak-to-valley roughness, and plateau ratio. This is confirmed by Tape Samples B and C, which illustrate the impact of calendering: the samples have the same formulation, but while Sample C was calendered, Sample B was not. *See* Ex. 1019 ¶7-8. Measurements for Samples B and C were all within the claimed ranges.

241. This fact—that reduced protrusions result in lower skew, kurtosis, peak height mean, and peak-to-valley roughness—is further confirmed by the '774 Patent. *See* Ex. 1001 at 8:20-23 ("it is generally desirable to decrease positive skew by decreasing the predominance of high peaks, and, consequently, decreasing the number and/or size of pits or embossments"), 8:33-34 ("a low peak height mean indicates that few large peaks are present"), 8:40-51 (describing peak-to-valley roughness as involving "measuring the distance from the top of a peak to the bottom of an adjacent valley" and that smaller peaks "generally decreases the peak-to-valley roughness"), 9:2-7 ("In general, for relatively spiky surfaces, kurtosis is greater than three; for wavy surfaces, kurtosis is less than three; and for perfectly random surfaces, kurtosis is generally equal to three."). The claimed measurements are therefore obvious over Aonuma because, as demonstrated by Sample A in light of Samples B and C, Aonuma teaches a calendered magnetic tape that would have satisfies the claim elements for skew, kurtosis, peak height mean, peak-to-valley roughness, and plateau ratio. *See supra* ¶¶232-237.

242. ***Third***, it would have been obvious to a person of ordinary skill in the art to manufacture a tape such as Tape Sample B based on the formulation disclosed by Aonuma by changing the concentration of the solvents in the back-coat layer coating material. *See* Ex. 1019 ¶8. This change in concentration was known in the art, and a person of ordinary skill in the art would have understood

how to use different solvents and concentrations to accommodate available equipment and coating conditions. *Id.* Aonuma itself teaches varying the liquid concentration of the back-coat layer coating material. *See* Ex. 1017 at [0095] ("the lubricant is typically added in an amount within the range of 0.5 to 5 mass parts per 100 mass parts of binder."). Ishikawa describes "varying the amount of the solvent" to adjust "the viscosity of the backcoating composition" as needed. Ex. 1015 at [0119]. "The solvent is preferably used in such an amount that the backcoating composition may have a solids content of 10 to 50% by weight, particularly 20 to 40% by weight." Ex. 1015 at [0063]. Similarly, Ishii teaches a backcoating composition including solid components dispersed in a solvent with the solvent varying in amount from 300 to 1500 parts by weight per 100 parts by weight of a binder. Ex. 1010 at 7:17-24.

243. A person of ordinary skill in the art would have known how to vary the solvent ratio—this was commonly performed in the magnetic tape industry to accommodate manufacturing choices and available equipment. *See* Ex. 1012 at [0018]. The coating equipment used by Mr. Kasada existed in the 2003–2005 timeframe; it, along with other equipment in that timeframe, required this type of variation in solvent ratio. Ex. 1019 ¶7. Thus, a person of ordinary skill in the art would have been motivated, and found it obvious, to make the back-coat layer coating material concentration thicker by changing the solvent ratio because such

changes could help optimize tape for equipment in the 2003–2005 timeframe. Therefore, a person of ordinary skill in the art would have found it obvious to manufacture a back-coat layer having the composition of Tape Sample B based on Aonuma's teachings.

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

245. Thus, a person of ordinary skill in the art would have been motivated to use a formulation such as that from Tape Sample B with a higher concentration of solid components per weight when compared to the formulation taught by

Aonuma and used for Tape Sample A. *See* Ex. 1019 ¶7, 4. A person of ordinary skill in the art would have understood, based on Aonuma's teachings and techniques common in the art, that a smoother surface could have been created by decreasing the amounts of solvents used to increase the concentration of solid components. Furthermore, the need for calendering to achieve a smooth surface would have been reduced. Thus a person of ordinary skill in the art would have been motivated and found it obvious to manufacture a back-coat layer having the composition of Tape Sample B based on Aonuma's teachings. Sample B has the claimed measurements. *See supra* ¶¶232-237.

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

E. Aonuma Renders Claim 1 Obvious

247. The preamble of claim 1 recites "A magnetic recording medium". To the extent the preamble is a limitation, it is taught by Aonuma. Aonuma teaches a

"magnetic recording medium according to the present invention[.]" Ex. 1017 at [0086].

248. Aonuma discloses "a substrate defining a first surface and a second surface opposite the first surface." Aonuma discloses "a back-coat layer on a plane of [a] nonmagnetic substrate opposite the plane on which the magnetic layer or the nonmagnetic layer and the magnetic layer will be provided." Ex. 1017 at [0086]. A person of ordinary skill in the art would have understood that the two "planes" of the support in Aonuma refer to two surfaces; a first surface upon which the non-magnetic layer and magnetic layer are placed, and a second surface upon which the back-coat layer is placed. Ex. 1017 at [0086].

249. The next element of claim 1 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Aonuma discloses this claim element. Aonuma provides a "magnetic recording medium that comprises the following layer(s) on at least one plane of a nonmagnetic substrate: A magnetic layer containing a ferromagnetic powder and a binder; or A nonmagnetic layer containing a nonmagnetic powder and a binder as well as a magnetic layer containing a ferromagnetic powder and a binder in the order given[.]" Ex. 1017 at [0009]. For magnetic tape, the magnetic layer is the recording surface, and a person of ordinary skill in the art would have understood that to be true. *See* Ex. 1017 at [0001-0002] ("the present invention pertains to a coated-type

of a magnetic recording medium comprising a magnetic layer, which if formed by coating, on a substrate, a magnetic coating material that contains a ferromagnetic powder and a binder ... the ferromagnetic metal powder and hexagonal ferrite are known to have superior high-density recording characteristics.”).

250. The last element of claim 1 begins “a backside coated on the second surface of the substrate and configured to decrease embossment of the recording surface, the backside defining a backside surface opposite the substrate.” Aonuma discloses this claim element. Aonuma discloses “a back-coat layer on a plane of the nonmagnetic substrate opposite the plane, on which the magnetic layer or the nonmagnetic layer and the magnetic layer will be provided.” Ex. 1017 at [0086]. A person of ordinary skill in the art would have understood the “back-coat layer” to be synonymous with the recited “backside” or a “backside coating.”

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

roughness less than about 325 nm … a peak height mean less than about 200 nm.”).

252. It was also known in the prior art that a smoother backside could be used to prevent embossment. *See, e.g.,* Ex. 1015 at [0044] (“it is preferred for the backcoating layer 5 to be as smooth as possible to prevent the surface profile of the backcoating layer from being transferred to the magnetic layer”).

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

254. The last element of claim 1 continues "the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0." Aonuma discloses this claim element. As discussed above, Tape Samples A, B, and C satisfy this element under the broadest reasonable interpretation. *See supra* ¶¶232-237. Thus, Aonuma's teaches provide four independent reasons why the claimed skew and kurtosis measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶¶238-246.

F. Aonuma Renders Claim 2 Obvious

255. Claim 2 of the '774 Patent recites: "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." As discussed above, Aonuma renders obvious claim 1. Aonuma further discloses the limitations of claim 2. Aonuma teaches a "magnetic recording medium that comprises the following layer(s) on at least one plane of a nonmagnetic substrate: A magnetic layer containing a ferromagnetic powder and a binder; or A nonmagnetic layer containing a nonmagnetic powder and a binder as well as a magnetic layer containing a ferromagnetic powder and a binder in the order given." Ex. 1017 at [0009]. This satisfies the element of "the magnetic side includ[ing] at least one layer." Furthermore, the magnetic layer would have been understood to be a magnetic recording layer. *See* Ex. 1017 at [0001-0002]. Additionally, a person of

ordinary skill in the art would have understood that the magnetic layer of a magnetic tape is necessarily used as a recording surface. *See supra* ¶¶67-68. Therefore, Aonuma renders obvious claim 2.

G. Aonuma Renders Claims 3-7 Obvious

256. Claims 3-7 of the '774 Patent each recite: "The magnetic recording medium of claim 1" and recite additional measurements of the backside surface: "a peak height mean less than about 200 nm" (claim 3), "a peak-to-valley roughness less than about 325 nm" (claim 4), "a peak-to-valley roughness less than 300 nm" (claim 5), "a plateau ratio less than or equal to about 0.65" (claim 6), and "a kurtosis value less than or equal to about 3.7" (claim 7).

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

H. Aonuma Renders Claim 15 Obvious

258. Claim 15 is identical to claim 1 with the exception of its last claim limitation. As discussed above, the other claim limitations are obvious in view of Aonuma. *See supra* ¶¶247-253. The last element is also disclosed. The last element recites "the backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm." Samples A, B,

and C satisfy these claimed measurements under the broadest reasonable interpretation. *See supra* ¶¶232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶238-246.

I. Aonuma Renders Claims 16 and 17 Obvious

259. Claims 16 and 17 of the '774 Patent each recite: "The magnetic recording medium of claim 15" and recite additional measurements of the backside surface: "a skew less than about 0.5" (claim 16) and "a peak-to-valley roughness less than about 300 nm" (claim 17).

260. Samples A, B, and C satisfy these claimed measurements under the broadest reasonable interpretation. *See supra* ¶¶232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶¶238-246.

J. Aonuma Renders Claim 20 Obvious

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

262. The last element of claim 20 recites "a skew less than about 0.5 and a kurtosis less than about 4.0, a peak height mean of less than about 200 [nm], and a peak-to-valley roughness less than about 325 nm." Aonuma discloses this claim

element. Samples A, B, and C satisfy these claimed measurements under the broadest reasonable interpretation. *See supra* ¶¶232-237. Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶¶238-246.

K. Aonuma Renders Claims 8-11, 18, and 19 Obvious

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

264. The SkSNR and small error rate parameters disclosed by the ’774 Patent are the obvious consequences of a back-coat layer with the characteristics of claim 20. The ’774 Patent does not disclose any particular technique for reducing SkSNR or small error rate; instead, the ’774 Patent simply discloses these parameters as measurements from tapes having the structure of claim 20 (i.e., skew, peak height mean, peak-to-valley roughness, plateau ratio, and kurtosis in the claimed ranges). *See* Ex. 1001 at 10:1-15 (Table 1 disclosing structural differences between embodiments and prior art), 11:57-12:49 (disclosing SkSNR and small error rate measurements for embodiments).

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

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

267. Claim 18 is identical to claim 9, aside from its dependency on a different independent claim (claim 15). Aonuma teaches the limitations recited in claims 18 and 9. Aonuma further teaches the elements of claim 15, on which claim 18 depends. *See supra* ¶258. Thus, Aonuma renders claim 18 obvious.

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

XIII. GROUND 5: Aonuma in view of Abe Renders Claims 1-11 and 15-20 of the '774 Patent Obvious

269. Aonuma teaches a magnetic tape with a bimodal back-coat layer (with both fine-grain and coarse-grain carbon black particles) whose surface characteristics fall in the recited ranges of the challenged claims. *See supra* ¶¶232-237. Abe's additional teachings further confirm that Aonuma's back-coat layer is configured to prevent embossment.

270. Abe further teaches a magnetic recording medium with a backside coating that uses two different sizes of carbon black, where the backside coating is "smooth enough such that the backside coating layer has less of a tendency to damage the magnetic layer relative to previously known backside coating layers comprising two different kinds of carbon black particles." Ex. 1013 at 2, ll. 54-56. Abe teaches that embossment can be prevented using particular ratios of the two sizes of carbon black particles. Ex. 1013 at 3, ll. 21-28 ("[I]n order to provide backside coating layers having a centerline average roughnesses of 30 nm or less [to provide a smooth surface], it is preferred to use a relatively large amount of finely divided carbon black particles having a particle size in the range from 10 to 30 nm … in order to provide backside coating layers having a surface density of 2% or less of projections having a particle size of 100 nm or more, it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"). Abe teaches example embodiments with a range of weight ratios for fine- and coarse-grain carbon black particles, along with corresponding measurements for centerline average roughness, surface density of projections having a height of 30nm or more, and surface density of projections having a height of 100nm or more. *See* Ex. 1013 at 3, ll. 9-14; *id.* at 6 (Table 2):

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

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

272. Therefore, a person of ordinary skill in the art would have found it obvious, based on the combined teachings of Aonuma and Abe, that Aonuma taught a magnetic recording medium with a reduced number of large peaks (as

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

A. Motivations to Combine

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

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

274. Therefore, a person of ordinary skill in the art would have been motivated to create a magnetic recording medium with the back-coat layer disclosed in Aonuma, reinforced by Abe's teaching that the weight ratio of carbon black particles in Aonuma would have provided a backside coating layer with a smooth surface for preventing embossment. Such a combination would have taught a magnetic tape having the claimed properties of the '774 Patent. *See supra* ¶¶232-237.

275. The alleged invention is simply a combination of familiar elements (backside coating on a magnetic tape using two sizes of carbon black particles) according to known methods (using a relatively high ratio of fine-grain to coarse-grain carbon black particles) to yield predictable results (minimizing damage to the magnetic layer caused by protrusions on the backside coating). Ex. 1017 at [0086] ("it is preferable to use a fine-powder carbon black with a mean grain size of 10 to 30 nm but preferably 10 to 20 nm, and a coarse-powder carbon black with a mean grain size of 150 to 300 nm but preferably 230 to 300 nm"); Ex. 1013 at 3, ll. 27-28 ("it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"); *id.* at 3,

ll. 15-16 (the specified weight ratio provides a characteristic to provide "a backside coating layer with a smooth surface, thus minimizing the tendency of the backside coating layer to damage the magnetic layer").

276. It was well known in the art that embossment could be prevented using specific weight ratios of fine-grain and coarse-grain carbon black particles in the backside coating. *See* Ex. 1013 at 3, ll. 9-28. Indeed, the '774 Patent admits that bimodal backside coatings with both large and small carbon black particles were known in the art. *See* Ex. 1001 at 1:47-53, FIG. 1. However, despite its efforts to distinguish the bimodal art (*see* Ex. 1001 at 10:1-14, 11:12-20, 11:39-55, FIGS. 1, 3), the '774 Patent recites broad claim ranges of surface topography measurements that encompass prior art tapes regardless of whether they were limited to fine-grain carbon black or whether they used the bimodal backside coatings that the '774 Patent admits were prior art (*see supra* ¶¶84, 86, 220, 269). In short, bimodal backside coating were known in the art and known to be capable of preventing embossment. Thus, the problem and solution of the '774 Patent were known in the art, and there is nothing novel or non-obvious about claiming measurements of known processes.

B. Aonuma in View of Abe Renders Obvious Claim 1

277. The preamble of claim 1 recites "A magnetic recording medium". To the extent the preamble is a limitation, it is taught by Aonuma. *See supra* ¶247; Ex.

1017 at [0086]. Abe is also directed to "magnetic recording media." *See* Ex. 1013 at 2, ll. 3-6.

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

279. The next element of claim 1 recites "a magnetic side formed over the first surface of the substrate and defining a recording surface". Aonuma discloses this claim element. *See supra* ¶249. It is further taught by Abe. Ex. 1013 at 2, ll. 10-12; *see id.* at 2, ll. 16 ("the surface of a magnetic layer is typically smoothly finished in order to improve output sensitivity").

280. The last element of claim 1 begins "a backside coated on the second surface of the substrate and configured to decrease embossment of the recording surface, the backside defining a backside surface opposite the substrate." Aonuma discloses this element. *See supra* ¶¶250-253. The back-coat layer of Aonuma is configured to prevent embossment. *Id.* Abe further confirms that a backside

coating such as that disclosed in Aonuma (with a fine/coarse carbon black weight ratio of 97.1/2.9) would have resulted in "a backside coating layer with a smooth surface, thus minimizing the tendency of the backside coating layer to damage the magnetic layer." Ex. 1013 at 3, ll. 15-16; *see id.* at 3, ll. 27-28 ("it is preferred that the weight ratio of the finely divided carbon black particles to the larger carbon black particles is in the range from 99.9/0.1 to 70/30"); *id.* at 2, ll. 12-13 ("Magnetic recording tapes may also comprise a backside coating layer[] comprising carbon black particles dispersed and bound in a binder provided on the other surface of the substrate").

281. The last element of claim 1 continues "the backside surface having a skew less than about 0.5 and a kurtosis less than about 4.0." Aonuma teaches this element, as illustrated by Tape Samples A, B, and C. *See supra* ¶254. Aonuma's teachings provide four independent reasons why the claimed skew and kurtosis measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶¶238-246. Thus a person of ordinary skill in the art would have found this element obvious based on Aonuma's teachings and further obvious in light of Abe's teachings.

C. Aonuma in View of Abe Renders Obvious Claim 2

282. Claim 2 of the '774 Patent recites: "The magnetic recording medium of claim 1, wherein the magnetic side includes at least one layer, and the at least

one layer includes a magnetic recording layer." Aonuma discloses this claim. *See supra* ¶255. Abe also teaches claim 2. Abe teaches "a magnetic layer obtained from a magnetic layer coating, metallic vapor deposition or the like provided on one surface of a non-magnetic substrate." Ex. 1013 at 2:10-11. A person of ordinary skill in the art would have understood that the magnetic layer of a magnetic tape is used as a recording surface. Therefore, the combination of Aonuma and Abe renders obvious claim 2.

D. Aonuma in View of Abe Renders Obvious Claims 3-7

283. Claims 3-7 of the '774 Patent depend on claim 1 and recite additional measurements of the backside surface: "a peak height mean less than about 200 nm" (claim 3), "a peak-to-valley roughness less than about 325 nm" (claim 4), "a peak-to-valley roughness less than 300 nm" (claim 5), "a plateau ratio less than or equal to about 0.65" (claim 6), and "a kurtosis value less than or equal to about 3.7" (claim 7). As discussed above, Aonuma renders each of these claims obvious. *Supra* ¶¶256-257.

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

E. Aonuma in View of Abe Renders Obvious Claim 15

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

286. The last element recites "the backside surface having a peak height mean less than about 200 [nm] and a peak-to-valley roughness less than about 325 nm." Aonuma discloses this claim element. *Supra* ¶258. Samples A, B, and C of Aonuma satisfy these claimed measurements under the broadest reasonable interpretation. *See supra* ¶¶232-237. Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶¶238-246. Thus, a person of ordinary skill in the art would have understood that the Aonuma-Abe combination would render obvious claim 15.

F. Aonuma in View of Abe Renders Obvious Claims 16-17

287. Claims 16 and 17 depend on claim 15 and additionally recite "a skew less than about 0.5" (claim 16) and "a peak-to-valley roughness less than about 300 nm" (claim 17). As discussed above, Aonuma renders these claim elements obvious. *Supra* ¶¶259-260. Samples A, B, and C satisfy these claimed measurements under the broadest reasonable interpretation. *See supra* ¶¶232-237.

Thus, Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶¶238-246. Thus, a person of ordinary skill in the art would have understood that the Aonuma-Abe combination would render obvious claims 16-17.

G. Aonuma in View of Abe Renders Obvious Claim 20

288. Claim 20 is identical to claim 1 with the exception of its last claim limitation. As discussed above, the other claim limitations are obvious in view of Aonuma and Abe. *See supra* ¶¶277-280. The last element is also disclosed by the Aonuma-Abe combination. The last element of claim 20 recites "a skew less than about 0.5 and a kurtosis less than about 4.0, a peak height mean of less than about 200 [nm], and a peak-to-valley roughness less than about 325 nm." Aonuma discloses this claim element. *Supra* ¶¶261-262. Samples A, B, and C of Aonuma satisfy these claimed measurements under the broadest reasonable interpretation. *See supra* ¶¶232-237. Aonuma's teachings provide four independent reasons why the claimed measurements would have been obvious to a person of ordinary skill in the art. *See supra* ¶238-246. Thus, a person of ordinary skill in the art would have understood that the Aonuma-Abe combination would render obvious claim 20.

H. Aonuma in View of Abe Renders Obvious Claims 8-11, 18, 19

289. Claims 8 and 9 depend on claim 1 and further recite elements directed to SkSNR measurements. *See supra* ¶263. The recited SkSNR measurements are

the obvious consequences of a back-coat layer with the characteristics of claim 20. *See id.* Claims 10 and 11 depend on claim 1 and further recite elements directed to small error rate measurements. *See id.* The recited small error rate measurements are the obvious consequences of a back-coat layer with the characteristics of claim 20. *See id.*

290. The combination of Aonuma and Abe teach a magnetic recording tape having the structure of claim 20, including the surface topology characteristics that allegedly result in the recited SkSNR and small error rate measurements. *See supra* ¶288. Thus, the combination renders claims 8-11 obvious. It would have been obvious to a person of ordinary skill in the art that the combination of Aonuma and Abe teaches a magnetic tape with the SkSNR measurements recited in claims 8-9 and the small error rate measurements recited in claims 10-11.

291. Furthermore, Abe teaches that Aonuma's ratio of coarse- and fine-grain carbon black particles is particularly suited for preventing embossment. *See supra* ¶¶271-272, 280. A person of ordinary skill in the art would have understood—as a basic principle of engineering that was widely known in the magnetic tape industry—that embossment increases noise and thus decreasing the amount of embossment caused by protrusions decreases the amount of noise. *See* Ex. 1005 at [0014]-[0015]. Since the signal-to-noise ratio is, by definition, the ratio of a signal (in the magnetic tape context, it typically refers to the magnetically

recorded signal) to noise, a decrease in noise leads to an increase in the signal-to-noise ratio. A person of ordinary skill in the art would have understood this principle and found it obvious that the reduced noise achieved by Aonuma's teachings—as further confirmed by Abe—would have directly led to a corresponding increase in SkSNR.

292. Similarly, a person of ordinary skill in the art would have understood—as a basic principle of engineering that was widely known in the magnetic tape industry—that noise cases errors and thus lower noise leads to a lower error rate. Because the combination of Aonuma and Abe teaches reduced embossment and noise, it would have been obvious to a person of ordinary skill in the art that their combined teachings would have also led to a corresponding decrease in the small error rate.

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

would have been small. These are general engineering principles that a person of ordinary skill in the art would have understood.

294. The ’774 Patent confirms this fact: “The decreased surface measurement values lead to a decrease in the number and/or level of pits or embossments formed in adjacent layers of tape, ***therefore, also decreasing the errors and increasing the signal-to-noise ratios of the magnetic recording mediums***.” Ex. 1001 at 9:62-67 (emphasis added). “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.

295. Thus, the ’774 Patent admits that the claimed SkSNR and small error rate measurements are the consequence of a magnetic tape with reduced transfer of protrusions from the backside coating to the magnetic layer. *See* Ex. 1001 at 9:29-37, 9:62-67. The combination of Aonuma and Abe teaches magnetic tape with a backcoat configured to reduce such transfer. *See supra* ¶280. Thus, a person of ordinary skill in the art would have found the claimed SkSNR and small error rate

measurements of claims 8-11 obvious in light of the combined teachings of Aonuma and Abe.

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

297. Claim 19 is identical to claim 11, aside from its dependency on a different independent claim (claim 15). The combination of Aonuma and Abe teaches the limitations recited in claims 19 and 11. The combination further teaches the elements of claim 15, on which claim 19 depends. *See supra* ¶¶285-286. Thus, Aonuma in view of Abe renders claim 19 obvious.

XIV. Reservation of Rights

298. My opinions are based upon the information that I have considered to date. I am unaware of any evidence of secondary considerations with respect to the ’774 Patent that would render any of the challenged claims non-obvious. I reserve the right, however, to supplement my opinions in the future to respond to any arguments raised by the owner of the ’774 Patent and to take into account new information that becomes available to me.

Declaration

I hereby declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true. I further understand that willful false statements and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 10, 2017.

Ryosuke Isobe

APPENDIX A
CURRICULUM VITAE OF RYOSUKE ISOBE

RYOSUKE ISOBE

SENIOR ENGINEER - PROJECT MANAGER - PATENT STRATEGIST

CONTACT INFORMATION

2641 W121st Ave, Westminster, CO 80234
Phone: (303) 519-2369, E-mail: isoberyosuke@zoho.com
https://www.linkedin.com/pub/ryosuke-isobe/4/8a/295

EXECUTIVE SUMMARY

I am an accomplished RD&E/manufacturing operation/project leader specialized in data storage industry and coating technology with global experience in both United States and Japan as an English-Japanese bilingual. I have a broad range of hands-on business/technical expertise coupled with highly effective communication and interpersonal business skills. I also have a working understanding of the cultural, operational and technical differences between companies in the United States and those in Japan and other Asian countries.

My notable achievements include:

- New product launches with innovative technology development and a product life-cycle
- Established new OEM business ($100M/year sales) marketed to competitors
- Developed *de facto* standard technology (dual-layer coating technology) for high area density magnetic tape
- Intellectual property (IP) monetization including patent license and technology transfer to global competitors
- Evaluated technical due diligence of U.S. start-up companies for Japanese company's M&A as a technical consultant
- Experience in data storage industry (tape, hard disk and optical disk), audio/video recording system industry (broadcasting and audio recording studio), optical film for touch screen and Li-ion battery coating process
- Strengthened/Protected companies' IP position

My proven project and personnel management skills include:

- New business development (such as OEM business, B2B), business strategy development, product design, R&D, scale-up to manufacturing and mass production
- Project leader for technology transfer to partners, joint product/technology development with partners, product development management, cost reduction/stable production management
- R&D/mass production management including human resource management
- Business/technical liaison between U.S. and Japanese companies

My core technical skills include:

- Specialty in coating technology using roll-to-roll process
- Ink/slurry formulation and process development including nano-particle dispersion with polymer/dispersant/additives, pigment dispersion (compounding/kneading/milling), surface chemistry control for adhesion and adsorption, and slurry rheology control for coating process
- Coating slurry/deposition on thin flexible substrate using roll-to-roll coating process with simultaneous dual-slot-die coating and roll coating processes (reverse roll/gravure roll), drying and calendaring process
- PVD/CVD/sputter (metal evaporated tape, DLC) on flexible substrate/roll to roll process
- Material science: raw material design including nano-particle (Fe-Co particle, barium ferrite, iron-oxide, alumina, sliver nanowire); substrate-film (PEN, PET, Aramid, copper); polymer design (polyurethane,

poly-vinyl-chloride=PVC, nitrocellulose etc.)

- Scale-up process from pilot scale to various type of production lines including contracted manufacturers' lines (Japan, US)
- Problem solving of technical performance issues (coating defects, equipment related issues)
- Tribology (magnetic head-media interface, especially tribo-chemical reaction, lubricant adsorption control/characterization) for reliability improvement and corrosion resistance
- Applications include hard disc drive, data storage tape drive, magnetic tape (magnetic layer containing Fe/Co and barium ferrite nano-particle, Co-O magnetic layer by PVD, sub-layer, back-coating layer containing carbon black), transparent conductive film (silver nano-wire), optical-servo system, Li-ion battery (anode/cathode/separator) and print circuit (silver nano-particle)

My patent related skills include:

- Strategic patent writing and evaluation in English and Japanese along with strong legal positions (inventor of 25 US patents, 44 Japanese patents, and 8 European patents frequently referenced by competitors)
- Analysis of patent infringement/legal strength/patentability for patent litigation by analyzing prior arts of English and Japanese documents
- Patent licensing negotiation and technology transfer

PROFESSIONAL EXPERIENCE

Panasonic of North America (Cupertino, CA, USA) **2016 to Present**

<u>Senior Project Manager, Optical Data Storage System (freeze-ray)</u>

- Project management of Freeze-ray product development including customer interface (facebook, etc.) and running Japan/US Panasonic teams, total ~100 people.

Independent Technical Consultant (Boulder, CO, USA) **2007 to Present**

- Consult technology development: Coating technology industry, magnetic tape industry, patent litigation, technical due diligence

Western Digital (San Jose, CA, USA) **2013 to 2015**

<u>Senior Engineering Manager, Tribology Programs</u>

- Managed tribology group (head-disk interface) for hard disk drive development for all of WD products with angstrom order head-media spacing tribology control
- Managed technology roadmap

Carestream Health, Advanced Material (Oakdale, MN, USA) **2013 to 2013**

<u>Senior Scientist</u>

- Developed transparent conductive film for touch screen/OLED market using roll-to-roll process using silver nano-wire coating on PET
- Developed new coating process and managed its scale-up to production phase

Imation Corporation (Oakdale, MN, USA) **2009 to 2013**

<u>Project Manager/Senior Principal Engineer</u>

- Managed and led joint development and production transfer of magnetic tape products to contracted manufacturer in Japan
- Developed advanced tape using new magnetic material (Barium ferrite) for high capacity data storage formats
- Managed technology roadmap and patent analysis
- Awarded 3 US patents

Quantum Corporation (Boulder, CO, USA) **2003 to 2009**

RYOSUKE ISOBE

Senior Engineer - Project Manager - Patent Strategist

Principal Media Engineer/Principal Chemist

- Developed advanced magnetic tape for Quantum's data storage tape drives (DLT and LTO)
- Acted as media development leader for joint technology/product development with HP
- Worked closely with media suppliers (Fujifilm, Maxell, Imation, SONY, and TDK) and led media development to meet Quantum's system requirement
- LTO consortium (IBM/HP/Quantum): worked as Quantum's media representative including establishment of LTO4/5 media spec and on-going LTO media business improvement

AMPEX ~ QUANTEGY INC. (Opelika, AL, USA) **1995 to 2003**

Senior R&D Manager, Principal Chemist, Pilot Plant Manager, Product Manager

- Established OEM business including business planning and data storage tape development
- Led technology transfer to Imation and joint product development with Imation
- Awarded 2 U.S. patents

KONICA Corporation (Hino, Tokyo, Japan) **1983 to 1995**

R&D Manager / Senior Research Staff

- Developed dual-layer coating technology, the *de facto* standard technology for magnetic tape industry
- IP monetization by technology transfer (dual-layer coating technology) to two competitors
- Awarded 21 U.S. patents including 10 dual-layer patents

PATENT EXPERIENCE

Awarded 25 U.S. patents, 8 European patents, 44 Japanese patents: Most patents have been referenced as a competitive technology by magnetic recording media manufacturers (Fujifilm, Hitachi Maxell, SONY, TDK, Imation). 4 U.S. patents pending.

EDUCATION

Bachelor of Engineering in Environmental Chemistry, Chiba University, Chiba, Japan 1983.

LANGUAGE SKILLS

Japanese-English bilingual with particular expertise in technical patent writing, due diligence and translation

REFERENCES (Comments Excerpt from LinkedIn)

Phil Ritti, VP & GM Media Storage Solutions, Quantum Corp and VP, Ampex, currently Principal, Excede Ventures
"I have known Ryosuke for many years and helped recruit him from Japan to the U.S. with Ampex and then from Ampex to Quantum. He has broad and deep technical knowledge that can easily translate into new, high tech industries including physics, chemistry, rheology, tribology, material sciences and associated process technologies. He is a strong project manager and is especially adept in Japanese to American liaison roles. He also maintains a practical business perspective in applying various technologies to products. He is a unique talent and I recommend him highly."

Richard Lindenmuth, Chairman and CEO, Quantegy Inc, currently Vetro Parners Founder/ Interim CEO at Styrotek
"Ryosuke is by far the best chemist and R&D manager that I have ever worked with. He is consistent in his quest to improve quality and reduce costs. Ryosuke keeps up with the current data in his field and is truly an expert. I recommend Ryosuke to anyone considering him for their team."

Joe Jurneke, Manager Advanced Development, Quantum Corp, currently President Applied Engineering Science, Inc.
"Ryosuke is a hard working, diligent development engineer. He was a key member of our team, contributed much to department success, and did it with a terrific can do attitude. I would be pleased to have Ryosuke on my team at anytime. His attention to detail and knowledge of polymer chemistry is outstanding."

RYOSUKE ISOBE

Senior Engineer - Project Manager - Patent Strategist

Mark LeClair, Executive Director Quality and Technical Operations, Imation, currently Director Program Management CyberOptics

"Ryosuke has excellent technical capabilities and has achieved the results to back this statement up. Over the past 10 years that I have known Ryosuke he has continually demonstrated his passion for both process development and the related technologies. Ryosuke has effectively worked with external partners and vendors, his multi-language capabilities have proven to be very valuable. Ryosuke utilizes both his traditional engineering skill sets, while also pushing the technology to be very innovative in solving problems. Ryosuke has been a true asset to our corporation."

Dennis Gladen, Mag. RD&E and Manufacturing Director, Imation, currently VP Administrative Affairs, North Dakota State College of Science

"Ryosuke is a dedicated engineer who is very knowledgeable. He is a key member in our tape development team. He has a tremendous work ethic and capable of handling multiple development projects simultaneously.

RYOSUKE ISOBE

Senior Engineer - Project Manager - Patent Strategist

Appendix:

1. RYOSUKE ISOBE's patent list (Magnetic recording media)

   a. US patent

	Patent #	Date of Patent			Content	Referenced by
		M	D	Y		
1	9324354	4	26	2016	Barium ferrite	
2	7364809	4	29	2008	Dual-layer patent	
3	7163714	1	16	2007	Dual-layer patent	7255908 **Quantum**
4	6818298	11	16	2004	Dual-layer patent	7563522/7208237/7157163 **TDK**, 7255908 **Quantum**, 7068464 **Sun**
5	6194058	2	27	2001	Dual-layer patent	7314467/7163714/6818298 **Quantegy/Imation,** 7088548 **Hitachi**, 6657813/6497989 **Fujifilm,** 6890631 **IBM,** 6776438 **HP,** 6815097 **Showa Denko**
6	5670245	9	23	1997	Dual-layer patent	6790522/5962125 **Fujifilm,** 6194058 **Quantegy**
7	5637390	6	10	1997	Dual-layer patent	6565964/6534168/6479131/6284361/6124030/6086986/6037051 **Fujifilm,** 6136410 **SONY**, 6797374/6607824 **TDK**, 6506264/6440545/5902676 **Dowa,** 7700204/7510790/7494728/7445585/7267896/7238439/6964811 /6517934 **Maxell,** 7361421 **Panasonic**, 6194058 **Quantegy,**
8	5527603	6	18	1996	Dual-layer patent	6506486/6037051/5922454/5795645 **Fujifilm,** , 6153295/5965248 **TDK**, 5935703 **JVC**, 6110581 **SONY**, 6248437 **Toda,** 6194058 **Quantegy**,
9	5496622	3	5	1996	Dual-layer patent	6124040/6086986/6074724/6030689/5922454/5955189 /5962125 **Fujifilm,** 6194058 **Quantegy**, 6506264/6440545 **Dowa**, 6248437/6117540/6087004/5750250 **Toda**
10	5480713	1	2	1996	Dual-layer patent	7449257/6893747 **Fujifilm,** 7547344 **Philip Morris** 6746508 **Chrysalis Technology,** 6857149 **Hoggatt,**
11	5458948	10	17	1995	Dual-layer patent	6579592/6444290/6432503/6316077/6291052/625496/6203934/6096406 /6025082/5955189/5922454/5876824/5804283/5747157 **Fujifilm**, 6936340 **Imation,** 5792548 **TDK**, 5705268 **Kao**, 7300535 **McCannel**
12	5455104	10	3	1995	Dual-layer patent	7086623/6667119/6579592/6444290/6432503/6316077/6291052/6254964 /6096406/6025082/5955189/6203934 **Fujifilm**, 5965248/5712028 **TDK**, 5993948/5776590**Kao**, 6440545 **Dowa**
13	5449527	9	12	1995		5702757 **SONY**, 5641891 **Sonplas**
14	5405679	4	11	1995	Dual-layer patent	6482506/5922454/5804283/5955189 **Fujifilm**, 5670245 **Konica**, 6274227/5840410/5612122 **Imation**,
15	5340635	8	23	1994	Dual-layer patent	7384700, 5728454 **Fujifilm**, 6033760 **Kao**, 5939170 **Hoya**, 5948522 **Verbatim**, 5532049 **Diafoil**,

						RE036220/5478626 **Konica**,
16	5324571	6	28	1994	Dual-layer patent	6420030/6352776/6287668 **Toda**, 6194058 **Quantegy**, 5948522 **Verbatim**, 8316724 **ABB**, 5532049 **Diafoil**, 8263685/7914617 **Yadav**
17	5242752	9	7	1993		5922824/5891578/5747630 **Morton**, 5712345/5674604/5501903 **3M**, 510607 **Sumitomo Chemical**, 6136428 **Imation**, 7449257/5480716 **Fujifilm**
18	5153079	10	6	1992		5622535/5594064/5534345/5446085 **IBM**, 5578376 **Fujifilm,** 5531914 **UCC**, 5451464 **TDK,** 5491029/5447682 **3M**
19	5094916	3	10	1992		5622535/5594064/5534345/5446085 **IBM**, 5531914 **UCC** 5578376 **Fujifilm**, 5433999/5618617 **Matsushita**
20	5084342	1	28	1992		5591512 **Maxell**
21	5061516	10	29	1991		6274227/5840410 **Imation**, 5449527 **Konica**
22	5045390	9	3	1991		5637390 **Konica**
23	4835049	5	30	1989		5635294 **Konica**, 5066539 **SONY**, 4933272 **Kodak**
24	4818606	4	6	1989		7124466 **Seagate**, 5635294 **Konica**, 5118565 **Kao**, 5407725/5112680/4992328 **Fujifilm**, 4937151 **Nissin Chemical**
25	4713293	12	15	1987		6124013/5091238/4970121/4959263 **Fujifilm**, 4853289 **Bayer**, 4803133 **Matsushita,** 5143637/4946613 **Nippon Seiko,** 7124466 **Seagate**, 6187439/6051060/5730893/5543219/5017784/7124466

b. Japanese patent

	Patent #	Date of Patent			Application			Content
		M	D	Y	M	D	Y	
1	3815675	6	16	06	8	26	02	Dual layer patent
2	3481684	10	10	03	7	26	94	Dual layer patent
3	3481680	10	10	03	6	8	94	Dual layer patent
4	3470154	9	12	03	11	16	92	Dual layer patent
5	3463174	8	22	03	2	2	93	
6	3452292	7	18	03	9	25	95	Dual layer patent
7	3451277	7	18	03	4	20	92	Dual layer patent
8	3448712	7	11	03	4	15	92	Dual layer patent
9	3429587	5	16	03	12	30	94	Dual layer patent
10	3419566	4	18	03	9	28	94	Dual layer patent
11	3416825	4	11	03	8	23	94	Dual layer patent
12	3396821	2	14	03	10	13	92	Dual layer patent
13	3395022	2	7	03	4	15	94	Dual layer patent

14	3385476	1	10	03	1	27	93	Dual layer patent
15	3370212	11	15	02	7	13	95	Dual layer patent
16	3359425	10	11	02	7	13	94	Dual layer patent
17	3335266	8	2	02	7	13	95	Dual layer patent
18	3333967	8	2	02	4	13	92	Dual layer patent
19	3261625	12	21	01	4	2	92	Dual layer patent
20	3252226	11	22	01	4	12	91	
21	3252225	11	22	01	3	22	91	
22	3230163	9	14	01	6	7	91	
23	3230161	9	14	01	4	12	92	
24	3045568	3	17	00	6	7	91	
25	3044673	3	17	00	4	12	91	
26	3041722	3	20	00	12	11	90	
27	2850028	11	13	98	12	28	89	
28	2802769	7	17	98	3	30	89	
29	2717586	11	14	97	12	28	89	
30	2696330	9	19	97	1	29	88	
31	2665671	6	27	97	4	28	88	
32	2649943	5	16	97	4	28	88	
33	2649942	5	16	97	4	28	88	
34	2649941	5	16	97	4	22	88	
35	2627635	4	18	97	1	29	88	
36	2538296	7	8	96	12	16	87	
37	2512315	4	16	96	12	30	87	
38	H07-40352	5	1	95	12	30	86	
39	H06-24067	3	30	94	4	1	85	
40	H05-65927	9	20	93	6	28	85	
41	H05-46614	7	14	93	7	17	85	
42	H05-39015	6	11	93	6	29	85	
43	H05-10731	2	10	93	12	5	83	
44	H05-09847	2	8	93	8	20	83	

c. European patent

	Patent #	Filing Date	Date of Patent	Content
		EPA	EPB	

		M	D	Y	M	D	Y	
1	602533	12	8	93	8	25	99	Dual-layer patent
2	592922	10	5	93	6	16	99	Dual-layer patent
3	566378	4	14	93	7	2	97	Dual-layer patent
4	493114	12	24	91	4	10	96	Dual-layer patent
5	339619	4	26	89	2	2	94	
6	338526	4	19	89	12	22	93	
7	337450	4	13	89	***	***	***	
8	273440	12	29	87	5	29	91	
9	270070	12	1	87	2	16	94	

2. Publications
   a. Studies on Heterogeneous Reaction of Ozone in Environment, III -Disappearance of Ozone on Metal Oxide, J. Japan Soc. Air Pollution, 18 (6) 539-543, (1983)
   b. Magnetic Recording Media Using Ferromagnetic Metal Powder, Konica Technical Report Vol.2, 102-111, (1989)
   c. Recording Media Technology, 2009-2019 International Magnetic Tape Storage Roadmap, 2009, INSIC
   d. Recording Media Technology, 2012-2022 International Magnetic Tape Storage Roadmap, May 2012, INSIC

.

APPENDIX B
MATERIALS CONSIDERED IN THE PREPARATION OF THIS REPORT

Ex.	Description
1001	U.S. Patent No. 7,029,774 (“the ’774 Patent”)
1002	File History for U.S. Patent No. 7,029,774
1004	U.S. Patent No. 5,607,747
1005	Translation of Japanese Patent Publication No. 2003-317228 (“Sasaki”), titled “Magnetic Recording Medium”
1006	Translation of Japanese Patent Publication No. JPH10-214414 (“Naoe”), titled “Magnetic recording medium”
1007	U.S. Patent No. 5,686,013
1008	U.S. Patent No. 4,837,082
1009	U.S. Patent No. 7,056,607
1010	U.S. Patent No. 6,103,365
1011	U.S. Patent No. 5,208,091
1012	U.S. Patent Publication No. 2004/0089564
1013	EP Patent Application Publication No. 0494793A1
1014	U.S. Patent No. 6,007,896
1015	U.S. Patent Publication No. 2003/0054203
1016	International Standard ISO 4287-1997 (“ISO 4287”)
1017	Translation of Japanese Patent Publication No. 2003-0336520 (“Aonuma”), titled “Magnetic Recording Medium”
1018	Declaration of Dr. Bart Raeymaekers

Ex.	Description
1019	Declaration of Norihito Kasada
1020	Declaration of Scott Bennett