

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NOKIA OF AMERICA CORPORATION *et al.*,

Petitioners

v.

IARNACH TECHNOLOGIES LIMITED,

Patent Owner

IPR2024-00899

U.S. Patent No. 9,806,892

DECLARATION OF SYLVIA HALL-ELLIS, PH.D.

I, Sylvia D. Hall-Ellis, Ph.D., declare as follows:

I. INTRODUCTION

1. My name is Sylvia D. Hall-Ellis. I have been retained as an expert by Petitioners.

2. I have written this declaration at the request of the Petitioner to provide my expert opinion regarding the public availability and authenticity of a number of publications identified in Section V below. My Declaration sets forth my opinions in detail and provides the basis for my opinions regarding the authenticity and public availability of these publications. If called to testify in the above-captioned matter, I will testify with regard to the opinions and bases set forth below.

3. I reserve the right to supplement or amend my opinions, and bases for them, in response to any additional evidence, testimony, discovery, argument, and/or other additional information that may be provided to me after the date of this Declaration.

4. I am being compensated for my time spent working on this matter at my normal consulting rate of \$400 per hour, plus reimbursement for any additional reasonable expenses. My compensation is not in any way tied to the content of this report, the substance of my opinions, or the outcome of this proceeding. I have no other interests in this proceeding or with any of the parties.

5. All of the materials that I considered and relied upon are discussed

explicitly in this declaration.

II. QUALIFICATIONS

6. I am currently an Adjunct Professor in the School of Information at San José State University in San José, California. I obtained a Master of Library Science from the University of North Texas in 1972 and a Ph.D. in Library and Information Science from the University of Pittsburgh in 1985. Over the last fifty years, I have held various positions in the field of library and information resources. I was first employed as a librarian in 1966 and have been involved in the field of library sciences since, holding numerous positions.

7. I am a member of the American Library Association (ALA) and its Association for Library Collections & Technical Services (ALCTS) Division, and I served on the Committee on Cataloging: Resource and Description (which wrote the new cataloging rules) and as the chair of the Committee for Education and Training of Catalogers and the Competencies and Education for a Career in Cataloging Interest Group. I also served as the Chair of the ALCTS Division's Task Force on Competencies and Education for a Career in Cataloging. Additionally, I have served as the Chair for the ALA Office of Diversity's Committee on Diversity, as a member of the REFORMA National Board of Directors, as a member of the Editorial Board for the ALCTS premier cataloging journal, *Library Resources and Technical Services*, as a Co-Chair for the Nominating Committee of the Library Research

Round Table for ALA. Currently I serve as a member of the CORE Division's Margaret Mann Citation Committee.

8. I have also given over one hundred presentations in the field, including several on library cataloging systems and Machine-Readable Cataloging ("MARC") standards. My current research interests include library cataloging systems, metadata, and organization of electronic resources.

9. My full curriculum vitae is attached hereto as **Exhibit 1019**.

III. PRELIMINARIES

A. Scope of Declaration and Legal Standards

10. I am not an attorney and will not offer opinions on the law. I am, however, rendering my expert opinion on the authenticity of the documents referenced herein and on when and how each of these documents was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, could have located the documents before the dates discussed below with respect to the specific documents.

11. I am informed by counsel that a printed publication qualifies as publicly accessible as of the date it was disseminated or otherwise made available such that a person interested in and ordinarily skilled in the relevant subject matter could locate it through the exercise of ordinary diligence.

12. While I understand that the determination of public accessibility under the foregoing standard rests on a case-by-case analysis of the facts particular to an individual publication, I also understand that a printed publication is rendered “publicly accessible” if it is cataloged and indexed by a library such that a person interested in the relevant subject matter could locate it (*i.e.*, I understand that cataloging and indexing by a library is sufficient, though there are other ways that a printed publication may qualify as publicly accessible). One manner of sufficient indexing is indexing according to subject matter category. I understand that the cataloging and indexing by a single library of a single instance of a particular printed publication is sufficient, even if the single library is in a foreign country. I understand that, even if access to a library is restricted, a printed publication that has been cataloged and indexed therein is publicly accessible so long as a presumption is raised that the portion of the public concerned with the relevant subject matter would know of the printed publication. I also understand that the cataloging and indexing of information that would guide a person interested in the relevant subject matter to the printed publication, such as the cataloging and indexing of an abstract for the printed publication, is sufficient to render the printed publication publicly accessible.

13. I understand that routine business practices, such as general library cataloging and indexing practices, can be used to establish an approximate date on

which a printed publication became publicly accessible. I also understand that the indicia on the face of a reference, such as printed dates and stamps, are considered as part of the totality of the evidence.

B. Persons of Ordinary Skill in the Art

14. I am informed by counsel that the subject matter of this proceeding generally relates to passive optical networks.

15. I have been informed by counsel that a “person of ordinary skill in the art at the time of the invention” is a hypothetical person who is presumed to be familiar with the relevant field and its literature at the time of the invention. This hypothetical person is also a person of ordinary creativity, capable of understanding the scientific principles applicable to the pertinent field.

16. I am informed by counsel that a person of ordinary skill in this subject matter or art would typically be someone who has a bachelor’s degree in electrical engineering, computer engineering, or similar discipline and had at least two years of experience with optical communications and networks, and that a person with a different degree but additional relevant experience could still qualify if the additional experience compensates for the different educational background. I have further been informed by counsel that a person of ordinary skill in the art would have been familiar with and able to understand the information known in the art relating to these fields, including the publications discussed in this declaration.

C. Use of Authoritative Databases

17. In preparing this report, I used authoritative databases, such as the OCLC bibliographic database and the Library of Congress Online Catalog, to confirm citation details of the publication discussed. Unless I note otherwise below in reference to a specific serial publication, it is my expert opinion that this standard protocol was followed for the publications discussed in Section V below.

18. *Indexing.* A researcher may discover material relevant to his or her topic in a variety of ways. One common means of discovery is to search for relevant information in an index of periodical and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from the publisher, a bookstore, a document delivery service, or other provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information.

19. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The formats in which these access terms are presented vary from service to service.

20. Online indexing services and digital repositories commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document. A citation of a

document is evidence that the document was publicly available and in use by researchers no later than the publication date of the citing document.

21. *ResearchGate*.¹ *ResearchGate* is a social networking site for scientists and researchers to share papers, ask and answer questions, and find collaborators. According to a 2014 study by Nature and a 2016 article in Times Higher Education, it is the largest academic social network in terms of active users, although other services have more registered users, and a 2015–2016 survey suggests that almost as many academics have Google Scholar profiles. Features available to *ResearchGate* members include following a research interest and the work of other individual participants, a blogging feature for users to write short reviews on peer-reviewed articles, private chat rooms for sharing data, editing documents, or discussing confidential topics, and a research-focused job board. *ResearchGate* indexes self-published information on user profiles and suggests members to connect with others who have similar interests. Member questions are fielded to others who have identified relevant expertise on their profiles.

22. Founded in 2008 by virologist and computer scientist Dr. Ijad Madisch with physician Dr. Sören Hofmayer, and computer scientist Horst Fickenscher, *ResearchGate* restricts its user accounts to people at recognized institutions and published researchers. As of 2018, *ResearchGate* had more than 15 million users,

¹ www.researchgate.net

with its largest user-bases coming from Europe and North America. Most of *ResearchGate*'s users are involved in medicine, biology, engineering, computer science, agricultural sciences, and psychology. *ResearchGate* publishes a citation impact measurement in the form of an "RG Score," which is reported to be correlated with existing citation impact measures. *ResearchGate* does not charge fees for putting content on the site and does not require peer review.

D. Summary of Opinions

23. I am informed by counsel that the alleged priority date for the patent at issue is July 13, 2012. As I will explain below, it is my opinion that the publications discussed in my Declaration were publicly accessible before the alleged July 13, 2012, priority date.

IV. LIBRARY CATALOGING PRACTICES

24. In preparing this declaration, I used authoritative databases, such as the OCLC bibliographic database, the Library of Congress Online Catalog, and the Library of Congress Subject Authorities, to confirm citation details of the various publications discussed. Unless I note otherwise below in reference to a specific serial publication, it is my expert opinion that this standard protocol was followed for the serial publication discussed below.

25. Based on my experience working in research libraries with researchers having the qualifications described above, or even lesser qualifications, it is my

opinion that such researchers would have been able to locate the material discussed herein on their own or with the assistance of a research librarian with relative ease using the tools and resources described herein.

A. INDEXING

26. A researcher may discover material relevant to his or her topic in a variety of ways. One common means of discovery is to search for relevant information in an index of periodical and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from the publisher, a bookstore, a document delivery service, or other provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information. However, date information for indexing entries is often unavailable. This is especially true for online indices.

27. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The formats in which these access terms are presented vary from service to service.

28. Online indexing services commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document. A citation of a document is evidence that the document was publicly available and in use by researchers no later than the

publication date of the citing document.

29. Before the widespread development of online databases to index articles in journals, magazines, conference papers, and technical reports, libraries purchased printed volumes of indices. Graduate library school education mandated that students learn about the bibliographic control of disciplines, the prominent indexing volumes, and searching strategies required to use them effectively and efficiently. Half of the courses that I studied in library school were focused on bibliography and resources in academic disciplines.

30. Librarians consulted with information seekers to verify citations, check availability in union catalogs, printed books catalogs, the OCLC database, and make formal requests for materials (e.g., books, conference proceedings, journal articles). Requests were transmitted using Telex machines, rudimentary email systems, and the United States Postal Service. During my career, I have performed and supervised staff who handled these resource sharing tasks.

31. Online indexing services such as Google Scholar² or ScienceDirect³ commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given

² <https://scholar.google.com/>

³ <https://www.sciencedirect.com/>

document.

32. A researcher may discover material relevant to his or her topic in a variety of ways. A citation of a document by another is evidence that the document was publicly available and in use no later than the publication date of the citing document. One common means of discovery is to search for relevant information in an index of periodicals and other publications. Having found relevant material, the researcher will then normally obtain it online, look for it in libraries, or purchase it from a publisher, a bookstore, a document delivery service, or other provider. Sometimes, the date of a document's public accessibility will involve both indexing and library date information. However, date information for indexing entries is often unavailable. This is especially true for online indices.

33. Indexing services use a wide variety of controlled vocabularies to provide subject access and other means of discovering the content of documents. The Library of Congress Subject Authorities includes standard forms of terms and cross references that are included in bibliographic records. Subject headings are terms that an individual seeking a document regardless of format can enter in the search bar of the online catalog. Subjects also connect an authenticated term (one included in the Library of Congress subject headings list) with related, broader, and narrower terms. The formats in which these access terms are presented vary from service to service.

34. Online indexing services commonly provide bibliographic information, abstracts, and full-text copies of the indexed publications, along with a list of the documents cited in the indexed publication. These services also often provide lists of publications that cite a given document. A citation of a document is evidence that the document was publicly available and in use by researchers no later than the publication date of the citing document. Prominent indexing services include *Scopus*, *ProQuest Dissertations and Theses Database*, the *IEEE Xplore* database, the *ACM Digital Library*, *Google Scholar*, and the *Internet Archive*.

B. MARC RECORDS AND THE ONLINE LIBRARY CATALOG

35. I am fully familiar with the library cataloging standard known as the MARC standard, which is an industry-wide standard method of storing and organizing library catalog information.⁴ MARC was first developed in the 1960s by the Library of Congress. A MARC-compatible library is one that has a catalog consisting of individual MARC records for each of its items. Today, MARC is the primary communications protocol for the transfer and storage of bibliographic metadata in libraries.⁵

⁴ The full text of the standard is available from the Library of Congress at <http://www.loc.gov/marc/bibliographic/>

⁵ Almost every major library in the world is MARC-compatible. *See, e.g., MARC Frequently Asked Questions (FAQ)*, Library of Congress, <https://www.loc.gov/marc/faq.html> (last visited April 20, 2024) (“MARC is the acronym for MACHine-Readable Cataloging. It defines a data format that emerged from a Library of Congress-led initiative that began nearly fifty years ago. It

36. Since at least the early 1970s and continuing to the present day, MARC has been the primary communications protocol for the transfer and storage of bibliographic metadata in libraries.⁶ As explained by the Library of Congress:

You could devise your own method of organizing the bibliographic information, but you would be isolating your library, limiting its options, and creating much more work for yourself. Using the MARC standard prevents duplication of work and allows libraries to better share bibliographic resources. Choosing to use MARC enables libraries to acquire cataloging data that is predictable and reliable. If a library were to develop a “home-grown” system that did not use MARC records, it would not be taking advantage of an industry-wide standard whose primary purpose is to foster communication of information.

Using the MARC standard also enables libraries to make use of commercially available library automation systems to manage library operations. Many systems are available for libraries of all sizes and are

provides the mechanism by which computers exchange, use, and interpret bibliographic information, and its data elements make up the foundation of most library catalogs used today.”). MARC is the ANSI/NISO Z39.2-1994 (reaffirmed 2016) standard for Information Interchange Format.

⁶ A complete history of the development of MARC can be found in *MARC: Its History and Implications* by Henrietta D. Avram (Washington, DC: Library of Congress, 1975) and available online from the Hathi Trust (<https://babel.hathitrust.org/cgi/pt?id=mdp.39015034388556;view=1up;seq=1>; last visited April 20, 2024).

designed to work with the MARC format. Systems are maintained and improved by the vendor so that libraries can benefit from the latest advances in computer technology. The MARC standard also allows libraries to replace one system with another with the assurance that their data will still be compatible.

Why Is a MARC Record Necessary? LIBRARY OF CONGRESS.⁷

37. Thus, almost every major library in the world is MARC-compatible. *See, e.g., MARC Frequently Asked Questions (FAQ)*, LIBRARY OF CONGRESS.⁸ (“MARC is the acronym for MACHine-Readable Cataloging. It defines a data format that emerged from a Library of Congress-led initiative that began fifty years ago. It provides the mechanism by which computers exchange, use, and interpret bibliographic information, and its data elements make up the foundation of most library catalogs used today.”). MARC is the ANSI/NISO Z39.2-1994 standard (reaffirmed in 2016) for Information Interchange Format. The full text of the standard is available from the Library of Congress.⁹

38. A MARC record comprises several fields, each of which contains specific data about the work. Each field is identified by a standardized, unique, three-digit code corresponding to the type of data that follow. For example, a work’s title

⁷ <http://www.loc.gov/marc/umb/um01to06.html#part2>

⁸ <https://www.loc.gov/marc/faq.html>

⁹ <http://www.loc.gov/marc/bibliographic/>

is recorded in Field 245; the primary author of the work is transcribed in Field 100; an item's International Standard Book Number ("ISBN") consisting of ten or thirteen digits is transcribed in Field 020; an item's International Standard Serial Number ("ISSN") is transcribed in Field 022; the Library of Congress classification notation is recorded in Field 050; and the publication date is recorded in Field 260 under the subfield "c." If a work is a periodical, then its publication frequency is recorded in Field 310, and the publication dates (e.g., the first and last publication) are recorded in Field 362, which is also referred to as the enumeration/chronology field.¹⁰

39. The library that created the record is recorded in Field 040 in subfield "a" with a unique library code. When viewing the MARC record online via Online Computer Library Center's ("OCLC") bibliographic database, hovering over this code with the mouse reveals the full name of the library. I used this method of "mousing over" the library codes in the OCLC database to identify the originating library for the MARC records discussed in this declaration. Where this "mouse over" option was not available, I consulted the Directory of OCLC Libraries to identify the institution that created the MARC record.¹¹

40. MARC records also include several fields that include subject matter

¹⁰ <http://www.loc.gov/marc/bibliographic/bd3xx.html>

¹¹ <https://www.oclc.org/en/contacts/libraries.html>

classification information. An overview of MARC record fields is available through the Library of Congress.¹² For example, 6XX fields are termed “Subject Access Fields.”¹³ Among these, for example, is the 650 field; this is the “Subject Added Entry – Topical Term” field.¹⁴ The 650 field is a “[s]ubject added entry in which the entry element is a topical term.” These entries “are assigned to a bibliographic record to provide access according to generally accepted thesaurus-building rules (e.g., *Library of Congress Subject Headings* (LCSH), *Medical Subject Headings* (MeSH)).” *Id.* Further, MARC records include call numbers, which themselves include a classification number. For example, the 050 field is the “Library of Congress Call Number.”¹⁵ A defined portion of the Library of Congress Call (LCC) Number is the classification number, and “source of the classification number is *Library of Congress Classification* and the *LC Classification-Additions and Changes*.” Thus, included in the 050 field is a subject matter classification. Further, the 082 field is the “Dewey Decimal Call Number.”¹⁶ A defined portion of the Dewey Decimal Call (DDC) Number is the classification number, and “source of the classification number is the *Dewey Decimal Classification and Relative Index*.” Thus, included in the 082 field is a subject matter classification. Each item in a

¹² <http://www.loc.gov/marc/bibliographic/>

¹³ <http://www.loc.gov/marc/bibliographic/bd6xx.html>

¹⁴ <http://www.loc.gov/marc/bibliographic/bd650.html>

¹⁵ <http://www.loc.gov/marc/bibliographic/bd050.html>

¹⁶ <http://www.loc.gov/marc/bibliographic/bd082.html>

library has a single classification number. A library selects a classification scheme (*e.g.*, the Library of Congress classification scheme just described or a similar scheme such as the Dewey Decimal classification scheme) and uses it consistently. When the Library of Congress assigns the LCC classification number, it appears as part of the 050 field. When the Library of Congress assigns the DDC classification number, it appears as part of the 082 field. If a local library assigns the classification number, it appears in a 090 field. In either scenario, the MARC record includes a classification number that represents a subject matter classification.

C. OCLC

41. The OCLC was created “to establish, maintain and operate a computerized library network and to promote the evolution of library use, of libraries themselves, and of librarianship, and to provide processes and products for the benefit of library users and libraries, including such objectives as increasing availability of library resources to individual library patrons and reducing the rate of rise of library per-unit costs, all for the fundamental public purpose of furthering ease of access to and use of the ever-expanding body of worldwide scientific, literary and educational knowledge and information.”¹⁷ Among other services, OCLC and

¹⁷ Third Article, Amended Articles of Incorporation of OCLC Online Computer Library Center, Incorporated (available at <https://www.oclc.org/content/dam/oclc/membership/articles-of-incorporation.pdf>).

its members are responsible for maintaining the WorldCat database,¹⁸ used by independent and institutional libraries throughout the world.

42. OCLC also provides its members online access to MARC records through its OCLC bibliographic database. When an OCLC member institution acquires a work, it creates a MARC record for this work in its computer catalog system in the ordinary course of its business. MARC records created at the Library of Congress are directly uploaded or may be tape-loaded into the OCLC database through a subscription to MARC Distribution Services daily or weekly. Once the MARC record is created by a cataloger at an OCLC member institution or is tape-loaded from a participating institution, the MARC record is then made available to any other OCLC members online, and therefore made available to the public. Accordingly, once the MARC record is created by a cataloger at an OCLC member institution or is tape-loaded from the Library of Congress or another library anywhere in the world, any publication corresponding to the MARC record has been cataloged and indexed according to its subject matter such that a person interested in that subject matter could, with reasonable diligence, locate and access the publication through any library with access to the OCLC bibliographic database or through the Library of Congress.

43. When an OCLC member institution creates a new MARC record,

¹⁸ <http://www.worldcat.org/>

OCLC automatically supplies the date of creation for that record. The date of creation for the MARC record appears in the fixed field (008), characters 00 through 05. The MARC record creation date reflects the date on which, or shortly after which, the item was first acquired or cataloged. Initially, field 005 of the MARC record is automatically populated with the date the MARC record was created in year, month, day format (YYYYMMDD) (some of the newer library catalog systems also include hour, minute, second (HHMMSS)). Thereafter, the library's computer system may automatically update the date in field 005 every time the library updates the MARC record (*e.g.*, to reflect that an item has been moved to a different shelving location within the library). Field 005 is visible when viewing a MARC record via an appropriate computerized interface. The date upon which the most recent update to field 005. Thus, when an item's MARC record has been printed to hardcopy—as is the case with the exhibits to this report—the date reflected in field 008 is necessarily on or after the date the library first cataloged and indexed the underlying item.

44. Once one library has cataloged and indexed a publication by creating a MARC record for that publication, other libraries that receive the publication do not create additional MARC records—the other libraries instead rely on the original MARC record. They may update or revise the MARC record to ensure accuracy, but they do not replace or duplicate it. This practice does more than save libraries

from duplicating labor. It also enhances the accuracy of MARC records. Further, it allows librarians around the world to know that a particular MARC record is authoritative (in contrast, a hypothetical system wherein duplicative records were created would result in confusion as to which record is authoritative).

45. The date of creation of the MARC record by a cataloger at an OCLC member institution reflects when the underlying item is accessible to the public. Upwards of two-thirds to three-quarters of book sales to libraries come from a jobber or wholesaler for online and print resources. These resellers make it their business to provide books to their customers as fast as possible, often providing turnaround times of only a single day after publication. Libraries purchase a significant portion of the balance of their books directly from publishers themselves, which provide delivery on a similarly expedited schedule. In general, libraries make these purchases throughout the year as the books are published and shelve the books as soon thereafter as possible in order to make the books available to their patrons. Thus, books are generally available at libraries across the country within just a few days of publication.

46. In preparing this report, I used authoritative databases, such as the OCLC bibliographic database, WorldCat, and the Library of Congress online catalog, to confirm citation details of the various publications discussed.

V. PUBLICATIONS IN THIS PROCEEDING

A. *10-Gigabit-Capable Passive Optical Networks (XG-PON): Transmission Convergence (TC) Layer Specification* – ITU-T Recommendation G.987.3 [Exhibit 1007]

47. Exhibit 1007 is a technical specification document, *10-Gigabit-Capable Passive Optical Networks (XG-PON): Transmission Convergence (TC) Layer Specification*, issued by the Telecommunication Standardization Sector of ITU of the International Telecommunication Union (ITU) (hereafter “ITU-T Recommendation G.987.3”), and published as part of Series G: Transmission Systems and Media, Digital Systems and Networks: Digital sections and digital line system – Optical line systems for local and access networks. The G987.3 document is designated as ITU-T Recommendation G.987.3 with an October 7, 2010, approval date (10/2010). *See* Exhibit 1007, History (“Recommendation ITU-T G.987.3 was approved on 10 October 2010 by ITU-T Study Group 15 (2009-2012) under Recommendation ITU-T A.8 procedure.”).

48. Exhibit 1007 is a true and correct copy of the ITU-T Recommendation G.987.3 document that I understand is being submitted as an exhibit in this proceeding. I obtained this copy of the ITU-T Recommendation G.987.3 document from the ITU website.¹⁹ The text of the document is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next.

¹⁹ <https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=10890>

Further, there are no visible alterations to the document. Exhibit 1007 was found within the custody of the issuing organization—a place where, if authentic, a copy of this document would likely be. Exhibit 1007 is a true and correct copy in a condition that creates no suspicion about its authenticity.

49. I understand that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence could have located the ITU-T Recommendation G.987.3 document from the ITU website. It is my opinion that the ITU-T Recommendation G.987.3 document was publicly accessible digitally by October 3, 2011, as indicated by the archived version of the ITU’s “ITU Publications” page which indicates that the ITU-T Recommendation G.987.3 document was “Posted” on “2011-10-03.” The 2011 date of publication of the ITU-T Recommendation G.987.3 document is also supported by a 2011 copyright date in the “Intellectual Property Rights” of the ITU-T Recommendation G.987.3 document.

50. I understand that prior to July 2012, ITU would have been known to persons at least of ordinary skill in the art as the “United Nations specialized agency for information and communication technologies.”²⁰ Established in 1865, ITU promotes cooperation among international telegraphy networks of the day and continues its work in three areas: radiocommunications, standardization, and

²⁰ <https://www.itu.int/en/about/Pages/default.aspx>

development.²¹ Furthermore, I understand that persons of ordinary skill in the art would have reasonably considered this organization and its website (<https://www.itu.int/en/Pages/default.aspx>) as reliable and useful sources of information for research, study, development or design. The ITU-T Recommendation G.987.3 document explains that G.987.3 is an “International Standard [that] describes the transmission convergence layer for 10-Gigabit-capable passive optical network systems – a family of flexible access network systems that operate over a point-to-multipoint optical access infrastructure at the nominal data rate of 10.0 Gbit/s in at least the downstream direction, while providing a wide range of broadband and narrow-band services to end-users” (Exhibit 1007, page 9).

51. The ITU website traces the history of the development of the ITU-T G.987.3 Recommendations. The ITU website indicates that an amendment was issued on June 22, 2012 (see Ex. 1020).²² The amendment “contains additional details and clarifications for the security clause of the Recommendation, introduces the optional features of PON-ID management and extended rogue optical network unit (ONU) mitigation capabilities, defines additional golden vectors and provides regular specification maintenance” (Ex. 1020, page 10).

52. The ITU-T Recommendation was superseded on January 13, 2014.²³

²¹ <https://www.itu.int/en/about/Pages/whatwedo.aspx>

²² <https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=11535&lang=en>

²³ <https://www.itu.int/rec/T-REC-G.987.3-201401-I>

53. In view of above, the ITU-G.987.3 technical standard document was publicly available on October 3, 2011, because by that date it had been approved by the ITU-T Study Group 15 and posted on the ITU website. For these reasons, it is my opinion that Exhibit 1007 was published and accessible to the public on October 3, 2011.

B. *ONU Management and Control Interface (OMCI) Specification – ITU-T Recommendation G.988 [Exhibit 1008]*

54. Exhibit 1008 is a technical specification document, *ONU Management and Control Interface (OMCI) Specification*, issued by the Telecommunication Standardization Sector of ITU of the International Telecommunication Union (ITU) (hereafter “ITU-T Recommendation G.988”), and published as part of Series G: Transmission Systems and Media, Digital Systems and Networks: Digital sections and digital line system – Optical line systems for local and access networks. The G988 document is designated as ITU-T Recommendation G.988 with an October 7, 2010, approval date (10/2010). See Exhibit 1003, History (“Recommendation ITU-T G.988 was approved on 10 October 2010 by ITU-T Study Group 15 (2009-2012) under Recommendation ITU-T A.8 procedure.”).

55. Exhibit 1008 is a true and correct copy of the ITU-T Recommendation G.988 document that I understand is being submitted as an exhibit in this proceeding. I obtained this copy of the ITU-T Recommendation G.988 document from the ITU

website.²⁴ The text of the document is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next. Further, there are no visible alterations to the document. Exhibit 1008 was found within the custody of the issuing organization—a place where, if authentic, a copy of this document would likely be. Exhibit 1003 is a true and correct copy in a condition that creates no suspicion about its authenticity.

56. I understand that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence could have located the ITU-T Recommendation G.988 document from the ITU website. It is my opinion that the ITU-T Recommendation G.988 document was publicly accessible digitally by September 22, 2011, as indicated by the archived version of the ITU’s “ITU Publications” page which indicates that the ITU-T Recommendation G.988 document was “Posted” on “2011-09-22.”²⁵ The 2011 date of publication of the ITU-T Recommendation G.988 document is also supported by a 2011 copyright date in the “Intellectual Property Rights” of the ITU-T Recommendation G.988 document.

57. I understand that prior to July 2012, ITU would have been known to persons at least of ordinary skill in the art as the “United Nations specialized agency

²⁴ <https://www.itu.int/ITU-T/recommendations/rec.aspx?rec=15125>

²⁵ <https://www.itu.int/rec/T-REC-G.988-201010-S/en>

for information and communication technologies.”²⁶ Established in 1865, ITU promotes cooperation among international telegraphy networks of the day and continues its work in three areas: radiocommunications, standardization, and development.²⁷ Furthermore, I understand that persons of ordinary skill in the art would have reasonably considered this organization and its website (<https://www.itu.int/en/Pages/default.aspx>) as reliable and useful sources of information for research, study, development or design. The ITU-T Recommendation G.988 document explains that G.988 is an “International Standard [that] specifies the optical network unit (ONU) management and control interface (OMCI) for optical access networks as defined in [ITU-T G.984.x], [ITU-T G.986], [ITU-T G.987.x] and potentially others” (Exhibit 1003, page 7).

58. The ITU website traces the history of the development of the ITU-T G.988 Recommendations.

59. The ITU website indicates that an erratum was issued on February 22, 2012 (see Ex. 1021).²⁸ Two amendments were issued and are identified as follows: Amendment 1, “Maintenance” was approved on April 13, 2011 and posted on the ITU website on February 28, 2012 (see Ex. 1022)²⁹ and Amendment 2,

²⁶ <https://www.itu.int/en/about/Pages/default.aspx>

²⁷ <https://www.itu.int/en/about/Pages/whatwedo.aspx>

²⁸ <https://www.itu.int/rec/T-REC-G.988-201202-S!Err1/en>

²⁹ <https://www.itu.int/rec/T-REC-G.988-201104-S!Amd1/en>

“Maintenance” was approved on April 22, 2012 and posted on the ITU website on November 8, 2012 (see Ex. 1023).³⁰ A Corrigendum was approved on June 13, 2012 and posted on the ITU website on October 23, 2012 (see Ex. 1024).³¹ The ITU-T Recommendation was superseded on October 29, 2012.³²

60. In view of above, the ITU-G.988 technical standard document was publicly available on September 22, 2011, because by that date it had been approved by the ITU-T Study Group 15 and posted on the ITU website. For these reasons, it is my opinion that Exhibit 1008 was published and accessible to the public on September 22, 2011.

D. “Optically Powered Fiber Networks” by M. Röger, G. Böttger, M. Dreschmann, C. Klamouris, M. Huebner, A. W. Bett, J. Becker, W. Freude, and J. Leuthold [Exhibit 1006]

61. Attached hereto as Exhibit 1006 is a copy of the open access journal article titled “Optically Powered Fiber Networks” by M. Röger, G. Böttger, M. Dreschmann, C. Klamouris, M. Huebner, A. W. Bett, J. Becker, W. Freude, and J. Leuthold (hereafter “Röger”). The Röger article was published in Volume 16, Number 26 of the open access journal *Optics Express* and was found in the National Library of Medicine (Bethesda, Maryland).³³ The Röger article appears beginning

³⁰ <https://www.itu.int/rec/T-REC-G.988-201204-S!Amd2/en>

³¹ <https://www.itu.int/rec/T-REC-G.988-201206-S!Cor1/en>

³² <https://www.itu.int/rec/T-REC-G.988-201210-S/en>

³³ <https://pubmed.ncbi.nlm.nih.gov/19104615/>

on page 21821 of this issue dated December 22, 2008. Exhibit 1006 is a true and correct copy of the Röger article (pages 21821-21834) that I understand is being submitted as an exhibit in this proceeding. Specifically, the text of the article is complete; no pages are missing, and the text on each page appears to flow seamlessly from one page to the next; further, there are no visible alterations to the document. The Röger article is also available from the publisher³⁴ and the digital repository *ResearchGate*.³⁵ Exhibit 1006 was found within the custody of a library – a place where an authentic copy of this journal would likely be. Exhibit 1006 is a true and correct copy in a condition that creates no suspicion about its authenticity.

62. Attached hereto as Ex. 1025 is a true and correct copy of the MARC record for the open access journal *Optics Express* at the National Library of Medicine. Library ownership is indicated by the presence of the library’s code (“DNLM”) in field 935. The library continues to update this MARC record and enhanced the MARC record to meet current cataloging rules. The most recent enhancement to Ex. 1025 occurred on February 9, 2024, as shown in field 005 (“20240209”). I personally identified and retrieved the MARC record that is Ex. 1025.

63. Based on finding a print copy of Exhibit 1006 in the National Library

³⁴ <https://opg.optica.org/oe/fulltext.cfm?uri=oe-16-26-21821&id=175486>

³⁵ https://www.researchgate.net/publication/23686186_Optically_powered_fiber_networks

of Medicine and MARC record in its online library catalog attached as Ex. 1025, it is my opinion that the Röger article published in the open access journal *Optics Express* was publicly available on December 17, 2008, as shown at the bottom of page 1 of Exhibit 1006. Ex. 1025 also shows that Exhibit 1006 was catalogued with a descriptor term reading “Optics and Photonics” (see Ex. 1026, National Library of Medicine subject heading D055095) in the 650 field.

64. As noted in the holdings information (362 field), the National Library of Medicine has received the open access journal *Optics Express* since July 1997 and continues to receive the publication. In view of the MARC record for Exhibit 1006, the Röger article was publicly on December 17, 2008, because the serial title had been received, cataloged, and indexed at the National Library of Medicine and made part of its online catalog database.

65. Attached hereto as Ex. 1027 is a true and correct copy of the MARC record for the open access journal *Optics Express* obtained from the OCLC bibliographic database. As previously noted, the library that created the record is recorded in field 040 with a unique library code. For Ex. 1027, that library code is “NSD,” which means that the MARC record for this serial was cataloged as part of the National Serials Data Program at the Library of Congress. As can be seen in the “Entered” field in the MARC record for this exhibit, a cataloger at the Library of Congress created OCLC record number 37160672 on June 20, 1997, as shown in

field 008 (“970620”). The library continues to update this MARC record and enhanced the MARC record to meet current cataloging rules. The most recent enhancement to Ex. 1027 occurred on August 1, 2023, as shown in field 005 (“20230801”). I personally identified and retrieved the MARC record that is Ex. 1027. The “BLvl” entry in Ex. 1027 is “s,” which indicates that the open access journal *Optics Express* is a serial publication. Field 310 of Ex. 1027 reads “Biweekly.” Accordingly, the MARC record for Exhibit 1006 corresponds to the open access journal *Optics Express* from the time the serial title began and includes the date of the Röger article.

66. Ex. 1027 includes an entry in field 050 (“QC350”)—as described above, a subject matter classification number consistent with the Library of Congress classification system (analogous to the Dewey Decimal classification system) and an entry in field 082 (“535”), a subject matter consistent with the Dewey Decimal classification system. Ex. 1027 further includes a descriptor term reading “Optics \$v Periodicals” (see Ex. 1028, Library of Congress subject heading sh2008108683) in the 650 field. Thus, as of its cataloging, the publication corresponding to the MARC record attached hereto as Ex. 1027 was indexed according to its subject matter by virtue of at least three independently sufficient classifications: the field 050 entry, the field 082 entry, and the field 650 entry. As of June 20, 1997, the MARC record attached hereto as Ex. 1027 was accessible through any library with

access to the OCLC bibliographic database or the online catalog at a library that subscribed to the serial, which means that the corresponding publication was publicly available on or before that same date through any library with access to the OCLC bibliographic database or through an individual library.

67. WorldCat indicates that the open access journal *Optics Express* as cataloged at the Library of Congress is currently available from 455 libraries. In view of the above, this issue of the open access journal *Optics Express* was publicly available on December 17, 2008, because by that date it had been cataloged and indexed at the Library of Congress, made part of the OCLC bibliographic database, and received at the National Library of Medicine. For these reasons, it is my opinion that Exhibit 1006 was published and accessible to the public on December 17, 2008.

VI. SUMMARY OF OPINIONS

68. In view of the foregoing, it is my opinion that the publications described above were publicly available on or about the corresponding date listed in the table below:

Document	Publication	Publicly Available
Exhibit 1007	International Communication Union. Series G: Transmission Systems and Media, Digital Systems and Networks: Digital sections and digital line system – Optical line systems for local and access networks. <i>10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) layer specification</i> . ITU-T G987.3 (10/2010). Geneva,	October 3, 2011

Document	Publication	Publicly Available
	Switzerland: International Communication Union, c2010.	
Exhibit 1008	International Communication Union. Series G: Transmission Systems and Media, Digital Systems and Networks: Digital sections and digital line system – Optical line systems for local and access networks. <i>ONU management and control interface (OMCI) specification</i> . ITU-T G.988 (10/2010). Geneva, Switzerland: International Communication Union, c2010.	September 22, 2011
Exhibit 1006	Röger, M., G. Böttger, M. Dreschmann, C. Klamouris, M. Huebner, A. W. Bett, J. Becker, W. Freude, and J. Leuthold. “Optically powered fiber networks.” <i>Optics Express</i> , vol. 16, no. 26 (22 December 2008): 21821-21834.	December 17, 2008

69. In signing this Declaration, I recognize that the Declaration will be filed as evidence in a case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

70. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

DATED: May 22, 2024

Respectfully submitted,



Sylvia D. Hall-Ellis, Ph.D.