

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

Case: IPR2024-00900

U.S. Patent No. 8,934,359

PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §312 AND 37 C.F.R. §42.104

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LIST OF EXHIBITS

Exhibit	Short Name	Description
Ex. 1001	'359 Patent	U.S. Patent No. 8,934,359
Ex. 1002	'359 FH	File History of U.S. Patent No. 8,934,359
Ex. 1003	Sergienko Dec.	Declaration of Dr. Alexander V. Sergienko
Ex. 1004	Sergienko CV	<i>Curriculum Vitae</i> of Dr. Alexander V. Sergienko
Ex. 1005	G.984.3	ITU-T Recommendation G.984.3, Gigabit-capable Passive Optical Networks (G-PON): Transmission convergence layer specification (Mar. 2008)
Ex. 1006	Lee	U.S. Patent App. Pub. No. 2005/0149822
Ex. 1007	Liu	U.S. Patent No. 6,005,694
Ex. 1008	Ramaswami	Rajiv Ramaswami & Kumar Sivarajan, <i>Optical Networks, A Practical Perspective</i> (2d ed. 2002)
Ex. 1009	Kramer	Glen Kramer & Gerry Pesavento, <i>Ethernet Passive Optical Network (EPON): Building a Next-Generation Optical Access Network</i> , IEEE Communications Magazine (February 2002)
Ex. 1010	Inf. Cont. Cover Pleading	Iarnach's Disclosure of Asserted Claims and Preliminary Infringement Contentions in <i>Iarnach Technologies Ltd. v. AT&T Inc., et al.</i> , 2:23-cv-231-JRG (E.D. Tex.)
Ex. 1011	'359 Patent Inf. Cont.	Iarnach's Infringement Contentions for the '359 Patent in <i>Iarnach Technologies Ltd. v. AT&T Inc., et al.</i> , 2:23-cv-231-JRG (E.D. Tex.)

Exhibit	Short Name	Description
Ex. 1012	Wijngaarden '381	U.S Patent App. Pub. No. 2010/0316381
Ex. 1013	Krimmel	U.S Patent App. Pub. No. 2006/0222362
Ex. 1014	Khermosh	U.S Patent App. Pub. No. 2008/0260378
Ex. 1015	Kanno	U.S Patent App. Pub. No. 2010/0021158
Ex. 1016	Wijngaarden '380	U.S Patent App. Pub. No. 2010/0316380
Ex. 1017	Hood	U.S. Patent No. 8,548,328
Ex. 1018	Effenberger II	Frank J. Effenberger, <i>et al.</i> , “Next-Generation PON—Part II: Candidate Systems for Next-Generation PON,” IEEE Comms. Mag., Vol. 47, Issue 11 (Nov. 3, 3009)
Ex. 1019	Effenberger III	Frank J. Effenberger, <i>et al.</i> , “Next-Generation PON—Part III: Candidate Systems for Next-Generation PON,” IEEE Comms. Mag., Vol. 47, Issue 11 (Nov. 3, 3009)
Ex. 1020	Chung	Hae Isni Chung & Young-Jin Kwon, Implementation of a High Speed GEM Frame Synchronization Circuit in the G-PON TC Sublayer Payload,” J. Korean Inst. of Comms. & Info. Sci., Vol. 34, Issue 5B (May 31, 2009)
Ex. 1021	Mohammadani	Khalid Mohammandani, <i>et al.</i> , “Highest Cost First-Based QoS Mapping Scheme for Fiber Wireless Architecture,” Photonics, Volume 7, Issue 4 (Nov. 22, 2020)

Exhibit	Short Name	Description
Ex. 1022	AT&T Case— DCO	Doc. No. 50, Docket Control Order, <i>Iarnach Technologies Ltd. v. AT&T Corp. et al.</i> , No. 2:23-cv-00231 (E.D. Tex.)
Ex. 1023	AT&T Case— Intervenor	Doc. No. 31, Order Granting Nokia’s Motion to Intervene, <i>Iarnach Technologies Ltd. v. AT&T Corp. et al.</i> , No. 2:23-cv-00231 (E.D. Tex.)
Ex. 1024	Caseload	U.S. District Courts – Judicial Caseload Profile (Dec. 2023)
Ex. 1025	Verizon Case— DCO	Doc. No. 45, Agreed Docket Control Order, <i>Iarnach Technologies Ltd. v. Verizon Communications, Inc. et al.</i> , No. 2:23-cv-00631 (E.D. Tex)
Ex. 1026	EPON v. GPON	<i>What is the Difference Between EPON and GPON?</i> , HITRON, https://us.hitrontech.com/learn/what-is-the-difference-between-epon-and-gpon/ (last accessed Apr. 21, 2024)
Ex. 1027	G.984.2	ITU-T Recommendation G.984.2, Gigabit-capable Passive Optical Networks (GPON): Physical Media Dependent (PMD) layer specification (March 2003)
Ex. 1028	Hall-Ellis Dec.	Declaration of Dr. Sylvia D. Hall-Ellis
Ex. 1029	Hall-Ellis CV	<i>Curriculum Vitae</i> of Dr. Sylvia D. Hall-Ellis
Ex. 1030	Attachment 1A	Hall-Ellis Declaration Attachment 1A
Ex. 1031	Attachment 1B	Hall-Ellis Declaration Attachment 1B
Ex. 1032	Attachment 1C	Hall-Ellis Declaration Attachment 1C
Ex. 1033	Attachment 1D	Hall-Ellis Declaration Attachment 1D

Exhibit	Short Name	Description
Ex. 1034	G.9807.1	ITU-T Recommendation G.9807.1, 10-Gigabit-capable symmetric passive optical network (XGS-PON) (June 2016)
Ex. 1035	AT&T Complaint	Doc. No. 1, Complaint, <i>Iarnach Technologies Ltd. v. AT&T Corp. et al.</i> , No. 2:23-cv-00231 (E.D. Tex.)
Ex. 1036	Verizon Complaint	Doc. No. 1, Complaint, <i>Iarnach Technologies Ltd. v. Verizon Communications, Inc. et al.</i> , No. 2:23-cv-00631 (E.D. Tex)

Nokia of America Corporation (“Nokia”) and AT&T Services, Inc. (“AT&T”) (collectively, “Petitioners”) seek IPR under 35 U.S.C. §§311–319 and 37 C.F.R. §42 of Claims 1-11 (“the Challenged Claims”) of U.S. Patent No. 8,934,359 (“the ’359 Patent”). Petitioners request cancellation of the Challenged Claims.

I. STANDING UNDER 37 C.F.R. §42.104(a)

Petitioners certify the ’359 Patent is available for IPR, and Petitioners are not barred or estopped from requesting IPR.

II. PAYMENT OF FEES

Petitioners authorize Account No. 16-0605 to be charged.

III. OVERVIEW OF CHALLENGES AND RELIEF REQUESTED

Pursuant to 37 C.F.R. §42.22(a)(1) and 42.104(b)(1)–(2), Petitioners request cancellation of the Challenged Claims pursuant to the grounds below. Additional support is provided in the Declaration of Dr. Alexander Sergienko (Ex. 1003).

Ground 1: Claims 1-11 are unpatentable under pre-AIA 35 U.S.C. §103(a) over G.984.3 in view of Khernosh.

IV. BACKGROUND

A. ’359 Patent Overview

The ’359 Patent describes and claims “a method for managing upstream burst overhead parameters ... according to the transmission quality [of a downlink].” Ex. 1001, cl. 1. The ’359 Patent utilizes the well-known technique of adjusting the

upstream burst overhead parameters (*e.g.*, the state of forward error correction (FEC)) based on the transmission quality. *Id.*, 1:16-33.

The '359 Patent fails to add anything to the then-existing state of the art, and instead merely describes standard implementation of FEC based on the transmission quality. Ex. 1003, ¶¶35-49. The Board should thus institute review and find each of the Challenged Claims unpatentable.

B. Technical Background

1. Passive Optical Networks (PON)

A Passive Optical Network (PON) is a fiber-optic telecommunications network that provides Ethernet connectivity from a main data source to endpoints. Ex. 1003, ¶38. To do so, the PON transmits information such as voice, video, or computer data in the form of pulses of light, called signals, from one location to another. Ex. 1003, ¶38; Ex. 1007, 1:14-24. Unlike active optical networks, which use active devices to split beams, PON networks use unpowered optical beam splitters to deliver a single signal to multiple points. Ex. 1003, ¶39; Ex. 1008, 603-604; Ex. 1009, 68. A PON network consists of two main interfaces: an Optical Line Terminal (OLT) as the network-side interface and Optical Network Terminations

(ONTs) or Optical Network Units (ONUs) as the client-side interfaces.¹ Ex. 1003, ¶40; Ex. 1005, 3, 7.

PONs gained increased popularity in the late 1990s and early 2000s as a direct result of the numerous benefits they provide, such as increased transmission speed and increased data capacity. Ex. 1003, ¶¶41-42; Ex. 1007, 1:24-30, 1:36-45. An additional benefit of PON networks is the ability to provide a longer reach between central offices and customer locations, reducing the burden on operators in maintaining a network. Ex. 1003, ¶42; Ex. 1009, 68.

PON requirements have been standardized by the ITU-T through a series of recommendations. Ex. 1003, ¶43. The G.984.3 recommendation describes a gigabit-capable PON system which can achieve transmission speeds in excess of 1 Gbit/s. Ex. 1003, ¶43; Ex. 1005, 1, 3.

2. *Link Quality*

Numerous well-known techniques may be used to determine the quality of the link or transmission between two endpoints in a PON network. Ex. 1003, ¶45.

¹ For purposes of the '359 Patent, there is no meaningful distinction between an ONU and an ONT. Ex. 1003, ¶40.

Some of those methods (called “performance monitoring” techniques²) are disclosed in G.984.3 and include measuring the bit error rate of a transmission, as shown below. Ex. 1003, ¶¶45-47.

11.2 Performance monitoring			
11.2.1 Items detected at OLT			
Type		Description	
		Detection conditions	Actions
ERRi	BIP error of ONUi	The received BIP-8 is compared with the calculated BIP-8 on the received stream. In case of a difference, ERRi counter is incremented.	The number of differing bits is accumulated in ERR. SDi and SFi are declared upon BER crossing a defined threshold.
REIi	Remote error indication of ONUi	Once the ONU detects BIP errors, it sends upstream the number of errors inside the REI PLOAM message. When the received REI message is different than zero, REIi counter is incremented.	REIi counter is incremented accordingly.
11.2.2 Items detected at ONU			
Type		Description	
		Detection conditions	Actions
ERR	BIP errors	The received BIP-8 is compared with the calculated BIP-8 on the received stream. In case of a difference, ERR counter is incremented.	The number of differing bits is accumulated in ERR. SD and SF alarms are declared upon BER crossing a defined threshold.

² Patent Owner has contended in related litigation that “performance monitoring” is synonymous with determining the link quality. Ex. 1011, 8-9.

13.1.3 FEC statistics for performance monitoring

While FEC decoding is being executed, some statistic functionality should be supported both upstream and downstream in order to monitor the transmission performance between OLT and ONU.

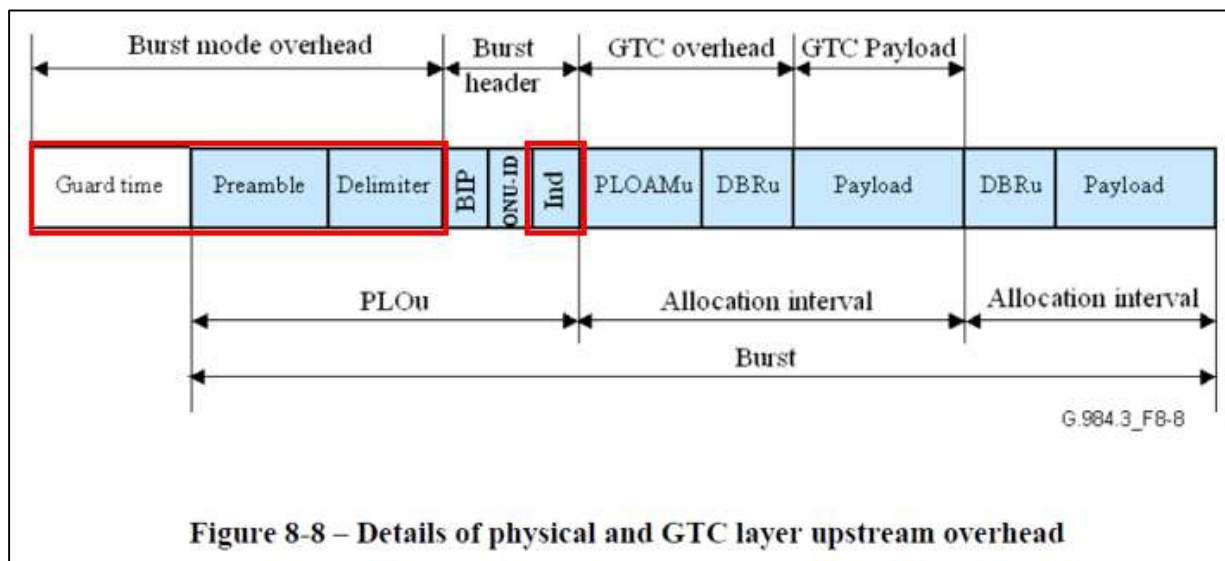
These FEC statistic measurements should include counting the following items:

- Number of corrected bytes (i.e., bytes that have been corrected by FEC decoding).
- Number of corrected codewords (i.e., codewords that have been corrected by FEC decoding).
- Number of uncorrectable codewords (i.e., codewords that have not yet been successfully corrected by FEC decoding).
- Number of total received codewords (i.e., codewords that have been received and involved in the FEC decoding process).
- FEC seconds (i.e., the number of seconds during which an uncorrectable codeword was received).

Ex. 1005, 89, 93.

3. *Upstream Burst Overhead Parameters*

Upstream burst parameters include the guard time, preamble, delimiter, and FEC status and are used to define the parameters for upstream burst overhead messages. Ex. 1001, 1:23-32; Ex. 1003, ¶48. The below figure, from G.984.3, shows several upstream burst overhead parameters.



Ex. 1005, 37-38 (annotated). In addition to guard time, preamble, and delimiter, another parameter described in the same figure is the status of FEC—either FEC on or FEC off. The “Ind” field above contains an indication of FEC status. Ex. 1005, 38-39; Ex. 1003, ¶48.

4. *Managing Upstream Burst Overhead Parameters based on Link Quality*

Monitoring the downstream link quality of transmissions and adjusting the upstream burst overhead parameters as a result is a well-known aspect of PON networks. Ex. 1003, ¶49. Before the priority date of the ’359 Patent, numerous prior art references disclosed such a method, and many more would have been known to a POSITA. Ex. 1003, ¶49; Ex. 1012, abs., [0022]; Ex. 1013, [0007], [0035]-[0037]; Ex. 1014, [0012]; Ex. 1015, [0015], [0060]; Ex. 1016, [0005]; Ex. 1006, abs., [0029]-[0030].

C. ’359 Patent Prosecution History

U.S. Patent Application No. 13/257,621 (the “’621 Application”), which matured into the ’359 Patent, was filed on April 2, 2012. Ex. 1001. The ’621 Application was filed with fourteen claims. Ex. 1002, 287-94. Originally filed independent claim 1 disclosed a method for managing upstream burst overhead parameters that involved detecting transmission quality, determining the parameters to use based on the transmission quality, and starting to use those parameters. Ex. 1002, 287. Dependent claim 2 added additional limitations regarding predetermining

a set of upstream burst overhead parameters that can be used based on the link quality. Ex. 1002, 287.

In a telephonic interview on October 21, 2014, the Examiner stated that allowable subject matter existed in originally filed dependent claim 2. Ex. 1002, 36. As a result, the application was amended to add the limitations from dependent claim 2 into independent claim 1. Ex. 1002, 16-50. In the Notice of Allowance, the Examiner explained that independent claim 1, as amended, was not disclosed in ITU-T G.984.2. Ex. 1002, 34.

At no point did the Examiner issue a rejection or address any of the references cited on the face of the '359 Patent in an office action or interview. *See generally* Ex. 1002.

D. Priority Date

The '359 Patent has an effective filing date of June 10, 2010. Ex. 1001. The '359 Patent also claims foreign priority to Chinese application 200910212093, filed on November 4, 2009. Petitioners assume (without determining) that the foreign priority claim is proper. If Patent Owner disputes the prior art status of any of Petitioners' cited references, Petitioners reserve the right to challenge the priority date.

E. Prior Decisions

The '359 Patent is currently asserted in two pending district court cases:

- *Iarnach Technologies Ltd. v. AT&T Corp. et al.*, No. 2:23-cv-00231 (E.D. Tex.) (hereafter, “AT&T Case”);
- *Iarnach Technologies Ltd. v. Verizon Communications, Inc. et al.*, No. 2:23-cv-00631 (E.D. Tex.) (hereafter, “Verizon Case”).

Petitioner AT&T is a defendant, and Petitioner Nokia is an intervenor, in the AT&T Case. Ex. 1023. No dispositive judgments or claim construction orders have issued in this case. A claim construction hearing is set for September 19, 2024; the dispositive motion deadline is set for December 5, 2024; and jury selection is presently set for March 17, 2025. Ex. 1022, 1-4. Likewise, no dispositive judgments or claim construction orders have issued in the Verizon Case. A claim construction hearing is set for March 11, 2025; the dispositive motion deadline is set for June 16, 2025; and jury selection is set for September 22, 2025. Ex. 1025.

F. Claim Construction (37 C.F.R. §42.104(b)(3))

The terms should receive their respective plain and ordinary meaning as understood by a person of ordinary skill in the art under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005).

V. PRIOR ART REFERENCES

A. G.984.3

ITU-T Recommendation G.984.3 (“G.984.3”), titled “Gigabit-capable Passive Optical Networks (G-PON): Transmission convergence layer specification,”

was publicly accessible at least as early as April 28, 2009. Ex. 1028, ¶49. G.984.3 was approved on March 29, 2008, and has 2009 copyright date and a 2009 print date. Ex. 1005, i-ii, 146. Dr. Hall-Ellis testified that “the ITU-G.984.3 technical standard document was publicly available on April 28, 2009, because by that date it had been approved by the ITU-T Study Group 15 and posted on the IUT website.” Ex. 1028, ¶52, ¶¶47-53.

This public availability of G.984.3 is also confirmed by the numerous patent and printed publications that cite to G.984.3. *See, e.g.*, Ex. 1012, [0003]; Ex. 1016, [0003]; Ex. 1017, 1; Ex. 1018, 57; Ex. 1019, 64; Ex. 1020, 479; Ex. 1021, 19. G.984.3 qualifies as prior art under at least pre-AIA 35 U.S.C. §102(a) and (b).

B. Khermosh

U.S. Patent Application Publication No. 2008/0260378 to Khermosh (“Khermosh”), titled “Method of Ethernet Frame Forward Error Correction Initialization and Auto-Negotiation,” published on October 23, 2008. Ex. 1014, 1. Khermosh qualifies as prior art under at least pre-AIA 35 U.S.C. §102(a), (b), and (e). Khermosh was never addressed or considered by the Examiner during prosecution, nor was it disclosed in any IDS filed by the Applicant.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSITA”) pertinent to the ’359 Patent would have had at least 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. Ex. 1003, ¶22. A person with a different degree but with additional relevant experience could still qualify if the additional experience compensates for the different educational background. *Id.*

VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1

1. Overview of Ground 1

i. G.984.3

G.984.3 discloses a “Gigabit-capable Passive Optical Network[.]” Ex. 1005, cover. G.984.3 further discloses specific technical specifications related to “upstream dynamic bandwidth assignment,” “ONU activation,” and “forward error correction.” Ex. 1005, 1. In the recommendation, G.984.3 discloses that “[t]he upstream FEC function of the ONU can be activated/deactivated by the OpS system via the OLT.” *See, e.g.*, Ex. 1005, i, 36-38, 92-93, 99.

ii. Khermosh

Khermosh discloses a “method of performing forward error correction initialization and auto-negotiation in passive optical networks.” Ex. 1014, [0002]. A stated goal of Khermosh is to “employ FEC [only] when available and required” and thus avoid the “bit rate penalty” which occurs by “employ[ing] FEC when not required.” Ex. 1014, [0007]. To accomplish this goal, Khermosh teaches a method

to enable or disable FEC by “monitoring communications quality from the optical line terminal, thereby determining a figure of merit of the communications” where the “figure of merit is one of (i) bit error rate ...” Ex. 1014, [0012].

iii. Motivation to Combine

G.984.3 and Khhermosh are both directed to methods of managing upstream burst overhead parameters in passive optical network systems. Ex. 1005, i, 36-38, 92-93; Ex. 1014, [0002]; Ex. 1003, ¶¶69-76. A POSITA, therefore, when looking for ways to improve G.984.3 would naturally have looked to Khhermosh. For example, G.984.3—which is a recommendation promulgated by the ITU-T for GPON networks—describes “the transmission convergence layer for gigabit-capable passive optical networks [GPON]” where the “[t]he upstream FEC function of the ONU can be activated/deactivated by the OpS system via the OLT.” *See, e.g.*, Ex. 1005, i, 36-38, 92-93, 99; Ex. 1003, ¶¶69-76. And Khhermosh discloses a “method of managing forward error correction (FEC) initialization and auto-negotiation in ethernet passive optical networks [EPON].” Ex. 1014, abs.; Ex. 1003, ¶¶69-76.

G.984.3 does not, however, disclose the OLT or ONU determining the upstream burst overhead parameters based on the downlink quality – a well-known problem in the field and a problem that was specifically identified by Khhermosh. *See* Ex. 1014, [0007]-[0008]. A POSITA would have been motivated to modify the method of G.984.3 to implement Khhermosh’s teaching: specifically, where the

upstream burst overhead parameters are determined by the OLT or ONU based on the downlink quality. Ex. 1014, abs., [0002], [0011]-[0012]; Ex. 1003, ¶¶69-76.

A POSITA would have been motivated to combine G.984.3 and Khhermosh for several reasons:

First, both references disclose similar products, methods, and solutions. *See generally* Ex. 1005; Ex. 1014; Ex. 1003, ¶¶69-76. Moreover, both references are analogous art in the same field of endeavor as each other. *See generally* Ex. 1005; Ex. 1014; Ex. 1003, ¶¶69-76. For example, both relate to passive optical network systems and include discussions of methods and processes for managing upstream burst overhead parameters. *See generally* Ex. 1005; Ex. 1014; Ex. 1003, ¶¶69-76. Accordingly, a POSITA would have been aware of both references and, as discussed below, would have been motivated to combine the references. Ex. 1003, ¶¶69-76.

Second, Khhermosh describes a problem and solution for an issue in G.984.3. Khhermosh explains that traditional PON systems do not determine the upstream burst overhead parameters based on the downlink quality. Ex. 1014, [0007]-[0008]. This tends to be true of many PON systems, which have static upstream burst overhead parameters after initialization. Ex. 1003, ¶73. Khhermosh explains that, while “FEC improves network performance when communications are limited by bit errors” and is thus “desirable to employ FEC when available and required,” “it is not desirable to employ FEC when not required because of the bit rate penalty.” Ex.

1014, [0007]. Khhermosh further explains: due to this problem, there is “a widely recognized need for, and it would be highly advantageous to have a method of performing forward error correction initialization and auto-negotiation in passive optical networks.” Ex. 1014, [0008].

After identifying this well-known problem with G.984.3, Khhermosh provides methods for addressing this problem. In one method, Khhermosh discloses where the ONU detects the transmission quality of the downlink and then determines the upstream burst overhead parameters accordingly. Ex. 1014, [0027]. In another method, Khhermosh discloses where the OLT detects the transmission quality of the downlink and then determines the upstream burst overhead parameters accordingly. *See, e.g.*, Ex. 1014, [0021], [0024], Fig. 2. A POSITA, when looking at G.984.3 and Khhermosh, would have been motivated to implement Khhermosh’s auto-negotiation method to solve the problem of unnecessary use of FEC, thereby maximizing the bandwidth efficiency. Ex. 1003, ¶74.

Third, a POSITA would also have been motivated to combine G.984.3 with Khhermosh after reviewing the prior art, which discloses additional methods for determining the upstream burst overhead parameters based on the downlink quality. Ex. 1003, ¶75. As described above in § IV.B.4, managing upstream burst overhead parameters based on the link quality was well-known in the art. *Supra*, § IV.B.4; Ex. 1003, ¶75. For example, Wijngaarden ’380 discloses that “the FECs can effectively

measure the BER and protect the channels adaptively.” Ex. 1016, [0035]. Likewise, Wijngaarden ’381 discloses that “FEC coding can be made channel dependent so that channels with low error rates can use minimal protection.” Ex. 1012, abs., [0022]. And Lee discloses “controlling effective FEC of an ONU and an OLT ... based on optical link quality.” Ex. 1006, abs, [0029]-[0030]. As such, a POSTIA would have reasonably looked to well-known art, like Khermosh, to improve G.984.3. Ex. 1003, ¶75³.

Fourth, a POSITA would have had a reasonable expectation of success in adding Khermosh’s teaching of automatic negotiation and enablement of FEC with G.984.3 to produce expected results. Ex. 1003, ¶76. In fact, many of the expected results of the combination were stated goals and benefits in the references and, more generally, goals of POSITAs in the optical communications space. *See, e.g.*, Ex. 1014, abs. (noting that “it is not desirable to employ FEC when not required because of the bit rate penalty.”); *see also* Ex. 1003, ¶76.

While Khermosh specifically describes defects of traditional EPON systems, a POSITA would recognize that the differences between EPON (disclosed in

³ Wijngaarden ’380 and Wijngaarden ’381 are not part of the ground but are instead cited to demonstrate that it was well-known to determine the upstream burst overhead parameters based on the downlink quality.

Khermosh) and GPON (disclosed in G.984.3) systems are immaterial to the identified defects and would apply to all PON systems that did not adjust FEC based on BER. Ex. 1003, ¶77. For example, EPON and GPON both cover PON technology. Ex. 1026, 2. As such, “[b]oth EPON and GPON operate similarly since they are a type of PON.” *Id.* One difference, however, is the bandwidth. GPON is more efficient and offers greater bandwidth than EPON. *Id.* Notwithstanding, GPON systems, like EPON systems, need to make the most efficient usage of bandwidth to maximize data transfer capabilities. Accordingly, a POSITA, when looking to maximize the available bandwidth in a GPON system as taught in G.984.3, would have looked to the similar EPON technology for methods of improving bandwidth. Ex. 1003, ¶77. A POSITA, therefore, would have looked to Khermosh as it teaches that bandwidth can be maximized by selectively enabling FEC based on the downlink quality and would have implemented such teachings in a GPON system. Ex. 1003, ¶77.

2. Claim 1

i. [1.PRE] A method for managing upstream burst overhead parameters, comprising:

To the extent the preamble is limiting, the G.984.3-Khermosh combination discloses claim limitation [1.PRE]. Ex. 1003, ¶¶78-85. The '359 Patent identifies examples of upstream burst overhead parameters, including the guard band, preamble, delimiter, and state of forward error correction. Ex. 1001, 1:23-32.

G.984.3 discloses how OLTs and ONUs communicate and, more specifically, how upstream burst overhead parameters are managed. *See, e.g.*, Ex. 1005, 13-14, 36-39, 124-131. The upstream burst overhead parameters control the format of upstream messages. Ex. 1005, 13-14, 36-39, 124-131. As shown below, the upstream message includes a “burst mode overhead” and a “burst header”, in addition to the payload.

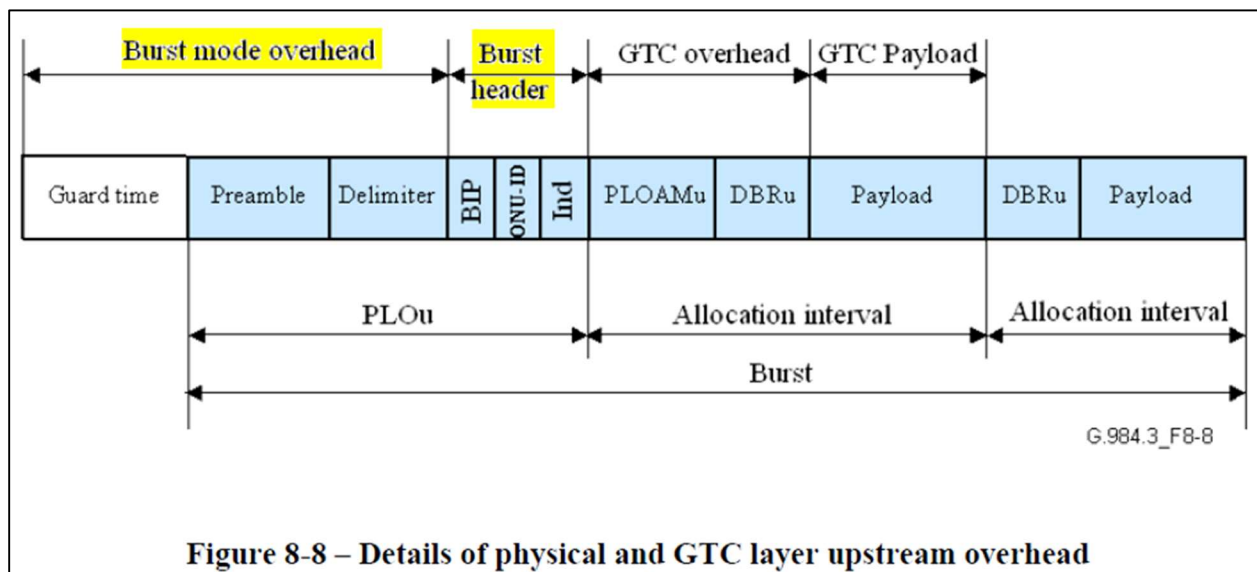


Figure 8-8 – Details of physical and GTC layer upstream overhead

Ex. 1005, 38 (annotated).

“The burst mode overhead is composed of guard time, preamble time and delimiter time.” Ex. 1005, 37. The “burst header” contains the “Ind” field. The format of the “Ind” field is shown below, and it includes the status of FEC.

Bit position	Function
7 (MSB)	Urgent PLOAMu waiting (1 = PLOAM waiting, 0 = no PLOAMs waiting)
6	FEC status (1 = FEC on, 0 = FEC off)
5	RDI status (1 = Defect, 0 = OK)
4	Reserved (Note)
3	Reserved (Note)
2	Reserved (Note)
1	Reserved (Note)
0 (LSB)	Reserved for future use
NOTE – Bits 1 through 4 shall be ignored by the OLT. They shall not be reassigned by vendors or standards organizations.	

Ex. 1005, 38-39 (annotated).

G.984.3 also discloses that upstream burst overhead parameters are controlled by the OLT and configured during initialization, and that multiple upstream burst overhead parameter sets can be sent to the ONU for future use. Ex. 1005, 109-110. Specifically, during an initialization state, “the ONU configures the overhead fields for the subsequent upstream transmissions using the Upstream_Overhead messages transmitted by the OLT.” Ex. 1005, 109-110. The structure of the Upstream_Overhead message is shown below.

Upstream_Overhead message			
Octet	Content	Description	Example value
1	11111111	Broadcast message to all ONUs.	
2	00000001	Message identification "Upstream_Overhead".	
3	gggggggg	Number of guard bits.	32 (G) (see Note 1)
4	xxxxxxx	Length of type 1 preamble bits.	8 (P1) (see Note 1)
5	yyyyyyyy	Length of type 2 preamble bits.	8 (P2) (see Note 1)
6	cccccccc	Pattern of type 3 preamble pattern.	AA
7	bbbbbbbbb	Pattern of byte 1 of delimiter.	0xAB
8	bbbbbbbbb	Pattern of byte 2 of delimiter.	0x59
9	bbbbbbbbb	Pattern of byte 3 of delimiter.	0x83
10	xxemsspp	xx – Reserved e – Status of pre-equalization mechanism m – Status of SN_Mask mechanism ss – Max number of extra SN-transmissions	0 (See Note 2)
11	dddddddd	MSB of pre-assigned delay.	0 (See Note 2)
12	dddddddd	LSB of pre-assigned delay.	0 (See Note 2)
General note – The values in this message, except for P1 and P2, are selected according to OLT parameters and preferences. NOTE 1 – Given that the total length of the burst overhead is L (L maximum value is 128 bytes), the values for G, P1, P2, P3 (number of type 3 preamble bytes) and D (delimiter length) must satisfy $G+P1+P2+P3+D=L$. The Extended_Burst_Length message may pre-empt the value of L by modifying the value of P3 (for both pre-ranged and ranged states). It is the responsibility of the OLT to ensure that the total length of the burst overhead is an integer number of bytes. NOTE 2 – It is assumed that the pre-assigned delay is not used and that the SN value is transmitted once by the ONUs. Note also that since the Serial_Number_Mask message has been deprecated, the m bit should always be set to 0.			

Ex. 1005, 109-110 (annotated). In addition, “[t]he OLT sets the desired ONU FEC encoding status (on/off).” Ex. 1005, 93. The upstream burst overhead parameters, therefore, “are formed as dictated by the OLT.” Ex. 1005, 38.

Moreover, Patent Owner’s infringement contentions confirm that G.984.3 satisfies this limitation. For example, Patent Owner cites to comparable portions of

G.9807.1⁴ in its infringement contentions to satisfy this limitation. *Compare* Ex. 1011, 6-8, *with* Ex. 1005, i, 30-40, 99-100, 109-111.

Khermosh also discloses how upstream burst overhead parameters are managed. Ex. 1003, ¶84. Specifically, Khermosh discloses “a method of managing forward error correction ... including the steps of ... monitoring communications quality from the optical line terminal, thereby determining a figure of merit of the communications” where the “figure of merit is one of (i) bit error rate ...” Ex. 1014, [0012]. A POSITA would have been motivated to combine Khermosh with G.984.3 to include determining the upstream burst overhead parameters based on downlink quality, as taught in Khermosh, with the G.984.3 specification for managing communications between OLTs and ONUs for the reasons previously stated. *See supra* Section VII.A.1.iii; *see also* Ex. 1003, ¶¶69-77, 85.

ii. [1.A] an optical line terminal or an optical network unit detecting transmission quality of a downlink between the optical line terminal and the optical network unit;

The G.984.3-Khermosh combination discloses claim limitation [1.A]. Ex. 1003, ¶¶86-92. G.984.3 discloses that “[a]larms and performance monitoring

⁴ G.9807.1 (the XGS-PON specification) contains many similar, if not identical, disclosures as G.984.3 (the G-PON specification) as the XGS-PON specification developed from the G-PON specification. Ex. 1003, ¶66; Ex. 1005; Ex. 1034.

encompasses mechanisms to detect link failure and monitor the health and performance of links.” Ex 1005, 83. G.984.3 further discloses that the ONU monitors the downlink quality by determining a number of alarms and performance characteristics, including downstream signal degradation. Ex. 1005, 87.

11.1.2 Items detected at ONU					
Type		Description			
		Detection conditions	Actions	Cancellation conditions	Actions
LOS	Loss of signal	No valid signal is received in the downstream.	Switch off laser. Generate Loss_of_phy_layer notification. Change state according to clause 10.	Valid optical signal.	Move to Standby state.
LOF	Loss of frame	When 5 consecutive invalid PSync from OLT are received.	Switch off laser. Generate Loss_of_phy_layer notification. Change state according to clause 10.	When 2 consecutive frames have correct PSync.	Move to Standby state.
SF	Signal failed	When the downstream BER becomes $\geq 10^{-Y}$, this state is entered. Y is configurable in the range of 5 to 8.	–	Set inactive when the downstream BER is $< 10^{-(Y+1)}$.	–
SD	Signal degraded	When the downstream BER becomes $\geq 10^{-X}$, this state is entered. X is configurable in the range of 6 to 9, but must be higher than Y.	–	Set inactive when the downstream BER is $< 10^{-(X+1)}$.	–
LCDG	Loss of GEM channel delineation	When GEM fragment delineation is lost according to clause 8.3.2 state machine.	Generate Loss_of_phy_layer notification.	When GEM delineation is achieved.	–

Ex. 1005, 87 (annotated). A POSITA would have understood that this limitation is satisfied when the ONU detects the downlink quality in a transmission from the OLT by measuring downstream signal degradation, which is determined by measuring the

bit error rate (BER) (*an ONU detecting transmission quality of a downlink between the OLT and the ONU*). Ex. 1003, ¶¶87-88.⁵ Moreover, Patent Owner's infringement contentions confirm that G.984.3 satisfies this limitation. For example, Patent Owner cites to comparable portions of G.9807.1⁶ in its infringement contentions to satisfy this limitation. *Compare* Ex. 1011, 8-10, *with* Ex. 1005, 83, 87 (both citing performance monitoring parameters).

The alarm and performance monitoring indicators used at the ONU are sent to the OLT via the ONU management and control interface (OMCI). Ex. 1005, 17-18, 100. The OLT, therefore, upon receipt of the alarm and performance monitoring indicators from the ONU, is able to detect the transmission quality of a downlink (*an OLT ... detecting transmission quality of a downlink between the OLT and the ONU*). Ex. 1003, ¶88. Moreover, Patent Owner's infringement contentions confirm that G.984.3 satisfies this limitation. For example, Patent Owner cites to comparable

⁵ The LOS (loss of signal) or LOF (loss of frame) are performance monitoring metrics that are used by the ONU to detect the downlink quality. Ex. 1005, 5, 68-70, 83-87; Ex. 1003, ¶159.

⁶ *See supra*, footnote 4.

portions of G.9807.1⁷ in its infringement contentions to satisfy this limitation.

Compare Ex. 1011, 9, *with* Ex. 1005, 17-18, 100 (both citing OMCI).

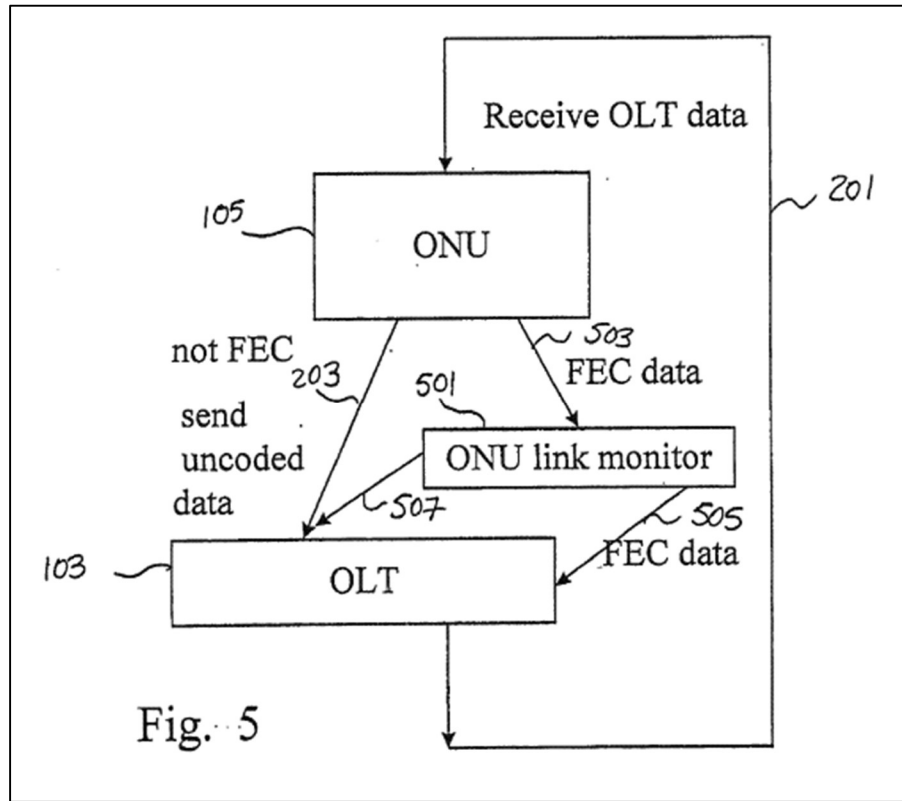
Khhermosh also discloses where the ONU detects that transmission quality of a downlink between the OLT and the ONU. For example, Khhermosh discloses that the “ONU 105 monitors the received data and determines a figure of merit for the communications from OLT 103.” Ex. 1014, [0027]. Khhermosh teaches that “the figure of merit is ... bit error rate.” Ex. 1014, [0012]. Khhermosh, therefore, discloses where the ONU monitors the downlink quality by determining a figure of merit based on the bit error rate (*an ONU detecting transmission quality of a downlink between the OLT and the ONU*). Ex. 1003, ¶91.

iii. [1.B] the optical line terminal or the optical network unit determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality; and

The G.984.3-Khhermosh combination discloses claim limitation [1.B]. Ex. 1003, ¶¶93-100. Khhermosh discloses that the ONU determines the upstream burst overhead parameters suitable for the ONU based on the downlink transmission quality. Ex. 1003, ¶¶96-97. For example, Figure 5 of Khhermosh (reproduced below)

⁷ See *supra*, footnote 4.

discloses where the ONU determines the upstream burst overhead parameters, including the state of FEC, based on the downlink transmission quality.



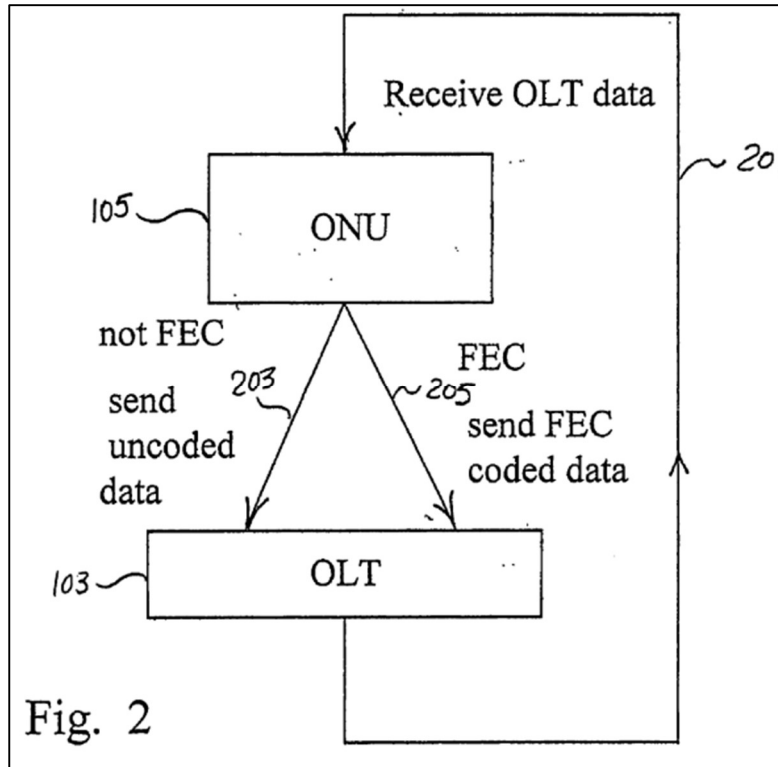
Ex. 1014, Fig. 5. In describing Figure 5, Khermosh explains:

FIG. 5 is a flow chart of an initialization and an auto-negotiation process, according to yet another embodiment of the present invention. ONU 105 receives data from OLT 103 (step 201). If the data received is non-FEC coded data, then ONU 105 responds with non-FEC coded data (step 203). **However, if the data received by ONU 105 is FEC coded data (step 503), then ONU 105 monitors the received data and determines a figure of merit for the communications from OLT 103. If the figure of merit is sufficient, then ONU 105 responds henceforth with non-FEC coded data (step 507). If the figure of merit is not sufficient, then ONU 105 responds henceforth with FEC coded data (step 505).**

Ex. 1014, [0027] (emphasis added).

When the ONU receives FEC coded data and then monitors the received data to determine a figure of merit for the communications from the OLT (*detecting downlink transmission quality*) and responds with FEC or non-FEC encoded data based on the figure of merit (*ONU determining the upstream burst overhead parameters suitable for the ONU according to the transmission quality*), this limitation is satisfied. Ex. 1003, ¶97. Moreover, Patent Owner's infringement contentions confirm that Khermosh satisfies this limitation. For example, Patent Owner cites to “dynamically activat[ing] or deactivat[ing] the FEC functionality for a given ONU in the upstream direction” in its infringement contentions to satisfy this limitation. *See* Ex. 1011, 11.

Khermosh also discloses where the OLT determines the upstream burst overhead parameters suitable for the ONU according to the transmission quality. Ex. 1003, ¶¶98-99. For example, Figure 2 of Khermosh (reproduced below) discloses where the OLT determines the upstream burst overhead parameters, including the state of FEC, based on the downlink transmission quality.



Ex. 1014, Fig. 2. In describing Figure 2, Khhermosh explains:

FIG. 2 is a flow chart of an initialization process, according to an embodiment of the present invention. ONU 105, capable of FEC coding, is added to an EPON 10. ONU 105 receives data from OLT 103 of EPON 10. ***If the data received from OLT 103 is FEC coded, then ONU 105 sends coded data (step 205) to OLT 103. If the data received from OLT 103 is not FEC coded, then ONU 105 sends uncoded data (step 203) to OLT 103.***

Ex. 1014, [0024] (emphasis added).

As explained in claim [1.A], Khhermosh discloses where the OLT detects the downlink transmission quality. And, as shown above in Figure 2 and paragraph [0024], Khhermosh also discloses where the OLT tells the ONU whether to send upstream messages with FEC enabled or disabled. Khhermosh also explains that “FEC coding is implemented when appropriate to improve the quality of the

communications.” Ex. 1014, [0021]. The OLT, therefore, determines the upstream burst overhead parameters (*e.g.*, FEC on or off) suitable for the ONU according to the transmission quality. Moreover, Patent Owner’s infringement contentions confirm that Khhermosh satisfies this limitation. For example, Patent Owner cites to the “OLT dynamically activat[ing] or deactivat[ing] the FEC functionality for a given ONU in the upstream direction” in its infringement contentions to satisfy this limitation. *See* Ex. 1011, 11.

iv. [1.C] the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit after switching time determined by the optical network unit itself or indicated by the optical line terminal;

The G.984.3-Khhermosh combination discloses claim limitation [1.C]. Ex. 1003, ¶¶101-10. G.984.3 discloses that “the ONU configures the overhead fields for the subsequent upstream transmissions using the Upstream_Overhead messages transmitted by the OLT.” Ex. 1005, 109-10. As explained in claim limitation [1.PRE], the Upstream_Overhead messages include information on the upstream burst overhead parameters, including the state of FEC, that the ONU should use. G.984.3 further discloses that the ONU receives the upstream burst overhead parameters via the Upstream_Overhead message, configures the upstream burst overhead parameters, and waits for a minimum response time before sending an upstream message using the upstream burst overhead parameters. Ex. 1005, 69. The

POSITA would have understood that a minimum response time is an example of switching time. Ex. 1003, ¶103. The switching time is shown below.

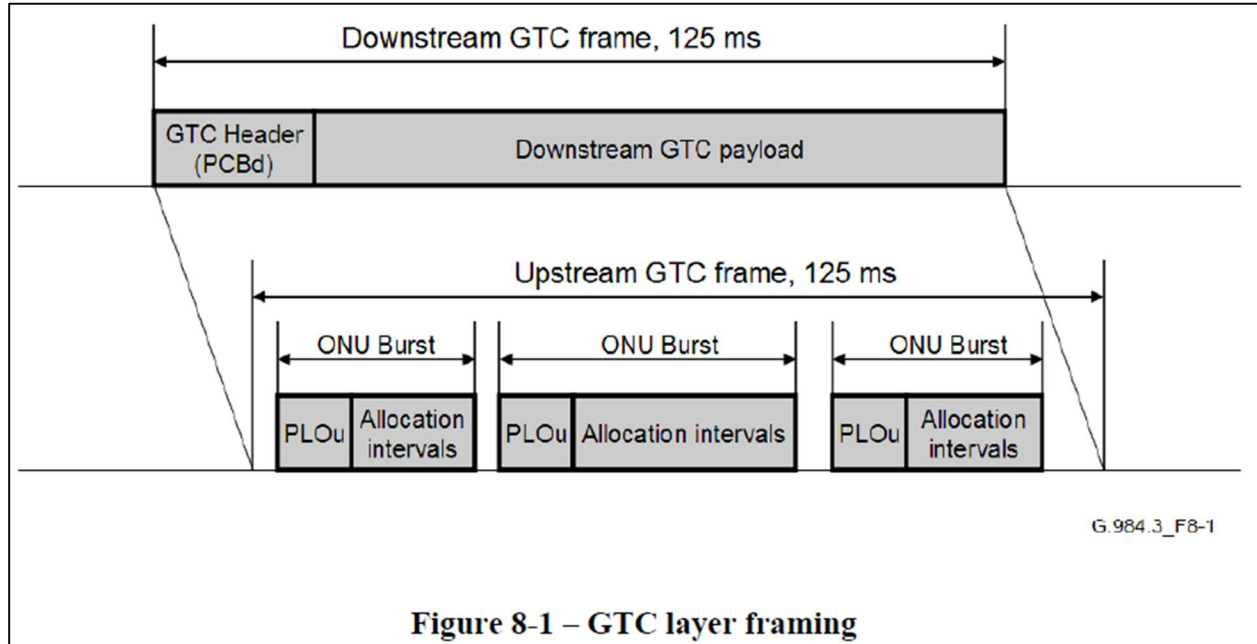
Table 10-1 – ONU activation states functional transitions

Event	States of the ONU						
	Init (O1)	Standby (O2)	Serial Number (O3)	Ranging (O4)	Operation (O5)	POPUP (O6)	Emergency Stop (O7)
ONU power up was last operational state (before power-down) O7?: => O7 else: => O1	–	–	–	–	–	–	–
ONU achieves PSync synchronization	The ONU clears LOS and LOF, then: => O2	–	–	–	–	–	–
The ONU receives the upstream overhead parameters (PLOAMd = Upstream_Overhead)	–	The ONU configures its transmit parameters with the received values; starts timer TO1 then: => O3	–	–	–	–	–
The ONU receives the extended burst parameters (PLOAMd = Extended_Burst_Length)	–	–	If no serial number request has been received, the ONU configures its type 3 preamble length with the received values; otherwise, no action.	–	–	–	–
The ONU receives a serial number request (BW allocation structure with Alloc-ID = 254 PLOAMu = '1')	–	–	The ONU waits for minimum response time, plus pre-assigned delay, plus random delay before responding with a Serial_Number_ONU message.	–	–	–	–

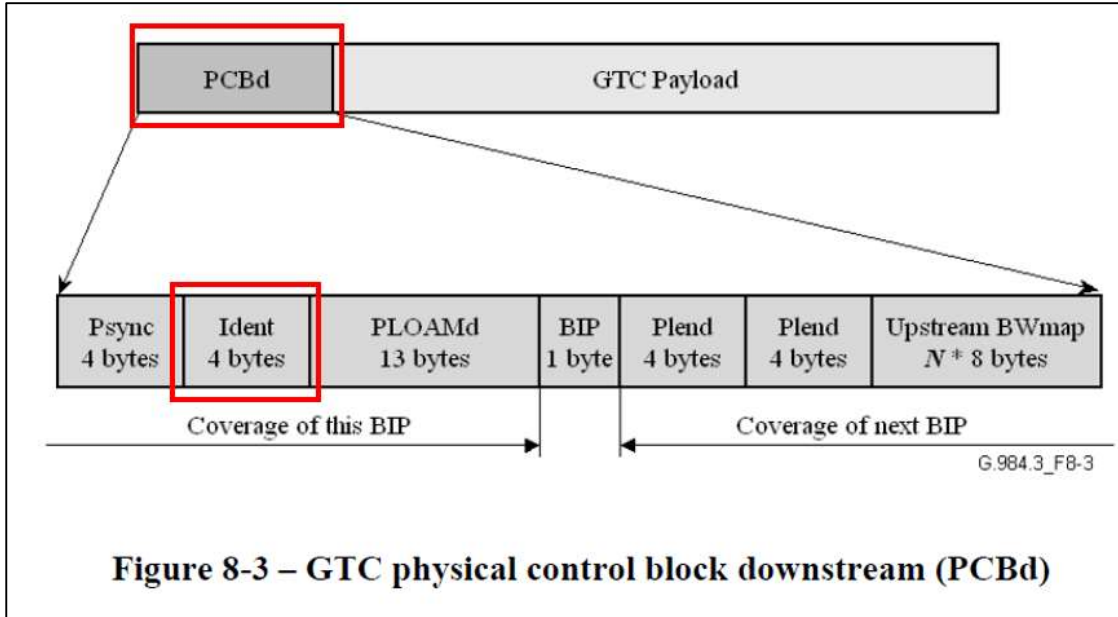
Ex. 1005, 69 (annotated and excerpted).

Another example of a switching time is the superframe counter. Ex. 1003, ¶¶106-09; *see also* Claims 5, 8, 11. For example, G.984.3 discloses that the OLT sends a downstream frame to the ONU that includes a GTC Header (PCBd) and GTC

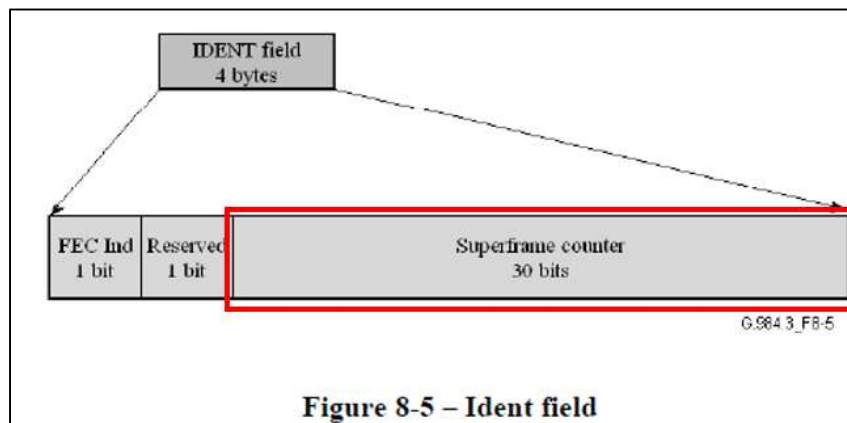
payload. “The downstream GTC frame provides the common time reference for the PON and the common control signalling for the upstream.” Ex. 1005, 30.



Ex. 1005, 30. “The OLT sends the PCBd in a broadcast manner, and every ONU receives the entire PCBd. The ONUs then act upon the relevant information contained therein.” Ex. 1005, 31. The PCBd includes an “Ident” field, shown below.



Ex. 1005, 31 (annotated). The Ident field includes a “Superframe counter” (shown below), which the ONU compares to its own local superframe counter to ensure correct synchronization. Ex. 1005, 31-33.



Ex. 1005, 33 (annotated).

The '359 Patent itself, and Patent Owner’s infringement contentions, confirm the “Superframe counter” covers the switching time limitation. For example, the '359 Patent explains, in one example, that the claimed “switching time” is indicated

“to the ONU according to the following manner: notifying a *hyper frame number* to the ONU, so that the ONU starts to use the upstream burst overhead parameters after a frame indicated by the hyper frame number arrives.” Ex. 1001, 6:41-46 (emphasis added), cl. 5. And Patent Owner’s infringement contentions confirm the superframe counter in G.984.3 is the hyper frame number. Ex. 1011, 30 (“The superframe counter is the claimed hyper frame number.”).

Moreover, the concept of a switching time was well-known to a POSITA because it is necessary for ONUs to send upstream messages only in their allocated time slot, otherwise upstream messages from ONUs would collide. Ex. 1003, ¶104. Therefore, a POSITA would have readily understood that there must be a non-zero period of time (*switching time*) between receipt by the ONU of the upstream burst overhead parameters and use of the parameters in future transmissions to allow the ONU to (1) receive the message with the upstream burst overhead parameters, (2) interpret the message, (3) implement the new parameters, and (4) send an upstream transmission at the correct time. Ex. 1003, ¶105.

v. [1.D] wherein, before the step of the optical line terminal or the optical network unit detecting the transmission quality of the downlink between the optical line terminal and the optical network unit, the method further comprises:

The G.984.3-Khermosh combination discloses claim limitation [1.D]. Ex. 1003, ¶¶111-13. Claim limitation [1.D] requires that claim limitations [1.E], [1.F],

and [1.G] occur before claim limitation [1.A]. Claim limitation [1.D], therefore, is disclosed by the G.984.3-Khermosh combination for the same reasons as previously explained in regard to claim limitation [1.A] and as will be explained for claim limitations [1.E], [1.F], and [1.G], each of which is incorporated by reference. *See supra*, claim limitation [1.A]; *see also infra*, claim limitations [1.E], [1.F], and [1.G].

vi. [1.E] the optical line terminal determining and identifying N kinds of upstream burst overhead parameter sets according to different levels of link quality, wherein N is an integer and is larger than zero; and

The G.984.3-Khermosh combination discloses claim limitation [1.E]. Ex. 1003, ¶¶114-19. G.984.3 discloses where the OLT determines and identifies N (one or more) kinds of upstream burst overhead parameter sets before claim limitation [1.A]. Ex. 1003, ¶115. As previously explained in claim limitations [1.PRE]-[1.C], G.984.3 discloses, during initialization, that the OLT determines and identifies upstream burst overhead parameter sets for the ONU and then sends the upstream burst overhead parameter sets to the ONU via the Upstream_Overhead message. Ex. 1005, 38, 69, 109-110. Thereafter, “the ONU configures the overhead fields for the subsequent upstream transmissions using the Upstream_Overhead messages transmitted by the OLT. The following table shows the structure of the message, with ranges and typical values for the different fields.” Ex. 1005, 109-110.

Upstream_Overhead message			
Octet	Content	Description	Example value
1	11111111	Broadcast message to all ONUs.	
2	00000001	Message identification "Upstream_Overhead".	
3	gggggggg	Number of guard bits.	32 (G) (see Note 1)
4	xxxxxxx	Length of type 1 preamble bits.	8 (P1) (see Note 1)
5	yyyyyyyy	Length of type 2 preamble bits.	8 (P2) (see Note 1)
6	cccccccc	Pattern of type 3 preamble pattern.	AA
7	bbbbbb	Pattern of byte 1 of delimiter.	0xAB 0x59 0x83
8	bbbbbb	Pattern of byte 2 of delimiter.	
9	bbbbbb	Pattern of byte 3 of delimiter.	
10	xxemsspp	xx – Reserved e – Status of pre-equalization mechanism m – Status of SN_Mask mechanism ss – Max number of extra SN-transmissions	0 (See Note 2)
11	ddddddd	MSB of pre-assigned delay.	0 (See Note 2)
12	ddddddd	LSB of pre-assigned delay.	0 (See Note 2)
General note – The values in this message, except for P1 and P2, are selected according to OLT parameters and preferences. NOTE 1 – Given that the total length of the burst overhead is L (L maximum value is 128 bytes), the values for G, P1, P2, P3 (number of type 3 preamble bytes) and D (delimiter length) must satisfy $G+P1+P2+P3+D=L$. The Extended_Burst_Length message may pre-empt the value of L by modifying the value of P3 (for both pre-ranged and ranged states). It is the responsibility of the OLT to ensure that the total length of the burst overhead is an integer number of bytes. NOTE 2 – It is assumed that the pre-assigned delay is not used and that the SN value is transmitted once by the ONUs. Note also that since the Serial_Number_Mask message has been deprecated, the m bit should always be set to 0.			

Ex. 1005, 109-110. The upstream burst overhead parameter sets include the state of FEC (on or off). Ex. 1005, 93.

The parameter sets in the Upstream_Overhead message “are formed as dictated by the OLT” and “are selected according to OLT parameters and preferences.” Ex. 1005, 38, 110. Moreover, the OLT determines and identifies the upstream burst overhead parameter sets before claim limitation [1.A] because the

Upstream_Overhead message is sent before the ONU sends any upstream communications, including upstream communications with information on the downlink quality. Ex. 1003, ¶116.

Khhermosh also discloses where the OLT determines and identifies N (one or more) kinds of upstream burst overhead parameter sets before claim limitation [1.A]. Ex. 1003, ¶117. Khhermosh, however, also teaches that the OLT determines and identifies N kinds of upstream burst overhead parameter sets according to different levels of link quality. Ex. 1003, ¶117. For example, Khhermosh discloses that the OLT “automatically initializes each ONU and registers each ONU according to FEC coding capability of the ONU and the communications quality to and from the ONU. FEC coding is implemented when appropriate to improve the quality of the communications.” Ex. 1014, [0021]. As taught in G.984.3, during initialization, the OLT determines and identifies upstream burst overhead parameter sets and then sends the upstream burst overhead parameter sets to the ONU. Ex. 1005, 38, 92-93, 109-10. Khhermosh, like G.984.3, discloses that the upstream burst overhead parameter sets include the status of FEC (on or off). Ex. 1014, [0021]. Moreover, the OLT determines and identifies the upstream burst overhead parameter sets before claim limitation [1.A] because the upstream burst overhead parameter sets are sent before the ONU sends any upstream communications, including upstream communications with information on the downlink quality. Ex. 1003, ¶118.

vii.[1.F] the optical line terminal sending a parameter value or an identification of one default upstream burst overhead parameter set to the optical network unit; and the optical network unit receiving the parameter value or the identification of the upstream burst overhead parameter set in a waiting state and using the upstream burst overhead parameter set; or,

Claim limitation [1.F] is not a required limitation as only one of claim limitation [1.F] *or* [1.G] is required and, for the reasons discussed *infra*, the G.984.3-Khermosh combination discloses claim limitation [1.G]. Regardless, the G.984.3-Khermosh combination also discloses claim limitation [1.F]. Ex. 1003, ¶¶120-27.

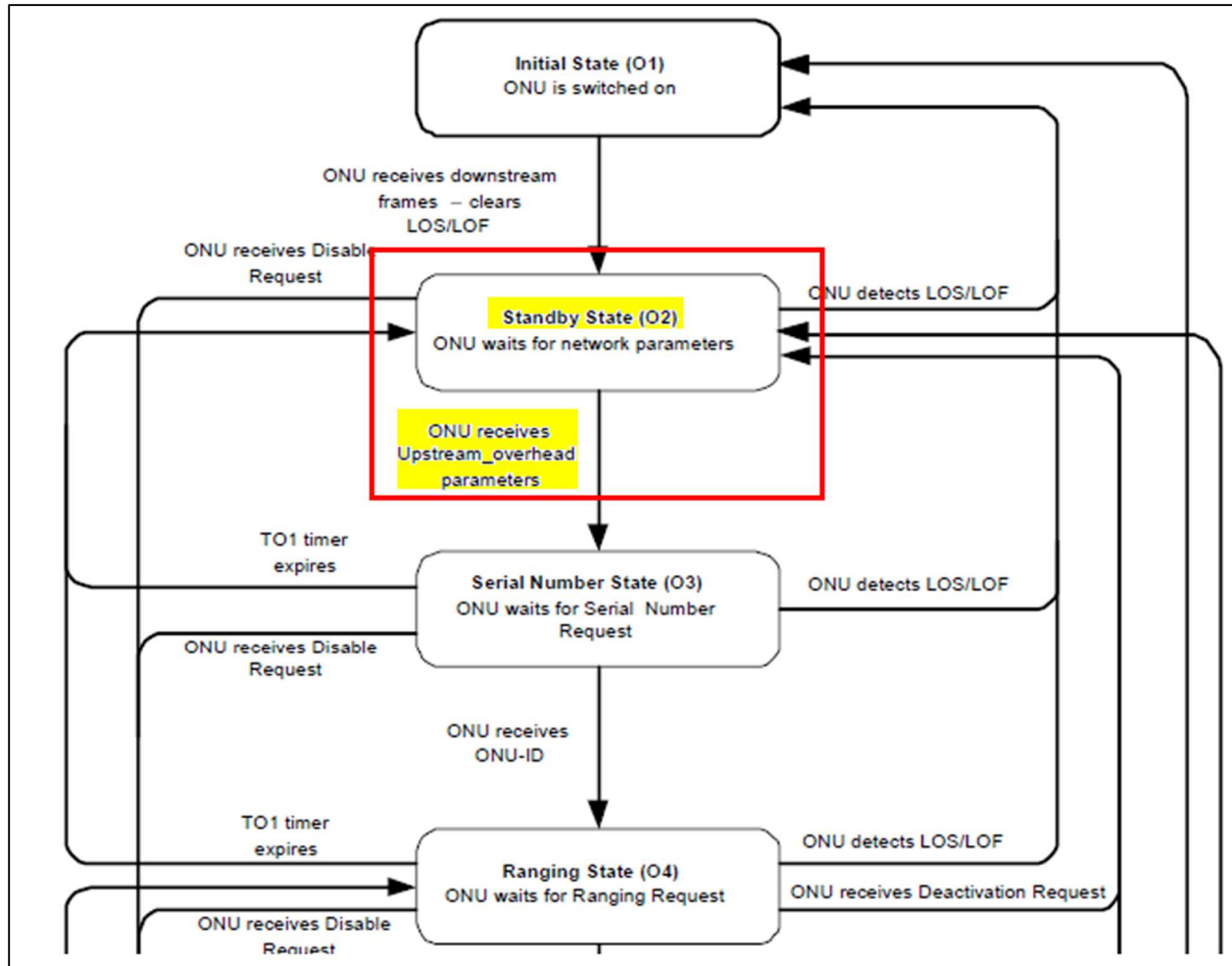
G.984.3 discloses that, during initialization, the OLT determines and identifies upstream burst overhead parameter sets for the ONU and then sends the upstream burst overhead parameter sets to the ONU via the Upstream_Overhead message. Ex. 1005, 38, 69, 109-110. The upstream burst overhead parameter sets in the Upstream_Overhead message include parameter values (each of which satisfy the claimed “a parameter value”) for the upstream burst overhead parameters in the set. Ex. 1005, 109-110. Thereafter, “the ONU configures the overhead fields for the subsequent upstream transmissions using the Upstream_Overhead messages transmitted by the OLT. The following table shows the structure of the message, with ranges and typical values for the different fields.” Ex. 1005, 109-110.

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4	xxxxxxx	Length of type 1 preamble bits.	8 (P1) (see Note 1)
5	yyyyyyyy	Length of type 2 preamble bits.	8 (P2) (see Note 1)
6	cccccccc	Pattern of type 3 preamble pattern.	AA
7	bbbbbbbb	Pattern of byte 1 of delimiter.	0xAB
8	bbbbbbbb	Pattern of byte 2 of delimiter.	0x59
9	bbbbbbbb	Pattern of byte 3 of delimiter.	0x83
10	xxemsspp	xx – Reserved e – Status of pre-equalization mechanism m – Status of SN_Mask mechanism ss – Max number of extra SN-transmissions	0 (See Note 2)
11	dddddddd	MSB of pre-assigned delay.	0 (See Note 2)
12	dddddddd	LSB of pre-assigned delay.	0 (See Note 2)
General note – The values in this message, except for P1 and P2, are selected according to OLT parameters and preferences. NOTE 1 – Given that the total length of the burst overhead is L (L maximum value is 128 bytes), the values for G, P1, P2, P3 (number of type 3 preamble bytes) and D (delimiter length) must satisfy $G+P1+P2+P3+D=L$. The Extended_Burst_Length message may pre-empt the value of L by modifying the value of P3 (for both pre-ranged and ranged states). It is the responsibility of the OLT to ensure that the total length of the burst overhead is an integer number of bytes. NOTE 2 – It is assumed that the pre-assigned delay is not used and that the SN value is transmitted once by the ONUs. Note also that since the Serial_Number_Mask message has been deprecated, the m bit should always be set to 0.			

Ex. 1005, 109-110. The parameter values include the state of FEC (on or off). Ex. 1005, 93. The parameter values in the Upstream_Overhead message “are formed as dictated by the OLT” and “are selected according to OLT parameters and preferences.” Ex. 1005, 38, 110.

G.984.3 also discloses that the ONU receives the parameter values in a waiting state. Ex. 1003, ¶123. For example, G.984.3 discloses that “[d]uring the parameter

learning phase, the ONU, *while remaining passive*, acquires the operating parameters to be used in the upstream transmission.” Ex. 1005, 64 (emphasis added). G.984.3 further discloses a “*standby state (O2)*” whereby “[d]ownstream traffic is received by the ONU. The ONU waits for global network parameters. Once the Upstream_Overhead message is received, the ONU configures these parameters (e.g., delimiter value, power level mode and pre-assigned delay) and moves to the Serial Number state (O3).” Ex. 1005, 66.



Ex. 1005, 68 (annotated).

As shown above, the ONU receives the Upstream_Overhead message with the parameter values in the “Standby State (O2).” The ’359 Patent confirms the “Standby State (O2)” is the claimed “waiting state.” For example, the ’359 Patent discloses that “the ONU receives the parameter value or the identification of the upstream burst overhead parameter set in *a waiting state (i.e., O2 state)*.” Ex. 1001, 7:49-52 (emphasis added).

G.984.3 further discloses that the ONU uses the upstream burst overhead parameter set based on the received values in the Upstream_Overhead message. For example, G.984.3 discloses that the “ONU waits for the Upstream_Overhead PLOAM message ... issued by the OLT,” the “ONU receives the PON operating parameters (the lengths and patterns of the burst mode overhead components...) through the Upstream_Overhead ... messages,” and the “ONU announces its presence on the PON by responding to a broadcast serial number request periodically issued by the OLT.” Ex. 1005, 64-65. By responding to the broadcast serial number request, the ONU uses the upstream burst overhead parameter set to send an upstream transmission to the OLT. Ex. 1003, ¶125.

Moreover, the OLT sends a parameter value to the ONU and the ONU receives the parameter value in a waiting state and uses the upstream burst overhead parameter set before claim limitation [1.A] because the Upstream_Overhead message is received and used to respond to a serial number request message to set

up the ONU-ID before the ONU sends upstream communications, via the OMCI, with information on the downlink quality. Ex. 1005, 10-11, 17-18, 100-12; Ex. 1003, ¶126.

viii. [1.G] the optical line terminal sending parameter values or identifications of more than one upstream burst overhead parameter set to the optical network unit; and the optical network unit receiving the parameter values or the identifications of the upstream burst overhead parameter sets in a waiting state and using one of the received upstream burst overhead parameter sets.

Claim limitation [1.G] is not a required limitation as only one of claim limitation [1.F] *or* [1.G] is required and, for the reasons discussed *supra*, the G.984.3-Khermosh combination discloses claim limitation [1.F]. Regardless, the G.984.3-Khermosh combination also discloses claim limitation [1.G]. Ex. 1003, ¶¶128-35.

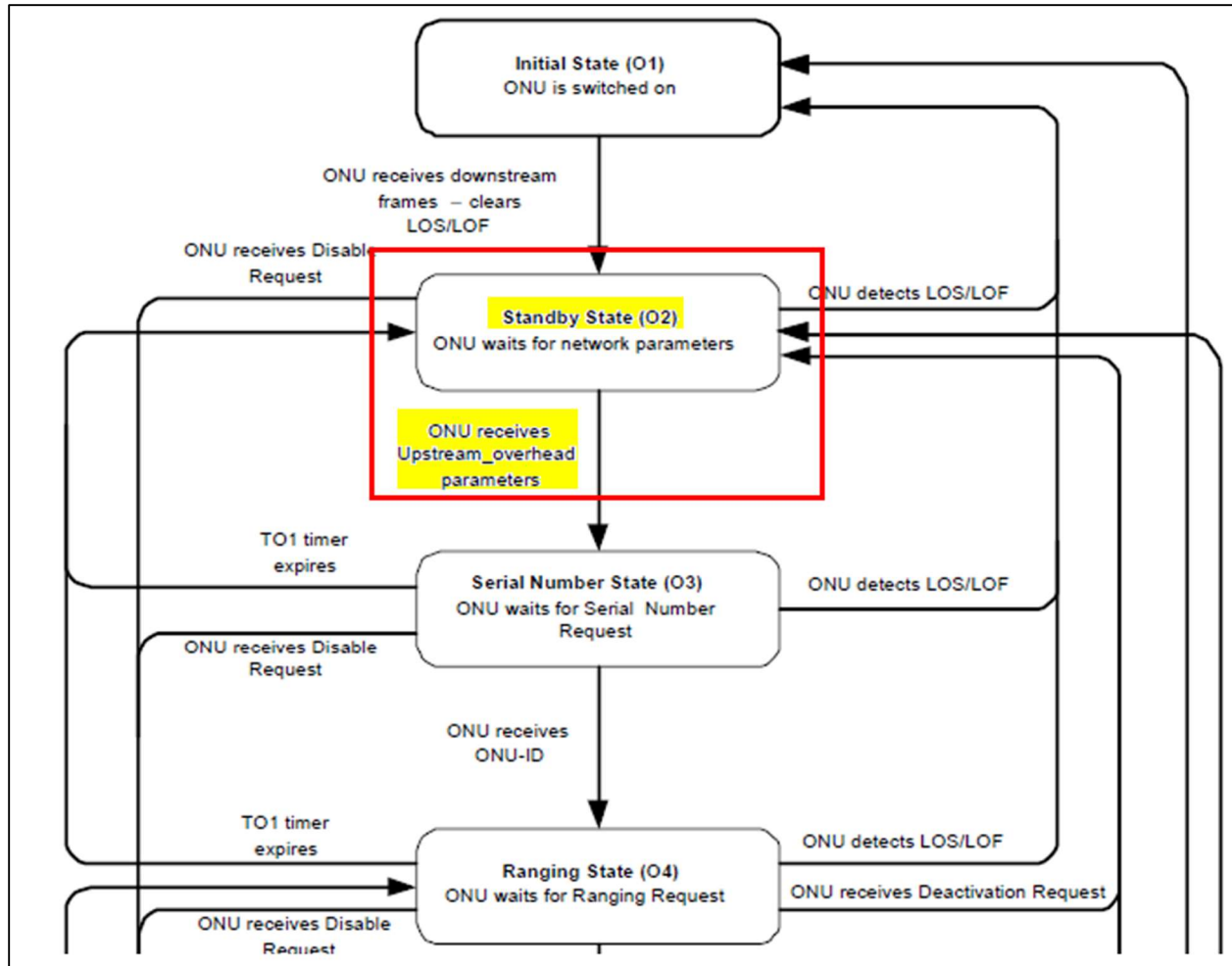
G.984.3 discloses that, during initialization, the OLT determines and identifies upstream burst overhead parameter sets for the ONU and then sends parameter values or identifications of upstream burst overhead parameter sets to the ONU via the Upstream_Overhead message. Ex. 1005, 38, 69, 109-110. The upstream burst overhead parameter sets in the Upstream_Overhead message include parameter values for the upstream burst overhead parameters in the set. Ex. 1005, 109-110. Thereafter, “the ONU configures the overhead fields for the subsequent upstream transmissions using the Upstream_Overhead messages transmitted by the

OLT. The following table shows the structure of the message, with ranges and typical values for the different fields.” Ex. 1005, 109-110.

Upstream_Overhead message			
Octet	Content	Description	Example value
1	11111111	Broadcast message to all ONUs.	
2	00000001	Message identification "Upstream_Overhead".	
3	ggggggggg	Number of guard bits.	32 (G) (see Note 1)
4	xxxxxxx	Length of type 1 preamble bits.	8 (P1) (see Note 1)
5	yyyyyyyyy	Length of type 2 preamble bits.	8 (P2) (see Note 1)
6	cccccccc	Pattern of type 3 preamble pattern.	AA
7	bbbbbbbbb	Pattern of byte 1 of delimiter.	0xAB 0x59 0x83
8	bbbbbbbbb	Pattern of byte 2 of delimiter.	
9	bbbbbbbbb	Pattern of byte 3 of delimiter.	
10	xxemsspp	xx – Reserved e – Status of pre-equalization mechanism m – Status of SN_Mask mechanism ss – Max number of extra SN-transmissions	0 (See Note 2)
11	ddddddddd	MSB of pre-assigned delay.	0 (See Note 2)
12	ddddddddd	LSB of pre-assigned delay.	0 (See Note 2)
General note – The values in this message, except for P1 and P2, are selected according to OLT parameters and preferences. NOTE 1 – Given that the total length of the burst overhead is L (L maximum value is 128 bytes), the values for G, P1, P2, P3 (number of type 3 preamble bytes) and D (delimiter length) must satisfy $G+P1+P2+P3+D=L$. The Extended_Burst_Length message may pre-empt the value of L by modifying the value of P3 (for both pre-ranged and ranged states). It is the responsibility of the OLT to ensure that the total length of the burst overhead is an integer number of bytes. NOTE 2 – It is assumed that the pre-assigned delay is not used and that the SN value is transmitted once by the ONUs. Note also that since the Serial_Number_Mask message has been deprecated, the m bit should always be set to 0.			

Ex. 1005, 109-110. The parameter values include the state of FEC (on or off). Ex. 1005, 93. The parameter values in the Upstream_Overhead message “are formed as dictated by the OLT” and “are selected according to OLT parameters and preferences.” Ex. 1005, 38, 110.

G.984.3 also discloses that the ONU receives the parameter values in a waiting state. Ex. 1003, ¶131. For example, G.984.3 discloses that “[d]uring the parameter learning phase, the ONU, *while remaining passive*, acquires the operating parameters to be used in the upstream transmission.” Ex. 1005, 64 (emphasis added). G.984.3 further discloses a “*standby state (O2)*” whereby “[d]ownstream traffic is received by the ONU. The ONU waits for global network parameters. Once the Upstream_Overhead message is received, the ONU configures these parameters (e.g., delimiter value, power level mode and pre-assigned delay) and moves to the Serial Number state (O3).” Ex. 1005, 66.



Ex. 1005, 68 (annotated).

As shown above, the ONU receives the Upstream_Overhead message with the parameter values or identifications of more than one upstream burst overhead parameter sets in the “Standby State (O2).” The ’359 Patent confirms the “Standby State (O2)” is the claimed “waiting state.” For example, the ’359 Patent discloses that “the ONU receives the parameter value or the identification of the upstream burst overhead parameter set in *a waiting state (i.e., O2 state)*.” Ex. 1001, 7:49-52 (emphasis added).

G.984.3 further discloses that the ONU uses one of the upstream burst overhead parameter sets based on the received values in the Upstream_Overhead message. For example, G.984.3 discloses that the “ONU waits for the Upstream_Overhead PLOAM message ... issued by the OLT,” the “ONU receives the PON operating parameters (the lengths and patterns of the burst mode overhead components...) through the Upstream_Overhead ... messages,” and the “ONU announces its presence on the PON by responding to a broadcast serial number request periodically issued by the OLT.” Ex. 1005, 64-65. By responding to the broadcast serial number request, the ONU uses one of the upstream burst overhead parameter sets to send an upstream transmission to the OLT. Ex. 1003, ¶133.

Moreover, the OLT sends parameter values or identifications of more than one upstream burst overhead parameter set to the ONU and the ONU receives the parameter values or identifications of the upstream burst overhead parameter sets in a waiting state and uses one of the upstream burst overhead parameter sets before claim limitation [1.A] because the Upstream_Overhead message is received and used to respond to a serial number request message to set up the ONU-ID before the ONU sends upstream communications, via the OMCI, with information on the downlink quality. Ex. 1005, 10-11, 17-18, 100-12; Ex. 1003, ¶126.

3. **Claim 2**

i. [2.PRE] The method of claim 1, wherein:

To the extent the preamble is limiting, the G.984.3-Khermosh combination discloses claim [2.PRE] for the reasons described in claim 1.

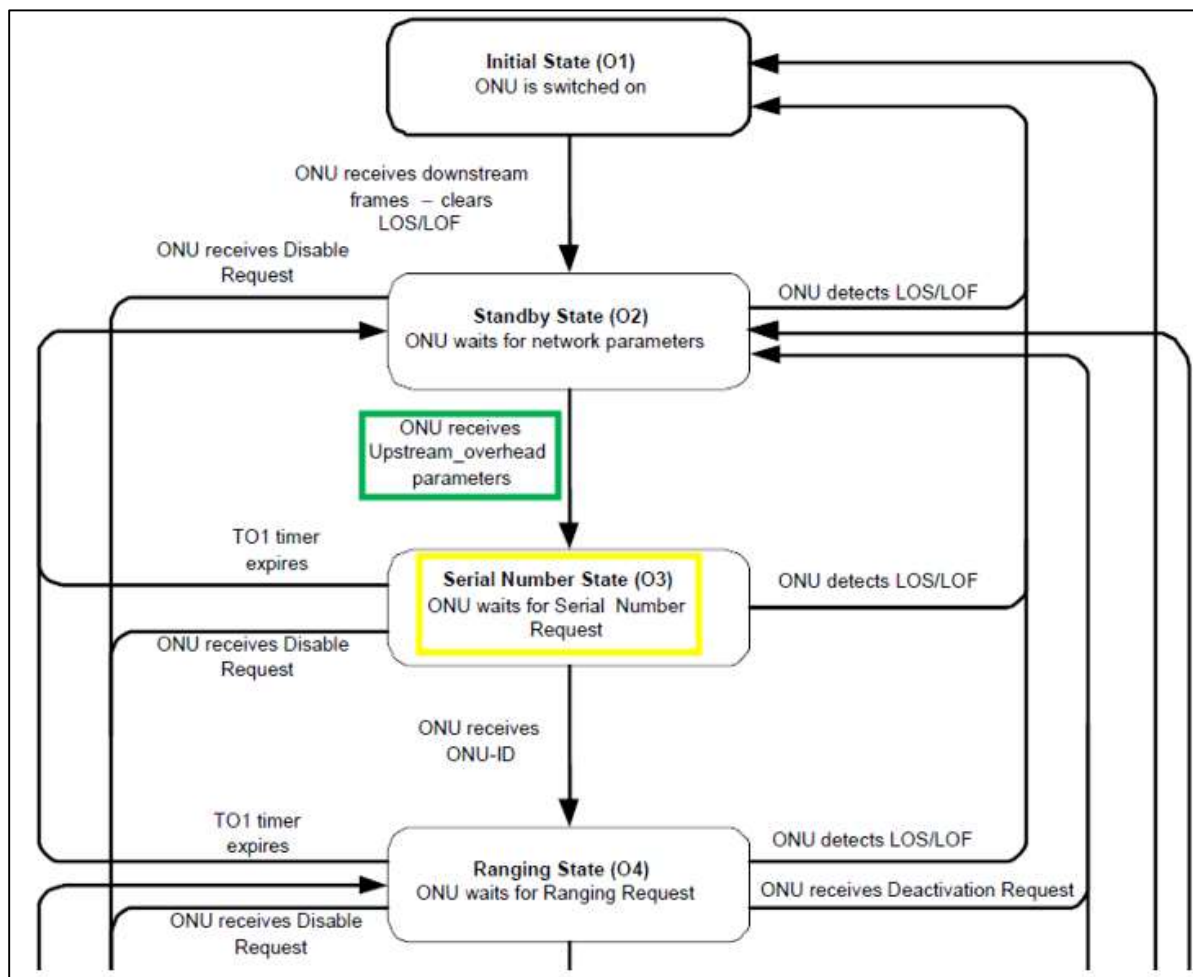
ii. [2.A] after the step of the optical network unit receiving the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s), the method further comprises: the optical network unit entering into a serial number state;

The G.984.3-Khermosh combination discloses claim limitation [2.A]. Ex. 1003, ¶¶137-40.

The G.984.3-Khermosh combination discloses “*the step of the optical network unit receiving the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s)*” for the same reasons as described in claim limitations [1.F] and [1.G], which are incorporated by reference in their entirety.

G.984.3 also discloses that, **after** the ONU receives the parameter values(s) or the identification(s) of the upstream burst overhead parameter set(s), the ONU enters into a serial number state. For example, G.984.3 discloses that the “ONU receives the PON operating parameters (the lengths and patterns of the burst mode overhead components ...) through the Upstream_Overhead” message and then “announces its presence on the PON by responding to a broadcast serial number request periodically issued by the OLT.” Ex. 1005, 64-65. G.984.3 further discloses that the ONU

receives the upstream burst overhead parameters from the Upstream_Overhead message in the standby state (O2), and then moves to the serial number state (O3), where it responds to the serial number requests sent by the OLT. Ex. 1005, 66. The figures below from G.984.3 show that the ONU enters the serial number state (yellow box) after receiving the upstream burst overhead parameters (green box) in the standby state. Ex. 1003, ¶139.



Ex. 1005, 68 (annotated and excerpted).

Event	States of the ONU						
	Init (O1)	Standby (O2)	Serial Number (O3)	Ranging (O4)	Operation (O5)	POPUP (O6)	Emergency Stop (O7)
ONU power up was last operational state (before power-down) O7?: => O7 else: => O1	—	—	—	—	—	—	—
ONU achieves PSync synchronization	The ONU clears LOS and LOF, then: => O2	—	—	—	—	—	—
The ONU receives the upstream overhead parameters (PLOAMd = Upstream_Overhead)	—	The ONU configures its transmit parameters with the received values; starts timer TO1 then: => O3	—	—	—	—	—
The ONU receives the extended burst parameters (PLOAMd = Extended_Burst_Length)	—	—	If no serial number request has been received, the ONU configures its type 3 preamble length with the received values; otherwise, no action.	—	—	—	—

Ex. 1005, 69 (annotated and excerpted).

iii. [2.B] the step of the optical line terminal detecting the transmission quality of the downlink between the optical line terminal and the optical network unit comprises: in the serial number state of the optical network unit, the optical line terminal detecting the downlink between the optical network unit and the optical line terminal to acquire quality information of the downlink;

The G.984.3-Khermash combination discloses claim limitation [2.B]. Ex. 1003, ¶¶141-44.

The G.984.3-Khermosh combination discloses “*the step of the optical line terminal detecting the transmission quality of the downlink between the optical line terminal and the optical network*” for the same reasons as described in claim limitation [1.A], which is incorporated by reference herein.

G.984.3 discloses that, in the serial number state, “there are four message types that are exchanged between the OLT and ONU”: (1) the Extended_Burst_Length PLOAM message, (2) the serial number request message, (3) the serial number response message, and (4) the Assign_ONU-ID message. Ex. 1005, 110-12. As a result of this process, the OLT detects the downlink between the ONU and the OLT to acquire quality information of the downlink.

For example, after the ONU receives a serial number request message from the OLT, the ONU responds with a serial number response message (Serial_Number_ONU message). Ex. 1005, 112. Upon receipt of the serial number response message, “the OLT associates available ONU-ID values with the received serial numbers and assigns them to ONUs using the Assign_ONU-ID message.” Ex. 1005, 112. As a result, the OLT has now detected a downlink between itself and the ONU and has set up an ONU management and control interface (OMCI) between the ONU and OLT, such that an ONU management and control channel (OMCC) is established. Ex. 1005, 10-11, 17-18, 100. Once established, the ONU sends the

performance monitoring metrics to the OLT, thereby allowing the OLT to detect the downlink quality information. Ex. 1005, 17-18, 100.

Moreover, Patent Owner's infringement contentions confirm that G.984.3 satisfies this limitation. Patent Owner admits that this limitation is satisfied "[o]nce the OMCC has been established" because "the ONU can provide performance information to the OLT." Ex. 1011, 19-21.

iv. [2.C] the step of the optical line terminal determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality comprises: the optical line terminal determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink, and notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical network unit via a unicast message or a broadcast message.

The G.984.3-Khermosh combination discloses claim limitation [2.C]. Ex. 1003, ¶¶145-51.

The G.984.3-Khermosh combination discloses "*the step of the optical line terminal determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality comprises: the optical line terminal determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink*" for

the same reasons as described in claim limitation [1.B], which is incorporated by reference herein.

The G.984.3-Khermosh combination discloses where the OLT “*notifies] the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical network unit via a unicast message or a broadcast message*” for the same reasons as described in claim limitations [1.E], [1.F], [1.G] (which are incorporated by reference), and as explained below.

G.984.3 discloses where the OLT notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the ONU to the ONU via a unicast message or a broadcast message. Specifically, G.984.3 discloses where the “ONU receives the PON operating parameters (the lengths and patterns of the burst mode overhead components, value of the pre-assigned delay, and initial optical power level) through the Upstream_Overhead” message sent by the OLT. Ex. 1005, 64-65. The Upstream_Overhead message, therefore, notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the ONU. Ex. 1003, ¶148. “The following table shows the structure of the message, with ranges and typical values for the different fields.” Ex. 1005, 109-110.

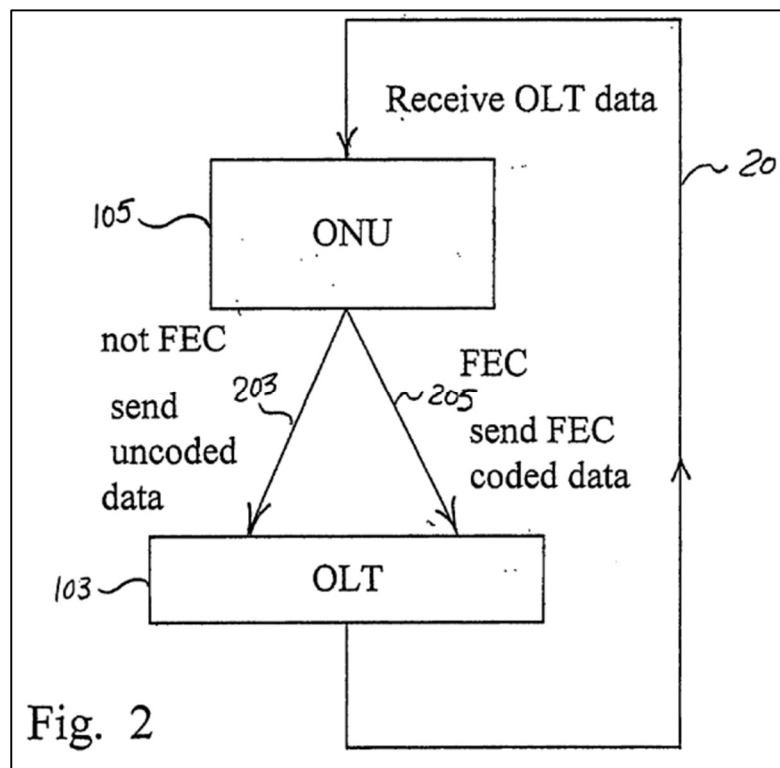
Upstream_Overhead message			
Octet	Content	Description	Example value
1	11111111	Broadcast message to all ONUs.	
2	00000001	Message identification "Upstream_Overhead".	
3	gggggggg	Number of guard bits.	32 (G) (see Note 1)
4	xxxxxxx	Length of type 1 preamble bits.	8 (P1) (see Note 1)
5	yyyyyyyy	Length of type 2 preamble bits.	8 (P2) (see Note 1)
6	ccccccc	Pattern of type 3 preamble pattern.	AA
7	bbbbbbb	Pattern of byte 1 of delimiter.	0xAB
8	bbbbbbb	Pattern of byte 2 of delimiter.	0x59
9	bbbbbbb	Pattern of byte 3 of delimiter.	0x83
10	xxemsspp	xx – Reserved e – Status of pre-equalization mechanism m – Status of SN_Mask mechanism ss – Max number of extra SN-transmissions	0 (See Note 2)
11	ddddddd	MSB of pre-assigned delay.	0 (See Note 2)
12	ddddddd	LSB of pre-assigned delay.	0 (See Note 2)

Ex. 1005, 109-10 (annotated). The Upstream_Overhead message is a **broadcast** message to all ONUs as highlighted above.

Moreover, Patent Owner's infringement contentions confirm that G.984.3 satisfies this limitation. Patent Owner cites to comparable portions of G.9807.1⁸ in its infringement contentions to satisfy this limitation. *Compare* Ex. 1011, 22, with Ex. 1005, 64-65, 109-10 (both citing where the ONU receives the upstream burst overhead parameters via a downstream PLOAM message).

⁸ See *supra*, footnote 4.

Khhermosh also discloses where the OLT notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the ONU to the ONU via a unicast message or a broadcast message. For example, Khhermosh discloses that the OLT notifies the ONU whether to enable or disable FEC in the upstream direction (*parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s)*), as shown in Figure 2.



Khhermosh further discloses that, “[i]f the data received from OLT 103 is FEC coded, then ONU 105 sends coded data (step 205) to OLT 103. If the data received from OLT 103 is not FEC coded, then ONU 105 sends uncoded data (step 203) to OLT 103.” Ex. 1014, [0024]. Khhermosh also discloses that “FEC coding is implemented when appropriate to improve the quality of the communications.” Ex.

1014, [0021]. The OLT in Khermosh, therefore, notifies the ONU whether FEC should be implemented in the upstream direction based on the transmission quality (*notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical network unit*) by sending or not sending FEC encoded data. Ex. 1003, ¶150. Khermosh also discloses that downlink communications from OLTs are “broadcasts” (*broadcast message*). Ex. 1014, [0023].

4. Claim 3

i. [3.PRE] The method of claim 1, wherein:

To the extent the preamble is limiting, the G.984.3-Khermosh combination discloses claim [3.PRE] for the reasons described in claim 1.

ii. [3.A] after the step of the optical network unit receiving the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s), the method further comprises: the optical network unit entering into a serial number state;

The G.984.3-Khermosh combination discloses claim limitation [3.A]. Ex. 1003, ¶¶153-55. Claim limitation [3.A] is identical to prior claim limitation [2.A]. Claim limitation [3.A], therefore, is disclosed for the same reasons as described in claim limitation [2.A], which is incorporated by reference herein. *See supra*, claim limitation [2.A].

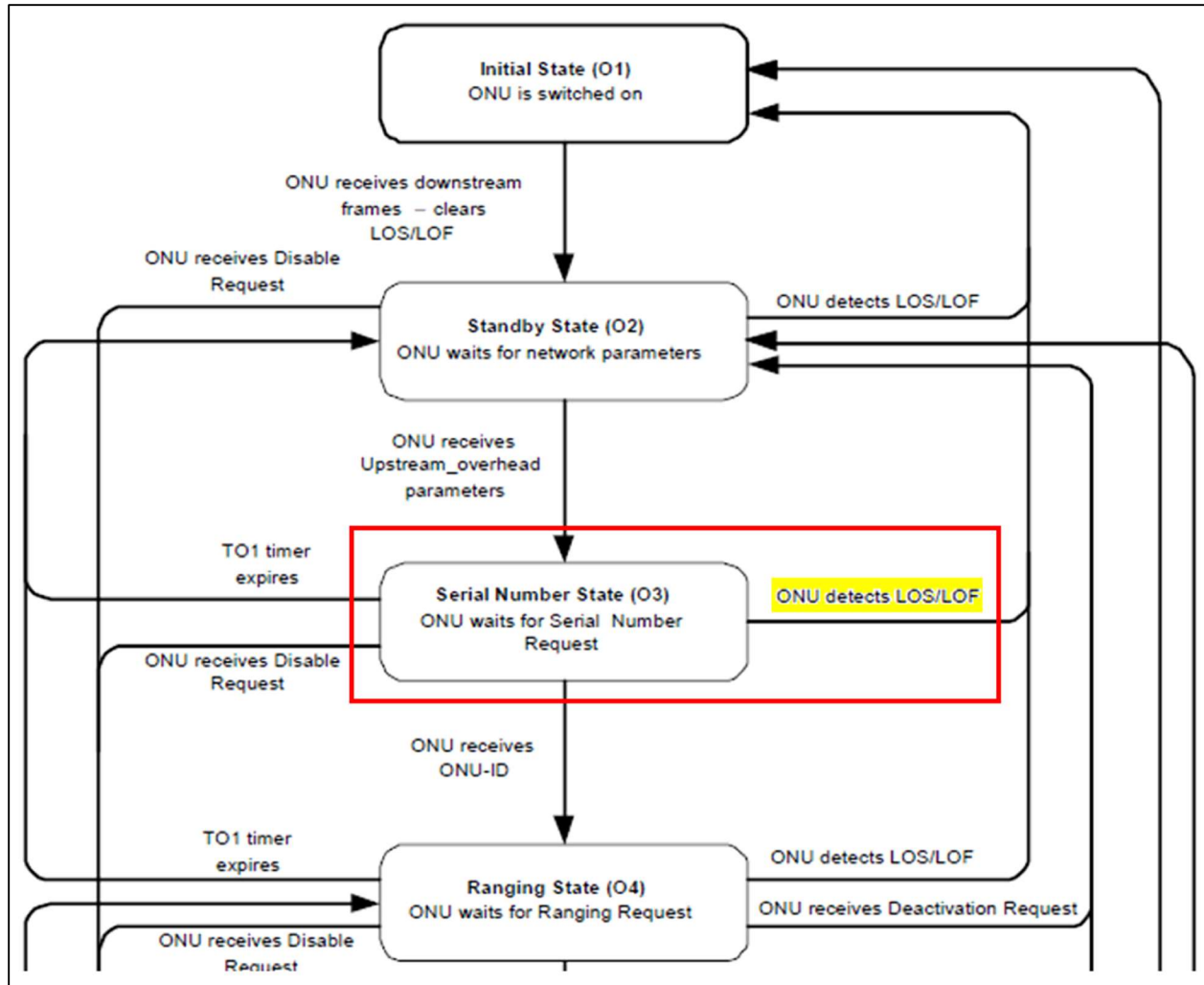
iii. [3.B] the step of the optical network unit detecting the transmission quality of the downlink between the optical line terminal and the optical network unit comprises: in the serial number state of the optical network unit, the optical network unit detecting the downlink between the optical network unit and the optical line terminal to acquire quality information of the downlink;

The G.984.3-Khermosh combination discloses claim limitation [3.B]. Ex. 1003, ¶¶156-60.

The G.984.3-Khermosh combination discloses “*the step of the optical network unit detecting the transmission quality of the downlink between the optical line terminal and the optical network unit*” for the same reasons as described in claim limitation [1.A], which is incorporated by reference herein.

The G.984.3-Khermosh combination also discloses “*in the serial number state of the optical network unit*” for the same reasons as described in claim limitation [2.A], which is incorporated by reference herein.

G.984.3 discloses that the ONU detects the downlink between the ONU and the OLT to acquire quality information of the downlink while in the serial number state. Ex. 1003, ¶¶158-159. For example, G.984.3 discloses that the “ONU detects LOS/LOF” in the serial number state, as shown below. Ex. 1005, 68.



Ex. 1005, 68 (annotated and excerpted)

The LOS (loss of signal) or LOF (loss of frame) are performance monitoring metrics that are used by the ONU to detect the downlink quality information. Ex. 1005, 5, 68-70, 83-87; Ex. 1003, ¶159; *see supra*, claim limitation [1.A]. While only two performance monitors are specifically shown in the figure above, G.984.3 makes clear that there are many different types of performance monitors that the ONU can use to detect the downlink quality, as shown below.

11.1.2 Items detected at ONU					
Type		Description			
		Detection conditions	Actions	Cancellation conditions	Actions
LOS	Loss of signal	No valid signal is received in the downstream.	Switch off laser. Generate Loss_of_phy_layer notification. Change state according to clause 10.	Valid optical signal.	Move to Standby state.
LOF	Loss of frame	When 5 consecutive invalid PSync from OLT are received.	Switch off laser. Generate Loss_of_phy_layer notification. Change state according to clause 10.	When 2 consecutive frames have correct PSync.	Move to Standby state.
SF	Signal failed	When the downstream BER becomes $\geq 10^{-Y}$, this state is entered. Y is configurable in the range of 5 to 8.	—	Set inactive when the downstream BER is $< 10^{-(Y+1)}$.	—
SD	Signal degraded	When the downstream BER becomes $\geq 10^{-X}$, this state is entered. X is configurable in the range of 6 to 9, but must be higher than Y.	—	Set inactive when the downstream BER is $< 10^{-(X+1)}$.	—

Ex. 1005, 87.

iv. [3.C] after the step of acquiring the quality information of the downlink, the method further comprises: the optical network unit notifying the quality information of the downlink to the optical line terminal;

The G.984.3-Khermosh combination discloses claim limitation [3.C]. Ex. 1003, ¶¶161-63.

The G.984.3-Khermosh combination discloses “the step of acquiring the quality information of the downlink” for the same reasons as described in claim limitation [3.B], which is incorporated by reference herein.

G.984.3 discloses that, *after* the ONU acquires the quality information of the downlink, as described in claim limitation [3.B] (which is incorporated by reference herein), the ONU notifies the quality information of the downlink to the OLT. For example, the ONU sends downlink quality information in the form of downlink performance monitor information to the OLT (*notifying the quality information of the downlink to the optical line terminal*) via the optical network unit management and control channel (OMCC), as explained in claim limitation [1.A] (which is incorporated by reference herein). Ex. 1005, 10-11, 48; Ex. 1003, ¶162; *supra*, claim limitation [1.A].

- v. ***[3.D] the step of the optical line terminal determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality comprises: the optical line terminal determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink, and notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical network unit via a unicast message or a broadcast message.***

The G.984.3-Khermosh combination discloses claim limitation [3.D]. Ex. 1003, ¶¶164-66. Claim limitation [3.D] is identical to prior claim limitation [2.C]. Claim limitation [3.D], therefore, is disclosed for the same reasons as described in claim limitation [2.C], which is incorporated by reference herein. *See supra*, claim limitation [2.C].

5. **Claim 4**

i. [4.PRE] The method of claim 1, wherein:

To the extent the preamble is limiting, the G.984.3-Khermosh combination discloses claim [4.PRE] for the reasons described in claim 1.

ii. [4.A] after the step of the optical network unit receiving the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s), the method further comprises: the optical network unit entering into a serial number state;

The G.984.3-Khermosh combination discloses claim limitation [4.A]. Ex. 1003, ¶¶168-70. Claim limitation [4.A] is identical to prior claim limitation [2.A]. Claim limitation [4.A], therefore, is disclosed for the same reasons as described in claim limitation [2.A], which is incorporated by reference herein. *See supra*, claim limitation [2.A].

iii. [4.B] the step of the optical network unit detecting the transmission quality of the downlink between the optical line terminal and the optical network unit comprises: in the serial number state of the optical network unit, the optical network unit detecting the downlink between the optical network unit and the optical line terminal to acquire quality information of the downlink;

The G.984.3-Khermosh combination discloses claim limitation [4.B]. Ex. 1003, ¶¶171-73. Claim limitation [4.B] is identical to prior claim limitation [3.B]. Claim limitation [4.B], therefore, is disclosed for the same reasons as described in

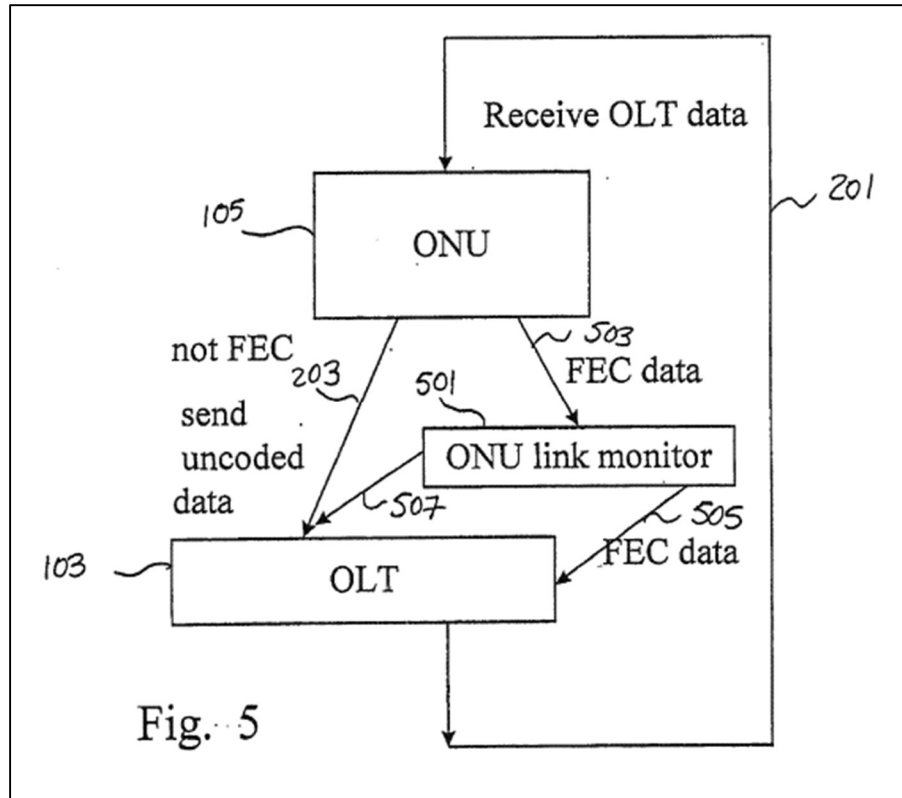
claim limitation [3.B], which is incorporated by reference herein. *See supra*, claim limitation [3.B].

iv. [4.C] The step of the optical network unit determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality comprises: the optical network unit determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink, and notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical line terminal via a unicast message or a broadcast message.

The G.984.3-Khermosh combination discloses claim limitation [4.C]. Ex. 1003, ¶¶174-82.

The G.984.3-Khermosh combination discloses “*The step of the optical network unit determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality*” for the same reasons as described in claim limitation [1.B], which is incorporated by reference herein.

Khermosh discloses that the ONU determines the upstream burst overhead parameter set suitable for the ONU according to the quality information of the downlink. Ex. 1003, ¶176. For example, Figure 5 of Khermosh (reproduced below) discloses where the ONU determines the upstream burst overhead parameter set, including the state of FEC, based on the downlink transmission quality.



Ex. 1014, Fig. 5. In describing Figure 5, Khhermosh explains:

FIG. 5 is a flow chart of an initialization and an auto-negotiation process, according to yet another embodiment of the present invention. ONU 105 receives data from OLT 103 (step 201). If the data received is non-FEC coded data, then ONU 105 responds with non-FEC coded data (step 203). *However, if the data received by ONU 105 is FEC coded data (step 503), then ONU 105 monitors the received data and determines a figure of merit for the communications from OLT 103. If the figure of merit is sufficient, then ONU 105 responds henceforth with non-FEC coded data (step 507). If the figure of merit is not sufficient, then ONU 105 responds henceforth with FEC coded data (step 505).*

Ex. 1014, [0027] (emphasis added).

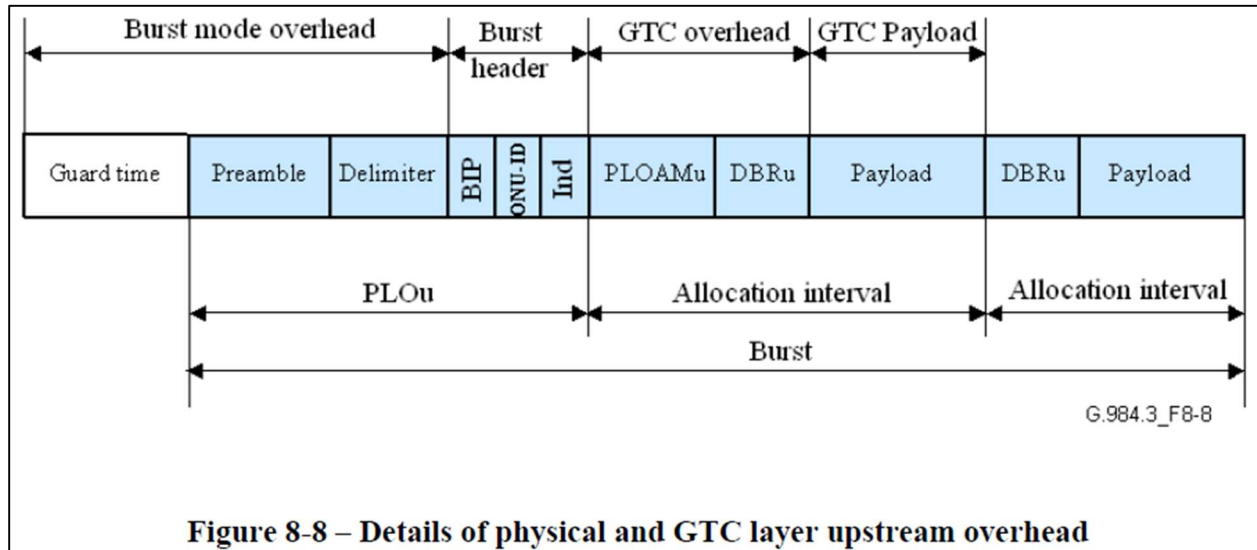
When the ONU receives FEC coded data and then monitors the received data to determine a figure of merit for the communications from the OLT (detecting

quality information of the downlink), and responds with FEC or non-FEC encoded data based on the figure of merit (which is determined based on BER), the ONU is “*determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink.*” Ex. 1003, ¶178.

Khhermosh also discloses “*notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical line terminal.*” As explained above, the ONU responds to the OLT with FEC-coded or non-FEC coded data according to the figure of merit (*quality information of the downlink*). When the ONU responds to the OLT, the ONU notifies the OLT of the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit. Ex. 1003, ¶179. For example, when the ONU responds with FEC coded data, the ONU notifies the OLT that the upstream burst overhead parameter set includes FEC. Ex. 1003, ¶179.

G.984.3 also discloses “*notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical line terminal.*” G.984.3 discloses that the upstream message from the ONU to the OLT includes information before the payload notifying the OLT of the upstream burst overhead parameters which, as Khhermosh disclosed, can be determined by the ONU based on the downlink quality. As shown

below, the upstream message notifies the OLT of the guard time, preamble, and delimiter values via the burst mode overhead. Ex. 1005, 37-38. And the Ind field in the burst header contains an indication of whether FEC is on or off. Ex. 1005, 38-39.



The guard time, preamble, delimiter, and FEC status are all upstream burst overhead parameter values as defined in the '359 Patent. Ex. 1001, 1:15-33.

Khhermosh and G.984.3 also disclose where the upstream message is “*a unicast message or a broadcast message.*” Due to the point-to-multipoint nature of a PON system, the upstream message (e.g., having the FEC coded data) from the ONU to the OLT is a unicast message. Ex. 1003, ¶182. This is because, unlike in the downstream direction where the OLT has the ability to send a message to one ONU (unicast) or all ONUs (broadcast), in the upstream direction the ONU sends a unicast message as the only recipient is the OLT. Ex. 1003, ¶182.

6. *Claim 5, 8, and 11*⁹

- i. *[5.PRE]/[8.PRE]/[11.PRE] The method of claim [2/3/4], wherein:*

To the extent the preamble is limiting, the G.984.3-Khermosh combination discloses claim [5.PRE]/[8.PRE]/[11.PRE] for the reasons described in claims 2/3/4.

- ii. *[5.A]/[8.A]/[11.A] while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical line terminal setting a switching index value of the upstream burst overhead parameters in a tag field assigned for a bandwidth of the optical network unit, and sending the switching index value to the optical network unit via a downstream frame; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the switching index value, the optical network unit using the upstream burst overhead parameters suitable for the optical network unit in a next frame; or,*

The G.984.3-Khermosh combination discloses claim limitation [5.A]/[8.A]/[11.A]. Ex. 1003, ¶¶185-96.

⁹ Claims 5, 8, and 11 contain verbatim language with the exception of the claim from which they depend. Accordingly, they are discussed together.

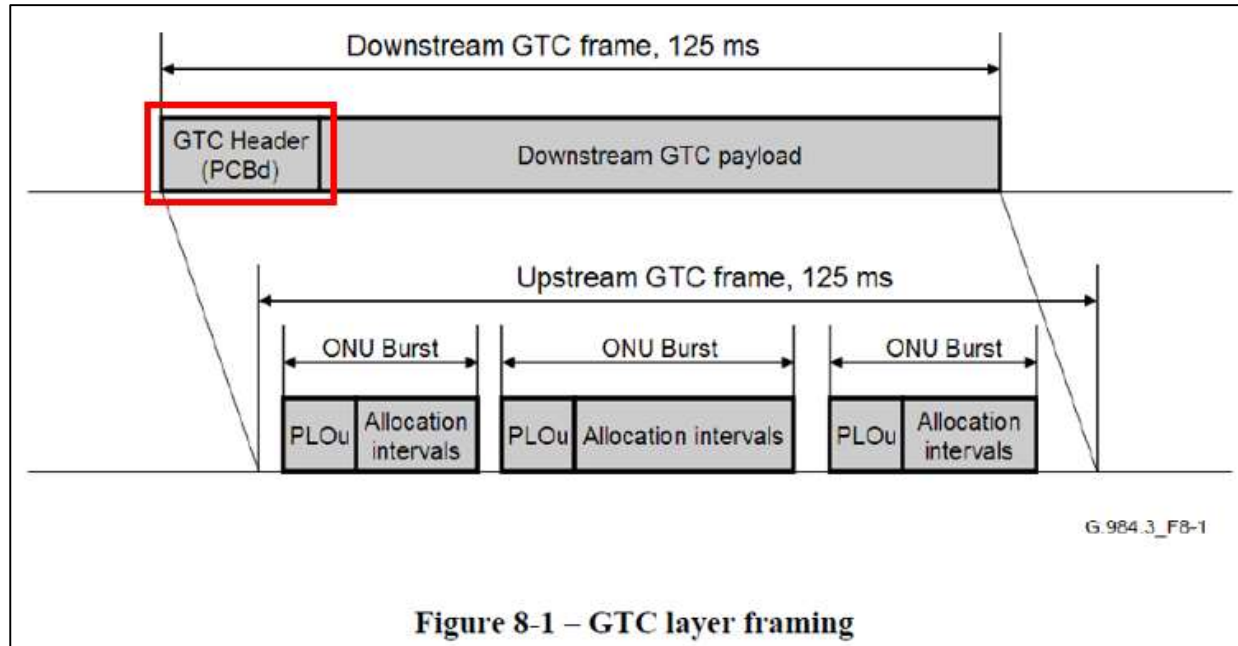
Claim limitations [5.A], [8.A], and [11.A] are not required limitations as only one of claim limitation [5.A]/[8.A]/[11.A], [5.B]/[8.B]/[11.B], or [5.C]/[8.C]/[11.C] is required and, for the reasons explained *infra*, the G.984.3-Khermosh combination discloses claim limitation [5.B]/[8.B]/[11.B]. Regardless, a POSITA would have understood the G.984.3-Khermosh combination also discloses claim limitation [5.A]/[8.A]/[11.A].

The G.984.3-Khermosh combination discloses “*the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or ... the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal*” for the same reasons as described in claim limitation [2.C]/[3.D]/[4.C], which is incorporated by reference herein.

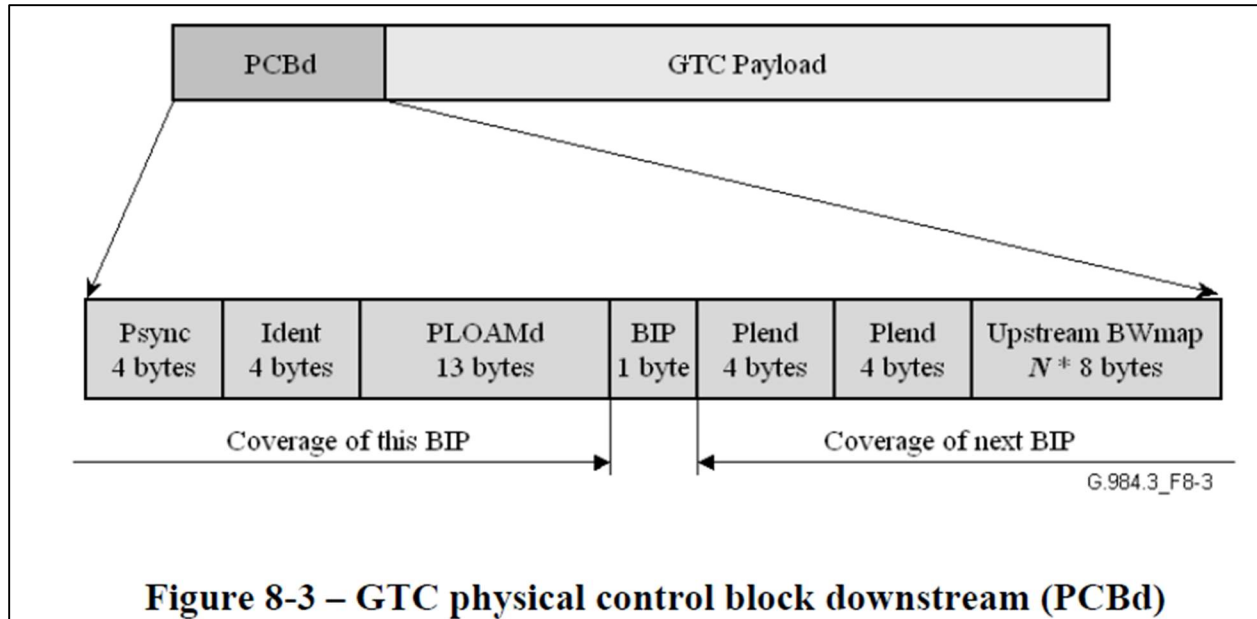
G.984.3 discloses that, while or after the OLT or ONU notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s), “*the optical line terminal setting a switching index value of the upstream burst overhead parameters in a tag field assigned for a bandwidth of the optical network unit, and sending the switching index value to the optical network unit via a downstream frame; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line*

terminal comprises: after the optical network unit receives the switching index value, the optical network unit using the upstream burst overhead parameters suitable for the optical network unit in a next frame.”

For example, G.984.3 discloses that the OLT sends a downstream GTC frame to the ONU. Ex. 1005, 30. “The downstream GTC frame provides the common time reference for the PON and the common control signalling for the upstream.” Ex. 1005, 30.

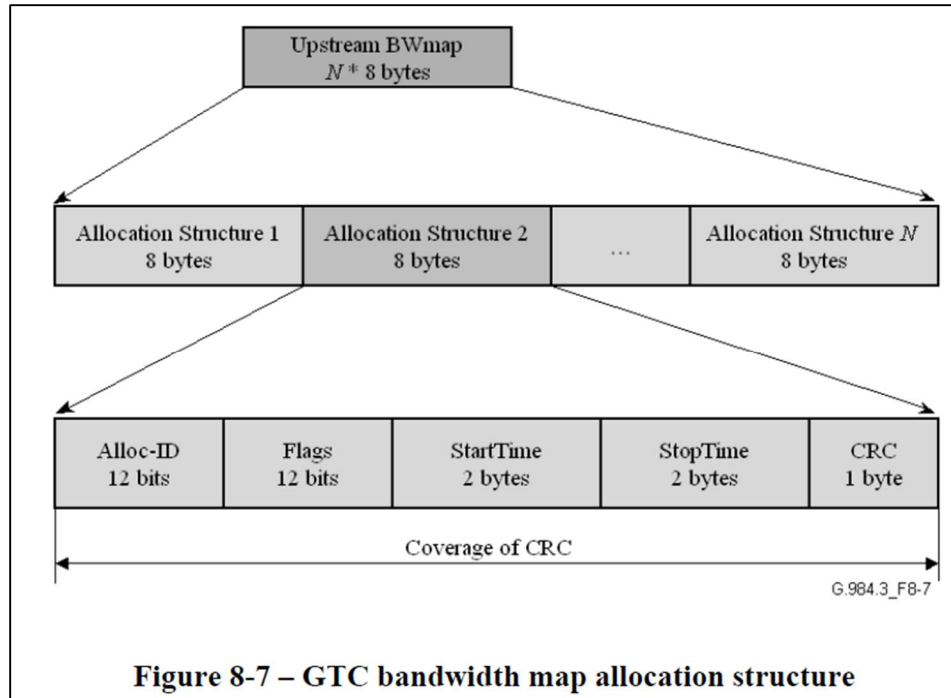


Ex. 1005, 30 (annotated). The downstream GTC frame includes a physical control block downstream (PCBd) in the GTC header (highlighted above). “The OLT sends the PCBd in a broadcast manner, and every ONU receives the entire PCBd. The ONUs then act upon the relevant information contained therein.” Ex. 1005, 31. The structure of the PCBd is shown below.

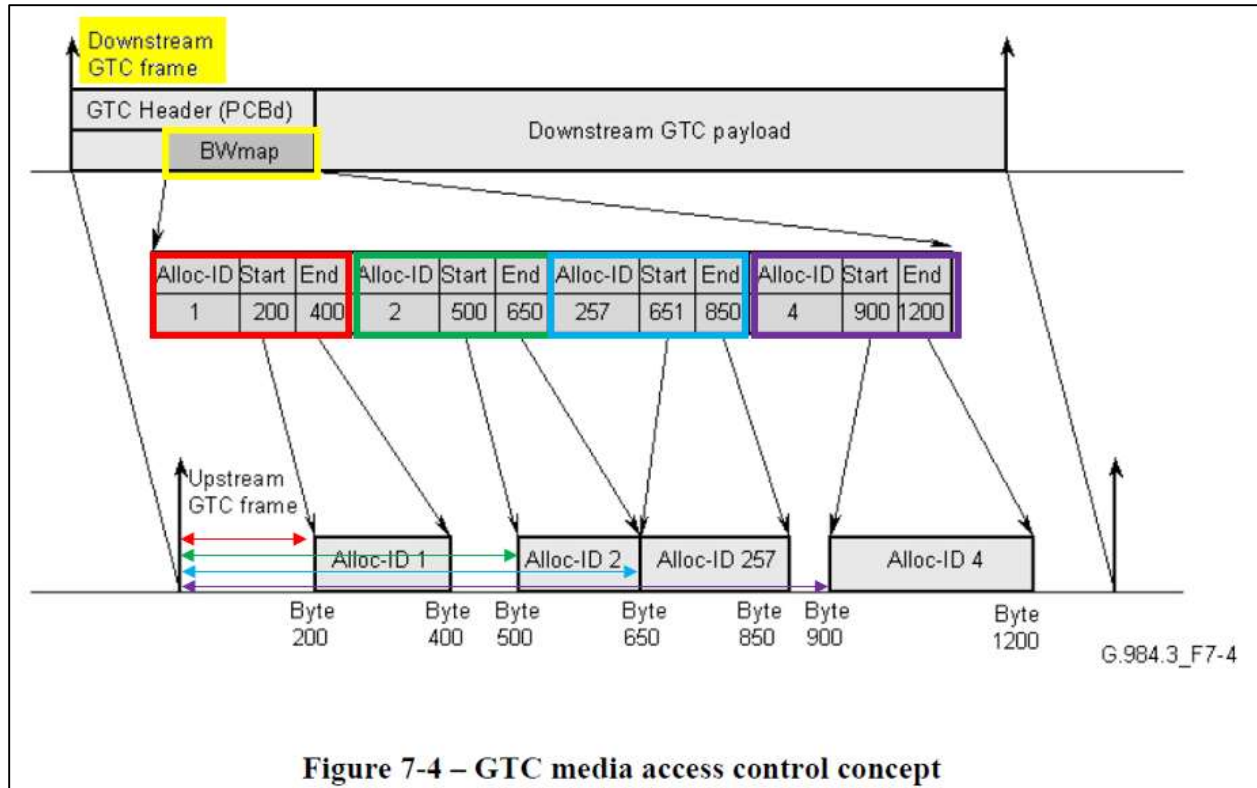


The PCBd field includes the PLOAMd, which is the downstream PLOAM message from the OLT to the ONU that includes the suitable upstream burst overhead parameters (*the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit*). Ex. 1005, 54-55, 69; Ex. 1003, ¶190.

The PCBd field also includes the Upstream BWmap field, which includes the allocation structure for each ONU to send messages at the appropriate time in the upstream direction. Ex. 1005, 34.



Ex. 1005, 34. The allocation structure in the Upstream BWmap includes the Alloc-ID, Flags, StartTime, and StopTime fields. The Alloc-ID “indicates the recipient of the bandwidth allocation” (specific ONU). Ex. 1005, 34. The Flags field includes, among other things, an indication of whether the ONU should use FEC. Ex. 1005, 35. The StartTime “indicates the starting time of the allocation” and the StopTime “indicates the stopping time of the allocation.” Ex. 1005, 35-36. The switching index value is shown by the colored arrows in the Figure below.



Ex. 1005, 19 (annotated); Ex. 1003, ¶¶193-94.

A POSITA would have understood that the time between when the upstream GTC frame begins and the assigned ONU start time is the claimed “switching index value” (colored arrows). This is because the ONU does not start to use the upstream burst overhead parameters suitable for the ONU until after the switching index value, as described and claimed in the ’359 Patent.

For example, the ’359 Patent describes the “switching index value” (one of the colored arrows above) “in a tag field assigned for a bandwidth of the ONU” (yellow box above) “and sending the switching index value to the ONU via a downstream frame” (yellow highlighting above) “so that after the ONU receives the

switching index value, the ONU uses the upstream burst overhead parameters in a next frame” (colored boxes and corresponding colored arrows above). Ex. 1001, 6:33-40; Ex. 1003, ¶195. This mirrors the claim language: “*the optical line terminal setting a switching index value of the upstream burst overhead parameters in a tag field assigned for a bandwidth of the optical network unit*” (yellow box above); “*sending the switching index value to the optical network unit via a downstream frame*” (yellow highlighting above); and “*the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the switching index value, the optical network unit using the upstream burst overhead parameters suitable for the optical network unit in a next frame*” (the ONU starts using the suitable upstream burst overhead parameters in the next frame after the switching time as shown by the colored arrows and corresponding colored boxes). Ex. 1001, cls. 5, 8, 11; Ex. 1003, ¶195.

Moreover, Patent Owner’s infringement contentions confirm that G.984.3 satisfies this limitation. For example, Patent Owner cites to comparable portions of G.9807.1¹⁰ in its infringement contentions to satisfy this limitation. *Compare* Ex.

¹⁰ See *supra*, footnote 4.

1011, 26-29, 39, *with* Ex. 1005, 30-36 (both citing to the BWmap and allocation structure for ONUs sent by the OLT in a downstream transmission).

iii. [5.B]/[8.B]/[11.B] while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical line terminal notifying a hyper frame number to the optical network unit; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the hyper frame number and after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit; or,

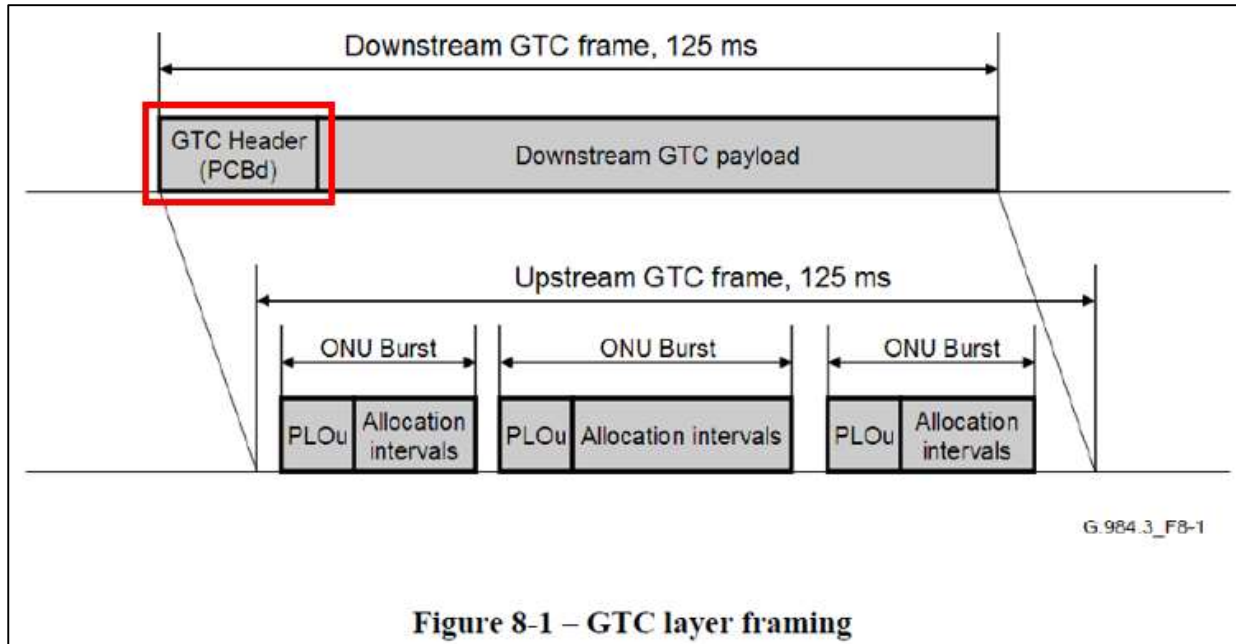
The G.984.3-Khermosh combination discloses claim limitation [5.B]/[8.B]/[11.B]. Ex. 1003, ¶¶197-205.

Claim limitations [5.B], [8.B], and [11.B] are not required limitations as only one of claim limitation [5.A]/[8.A]/[11.A], [5.B]/[8.B]/[11.B], *or* [5.C]/[8.C]/[11.C] is required and, for the reasons explained *supra*, the G.984.3-Khermosh combination discloses claim limitation [5.A]/[8.A]/[11.A]. Regardless, a POSITA would have understood the G.984.3-Khermosh combination also discloses claim limitation [5.B]/[8.B]/[11.B].

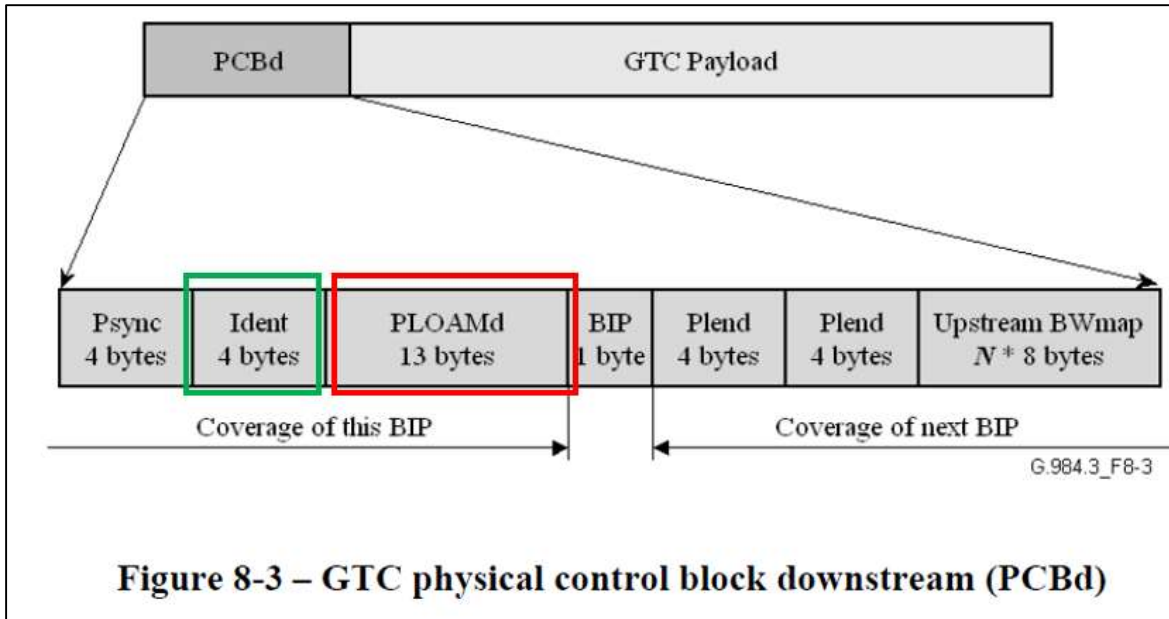
The G.984.3-Khermosh combination discloses “*the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or ... the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal*” for the same reasons as described in claim limitation [2.C]/[3.D]/[4.C], which is incorporated by reference herein.

G.984.3 discloses that, while or after the OLT or ONU notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s), “*the optical line terminal notifying a hyper frame number to the optical network unit; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the hyper frame number and after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit.*”

For example, G.984.3 discloses that the OLT sends a downstream GTC frame to the ONU. Ex. 1005, 30. “The downstream GTC frame provides the common time reference for the PON and the common control signaling for the upstream.” Ex. 1005, 30.



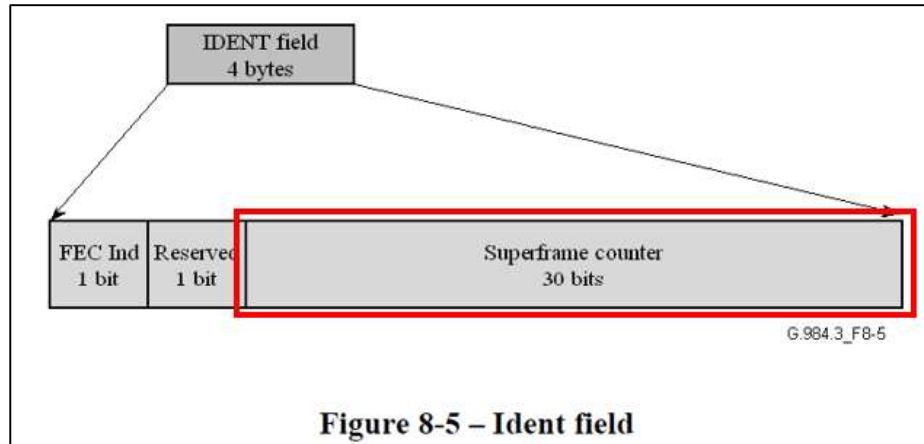
Ex. 1005, 30 (annotated). The downstream GTC frame includes a physical control block downstream (PCBd) in the GTC header (highlighted above). “The OLT sends the PCBd in a broadcast manner, and every ONU receives the entire PCBd. The ONUs then act upon the relevant information contained therein.” Ex. 1005, 31. The structure of the PCBd is shown below.



Ex. 1005, 31 (annotated).

The PCBd field includes the PLOAMd (red box above) and Ident fields (green box above). The PLOAMd field is the downstream PLOAM message from the OLT to the ONU that includes the suitable upstream burst overhead parameters (*the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit*).

Ex. 1005, 54-55, 69; Ex. 1003, ¶201. The Ident field includes an indication of FEC and a Superframe counter (red box below).



Ex. 1005, 32-33. The ONU compares to its own local superframe counter to the Superframe counter above to ensure correct synchronization. Ex. 1005, 32-33; Ex. 1003, ¶203. Because proper upstream communication is not possible until synchronization is confirmed, the ONU does not begin sending upstream communications using the upstream burst overhead parameters until after synchronization with the superframe counter (*switching time*), as described and claimed in the '359 Patent. Ex. 1003, ¶203.

For example, the '359 Patent describes, in one embodiment, that the switching time is indicated to the ONU by “notifying a hyper frame number to the ONU, so that the ONU starts to use the upstream burst overhead parameters after a frame indicated by the hyper frame number arrives.” Ex. 1001, 6:41-46. The superframe counter in G.984.3 is the claimed hyper frame number because it indicates to the ONU what frame to start using the upstream burst overhead parameters, as the '359 Patent explains that notifying a hyper frame number to the ONU tells the ONU to

begin using the upstream burst overhead parameters after the frame indicated by the hyper frame number. Ex. 1001, 6:41-46; Ex. 1003, ¶204.

Moreover, Patent Owner's infringement contentions confirm that G.984.3 satisfies this limitation. For example, Patent Owner's infringement contentions confirm the superframe counter in G.984.3 is the claimed hyper frame number. Ex. 1011, 30 ("The superframe counter is the claimed hyper frame number.")

iv. [5.C]/[8.C]/[11.C] while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical network unit notifying a hyper frame number to the optical line terminal; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time determined by the optical network unit itself comprises: after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit.

Claim limitations [5.C], [8.C], and [11.C] are not required limitations as only one of claim limitation [5.A]/[8.A]/[11.A], [5.B]/[8.B]/[11.B], or [5.C]/[8.C]/[11.C] is required and, for the reasons explained *supra*, the G.984.3-Khermash combination discloses claim limitations [5.A]/[8.A]/[11.A] and [5.B]/[8.B]/[11.B]. See *supra*, claim limitations [5.A]/[8.A]/[11.A] and [5.B]/[8.B]/[11.B].

7. ***Claims 6, 9, and 10¹¹***

i. [6.PRE]/[9.PRE]/[10.PRE] The method of claim [2/3/4], wherein:

To the extent the preamble is limiting, the G.984.3-Khermosh combination discloses claim [6.PRE]/[9.PRE]/[10.PRE] for the reasons described in claim 2/3/4.

ii. [6.A]/[9.A]/[10.A] the upstream burst overhead parameter set comprises: state of forward error correction, delimiter, preamble and guard band.

The G.984.3-Khermosh combination discloses claim limitation [6.A]/[9.A]/[10.A] for the same reasons as described in claim limitation [1.PRE], which is incorporated by reference herein. *See supra*, claim limitation [1.PRE]; *see also* Ex. 1003, ¶¶208-212.

For example, G.984.3 discloses that the “[t]he burst mode overhead is composed of guard time, preamble time and delimiter time” (*delimiter, preamble and guard band*). Ex. 1005, 37. G.984.3 also discloses that “FEC status” (*state of forward error correction*) is another upstream burst overhead parameter controlled by the OLT. Ex. 1005, 38-39; Ex. 1003, ¶209.

¹¹ Claims 6, 9, and 10 contain verbatim language with the exception of the claim from which they depend. Accordingly, they are discussed together.

Moreover, Patent Owner's infringement contentions confirm that G.984.3 satisfies this limitation. For example, Patent Owner cites to the "FEC indication," "delimiter," "preamble," and "guard time" to satisfy this limitation. Ex. 1011, 33-35.

8. Claim 7

i. [7.PRE] The method of claim 1, wherein:

To the extent the preamble is limiting, the G.984.3-Khermosh combination discloses claim [7.PRE] for the reasons described in claim 1.

ii. [7.A] in the step of the optical line terminal sending the parameter values or the identifications of more than one upstream burst overhead parameter set to the optical network unit, the optical line terminal sends the parameter values or the identifications of one or more upstream burst overhead parameter sets to all optical network units or one or more optical network units which communicate with the optical line terminal.

The G.984.3-Khermosh combination discloses claim limitation [7.A]. Ex. 1003, ¶¶214-16.

The G.984.3-Khermosh combination discloses "*in the step of the optical line terminal sending the parameter values or the identifications of more than one upstream burst overhead parameter set to the optical network unit*" for the same reasons as described in claim limitation [1.G], which is incorporated by reference herein.

G.984.3 discloses that “*the optical line terminal sends the parameter values or the identifications of one or more upstream burst overhead parameter sets to all optical network units or one or more optical network units which communicate with the optical line terminal.*” Ex. 1003, ¶215. For example, G.984.3 discloses that the Upstream_Overhead message from the OLT to the ONU, which includes the parameter values or the identification of one or more upstream burst overhead parameter sets, is sent to all ONUs that communicate with the OLT via a “Broadcast message to all ONUs.” Ex. 1005, 109; Ex. 1003, ¶215.

Upstream_Overhead message			
Octet	Content	Description	Example value
1	11111111	Broadcast message to all ONUs.	
2	00000001	Message identification "Upstream_Overhead".	
3	ggggggggg	Number of guard bits.	32 (G) (see Note 1)
4	xxxxxxx	Length of type 1 preamble bits.	8 (P1) (see Note 1)
5	yyyyyyyyy	Length of type 2 preamble bits.	8 (P2) (see Note 1)
6	ccccccc	Pattern of type 3 preamble pattern.	AA
7	bbbbbbbbb	Pattern of byte 1 of delimiter.	0xAB
8	bbbbbbbbb	Pattern of byte 2 of delimiter.	0x59
9	bbbbbbbbb	Pattern of byte 3 of delimiter.	0x83
10	xxemsspp	xx – Reserved e – Status of pre-equalization mechanism m – Status of SN_Mask mechanism ss – Max number of extra SN-transmissions	0 (See Note 2)
11	dddddddd	MSB of pre-assigned delay.	0 (See Note 2)
12	dddddddd	LSB of pre-assigned delay.	0 (See Note 2)

Ex. 1005, 109-110 (annotated).

Khermosh also discloses this limitation as Khermosh discloses that downlink communications from OLTs are “broadcasts.” Ex. 1014, [0023]. Broadcast messages are sent to all optical network units. Ex. 1003, ¶215.

VIII. DISCRETIONARY ISSUES

A. The Petition Does Not Present the Same References Addressed in Prosecution

Institution should not be denied under §325(d). Under *Advanced Bionics*, the Board uses a two-part framework in determining whether to exercise its discretion under §325(d), specifically:

- (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office; and
- (2) if either condition of [the] first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims.

Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential). The Board has held that the first prong of *Advanced Bionics* is not met where “neither [the combination references] nor similar prior art was before the examiner and ... the prosecution history does not include any overlapping arguments directed to this prior art.” *Godbersen-Smith Constr. Co. v. Guntert & Zimmerman Const. Div., Inc.*, IPR2021-00050, Paper 24 at 19-21 (PTAB May 7, 2021).

Under the first prong, the G.984.3-Khermosh combination was not before the Examiner, and the prosecution history does not include any overlapping arguments to this Petition. For example, Khermosh was never considered by the Examiner as it was not discussed during prosecution or cited on the face of the '359 Patent. And there are no overlapping arguments because the only argument the Examiner made during prosecution was in the Notice of Allowance, where the Examiner allowed the '359 Patent because G.984.2¹² “states that uplink parameters stay the same as long as the optical network is operational” but “[t]he invention is for setting up multiple sets of parameters to use in the uplink burst cycle in order to better use bandwidth based on the quality of the transmission channel.” Ex. 1002, 34. But, as previously discussed, Khermosh addresses the exact limitation the Examiner argued was missing in the prior art—determining the upstream burst overhead parameters based on the downlink quality. *See Amphenol Corporation v. PPC Broadband, Inc.*, IPR2023-01363, Paper 9 at 30-31 (PTAB Mar. 20, 2024) (holding that a combination could not have been “extensively evaluated during prosecution prior to

¹² G.984.2 is not cited on the face of the '359 Patent and does not disclose how OLTs manage the upstream burst overhead parameters via the Upstream_Overhead message as disclosed in G.984.3. G.984.2, therefore, is not substantially the same as G.984.3. *Compare* Ex. 1005, *with* Ex. 1027.

allowance of the claims” when it addressed the limitation that the Examiner relied upon in a notice of allowance).

Accordingly, the combination of references used in this Petition cannot be cumulative of the art and/or arguments raised during prosecution as there are material differences between the grounds herein and what was previously presented. *Tianma Microelectronics Co., v. Japan Display Inc.*, IPR2021-01058, Paper 16 at 31 (PTAB Jan. 5, 2022); *Samsung Elecs. Co. v. Dodots Licensing Sols. LLC*, IPR2023-00756, Paper 9 at 21-22 (PTAB Oct. 11, 2023). Because the first prong is not met, the Board need not move to the second prong. *See id.* at 21; *Oticon Med. AB v. Cochlear Ltd.*, IPR2019-00975, Paper 15 at 20 (PTAB Oct. 16, 2019).

For at least these reasons, the Board should not deny institution under §325(d).

B. The Board Should Not Deny Institution Under *Fintiv*

The claims of the ’359 Patent have never been tested in view of the most relevant prior art. In view of these strong challenges and the different upcoming trial dates related to the different district court proceedings, institution should not be discretionarily denied under §314(a). *See NHK Spring Co. v. Intrix-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 19-20 (PTAB Sept. 12, 2018) (precedential); *Apple v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 13-14 (PTAB Mar. 20, 2020) (precedential).

Factor 1—a potential stay of the district court litigation—is neutral because no party has requested a stay. *VMWare, Inc. v. Intellectual Ventures I LLC*, IPR2020-00470, Paper 13 at 17 (PTAB Aug. 18, 2020) (finding in the absence of a stay motion that this factor “does not weigh for or against discretionary denial”).

Factor 2—the district court trial date and the Board’s statutory deadline—should be considered neutral when viewed in light of both district court cases involving the ’359 Patent. The ’359 Patent is asserted by Patent Owner in two district court cases. In the AT&T case, in which Nokia has intervened, the trial date is set for March 17, 2025. Ex. 1023. In the Verizon case, which involves ONUs that Nokia provides to Verizon¹³ and in which Nokia might intervene, the trial date is set for September 22, 2025. Ex. 1025. *Compare* Ex. 1035, ¶61, *with* Ex. 1036, ¶81; *see e.g.*, *HP Inc. et al. v. Neodron Ltd.*, IPR2020-00459, Paper 17 at 38 (PTAB Sep. 9, 2020) (instituting and finding Factor 2 neutral when the multiple petitioners had different trial dates and not all cases were scheduled for trial prior to the estimated final written decision date).

The Director has also directed the PTAB to consider “statistics on median time-to-trial for civil actions in the district court in which the parallel litigation

¹³ Verizon did not participate, or make any contribution substantively or monetarily, to this Petition.

resides.” Interim Procedure, 8-9. The median time to trial in the Eastern District of Texas is 21.4 months (Ex. 1024, 35), which gives the AT&T case an estimated trial date of no earlier than March 2025 and the Verizon case an estimated trial date of no earlier than December 2025. Because much can change in 9 months (AT&T case) and 19 months (Verizon Case), the current trial date does not support denial. *See Dish Network v. Broadband iTV*, IPR2020-01280, Paper 17 at 16 (PTAB Feb. 4, 2021) (“We cannot ignore the fact that the currently scheduled trial date is more than nine months away and much can change during this time”).

Moreover, given the existence of two cases, the potential length of the trials, and post-trial motions, it is likely that the district court proceedings will not be complete before the final written decision in this matter. The Board has frequently held that this factor does not implicate the decision whether to institute “if the trial date is at or around the same time as the projected statutory deadline.” *Fintiv*, IPR2020-00019, Paper 11 at 6. Thus, this factor does not support discretionary denial.

Factor 3—investment in the district court proceedings—weighs against discretionary denial. The district court cases are in their early stages and the court has not issued any substantive rulings in either case with respect to the ’359 Patent. Specifically, infringement contentions in the AT&T case were served on September 14, 2023, invalidity contentions were served on December 7, 2023, and the claim

construction hearing is not scheduled until September 19, 2024. Ex. 1022. No depositions have taken place whatsoever in the litigation. In the Verizon Case, Petitioners understand that infringement contentions were served on March 11, 2024, invalidity contentions were served on May 6, 2024, and the claim construction hearing is not scheduled until March 11, 2025. Ex. 1025. Accordingly, the district court will not invest significant resources related to the challenged patent prior to the issuance of an institution decision. *See Fintiv*, IPR2020-00019, Paper 11 at 9-12; *DISH Network*, IPR2020-01280, Paper 17 at 18-21.

Factor 4—overlap between this proceeding and the district court proceedings—favors institution. First, the scope of this Petition and the AT&T case is different as this Petition covers a number of claims that are not asserted in the AT&T case. Second, instituting this Petition will allow issues to be narrowed in the AT&T case because, if instituted, Petitioners stipulate that they will not pursue invalidity against the asserted claims in the district court using the specific combination of prior art references set forth in the grounds presented in this Petition for purposes of establishing obviousness. *See Sand Revolution II LLC v. Continental Intermodal Group-Trucking LLC*, IPR2019-01393, Paper 24 at 11-12 (PTAB June 16, 2020) (holding a similar stipulation weighs against discretionary denial). Given the differences between this proceeding and the AT&T case, this factor weighs against the Board exercising discretion to deny.

Factor 5—overlapping parties—is neutral as it is “far from an unusual circumstance that a petitioner in *inter partes* review and a defendant in a parallel district court proceeding are the same.” *Sand Revolution*, IPR2019-01393, Paper 24 at 12-13.

The final *Fintiv* factor—other considerations—weighs strongly against discretionary denial. As detailed herein, this is a compelling case, and the merits of the Petition are strong. For example, the Examiner issued a first action allowance because G.984.2 did not determine “parameters to use in the uplink burst cycle ... based on the quality of the transmission channel.” Ex. 1002, 34. The Khernosh reference used in this petition directly discloses the missing element identified by the Examiner. *See supra*, claim limitation [1.B]; *see also* Ex. 1014, [0021] (“The EPON automatically initializes each ONU and registers each ONU according to ... the communications quality to and from the ONU. FEC coding is implemented when appropriate to improve the quality of the communications.”). Moreover, none of the grounds asserted herein were previously considered by either the Office or the district courts. *Cf. Comcast Cable Comm’n’s, LLC v. Rovi Guides, Inc.*, IPR2019-00231, Paper 14 at 11 (PTAB May 20, 2019) (obviousness challenges not “previously considered by the Office or any court” weigh in favor of not denying institution). Moreover, the ’359 Patent is currently asserted in two district court

cases. Institution of this IPR provides the opportunity for narrowing and simplifying the litigations for the district court.

C. The Board Should Not Deny Institution Under *General Plastic*

The *General Plastic* factors do not apply because this is the first and only *inter partes* review (“IPR”) petition filed by any Petitioner with respect to the ’359 Patent.

IX. CONCLUSION

Petitioners respectfully request cancellation of the Challenged Claims.

X. MANDATORY NOTICES UNDER 37 C.F.R. §42.8

A. Real Party in Interest Under 37 C.F.R. §42.8(b)(1)

The real parties in interest are Nokia of America Corporation; AT&T Ventures, LLC; AT&T Enterprises, LLC; AT&T Mobility II LLC; AT&T Mobility LLC; AT&T Services, Inc.; AT&T Communications LLC¹⁴; and AT&T Corp.¹⁵ Out of an abundance of caution, Petitioners have identified all current defendants in the AT&T case as potential real parties in interest only for the purpose of this proceeding and only to the extent that Patent Owner contends that these separate legal entities should be named real parties in interest in this IPR. Petitioners do so to avoid the potential expenditure of resources to resolve such a challenge. Petitioners also acknowledge that each petitioner has a number of affiliates. No unnamed entity is funding, controlling, or otherwise has an opportunity to control or direct this Petition or Petitioners' participation in any resulting IPR. Petitioners are also not aware of any affiliate that would be barred from filing this Petition under 35 U.S.C. § 315(e).

B. Related Matters Under 37 C.F.R. §42.8(b)(2)

The '359 Patent is the subject of litigation pending against AT&T and separately pending against Verizon, as highlighted below:

¹⁴ AT&T Communications LLC changed its name to AT&T Ventures, LLC.

¹⁵ AT&T Corp. is now AT&T Enterprises, LLC.

- *Iarnach Technologies Ltd. v. AT&T Corp. et al.*, No. 2:23-cv-00231 (E.D. Tex.) (“AT&T Case”);
- *Iarnach Technologies Ltd. v. Verizon Communications, Inc. et al.*, No. 2:23-cv-00631 (E.D. Tex.) (“Verizon Case”).

AT&T is a defendant, and Nokia is an intervenor in case No. 2:23-cv-00231. Ex. 1023. Verizon is a defendant in case No. 2:23-cv-00631. Nokia supplies Verizon certain of the accused ONUs in that case. Petitioners are not aware of any other judicial or administrative matter that would affect or be affected by a decision in this IPR.

C. Designation of Counsel Under 37 C.F.R. §42.8(b)(3)

Petitioners provide the following designation of counsel.

Lead Counsel	Backup Counsel
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Pursuant to 37 C.F.R. § 42.8(b)(4), counsel agrees to service by mail as detailed above, and to electronic service by email at the following addresses: christopher.douglas@alston.com; scott.stevens@alston.com; karlee.wroblewski@alston.com; matt.welch@alston.com; and bennett.hardymon@alston.com. Pursuant to 37 C.F.R. §42.10(b), a Power of Attorney executed by Petitioners accompanies this Petition.

D. Service Information

Please address all correspondence and service to the addresses listed above. Petitioners consent to electronic service directed to christopher.douglas@alston.com; scott.stevens@alston.com; karlee.wroblewski@alston.com; matt.welch@alston.com; and bennett.hardymon@alston.com.

Date: May 30, 2024

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CLAIMS APPENDIX

Claim	Recitation
[1.PRE]	A method for managing upstream burst overhead parameters, comprising:
[1.A]	an optical line terminal or an optical network unit detecting transmission quality of a downlink between the optical line terminal and the optical network unit;
[1.B]	the optical line terminal or the optical network unit determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality; and
[1.C]	the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit after switching time determined by the optical network unit itself or indicated by the optical line terminal;
[1.D]	wherein, before the step of the optical line terminal or the optical network unit detecting the transmission quality of the downlink between the optical line terminal and the optical network unit, the method further comprises:
[1.E]	the optical line terminal determining and identifying N kinds of upstream burst overhead parameter sets according to different levels of link quality, wherein N is an integer and is larger than zero; and
[1.F]	the optical line terminal sending a parameter value or an identification of one default upstream burst overhead parameter set to the optical network unit; and the optical network unit receiving the parameter value or the identification of the upstream burst overhead parameter set in a waiting state and using the upstream burst overhead parameter set; or,
[1.G]	the optical line terminal sending parameter values or identifications of more than one upstream burst overhead parameter set to the optical network unit; and the optical network unit receiving the parameter values or the identifications of the upstream burst overhead parameter sets in a waiting state and using one of the received upstream burst overhead parameter sets.
[2.PRE]	The method of claim 1, wherein:
[2.A]	after the step of the optical network unit receiving the parameter value(s) or the identification(s) of the upstream burst overhead

Claim	Recitation
	parameter set(s), the method further comprises: the optical network unit entering into a serial number state;
[2.B]	the step of the optical line terminal detecting the transmission quality of the downlink between the optical line terminal and the optical network unit comprises: in the serial number state of the optical network unit, the optical line terminal detecting the downlink between the optical network unit and the optical line terminal to acquire quality information of the downlink;
[2.C]	the step of the optical line terminal determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality comprises: the optical line terminal determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink, and notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical network unit via a unicast message or a broadcast message.
[3.PRE]	The method of claim 1, wherein:
[3.A]	after the step of the optical network unit receiving the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s), the method further comprises: the optical network unit entering into a serial number state;
[3.B]	the step of the optical network unit detecting the transmission quality of the downlink between the optical line terminal and the optical network unit comprises: in the serial number state of the optical network unit, the optical network unit detecting the downlink between the optical network unit and the optical line terminal to acquire quality information of the downlink;
[3.C]	after the step of acquiring the quality information of the downlink, the method further comprises: the optical network unit notifying the quality information of the downlink to the optical line terminal;
[3.D]	the step of the optical line terminal determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality comprises: the optical line terminal determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink, and notifying the parameter value(s) or the identification(s)

Claim	Recitation
	of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical network unit via a unicast message or a broadcast message.
[4.PRE]	The method of claim 1, wherein:
[4.A]	after the step of the optical network unit receiving the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s), the method further comprises: the optical network unit entering into a serial number state;
[4.B]	the step of the optical network unit detecting the transmission quality of the downlink between the optical line terminal and the optical network unit comprises: in the serial number state of the optical network unit, the optical network unit detecting the downlink between the optical network unit and the optical line terminal to acquire quality information of the downlink;
[4.C]	The step of the optical network unit determining the upstream burst overhead parameters suitable for the optical network unit according to the transmission quality comprises: the optical network unit determining the upstream burst overhead parameter set suitable for the optical network unit according to the quality information of the downlink, and notifying the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) suitable for the optical network unit to the optical line terminal via a unicast message or a broadcast message.
[5.PRE]	The method of claim 2, wherein:
[5.A]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical line terminal setting a switching index value of the upstream burst overhead parameters in a tag field assigned for a bandwidth of the optical network unit, and sending the switching index value to the optical network unit via a downstream frame; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the switching index

Claim	Recitation
	value, the optical network unit using the upstream burst overhead parameters suitable for the optical network unit in a next frame; or,
[5.B]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical line terminal notifying a hyper frame number to the optical network unit; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the hyper frame number and after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit; or,
[5.C]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical network unit notifying a hyper frame number to the optical line terminal; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time determined by the optical network unit itself comprises: after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit.
[6.PRE]	The method of claim 2, wherein:
[6.A]	the upstream burst overhead parameter set comprises: state of forward error correction, delimiter, preamble and guard band.
[7.PRE]	The method of claim 1, wherein:
[7.A]	in the step of the optical line terminal sending the parameter values or the identifications of more than one upstream burst overhead parameter set to the optical network unit, the optical line terminal

Claim	Recitation
	sends the parameter values or the identifications of one or more upstream burst overhead parameter sets to all optical network units or one or more optical network units which communicate with the optical line terminal.
[8.PRE]	The method of claim 3, wherein:
[8.A]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical line terminal setting a switching index value of the upstream burst overhead parameters in a tag field assigned for a bandwidth of the optical network unit, and sending the switching index value to the optical network unit via a downstream frame; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the switching index value, the optical network unit using the upstream burst overhead parameters suitable for the optical network unit in a next frame; or,
[8.B]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical line terminal notifying a hyper frame number to the optical network unit; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the hyper frame number and after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit; or,
[8.C]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the

Claim	Recitation
	optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical network unit notifying a hyper frame number to the optical line terminal; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time determined by the optical network unit itself comprises: after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit.
[9.PRE]	The method of claim 3, wherein:
[9.A]	the upstream burst overhead parameter set comprises: state of forward error correction, delimiter, preamble and guard band.
[10.PRE]	The method of claim 4, wherein:
[10.A]	the upstream burst overhead parameter set comprises: state of forward error correction, delimiter, preamble and guard band.
[11.PRE]	The method of claim 4, wherein:
[11.A]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical line terminal setting a switching index value of the upstream burst overhead parameters in a tag field assigned for a bandwidth of the optical network unit, and sending the switching index value to the optical network unit via a downstream frame; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the switching index value, the optical network unit using the upstream burst overhead parameters suitable for the optical network unit in a next frame; or,
[11.B]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to

Claim	Recitation
	the optical line terminal, the method further comprises: the optical line terminal notifying a hyper frame number to the optical network unit; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time indicated by the optical line terminal comprises: after the optical network unit receives the hyper frame number and after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit; or,
[11.C]	while or after the optical line terminal notifies the parameter value(s) or the identification(s) of the determined upstream burst overhead parameter set(s) to the optical network unit, or while or after the optical network unit notifies the parameter value(s) or the identification(s) of the upstream burst overhead parameter set(s) to the optical line terminal, the method further comprises: the optical network unit notifying a hyper frame number to the optical line terminal; the step of the optical network unit starting to use the upstream burst overhead parameters after the switching time determined by the optical network unit itself comprises: after a frame indicated by the hyper frame number arrives, the optical network unit starting to use the upstream burst overhead parameters suitable for the optical network unit.

CERTIFICATION UNDER 37 C.F.R. §42.24

Petitioners certify that the word count in this Petition is 13,832 words, as counted by the word-processing program (Microsoft Word for Office 365) used to generate this Petition, where such word count excludes the table of contents, table of authorities, mandatory notices, certificate of service, appendix of exhibits, and this certificate of word count. This Petition is in compliance with the 14,000-word limit set in 37 C.F.R. § 42.24(a)(1)(i).

Date: May 30, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§42.6(e), 42.105 and in view of the agreement between the Parties under 37 C.F.R. § 42.105(b), the undersigned hereby certifies that true and correct copies of the above-captioned PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 8,934,359, all associated exhibits, and Petitioners' Power of Attorney were served in their entirety on May 30, 2024, upon the Patent Owner at the following email addresses of Patent Owner's litigation counsel:

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