

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,
Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,
Patent Owner.

Patent No. 7,889,759

Filing Date: July 12, 2004

Issue Date: February 15, 2011

Title: BROADBAND CABLE NETWORK UTILIZING COMMON BIT-
LOADING

Inter Partes Review No.: IPR2024-00452

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

TABLE OF CONTENTS

MANDATORY NOTICES.....	v
I. INTRODUCTION	1
II. SUMMARY OF ARGUMENT.....	1
III. OVERVIEW OF THE '759 PATENT	2
A. Brief Description	2
B. Prosecution History	5
C. Overview of Claim Commonality.....	7
D. Earliest Priority Date for the Claims	7
IV. OVERVIEW OF PRIOR ART	8
A. Gurantz (US 2002/0166124).....	8
B. Grube (US 5,682,419)	9
C. Gesbert (US 2002/0056066).....	10
D. Shattil (US 7,418,043).....	11
V. IDENTIFICATION OF CHALLENGE PURSUANT TO 37 C.F.R. §42.104(b).....	11
A. Claims for Which Review is Requested and Grounds on Which Challenge Is Based	11
B. §314(a) Discretion Does Not Apply	12
1. <i>Fintiv</i> Discretionary Denial Unwarranted.....	12
2. <i>General Plastic</i> Discretionary Denial Unwarranted.....	13
C. §325(d) Discretion Does Not Apply	17
D. Level of Ordinary Skill	17
E. Claim Construction.....	18
VI. SPECIFIC GROUNDS FOR UNPATENTABILITY	21
A. GROUND A: Claims 1, 4, 7-9, 11, 14-16, 20 and 21 are Rendered Obvious by Gurantz in view of Grube	22
1. Independent Claim 1	22
2. Claim 4.....	42

3.	Claim 7	46
4.	Claims 8-9 Depending from Claim 7	48
5.	Claim 11	50
6.	Claim 14	51
7.	Claims 15-16 Depending from Claim 14	52
8.	Claim 20	53
9.	Claim 21	55
B.	GROUND B: Claims 2, 3, 5, 6, 12, 13, 22, 23 are Rendered Obvious by Gurantz in view of Grube and further in view of Gesbert	57
1.	Claim 2	57
2.	Claim 3	60
3.	Claim 5	63
4.	Claim 6	65
5.	Claim 12 (depending from claim 7)	66
6.	Claim 13	67
7.	Claim 22	69
8.	Claim 23 (depending from claim 22)	71
C.	GROUND C: Claims 10 and 17 are Rendered Obvious by Gurantz in view of Grube and further in view of Shattil	71
1.	Claim 10: “The BCN of claim 9, wherein each bit-loading modulation scheme is chosen from the group essentially consisting of 64 QAM modulation, 128 QAM modulation, 256 QAM modulation, 512 QAM modulation and 1024 QAM modulation.”	71
2.	Claim 17: (same as [10] but depending from [16])	73
D.	GROUND D: Claims 18 and 19 are Rendered Obvious by Gurantz in view of Grube and further in view of Shattil and Gesbert	73
3.	Claim 18 (depending from claim 17)	73
4.	Claim 19 (depending from claim 17)	74
VII.	GROUNDS FOR STANDING & FEE PAYMENT	75

VIII. CONCLUSION.....	75
CERTIFICATION UNDER 37 CFR § 42.24(d)	76
CERTIFICATE OF SERVICE	77
CLAIM LISTING APPENDIX	78

EXHIBITS

- Ex. 1001: U.S. Patent No. 7,889,759 (“the ’759 patent”), with Certificate of Correction
- Ex. 1002: Expert Declaration of James Bertonis
- Ex. 1003: [Reserved]
- Ex. 1004: Certified Prosecution History of the ’759 patent
- Ex. 1005: Abandoned U.S. Application Serial No. 10/778,505 (co-parent of ’759 patent)
- Ex. 1006: U.S. Patent No. 7,295,518 (co-parent of ’759 patent)
- Ex. 1007: U.S. Pub. No. 2002/0166124 (“Gurantz”)
- Ex. 1008: [Reserved]
- Ex. 1009: U.S. Patent No. 5,682,419 (“Grube”)
- Ex. 1010: U.S. Pub. No. 2002/0056066 (“Gesbert”)
- Ex. 1011: U.S. Patent No. 7,418,043 (“Shattil”)
- Ex. 1012: Ciciora, Walter S. *Modern Cable Television Technology: Video, Voice, and Data Communications*. San Francisco, Calif: Morgan Kaufmann Publishers, 1999, Sections 4.1-4.3.3 (Chapter 4, pp. 161-192)
- Ex. 1013: EP 1087586 (“Mirfakhraei”)
- Ex. 1014: U.S. Pub. No. 2009/0279498 (“Li”)
- Ex. 1015: U.S. Pub. No. 2009/0323851 (“Ling”)
- Ex. 1016: U.S. Pub. No. 2005/00310444 (“Gesbert II”)

MANDATORY NOTICES

Real Parties in Interest (37 C.F.R. §42.8(b)(1))

The real parties-in-interest for this petition are (i) Comcast Corporation, (ii) Comcast Cable Communications, LLC, and (iii) Comcast Cable Communications Management, LLC. These entities are referenced below as “Comcast entity _” or as “Comcast entities __,” where “__” is one of or more of (i)-(iii).

No unnamed entity is funding, controlling, or directing this Petition for *inter partes* review (IPR) of U.S. Patent No. 7,889,759 (“the ’759 patent”), or otherwise has an opportunity to control or direct this Petition or Petitioner’s participation in any resulting IPR.

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

The ’759 patent is asserted against Comcast Corporation, Comcast Cable Communications, LLC, and Comcast Cable Communications Management, LLC, in the Central District of California in *Entropic Communications, LLC v. Comcast Corporation et al.*, 2-23-cv-01048 (C.D. Cal.) (“1048 CDCA Litigation”). The earliest date of service on any Comcast entity named in the 1048 CDCA Litigation was February 16, 2023.

Petitioner is aware of the following additional litigation matters involving the ’759 patent:

Case	Filing Date
<i>Entropic Communications, LLC v. DirecTV, LLC f/k/a DirecTV, Inc. et al.</i> , 2-23-cv-05253 (CDCA)	July 1, 2023
<i>Entropic Communications, LLC v. Cox Communications, Inc. et al.</i> , 2-23-cv-01047 (CDCA)	February 10, 2023
<i>Entropic Communications, LLC v. DISH Network Corporation et al.</i> , 2-23-cv-01043 (CDCA)	February 10, 2023
<i>Entropic Communications, LLC v. Charter Communications, Inc.</i> , 2-23-cv-00050 (EDTX)	February 10, 2023
<i>Entropic Communications, Inc. v. ViXS Systems, Inc. et al.</i> , 3-13-cv-01102 (SDCA)	May 8, 2013

A petition for *inter partes* review was filed against the '759 patent by Dish Network L.L.C. on January 22, 2024 as IPR2024-00462.

Lead and Back-Up Counsel (37 C.F.R. §42.8(b)(3))

Petitioner designates counsel listed below. A power of attorney for counsel is being concurrently filed.

<u>Lead Counsel</u>	<u>Back-Up Counsel</u>
Frederic M. Meeker (Reg. No. 35,282) fmeeker@bannerwitcoff.com	Paul T. Qualey (Reg. No. 45,027) pqualey@bannerwitcoff.com
BANNER & WITCOFF, LTD. 1100 13th Street, NW Suite 1200 Washington, DC 20005 Tel: (202) 824-3000 Fax: (202) 824-3001	Christopher L. McKee (Reg. No. 32,384) cmckee@bannerwitcoff.com
	Wesley Jones (Reg. No. 56,552) wjones@bannerwitcoff.com
	[Address same as for Lead Counsel]

Please address all correspondence to counsel at the address shown above.

Petitioner consents to electronic service by email sent to all the above emails of counsel and: ComcastIPRService@bannerwitcoff.com.

I. INTRODUCTION

Comcast Cable Communications, LLC (“Petitioner”) petitions for *inter partes* review and cancellation of claims 1-23 of U.S. Patent No. 7,889,759 (“the ’759 patent”) (Ex. 1001). This petition demonstrates the unpatentability for obviousness of the claims under 35 U.S.C. §103(a) (pre-AIA), and merits institution of trial under 35 U.S.C. §314(a).

II. SUMMARY OF ARGUMENT

The ’759 patent’s claims 1-23 set forth, in various repetitive combinations and permutations, elements which were all known in the prior art.¹ Notably, Entropic’s own prior art, Gurantz (Ex. 1007), anticipates most of the claim elements, including a broadband cable network (BCN), and bit-loading in connection with multi-carrier modulation for communications between network nodes. The few limitations that Gurantz does not explicitly teach are plainly rendered obvious by other prior art.

Grube (Ex. 1009) renders obvious the various recitations relating to the transmission of probe signals—signals used by receiving nodes to make respective bit-loading determinations—and the determination of a *common* bit-loading scheme by a transmitting node.

¹ Like claims are also expressed in terms of various categories of invention (i.e., method, apparatus, and computer-readable medium).

What is left are claim limitations of a few claims which are rendered obvious in Gurantz-Grube, by one or both of Gesbert (Ex. 1010) and Shattil (Ex. 1011). Some of these limitations concern conventional measures of signal/channel characteristics, e.g., bit-error rate (BER) in claim 2 and packet error rate (PER) in claim 3. These were obvious, known alternatives to the signal-to-noise ratio determination expressly taught by Gurantz, as shown by Gesbert. Dependent claims 10 and 17 recite nothing more than known alternative orders of quadrature amplitude modulation (QAM) suitable for selective use in the bit-loading. Shattil discloses (and renders obvious) the use of one of those (64-QAM), thus meeting the limitation.

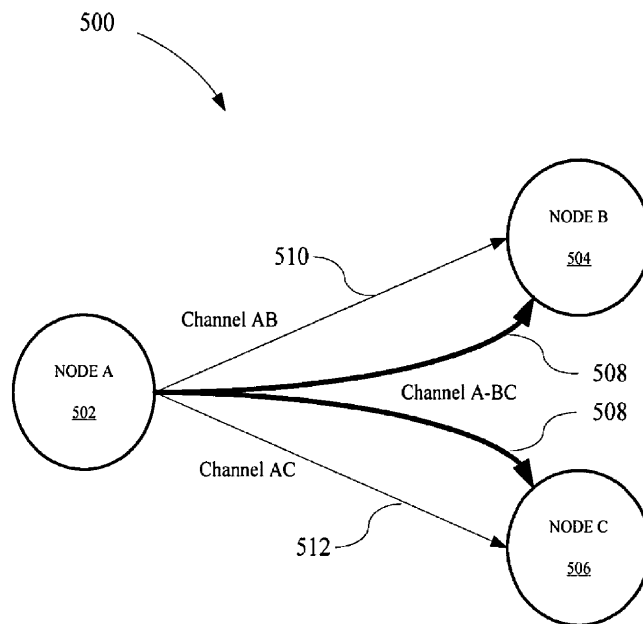
III. OVERVIEW OF THE '759 PATENT

A. Brief Description

The '759 patent describes a BCN with nodes that communicate with each other using a known multi-carrier modulation technique, namely “bit-loaded orthogonal frequency division multiplexing (OFDM).” Ex. 1001, 7:19-20. “Bit-loading is the process of optimizing the bit distribution to each of the channels [(carriers)] to increase throughput.” *Id.*, 7:12-14.²

² Petitioner’s expert James Bertonis explains relevant background technologies in his declaration. Ex. 1002, ¶¶30-58.

The process includes determining a common bit-loading modulation scheme for broadcasting/multi-casting from a transmitting node (e.g., A) to multiple receiving nodes (e.g., B, C). *Id.*, Abstract, 6:55-7:4. The '759 patent depicts this in Figure 5, with NODE A sending the same message to NODES B and C over Channel A-BC (paths 510, 512). *Id.*

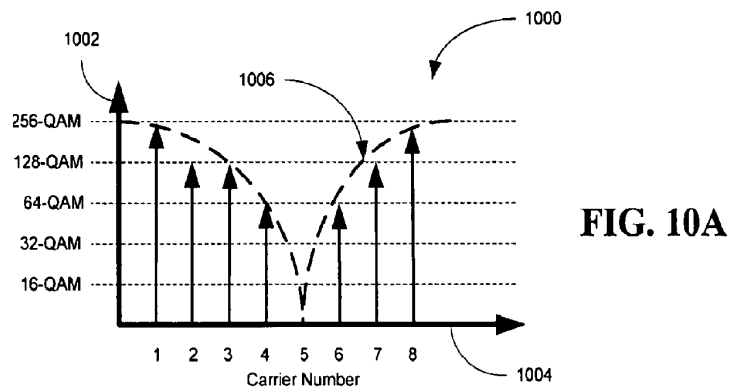


Ex. 1001, Fig. 5

The different physical attributes of paths 510, 512 dictate the most-efficient bit-loading for each path. The '759 patent determines and uses a common bit-loading modulation scheme to address this. Ex. 1001, 6:61-7:14, 10:6-14. As part of the process, the transmitting node (A) sends a probe signal to the receiving nodes (A, B), the receiving nodes reply with a bit-loading modulation scheme, and the

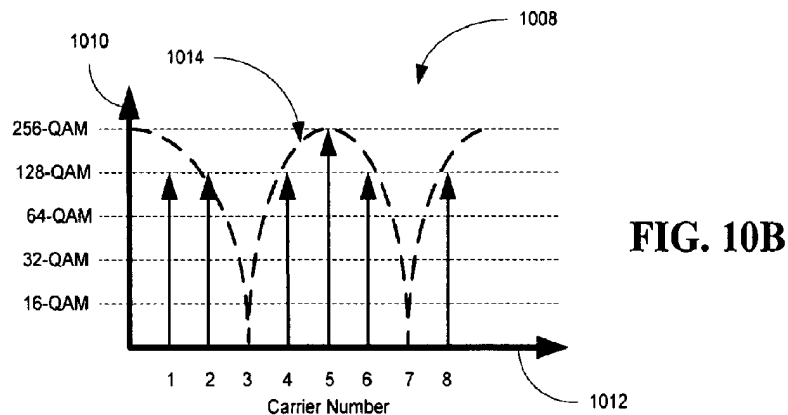
transmitting node determines a common scheme from the responses. *Id.*, 10:58-11:28; Ex. 1002, ¶61.

Figures 10A-10C collectively illustrate the methodology used for determining the common bit-loading scheme from plural schemes for different transmission paths. Ex. 1001, 10:15-57; Ex. 1002, ¶62. Figure 10A depicts a plot of the bit-loading constellation size (QAM order) versus carrier number for the AB channel (path 510):



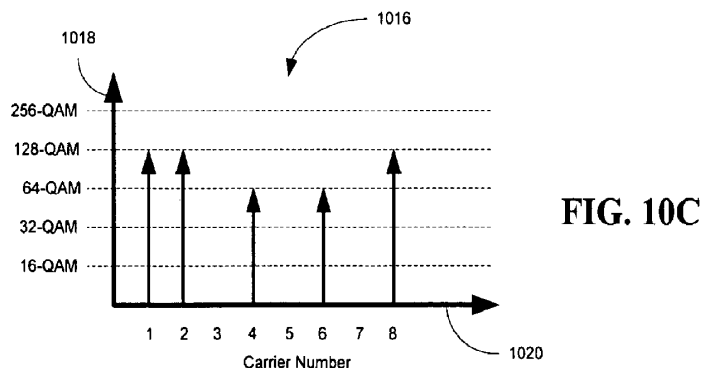
Ex. 1001, Fig. 10A

Figure 10B depicts the same for the AC channel (path 512):



Ex. 1001, Fig. 10B

Finally, Figure 10C shows plots that graphically represent the “common bit-loaded modulation scheme” determined for the A-BC channel path between node A and nodes B and C:



Ex. 1001, Fig. 10C

Ex. 1001, 10:43-56. This “common bit-loaded modulation scheme” is the result of “comparing the carrier number signals from the AB channel in FIG. 10A and the corresponding carrier number signals from the AC channel in FIG. 10B and choosing *the lowest corresponding modulation value* for each carrier number.” *Id.* (emphasis added). Thus, the “common bit-loaded modulation scheme” of Figure 10C uses 128-QAM for carriers 1, 2, and 8; 64-QAM for carriers 4 and 6; and carriers 3, 5, and 7 are kept OFF. *Id.*; Ex. 1002, ¶¶62-64.

B. Prosecution History

The '759 patent's underlying application originally presented 81 claims and the first Office Action rejected all but 24 of the claims, which it objected-to without comment. Ex. 1004, 29-49, 90-105.

The Examiner found most of the claims obvious over a combination of two prior art references, Ling (Ex. 1015) in view of Li (Ex. 1014). *Id.*, 94. The Examiner found that Ling discloses most of the claimed elements, including transmitting a probe signal and determining a common bit-loading scheme based on a feedback signal including the signal-to-noise ratio (“SNR”) of the channel. The Examiner found that Li discloses a receiving node making a determination of a bit-loading modulation scheme and transmitting that back in a response signal. Ex. 1004, 95. On these and other bases, the Examiner concluded that Ling in view of Li rendered obvious most of the claims. *Id.* 94-101.

The Examiner also found that a third reference, Gesbert II (Ex. 1016), discloses using bit-error rate (“BER”) and “product [sic: packet]³-error rate (“PER”)” as measures of the transmission characteristics of the received probe signal, rendering obvious (in combination with Li-Ling) the claims reciting these limitations. Ex. 1004, 102.

In response, Applicant cancelled every rejected claim and amended the objected-to claims to place those claims in independent form. *Id.* 126-146. **None of the grounds of rejection, or obviousness rationales supporting the same, were**

³ Claims corrected post-issuance. Ex. 1001, Certificate of Correction.

traversed. The Applicant asserted that its claim amendments rendered those rejections “moot.” *Id.* 147-149.

The amended claims were subsequently allowed without any reasons for allowance (*id.*, 153-158), and became ’759 patent claims 1-23.

C. Overview of Claim Commonality

There is much commonality and overlap among the claims. Notably, claims 1-4 and 7-10 collectively address all of the elements and limitations that appear in claims 5-6 and 11-23. In this sense, claims 1-4 and 7-10 may be considered representative.⁴

D. Earliest Priority Date for the Claims

The earliest possible priority date for the ’759 patent claims is its July 12, 2004 filing date. The ’759 patent is a continuation-in-part of two parent applications, abandoned SN 10/778,505 (Ex. 1005), and SN 10/322,834, now US 7,295,518 (Ex. 1006). Ex. 1001, cover. Each fails to disclose any method, apparatus or functionality of “determining a common bit-loading modulation scheme” as described throughout the ’759 patent and each claim.

The term “common bit-loading” makes its first appearance in the ’759 patent’s continuation-in-part application, where it is described with reference to a broadcast

⁴ Ex. 1002, ¶¶96-108 provides further detail on claim commonality/overlap.

or multicast scenario. Ex. 1001, 6:52-7:4, 10:6-14, Fig. 5. The '759 patent purports to present an improvement over the prior applications. Thus, none of the prior applications supports the claims under 35 U.S.C. §112, ¶1 and accordingly, the '759 patent is not entitled to the benefit of an earlier U.S. filing date under 35 U.S.C. §120.⁵

IV. OVERVIEW OF PRIOR ART

A. Gurantz (US 2002/0166124)

Gurantz was published on November 7, 2002, more than a year prior to the July 12, 2004 effective filing date of the '759 patent, and thus is prior art under 35 U.S.C. §102(b) (pre-AIA). Ex. 1007, cover.

Gurantz is in the same family as the '759 patent, (the '759 patent is a continuation-in-part of SN 10/778,505, which is a continuation of Gurantz). Ex. 1001, cover. It is directed to closely related, analogous art, and the same field of endeavor as the '759 patent. *See* Ex. 1007, Abstract; *cf.*, Ex. 1001, 3:62-4:3; Ex. 1002, ¶72.

⁵ The priority claims to multiple provisional applications are also ineffective as the '759 patent's regular (CIP) application filing date is more than 12 months after each provisional filing. 35 U.S.C. §119(e).

Gurantz teaches, like the '759 patent, BCN nodes that communicate with each other using multi-carrier modulation (e.g., OFDM), and bit-loading, for overcoming frequency selective channel impairments in coaxial building wiring. *See*, Ex. 1007, ¶¶[0046]-[0050]; *cf.*, Ex. 1001, 7:5-30; Ex. 1002, ¶73.

B. Grube (US 5,682,419)

Grube issued on January 26, 1995, more than one year prior to the effective filing date of the '759 patent. Ex. 1009, cover. Grube is thus prior art under §102(b).

Like Gurantz, Grube focuses on improving reliability and bandwidth over existing wiring to facilitate data transmission without compromising other services. Grube also addresses the need for “a one-to-many and/or many-to-one communication system infrastructure,” i.e., a multi-cast or broadcast scenario. Ex. 1009, 4:43-51; Ex. 1002, ¶75. To do so, Grube uses discrete multi-tone (“DMT”) modulation to facilitate communication between a primary site and multiple secondary sites. Ex. 1009, 7:9-19, Fig. 9 (depicting an embodiment with a primary site 102 connected to secondary sites 104, 106 and 108). Specifically, Grube’s DMT system uses multicarrier modulation, with quadrature amplitude modulation (“QAM”). *Id.*, 35:4-11.

Addressing multi-cast/broadcast, Grube ensures that there is sufficient bandwidth for communications between the primary site and multiple secondary sites by determining a lowest-common-denominator (LCD) bit-loading table.

Channels (from the LCD table) are allocated to the communication, based on the bandwidth requirements. *Id.*, 7:36-8:37, 14:59-15:5; Ex. 1002, ¶76.

The primary site determines the LCD table through a comparison of the bit-loading tables received from the multiple secondary sites. Ex. 1009, 18:44-55, Fig. 17. The secondary sites determine their respective bit-loading tables, and return those to the primary site, in response to receiving a “training signal” from the primary site. *Id.*, 7:56-65; Ex. 1002, ¶77.

Grube teaches using this methodology at a variety of “secondary sites” (e.g., as seen in Figure 9), including sites equipped with cable boxes or “any ... device that can receive digital information.” Ex. 1009, 8:50-9:6, 13:13-28, 24:8-19; Ex. 1002, ¶78.

C. Gesbert (US 2002/0056066)

Gesbert was published on May 9, 2002, more than a year prior to the effective filing date of the '759 patent (Ex. 1010, cover). It is thus prior art under §102(b).

Gesbert discloses a multi-mode wireless data transmission system, wherein selection of a transmission mode is made from among multi-carrier transmission modes having different modulation and coding rates. Ex. 1010, ¶¶[0036]-[0037], Table 1. The mode selections are based on one or more monitored quality parameters of the communication channel, including bit error rate (BER), packet

error rate (PER) and signal-to-noise ratio (SNR). *Id.*, ¶¶[0014]-[0017]; Ex. 1002, ¶80.

D. Shattil (US 7,418,043)

Shattil was filed December 8, 2003 and subsequently issued. Ex. 1011, cover. It is thus prior art under §102(e) (pre-AIA).

Shattil discloses, similar to Gurantz, a multicarrier transmission protocol (including OFDM) and employing bit-loading based on determined channel characteristics. Shattil specifically discloses that in such a method “[t]he modulation of the binary input data can be of many types [including] quadrature amplitude modulation (QAM) or other derivatives of these modulation schemes, such as ... 64-QAM.” *Id.*, 6:20-25; Ex. 1002, ¶82.

V. IDENTIFICATION OF CHALLENGE PURSUANT TO 37 C.F.R. §42.104(b)

A. Claims for Which Review is Requested and Grounds on Which Challenge Is Based

Petitioner requests review of claims 1–23 on the following grounds.

Ground	References	Basis	Claims
A	Gurantz in view of Grube	§103	1, 4, 7-9, 11, 14-16, 20, 21
B	Gurantz in view of Grube and further view of Gesbert	§103	2, 3, 5, 6, 12, 13, 22, 23
C	Gurantz in view of Grube and further view of Shattil	§103	10, 17

D	Gurantz in view of Grube and further view of Shattil and Gesbert	§103	18, 19
---	--	------	--------

B. §314(a) Discretion Does Not Apply

1. *Fintiv* Discretionary Denial Unwarranted

The *Fintiv* factors as set forth in the Director’s June 21, 2022 Guidance Memorandum do not warrant discretionary denial.

Factor one (court stay-related) appears neutral. Petitioner has filed IPR petitions challenging two of the twelve patents asserted in the District Court in case no. 2:23-cv-01048. If trial is instituted in one or more of those IPRs, Petitioner expects to request a stay.

Factor two (proximity of trial date) favors institution. Petitioner has filed a motion to dismiss, Patent Owner has filed an Amended Complaint, and Petitioner will renew its Motion to Dismiss in order to seek dismissal of the operative complaint. Further, no trial date has been set.

Factor three (investment in parallel proceedings) favors institution. The investment by the District Court has been limited to considering motions to dismiss.

Factor four (issues overlap) strongly favors institution. The petition challenges all 23 claims in the ’759 Patent, while only claims 1-3 are asserted in the District Court.

Factor five (parties-related) does not warrant denial as Petitioner is a defendant in the District Court case.

Factor six (other circumstances including merits) favors institution. Petitioner presents compelling unpatentability challenges that merit institution.

2. *General Plastic* Discretionary Denial Unwarranted

An unrelated party, Dish Network L.L.C., (“Dish”), filed a petition challenging claims 1-3 of the ’759 patent on January 22, 2024. Dish’s filing does not warrant a discretionary denial of this petition—filed less than a month later. The *General Plastic*⁶ factors are addressed below.

a. Factor One (whether the same petitioner previously filed a petition directed to the same claims of the same patent) favors institution

Dish is not the present petitioner. Nor does Dish’s prior petition challenge the same claims as the instant petition. Moreover, petitioner Comcast and the prior petitioner Dish have no significant relationship to each other. They are unrelated competitor companies sued separately for alleged patent infringement based on their respective products/services. Further, counsel can (and does) represent that Comcast

⁶*General Plastic Industrial Co. Ltd. v. Cannon Kabushiki Kaisha*, No. IPR2016-01357, Paper 19 at 16 (PTAB Sept. 6, 2017) (precedential as to section II.B.4.i).

and Dish have not cooperated in any way in preparing their petitions. Thus, these parties have no relationship in their requested IPRs.

In these (and other) respects, the facts align with *Google LLC v. Uniloc 2017 LLC*, No. IPR2020-00396, 2020 WL 4463086, *4 (PTAB Aug, 3, 2020; Paper 11) (petitioners “have no relationship and offer competing products”; no cooperation in preparing the petitions). “[T]here is not a significant relationship between Petitioner and [Dish], and accordingly, the first *General Plastic* factor does not weigh in favor of denying institution.” *Id.*, *5.

Valve Corp. v. Elec. Scripting Prods., Inc., No. IPR2019-00062, Paper 11 at 9–10 (PTAB April 2, 2019) (precedential) is clearly distinguishable. There, the Board discretionarily denied a second petition filed by another petitioner largely because of the significant relationship found to exist between the petitioners (HTC and Valve). The petitioners were co-defendants accused of infringing the same patent based on “HTC’s ... devices that incorporate technology licensed from Valve.” *Id.*

b. Factor Two (knowledge of prior art asserted in second petition at the time first position was filed)

That Comcast knew of the references it relies on here, at the time Dish filed its petition, at most “weighs slightly in favor of denying institution.” This is even further reduced by the short time (less than a month) between the filing of the two petitions. *Google*, 2020 WL 4463086 at *6.

c. Factor Three (timing in relation to preliminary response and institution decision in first IPR) favors institution

As in *Google*, there can be “no dispute that the Petition was filed before the preliminary response was filed or the institution decision was issued” in the earlier proceeding. *Id.*

d. Factor Four (elapsed time between when the petitioner learned of the prior art asserted in the second petition and the time of its filing) does not favor denial of institution

Upon Entropic filing suit, Comcast undertook to diligently investigate the allegations, including the invalidity of the patents asserted. Patent invalidity searches and studies were undertaken, with the references relied upon herein ultimately being identified as material prior art.

Petitioner submits that the time taken to investigate invalidity, identify IPR challenge grounds and prepare the instant petition was reasonable under the circumstances, including the large number of patents asserted against Petitioner by Entropic (twelve). The situation is a direct result of Patent Owner’s litigation activity. *Cf., id.* at *7.

e. Factor Five (explanation of time elapsed between filing of multiple petitions directed to same claims of same patent) favors institution

Dish’s earlier petition challenges only claims 1-3 of the ’759 patent. On the other hand, the instant petition challenges all 23 claims. Further, the time elapsed between the two petition filings (less than a month) is minimal. *Cf., Google*, 2020 WL 4463086 at *6 (“nearly three month lapse in time” not unreasonable).

f. Factors Six (Board's finite resources) and Seven (statutory time frame for IPR) do not favor denial of institution

As in *Google*, the filing of two petitions by different petitioners here is the direct result of Patent Owner's litigation activity. The Board should be “mindful of potential prejudice to a second or subsequent petitioner if institution of review based on the second petition is denied and the proceeding involving the first petitioner is terminated.” *Id.* at *7. The potential prejudice to Comcast is even greater here, where Dish's petition challenges only claims 1-3, while the instant petition challenges claims 1-23.

Further, the grounds asserted in the respective petitions are distinct, and merit the Board's separate reviews. Each relies on a different primary reference. The primary reference in the instant petition is Entropic's own published application (Gurantz), which is §102(b) prior art due to the ineffectiveness of the '759 patent's priority claims. *See* §III.D, *supra*. Dish relies on prior art that predates the patent's earliest claimed priority.

Still further, the minimal amount of elapsed time between the two petition filings lends itself to the efficient conduct of proceedings, e.g., potentially consolidation and concurrent issuance of final written decisions within the statutory time frame.

C. §325(d) Discretion Does Not Apply

Considering the two-part framework discussed in *Advanced Bionics, LLC v. Med-El Elektromedizinische Geräte GMBH*, No. IPR2019-01469, Paper 6 at 8-9 (PTAB Feb. 13, 2020), the Board should not exercise its §325(d) discretion to deny institution. The grounds of this Petition do not present the same or substantially the same art or arguments as raised during prosecution. The references relied upon were not before the Examiner. And Gurantz and Grube relied on here differ very substantially and materially from the applied Ling and Li references.

Moreover, the Examiner's combination of Ling and Li differs substantially from the asserted obviousness combination of Gurantz and Grube. The Examiner's grounds were never withdrawn or even traversed in any event. *See*, §III.B, *supra*.

The allowed claims all have a limitation relating to determining the common bit-loading modulation scheme in response to comparing the bit-loading schemes received in response signals. *Id.* The Examiner erred in allowing these claims at least because the Examiner was not aware of Grube, which teaches this (*see* §IV.B, *supra*; §§IV.A.1.b, IVA.1.c, *infra*), nor the high materiality of Entropic's own prior art, Gurantz, which is readily combinable with Grube.

D. Level of Ordinary Skill

For the '759 patent, a person having ordinary skill in the art (a "POSITA") would have had a bachelor's degree in electrical engineering, computer engineering,

or a similar discipline, and three to four years of experience working in signal processing and/or communication systems/networks. Additional education may substitute for experience, and significant work experience may substitute for formal education. Ex. 1002, ¶84.⁷

E. Claim Construction

The same claim construction standard that would be used in a civil action under 35 U.S.C. §282(b) is applicable here. 37 C.F.R. §42.100(b). The claim terms are to be given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

A large number of the terms in claims 14 and 18-23 use the words “means for” followed by a statement of function, and thus presumptively invoke 35 U.S.C. §112 ¶6 (pre-AIA).⁸ *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015). Construing these terms requires identifying the claimed function, then

⁷ Petitioner’s expert Mr. Bertoni meets and exceeds this level of skill, and has the necessary skills and experience to testify from the perspective of a POSITA in the relevant timeframe. Ex. 1002, ¶4-16.

⁸ In the Claim Listing Appendix, occurrences of “means for” are italicized.

identifying the corresponding structure described in the specification. *Id.* at 1351-52. Under §112, ¶6, the means-plus-function terms are to be construed “to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.”

The various “means” recited in the claims are typically identified (in the claims) as being included at one or more particular nodes of a BCN, e.g., transmitting node A (502) or receiving nodes B (404) and C (406), as seen in Figure 5; the functions as recited generally correspond to the steps of the process flowchart of Fig. 11. These functions (readily identifiable in the claims) also directly correspond to method/functional limitations recited in other claims, as identified in the respective unpatentability grounds set forth below (§VI).

The ’759 patent generally and inclusively describes the BCN *structure* that may be used to carry out the process steps of Figure 11, as “hardware or software.” Ex. 1001, 11:52-53. For example, according to the ’759 patent:

If the process is performed by software, the software may reside in software memory (not shown) in the BCN. The software ... may include an ordered listing of executable instructions for implementing logical functions ... , may selectively be embodied in any computer-readable (or signal-bearing) medium for use by or in connection with an instruction execution system ... such as a computer based system

Id., 11:53-67.⁹ A POSITA would understand the structure for carrying out the variously recited BCN functions to be conventional BCN hardware components operating under the control of suitable programming. Ex. 1002, ¶91.

For purposes of this proceeding,¹⁰ the means-plus-function terms in the claims should be construed to cover BCN hardware and/or software systems operable to carry out the particular function recited, at any particular location within the BCN that may be specified in the claims, e.g., at a “transmitting node” or “receiving node” of the network.

⁹ While the '759 patent includes general incorporations by reference of a large number of other patents/patent applications (Ex. 1001, 1:8-35, 7:14-18), there is no clear link of these disclosures to the recited means. And regardless, the '759 patent's broad characterizations of suitable BCN structures for carrying out the relevant functions (e.g., steps of Figure 11) should, for purposes of this proceeding, be deemed controlling.

¹⁰ No admission is made with respect to the sufficiency of the disclosures of corresponding structure/algorithm for satisfying 35 U.S.C. § 112, ¶2, or for compliance with 35 U.S.C. § 101.

Claims 4-6 are computer-readable medium (CRM) claims, i.e., drawn to “[a] *non-transitory computer-readable medium having software for* [carrying out a specified function].”¹¹ Here, as with the means-plus-function terms, a broad construction is warranted for purposes of this proceeding. In this regard, the inventors acted as their own lexicographers in providing an all-encompassing definition. “In the context of this document, a ‘computer-readable medium’ ... is any means that may contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus or device.” *Id.*, 11:67-12:22.

Except as otherwise indicated, the claim terms of the ’759 patent should be given their ordinary and customary meaning to a POSITA, consistent with the specification and prosecution history, as they would be given in a civil action under 35 U.S.C. §282(b); 37 C.F.R. §42.100(b).

VI. SPECIFIC GROUNDS FOR UNPATENTABILITY

Claims 1-23 are unpatentable under §103(a), because the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a POSITA. *See, KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). Consideration of the

¹¹ Relevant phrasing is italicized in the Claim Listing Appendix.

Graham factors underlying the question of obviousness leads inexorably to a conclusion of obviousness for all claims. *See, Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

A. GROUND A: Claims 1, 4, 7-9, 11, 14-16, 20 and 21 are Rendered Obvious by Gurantz in view of Grube

1. Independent Claim 1

- a. [1PRE]: “A method for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network (“BCN”), the method comprising:”**

To the extent the preamble [1PRE] is limiting, Gurantz in view of Grube teaches it. Ex. 1002, ¶110.

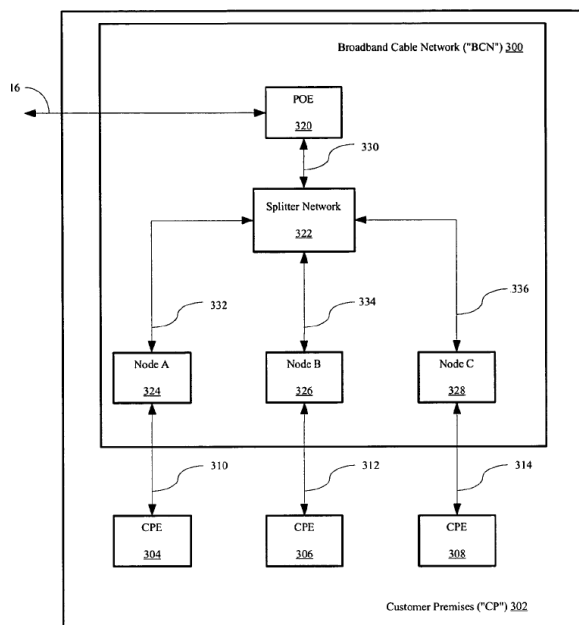
Gurantz teaches a method *including determination and use of a bit-loading modulation scheme for communicating between plural nodes in a BCN*.

Regarding the BCN, Gurantz teaches:

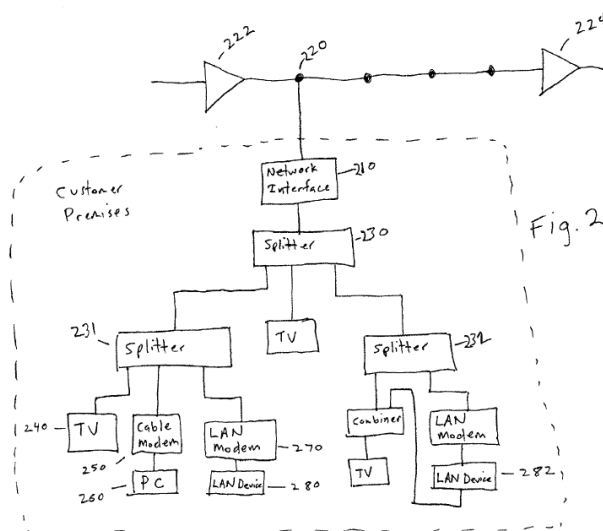
A local area network uses coaxial cable wiring for interconnection of terminal devices. ... By reflecting network upstream signals back ... as downstream signals, the network interface provides a path for terminal devices to transmit to and receive from other terminal devices.

Ex. 1007, Abstract, ¶¶[0013], [0020], Fig. 2. In this regard, it is useful to compare ’759 Patent, Figure 3 with Gurantz, Figure 2. In Gurantz’s Figure 2, each of the representative pairs of LAN modem/LAN device (LAN modem 270, LAN device 280), (LAN modem (unlabeled), LAN device 282)), correspond to a respective one

of the '759 patent's node/customer premises equipment (CPE) pairs, (Node A 324, CPE 304), (Node B 326, CPE 306), (Node C 328, CPE 308):¹²



Ex. 1001, Fig. 3



Ex. 1007, Fig. 2

Bit-loading was known for carrying out multi-carrier modulation. Gurantz discloses “[a]pplication of DMT and OFDM,” which are both methods of multi-carrier modulation. Ex. 1007, ¶¶[0046]-[0047]; Ex. 1002, ¶113. As Gurantz explains, “OFDM provides a mechanism to overcome the frequency selective channel impairments present in coaxial building wiring when employing a network

¹² Gurantz’s pair of cable modem 250, PC 260 appear to be outside of the LAN. Ex. 1007, ¶[0021]; Ex. 1002, ¶112.

interface device.” Ex.1007, ¶[0048]. *Disclosing the use of bit-loading*, Gurantz teaches:

Higher SNR channels can support higher data capacity. Frequency bins occupying parts of the channel where the SNR is high can be used to transmit more bits. Each carrier may be modulated with a different order constellation, where higher SNR frequencies can bear a higher order constellation, and the resulting closer spacing of the constellation points. Frequencies with the lower SNR use lower order constellations such as QPSK.

Id., ¶[0050]; Ex. 1002, ¶114.

Such modulation of the carriers is the essence of bit-loading. Ex. 1002, ¶115. Consistently, according to the ’759 patent, “[b]it-loading is the process of optimizing the bit distribution to each of the channels to increase throughput.” Ex. 1001, 7:12-14. Further, the ’759 patent incorporates by reference an earlier application (10/322,834, which issued as US 7,295,518, Ex. 1006). Ex. 1001, 7:14-17. The ’518 patent characterizes bit-loading further. *See*, Ex. 1006, 8:9-12. Notably, it describes bit-loading in precisely the same terms as Gurantz. *Id.*, 8:12-19; *cf.*, Ex. 1007, ¶[0050].

Gurantz does not disclose that its determined bit-loading modulation scheme is a “common” scheme. However, this feature is taught by Grube, as further described below with respect to elements [1B]-[1G].

b. [1A] “transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;”

Gurantz’s network, which employs bit-loading, includes a transmitting node within the plurality of nodes, and a sub-plurality¹³ of receiving nodes (*see* §I.A.1.a ([1PRE]), *supra*). Gurantz does not disclose the detail of transmitting a probe signal from the transmitting node to the sub-plurality of receiving nodes in connection with carrying out its bit-loading. Grube teaches transmission of a “probe signal” to a sub-plurality of receiving nodes as recited, for that purpose.

Specifically, with reference to Figure 15, Grube teaches the transmission from a primary site 102 (transmitting node) of a training signal 280 to a plurality of secondary sites 104-106 (a sub-plurality of receiving nodes). Ex. 1009, 17:10-45, Fig. 15. These receiving nodes ascertain a “spectral response” of the training signal which is used to determine “a bit loading for each of the carrier channels to produce a bit loading table 282.” *Id.* A POSITA would have understood Grube’s “spectral response” to indicate SNR among other characteristics of the channel under test. Ex. 1002, ¶119.

¹³ The plain meaning of “sub-plurality” here is a smaller plurality (i.e., less than all or a sub-group), which is met by the receiving nodes in Gurantz-Grube, since one of the nodes is the transmitting node.

It would have been obvious to a POSITA to employ in Gurantz a training (i.e., probe) signal transmitted from a transmitting node to a sub-plurality of receiving nodes as taught by Grube, for purposes of making the SNR-based bit-loading determinations already taught by Gurantz. *Id.*, ¶120; Ex. 1007, ¶[0050].

Applying Grube to Gurantz in this manner would have been nothing more than combining prior art elements—Gurantz’s bit-loading BCN network, with Grube’s technique for determining the bit-loadings using a transmitted training (i.e., probe) signal—using the known methods taught by the respective prior art references. And it would have yielded the predictable result of a BCN employing bit-loading, beneficially including a probe signal transmission methodology for determining an optimal bit-loading for particular transmission paths. *Cf.*, *KSR*, 550 U.S. at 401. Simply put, Grube supplies detail missing from Gurantz regarding a suitable, beneficial technique for determining the bit-loading that Gurantz already contemplates. Ex. 1002, ¶125-26.

In the combination, parts of the channel with higher SNR would be used to transmit more bits, while frequencies having a lower SNR would use “lower order constellations,” in accordance with Gurantz’s teachings Ex. 1007, ¶[0050]. This would have furthered Gurantz’s objective of overcoming “frequency selective channel impairments.” *Id.*, ¶[0048]; Ex. 1002, ¶126.

The obvious combination is equally characterizable as use of a known technique (Grube's training signals) to improve a similar device (Gurantz's bit-loading BCN) in the same way, and applying a known technique (Grube's training signals) to a known device ready for improvement (Gurantz's BCN) to yield predictable results. *KSR*, 550 U.S. at 401.

A POSITA would have recognized that Grube's teachings for improving bit-loaded data transmission over a network utilizing two-wire (e.g., twisted pair) telephone line would have similar application, with similar benefits, as applied to Gurantz's BCN employing coaxial cable. In this respect, a POSITA would have understood that both types of networks are subject to similar interference and signal reflections. Ex. 1002, ¶121. Recognizing the differences between coaxial cable and telephone wiring as a transmission medium, a POSITA would have considered the concerns with transmission impairments, and the advantages obtainable through the use bit-loading, to be largely common between the two. *Id.*, ¶122-124.

Therefore, Gurantz-Grube teaches [1A].

c. [1B] “receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node”

Gurantz teaches use of a “bit-loading modulation scheme” as previously set forth, but does not specifically describe that scheme being determined by a corresponding receiving node and included in a plurality of received response

signals (responsive to the transmitted probe signal). Grube teaches such an arrangement and would have suggested to a POSITA its use in Gurantz. Ex. 1002, ¶127.

Grube teaches in detail a *common* bit-loading methodology for use in a multi-cast scenario where the same data (e.g., control data) is to be transmitted simultaneously to multiple receiving nodes. Therein, multiple receiving nodes (“secondary sites”) of a communication network determine and inform a transmitting node (“primary site”) of a bit-loading scheme (table) for the respective receiving node, responsive to receiving the probe (“training”) signal sent by the transmitting node. Ex. 1009, 14:3-19, 17:10-45, Figs. 12, 15; Ex. 1002, ¶128.

The tables are compared by the primary site (transmitting node) in order to determine a *common* bit-loading scheme for outgoing multi-carrier data transmissions, which Grube terms lowest common denominator (LCD) bit-loading. Ex. 1009, 14:64-15:5, 18:44-19:26, Fig. 17; Ex. 1002, ¶129.

With reference to Figure 12 (below), Grube explains that in a process for establishing an infrastructure path for data transmission, “[a]t step 230, the primary site obtains outbound bit loading information from a plurality of secondary sites. This is generally done by providing a training signal to each of the plurality of

secondary sites.” Ex. 1009, 14:5-8.¹⁴ The secondary sites each calculate bit-loading information from a spectral response to the training signal, and provide that information to the primary site. *Id.*, 14:11-19; Ex. 1002, ¶130. At step 238, the primary site utilizes the bit-loading information it receives from the secondary sites “to establish an infrastructure for a data transmission.” Ex. 1009, 14:59-61.

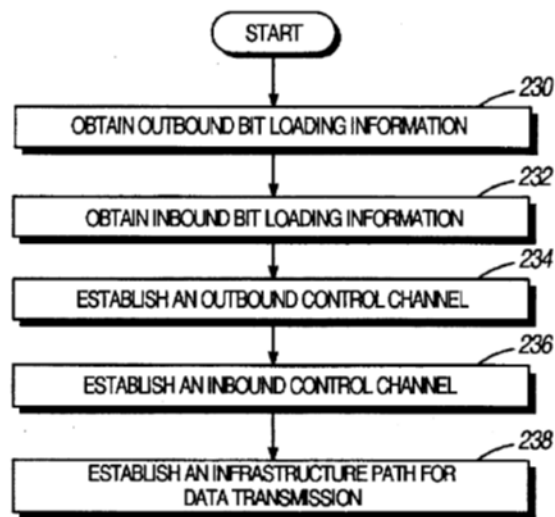


FIG.12

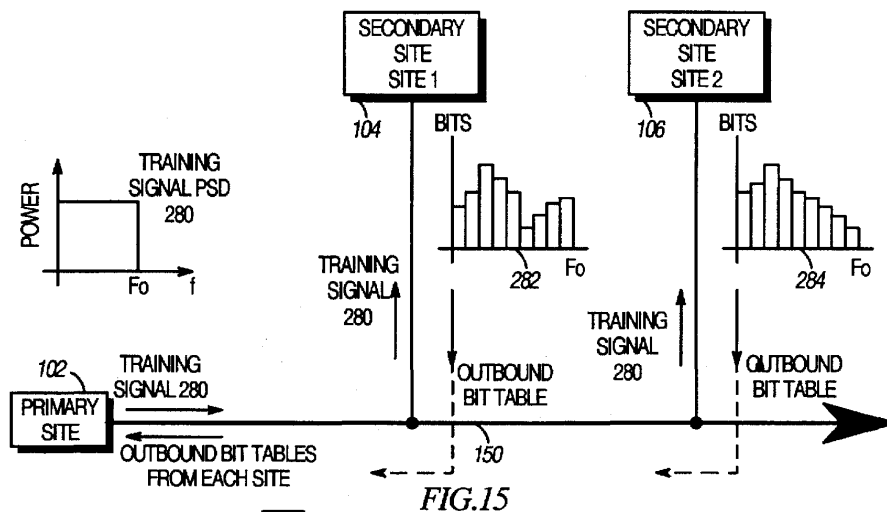
Ex. 1009, Fig. 12

“[T]his is accomplished by first determining the number of sites involved in the data transmission [a multi-cast scenario] and retrieving the respective site bit loading

¹⁴ While Grube discloses similar steps for establishing an inbound control channel, as well as “call” channels, the focus here is on the bit-loading determination for establishing the outbound control channel.

tables. From the site bit loading tables, a lowest common denominator call [sic: site] bit loading table is determined” *Id.*, 14:61-65.

Grube further describes the process for obtaining the outbound bit-loading tables from the secondary sites in response to the training signals, with reference to Figure 15 (below).



Ex. 1009, Fig. 15

As shown, the primary site 102 transmits a training signal 280 to a plurality of secondary sites 104-106. ... The first secondary site 104, upon receiving the training signal, generates a spectral response for each of the sinusoidal signals of the training signal 280. From the spectral response, the secondary site determines a bit loading for each of the carrier channels to produce a bit loading table 282. ... The second secondary site 106 calculates a similar bit loading table and provides the bit loading table back to the primary site 102.

Id., 17:11-34.

Grube describes the process for determining a *common* bit-loading table (outbound control channel bit loading table 338) from the bit-loading tables (320, 322, 324) it receives back from the secondary sites (1-3) in response to the training signals, with reference to Figure 17 (below).

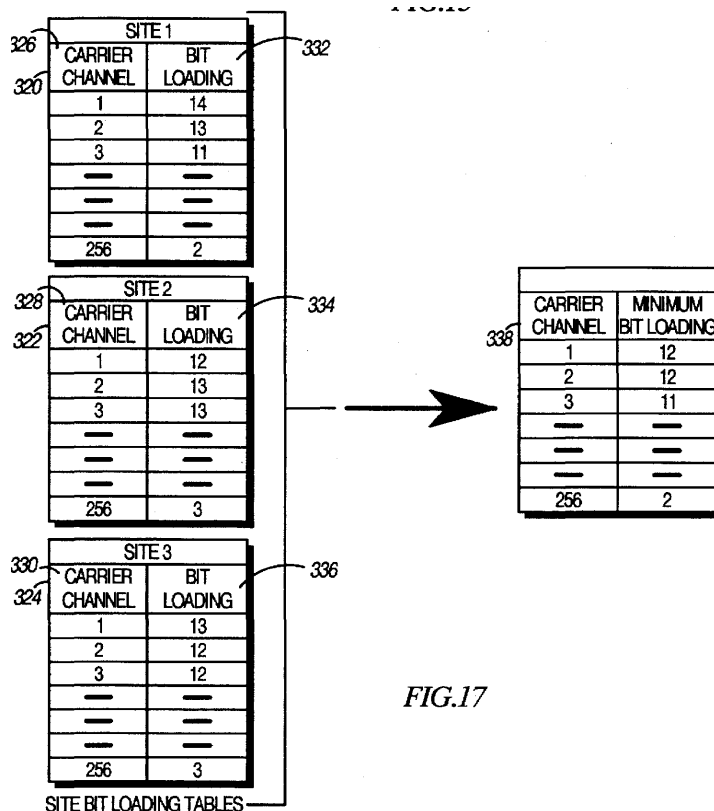


FIG.17

Ex. 1009, Fig. 17

Outbound bit loading tables for the plurality of sites are shown as outbound site bit loading tables 320-324. ... The outbound control channel bit loading table 338 is generated by comparing the bit loading, on a carrier channel by carrier channel basis, of all of the site bit loading tables. ... This process continues on a carrier channel by carrier channel basis until the outbound control channel bit loading table 338 contains,

for each carrier channel entry, the lowest bit loading value of all of the site bit loading tables.

Id., 18:45-19:16. Outbound control channel bit loading table 338 constitutes a determined *common* bit-loading modulation scheme, as recited. Ex. 1002, ¶133.

It would have been obvious for a POSITA to have employed Grube's teachings concerning a common bit-loading scheme in carrying out the system of Gurantz. Grube is analogous art to the '759 patent, and to Gurantz, in that each pertains to data communications between network nodes employing multi-carrier modulation (e.g., OFDM or DMT) and bit-loading. Additionally, Grube shares the goal of Gurantz to allow communication infrastructure to be placed in areas where it was not achievable before. Gurantz seeks to extend the usefulness of existing home cable wiring for use in broadband local area networking. Ex. 1007, ¶ [0020]. Grube similarly seeks to extend the usefulness of twisted pair telephone line. Ex. 1009, 58:4-14; Ex. 1002, ¶134.

Further, Grube presents an improvement over the known use of bit-loading, extending it to provide an architecture that allows for "one-to-many and/or many-to-one" communications, i.e., a multi-cast scenario. Ex. 1009, 4:43-50. Combination with Gurantz would have been motivated in order to achieve a similar improvement in data networking over coaxial cable. Ex. 1002, ¶135.

More specifically, the combination would have been motivated by the benefits expressly taught in Grube, e.g., optimizing communications for the case of multi-

cast data communications. Ex. 1009, 4:43-51. *See also, id.*, 17:20-40 (describing how this is achieved, paralleling Gurantz's bit-loading process (Ex. 1007, ¶ [0050])); Ex. 1002, ¶136.

A POSITA would have recognized Grube's approach to be similarly beneficial in the Gurantz BCN, for multicast/broadcast transmissions from a transmitting node to plural receiving nodes. This includes a scenario where a transmitting node of Gurantz includes a PC that broadcasts data to the plural receiving nodes. In the case of a database or server being associated with the PC, the data could comprise database/server control data or content. *Id.*, ¶¶137-38; Ex. 1007, ¶ [0020], Fig. 2; Ex. 1009, Fig. 9, 11:29-51. *See also*, VI.A.1.d, *infra*.

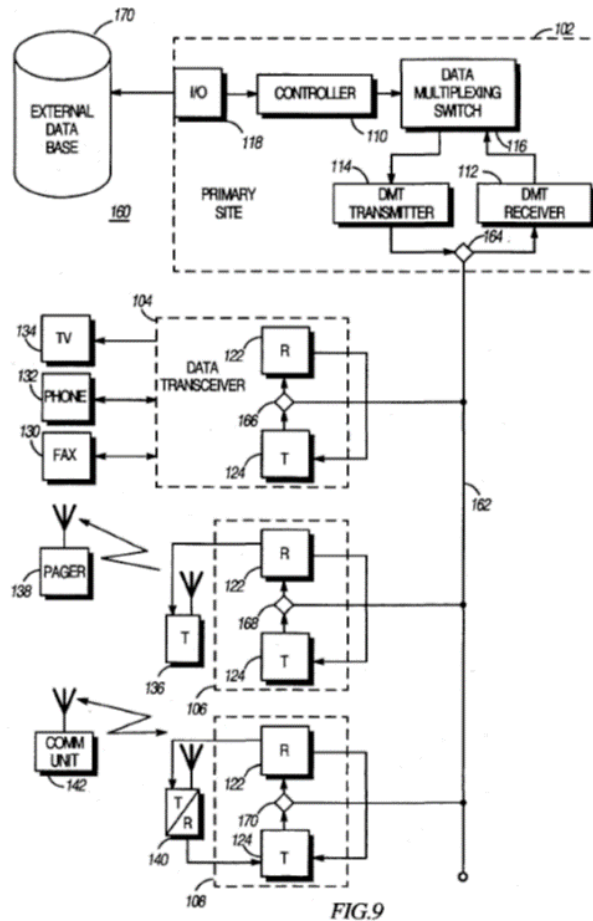
Applying Grube to Gurantz in this manner would have been nothing more than combining prior art elements—Gurantz's bit-loading BCN network, with Grube's system of comparing determined bit-loadings of multiple receiving nodes to arrive at a common bit-loading scheme—according to known methods (as taught in Gurantz and Grube). This would have yielded the predictable result of a BCN advantageously employing common bit-loading for plural transmission paths in a multi-cast or broadcast scenario. *Id.*, ¶139; *Cf.*, *KSR*, 550 U.S. at 401.

Therefore, Gurantz-Grube teaches [1B].

d. [1C] “determining the common bit-loading modulation scheme from the received plurality of response signals;”

Gurantz-Grube set forth above for [1B] teaches this step. Gurantz teaches use of a “bit-loading modulation scheme,” but does not detail that scheme being determined by a corresponding receiving node and included in a plurality of received response signals (responsive to the transmitted probe signal), and determining a *common* bit-loading modulation scheme as recited. Grube teaches such an arrangement and would have suggested to a POSITA its use in Gurantz. *See* §VI.1.c, *supra*.

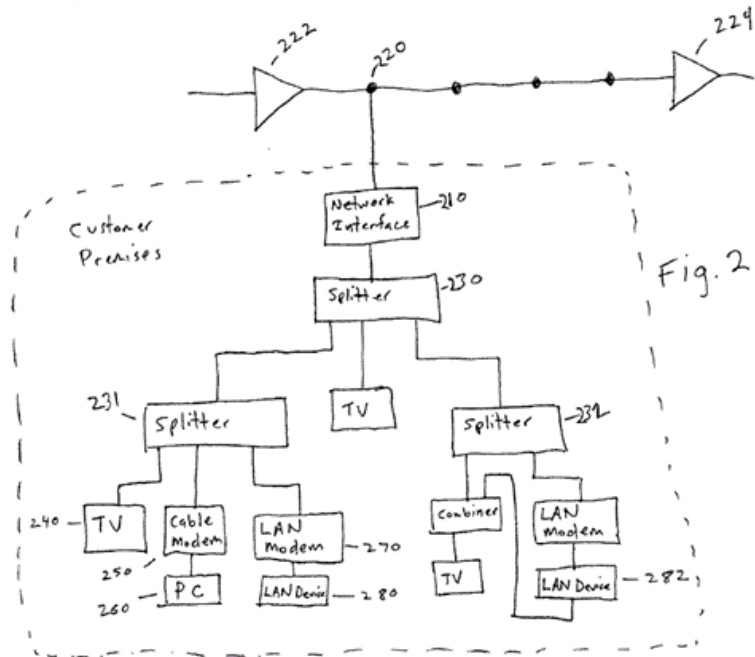
More specifically, according to Grube, determination of a common bit-loading scheme for outgoing multi-carrier data transmissions would be made by a “primary site” (e.g., primary site 102 in Figure 9 (below)), based on the bit-loading tables it would receive back from designated “secondary sites” (e.g., Grube’s secondary sites 104, 106 and 108), in response to the training (i.e., probe) signals sent to the secondary sites by the primary site 102. Ex. 1002, ¶141.



Ex. 1009, Fig. 9

In view of Grube, it would have been obvious to a POSITA to configure any selected one of Gurantz's terminal devices as a primary site, and Gurantz's other terminal devices as secondary sites with which the primary site would communicate. Ex. 1002, ¶142.

For example, Gurantz's Figure 2 (below) depicts a cable LAN on a customer premises comprising, on one branch, LAN modem 270 and LAN device 280.



Ex. 1007, Fig. 2

As Gurantz discloses, “terminal devices such as LAN modem 270, can receive a signal transmitted by another terminal device connected to the LAN wiring forming the network.” Ex. 1007, ¶[0020]. LAN modem 270 further “provides modulation and demodulation of the waveform transmitted over the cable”; and “has an interface to communicate with [the] LAN device 280 which is the source or destination of data transmitted over the LAN.” *Id.* Gurantz further discloses: “LAN device 280 can be, for example, a personal computer (PC). LAN device 282 [shown at a second node] can be, for example, a modulator to produce a signal for driving a TV through a signal combiner.” *Id.*

It would have been obvious to a POSITA to have configured Gurantz’s LAN modem/device pair 270/280 as a primary site as taught by Grube, while configuring

other LAN modem/device pairs, such as LAN modem/device pair (unlabeled)/282, as secondary sites on the LAN. *Cf.*, Ex. 1007, Fig. 2 with Ex. 1009, Fig. 9 (each above). *See*, §VI.A.1.c, *supra*. In this obvious configuration, it would be Gurantz's LAN modem/device pair 270/280 that determines a common bit-loading modulation scheme, from the plurality of response signals received from the plurality of secondary sites exemplified by Gurantz's LAN modem/device pair (unlabeled)/282. Ex. 1002, ¶144.

While Gurantz's Figure 2 illustratively depicts two LAN nodes, either of which may be a receiving or transmitting node (Ex. 1007, ¶[0020]), a POSITA would understand from Gurantz that the BCN may include any desired number of nodes. Thus, a scenario where two or more of the nodes are configured as receiving nodes, while one is configured as a transmitting node, would have been obvious to a POSITA. Ex. 1002, ¶145.

As discussed for [1B], applying Grube to Gurantz this way would have been nothing more than combining prior art elements—Gurantz's bit-loading BCN network, with Grube's system of comparing determined bit-loadings of multiple receiving nodes to arrive at a common bit-loading scheme—according to known methods (as taught in Gurantz and Grube). This would have yielded the predictable result of a BCN employing common bit-loading for plural transmission paths in a multi-cast or broadcast scenario. *Id.*, ¶146; *cf.*, *KSR*, 550 U.S. at 401.

Therefore, Gurantz-Grube teaches [1C].

- e. [1D] “receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;”**

The obvious combination of Gurantz and Grube set forth above for [1PRE]-[1C] teaches this step. *See* §§VI.A.1.a-VI.A.1.d, *supra*. With reference to the detailed Gurantz-Grube combination set forth for [1C], it would have been Gurantz’s representative LAN modem/device pair (unlabeled)/282 (and other like nodes), configured as secondary sites according to Grube, that would receive the training (probe) signal from Gurantz’s LAN modem/device pair 270/280 configured as a primary site. The signal would be received over the channel path connecting these terminal devices/nodes, as depicted in Gurantz’s Figure 2. Ex. 1002, ¶147.

Therefore, Gurantz-Grube teaches [1D].

- f. [1E] “determining the transmission characteristics of the channel path at the one receiving node; and”**

The obvious combination of Gurantz and Grube set forth above for [1PRE]-[1D] teaches this step. *See* §§VI.A.1.a-VI.A.1.e, *supra*. As set forth above for [1D], Gurantz’s representative LAN modem/device pair (unlabeled)/282 would be configured as a secondary site according to Grube. It would receive the training (probe) signal from Gurantz’s LAN modem/device pair 270/280 (configured as a primary site), over the channel path connecting these terminal devices/nodes, as depicted in Gurantz’s Figure 2. Ex. 1007, Fig. 2. It would be this same receiving

node (“the one receiving node”) that determines the transmission characteristics (e.g., Grube’s “spectral response”) of that channel path using the training (probe) signal. Ex. 1002, ¶148.

Therefore, Gurantz-Grube teaches limitation [1E].

g. [1F] “transmitting a response signal from the one receiving node to the transmitting node,”

The obvious combination of Gurantz and Grube set forth above for [1PRE]-[1E] teaches this step. *See* §§VI.A.1.a-VI.A.1.f, *supra*. In the combination, Gurantz’s representative LAN modem/device pair (unlabeled)/282 is configured as a secondary site according to Grube. It receives the training (probe) signal from Gurantz’s LAN modem/device pair 270/280 (configured as a primary site), over the channel path connecting these terminal devices/nodes, as depicted in Gurantz’s Figure 2. Ex. 1007, Fig. 2. This same receiving node (“the one receiving node”) would determine the transmission characteristics (e.g., Grube’s “spectral response”) of that channel path using the training (probe) signal. From these characteristics, a bit-loading table would be determined, and that table would be sent in a response signal to the primary site (“transmitting node”). Ex. 1002, ¶149.

Therefore, Gurantz-Grube teaches [1F].

- h. [1G] “wherein the transmission characteristics of the channel path are determined by measuring the signal-to-noise (“SNR”) characteristics of the received probe signal at the one receiving node and”**

Gurantz-Grube teaches this limitation. Gurantz teaches bit-loading its multi-carrier data transmissions based upon the SNRs of the particular channels. Ex. 1007, ¶[0050]. Gurantz does not detail how the SNR of a given channel is to be determined. Grube provides more detail in this regard, suggesting use of a training signal (i.e., a “probe signal” as recited). Ex. 1002, ¶150.

Specifically, with reference to Figure 15, and as discussed for [1A] (§VI.A.1.b, *supra*), Grube teaches transmission from a primary site 102 of a training signal 280 to a plurality of secondary sites 104-106. These receiving nodes ascertain a “spectral response” of the training signal which is used to determine “a bit loading for each of the carriers to produce a bit loading table 282.” Ex. 1009, 17:10-31, Fig. 15; Ex. 1002, ¶151.

As set forth for [1A] (§I.A.1.b, *supra*), it would have been obvious to a POSITA to employ in Gurantz a training (i.e., probe) signal as taught by Grube for purposes of making SNR determinations for the multi-carrier channels, and determining bit-loadings based thereon, in accordance with the teachings of Gurantz. Ex. 1002, ¶¶152-53.

Therefore, Gurantz-Grube teaches [1G].

- i. [1H] “wherein determining a common bit-loading modulation scheme includes: comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.”

The Gurantz-Grube combination set forth above for [1PRE]-[1G] also teaches this limitation. *See* §§VI.A.1.a-VI.A.1.h, *supra*. Gurantz does not disclose that its determined bit-loading modulation scheme is a “common” bit-loading modulation scheme. However, this feature is taught by Grube. As set forth for [1B], Grube teaches a *common* bit-loading scheme for use in a multi-cast scenario where the same data (e.g., control data) is to be transmitted simultaneously to multiple receiving nodes. *See* §VI.A.1.c, *supra*; Ex. 1002, ¶154.

Therein, multiple secondary sites (“receiving nodes”) of a communication network determine and inform a primary site (“transmitting node”) of a bit-loading table (“scheme”) for the respective receiving node, responsive to receiving the training (probe) signal sent by the transmitting node. Ex. 1009, 14:3-19, 17:10-45, Figs. 12, 15; Ex. 1002, ¶155.

These tables are compared by the primary site (transmitting node) in order to determine a common bit-loading scheme for outgoing multi-carrier data transmissions, which Grube terms lowest common denominator (LCD) bit-loading. *Id.*, 14:64-15:5, 18:44-19:26, Fig. 17; Ex. 1002, ¶156.

Grube describes the process for determining a common bit-loading table (outbound control channel bit loading table 338) from the bit-loading tables (320, 322, 324) it receives back from the secondary sites (1-3) in response to the training signals, with reference to Figure 17 (*see* §VI.A.1.c, *supra*). As previously described, bit loading table 338 constitutes a determined common bit-loading modulation scheme, and the determination of that scheme is made based on a comparison as recited. Ex. 1002, ¶157. “The outbound control channel bit loading table 338 is generated by comparing the bit loading, on a carrier channel by carrier channel basis, of all of the site bit loading tables.” Ex. 1009, 18:53-55. Further, for the reasons previously set forth (*see* §VI.A.1.c, *supra*), it would have been obvious for a POSITA to have employed Grube’s teachings concerning a common bit-loading scheme in carrying out the system of Gurantz for a multi-cast scenario. Ex. 1002, ¶157.

Therefore, Gurantz-Grube teaches [1H] and every limitation of claim 1.

2. Claim 4

Gurantz in view of Grube teaches each and every limitation of claim 4. Ex. 1002, ¶158.

a. [4PRE] (CRM preamble corresponds directly to method preamble of [1PRE])

As set forth for [1PRE], Gurantz in view of Grube teaches [4PRE]. §VI.A.1.a, *supra*. With respect to the requirement for a “non-transitory computer-readable

medium having software” for carrying out the recited functions/steps, a broad construction is warranted for purposes of this proceeding (*see* §V.E, *supra*) and the limitation is met by Gurantz-Grube. A POSITA would understand each of these systems to be carried out, implicitly and obviously, as software-driven computer-based processes. Ex. 1002, ¶159. For example, Gurantz teaches that its terminal devices, e.g., LAN device 280, “can be, for example, a personal computer (PC).” Ex. 1007, ¶[0020]. Similarly, Grube describes its primary site components as including a controller 110 including a processor 172 and memory 174, which “may be a micro-computer, a personal computer, a work station, or a main frame computer” and having “sufficient processing power and memory to execute the primary site functions described throughout this specification.” Ex. 1009, 10:15-26, Fig. 10; Ex. 1002, ¶159.

b. [4A] (CRM “logic” corresponds directly to method step [1A])

As set forth for [1A] in §VI.A.1.b, *supra*, Gurantz-Grube teaches [4A]. *Id.*, ¶160.

c. [4B] (CRM “logic” corresponds directly to method step [1B])

As set forth for [1B] in §VI.A.1.c, *supra*, Gurantz-Grube teaches [4B]. *Id.*, ¶161.

d. [4C] (CRM “logic” corresponds directly to method step [1C])

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [4C]. *Id.*, ¶162.

e. [4D] (CRM “logic” corresponds directly to method step [1D])

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [4D]. *Id.*, ¶163.

f. [4E] (CRM “logic” corresponds directly to method step [1E])

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [4E]. *Id.*, ¶164.

g. [4F] (CRM “logic” corresponds directly to method step [1F])

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [4F]. *Id.*, ¶165.

h. [4G] (CRM “*logic configured for generating the response signal ...*”—corresponds directly to method step [2H])

A corresponding “generating” step is not included in claim 1, although similar limitations are included in steps of “receiving a plurality of response signals” [1B] and “transmitting a response signal” [1F]. *See* §§VI.A.1.c, VI.A.1.g, *supra*. The recited “logic configured for generating” is taught by the Gurantz-Grube combination. Ex. 1002, ¶166.

Gurantz teaches use of a “bit-loading modulation scheme” as previously set forth, but does not give detail on that scheme being generated by a corresponding receiving node and included in a response signal (responsive to the transmitted probe signal). Grube teaches such an arrangement and would have suggested to a POSITA its use in Gurantz. *Id.*, ¶167.

In particular, Grube teaches in detail a common bit-loading scheme for use in a multi-cast scenario where the same data is to be transmitted simultaneously to multiple receiving nodes. Therein, receiving nodes (“secondary sites”) of a communication network generate a bit-loading scheme (table), responsive to receiving the training (probe) signal sent by the primary site (transmitting node). The table is generated based on the characteristics of the channel path ascertained from a “spectral response” of the training (probe) signal (which as taught by Gurantz would include evaluation of SNR—*see* §VI.A.1.h, *supra*). Ex. 1009, 14:3-19, 17:10-45, Figs. 12, 15. Once generated, these tables are sent to, and compared by, the transmitting node in order to determine a common bit-loading scheme for outgoing multi-carrier data transmissions, which Grube terms lowest common denominator (LCD) bit-loading. *Id.*, 14:59-15:5, 18:44-19:26, Fig. 17; Ex. 1002, ¶168.

It would have been obvious for a POSITA to have employed Grube’s teachings concerning a common bit-loading scheme in carrying out the system of Gurantz, for benefits as expressly taught in Grube, e.g., optimizing communications for the case of multi-cast data communications. Ex. 1009, 4:43-51. *See also*, VI.A.1.c, *supra* ([1B]). This would have resulted in a step of (and logic configured for) generating the response signal as recited, i.e., the Grube bit-loading tables being generated at a receiving node of the Gurantz BCN. Ex. 1002, ¶169.

i. [4H] (CRM “logic” corresponds directly to method step [1G])

As set forth for [1G] in §VI.A.1.h, *supra*, Gurantz-Grube teaches [4H]. *Id.*, ¶170.

j. [4I] (CRM “logic” corresponds directly to method step [1H])

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [4I]. *Id.*, ¶171.

3. Claim 7

Gurantz in view of Grube teaches each and every limitation of claim 7, as detailed below. *Id.*, ¶172.

a. [7PRE] “A broadband cable network (“BCN”) for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in the BCN, the BCN comprising:”

[1PRE] is directed to a corresponding method carried out in a BCN as recited in [7PRE]. As set forth for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [7PRE]. *Id.*, ¶173.

b. [7A] “a transmitting node within the plurality of nodes, the transmitting node capable of sending a probe signal; and”

Gurantz’s network includes a transmitting node within the plurality of nodes, and a sub-plurality of receiving nodes, but does not disclose the detail of the transmitting node being capable of sending a probe signal. *See* §VI.A.1.a, *supra*. Grube teaches a transmitting node capable of sending a probe signal as recited. *See* §VI.A.1.b, *supra*); Ex. 1002, ¶174.

For the reasons set forth in §VI.A.1.b, *supra* it would have been obvious to a POSITA to employ in Gurantz a training (i.e., probe) signal transmitted from a transmitting node as taught by Grube, for purposes of making SNR determinations for the multi-carrier channels in accordance with the teachings of Gurantz. Ex. 1002, ¶175.

Therefore, Gurantz-Grube teaches limitation [7A]. *Id.*, ¶176.

- c. [7B] “a sub-plurality of receiving nodes within the plurality of nodes, wherein the sub-plurality of receiving nodes are capable of transmitting a sub-plurality of response signals in response to receiving the probe signal ...”**

Gurantz-Grube teaches a sub-plurality of receiving nodes capable of transmitting a sub-plurality of response signals as recited. *See*, §VI.A.1.c, *supra* regarding [1B], directed to a corresponding step of *receiving* a plurality of response signals transmitted by the sub-plurality of receiving nodes, wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node in response to receiving the probe signal. Ex. 1002, ¶177.

Therefore, Gurantz-Grube teaches limitation [7B].

- d. [7C] “wherein the transmitting node is capable of determining the common bit-loading modulation scheme from the sub-plurality of response signals”**

Gurantz-Grube teaches a transmitting node capable of determining a common bit-loading modulation scheme from the sub-plurality of response signals as recited, including by comparing all bit-loading schemes within the plurality of bit-loading

modulation schemes of the response signals. *Cf.*, §§VI.A.1.d, VI.A.1.h, *supra*, regarding [1C] and [1G] respectively, which collectively recite the same functional limitations. Ex. 1002, ¶178.

Therefore, Gurantz-Grube teaches limitation [7C], and every limitation of claim 7.

4. Claims 8-9 Depending from Claim 7

Gurantz in view of Grube teaches each and every limitation of claims 8-9. Ex. 1002, ¶179.

- a. [8] “The BCN of claim 7, wherein each bit-loading modulation scheme utilizes a quadrature phase shift keying (QPSK) modulation.”**

Gurantz teaches claim 8 through its teaching of “[a]pplication of DMT and OFDM to the present invention.” Ex. 1007, ¶[0046]. As Gurantz explains, “OFDM utilizes **quadrature phase shift keying (QPSK)** and multi-level quadrature amplitude modulation (QAM) wherein each OFDM carrier can be modulated by an amplitude/phase varying signal.” *Id.*, ¶¶[0047] (emphasis added), [0049] (explaining composition and use of QPSK). Ex. 1002, ¶180.

Gurantz further teaches bit-loading as part of the modulation. “Higher SNR channels can support higher data capacity. ... Frequencies with the lower SNR use lower order constellations such as QPSK.” Ex. 1007, ¶[0050]; Ex. 1002, ¶181.

In view of Gurantz’s teachings of QPSK modulation as set forth above, it would have been obvious to carry out the combined teachings of Gurantz and Grube with each bit-loading modulation scheme utilizing QPSK. *Id.*, ¶182. This would have been nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success, and combining prior art elements according to known methods to yield predictable results. *Id.*; *see, KSR*, 550 U.S. at 402, 416.

Therefore, Gurantz-Grube teaches claim 8.

b. [9] “The BCN of claim 7, wherein the [sic] each bit-loading modulation scheme utilizes quadrature amplitude modulation (QAM).”

Gurantz teaches claim 9 through its teaching of “[a]pplication of DMT and OFDM to the present invention.” Ex. 1007, ¶[0046]. As Gurantz explains, “OFDM utilizes quadrature phase shift keying (QPSK) and **multi-level quadrature amplitude modulation (QAM)** wherein each OFDM carrier can be modulated by an amplitude/phase varying signal.” *Id.*, ¶¶[0047] (emphasis added), [0049] (explaining composition and use of QAM). Ex. 1002, ¶183.

Gurantz further teaches bit-loading as part of the modulation. Ex. 1007, ¶[00050]; Ex. 1002, ¶184.

In view of Gurantz’s teachings to use QAM modulation as set forth above, it would have been obvious for a POSITA to carry out the combined teachings of

Gurantz and Grube with each bit-loading modulation scheme utilizing QAM. Ex. *Id.*, ¶185. This would have been nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success, and combining prior art elements according to known methods to yield predictable results. *Id.*; see, *KSR*, 550 U.S. at 402, 416.

Therefore, Gurantz-Grube teaches claim 9.

5. Claim 11

Gurantz-Grube teaches each and every limitation of claim 11. Ex. 1002, ¶186.

a. [11PRE] “The BCN of claim 7, wherein a receiving node within the sub-plurality of receiving nodes is capable of:”

The receiving nodes of Gurantz-Grube have the recited capabilities, as demonstrated for [11A]-[11F] below. *Id.*, ¶187.

b. [11A] “receiving the probe signal at the receiving node ...” (direct correspondence to method step [1D])

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [11A]. *Id.*, ¶188.

c. [11B] “determining the transmission characteristics of the channel path ...” (direct correspondence to method step [1E])

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [11B]. *Id.*, ¶189.

- d. [11C] “transmitting a response signal ... from the receiving node to the transmitting node,” (direct correspondence to method step [1F])**

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [11C]. *Id.*,

¶190.

- e. [11D] “receiving node” capability directly corresponding to method limitation [1G]—SNR measurement**

As set forth for [1G] in §VI.A.1.h, *supra*, Gurantz-Grube teaches [11D]. *Id.*,

¶191.

- f. [11E] “receiving node” capability directly corresponding to method step [2H] and logic of [4G]—generating the response signal**

As set forth for [4G] in §VI.A.2.h, *supra*, Gurantz-Grube teaches [11E]. *Id.*,

¶192.

- g. [11F] “transmitting node” capability directly corresponding to method step [1H]—determining a common bit-loading modulation scheme**

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [11F]. *Id.*,

¶193.

6. Claim 14

Gurantz in view of Grube teaches each and every limitation of claim 14, as detailed below. *Id.*, ¶194.

a. [14PRE] (same as [7PRE])

[1PRE] is directed to a corresponding method, carried out in a BCN as recited in [14PRE]. As set forth for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [14PRE]. *Id.*, ¶195.

b. [14A] (same as [7A] but substituting “having means for” for “capable of”)

As set forth for [7A] in §VI.A.3.b, *supra*, Gurantz-Grube teaches [14A]. *Id.*, ¶196.

c. [14B] (same as [7B] but substituting “means for” for “capable of”)

As set forth for [7B] in §VI.A.3.c, *supra*, Gurantz in view of Grube teaches [14B]. *Id.*, ¶197.

d. [14C] (same as [7C] but substituting “means for” for “capable of”)

As set forth for [7C] in §VI.A.3.d, *supra*, Gurantz-Grube teaches [14C]. *Id.*, ¶198.

7. Claims 15-16 Depending from Claim 14

a. [15] (same as [8] but depending from [14])

As set forth for claim 8 in §VI.A.4.a, *supra*, Gurantz-Grube teaches claim 15. *Id.*, ¶199.

b. [16] (same as [9] but depending from [14])

As set forth for claim 9 in §VI.A.4.b, *supra*, Gurantz-Grube teaches claim 16. *Id.*, ¶200.

8. Claim 20

Gurantz in view of Grube teaches each and every limitation of claim 20, as detailed below. *Id.*, ¶201.

a. [20PRE] (same as [14PRE], [7PRE])

[1PRE] is directed to a corresponding method, carried out in a BCN as recited in [20PRE]. As set forth for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches it. *Id.*, ¶202.

b. [20A] (same as [14A]; same as [7A] but substituting “having means for” for “capable of”)

As set forth for [7A] in §VI.A.3.b, *supra*, Gurantz-Grube teaches [20A]. *Id.*, ¶203.

c. [20B] (same as [14B]; same as [7B] but substituting “having means for” for “capable of”)

As set forth for [7B] in §VI.A.3.c, *supra*, Gurantz-Grube teaches [20B]. *Id.*, ¶204.

d. [20C] (recites the same “transmitting node includes means for determining the common bit-loading modulation scheme ...” as recited in [14C]; same with respect to [7C], but substituting “means for” for “capable of”)

As set forth for [7C] in §VI.A.3.d, *supra*, Gurantz-Grube teaches [20C]. *Id.*, ¶205.

- e. [20D] (a “receiving node” includes “means for” carrying out the same method step (function) recited in [1D]—receiving the probe signal)**

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [20D]. *Id.*,

¶206.

- f. [20E] (“means for” carrying out the same method step (function) recited in [1E]—determining transmission characteristics)**

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [20E]. *Id.*,

¶207.

- g. [20F] (“means for” carrying out the same method step (function) recited in [1F]—transmitting a response signal)**

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [20F]. *Id.*,

¶208.

- h. [20G] (receiving node includes “means for” carrying out the same method step (function) recited in [1G]—SNR measuring)**

As set forth for [1G] in §VI.A.1.h, *supra*, Gurantz-Grube teaches [20G]. *Id.*,

¶209.

- i. [20H] (same “means” as [18B]; “receiving node includes means for” carrying out the same method step (function) in [2H] and logic of [4G]—generating the response signal)**

As set forth for [4G] in §VI.A.2.h, *supra*, Gurantz-Grube teaches [20H]. *Id.*,

¶210.

j. [20I] (same as [18C]; redundant of [20C])

As set forth for [7C] in §VI.A.3.d, *supra*, Gurantz-Grube teaches [20I]. *Id.*,

¶211.

k. [20J] (same as [18D]; “means for” recitations directly corresponding to the method steps (functions) of [1H]—related to the determining of the common bit-loading modulation scheme)

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [20J]. *Id.*,

¶212.

9. Claim 21

Gurantz in view of Grube teaches each and every limitation of claim 21, as detailed below. *Id.*, ¶213.

a. [21PRE] (same as [7PRE], [14PRE], [20PRE])

[1PRE] is directed to a corresponding method, carried out in a BCN as recited in [21PRE]. As set forth for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [21PRE]. *Id.*, ¶214.

b. [21A] (“means for” carrying out the same method step (function) recited in [1A]—transmitting a probe signal)

As set forth for [1A] in §VI.A.1.b, *supra*, Gurantz-Grube teaches [21A]. *Id.*,

¶215.

c. [21B] (“means for” carrying out the same method step (function) recited in [1B]—receiving a plurality of response signals)

As set forth for [1B] in §VI.A.1.c, *supra*, Gurantz-Grube teaches [21B]. *Id.*,

¶216.

- d. [21C] (“means for” carrying out the same method step (function) recited in [1C]—determining the common bit-loading modulation scheme)**

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [21C]. *Id.*,

¶217.

- e. [21D] (“means for” carrying out the same method step (function) recited in [1D]—receiving the probe signal)**

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [21D]. *Id.*,

¶218.

- f. [21E] (“means for” carrying out the same method step (function) recited in [1E]—determining the transmission characteristics)**

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [21E]. *Id.*,

¶219.

- g. [21F] (like [20F]; “means for” carrying out the same method step (function) recited in [1F]—transmitting a response signal)**

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [21F]. *Id.*,

¶220.

- h. [21G] (like [18B] and [20H]; “means for” carrying out the same method step (function) in [2H] and logic in [4G]—generating the response signal)**

As set forth for [4G] in §VI.A.2.h, *supra*, Gurantz-Grube teaches [21G]. *Id.*,

¶221.

i. [21H] (“means for” carrying out the same method step (function) recited in [1G]—SNR measuring)

As set forth for [1G] in §VI.A.1.h, *supra*, Gurantz-Grube teaches [21H]. *Id.*, ¶222.

j. [21I] (same as [20J], [18D]; “means for” recitations directly corresponding to the method steps (functions) of [1H]—related to determining the common bit-loading modulation scheme)

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [21I]. *Id.*, ¶223.

B. GROUND B: Claims 2, 3, 5, 6, 12, 13, 22, 23 are Rendered Obvious by Gurantz in view of Grube and further in view of Gesbert

1. Claim 2

Gurantz in view of Grube and further in view of Gesbert teaches each and every limitation of claim 2. *Id.*, ¶224.

a. [2PRE] (identical to [1PRE])

As set forth for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [2PRE]. *Id.*, ¶225.

b. [2A] (identical to [1A])

As set forth for [1A] in §VI.A.1.b, *supra*, Gurantz-Grube teaches [2A]. *Id.*, ¶226.

c. [2B] (identical to [1B])

As set forth for [1B] in §VI.A.1.c, *supra*, Gurantz-Grube teaches [2B]. *Id.*, ¶227.

d. [2C] (identical to [1C])

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [2C]. *Id.*, ¶228.

e. [2D] (identical to [1D])

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [2D]. *Id.*, ¶229.

f. [2E] (identical to [1E])

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [2E]. *Id.*, ¶230.

g. [2F] (identical to [1F])

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [2F]. *Id.*, ¶231.

h. [2G] “wherein the transmission characteristics of the channel path are determined by measuring the bit-error rate (“BER”) characteristics of the received probe signal at the one receiving node and”

[2G] is identical to [1G] above, except that [2G] substitutes “bit-error rate (‘BER’) characteristics” for “signal-to-noise (‘SNR’) characteristics” as the measured parameter of the received probe signal. Gurantz-Grube, while disclosing SNR as a measure of the characteristics of the received probe signal, does not expressly mention BER as an alternative measure. This alternative measure would have been obvious to a POSITA in view of Gesbert. Ex. 1002, ¶232.

Gesbert discloses a multi-mode wireless data transmission system, wherein the selection of a transmission mode is made from among multi-carrier transmission modes having different modulation rates and coding rates. *See, e.g.*, Ex. 1010, ¶¶[0036]-[0037], Table 1. The mode selections are made based on one or more monitored quality parameters of the communication channel, including BER and SNR. *Id.*, ¶¶[0014]-[0017]. Ex. 1002, ¶233.

In view of Gesbert, it would have been obvious to employ in the Gurantz-Grube combination a BER for determining the channel characteristics from which bit-loading would be determined. Ex. 1002, ¶234. BER is a measure for the average number of bit errors in a data transmission. A POSITA would have appreciated that BER and SNR are closely-related measures of transmission characteristics, with BER being a digital domain measure generally inversely correlated to the SNR, an analog measurement. *Id.* For a given form of digital modulation (i.e., QPSK or QAM), graphs were known that plotted this inverse relationship. *Id.* A POSITA would have recognized both measures as useful for carrying out bit-loading. *Id.* The '759 patent itself recognizes these (and other) measures as mere examples of “metric values of the channel path” that would be “appreciate[d] by those skilled in the art.” Ex. 1001, 11:5-14; Ex. 1002, ¶234.

To use BER in Gurantz-Grube, instead of (or in addition to) SNR, for determining transmission characteristics (and hence suitable bit-loading) would

have been nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success. Ex. 1002, ¶235; *KSR*, 550 U.S. at 421.

i. [2H] (step of “generating the response signal” corresponding directly to function of CRM “logic” recited in [4G])

As set forth for [4G] in §VI.A.2.h, *supra*, Gurantz-Grube teaches [2H]. Ex. 1002, ¶236.

j. [2I] (identical to [1H])

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [2I]. *Id.*, ¶237.

2. Claim 3

Gurantz in view of Grube and further in view of Gesbert teaches each and every limitation of claim 3. *Id.*, ¶238.

a. [3PRE] (identical to [1PRE])

As set forth for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [3PRE]. *Id.*, ¶239.

b. [3A] (identical to [1A])

As set forth for [1A] in §VI.A.1.b, *supra*, Gurantz-Grube teaches [3A]. *Id.*, ¶240.

c. [3B] (identical to [1B])

As set forth for [1B] in §VI.A.1.c, *supra*, Gurantz-Grube teaches [3B]. *Id.*, ¶241.

d. [3C] (identical to [1C])

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [3C]. *Id.*, ¶242.

e. [3D] (identical to [1D])

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [3D]. *Id.*, ¶243.

f. [3E] (identical to [1E])

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [3E]. *Id.*, ¶244.

g. [3F] (identical to [1F])

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [3F]. *Id.*, ¶245.

h. [3G] (identical to [1G])

As set forth for [1G] in §VI.A.1.h, *supra*, Gurantz-Grube teaches [3G]. *Id.*, ¶246.

- i. [3H] “wherein the transmission characteristics of the channel path are determined by measuring the packet error rate (“PER”) characteristics of the received probe signal ... ”

[3H] is identical to [1G] above, except that [3H] substitutes “packet error rate (“PER”) characteristics” for “signal-to-noise (“SNR) characteristics.” Gurantz-Grube, while disclosing SNR as a measure of the characteristics of the received probe signal, does not expressly mention PER as an alternative measure. This alternative measure would have been obvious to a POSITA in view of Gesbert. Ex. 1002, ¶247.

As described above for [2G], Gesbert discloses a multi-mode wireless data transmission system, wherein the selection of a transmission mode is made from among multi-carrier transmission modes having different modulation rates and coding rates. Ex. 1010, ¶¶[0036]-[0037], Table 1. The mode selections are made based on one or more monitored quality parameters of the communication channel, including PER (in addition to BER and SNR). *Id.*, ¶¶[0014]-[0017]; Ex. 1002, ¶248.

In view of Gesbert, it would have been obvious to employ in the Gurantz-Grube combination a packet error rate (PER) for determining the channel characteristics from which bit-loading would be determined. *Id.*, ¶249. While BER is a measure for the average number of bit errors in a data transmission, PER takes this measure one step further, to measure the average error rates in transmitted packets of bits. Both are measures of performance in the “digital” domain. *Id.*

A POSITA would have appreciated that PER, BER and SNR are closely-related measures of transmission characteristics, with PER and BER being digital measures generally inversely correlated to the SNR, a measurement taken in the analog domain. *Id.*, ¶250. A POSITA would have recognized all three measures as useful for carrying out bit-loading. *Id.* The '759 patent itself recognizes these three measures as mere examples of “metric values of the channel path” that would be “appreciate[d] by those skilled in the art.” Ex. 1001, 11:5-14; *Id.*

To use PER in Gurantz-Grube, instead of (or in addition to) SNR, for determining transmission characteristics (and hence suitable bit-loading) would have been nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success. *KSR*, 550 U.S. at 421; Ex. 1002, ¶251.

j. [3I] (identical to [1H])

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [3I]. *Id.*, ¶252.

3. Claim 5

Gurantz in view of Grube and further in view of Gesbert teaches each and every limitation of claim 5. *Id.*, ¶253.

a. [5PRE] (same as [4PRE]—CRM preamble corresponds directly to method preamble of [1PRE])

As set forth for [4PRE] in §VI.A.2.a, and for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [5PRE]. *Id.*, ¶254.

b. [5A] (same as [4A]—CRM “logic” corresponds directly to method step [1A])

As set forth for [1A] in §VI.A.1.b, *supra*, Gurantz-Grube teaches [5A]. *Id.*, ¶255.

c. [5B] (same as [4B]—CRM “logic” corresponds directly to method step [1B])

As set forth for [1B] in §VI.A.1.c, *supra*, Gurantz-Grube teaches [5B]. *Id.*, ¶256.

d. [5C] (same as [4C]—CRM “logic” corresponds directly to method step [1C])

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [5C]. *Id.*, ¶257.

e. [5D] (CRM “logic” corresponds directly to method step [2G])

As set forth for [2G] in §VI.B.1.h, *supra*, Gurantz-Grube teaches [5D]. *Id.*, ¶258.

f. [5E] (CRM “logic” corresponds directly to method step [1H])

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [5E]. *Id.*, ¶259.

4. Claim 6

Gurantz-Grube and further in view of Gesbert teaches each and every limitation of claim 6. *Id.*, ¶260.

a. [6PRE] (same as [4PRE]—CRM preamble corresponds directly to method preamble of [1PRE])

As set forth for [4PRE] in §VI.A.2.a, and for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [6PRE]. *Id.*, ¶261.

b. [6A] (same as [4A]—CRM “logic” corresponds directly to method step [1A])

As set forth for [1A] in §VI.A.1.b, *supra*, Gurantz-Grube teaches [6A]. *Id.*, ¶262.

c. [6B] (same as [4B]—CRM “logic” corresponds directly to method step [1B])

As set forth for [1B] in §VI.A.1.c, *supra*, Gurantz-Grube teaches [6B]. *Id.*, ¶263.

d. [6C] (same as [4C]—CRM “logic” corresponds directly to method step [1C])

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [6C]. *Id.*, ¶264.

e. [6D] (same as [4G]—CRM “logic” corresponds directly to method step [2H])

As set forth for [4G] in §VI.A.2.h, *supra*, Gurantz-Grube teaches [6D]. *Id.*, ¶265.

f. [6E] (CRM “logic” corresponds directly to method step [3H])

As set forth for [3H] in §VI.B.2.i, *supra*, Gurantz-Grube teaches [6E]. *Id.*, ¶266.

g. [6F] (same as [4I]—CRM “logic” corresponds directly to method step [1H])

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [6F]. *Id.*, ¶267.

5. Claim 12 (depending from claim 7)

Gurantz in view of Grube and further in view of Gesbert teaches each and every limitation of claim 12, as detailed below. *Id.*, ¶268.

a. [12PRE] (same as [11PRE])

The receiving nodes of Gurantz-Grube-Gesbert have the recited capabilities, as demonstrated for [12A]-[12F]. *Id.*, ¶269.

b. [12A] (same as [11A]; direct correspondence to method step [1D])

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [12A]. *Id.*, ¶270.

c. [12B] (same as [11B]; direct correspondence to method step [1E])

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [12B]. *Id.*, ¶271.

d. [12C] (same as [11C]; direct correspondence to method step [1F])

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [12C]. *Id.*, ¶272.

e. [12D] “receiving node” capability directly corresponding to method limitation [2G]—BER measurement

As set forth for [2G] in §VI.B.1.h, *supra*, Gurantz in view of Grube, and further in view of Gesbert, teaches [12D]. *Id.*, ¶273.

f. [12E] (same as [11E]; “receiving node” capability directly corresponding to method step [2H]—generating the response signal)

As set forth for [2H] in §VI.B.1.i, *supra*, Gurantz-Grube teaches [12E]. *Id.*, ¶274.

g. [12F] (same as [11F]; “transmitting node” capability directly corresponding to method step [1H]—determining a common bit-loading modulation scheme)

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [12F]. *Id.*, ¶275.

6. Claim 13

Gurantz in view of Grube and further in view of Gesbert teaches each and every limitation of claim 13. *Id.*, ¶276.

a. [13PRE] (same as [11PRE], [12PRE])

The receiving nodes of Gurantz-Grube-Gesbert have the recited capabilities, as demonstrated for [13A]-[13F]. *Id.*, ¶277.

b. [13A] (same as [11A], [12A]; direct correspondence to method step [1D])

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [13A]. *Id.*, ¶278.

- c. [13B] (same as [11B], [12B]; direct correspondence to method step [1E])**

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [13B]. *Id.*,

¶279.

- d. [13C] (same as [11C], [12C]; direct correspondence to method step [1F])**

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [13C]. *Id.*,

¶280.

- e. [13D] (“receiving node” capability directly corresponding to method limitation [3H]—PER measurement)**

As set forth for [3H] in §VI.B.2.i, *supra*, Gurantz in view of Grube and further in view of Gesbert teaches [13D]. *Id.*, ¶281.

- f. [13E] (same as [11E], [12E]; “receiving node” capability directly corresponding to method step [2H]—generating the response signal)**

As set forth for [2H] in §VI.B.1.i, *supra*, Gurantz-Grube teaches [13E]. *Id.*,

¶282.

- g. [13F] (same as [11F], [12F]; “transmitting node” capability directly corresponding to method step [1H]—determining a common bit-loading modulation scheme)**

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [13F]. *Id.*,

¶283.

7. Claim 22

Gurantz-Grube and further in view of Gesbert teaches each and every limitation of claim 22, as detailed below. *Id.*, ¶284.

a. [22PRE] (same as [7PRE], [14PRE], [20PRE], [21PRE])

[1PRE] is directed to a corresponding method carried out in a BCN as recited in [22PRE]. As set forth for [1PRE] in §VI.A.1.a, *supra*, Gurantz-Grube teaches [22PRE]. *Id.*, ¶285.

b. [22A] (same as [21A]; (“means for” carrying out the same method step (function) recited in [1A]—transmitting a probe signal)

As set forth for [1A] in §VI.A.1.b, *supra*, Gurantz-Grube teaches [22A]. *Id.*, ¶286.

c. [22B] (same as [21B]; “means for” carrying out the same method step (function) recited in [1B]—receiving a plurality of response signals)

As set forth for [1B] in §VI.A.1.c, *supra*, Gurantz-Grube teaches [22B]. *Id.*, ¶287.

d. [22C] (same as [21C]; “means for” carrying out the same method step (function) recited in [1C]—determining the common bit-loading modulation scheme)

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [22C]. *Id.*, ¶288.

- e. [22D] (same as [21D]; “means for” carrying out the same method step (function) recited in [1D]—receiving the probe signal)**

As set forth for [1D] in §VI.A.1.e, *supra*, Gurantz-Grube teaches [22D]. *Id.*,

¶289.

- f. [22E] (same as [21E]; “means for” carrying out the same method step (function) recited in [1E]—determining the transmission characteristics)**

As set forth for [1E] in §VI.A.1.f, *supra*, Gurantz-Grube teaches [22E]. *Id.*,

¶290.

- g. [22F] (same as [21F]; (“means for” carrying out the same method step (function) recited in [1F]—transmitting a response signal)**

As set forth for [1F] in §VI.A.1.g, *supra*, Gurantz-Grube teaches [22F]. *Id.*,

¶291.

- h. [22G] (same as [21G]; “means for” carrying out the same method step (function) recited in [2H]—generating the response signal)**

As set forth for [2H] in §VI.B.1.i, *supra*, Gurantz-Grube teaches [22G]. *Id.*,

¶292.

- i. [22H] (same means recited in [18A]; “receiving node includes means for” carrying out the same method step (function) recited in [2G]—BER measuring)**

As set forth for [2G] in §VI.B.1.h, *supra*, Gurantz-Grube and further in view of Gesbert teaches [22H]. *Id.*, ¶293.

- j. [22I] (same as [20J], [18D]; “means for” recitations directly corresponding to the method steps (functions) of [1H]—related to the determining of the common bit-loading scheme)**

As set forth for [1H] in §I.A.1.i, *supra*, Gurantz-Grube teaches [22I]. *Id.*,

¶294.

8. Claim 23 (depending from claim 22)

Gurantz in view of Grube and further in view of Gesbert teaches each and every added limitation of claim 23. *Id.*, ¶295.

a. [23A] (same as/redundant of [22G])

As set forth for [2H] in §VI.B.1.i, *supra*, Gurantz-Grube teaches [23A]. *Id.*,

¶296.

b. [23B] (same as/redundant of [22I])

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [23B]. *Id.*,

¶297.

C. GROUND C: Claims 10 and 17 are Rendered Obvious by Gurantz in view of Grube and further in view of Shattil

- 1. Claim 10: “The BCN of claim 9, wherein each bit-loading modulation scheme is chosen from the group essentially consisting of 64 QAM modulation, 128 QAM modulation, 256 QAM modulation, 512 QAM modulation and 1024 QAM modulation.”**

Gurantz teaches each bit-loading modulation scheme comprising QAM of higher and lower order constellations as sustainable by the respective carriers. *See* §VI.A.1.a, *supra*; Ex.1007, ¶[0047] (“OFDM utilizes ... multi-level [QAM] wherein each OFDM carrier can be modulated by an amplitude/phase varying signal. To

modulate, data bits are encoded into a number of m-ary PSK constellations, which then modulate the respective carriers.”). Ex. 1002, ¶298.

Gurantz does not specifically mention the particular orders of QAM modulation that may be used, i.e., 64 QAM, 128 QAM, etc. It would have been obvious to a POSITA to carry out the Gurantz-Grube methodology employing one or more of “64 QAM ... and 1024 QAM” as recited, in view of Shattil. *Id.*, ¶299.

Shattil, similar to Gurantz, teaches a multicarrier transmission protocol (including OFDM) and employing bit-loading based on determined channel characteristics. Shattil further discloses that “[t]he modulation of the binary input data can be of many types [including] quadrature amplitude modulation (QAM) or other derivatives of these modulation schemes, such as ... 64-QAM.” Ex. 1011, 6:20-25; Ex. 1002, ¶300.

Thus, Shattil evidences recognition in the art of 64-QAM as a known suitable order of QAM for use in multi-carrier (including OFDM) data transmissions employing bit-loading. *Id.*, ¶301; Ex. 1012, 38-42 (§4.2.9) (general knowledge in the art regarding QAM, including 64 and 256-QAM). Selection of 64-QAM for use in the Gurantz-Grube bit-loading, thus meeting the claim limitation, would have been nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success. Ex. 1002, ¶301; *see, KSR*, 550 U.S. at 402, 416.

2. Claim 17: (same as [10] but depending from [16])

As set forth for claim 10 in §VI.C.1, *supra*, Gurantz-Grube and further in view of Shattil teaches claim 17. Ex. 1002, ¶302.

D. GROUND D: Claims 18 and 19 are Rendered Obvious by Gurantz in view of Grube and further in view of Shattil and Gesbert

3. Claim 18 (depending from claim 17)

Gurantz in view of Grube, and further in view of Shattil and Gesbert, teaches each and every added limitation of dependent claim 18. *Id.*, ¶303.

a. [18A] (“receiving node includes means for” carrying out the same method step (function) recited in [2G]—BER measuring)

As set forth for [2G] in §VI.B.1.h, *supra*, Gurantz in view of Grube and further in view of Gesbert teaches [18A]. *Id.*, ¶304.

b. [18B] (“receiving node includes means for” carrying out the same method step (function) recited in [2H]—generating the response signal; corresponds directly to function of CRM “logic” recited in [4G])

As set forth for [4G] in §VI.A.2.h, *supra*, Gurantz-Grube teaches [18B]. *Id.*, ¶305.

c. [18C] (“transmitting node includes means for” carrying out the same method step (function) recited in [1C]—determining a common bit-loading modulation scheme)

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [18C]. *Id.*, ¶306.

- d. [18D] (“means for” recitations directly corresponding to the method steps (functions) of [1H]—related to the determining of the common bit-loading scheme)**

As set forth for [1H] in §VI.A.1.i, *supra*, Gurantz-Grube teaches [18D]. *Id.*, ¶307.

4. Claim 19 (depending from claim 17)

Gurantz in view of Grube, and further in view of Shattil and Gesbert, teaches each and every limitation of dependent claim 19, as detailed below (and in §VI.C.2, *supra* for parent claim 17). *Id.*, ¶308.

- a. [19A] (“receiving node includes means for” carrying out the same method step (function) recited in [3H]—PER measuring)**

As set forth for [3H] in §VI.B.2.i, *supra*, Gurantz in view of Grube and further in view of Gesbert teaches [19A]. *Id.*, ¶309.

- b. [19B] (same as [18B]; “receiving node includes means for” carrying out the same method step (function) recited in [2H]—generating the response signal; corresponds directly to function of CRM “logic” recited in [4G])**

As set forth for [4G] in §VI.A.2.h, *supra*, Gurantz-Grube teaches [19B]. *Id.*, ¶310.

- c. [19C] (same as [18C]; “transmitting node includes means for” carrying out the same method step (function) recited in [1C]—determining the common bit-loading modulation scheme)**

As set forth for [1C] in §VI.A.1.d, *supra*, Gurantz-Grube teaches [19C]. *Id.*, ¶311.

d. [19D] (same as [18D]; “means for” recitations directly corresponding to the method steps (functions) of [1H]—related to determining the common bit-loading modulation scheme)

As set forth for [1H] in §I.A.1.i, *supra*, Gurantz-Grube teaches [19D]. *Id.*, ¶312.

VII. GROUNDS FOR STANDING & FEE PAYMENT

Petitioner hereby certifies that the '759 patent is available for, and Petitioner is not barred or estopped from requesting, *inter partes* review challenging claims 1-23.

Pursuant to 37 C.F.R. § 42.103, the undersigned authorizes the charge of any required fees to Deposit Account No. 19-0733.

VIII. CONCLUSION

Inter partes review should be instituted and claims 1-23 canceled.

Dated: February 15, 2024

By: /Frederic M. Meeker/

Frederic M. Meeker
Reg. No. 35,282
Banner & Witcoff, Ltd.
1100 13th Street, NW
Suite 1200
Washington, DC 20005
(202) 824-3000
fmeeker@bannerwitcoff.com

CERTIFICATION UNDER 37 CFR § 42.24(d)

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for Inter Partes Review totals 13,718, which is less than the 14,000 allowed under 37 CFR § 42.24(a)(1)(i). This total includes 13,718 words as counted by the Word Count feature of Microsoft Word and 0 words used in annotations.

Pursuant to 37 C.F.R. § 42.24(a)(1), this count does not include the table of contents, the table of authorities, mandatory notices under § 42.8, the certificate of service, this certification of word count, the claims listing appendix, or appendix of exhibits.

BANNER & WITCOFF, LTD

Dated: February 15, 2024

By: /Frederic M. Meeker/

Frederic M. Meeker
Reg. No. 35,282
Banner & Witcoff, Ltd.
1100 13th Street, NW
Suite 1200
Washington, DC 20005
(202) 824-3000
fmeeker@bannerwitcoff.com

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.105, I hereby certify that I caused a true and correct copy of this Petition for *Inter Partes* Review in connection with U.S. Patent No. 7,889,759 and supporting evidence to be served via FedEx Priority Overnight on February 15, 2024, on the following:

23446 - MCANDREWS HELD & MALLOY, LTD
500 WEST MADISON STREET
SUITE 3400
CHICAGO, IL 60661
UNITED STATES

Dated: February 15, 2024

By: /Frederic M. Meeker/

Frederic M. Meeker
Reg. No. 35,282

CLAIM LISTING APPENDIX

U.S. Pat. No. 7,889,759

Designation	Claim Language
Claim 1	
[1PRE]	A method for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network (“BCN”), the method comprising:
[1A]	transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;
[1B]	receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node;
[1C]	determining the common bit-loading modulation scheme from the received plurality of response signals;
[1D]	receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;
[1E]	determining the transmission characteristics of the channel path at the one receiving node; and
[1F]	transmitting a response signal from the one receiving node to the transmitting node,
[1G]	wherein the transmission characteristics of the channel path are determined by measuring the signal-to-noise (“SNR”) characteristics of the received probe signal at the one receiving node and
[1H]	wherein determining a common bit-loading modulation scheme includes: comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 2	
[2PRE]	A method for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network (“BCN”), the method comprising:

Designation	Claim Language
[2A]	transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;
[2B]	receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node;
[2C]	determining the common bit-loading modulation scheme from the received plurality of response signals;
[2D]	receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;
[2E]	determining the transmission characteristics of the channel path at the one receiving node;
[2F]	transmitting a response signal from the one receiving node to the transmitting node,
[2G]	wherein the transmission characteristics of the channel path are determined by measuring the bit-error rate (“BER”) characteristics of the received probe signal at the one receiving node and
[2H]	generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the one receiving node in response to determining the transmission characteristics of the channel path,
[2I]	wherein determining a common bit-loading modulation scheme includes: comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 3	
[3PRE]	A method for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network (“BCN”), the method comprising:
[3A]	transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;

Designation	Claim Language
[3B]	receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node; and
[3C]	determining the common bit-loading modulation scheme from the received plurality of response signals;
[3D]	receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;
[3E]	determining the transmission characteristics of the channel path at the one receiving node; and
[3F]	transmitting a response signal from the one receiving node to the transmitting node,
[3G]	wherein the transmission characteristics of the channel path are determined by measuring the signal-to-noise (“SNR”) characteristics of the received probe signal at the one receiving node,
[3H]	wherein the transmission characteristics of the channel path are determined by measuring the packet error rate (“PER”) characteristics of the received probe signal at the one receiving node, and
[3I]	wherein determining a common bit-loading modulation scheme includes: comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 4	
[4PRE]	<i>A non-transitory computer-readable medium having software for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network (“BCN”), the non-transitory computer-readable medium comprising:</i>
[4A]	<i>logic configured for</i> transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;
[4B]	<i>logic configured for</i> receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each

Designation	Claim Language
	response signal includes a bit-loading modulation scheme determined by a corresponding receiving node;
[4C]	<i>logic configured for</i> determining the common bit-loading modulation scheme from the received plurality of response signals,
[4D]	<i>logic configured for</i> receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;
[4E]	<i>logic configured for</i> determining the transmission characteristics of the channel path at the one receiving node;
[4F]	<i>logic configured for</i> transmitting a response signal from the one receiving node to the transmitting node; and
[4G]	<i>logic configured for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the one receiving node in response to determining the transmission characteristics of the channel path;
[4H]	wherein the transmission characteristics of the channel path are determined by <i>logic configured for</i> measuring the signal-to-noise (“SNR”) characteristics of the received probe signal at the one receiving node, and
[4I]	wherein the <i>logic configured for</i> determining a common bit-loading modulation scheme includes: <i>logic configured for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>logic configured for</i> determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 5	
[5PRE]	A <i>non-transitory computer-readable medium having software</i> for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network (“BCN”), the <i>non-transitory computer-readable medium</i> comprising:
[5A]	<i>logic configured for</i> transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;

Designation	Claim Language
[5B]	<i>logic configured for</i> receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node; and
[5C]	<i>logic configured for</i> determining the common bit-loading modulation scheme from the received plurality of response signals,
[5D]	wherein the transmission characteristics of the channel path are determined by <i>logic configured for</i> measuring the bit-error rate (“BER”) characteristics of the received probe signal at the one receiving node, and
[5E]	wherein the <i>logic configured for</i> determining a common bit-loading modulation scheme includes: <i>logic configured for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>logic configured for</i> determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 6	
[6PRE]	A <i>non-transitory computer-readable medium having software</i> for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in a broadband cable network (“BCN”), the <i>non-transitory computer-readable medium</i> comprising:
[6A]	<i>logic configured for</i> transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;
[6B]	<i>logic configured for</i> receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node;
[6C]	<i>logic configured for</i> determining the common bit-loading modulation scheme from the received plurality of response signals; and
[6D]	<i>logic configured for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the one receiving node in response to

Designation	Claim Language
	determining the transmission characteristics of the channel path
[6E]	wherein the transmission characteristics of the channel path are determined by <i>logic configured for</i> measuring the product-error rate (“PER”) characteristics of the received probe signal at the one receiving node,
[6F]	wherein [<i>the logic configured for</i>] determining a common bit-loading modulation scheme includes: <i>logic configured for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>logic configured for</i> determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 7	
[7PRE]	A broadband cable network (“BCN”) for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in the BCN, the BCN comprising:
[7A]	a transmitting node within the plurality of nodes, the transmitting node capable of sending a probe signal; and
[7B]	a sub-plurality of receiving nodes within the plurality of nodes wherein the sub-plurality of receiving nodes are capable of transmitting a sub-plurality of response signals in response to receiving the probe signal, wherein the sub-plurality of response signals includes a plurality of bit-loading modulation schemes, wherein each bit-loading modulation scheme of the plurality of bit-loading modulation schemes is determined by a receiving node within the sub-plurality of receiving nodes,
[7C]	wherein the transmitting node is capable of determining the common bit-loading modulation scheme from the sub-plurality of response signals, wherein the transmitting node is further capable of determining the common bit-loading modulation scheme in response to comparing all bit-loading modulation schemes within the plurality of bit-loading modulation schemes.
Claim 8	

Designation	Claim Language
[8]	The BCN of claim 7, wherein each bit-loading modulation scheme utilizes a quadrature phase shift keying (“QPSK”) modulation.
Claim 9	
[9]	The BCN of claim 7, wherein the each bit-loading modulation scheme utilizes quadrature amplitude modulation (“QAM”).
Claim 10	
[10]	The BCN of claim 9, wherein each bit-loading modulation scheme is chosen from the group essentially consisting of 64 QAM modulation, 128 QAM modulation, 256 QAM modulation, 512 QAM modulation and 1024 QAM modulation.
Claim 11	
[11PRE]	The BCN of claim 7, wherein a receiving node within the sub-plurality of receiving nodes is capable of:
[11A]	receiving the probe signal at the receiving node through a channel path of transmission; and
[11B]	determining the transmission characteristics of the channel path at the receiving node; and
[11C]	transmitting a response signal, of the sub-plurality of response signals, from the receiving node to the transmitting node,
[11D]	wherein the receiving node is capable of determining the transmission characteristics of the channel path by measuring the signal-to-noise (“SNR”) characteristics of the received probe signal at the receiving node
[11E]	wherein the receiving node is capable of generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the receiving node in response to determining the transmission characteristics of the channel path, and
[11F]	wherein the transmitting node is capable of determining a common bit-loading modulation scheme by: comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 12	

Designation	Claim Language
[12PRE]	The BCN of claim 7, wherein a receiving node within the sub-plurality of receiving nodes is capable of:
[12A]	receiving the probe signal at the receiving node through a channel path of transmission;
[12B]	determining the transmission characteristics of the channel path at the receiving node; and
[12C]	transmitting a response signal, of the sub-plurality of response signals, from the receiving node to the transmitting node,
[12D]	wherein the receiving node is capable of determining the transmission characteristics of the channel path by measuring the bit-error rate (“BER”) characteristics of the received probe signal at the one receiving node,
[12E]	wherein the receiving node is capable of generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the receiving node in response to determining the transmission characteristics of the channel path, and
[12F]	wherein the transmitting node is capable of determining a common bit-loading modulation scheme by: comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 13	
[13PRE]	The BCN of claim 7, wherein a receiving node within the sub-plurality of receiving nodes is capable of:
[13A]	receiving the probe signal at the receiving node through a channel path of transmission;
[13B]	determining the transmission characteristics of the channel path at the receiving node; and
[13C]	transmitting a response signal, of the sub-plurality of response signals, from the receiving node to the transmitting node,
[13D]	wherein the receiving node is capable of determining the transmission characteristics of the channel path by measuring the packet error rate (“PER”) characteristics of the received probe signal at the one receiving node,

Designation	Claim Language
[13E]	wherein the receiving node is capable of generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the receiving node in response to determining the transmission characteristics of the channel path, and
[13F]	wherein the transmitting node is capable of determining a common bit-loading modulation scheme by: comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 14	
[14PRE]	A broadband cable network (“BCN”) for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in the BCN, the BCN comprising:
[14A]	a transmitting node within the plurality of nodes, the transmitting node <i>having means for</i> sending a probe signal; and
[14B]	a sub-plurality of receiving nodes within the plurality of nodes, wherein the sub-plurality of receiving nodes <i>have means for</i> transmitting a sub-plurality of response signals in response to receiving the probe signal, wherein the sub-plurality of response signals includes a plurality of bit-loading modulation schemes, wherein each bit-loading modulation scheme of the plurality of bit-loading modulation schemes is determined by a receiving node within the sub-plurality of receiving nodes; and
[14C]	wherein the transmitting node <i>includes means for</i> determining the common bit-loading modulation scheme from the sub-plurality of response signals, wherein the transmitting node further includes <i>means for</i> determining the common bit-loading modulation scheme in response to comparing all bit-loading modulation schemes within the plurality of bit-loading modulation schemes.
Claim 15	
[15]	The BCN of claim 14, wherein each bit-loading modulation scheme utilizes a quadrature phase shift keying (“QPSK”) modulation.

Designation	Claim Language
Claim 16	
[16]	The BCN of claim 14, wherein the each bit-loading modulation scheme utilizes quadrature amplitude modulation (“QAM”).
Claim 17	
[17]	The BCN of claim 16, wherein each bit-loading modulation scheme is chosen from the group essentially consisting of 64 QAM modulation, 128 QAM modulation, 256 QAM modulation, 512 QAM modulation and 1024 QAM modulation.
Claim 18	
[18A]	The BCN of claim 17, wherein the receiving node includes <i>means for</i> determining the transmission characteristics of the channel path by measuring the bit-error rate (“BER”) characteristics of the received probe signal at the one receiving node,
[18B]	wherein the receiving node includes <i>means for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the receiving node in response to determining the transmission characteristics of the channel path,
[18C]	wherein the transmitting node includes <i>means for</i> determining a common bit-loading modulation scheme, and
[18D]	wherein the <i>means for</i> determining a common bit-loading modulation scheme includes: <i>means for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>means for</i> determining the common bit-loading modulation scheme in response to the means for comparing the plurality of bit-loaded modulation schemes.
Claim 19	
[19A]	The BCN of claim 17, wherein the receiving node includes <i>means for</i> determining the transmission characteristics of the channel path by measuring the packet error rate (“PER”) characteristics of the received probe signal at the one receiving node,
[19B]	wherein the receiving node includes <i>means for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the receiving

Designation	Claim Language
	node in response to determining the transmission characteristics of the channel path,
[19C]	wherein the transmitting node includes means for determining a common bit-loading modulation scheme,
[19D]	wherein the <i>means for</i> determining a common bit-loading modulation scheme includes: <i>means for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>means for</i> determining the common bit-loading modulation scheme in response to the means for comparing the plurality of bit-loaded modulation schemes.
Claim 20	
[20PRE]	A broadband cable network (“BCN”) for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in the BCN, the BCN comprising:
[20A]	a transmitting node within the plurality of nodes, the transmitting node having means for sending a probe signal; and
[20B]	a sub-plurality of receiving nodes within the plurality of nodes, wherein the sub-plurality of receiving nodes have means for transmitting a sub-plurality of response signals in response to receiving the probe signal, wherein the sub-plurality of response signals includes a plurality of bit-loading modulation schemes, wherein each bit-loading modulation scheme of the plurality of bit-loading modulation schemes is determined by a receiving node within the sub-plurality of receiving nodes; and
[20C]	wherein the transmitting node includes <i>means for</i> determining the common bit-loading modulation scheme from the sub-plurality of response signals,
[20D]	wherein a receiving node within the sub-plurality of receiving nodes includes: <i>means for</i> receiving the probe signal at the receiving node through a channel path of transmission;
[20E]	<i>means for</i> determining the transmission characteristics of the channel path at the receiving node; and
[20F]	<i>means for</i> transmitting a response signal, of the sub-plurality of response signals, from the receiving node to the transmitting node

Designation	Claim Language
[20G]	wherein the receiving node includes <i>means for</i> determining the transmission characteristics of the channel path by measuring the signal-to-noise (“SNR”) characteristics of the received probe signal at the receiving node,
[20H]	wherein the receiving node includes <i>means for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the receiving node in response to determining the transmission characteristics of the channel path,
[20I]	wherein the transmitting node includes <i>means for</i> determining a common bit-loading modulation scheme, and
[20J]	wherein the <i>means for</i> determining a common bit-loading modulation scheme includes: <i>means for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>means for</i> determining the common bit-loading modulation scheme in response to the means for comparing the plurality of bit-loaded modulation schemes.
Claim 21	
[21PRE]	A broadband cable network (“BCN”) for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in the BCN, the BCN comprising:
[21A]	<i>means for</i> transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;
[21B]	<i>means for</i> receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node;
[21C]	<i>means for</i> determining the common bit-loading modulation scheme from the received plurality of response signals;
[21D]	<i>means for</i> receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;
[21E]	<i>means for</i> determining the transmission characteristics of the channel path at the one receiving node;
[21F]	<i>means for</i> transmitting a response signal from the one receiving node to the transmitting node; and

Designation	Claim Language
[21G]	<i>means for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the one receiving node in response to determining the transmission characteristics of the channel path;
[21H]	wherein the one receiving node includes <i>means for</i> determining the transmission characteristics of the channel path by measuring the signal-to-noise (“SNR”) characteristics of the received probe signal at the one receiving node, and
[21I]	wherein the <i>means for</i> determining a common bit-loading modulation scheme includes: means for comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>means for</i> determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 22	
[22PRE]	A broadband cable network (“BCN”) for determining a common bit-loading modulation scheme for communicating between a plurality of nodes in the BCN, the BCN comprising:
[22A]	<i>means for</i> transmitting a probe signal from a transmitting node within the plurality of nodes to a sub-plurality of receiving nodes within the plurality of nodes;
[22B]	<i>means for</i> receiving a plurality of response signals from the sub-plurality of receiving nodes wherein each response signal includes a bit-loading modulation scheme determined by a corresponding receiving node; and
[22C]	<i>means for</i> determining the common bit-loading modulation scheme from the received plurality of response signals;
[22D]	<i>means for</i> receiving the probe signal at one receiving node of the plurality of receiving nodes through a channel path of transmission;
[22E]	<i>means for</i> determining the transmission characteristics of the channel path at the one receiving node;
[22F]	<i>means for</i> transmitting a response signal from the one receiving node to the transmitting node; and
[22G]	<i>means for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is

Designation	Claim Language
	generated by the one receiving node in response to determining the transmission characteristics of the channel path,
[22H]	wherein the one receiving node includes <i>means for</i> determining the transmission characteristics of the channel path by measuring the bit-error rate (“BER”) characteristics of the received probe signal at the one receiving node, and
[22I]	wherein the <i>means for</i> determining a common bit-loading modulation scheme includes: <i>means for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>means for</i> determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.
Claim 23	
[23A]	The BCN of claim 22, further including <i>means for</i> generating the response signal, wherein the response signal utilizes a bit-loading modulation scheme that is generated by the one receiving node in response to determining the transmission characteristics of the channel path,
[23B]	wherein the <i>means for</i> determining a common bit-loading modulation scheme includes: <i>means for</i> comparing a plurality of bit-loading modulation schemes from the corresponding received plurality of response signals; and <i>means for</i> determining the common bit-loading modulation scheme in response to comparing the plurality of bit-loaded modulation schemes.