

Comcast Cable Communications, LLC, v. Entropic Communications, LLC
Case No.: IPR2024-00431
U.S. Patent No. 7,295,518

Patent Owner Demonstrative Slides

Wednesday, June 4, 2025
2:00 P.M. Eastern

Demonstrative Only - Not Evidence

Network Composition and Capability

- **The Petition Ignores The Coaxial Limitations of the '518 Patent**
 - The '518 Patent addresses a specific network topology
 - The '518 Patent claims a specific medium
- **The Petition Relies on Fundamentally Different Prior Art in Mirfakhraei**
 - Mirfakhraei is not analogous art
 - Mirfakhraei cannot function in the claimed network

Demonstrative Only - Not Evidence PO-2

Claimed Arrangement of the '518 Patent – Network Composition

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and

cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;

whereby network devices communicate with each other through the cable wiring using multi-carrier signaling; wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

Ex. 1001, cl. 1; POR, 10-11

Signal splitters are commonly used in home and other building type coaxial cable wiring. They have an input port and multiple output ports. The input port can also be considered a common port. The output ports can also be considered tap ports. Splitters are generally passive devices

Ex. 1001, 1:53-57; POR, 2

Demonstrative Only - Not Evidence PO-3

Overview of the '518 Patent – Network Capability

- Solves for impairments present in home wiring that restrict high-bandwidth communication between devices within a home
- Transmits probe messages to estimate channel characteristics between network devices
- Solves multipath environment problems

a communication network. The signal reflections and tap port isolation of splitters existing in a typical cable TV wiring configuration presents a problem to shared usage of the cable for a LAN system. The prior art references address communicating between a cable head end and in-home units but do not address the impairments present in the home wiring that restricts high bandwidth communication between devices within the home.

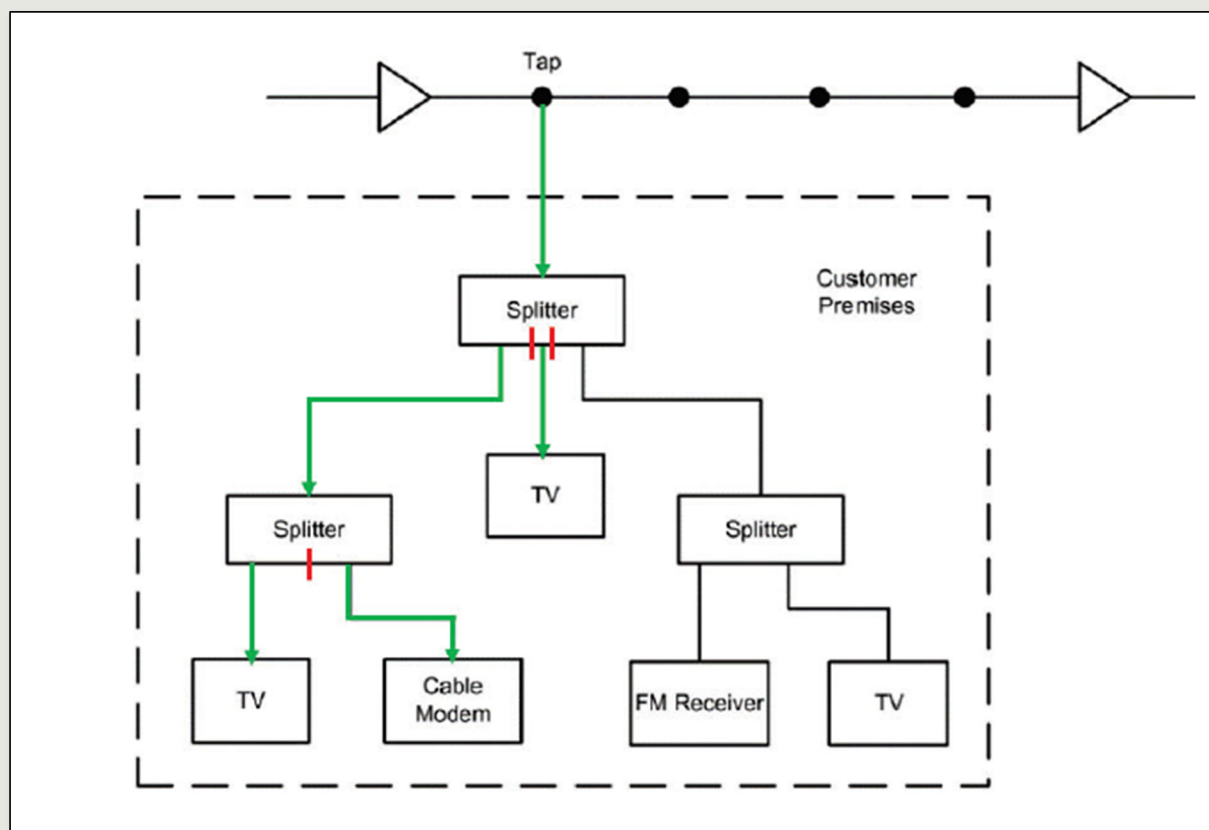
Ex. 1001, 4:25-32; POR, 1-2

In a conventional cable TV or cable modem use, this isolation is desirable because terminal devices do not communicate with each other, they only communicate through the POE with the cable head-end. In a LAN system, terminal devices must communicate directly with each other, therefore attenuation between tap ports in the signal splitters results in an undesirable signal loss. Presenting a further problem to terminal to terminal communications is the variation in attenuation in different branches of the building wiring. All terminal devices are not connected directly to the main splitter, but may be connected at a secondary splitter, for example in a room. The level of attenuation between different pairs of terminal devices needing to communicate may vary by 10 to 40 dB or more.

Ex. 1001, 2:35-48; POR, 8

Demonstrative Only - Not Evidence PO-4

Overview of the '518 Patent – Network Composition

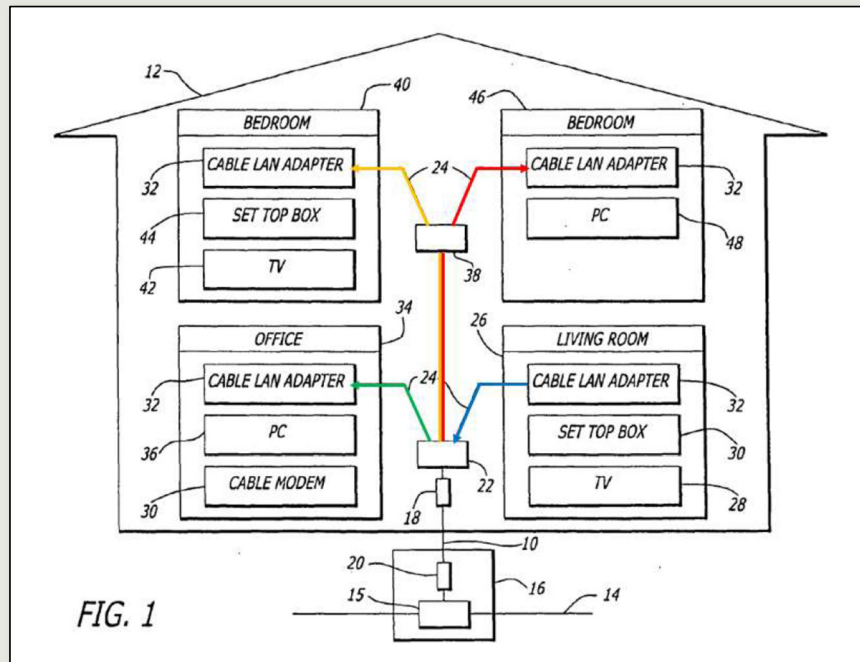


Ex. 1001, Fig. 1 (annotated in Ex. 2001, ¶ 47); POR, 8

Demonstrative Only - Not Evidence PO-5

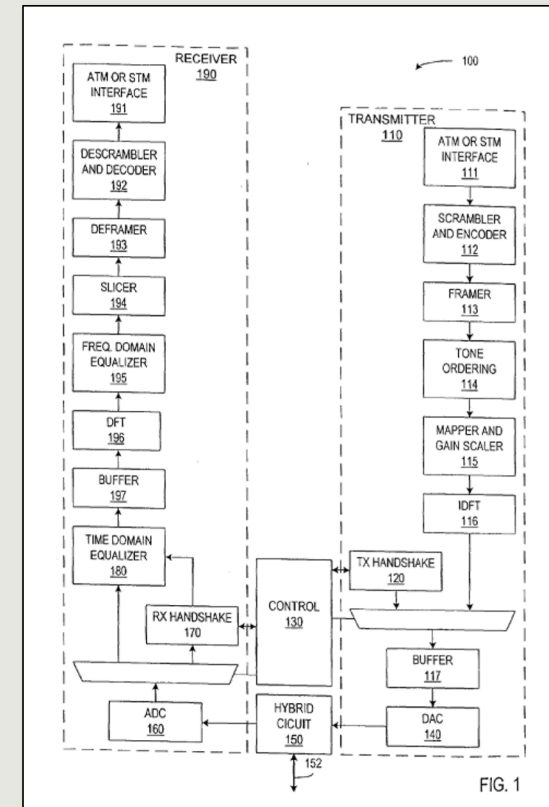
Overview of the References – Network Capability

- Afshary



Ex. 1006, Fig. 1 (annotated in Ex. 2001, ¶ 108); POR, 66

- Mirfakhraei



Ex. 1007, Fig. 1; POR, 15

Mirfakhraei's Lack of Splitters – Network Composition

- Mirfakhraei's system is specific to twisted pair as confirmed by its single, exemplary embodiment designed to operate over twisted pair

time domain samples. A buffer 117 receives the time domain samples and sequentially provides samples to DAC 140 at the rate required for conversion to an analog communication signal. Hybrid circuit 150 transmits the analog signal from DAC 140 to telephone lines 152 coupled to hybrid circuit 150.

Ex. 1007, [0019]; POR, 18

[0021] Hybrid circuit 150 directs a received analog communication signal from telephone lines 152 to receiver 190. An analog-to-digital converter (ADC) 160 samples the analog signal and passes digitized samples to an RX handshake block 170 during a connection sequence and to a time domain equalizer (TEQ) 180 once a connection is established.

Ex. 1007, [0021]; POR, 18

[0015] Fig. 1 is the general block diagram of a client side (atu-r) ADSL transceiver 100 including a transmitter 110 and a receiver 190, that connect to a conventional telephone line via a hybrid circuit 150. ADSL protocols are asymmetric

Ex. 1007, [0021]; POR, 18-19

Demonstrative Only - Not Evidence PO-7

The Level of Ordinary Skill in the Art Requires Experience with Coaxial Cabling

Demonstrative Only - Not Evidence PO-8

The '518 Patent Is Specific to Coaxial Cables

BROADBAND NETWORK FOR COAXIAL CABLE USING MULTI-CARRIER MODULATION

(57)

ABSTRACT

A broadband local area data network uses coaxial cable wiring for interconnection of terminal devices. Orthogonal frequency division multiplexing (OFDM) with bit loading is used to overcome channel impairments and provide a path for terminal devices to transmit to and receive from other terminal devices. Probe messages are sent between devices to characterize the communication channel and determine optimum bit loading. The data network shares the cable spectrum with other services and uses frequency bands not used by other services. Adaptive power control can be used to maintain signal to noise ratio in a communication between terminal devices. Frequency coordination can be used to avoid interference between the LAN communications and other services transmitted on the cable.

Ex. 1001, Title, Abstract; POR, 10-11

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and

cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;

whereby network devices communicate with each other through the cable wiring using multi-carrier signaling; wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

This invention relates to broadband communication networks and specifically to communications using coaxial cable building wiring.

Ex. 1001, cl. 1, 1:25-30; POR, 16

Demonstrative Only - Not Evidence PO-9

The '518 Patent Is Specific to Coaxial Cables

- Mr. Bertonis applies a level of skill that includes experience with coaxial cables

Q. And your definition of "experience working in signal processing and/or communication system networks," that would include experience in coaxial cables; is that correct?

A. Yes.

Ex. 2006, 15:15-19, PO-SR, 14

Demonstrative Only - Not Evidence PO-10

Mirfakhraei is Not Analogous Art

Demonstrative Only - Not Evidence PO-11

Mirfakhraei is Not Reasonably Pertinent to the Problems that the '518 Patent Addresses

Demonstrative Only - Not Evidence PO-12

The '518 Patent Addresses Impairments Specific to an In-Home Network

The present invention uses a form of multi-carrier modulation, orthogonal frequency division multiplex (OFDM), to transmit digital data signals through the coaxial cable wiring installed in homes. Communication is achieved through splitters and signal impairments caused by reflections and attenuation are overcome. Bit loading, along with power loading, adaptive power control, and frequency coordination can be used individually or in combination to implement a network that overcomes the problem of multipath and high attenuation in building cable wiring that would restrict the ability of terminal devices to communicate with each other.

Ex. 1001, 4:36-46; POR, 4

the cable for a LAN system. The prior art references address communicating between a cable head end and in-home units but do not address the impairments present in the home wiring that restricts high bandwidth communication between devices within the home.

Ex. 1001, 4:28-33; POR, 1

Demonstrative Only - Not Evidence PO-13

The '518 Patent Addresses Impairments Specific to an In-Home Network

In a conventional cable TV or cable modem use, this isolation is desirable because terminal devices do not communicate with each other, they only communicate through the POE with the cable head-end. In a LAN system, terminal devices must communicate directly with each other, therefore attenuation between tap ports in the signal splitters results in an undesirable signal loss. Presenting a further problem to terminal to terminal communications is the variation in attenuation in different branches of the building wiring. All terminal devices are not connected directly to the main splitter, but may be connected at a secondary splitter, for example in a room. The level of attenuation between different pairs of terminal devices needing to communicate may vary by 10 to 40 dB or more.

Ex. 1001, 2:35-48; POR, 8

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and
cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;
whereby network devices communicate with each other through the cable wiring using multi-carrier signaling;
wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

Ex. 1001, cl. 1; POR, 10-11

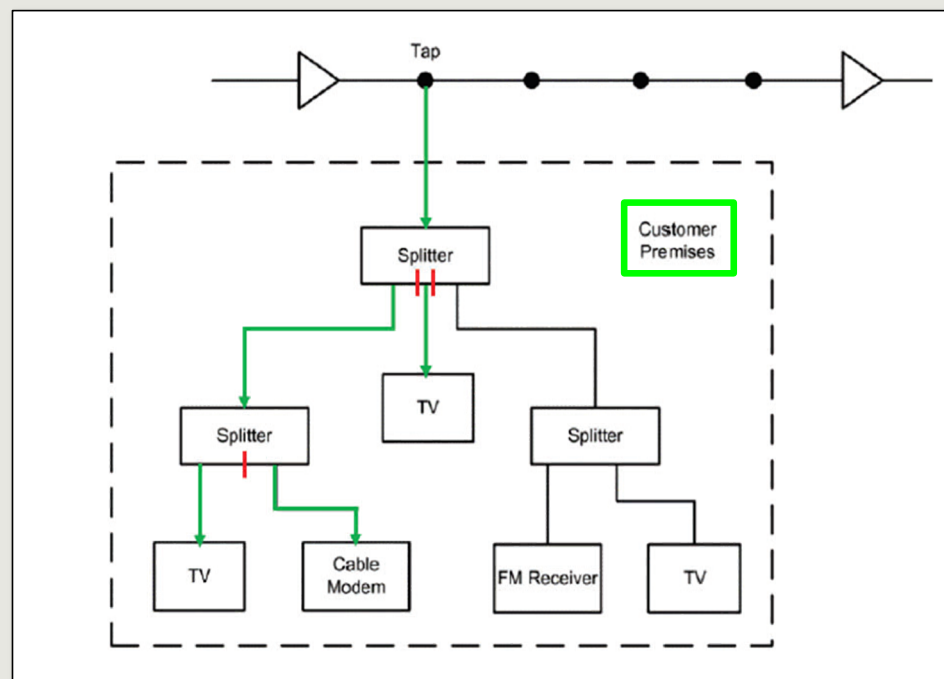
Demonstrative Only - Not Evidence PO-14

The '518 Patent Addresses Impairments Specific to an In-Home Network

- Claims may be no broader than the supporting disclosure. *See, e.g., Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1480 (Fed.Cir.1998)

This invention relates to broadband communication networks and specifically to communications using coaxial cable building wiring.

Ex. 1001, cl. 1, 1:25-30; POR, 16-17



Ex. 1001, Fig. 1 (annotated in Ex. 2001, ¶ 47); POR, 8

Demonstrative Only - Not Evidence PO-15

The '518 Patent and Mirfakhraei Are From Different Fields of Endeavors

Demonstrative Only - Not Evidence PO-16

The '518 Patent Is Specific to Coaxial Cables

- The entirety of the '518 Patent is directed to coaxial cabling

BROADBAND NETWORK FOR COAXIAL CABLE USING MULTI-CARRIER MODULATION

(57)

ABSTRACT

A broadband local area data network uses coaxial cable wiring for interconnection of terminal devices. Orthogonal frequency division multiplexing (OFDM) with bit loading is used to overcome channel impairments and provide a path for terminal devices to transmit to and receive from other terminal devices. Probe messages are sent between devices to characterize the communication channel and determine optimum bit loading. The data network shares the cable spectrum with other services and uses frequency bands not used by other services. Adaptive power control can be used to maintain signal to noise ratio in a communication between terminal devices. Frequency coordination can be used to avoid interference between the LAN communications and other services transmitted on the cable.

Ex. 1001, Title, Abstract; POR, 17

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and
cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;
whereby network devices communicate with each other through the cable wiring using multi-carrier signaling; wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

This invention relates to broadband communication networks and specifically to communications using coaxial cable building wiring.

Ex. 1001, cl. 1, 1:25-30; POR, 16-17

Demonstrative Only - Not Evidence PO-17

The '518 Patent Is Specific to Coaxial Cables

- Mr. Bertonis uses a results-oriented approach to conclude that Mirfakhraei is of the same field of endeavor as the '518 Patent

Disclosure	'518 Patent	Mirfakhraei
Title	coaxial cable specific	"Bit loading process for multicarrier communications"
Field of Invention	coaxial cable specific	"[I]nvention relates to communications and communications systems"
Claims	coaxial cable specific	"A process for determining bit loadings for subchannels of a communication signal"

PO-SR, 20; POR, 17-18

PO-SR, 20-21; Ex. 1036, ¶ 17

Demonstrative Only - Not Evidence PO-18

Mirfakhraei's Field of Endeavor is Not Coaxial Cabling

- Mirfakhraei system is specific to twisted pair as confirmed its single, exemplary embodiment designed to operate over twisted pair

time domain samples. A buffer 117 receives the time domain samples and sequentially provides samples to DAC 140 at the rate required for conversion to an analog communication signal. Hybrid circuit 150 transmits the analog signal from DAC 140 to telephone lines 152 coupled to hybrid circuit 150.

Ex. 1007, [0019]; POR, 18

[0021] Hybrid circuit 150 directs a received analog communication signal from telephone lines 152 to receiver 190. An analog-to-digital converter (ADC) 160 samples the analog signal and passes digitized samples to an RX handshake block 170 during a connection sequence and to a time domain equalizer (TEQ) 180 once a connection is established.

Ex. 1007, [0021]; POR, 18

[0015] Fig. 1 is the general block diagram of a client side (atu-r) ADSL transceiver 100 including a transmitter 110 and a receiver 190, that connect to a conventional telephone line via a hybrid circuit 150. ADSL protocols are asymmetric

Ex. 1007, [0021]; POR, 18-19

Demonstrative Only - Not Evidence PO-19

Petition's Challenged Grounds

Ground	References	Basis	Claims Challenged
A	Afshary in view of Mirfakhraei	§103	1-4
B	Afshary in view of Mirfakhraei in further view of Welles	§103	2

Petition, 18

Demonstrative Only - Not Evidence PO-20

Ground A
A POSITA Would Not Combine Mirfakhraei and Afshary

Demonstrative Only - Not Evidence PO-21

Mirfakhraei Would Frustrate Afshary's Goals

Demonstrative Only - Not Evidence PO-22

Afshary Provides a Simple, Low-Cost Home Networking Solution

- Petitioner does not dispute Afshary's goal of providing a simple, low-cost home networking solution

You agree that Afshary identified cost as one goal in its network?

A. Yes.

Ex. 2006, 42:17-19; PO-SR, 9-11

and IEEE 1394 (fire-wire). In general, the solutions that do not require new wires suffer from low bandwidth or high cost. Solutions that require new wires suffer from being expensive as well as technology that has not been proven over time as compared to coaxial cables. Table I lists some

Ex. 1006, [0005]; POR, 31

[0006] Thus, there is a need to transmit data around the home and elsewhere in cost-effective, quick, and secure fashion.

Ex. 1006, [0006]; POR, 31

Demonstrative Only - Not Evidence PO-23

New Evidence Post-Institution

Demonstrative Only - Not Evidence PO-24

PO's Expert Identifies Several Drawbacks of Petition's Combinations

TECHNICAL ANALYSIS

- Mr. Garrett identified multiple technical drawbacks related to added costs and complexity that only hindsight would overlook
(Ex. 2001, ¶¶ 82 – 91)
- Mr. Garrett details the issues and modifications of implementing Mirfakhraei's multi-carrier modulation in Afshary's network
(Ex. 2001, ¶¶ 92 – 110)
- Mr. Bertoni now relies on a catch-all knowledge within the skillset of a POSITA to address all issues with the combination
(Ex. 1036, ¶ 52; Reply, 21-22)

Demonstrative Only - Not Evidence PO-25

Mirfakhraei's Multi-Carrier Modulation Frustrates Afshary's Goals

- Mr. Garrett confirms that Mirfakhraei's adds complexity and costs

83. First, a POSITA would have identified Afshary's goal as providing a simple, low-cost home network. *See* ¶¶ 84–87. Second, a POSITA would have understood that replacing Afshary's single-carrier modulation with Mirfakhraei's multi-carrier modulation would require adding the functionality of “Mirfakhraei's transmitter 110 and receiver 190” to Afshary's adapters. Ex. 1004 (Bertonis Declaration), ¶ 141; *see* ¶¶ 88–91. These requirements would add unwanted complexity and costs to Afshary's network. Accordingly, a POSITA would not have

Ex. 2001, ¶ 83; POR, 31

Demonstrative Only - Not Evidence PO-26

Mirfakhraei's Multi-Carrier Modulation Frustrates Afshary's Goals

With this functionality of the transmitter 110 and the receiver 190, Mirfakhraei builds a complex parallel-processing system that requires precise gain, frequency, and phase control to allow detection of high-order QAM. Conversely, Afshary constrains the problem to sequential processing of QPSK symbols, which significantly mitigates the burden of gain and frequency tracking algorithms.

Ex. 2001, ¶ 90; POR, 35

Demonstrative Only - Not Evidence PO-27

Mirfakhraei's Multi-Carrier Modulation Necessitates Modifications to Afshary

transmissions from Mirfakhraei are different from those of Afshary. To the extent that a POSITA would have been motivated to make Mr. Bertonis' combination (which I do not agree with), Afshary would require additional improvements in the baseband layer. Examples of these improvements includes packetizing Mirfakhraei's transmissions into units with a preamble and payload, defining a preamble with an acceptable time duration and performance in terms of gain, frequency, and phase accuracy for use with multi-carrier modulation, and defining Mirfakhraei's handshake signal in a compact, functional way as opposed to the unbounded fashion of the DSL proposal. A POSITA would have understood that Mirfakhraei's modulator and demodulator could not be added Afshary without these required improvements.

Ex. 2001, ¶ 94; POR, 37

Demonstrative Only - Not Evidence PO-28

Mirfakhraei's Multi-Carrier Modulation Necessitates Modifications to Afshary

99. Further, to the extent that Mirfakhraei's handshake protocol could be integrated into Afshary's ASIC (which I disagree is obvious), the system would require a buffer on all sides of the modulators, additional controls, and an overhaul of the circuit board to handle the increased components to achieve any improvements. A POSITA would need to determine how to handle the broadband to analog conversion within the ASIC when transmitting the data from the MAC layer of the ASIC in Afshary. In view of the increased work to provide any functioning system, a POSITA would not be motivated to insert Mirfakhraei's complex and costly multi-carrier modulator and multicarrier demodulator into the ASIC of Afshary's cable LAN adapter, especially when the ASIC of Afshary is complete without the need for improvements.

Ex. 2001, ¶ 99; POR, 40

Demonstrative Only - Not Evidence PO-29

Mirfakhraei's Multi-Carrier Modulation Necessitates Modifications to Afshary

- Petitioner's expert, Mr. Bertonis, agrees that Mirfakhraei would add costs to Afshary network

A. Offhand, a more powerful processor, because multi-carrier requires more signal processing.

Ex. 2006, 41:2-4; PO-SR, 9-10

Q. And you also mentioned these changes may add costs. How would these changes add costs?

A. Well, potentially, that digital processing would, whether it's a more powerful ASIC or a natural DSP, there's a bill of materials cost for that.

Ex. 2006, 41:10-15; PO-SR, 9-10

Demonstrative Only - Not Evidence PO-30

Petitioner's New Theory is Improper

Demonstrative Only - Not Evidence PO-31

Petitioner Introduces a New Theory Regarding the Combination's Issues

- The Petitioner failed to address issues with its combination

The Petition fails to explain why the baseband layer outlined in *Afshary* would sufficiently motivate a POSITA given the completeness of the system already created in *Afshary*. The Petition never addresses the pre-existing capabilities of *Afshary* or the difficulty of implementing the Petition's "improvements." Thus, a POSITA would not be motivated to make the proposed changes to the complete cable LAN system described in *Afshary*. Ex. 2001, ¶ 99.

POR, 40

- The Petitioner's new theory

PO alleges that a POSITA would not be motivated to modify *Afshary* with the teachings of Mirfakhraei because doing so "would fundamentally change the architecture of the ASIC in *Afshary*" and would be difficult. POR 36-40. But neither renders the combination nonobvious when, as here, the alleged modifications to *Afshary*'s ASIC are well within the capabilities of a POSITA. Ex. 1036 ¶52. "The

Reply, 21-22; PO-SR, 9-13

Demonstrative Only - Not Evidence PO-32

**A POSITA Would Not Combine Mirfakhraei and Afshary to Improve
the Alleged Issues the Petitioner Identifies**

Demonstrative Only - Not Evidence PO-33

Petitioner's Combination Theories - Riddled with Hindsight

NON-EXISTENT PROBLEMS

- Petitioner adds Mirfakhraei's modulation to allegedly "improve the reliability and robustness" of Afshary

Petition, 41 (citing Ex. 1002, ¶ 139); POR, 53

- Petitioner adds Mirfakhraei's modulation to address "variable frequency response" in the "harsh coaxial cable medium" of Afshary

Petition, 41 (citing Ex. 1002, ¶ 139); POR, 53

Demonstrative Only - Not Evidence PO-34

Afshary Already Provides a Robust Communication Network

[0037] Once through FEC encoder 92, the data encounters modulator 96. Modulator 96 remaps the digital data and presents the data in an analog wave form to permit the data to be transmitted within the coaxial cable. It is important for cable LAN adapter 32 to be screened from noise and hardy enough to work in any environment while remaining inexpensive. Thus, in order to keep costs low and the system robust, the architecture design of adapter 32 uses a digital modulation scheme such as Frequency Shift Keying (FSK) modulation or Binary Phase Shift Keying (BPSK) modula-

Ex. 1006, [0037]; POR, 58-59

Demonstrative Only - Not Evidence PO-35

Afshary Already Provides a Robust Communication Network

With single carrier modulation, each piece of data is encoded, which reduces complexity and the speed burden on the syndrome block with other bits added to specify routing, content data, and other known bits. Ex. 1006 (Afshary), [0036]

Ex. 2001, ¶ 124; POR, 58-59

(Afshary), [0036]–[0037]. When transmitting data, Afshary also adds bytes to detect corrupted transmissions and a means to correct such errors. Ex. 1006 (Afshary), [0037] (“On interacting with FEC encoder 92, parity bits (or bytes) are added to the data to permit detection of data that becomes corrupted in transit as well as permit correction of the same.”). These features allow Afshary to achieve reliable and efficient “data transmission” without the need for further modulation.

Ex. 2001, ¶ 123; POR, 58-59

Demonstrative Only - Not Evidence PO-36

Afshary Already Addresses Variable Frequency Response

But even assuming that Mirfakhraei could establish a deficiency in Afshary's fundamentally different system, a POSITA would have understood that Afshary addresses reflections by using its "[f]ilters within the Baseband section 90 [to] filter out such reflected signals." Ex. 1006 (Afshary), [0042]. Because Afshary provides a mechanism to address reflections, a POSITA would not have viewed reflections as a problem needing a solution. Moreover, Afshary's use of a filter, which is a simple hardware component, reflects Afshary's goal of cost reduction and simplicity. See ¶¶ 84–87. Introducing multi-carrier modulation in every device on the network, would be a far more expensive and complicated solution that contradicts Afshary's stated goals.

Ex. 2001, ¶ 122; POR, 55

Demonstrative Only - Not Evidence PO-37

Petitioner's Combination Theories - Riddled with Hindsight

NON-EXISTENT PROBLEMS

- Petitioner identifies “reliability and robustness” as a motivation, but Afshary already details its reliable network

Petition, 41 (citing Ex. 1002, ¶ 139); POR, 53

- Petitioner identifies “variable frequency response” as a motivation, but Afshary provides a filter to address such response

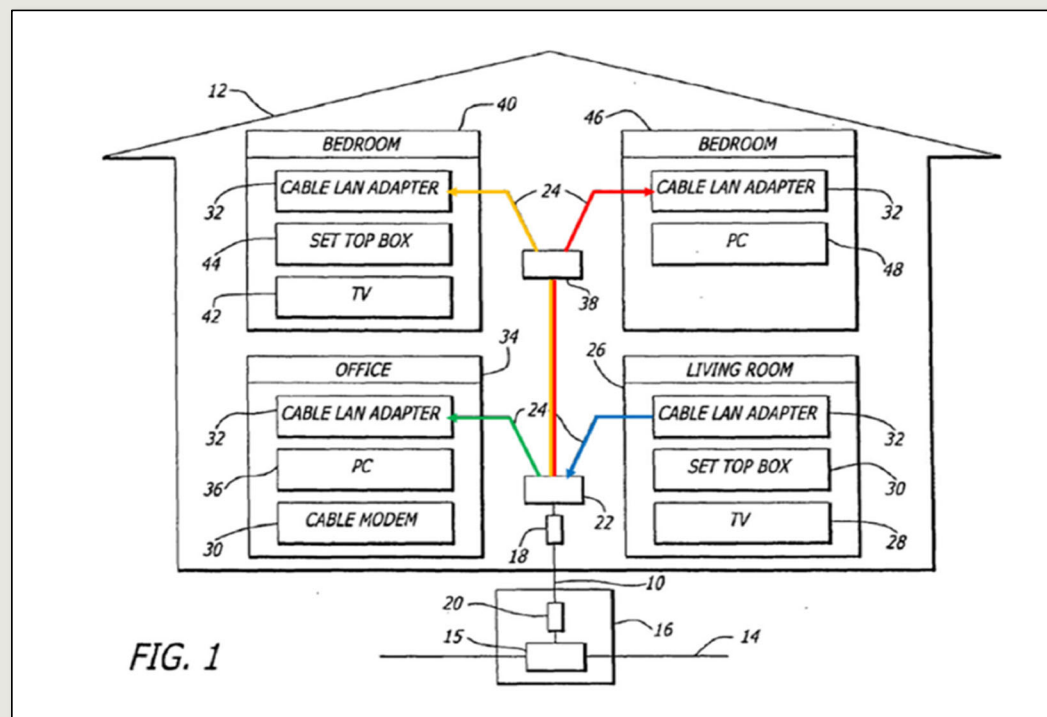
Petition, 41 (citing Ex. 1002, ¶ 139); POR, 53

Demonstrative Only - Not Evidence PO-38

**A POSITA Would Not Combine Mirfakhraei and Afshary to Improve
the Alleged Issues the Petitioner Identifies**

Demonstrative Only - Not Evidence PO-39

Afshary's Network Topology



Ex. 1006, Fig. 1 (annotated in Ex. 2001, ¶ 108); POR, 66

Demonstrative Only - Not Evidence PO-40

The '518 Patent Adjusts Its Bit-loading

1. A data communication network comprising:
at least two network devices, each network device comprising a multi-carrier modulator for modulating data, an up converter for translating the modulated data to an RF carrier frequency, a down converter for translating an RF signal, and a multi-carrier demodulator for demodulating the translated RF signal to produce data; and
cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices;
whereby network devices communicate with each other through the cable wiring using multi-carrier signaling;
wherein network devices transmit probe messages through the cable wiring and analyze received probe message signals to determine channel characteristics and bit loading is selected based on the determined channel characteristics.

Ex. 1001, cl. 1; POR, 10-11

Demonstrative Only - Not Evidence PO-41

Mirfakhraei is a Point-To-Point Network

103. Mirfakhraei's modem communicates with a remote modem over a point-to-point link via a predetermined connection sequence to establish the bit-loading sequence between the two points. Ex. 1007 (Mirfakhraei), ¶ [0022]–[0023].

Ex. 2001, ¶ 103; POR, 41-42.

110. A POSITA would have understood that this would lead to the transmitting node in the combined system calculating the SNR for the entire in-home coaxial environment rather than specific channel characteristics between each endpoint. And without channel characteristics specific to each endpoint, the system could not apply or optimize respective bit loading schemes for each channel between specific nodes. Thus, data would be inefficiently transmitted and potentially less efficient than what Afshary already provides. For these reasons, a POSITA would not be motivated to make the proposed combination.

Ex. 2001, ¶ 110; POR, 43-44.

Demonstrative Only - Not Evidence PO-42

Mirfakhraei Would Not Function in Afshary's Environment

- Mr. Bertonis fails to explain how Mirfakhraei's handshake process would work in Afshary's environment with multiple endpoints

Q. You had said the handshake exchanges information for achieving bit loading, and I'm wondering if you have an opinion about what information is exchanged to achieve bit loading?

A. Well, to some extent it would be up to the person implementing the invention how they want to design and build it. But if you're asking for an

Ex. 2002, 59:22-60:6; POR, 42-43

Q. Is it fair to say that the way that Mirfakhraei calculates the SNR is to transmit a known signal from one transceiver to the other and look at what is received?

A. Well, I would say by look, it's looking at the signal-to-noise ratio, so that's important.

Ex. 2002, 61:19-62:5; POR, 43

Demonstrative Only - Not Evidence PO-43

Mr. Bertonis's Hindsight

- Mr. Bertonis relies on the '518 Patent for the combination

Q. Okay. So you used the -- you considered the similarities in the networks between Afshary and the '518?

A. Yes.

Ex. 2006, 50:14-17; PO-SR, 12

Q. And you compared the multi-carrier and bit-loading from Mirfakhraei to the '518?

A. I did.

Ex. 2006, 50:25-51:2; PO-SR, 12

41. Before addressing the individual arguments in detail, it is important to note that the network architectures in Afshary and the '518 patent are essentially identical, and the bit-loaded multicarrier modulation techniques in Mirfakhraei and the '518 patent are also essentially the same. Neither PO nor Mr. Garrett disputes

Ex. 1036, ¶ 41

Demonstrative Only - Not Evidence PO-44

Overview of the '518 Patent

(57)

ABSTRACT

A broadband local area data network uses coaxial cable wiring for interconnection of terminal devices. Orthogonal frequency division multiplexing (OFDM) with bit loading is used to overcome channel impairments and provide a path for terminal devices to transmit to and receive from other terminal devices. Probe messages are sent between devices to characterize the communication channel and determine optimum bit loading. The data network shares the cable spectrum with other services and uses frequency bands not used by other services. Adaptive power control can be used to maintain signal to noise ratio in a communication between terminal devices. Frequency coordination can be used to avoid interference between the LAN communications and other services transmitted on the cable.

Ex. 1001, Abstract; POR, 2

The present invention uses a form of multi-carrier modulation, orthogonal frequency division multiplex (OFDM), to transmit digital data signals through the coaxial cable wiring installed in homes. Communication is achieved through splitters and signal impairments caused by reflections and attenuation are overcome.

Ex. 1001, 4:36-42; POR, 4

Demonstrative Only - Not Evidence PO-46

Overview of Afshary

(19) **United States**
 (12) **Patent Application Publication** (10) **Pub. No.: US 2006/0218593 A1**
 Afshary et al. (43) **Pub. Date: Sep. 28, 2006**

(54) **DIGITAL COAXIAL CABLE LAN**

Publication Classification

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Desikan Iyadurai, Phoenix, AZ (US);
Brian R. Mears, Tempe, AZ (US);
Gregory B. Tucker, Chandler, AZ (US)

(51) **Int. Cl.**
H04N 7/18 (2006.01)
 (52) **U.S. Cl.** **725/74; 725/78**

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(21) Appl. No.: **11/325,093**

(22) Filed: **Jan. 3, 2006**

Related U.S. Application Data

(63) Continuation of application No. 09/164,427, filed on
 Sep. 30, 1998.

(57) **ABSTRACT**

The invention relates to a coaxial cable local area network (LAN) for digitally communicating client generated data between clients of the cable LAN. The cable LAN has adapters in communication with both the clients and other adapters of the cable LAN. Connected through coaxial cable, these adapters generate and communicate data transmitting signals that take advantage of the operating frequency spectrum of the coaxial cable so as to not interfere with the operating frequency of the client data within the coaxial cable. Other features are disclosed.

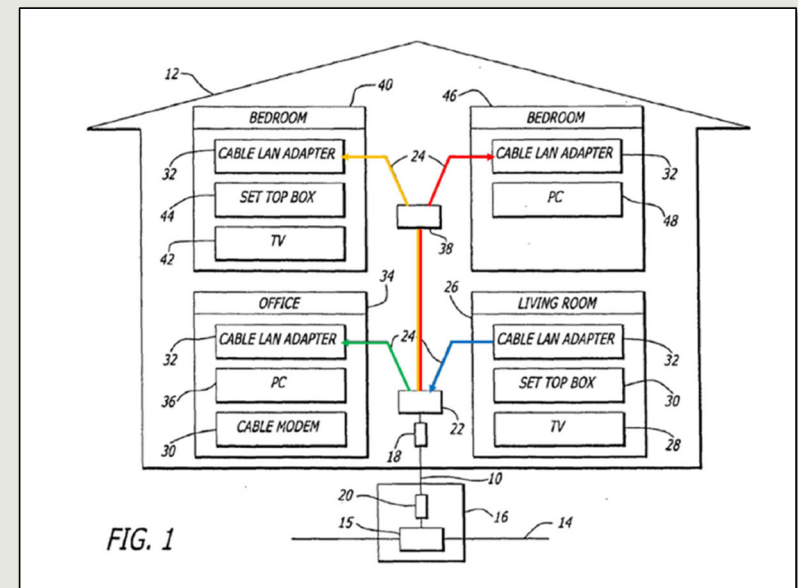


FIG. 1

Ex. 1006, Fig. 1; POR, 66

Demonstrative Only - Not Evidence PO-47

Overview of Mirfakhraei



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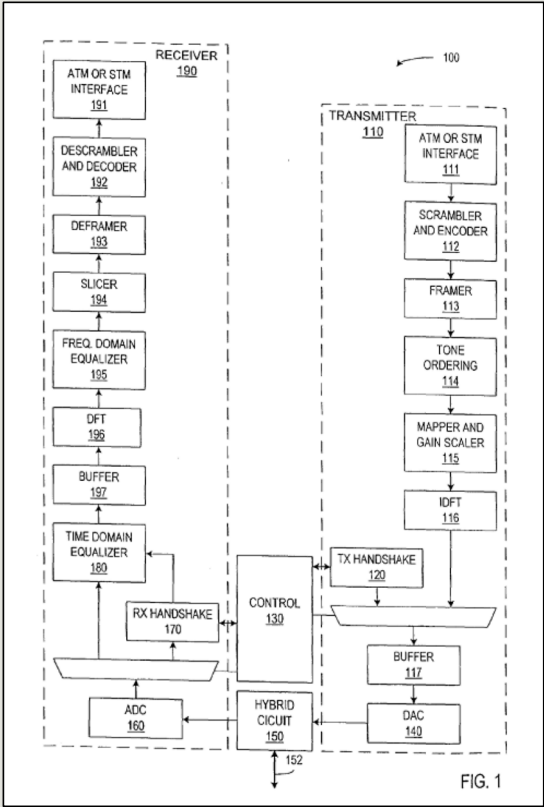
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(54) **Bit loading process for multicarrier communications**

(57) A process for determining bit loadings for a signal employing discrete multi-tone modulation includes: determining the noise in each sub-channel; determining target loadings that provide a desired error rate at the measured noise; rounding the target loadings to determine proposed loadings that are integers, and determining whether the proposed loadings provide a desired data rate. If the proposed loadings provide a data rate less than that desired, the process selects one or more sub-channels having a positive difference between target and proposed loading, and for each selected sub-channel increases the proposed loading by 1. The gains for the selected channels are increased to maintain the desired bit error rate at the higher loading. If the proposed loadings provide a data rate greater than that desired, the process selects one or more sub-channels having a negative difference between target and proposed loading, and for each selected sub-channel decreases the proposed loading by 1. The gains of the channels having decrease loadings are decrease to improve power efficiency.

Ex. 1007, Cover



Ex. 1007, Fig. 1; POR, 15