

United States Court of Appeals for the Federal Circuit

00-1475

BELL ATLANTIC NETWORK SERVICES, INC.
(doing business as Verizon Services, Inc.),

Plaintiff-Appellant,

v.

COVAD COMMUNICATIONS GROUP, INC.,
DIECA COMMUNICATIONS, INC. (doing business as COVAD Communications Company), and
COVAD COMMUNICATIONS COMPANY, INC.,

Defendants-Appellees.

Richard G. Taranto, Farr & Taranto, of Washington, DC, argued for plaintiff-appellant. Of counsel on the brief were George C. Lombardi, and James F. Hurst, Winston & Strawn, of Chicago, Illinois; Adam T. Bernstein, Verizon Communications, of New York, New York; and John Thorne, Verizon Services, Inc., of Arlington, Virginia.

Ruffin B. Cordell, Fish & Richardson P.C., of Washington, DC, argued for defendants-appellees. With him on the brief were Michael J. McKeon, and Lauren A. Degnan.

Appealed from: United States District Court for the Eastern District of Virginia

Judge Jerome B. Friedman

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DECIDED: August 17, 2001

Before LOURIE, Circuit Judge, PLAGER, Senior Circuit Judge, and GAJARSA, Circuit Judge.

GAJARSA, Circuit Judge.

Bell Atlantic Network Services, Inc. ("Bell Atlantic") is the owner of United States Patent No. 5,812,786 ("the '786 patent"), which concerns certain data transmission services, particularly certain digital subscriber line ("DSL") services. [\[1\]](#) In 1999, Bell Atlantic brought this patent infringement action against Covad Communications Company, Inc., DIECA Communications, Inc., and Covad Communications Group, Inc.

(collectively "Covad"), alleging that certain DSL services offered by Covad infringe the '786 patent. On April 4, 2000, the United States District Court for the Eastern District of Virginia ("district court") determined that certain limitations required by claims 1 and 21 of the '786 patent are not present in Covad's DSL systems either literally or under the doctrine of equivalents, and granted Covad's motion for summary judgment of noninfringement. Bell Atlantic Network Servs. v. Covad Communications Group, Inc., No. 2:99cv712, slip. op. at 28 (E.D. Va. Apr. 4, 2000). Bell Atlantic appeals that judgment.

For the reasons discussed below, we affirm.

I. BACKGROUND

A. Introduction

DSL technology is a relatively new data transfer technology that can turn a single pair of copper telephone wires ("a copper pair") into a high-speed, multi-channel, data delivery system. A basic DSL system consists of two high-speed modems located at each end of a conventional telephone line? one at the telephone company's end, and one at the customer's end. This technology allows customers to gain high-speed access to large sources of data, including the internet, without the need for expensive additional wiring.

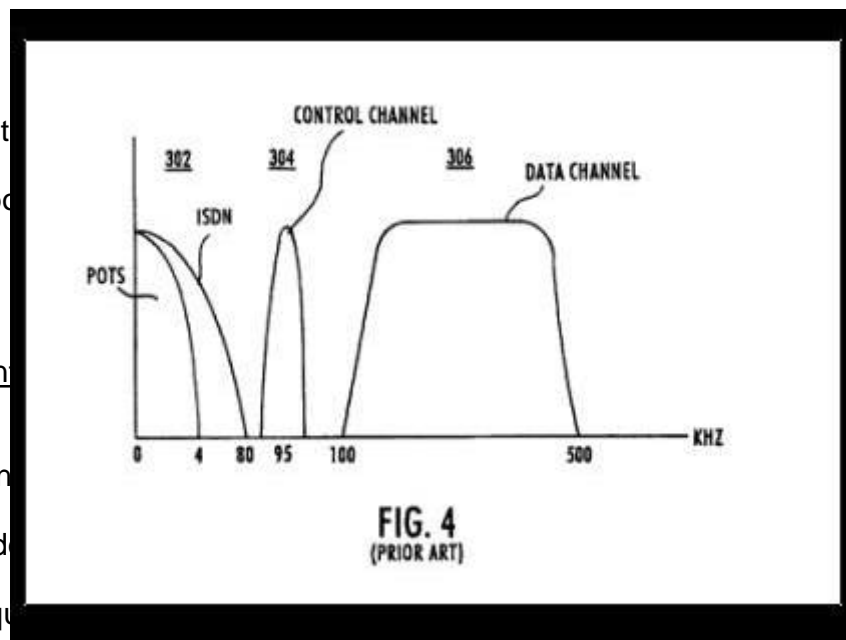
Prior to the advent of DSL technology, copper telephone wiring transmitted simple voice data at frequencies below four kilohertz (4 kHz). The transmission of this common residential telephone service is known as "POTS" ("Plain Old Telephone Service"). It has been known for some time that additional communications streams can be carried on the same wire with POTS through a technique called "frequency division multiplexing." Frequency division multiplexing is a scheme in which numerous signals are combined for transmission on a single communications line by assigning each signal a different frequency. Until recently, much of the available range of frequencies, or "bandwidth," on twisted-pair copper telephone wiring remained unused. DSL technology enables high-speed transmissions over common copper telephone wiring by exploiting the unused, higher frequencies over twisted-pair wires.

In order to take advantage of the higher frequencies, DSL technology employs high-speed modems, or transceivers, to modulate and demodulate the high-frequency data. The transceivers allow the low frequencies to be used for traditional POTS communication, while simultaneously using the higher frequencies for high-speed digital communications. A transceiver must be employed at each end of the "subscriber loop" ? the customer's end and the telephone company's switching office.

Currently, there are two major types of DSL technology. Symmetric or single-line digital

subscriber line ("SDSL") technology uses a range of frequencies as a single two-way channel, and transmits and receives data on this channel at the same rate. Asymmetric digital subscriber line ("ADSL") technology allocates different amounts of bandwidth based on the needs of the customer. SDSL technology may be more suitable for videoconferencing applications, because equal upstream and downstream data transmission rates are preferable. However, ADSL technology may be more suitable for video-on-demand services and for customers who download more data in the "downstream" direction than they upload in the "upstream" direction. Traditionally, ADSL systems have allocated more bandwidth for downstream communication than for upstream communication. Indeed, prior art ADSL systems allocate only a small amount of bandwidth (approximately 15 kHz) to the upstream channel, also referred to as the "control" channel.

Figure 4 of the '786 patent specification illustrates how conventional ADSL systems have divided common telephone lines into different channels using frequency division multiplexing:



The diagram illustrates how conventional ADSL systems have divided common telephone lines into different channels using frequency division multiplexing: the control channel uses about 4 kHz, the control of the remaining bandwidth.

B. The '786 Patent

The invention can be used to provide hardware and equipment

4 kHz, the control of the remaining

systems that can be used to provide hardware and equipment that prior art ADSL

systems were "not well suited for other services in which the nature and amount of data and control signal transfer is substantially different and changes frequently." '786 patent, col. 2, ll. 26-28. The specification observes that "the two-way control channel may be unacceptably slow

for services such as interactive multi-media, distance learning, or accessing a server in a remote local area network (LAN) over a POTS line using a single copper pair. One or more of these services may require a bi-directional control channel of up to, for example, 384 kbps [kilobits per second] in order to allow substantially real-time communications so that a subscriber is not waiting for information to be transmitted." Id. at col. 2, ll. 29-36.

Thus, the invention disclosed by the '786 patent adds capabilities to current DSL technology by providing an ADSL system with "adjustable variable rate" functionality ("ADSL/AVR"). The '786 patent notes in the Summary of the Invention that "such a network has the advantages of conventional ADSLs, while allowing the data rate of the reverse control signaling channel to be controllably increased so as to have a higher rate transmission than ADSL in a bi-directional mode." Id. at col. 3, ll. 15-19. In other words, the ADSL system described by the '786 patent allows customers to "access any file server, download files, store information, and perform any other functions permitted in the optimum mode and at the optimum rate for that function." Id. at col. 15, ll. 7-9.

Claims 1 and 21 are the two independent claims at issue in this appeal. The claims read as follows:

1. A transmission system for variably transmitting information data in a plurality of different modes over a network, said transmission system comprising:

a first transceiver, connected to a first end of a subscriber loop, for selectively operating in one of said plurality of different modes, said first transceiver transmitting or receiving signals, at a first transmission rate, on a first channel, and transmitting or receiving signals, at a second transmission rate, on a second channel, in each of said plurality of different modes;

a second transceiver, connected to said first transceiver via said subscriber loop, for selectively operating in one of said plurality of different modes, said second transceiver transmitting or receiving said first channel signals at said first transmission rate on said first channel and transmitting or receiving said second channel signals at said second transmission rate on said second channel; and

a controller connected to said first transceiver for selectively changing said first and second transmission rates.

21. An ADSL/AVR transmission system for variably transmitting information data over a plurality of channels, comprising:

a first ADSL/AVR transceiver for transmitting or receiving signals at a first transmission rate on a first channel, and transmitting or receiving signals at a second transmission rate on a second channel;
a second ADSL/AVR transceiver for transmitting or receiving signals at said first transmission rate on said first channel and transmitting or receiving said second channel signals at said second transmission rate on said second channel; and
a subscriber loop for connecting said first and second ADSL/AVR transceivers together; wherein
each of said first and second ADSL/AVR transceivers includes a controller for selectively changing the transmission rates on said first and second channels.

Id. at col. 17, ll. 5-23; col. 19, ll. 27-44 (emphasis added).

C. The Accused Covad DSL System

Covad provides its customers with both ADSL and SDSL services. Covad also uses DSL transceivers, called "linecards," at both ends of the subscriber loop. In Covad's ADSL linecard transceivers, the allocation of bandwidth between the upstream and downstream channels is fixed, with most of the frequency allocated to the downstream channel. Because the bandwidth allocation is fixed, Covad's ADSL linecard transceivers are incapable of shifting bandwidth between the upstream and downstream channels without removing and reprogramming the linecard transceivers. In Covad's SDSL linecard transceivers, the allocation of bandwidth to the single, two-way SDSL channel is also fixed. Covad's SDSL linecard transceivers use "echo cancellation" techniques to allow two-way communication within the single SDSL frequency range.^[2]

D. Procedural Background

On January 20, 2000, Covad filed a motion for summary judgment of noninfringement based on its proposed claim construction of three limitations contained in the '786 patent. On

February 11, 2000, prior to the close of discovery, the district court conducted a hearing in which the parties discussed the technology and claims of the '786 patent. On February 18, 2000, the district court informed the parties that it would grant Covad's motion for summary judgment of noninfringement. On April 4, 2000, the district court issued its opinion and order explaining its claim constructions, and granting summary judgment of noninfringement in favor of Covad.

The district court's grant of summary judgment of noninfringement was based on the construction of three limitations contained in claims 1 and 21: (1) the "plurality of different modes" limitation in claim 1 and the "ADSL/AVR transceiver" limitation in claim 21; (2) the first and second "channel" limitation in both claims; and (3) the "selectively changing [the] transmission rates" limitation in both claims. '786 patent, col. 17, ll. 5-23; col. 19, ll. 27-44.

The district court construed the first limitation to require the transceiver described in both claims 1 and 21 to be:

[A] transceiver that operates by dividing available bandwidth between two channels in at least two of the following ways, (1) where the first channel is smaller than the second ("conventional ADSL" mode); (2) where the two channels are of "roughly" equal size ("bi-directional" mode); and (3) where the first channel is larger than the second ("reversible" mode).

Bell Atlantic, No. 2:cv712, slip. op. at 14. The district court relied exclusively on the intrinsic evidence, including the claims, the written description, and the prosecution history, in arriving at its construction. It observed that, throughout the specification, the written description describes only these three possible modes. It concluded that it would "not broaden claims 1 and 21 beyond their support in the specification, as the three modes discussed in the patent specification literally occupy the field of possibilities contemplated by the '786 patent." Id. at 20.

The district court also relied solely on the intrinsic evidence for its construction of the first and second "channels" limitation. Based on a reading of the written description, the district court

construed the first and second "channels" to mean: "An amount of bandwidth isolated for communications that may be either unidirectional or bi-directional." Id. at 24. Finally, it construed the "selectively changing" limitation to mean that "a change [in transmission rates] is chosen and occurs, although it need not occur during a communication session." Id. at 27. Based on these claim constructions, Bell Atlantic conceded that the accused Covad systems do not literally infringe. Moreover, the district court determined that Covad's SDSL transceivers do not infringe under the doctrine of equivalents because they "perform substantially different functions in a substantially different way to achieve substantially different results." Id. at 28. The district court reasoned that "Covad's single channel utilizes echo cancellation techniques to allow two-way communications, which differs substantially from two separate unidirectional channels." Id. at 27.

Bell Atlantic timely appealed to this court. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(1) (1994).

II. STANDARD OF REVIEW

We review the grant of a motion for summary judgment de novo, drawing all reasonable inferences in favor of the non-moving party. Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 255 (1986). Summary judgment "shall be rendered forthwith if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." Fed. R. Civ. P. 56(c); Newbanks v. Cent. Gulf Lines, Inc., 64 F. Supp. 2d 1, 4 (D. Mass. 1999).

The determination of infringement is a two-step process. First, the court construes the claims to correctly determine the scope of the claims. Second, it compares the properly construed claims to the accused device. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1454, 46 USPQ2d 1169, 1172 (Fed. Cir. 1998) (en banc). Claim construction is an issue of law that we

review de novo. Markman v. Westview Instruments, Inc., 52 F.3d 967, 970-71, 34 USPQ2d 1321, 1322 (Fed. Cir. 1995) (en banc), aff'd, 517 U.S. 370 (1996); Cybor, 138 F.3d at 1456, 46 USPQ2d at 1172.

A determination of infringement, both literal and under the doctrine of equivalents, is a question of fact. Insituform Techs., Inc. v. CAT Contracting, Inc., 161 F.3d 688, 692, 48 USPQ2d 1610, 1614 (Fed. Cir. 1998). Thus, viewing the facts and inferences in the light most favorable to Bell Atlantic, summary judgment is proper only if "no reasonable jury could return a verdict for the nonmoving party." Anderson, 477 U.S. at 255. The determination of infringement under the doctrine of equivalents is limited by two primary legal doctrines: (1) prosecution history estoppel and (2) the "all elements" rule. Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 234 F.3d 558, 586, 56 USPQ2d 1865, 1886 (Fed. Cir. 2000) (en banc), cert. granted, 69 U.S.L.W. 3673 (U.S. June 18, 2001) (No. 00-1543). The application of these legal limitations is reviewed by this court de novo. Id.

III. DISCUSSION

A. Claim Construction

"It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, i.e., the patent itself, including the claims, the specification and, if in evidence, the prosecution history Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language." Vitronics Corp. v. Conceptor, Inc., 90 F.3d 1576, 1582, 39 USPQ2d 1573, 1576 (Fed. Cir. 1996).

We look first to the claim language itself to define the scope of the patented invention. Id. As a starting point, we give claim terms their ordinary and accustomed meaning as understood by one of ordinary skill in the art. Hockerson-Halberstadt, Inc. v. Avia Group Int'l, Inc., 222 F.3d 951, 955, 55 USPQ2d 1487, 1490 (Fed. Cir. 2000). Accordingly, a technical term used in a patent

is interpreted as having the meaning a person of ordinary skill in the field of the invention would understand it to mean. Interactive Gift Express, Inc. v. CompuServe Inc., 2001 WL 792669, *7 (Fed. Cir. July 13, 2001).

Dictionaries and technical treatises, which are extrinsic evidence, hold a "special place" and may sometimes be considered along with the intrinsic evidence when determining the ordinary meaning of claim terms. Vitronics, 90 F.3d at 1584 n.6, 39 USPQ2d at 1577 n.6. Furthermore, we have previously cautioned against the use of non-scientific dictionaries "lest dictionary definitions . . . be converted into technical terms of art having legal, not linguistic significance." Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 1478, 45 USPQ2d 1429, 1433 (Fed.Cir.1998).

Generally, there is a "heavy presumption" in favor of the ordinary meaning of claim language as understood by one of ordinary skill in the art. Johnson Worldwide Assocs., Inc. v. Zebco Corp., 175 F.3d 985, 989, 50 USPQ2d 1607, 1610 (Fed. Cir. 1999). This presumption is overcome: (1) where the patentee has chosen to be his own lexicographer, or (2) where a claim term deprives the claim of clarity such that there is "no means by which the scope of the claim may be ascertained from the language used." Id. at 990, 50 USPQ2d at 1610. In the first situation, a patentee may choose to be his own lexicographer and use terms in a manner other than their ordinary meaning. Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1576. Therefore, the court must examine the intrinsic evidence to determine whether the patentees have given the term an unconventional meaning. Hockerson, 222 F.3d at 955, 55 USPQ2d at 1490. The specification acts as a dictionary "when it expressly defines terms used in the claims or when it defines terms by implication." Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1577. "Thus, the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." Id.

We have previously held that, in redefining the meaning of particular claim terms away

from the ordinary meaning, the intrinsic evidence must "clearly set forth" or "clearly redefine" a claim term so as to put one reasonably skilled in the art on notice that the patentee intended to so redefine the claim term. Elektra Instr. v. O.U.R. Scientific Int'l, 214 F.3d 1302, 1307, 54 USPQ2d 1910, 1913 (Fed. Cir. 2000); N. Telecom v. Samsung, 215 F.3d 1281, 1287, 55 USPQ2d 1065, 1069 (Fed. Cir. 2000). We have also stated that the specification must exhibit an "express intent to impart a novel meaning" to claim terms. Schering v. Amgen, 222 F.3d 1347, 1353, 55 USPQ2d 1650, 1654 (Fed. Cir. 2000); Optical Disc v. Del Mar Avionics, 208 F.3d 1324, 1334, 54 USPQ2d 1289, 1295 (Fed. Cir. 2000). However, a claim term may be clearly redefined without an explicit statement of redefinition. Indeed, we have specifically held that the written description of the preferred embodiments "can provide guidance as to the meaning of the claims, thereby dictating the manner in which the claims are to be construed, even if the guidance is not provided in explicit definitional format." Scimed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc., 242 F.3d 1337, 1344, 58 USPQ2d 1059, 1065 (Fed. Cir. 2001). In other words, the specification may define claim terms "by implication" such that the meaning may be "found in or ascertained by a reading of the patent documents." Vitronics, 90 F.3d at 1582, 1584 n.6, 39 USPQ2d at 1577, 1578 n.6.

Moreover, we must also examine the prosecution history to determine whether the patentee has relinquished a potential claim construction in an amendment to the claim or in an argument to overcome or distinguish a reference. Southwall Techs., Inc. v. Cardinal IG, Co., 54 F.3d 1570, 1576, 34 USPQ2d 1673, 1676 (Fed. Cir. 1995); Interactive Gift, 2001 WL 792669, *6. This history contains the complete record of all the proceedings before the Patent and Trademark Office, including any express representations made by the applicant regarding the scope of the claims. Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1577. The prosecution history is considered to determine whether or not there were any express representations made in obtaining the patent regarding the scope and meaning of the claims. Id.

Finally, if the meaning of the claim limitation is apparent from the intrinsic evidence alone,

it is improper to rely on extrinsic evidence other than that used to ascertain the ordinary meaning of the claim limitation. Id. However, in the rare circumstance that the court is unable to determine the meaning of the asserted claims after assessing the intrinsic evidence, it may look to additional evidence that is extrinsic to the complete document record to help resolve any lack of clarity. Id. at 1584, 39 USPQ2d at 1578. This additional extrinsic evidence includes such evidence as expert testimony, articles, and inventor testimony. Id. This extrinsic evidence may be used only to assist in the proper understanding of the disputed limitation; it may not be used to vary, contradict, expand, or limit the claim language from how it is defined, even by implication, in the specification or file history. Id. at 1584-85, 39 USPQ2d at 1579.

1. The "Plurality of Different Modes" and "ADSL/AVR" Limitations

Bell Atlantic challenges the district court's claim construction of the "plurality of different modes" limitation in claim 1 and the "ADSL/AVR transceiver" limitation in claim 21. Based on the ordinary meaning of the word "mode," Bell Atlantic argues that the phrase "plurality of different modes" simply requires "multiple operational states providing different transmission services, as distinguished by their upstream and downstream transmission rates, whether the differences are achieved by altering bandwidth or by the other familiar methods of altering transmission rates." Bell Atlantic argues that the universe of "modes" contemplated by the '786 patent is not limited to the three modes discussed by the district court (conventional, bi-directional, and reversible). Bell Atlantic reasons that these three modes are simply "three broad categories" that may encompass other operational "modes." Specifically, Bell Atlantic contends that the rate of data transfer (as opposed to the bandwidth) within each of the three broad categories can be changed to create additional modes.

For example, Bell Atlantic posits that a bi-directional service "offering 192 Kbps [kilobits per second] in each direction is quite different from one offering 1.1 Mbps [megabits per second]." Under the district court's construction, both services would operate in the same "mode"

(bi-directional) because both services allocate the same amount of bandwidth to both the upstream and downstream directions. However, Bell Atlantic argues that the 192 Kbps bi-directional service would operate in a different "mode" than the 1.1 Mbps bi-directional service because the rate of data transmission varies between the two services. Bell Atlantic also suggests that a transmission system may be changed from a conventional ADSL mode to a bi-directional mode by increasing the coding to allow "more bits per baud" or by "bit stuffing" without altering the relative bandwidth distribution of the upstream and downstream channels. In short, Bell Atlantic argues that "a plurality of different modes" also encompasses different methods of altering the transmission rates within the three broad categories.

It may be true that the ordinary meaning of the word "mode" supports a broader meaning than the construction ascertained by the district court. However, we must look at the intrinsic evidence to determine whether the patentee has given the term an unconventional meaning. Hockerson, 222 F.3d at 955, 55 USPQ2d at 1490; Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1576. We are mindful that the patentee may act as his own lexicographer by using the specification to define terms either expressly or "by implication." Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1577. Moreover, the ordinary meaning of the non-technical term "mode" is sufficiently broad and amorphous that the scope of the claim language can be reconciled only with recourse to the written description. Comark Communications, Inc. v. Harris Corp., 156 F.3d 1182, 1187, 48 USPQ2d 1001, 1005 (Fed. Cir. 1998).

a. The '786 Patent Specification

At the outset, we note that the '786 patent is entitled "Variable Rate and Variable Mode Transmission System." Consistent with the title of the patent, the patentees, throughout the specification, use the terms "rate" and "mode" to refer to separate and distinct concepts. In the summary of the invention, the specification states that it is an object of the invention to operate in:

a plurality of different modes and at any one of a plurality of different bit rates

Still another object of the invention is to simply and easily vary the bit rates of the upstream and downstream channels, or the modes of the transceivers Another object is to either automatically control bit rate or mode by the CO or selectively control bit rate or mode by the subscriber.

'786 patent, col. 2, ll. 49-64 (emphasis added). Later, the Summary of the Invention notes that the present invention "has the advantages of conventional ADSLs, while allowing the data rate of the reverse control signaling channel to be controllably increased so as to have a higher rate transmission than ADSL in a bi-directional mode." Id. at col. 3, ll. 15-19 (emphasis added). The specification continues:

This variable rate / variable mode ADSL service will accommodate access to a wide variety of information providers In addition to variable bit rates for the control channel, the invention enables at least two modes for the ADSL transceivers, one providing bi-directional communications and the other providing asymmetrical communications.

Id. at col. 3, ll. 36-46 (emphasis added). Thus, before we even reach the Detailed Description of the Preferred Embodiments, it is clear that the '786 patent specification (in the Summary of the Invention) refers to the terms "rate" and "mode" as two separate and distinct concepts. The term "rate" describes the data rate within a given channel, while the term "mode" differentiates between asymmetrical and bi-directional communications.

The written description of the preferred embodiments also guides our interpretation of the claim language, as claims must be read in light of the specification. Scimed, 242 F.3d at 1340-41, 58 USPQ2d at 1062. We are mindful of the fact that limitations from the specification may not be read into the claims. Comark, 156 F.3d at 1186, 48 USPQ2d at 1005. Indeed, Bell Atlantic argues that by limiting the construction of the term "mode" to the three broad categories described in the specification, the district court improperly imported the limitations of one embodiment into the claim term. We disagree.

We recognize that there is sometimes "a fine line between reading a claim in light of the specification, and reading a limitation into the claim from the specification." Comark, 156 F.3d at

1186, 48 USPQ2d at 1005. For example, relying on Johnson Worldwide, Bell Atlantic argues that it is impermissible to rely on the written description of a preferred embodiment to limit the claim language. In Johnson Worldwide, we held that the meaning of a claim term was not limited by its specific usage in the written description of a preferred embodiment. 175 F.3d at 991, 50 USPQ2d at 1611. We reasoned that the "[v]aried use of a disputed term in the written description demonstrates the breadth of the term rather than providing a limited definition." Id.; see also Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1310, 51 USPQ2d 1161, 1170 (Fed. Cir. 1999) (holding that the written description of the preferred embodiments can set forth more than one definition of a claim term).

However, Bell Atlantic's reading of Johnson Worldwide and characterization of the role of the written description is too narrow. We held in Scimed, 242 F.3d at 1344, 58 USPQ2d at 1065, that the written description "can provide guidance as to the meaning of the claims, thereby dictating the manner in which the claims are to be construed, even if the guidance is not provided in explicit definitional format." Id. (emphasis added). Thus, when a patentee uses a claim term throughout the entire patent specification, in a manner consistent with only a single meaning, he has defined that term "by implication." Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1577; see also Hockerson, 222 F.3d at 955, 55 USPQ2d at 1490.

In this case, in addition to the Summary of the Invention, the Detailed Description of the Preferred Embodiments continues to use the terms "mode" and "rate" to refer to two separate and distinct concepts. The specification notes that the arrows used in figure seven "illustrate the reversible mode feature of the system and no fixed data rate is given due to the capability of the system to transmit at any one of a number of different transmission rates." '786 patent, col. 10, ll. 64-67 (emphasis added). This passage uses the term "rate" to refer to the speed of data transmission, and uses the term "mode" to refer to the reversible mode feature. When describing the microprocessor that controls the transceivers, the specification states that "the variable

transmission rates are controlled by a first [program] and the mode of the transceiver is controlled by a second [program]." '786 patent, col. 11, ll. 35-39 (emphasis added). Thus, the "mode" and "rate" of the transceiver are controlled by separate programs.

Further, the specification states that the system "operates in one of three selectable modes." '786 patent, col. 12, ll. 3-4 (emphasis added). The specification describes the modes:

The first mode is conventional ADSL, which is appropriate for applications in which a subscriber wishes to view video data (using the fixed rate interface) or download a large amount of information in a predetermined downstream direction (utilizing the ethernet interface).

The second mode is a bi-directional transmission mode which improves upon conventional ADSL by increasing the transmission rate of the upstream channel while decreasing the transmission rate of the downstream channel. This mode is preferable for certain interactive real-time applications such as video games and distance learning, in which a 8 Kbps or 16 Kbps upstream channel is insufficient for the flow of data in the upstream direction. An example of the channelization in the bi-directional mode in which the downstream and upstream channels are roughly equivalent is illustrated in FIG. 10 by channels 302', 304' and 306'.

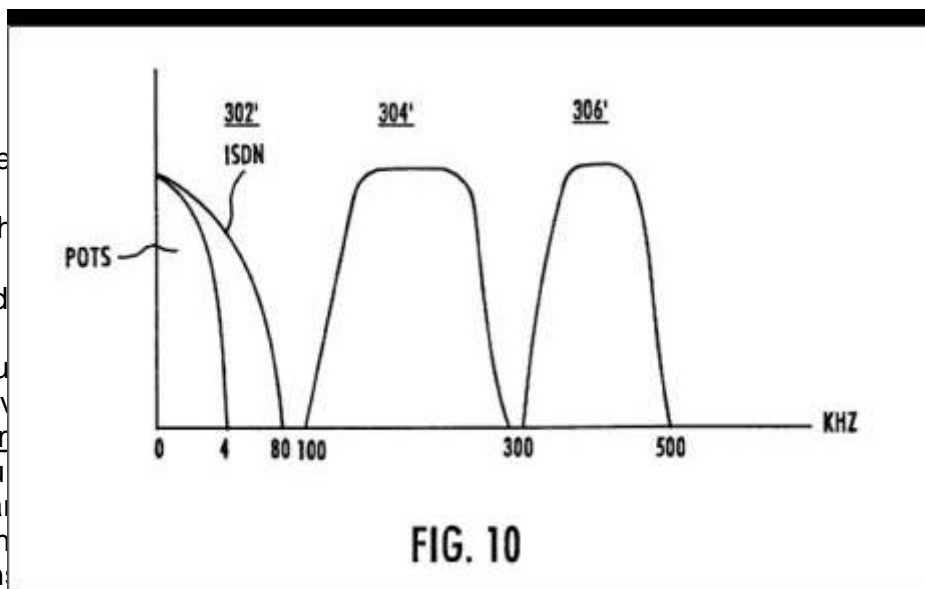
The third mode is a reversible mode in which the asymmetrical transmission of data and other information is carried out in the same manner as conventional ADSL shown in FIG. 4, but the direction of flow is selectively reversed so that the upstream direction becomes the downstream direction and vice versa. This mode is especially useful for applications in which there are non-simultaneous, non-real-time, exchanges of large amounts of information in both directions.

'786 patent, col. 12, ll. 3-29 (emphasis added).

These passages refer to Figure 10 of the '786 patent, which illustrates the described distribution of channel bandwidth. Channel 306' is the downstream channel, while channel 304' is the upstream channel:

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FIG. 10

Another passage refers to an "asymmetrical mode." '786 patent, col. 13, ll. 6-7 (emphasis added). Other passages discuss the "reversible ADSL mode." '786 patent, col. 13, ll. 51-52. Still others explain how the system may change from "bi-directional mode to ADSL mode." '786 patent, col. 14, ll. 7-8, 44-58.

In short, there is no question that the '786 patent specification uses the terms "mode" and "rate" to refer to two different and distinct concepts. The "rate" of data flow is characterized as the transmission rate within a given channel. The "mode" is characterized by whether the relative bandwidth between the upstream and downstream channels is symmetrical or asymmetrical. Moreover, because the two terms are used separately and distinctly, different "modes" cannot be created by varying the data rate within one of the three broad categories. In other words, although a bi-directional service "offering 192 Kbps in each direction is quite different from one offering 1.1 Mbps," nevertheless, the two services do not constitute different "modes." Thus, given the single meaning of the term "mode" contemplated by the '786 patent specification, there are only three possible permutations by which the relative bandwidth may be characterized: (1) where the first channel is smaller than the second (conventional mode); (2) where the two channels are of roughly equal size (bi-directional mode); and (3) where the first

channel is larger than the second (reversible mode).

We acknowledge that it is generally impermissible to limit claim terms by a preferred embodiment or inferences drawn from the description of a preferred embodiment. Johnson Worldwide, 175 F.3d at 992, 50 USPQ2d at 1612. However, that is not the case here. We note that "[t]he usage 'preferred' does not of itself broaden the claims beyond their support in the specification." Wang Labs., Inc. v. America Online, Inc., 197 F.3d 1377, 1383, 53 USPQ2d 1161, 1165 (Fed. Cir. 1999). Moreover, unlike Johnson Worldwide, this case does not involve the "[v]aried use of a disputed term." Id. at 991, 50 USPQ2d at 1611. Instead, the patentees defined the term "mode" by implication, through the term's consistent use throughout the '786 patent specification. Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1577. Given this definition, the three modes described in the Detailed Description of the Preferred Embodiments describe the three possible modes of the invention, and the claims are not entitled to any broader scope. Wang, 197 F.3d at 1383, 53 USPQ2d at 1165.

b. Prosecution History

The prosecution history also supports limiting the transceiver to the three possible modes. During the prosecution of the '786 patent, the examiner rejected the relevant claims as obvious over U.S. Patent No. 5,408,260 ("Arnon"). Arnon describes an ADSL transmission system and transceiver that combines ADSL data with television signals, and transmits the data at varying frequencies over coaxial cable wires. Arnon, col. 2, ll. 9-50. Arnon describes a system that combines the ADSL data signals with the cable television signal at ADSL "terminal units" within a residential building. Arnon, col. 3, ll. 23-57. The examiner initially rejected the relevant claims of the '786 patent because:

Arnon did not expressly detail that the controller selected the mode of operation for the transceivers. Arnon however taught that the receivers and transmitters could be automatically retuned to a different frequency when a terminal unit was faulty Therefore, it would have been obvious to one of ordinary skill in the [data processing] art at the time of the claimed invention that the Arnon system comprised

control means which retuned the receivers and transmitters when a terminal unit was faulty so that it could communicate via another terminal unit. Also clearly it would have been obvious that this operation would have comprised selecting the new mode of operation for transmission of data. Further since the Arnon system operated on different channels at different rates it would have been obvious to a routinier that even in normal operation the Arnon system would have used a control means to change modes of transfer and speeds of transfer.

(emphasis added). Although the statements of an examiner will not necessarily limit a claim, we observe that the examiner understood that the "mode of transfer" was a separate and distinct concept than the "speed of transfer."

Moreover, in an attempt to distinguish his invention from Arnon, the patentees responded with various statements. Importantly, the patentee argued:

In the present invention, the transmission bandwidth of channels 302, 304, and 306 are controlled for various modes using a microprocessor/controller in the ADSL/AVR unit.

(Emphasis added.) It is clear from this statement that the "mode" of the present invention varies solely by changing the amount of bandwidth allocated between the upstream and downstream channels. In subsequent statements, the patentees described the "exemplary ADSL/AVR embodiment" that operates "in one of three" modes: conventional, bi-directional, and reversible. The patentees observed that the invention allows one to perform various functions "in the optimum mode and at the optimum transmission rate for that function." (emphasis added). The patentees further distinguished Arnon because:

[T]he ADSL unit of Arnon's subscriber loops appear to be conventional ADSL unit having a bandwidth distribution of the type illustrated in Applicants' Fig. 4. . . . Arnon's ADSL terminal comprises transmitters and receivers for communicating bi-directional data and control signals via the coaxial cable between the ADSL units and the subscriber, in each case modulated at a frequency which is not used for television signals. This is completely different from the present invention in which the ADSL terminal selectively changes the bandwidth for both control and data channels in the subscriber loop."

(emphasis in original). Bell Atlantic now contends that this statement merely distinguishes the fact that Arnon's terminal units operated within a residential unit, while the transceivers described

by the '786 patent operate outside the building, or "in the subscriber loop." It is true that the emphasized language supports this distinction. However, the statement also states that, "the present invention . . . selectively changes the bandwidth." Thus, not only did the patentees distinguish that the invention operated in the subscriber loop, but they also emphasized that a conventional bandwidth distribution is "completely different" from the invention's system of "selectively chang[ing] the bandwidth."

That the transceivers must operate in one of the three described modes is further supported by the language of dependent claims 9 through 12:

9. The transmission system of claim 1, wherein said plurality of different modes includes a conventional ADSL mode and a bi-directional mode.
10. The transmission system of claim 1, wherein said plurality of different modes includes a conventional ADSL mode and a reversible mode.
11. The transmission system of claim 1, wherein said plurality of different modes includes a bi-directional mode and a reversible mode.
12. The transmission system of claim 1, wherein said plurality of different modes includes a conventional ADSL mode, a bi-directional mode, and a reversible mode.

'786 patent, col. 17, l. 59 to col. 18, l. 3. These four dependent claims contemplate the only four possible permutations of a "plurality of different modes." It is true that limitations stated in dependent claims are normally not to be read into the independent claim from which they depend. Karlin Tech., Inc. v. Surgical Dynamics, Inc., 177 F.3d 968, 972, 50 USPQ2d 1465, 1468 (Fed. Cir. 1999). However, our acknowledgement of dependent claims 9-12 simply further demonstrates that the '786 patent defined the term "mode" by implication to mean the relative allocation of bandwidth between the first and second channel. Such a meaning leaves only three possible modes: conventional, bi-directional, and reversible.

Bell Atlantic observes that independent claim 21 does not contain the "plurality of different modes" language contained in claim 1. Nevertheless, the district court held that the "ADSL/AVR transceiver" described in claim 21 must also operate by dividing available bandwidth between the two channels in conventional, bi-directional, and reversible modes. We agree with the district

court. The second sentence of the '786 patent abstract refers to ADSL transceivers "operating at variable rates and in variable modes (ADSL/AVR)." (emphasis added). In the Summary of the Invention, the '786 patent specification defines the invention as "an ADSL having adjustable variable rate functionality (ADSL/AVR)." '786 patent, col. 3, l. 10-11. The '786 patent uses the terms "transceiver," "ADSL/AVR," and "ADSL/AVR transceiver" interchangeably throughout the written description and the prosecution history. Therefore, one of ordinary skill in the art would understand that the transceiver described in claim 1 is the same transceiver described in claim 21. Thus, at the same time the patentees defined the term "mode" by implication, they also defined the ADSL/AVR transceivers as those that operate in conventional, bi-directional, and reversible modes by allocating bandwidth between the first and second channels. For these reasons, the transceivers described in claims 1 and 21 are construed synonymously with the definition of "mode" set forth above.

2. The First and Second "Channel" Limitation

Bell Atlantic also challenges the district court's claim construction of the term "channel" as used in claims 1 and 21. The district court determined that the first and second channels are "an amount of bandwidth isolated for communications that may be either unidirectional or bi-directional." Bell Atlantic argued that channel means "a one-way path between communicating entities." Thus, we must determine whether the '786 patent specification requires the first and second channels to: (1) be an amount of bandwidth separated in frequency, and/or (2) support both unidirectional and bi-directional communications.

a. Unidirectional Channels

The district court determined that the first and second channels described in claims 1 and 21 may support either unidirectional or bi-directional communications. The district court noted that various phrases in the specification described "two-way" channels, and reasoned that "the

inventors clearly intended 'channel' to encompass both one-way and two-way segments of bandwidth." However, Bell Atlantic contends that the first and second channels are instead "one way path[s]." We agree with Bell Atlantic on this aspect of the interpretation of the "channel" limitation.

First, the language of the claims supports Bell Atlantic's contention that the first and second "channels" are intended to encompass only one-way communication. Claims 1 and 21 both describe a first transceiver "transmitting or receiving signals, at a first transmission rate, on a first channel, and transmitting or receiving signals, at a second transmission rate, on a second channel." '786 patent, col. 17, ll. 9-12 (emphasis added). The use of the word "or" demonstrates that each transceiver either transmits or receives on a single channel, but not both simultaneously. Thus, the language of the claims themselves supports a construction of the first and second "channels" that excludes bi-directional or two-way communications.

Second, the written description defines the first and second channels as those that support one-way communication. Throughout the written description, the specification discusses the data channels as either "upstream" or "downstream" channels. '786 patent, col. 2, l. 60; col. 3, l. 57; col. 7, l. 48; col. 8, l. 57; col. 12, ll. 10-29. Indeed, the written description notes that in conventional ADSL systems, "channels 304 and 306 are unidirectional." '786 patent, col. 9, l. 8 (emphasis added). Other passages refer to the "unidirectional" nature of the downstream or upstream channels. '786 patent, col. 9, l. 50. Thus, it is clear that the specification defines by implication the first and second channels as supporting only unidirectional communication.

Covad nevertheless contends that the specification and prosecution history also use the term "channel" to refer to bi-directional communications. Therefore, Covad reasons that the term as used in claims 1 and 21 must be construed to encompass both unidirectional and bi-directional communications. It is true that the specification refers to a "two-way" or bi-directional channel in numerous instances. '786 patent, col. 2, ll. 29-30; col. 8, ll. 24-26; col. 8, ll. 44-46; col. 13, l. 7. It

is also true that during prosecution history, the patentees stated that "channel 302 provides connectivity for conventional [bi-directional] telephone services." However, in each of these instances, it is evident that the statements regarding the bi-directional channels refer to only the prior art control channel, the signaling channel, or the POTS channel. Conversely, wherever the specification discusses the first and second (upstream and downstream) data channels referenced in the claims at issue, it is clear that the communication is unidirectional.

"In circumstances such as this, where the language of the written description is sufficient to put a reader on notice of the different uses of a term, and where those uses are further apparent from publicly-available documents referenced in the patent files, it is appropriate to depart from the normal rule of construing seemingly identical terms in the same manner. This entirely accords with the public notice function of claims." Pitney Bowes, 182 F.3d at 1311, 51 USPQ2d at 1170. Thus, although the term "channel" may encompass both unidirectional and bi-directional communications, it is clear that the first and second data channel limitations in claims 1 and 21 support only unidirectional communications.

b. Frequency Separated Channels

The district court also held that the first and second "channels" are "an amount of bandwidth" or "bands of frequencies" or "frequency channels." In other words, the district court determined that the channels must be separated by frequency. Bell Atlantic contends that the ordinary meaning of the term "channel" is not limited to communication paths separated by frequency. Indeed, as understood by one of ordinary skill in the art, the ordinary meaning of the term "channel" is quite broad. Within the realm of DSL technology, technical treatises refer to channels separated by frequency ("frequency division multiplexing"), channels subdivided by time ("time division multiplexing"), channels separated by "echo cancellation" techniques, and channels subdivided by various "modulation" techniques. See, e.g., E. Bryan Carne, Telecommunications Primer 223 (Prentice Hall 2d ed. 1999); Michael Busby, Demystifying

ATM/ADSL 37, 53-54, 205-206 (Wordware 1998).

However, the '786 patent specification defines the first and second channels, by implication, as amounts of bandwidth, and thus, communication paths separated by frequency. The summary of the invention references the upstream and downstream channels. '786 patent, col. 2, l. 59; col. 3, l. 57. The written description of the preferred embodiments notes that the upstream and downstream channels are illustrated in Figure 10 as channels 304' and 306'. '786 patent, col. 12, ll. 10-21. Figure 10, discussed above, illustrates the upstream and downstream channels as channels separated by frequency.

Moreover, the specification states that "the ADSL/AVRs used in the present invention are a modification of, and an improvement over, conventional ADSL." '786 patent, col. 8, ll. 15-17 (emphasis added). The specification notes that conventional transceivers use "frequency multiplexing to divide the available loop bandwidth into three channels 302, 304 and 306." '786 patent, col. 8, ll. 20-22. In numerous other passages, the specification describes the channels in conventional ADSL systems as separated by frequency. '786 patent, col. 8, l. 20; col. 8, l. 44; col. 8, l. 60; col. 9, l. 43; col. 10, l. 46. The specification notes that the ADSL/AVR system of the present invention is similar to conventional ADSL systems. '786 patent, col. 10, ll. 60-61. Furthermore, the written description states that the channelization between the upstream and downstream channels is illustrated in Figure 10. '786 patent, col. 12, ll. 19-21. Both Figure 4 (conventional ADSL channelization) and Figure 10 (bi-directional mode channelization) show that data channels 304, 306, 304', and 306' correspond to bandwidths separated by frequency.

Moreover, the patentees stated during prosecution that "[i]n the present invention, the transmission bandwidth of channels 302, 304, and 306 are controlled for various modes." (emphasis added). This statement further demonstrates that the channels used in the present invention are defined by an amount of bandwidth. Thus, the only type of channels contemplated by the '786 patent are those that occupy an amount of bandwidth? those that are separated in

frequency. Nowhere does the specification discuss channels created by time-division multiplexing or echo cancellation. Indeed, in the one reference to time division multiplexing, the specification states:

A down-stream control signal to the subscriber (not shown in Fig. 4) is time division multiplexed with the 1.544 mbps video signal on the 100-500 Hz carrier. This down-stream control signal, together with the digitized information and overhead, occupies a bit rate band of about 1.6 mbps.

'786 patent, col. 8, l. 66 to col. 9, l. 4 (emphasis added). The specification refrains from identifying the time-division multiplexed signal as a "channel," instead referring to it as a "signal."

Our construction does not limit the term "channel" through inferences drawn from the description of a preferred embodiment. Johnson Worldwide, 175 F.3d at 992, 50 USPQ2d at 1612. Neither does this case involve the "[v]aried use of a disputed term." Id. at 991, 50 USPQ2d at 1611. Instead, the written description "provide[s] guidance as to the meaning of the claims, thereby dictating the manner in which the claims are to be construed, even if the guidance is not provided in explicit definitional format." Scimed, 242 F.3d at 1344, 58 USPQ2d at 1065. Because the patentees used the term "channel" throughout the entire patent specification, consistent with a single meaning, they defined that term "by implication." Vitronics, 90 F.3d at 1582, 39 USPQ2d at 1577; see also Hockerson, 222 F.3d at 955, 55 USPQ2d at 1490. Thus, in addition to being unidirectional, the first and second channels described in claims 1 and 21 also constitute an amount of bandwidth, and as such, are channels that are separated by frequency.

3. "Selectively Changing"

Covad challenges the district court's construction of the "selectively changing" limitation found in both claims 1 and 21. The district court determined that "selectively changing" the first and second transmission rates means that "a change is chosen and occurs, although it need not occur during a communication session." However, Covad posits that this limitation requires a

change "during a communication session."

As an initial matter, Bell Atlantic argues that we lack jurisdiction to decide this issue because Covad did not file a cross-appeal, and Covad's proposed claim construction would require modification of the judgment on appeal. However, the general rule is that "without taking a cross-appeal, the prevailing party may present any argument that supports the judgment in its favor" as long as the acceptance of the argument would not lead to "a reversal or modification of the judgment rather than an affirmance." Carnival Cruise Lines, Inc. v. United States, 200 F.3d 1361, 1365 (Fed. Cir. 2000). Thus, where the prevailing party in a motion for summary judgment of noninfringement seeks "a claim construction more favorable to [its] case than the construction adopted by the district court on summary judgment, that would have no different result than affirmance of the [judgment]." Genentech, Inc. v. Wellcome Found. Ltd., 29 F.3d 1555, 1562, 31 USPQ2d 1161, 1165 (Fed. Cir. 1994). Because Covad's proposed construction of the "selectively changing" limitation would merely lead to an affirmance of the judgment below, there is no requirement for a cross-appeal on this issue.

It is true that the '786 patent specification explains that the transmission rate or mode of the ADSL/AVR may be selectively changed "during a communication session." '786 patent, col. 13, l. 65; col. 15, ll. 4-6. Indeed, the written description describes how a user may selectively change the "mode and/or data rate." '786 patent, col. 14, ll. 11-16. At the same time, however, the specification discusses selectively changing the mode and rate at times other than during a communication session:

In addition to the direct subscriber selection or control of modes during a communication session mentioned above, the selection of modes may also be made indirectly, programmed or otherwise controlled so that it is executed upon the performance of some event.

'786 patent, col. 14, ll. 38-42. Elsewhere, the written description notes that "[w]hen a request for a change in modes (e.g. from ADSL to bi-directional) is received during or prior to a communication

session, a negotiation is made." '786 patent, col. 14, ll. 7-9 (emphasis added). The specification also recognizes that "the subscriber could . . . change the mode and download the file or information upon the occurrence of some detectable event or at a designated time." '786 patent, col. 14, ll. 59-62 (emphasis added). Thus, the patent clearly contemplates the possibility of selectively changing the transmission mode or rate at times other than during a communication session. Consequently, the specification does not define the limitation, either expressly or by implication, as a change made only during a communication session. The varied use of this limitation throughout the '786 patent specification "demonstrates the breadth of the term rather than providing a limited definition." Johnson Worldwide, 175 F.3d at 991, 50 USPQ2d at 1611. Covad's proposed construction would improperly import a limitation from the specification into the claim. Comark, 156 F.3d at 1186, 48 USPQ2d at 1005.

Instead, the significance of the "selectively changing" and "selectively operating" limitations is that the transmission mode or rate may be changed either automatically or manually without altering the transceiver hardware. The specification notes that a subscriber may "upgrade the capability of the service to higher data rates in the future using a network management system without altering the hardware." '786 patent, col. 11, ll. 57-59 (emphasis added). The specification also states:

[t]he structure of the chips in the chip set does not need to be changed to vary the mode of the transceiver or the transmission rates The use of a single chip set, capable of either transmitting or receiving conventional ADSL, at both ends of the transmission loop in the ADSL/AVR system . . . make it possible to easily and selectively implement the reversible ADSL mode.

'786 patent, col. 13, ll. 46-60. Moreover, in the prosecution history, the patentees distinguished the fixed-bandwidth nature of Arnon:

[E]ven though Arnon teaches a fault induced substitution mode . . . the bandwidth or transmission rates in the ADSL loops during the fault mode or during the normal modes remain unchanged. Hence, it is submitted that Arnon fails to show, teach, or suggest selectively changing the first and second transmission rates in the subscriber loop.

(Emphasis added.)

Thus, the "selectively changing" and "selectively operating" limitations in claims 1 and 21 mean that a change is chosen or occurs without alteration of the transceiver hardware, although the change need not occur during a communication session.

B. Infringement Analysis

Bell Atlantic does not argue, under our claim construction, that Covad's accused DSL systems literally infringe the '786 patent. However, Bell Atlantic contends that Covad's accused SDSL systems, which use echo cancellation, could infringe under the doctrine of equivalents. Bell Atlantic notes that it furnished evidence establishing that the single bi-directional channel used by Covad's SDSL linecards is insubstantially different from the two unidirectional channels described in claims 1 and 21 of the '786 patent. The district court rejected this argument, holding that "Covad's SDSL transceivers perform substantially different functions in a substantially different way to achieve substantially different results."

Bell Atlantic submitted the affidavit of Dr. Charles L. Jackson as expert testimony supporting its position. Dr. Jackson states:

One could substitute the upstream SDSL communications path [in Covad's system] for one of the channels in claim 1 and the downstream SDSL communications path for the other channel in claim 1. The overlapping paths of the SDSL connection would perform the same function as the nonoverlapping channels required by Covad's view of claim 1. They are used in the same fashion as are the channels in the claim and they result in moving information signals to and from the customer premises as would the channels in Covad's interpretation of claim 1.

Bell Atlantic asserts that its expert testimony creates at least a genuine issue of material fact to prevent summary judgment.

However, under the "all elements rule," there can be no infringement under the doctrine

of equivalents if even one element of a claim or its equivalent is not present in the accused device. Pennwalt Corp. v. Durand-Wayland, Inc., 833 F.2d 931, 935-36, 4 USPQ2d 1737, 1739-40 (Fed. Cir. 1987) (en banc), cited in Festo, 234 F.3d at 587, 56 USPQ2d at 1887. Such a determination must be premised upon a proper claim construction. Insituform, 99 F.3d at 1109, 40 USPQ2d at 1610. Thus, if a court determines that a finding of infringement under the doctrine of equivalents "would entirely vitiate a particular claim element," then the court should rule that there is no infringement under the doctrine of equivalents. Festo, 234 F.3d at 587, 56 USPQ2d at 1887 (citing Warner-Jenkinson Co., Inc. v. Hilton Davis Chemical Co., 520 U.S. 17, 39 n.8, 41 USPQ2d 1865, 1875 n.8 (1997)).

In this case, Bell Atlantic's theory of infringement under the doctrine of equivalents would entirely vitiate at least two limitations contained in claims 1 and 21. The bandwidth of Covad's SDSL linecards is fixed with physical filters, and the amount of bandwidth cannot be changed once the transceivers are implemented and manufactured. Thus, Bell Atlantic's theory of equivalence would entirely vitiate the claim limitations that require the transceivers to "selectively change" or "selectively operate" the rate or mode without changing the transceiver hardware. Moreover, Covad's SDSL linecards use "echo cancellation" techniques to allow two-way communication in a single frequency range over a single channel. Again, Bell Atlantic's theory of equivalence would entirely vitiate the limitations that require two unidirectional channels, separated by frequency. Accordingly, there can be no infringement under the doctrine of equivalents.

IV. CONCLUSION

For the reasons discussed, the district court's grant of summary judgment of noninfringement in favor of Covad is

AFFIRMED.

COSTS

Plaintiff-Appellant shall bear the costs of this appeal.

[1] Bell Atlantic is now called Verizon Services Corporation, a wholly owned subsidiary of Verizon Communications, Inc., formerly Bell Atlantic Corporation. For purposes of consistency, we refer to the plaintiff as Bell Atlantic.

[2] Echo cancellation allows a single frequency range to carry both the upstream and downstream signals. The signals overlap and are separated by the well-known technique of local echo cancellation.