PATROLL Winning Submission

U.S. Patent No. 10,075,941

U.S. Patent No. 10,075,941 ("*Neo Wireless LLC*" or the "patent-at-issue") was filed on March 28, 2016. According to the paragraph in the specification entitled "Cross-Reference to Related Applications," claims priority of pending U.S. patent application Ser. No. 60/540,032, filed January 29, 2004. Claim 1 of the patent-at-issue is generally directed to a link adaptation method by a base station serving a plurality of mobile stations in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, utilizing a transmission structure with time slots in the time domain and frequency subchannels in the frequency domain. A control message is transmitted to a mobile station over a control channel, wherein the control message contains transmission parameters that indicate an antenna transmission scheme and a corresponding subchannel configuration, which is used to transmit a data packet to the mobile station over the frequency subchannel in accordance with the mobile station-specific transmission parameters.

The primary reference, U.S. Patent No. 7,522,514 ("*Intel*"), was filed on March 7, 2003 and claims an earliest priority date of March 8, 2002. The patent is directed to a multicarrier modulation system that uses messages sent from the receiver to the transmitter to exchange optimized communication parameters. The transmitter then stores these communication parameters and when transmitting to that particular receiver, the transmitter utilizes the stored parameters in an effort to maximize the data rate to that receiver. Likewise, when the receiver receives packets from that particular transmitter, the receiver can utilize the stored communication parameters for reception.

The primary reference, U.S. Patent No. 7,126,996 ("*Google*"), was filed on December 28, 2001 and claims priority on the same date. The patent is directed to a multicarrier, multidimensional communications system that can assess their own channel coherence time attribute, used for mobile units and base stations. This information is utilized to determine a level of trustworthiness for other channel quality data as might be measured by the mobile unit. Different modulation and coding schemes, along with responsive frequency and time diversity resource allocations, are adaptively selected as a function of this level of trustworthiness.

The secondary reference, U.S. Patent No. 8,032,144 ("*Panasonic*"), was filed on June 30, 2004, and claims an earliest priority date of July 3, 2003. The patent is directed to a multicarrier communication apparatus that comprises a reception section that receives a multicarrier signal with data mapped on a plurality of carriers, a measuring section that measures reception quality of the plurality of carriers and a determining section that determines a carrier having the best measured reception quality as a feedback information carrier.

A sample claim chart comparing claim 1 of *Neo Wireless LLC* to *Intel*, *Google*, and *Panasonic* is provided below.

US 10075941 (“*Neo Wireless LLC*”)	**A. US7522514** (*“Intel”*) **B. US7126996** (*“Google”*) **C. US8032144** (*“Panasonic”*)
1.pre A **link adaptation method by a base station serving a plurality of mobile stations** in an **Orthogonal Frequency Division Multiplexing (OFDM) communication system**, the communication system utilizing a transmission structure with **time slots in the time domain** and **frequency subchannels in the frequency domain**, the method comprising:	**A. US7522514** “The exemplary embodiment of the protocol used for **exchanging communication parameters** in accordance with an exemplary embodiment of this invention will be discussed in relation to FIGS. 1 and 2. In particular, FIG. 1 illustrates an exemplary network 1, such as a wireless network. The network 1 comprises **a plurality of stations** 10 **interconnected by a plurality of links and an access point** 20.” *Intel* at col. 5:46-52 “For ease of illustration the exemplary method used for the high rate **OFDM communication systems** will be discussed in relation to a first transceiver sending packets to a second transceiver.” *Intel* at col. 5:65-67 through col. 6:1 **B. US7126996** “Referring now to FIG. 4, an illustrative **multicarrier communications system** 40 **includes a base site** 41 **and two receiving platforms** 42 **and** 43. These elements support **communications pursuant to an orthogonal frequency division multiplexing scheme**. Consequently, **communications** 44 **from the base site** 41 **to the first receiving platform** 42 **are conveyed through a multicarrier channel (in this specific embodiment a channel consisting of a set of orthogonal subcarriers)**. As will be detailed below, such a communications 44 can be broadband across a **plurality of subcarriers or subbands, or narrowband across fewer (or only one) subcarriers or subbands**. Further, **such communications** 44 **can also be diversified with respect to time as well**.” *Cochran* at col. 4:60-67 through col. 5:1-6 “1. **A method for facilitating adaptive transmissions by a base station in a multi-carrier system** where a total available bandwidth is split into **a set of subbands, each subband of the set of subbands comprising at least one subcarrier**, the method comprising:” *Cochran* at claim 1

(cont.) 1.pre A **link adaptation method by a base station serving a plurality of mobile stations** in an **Orthogonal Frequency Division Multiplexing (OFDM) communication system**, the communication system utilizing a transmission structure with **time slots in the time domain** and **frequency subchannels in the frequency domain**, the method comprising:	"The data payload section 84 can be allocated across the **subcarriers of the channel (and hence across the frequency domain)**, across the transmit antennas (and hence across the spatial domain), **and also across the time domain**." *Cochran* at col. 9:28-31 **C. US8032144** "The **base station apparatus** shown in FIG. 1 is provided with **control CH (CHannel) transmission section** 110, user CH transmission section 120, **multiplexing section** 130, S/P (Serial/Parallel) conversion section 140**, IFFT (Inverse Fast Fourier Transform) section** 150, GI (Guard Interval) insertion section 160, radio transmission section 170, radio reception section 210, GI elimination section 220, FFT (Fast Fourier Transform) section 230, P/S (Parallel/Serial) conversion section 240, FB (FeedBack) information reception section 250, PL (PiLot) signal reception section 260 and FBSC (FeedBack Sub-Career: subcarrier for feedback information) determining section 270." *IBM* at col. 3:34-45 "**Control CH transmission section** 110 **carries out coding and modulation on control data such as assignment information indicating a destination of user data and information about feedback information subcarrier** (hereinafter referred to as "FBSC information") **output from FBSC determining section** 270 which will be described later." *IBM* at col. 3:46-51 "**IFFT section** 150 **carries out an inverse fast Fourier transform on the parallel data, maps data on subcarriers of frequencies orthogonal to one another and outputs the obtained OFDM data to GI insertion section** 160." *IBM* at col. 4:11-14 "**Radio transmission section** 170 carries out predetermined radio transmission processing (D/A conversion, up-conversion or the like) on the OFDM data after the insertion of the guard interval and **transmits the OFDM data to a mobile station apparatus through an antenna**." *IBM* at col. 4:18-22
1.a **transmitting a control message to a mobile station over a control channel**,	**A. US7522514** "The relevant portion of the protocol commences with the **first transceiver sending a packet at one of a highest possible data rate**, e.g., 54 Mbps for 802.11a/g, at the data rate of the

(cont.) 1.a **transmitting a control message to a mobile station over a control channel**,	last successful transmission, or at a known data rate." *Intel* at col. 6:4-8 "Next, if the second transceiver's receiver 250 successfully receives the packet from the first transceiver 100, **the second transceiver** 200 **returns to the first transceiver a positive acknowledgment packet** again with the cooperation of the packet determination modulation 230, the transmitter 240, the memory 260 and the controller 270. **This positive acknowledgment packet also comprises optimized communication parameters** determined by the communication parameter determination module 220 to be used by the second transceiver 200 for subsequent reception of packets from the first transceiver 100." *Intel* at col. 6:16-26 **B. US7126996** "In one embodiment that uses time division duplexing, and referring now to FIG. 8, **a downlink frame** 81 as used in conjunction with an uplink frame 82 can well suit the flexibility that accompanies the above approach. (The two frames can be considered part of one frame, such as in a TDD system. The TDD system can also have a flexible boundary between the frames.) **The downlink frame** 81 (**which facilitates base site to transmission target communications**) **includes a resource allocation control channel portion** 83, **a data payload portion** 84, and a fast sounding channel 85." *Cochran* at col. 8:61-67 through col. 9:1-4 **C. US8032144** "FBSC determining section 270 determines a feedback information subcarrier based on reception quality of subcarriers. More specifically, FBSC determining section 270 determines a subcarrier having the highest reception quality as a feedback information subcarrier. **FBSC determining section** 270 **then outputs information about the feedback information subcarrier (FBSC information) to control CH transmission section** 110 **and FB information reception section** 250." *IBM* at col. 4:63-67 through col. 5:1-3
1.b wherein: the control message contains **transmission parameters allocated to the mobile station** for a **subsequent transmission of data by the base**	**A. US7522514** "This positive acknowledgment packet also comprises **optimized communication parameters determined by the communication parameter determination module** 220 **to be used by the second transceiver** 200 **for subsequent**

station over a frequency subchannel to the mobile station in a **time slot**; and	**reception of packets from the first transceiver** 100." *Intel* at col. 6:21-26 **B. US7126996** "The **data payload section** 84 **can be allocated across the subcarriers of the channel (and hence across the frequency domain)**, across the transmit antennas (and hence across the spatial domain), **and also across the time domain**. The apportionment depicted serves only as an illustrative example and is meant only to suggest that the data payload section 84 can be allocated in a significant number of ways to suit the data transmission needs, the channel quality circumstances, and the various modulation and coding schemes that might be available in a given application. As depicted, and for purposes of clarity, only two primary transmission schemes are being utilized. **The "user type 1" represents transmission targets for which channel quality information is likely trustworthy such that individual subcarriers can be assigned to support specific transmissions**. (**For example, different subcarriers or different sets of subcarriers can be assigned to different targets, and the subcarriers assigned to a target can use different modulations and/or different coding**." *Cochran* at col. 9:28-46 **C. US8032144** "**FBSC determining section** 270 **determines a feedback information subcarrier based on reception quality of subcarriers**. More specifically, FBSC determining section 270 **determines a subcarrier having the highest reception quality as a feedback information subcarrier**. FBSC determining section 270 then outputs information about the feedback information subcarrier (FBSC information) to control CH transmission section 110 and FB information reception section 250. A subcarrier number of the feedback information subcarrier, for example, is used as the FBSC information." *IBM* at col. 4:63-67 through col. 5:1-3
1.c the **mobile station-specific transmission parameters indicate an antenna transmission scheme** and **a corresponding subchannel configuration**, **the antenna transmission scheme comprising a transmission diversity scheme or a multiple-input multiple-output**	**A. US7522514** "For example, **the positive acknowledgment packet may contain a BAT with different bits per subcarrier based on, for example, the channel characteristics as measured by the second transceiver** 200 and determined by the communication parameter determination module 220. Alternatively, or in addition, this acknowledgment packet may also indicate any of the **optimized transmission parameters**

(MIMO) scheme and the **corresponding subchannel configuration characterized by distributed subcarriers or localized subcarriers in the frequency domain**; and	**described above, e.g., which one or more carriers should be used as pilot tones** as discussed above." *Intel* at col. 6:26-34 **B. US7126996** "A **second transmission selection mode** 55 follows. Pursuant to this mode, and based at least in part upon the channel quality data, **an adaptive modulation and coding scheme is selected for utilization and transmission of data to the corresponding transmission target**. . . So configured, the **second transmission selection mode** 55 **can include selecting a particular subcarrier from amongst a plurality of candidate subcarriers, the selection of a plurality of subcarriers from amongst a plurality of candidate subcarriers**, **selecting a particular modulation technique from amongst a plurality of candidate modulation techniques, and even selecting a first modulation technique for use with a first subcarrier and a second modulation technique for use with a second subcarrier**. Even when the same modulation technique is used on different subcarriers, the coding scheme or code rate can be changed as part of the adaptive modulation and coding scheme. Of course, the second transmission selection mode 55 can also include a decision to not transmit all or part of the data as well. **A similar fast selective adaptive modulation and coding scheme can be used in the case of multi-antenna systems**, **including selecting a particular antenna from amongst a plurality of candidate transmit antennas, the selection of a plurality of antennas from amongst a plurality of candidate antennas, and selecting a first modulation and coding technique for use with a first antenna and a second modulation and coding technique for use with a second antenna**." *Cochran* at col. 8:19-58 **C. US8032144** "**A signal received by the base station apparatus includes a known pilot signal for subcarriers**, pilot signals are extracted by PL signal extraction section 261 and reception quality is measured by reception quality measuring section 262. Then, **FBSC determining section** 270 **determines a subcarrier including a pilot signal of the highest reception quality as a feedback information subcarrier**. Thus determined feedback information subcarrier (FBSC) is a subcarrier having an optimum propagation state of frequency selective fading as shown in FIG. 6 or subcarrier having the small amount of interference from other cells and a frequency band of good reception quality." *IBM* at col. 6:33-44

1.d **transmitting a data packet to the mobile station over the frequency subchannel** in accordance with the **mobile station-specific transmission parameters.**	**A. US7522514** "If the first transceiver 100 receives the positive acknowledgment packet, the first transceiver 100, in cooperation with memory 160 stores the optimized communication parameters. **The first transceiver** 100 **then uses the stored communication parameters for transmission of subsequent packets to the second transceiver** 200. The use of the optimized communication parameters is indicated in the header field of the packet sent from the first transceiver 100 to the second transceiver 200. For example, the message determination module 110 modifies the header field to indicate which optimized communication parameters are being used." *Intel* at col. 6:43-53 **B. US7126996** "**A second transmission selection mode** 55 follows. Pursuant to this mode, and **based at least in part upon the channel quality data, an adaptive modulation and coding scheme is selected for utilization and transmission of data to the corresponding transmission target**." *Cochran* at col. 8:19-23 "For example, **it can be seen that user** 2 **is experiencing favorable reception** 96 **around a particular frequency** and conversely that user 1 is experiencing a deep fade around this same frequency. **Based upon this channel quality information as provided by both users to the base site**, and with an assurance that such data is trustworthy for both users, **the base site can assign subcarriers that correspond in frequency to this favorable frequency** 96 for user 2." *Cochran* at col. 10:35-42 **C. US8032144** "Then, FBSC determining section 270 determines a subcarrier including a pilot signal of the highest reception quality as a feedback information subcarrier. Thus determined feedback information subcarrier (FBSC) is a subcarrier having an optimum propagation state of frequency selective fading as shown in FIG. 6 or subcarrier having the small amount of interference from other cells and a frequency band of good reception quality. Therefore, **when the mobile station apparatus transmits feedback information using the feedback information subcarrier**, it is possible to satisfy **required quality of feedback information generally having strict requirements** with relatively low transmit power." *IBM* at col. 6:36-48