receiving from the MSS the weight value for each channel. However, in order for the MSS, which uses multiple antennas, to achieve transmission diversity gain, the MSS has to receive feedback information on uplink channel quality value (channel information or weight value) from the BS. In other words, after the steps (S10-S13) are performed and the BS receives the downlink channel quality assessed value (channel information or weight value) from the MSS, the BS transmits feedback information concerning the uplink channel quality assessed value (channel information or weight value) to the MSS.

Furthermore, the BS uses the DIUC or the DL fast feedback channel IE message to notify the MSS of the high speed downlink feedback channel (S14). As illustrated in Figure 3, the BS transmits the uplink channel quality assessed value (channel information or weight value) to the MSS on an assigned specific location (or space) of the high speed downlink feedback channel (S15).

Figure 4 and Figure 5 illustrate examples of a format of an IE message for the BS notifying the MSS of the high speed downlink feedback channel. Here, Figure 4 is an example using an extended DIUC, and Figure 5 is an example using OFDMA DIUC value.

Furthermore, Figure 6 is an example of a format illustrating the CQICH DL location IE message which

includes the weight value and channel information of the BS. Here, each CQICH location IE occupies one downlink (DL) slot, and as illustrated in Figure 3, the DIUC = 14 or the DL fast feedback channel IE is assigned to the high speed downlink feedback channel.

Figure 7 is an example of a structure of a wireless communication system illustrating an operation of transmitting/receiving information between the BS and the MSS. More specifically, the BS receives via the receiver 21 data from the MSS via an uplink channel to determine the quality of the uplink channel by the controller 20. The BS can receive data as well as other types of data and information through which channel status and/or quality can be determined, for example. The BS can then use the transmitter 22 to transmit feedback information to the MSS. Here, the feedback information is based on the determined quality of the uplink channel.

In order for communication to take place, the MSS transmits data first to the BS via the transmitter 14. After the controller 20 of the BS determines the quality of the uplink channel and transmits via the transmitter 22, the receiver 13 of the MSS receives the feedback information from the BS.

Another embodiment of the present invention relates to allocating a physical channel space to provide fast

feedback channel in a downlink direction and defining a sub-carrier modulation method for the feedback channel so that the BS can send feedback information, including channel quality information and weight value(s), received in the uplink transmission, to the MSS via a defined feedback channel.

Figure 8 is an example illustrating a basic allocation unit of a fast feedback channel in a downlink Partial Usage of Sub-Channels (PUSC) mode. Figure 9 is an example illustrating a basic allocation unit of a fast feedback channel in a downlink Full Usage of Sub-Channels (FUSC) mode. In IEEE 802.26 OFDMA system, the downlink frame fundamentally provides the PUSC and FUSC modes.

The PUSC mode provides a permutation scheme whereby only partial sub-channels are used in transmitting data. As illustrated in Figure 8, a slot of the PUSC mode signifies a sub-channel comprised of two symbols and of four clusters. Furthermore, each cluster has 12 data sub-carriers.

The FUSC mode provides a permutation scheme whereby full or all sub-channels are used in transmitting data. As illustrated in Figure 9, a slot of the FUSC mode signifies a sub-channel comprising one symbol and 48 data sub-carriers, as in the PUSC mode. Furthermore, both in the PUSC mode and the FUSC mode, each slot possesses 48 data

sub-carriers.

In the present embodiment, as is the case in the fast feedback channel in the downlink direction, one slot is allocated to the fast feedback channel in downlink direction. In other words, the slot indicated in Figures 1 and 2 can be expressed as the basic allocation unit of the physical channel space of the fast feedback channel. Because the PUSC mode and the FUSC mode each include 48 data sub-carriers, the same modulation method can be applied despite the differences in shapes of the two modes. Figure 10 and Figure 11 are example illustrating a composition of data sub-carriers. In Figures 10 and 11, 48 data sub-carriers can be divided into six small groups. Furthermore, each small group includes eight sub-carriers. With this arrangement, the downlink fast feedback channel can apply the composition of the uplink fast feedback channel. Table 3 illustrates a sub-carrier modulation method of a feedback channel according to the embodiment of the present invention.

[Table 3]

4 bit payload	Vector indices to be used by fast feedback channel per small group (small group 0, small group 1... small group 5)
0b0000	0,0,0,0,0,0

0b0001	1,1,1,1,1,1
0b0010	2,2,2,2,2,2
0b0011	3,3,3,3,3,3
0b0100	4,4,4,4,4,4
0b0101	5,5,5,5,5,5
0b0110	6,6,6,6,6,6
0b0111	7,7,7,7,7,7
0b1000	0,1,2,3,4,5
0b1001	1,2,3,4,5,6
0b1010	2,3,4,5,6,7
0b1011	3,4,5,6,7,0
0b1100	4,5,6,7,0,1
0b1101	5,6,7,0,1,2
0b1110	6,7,0,1,2,3
0b1111	7,0,1,2,3,4

In Table 3, the order combination(s) of vector indices according to payload and the small groups (0-5) can be changed. Table 4 of below shows data sub-carrier modulation method for each vector of Table 3.

[Table 4]

Vector Index	Data sub-carrier modulation technique per each vector index (sub-carrier 0, sub-carrier 1 … sub-carrier 7)
0	P0, P1, P2, P3, P0, P1, P2, P3
1	P0, P3, P2, P1, P0, P3, P2, P1
2	P0, P0, P1, P1, P2, P2, P3, P3
3	P0, P0, P3, P3, P2, P2, P1, P1

4	P0, P0, P0, P0, P0, P0, P0, P0
5	P0, P2, P0, P2, P0, P2, P0, P2
6	P0, P2, P0, P2, P2, P0, P2, P0
7	P0, P2, P2, P0, P2, P0, P0, P2

The fast feedback channel modulation according to the embodiment of the present invention can use various modulation techniques such as Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK), and 16 Quadrature Amplitude Modulation (16QAM). Each modulation techniques (P0, P1, P2, P3) of Table 4 shows an example of the QPSK technique applied to the OFDM/OFDMA system. Furthermore, the modulation order combination(s) according to each vector index in Table 4 may vary.

To describe another operation of transmitting/receiving information between the BS and the MSS in a wireless communication system for transmitting information, the structure of Figure 7 will be used, along with the number labels, to explain the operation. In operation, a controller 20 of the BS allocates a physical resource for a downlink fast feedback channel and establishes a modulation pattern to the downlink fast feedback channel by the BS. Here, the physical resource for the downlink fast feedback channel is different from a physical resource for a data channel, and also, the modulation pattern corresponds to feedback information. Thereafter,

the transmitter 22 of the BS transmits the modulation pattern to the MSS.

At the MSS, a receiver 13 receives the modulation pattern transmitted from a base station (BS). Here, the modulation pattern was established to the downlink fast feedback channel at the controller 20 of the BS, and the modulation pattern corresponds to feedback information. Upon receipt, a controller 10 of the MSS detects the modulation pattern transmitted from the BS and determines which feedback information is transmitted from the BS via the modulation pattern. After determining the feedback information, a transmitter 14 of the MSS transmits an uplink data, which has been configured by using the feedback information, to the BS.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

[CLAIMS]

1. A method of transmitting information in a wireless communication system, the method comprising:

receiving data from a mobile subscriber station (MSS) via an uplink channel;

determining quality of the uplink channel based on the received data by a base station (BS); and

transmitting a feedback information to the MSS, wherein the feedback information is based on the determined quality of the uplink channel.

2. The method of claim 1, wherein the feedback information includes channel quality information (CQI) of an uplink channel.

3. The method of claim 1, wherein the feedback information includes weight values.

4. The method of claim 1, wherein the feedback information includes a combination of channel quality information (CQI) and weight values.

5. The method of claim 1, wherein the feedback

information is transmitted via a downlink fast feedback channel.

6. The method of claim 1, wherein the feedback information is transmitted via a data burst.

7. The method of claim 1, wherein the feedback information is transmitted via a Medium Access Channel (MAC) message.

8. A method of receiving information in a wireless communication system, the method comprising:

transmitting data to a base station (BS) via an uplink channel; and

receiving a feedback information from the BS, wherein the feedback information is based on quality of the uplink channel, and wherein the quality of the uplink channel is determined based on the transmitted data.

9. The method of claim 8, wherein the feedback information includes channel quality information (CQI) of an uplink channel.

10. The method of claim 8, wherein the feedback information includes weight values.

11. The method of claim 8, wherein the feedback information includes a combination of channel quality information (CQI) and weight values.

12. The method of claim 8, wherein the feedback information is transmitted via a downlink fast feedback channel.

13. The method of claim 8, wherein the feedback information is transmitted via a data burst.

14. The method of claim 8, wherein the feedback information is transmitted via a Medium Access Channel (MAC) message.

15. A method of transmitting and receiving information in a wireless communication system, the method comprising:

transmitting data to a base station (BS) by a mobile subscriber station (MSS) via an uplink channel;

receiving the transmitted data from the MSS via the uplink channel;

determining quality of the uplink channel based on the received data by the BS;

transmitting a feedback information to the MSS by the BS, wherein the feedback information is based on the determined quality of the uplink channel; and

receiving the transmitted feedback information from the BS.

16. The method of claim 15, wherein the feedback information includes channel quality information (CQI) of an uplink channel.

17. The method of claim 15, wherein the feedback information includes weight values.

18. The method of claim 15, wherein the feedback information includes a combination of channel quality information (CQI) and weight values.

19. The method of claim 15, wherein the feedback information is transmitted via a downlink fast feedback

channel.

20. The method of claim 15, wherein the feedback information is transmitted via a data burst.

21. The method of claim 15, wherein the feedback information is transmitted via a Medium Access Channel (MAC) message.

22. A wireless communication system for transmitting information, the system comprising a base station (BS) which includes:

a receiver for receiving data from a mobile communication station (MSS) via an uplink channel;

a controller for determining quality of the uplink channel based on the received data by the BS; and

a transmitter for transmitting a feedback information to the MSS, wherein the feedback information is based on the determined quality of the uplink channel.

23. A wireless communication system for receiving information, the system comprising a mobile communication station (MSS) which includes:

a transmitter for transmitting data to a base station (BS) via an uplink channel; and

a receiver for receiving a feedback information from the BS, wherein the feedback information is based on quality of the uplink channel, and wherein the quality of the uplink channel is determined based on the transmitted data.

24. A method of transmitting information in a wireless communication system, the method comprising:

allocating a physical resource for a downlink fast feedback channel by a base station (BS), wherein the physical resource for the downlink fast feedback channel is different from a physical resource for a data channel;

establishing a modulation pattern to the downlink fast feedback channel by the BS, wherein the modulation pattern corresponds to feedback information; and

transmitting the modulation pattern to a mobile subscriber station (MSS).

25. The method of claim 24, further comprising receiving uplink data from the MSS, wherein the uplink

data is configured by using feedback information.

26. The method of claim 24, wherein the modulation pattern consists of sub-carriers.

27. The method of claim 24, wherein a location of the downlink fast feedback channel is notified to the MSS by the BS.

28. The method of claim 24, wherein a size of the downlink fast feedback channel is notified to the MSS by the BS.

29. The method of claim 24, wherein the modulation patterns have orthogonal relationships with each other.

30. The method of claim 24, wherein the feedback information includes channel quality information (CQI).

31. The method of claim 24, wherein the feedback information includes weight values.

32. The method of claim 24, wherein the feedback

information includes a combination of channel quality information (CQI) and weight values.

33. A method of receiving information in a wireless communication system, the method comprising:

receiving and detecting a modulation pattern transmitted from a base station (BS), wherein the modulation pattern is established to a downlink fast feedback channel and wherein the modulation pattern corresponds to feedback information;

determining which feedback information is transmitted from the BS via the modulation pattern; and

transmitting uplink data, wherein the uplink data is configured by using the feedback information.

34. The method of claim 33, wherein the feedback information includes channel quality information (CQI).

35. The method of claim 33, wherein the feedback information includes weight values.

36. The method of claim 33, wherein the feedback information includes a combination of channel quality

information (CQI) and weight values.

37. A method of transmitting and receiving information in a wireless communication system, the method comprising:

allocating a physical resource for a downlink fast feedback channel by a base station (BS), wherein the physical resource for the downlink fast feedback channel is different from a physical resource for a data channel;

establishing a modulation pattern to the downlink fast feedback channel by the BS, wherein the modulation pattern corresponds to feedback information;

transmitting the modulation pattern to a mobile subscriber station (MSS);

receiving and detecting a modulation pattern transmitted from a base station (BS), wherein the modulation pattern is established to a downlink fast feedback channel and wherein the modulation pattern corresponds to feedback information;

determining which feedback information is transmitted from the BS via the modulation pattern; and

transmitting uplink data, wherein the uplink data is configured by using the feedback information.

38. The method of claim 37, wherein the modulation pattern consists of sub-carriers.

39. The method of claim 37, wherein a location of the downlink fast feedback channel is notified to the MSS by the BS.

40. The method of claim 37, wherein a size of the downlink fast feedback channel is notified to the MSS by the BS.

41. The method of claim 37, wherein the modulation patterns have orthogonal relationships with each other.

42. The method of claim 37, wherein the feedback information includes channel quality information (CQI).

43. The method of claim 37, wherein the feedback information includes weight values.

44. The method of claim 37, wherein the feedback information includes a combination of channel quality

information (CQI) and weight values.

45. A wireless communication system for transmitting information, the system comprising a base station (BS) which includes:

a controller for allocating a physical resource for a downlink fast feedback channel by a base station (BS) and establishing a modulation pattern to the downlink fast feedback channel by the BS, wherein the physical resource for the downlink fast feedback channel is different from a physical resource for a data channel, and wherein the modulation pattern corresponds to feedback information; and

a transmitter for transmitting the modulation pattern to a mobile subscriber station (MSS).

46. A wireless communication system for receiving information, the system comprising a mobile subscriber station (MSS) which includes:

a receiver for receiving a modulation pattern transmitted from a base station (BS), wherein the modulation pattern is established to a downlink fast feedback channel and wherein the modulation pattern

corresponds to feedback information;

a controller for detecting the modulation pattern transmitted from the BS and determining which feedback information is transmitted from the BS via the modulation pattern; and

a transmitter for transmitting uplink data, wherein the uplink data is configured by using the feedback information.

FIG. 1

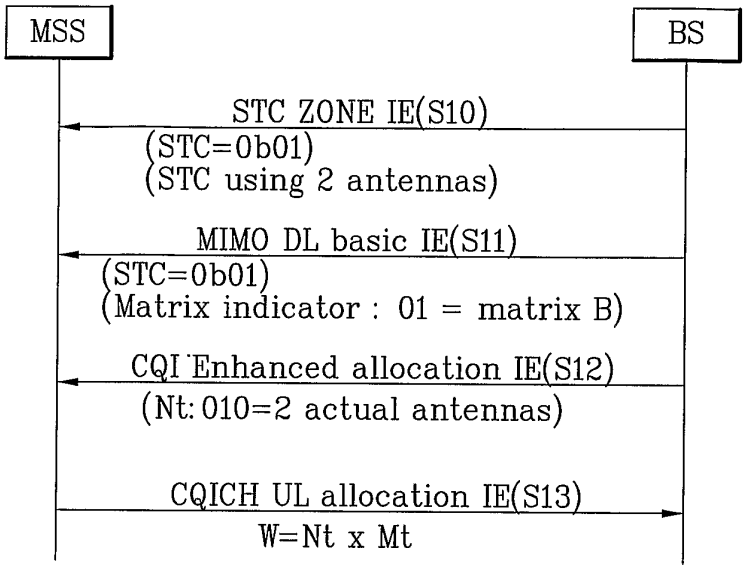

MSS
BS
STC ZONE IE(S10)
(STC=0b01)
(STC using 2 antennas)
MIMO DL basic IE(S11)
(STC=0b01)
(Matrix indicator : 01 = matrix B)
CQI Enhanced allocation IE(S12)
(Nt: 010=2 actual antennas)
CQICH UL allocation IE(S13)
W=Nt x Mt

FIG. 2

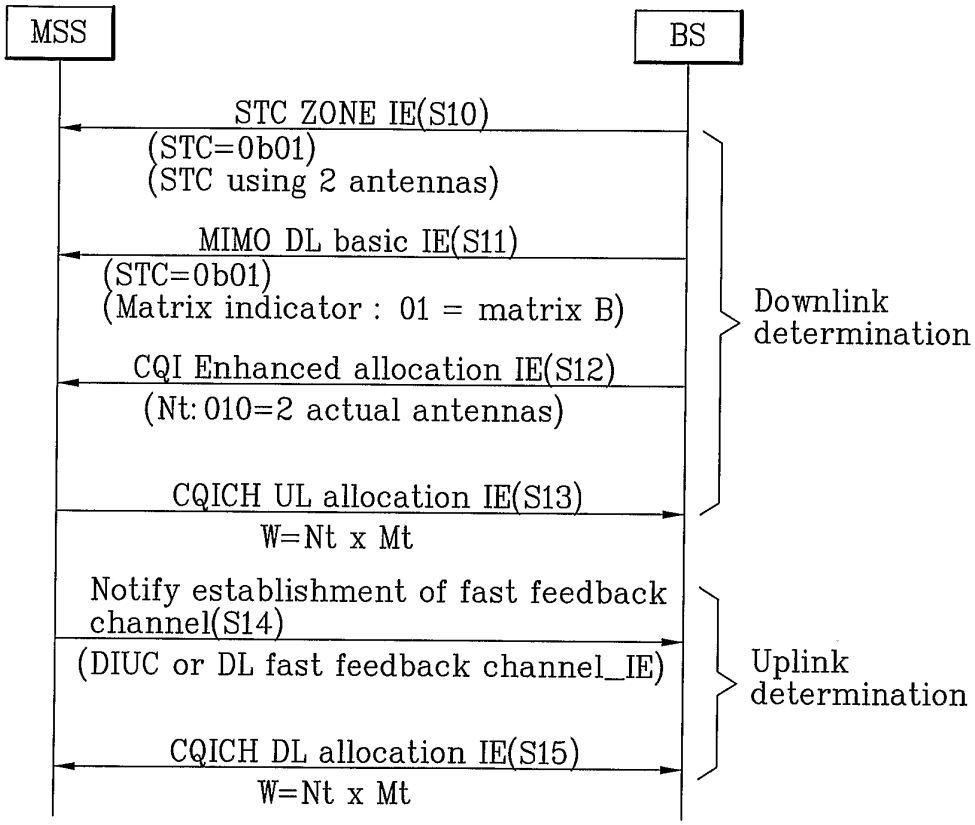

MSS
BS
STC ZONE IE(S10)
(STC=0b01)
(STC using 2 antennas)
MIMO DL basic IE(S11)
(STC=0b01)
(Matrix indicator : 01 = matrix B)
CQI Enhanced allocation IE(S12)
(Nt: 010=2 actual antennas)
CQICH UL allocation IE(S13)
W=Nt x Mt
Notify establishment of fast feedback channel(S14)
(DIUC or DL fast feedback channel_IE)
CQICH DL allocation IE(S15)
W=Nt x Mt
Downlink determination
Uplink determination

FIG. 3

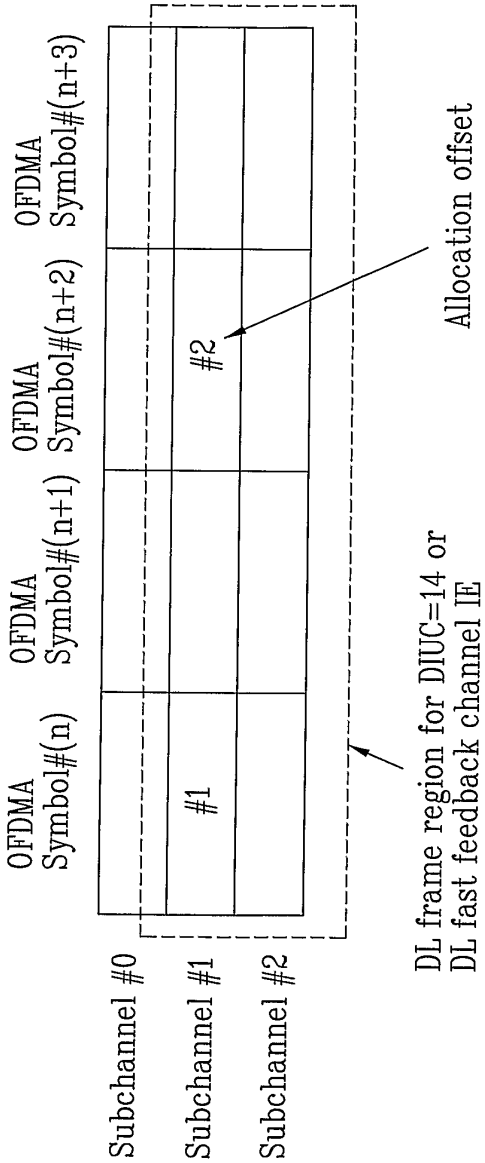

OFDMA Symbol#(n)
OFDMA Symbol#(n+1)
OFDMA Symbol#(n+2)
OFDMA Symbol#(n+3)
#1
#2
Subchannel #0
Subchannel #1
Subchannel #2
DL frame region for DIUC=14 or DL fast feedback channel IE
Allocation offset

FIG. 4

Syntax	Size	Notes
DL fast feedback channel IE(){		
Extended DIUE	4bits	
Length	variable	
OFDMA symbol offset	8bits	
Subchannel offset	6bits	
Boosting	3bits	
No. OFDMA Symbols	7bits	
No.subchannels	6bits	
Repetition coding Indication	2bits	0b00=No repetition coding 0b01=Repetition coding of 2 used 0b10=Repetition coding of 4 used 0b11=Repetition coding of 6 used
CID	16bits	
}		

FIG. 5

DIUC	Usage)
0~12	Different burst profile
13	Gap/PARP reduction
14	DL fast feedback channel
15	Extended DIUC

FIG. 6

Syntax	Size	Notes
CQICH DL allocation IE(){		
Extended DIUC	4bits	
Length	variable	
Feedback type	2bits	00=complex weigh 01=channel quality 10~11=reserved
Matrix size	4bits	LSB 2bits repesents rows, MSB 2bits represents columns
For(I=0;i<N_element;I++){		Number of rows x number of columns
Allocation index	6bits	Index of DL fast feedback channel region indicated due to DL feedback channel IE(DIUE=14)
}		
}		

FIG. 7

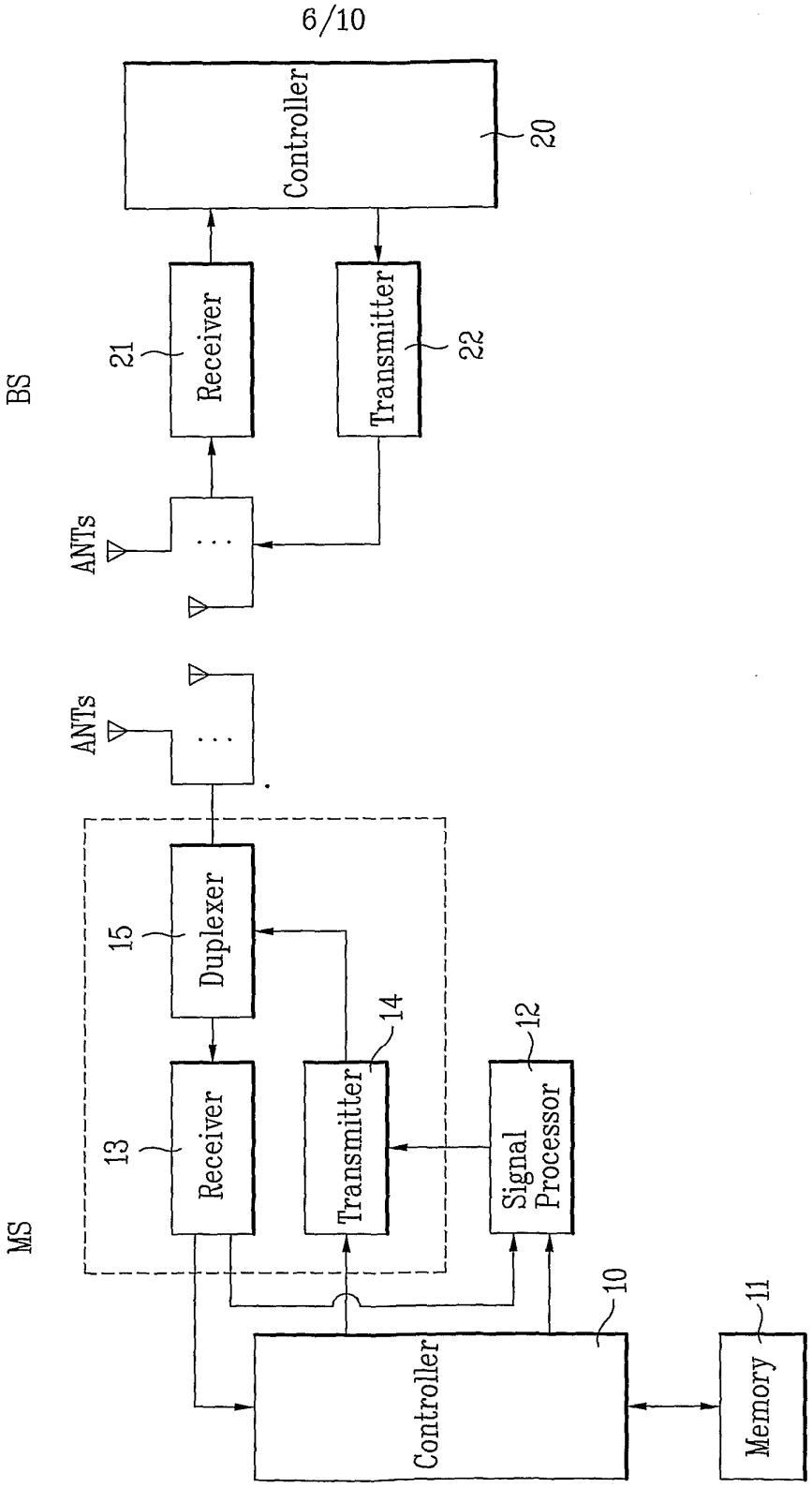

BS
Controller
20
21
Receiver
Transmitter
22
ANTs
MS
ANTs
15
Duplexer
13
Receiver
Transmitter
14
Signal Processor
12
10
Controller
Memory
11

FIG. 8

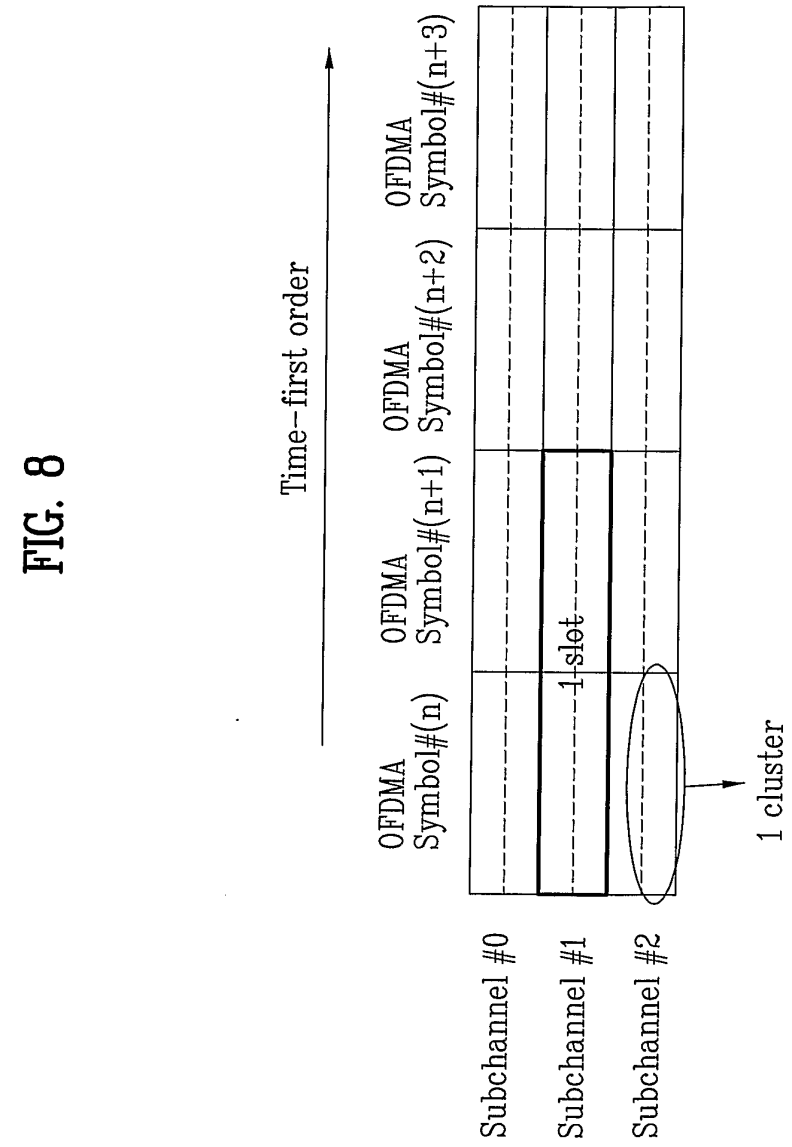

Time-first order
OFDMA Symbol#(n)
OFDMA Symbol#(n+1)
OFDMA Symbol#(n+2)
OFDMA Symbol#(n+3)
1 slot
1 cluster
Subchannel #0
Subchannel #1
Subchannel #2

FIG. 9

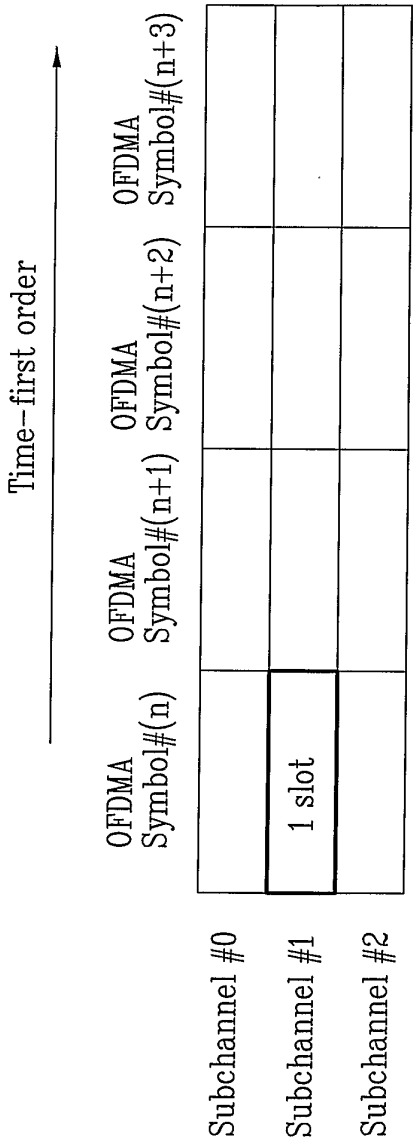

Time-first order
OFDMA Symbol#(n)
OFDMA Symbol#(n+1)
OFDMA Symbol#(n+2)
OFDMA Symbol#(n+3)
1 slot
Subchannel #0
Subchannel #1
Subchannel #2

FIG. 10

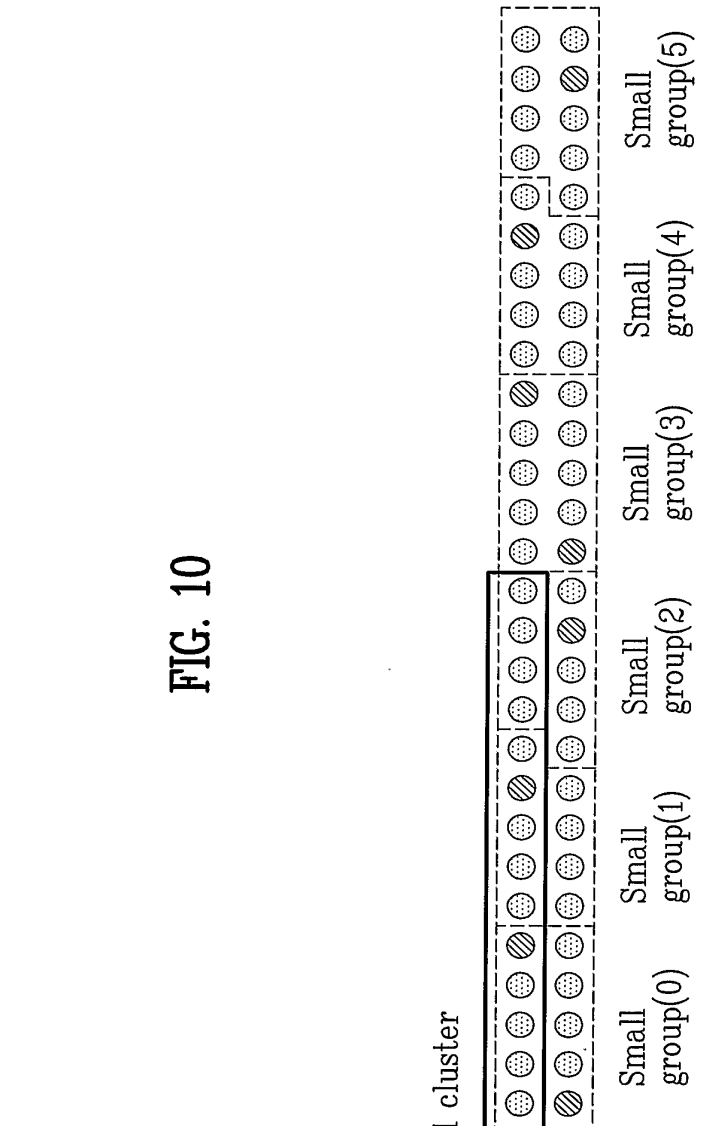
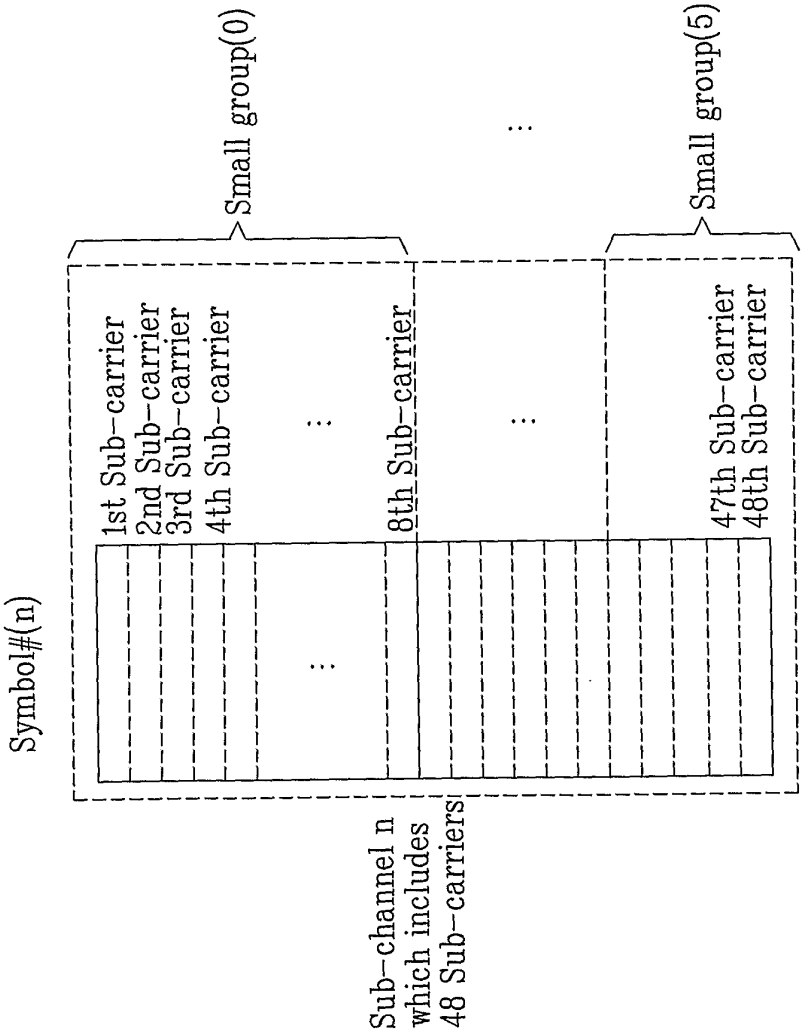

1 cluster
Odd Symbols
Even Symbols
Small group(0)
Small group(1)
Small group(2)
Small group(3)
Small group(4)
Small group(5)
Data Sub-carrier
Pilot Sub-carrier

FIG. 11


Small group(0)
Small group(5)
1st Sub-carrier
2nd Sub-carrier
3rd Sub-carrier
4th Sub-carrier
8th Sub-carrier
47th Sub-carrier
48th Sub-carrier
Symbol#(n)
Sub-channel n which includes 48 Sub-carriers

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ART UNIT	PAPER NUMBER
2476	

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04/10/2013	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eoffice@volpe-koenig.com

Office Action Summary	Application No.	Applicant(s)	
	13/176,298	HOWARD, PAUL	
	Examiner	Art Unit	
	RONALD B. ABELSON	2476	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *2/7/13, 1/19/13, 7/20/12, 4/16/12*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *45-86* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *45,51,52,73 and 80* is/are rejected.

8)☒ Claim(s) *46-50,53-72,74-79 and 81-86* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *19 January 2013* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2/7/13,7/20/12 and 4/16/12*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> **(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.**

2. Claims 45, 52, 59, 66, 73, and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Malladi US 20080090528. For support see US 60819268 (fig. 4A top drawing).

Regarding claims 45, 52, 59, 66, 73, and 80, Malladi teaches a user equipment (UE) comprising:

a processor configured to receive resource allocation information associated with an uplink physical control channel / PUCCH, wherein the uplink physical control channel and a physical uplink shared channel / PUSCH have different resources;

the processor is further configured to send data over the physical uplink shared channel in assigned frequency intervals; and

the processor is further configured, in a frequency interval that it is not sending data over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information (fig. 3, UE assigned control segment of M contiguous subcarriers, M may be fixed or configurable, control segment referred to as physical uplink control channel 'PUCCH', UE may also be assigned Q contiguous subcarriers, Q may be fixed or configurable, data segment referred to as physical uplink shared channel 'PUSCH', [0040, 0041]).

Although Malladi teaches assigning the PUCCH and PUSCH in different frequency intervals, it would have been obvious to one of ordinary skill in the art to assign the two channels in different time intervals. Note, Speight US 20030069020 teaches assigning PUSCH timeslots.

3. Claim 51 rejected under 35 U.S.C. 103(a) as being unpatentable over Malladi as applied to claim 45 above, and further in view of Kim US 20020150058.

Malladi is silent on in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval.

Kim teaches a channelization code serves to identify uplink channel of each UE, when plurality of UEs simultaneously transmit data in one time slot in NB-TDD CDMA mobile communication system ([0087]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Malladi by in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval, as suggested by Kim. This modification would benefit the system by allowing a plurality of UEs to transmit simultaneously.

Allowable Subject Matter

4. Claims 46-50, 53-68, 60-65, 67-72, 74-79, and 81-86 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RONALD B. ABELSON whose telephone number is (571)272-3165. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ayaz Sheikh can be reached on (571) 272-3795. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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RONALD B ABELSON
Primary Examiner
Art Unit 2476

***

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/RONALD B ABELSON/

Primary Examiner, Art Unit 2476

Notice of References Cited	Application/Control No. 13/176,298	Applicant(s)/Patent Under Reexamination HOWARD, PAUL	
	Examiner RONALD B. ABELSON	Art Unit 2476	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2008/0090528	04-2008	Malladi, Durga Prasad	455/070
*	B	US-2002/0150058	10-2002	Kim et al.	370/280
*	C	US-2003/0069020	04-2003	Speight, Timothy James	455/450
	D	US-			
	E	US-			
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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	13176298
Filing Date	2011-07-05
First Named Inventor	Paul Howard
Art Unit	2472
Examiner Name	Hassan Kizou
Attorney Docket Number	IPW2-USCN191712

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	1	20020061005	A1	2002-05-23	Lee et al.	

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	1	2006/063138	WO	A2	2006-06-15	Adaptix, Inc.		☐

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	First Named Inventor	Paul Howard
	Art Unit	2472
	Examiner Name	Hassan Kizou
	Attorney Docket Number	IPW2-USCN191712

	1	3RD GENERATION PARTNERSHIP PROJECT, "Technical Specification Group Radio Access Network; Radio Resource Control (RRC); Protocol Specification (Release 7)," 3GPP TS 25.331 V7.3.0, December 2006.	☐
	2	Non-Final Rejection issued by USPTO, dated May 14, 2009 for 11/646,692.	☐
	3	Final Rejection issued by USPTO, dated November 19, 2009 for 11/646,692.	☐
	4	Non-Final Rejection issued by USPTO, dated May 28, 2010 for 11/646,692.	☐
	5	Notice of Allowance issued by USPTO, dated February 2, 2011 for 11/646,692.	☐
	6	Notice of Allowance issued by USPTO, dated May 17, 2011 for 11/646,692.	☐

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	First Named Inventor	Paul Howard
	Art Unit	2472
	Examiner Name	Hassan Kizou
	Attorney Docket Number	IPW2-USCN191712

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Signature	/Harry Vartanian/	Date (YYYY-MM-DD)	2012-07-20
Name/Print	Harry Vartanian	Registration Number	56,787

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	First Named Inventor	Paul Howard
	Art Unit	2476
	Examiner Name	Ronald B. Abelson
	Attorney Docket Number	IPW2-USCN191712

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	1	6611509	BA	2003-08-26	Hayashi et al.	* Corresponds to JP 11-261544
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	1	11-261544	JP		1999-09-24	Hayashi et al.		☐
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	1	OFFICE ACTION, Japanese Patent Application No. 2009-543459, dated December 18, 2012.	☐

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Name/Print	Harry Vartanian	Registration Number	56,787

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SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/176,298	07/05/2011 RULE	370	2476	IPW2-USCN191712

APPLICANTS
Paul Howard, Bristol, UNITED KINGDOM;

**** CONTINUING DATA **************************
This application is a CON of 11/646,692 12/27/2006 PAT 8,009,639

**** FOREIGN APPLICATIONS **************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
07/14/2011

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/RONALD B ABELSON/ Examiner's Signature	☐ Initials	UNITED KINGDOM	5	24	3

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VOLPE AND KOENIG, P.C.
UNITED PLAZA
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UNITED STATES

TITLE

Feedback Control in an FDD TDD-CDMA System

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	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

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	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Howard, Paul
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	Examiner Name	Not Yet Assigned
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	1	5056109		1991-10-08	Gilhousen et al.	
	2	5265119		1993-11-23	Gilhousen et al.	
	3	5485486		1996-01-16	Gilhousen et al.	
	4	6061784		2000-05-09	Tarsky et al.	
	5	6567459		2003-05-20	Hakkinen et al.	
	6	6978151		2005-12-20	Choi et al.	
	7	7120134		2006-10-10	Tiedemann, Jr. et al.	
	8	7215657		2007-05-08	Toshimitsu et al.	

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	Art Unit	2473
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	9010-99460-US

	9	8009639		2011-08-30	Howard	

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	1	20020075891		2002-06-20	Souissi	
	2	20020168993		2002-11-14	Choi et al.	
	3	20040152473		2004-08-05	Kuwano et al.	
	4	20040203419		2004-10-14	Crocker et al.	
	5	20060093026		2006-05-04	Montojo et al.	
	6	20060211417		2006-09-21	Pedlar	
	7	20070173256		2007-07-26	Laroia et al.	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Howard, Paul
	Art Unit	2473
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	9010-99460-US

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	DE10201270	DE		2002-08-08	Samsung Electronics Co., Ltd.		☐
	2	EO1467582	EP		2004-10-13	Telefonaktiebolaget LM Ericsson		☐
	3	EP1615384	EP		2006-01-11	Qualcomm Incorporated		☐
	4	EP1681780	EP		2006-07-19	Fujitsu Limited		☐

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	"3 UMTS Interfaces," UMTS Protocols and Protocol Testing, pp. 9-14, located at <http://www.tek.com/Measurement/App.sub.--Notes/2F.sub.--14251/eng/int- erfaces.pdf>.	☐
	2	"3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Feasibility Study for Evolved UTRA and UTRAN (Release 7)," (Mar. 2006). 3GPP:Valbonne, France, TS 25.912 v0.0.4:1-13.	☐
	3	"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; 3GPP System Architecture Evolution: Report on Technical Options and Conclusions (Release 7)," (Jul. 2005). 3GPP:Valbonne, France, TS 23.882 v0.3.0:1-13.	☐
	4	"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; General UMTS Architecture (3G TS23.101 version 3.0.1)," (Apr. 1999). 3GPP:Valbonne, France, TS 23.101 v3.0.1:1-13.	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.A./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Howard, Paul
	Art Unit	2473
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	9010-99460-US

	5	"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Multimedia Broadcast/Multicast Service (MBMS); Architecture and Functional Description (Release 6); 3GPP: Valbonne, France; 3GPP TS 23.246 v.6.4.0 (2004-09);	☐
	6	"UMTS Protocols and Protocol Testing," Tektronix, The International Engineering Consortium, pp. 1-45, located at <http://www.rfpeople.com/docs/umts.pdf>.	☐
	7	Ghadialy, Z. "Tutorial: Medium Access Control (MAC) in 3G/UMTS Protocol Stack," located at <http://www.3g4g.co.uk/Tutorial/ZG/zg.sub.--mac.html> visited on Jun. 20, 2007. (9 pages).	☐
	8	International Engineering Consortium. "Universal Mobile Telecommunications System (UMTS) Protocols and Protocol Testing," located at <http://www.iec.org/online/tutorials/umts/topic02.html> visited on Jun. 20, 2007. (7 pages).	☐
	9	International Preliminary Report on Patentability issued on Jun. 30, 2009 from PCT Application No. PCT/EP20071064483.	☐

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EXAMINER SIGNATURE

Examiner Signature	/Ronald Abelson/	Date Considered	02/01/2013

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Howard, Paul
	Art Unit	2473
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	9010-99460-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Steven G. Parmelee/	Date (YYYY-MM-DD)	2012-04-16
Name/Print	Steven G. Parmelee	Registration Number	28,790

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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(12) 特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

(43) 国際公開日
2006 年8 月17 日 (17.08.2006)

PCT

(10) 国際公開番号
WO 2006/085353 A1

(51) 国際特許分類:
H04Q 7/36 (2006.01)

(21) 国際出願番号: PCT/JP2005/001825

(22) 国際出願日: 2005 年2 月8 日 (08.02.2005)

(25) 国際出願の言語: 日本語

(26) 国際公開の言語: 日本語

(71) 出願人 (米国を除く全ての指定国について): 富士通株式会社 (FUJITSU LIMITED) [JP/JP]; 〒2118588 神奈川県川崎市中原区上小田中４丁目１番１号 Kanagawa (JP).

(72) 発明者; および

(75) 発明者/出願人 (米国についてのみ): 関 宏之 (SEKI, Hiroyuki) [JP/JP]; 〒2118588 神奈川県川崎市中原区上小田中４丁目１番１号 富士通株式会社内 Kanagawa (JP).

(74) 代理人: 真田 有 (SANADA, Tamotsu); 〒1800004 東京都武蔵野市吉祥寺本町１丁目１０番３１号吉祥寺広瀬ビル５階 Tokyo (JP).

(81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

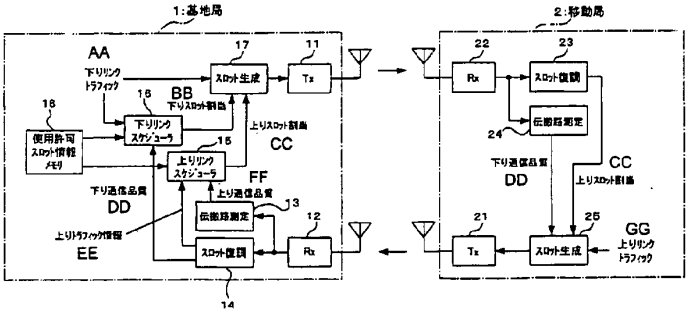
(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:
— 国際調査報告書

[続葉有]

(54) Title: SLOT ALLOCATING METHOD IN CELLULAR RADIO COMMUNICATION SYSTEM, AND BASE STATION USED IN THE SYSTEM

(54) 発明の名称: セルラー無線通信システムにおけるスロット割り当て方法及び同システムに用いられる基地局



1 BASE STATION
AA DOWNSTREAM LINK TRAFFIC
17 SLOT FORMATION
18 USE PERMITTING SLOT INFORMATION
16 DOWNSTREAM LINK SCHEDULER
BB DOWNSTREAM SLOT ALLOCATION
CC UPSTREAM SLOT ALLOCATION
15 UPSTREAM LINK SCHEDULER
DD DOWNSTREAM COMMUNICATION QUALITY
EE UPSTREAM TRAFFIC INFORMATION
FF UPSTREAM COMMUNICATION QUALITY
13 PROPAGATION PASSAGE MEASUREMENT
14 SLOT DEMODULATION
2 MOBILE STATION
23 SLOT DEMODULATION
24 PROPAGATION PASSAGE MEASUREMENT
25 SLOT FORMATION
GG UPSTREAM LINK TRAFFIC

(57) **Abstract:** A base station (1) to be used in a cellular radio communication system comprises a use permitting slot information storage unit (18) and slot allocation units (15 and 16). The use permitting slot information storage unit (18) is caused to store the use permitting slot information on the slot permitted for the base station (1) to use, by setting a cell repetition factor or information on the repetition number of different cells, for the divided slots of a radio communication channel between the base station (1) and the mobile station. The slot allocation units (15, 16) determine

[続葉有]

WO 2006/085353 A1

PCT REQUEST

F8630453125

0 **0-1**	**For receiving Office use only** International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	

0-4 0-4-1	**Form - PCT/RO/101 PCT Request** Prepared using	JPO-PAS 0322
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	Japanese Patent Office (RO/JP)
0-7	**Applicant's or agent's file reference**	F8630453125
I	**Title of invention**	SLOT ALLOCATION METHOD FOR USE IN CELLULAR RADIO COMMUNICATION SYSTEM AND BASE STATION FOR USE IN THE SAME SYSTEM
II	**Applicant**	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	FUJITSU LIMITED
II-5	Address:	1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588 Japan
II-6	State of nationality	JP
II-7	State of residence	JP
II-11	Registration number of Applicant	000005223

PCT REQUEST F8630453125

III-1	**Applicant and/or inventor**	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	SEKI, Hiroyuki
III-1-5	Address:	c/o FUJITSU LIMITED, 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588 Japan
III-1-6	State of nationality	JP
III-1-7	State of residence	JP
IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name (LAST, First)	SANADA, Tamotsu
IV-1-2	Address:	Kichijoji-Hirose Bldg. 5th Floor, 10-31, Kichijoji-honcho 1-chome, Musashino-shi, Tokyo 180-0004 Japan
IV-1-3	Telephone No.	0422-21-4222
IV-1-4	Facsimile No.	0422-21-3359
IV-1-5	E-mail address.	foreign@pat-sanada.com
IV-1-6	Registration number	100092978
V	**Designation of States**	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	
VI-1	**Priority claim of earlier national application**	NONE
VII-1	**International Searching Authority Chosen**	Japanese Patent Office (JPO) (ISA/JP)

PCT REQUEST F8630453125

VIII	Petition	-	
IX	Check list	number of sheets	electronic file(s) attached
IX-1	Request	3	✓
IX-2	Description	16	✓
IX-3	Claims	4	✓
IX-4	Abstract	1	✓
IX-5	Drawings	10	✓
IX-7	TOTAL	34	
	Accompanying items	paper document(s) attached	electronic file(s) attached
IX-8	Fee calculation sheet	-	✓
IX-17	PCT-SAFE electronic filing	-	-
IX-19	Figure of the drawings which should accompany the abstract	5	
IX-20	Language of filing of the international application	Japanese	
X-1	Signature of applicant or agent	100092978	
X-1-1	Name (LAST, First)	SANADA, Tamotsu	

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10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/JP
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F8630453125

PCT (ANNEX - FEE CALCULATION SHEET)

(This sheet is not part of and does not count as a sheet of the international application)

0 0-1	**For receiving Office use only** International Application No.	
0-2	Date stamp of the receiving Office	

0-4	**Form - PCT/RO/101 (Annex)** **PCT Fee Calculation Sheet**				
0-4-1	Prepared using		JPO-PAS 0322		
0-9	**Applicant's or agent's file reference**		F8630453125		
2	**Applicant**		FUJITSU LIMITED		
12	**Calculation of prescribed fees**		fee amount/multiplier	total amounts (JPY)	
12-1	Transmittal fee	T	⇨	13000	
12-2	Search fee	S	⇨	97000	
12-3	International fee Basic fee (first 30 sheets)	b1	123200		
12-4	Remaining sheets		4		
12-5	Additional amount	(X)	1300		
12-6	Total additional amount	i2	5200		
12-7	i1 + i2 =	i	128400		
12-12	Fully electronic filing fee reduction	R	-26400		
12-13	Total International fee (i-R)	I	⇨	102000	
12-17	**TOTAL FEES PAYABLE (T+S+I+P)**		⇨	212000	
12-19	**Mode of payment**		Transmittal fee: authorization to charge deposit account Search fee: authorization to charge deposit account International fee: remittance to the designated bank account		
12-20	Deposit account		Japanese Patent Office (RO/JP)		
12-20-1	Confirmation of total fees		✓		
12-21	Deposit account number		007696		
12-22	Date		08.02.2005		
12-23	Sign				

F8630453125

特許協力条約に基づく国際出願願書

紙面による写し（注意：電子データが原本となります）

0	受理官庁記入欄	
0-1	国際出願番号	
0-2	国際出願日	
0-3	(受付印)	

0-4	様式-PCT/RO/101 この特許協力条約に基づく国際出願願書は、	
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0-6	出願人によって指定された受理官庁	日本国特許庁 (RO/JP)
0-7	出願人又は代理人の書類記号	F8630453125
I	発明の名称	セルラー無線通信システムにおけるスロット割り当て方法及び同システムに用いられる基地局
II	出願人	
II-1	この欄に記載した者は	出願人である (applicant only)
II-2	右の指定国についての出願人である。	米国を除く全ての指定国 (all designated States except US)
II-4ja	名称	富士通株式会社
II-4en	Name:	FUJITSU LIMITED
II-5ja	あて名	2118588 日本国 神奈川県川崎市中原区上小田中４丁目１番１号
II-5en	Address:	1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 2118588 Japan
II-6	国籍(国名)	日本国 JP
II-7	住所(国名)	日本国 JP
II-11	出願人登録番号	000005223

特許協力条約に基づく国際出願願書

紙面による写し（注意：電子データが原本となります）

III-1	その他の出願人又は発明者	
III-1-1	この欄に記載した者は	出願人及び発明者である (applicant and inventor)
III-1-2	右の指定国についての出願人である。	米国のみ (US only)
III-1-4ja	氏名(姓名)	関　宏之
III-1-4en	Name (LAST, First):	SEKI, Hiroyuki
III-1-5ja	あて名	2118588 日本国 神奈川県川崎市中原区上小田中４丁目１番１号 富士通株式会社内
III-1-5en	Address:	c/o FUJITSU LIMITED, 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 2118588 Japan
III-1-6	国籍(国名)	日本国 JP
III-1-7	住所(国名)	日本国 JP
IV-1	代理人又は共通の代表者、通知のあて名 下記の者は国際機関において右記のごとく出願人のために行動する。	代理人 (agent)
IV-1-1ja	氏名(姓名)	真田　有
IV-1-1en	Name (LAST, First):	SANADA, Tamotsu
IV-1-2ja	あて名	1800004 日本国 東京都武蔵野市吉祥寺本町１丁目１０番３１号吉祥寺広瀬ビル５階
IV-1-2en	Address:	Kichijoji-Hirose Bldg. 5th Floor, 10-31, Kichijoji-honcho 1-chome, Musashino-shi, Tokyo 1800004 Japan
IV-1-3	電話番号	0422-21-4222
IV-1-4	ファクシミリ番号	0422-21-3359
IV-1-5	電子メール	foreign@pat-sanada.com
IV-1-6	代理人登録番号	100092978
V	国の指定	
V-1	この願書を用いてされた国際出願は、規則4.9(a)に基づき、国際出願の時点で拘束される全てのPCT締約国を指定し、取得しうるあらゆる種類の保護を求め、及び該当する場合には広域と国内特許の両方を求める国際出願となる。	
VI-1	優先権主張	なし (NONE)
VII-1	特定された国際調査機関(ISA)	日本国特許庁 (ISA/JP)

特許協力条約に基づく国際出願願書

紙面による写し（注意：電子データが原本となります）

VIII	申立て	申立て数	
VIII-1	発明者の特定に関する申立て	_	
VIII-2	出願し及び特許を与えられる国際出願日における出願人の資格に関する申立て	_	
VIII-3	先の出願の優先権を主張する国際出願日における出願人の資格に関する申立て	_	
VIII-4	発明者である旨の申立て（米国を指定国とする場合）	_	
VIII-5	不利にならない開示又は新規性喪失の例外に関する申立て	_	
IX	照合欄	用紙の枚数	添付された電子データ
IX-1	願書（申立てを含む）	3	✓
IX-2	明細書	16	✓
IX-3	請求の範囲	4	✓
IX-4	要約	1	✓
IX-5	図面	10	✓
IX-7	合計	34	
	添付書類	添付	添付された電子データ
IX-8	手数料計算用紙	-	✓
IX-17	PCT-SAFE 電子出願	-	-
IX-19	要約書とともに提示する図の番号	5	
IX-20	国際出願の使用言語名	日本語	
X-1	出願人、代理人又は代表者の記名押印	/100092978/	
X-1-1	氏名（姓名）	真田　有	
X-1-2	署名者の氏名		
X-1-3	権限		

受理官庁記入欄

10-1	国際出願として提出された書類の実際の受理の日	
10-2	図面	
10-2-1	受理された	
10-2-2	不足図面がある	
10-3	国際出願として提出された書類を補完する書類又は図面であってその後期間内に提出されたものの実際の受理の日（訂正日）	
10-4	特許協力条約第11条(2)に基づく必要な補完の期間内の受理の日	
10-5	出願人により特定された国際調査機関	ISA/JP
10-6	調査手数料未払いにつき、国際調査機関に調査用写しを送付していない	

国際事務局記入欄

11-1	記録原本の受理の日	

F8630453125

PCT手数料計算用紙(願書付属書)

紙面による写し(注意:電子データが原本となります)
[この用紙は、国際出願の一部を構成せず、国際出願の用紙の枚数に算入しない]

0	受理官庁記入欄	
0-1	国際出願番号	
0-2	受理官庁の日付印	

0-4	様式-PCT/RO/101(付属書) このPCT手数料計算用紙は、				
0-4-1	右記によって作成された。		JPO-PAS 0322		
0-9	出願人又は代理人の書類記号		F8630453125		
2	出願人		富士通株式会社		
12	所定の手数料の計算		金額/係数	小計 (JPY)	
12-1	送付手数料	T	➪	13000	
12-2	調査手数料	S	➪	97000	
12-3	国際出願手数料 (最初の30枚まで)	i1	123200		
12-4	30枚を越える用紙の枚数		4		
12-5	用紙1枚の手数料	(X)	1300		
12-6	合計の手数料	i2	5200		
12-7	i1 + i2 =	i	128400		
12-12	fully electronic filing fee reduction	R	-26400		
12-13	国際出願手数料の合計 (i-R)	I	➪	102000	
12-17	納付するべき手数料の合計 (T+S+I+P)		➪	212000	
12-19	支払方法		送付手数料: 予納口座引き落としの承認 調査手数料: 予納口座引き落としの承認 国際出願手数料 : 銀行口座への振込み		
12-20	予納口座 受理官庁		日本国特許庁 (RO/JP)		
12-20-1	上記手数料合計額の請求に対する承認		✓		
12-21	予納口座番号		007696		
12-22	日付		2005年 02月 08日 (08.02.2005)		
12-23	記名押印				

明 細 書

セルラー無線通信システムにおけるスロット割り当て方法及び同システムに用いられる基地局

技術分野

[0001] 本発明は、セルラー無線通信システムにおけるスロット割り当て方法及び同システムに用いられる基地局に関し、特に、無線通信チャネルを一定の時間および周波数間隔のスロットに分割し、複数のユーザに対してそれらのスロットを適応的に割り当てることで、マルチユーザ多重(Multiple Access)を実現するパケット伝送型のセルラー無線通信システムに用いて好適な技術に関する。

背景技術

[0002] セルラー移動(無線)通信システムにおけるパケット伝送では、無線通信チャネルを一定時間間隔のタイムスロットや一定帯域幅の周波数バンドに分割し、基地局装置(以下、単に「基地局」ともいう)がスケジューリングによって、それらの分割スロットに対して複数のユーザ〔移動局装置(以下、単に「移動局」ともいう)〕のトラフィックを適応的に割り当てることで、高効率なパケット伝送を実現する。

[0003] 基地局のスケジューリングによるパケット伝送は、下りリンク(基地局から移動局への通信)と上りリンク(移動局から基地局への通信)の両方に用いることができる。基地局は、上下リンクのトラフィックと通信品質に応じてスケジューリングを行なう。スケジューラは、要求する伝送速度(レート)の高いトラフィック(ユーザ)や、要求する伝送遅延の短いユーザには優先的にパケットを割り当てる。また、システム全体のスループットを高めるためには、通信品質の良いユーザに対して優先的にパケットを割り当てる。これらの優先度の重み付けは、各ユーザに対するトラフィックの公平性とトータルスループットのバランスによって決定される。

[0004] 図10に、上下リンクのタイムスロットの構成例を示す。この図10では、スロット＃1からスロット＃5までの間にユーザ＃1，ユーザ＃2，ユーザ＃3のトラフィックが上下リンク独立のスケジューラによって割り当てられている様子を示している。図10に示すように、1つのスロットは、パイロットシンボル501，制御シンボル502及びデータシンボル

503から構成されている。

[0005] パイロットシンボル501は、既知のパターンのシンボルであり、受信局において伝搬路によるチャネル変動を推定し、制御シンボル502及びデータシンボル503を復調するために用いられる。制御シンボル502には、そのスロットのユーザ割り当て情報やデータシンボル503の変調方式、パケット番号、通信品質のフィードバック情報などが含まれる。

[0006] 図11に、上下リンクのスケジューラを有する基地局100と、この基地局100にアクセスし得る1台以上の移動局200とをそなえたセルラー移動通信システムの構成を示す。この図11に示すように、基地局100は、例えば、送信部(Tx)101, 受信部(Rx)102, 伝搬路測定部103, スロット復調部104, 上りリンクスケジューラ105, 下りリンクスケジューラ106及びスロット生成部107をそなえて構成され、移動局200は、例えば、送信部(Tx)201, 受信部(Rx)202, スロット復調部203, 伝搬路測定部204及びスロット生成部205をそなえて構成されている。なお、基地局100の下りリンクトラフィックには、複数のユーザ(移動局200)のトラフィックが存在する。

[0007] 基地局100の下りリンクスケジューラ106では、各ユーザのトラフィック情報(要求伝送速度、要求伝送遅延)や、移動局200からフィードバックされるユーザ毎の下りリンクの通信品質などの情報を基に、スロットのユーザ割り当てが決定される。スロット生成部107では、図10に示すスロットが生成され、移動局200に向けて送信される。

[0008] ここで、スロットの制御シンボル502には、基地局100の上りリンクスケジューラ105で決定した、上りリンクのユーザ割り当て情報が含まれる。

移動局200では、下りリンクの制御シンボル502を復調し、自局200宛てにスロットが割り当てられている場合に、そのスロットのデータシンボル503の復調を行なう。また、制御シンボル502に、自局200宛の上りリンクのスロット割り当て情報が含まれている場合は、スロット生成部205において、上りリンクのスロットを生成し、上りデータトラフィックの伝送を行なう。

[0009] また、移動局200では、伝搬路測定部204において、下りリンクスロットのパイロットシンボル501を用いて、下りリンクの通信品質(受信SIR:Signal to Interference Ratio)の測定を行ない、その結果を上りリンクスロットの制御シンボル502を用いて、基地

局100にフィードバックする。

基地局100では、上りリンクの信号を受信し、スロット復調部104において制御シンボル502を復調し、制御チャネルに含まれる下りリンクの通信品質情報を下りリンクスケジューラ106に通知する。また、制御シンボル502に含まれる上りリンクのトラフィック情報(要求伝送速度、要求遅延)を上りリンクスケジューラ105に通知する。さらに、基地局100の伝搬路測定部103では、上りリンクの通信品質(受信SIR)の測定を行ない、その結果を上りリンクスケジューラ105に通知する。そして、上りリンクスケジューラ105では、各ユーザの上りリンクのトラフィック情報と上りリンクの通信品質を用いて、上りリンクのスロット割り当てを決定する。

[0010] しかしながら、セルラー移動通信では、移動局200と基地局100との間の距離が離れるにしたがって、受信信号レベルが低下するとともに、隣接する他セルからの干渉が増大し、その結果、受信SIRが低下する課題がある。したがって、移動局200がセル端の領域に位置する場合は、受信SIRが低いために、伝送レートの高い通信を行なうことができない。また、図10および図11で説明したパケット伝送では、スケジューラ105, 106によって、受信SIRの低いユーザには、スロット割り当ての優先度が低く抑えられることにより、セル端の領域に位置するユーザのスループットが伸びないという課題がある。

[0011] このような課題を解決するための従来の方法として、セル繰返しを用いる方法がある。図12は、セル繰返しファクタが3(3セル繰返し)のセル構成を示している。六角形のセルの中心に基地局100が存在していると仮定しており、セルの番号は割り当てるスロット番号を意味している。この図12に示すように、隣接する3つのセルがそれぞれ異なるスロットを使用することで、隣り合ったセルの基地局100や移動局200はお互いに干渉しないため、他セル干渉が減り受信SIRが向上する。しかしながら、この場合、1つのセルは、3スロットの中の1スロットしか使用できないため、スロット使用効率が3分の1になるためトータルのスループットは低下してしまう。

[0012] そこで、例えば、下記特許文献1(特開平8－65738号公報)では、各基地局が、周囲に存在する基地局との相互の干渉を測定し、その結果を用いて使用するタイムスロットの設定を自律的に行ない、相互の干渉が大きい基地局間では互いに異なる

タイムスロットを割り当て、相互の干渉が少ない基地局間ではタイムスロットをセル毎に任意に設定する方法を提案している。しかしながら、この特許文献1の技術では、周囲に存在する基地局との相互の干渉を測定する仕組みや、基地局間で互いに異なるスロットを割り当てるスケジューリングが必要となり、装置やシステムに与える付加が大きいという課題がある。

[0013] また、下記特許文献2(特開2000－102062号公報)では、移動局がセル端などの干渉エリア内で通信を行なう場合にはこの干渉エリアを構成する全てのサービスエリア内(隣接する基地局)で未使用の無線通信チャネルを割り当てることを提案している。また、この特許文献2では、移動局の識別番号を複数の基地局で受信した場合に、その移動局が干渉エリアに存在することを判定する方法についても提案している。しかしながら、この特許文献2の技術では、隣接する基地局の間で、未使用のスロットを判別する仕組みが必要であり、装置やシステムに与えるインパクトが大きいという課題がある。

[0014] さらに、下記特許文献3(特開2002－159048号公報)では、セル端での干渉を減らす簡易な方法が提案されている。この特許文献3では、セル内を基地局を中心とする複数のサブエリアに分割し、各サブエリアに特定のタイムスロットを割り当てる方法を提案している。そして、隣接するセルでは、各サブエリアに異なるタイムスロットを割り当てることにより、他セルからの干渉を低減する方法を提案している。しかしながら、この技術では、1セル繰返しを前提としているため、他セル干渉の低減効果には限界がある。また、この技術を下りリンクに適用する場合は、送信電力制御と組合せて、基地局に近いユーザに対する送信電力を小さく抑えるように制御する必要がある。

[0015] 本発明は、このような課題に鑑み創案されたもので、システム全体のスループットを低下することなく、基地局から離れたセル端の領域に位置するユーザ(移動局)に対しても、伝送レートの高い通信を可能にすることを目的とする。

特許文献1:特開平8－65738号公報

特許文献2:特開2000－102062号公報

特許文献3:特開2002－159048号公報

発明の開示

[0016] 上記の目的を達成するために、本発明のセルラー無線通信システムにおけるスロット割り当て方法は、移動局とセルを形成する基地局との間の無線通信チャネルを所定のスロットに分割し、該基地局が前記分割したスロットを複数の移動局に対して適応的に割り当てることにより無線多重アクセスを実現するセルラー無線通信システムにおいて、上記分割されたスロットに対して異なるセル繰返し数に関する情報であるセル繰返しファクタを混在して設定し、該基地局が該セル繰返しファクタに基づいて自局の形成するセルに位置する移動局に割り当てるスロットを決定することを特徴としている。

[0017] ここで、該スロットは、該無線通信チャネルを一定の時間間隔に分割したタイムスロットでもよいし、該無線通信チャネルを一定の周波数間隔に分割したスロットでもよいし、該無線通信チャネルを時間及び周波数の2次元方向に分割したスロットでもよい。

また、該基地局は、該移動局との間の通信品質に応じて割り当てるスロットを決定してもよく、この場合、例えば、該通信品質の低い移動局に対しては該通信品質の高い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てることができる。

[0018] さらに、該基地局は、該移動局の要求伝送速度に応じて割り当てるスロットを決定してもよく、この場合は、例えば、該要求伝送速度の高い移動局に対しては該要求伝送速度の低い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てることができる。

また、該基地局は、該移動局の当該基地局からの距離に応じて割り当てるスロットを決定してもよく、この場合は、例えば、該距離が遠い移動局に対しては該距離が近い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てることができる。

[0019] さらに、複数の該基地局間のハンドオーバ領域に位置する移動局に対しては、ハンドオーバ元の基地局及びハンドオーバ先の基地局は、それぞれ、該セル繰返しファクタが1以外のスロットを割り当てることもできる。

また、本発明のセルラー無線通信システムに用いられる基地局は、移動局とセルを

形成する基地局との間の無線通信チャネルを所定のスロットに分割し、該基地局が前記分割したスロットを複数の移動局に対して適応的に割り当てることにより無線多重アクセスを実現するセルラー無線通信システムに用いられるものであって、上記分割されたスロットに対して異なるセル繰返し数に関する情報であるセル繰返しファクタが混在して設定されることにより、自局に使用が許可されたスロットに関する使用許可スロット情報を記憶する使用許可スロット情報記憶部と、該使用許可スロット情報記憶部における該使用許可スロット情報に基づいて自局の形成するセルに位置する移動局に割り当てるスロットを決定するスロット割り当て部とをそなえたことを特徴としている。

[0020] ここで、この場合も、該スロットは、該無線通信チャネルを一定の時間間隔に分割したタイムスロットでもよいし、該無線通信チャネルを一定の周波数間隔に分割したスロットでもよいし、該無線通信チャネルを時間及び周波数の2次元方向に分割したスロットでもよい。

また、該スロット割り当て部は、該移動局との間の通信品質に応じて割り当てるスロットを決定すべく構成されていてもよく、この場合は、例えば、該通信品質の低い移動局に対しては該通信品質の高い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるべく構成することができる。

[0021] さらに、該スロット割り当て部は、該移動局の要求伝送速度に応じて割り当てるスロットを決定すべく構成されてもよく、この場合は、例えば、該要求伝送速度の高い移動局に対しては該要求伝送速度の低い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるべく構成することができる。

また、該スロット割り当て部は、該移動局の当該基地局からの距離に応じて割り当てるスロットを決定すべく構成されてもよく、この場合は、例えば、該距離が遠い移動局に対しては該距離が近い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるべく構成することができる。

[0022] 上記本発明によれば、パケットスケジューリング型の通信方式に特有の課題である、基地局からの距離に応じて伝送レートが低下する課題を解決し、公正な無線リソース割り当てが可能である。また、システム全体のスループットを低下することなく、基地

局から離れたセル端の領域に位置するユーザに対しても、伝送レートの高い通信が可能になる。

図面の簡単な説明

[0023] [図1]本発明の原理を説明すべく無線通信チャネルの構成(タイムスロット)を示す図である。

[図2]本発明の原理を説明すべく無線通信チャネルの構成(周波数帯スロット)を示す図である。

[図3]本発明の原理を説明すべく無線通信チャネルの構成(2次元分割スロット)を示す図である。

[図4]本発明の原理を説明すべくセル配置例を示す図である。

[図5]本発明の一実施形態としてのセルラー移動(無線)通信システムの構成を示すブロック図である。

[図6]本実施形態で用いる伝送速度とSIRとの関係を示すグラフである。

[図7]図5に示す基地局における上下リンクのスケジューラの構成例を示すブロック図である。

[図8]図5に示すシステム(基地局)によるスロット割り当て手順を説明するためのフローチャートである。

[図9]図5に示す移動局のハンドオーバ中のスロット割り当て方法を説明するための図である。

[図10]従来の上下リンクのフレーム構成例を示す図である。

[図11]従来のパケット移動通信システムの構成例を示すブロック図である。

[図12]従来のパケット移動通信システムでのセル配置例を示す図である。

発明を実施するための最良の形態

[0024] 以下、図面を参照して本発明の実施の形態を説明する。

〔A〕本発明の概要(原理)説明

本発明では、図1に示すように、基地局と移動局との間の無線通信チャネル(無線リソース)を複数のタイムスロットに分割し、タイムスロット毎にセル繰返し数に関する情報であるセル繰返しファクタを予め決めておき、その中から基地局が各ユーザ(移動

局)に割り当てるスロットを決定する。図1の例では、スロット＃1～＃7が繰返し使用されるフレーム構成において、スロット＃1～＃4までのセル繰返しファクタが1に、スロット＃5～＃7までのセル繰返しファクタが3に予め決められている。

[0025] 即ち、スロット＃1～＃4までは全てのセルで使用可能とし、スロット＃5はセル＃1が、スロット＃6はセル＃2が、スロット＃7はセル＃3がそれぞれ使用可能であることが予め決められている。換言すれば、分割された各スロット＃1～＃7のうち複数のセル(基地局)で共有使用が許可された共有スロット＃1～＃4と1つのセルで単独使用が許可された個別スロット＃5，＃6，＃7とが混在して設定されている。

[0026] この時、セル＃1からセル＃3は、例えば図12に示すようなセル配置になっている。このような構成にすることで、基地局は、1セル繰返しのスロット＃1～＃4と3セル繰返しのスロット＃5，＃6又は＃7の中から、ユーザに適したスロットを割り当てることが可能になる。いうまでもないが、3セル繰返しのスロット＃5，＃6，＃7は、1セル繰返しのスロットと比較して、干渉となるセルが遠い距離に位置するため、他セル干渉が低減され、高品質の通信が可能になる。

[0027] 例えば、基地局は、高い伝送速度の通信が必要なユーザに対しては、低い伝送速度の通信でよいユーザに割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるとよい。また、基地局は、リアルタイムトラフィックなど、伝送遅延の短い通信が必要なユーザに対しては、伝送遅延が大きくてもよいユーザに割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるとよい。さらに、ユーザの要求伝送速度と実際のスループットとの差分に応じてスロット割り当てを行なうこともできる。例えば、差分が大きいユーザには差分の小さいユーザに割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるとよい。つまり、基地局は、所要の伝送速度に応じて割り当てるスロットを決定する。

[0028] また、基地局は、移動局との通信品質(伝搬路状態)に応じて割り当てるスロットを決定することもできる。例えば、通信品質(伝搬路状態)が悪い(低い)ユーザに対しては、伝搬路状態の良いユーザに割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるとよい。ここで、伝搬路状態の判断には、

受信電力、受信SIR、遅延スプレッド、ドップラ周波数などを用いることができる。

[0029] また、基地局は、移動局の基地局からの距離に応じて割り当てるスロットを決定することもできる。例えば、セル端などの基地局から遠い位置に存在するユーザは、他セル干渉の影響を受け易いため、基地局から遠い位置に存在するユーザに対しては、基地局に近い位置に存在するユーザに割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるとよい。ここで、ユーザの位置は、基地局において、受信電力や電波の到来角度、到来時間などを用いて測定してもよいし、GPS(Global Positioning System)を搭載した端末からユーザの位置情報を通知してもらってもよい。

[0030] なお、上記の例ではスロットを時間方向に分割したタイムスロットとしているが、例えば図2に示すように、周波数バンドをスロットと定義しても、図1に示したのと同様のスロット割り当てを行なうことができる。また、例えば図3に示すように、時間および周波数方向の2次元に分割されたスロットを用いることもできる。この図3では、2次元に分割された各スロットに対して、セル繰返しファクタが1，3，9の3種類の中から所定のセル繰返しファクタが決められている。そして、例えば図4に示すセル配置に対して、各セルが使用できるスロット位置を予め決めておく。

[0031] 図3の例では、左側の3×3(周波数方向×時間方向)＝9スロットは全セルが使用可能であり、次の3×1＝3スロットのうち、周波数の最も高いスロットはセル＃3，＃6，＃9で、中間の周波数のスロットはセル＃2，＃5，＃8で、周波数の最も低いスロットはセル＃1，＃4，＃7でそれぞれ使用可能であり、残りの3×3＝9スロットはそれぞれセル＃1～＃9の1つずつで使用可能であることを示している。

[0032] このように、本発明では、2次元のスロット分割を用いることも可能であるし、また、3種類以上のセル繰返しファクタを共存させることも可能である。

このように、本発明では、各基地局が使用するスロットを予め決めておくため、先に示した従来技術のように、隣接する基地局間でスロットの割り当てを調整する仕組みや、複数の基地局に対してスロットの割り当てを指示する基地局制御局のような特別な装置を設ける必要がないため、装置やシステムへのインパクトが小さく、低コストで実現することが可能である。即ち、基地局は、自局に対して予め使用が決められたス

ロットの中から、先に述べたような原理に従って、トータルのスループットが向上するように、各ユーザに対してスロットの割り当てを行なえばよい。

[0033] また、従来技術では、トータルのスループットを向上するために、全てのセルが同時に同じスロットを使用することができるように、セル繰返しファクタ＝1を用い、基地局からの距離や通信品質に応じて適応的に伝送レートを決定していた。この方法では、基地局に近いユーザに対しては伝送レートの速い通信が可能であるが、基地局から離れたセル端のユーザに対しては伝送レートの低い通信しか行なうことができない課題があった。これに対して、本発明では、セル端のユーザに対しては、セル繰返しファクタが1よりも大きいスロットを割り当てることにより他セル干渉を低減し、従来の方法よりも、伝送レートの高い通信を実現することができる。

[0034] 〔B〕一実施形態の説明

図5は本発明の一実施形態としてのセルラー移動（無線）通信システムの構成を示すブロック図で、この図5に示すシステムは、図11により前述したシステムと同様に、基地局1と、この基地局1にアクセスし得る1台以上の移動局2とをそなえて構成され、さらに、基地局1は、例えば、送信部（Tx）11，受信部（Rx）12，伝搬路測定部13，スロット復調部14，上りリンクスケジューラ15，下りリンクスケジューラ16，スロット生成部17及び使用許可スロット情報メモリ18をそなえて構成され、移動局2は、例えば、送信部（Tx）21，受信部（Rx）22，スロット復調部23，伝搬路測定部24及びスロット生成部25をそなえて構成されている。なお、本例においても、基地局1の下りリンクトラフィックには、通常、複数のユーザ（移動局2）のトラフィックが存在する。

[0035] ここで、基地局1において、送信部11は、移動局2への下りリンクデータ（図10により前述したパイロットシンボル（以下、単に「パイロット」ともいう）501，制御シンボル502及びデータシンボル503）を無線により送信するもので、所要の符号化処理、QAMやQPSK等の変調処理、デジタルーアナログ変換処理、周波数変換処理（アップコンバート）等を含む必要な送信処理を行なえるようになっており、受信部12は、移動局2から無線により送信されてくる上りリンクデータ（パイロットシンボル501，制御シンボル502及びデータシンボル503）を受信するもので、所要の周波数変換処理（ダウンコンバート）、直交検波処理、アナログーデジタル変換処理、パイロット501を用

いたチャネル推定処理、復調処理、復号処理等を含む必要な受信処理を行なえるようになっている。

[0036] 伝搬路測定部13は、受信部12での受信信号(上りリンクデータ)に基づいて移動局2との間の伝搬路状態を測定するもので、前述したように、受信電力や、受信SIR、遅延スプレッド、ドップラ周波数などを用いて測定することができる。これらの伝搬路情報の推定は、スロット内に挿入されているパイロット501を用いて行なわれ、パイロット501が伝搬路によって受ける変化量から、チャネル推定値が計算される。そして、チャネル推定値の電力から受信電力が、チャネル推定値の分散から干渉電力が計算され、それらの比から受信SIRが求められる。また、チャネル推定値の単位時間あたりの位相変化量から、ドップラ周波数が推定される。また、受信したパイロット501と既知のパイロットとの時間相関を計算することにより、遅延プロファイルを求めることができる。

[0037] スロット復調部14は、受信部12で受信された上りリンクデータの各スロットを復調するもので、前記制御シンボル502を復調し、制御チャネルに含まれる下りリンクの通信品質情報を下りリンクスケジューラ16に通知するとともに、制御シンボル502に含まれる上りリンクのトラフィック情報(要求伝送速度、要求遅延)を上りリンクスケジューラ15に通知する機能も有している。

[0038] 上りリンクスケジューラ(スロット割り当て部)15は、使用許可スロット情報メモリ18に記憶されている、使用可能な上下リンクについてそれぞれ使用可能なスロットとして予め決められたスロット情報に基づいて、使用可能なスロットの中から、自局1に接続しているユーザ(移動局2)に対して、所定のスケジューリング方法に従って、上りリンクのスロット割り当てを行なうものであり、下りリンクスケジューラ(スロット割り当て部)16は、同様に、使用許可スロット情報メモリ18のスロット情報に基づいて、使用可能なスロットの中から、自局1に接続しているユーザ(移動局2)に対して、所定のスケジューリング方法に従って、下りリンクのスロット割り当てを行なうものである。

[0039] スロット生成部17は、上記の各スケジューラ15及び16によるスロット割り当てに従って、上下リンクのスロット(パイロットシンボル501, 制御シンボル502及びデータシンボル503)を生成するものであり、使用許可スロット情報メモリ18は、図1(又は図2、

又は図3)により前述したごとく自局1で使用可能なスロットとして予め決められたスロット情報を記憶するものである。

[0040] 一方、移動局2において、送信部(Tx)21は、基地局1への上りリンクデータ(パイロットシンボル501, 制御シンボル502及びデータシンボル503)を無線により送信するもので、所要の符号化処理、QAMやQPSK等の変調処理、デジタルーアナログ変換処理、周波数変換処理(アップコンバート)等を含む必要な送信処理を行なえるようになっており、受信部22は、基地局1から無線により送信されてくる下りリンクデータ(パイロットシンボル501, 制御シンボル502及びデータシンボル503)を受信するもので、所要の周波数変換処理(ダウンコンバート)、直交検波処理、アナログーデジタル変換処理、パイロットを用いたチャネル推定処理、復調処理、復号処理等を含む必要な受信処理を行なえるようになっている。

[0041] スロット復調部23は、受信部22で受信された下りリンクデータの各スロットを復調するもので、前記制御シンボル502を復調し、制御チャネルに含まれる上りリンクのスロット割当情報をスロット生成部25に通知する機能も有している。なお、スロット復調部23は、下りリンクのすべてのスロットを復調(つまり、監視)してもよいし、消費電力低減等のために、少なくとも自局2で受信(復調)すべきスロット(例えば図1において、セル1に存在する移動局2なら、全スロット1～7のうちスロット1～5のみ)を監視するようにしてもよい。

[0042] 伝搬路測定部24は、受信部22での受信信号(下りリンクデータ)に含まれるパイロット501に基づいて基地局1との間の伝搬路状態を測定するもので、移動局2側においても、受信電力や、受信SIR、遅延スプレッド、ドップラ周波数などを用いて測定することができる。

スロット生成部25は、スロット復調部23からの上記スロット割当情報(つまり、基地局1により使用が許可されたスロット情報)に従って、上りリンクのスロット(パイロットシンボル501, 制御シンボル502及びデータシンボル503)を生成するもので、この際、制御シンボル502に、伝搬路測定部24で測定された下りリンクの通信品質情報を格納することにより、下りリンクの通信品質を基地局1へフィードバックする機能も有している。

[0043] つまり、本実施形態のパケット移動通信システムは、基本的に、図11により前述したシステムに対して、使用許可スロット情報メモリ18を追加するだけで、項目〔A〕で述べた特徴を有するシステムを実現することができる。

以下、上述のごとく構成された本実施形態のパケット移動通信システムの動作、特に、具体的なスロット割り当て方法(スケジューリング)について詳述する。なお、ここでは、スロット割り当てに必要な情報として、ユーザ(移動局2)毎の受信SIRと要求伝送速度とを用いる例について説明する。

[0044] 一般に、無線通信システムでは、システムで使用するアクセス方式(CDMAやOFDMなど)や受信信号の復調アルゴリズムに応じて、例えば図6に示すごとくSIRと伝送速度との関係が決まっている。上下リンクの各スケジューラ15, 16は、それぞれ、この図6に示す関係をSIR／伝送速度換算テーブル等としてメモリ等に保持しておき、各ユーザの要求伝送速度を基に各ユーザの所要SIRを計算する。

[0045] 即ち、下りリンクスケジューラ16では、下りリンクのトラフィック情報から要求伝送速度が分かるので、この情報を基に所要SIRを計算することができる。これに対して、上りリンクスケジューラ15では、移動局2からのトラフィック情報(伝送速度要求)を受けることにより、所要SIRを計算することができる。また、下りリンクスケジューラ16は、移動局2からのフィードバックにより下りリンクの受信SIRの情報を得ることができ、上りリンクスケジューラ15は、基地局1で測定した上りリンクのSIRの情報を得ることができる。

[0046] そして、各スケジューラ15, 16は、それぞれ、例えば図7に示すような回路を用いて、全ユーザ＃1～＃N(Nは自然数)の所要SIRと実際の受信SIRとの差分情報を求める。即ち、各スケジューラ15, 16は、ユーザ(移動局2)毎に、上記SIR／伝送速度換算テーブルを有し、要求伝送速度を所要SIRに変換する所要SIR換算部151と、この所要SIR換算部151と実際の受信SIR(測定値)との差分をとる減算器152とをそなえるとともに、各減算器152の減算結果と使用許可スロット情報メモリ18の使用許可スロット情報とに基づいて移動局2に対するスロット割り当てを行なうスロット割り当て回路153とをそなえて構成される。

[0047] これにより、基地局1は、例えば図8に示す処理フローに従って、所要SIRと受信SIRの差が最も大きいユーザに対して、セル繰返しファクタの大きいスロットの割り当て

を行なう。即ち、スケジューラ15，16は、所要SIR換算部151及び減算器152によって全ユーザの所要SIRと受信SIR（測定値）との差分情報を更新し（ステップS1）、スロット割り当て回路153によって当該差分情報が最も大きいユーザを選出する（ステップS2）。

[0048] そして、スロット割り当て回路153は、使用許可スロット情報と現在のスロット割り当て状況とに基づいて、セル繰返しファクタの大きい（1以外の）スロット（例えば図1のセル1ならスロット5）に空きがあるか否かを確認し（ステップS3）、空きがあれば（ステップS3でYESなら）、当該スロットを当該ユーザに対して割り当てる（ステップS4）。なお、セル繰返しファクタの大きいスロットに空きが無い場合（ステップS3でNOの場合）は、上記ステップS1以降の処理が繰り返される。

[0049] なお、分割スロットとして例えば図3により前述した2次元分割スロットを用いる場合のように、セル繰返しファクタが1以外のスロットが複数種類存在する場合には、どのような順序でスロット割り当てを行なうかが問題となるが、例えば、上記差分情報について閾値を設けておき、当該閾値を超えている場合には最もセル繰返しファクタが大きいスロットから割り当て対象とし、当該閾値以下なら最もセル繰返しファクタが大きいスロットを除くスロットから割り当て対象とすることができる。

[0050] また、上記各ユーザについての差分情報を更新する（図8のステップS1参照）毎に一時的に記憶してソーティングし、差分情報の大きいユーザから優先的にセル繰返しファクタの大きいスロットを割り当てるようにすることもできる。他にも優先度（スケジューリング方法）は自由に設定することができ、当該優先度に応じて割り当てるスロットを決定することができる。

[0051] さらに、上記ではスロット割り当て（スケジューリング）の例として、ユーザ（移動局2）毎の受信SIRと要求伝送速度とに基づく手法について説明したが、勿論、これに限られるものではなく、項目〔A〕にて前述した種々の手法を単独あるいは組み合わせて適用できることはいうまでもない。

〔C〕ハンドオーバ中のスロット割り当て

次に、ハンドオーバ中の移動局2に対するスロット割り当てについて、図9を参照しながら説明する。

[0052] 移動局2がハンドオーバ状態(セルサーチ等において複数の基地局1から同程度の受信電力で信号を受信できている状態)の場合、当該移動局2は、ハンドオーバ元とハンドオーバ先の基地局1A，1Bに対して、ハンドオーバ要求を行なう。ハンドオーバ要求を受けた基地局1A，1Bは、移動局2に対して、セル繰返しファクタが1よりも大きいスロット(個別スロット)を割り当てる。換言すれば、この場合、基地局1A，1Bは、移動局2からのハンドオーバ要求に応じて移動局2に対して割り当てるスロットを決定するのである。

[0053] 例えば図1に示すように、ハンドオーバ中の移動局2には、セル繰返しファクタが1よりも大きいスロット＃5およびスロット＃6が割り当てられるため、移動局2は、ハンドオーバ元の基地局1Aとハンドオーバ先の基地局1Bの両方から割り当てられるスロット＃5，＃6を同時に使用することができる。これにより、移動局2は、ハンドオーバ領域においてスループットを向上することができるだけでなく、ハンドオーバ切り替え時に発生するパケット損失を回避することが可能となる。また、異なるスロット＃5，＃6をシーケンシャルに受信(復調)することができるので、受信系(スロット復調部23)が1つで済み、移動局2の小型化にも寄与する。

[0054] 以上のように、本実施形態によれば、無線通信チャネル(無線リソース)を分割した各スロットに対して異なるセル繰返しファクタを混在して設定しておき、各基地局1が、自局に使用が許可されているスロットの中から所定のスケジューリング方法に従って移動局2に割り当てるスロットを決定するので、パケットスケジューリング型の通信方式に特有の課題である、基地局1からの距離に応じて伝送レートが低下する課題を解決して、公正な無線リソース割り当てを可能とする。また、システム全体のスループットを低下することなく、基地局1から離れたセル端の領域に位置するユーザに対しても、伝送レートの高い通信を可能にする。

[0055] なお、本発明は、上述した実施形態に限定されず、本発明の趣旨を逸脱しない範囲で種々変形して実施することができることはいうまでもない。

産業上の利用可能性

[0056] 以上詳述したように、本発明によれば、公正な無線リソース割り当てが可能であり、また、システム全体のスループットを低下することなく、基地局から離れたセル端の領

域に位置するユーザに対しても、伝送レートの高い通信を可能にできるので、無線通信技術分野において極めて有用と考えられる。

請求の範囲

[1] 移動局とセルを形成する基地局との間の無線通信チャネルを所定のスロットに分割し、該基地局が前記分割したスロットを複数の移動局に対して適応的に割り当てることにより無線多重アクセスを実現するセルラー無線通信システムにおいて、

上記分割されたスロットに対して異なるセル繰返し数に関する情報であるセル繰返しファクタを混在して設定し、

該基地局が該セル繰返しファクタに基づいて自局の形成するセルに位置する移動局に割り当てるスロットを決定することを特徴とする、セルラー無線通信システムにおけるスロット割り当て方法。

[2] 該スロットが、該無線通信チャネルを一定の時間間隔に分割したタイムスロットであることを特徴とする、請求項1記載のセルラー無線通信システムにおけるスロット割り当て方法。

[3] 該スロットが、該無線通信チャネルを一定の周波数間隔に分割したスロットであることを特徴とする、請求項1記載のセルラー無線通信システムにおけるスロット割り当て方法。

[4] 該スロットが、該無線通信チャネルを時間及び周波数の2次元方向に分割したスロットであることを特徴とする、請求項1記載のセルラー無線通信システムにおけるスロット割り当て方法。

[5] 該基地局が、該移動局との間の通信品質に応じて割り当てるスロットを決定することを特徴とする、請求項1～4のいずれか1項に記載のセルラー無線通信システムにおけるスロット割り当て方法。

[6] 該基地局が、該通信品質の低い移動局に対しては該通信品質の高い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てることを特徴とする、請求項5記載のセルラー無線通信システムにおけるスロット割り当て方法。

[7] 該基地局が、該移動局の要求伝送速度に応じて割り当てるスロットを決定することを特徴とする、請求項1～4のいずれか1項に記載のセルラー無線通信システムにおけるスロット割り当て方法。

[8] 該基地局が、該要求伝送速度の高い移動局に対しては該要求伝送速度の低い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てることを特徴とする、請求項7記載のセルラー無線通信システムにおけるスロット割り当て方法。

[9] 該基地局が、該移動局の当該基地局からの距離に応じて割り当てるスロットを決定することを特徴とする、請求項1～4のいずれか1項に記載のセルラー無線通信システムにおけるスロット割り当て方法。

[10] 該基地局が、該距離が遠い移動局に対しては該距離が近い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てることを特徴とする、請求項9記載のセルラー無線通信システムにおけるスロット割り当て方法。

[11] 複数の該基地局間のハンドオーバ領域に位置する移動局に対しては、ハンドオーバ元の基地局及びハンドオーバ先の基地局は、それぞれ、該セル繰返しファクタが1以外のスロットを割り当てることを特徴とする、請求項1～4のいずれか1項に記載のセルラー無線通信システムにおけるスロット割り当て方法。

[12] 移動局とセルを形成する基地局との間の無線通信チャネルを所定のスロットに分割し、該基地局が前記分割したスロットを複数の移動局に対して適応的に割り当てることにより無線多重アクセスを実現するセルラー無線通信システムに用いられる該基地局であって、

上記分割されたスロットに対して異なるセル繰返し数に関する情報であるセル繰返しファクタが混在して設定されることにより、自局に使用が許可されたスロットに関する使用許可スロット情報を記憶する使用許可スロット情報記憶部と、

該使用許可スロット情報記憶部における該使用許可スロット情報に基づいて自局の形成するセルに位置する移動局に割り当てるスロットを決定するスロット割り当て部とをそなえたことを特徴とする、セルラー無線通信システムに用いられる基地局。

[13] 該スロットが、該無線通信チャネルを一定の時間間隔に分割したタイムスロットであることを特徴とする、請求項12記載のセルラー無線通信システムに用いられる基地局。

[14] 該スロットが、該無線通信チャネルを一定の周波数間隔に分割したスロットであることを特徴とする、請求項12記載のセルラー無線通信システムに用いられる基地局。

[15] 該スロットが、該無線通信チャネルを時間及び周波数の2次元方向に分割したスロットであることを特徴とする、請求項12記載のセルラー無線通信システムに用いられる基地局。

[16] 該スロット割り当て部が、

該移動局との間の通信品質に応じて割り当てるスロットを決定すべく構成されたことを特徴とする、請求項12～15のいずれか1項に記載のセルラー無線通信システムに用いられる基地局。

[17] 該スロット割り当て部が、

該通信品質の低い移動局に対しては該通信品質の高い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるべく構成されたことを特徴とする、請求項16記載のセルラー無線通信システムに用いられる基地局。

[18] 該スロット割り当て部が、

該移動局の要求伝送速度に応じて割り当てるスロットを決定すべく構成されたことを特徴とする、請求項12～15のいずれか1項に記載のセルラー無線通信システムに用いられる基地局。

[19] 該スロット割り当て部が、

該要求伝送速度の高い移動局に対しては該要求伝送速度の低い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるべく構成されたことを特徴とする、請求項18記載のセルラー無線通信システムに用いられる基地局。

[20] 該スロット割り当て部が、

該移動局の当該基地局からの距離に応じて割り当てるスロットを決定すべく構成されたことを特徴とする、請求項12～15のいずれか1項に記載のセルラー無線通信システムに用いられる基地局。

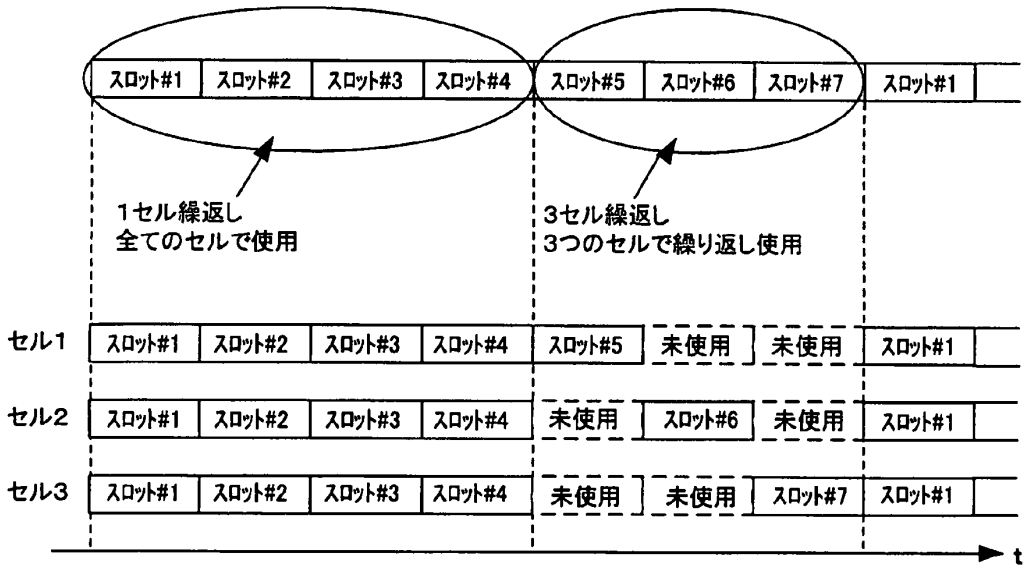
[21] 該スロット割り当て部が、

該距離が遠い移動局に対しては該距離が近い移動局に割り当てるスロットのセル繰返しファクタよりも大きいセル繰返しファクタのスロットを割り当てるべく構成されたことを特徴とする、請求項20記載のセルラー無線通信システムに用いられる基地局。

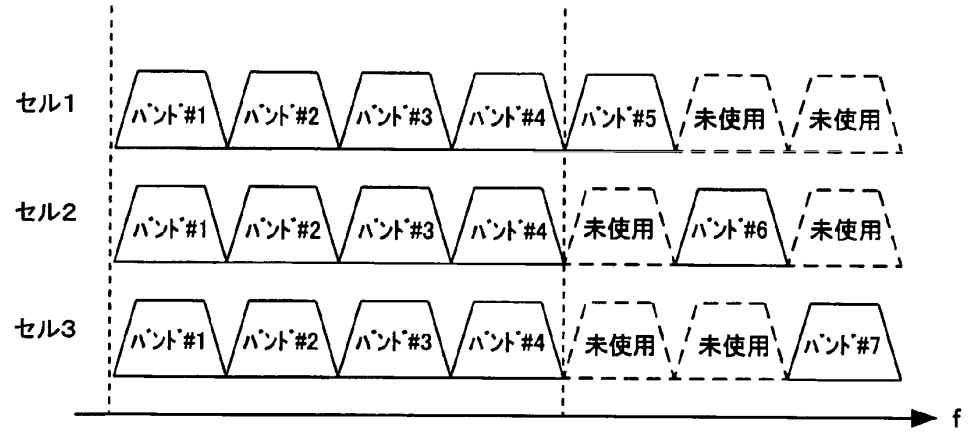
要 約 書

セルラー無線通信システムに用いられる基地局において、移動局との間の無線通信チャネルの分割されたスロットに対して異なるセル繰返し数に関する情報であるセル繰返しファクタが混在して設定されることにより、自局に使用が許可されたスロットに関する使用許可スロット情報を記憶する使用許可スロット情報記憶部(18)と、この使用許可スロット情報記憶部(18)における使用許可スロット情報に基づいて自局の形成するセルに位置する移動局(2)に割り当てるスロットを決定するスロット割り当て部(15, 16)とをそなえる。これにより、基地局(1)からの距離に応じて伝送レートが低下することを回避し、公正な無線リソース割り当てを可能とする。また、システム全体のスループットを低下することなく、基地局(1)から離れたセル端の領域に位置するユーザに対しても、伝送レートの高い通信を可能にする。

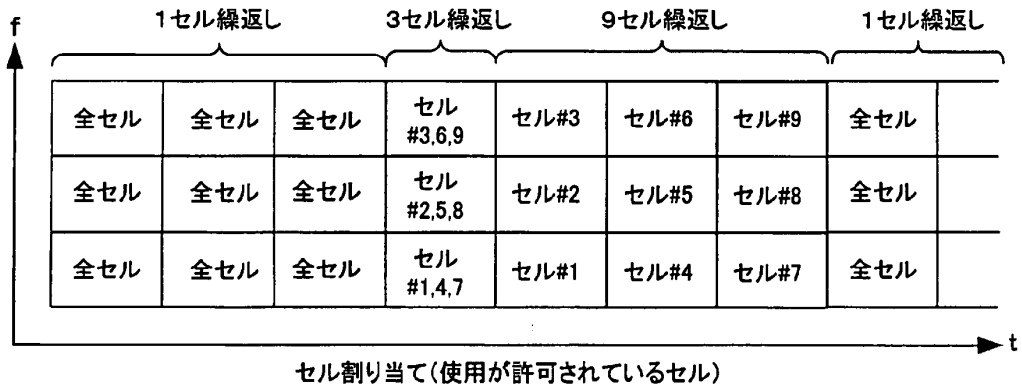
[図1]


スロット#1
スロット#2
スロット#3
スロット#4
スロット#5
スロット#6
スロット#7
スロット#1
1セル繰返し
全てのセルで使用
3セル繰返し
3つのセルで繰り返し使用
セル1
スロット#1
スロット#2
スロット#3
スロット#4
スロット#5
未使用
未使用
スロット#1
セル2
スロット#1
スロット#2
スロット#3
スロット#4
未使用
スロット#6
未使用
スロット#1
セル3
スロット#1
スロット#2
スロット#3
スロット#4
未使用
未使用
スロット#7
スロット#1
t

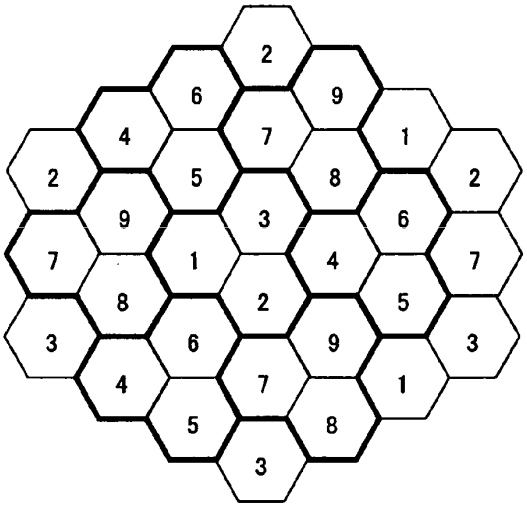
[図2]


セル1
ﾊﾞﾝﾄﾞ#1
ﾊﾞﾝﾄﾞ#2
ﾊﾞﾝﾄﾞ#3
ﾊﾞﾝﾄﾞ#4
ﾊﾞﾝﾄﾞ#5
未使用
未使用
セル2
ﾊﾞﾝﾄﾞ#1
ﾊﾞﾝﾄﾞ#2
ﾊﾞﾝﾄﾞ#3
ﾊﾞﾝﾄﾞ#4
未使用
ﾊﾞﾝﾄﾞ#6
未使用
セル3
ﾊﾞﾝﾄﾞ#1
ﾊﾞﾝﾄﾞ#2
ﾊﾞﾝﾄﾞ#3
ﾊﾞﾝﾄﾞ#4
未使用
未使用
ﾊﾞﾝﾄﾞ#7
f

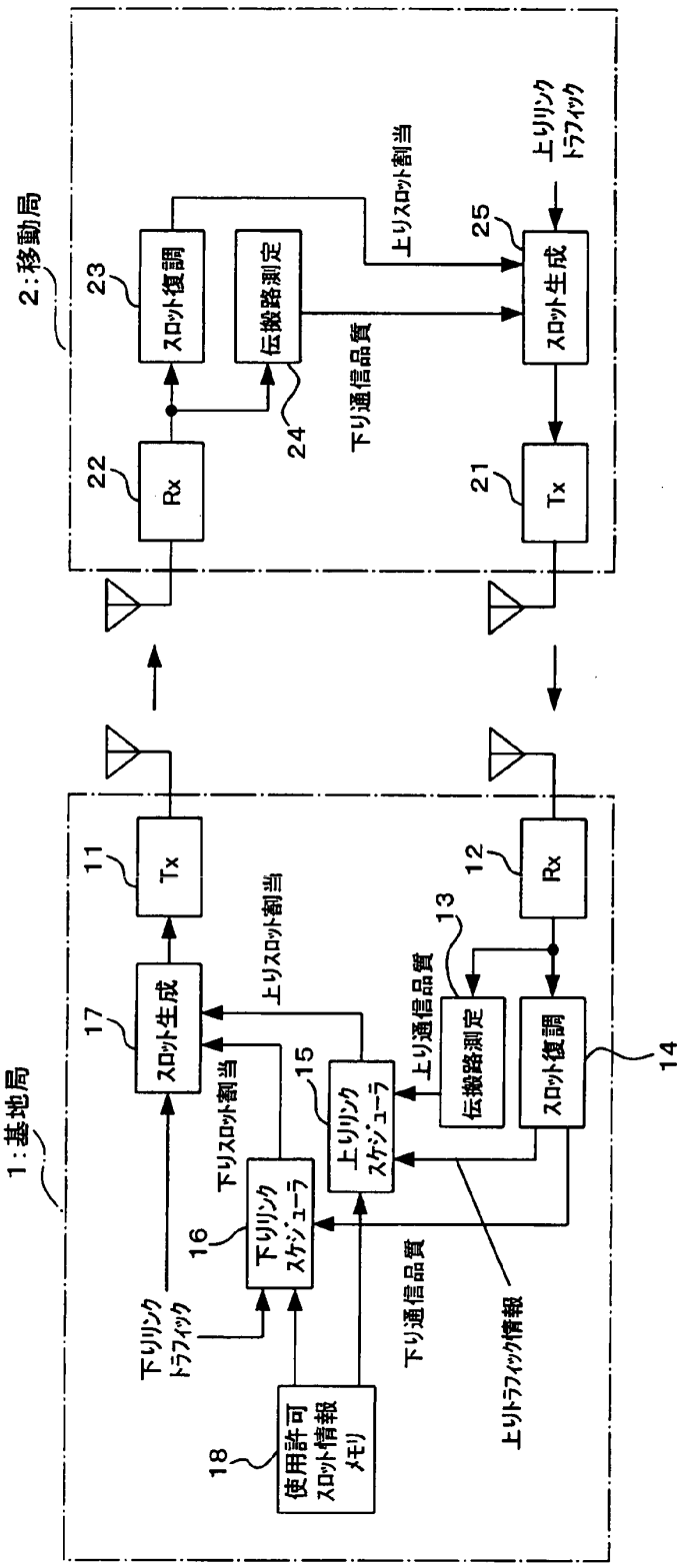
[図3]


f
1セル繰返し
3セル繰返し
9セル繰返し
1セル繰返し
全セル
全セル
全セル
セル #3,6,9
セル#3
セル#6
セル#9
全セル
全セル
全セル
全セル
セル #2,5,8
セル#2
セル#5
セル#8
全セル
全セル
全セル
全セル
セル #1,4,7
セル#1
セル#4
セル#7
全セル
t
セル割り当て(使用が許可されているセル)

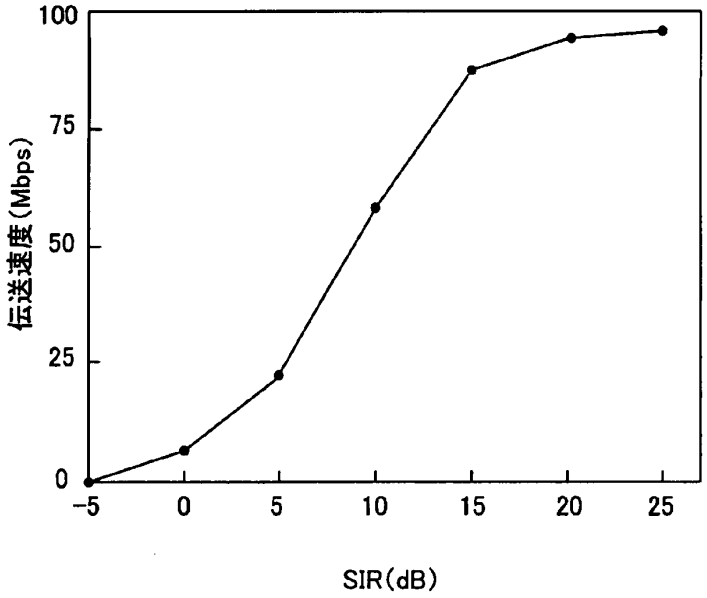
[図4]


2
6
9
4
7
1
2
5
8
2
9
3
6
7
1
4
7
8
2
5
3
6
9
3
4
7
1
5
8
3

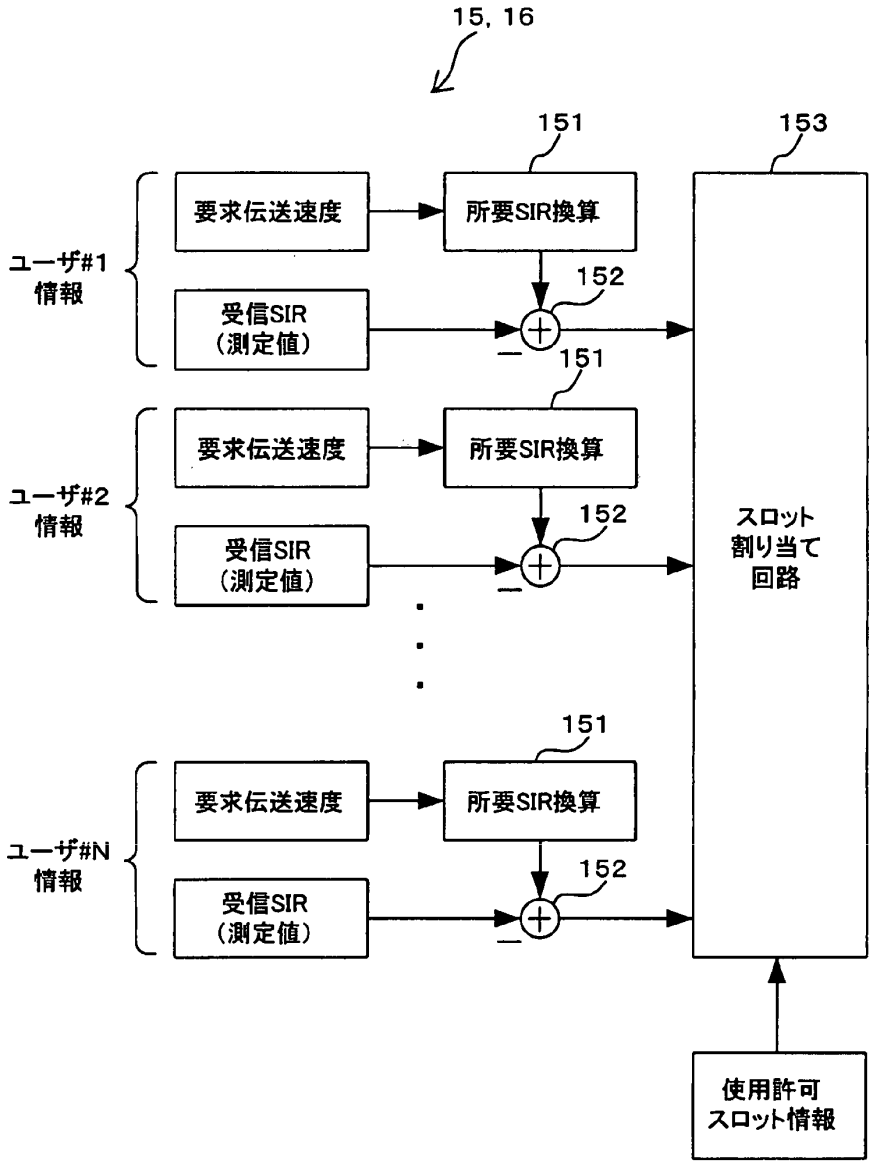
[図5]


1:基地局
2:移動局
11
Tx
12
Rx
13
伝搬路測定
14
スロット復調
15
上りリンク スケジューラ
16
下りリンク スケジューラ
17
スロット生成
18
使用許可 スロット情報 メモリ
21
Tx
22
Rx
23
スロット復調
24
伝搬路測定
25
スロット生成
下りリンク トラフィック
下りスロット割当
上りスロット割当
上り通信品質
下り通信品質
上りトラフィック情報
上りリンク トラフィック

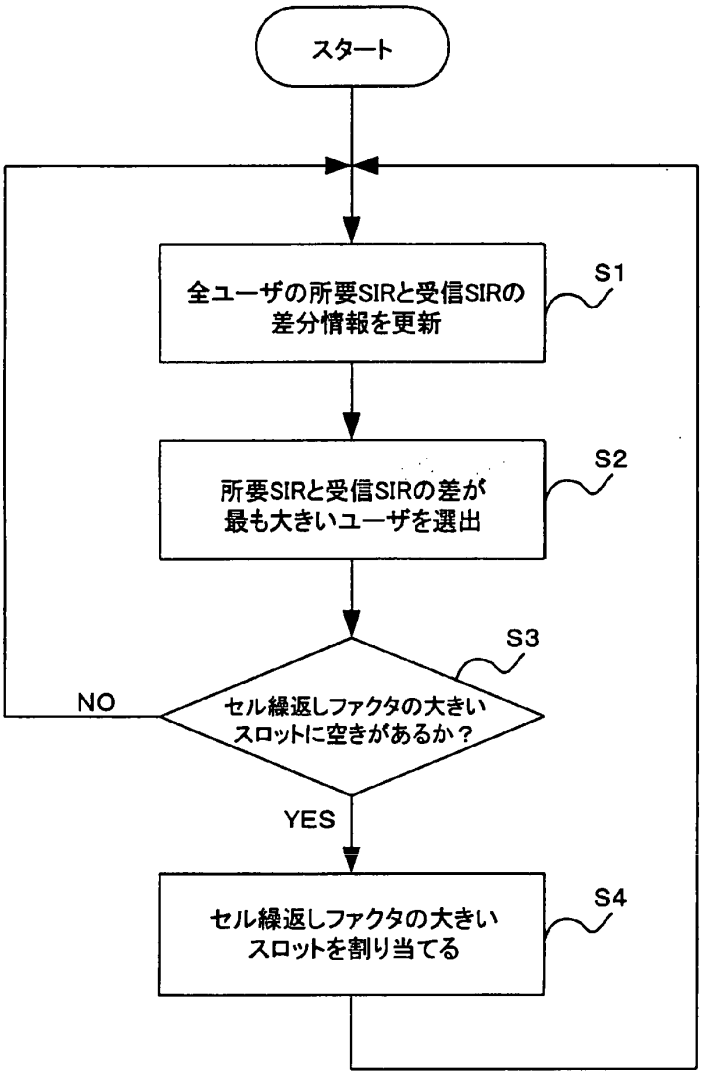
[図6]



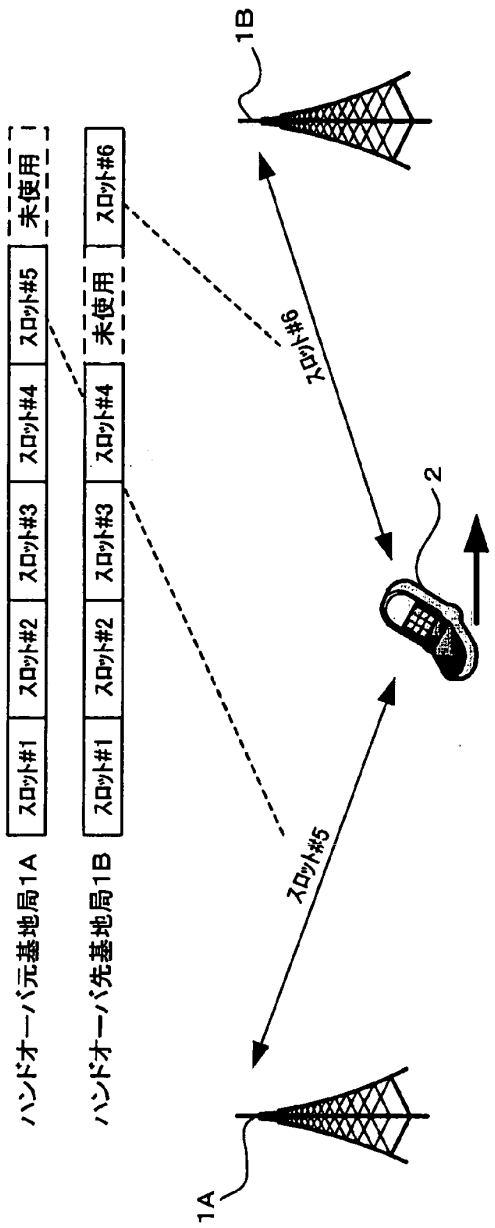
[図7]


15, 16
151
153
要求伝送速度
所要SIR換算
ユーザ#1
情報
受信SIR
(測定値)
152
151
要求伝送速度
所要SIR換算
ユーザ#2
情報
受信SIR
(測定値)
152
スロット
割り当て
回路
151
要求伝送速度
所要SIR換算
ユーザ#N
情報
受信SIR
(測定値)
152
使用許可
スロット情報

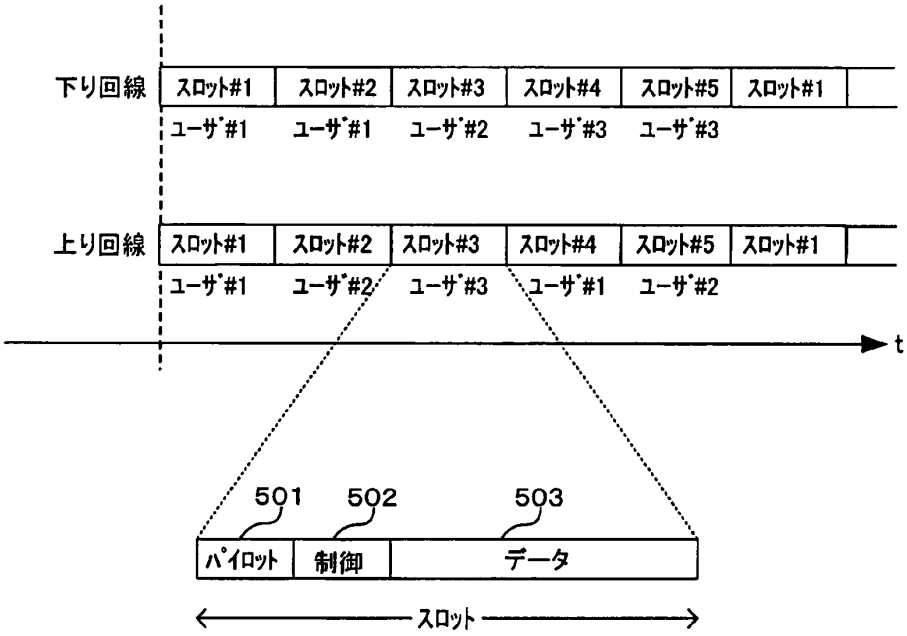
[図8]


スタート
全ユーザの所要SIRと受信SIRの差分情報を更新
S1
所要SIRと受信SIRの差が最も大きいユーザを選出
S2
S3
セル繰返しファクタの大きいスロットに空きがあるか？
NO
YES
セル繰返しファクタの大きいスロットを割り当てる
S4

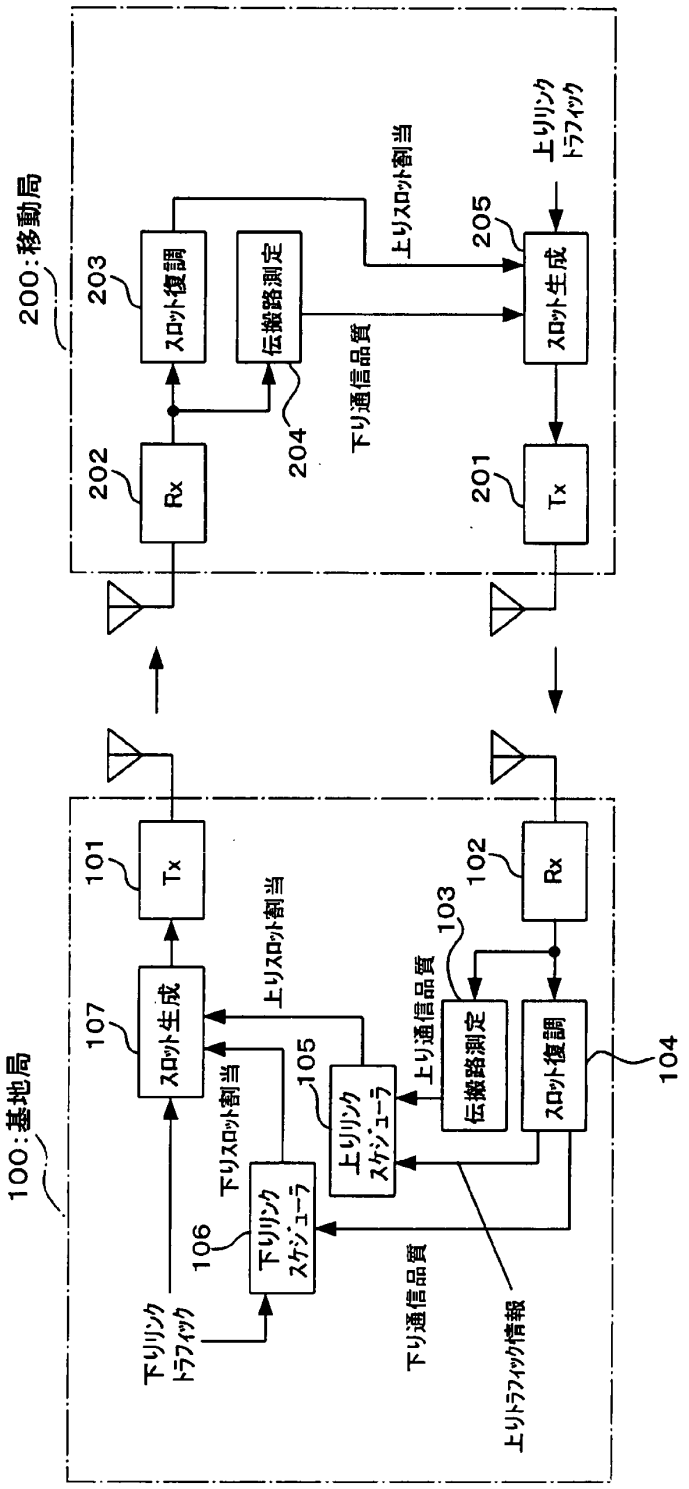
[図9]


ハンドオーバ元基地局1A
スロット#1
スロット#2
スロット#3
スロット#4
スロット#5
未使用
ハンドオーバ先基地局1B
スロット#1
スロット#2
スロット#3
スロット#4
未使用
スロット#6
1A
1B
2
スロット#5
スロット#6

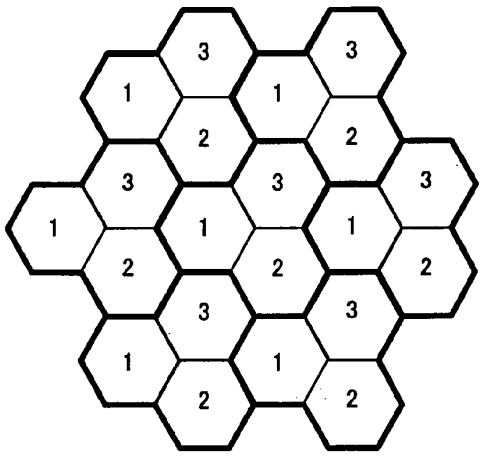
[図10]


下り回線
スロット#1
スロット#2
スロット#3
スロット#4
スロット#5
スロット#1
ユーザ#1
ユーザ#1
ユーザ#2
ユーザ#3
ユーザ#3
上り回線
スロット#1
スロット#2
スロット#3
スロット#4
スロット#5
スロット#1
ユーザ#1
ユーザ#2
ユーザ#3
ユーザ#1
ユーザ#2
t
501
502
503
パイロット
制御
データ
スロット

[図11]


200:移動局
203
スロット復調
伝搬路測定
上りスロット割当
205
上りリンク
トラフィック
スロット生成
202
Rx
204
下り通信品質
201
Tx
100:基地局
101
Tx
107
スロット生成
上りスロット割当
下りスロット割当
105
上りリンク
スケジューラ
106
下りリンク
スケジューラ
下りリンク
トラフィック
下り通信品質
上り通信品質
103
伝搬路測定
102
Rx
スロット復調
104
上りトラフィック情報

[図12]



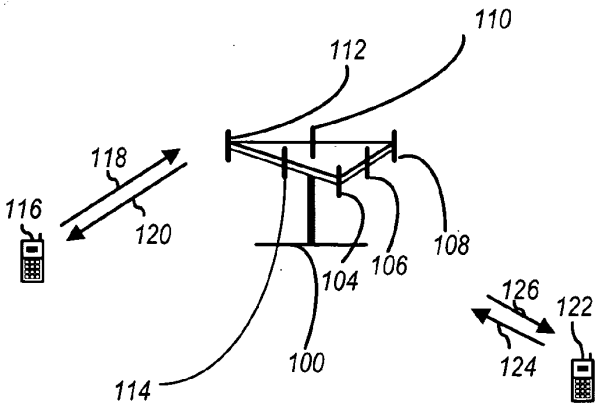

110
112
118
116
120
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104
106
126
122
124
114
100

Fig. 1

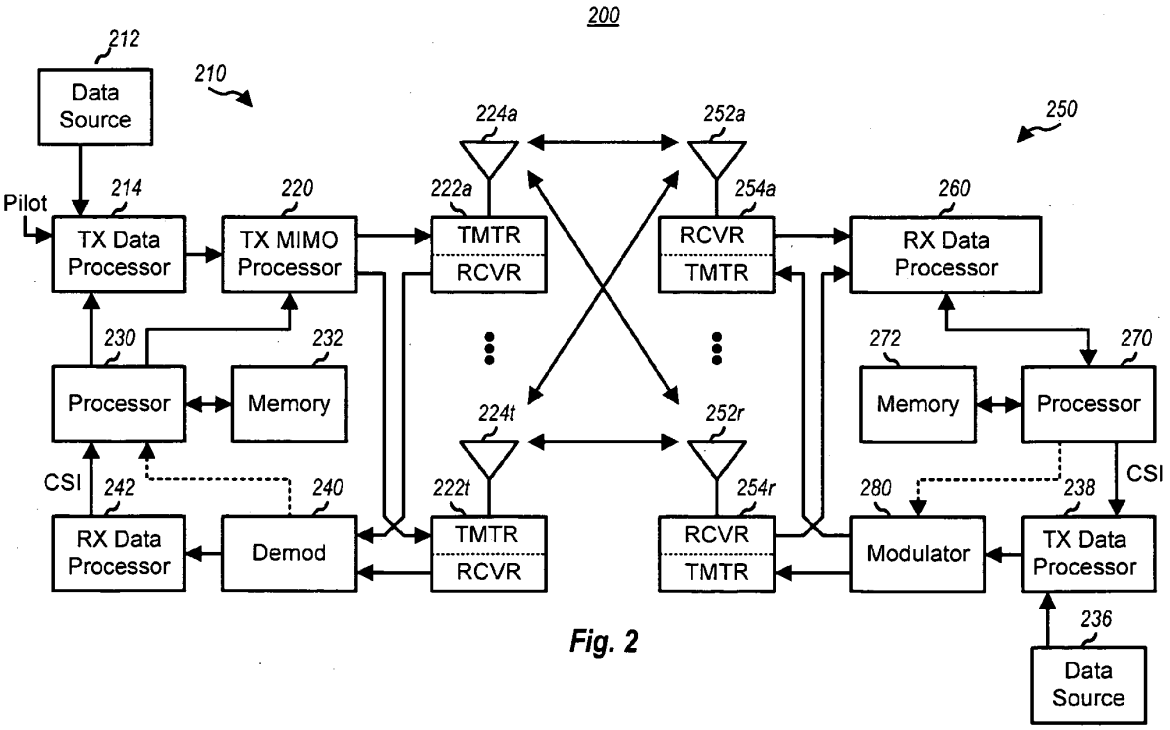

200
212
210
Data Source
224a
252a
250
Pilot
214
220
222a
254a
260
TX Data Processor
TX MIMO Processor
TMTR
RCVR
RCVR
TMTR
RX Data Processor
230
232
272
270
Processor
Memory
Memory
Processor
224t
252r
CSI
242
240
222t
254r
280
238
CSI
RX Data Processor
Demod
TMTR
RCVR
RCVR
TMTR
Modulator
TX Data Processor
236
Data Source

Fig. 2

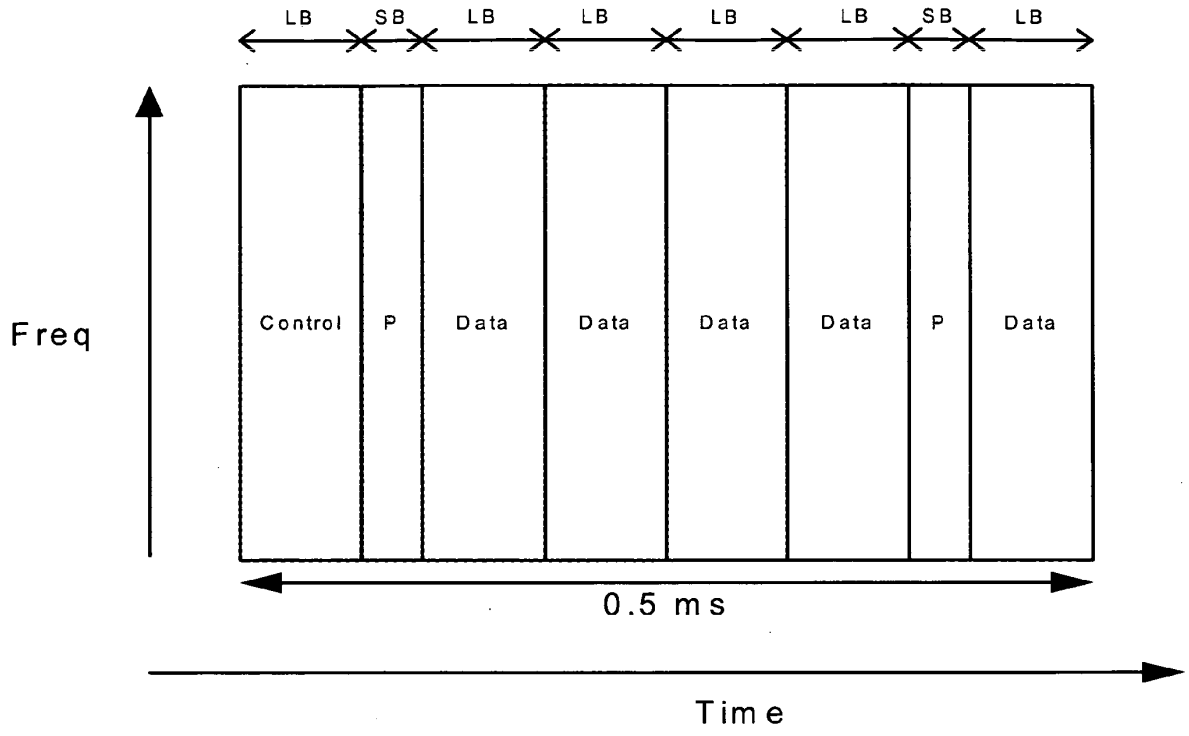

LB
SB
LB
LB
LB
LB
SB
LB
Freq
Control
P
Data
Data
Data
Data
P
Data
0.5 ms
Time

FIG 3A

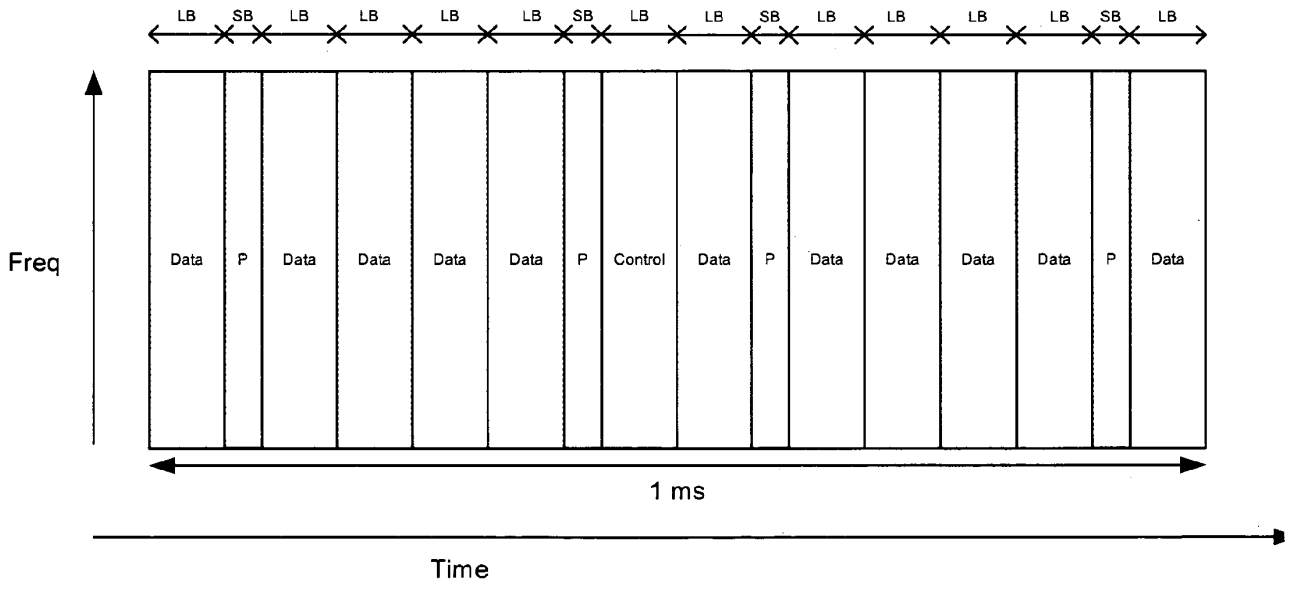

LB
SB
LB
LB
LB
LB
SB
LB
LB
SB
LB
LB
LB
LB
SB
LB
Freq
Data
P
Data
Data
Data
Data
P
Control
Data
P
Data
Data
Data
Data
P
Data
1 ms
Time

FIG 3B

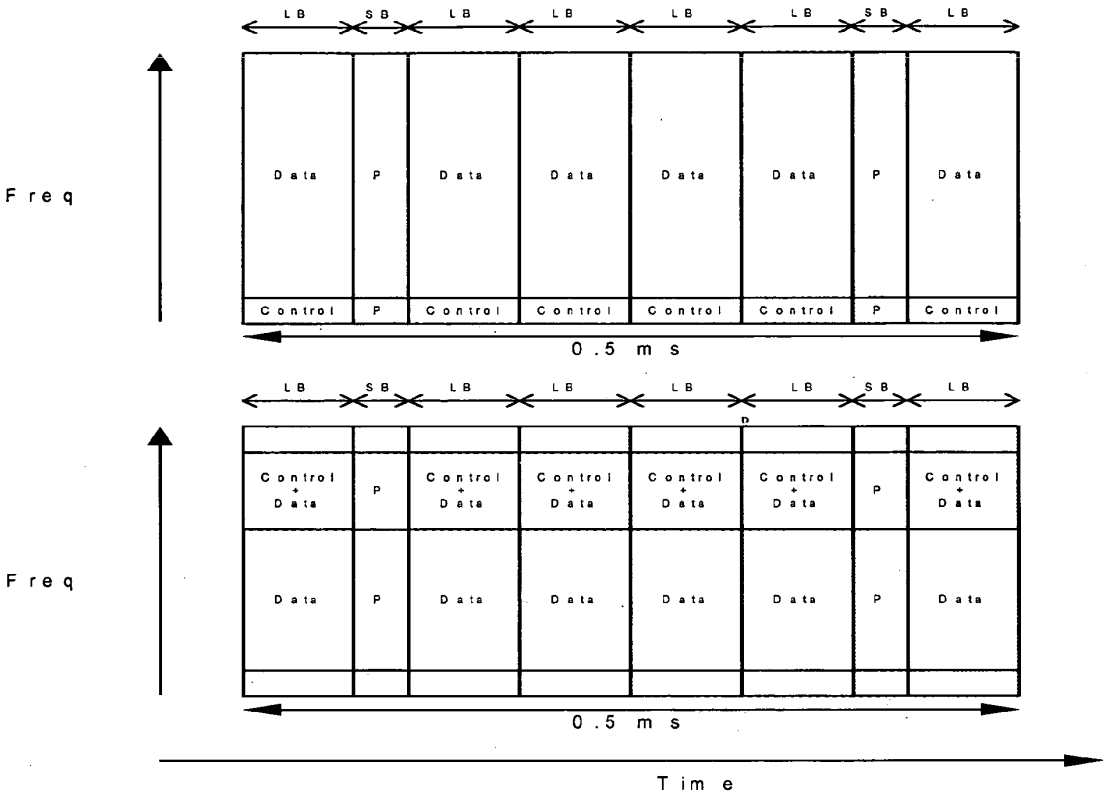

LB
SB
LB
LB
LB
LB
SB
LB
Data
P
Data
Data
Data
Data
P
Data
Control
P
Control
Control
Control
Control
P
Control
0.5 ms
Freq
Control + Data
Data
Time

FIG 4A

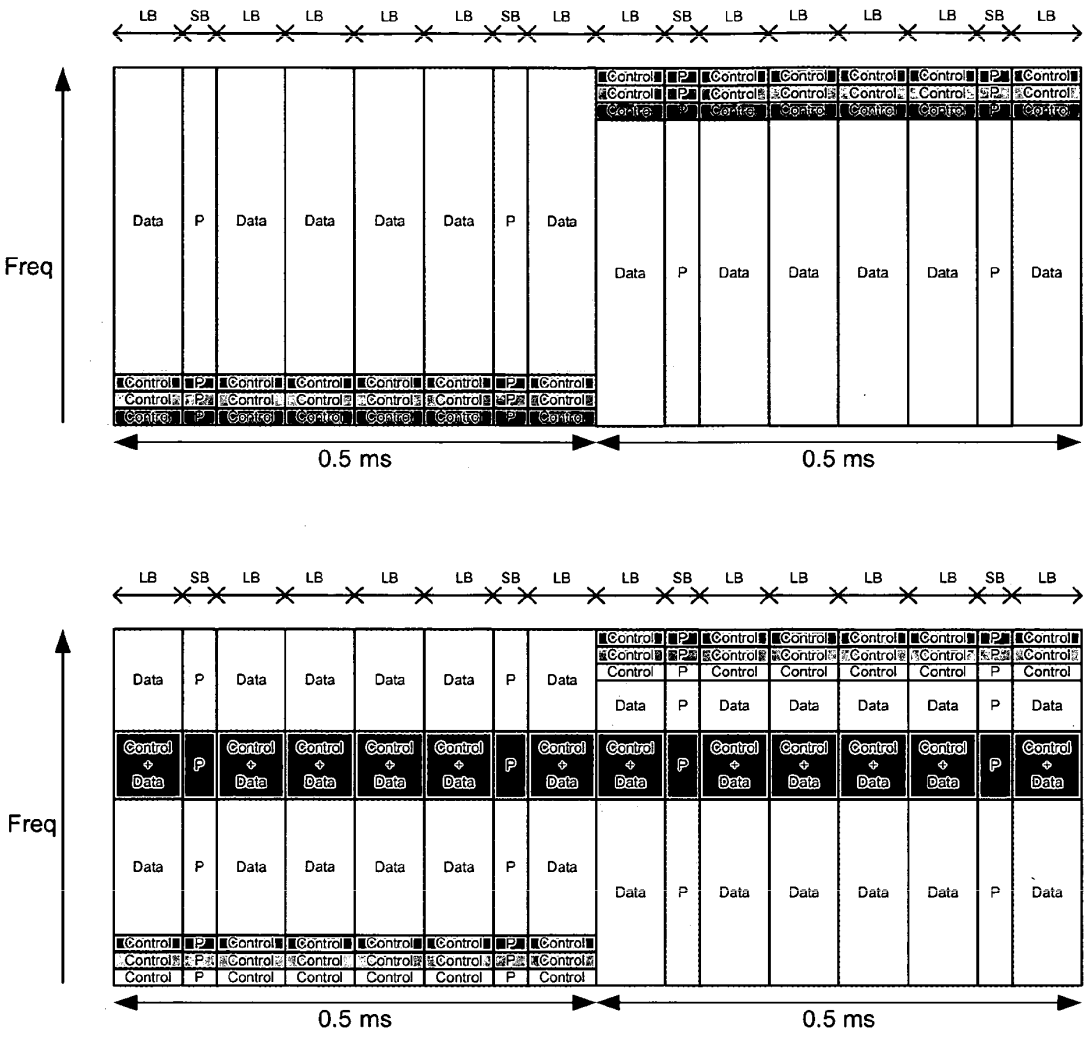


FIG 4B

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013								
	45	✓								
	46	O								
	47	O								
	48	O								
	49	O								
	50	O								
	51	✓								
	52	✓								
	53	O								
	54	O								
	55	O								
	56	O								
	57	O								
	58	O								
	59	✓								
	60	O								
	61	O								
	62	O								
	63	O								
	64	O								
	65	O								
	66	✓								
	67	O								
	68	O								
	69	O								
	70	O								
	71	O								
	72	O								
	73	✓								
	74	O								
	75	O								
	76	O								
	77	O								
	78	O								
	79	O								
	80	✓								

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013								
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	82	O								
	83	O								
	84	O								
	85	O								
	86	O								
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	90									
	91									
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	**Art Unit**
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013								
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	120									
	121									
	122									
	123									
	124									
	125									
	126									
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	128									
	129									
	130									

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UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

Courtesy Reminder for
Application Serial No: 13/176,298

Attorney Docket No: IPW2-USCN191712
Customer Number: 3624
Date of Electronic Notification: 04/10/2013

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:
eoffice@volpe-koenig.com

To view your correspondence online or update your email addresses, please visit us anytime at **https://sportal.uspto.gov/secure/myportal/privatepair.** If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the **PATENT APPLICATION** of: Paul Howard **Application No.:** 13/176,298 **Confirmation No.: 4342** **Filed:** July 5, 2011 For: Feedback Control in an FDD TDD-CDMA System Group: 2476 Examiner: Ronald B. Abelson	Our File: IPW2-USCN191712 Date: June 13, 2013

REPLY PURSUANT TO 37 C.F.R. §1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This Reply is being timely filed in response to the Non-final Office Action dated April 10, 2013.

Please amend the application without prejudice or disclaimer as follows:

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. - 44. (CANCELED)

45. (Currently Amended) A user equipment (UE) comprising:

a processor configured to receive resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

the processor is further configured to send data over the physical uplink shared channel in assigned time intervals; ~~and~~

the processor is further configured, in a time interval that it is not sending ~~data~~ information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information; and

the processor is further configured to receive feedback information from a downlink control channel.

46. (Canceled)

47. (Currently Amended) The UE of claim [[46]] 45 wherein the processor is further configured to receive data on a physical downlink shared channel.

48. (Previously presented) The UE of claim 47 wherein the downlink control channel and the physical downlink shared channel are time multiplexed.

49. (Currently Amended) The UE of claim [[46]] 45 wherein the feedback information includes power control information.

50. (Previously presented) The UE of claim 49 wherein the downlink control channel includes power control information for a plurality of UEs using different bits.

51. (Currently Amended) The UE of claim 45 wherein in the time interval that the signal on the uplink physical control channel is sent by the UE, a plurality of UEs each transmit on respective uplink physical control channels in ~~that~~ the time interval.

52. (Currently Amended) A network device comprising:

a processor configured to send resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

the processor is further configured to receive data over the physical uplink shared channel in assigned time intervals; ~~and~~

the processor is further configured, in a time interval that it is not receiving ~~data~~ information over the physical uplink shared channel, to receive a signal over the uplink physical control channel based on the sent resource allocation information; and

the processor is further configured to send feedback information on a downlink control channel.

53. (Canceled)

54. (Currently Amended) The network device of claim [[53]] 52 wherein the processor is further configured to send data on a physical downlink shared channel.

55. (Previously presented) The network device of claim 54 wherein the downlink control channel and the physical downlink shared channel are time multiplexed.

56. (Currently Amended) The network device of claim [[53]] 52 wherein the feedback information includes power control information.

57. (Previously presented) The network device of claim 56 wherein the downlink control channel includes power control information for a plurality of UEs using different bits.

58. (Currently Amended) The network device of claim [[53]] 52 wherein in the time interval that the signal on the uplink physical control channel is received by the network device, ~~a plurality of UEs transmit on uplink physical control channels in that time interval~~ signals are received on other uplink physical control channels in the time interval from a plurality of UEs.

59. (Currently Amended) A wireless network comprising:

a network device comprising:

circuitry configured to send resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

and

a user equipment (UE) comprising:

circuitry configured to send data over the physical uplink shared channel in assigned time intervals; ~~and~~

the circuitry is further configured, in a time interval that it is not sending ~~data~~ information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the sent resource allocation information; and

the UE receives feedback information on a downlink control channel.

60. (Canceled)

61. (Currently Amended) The wireless network of claim [[60]] 59 wherein the network device is configured to send data on a physical downlink shared channel.

62. (Previously presented) The wireless network of claim 61 wherein the downlink control channel and the physical downlink shared channel are time multiplexed.

63. (Currently Amended) The wireless network of claim [[60]] 59 wherein the feedback information includes power control information.

64. (Previously presented) The wireless network of claim 63 wherein the network device is configured to send, on the downlink control channel, power control information for a plurality of UEs using different bits.

65. (Currently Amended) The wireless network of claim [[60]] 59 wherein in the time interval that the signal is sent on the uplink physical control channel by the UE, a plurality of UEs each transmit on respective uplink physical control channels in ~~that~~ the time interval.

66. (Currently Amended) A method performed by a user equipment (UE), the method comprising:

receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

sending, by the UE, data over the physical uplink shared channel in assigned time intervals; ~~and~~

sending, by the UE in a time interval that it is not sending ~~data~~ information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and

receiving, by the UE, feedback information from a downlink control channel.

67. (Canceled)

68. (Currently Amended) The method of claim [[67]] 66 further comprising:

receiving, by the UE, data on a physical downlink shared channel.

69. (Previously presented) The method of claim 68 wherein the downlink control channel and the physical downlink shared channel are time multiplexed.

70. (Currently Amended) The method of claim [[67]] 66 wherein the feedback information includes power control information.

71. (Previously presented) The method of claim 70 wherein the downlink control channel includes power control information for a plurality of UEs using different bits.

72. (Currently Amended) The method of claim 66 wherein in the time interval that the signal on the uplink physical control channel is sent by the UE, a plurality of UEs each transmit on respective uplink physical control channels in ~~that~~ the time interval.

73. (Currently Amended) A method performed by a network device, the method comprising:

sending, by the network device, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control

channel and a physical uplink shared channel have different resources;

receiving, by the network device, data over the physical uplink shared channel in assigned time intervals; ~~and~~

receiving, by the network device in a time interval that it is not receiving ~~data~~ information over the physical uplink shared channel, a signal over the uplink physical control channel based on the sent resource allocation information; and

sending, by the network device, feedback information on a downlink control channel.

74. (Canceled)

75. (Currently Amended) The method of claim [[74]] 73 further comprising:

sending, by the network device, data on a physical downlink shared channel.

76. (Previously presented) The method of claim 75 wherein the downlink control channel and the physical downlink shared channel are time multiplexed.

77. (Currently Amended) The method of claim [[74]] 73 wherein the feedback information includes power control information.

78. (Previously presented) The method of claim 77 wherein the downlink control channel includes power control information for a plurality of UEs using different bits.

79. (Currently Amended) The method of claim [[74]] 73 wherein in the time interval that the signal on the uplink physical control channel is received by the network device, ~~a plurality of UEs transmit on uplink physical control channels in that time interval~~ signals are received on other uplink physical control channels in the time interval from a plurality of UEs.

80. (Currently Amended) A method performed by a wireless network, the method comprising:

sending, by a network device, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

sending, by a user equipment (UE), data over the physical uplink shared channel in assigned time intervals; ~~and~~

sending, by the UE in a time interval that it is not sending ~~data~~ information over the physical uplink shared channel, a signal over the uplink physical control channel based on the sent resource allocation information; and

receiving, by the UE, feedback information on a downlink control channel.

81. (Canceled)

82. (Currently Amended) The method of claim [[81]] 80 further comprising:

sending, by the network device, data on a physical downlink shared channel.

83. (Previously presented) The method of claim 82 wherein the downlink control channel and the physical downlink shared channel are time multiplexed.

84. (Currently Amended) The method of claim [[81]] 80 wherein the feedback information includes power control information.

85. (Previously presented) The method of claim 84 further comprising:

sending, by the network device on the downlink control channel, power control information for a plurality of UEs using different bits.

86. (Currently Amended) The method of claim [[81]] 80 wherein in the time interval that the signal is sent on the uplink physical control channel by the UE, a plurality of UEs each transmit on respective uplink physical control channels in ~~that~~ the time interval.

87. (NEW) A user equipment (UE) comprising:

a processor configured to receive resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

the processor is further configured to send data over the physical uplink shared channel in assigned time intervals;

the processor is further configured, in a time interval that it is not sending ~~data~~ information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information; and

wherein in the time interval that the signal on the uplink physical control channel is sent by the UE, a plurality of UEs each send respective signals on respective uplink physical control channels in the time interval.

88. (NEW) A method performed by a user equipment (UE), the method comprising:

receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

sending, by the UE, data over the physical uplink shared channel in assigned time intervals;

sending, by the UE in a time interval that it is not sending ~~data~~ information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and

wherein in the time interval that the signal on the uplink physical control channel is sent by the UE, a plurality of UEs each send respective signals on respective uplink physical control channels in the time interval.

89. (NEW) The UE of claim 45 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

90. (NEW) The network device of claim 52 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

91. (NEW) The wireless network of claim 59 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

92. (NEW) The method of claim 66 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

93. (NEW) The method of claim 73 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

94. (NEW) The method of claim 80 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

95. (NEW) The UE of claim 87 further comprising the uplink physical control channel, the respective uplink physical control channels, or the physical uplink shared channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

96. (NEW) The method of claim 88 further comprising the uplink physical control channel, the respective uplink physical control channels, or the physical uplink shared channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

Amendments to the Specification:

Please substitute the Abstract with the following new Abstract:

ABSTRACT

Receiving resource allocation information associated with an uplink physical control channel is disclosed. The uplink physical control channel and a physical uplink shared channel may have different resources. Data may be sent over the physical uplink shared channel in assigned time intervals. A signal may be sent over the uplink physical control channel based on the received resource allocation information in a time interval that the UE is not sending data over the physical uplink shared channel.

REMARKS

After the foregoing Amendment, claims 45, 47-52, 54-59, 61-66, 68-73, 75-80, and 82-96 are currently pending in this application. Claims 46, 53, 60, 67, 74, and 81 have been canceled without prejudice. Claims 45, 47, 49, 51, 52, 54, 56, 58, 59, 61, 63, 65, 66, 68, 70, 72, 73, 75, 77, 79, 80, 82, 84, and 86 have been amended. New claims 87-96 are added. New independent claims 87 and 88 are similar to an independent form of claim 72. In the specification a substitute abstract is submitted herewith.

Allowable Subject Matter

The Examiner is thanked for indicating that claims 46-50, 53-68, 60-65, 67-72, 74-79, and 81-86 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Objections

The Examiner objected to claims 46-50, 53-68, 60-65, 67-72, 74-79, and 81-86 as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any

intervening claims. Applicant assumes that the examiner intended to object to claims 53-58 not 53-68.

Claims 46, 53, 60, 67, 74, and 81 have been incorporated into their respective independent claims thus making 47-50, 54-58, 61-65, 68-72, 75-79, and 82-86 allowable. The withdrawal of the objection to the claims 46-50, 53-68, 60-65, 68-72, 75-79, and 81-86 is respectfully requested.

Moreover, new independent claims 87 and 88 are similar to an independent form of claim 72, a claim that the Examiner said would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 U.S.C. § 103(a)

Claims 45, 52, 59, 66, 73, and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Pat. Publication 2008/0090528 to Malladi (hereinafter "Malladi"). Claims 45, 52, 59, 66, 73, and 80 have been amended to include language from dependent claims that the Examiner objected to as being allowable if rewritten in independent form making the rejection moot.

Based on the arguments presented above, withdrawal of the 35 U.S.C. § 103(a) rejection of claims 45, 52, 59, 66, 73, and 80 is respectfully requested.

Claim 51 is rejected under 35 U.S.C. 103(a) as being unpatentable over Malladi further in view of U.S. Pat. Publication 2002/0150058 to Kim et al. (hereinafter "Kim"). Claim 51 is dependent upon amended claim 45. Amended claim 45 incorporates language from canceled claim 46 which the Examiner objected to as being allowable if rewritten in independent form. Thus the rejection of claim 51 is moot in view of the amendments made to claim 45.

Based on the arguments presented above, withdrawal of the 35 U.S.C. § 103(a) rejection of claim 51 is respectfully requested.

Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendment and remarks, Applicant respectfully submits that the present application is in condition for allowance and a notice to that effect is respectfully requested.

It should also be noted that although arguments have been presented with respect to certain claims herein, the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons. Further, the failure to address any statement by the Examiner herein should not be interpreted as acquiescence or agreement with such statement. Applicant expressly reserves the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding, and to rebut any statement presented by the Examiner in this or other papers during prosecution of the present Application.

Applicant: Paul Howard
Application No.: 13/176,298

Respectfully submitted,

Paul Howard

By___/Harry Vartanian/___
Harry Vartanian
Registration No. 56,787

Volpe and Koenig, P.C.
United Plaza
30 South 17th Street
Philadelphia, PA 19103-4009
Telephone: (215) 568-6400
Facsimile: (215) 568-6499

HV/eam

2309704-2

Electronic Patent Application Fee Transmittal

Application Number:	13176298
Filing Date:	05-Jul-2011
Title of Invention:	Feedback Control in an FDD TDD-CDMA System
First Named Inventor/Applicant Name:	Paul Howard
Filer:	Harry Vartanian/Elizabeth McGinty
Attorney Docket Number:	IPW2-USCN191712

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Claims in Excess of 20	1202	8	80	640
Independent claims in excess of 3	1201	2	420	840
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1480**

Electronic Acknowledgement Receipt	
EFS ID:	16034429
Application Number:	13176298
International Application Number:	
Confirmation Number:	4342
Title of Invention:	Feedback Control in an FDD TDD-CDMA System
First Named Inventor/Applicant Name:	Paul Howard
Customer Number:	3624
Filer:	Harry Vartanian/Elizabeth McGinty
Filer Authorized By:	Harry Vartanian
Attorney Docket Number:	IPW2-USCN191712
Receipt Date:	13-JUN-2013
Filing Date:	05-JUL-2011
Time Stamp:	17:20:58
Application Type:	Utility under 35 USC 111(a)

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Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1480
RAM confirmation Number	4701
Deposit Account	220493
Authorized User	VARTANIAN, HARRY
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees) Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IPW2-USCN191712_Reply.PDF	122671 189110b79c0fd9612410d25d4973a985402755e6	yes	24

Multipart Description/PDF files in .zip description

Document Description	Start	End
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Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	32192 33b870c4c851a81c47dfb9fef13ffab4ccbcb111	no	2

Warnings:

Information:

Total Files Size (in bytes):	154863

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/176,298	Filing Date 07/05/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	06/13/2013	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 46	Minus	** 38	= 8	X $80 =	640
	Independent (37 CFR 1.16(h))	* 8	Minus	***6	= 2	X $420 =	840
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**1480**

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/NICOLLE L. SCRIVNER/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/08a (01-10)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	13176298
Filing Date	2011-07-05
First Named Inventor	Paul Howard
Art Unit	2476
Examiner Name	Ronald B. Abelson
Attorney Docket Number	IPW2-USCN191712

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020077151	AA	2002-06-20	Matthews et al.	
	2	20020119798	AA	2002-08-29	Hamabe	
	3	20020150058	AA	2002-10-17	Kim et al.	
	4	20030022683	AA	2003-01-30	Beckmann et al.	
	5	20030069020	AA	2003-04-10	Speight	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Paul Howard
	Art Unit	2476
	Examiner Name	Ronald B. Abelson
	Attorney Docket Number	IPW2-USCN191712

	6	20070265017	AA	2007-11-15	Ishii et al.	
	7	20080090528	AA	2008-04-17	Malladi	
	8	20080144600	AA	2008-06-19	Anderson	
	9	20020196766	AA	2002-12-26	Hwang et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

EFS Web 2.1.17

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Paul Howard
	Art Unit	2476
	Examiner Name	Ronald B. Abelson
	Attorney Docket Number	IPW2-USCN191712

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Paul Howard
	Art Unit	2476
	Examiner Name	Ronald B. Abelson
	Attorney Docket Number	IPW2-USCN191712

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Harry Vartanian/	Date (YYYY-MM-DD)	2013-07-19
Name/Print	Harry Vartanian	Registration Number	56,787

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the **PATENT APPLICATION** of:	
Paul Howard	
Application No.: 13/176,298	Our File: IPW2-USCN191712
Confirmation No.: 4342	Date: July 19, 2013
Filed: July 5, 2011	
For: FEEDBACK CONTROL IN AN FDD TDD-CDMA SYSTEM	
Group: 2476	
Examiner: Ronald B. Abelson	

INFORMATION DISCLOSURE STATEMENT

Mail Stop Amendment (via EFS)
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Madam:

Further to Applicant's Duty of Disclosure pursuant to 37 C.F.R. §1.56, Applicant wishes to bring to the Examiner's attention the material cited on the enclosed Form SB-08. Pursuant to 37 C.F.R. §1.98(a)(2)(ii), copies of the newly cited U.S. publications and/or patent documents have not been included.

This Application is a continuation of U.S Patent Application No. 11/646,692, filed on December 27, 2006, which issued on August 30, 2011 as U.S. Patent No. 8,009,639.

This Information Disclosure Statement is being filed with the fee required by 37 C.F.R. § 1.17(p).

It is respectfully requested that the Examiner consider these documents and return an initialed copy of the Form SB-08 indicating consideration of the cited materials.

Respectfully submitted,

Paul Howard

By /Harry Vartanian/
Harry Vartanian
Registration No. 56,787
(215) 568-6400

Volpe and Koenig, P.C.
United Plaza, Suite 1600
30 South 17th Street
Philadelphia, PA 19103

HV/PCK
Enclosure

Electronic Patent Application Fee Transmittal	
Application Number:	13176298
Filing Date:	05-Jul-2011
Title of Invention:	Feedback Control in an FDD TDD-CDMA System
First Named Inventor/Applicant Name:	Paul Howard
Filer:	John Porrazza/Carey Kulp
Attorney Docket Number:	IPW2-USCN191712
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	16368937
Application Number:	13176298
International Application Number:	
Confirmation Number:	4342
Title of Invention:	Feedback Control in an FDD TDD-CDMA System
First Named Inventor/Applicant Name:	Paul Howard
Customer Number:	3624
Filer:	John Porrazza/Carey Kulp
Filer Authorized By:	John Porrazza
Attorney Docket Number:	IPW2-USCN191712
Receipt Date:	19-JUL-2013
Filing Date:	05-JUL-2011
Time Stamp:	17:48:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$180
RAM confirmation Number	4682
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Information Disclosure Statement (IDS) Form (SB08)	sb08.pdf	634181 16f8764b09f70d51249dac768ddf7e67aec4c812	no	5
Warnings:					
Information:					
2	Transmittal Letter	IDS.pdf	46652 ab0c991faa8142b04b85fd3c25bec72bfc86b10a	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30416 d6d9462706f362760e8a22d23a4a80992373aaf9	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	711249	

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New Applications Under 35 U.S.C. 111
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New International Application Filed with the USPTO as a Receiving Office
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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	07/05/2011	Paul Howard	IPW2-USCN191712	4342

3624 7590 07/24/2013

VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

EXAMINER	
ABELSON, RONALD B	
ART UNIT	**PAPER NUMBER**
2476	

NOTIFICATION DATE	DELIVERY MODE
07/24/2013	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eoffice@volpe-koenig.com

Office Action Summary	Application No. 13/176,298	Applicant(s) HOWARD, PAUL	
	Examiner RONALD B. ABELSON	Art Unit 2476	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 June 2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *45,47-52,54-59,61-66,68-73,75-80 and 82-96* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *45,47-52,54-59,61-66,68-73,75-80 and 82-96* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *1/19/13* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 45, 47, 49, 50, 52, 54, 56, 57, 59, 61, 63, 64, 66, 68, 70, 71, 73, 75, 77, 78, 80, 82, 84, 85, and 89-96 are rejected under 35 U.S.C. 103(a) as being unpatentable Ishii US 20070265017 in view of Matthews US 20020077151 and Anderson US 20080144600.

Regarding claims 45, 52, 59, 66, 73, and 80, Ishii teaches a user equipment (UE) comprising:

a processor configured to receive resource allocation information associated with an uplink physical control channel (uplink control channel, [0207]), wherein the uplink physical

control channel and a physical uplink shared channel / PUSCH have different resources;

the processor is further configured to send data over the physical uplink shared channel in assigned time intervals (uplink control channel can be one of two types, a channel to be time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

Although Ishii teaches time multiplexing the uplink physical control channel and a physical uplink shared channel / PUSCH, the reference is silent on the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information. The Examiner interprets this limitation to be dynamically allocating the time slots for transmitting the uplink physical control channel and a physical uplink shared channel.

Matthews teaches dynamically allocating control channels on uplink time slots (control channels dynamically allocated on

uplink and downlink frequencies, time slots and code channels, [0074]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Ishii by the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information, as suggested by Matthews. This modification would benefit the system by efficiently using bandwidth.

Although Ishii teaches PLCCH, the reference is silent on the processor is further configured to receive feedback information from a downlink control channel.

Anderson teaches a processor in a UE configured to receive feedback information from a downlink control channel (PLCCH implemented for communication of TPC and SS data, transmission comprising TPC and SS data bits for plurality of UEs, [0131]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Malladi by the processor is further configured to receive feedback information

from a downlink control channel, as suggested by Anderson. This modification would benefit the system by providing a proven, reliable method for the UEs to receive feedback data.

Regarding claims 47, 54, 61, 68, 75, 82, the processor is further configured to receive data on a physical downlink shared channel (Ishii: PDSCH, [0207]).

Regarding claims 49, 56, 63, 70, 77, 84, the feedback information includes power control information (Anderson: PLCCH implemented for communication of TPC and SS data, transmission comprising TPC and SS data bits for plurality of UEs, [0131]).

Regarding claims 50, 57, 64, 71, 78, 85, the downlink control channel includes power control information for a plurality of UEs using different bits (Anderson: PLCCH implement by including one TPC data bit and two SS data bits for each UE, [0132], [0136]).

Regarding claims 89-94, the uplink physical control channel, the respective uplink physical control channels, or the physical
uplink shared channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel (Ishii: (uplink control channel can be one of two types, a channel to be time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

Regarding claims 95, 96, the uplink physical control channel, the respective uplink physical control channels, or the physical uplink shared channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal
mobile telecommunication system (UMTS) physical channel (Ishii: uplink control channel can be one of two types, a channel to be

time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

3. Claims 48, 55, 62, 69, 76, and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ishii, Matthews, and Anderson as applied to claim 47, 54, 61, 68, 75, 82 above, and further in view of Beckmann US 20030022683.

Anderson teaches the downlink control channel is time multiplexed (TDD, PLCCH, [0149]).

The combination is silent on teaches the physical downlink shared channel is time multiplexed.

Beckmann teaches the physical downlink shared channel is time multiplexed (TDD, PDSCH, [0030]).

Therefore it would have been obvious to one of ordinary

skill in the art, to modify the system of the combination by the downlink control channel and the physical downlink shared channel are time multiplexed, as shown by Anderson and Beckmann. This modification would benefit the system by providing efficient use of resources.

4. Claim 51, 58, 65, 72, 79, 86, rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ishii, Matthews, and Anderson as applied to claim 45, 52, 59, 66, 73, 80 above, and further in view of Kim US 20020150058.

The combination is silent on in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval.

Kim teaches a channelization code serves to identify uplink channel of each UE, when plurality of UEs simultaneously transmit data in one time slot in NB-TDD CDMA mobile communication system ([0087]).

Therefore it would have been obvious to one of ordinary

skill in the art, to modify the system of the combination by in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval, as suggested by Kim. This modification would benefit the system by allowing a plurality of UEs to transmit simultaneously.

5. 87 and 88 are rejected under 35 U.S.C. 103(a) as being unpatentable Ishii US 20070265017 in view of Matthews US 20020077151, Anderson US 20080144600, and Kim US 20020150058.

Regarding claims 87 and 88, Ishii teaches a user equipment (UE) comprising:

a processor configured to receive resource allocation information associated with an uplink physical control channel (uplink control channel, [0207]), wherein the uplink physical control channel and a physical uplink shared channel / PUSCH have different resources;

the processor is further configured to send data over the physical uplink shared channel in assigned time intervals

(uplink control channel can be one of two types, a channel to be time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

Although Ishii teaches time multiplexing the uplink physical control channel and a physical uplink shared channel / PUSCH, the reference is silent on the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information. The Examiner interprets this limitation to be dynamically allocating the time slots for transmitting the uplink physical control channel and a physical uplink shared channel.

Matthews teaches dynamically allocating control channels on uplink time slots (control channels dynamically allocated on uplink and downlink frequencies, time slots and code channels, [0074]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Ishii by the processor is further configured, in a time interval that it is not sending

information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information, as suggested by Matthews. This modification would benefit the system by efficiently using bandwidth.

Although Ishii teaches PLCCH, the reference is silent on the processor is further configured to receive feedback information from a downlink control channel.

Anderson teaches a processor in a UE configured to receive feedback information from a downlink control channel (PLCCH implemented for communication of TPC and SS data, transmission comprising TPC and SS data bits for plurality of UEs, [0131]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Malladi by the processor is further configured to receive feedback information from a downlink control channel, as suggested by Anderson. This modification would benefit the system by providing a proven, reliable method for the UEs to receive feedback data.

The combination is silent on in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval.

Kim teaches a channelization code serves to identify uplink channel of each UE, when plurality of UEs simultaneously transmit data in one time slot in NB-TDD CDMA mobile communication system ([0087]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of the combination by in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval, as suggested by Kim. This modification would benefit the system by allowing a plurality of UEs to transmit simultaneously.

Response to Arguments

6. Applicant's arguments with respect to claims have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RONALD B. ABELSON whose telephone number is (571)272-3165. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ayaz Sheikh can be reached on (571) 272-3795. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RONALD B ABELSON
Primary Examiner
Art Unit 2476

***

***

/RONALD B ABELSON/

Primary Examiner, Art Unit 2476

Notice of References Cited	Application/Control No. 13/176,298	Applicant(s)/Patent Under Reexamination HOWARD, PAUL	
	Examiner RONALD B. ABELSON	Art Unit 2476	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2007/0265017	11-2007	Ishii et al.	455/453
*	B	US-2002/0077151	06-2002	Matthews et al.	455/561
*	C	US-2008/0144600	06-2008	Anderson, Nicholas William	370/350
*	D	US-2003/0022683	01-2003	Beckmann et al.	455/518
*	E	US-2002/0150058	10-2002	Kim et al.	370/280
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013							
	45	✓	✓							
	46	O	-							
	47	O	✓							
	48	O	✓							
	49	O	✓							
	50	O	✓							
	51	✓	✓							
	52	✓	✓							
	53	O	-							
	54	O	✓							
	55	O	✓							
	56	O	✓							
	57	O	✓							
	58	O	✓							
	59	✓	✓							
	60	O	-							
	61	O	✓							
	62	O	✓							
	63	O	✓							
	64	O	✓							
	65	O	✓							
	66	✓	✓							
	67	O	-							
	68	O	✓							
	69	O	✓							
	70	O	✓							
	71	O	✓							
	72	O	✓							
	73	✓	✓							
	74	O	-							
	75	O	✓							
	76	O	✓							
	77	O	✓							
	78	O	✓							
	79	O	✓							
	80	✓	✓							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013							
	81	O	-							
	82	O	✓							
	83	O	✓							
	84	O	✓							
	85	O	✓							
	86	O	✓							
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Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	**Art Unit**
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013							
	117									
	118									
	119									
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	121									
	122									
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
East database	7/17/13	RA

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the **PATENT APPLICATION** of:	
Paul Howard	
Application No.: 13/176,298	
Confirmation No.: 4342	
Filed: July 5, 2011	
For: FEEDBACK CONTROL IN AN FDD TDD-CDMA SYSTEM	
Group: 2476	
Examiner: Ronald B. Abelson	

Our File: IPW2-USCN191712
Date: October 24, 2013

REPLY PURSUANT TO 37 C.F.R. §1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This Reply is being timely filed in response to the Non-final Office Action dated July 24, 2013.

Please amend the application without prejudice or disclaimer as follows:

REMARKS/ARGUMENTS

Claims 45, 47-52, 54-59, 61-66, 68-73, 75-80, and 82-96 are currently pending in this application.

Request for a Telephonic Interview

If the Examiner determines that a Final Rejection is needed subsequent to this response without any allowable claims, the Applicant respectfully asks the Examiner to contact the undersigned before doing so.

Claim Rejections - 35 U.S.C § 103(a)

Claims 45, 47, 49, 50, 52, 54, 56, 57, 59, 61, 63, 64, 66, 68, 70, 71, 73, 75, 77, 78, 80, 82, 84, 85, and 89-96 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Publication No. 2007/0265017 to Ishii (hereinafter "Ishii") in view of U.S. Publication No. 2002/0077151 to Matthews (hereinafter "Matthews") and U.S. Publication No. 2008/0144600 to Anderson (hereinafter "Anderson").

Ishii is related to call admission control and scheduling primarily in a HSPA system. In Ishii, call admission may be based on the activity of mobile stations in an HSPA cell.

In the outstanding Office Action, the Examiner correctly states that Ishii at least does not teach or suggest "in a time interval that it is not sending information

over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information…" as found in claim 45. However, the Examiner improperly interprets this feature and makes a generalization that this feature may mean "dynamically allocating the time slots for transmitting the uplink physical control channel and a physical uplink shared channel."

On the contrary, this feature of claim 45 may mean that a user equipment (UE) is configured to send a signal on an uplink physical control channel **using allocated resources** in the same time interval it is not sending information on a physical uplink shared channel. This feature of claim 45 specifically relates to channel configurations, channel resource allocation, and timing relationships that is simply not "dynamically allocating the time slots."

Matthews does not teach or cure the deficiencies of Ishii. The outstanding Office Action points to paragraph [0074] as allegedly teaching "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information…" as found in claim 45. Paragraph [0074] or any other part of Matthews at least does not teach this feature. Paragraph [0074] recites:

> The radio network of the present invention provides for capacity expansion through frequency reuse among a preponderance of intercommunicating nanoCell base stations. Communications and

> control channels are capable of being dynamically allocated from a set of allowed uplink and downlink frequencies, time slots and code channels. Communication paths are dynamically assigned to the appropriate base station based on traffic load, quality of service requirements and intercommunicating base station connectivity constraints.

Paragraph [0074] makes a general statement about dynamic allocation of wireless resources. Matthews or paragraph [0074] do not specifically teach the channel configurations, channel resource allocation, and timing relationships where "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information…" as found in claim 45. Moreover, Matthews does not even teach or suggest the interworking between **an uplink shared channel** and an uplink physical control channel as in claim 45.

The combination of Ishii, Matthew, and Anderson is moot since Ishii and Matthews, alone or combined, do not teach or suggest the feature of "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information…" as found in claim 45.

Claims 52, 59, 66, 73, and 80 have features similar to those found in claim 45. Thus claims 52, 59, 66, 73, and 80 are allowable for at least the same reasons provided above for claim 45.

Claims 47, 49, 50, 54, 56, 57, 61, 63, 64, 68, 70, 71, 75, 77, 78, 82, 84, 85, and 89-94 are dependent upon claims 45, 52, 59, 66, 73, and 80, which the Applicant believes are allowable over the cited prior art of record for the same reasons provided above.

Based on the arguments presented above, withdrawal of the 35 U.S.C § 103(a) rejection of claims 45, 47, 49, 50, 52, 54, 56, 57, 59, 61, 63, 64, 66, 68, 70, 71, 73, 75, 77, 78, 80, 82, 84, 85, and 89-96 is respectfully requested.

Claims 48, 55, 62, 69, 76, and 83 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishii in view of Matthews and Anderson as applied to claims 47, 54, 61, 68, 75, and 82 above, and in further view of U.S. Publication No. 2003/0022683 to Beckmann (hereinafter "Beckmann").

The combination of Ishii, Matthews, Anderson, and Beckman is moot since Ishii and Matthews, alone or combined, do not teach or suggest the feature of "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information..." as found in claim 45. This feature is also similarly found in claims 52, 59, 66, 73, and 80.

Based on the arguments presented above, withdrawal of the 35 U.S.C § 103(a) rejection of claims 48, 55, 62, 69, 76, and 83 is respectfully requested.

Claims 51, 58, 65, 72, 79, and 86 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishii in view of Matthews and Anderson as applied to claims 45, 52, 59, 66, 73, and 80 above, and in further view of U.S. Publication No. 2002/0150058 to Kim (hereinafter "Kim").

The combination of Ishii, Matthews, Anderson, and Kim is moot since Ishii and Matthews, alone or combined, do not teach or suggest the feature of "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information…" as found in claim 45. This feature is also similarly found in claims 52, 59, 66, 73, and 80.

Based on the arguments presented above, withdrawal of the 35 U.S.C § 103(a) rejection of claims 51, 58, 65, 72, 79, and 86 is respectfully requested.

Claims 87 and 88 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishii in view Matthews, Anderson, and Kim. The combination of Ishii, Matthews, Anderson, and Kim is moot since Ishii and Matthews, alone or combined, do not teach or suggest the feature of "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information…" as found in claim 45. This feature is also similarly found in claims 52, 59, 66, 73, and 80.

Furthermore, Ishii in view Matthews, Anderson, and Kim, alone or in combination, do not teach the feature in claims 87 and 88 of "in the time interval that the signal on the uplink physical control channel is sent by the UE, a plurality of UEs each send respective signals on respective uplink physical control channels in the time interval."

Based on the arguments presented above, withdrawal of the 35 U.S.C § 103(a) rejection of claims 87 and 88 is respectfully requested.

Conclusion

It should also be noted that although arguments have been presented with respect to certain claims herein, the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons. Further, the failure to address any statement by the Examiner herein should not be interpreted as acquiescence or agreement with such statement. The Applicant expressly reserves the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding, and to rebut any statement presented by the Examiner in this or other papers during prosecution of the present Application.

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a

telephone interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendment and remarks, Applicant respectfully submits that the present application is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

Paul Howard

By /Harry Vartanian/
Harry Vartanian
Registration No. 56,787

Volpe and Koenig, P.C.
United Plaza
30 South 17th Street
Philadelphia, PA 19103-4009
Telephone: (215) 568-6400
Facsimile: (215) 568-6499

HV/eam

Electronic Acknowledgement Receipt	
EFS ID:	17221475
Application Number:	13176298
International Application Number:	
Confirmation Number:	4342
Title of Invention:	Feedback Control in an FDD TDD-CDMA System
First Named Inventor/Applicant Name:	Paul Howard
Customer Number:	3624
Filer:	Harry Vartanian/Elizabeth McGinty
Filer Authorized By:	Harry Vartanian
Attorney Docket Number:	IPW2-USCN191712
Receipt Date:	24-OCT-2013
Filing Date:	05-JUL-2011
Time Stamp:	17:01:12
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IPW2-USCN191712_Reply.PDF	106912 a7f578467e8898955e80c263ed9d8dd1a0b7e941	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	8
Warnings:			
Information:			
	Total Files Size (in bytes):	106912	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	07/05/2011	Paul Howard	IPW2-USCN191712	4342

3624 7590 11/06/2013

VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

EXAMINER	
ABELSON, RONALD B	
ART UNIT	PAPER NUMBER
2476	

NOTIFICATION DATE	DELIVERY MODE
11/06/2013	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eoffice@volpe-koenig.com

Office Action Summary	Application No. 13/176,298	Applicant(s) HOWARD, PAUL	
	Examiner RONALD B. ABELSON	Art Unit 2476	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/24/13*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *45,47-52,54-59,61-66,68-73,75-80 and 82-96* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *45,47-52,54-59,61-66,68-73,75-80 and 82-96* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *1/19/13* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

1. The present application is being examined under the pre-AIA first to invent provisions.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 45, 47, 49, 50, 52, 54, 56, 57, 59, 61, 63, 64, 66, 68, 70, 71, 73, 75, 77, 78, 80, 82, 84, 85, and 89-96 are rejected under 35 U.S.C. 103(a) as being unpatentable Ishii US 20070265017 in view of Matthews US 20020077151 and Anderson US 20080144600.

Regarding claims 45, 52, 59, 66, 73, and 80, Ishii teaches a user equipment (UE) comprising:

a processor configured to receive resource allocation information associated with an uplink physical control channel (uplink control channel, [0207]), wherein the uplink physical control channel and a physical uplink shared channel / PUSCH have different resources;

the processor is further configured to send data over the physical uplink shared channel in assigned time intervals (uplink control channel can be one of two types, a channel to be time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

Although Ishii teaches time multiplexing the uplink physical control channel and a physical uplink shared channel / PUSCH, the reference is silent on the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information. The Examiner interprets this limitation to be dynamically allocating the time slots for transmitting the uplink physical control channel and a

physical uplink shared channel based on received resource allocation information transmitted from the network.

Matthews teaches dynamically allocating control channels on uplink time slots (control channels dynamically allocated on uplink and downlink frequencies, time slots and code channels, [0074]) based on received resource allocation information transmitted from the network (primary base station subsystem provides principle interface between base station controller and radio network, commands from base station controller interface used to configure primary base station, frequency, time slot and code channel allocation are based on commands received through the base station controller interface, [0084]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Ishii by the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information, as suggested by Matthews. This modification would benefit the system by efficiently using bandwidth.

Although Ishii teaches PLCCH, the reference is silent on the processor is further configured to receive feedback information from a downlink control channel.

Anderson teaches a processor in a UE configured to receive feedback information from a downlink control channel (PLCCH implemented for communication of TPC and SS data, transmission comprising TPC and SS data bits for plurality of UEs, [0131]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Malladi by the processor is further configured to receive feedback information from a downlink control channel, as suggested by Anderson. This modification would benefit the system by providing a proven, reliable method for the UEs to receive feedback data.

Regarding claims 47, 54, 61, 68, 75, 82, the processor is further configured to receive data on a physical downlink shared channel (Ishii: PDSCH, [0207]).

Regarding claims 49, 56, 63, 70, 77, 84, the feedback information includes power control information (Anderson: PLCCH

implemented for communication of TPC and SS data, transmission comprising TPC and SS data bits for plurality of UEs, [0131]).

Regarding claims 50, 57, 64, 71, 78, 85, the downlink control channel includes power control information for a plurality of UEs using different bits (Anderson: PLCCH implement by including one TPC data bit and two SS data bits for each UE, [0132], [0136]).

Regarding claims 89-94, the uplink physical control channel, the respective uplink physical control channels, or the physical
uplink shared channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel (Ishii: (uplink control channel can be one of two types, a channel to be time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

Regarding claims 95, 96, the uplink physical control channel, the respective uplink physical control channels, or the physical uplink shared channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel (Ishii: uplink control channel can be one of two types, a channel to be time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

4. Claims 48, 55, 62, 69, 76, and 83 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ishii, Matthews, and Anderson as applied to claim 47, 54, 61, 68, 75, 82 above, and further in view of Beckmann US 20030022683.

Anderson teaches the downlink control channel is time multiplexed (TDD, PLCCH, [0149]).

The combination is silent on teaches the physical downlink shared channel is time multiplexed.

Beckmann teaches the physical downlink shared channel is time multiplexed (TDD, PDSCH, [0030]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of the combination by the downlink control channel and the physical downlink shared channel are time multiplexed, as shown by Anderson and Beckmann. This modification would benefit the system by providing efficient use of resources.

5. Claim 51, 58, 65, 72, 79, 86, rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ishii, Matthews, and Anderson as applied to claim 45, 52, 59, 66, 73, 80 above, and further in view of Kim US 20020150058.

The combination is silent on in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval.

Kim teaches a channelization code serves to identify uplink channel of each UE, when plurality of UEs simultaneously transmit data in one time slot in NB-TDD CDMA mobile communication system ([0087]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of the combination by in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval, as suggested by Kim. This modification would benefit the system by allowing a plurality of UEs to transmit simultaneously.

6. Claims 87 and 88 are rejected under 35 U.S.C. 103(a) as being unpatentable Ishii US 20070265017 in view of Matthews US 20020077151, Anderson US 20080144600, and Kim US 20020150058.

Regarding claims 87 and 88, Ishii teaches a user equipment (UE) comprising:

a processor configured to receive resource allocation information associated with an uplink physical control channel (uplink control channel, [0207]), wherein the uplink physical control channel and a physical uplink shared channel / PUSCH have different resources;

the processor is further configured to send data over the physical uplink shared channel in assigned time intervals (uplink control channel can be one of two types, a channel to be time-multiplexed with physical uplink shared channel PUSCH and a channel to be frequency-multiplexed with it, [0207]).

Although Ishii teaches time multiplexing the uplink physical control channel and a physical uplink shared channel / PUSCH, the reference is silent on the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information. The Examiner interprets this limitation to be dynamically allocating the time

slots for transmitting the uplink physical control channel and a physical uplink shared channel.

Matthews teaches dynamically allocating control channels on uplink time slots (control channels dynamically allocated on uplink and downlink frequencies, time slots and code channels, [0074]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Ishii by the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information, as suggested by Matthews. This modification would benefit the system by efficiently using bandwidth.

Although Ishii teaches PLCCH, the reference is silent on the processor is further configured to receive feedback information from a downlink control channel.

Anderson teaches a processor in a UE configured to receive feedback information from a downlink control channel (PLCCH

implemented for communication of TPC and SS data, transmission comprising TPC and SS data bits for plurality of UEs, [0131]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of Malladi by the processor is further configured to receive feedback information from a downlink control channel, as suggested by Anderson. This modification would benefit the system by providing a proven, reliable method for the UEs to receive feedback data.

The combination is silent on in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control channels in that time interval.

Kim teaches a channelization code serves to identify uplink channel of each UE, when plurality of UEs simultaneously transmit data in one time slot in NB-TDD CDMA mobile communication system ([0087]).

Therefore it would have been obvious to one of ordinary skill in the art, to modify the system of the combination by in the time interval that the uplink physical control channel is sent, a plurality of UEs transmit on uplink physical control

channels in that time interval, as suggested by Kim. This modification would benefit the system by allowing a plurality of UEs to transmit simultaneously.

Response to Arguments

7. Applicant's arguments filed 10/24/13 have been fully considered but they are not persuasive. Applicant argues Matthews or paragraph [0074] do not specifically teach the channel configurations, channel resource allocation, and timing relationships where "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information..." as found in claim 45 (pg. 1st paragraph). However, Ishii teaches time multiplexing the physical uplink shared channel and the uplink physical control channel. Furthermore, Matthews teaches dynamically allocating control channels on uplink time slots based on received resource allocation information transmitted from the network. In the same paragraph the applicant states, “Matthews does not even teach or suggest the interworking between an uplink shared channel and an uplink physical control channel as in claim 45”. However, as shown above, Ishii teaches

interworking between an uplink shared channel and an uplink physical control channel.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RONALD B. ABELSON whose telephone number is (571)272-3165. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ayaz Sheikh can be reached on (571) 272-3795. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RONALD B ABELSON
Primary Examiner
Art Unit 2476

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/RONALD B ABELSON/

Primary Examiner, Art Unit 2476

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013	10/29/2013						
	45	✓	✓	✓						
	46	O	-	-						
	47	O	✓	✓						
	48	O	✓	✓						
	49	O	✓	✓						
	50	O	✓	✓						
	51	✓	✓	✓						
	52	✓	✓	✓						
	53	O	-	-						
	54	O	✓	✓						
	55	O	✓	✓						
	56	O	✓	✓						
	57	O	✓	✓						
	58	O	✓	✓						
	59	✓	✓	✓						
	60	O	-	-						
	61	O	✓	✓						
	62	O	✓	✓						
	63	O	✓	✓						
	64	O	✓	✓						
	65	O	✓	✓						
	66	✓	✓	✓						
	67	O	-	-						
	68	O	✓	✓						
	69	O	✓	✓						
	70	O	✓	✓						
	71	O	✓	✓						
	72	O	✓	✓						
	73	✓	✓	✓						
	74	O	-	-						
	75	O	✓	✓						
	76	O	✓	✓						
	77	O	✓	✓						
	78	O	✓	✓						
	79	O	✓	✓						
	80	✓	✓	✓						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
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	Examiner	Art Unit
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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013	10/29/2013						
	81	O	-	-						
	82	O	✓	✓						
	83	O	✓	✓						
	84	O	✓	✓						
	85	O	✓	✓						
	86	O	✓	✓						
	87		✓	✓						
	88		✓	✓						
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	13176298	HOWARD, PAUL
	Examiner	**Art Unit**
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013	10/29/2013						
	117									
	118									
	119									
	120									
	121									
	122									
	123									
	124									
	125									
	126									
	127									
	128									
	129									
	130									

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the **PATENT APPLICATION** of:	
Paul Howard	
Application No.: 13/176,298	
Confirmation No.: 4342	
Filed: July 5, 2011	
For: FEEDBACK CONTROL IN AN FDD TDD-CDMA SYSTEM	
Group: 2476	
Examiner: Ronald B. Abelson	

Our File: IPW2-USCN191712
Date: April 1, 2014

REPLY PURSUANT TO 37 C.F.R. §1.116

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

This Reply is being filed in response to the Final Office Action dated November 6, 2013. A petition for an extension of time is submitted herewith.

REMARKS/ARGUMENTS

Claims 45, 47-52, 54-59, 61-66, 68-73, 75-80, and 82-96 are currently pending in this application.

Declaration Pursuant to 37 C.F.R. §1.131

A Declaration pursuant to 37 C.F.R. §1.131 with Exhibits is submitted herewith to swear behind U.S. Publication No. 2007-0265017 to Ishii (hereinafter "Ishii"). The declaration evidences that the present claimed invention was made at least before November 29, 2006 (Ishii's earliest U.S. filing date).

Claim Rejections - 35 U.S.C. § 103(a)

Claims 45, 47, 49, 50, 52, 54, 56, 57, 59, 61, 63, 64, 66, 68, 70, 71, 73, 75, 77, 78, 80, 82, 84, 85, and 89-96 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishii in view of U.S. Publication No. 2002-0077151 to Matthews (hereinafter "Matthews") and U.S. Publication No. 2008-0144600 to Anderson (hereinafter "Anderson"). Without conceding the propriety of the rejection, in an effort to advance prosecution of the present application, a declaration pursuant to 37 C.F.R. §1.131 is submitted herewith that disqualifies Ishii as a 35 U.S.C. 102(e).

Without Ishii as a primary reference, Claims 45, 47, 49, 50, 52, 54, 56, 57, 59, 61, 63, 64, 66, 68, 70, 71, 73, 75, 77, 78, 80, 82, 84, 85, and 89-96 are allowable over Matthews in view of Anderson.

Based on the arguments presented above, withdrawal of the 35 U.S.C. § 103(a) rejection of claims 45, 47, 49, 50, 52, 54, 56, 57, 59, 61, 63, 64, 66, 68, 70, 71, 73, 75, 77, 78, 80, 82, 84, 85, and 89-96 is respectfully requested.

Claims 48, 55, 62, 69, 76, and 83 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishii, Matthews, and Anderson as applied to claims 47, 54, 61, 68, 75 and 82 above and in further view of U.S. Publication No. 2003-0022683 to Beckmann (hereinafter "Beckmann"). Claims 48, 55, 62, 69, 76, and 83 are allowed for at least the same reasons provided above.

Based on the arguments presented above, withdrawal of the 35 U.S.C. § 103(a) rejection of claims 48, 55, 62, 69, 76, and 83 is respectfully requested.

Claims 51, 58, 65, 72, 79, and 86 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishii, Matthews, and Anderson as applied to claims 45, 52, 59, 66, 73, and 80 above and in further view of U.S. Publication 2002-0150058 to Kim (hereinafter "Kim). Claims 51, 58, 65, 72, 79, and 86 are allowed for at least the same reasons provided above.

Based on the arguments presented above, withdrawal of the 35 U.S.C. § 103(a) rejection of claims 51, 58, 65, 72, 79, and 86 is respectfully requested.

Claims 87 and 88 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishii, Matthews, Anderson, and Kim. Claims 87 and 88 are allowed for at least the same reasons provided above.

Based on the arguments presented above, withdrawal of the 35 U.S.C. § 103(a) rejection of claims 87 and 88 is respectfully requested.

Conclusion

It should be noted that although arguments have been presented with respect to certain claims herein, the recited subject matter as well as various other subject matter and/or combinations of subject matter may be patentable for other reasons. Further, the failure to address any statement by the Examiner herein should not be interpreted as acquiescence or agreement with such statement. The Applicant expressly reserves the right to set forth additional and/or alternative reasons for patentability and/or allowance with the present Application or in any other future proceeding, and to rebut any statement presented by the Examiner in this or other papers during prosecution of the present Application.

If the Examiner believes that any additional minor formal matters need to be addressed in order to place this application in condition for allowance, or that a telephonic interview will help to materially advance the prosecution of this application, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing, Applicants respectfully submit that the present application is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,

Paul Howard

By /Harry Vartanian/
Harry Vartanian
Registration No. 56,787

Volpe and Koenig, P.C.
United Plaza
30 South 17th Street
Philadelphia, PA 19103-4009
Telephone: (215) 568-6400
Facsimile: (215) 568-6499

HV/eam

PTO/SB/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) IPW2-USCN191712
Application Number 13/176,298	Filed July 5, 2011
For Feedback Control in an FDD TDD-CDMA System	
Art Unit 2476	Examiner Ronald B. Abelson

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$200	$100	$50	$
☑	Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$ 600
☐	Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐	Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐	Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☑ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 22-0493.

☑ Payment made via EFS-Web.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. 37 CFR 3.73(b) statement is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration number 56,787.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Harry Vartanian/	April 1, 2014
Signature	Date
Harry Vartanian	215-568-6400
Typed or printed name	Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public, which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the PATENT APPLICATION of: Paul Howard **Application No.:** 13/176,298 **Confirmation No.:** 4342 **Filed:** July 5, 2011 For: Feedback Control in an FDD TDD-CDMA System Group: 2476 Examiner: Ronald B. Abelson	Our File: IPW2-USCN191712 Date: March 29, 2014

DECLARATION PURSUANT TO 37 C.F.R. §1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

1. I, Paul Howard, am the sole inventor of the subject matter of the above-identified patent application as described therein.
2. The above-referenced application is a continuation of U.S. Appln. No. 11/646,692, filed December 27, 2006, which issued as U.S. Patent No. 8,009,639, which also lists me as the sole inventor.
3. Prior to December 27, 2006, the U.S. effective filing date of the above-identified patent application, I conceived of and completed the invention disclosed and claimed in the above-identified patent application.
4. The acts relied upon to establish a date prior to U.S. Publication 2007-0265017 to Ishii (hereinafter "Ishii" that has an effective U.S. filing date under Pre-AIA 35 U.S.C. 102(e) of **November 29, 2006**) were carried out in the United Kingdom. As required by 37 CFR 1.131(a), the United

Kingdom was a World Trade Organization (WTO) member country prior to December 27, 2006 and during the entire period of the acts being relied upon herein.

5. Prior to November 29, 2006, I received an email from outside U.S. counsel, Morrison Foerster, to discuss an Invention Disclosure (also referred to as the IPW 20074.00 application) that I had previously prepared for the subject matter of the above-identified patent application (Exhibit A). The dates in the Invention Disclosure are redacted in Exhibit A, but are prior to November 29, 2006. The Invention Disclosure discloses the features of the subject matter claimed in this application.
6. Prior to November 29, 2006, and after the date of Exhibit A, I received an email from U.S. outside counsel, Morrison Foerster, to further discuss the subject matter of the above-identified patent application (Exhibit B). The dates in the email are redacted in Exhibit B, but are prior to November 29, 2006.
7. I received an email from U.S. outside counsel, Morrison Foerster, for feedback related to the subject matter of the above-identified patent application (Exhibit C) on October 13, 2006.
8. I received an email from U.S. outside counsel, Morrison Foerster, with the first draft of the above-identified patent application (Exhibit D) on December 15, 2006. The first draft of the above-identified patent application discloses the features claimed in this application.
9. The patent application, which resulted in U.S. Pat. No. 8,009,639, was then filed on December 27, 2006.

10. It was my intent to file a U.S. patent application based on the Invention Disclosure in Exhibit D without delay. As proven above, I worked diligently with U.S. patent counsel from a date prior to November 29, 2006 up to the filing date of December 27, 2006 to complete and file the application which resulted in U.S. Pat. No. 8,009,639.

11. I have been warned that willful false statement and the like are punishable by fine or imprisonment or both (18 U.S.C. §1001) and may jeopardize the validity of the application or any patent issuing thereon.

We declare under penalty of perjury that the foregoing is true and correct.

Executed on this 31ST day of March 2014 at TGWYSON COTTAGE TGWYSON ROAD BRISTOL BS7 8SB UNITED KINGDOM.

Paul Howard

2961624-2

EXHIBIT A

From: Saltzberg, Robert A. <RSaltzberg@mofo.com>
Sent: [redacted]
To: Paul Howard
Cc: [redacted]
Subject: Patent Application
Attachments: FDD Disclosure.doc

REDACTED

Dear Paul,

Are you free either Wednesday, Thursday or Friday of this week at 5:15 pm UK time to discuss your patent application?

Best regards,
Rob Saltzberg

Robert Saltzberg
Morrison & Foerster
425 Market Street
San Francisco, CA 94105
W: 415 268-6428
F: 415 268-7522

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To ensure compliance with requirements imposed by the IRS, Morrison & Foerster LLP informs you that, if any advice concerning one or more U.S. Federal tax issues is contained in this communication (including any attachments), such advice is not intended or written to be used, and cannot be used, for the purpose of (i) avoiding penalties under the Internal Revenue Code or (ii) promoting, marketing or recommending to another party any transaction or matter addressed herein.

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IPWireless

subject:

date: [redacted]

circ:
cc:

from:

ref:

REDACTED

INTERNAL MEMORANDUM

Patent Disclosure for FDD TD-CDMA Concept

1 Background

TD-CDMA is an air-interface technology that combines benefits of the three elemental concepts of time division multiple access, code division multiple access and time division duplex.

Most pertinent aspect to this disclosure is the concept of time division duplex (TDD). Time division duplex uses the same radio channel for both uplink and downlink communications, discrimination between the links is achieved by separating the transmissions in time. One of the benefits obtained by operating both links on the same frequency is the ability to exploit the phenomenon of channel reciprocity.

In particular, channel reciprocity gives equipment the ability to derive information about the uplink channel conditions from the downlink channel conditions derived from signals received by the equipment. Pathloss is one aspect the channel information that can be obtained from channel reciprocity. Knowledge of the uplink pathloss enables open-loop power control to be employed for uplink transmissions. Note that uplink power control is important for the operation of the CDMA element of TD-CDMA as it counteracts the near-far effect that would otherwise be encountered if all UEs transmitted at a fixed power irrespective of the uplink pathloss.

The open-loop uplink power control feature provides a significant advantage when coupled with a multiple access data transmission system that is used for packet based communication and/or shared channels. When access to a limited number of uplink channels is shared between a large population of terminals it is imperative that access to the channels can be switched between terminals with minimal latency. A data terminal that can derive information needed to access uplink channels from the downlink transmissions (beacon signals) has a significant advantage over a terminal that relies on the (lengthy) configuration of a dedicated channel in order to establish a feedback channel as well as reserved capacity for data transfer.

However, channel reciprocity can not always be guaranteed. For example TDD transmissions may not be permitted in certain spectrum allocations; this is a regulatory issue and may be used to protect other wireless equipment in the same or adjacent bands. In these situations the correlation between uplink and downlink channels is lost because the channels are transported on carrier frequencies that are separated in frequency by an amount that is greater than the coherence bandwidth of the channel (usually, only a few MHz separation is sufficient to make the uplink and downlink fading profiles independent).

In high speed mobile applications, the time delay between downlink and uplink transmissions may exceed the coherence time of the channel. The maximum time delay that can be tolerated is a function of the mobile speed and the RF carrier frequency used, with the coherence time reducing with increasing speed and RF carrier frequency.

Also, the use of multiple transmit and/or receive antennas at the network and/or the mobile terminal can introduce intentional decorrelation between the uplink and downlink channels.

If the TD-CDMA air interface is to be used in applications where the correlation between the uplink and downlink path loss is not guaranteed then a substitute for channel reciprocity needs to be found.

2 Invention

Although there is a lot of prior art on the subject of supporting air-interfaces where the pathloss is not reciprocal, we believe there is little prior art that deals directly with the evolution or adaptation of an air-interface that uses *channel reciprocity* to deliver key features and advantages to operate in the conditions where channel reciprocity is not guaranteed. The adaptation described here introduces a new method for uplink channel control that introduces a feedback scheme as a substitute for the loss in channel reciprocity with minimal impact on the ability of the air interface to support uplink shared channels.

The approach taken here is to try to develop a 'concept-level' disclosure that covers the scheme in the most general sense and this is then supported by a number of detail-level disclosures that capture the specific implementations needed to implement the concept.

2.1 TDD to FDD Evolution

A system designed for operation in Time Division Duplex (TDD) mode has basestations and terminals that transmit and receive at orthogonal points in time. In normal operation terminals are in receive mode when the basestation is transmitting and basestations are in receive mode when terminals are transmitting. In conventional implementations, neither basestations nor the terminals are able to transmit and receive at the same points in time (because the same frequency is used for uplink and downlink communication).

Such a system can be evolved to operate in FDD mode where the uplink and downlink communications occur on different frequencies. In order to make full and efficient use of the spectrum resource, the basestations are adapted to permit them to transmit and receive at the same time (note this is possible since the uplink and downlink communications now occur on different frequencies). The terminals retain the restriction of transmitting and receiving at orthogonal points in time to preserve the complexity saving that come as a consequence for not having to transmit and receive at the same time (eg no duplexer required). The full use of the spectrum is then obtained by allocating the resource across a plurality of terminals.

Additional measures may be required if there are aspects of the air-interface that rely on the channel reciprocity that can be assumed for TDD systems. In the case of TD-CDMA, modifications are required for the correct operation of:

i) **uplink power control and rate adaptation**
This achieved by the definition of an uplink physical control channel used for estimating the uplink channel conditions and a downlink channel used to feeback control information to the terminal. These channels do not need an associated data physical channel to be operational.

ii) **random access channel**
This is achieved by introducing an additional indicator step at the start of any physical random access. A new uplink physical channel is defined to carry the random access indicators. A new downlink physical channel is defined to carry response to received uplink indicators.

2.2 Uplink Physical Channel Control Signal

When pathloss reciprocity is not available, the combination of an uplink physical channel control signal with a downlink feedback channel can be used as an alternative mechanism to keep the terminal informed of the condition of the uplink channel. A system that relies on pathloss reciprocity will need to be expanded to include these additional components. The terminology applied to these channels in the rest of the document refers to the uplink physical control signal as an 'Uplink Beacon' (UL_Beacon) and a Downlink Feedback Channel.

In general, a system that supports shared channels will also support a large number of terminals that share access to them. To extract the maximum benefit from the resulting trunking gain, it is important that the shared channels can be quickly and efficiently re-allocated between the population of UEs. In order to obtain rapid access to the uplink shared channels, terminals need to be able to transmit at the correct power with their first transmission so that latency can be kept to a minimum.

This invention proposes that the physical channel control signal is separate from the uplink (shared) physical channel. With this innovation, terminals are able to transmit an UL_Beacon independently of their access to the uplink shared channel. The system implements a closed loop control system by requiring that the basestation detects the received power and/or other channel information from the UL_Beacon and sends controlling commands back to each terminal in order to keep the terminal informed of the channel conditions observed at the basestation.

In its simplest form the closed loop control system is simply based on the UL_Beacon power received at the basestation. Power control commands are then sent on a shared downlink channel to each terminal based on the power received from the UL_Beacon signal. This channel is referred to as the Physical Layer Control Channel (PLCCH). The capacity of the PLCCH is matched to the number of bits required in the feedback field and the number of UL_Beacon signals that can be supported simultaneously. All terminals transmitting UL_Beacon signals receive this channel and extract the relevant feedback field.

It is possible to extend the complexity of the control loop by sending control commands based on other aspects of the UL_Beacon signal as received by the basestation, such as time-of-arrival, channel impulse response etc. The amount of resource that is required for the feedback channel increases with the size (in bits) of the feedback information to each UE.

2.3 Example Arrangement

For air-interface technologies with a Time Division Multiple Access element, it is possible to adapt the TDMA frame structure to provide separation between the UL_Beacon and the normal physical channels by dedicating at least one uplink timeslot per frame (or at least one timeslot per multi-frame) to carrying UL_Beacon signals.

By placing UL_Beacon signals in a dedicated timeslot, a dedicated detection scheme can be applied which may include performance enhancing features such as intra-cell cancelling (for alleviating the effects of cross-correlation interference between UL_Beacon signals transmitted by multiple terminals in the same cell), or inter-cell cancelling (for reducing the interference from neighbouring cells in the case where the UL_Beacon timeslots are time synchronised). Cross interference between UL_Beacon and normal uplink bursts is avoided by the separation obtained from the use of separate timeslots.

There are a large number of possibilities for the arrangement of UL_Beacon and its associated PLCCH within the frame structure of an existing standard. More than one UL_Beacon and PLCCH per frame could be supported if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). For system applications that can tolerate a slower feedback rate, it may be possible to fractionate the use of the UL_Beacon timeslot (and the associated PLCCH).

When fractionation is employed, the allocation of the UL_Beacon timeslot in a given frame is assigned to a group of terminals depending on the current fractionation phase, thus increasing the number of terminals that can be supported with active physical channel feedback control. The maximum fractionation cycle length is determined by the feedback update rate that the system requires in order to meet its performance targets.

Figure 1 shows an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCH within a TD-CDMA frame structure modified to support FDD. Note that this is an illustration only; it does not represent a preferred implementation. In this example, the PLCCH shares a timeslot with another downlink shared channel, this is possible since normal downlink physical channels are used to transmit the PLCCH.

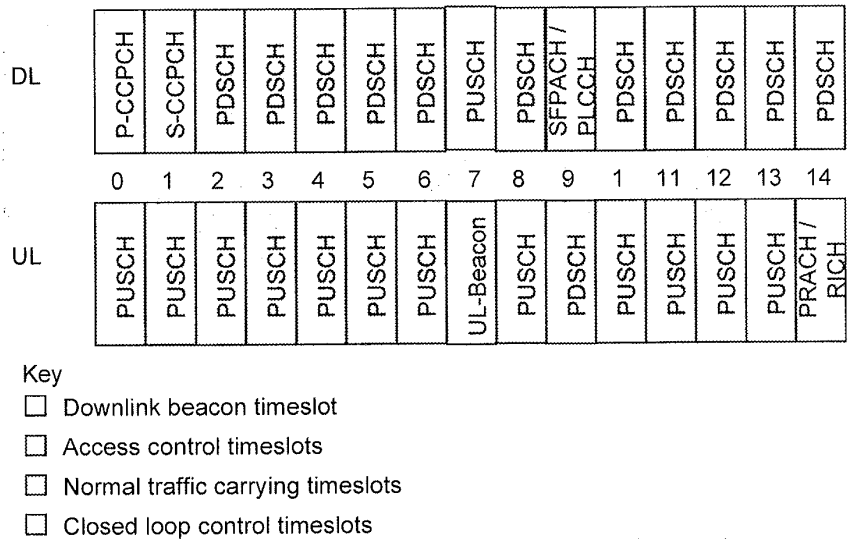


Figure 1 Example of UL_Beacon and PLCCH timeslot arrangement

The diagram in Figure 2 shows an example where fractionation is employed. The UL_Beacon and PLCCH timeslots are active in every frame at the basestation. However the terminals #0, #1 and #2 have been assigned a different fractionation phase. The example shows the case where the fractionation phase is 3.

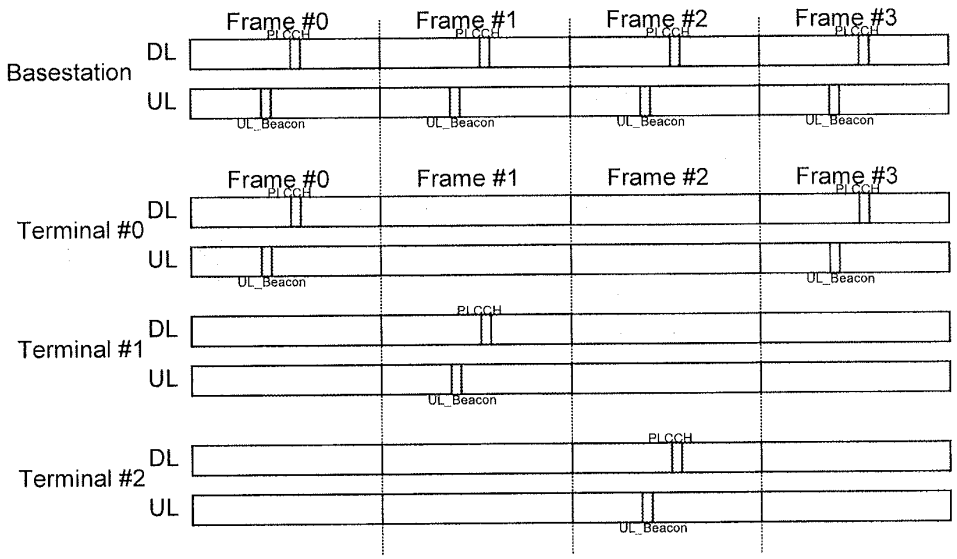


Figure 2 Example of Fractionation Applied to UL_Beacon and PLCCH

2.4 Half Duplex Terminals

A system designed for TDD has basestations and terminals that do not transmit and receive simultaneously. This is termed half-duplex operation. When such a system is evolved to operate in paired spectrum, it becomes inefficient if basestations retain their half duplex operation. The same is not necessarily true for the terminals as half duplex operation has some advantages.in the design and implementation of the terminal that are beyond the scope of this disclosure.

However, there are some important points that need to be considered. A single terminal is not able to access all transmit and all receive slots, therefore the system will have to manage the resource across the population of terminals in order to ensure all the available resource at the basestation is efficiently utilised. To prevent blocking of timeslots, half duplex terminals should be operated with a fractionation cycle of greater than one (note that this would also apply for the case where there are more than one UL_Beacon timeslots per frame). Half duplex terminals take time to switch between transmit and receive functions. In some cases this time exceeds the guard period inserted between consecutive timeslots and in this case the terminal is unable to transmit and receive on adjacent timeslots. This will affect the locations of the UL_Beacon, PLCCH and other common channels and the timeslot arrangement must take these locations into consideration when the system is configured.

Note that operation of full-duplex terminals is not precluded from inclusion in the system, it is just that half duplex operation is supported as a fundamental operational mode.

2.5 Terminal Management

This disclosure is describing a technique for implementing a closed-loop feedback control mechanism to replace the information normally obtained from the assumption of channel reciprocity. One of the central themes is the separation of the physical implementation of this uplink control from the uplink physical traffic. This step allows the control feedback to operate even when the terminal does not have data to send with the consequence that uplink shared channels can be used with maximum efficiency.

In order to use shared channels efficiently, a relatively large user base is required. At the same time, the network resource required to support the control feedback channels for these terminals needs to be minimised. In general, the number of users can be supported with active control feedback channels is smaller than the typical number of users per cell. Therefore the terminals in this active state need to be managed.

In UMTS terminology, we have introduced a new UTRA RRC-Connected substate into the system. UTRA systems already support the idea of different RRC-Connected states [1], eg CELL_DCH, CELL_FACH etc. For want of a better description we call this substate CELL_ACTIVE state. Figure 3 shows this substate in context with other UTRA RRC-connected states. A UE in Cell_Active substate is transmitting the physical channel control part of the uplink physical channel only.

As shown in Figure 3, CELL_ACTIVE substate is a substate of CELL_FACH state. In general all UEs in CELL_FACH state have an RRC connection, but they may not be actively transferring data. Out of the population of UEs in CELL_FACH state, a smaller number of UEs (determined by the network to be the most-active UEs) are supported in CELL_ACTIVE state. In this state, the UEs transmit the physical channel control signal and listen to the associated feedback channel from the network. Because the UE is aware of the uplink pathloss conditions (from the feedback channel) it can have instant access to the uplink shared channels and the resource allocator in the network can treat the UE accordingly.

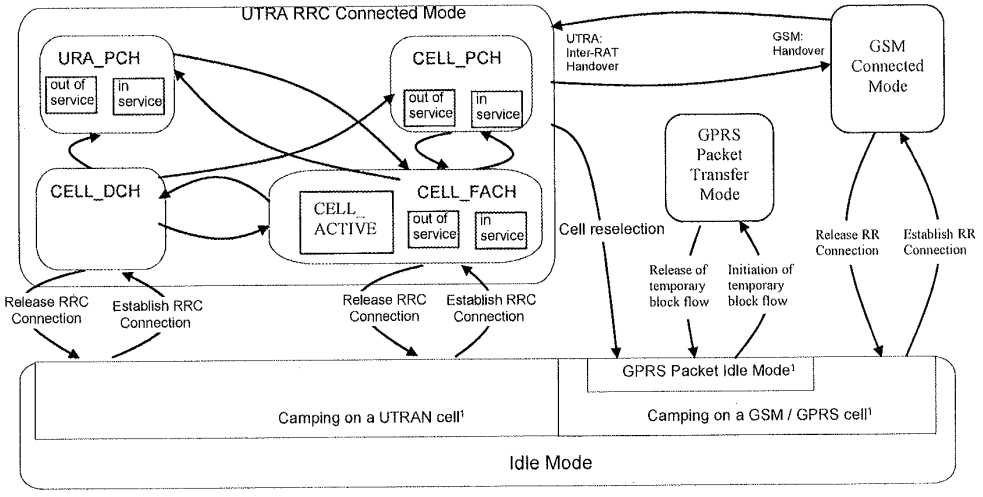


Figure 3 UTRA RRC Connected Modes

The rules governing which UEs are maintained in CELL_ACTIVE state are decided by the network and may be based on factors such as the volume of data transfer required by the UE, the data transfer rate required by a UE, the frequency of short bursts of data transfer, the total number of UEs in CELL_FACH state, the time since the last data transfer, the UE power saving requirements etc. Note, this list of examples is not intended to be exhaustive.

Note that UEs in CELL_ACTIVE state have their transmitters active, therefore it is necessary for these UEs to monitor the status of the downlink and automatically come out of CELL_ACTIVE state if the downlink is deemed to be out-of-synchronisation (for example, very high downlink errors or low received signal strength). This feature prevents UEs continuing to transmit in a state where the feedback channel may be unreliable and thus causing interference.

3 Notes For Possible Claims

This section is to be used as a guide only, it reflects the aspects of the invention that I consider represent the best example of 'inventive step'. The order of the suggestions does not infer any priority.

3.1 Adaption of a System Conceived for TDD (Unpaired) to FDD (Paired) Operation

This basic 'concept level' claim is designed to cover the fundamental idea of expanding the operation of a system designed for TDD, or unpaired operation, to operating in FDD, or paired, mode. This requires that system functions such as an uplink beacon function (for power control) and a modified random access process are added as a replacement for the information lost due to the lack of channel reciprocity in paired operation.

3.2 Separation Between Uplink Physical Channel Control Signals and Uplink Physical Channels

This refers to the ability of a terminal to transmit the uplink physical channel control signal (UL_Beacon) independently from the Uplink Physical Channel. This permits the implementation of a closed loop feedback loop to operate in the absence of an uplink physical channel.

3.3 Concept of Cell_Active state.

The introduction of a new RRC connected state to cover the subset of terminal that are in Cell_FACH that are also transmitting UL_Beacon and receiving PLCCH, and thus have an active control feedback channel. This also covers the management of the UEs that are in Cell_Active state – removing users that are 'less active' and adding users that are newly active whilst retaining users that have on going data transfer requirements.

3.4 Implementation of Uplink Physical Channel Control Signal

This refers to the combination of the UL_Beacon signal with the PLCCH to form a feedback system.

3.5 Providing a Dedicated Timeslot for the Transmission of UL_Beacon

This refers to the grouping of all UL_Beacon signals in a specific uplink timeslot. By grouping the UL_Beacon signals together, it is possible to obtain separation between the UL_Beacon signals and the standard uplink physical channels.

3.6 Cancellation of the UL_Beacon

In a synchronous system it is possible to detect and cancel the UL_Beacon signals from other cell sites (inter-cell interference).

3.7 Implementation of PLCCH on standard DL common physical channel

The PLCCH carries feedback information to the UEs that are transmitting UL_Beacon signals. The physical channel used is a standard physical channel therefore the PLCCH can share a timeslot with other physical channels.

3.8 Fractionation

The number of supported UEs can be increased by fractionating the use of the UL_Beacon and PLCCH across a multiframe period. Fractionation can also prevent timeslot blocking where half duplex UEs have a long UL/DL switching time.

3.9 Half Duplex Terminals

Support for half duplex terminals is implicit due to the nature of the TDMA frame structure. The system is able to manage the allocation of resource across the population of teminals such that the full capacity of the basestation can be utilised even when only half-duplex terminals are deployed. Note that full-duplex terminals can be still be supported along with half duplex UEs.



EXHIBIT B

REDACTED

From: Saltzberg, Robert A. <RSaltzberg@mofo.com>
Sent: [redacted]
To: Paul Howard
Cc: [redacted]
Subject: Patent Application
Attachments: FDD Disclosure.doc

Dear Paul,

Are you free either Wednesday, Thursday or Friday of this week at 5:15 pm UK time to discuss your patent application?

Best regards,
Rob Saltzberg

Robert Saltzberg
Morrison & Foerster
425 Market Street
San Francisco, CA 94105
W: 415 268-6428
F: 415 268-7522

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EXHIBIT C

REDACTED

From: Saltzberg, Robert A. <RSaltzberg@mofo.com>
Sent: Friday, October 13, 2006 8:21 PM
To: Paul Howard
Cc: [redacted]

[redacted]

Hi Paul,

Attached please find a first draft of claims for your review.

Best regards,
Rob

Robert Saltzberg
Morrison & Foerster
425 Market Street
San Francisco, CA 94105
W: 415 268-6428
F: 415 268-7522

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EXHIBIT D

REDACTED

From: Saltzberg, Robert A. <RSaltzberg@mofo.com>
Sent: Friday, December 15, 2006 6:59 PM
To: Paul Howard
Cc: [redacted]
Subject: IPW 20074.00 Draft Application
Attachments: [redacted]5624920074specification_[redacted]

[redacted]<<5624920074specification[redacted]

Hi Paul,

Attached please find a draft application for your invention. We previously sent you draft claims (included herein), but have not yet received your comments.

Please provide your comments on the attached application. We would like to file the application before the end of the year. If you think a telephone conference would expedite preparation of the application, please let us know a convenient day next week (preferably Tuesday or Thursday at around 4:30 or later UK time).

Best regards,
Rob

Robert Saltzberg
Morrison & Foerster
425 Market Street
San Francisco, CA 94105
W: 415 268-6428
F: 415 268-7522

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REDACTED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR U.S. LETTERS PATENT

Title:

FDD TDD-CDMA CONCEPT

Inventor:

Paul HOWARD

Citizenship: United Kingdom

Robert A. Saltzberg - 36,910
MORRISON & FOERSTER LLP
425 Market Street
San Francisco, California 94105-2482
(415) 268-6428

[redacted]

[redacted]

FDD TDD-CDMA CONCEPT

REDACTED

BACKGROUND OF THE INVENTION

[0001] Time division-code division multiple access (TD-CDMA) is an air interface technology that combines the benefits of the three elemental concepts in a universal mobile telecommunication system (UMTS): time division multiple access (TDMA); code division multiple access (CDMA); and time division duplex (TDD). TDD, in particular, uses the same radio channel for both uplink and downlink communications, and discriminates between signals by separating the transmissions in time. One of the benefits obtained by operating both links on the same frequency is the ability to exploit channel reciprocity.

[0002] Channel reciprocity gives equipment the ability to derive information about uplink channel conditions from downlink channel conditions based upon signals received by the user equipment (UE). Pathloss is one example of channel information that can be obtained from channel reciprocity. Knowledge of the uplink pathloss enables open-loop power control to be employed for uplink transmissions. For example, uplink power control is important for the operation of the CDMA element of TD-CDMA as it counteracts the near-far effect that would otherwise be encountered if all UEs transmitted at a fixed power regardless of the uplink pathloss.

[0003] The open-loop uplink power control feature provides a significant advantage when coupled with a multiple access data transmission system that is used for packet-based communication and/or shared channels. When access to a limited number of uplink channels is shared between a large population of terminals it is imperative that access to the channels can be switched between terminals with minimal latency. A data terminal that can derive information needed to access uplink channels from the downlink transmissions (beacon signals) has a significant advantage over a terminal that relies on the (lengthy) configuration of a dedicated channel in order to establish a feedback channel, [redacted]

[0004] However, channel reciprocity cannot always be guaranteed. For example TDD transmissions may not be permitted in certain frequency spectrum allocations; this is a regulatory

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issue and may be used to protect other wireless equipment in the same or adjacent frequency bands. In these situations the correlation between uplink and downlink channels is lost because the channels are transported on carrier frequencies that are separated in frequency by an amount that is greater than the coherence bandwidth of the channel (usually, only a few MHz separation is sufficient to cause the uplink and downlink fading profiles to be independent).

[0005] In high speed mobile applications, the time delay between downlink and uplink transmissions may exceed the coherence time of the channel. The maximum time delay that can be tolerated is a function of the mobile speed and the RF carrier frequency used, with the coherence time reducing with increasing speed and RF carrier frequency. Also, the use of multiple transmit and/or receive antennas at the network and/or the mobile terminal can introduce intentional [redacted] decorrelation between the uplink and downlink channels.

[0006] If the TD-CDMA air interface is to be used in applications where the correlation between the uplink and downlink path loss is not guaranteed, then a substitute for channel reciprocity needs to be found.

BRIEF SUMMARY OF THE INVENTION

[0007] Although it is known that methods need to be developed to support air interfaces where the pathloss is not reciprocal, there is not a method that deals directly with the evolution or adaptation of an air interface that uses channel reciprocity to deliver key features and advantages to operate in the conditions where channel reciprocity is not guaranteed. The adaptation provided in embodiments of the invention introduces a new method for uplink channel control that uses a feedback scheme as a substitute for the absence of channel reciprocity, with minimal impact on the ability of the air interface to support uplink shared channels.

[0008] Embodiments of the present invention enables active feedback control between a base station and user equipment (UE). In particular, the operation of a system designed for TDD, or unpaired operation, is expanded to operate in FDD, or paired, mode. For example, an uplink beacon function (for power control) and a modified random access process are added as a

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replacement for the information lost due to the lack of channel reciprocity in paired operation. A UE allocates a time slot for a beacon signal in a frame separated from the time slots for data. A second time slot is allocated within the frame for the base station to transmit a control signal in response to the beacon signal. Embodiments of the invention allow a terminal to transmit the uplink physical channel control signal (UL_Beacon) independently from tanhe uplink physical channel. Therefore, the implementation of closed loop feedback may operate in the absence of an uplink physical channel. The control signal instructs the UE to adjust a transmission parameter.

[0009] In other embodiments of the invention a UL_Beacon signal may be combined with a physical layer common control channel (PLCCH) to form a feedback system. A dedicated timeslot groups all of the UL_Beacon signals in a specific uplink timeslot. By grouping the UL_Beacon signals together, embodiments obtain separation between the UL_Beacon signals and the standard uplink physical channels. Additionally, in a synchronous system embodiments of the invention detect and cancel the UL_Beacon signals from other cell sites (inter-cell interference). The PLCCH carries feedback information to the UEs that are transmitting UL_Beacon signals. The PLCCH can share a timeslot with other physical channels.

[0010] In other embodiments, the number of supported UEs can be increased by fractionating the use of the UL_Beacon and PLCCH across a multiframe period. Fractionation may also prevent timeslot blocking where half duplex UEs have a long UL/DL switching time. Additionally, support for half duplex terminals is implicit due to the nature of the TDMA frame structure. The system may manage the allocation of resource across the population of terminals such that the full capacity of the base station can be utilized even when only half-duplex terminals are deployed. In embodiments of the invention, full-duplex terminals can be still be supported along with half duplex UEs.

[0011] Moreover, in other embodiments, a radio resource control (RRC) connected state covers the subset of terminals that are in cell forward access channel (Cell_FACH), which are also transmitting UL_Beacon and receiving PLCCH, thus creating an active control feedback channel. Management of the UEs that are in Cell_Active state may remove users that are less active, and may

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add users that are newly active while retaining users that may have on-going data transfer requirements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Figure 1 illustrates a cellular communication system according to embodiments of the invention;

[0013] Figure 2 illustrates a timeslot arrangement for uplink and downlink messages supporting the UL_Beacon and its corresponding PLCCH within a TD-CDMA frame structure modified to support FDD according to embodiments of the invention;

[0014] Figure 3 illustrates fractionation in different frames at the base station according to embodiments of the invention;

[0015] Figure 4 illustrates UTRA RRC connected modes according to embodiments of the invention;

[0016] Figure 5 illustrates a computer system that may be employed to implement embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0002] Figure 1 illustrates an example of a cellular communication system according to embodiments of the invention. The network includes a user equipment (UE) domain, a radio access network (RAN) domain, and a core network domain. The UE domain includes user equipment 110 that communicate with at least one base station 112 in the RAN domain via a wireless interface. The RAN domain may also include a network controller 118 (e.g., radio network controller), such as that used in UMTS systems. Alternatively, such functionality may be distributed between the Node Bs and the access gateway (AGW) or other controller in the core network. Figure 1 also illustrates an optional radio resource manager (RRM) 114. As described below, the RRM may perform functions otherwise performed by the Node Bs or an AGW in some embodiments.

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[0003] The core network (CN) 116 includes, in this example, an access gateway (AGW) 118, a serving GPRS support node (SGSN) 120, and a gateway GPRS support node (GGSN) 122. The core network is coupled to an external network 124. The SGSN 120 is responsible for session control, including keeping track of the location of the UEs. The GGSN 122 concentrates and tunnels user data within the core network 116 to the ultimate destination (e.g., an Internet service provider) in the external network 124. Further details may be found in the 3GPP UMTS technical specifications, such as TS23.246 v6.4.0 "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Multimedia Broadcast/Multicast Service (MBMS); Architecture and Functional Description (Release 6)," published by the 3GPP Support Office, 650 Route des Lucioles - Sophia Antipolis, Valbonne - FRANCE, which are incorporated by reference herein.

[0001] Further details regarding exemplary communications systems that may implement embodiments of the invention may be found in 3GPP UMTS technical specifications, such as TR 23.882, "3GPP System Architecture Evolution: Report on Technical Options and Conclusions"; TR 25.912, "Feasibility Study for Evolved UTRA and UTRAN"; TS 23.101, "General Universal Mobile Telecommunications System (UMTS) Architecture," all of which are incorporated by reference herein.

TDD to FDD Evolution

[0002] A system designed for operation in Time Division Duplex (TDD) mode has base stations and terminals that transmit and receive at orthogonal points in time. In normal operation terminals are in receive mode when the base station is transmitting, and base stations are in receive mode when terminals are transmitting. In conventional TDD implementations, neither base stations nor the terminals are able to transmit and receive at the same points in time because the same frequency is used for uplink and downlink communication.

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[redacted]

[0003] Such a system can be adjusted to operate in Frequency Division Duplex (FDD) mode, where the uplink and downlink communications occur on different frequencies. According to embodiments of the invention, to make full and efficient use of the frequency spectrum resources, the base stations are adapted to transmit and receive at the same time. This is possible since the uplink and downlink communications now occur on different frequencies. The terminals, however, retain the restriction of transmitting and receiving at orthogonal points in time to retain the simplicity of not having to transmit and receive at the same time (e.g., no duplexer required). The full use of the frequency spectrum is then obtained by allocating the resource across a plurality of terminals.

[0004] Additional measures may be needed if there are aspects of the air interface that rely on the channel reciprocity that can be assumed for TDD systems. In the case of TD-CDMA, modifications may be made for the correct operation of uplink power control and rate adaptation. This can be achieved by defining an uplink physical control channel used for estimating the uplink channel conditions and a downlink channel used to feed back control information to the terminal. These channels may not need an associated data physical channel to be operational.

[0005] Modifications may be made to the random access channel. This may be achieved by introducing an additional indicator step at the start of any physical random access. A new uplink physical channel carries the random access indicators. A new downlink physical channel carries the response to received uplink indicators.

Uplink Physical Channel Control Signal

[0006] When pathloss reciprocity is not available, the combination of an uplink physical channel control signal with a downlink feedback channel may be used to keep the terminal informed of the condition of the uplink channel. The uplink physical control signal is referred to herein as an "Uplink Beacon" (UL_Beacon).

[0007] In general, a system that supports shared channels may also support shared access to a large number of terminals. To extract the maximum benefit from the resulting trunking gain, shared channels can be quickly and efficiently re-allocated between the population of UEs. In order

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to obtain rapid access to the uplink shared channels, terminals can transmit at the correct power with their first transmission so that latency can be kept to a minimum.

[0008] According to embodiments of the invention, the physical channel control signal is separate from the uplink (shared) physical channel. Thus, terminals are able to transmit an UL_Beacon independently of their access to the uplink shared channel. The system may implement a closed loop control system, in which the base station detects the received power and/or other channel information from the UL_Beacon, and sends controlling commands back to each terminal to keep the terminal informed of the channel conditions observed at the base station.

[0009] In certain embodiments, the closed loop control system is simply based on the UL_Beacon power received at the base station. The base station may send power control commands on a shared downlink channel to each terminal based on the power received from the UL_Beacon signal. Each power control command may, for example, indicate whether terminal power should be increased or decreased by a predetermined amount. [redacted] This downlink channel is referred to as the "Physical Layer Control Channel" (PLCCH). The capacity of the PLCCH may be matched to the number of bits required in the feedback field and the number of UL_Beacon signals that can be simultaneously supported. That is, each UL_Beacon may correspond to one bit of the PLLCH. All terminals transmitting UL_Beacon signals may receive this channel and extract the relevant feedback field.

[0010] It is possible to extend the complexity of the control loop by sending control commands based on other aspects of the UL_Beacon signal as received by the base station, such as time-of-arrival, and channel impulse response. The amount of resource that is required for the feedback channel increases with the size (in bits) of the feedback information to each UE.

[0011] For example, for air interface technologies with a TDMA element, it is possible to adapt the TDMA frame structure to provide separation between the UL_Beacon and the normal physical channels by dedicating at least one uplink time slot per frame (or at least one time slot per multi-frame) to carrying UL_Beacon signals.

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[0012] By placing UL_Beacon signals in a dedicated timeslot, a dedicated detection scheme can be applied which may include performance enhancing features such as intra-cell cancelling (for alleviating the effects of cross-correlation interference between UL_Beacon signals transmitted by multiple terminals in the same cell), or inter-cell cancelling (for reducing the interference from neighboring cells in the case where the UL_Beacon timeslots are time synchronized). Cross-interference between UL_Beacon and normal uplink bursts is avoided by the separation obtained from the use of separate time slots.

[0013] Those skilled in the art will recognize that there are a large number of possibilities for the arrangement of a UL_Beacon and its associated PLCCH within the frame structure according to embodiments of the invention. More than one UL_Beacon and PLCCH per frame could be supported if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). For system applications that can tolerate a slower feedback rate, embodiments may fractionate the use of the UL_Beacon timeslot (and the associated PLCCH).

[0014] When fractionation is employed, the allocation of the UL_Beacon timeslot in a given frame may be assigned to a group of terminals depending on the current fractionation phase, thus increasing the number of terminals that can be supported with active physical channel feedback control. The maximum fractionation cycle length may be determined by the feedback update rate that the system requires in order to meet its performance targets.

[0015] Figure 2 illustrates an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCH within a TD-CDMA frame structure modified to support FDD. In this example, the PLCCH 212 shares a timeslot with another downlink shared channel. This is possible since normal downlink physical channels are used to transmit the PLCCH. The downlink frame also comprises a downlink beacon timeslot 206, a access control timeslot 208, and normal traffic carrying timeslots 210. The uplink frame comprises a UL_Beacon control timeslot 216, an access control timeslot 218, and normal traffic carrying timeslots 214.

[0016] Figure 3 illustrates an example where fractionation is employed. The UL_Beacon and PLCCH timeslots are active in every frame at the base station 302. However, terminal 304, terminal 306, and terminal 308 have been assigned a different fractionation phase. Figure 3

illustrates the case where the fractionation phase is 3. For example, the fractionation phase of terminal 304 occurs in frame #0 310, the fractionation phase of terminal 306 occurs in frame #1 312, and the fractionation phase of terminal 308 occurs in frame #2. Since the fractionation phase is 3, the phase for terminal 304 occurs again in frame #3 316.

Half Duplex Terminals

[0017] Embodiments of the invention enable terminals to operate in half duplex or full duplex mode. In a half duplex system, base stations and terminals do not transmit and receive simultaneously. When such a system is evolved to operate in paired spectrum, it becomes inefficient if base stations retain their half duplex operation. It is not necessarily inefficient for the terminals to do so, however, since half duplex operation may have some advantages in the design and implementation of the terminal.

[0018] Nonetheless, there are some points that should be considered. For example, a single terminal may not be able to access all transmit and all receive slots. Therefore, the system may have to manage resources across the population of terminals to ensure all the available resources at the base station are efficiently utilized. To prevent blocking of timeslots, half duplex terminals may be operated with a fractionation cycle of greater than one. In particular, this may also apply for the case where there are more than one UL_Beacon timeslot per frame. There is a time delay for half duplex terminals to switch between transmit and receive functions. In some cases this delay exceeds the guard period inserted between consecutive timeslots. In the half duplex terminal case, the terminal is unable to transmit and receive on adjacent timeslots. This will affect the locations of the UL_Beacon, PLCCH, and other common channels. Accordingly, the timeslot arrangement may be adjusted when the system is configured.

Terminal Management

[0019] Embodiments of this invention separate uplink control from the uplink physical traffic. This allows the control feedback to operate even when the terminal does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency.

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[0020] In order to use shared channels efficiently, a relatively large user base may be needed. At the same time, the network resources required to support the control feedback channels for these terminals need to be minimized. In general, the number of users that can be supported with active control feedback channels is smaller than the typical number of users per cell. Therefore, the terminals in this active state may be managed.

[0021] In UMTS terminology, embodiments of the invention provide a new Universal Terrestrial Radio Access- Radio Resource Control-Connected (UTRA RRC-Control) sub-state into the system. UTRA systems already support the idea of different RRC-Connected states (see, TS25.331 Radio Resource Control (RRC) Protocol Specification, which is incorporated herein by reference), e.g., CELL_DCH, CELL_FACH etc. This sub-state is referred to as the CELL_ACTIVE state. Figure 4 illustrates this sub-state in context with other UTRA RRC-connected states. A UE in a Cell_Active sub-state transmits the physical channel control part of the uplink physical channel only, and nothing else (i.e., no data).

[0022] [redacted] As shown in Figure 4, CELL_ACTIVE sub-state is a sub-state of CELL_FACH state 404. In general, UEs in CELL_FACH state have an RRC connection, but they may not be actively transferring data. Out of the population of UEs in CELL_FACH state 404, a smaller number of UEs, determined by the network to be the most-active UEs, are supported in a CELL_ACTIVE state 406. In this state, the UEs transmit the physical channel control signal and listen to the associated feedback channel from the network. Because the UE is aware of the uplink pathloss conditions from the feedback channel, it can have instant access to the uplink shared channels, and the resource allocator in the network can treat the UE accordingly.

[0023] The rules governing which UEs are maintained in CELL_ACTIVE state are decided by the network and may be based on factors such as the volume of data transfer required by the UE, the data transfer rate required by a UE, the frequency of short bursts of data transfer, the total number of UEs in CELL_FACH state, the time since the last data transfer, the UE power saving requirements, etc.

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[0024] Note that UEs in CELL_ACTIVE state have their transmitters active, therefore it is necessary for these UEs to monitor the status of the downlink and automatically come out of CELL_ACTIVE state if the downlink is deemed to be out-of-synchronization (for example, very high downlink errors or low received signal strength). This feature prevents UEs continuing to transmit in a state where the feedback channel may be unreliable and thus causing interference.

[0025] While the invention has been described in terms of particular embodiments and illustrative figures, those of ordinary skill in the art will recognize that the invention is not limited to the embodiments or figures described. Although embodiments of the present invention are described, in some instances, using UMTS terminology, those skilled in the art will recognize that such terms are also used in a generic sense herein, and that the present invention is not limited to such systems.

[0026] Those skilled in the art will recognize that the operations of the various embodiments may be implemented using hardware, software, firmware, or combinations thereof, as appropriate. For example, some processes can be carried out using processors or other digital circuitry under the control of software, firmware, or hard-wired logic. (The term "logic" herein refers to fixed hardware, programmable logic and/or an appropriate combination thereof, as would be recognized by one skilled in the art to carry out the recited functions.) Software and firmware can be stored on computer-readable media. Some other processes can be implemented using analog circuitry, as is well known to one of ordinary skill in the art. Additionally, memory or other storage, as well as communication components, may be employed in embodiments of the invention.

[0027] Figure 5 illustrates a typical computing system 500 that may be employed to implement processing functionality in embodiments of the invention. Computing systems of this type may be used in the SC, the radio controllers, the base stations, and the UEs, for example. Those skilled in the relevant art will also recognize how to implement the invention using other computer systems or architectures. Computing system 500 may represent, for example, a desktop, laptop or notebook computer, hand-held computing device (PDA, cell phone, palmtop, etc.), mainframe, server, client, or any other type of special or general purpose computing device as may be desirable or appropriate for a given application or environment. Computing system 500 can

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include one or more processors, such as a processor 504. Processor 504 can be implemented using a general or special purpose processing engine such as, for example, a microprocessor, microcontroller or other control logic. In this example, processor 504 is connected to a bus 502 or other communications medium.

[0028] Computing system 500 can also include a main memory 508, such as random access memory (RAM) or other dynamic memory, for storing information and instructions to be executed by processor 504. Main memory 508 also may be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor 504. Computing system 500 may likewise include a read only memory ("ROM") or other static storage device coupled to bus 502 for storing static information and instructions for processor 504.

[0029] The computing system 500 may also include information storage system 510, which may include, for example, a media drive 512 and a removable storage interface 520. The media drive 512 may include a drive or other mechanism to support fixed or removable storage media, such as a hard disk drive, a floppy disk drive, a magnetic tape drive, an optical disk drive, a CD or DVD drive (R or RW), or other removable or fixed media drive. Storage media 518, may include, for example, a hard disk, floppy disk, magnetic tape, optical disk, CD or DVD, or other fixed or removable medium that is read by and written to by media drive 514. As these examples illustrate, the storage media 518 may include a computer-readable storage medium having stored therein particular computer software or data.

[0030] In alternative embodiments, information storage system 510 may include other similar components for allowing computer programs or other instructions or data to be loaded into computing system 500. Such components may include, for example, a removable storage unit 522 and an interface 520, such as a program cartridge and cartridge interface, a removable memory (for example, a flash memory or other removable memory module) and memory slot, and other removable storage units 522 and interfaces 520 that allow software and data to be transferred from the removable storage unit 518 to computing system 500.

[0031] Computing system 500 can also include a communications interface 524. Communications interface 524 can be used to allow software and data to be transferred between

computing system 500 and external devices. Examples of communications interface 524 can include a modem, a network interface (such as an Ethernet or other NIC card), a communications port (such as for example, a USB port), a PCMCIA slot and card, etc. Software and data transferred via communications interface 524 are in the form of signals which can be electronic, electromagnetic, optical or other signals capable of being received by communications interface 524. These signals are provided to communications interface 524 via a channel 528. This channel 528 may carry signals and may be implemented using a wireless medium, wire or cable, fiber optics, or other communications medium. Some examples of a channel include a phone line, a cellular phone link, an RF link, a network interface, a local or wide area network, and other communications channels.

[0032] In this document, the terms "computer program product," "computer-readable medium" and the like may be used generally to refer to media such as, for example, memory 508, storage device 518, or storage unit 522. These and other forms of computer-readable media may store one or more instructions for use by processor 504, to cause the processor to perform specified operations. Such instructions, generally referred to as "computer program code" (which may be grouped in the form of computer programs or other groupings), when executed, enable the computing system 500 to perform functions of embodiments of the present invention. Note that the code may directly cause the processor to perform specified operations, be compiled to do so, and/or be combined with other software, hardware, and/or firmware elements (e.g., libraries for performing standard functions) to do so.

[0033] In an embodiment where the elements are implemented using software, the software may be stored in a computer-readable medium and loaded into computing system 500 using, for example, removable storage drive 514, drive 512 or communications interface 524. The control logic (in this example, software instructions or computer program code), when executed by the processor 504, causes the processor 504 to perform the functions of the invention as described herein.

[0034] It will be appreciated that, for clarity purposes, the above description has described embodiments of the invention with reference to different functional units and processors. However,

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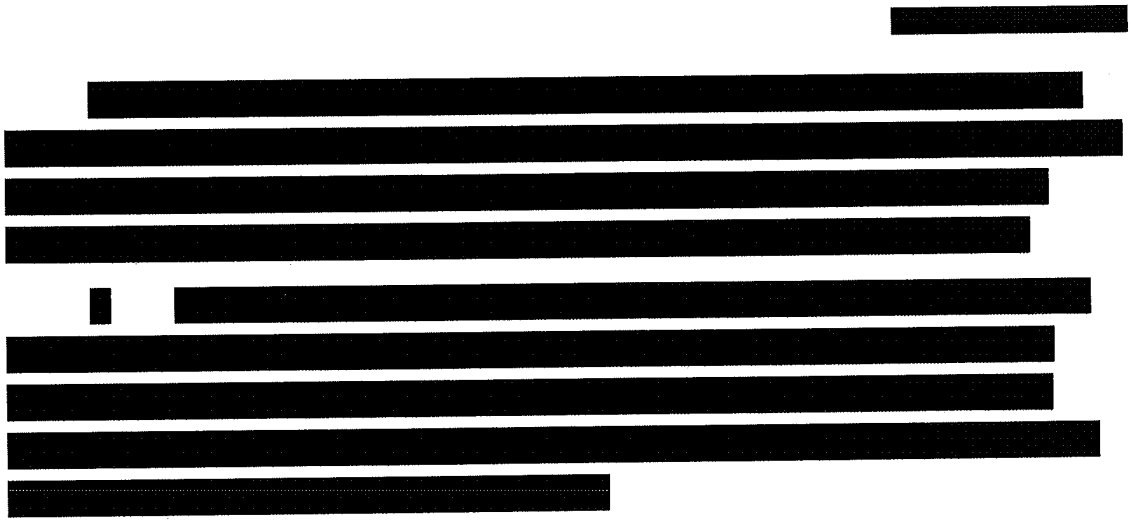
it will be apparent that any suitable distribution of functionality between different functional units, processors or domains may be used without detracting from the invention. For example, functionality illustrated to be performed by separate processors or controllers may be performed by the same processor or controller. Hence, references to specific functional units are only to be seen as references to suitable means for providing the described functionality, rather than indicative of a strict logical or physical structure or organization.

[0035] Although the present invention has been described in connection with some embodiments, it is not intended to be limited to the specific form set forth herein. Rather, the scope of the present invention is limited only by the claims. Additionally, although a feature may appear to be described in connection with particular embodiments, one skilled in the art would recognize that various features of the described embodiments may be combined in accordance with the invention.

[0036] Furthermore, although individually listed, a plurality of means, elements or method steps may be implemented by, for example, a single unit or processor. Additionally, although individual features may be included in different claims, these may possibly be advantageously combined, and the inclusion in different claims does not imply that a combination of features is not feasible and/or advantageous. Also, the inclusion of a feature in one category of claims does not imply a limitation to this category, but rather the feature may be equally applicable to other claim categories, as appropriate.

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ABSTRACT

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First Named Inventor/Applicant Name:	Paul Howard
Filer:	Harry Vartanian/Elizabeth McGinty
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Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
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Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
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	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Response After Final Action		1	1	
	Applicant Arguments/Remarks Made in an Amendment		2	5	
Warnings:					
Information:					
2	Extension of Time	IPW2-USCN191712_EOT.PDF	187475 9aa3b47c694c8e9787e667f370bbbfae7089fc76	no	2
Warnings:					
Information:					
3	Oath or Declaration filed	IPW2-USCN191712_1-131_Declaration_Signed_2.PDF	67839 6e256ed4f007d61503e7d4069011e80d7374e80e	no	3
Warnings:					
Information:					
4	Oath or Declaration filed	IPW2-USCN191712_1-131DecExhibits.PDF	1548937 847583ec6fab75edf19ae91eeec17bb0f0624c42	no	34
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30623 a35386460065153aa43416ad1fec671a7adbe942	no	2
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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/176,298	Filing Date 07/05/2011	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	04/01/2014	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 46	Minus	** 46	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 8	Minus	***8	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/DEBORAH NASH/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

3624 7590 04/15/2014

VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

EXAMINER
ABELSON, RONALD B

ART UNIT	PAPER NUMBER
2476	

DATE MAILED: 04/15/2014

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	07/05/2011	Paul Howard	IPW2-USCN191712	4342

TITLE OF INVENTION: Feedback Control in an FDD TDD-CDMA System

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	07/15/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

3624 7590 04/15/2014
VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	07/05/2011	Paul Howard	IPW2-USCN191712	4342

TITLE OF INVENTION: Feedback Control in an FDD TDD-CDMA System

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	07/15/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
ABELSON, RONALD B	2476	370-281000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	07/05/2011	Paul Howard	IPW2-USCN191712	4342

3624 7590 04/15/2014

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PHILADELPHIA, PA 19103

EXAMINER	
ABELSON, RONALD B	
ART UNIT	PAPER NUMBER
2476	

DATE MAILED: 04/15/2014

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 127 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 127 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/176,298	Applicant(s) HOWARD, PAUL	
	Examiner RONALD B. ABELSON	Art Unit 2476	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *4/1/14, 7/19/13*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *45, 47-51, 89, 52, 54-58, 90, 59, 61-65, 91, 66, 68-72, 92, 73, 75-79, 93, 80, 82-86, 94, 87, 95, 88, 96; renumbered as 1-46*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 7/19/13
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/RONALD B ABELSON/
Primary Examiner, Art Unit 2476

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	13176298
Filing Date	2011-07-05
First Named Inventor	Paul Howard
Art Unit	2476
Examiner Name	Ronald B. Abelson
Attorney Docket Number	IPW2-USCN191712

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20020077151	AA	2002-06-20	Matthews et al.	
	2	20020119798	AA	2002-08-29	Hamabe	
	3	20020150058	AA	2002-10-17	Kim et al.	
	4	20030022683	AA	2003-01-30	Beckmann et al.	
	5	20030069020	AA	2003-04-10	Speight	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.A./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Paul Howard
	Art Unit	2476
	Examiner Name	Ronald B. Abelson
	Attorney Docket Number	IPW2-USCN191712

	6	20070265017	AA	2007-11-15	Ishii et al.	
	7	20080090528	AA	2008-04-17	Malladi	
	8	20080144600	AA	2008-06-19	Anderson	
	9	20020196766	AA	2002-12-26	Hwang et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/Ronald Abelson/	Date Considered	04/07/2014

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

EFS Web 2.1.17

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.A./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Paul Howard
	Art Unit	2476
	Examiner Name	Ronald B. Abelson
	Attorney Docket Number	IPW2-USCN191712

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

EFS Web 2.1.17

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.A./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	13176298
	Filing Date	2011-07-05
	First Named Inventor	Paul Howard
	Art Unit	2476
	Examiner Name	Ronald B. Abelson
	Attorney Docket Number	IPW2-USCN191712

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Harry Vartanian/	Date (YYYY-MM-DD)	2013-07-19
Name/Print	Harry Vartanian	Registration Number	56,787

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.A./

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /R.A./

Issue Classification	Application/Control No. 13/176,298	Applicant(s)/Patent under Reexamination HOWARD, PAUL
	Examiner RONALD B. ABELSON	Art Unit 2476

ISSUE CLASSIFICATION

ORIGINAL		INTERNATIONAL CLASSIFICATION											
CLASS	SUBCLASS	CLAIMED							NON-CLAIMED				
370	337	H	04	B	7	/2643							/
CROSS REFERENCES		H	04	W	74	/04							/
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)												
370	280 329 442	H	04	B	1	/56							/
		H	04	B	7	/2656							/
		H	04	W	28	/04							/
		H	04	W	72	/04							/
		H	04	L	12	/2801							/

(Assistant Examiner) (Date)	/Ronald Abelson/ 4/7/14 (Primary Examiner) (Date)	Total Claims Allowed: 46	
(Legal Instruments Examiner) (Date)		O.G. Print Claim(s) 45	O.G. Print Fig. 1

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		31	16	61	21	91		121		151		181
	2		32	17	62	28	92		122		152		182
	3		33	18	63	35	93		123		153		183
	4		34	19	64	42	94		124		154		184
	5		35	20	65	44	95		125		155		185
	6		36	22	66	46	96		126		156		186
	7		37		67		97		127		157		187
	8		38	23	68		98		128		158		188
	9		39	24	69		99		129		159		189
	10		40	25	70		100		130		160		190
	11		41	26	71		101		131		161		191
	12		42	27	72		102		132		162		192
	13		43	29	73		103		133		163		193
	14		44		74		104		134		164		194
	15	1	45	30	75		105		135		165		195
	16		46	31	76		106		136		166		196
	17	2	47	32	77		107		137		167		197
	18	3	48	33	78		108		138		168		198
	19	4	49	34	79		109		139		169		199
	20	5	50	36	80		110		140		170		200
	21	6	51		81		111		141		171		201
	22	8	52	37	82		112		142		172		202
	23		53	38	83		113		143		173		203
	24	9	54	39	84		114		144		174		204
	25	10	55	40	85		115		145		175		205
	26	11	56	41	86		116		146		176		206
	27	12	57	43	87		117		147		177		207
	28	13	58	45	88		118		148		178		208
	29	15	59	7	89		119		149		179		209
	30		60	14	90		120		150		180		210

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013	10/29/2013	04/07/2014					
1	45	✓	✓	✓	=					
	46	O	-	-	-					
2	47	O	✓	✓	=					
3	48	O	✓	✓	=					
4	49	O	✓	✓	=					
5	50	O	✓	✓	=					
6	51	✓	✓	✓	=					
8	52	✓	✓	✓	=					
	53	O	-	-	-					
9	54	O	✓	✓	=					
10	55	O	✓	✓	=					
11	56	O	✓	✓	=					
12	57	O	✓	✓	=					
13	58	O	✓	✓	=					
15	59	✓	✓	✓	=					
	60	O	-	-	-					
16	61	O	✓	✓	=					
17	62	O	✓	✓	=					
18	63	O	✓	✓	=					
19	64	O	✓	✓	=					
20	65	O	✓	✓	=					
22	66	✓	✓	✓	=					
	67	O	-	-	-					
23	68	O	✓	✓	=					
24	69	O	✓	✓	=					
25	70	O	✓	✓	=					
26	71	O	✓	✓	=					
27	72	O	✓	✓	=					
29	73	✓	✓	✓	=					
	74	O	-	-	-					
30	75	O	✓	✓	=					
31	76	O	✓	✓	=					
32	77	O	✓	✓	=					
33	78	O	✓	✓	=					
34	79	O	✓	✓	=					
36	80	✓	✓	✓	=					

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

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☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013	10/29/2013	04/07/2014					
	81	O	-	-	-					
37	82	O	✓	✓	=					
38	83	O	✓	✓	=					
39	84	O	✓	✓	=					
40	85	O	✓	✓	=					
41	86	O	✓	✓	=					
43	87		✓	✓	=					
45	88		✓	✓	=					
7	89		✓	✓	=					
14	90		✓	✓	=					
21	91		✓	✓	=					
28	92		✓	✓	=					
35	93		✓	✓	=					
42	94		✓	✓	=					
44	95		✓	✓	=					
46	96		✓	✓	=					
	97									
	98									
	99									
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	113									
	114									
	115									
	116									

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	**Art Unit**
	RONALD B ABELSON	2476

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	02/01/2013	07/17/2013	10/29/2013	04/07/2014					
	117									
	118									
	119									
	120									
	121									
	122									
	123									
	124									
	125									
	126									
	127									
	128									
	129									
	130									

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 4342

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/176,298	07/05/2011 RULE	370	2476	IPW2-USCN191712

APPLICANTS

INVENTORS

Paul Howard, Bristol, UNITED KINGDOM;

**** CONTINUING DATA ***************************

This application is a CON of 11/646,692 12/27/2006 PAT 8009639

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

07/14/2011

Foreign Priority claimed	☐ Yes ☑ No	☐ Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met	☐ Yes ☑ No		UNITED KINGDOM	5	24	3
Verified and Acknowledged	/RONALD B ABELSON/ Examiner's Signature	Initials				

ADDRESS

VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103
UNITED STATES

TITLE

Feedback Control in an FDD TDD-CDMA System

FILING FEE RECEIVED		
4644	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13176298	HOWARD, PAUL
	Examiner	Art Unit
	RONALD B ABELSON	2476

CPC- SEARCHED		
Symbol	Date	Examiner
H04B 1/56, 7/2656, 7/2643	4/7/14	RA
H04W 80/04, 88/06, 28/04, 72/04, 72/0446, 84/12, 74/04	4/7/14	RA
H04L 12/2801	4/7/14	RA

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
370	280,328,329,336,337,442	4/7/14	RA

SEARCH NOTES		
Search Notes	Date	Examiner
CPC combined with limited text search in East	4/7/14	RA

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
370	280,328,329,336,337,442	4/7/14	RA

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/176,298	07/05/2011	2476	4644	IPW2-USCN191712	24	3

CONFIRMATION NO. 4342

CORRECTED FILING RECEIPT

3624
VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

OC000000068519732

Date Mailed: 05/20/2014

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Paul Howard, Bristol, UNITED KINGDOM;

Applicant(s)

Paul Howard, Bristol, UNITED KINGDOM;

Assignment For Published Patent Application

WIRELESS TECHNOLOGY SOLUTIONS LLC, New York, NY

Power of Attorney: The patent practitioners associated with Customer Number 3624

Domestic Priority data as claimed by applicant

This application is a CON of 11/646,692 12/27/2006 PAT 8009639

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

If Required, Foreign Filing License Granted: 07/14/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/176,298**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

COMMUNICATIONS IN A WIRELESS NETWORK

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

3624 7590 04/15/2014
VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	07/05/2011	Paul Howard	IPW2-USCN191712	4342

TITLE OF INVENTION: ~~Feedback Control in an FDD TDD-CDMA System~~ COMMUNICATIONS IN A WIRELESS NETWORK

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	07/15/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
ABELSON, RONALD B	2476	370-281000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 Volpe and Koenig, P.C.
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Intellectual Ventures Holding 81 LLC
(B) RESIDENCE: (CITY and STATE OR COUNTRY): Las Vegas, NV

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☑ Issue Fee
☑ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☑ Payment by credit card. Form PTO-2038 is attached.
☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number 22-0493 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Harry Vartanian/ Date July 11, 2014
Typed or printed name Harry Vartanian Registration No. 56,787

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	13176298
Filing Date:	05-Jul-2011
Title of Invention:	COMMUNICATIONS IN A WIRELESS NETWORK
First Named Inventor/Applicant Name:	Paul Howard
Filer:	Harry Vartanian/Elizabeth McGinty
Attorney Docket Number:	IPW2-USCN191712

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	960	960
Publ. Fee- Early, Voluntary, or Normal	1504	1	0	0

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**960**

Electronic Acknowledgement Receipt	
EFS ID:	19552403
Application Number:	13176298
International Application Number:	
Confirmation Number:	4342
Title of Invention:	COMMUNICATIONS IN A WIRELESS NETWORK
First Named Inventor/Applicant Name:	Paul Howard
Customer Number:	3624
Filer:	Harry Vartanian/Elizabeth McGinty
Filer Authorized By:	Harry Vartanian
Attorney Docket Number:	IPW2-USCN191712
Receipt Date:	11-JUL-2014
Filing Date:	05-JUL-2011
Time Stamp:	14:49:01
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RAM confirmation Number	1143
Deposit Account	220493
Authorized User	VARTANIAN, HARRY
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	IPW2-USCN191712-IssueFeePayment-20140711.PDF	321197 2d513a72ebe4f7aa05e5cc1d8fe220100d679182	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32217 f77ef4c9facc931af411ca276a433d65e362ca66	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	353414		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	08/19/2014	8811356	IPW2-USCN191712	4342

3624 7590 07/30/2014

VOLPE AND KOENIG, P.C.
UNITED PLAZA
30 SOUTH 17TH STREET
PHILADELPHIA, PA 19103

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 172 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Paul Howard, Bristol, UNITED KINGDOM;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☑ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT Eastern District of Texas
PLAINTIFF INTELLECTUAL VENTURES I LLC and INTELLECTUAL VENTURES II LLC		DEFENDANT TOYOTA MOTOR CORP.; TOYOTA MOTOR NORTH AMERICA, INC.; TOYOTA MOTOR ENGINEERING & MANUFACTURING NORTH AMERICA, INC.; and TOYOTA MOTOR SALES, U.S.A., INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,832,283	12/14/2004	INTELLECTUAL VENTURES II LLC
2	7,484,008	1/27/2009	INTELLECTUAL VENTURES I LLC
3	9,291,475	3/22/2016	INTELLECTUAL VENTURES II LLC
4	7,382,771	6/3/2008	INTELLECTUAL VENTURES II LLC
5	SEE ATTACHED		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

INTELLECTUAL VENTURES I LLC and INTELLECTUAL VENTURES II LLC,	)	
Plaintiffs,	)	C.A. No. 2:21-cv-389
v.	)	
TOYOTA MOTOR CORP.; TOYOTA MOTOR NORTH AMERICA, INC.; TOYOTA MOTOR ENGINEERING & MANUFACTURING NORTH AMERICA, INC.; and TOYOTA MOTOR SALES, U.S.A., INC.,	)	**JURY TRIAL DEMANDED**
Defendants.	)	

Patent or Trademark No.	Date of Patent Or Trademark	Holder of Patent or Trademark
9,232,158	1/5/2016	INTELLECTUAL VENTURES II LLC
9,602,608	3/21/2017	INTELLECTUAL VENTURES II LLC
10,292,138	5/14/2019	INTELLECTUAL VENTURES II LLC
7,684,318	3/23/2010	INTELLECTUAL VENTURES I LLC
8,953,641	2/10/2015	INTELLECTUAL VENTURES II LLC
9,681,466	6/13/2017	INTELLECTUAL VENTURES II LLC
8,811,356	8/19/2014	INTELLECTUAL VENTURES II LLC

AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☑ Trademarks or ☐ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT Eastern District of Texas
PLAINTIFF INTELLECTUAL VENTURES I LLC and INTELLECTUAL VENTURES II LLC		DEFENDANT HONDA MOTOR COMPANY, LTD.; AMERICAN HONDA MOTOR COMPANY, INC.; AMERICAN HONDA FINANCE CORP.; HONDA OF AMERICA MANUFACTURING, INC., et al.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,832,283	12/14/2004	INTELLECTUAL VENTURES II LLC
2	9,602,608	3/21/2017	INTELLECTUAL VENTURES II LLC
3	7,891,004	2/15/2011	INTELLECTUAL VENTURES I LLC
4	9,291,475	3/22/2016	INTELLECTUAL VENTURES II LLC
5	SEE ATTACHED		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

INTELLECTUAL VENTURES I LLC and INTELLECTUAL VENTURES II LLC,	)	
Plaintiffs,	)	C.A. No. 2:21-cv-390
v.	)	
HONDA MOTOR COMPANY, LTD.; AMERICAN HONDA MOTOR COMPANY, INC.; AMERICAN HONDA FINANCE CORP.; HONDA OF AMERICA MANUFACTURING, INC.; HONDA MANUFACTURING OF ALABAMA, LLC; and HONDA MANUFACTURING OF INDIANA, LLC,	)	**ADDENDUM TO REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**
Defendants.	)	

Patent or Trademark No.	Date of Patent Or Trademark	Holder of Patent or Trademark
7,382,771	6/3/2008	INTELLECTUAL VENTURES II LLC
9,232,158	1/5/2016	INTELLECTUAL VENTURES II LLC
9,681,466	6/13/2017	INTELLECTUAL VENTURES II LLC
10,292,138	5/14/2019	INTELLECTUAL VENTURES II LLC
7,684,318	3/23/2010	INTELLECTUAL VENTURES I LLC
8,953,641	2/10/2015	INTELLECTUAL VENTURES II LLC
8,811,356	8/19/2014	INTELLECTUAL VENTURES II LLC

The United States Patent and Trademark Office
PATENT TRIAL AND APPEAL BOARD

A petition has been filed in Patent Number 8,811,356, Application Number 13/176,298 on 6/13/2022 (Date).

The Case Number is IPR2022-01130.
(IPR, CBM, PGR, DER #)

To view the documents filed in this petition, go to https://ptab.uspto.gov.

Use the Search PTAB tab and enter the Patent Number or the Trial or Case Number and select the Search button.

Questions regarding this notice should be directed to the Patent Trial and Appeal Board at 571-272-7822.

Trials@uspto.gov
571-272-7822

Paper 13
Date: December 12, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORP. and
CONTINENTAL AUTOMOTIVE SYSTEMS, INC.,
Petitioners,

v.

INTELLECTUAL VENTURES II LLC,
Patent Owner.

IPR2022-01130
U.S. Patent No. 8,811,356 B2

Before JAMES P. CALVE, SCOTT A. DANIELS, and
FREDERICK C. LANEY, *Administrative Patent Judges.*

CALVE, *Administrative Patent Judge.*

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Toyota Motor Corporation ("Toyota" or "Petitioner") and Continental Automotive Systems, Inc. ("Continental" or "Petitioner") (also collectively "Petitioners") filed a Petition requesting *inter partes* review ("IPR") of claims 1–7, 22–28, and 43–46 of U.S. Patent No. 8,811,356 B2 (Ex. 1001, "the '356 patent"). Paper 1 ("Pet."). Intellectual Ventures II LLC ("Intellectual Ventures" or "Patent Owner") filed a Preliminary Response to the Petition. Paper 10 ("Prelim. Resp.").

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted "unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." Upon consideration of the arguments and evidence presented by Petitioners and Patent Owner, we are persuaded that Petitioners demonstrated a reasonable likelihood that they would prevail in showing the unpatentability of at least one of the challenged claims. *See* 35 U.S.C. § 314(a). Accordingly, we institute an *inter partes* review of the challenged claims.

A. Real Parties in Interest

Petitioners state that Toyota Motor Corp., Toyota Motor North America, Inc., Toyota Motor Engineering & Manufacturing North America, Inc., Toyota Motor Sales, U.S.A., Inc., Continental Automotive Systems, Inc., Continental Automotive GmbH, Continental Automotive Technologies GmbH, Continental Automotive, Inc., and Continental AG (identified as the parent of Continental Automotive, Inc.) are the real parties in interest. Pet. 83. Patent Owner states that Intellectual Ventures II LLC is the patent owner and the sole real party in interest. Paper 5, 2.

B. Related Matters

The parties indicate that the '356 patent is at issue in the district court litigations of *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Toyota Motor Corp. et al.*, Case No. 2:21-cv-00389 (E.D. Tex. October 19, 2021), *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Honda Motor Co., Ltd. et al.*, Case No. 3:22-cv-00761 (N.D. Tex. April 4, 2022), and *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. General Motors Company*, Case No. 6:21-cv-01088 (W.D. Tex. October 19, 2021). Pet. 84; Paper 5, 2.

C. The '356 Patent (Ex. 1001)

The '356 patent is titled "Communications in a Wireless Network" and describes closed loop feedback by allocating a timeslot[1] in an uplink frame to send a control signal from user equipment (UE) to a base station, which sends controls back to the UE. Ex. 1001, 2:6–48, 4:35–5:41, 5:50–6:4. Each UE allocates a timeslot to send a beacon signal (UL_Beacon) in an uplink frame separated from timeslots to send data. *Id.* at 2:20–42, 4:35–55, 5:15–20. Base stations respond to UL_Beacon signals on a downlink Physical Layer Control Channel (PLCCH) with power control commands. *Id.* at 2:31–60, 4:49–5:60.

This technique provides active feedback control between a base station and UE terminals. *Id.* at 2:17–18. An Uplink Beacon (UL_Beacon) signal is received by a base station, which determines power and channel information from it and sends power and other control commands to the UE terminal on the PLCCH to control uplink transmission parameters of the UE. *Id.* at 2:20–61, 4:35–5:41, 5:50–60. Figure 2 of the '356 patent is reproduced below to illustrate the allocation of a separate timeslot for a UL_Beacon and a PLCCH.

[1] The '356 Patent uses "timeslot" and "time slot" interchangeably. We do too.

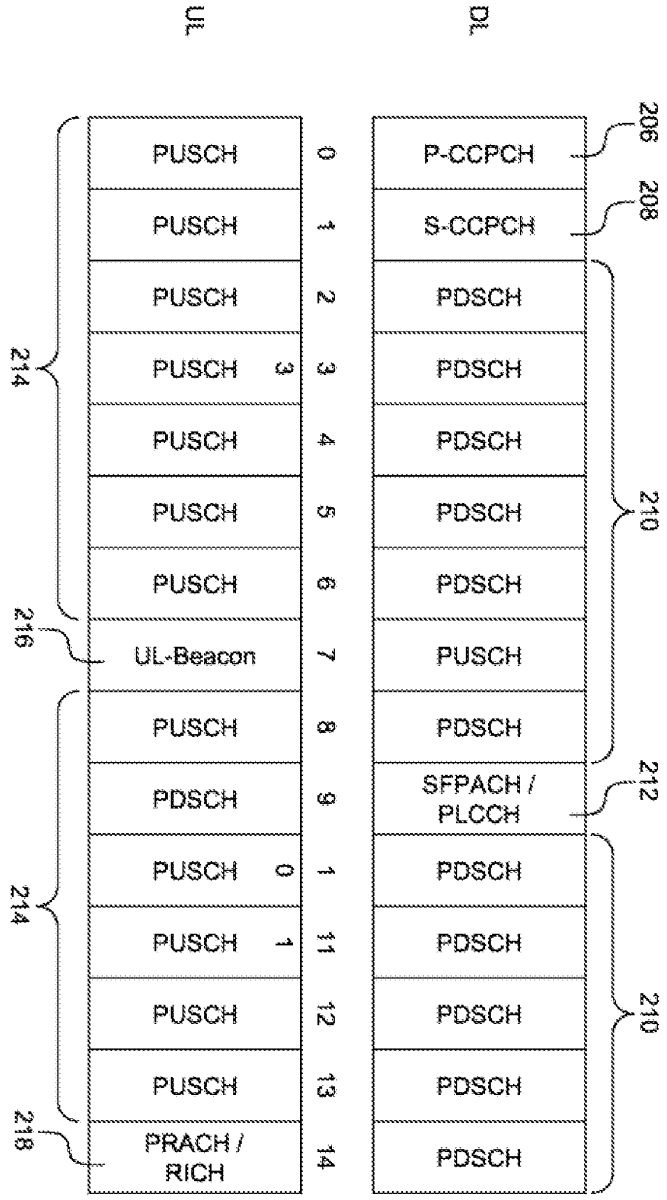


FIG. 2

Figure 2 depicts an uplink (UL) frame with a timeslot 216 allocated to transmit a UL_Beacon *separate* from timeslots 214 used to transmit data. A base station allocates a timeslot 212 in a downlink (DL) frame to transmit PLCCH control commands to control uplink transmissions of the UE separate from timeslots 210 used to transmit data. *Id.* at 2:11–48, 4:35–5:20, 5:50–60.

Because "a UE allocates a time slot for a beacon signal *separated from* the time slots for data in a frame," the UE may "transmit the uplink physical channel control signal (UL_Beacon) independently from the uplink physical channel." *Id.* at 2:24–30 (emphasis added).

Separating uplink control channel and UL_Beacon timeslot 216 from uplink physical traffic timeslots 214 "allows the control feedback to operate even when the terminal does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency." *Id.* at 6:33–37. If a slower update rate is desired, UL_Beacon and PLCCH timeslots can be fractionated as illustrated in Figure 3, which is reproduced below. *Id.* at 5:38–41.

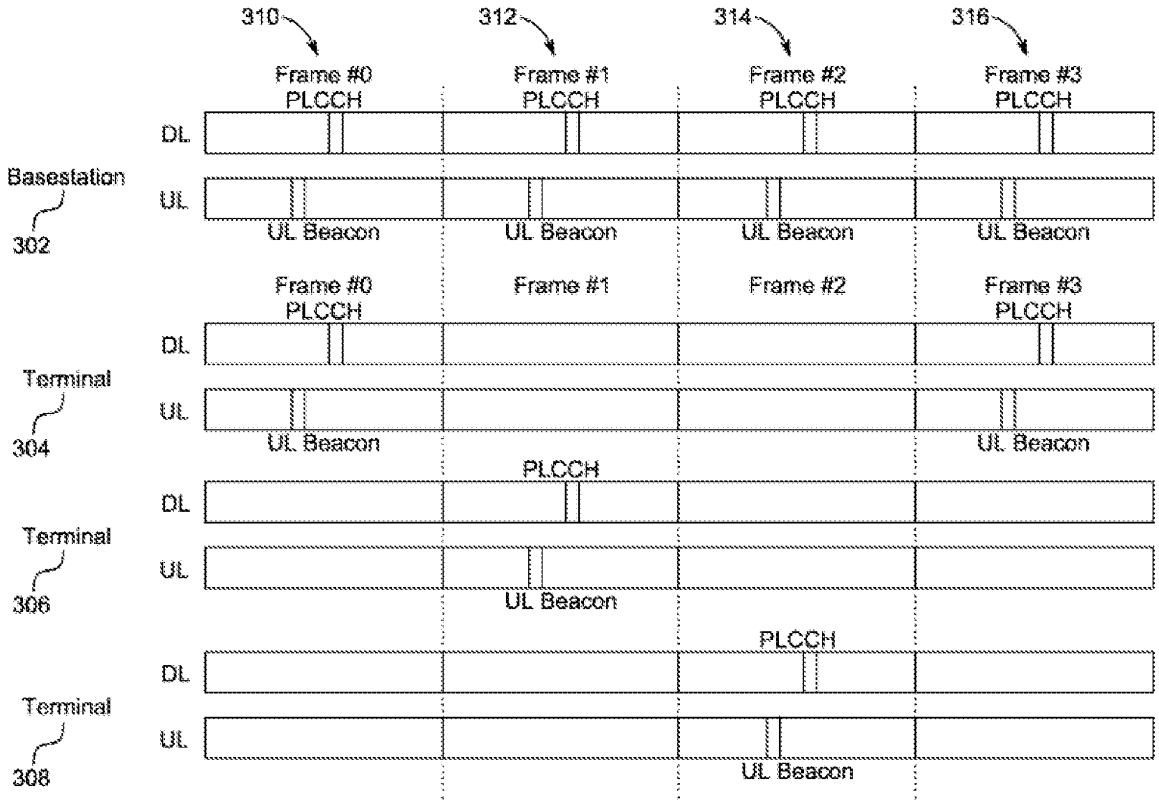


FIG. 3

Figure 3 illustrates a fractionation that provides updates in every third frame. Terminal 304 receives feedback in frames #0 310, #3 316. Terminal 306 receives an update in frame #1 312, and terminal 308 receives an update in frame #2 314. *Id.* at 5:65–6:4. The fractionation phase is 3. *Id.* at 6:3.

As a result of allocating at least one separate timeslot per uplink frame to send a UL_Beacon control signal 216 separated from normal data physical channels 214, a TDMA frame structure may be adapted to provide separation between the UL_Beacon and the normal physical channels as illustrated in Figure 2. *Id.* at 5:15–20. Alternatively, this use of an allocated, separated timeslot for sending control signals such as a UL_Beacon may be used to send at least one signal per multiple uplink frames by allocating a separate timeslot every two, three, or more uplink frames as illustrated in Figure 3 for system applications that can tolerate a slower feedback rate. *Id.* at 5:21–41.

More than one UL_Beacon and its associated PLCCH timeslot may be allocated within a frame structure if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). *Id.* at 5:35–38. Allocating a separate timeslot to send a UL_Beacon allows a large number of possibilities to arrange a UL_Beacon and PLCCH in a frame. *Id.* at 5:32–35.

> By placing UL_Beacon signals in a dedicated timeslot, a dedicated detection scheme can be applied which may include performance enhancing features such as intra-cell cancelling (for alleviating the effects of cross-correlation interference between UL_Beacon signals transmitted by multiple terminals in the same cell), or inter-cell cancelling (for reducing the interference from neighboring cells in the case where the UL_Beacon timeslots are time synchronized). Cross-interference between UL_Beacon and normal uplink bursts is avoided *by the separation obtained from the use of separate time slots.*

Id. at 5:21–31 (emphasis added).

This description of the closed loop feedback control in the '356 Patent makes clear that allocation of a separate timeslot for sending a UL_Beacon control signal in an uplink frame or uplink channel with the allocated timeslot for the UL_Beacon *separated from* timeslots used to send data in the uplink frame is a key feature. As a result, feedback control can operate "even when the terminal does not have data to send" so that the separated "uplink shared channels can be used with maximum efficiency." *Id.* at 6:33–37.

D. Illustrative Claims

Of challenged claims 1–7, 22–28, and 43–46, claims 1, 22, 43, and 45 are independent. Claims 2–7 depend from claim 1. Claims 23–28 depend from claim 22. Claim 44 depends from claim 43, and claim 46 depends from claim 45. Claims 1 and 22, which illustrate the claimed subject matter, are reproduced below with Petitioners' alphanumeric annotations to indicate each limitation. Claim 1 is directed to user equipment while claim 22 is directed to a method performed by a UE similar in scope to claim 1 as indicated below.

> 1. [1p] A user equipment (UE) comprising:
>
> 1[a] a processor configured to receive resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;
>
> 1[b] the processor is further configured to send data over the physical uplink shared channel in assigned time intervals;
>
> 1[c] the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information; and
>
> 1[d] the processor is further configured to receive feedback information from a downlink control channel.

Ex. 1001, 9:40–54; *see* Pet. iv, 67–71.

22. [22p] A method performed by a user equipment (UE), the method comprising:

22[a] receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

22[b] sending, by the UE, data over the physical uplink shared channel in assigned time intervals;

22[c] sending, by the UE in a time interval that it is not sending information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and

22[d] receiving, by the UE, feedback information from a downlink control channel.

Ex. 1001, 11:25–38; *see* Pet. i–ii, 33–42.

D. Prior Art and Asserted Grounds

Petitioners challenge the claims on the following grounds:[2]

Ground	Claim(s) Challenged	35 U.S.C. §[3]	Reference(s)/Basis
1	22, 23, 25–28, 45, 46	102(a), (b)	802.16 Standard[4]
2	1–7, 24, 43, 44	103(a)	802.16 Standard
3	1–7, 43, 44	103(a)	802.16 Standard, Mohanty[5]

[2] Petitioners support their challenge with a Declaration of Dr. Robert Akl, D.Sc. (Ex. 1003). *See infra*.
[3] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, is effective March 16, 2013. Because the application from which the '356 patent issued has an effective filing date prior to March 16, 2013, the pre-AIA version of § 103 applies. *See* Ex. 1001, code (63).
[4] Ex 1005, IEEE Std 802.16-2004, IEEE Standard for Local and metropolitan area networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems, publicly available Nov. 23, 2004 ("the Standard").
[5] Ex. 1009, US 2007/0105600 A1, published May 10, 2007 ("Mohanty").

II. ANALYSIS

A. Legal Standards

A "prior art reference—in order to anticipate under 35 U.S.C. § 102—must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements 'arranged as in the claim.'" *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (quoting *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1548 (Fed. Cir. 1983)). "A single prior art reference may anticipate without disclosing a feature of the claimed invention if such feature is necessarily present, or inherent, in that reference." *Allergan, Inc. v. Apotex Inc.*, 754 F.3d 952, 958 (Fed. Cir. 2014).

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. 35 U.S.C. § 103; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). "[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR*, 550 U.S. at 416 (citing *United States v. Adams*, 383 U.S. 39, 50–51 (1966)). The question of obviousness is resolved based on underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioners assert that a person of ordinary skill in the art at the time of the '356 patent

> would have had at least a Bachelor's degree in Electrical Engineering, Computer Engineering, or related field, with at least three to four years of experience in wireless communication technology, or a Master's degree in electrical engineering, computer engineering, or equivalent. Akl, ¶ 19. Additional education could substitute for professional experience and vice versa. *Id.*

Pet. 32 (citing Ex. 1003 ¶ 19). Petitioners also assert that "[t]he level of ordinary skill in the art may be reflected by the prior art of record." *Id.*

Patent Owner does not expressly address the level of ordinary skill in the art. *See generally* Prelim. Resp.

On this record, Petitioners' proposed level of ordinary skill in the art is not disputed and is consistent with our review and understanding of the technology and descriptions in the '356 patent and the asserted prior art references. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). For purposes of this Decision, we rely on Petitioners' proposed level of ordinary skill in the art.

C. Claim Construction

We interpret a claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2020). Under this standard, we construe the claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.* Furthermore, at this stage in the proceeding, we expressly construe the claims only to the extent necessary to determine whether to institute *inter partes* review. *See Nidec Motor Corp. v. Zhongshan*

Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

Petitioners do not assert any particular claim constructions, stating that "no terms need construction because the claims read on the prior art under any construction consistent with *Phillips*." Pet. 33 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc)).

Patent Owner proposes the following construction of "time interval":

Claim Term	Proposed Construction
"the processor is further configured, *in a time interval that it is not sending information over the physical uplink shared channel*, to send a signal over the uplink physical control channel	The processor is further configured to send a signal over the uplink physical control channel *between transmissions of information over the physical uplink shared channel*

Prelim. Resp. 10.

Patent Owner argues, "[t]he plain meaning of an 'interval' is 'a period of time *between* events or states'" and "[i]n the context of the '356 Patent, the recited 'interval' is the period of time *between transmissions* over the physical uplink shared channel." *Id.* (citing a definition of "interval" from *Merriam-Webster.com Dictionary*, at https://www.merriam-webster.com/dictionary/interval, captured on October 4, 2022 (Ex. 2003)). Patent Owner also cites the Declaration of Dr. Lomp, who testifies that "[a] person of ordinary skill in the art, reading the '356 Patent, would understand that the recited 'interval' is the period of time *between transmissions* over the physical uplink shared channel." Ex. 2001 ¶ 38. Patent Owner argues, "[t]his interpretation aligns with the description in the '356 Patent's specification." Prelim. Resp. 10.

As discussed below, we interpret "time interval" to mean a "timeslot" and the processor sends a signal over an uplink physical control channel "in a timeslot that is not sending information over the physical uplink shared channel, e.g., a timeslot separated from timeslots used to send data."

Patent Owner contends, "[t]he term 'time interval' and 'time slot' are used synonymously in the '356 Patent." Prelim. Resp. 11. Patent Owner's expert, Dr. Lomp, testifies, "[i]n the '356 Patent, the term 'time interval' and 'time slot' are used synonymously. In *every* instance, the term refers to *a time slot within a frame*, e.g., a TD-CDMA frame." Ex. 2001 ¶ 41.

According to the plain meaning of the claim language, the processor is configured "to send a signal over the uplink physical control channel" "in a time interval that is not sending information over the physical uplink shared channel." Ex. 1001, 9:48–52 (claim 1). According to Patent Owner's own interpretation of a timeslot as synonymous with time interval, the processor sends a signal over the uplink physical control channel "in a *timeslot* that is not sending information over the physical uplink shared channel." In other words, the processor may send a signal in any timeslot of a frame as long as that timeslot is not used to send information over the physical uplink shared channel. A "time interval" is allocated as a *timeslot* to send control signals, not data. It is *separate from* timeslots used to send data in a frame.

According to dependent claim 6, "a plurality of UEs each transmit on respective uplink physical control channels in the time interval." Ex. 1001, 10:1–2. Multiple UEs may transmit signals on the uplink physical control channel in the same timeslot. However, this separate timeslot is not used to transmit data over the physical uplink shared channel.

A UE allocates (dedicates) a timeslot for transmitting a beacon signal separated from timeslots used to send data in a frame. *Id.* at 2:29–30.

This interpretation is consistent with the '356 Patent specification, which, as Patent Owner asserts (Prelim. Resp. 11–12; Ex. 2001 ¶ 41), states:

> "a UE allocates *a time slot for a beacon signal [UL_Beacon] separated from the time slots for data in a frame*. A second time slot is allocated within the frame for . . ." '356 Patent, Col. 2, Ll. 29–33 (emphasis added).
>
> "FIG. 2 illustrates a timeslot arrangement for uplink and downlink messages supporting the UL_Beacon and its corresponding PLCCH *within a TD-CDMA frame* structure . . ." ['356 Patent], Col. 3, Ll. 9–11 (emphasis added).
>
> "[I]t is possible to adapt the TDMA frame structure to provide separation between the UL_Beacon and the normal physical channels by *dedicating at least one uplink time slot per frame . . . to carrying UL_Beacon signals*. ['356 Patent], Col. 5, Ll. 15–19 (emphasis added).
>
> "Those skilled in the art will recognize that there are a large number of possibilities for the arrangement of a *UL_Beacon* and its associated PLCCH *within the frame structure* according to embodiments of the invention. More than one UL_Beacon and PLCCH *per frame* could be supported if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). . . ." ['356 Patent], Col. 5, Ll. 32–41 (emphasis added).
>
> "When fractionation is employed, the RNC or other controller may allocate the *UL_Beacon timeslot in a given frame* to a group of terminals. . ." ['356 Patent], Col. 5, Ll. 42–45 (emphasis added).
>
> "FIG. 2 illustrates an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCH *within a TD-CDMA frame structure* . . . The *uplink frame comprises a UL_Beacon control timeslot 216, an access control timeslot 218, and normal traffic carrying timeslots 214*. ['356 Patent], Col. 5, Ll. 50–60 (emphasis added).

These descriptions indicate a UE allocates a timeslot for a UL_Beacon signal in an uplink frame. This timeslot is *separated from* time slots used to transmit data in the frame over a shared physical channel. Ex. 1001, 2:29–33, 4:49–60. "Cross-interference between UL_Beacon and normal uplink bursts is avoided by the *separation* obtained from the use of *separate* time slots." *Id.* at 5:29–31 (emphasis added). Figure 2 of the '356 Patent depicts UL_Beacon in time slot 216 *separate* from time slots 214 (PUSCH) that carry normal traffic. *Id.* at 5:58–60. Because the signal timeslot only needs to be *separated from* data timeslots, a large number of possibilities exist to arrange a timeslot for a UL_Beacon signal and its PLCCH in a frame. *Id.* at 5:32–35. *The UE allocates a timeslot to send control signals separated from data timeslots.*

A dedicated timeslot for a UL_Beacon is *separated* from timeslots used to transmit data in a frame. *Id.* at 2:29–33, 5:15–19. "Embodiments of this invention *separate* uplink control from the uplink physical traffic. This allows the control feedback to operate even when the terminal does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency." *Id.* at 6:33–37 (emphasis added). As a result, *a UE processor might configure a UL_Beacon timeslot for a frame where no other timeslots are used to transmit data by that UE in that frame. See id.* at 6:33–37. Neither the claims nor written description requires a time slot allocated to send control signals to be allocated between timeslots used to send data.

The term "interval" is not used in the Specification of the '356 Patent. It appears only in the claims and Abstract, which states: "Data may be sent over the physical uplink shared channel in assigned time intervals. A signal may be sent over the uplink physical control channel based on the received resource allocation information in a time interval that the UE is not sending data over the physical uplink shared channel." Ex. 1001, Abstract.

The claimed time interval is an assigned timeslot in which a signal (e.g., a UL_Beacon) is sent and in which timeslot the UE is not also sending data over the physical uplink shared channel in that same timeslot that has been allocated to send the UL_Beacon signal. *See id.*

Nor do we view the use of "time *interval*" in the claims as an intent by Patent Owner to limit the claim scope to embodiments where a UL_Beacon timeslot is placed between timeslots for data transmissions given Patent Owner's and Dr. Lomp's contention that the '356 Patent uses "time interval" and "time slot" synonymously (Prelim. Resp. 11; Ex. 2001 ¶ 41), and the only feature claimed (and described) for the time interval is its *separation* from other timeslots used to transmit data in a frame. As claimed, the time interval can be allocated anywhere in a frame. *See* Ex. 1001, 5:32–41; *see also Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1369 (Fed. Cir. 2012) ("Appellees cannot overcome the plain meaning of claim 1 by pointing to an embodiment disclosed in the specification or prosecution history.").

During prosecution of the application that issued as the '356 Patent, Patent Owner argued, "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information" in claim 45 "may mean that a user equipment (UE) is configured to send a signal on an uplink physical control channel **using allocated resources** in the same time interval it is not sending information on a physical uplink shared channel." Ex. 1002, 244–45 (Reply Pursuant to 37 C.F.R. § 1.111, Oct. 24, 2013), *id.* at 246 (arguing that the prior art does not teach or suggest the feature of "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information").

Dr. Lomp testifies that "[i]n *every* instance, the term [time interval] refers to *a time slot within a frame*, e.g., a TD-CDMA frame, where *data* is sent by a UE 'over the physical uplink shared channel in *assigned time intervals within a frame*,' while *another time interval between the data slots* – i.e., 'a time interval that it is not sending information over the physical uplink shared channel" – is used by the UE to send control information over the uplink physical control channel." Ex. 2001 ¶ 41. Dr. Lomp thus describes a "time interval" as "a time interval that it is not sending information over the physical uplink shared channel." *Id.* Dr. Lomp does not explain why the time interval must be allocated *between* data slots in a frame to transmit a signal.

Yet, Dr. Lomp also avers that "[t]he specification makes clear that the timeslot used by the UE for the UL-Beacon is interposed in a frame structure between data time slots." *Id.* Dr. Lomp testifies that a skilled artisan would interpret this limitation in light of the specification to mean "the processor is further configured to send a signal over the uplink physical control channel *between transmissions of information over the physical uplink shared channel*." *Id.* ¶ 42. Dr. Lomp testifies that this construction is supported by the plain meaning of interval, and it aligns with operation of the feedback control system taught by the specification and comports with the stated goal of the '356 Patent to "find a substitute for channel reciprocity" "where the correlation between the uplink and downlink path loss is not guaranteed." *Id.* (quoting Ex. 1001, 1:66–2:2).

Patent Owner's arguments and Dr. Lomp's testimony that the plain meaning of time interval requires the time slot for the signal to be *between* time slots for transmission of information is undermined by their contentions that "time interval" is synonymous with a "time slot," which the '356 Patent describes as being *separated from*, rather than between, data timeslots.

We give more weight to Patent Owner's and Dr. Lomp's contention that a time interval is used in the '356 Patent to mean a timeslot than to a nontechnical dictionary definition of "interval." A timeslot *allocated* for a UL_Beacon is "separated from the time slots for data in a frame." Ex. 1001, 2:29–33. The UL_Beacon channel is *independent* from the uplink physical channel. *Id.* at 2:24–27. A *dedicated* timeslot groups all UL_Beacon signals from many UEs in a *specific* uplink timeslot to "obtain separation from the UL_Beacon signals and the standard uplink physical channels." *Id.* at 2:35–42. A UE "allocates resources so that the physical channel control signal is separate from the uplink (shared) physical channel." *Id.* at 4:49–60. TDMA frame structure *separates* a UL_Beacon from normal channels by dedicating an uplink timeslot per frame. *Id.* at 5:15–41. Many arrangements may be used to achieve this separation of the UL_Beacon signal. *Id.* at 5:32–41.

We have no persuasive evidence that a "time interval" must be allotted *between* data transmission timeslots to provide closed loop feedback control. The '356 Patent indicates: "Embodiments of this invention *separate* uplink control from the uplink physical traffic. This allows the control feedback to operate even when a UE does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency." Ex. 1001, 6:33–37 (emphasis added). This capability exists if a UL_Beacon is sent in a timeslot *separated from* timeslots used to send data in the uplink frame.[6]

[6] Patent Owner asserts that the feedback control system is "a substitute for channel reciprocity" "where the correlation between the uplink and downlink path loss is not guaranteed." Prelim. Resp. 14; Ex. 2001 ¶ 42. An allocated, separate timeslot allows UL_Beacons from multiple UEs to be grouped into a single timeslot to avoid cross interference with uplink physical channels. Ex. 1001, 2:36–61, 5:21–49. If anything, placing a UL_Beacon timeslot between data channels would appear to increase the risk of such cross interference.

D. Ground 1: Claims 22, 23, 25–28, 45, and 46 — Alleged Anticipation by the Standard (Ex. 1005)

1. The Standard (Ex. 1005)

The Standard specifies an air interface for wireless systems in which a subscriber station (SS) receives uplink parameters, chooses a Ranging Slot to perform ranging, sends a Ranging Code to a base station (BS), and receives a Ranging Response with adjustments to its time and power settings. Ex. 1005, 48–51, 174–81, 205–06, 577, 620. Ranging requests are sent over an uplink frame separate from data bursts as shown in Figure 218, reproduced below.

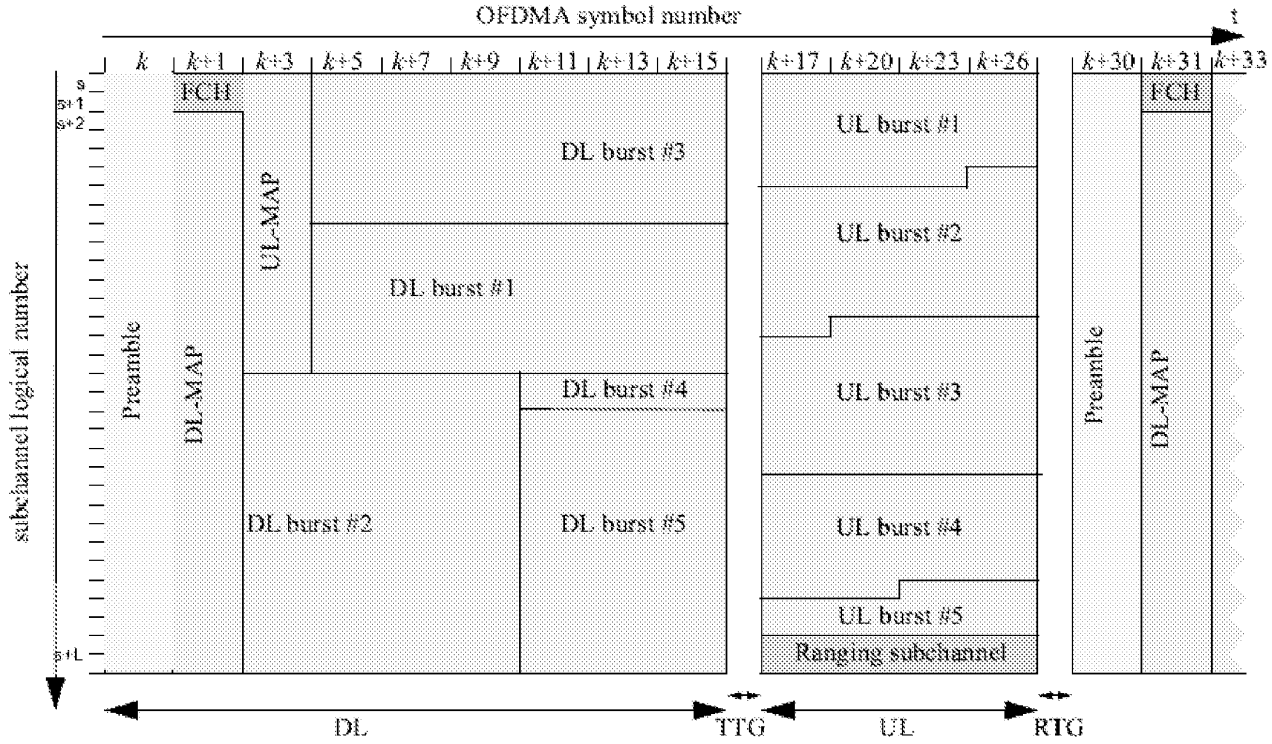


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 depicts a time division duplex TDD time frame in which a SS sends a ranging code over an allocated "Ranging subchannel" timeslot that is separated from timeslots used to send data (UL Bursts #1–5) in an uplink frame. *Id.* 49–51, 154, 167, 174–76, 500, 577, 578, 620, 666.

Table 121 is reproduced below to illustrate a ranging process.

Table 121—CDMA initial Ranging and automatic adjustments procedure

BS		SS
[time to send the CDMA Initial Ranging opportunity]		
send map containing CDMA Initial Ranging IE with a broadcast Connection ID	----------UL-MAP---------->	
	<----------Ranging Code--------	Transmit randomly selected Initial Ranging code in a randomly selected Ranging Slot from available Ranging Region
[Receive Ranging Code]		
Send RNG-RSP with Time & Power Corrections and original Ranging Code and Ranging Slot Status = Continue	----------RNG-RSP-------->	
		Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values Adjust Time & Power parameters
[time to send the CDMA Initial Ranging opportunity]		
send map containing CDMA Initial Ranging IE with a broadcast Connection ID	----------UL-MAP---------->	
	<----------Ranging Code--------	Transmit randomly selected Periodic Ranging code in a randomly selected Ranging Slot from available Ranging Region
[Receive Ranging Code]		
Send RNG-RSP with Time & Power Corrections and original Ranging Code and Ranging Slot Status = Success	----------RNG-RSP-------->	
		Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values Adjust Time and Power parameters

As indicated by its title, Table 121 describes steps that a SS performs in an initial ranging to obtain power and timing adjustments for its transmissions to communicate with the BS. Ex. 1005, 48–51, 154, 174–77, 205–06, 212. If a SS wants to join a network, it scans a UL-MAP message to find an Initial Ranging Interval/Ranging Slot allocated by a BS to access the uplink channel to transmit a Ranging Code to the BS. *Id.* at 48–51, 174–77, 205–06. An Initial Ranging IE (Information Element) in a UL-MAP specifies intervals (Ranging Slots) for the SS to send a Ranging Code. *Id.* at 48, 154, 167, 205–06. The SS chooses an allocated Ranging Slot from the Initial Ranging IE to transmit a Ranging Code or a Ranging Request (RNG-REQ) at prescribed power levels to determine network delay and request power, timing, and other control parameters from the BS. *Id.* at 48–51, 174–78, 205–06, 212–13.

In response to successful receipt of a Ranging Code/RNG-REQ, a BS transmits a ranging response (RNG-RSP). *Id.* at 50, 176, 205–06. The RNG-RSP provides parameters to control uplink communication of the SS such as timing and power adjust information. *Id.* In the RNG-RSP, the BS includes the Ranging subchannel and code attributes of the received Ranging Code to identify the Ranging Code/RNG-REQ to which the BS is responding. *Id.* at 51–52. An uplink Ranging subchannel is illustrated in Figure 218. *Id.* at 666.

When the SS receives the requested RNG-RSP, it adjusts its parameters specified in the RNG-RSP such as transmit power and increases or reduces its transmit power by the amount specified in the RNG-RSP message. *Id.* at 178, 205, 206 ("Adjust Time & Power parameters"). A SS does not transmit until it adjusts the RF signal to meet the RNG-RSP. *Id.* at 205. A power control algorithm is used on the uplink channel for initial calibration and periodic adjustments to prevent data loss. *Id.* 620. The BS should be able capable of providing accurate power measurements of received burst signals of a SS. *Id.*

2. Independent Claim 22

On this record, based on following analysis, we find that Petitioners have established a reasonable likelihood of establishing that at least claim 22 would be anticipated by the Standard for the reasons explained below.

a) Petitioners' Arguments

(1) Preamble – 22[p] A method performed by a user equipment (UE), the method comprising:

To the extent the preamble is limiting, Petitioners argue the Standard discloses "[a] method performed by a user equipment," which the Standard refers to as a "subscriber station" or a "SS." Pet. 33 (quoting Dr. Akl's testimony at Ex. 1003 ¶ 72 and citing the Standard at Ex. 1005, 11).

(2) Limitation 22[a] –receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;

Petitioners argue that the Standard discloses an uplink physical control channel as a ranging subchannel used by a SS to transmit a Ranging Code message, which is control information, not data. Pet. 33–34 (citing Ex. 1005, 500, Fig. 218), Ex. 1003 ¶¶ 73–77, and Pet. 16–17). Petitioners argue that a BS sends UL-MAP messages that include "Initial Ranging IE" that specifies an "Initial Ranging Interval" in which new stations may join the network and the SS selects an allocated interval to send a Ranging Code, which is control information, over the Ranging subchannel, which is a different region than is allocated for uplink bursts. *Id.* at 33–37 (citing Ex. 1003 ¶¶ 73–77; Ex. 1005, 51, 154, 167, 174, 178, 493, 500, 577, 578, 666, Fig. 218). Dr. Akl testifies that a UL-MAP provides the Initial Ranging IE to a SS with different time slots to send a Ranging Code than to send data bursts. Ex. 1003 ¶¶ 73–77.

Petitioners also contend that the ranging subchannel is an uplink control channel because it is part of the uplink subframe and is used by the SS to transmit the Ranging Code message, which a person of ordinary skill in the art (POSA) would have recognized is control information, not data. Pet. 34 (citing Section V.A.2. of the Pet. and Ex. 1003 ¶ 73). Section V.A.2. of the Petition asserts that the SS transmits a Ranging Code message in an Initial Ranging opportunity such as on a Ranging Subchannel that is identified in the UL-MAP (illustrated in Table 121) as allocated resource information for the SS to send the Ranging Code message. Pet. 14–16 (citing Ex. 1005, 51, 154, 167, 174, 178, 500, 577, 578, 666, Table 121, Fig. 218; Ex. 1003 ¶¶ 52, 54). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 52–54.

Section V.A.2. of the Petition is part of Petitioners' explanation of the way that the Standard provides control information from a BS to a SS. In particular, the next section of the Petition, Section V.A.3. explains that after a SS sends the Ranging Code message to the BS, the BS transmits a Ranging Response (RNG-RSP) message to the SS with Power Adjust Information and other parameters to control the uplink transmissions of the SS. Pet. 17–18 (citing Ex. 1005, 50–51, 178, 205–06, Table 121; Ex. 1003 ¶ 56). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶ 56.

> *(3) Limitation 22[b] –sending, by the UE, data over the physical uplink shared channel in assigned time intervals;*

Petitioners argue that the Standard discloses the SS sending data in allocated burst time slots of the uplink subframe, which are time intervals that a BS assigns to the SS in a second UL-MAP message. Pet. 37–40 (citing Ex. 1003 ¶¶ 78–80, 83; Ex. 1005, 8, 11, 103, 176, 500, 533, Fig. 218, Table 287). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 78–83.

(4) Limitation 22[c] – sending, by the UE in a time interval that it is not sending information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and

Petitioners argue that the Standard discloses this limitation by the SS sending a Ranging Code over the Ranging subchannel based on the Initial Ranging opportunity in a time interval that the SS is not sending uplink data bursts as claimed. Pet. 40–42 (citing Ex. 1003 ¶¶ 84–87 and Ex. 1005, 7, 48–51, 154, 174, 175, 178, 205–06, 666, Table 121). Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 84–87. In particular, Petitioner asserts that the Ranging Code is sent over the Ranging subchannel based on the received Initial Ranging opportunity, which provides resource allocation information for the SS to select a Ranging subchannel over which to send the Ranging Code message from the Initial Ranging opportunity sent by the BS without sending data over that subchannel. Pet. 40–42; Ex. 1003 ¶¶ 84–87.

(5) Limitation 22[d] –receiving, by the UE, feedback information from a downlink control channel.

Petitioners argue that a SS receives a RNG-RSP message in response to sending a Ranging code message to a BS, and the RNG-RSP provides control parameters like "Power Adjust Information" for a SS to adjust transmissions. Pet. 42–52 (citing Ex. 1003 ¶¶ 88–97, Ex. 1005, 9, 31, 46–48, 50–51, 123, 178, 205, 497, 500, 522–23, 532–33, 547, 620, Table 121, Fig. 218). Petitioner asserts that upon receiving a CDMA Ranging Code, a BS sends a RNG-RSP message with needed time, power, and frequency corrections for the SS to control its transmission. Pet. 43–47 (citing § V.A.3.; Ex. 1005, 178, 205, 620). Dr. Akl provides testimony to the same effect. Ex. 1003 ¶¶ 88–97.

b) Patent Owner's Arguments

Patent Owner argues that the '356 Patent provides an active feedback control system in which user equipment (UE) such as a cell phone transmits an uplink physical control signal referred to as a UL_Beacon. Prelim. Resp. 15 (citing Ex. 1001, 4:35–40 ("The uplink physical control signal is referred to herein as an 'Uplink Beacon' (UL_Beacon)."). Patent Owner asserts that "[t]he UL_Beacon is a *control* channel signal, because it is used to control the uplink channel as conditions change." *Id.* (citing Ex. 1001, 4:56–60 ("the base station detects the received power and/or other channel information from the UL_Beacon, and sends *controlling* commands back to each terminal to keep the terminal informed of the channel conditions observed at the base station." (emphasis in original)).

Patent Owner contends that this feature is recited in the claims as "the processor is further configured *to send a signal over the uplink physical control channel*." Prelim. Resp. 15. Patent Owner asserts that the Petition identifies the "Ranging Code" sent over the "ranging subchannel" as the claimed "uplink control channel signal." *Id.* at 15–16 (citing Pet. 16–17, 34, 40). Patent Owner asserts, "[t]he Petition does not provide any support for how a randomly selected Ranging Code transmitted in a randomly selected slot constitutes the claimed 'uplink control channel signal.'" *Id.* at 16.

Patent Owner argues that the Petition and Dr. Akl make conclusory remarks that the Ranging Code is an uplink control channel signal by stating, "[t]he ranging subchannel is an 'uplink . . . control channel' because it is part of the uplink subframe and is used by the SS to transmit the Ranging Code Message, which a POSA would have recognized is control information, not data." *Id.* at 19 (quoting Pet. 34); *id.* at 20 (citing Ex. 1003 ¶ 73 as making the same allegedly conclusory remark that is entitled to no weight).

c) Analysis (Claim 22)

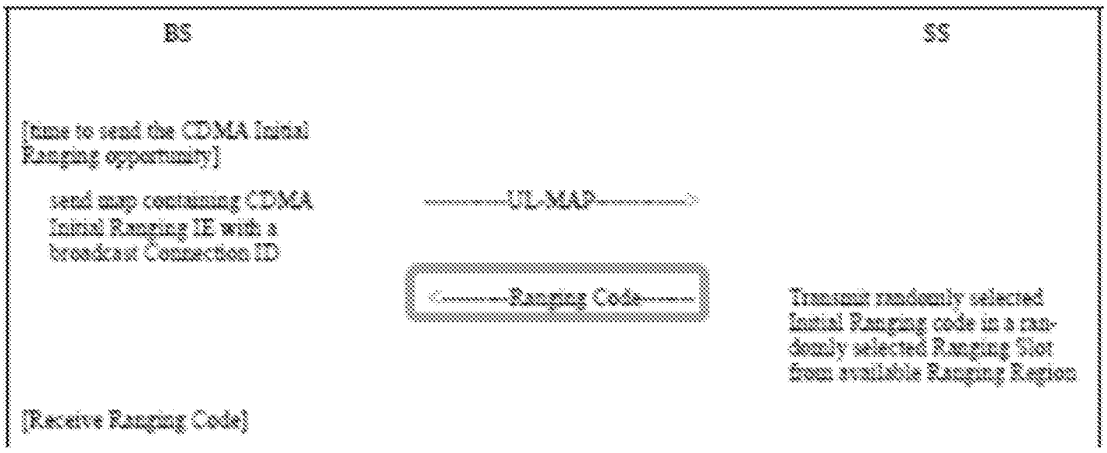
(1) Alleged failure to establish a ranging code is an uplink control channel signal (Limitation 22[c])

Claim 22 recites, "sending . . . a signal over the uplink physical control channel." Ex. 1001, 11:33–35. Patent Owner asserts, "[i]nterpreted in light of the Specification, this limitation requires, at a minimum, the transmission of a signal that is used in at least some way to *control the uplink channel*." Prelim. Resp. 15. According to Patent Owner, "[t]he UL_Beacon is a *control* channel signal, because it is used to control the uplink channel as conditions change. . . 'the base station detects the received power and/or other channel information from the UL_Beacon, and sends *controlling* commands back to each terminal to keep the terminal informed of the channel conditions observed at the base station.'" *Id.* at 15 (quoting Ex. 1001, 4:56–60); *id.* ("This aspect of the '356 Patent is captured in the limitation of Claim 1 which recites that 'the processor is further configured *to send a signal over the uplink physical channel*.'").

Petitioners have shown that a SS sends a Ranging Code over an allotted Ranging subchannel to a BS, which uses the Ranging Code to control the SS's uplink transmissions. Pet. 14–18, 33–47; *id.* at 17 (a BS uses a Ranging Code received from a SS to transmit a RNG-RSP message to provide the SS with control parameters, e.g., Power Adjust Information, that the SS uses to adjust its uplink transmissions), 43–44 (a BS sends a RNG-RSP message to a SS in response to receiving a Ranging Code message, and the RNG-RSP provides the SS with time, power, and other control parameters including Power Adjust Information that a SS uses to adjust uplink transmissions). Dr. Akl testifies to the same facts and process under the Standard. Ex. 1003 ¶¶ 52–56, 72–92.

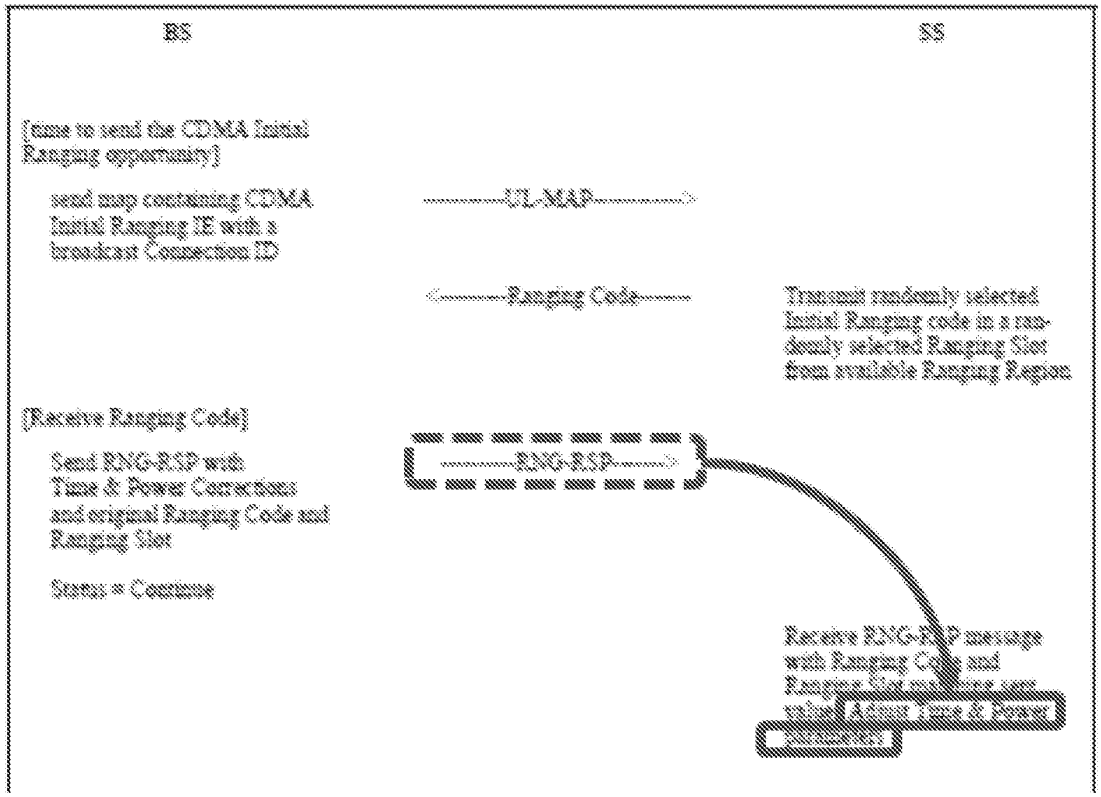
Petitioners annotate two cropped portions of Table 121 to support their contentions. We reproduce both annotated portions of Table 121 below.

Table 121—CDMA initial Ranging and automatic adjustments procedure



The first portion of Table 121 shows a SS sending a Ranging Code on a selected Ranging Slot to a BS. Pet. 17, 41; Ex. 1003 ¶¶ 55, 85; Ex. 1005, 206.

Table 121—CDMA initial Ranging and automatic adjustments procedure



The second annotated portion of Table 121 illustrates a BS responding to a Ranging Code from a SS by sending a Ranging Response (RNG-RSP) to provide the SS with controls to Adjust Time & Power parameters. Ex. 1005, 206. Thus, a Ranging Code is used by a BS to transmit control parameters to control a SS's uplink transmissions. Pet. 17–18, 42–45; Ex. 1003 ¶¶ 56, 89.

Petitioners assert that a SS transmits a Ranging Code over an allocated Ranging Subchannel, which is a "physical uplink control channel" of an Initial Ranging Interval, and a BS responds to this signal by sending power and time adjustments to control the SS's uplink transmissions as in Table 121. Pet. 16–18, 33–36, 40–47; Ex. 1003 ¶¶ 55–56, 73–77, 84–87. We reproduce Figure 218 below to depict a Ranging subchannel in a TDD frame. *See* Pet. 34–35.

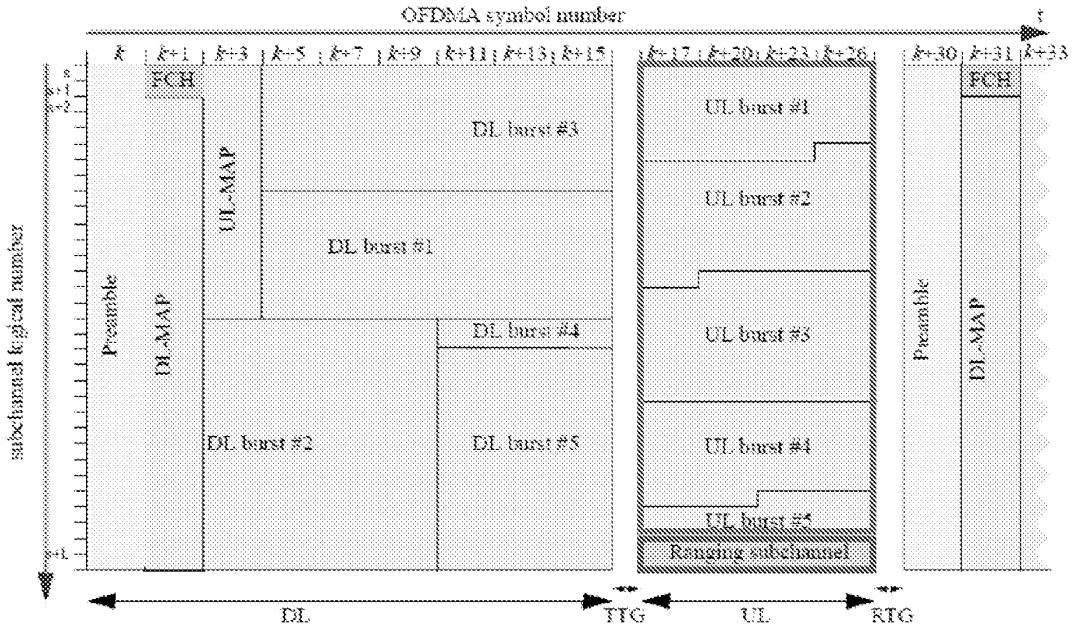


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 of the Standard depicts a TDD time frame with annotated uplink data channels for UL bursts and a separated Ranging subchannel for sending Ranging codes to a BS to obtain time and power settings to control a SS's uplink transmissions. *See* Pet. 33–47; Ex. 1003 ¶ 74; Ex. 1005, 500.

Petitioners' contentions that a ranging subchannel is an uplink control channel used to transmit a Ranging Code that a POSA would recognize to be control information (Pet. 34) has sufficient support in this record because a SS sends a Ranging Code over a Ranging subchannel to a BS, which provides controls to the SS to adjust its power and timing. Pet. 33–47; Ex. 1003 ¶¶ 55, 56, 73–77, 84–92. Petitioners assert that an Initial Ranging opportunity is sent by a BS in a UL-MAP as resource allocation information that SSs use to select a Ranging Subchannel/Slot to send a Ranging Code. Pet. 14–17, 40 (citing Ex. 1005, 49, 154, 174, 175, 205–06, 666). Dr. Akl testifies that a Ranging subchannel is a physical layer (Ex. 1003 ¶ 73) and an OFDM subchannel of an Initial Ranging opportunity allocated in a UL-MAP (*id.* ¶ 85 (citing Ex. 1005, 666); *id.* ¶¶ 72–92) to send a Ranging Code. These proofs indicate Ranging Codes are sent over an allotted control channel to obtain BS control feedback.

Patent Owner argues that the Petition cites to pages 49, 154, 175, and 666 of the Standard in connection with its description of the Ranging Code, but these pages of the Standard describe different messages referred to in the Standard as a "Ranging Request (RNG-REQ) message" and the "RNG-RSP message." Prelim. Resp. 17 & nn. 2, 3. Patent Owner argues that page 19 of the Petition clearly shows the Ranging Code, which the Petition maps to the "uplink control channel signal," is a different message from the RNG-RSP and RNG-REQ messages, which come later in the sequence. *Id.*

Petitioners and their expert Dr. Akl identify the Ranging Code message as a signal that is sent over an allocated uplink physical control channel (i.e., a Ranging subchannel) as claimed. Pet. 14–17, 33–37, 40–42; Ex. 1003 ¶¶ 52–55, 73–77, 84–87. Petitioners and Dr. Akl also identify a Ranging Response (RNG-RSP) message is provided in response to the Ranging Code to control settings of the SS. Pet. 17–18, 42–47; Ex. 1003 ¶¶ 56, 88–92; Ex. 1005, 206.

Petitioners and Dr. Akl contend that a ranging request (RNG-REQ) message in OFDMA (i.e., orthogonal frequency division multiple access) is a Ranging Code message. Pet. 43 (citing Ex. 1005, 205); Ex. 1003 ¶ 106 (citing Ex. 1005, 50, 51). In the Standard, a Ranging Response (RNG-RSP) message is "transmitted by the BS in response to a received RNG-REQ." Ex. 1005, 50. The RNG-RSP message includes the uplink channel on which the BS received the RNG-REQ, *Initial Ranging opportunity number* in the frame in which the RNG-REQ message was received, *Ranging subchannel* used for the initial ranging message, and "*Ranging code attributes*" to "[i]ndicate[] the OFDMA time symbols reference, *subchannel reference*, and frame number used to transmit the *ranging code*, and the *ranging code index* that was sent by the SS." *Id.* at 50–51 (emphasis added). A Ranging Code and RNG-REQ appear to be used for initial ranging to obtain control parameters to control a SS's uplink transmissions, and both are referenced in the RNG-RSP message.

At this stage, we find sufficient evidence to indicate that a RNG-REQ and/or a Ranging Code are sent over an allotted Ranging subchannel for initial ranging to a BS, which sends Time and Power Adjustments to a SS to control its uplink transmissions based on the received Ranging Code and/or RNG-REQ. Ex. 1005, 48–51, 154, 174–81; *see also id.* at 176–77 (Table 115).

Even disregarding citations in the Petition and Dr. Akl's testimony to RNG-REQ messages, we find sufficient evidence at this stage of the proceeding to institute *inter partes* review based on the SS transmitting a Ranging Code in an allocated Ranging Slot of a Ranging Subchannel/Initial Ranging Interval to a BS, which returns control parameters (e.g., Power and Time Adjustments) to the SS in a RNG-RSP based on the received Ranging Code as described in Table 121 and related portions of the Standard. Pet. 14–18, 33–47; Ex. 1003 ¶¶ 51–56, 73–92; Ex. 1005, 50–51, 174–76, 205–06.

Table 121 "define[s] the ranging and adjustment process that shall be followed by compliant SSs and BSs." Ex. 1005, 205. A SS chooses randomly a Ranging Slot to perform ranging and a Ranging Code from the available Ranging Region and sends the Ranging Code to the BS as a CDMA code. *Id.*

In response to the Ranging Code, a BS provides a ranging response. "The Ranging Response message contains all the needed adjustments (e.g., time, power, and possibly frequency corrections) and a status notification." Ex. 1005, 205. "Power adjustment shall be capable of being reduced or increased by the specified amount in response to RNG-RSP messages." *Id.*

"[T]he SS shall not transmit until the RF signal has been adjusted in accordance with the RNG-RSP and has stabilized." *Id.* Table 121 defines a ranging and adjustment process that sends a Ranging Code signal from a SS to a BS and receives commands to control the SS's power and other parameters as Petitioners contend. *See* Pet. 14–17, 33–47; Ex. 1003 ¶¶ 52–56, 73–89.

Ranging Codes may be transmitted periodically for ranging. *Id.* at 577–78. A SS modulates a ranging code on a ranging subchannel for an OFDMA symbol period as Patent Owner notes. *Id.*; *see* Prelim. Resp. 18–19. This modulation does not undercut a BS's use of a received Ranging Code to send control commands to a SS as described in the Standard and discussed above.

Ranging for time and power may be performed during FDD or TDD transmissions on a periodic basis. *Id.* at 620. A power control algorithm is supported on the uplink channel for initial calibration and periodic adjustment procedures without data loss with a BS capable of providing accurate power measurements of the received burst signal. *Id.*

Petitioners cite Table 121 and these other portions to describe the UL-MAP, Ranging Code, and Ranging Response used to send control commands to a SS. *See* Pet. 14–18, 33–37, 40–47; Ex. 1003 ¶¶ 52–56, 72–77, 84–92.

The Standard also appears to describe the use of a RNG-REQ message and a CDMA code as alternative ways to send control signals over a dedicated and allocated Ranging Slot (Table 121) or Ranging subchannel at initialization (and periodically) in order for a SS to receive power and timing adjustments from a BS via a RNG-RSP message sent with control commands to a SS in response to a CDMA ranging code or RNG-REQ message. Ex. 1005, 174–77 (cited in Pet. 15–17, 35, 37, 40 and Ex. 1003 ¶¶ 52, 55, 56, 75, 79, 85, 89).

The Standard appears to describe similar ranging procedures for a CDMA ranging code and a RNG-REQ message. For OFDM PHY, the SS shall send the RNG-REQ at a power level below $P_{TX\_IR\_MAX}$ measured at the antenna connector. *Id.* at 175. For OFDMA, the SS shall send a CDMA code at a power level below $P_{TX\_IR\_MAX}$ measured at the antenna connector. *Id.* at 176. If the SS does not receive a response, the SS shall resend the RNG-REQ at the next appropriate Initial Ranging transmission opportunity at one step higher power level. *Id.* at 175. For OFDMA, the SS shall send a new CDMA code at the next appropriate Initial Ranging transmission opportunity at one step higher power level. *Id.* at 176. If the SS receives a response containing its MAC Address, it shall consider the RNG-RSP reception of the RNG-REQ to be successful. *Id.* at 175. If the SS receives a UL-MAP containing a CDMA allocation ID with parameters of the code that it transmitted, it shall consider the RNG-RSP reception successful and send a unicast RNG-REQ on the allocated BW. *Id.* at 176. Once a BS successfully receives the RNG-REQ message, it returns a RNG-RSP message with RF power level and frequency adjustments and timing offsets. *Id.*; *see* Pet. 40–44; Ex. 1003 ¶¶ 84–89.

A SS randomly chooses a Ranging Slot and sends a CDMA Ranging Code to the BS, which sends a RNG-RSP for power adjustment to the SS as illustrated in Table 121. *Id.* at 205–06; *see id.* at 174–76, 212–13 (Table 122).

Patent Owner also contends, "the Ranging Code is just a code – nothing more." Prelim. Resp. 18. Patent Owner cites Figure 243 of the Standard to illustrate that a Ranging Code is a code. *Id.* at 19.

Under the Standard, a BS defines uplink bandwidth allocations in IEs of a UL-MAP for a SS to send initial ranging codes. Ex. 1005, 48. For periodic ranging, a SS transmits by *modulating* one or more ranging codes onto the ranging subchannel for a period of one or more OFDMA symbols. *Id.* at 577.

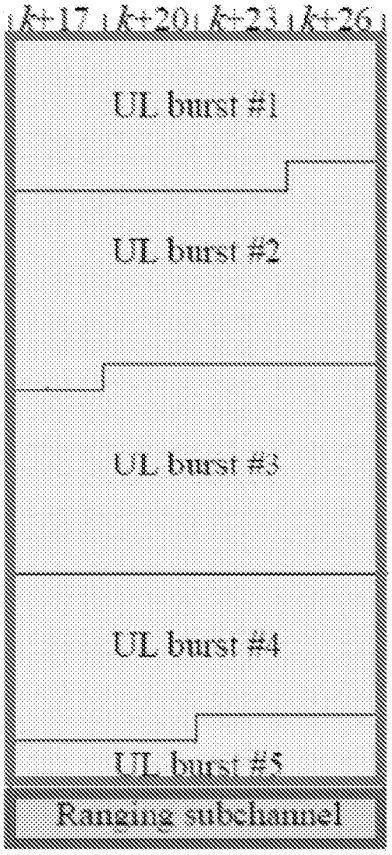
Ranging subchannels are allocated dynamically by the MAC layer and indicated in the UL-MAP. *Id.* at 48; *see* Pet. 14–17 (citing Ex. 1005, 577 as evidence that a Ranging Subchannel is an uplink subframe for Ranging Code messages), 36 (citing Ex. 1005, 577 as evidence a Ranging Code message would be understood by a POSA as control information); Ex. 1003 ¶¶ 52–55 (citing Ex. 1005, 577 as evidence Ranging subchannels are uplink subframes used to transmit ranging code messages), 73–77 (ranging subchannels are sent in a UL-MAP as physical control channels to send a Ranging Code message that a POSA would recognize is control information, not data), 84–87 (same).

Figure 243 discusses ranging codes produced by a pseudo-random noise generator (PRBS) to *modulate subcarriers* in groups of subchannels that form a *ranging subchannel* referenced in *ranging* and *bandwidth request messages*. Ex. 1005, 578. These ranging codes appear to be used to send ranging signals.

At this stage, Petitioners have provided sufficient evidence that the Standard describes sending a Ranging code and/or RNG-REQ message signal over an uplink control channel (Ranging subchannel/Slot) to obtain control commands for a SS as recited in claim 22. *See* Pet. 15–17, 35–37, 40–47; Ex. 1003 ¶¶ 55, 56, 76, 84–86, 88–92; Ex. 1005, 49, 50, 205–06.

The parties are invited to submit additional briefing regarding ranging codes and ranging requests and any other issues discussed herein.

Regarding Patent Owner's argument that the Standard fails to disclose the transmission of a control signal interposed *between* data transmissions as required by the Challenged Claims (Prelim. Resp. 20–22), our interpretation of "interval" largely resolves this issue. Patent Owner asserts that sending an initial ranging code over a Ranging subchannel as "a signal [sent] over the uplink physical control channel" (as claimed) before the SS device sends data over the uplink channel as UL-bursts) means that the Standard fails to disclose that the signal is interposed *between* transmissions of data over the physical uplink shared channel as claimed. *Id.* at 21–22. Patent Owner reproduces the uplink portion of the Standard from the Petition (Pet. 35) to illustrate this asserted shortcoming. We reproduce this annotated uplink frame below.



This uplink frame is part of a TDD time frame depicted in Figure 218 of the Standard with Petitioners' annotations to illustrate an uplink ranging subchannel as an uplink physical control channel and uplink data channels as UL burst #1–5 over which a SS transmits data to a BS. *See* Ex. 1005, 500; Pet. 35.

Patent Owner's argument is unpersuasive in view of our interpretation of "interval" in the claims as not requiring a signal to be transmitted from a UE *between* data transmissions. The language of claim 22 and the other challenged claims merely require a signal to be sent in a time interval in which a UE is not sending information over the physical uplink shared channel. *See* Ex. 1001, 9:48–52, 11:33–36, 13:13–17, 14:11–14. Patent Owner recognizes that the Standard transmits a Ranging code in an interval (i.e., the Ranging subchannel) in which the SS is not sending data bursts over a physical uplink shared channel during initial ranging and later when UL bursts are sent in different intervals (timeslots) as illustrated in the portion of Figure 218 that is reproduced above and in the Petition and Standard. *See* Prelim. Resp. 16–17 n.2, 20; Pet. 35; Ex. 1005, 500. We invite the parties to submit additional briefing on this issue and our interpretation of time interval set forth above in the claim construction section of this decision.

d) Analysis of Claims 23, 25–28, 45, and 46

Petitioners provide detailed contentions regarding their assertion that claims 23, 25–28, 45, and 46 are anticipated by the Standard. Pet. 52–62. Petitioners support the contentions with citations to supporting disclosures in the Standard and testimony of Dr. Akl. *Id.* (citing Ex. 1003 ¶¶ 98–118). At this stage, we find that these contentions and evidence establish a reasonable likelihood of Petitioners prevailing on at least one of these claims. Patent Owner has not disputed any of these contentions. *See* Prelim. Resp. 15–22.

E. Grounds 2 and 3: Claims 1–7, 24, 43, and 44 — Alleged Obviousness over the Standard Alone (Ex. 1005) or in Combination with Mohanty (Ex. 1009)

1. Petitioners' Contentions

Petitioners assert that the Standard alone or in combination with Mohanty would have rendered obvious claims 1–7, 24, 43, and 44. Pet. 62. For Ground 2, Petitioners assert that the Standard describes user equipment (UE) as a subscriber station (SS) that performs functions performed by the processor in limitations 1[a]–1[d]. *Id.* Petitioners argue that a skilled artisan would have been motivated and found it obvious based on the Standard to implement the SS with a "processor configured to" perform the SS functions because a skilled artisan would know that SSs like those in the Standard are implemented this way. *Id.* (citing Ex. 1003 ¶¶ 119, 120). Dr. Akl testifies that the Standard describes a UE as a SS that performs functions performed by the processor in limitations 1[a]–1[d] and a skilled artisan would have been motivated to implement a SS with a processor configured to perform the SS's functions because a skilled artisan would have known that SSs like those in the Standard typically are implemented this way. Ex. ¶¶ 119, 120.

For Ground 3, Petitioners cite Mohanty as evidence that it is known to implement an SS using a predefined computer language, manner, or syntax to instruct a processor to perform a certain function. Pet. 63 (citing Ex. 1009 ¶¶ 18, 19). Petitioners cite Figure 2 of Mohanty and associated description of processor 202-1 connected to memory 202-2 and implemented as various types of processors that implement instruction sets as being consistent with the '356 patent's description of a processor configured to carry out functions of a UE in claim 1. *Id.* at 63–64 (citing Ex. 1009 ¶¶ 59–61). Dr. Akl offers supporting testimony to the same effect. Ex. 1003 ¶¶ 120–123.

Petitioners contend that a skilled artisan would have been motivated by Mohanty to implement the SS of the Standard on a processor configured to perform functions described in the Standard to yield predictable results and for technical advantages of processors such as efficient and powerful computing and flexible programming. Pet. 65–67 (citing Ex. 1009 ¶¶ 18–20, 59–61; Ex. 1003 ¶¶ 123–125). Dr. Akl offers supporting testimony to the same effect. Ex. 1003 ¶¶ 123–125 (citing Ex. 1009 ¶¶ 18–20, 59–61).

For claim 1, Petitioners' contentions for limitations 1[p]–1[d] under Ground 2 rely on the Standard to the same extent as Petitioners did for the similar limitations 22[a]–22[d] of claim 22 for Ground 1 with Mohanty's teachings also cited to support Ground 3. Pet. 67–73. Dr. Akl provides supporting testimony to the same effect. Ex. 1003 ¶¶ 126–130. For claims 2–7, 24, 43, and 44 under Ground 2, Petitioners provide their contentions with the supporting testimony of Dr. Akl and rely on their contentions for similar limitations in claims 22–28, 45, and 46 under Ground 1 and also cite Mohanty to support Ground 3. Pet. 73–83 (citing Ex. 1003 ¶¶ 131–150).

2. Patent Owner's Arguments

Patent Owner argues that Grounds 2 and 3 should be denied because Petitioners map the initial ranging code of the Standard to "a signal [sent] over the uplink physical control channel" and UL bursts of the Standard to "data [sent] over the physical uplink shared channel in assigned time intervals" and the mappings fail for the reasons set forth for Ground 1. Prelim. Resp. 22–23.

3. Analysis

Based on the current record, Petitioners' contentions and evidence establish a reasonable likelihood of prevailing on at least one of these claims asserted to be unpatentable under Grounds 2 and 3. Patent Owner's argument is not persuasive for the reasons discussed above for Ground 1.

III. CONCLUSION

On this record, we are persuaded that Petitioners have demonstrated a reasonable likelihood of prevailing in showing the unpatentability of at least one of the challenged claims of the '356 patent. We, therefore, institute an *inter partes* review as to all claims and grounds in the Petition. 35 U.S.C. § 314(a); 37 C.F.R. § 42.108(a). Our factual findings and determinations at this stage of the proceeding are preliminary, and based on the evidentiary record developed thus far. This is not a final decision as to the patentability of claims for which *inter partes* review is instituted. Our final decision will be based on the record as fully developed during trial.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that *inter partes* review of the '356 patent is hereby instituted as to claims 1–7, 22–28, and 43–46 on all grounds set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial on the grounds of unpatentability authorized above; the trial commences on the entry date of this decision.

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Paper 8
Entered: February 7, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMERICAN HONDA MOTOR CO., INC.,
Petitioner,

v.

INTELLECTUAL VENTURES II LLC,
Patent Owner.

IPR2023-00077
Patent 8,811,356 B2

Before JAMES P. CALVE, SCOTT A. DANIELS, and FREDERICK C. LANEY, *Administrative Patent Judges.*

CALVE, *Administrative Patent Judge*.

DECISION
Settlement Prior to Institution of Trial
37 C.F.R. § 42.74

With our authorization, the parties filed a Joint Motion to Terminate Proceeding. Paper 6. The parties assert that they "have reached an agreement to resolve this *inter partes* review (IPR) proceeding." *Id.* at 1. The parties represent that, as a result of the parties' resolution of their dispute, they also are filing a motion to dismiss the co-pending lawsuit related to U.S. Patent No. 8,811,356 B2 ("the '356 Patent"), which is the patent at issue in this proceeding. *Id.* at 3. The parties also represent that "[a] true copy of the document resolving the disputes related to the '356 Patent is filed concurrently herewith," which was filed as Exhibit 2001. *Id.* at 4. We have reviewed that document, and it indicates that the agreement is the entire agreement between the parties.

In a separate paper, the parties also jointly request that the Board "treat the document resolving the proceeding (the 'Resolution Document,' Exhibit 2001) . . . as business confidential information" and "that the confidential Resolution Document be kept separate from the file of the subject patent in the captioned proceeding and be made available only to Federal Government agencies on written request or to persons showing good cause." Paper 7, 1.

The Board has not yet entered a decision on institution of a trial, and we determine that good cause exists to dismiss the Petition (Paper 2) and to terminate the preliminary proceeding. *See* 37 C.F.R. § 42.74. After reviewing the parties' confidential Resolution Document, we find that the Resolution Document contains confidential business information regarding the terms of settlement, and we determine that good cause exists to treat the Resolution Document as business confidential information.

It is

ORDERED that the Joint Motion to Terminate Proceeding is *granted*;

FURTHER ORDERED that the Petition (Paper 2) is *dismissed* and the preliminary proceeding is *terminated*; and

FURTHER ORDERED that the filed Resolution Document (Ex. 2001) be treated as business confidential information pursuant to 37 C.F.R. § 42.74(c) and also remain designated as available only to "Parties and Board" in the Board's E2E system.

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Paper 41
Date: December 4, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CONTINENTAL AUTOMOTIVE SYSTEMS, INC.,
Petitioner,

v.

INTELLECTUAL VENTURES II LLC,
Patent Owner.

IPR2022-01130
U.S. Patent No. 8,811,356 B2

Before JAMES P. CALVE, SCOTT A. DANIELS, and FREDERICK C. LANEY, *Administrative Patent Judges.*

CALVE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. Background and Summary

Toyota Motor Corporation ("Toyota") and Continental Automotive Systems, Inc. ("Continental") (collectively "Petitioners") filed a Petition (Paper 1, "Pet.") requesting *inter partes* review of claims 1–7, 22–28, and 43–46 of U.S. Patent No. 8,811,356 B2 (Ex. 1001, "the '356 patent"). Intellectual Ventures II LLC ("Intellectual Ventures" or "Patent Owner") filed a Preliminary Response to the Petition. Paper 10 ("Prelim. Resp.").

We concluded that Petitioners satisfied the burden, under 35 U.S.C. § 314(a), to show that there was a reasonable likelihood that Petitioners would prevail with respect to at least one of the challenged claims. Accordingly, on behalf of the Director (37 C.F.R. § 42.4(a)), and in accordance with *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1353 (2018), we instituted an *inter partes* review of all the challenged claims, on all of the asserted grounds. Paper 13 ("Decision" or "Dec. Inst.").

Following institution, Toyota and Intellectual Ventures filed a Joint Motion to Terminate proceedings based on their settlement agreement that resolved all disputes between them in this proceeding and a related district court action. Paper 21; Ex. 1018. We granted the Joint Motion to Terminate and terminated proceedings as to Petitioner Toyota Motor Corp. Paper 25, 4.

Thereafter, Patent Owner filed a Response. Paper 26 ("PO Resp."). Continental ("Petitioner") filed a Reply. Paper 28 ("Reply"). Patent Owner filed a Sur-reply. Paper 33 ("Sur-reply").

Patent Owner filed a Motion to Exclude. Paper 34. Petitioner filed an Opposition. Paper 35. Patent Owner filed a Reply. Paper 37.

A hearing was held on August 28, 2023. Paper 40 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6. We enter this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

Petitioner Continental has the burden of proving the unpatentability of a claim by a preponderance of the evidence. 35 U.S.C. § 316(e).

Based on the findings and conclusions below, we determine that Petitioner has proven that claims 1–7, 22–28, and 43–46, which comprise all of the claims challenged in this proceeding, are unpatentable.

We also deny Patent Owner's Motion to Exclude.

B. Real Parties in Interest

Petitioner identifies Continental Automotive Systems, Inc., Continental Automotive GmbH, Continental Automotive Technologies GmbH, Continental Automotive, Inc., and Continental AG (the parent of Continental Automotive, Inc.) as real parties-in-interest. Pet. 83. Patent Owner identifies Intellectual Ventures II LLC as the patent owner and the sole real party-in-interest. Paper 5, 2.

C. Related Matters

The parties indicate that the '356 patent is at issue in the district court litigations of *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Toyota Motor Corp. et al.*, Case No. 2:21-cv-00389 (E.D. Tex. October 19, 2021), *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Honda Motor Co., Ltd. et al.*, Case No. 3:22-cv-00761 (N.D. Tex. April 4, 2022), and *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. General Motors Company*, Case No. 6:21-cv-01088 (W.D. Tex. October 19, 2021). Pet. 84; Paper 5, 2. The parties also indicate that the related district court proceeding in *Intellectual Ventures I LLC and Intellectual Ventures II LLC v. Toyota Motor Corp. et al.*, Case No. 2:21-cv-00389 (E.D. Tex. October 19, 2021) was resolved by their settlement agreement. Paper 21, 2.

D. The '356 Patent (Ex. 1001)

The '356 patent addresses the problem of uplink control when channel reciprocity is lost.[1] It introduces a new uplink channel control technique that uses a feedback scheme as a substitute for channel reciprocity with minimal impact on the ability of the air interface to support uplink channels. Ex. 1001, 2:11–16. In one embodiment,

> an uplink beacon function (for power control) and a modified random access process substitute for the information lost due to the lack of channel reciprocity in paired operation. Embodiments of the invention allow a terminal to transmit the uplink physical channel control signal (UL_Beacon) independently from the uplink physical channel. Therefore, the implementation of closed loop feedback may operate in the absence of an uplink physical channel. In one embodiment, a UE allocates a time slot for a beacon signal separated from the time slots for data in a frame. A second time slot is allocated within the frame for the base station to transmit a control signal in response to the beacon signal. The control signal instructs the UE to adjust a transmission parameter.

Ex. 1001, 2:21–34; *id.* at 4:35–60.

The closed loop feedback allocates a timeslot in an uplink frame to send a control signal from a UE to a base station, which sends controls back to the UE. Ex. 1001, 2:6–48, 4:35–5:41, 5:50–6:4. Each UE allocates a timeslot to send a UL_Beacon signal separated from timeslots used to send data in an uplink frame. *Id.* at 2:20–42, 4:35–55, 5:15–20. Base stations respond to the UL_Beacon signal on a downlink Physical Layer Common Control Channel (PLCCH) with control commands to adjust power. *Id.* at 2:31–60, 4:49–5:60.

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[1] Channel reciprocity exists when the same radio channel is used for uplink and downlink communications so information about uplink channel conditions such as pathloss can be derived from downlink channel conditions based on signals received by user equipment (UE). Ex. 1001, 1:17–29.

A dedicated timeslot can group UL_Beacon signals from multiple UEs into a specific uplink timeslot to "obtain separation between the UL_Beacon signals and the standard uplink physical channels." Ex. 1001, 2:35–42. A downlink PLCCH carries feedback information (power, control commands) to UEs that transmit UL_ Beacon signals. *Id.* at 2:45–46; 4:35–5:41, 5:50–60. Figure 2 of the '356 patent, reproduced below, depicts this feedback system.

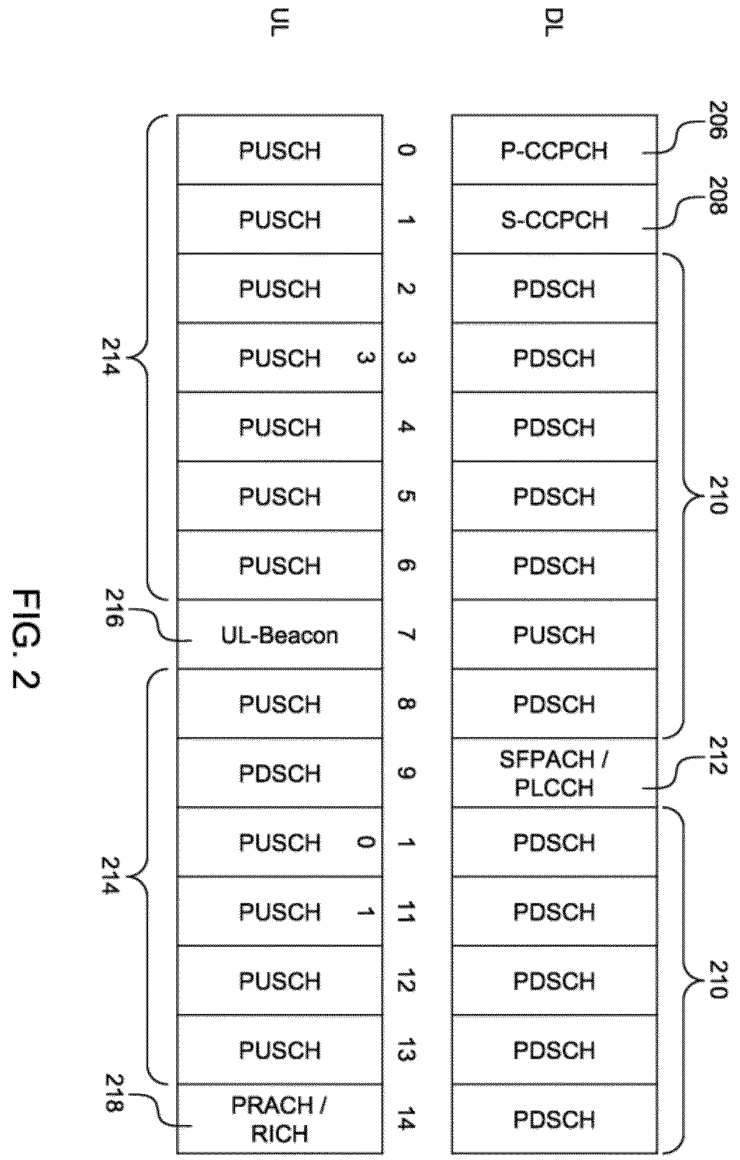


FIG. 2

Figure 2 depicts an uplink (UL) frame with timeslot 216 allocated to transmit UL_Beacons *separate* from timeslots 214 used to transmit data. A base station allocates timeslot 212 in a downlink (DL) frame to send PLCCH control commands to UEs to control their uplink transmissions separate from DL timeslots 210 used to transmit data. *Id.* at 2:11–48, 4:35–5:20, 5:50–60.

By separating the uplink physical channel control signal (UL_Beacon) from the uplink physical data channel, the closed loop feedback system may operate without an uplink physical channel for data. Ex. 1001, 2:24–28. The uplink physical control channel and downlink control channel "may not need an associated data physical channel to be operational." *Id.* at 4:24–27. This separation "allows the control feedback to operate even when the terminal does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency." *Id.* at 6:33–37.

More than one UL_Beacon and its associated PLCCH timeslot may be allocated per frame if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). *Id.* at 5:35–38. Allocating a separate timeslot to send a UL_Beacon provides a large number of possibilities to arrange a UL_Beacon and its associated PLCCH in frames. *Id.* at 5:32–35.

> By placing UL_Beacon signals in a dedicated timeslot, a dedicated detection scheme can be applied which may include performance enhancing features such as intra-cell cancelling (for alleviating the effects of cross-correlation interference between UL_Beacon signals transmitted by multiple terminals in the same cell), or inter-cell cancelling (for reducing the interference from neighboring cells in the case where the UL_Beacon timeslots are time synchronized). Cross-interference between UL_Beacon and normal uplink bursts is avoided *by the separation obtained from the use of separate time slots*.

Id. at 5:21–31 (emphasis added).

If a slower update rate is tolerable, UL_Beacon and PLCCH timeslots can be fractionated as shown in Figure 3, reproduced below. *Id.* at 5:38–41.

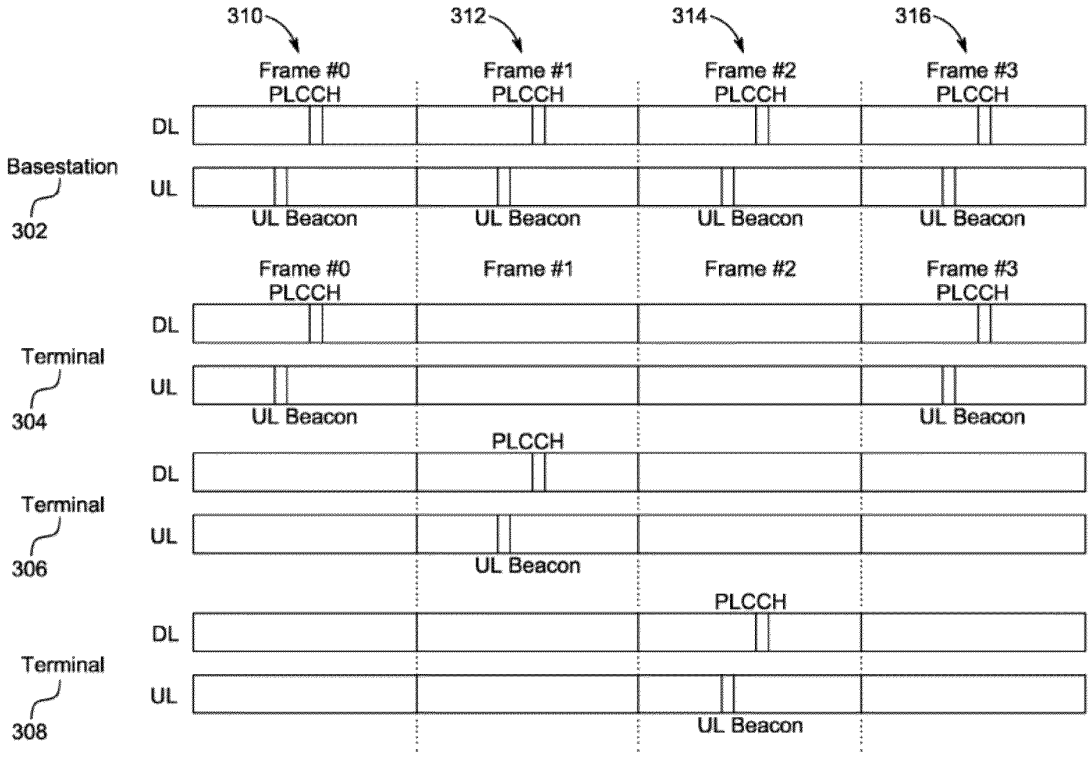


FIG. 3

Figure 3 illustrates a fractionation phase of 3 that updates a terminal in every third frame. Terminal 304 receives feedback in frames #0 310, #3 316. Terminal 306 receives an update in frame #1 312. Terminal 308 receives an update in frame #2 314. *Id.* at 5:65–6:4. Fractionation supports more UEs at a slower feedback rate when a slower update rate meets performance targets. *Id.* at 5:38–49. If a faster feedback update rate is required than the frame rate, more than one UL_Beacon and PLCCH timeslot can be supported in a frame at the expense of system capacity. *Id.* at 5:32–38. A UL_Beacon can be sent even when no data is sent in a frame. *Id.* at 2:24–28, 6:33–37.

E. Illustrative Claims

Of the challenged claims 1–7, 22–28, and 43–46, claims 1, 22, 43, and 45 are independent. Claims 2–7 depend from claim 1. Claims 23–28 depend from claim 22. Claim 44 depends from claim 43, and claim 46 depends from claim 45. Claims 1 and 22 illustrate the claimed subject matter and are reproduced below with Petitioners' annotations in italics to identify each element. Claim 1 is directed to user equipment while claim 22 is directed to a method performed by a UE similar in scope to claim 1 as indicated below.

> 1. *1[p]* A user equipment (UE) comprising:
>
> *1[a]* a processor configured to receive resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;
>
> *1[b]* the processor is further configured to send data over the physical uplink shared channel in assigned time intervals;
>
> *1[c]* the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information; and
>
> *1[d]* the processor is further configured to receive feedback information from a downlink control channel.

Ex. 1001, 9:40–54; *see* Pet. iv, 67–73.

> 22. *22[p]* A method performed by a user equipment (UE), the method comprising:
>
> *22[a]* receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;
>
> *22[b]* sending, by the UE, data over the physical uplink shared channel in assigned time intervals;

> *22[c]* sending, by the UE in a time interval that it is not sending information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and
>
> *22[d]* receiving, by the UE, feedback information from a downlink control channel.

Ex. 1001, 11:25–38; *see* Pet. i–ii, 33–42.

F. Instituted Grounds of Unpatentability

Petitioner contends that the challenged claims 1–7, 22–28, and 43–46 of the '356 patent are unpatentable based on the following grounds, all of which are grounds that have been instituted in this proceeding (*see* Pet. 1–3):

Ground	Claim(s) Challenged	35 U.S.C. §[2]	Reference(s)/Basis
1	22, 23, 25–28, 45, 46	102(a), (b)	802.16 Standard[3]
2	1–7, 24, 43, 44	103(a)	802.16 Standard
3	1–7, 43, 44	103(a)	802.16 Standard, Mohanty[4]

Petitioner also relies on the declaration testimony of Dr. Robert Akl. Ex. 1003. Patent Owner relies on the declaration testimony of Dr. Gary Lomp. Ex. 2005. We have reviewed the credentials of Petitioner's declarant, Dr. Akl, and Patent Owner's declarant, Dr. Lomp, and consider both to be qualified to provide the opinions for which their testimony has been submitted. Neither party has challenged their qualifications.

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[2] The Leahy-Smith America Invents Act ("AIA") revised 35 U.S.C. §§ 102 and 103 effective on March 16, 2013. Because the'356 patent has an effective filing date before March 16, 2013, we use the pre-AIA versions of §§ 102 and 103.

[3] Ex 1005, IEEE Std 802.16-2004, IEEE Standard for Local and metropolitan area networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems, dated Oct. 1, 2004 ("the Standard").

[4] Ex. 1009, US 2007/0105600 A1, published May 10, 2007 ("Mohanty").

II. MOTION TO EXCLUDE EVIDENCE

Patent Owner filed a motion to exclude Exhibit 1005 from evidence. Paper 34 ("Motion"). Exhibit 1005 is the Standard. Patent Owner's objections are based on (1) Petitioner's objection to the admissibility of the Standard in IPR2022-00974 as lacking authentication under Fed. R. Evid. ("FRE") § 901, irrelevant or prejudicial, confusing, and a waste of time under FRE 401, 402, and 403, and inadmissible hearsay under FRE 801 and 802, (2) alleged lack of authentication of the date of public availability or public accessibility of the Standard, (3) a reliance on a copyright notice as evidence of a publication date of a printed publication as inadmissible hearsay, and (4) irrelevance because the publication date of the Standard is not established to qualify it as prior art. *Id.*; *see* Paper 15 (Patent Owner's Objections to Evidence), 1. Petitioner filed an Opposition to the Motion. Paper 35 ("Opp."). Patent Owner filed a Reply in Support of its Motion to Exclude Evidence. Paper 37 ("Reply").

A. Petitioner's Alleged Admissions in IPR2022-00974

Petitioner asserts that "Petitioner has not admitted that the Standard is not admissible evidence in the instant proceeding." Opp. 11. Petitioner also asserts that it objected to Patent Owner's reliance on the Standard in IPR2022-00974, which challenged claims of U.S. Patent No. 8,953,641 ("the '641 patent"), because "the Standard's publication date is *after* the critical date of the '641 patent," which is not at issue in the instant proceeding. *Id.* at 11–12. Petitioner asserts that the Standard is relevant to the patentability of the '356 patent in this proceeding because Petitioner "relies upon the Standard as a primary prior art invalidity reference [and the] public availability/accessibility date of the Standard is *before* the effective filing date of the '356 patent." *Id.* at 11.

Patent Owner replies that "Petitioner's objections based on lack of authentication and hearsay to the admissibility of the Standard as evidence in IPR2022-00974 are not contingent upon the critical date of the challenged patent, which is extrinsic to the proffered evidence at issue." Reply 1.

We find that Petitioner objected to the Standard in IPR2022-00974 because its publication date is *after* the critical date of the '641 patent, which was at issue in that proceeding. Opp. 11. Those objections are not relevant in this proceeding because the Standard was published before the critical date of the '356 patent. *Id.* In IPR2022-00974, Petitioner objected that the Standard (Ex. 2019) *lacked authentication* because "sufficient evidence has not been provided to establish authenticity, dates, or public accessibility *prior to the critical date of the '641 patent*." IPR2022-00974, Paper 23, 1 (emphasis added). Petitioner also objected to the Standard (Ex. 2019) as *irrelevant, prejudicial, confusing, and a waste of time* because "there is not sufficient evidence establishing public accessibility *prior to the critical date of the '641 patent*," and the October 1, 2004 date printed on the first page of the Standard is later than the critical date of the '641 patent. *Id.* (emphasis added). And, in this proceeding, Petitioner has proffered evidence to address potential hearsay objections asserted by Patent Owner to the Standard, as discussed below.

B. Authenticity of the Standard (Ex. 1005)

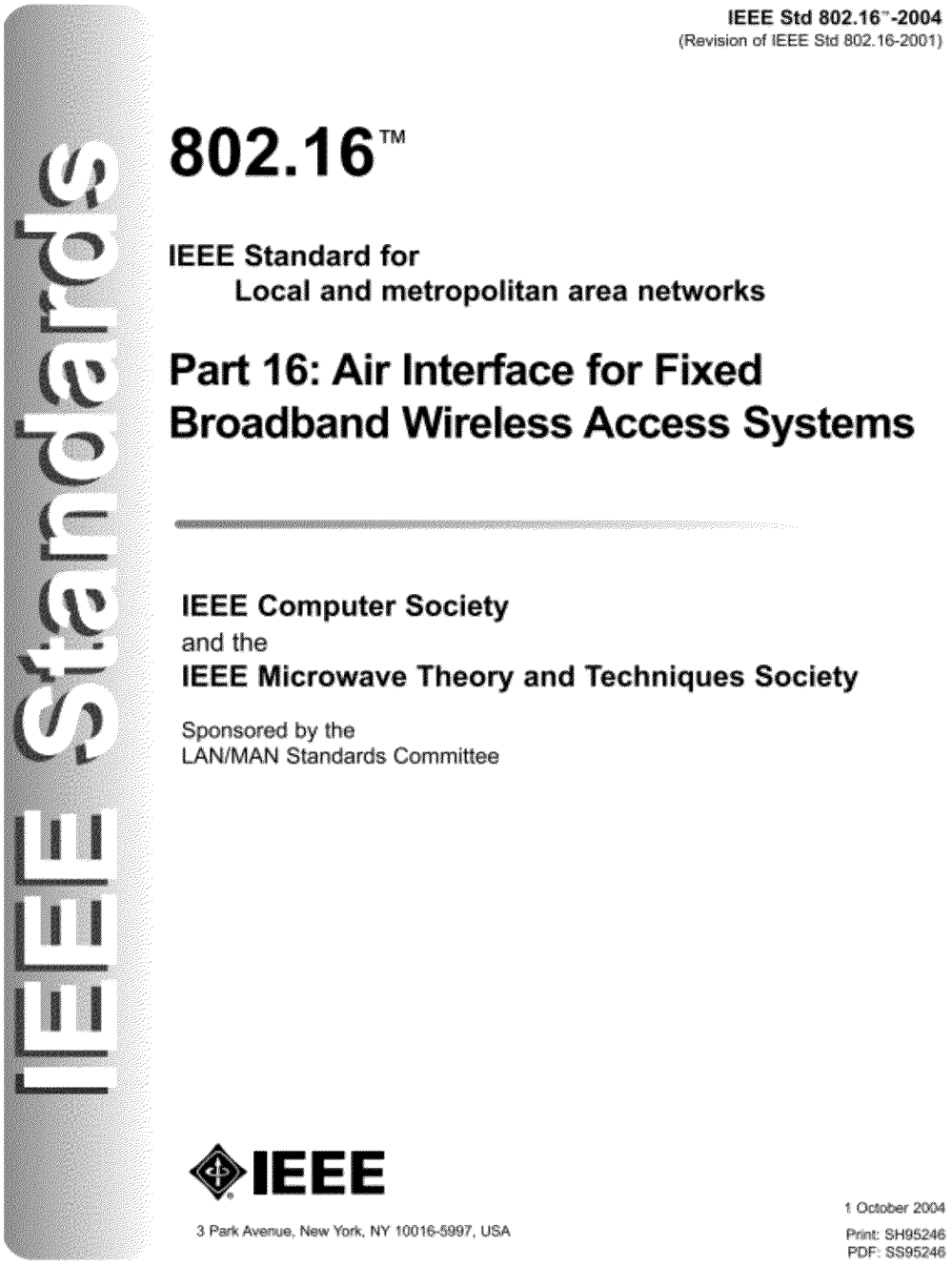
Petitioner asserts that Exhibit 1005 is an authentic copy of the Standard under Fed. R. Evid. ("FRE") 901(b)(4) because it bears distinctive indicia of authenticity recognized by the scientific and technical communities, and the distinctive indicia include an IEEE copyright line with a publication date, IEEE trade inscriptions, IEEE product numbers, and an International Standard Book Number (ISBN). Opp. 1–5.

Patent Owner asserts "a document is not self-authenticated or otherwise automatically authenticated just because it was released or published by IEEE or a working group associated with IEEE." Motion 6. Patent Owner argues that *TRW Automotive U.S. LLC v. Magna Elecs. Inc.*, IPR2014-01348 (PTAB Jan. 15, 2016) held that an IEEE copyright notice and ISBN number did not establish that a document was an IEEE *publication* from an IEEE *periodical*. *Id.* Patent Owner also asserts that the Standard is not published in a periodical and, therefore, is not self-authenticating. Reply 2–3.

The holding in *TRW* is distinguishable from our facts here because the Board in *TRW* held that TRW did not cite sufficient evidence to establish that the non-patent literature printed publication at issue in that proceeding was "an article from an IEEE periodical" or published in an IEEE periodical called *Intelligent Transportation Systems*. *TRW*, IPR2014-01348, Paper 25 at 7–8. TRW failed to link the IEEE copyright notice to a particular IEEE publication. *Id.* at 8. In that case, TRW failed to establish that the number at the bottom of the paper, "0-7803-4975-X," was an ISBN or that the paper was published in an IEEE periodical such that it was self-authenticating. *Id.* at 9.

Here, the Standard bears distinctive indicia of authenticity that were not present in the paper at issue in *TRW*. Opp. 2–4. The distinctive indicia are an IEEE copyright notice and publication date, IEEE logo and trade inscription, IEEE product numbers, and an ISBN. *Id.* Such indicia have been found to be sufficient to support authentication. *See Intel Corp. v. FG SRC LLC*, IPR2020-01449, Paper 53 at 33 (PTAB Mar. 1, 2022); *Microsoft Corp. v. FG SRC LLC*, IPR2018-01604, Paper 76 at 15 (PTAB Apr. 30, 2020); *Ericsson, Inc. v. Intellectual Ventures I LLC*, IPR2014-00527, Paper 41 at 11 (PTAB May 18, 2015); *see* Opp. 3–4 (citing these decisions). Patent Owner does not dispute the distinctiveness of the indicia. *See* Reply 2–3; Mot. 6.

The cover page of the Standard is reproduced below to show its indicia.



The cover page of the Standard includes an IEEE Std 802.16 trademark, IEEE's logo, mark, address, product numbers (print, PDF), and a date of "1 October 2004." Ex. 1005, 1. We reproduce other distinctive indicia below.

IEEE Std 802.16™-2004
(Revision of
IEEE Std 802.16-2001)

IEEE Standard for
Local and metropolitan area networks

Part 16: Air Interface for Fixed Broadband Wireless Access Systems

Sponsor
LAN/MAN Standards Committee
of the
IEEE Computer Society

and the
IEEE Microwave Theory and Techniques Society

Approved 24 June 2004
IEEE-SA Standards Board



This page of the Standard includes the IEEE Std 802.16™ trademark and the IEEE Wireless MAN® 802.16 registered mark. Ex. 1005, 3; Opp. 3.

We reproduce indicia from another page of the Standard below.

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

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Print: ISBN 0-7381-4069-4 SH95246
PDF: ISBN 0-7381-4070-8 SS95246

This page includes a 2004 IEEE copyright notice and a *publication date* of the Standard, an ISBN, catalog numbers, and trademark notices. Ex. 1005, 4.

Under FRE 901(b)(4), "[t]he appearance, contents, substance, internal patterns, or other distinctive characteristics of the item, taken together with all the circumstances" can authenticate an item of evidence. Under FRE 902(7), an inscription, signs, tag, or label affixed in the course of business to indicate origin, ownership, or control can establish an item's authenticity.

The Board has found such distinctive indicia sufficient to establish the authenticity of IEEE publications. *See Ericsson*, IPR2014-00527, Paper 41 at 12; Opp. 3–4 (discussing Board decisions that relied on copyright lines, trade inscriptions, ISBN and IEEE catalog order numbers for authentication); *Microsoft Corp. v. FG SRC LLC*, IPR2018-01604, Paper 76 at 15–16 (PTAB Apr. 30, 2020) (finding an IEEE trade inscription, copyright symbol, and ISBN provided evidence to self-authenticate documents under FRE 902(6) and 902(7)); *see also Intel Corp. v. FG SRC LLC*, IPR2020-01449, Paper 53 at 32–34 (PTAB Mar. 1, 2022) (finding printed publications at issue included "conventional indicia of publication" such as an IEEE copyright notice and date, ISBN numbers, IEEE order plan catalog numbers, and addresses where additional copies of the publication may be ordered provided evidence that these documents were publicly accessible publications of IEEE).

Such distinctive indicia were lacking in *TRW* where Petitioner cited only an IEEE copyright notice of "©1999 IEEE" without a publication date, publication information, and other indicia found in the Standard here. Opp. 4.

In this case, we find Exhibit 1005 bears sufficient distinctive indicia of public dissemination (publication) to authenticate it as a copy of the IEEE Std 802.16-2004, IEEE Standard for Local and Metropolitan area networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems published 1 October 2004, printed in the United States, and available at ISBN 0-7381-4069-4, ISBN 0-7381-4070-8, and IEEE Product # SH95246. *See* Opp. 1–5.

C. Hearsay

We agree with Petitioner that the indicia of publication and authenticity indicate the Standard satisfies an exception to the hearsay rule in FRE 803(17) as a commercial publication relied on by persons in particular occupations and also has sufficient guarantees of trustworthiness to satisfy FRE 807. Opp. 12.

Patent Owner argues that the Standard is not a periodical. Reply, 3.

However, IEEE is a well-known, reputable compiler and publisher of scientific and technical publications used by members in the scientific and technical research and publication communities in reliance on such indicia. *See Ericsson*, IPR2014-00527, Paper 41, 10–11. These indicia also provide sufficient guarantees of trustworthiness under a totality of circumstances, are more probative than other evidence, and are supported by Mr. Schwartz's testimony that the Standard was published by IEEE WirelessMAN for use by members of these communities. Ex. 1006 ¶¶ 14–17; Ex. 1005, 3–4.

D. Public Availability and Public Accessibility

Patent Owner asserts that Petitioner failed to prove a date of public availability or public accessibility of the Standard. Motion 2–7. This issue is a substantive merits issue related to the sufficiency of evidence to show that the Standard is a prior art printed publication under 35 U.S.C. § 102, rather than to its admissibility into evidence. The Consolidated Trial Practice Guide makes clear that a motion to exclude "may not be used to challenge the sufficiency of the evidence to prove a particular fact." Patent Trial and Appeal Board Consolidated Trial Practice Guide at 79 (Nov. 2019);[5] *see Xactware Sols., Inc. v. Pictometry Int'l Corp.*, IPR2016-00594, Paper 46 at 7 (PTAB Aug. 24, 2017).

[5] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

III. UNPATENTABILITY ANALYSIS

A. Legal Standards

1. Anticipation

To anticipate, a prior art reference must disclose all the elements of the claim within the four corners of the document, arranged as in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). "A single prior art reference may anticipate without disclosing a feature of the claimed invention if such feature is necessarily present, or inherent, in that reference." *Allergan, Inc. v. Apotex Inc.*, 754 F.3d 952, 958 (Fed. Cir. 2014).

2. Obviousness

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. 35 U.S.C. § 103; *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). "[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR*, 550 U.S. at 416). The question of obviousness is resolved based upon underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of nonobviousness.[6] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

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[6] In this proceeding, neither party has presented evidence or made arguments regarding any objective criteria of nonobviousness.

B. Level of Ordinary Skill in the Art

Relying on the declaration testimony of Dr. Akl, Petitioner asserts that a person of ordinary skill in the art "would have had at least a Bachelor's degree in Electrical Engineering, Computer Engineering, or related field, with at least three to four years of experience in wireless communication technology, or a Master's degree in electrical engineering, computer engineering, or equivalent." Pet. 32 (citing Ex. 1003 ¶ 19). Petitioner asserts that additional education could substitute for professional experience and "[t]he level of ordinary skill in the art may be reflected by the prior art of record." *Id.*

Patent Owner does not address the level of ordinary skill in the art. *See generally* PO Resp.

Petitioner's proposed level of ordinary skill in the art is not disputed and is consistent with our review and understanding of the technology and descriptions in the '356 patent and the asserted prior art references. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). We adopt Petitioner's proposed level of ordinary skill in the art for this Decision.

C. Claim Construction

We interpret a claim "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b) (2020). This standard includes construing a claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.* Petitioner does not argue claim constructions, stating that "no terms need construction because the claims read on the prior art under any construction consistent with *Phillips*." Pet. 32–33 (citing *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc)). Patent Owner does not argue any claim constructions. *See generally* PO Resp.

Other than our construction of "time interval," which is set forth below, we determine that we do not need to provide any express claim constructions of limitations to reach our Decision.

Patent Owner proposed the following construction of "time interval" in the Preliminary Response (Prelim. Resp. 10):

Claim Term	Proposed Construction
"the processor is further configured, *in a time interval that it is not sending information over the physical uplink shared channel*, to send a signal over the uplink physical control channel	The processor is further configured to send a signal over the uplink physical control channel *between transmissions of information over the physical uplink shared channel*

Patent Owner argued, "[t]he plain meaning of an 'interval' is 'a period of time *between* events or states'" and "[i]n the context of the '356 Patent, the recited 'interval' is the period of time *between transmissions* over the physical uplink shared channel." *Id.* (citing a definition of "interval" from *Merriam-Webster.com Dictionary*, at https://www.merriam-webster.com/dictionary/interval, captured on October 4, 2022 (Ex. 2003)). Patent Owner also cited the Declaration of Dr. Lomp, who testified that "[a] person of ordinary skill in the art, reading the '356 Patent, would understand that the recited 'interval' is the period of time *between transmissions* over the physical uplink shared channel." Ex. 2001 ¶ 38. Patent Owner argued, "[t]his interpretation aligns with the description in the '356 Patent's specification." Prelim. Resp. 10.

In our Decision, we interpreted "time interval" as a "timeslot." The processor sends a signal over an uplink physical control channel "in a timeslot that is not sending information over the physical uplink shared channel, e.g., a timeslot separated from timeslots used to send data." Dec. Inst. 12.

Although Patent Owner does not reassert this claim interpretation in its Response (*see generally* PO Resp.), Patent Owner argues that "[a]s explained in the Summary of the Invention, the solution includes a closed loop feedback scheme, where *a timeslot for transmission of a control signal (referred to as 'UL-Beacon') is inserted in the uplink frame between time slots used for transmitting data*." PO Resp. 7 (citing Ex. 2005 ¶ 28); *id.* at 9 ("the '356 patent teaches that each UE transmits the physical uplink control channel signal in a dedicated timeslot of the uplink frame, between timeslots used for sending data to the base station."); *id.* at 9–10 (same); *id.* at 11 (same).

As discussed below, we interpret this claim language in light of the '356 patent specification to require a dedicated timeslot for a UL_Beacon. The dedicated time interval/timeslot used for the UL_Beacon signal does not have to be *between* timeslots that are used to send data in a frame, contrary to Patent Owner's arguments. Portions of the '356 patent cited by Patent Owner only require a "dedicated timeslot" without regard to its location vis-à-vis any timeslots used to send data. *See* PO Resp. 11 (citing Ex. 1001, 5:21–28).

According to the plain meaning of the claim language, the processor is configured "to send a signal over the uplink physical control channel" "in a time interval that is not sending information over the physical uplink shared channel." Ex. 1001, 9:48–52 (claim 1). According to Patent Owner's own interpretation of a timeslot as synonymous with time interval, the processor sends a signal over the uplink physical control channel "in a *timeslot* that is not sending information over the physical uplink shared channel." Thus, the processor sends a signal in a dedicated timeslot of a frame that is not used to send information (data) over the physical uplink shared channel. A "time interval" is allocated as a *timeslot* to send control signals, not data. It is *separate from* timeslots allocated and used to send data in a frame.

This interpretation is consistent with the '356 patent specification, which describes the UL_Beacon signal sent in a dedicated timeslot that is separate from timeslots used to send data, as Patent Owner has asserted.

> "a UE allocates *a time slot for a beacon signal [UL_Beacon] separated from the time slots for data in a frame*. A second time slot is allocated within the frame for . . ." Ex. 1001, 2:29–33 (emphasis added).
>
> "FIG. 2 illustrates a timeslot arrangement for uplink and downlink messages supporting the UL_Beacon and its corresponding PLCCH *within a TD-CDMA frame* structure . . ." *Id.* at 3:9–11 (emphasis added).
>
> "[I]t is possible to adapt the TDMA frame structure to provide separation between the UL_Beacon and the normal physical channels by *dedicating at least one uplink time slot per frame . . . to carrying UL_Beacon signals*. *Id.* at 5:16–20 (emphasis added).
>
> "Those skilled in the art will recognize that there are a large number of possibilities for the arrangement of a *UL_Beacon* and its associated PLCCH *within the frame structure* according to embodiments of the invention. More than one UL_Beacon and PLCCH *per frame* could be supported if the feedback update rate is required to be faster than the frame rate (at the expense of system capacity). . . ." *Id.* at 5:32–41 (emphasis added).
>
> "When fractionation is employed, the RNC or other controller may allocate the *UL_Beacon timeslot in a given frame* to a group of terminals. . ." *Id.* at 5:42–45 (emphasis added).
>
> "FIG. 2 illustrates an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCH *within a TD-CDMA frame structure* . . . The *uplink frame comprises a UL_Beacon control timeslot 216, an access control timeslot 218, and normal traffic carrying timeslots 214*. *Id.* at 5:50–60 (emphasis added).

See Prelim. Resp. 11–12.

These descriptions indicate a UE allocates a timeslot for a UL_Beacon signal in an uplink frame. This timeslot is *separated from* time slots used to transmit data in the frame over a shared physical channel. Ex. 1001, 2:29–33, 4:49–60. "Cross-interference between UL_Beacon and normal uplink bursts is avoided by the *separation* obtained from the use of *separate* time slots." *Id.* at 5:29–31 (emphasis added). Figure 2 of the '356 Patent depicts UL_Beacon sent in timeslot 216 *separate* from timeslots 214 (PUSCH) that carry normal traffic. *Id.* at 5:58–60. Because the signal timeslot only needs to be *separated from* data timeslots, a large number of possibilities exist to arrange a timeslot for a UL_Beacon signal and its PLCCH in a frame. *Id.* at 5:32–35. *The UE allocates a timeslot to send control signals separated from data timeslots*.

A dedicated timeslot for a UL_Beacon is *separated* from timeslots used to transmit data in a frame. *Id.* at 2:29–33, 5:15–19. "Embodiments of this invention *separate* uplink control from the uplink physical traffic. This allows the control feedback to operate even when the terminal does not have data to send, with the consequence that uplink shared channels can be used with maximum efficiency." *Id.* at 6:33–37 (emphasis added). As a result, *a UE processor might configure a UL_Beacon timeslot for a frame where no other timeslots are used to transmit data by that UE in that frame*. *See id.* at 6:33–37. Neither the claims nor written description requires a timeslot allocated to send control signals also to be allocated between timeslots used to send data.

The term "interval" is not used in the Specification of the '356 Patent. It appears only in the claims and Abstract, which states: "Data may be sent over the physical uplink shared channel in assigned time intervals. A signal may be sent over the uplink physical control channel based on the received resource allocation information in a time interval that the UE is not sending data over the physical uplink shared channel." Ex. 1001, Abstr.

The claimed time interval is an assigned timeslot in which a signal (e.g., a UL_Beacon) is sent. The UE does not use this timeslot to send data over the physical uplink shared channel because this timeslot is allocated by the UE to send the UL_Beacon signal over the uplink physical control channel. *Id.*

Nor do we view the use of "time *interval*" in the claims as an intent by Patent Owner to limit the claim scope to embodiments where a UL_Beacon timeslot is placed between timeslots that are used to transmit data given Patent Owner's and Dr. Lomp's contention that the '356 Patent uses "time interval" and "time slot" synonymously (Prelim. Resp. 11; Ex. 2001 ¶ 41), and the only feature claimed (and described) for the time interval is that it is *separate from* timeslots used to transmit data in a frame. As claimed, the time interval can be allocated/located anywhere in a frame. *See* Ex. 1001, 5:21–49; *see also Toshiba Corp. v. Imation Corp.*, 681 F.3d 1358, 1369 (Fed. Cir. 2012) ("Appellees cannot overcome the plain meaning of claim 1 by pointing to an embodiment disclosed in the specification or prosecution history.").

During prosecution of the application that issued as the '356 Patent, Patent Owner argued, "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information" in claim 45 "may mean that a user equipment (UE) is configured to send a signal on an uplink physical control channel **using allocated resources** in the same time interval it is not sending information on a physical uplink shared channel." Ex. 1002, 244–45 (Reply Pursuant to 37 C.F.R. § 1.111, Oct. 24, 2013), *id.* at 246 (arguing that the prior art does not teach or suggest the feature of "in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information").

Dr. Lomp testifies that "[i]n *every* instance, the term [time interval] refers to *a time slot within a frame*, e.g., a TD-CDMA frame, where *data* is sent by a UE 'over the physical uplink shared channel in *assigned time intervals within a frame*,' while *another time interval between the data slots* – i.e., 'a time interval that it is not sending information over the physical uplink shared channel" – is used by the UE to send control information over the uplink physical control channel." Ex. 2001 ¶ 41. Dr. Lomp thus describes a "time interval" as "a time interval that it is not sending information over the physical uplink shared channel." *Id.* Dr. Lomp does not explain why the time interval must be allocated *between* data slots in a frame to transmit a signal.

Yet, Dr. Lomp also avers that "[t]he specification makes clear that the timeslot used by the UE for the UL-Beacon is interposed in a frame structure between data time slots." *Id.* Dr. Lomp testifies that a skilled artisan would interpret this limitation in light of the specification to mean "the processor is further configured to send a signal over the uplink physical control channel *between transmissions of information over the physical uplink shared channel*." *Id.* ¶ 42. Dr. Lomp testifies that this construction is supported by the plain meaning of interval, and it aligns with operation of the feedback control system taught by the specification and comports with the stated goal of the '356 Patent to "find a substitute for channel reciprocity" "where the correlation between the uplink and downlink path loss is not guaranteed." *Id.* (quoting Ex. 1001, 1:66–2:2).

Patent Owner's arguments and Dr. Lomp's testimony that the plain meaning of time interval requires the time slot for the signal to be *between* time slots for transmission of information is undermined by their contentions that "time interval" is synonymous with a "time slot," which the '356 Patent describes as being *separated from*, rather than between, data timeslots.

At his deposition, Dr. Lomp testified, "I would imagine that there's -- some latitude would be available into where the UL-Beacon is" and "I could imagine it also not being in the center" as in Figure 2 and "I suppose in principle it could" be in the first timeslot. Ex. 1019, 23:1–19.

We give more weight to the '356 patent's description of a time interval as a timeslot than to a dictionary definition of "interval." A timeslot *allocated* for a UL_Beacon is "separated from the time slots for data in a frame." Ex. 1001, 2:29–33. A *dedicated* timeslot groups all UL_Beacon signals from multiple UEs into a *specific* uplink timeslot to "obtain separation from the UL_Beacon signals and the standard uplink physical channels." *Id.* at 2:35–42. A UE "allocates resources so that the physical channel control signal is separate from the uplink (shared) physical channel." *Id.* at 4:49–60. TDMA frame structure *separates* a UL_Beacon from normal channels by dedicating an uplink timeslot per frame. *Id.* at 5:15–41. Many arrangements may be used to achieve this *separation* of the UL_Beacon signal. *Id.* at 5:32–41.

Indeed, "[e]mbodiments of this invention *separate* uplink control from the uplink physical traffic [so that] control feedback [can] operate even when the terminal does not have data to send [for] maximum efficiency." Ex. 1001, 6:33–37 (emphasis added). Therefore, a UL_Beacon may be sent in a time interval of a frame in which no data is sent by the UE.[7] *See id.* at 2:24–28 (a terminal can transmit a control signal without an uplink physical channel), 4:20–27 (explaining that the uplink and downlink physical control channels do not need an associated data physical channel to be operational).

[7] A separate timeslot allows UL_Beacons from multiple UEs to be grouped into a single timeslot to avoid cross interference with uplink physical channels. Ex. 1001, 2:36–61, 5:21–49. Placing UL_Beacon signals between data channel timeslots would appear to increase the risk of cross interference.

D. Ground 1: Alleged Anticipation of Claims 22, 23, 25–28, 45, and 46 by the Standard

1. The Standard (Ex. 1005)

The Standard specifies an air interface for wireless systems in which a subscriber station (SS) receives uplink parameters, chooses a Ranging Slot to send a Ranging Code to a base station (BS), and receives a Ranging Response with control commands to adjust timing and power settings as shown in Figure 218, reproduced below. Ex. 1005, 48–51, 174–81, 205–06, 577, 620.[8]

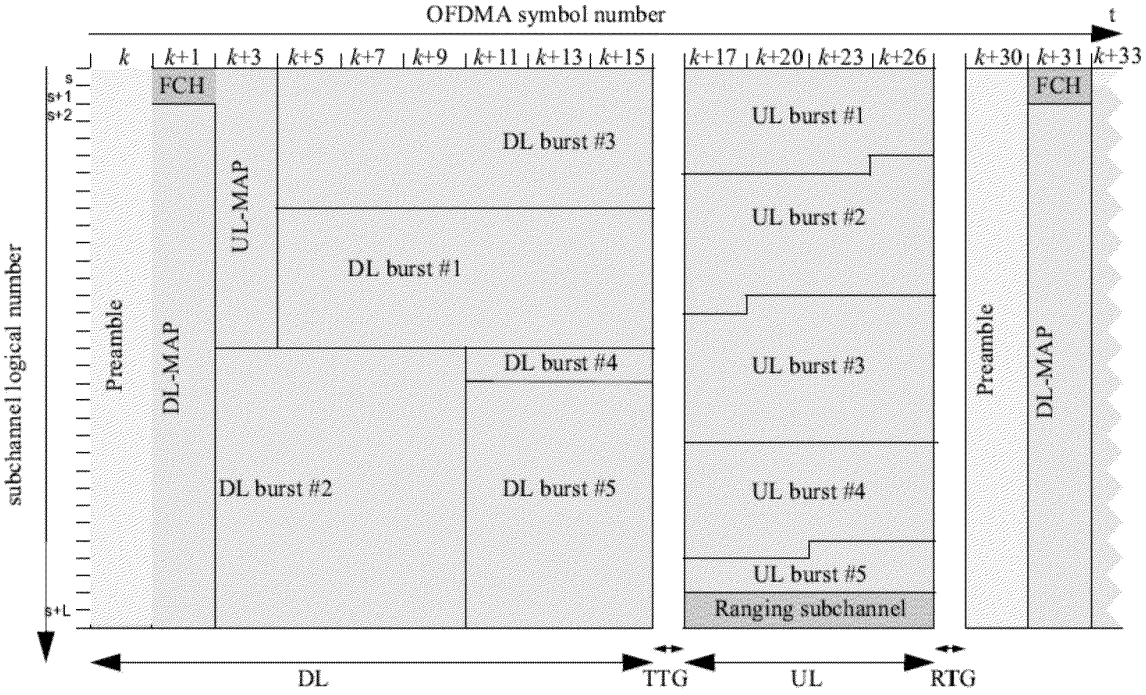


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 depicts a time division duplex (TDD) frame structure where an SS sends a ranging code in an allocated "Ranging subchannel" region separated from a region that is allocated to send data (UL Bursts ##1–5) in an uplink (UL) frame. Ex. 1005, 49–51, 154, 167, 174–76, 500, 577–78, 620, 666.

[8] Citations are to pages of the Standard rather than pages added by Petitioner.

Table 121 is reproduced below to illustrate the ranging process.

Table 121—CDMA initial Ranging and automatic adjustments procedure

BS		SS
[time to send the CDMA Initial Ranging opportunity]		
send map containing CDMA Initial Ranging IE with a broadcast Connection ID	----------UL-MAP---------->	
	<---------Ranging Code-------	Transmit randomly selected Initial Ranging code in a randomly selected Ranging Slot from available Ranging Region
[Receive Ranging Code]		
Send RNG-RSP with Time & Power Corrections and original Ranging Code and Ranging Slot Status = Continue	----------RNG-RSP------->	
		Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values Adjust Time & Power parameters
[time to send the CDMA Initial Ranging opportunity]		
send map containing CDMA Initial Ranging IE with a broadcast Connection ID	----------UL-MAP---------->	
	<---------Ranging Code-------	Transmit randomly selected Periodic Ranging code in a randomly selected Ranging Slot from available Ranging Region
[Receive Ranging Code]		
Send RNG-RSP with Time & Power Corrections and original Ranging Code and Ranging Slot Status = Success	----------RNG-RSP------->	
		Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values Adjust Time and Power parameters

Table 121 describes an initial ranging process between an SS and a BS.

An SS performs initial ranging to obtain power and timing adjustments used to send data transmissions to the BS over a network. Ex. 1005, 48–51, 154, 174–77, 205–06, 212. To join the network, the SS scans a UL-MAP message to select an Initial Ranging Interval/Ranging Slot allocated by a BS to access the uplink channel to transmit a Ranging Code to the BS. *Id.* at 48–51, 174–77, 205–06. An Initial Ranging IE (Information Element) in a UL-MAP specifies intervals (Ranging Slots) for the SS to send a Ranging Code. *Id.* at 48, 154, 167, 205–06. The SS randomly selects an allocated Ranging Slot from the Initial Ranging IE to transmit a Ranging Code or a Ranging Request (RNG-REQ) to the BS to request power, timing, and other control parameters from the BS. *Id.* at 48–51, 174–78, 205–06, 212–13. The SS performs this process at registration as a new subscriber. *Id.* at 620.

In response to receiving a Ranging Code/RNG-REQ, the BS transmits a ranging response (RNG-RSP) message. *Id.* at 50, 176, 205–06. The RNG-RSP message provides timing and power adjust parameters to control uplink communication of the SS. *Id.* In the RNG-RSP, the BS includes the Ranging Subchannel and code attributes of the received Ranging Code to identify the Ranging Code/RNG-REQ to which the BS is responding. *Id.* at 51–52. The Ranging Subchannel is allocated in the uplink frame. *Id.* at 666, Fig. 218.

When the SS receives the requested RNG-RSP, it adjusts its parameters specified in the RNG-RSP, such as transmit power, and it increases or reduces transmit power by the amount specified in the RNG-RSP message. *Id.* at 178, 205, 206 ("Adjust Time & Power parameters"). An SS does not transmit until it adjusts the RF signal to meet the RNG-RSP. *Id.* at 205. The BS may send another RNG-RSP message to the SS with any additional required fine tuning. *Id.* at 176. Once successfully ranged (RNG-REQ is within the tolerance of the BS), the SS may join the normal data traffic in the uplink. *Id.*

After initial ranging, a BS sends a second UL-MAP to allocate regions for an SS to send data. Ex. 1005, Table 121. The second UL-MAP "allocates access to the uplink channel" (*id.* at 47) and includes a Map IE that "define[s] uplink bandwidth allocations" for sending data bursts (*id.* at 48). Table 287, reproduced below, illustrates a BS's allocation of subchannels for data bursts.

Table 287—OFDMA UL-MAP IE format

Syntax	Size	Notes
UL-MAP_IE() {		
CID	16 bits	
UIUC	4 bits	
if (UIUC == 12) {		
OFDMA Symbol offset	8 bits	
Subchannel offset	7 bits	
No. OFDMA Symbols	7 bits	
No. Subchannels	7 bits	
Ranging Method	2 bits	0b00 – Initial Ranging over two symbols 0b01 – Initial Ranging over four symbols 0b10 – BW Request/Periodic Ranging over one symbol 0b11– BW Request/Periodic Ranging over three symbols
reserved	1 bit	Shall be set to zero
} else if (UIUC == 14) {		
CDMA_Allocation_IE()	32 bits	
else if (UIUC == 15) {		
Extended UIUC dependent IE	*variable*	See subclauses following 8.4.5.4.3
} else {		
Duration	10 bits	In OFDMA slots (see 8.4.3.1)
Repetition coding indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
}		
Padding nibble, if needed	4 bits	Completing to nearest byte, shall be set to 0.
}		

Table 287 depicts a UL-Map IE that allocates uplink regions. Ex. 1005, 531–532. "OFDMA[9] Symbol offset" sets the time that an uplink burst starts. *Id.* at 533. "Subchannel offset" is the lowest subchannel used to carry a burst. *Id.* "No. OFDMA Symbols" is the number of symbols (time) used to carry the uplink burst. *Id.* "No. subchannels" is the allocated frequency region. *Id.* "Duration" allocates OFDMA timeslots. *Id.* An OFDMA slot is defined by time and subchannel frequency. *Id.* at 496. A data region is an allocation of subchannels (frequencies) and OFDMA symbols (time intervals). *Id.*

Figure 218 above shows an allocation of resources (OFDMA symbols (time), subchannels (frequency)) for uplink data transmissions in UL Bursts #1–#5 regions and for uplink physical channel control signals in a Ranging Subchannel region. Ex. 1005, 500. Different resources (time, frequency) are allocated for the UL Burst and Ranging Subchannel regions of the UL frame.

The downlink map (DL-MAP) message defines access to the downlink (DL) frame. Ex. 1005, 46, Table 16. The DL-MAP defines burst start times to an SS on the DL frame. *Id.* at 8, 500. It includes a "DL-MAP_IE()" that defines "OFDMA Symbol offset" as "the OFDMA symbol in which the burst starts, measured in OFDMA symbols from beginning of the downlink frame in which the DL-MAP is transmitted." *Id.* at 521–22, Table 275. The DL-MAP IE defines a "Subchannel offset," which is the "lowest index subchannel used for carrying the burst, starting from subchannel 0." *Id.* It defines the "No. OFDMA Symbols," which are the number of symbols (time intervals) used to carry the downlink PHY Burst. *Id.* "No. of Subchannels" allocates a number of frequency subchannels that are used to carry the data burst. *Id.*

[9] "OFDMA" is an abbreviation for "orthogonal frequency division multiple access." Ex. 1005, 15.

2. Public Accessibility of the Standard

"A reference is deemed publicly available if it has been 'disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it.'" *Telefonaktiebolaget LM Ericsson v. TCL Corp.*, 941 F.3d 1341, 1346 (Fed. Cir. 2019) (quoting *Jazz Pharm., Inc. v. Amneal Pharm., LLC*, 895 F.3d 1347, 1355 (Fed. Cir. 2018)). "Because there are many ways in which a reference may be disseminated to the interested public, 'public accessibility' has been called the touchstone in determining whether a reference constitutes a 'printed publication.'" *Id.* (quoting *In re Hall*, 781 F.2d 897, 898–99 (Fed. Cir. 1986)).

A reference is considered publicly accessible if "persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it." *Samsung Elecs. Co., Ltd. v. Infobridge Pte. Ltd.*, 929 F.3d 1363, 1369 (Fed. Cir. 2019) (quoting *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 772 (Fed. Cir. 2018)). "If accessibility is proved, there is no requirement to show that particular members of the public actually received the information." *Jazz Pharm.*, 895 F.3d at 1355–56 (quoted in *Samsung Elecs.*, 929 F.3d at 1374 (citing *In re Lister*, 583 F.3d 1307, 1314 (Fed. Cir. 2009) ("[O]ur cases have held that once accessibility is shown, it is unnecessary to show that anyone actually inspected the reference.")) and *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1569 (Fed. Cir. 1988) ("If accessibility is proved, there is no requirement to show that particular members of the public actually received the information.")) As a result, a petitioner need not establish that specific persons actually accessed or received a work to show that the work was publicly accessible. *Samsung Elecs.*, 929 F.3d at 1374.

Petitioner introduces a declaration of Randall Schwartz who avers that "[t]he final version of the Standard received approval on October 1, 2004, and was, to the best of my recollection, published on the www.WirelessMAN.org website by 2005." Ex. 1006 ¶ 14. Mr. Schwartz also testifies that five drafts were submitted for review, and he voted to approve the Standard. *Id.*

Mr. Schwartz testifies that anyone "interested in accessing and reading the Standard could do so." Ex. 1006 ¶ 15. Mr. Schwartz states "[t]he whole purpose of the Standard was to guide the development and implementation of cellular networks and devices," and "the whole purpose of IEEE's online database hosting and making the Standard and related documents available was so that engineers and other individuals would have ready access to them when developing and implementing cellular networks and devices." *Id.*

To show the Standard was publicly accessible more than one year before the December 27, 2006, priority date of the '356 patent (Pet. 25–27; Opp. 9 n.3), Mr. Schwartz searched the Wayback Machine for webpages at www.wirelessman.org that made the Standard publicly accessible by 2005. Ex. 1006 ¶ 16. Mr. Schwartz found a webpage from www.wirelessman.org that was archived by November 23, 2004, and included a hyperlink that made the final version of the Standard available for interested persons to order. *Id.* Mr. Schwartz testified that the Standard was published by November 2004, and a webpage with a link that made it available to interested persons was archived on *November 23, 2005*, by the Wayback Machine. Ex. 2008, 10:16–23. Mr. Schwartz's testimony indicates the Standard was publicly accessible at www.wirelessman.org at least by *November 23, 2005*, as indicated by a webpage archived from that site by the Wayback Machine on that date. *Id.*; Ex. 1006 ¶ 16.

Publication of the final version of the Standard (Ex. 1005), whether by the end of 2004 or by November 23, 2005, predates the December 27, 2006, priority date of the '356 patent by more than one year. *See* Opp. 9 n.3.

The Standard was publicly available and publicly accessible to skilled artisans and the interested public at www.wirelessman.org more than one year before the December 27, 2006, priority date of the '356 patent.

Mr. Schwartz's testimony is corroborated by indicia that the Standard was published "1 October 2004" with IEEE catalog order numbers for Print (SH95246) and PDF (SH95246) copies of the Standard. Ex. 1005, 1, 4. The 2004 IEEE Copyright notice indicates the Standard was "Published 1 October 2004" and "Printed in the United States." *Id.* at 4. ISBN numbers are given for print (ISBN 0-7381-4069-4) and PDF (ISBN 0-7381-4070-8) copies of the Standard. *Id.* Mr. Schwartz has personal knowledge because he served on the committee that prepared the Standard, and he accessed archived copies of www.wirelessman.org webpages that provided copies of the Standard at least by November 23, 2005. Ex. 1006 ¶¶ 11–17; Ex. 2008, 10:1–15:4.

After considering the arguments and weighing the evidence presented by the parties, we determine that Petitioner has shown by a preponderance of the evidence that the Standard was publicly accessible to the interested public more than one year before the priority date of the '356 patent, and therefore qualifies as prior art under 35 U.S.C. § 102(b).[10]

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[10] To the extent our determination of admissibility or accessibility of Ex. 1005 could be viewed as based, in whole or in part, on taking judicial notice of facts relating to IEEE indicia of authenticity and publication procedures, including publication of five drafts (*see* Ex. 1006 ¶ 14), we add Ex. 3001 to the record to demonstrate that such facts are capable of instant and unquestionable proof. *See In re Ahlert*, 424 F.2d 1088, 1027 (CCPA 1970). Our determination does not rely on this evidence, however.

3. Independent Claim 22

a) 22[p]: "A method performed by a user equipment (UE), the method comprising:"

Petitioner asserts that the Standard discloses "[a] method performed by a user equipment" as a subscriber station. Pet. 33 (citing Ex. 1003 ¶ 72 (the Standard defines "subscriber station (SS)" as "[a] generalized equipment set providing connectivity between subscriber equipment and a base station (BS)" (citing Ex. 1005, 11)). Patent Owner does not contest these contentions. *See generally* PO Resp. Based on Petitioner's arguments and evidence, as summarized above, regardless of whether the preamble is limiting, we determine that Petitioner has shown that the Standard discloses element 22[p].

b) 22[a]: "receiving, by the UE, resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources;"

Petitioner contends that the Standard discloses "receiving, by the UE, resource allocation information associated with an uplink physical control channel" as an SS receiving a UL-MAP from a BS with an "Initial Ranging IE" that specifies an "Initial Ranging Interval" ("Initial Ranging opportunity") that allocates a region of an uplink subframe for an SS to transmit a Ranging Code message to a BS over a Ranging subchannel. Petitioner asserts that an "uplink physical control channel" is an allocated region of an uplink subframe that has different resources than a physical uplink shared channel that is used to send the uplink data bursts. Figure 218 of the Standard is reproduced below with Petitioner's annotations of these regions. Pet. 33–37 (citing Ex. 1005, 51, 154, 167, 174, 178, 493, 500, 577–78, 666, Table 121, Fig. 218; Ex. 1003 ¶¶ 73–77; Pet. §§ IV, V.A.1., V.A.2, V.A.4 contentions).

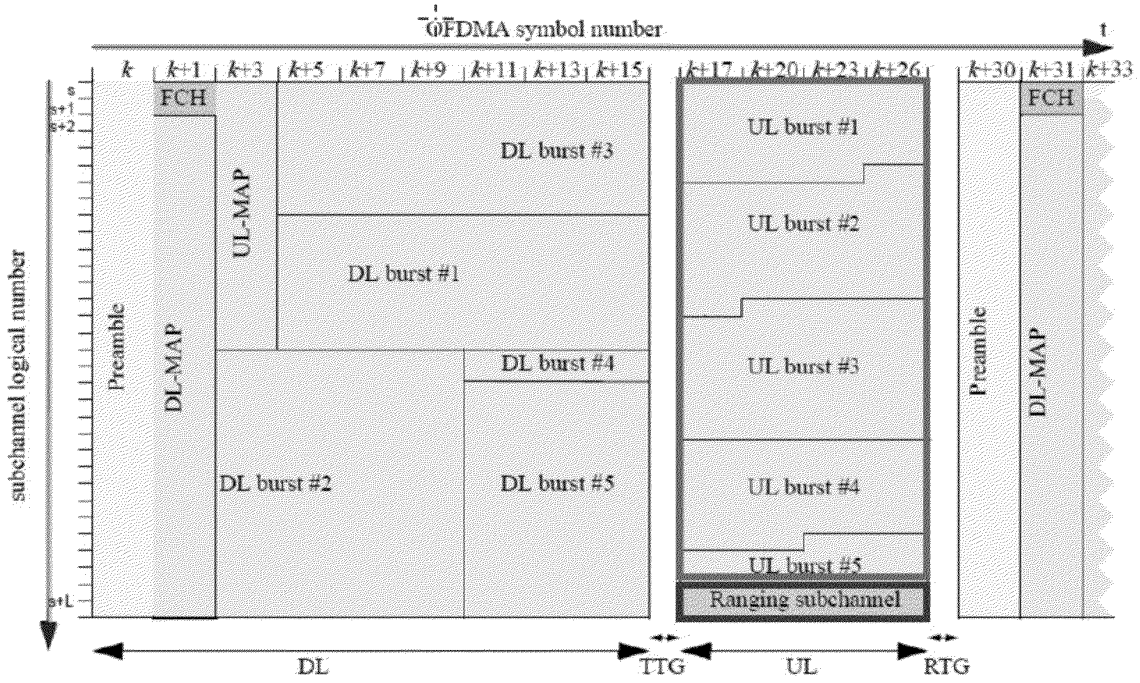


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 shows a resource allocation in a TDD frame with Petitioner's annotation of regions allocated in a UL subframe for a Ranging Subchannel as an uplink physical control channel for signals, and for UL Bursts ##1–5 in a physical uplink shared channel for data. Pet. 33–35; Ex. 1005 500. The regions are defined by OFDMA symbols (time) and subchannels (frequency).

Dr. Akl testifies that a skilled artisan would recognize that a Ranging Code message sent by the SS to the BS over the Ranging Subchannel is control information, not data, because the BS transmits a RNG-RSP message with Power Adjust Information and other control parameters in response to the Ranging Code message, and the SS adjusts uplink transmissions to the BS according to parameters provided in the RNG-RSP message. Ex. 1003 ¶¶ 55 (citing Ex. 1005, 49, 154, 175, 666, Table 121), 56 (citing *id.* 50, 51, 178, 205–06, Table 121), 73 (citing *id.* 15, 493, 500, Fig. 218; Ex. 1008, 45), 76 (citing Ex. 1005, 51, 154, 176, 500, 577–78, 666, Fig. 218); *see* Pet. 36.

Dr. Akl testifies that the Ranging Subchannel and uplink data bursts are physical channels for transmissions made at actual frequencies and times. Dr. Akl testifies that the Standard describes a ranging subchannel and uplink bursts as a "PHY" implementation of OFDMA where "PHY" is the physical layer, and the channels use different frequency and time resources as shown in Figure 218. Ex. 1003 ¶¶ 73, 74 (citing Ex. 1005, Fig. 215 (an OFDMA data region is an allocation of time and frequency subchannels); Ex. 1008, 39, 40).

Petitioner contends that the BS allocates different resources to the SS for the Ranging Subchannel (uplink physical control channel) and UL Bursts (physical uplink shared channel) in the first and second UL-MAP messages. Pet. 14–17 (first UL-MAP), 18–22 (second UL-MAP), 34–37 (the ranging subchannel and uplink bursts are allocated as different regions).

c) Do the claims recite a frame structure?

Patent Owner argues that the Standard does not disclose "channels" of the '356 patent because it discloses a different frame structure than the '356 patent. PO Resp. 20. Patent Owner argues that the Standard's frames are dynamic with variable duration of 2 ms to 20 ms, a variable split between the DL and UL subframes, and varying numbers, shapes, and sizes of DL and UL bursts in contrast to the FDD frames *illustrated in* Figure 2 of the '356 patent. *Id.* at 21–22. Dr. Lomp provides similar testimony. Ex. 2005 ¶¶ 50–52.

These arguments are not commensurate with claim 22 or claims 1, 43, and 45, which do not recite a frame structure, frame size, or frame duration. Nor do they require a fixed number of time intervals to send data or signals. The '356 patent describes embodiments that send more than one signal per frame, no signals in fractionated frames, and signals in frames with no data. Ex. 1001, 2:24–28, 4:20–27, 4:49–55, 5:15–60, 6:33–37, Figs. 2, 3. Frame structure varies as time intervals are allocated for data and signals in a frame.

Petitioner argues that "IV points to no support for [its] construction in the plain language of the claims" and could not "because the claims do not recite any 'frame,' let alone **multiple** frames across which the 'channels' remain unchanged." Pet. Reply 9. Petitioner asserts that Figure 2 of the '356 Patent shows a timeslot arrangement that cannot be used to limit the scope of the claims, as it is merely an example of a structural arrangement. *Id.*

Claims are not limited to particular embodiments when the claim language is broader than those embodiments absent express definition or a disclaimer, neither of which are asserted by Patent Owner. *See* Sur-reply 2–9; Reply 8–10; *Acceleration Bay, LLC v. Activision Blizzard Inc.*, 908 F.3d 765, 771 (Fed. Cir. 2018) ("Acceleration again attempts to import structural limitations into claims lacking those limitations. . . . While the specifications discuss a broadcast channel overlaying a network, the claims at issue are not so limited."); *see also Evolusion Concepts, Inc. v. HOC Events, Inc.*, 22 F.4th 1361, 1367 (Fed. Cir. 2022) ("We have repeatedly held that 'it is not enough that the only embodiments, or all of the embodiments, contain a particular limitation to limit claims beyond their plain meaning.'") (citation omitted); *Howmedica Osteonics Corp. v. Wright Med. Tech., Inc.*, 540 F.3d 1337, 1345 (Fed. Cir. 2008) ("[W]e have repeatedly held that the fact that the specification describes only a single embodiment, standing alone, is insufficient to limit otherwise broad claim language."); *Phillips*, 415 F.3d at 1316, 1323 (claim terms are not limited to embodiments disclosed in the specification absent redefinition or disclaimer). Here, the intrinsic evidence does not limit the claims to particular cellular networks/protocols, and the claim language itself is not so limited. *See Sisvel Int'l S.A. v. Sierra Wireless, Inc.*, 81 F.4th 1231, 1236 (Fed. Cir. 2023) (the invention is described as applying to many different cellular telecommunications systems); Ex. 1001, 2:6–4:27, 11:54–61.

d) Are the channels limited to FDD schemes?

Essentially, Patent Owner asks us to limit claim 22 to a frame structure of a frequency division duplex (FDD) scheme. *See* PO Resp. 24; Sur-reply 2–7. As discussed above, claim 22 is not so limited. In addition, claim 28, which depends from claim 22, recites that the claimed channels can be TDD, FDD, TDMA, CDMA, and other schemes (Ex. 1001, 11:54–61):

> 28. The method of claim 22 further comprising the uplink physical control channel, the physical uplink shared channel, or the downlink control channel is any one of a time division multiple access (TDMA), code division multiple access (CDMA), time division duplex (TDD), frequency division duplex (FDD), time division-code division multiple access (TD-CDMA), or universal mobile telecommunication system (UMTS) physical channel.

Claiming TDD channels in dependent claim 28 means that claim 22 includes this subject matter. The "uplink physical control channel," "physical uplink shared channel," and "downlink control channel" recited in claim 22 can be TDD, FDD, CDMA, TDMA, or other channels. *See Littelfuse, Inc. v. Mersen USA EP Corp.*, 29 F.4th 1376, 1380 (Fed. Cir. 2022) ("By definition, an independent claim is broader than a claim that depends from it, so if a dependent claim reads on a particular embodiment of the claimed invention, the corresponding independent claim must cover that embodiment as well.").

Because channels can be TDD or FDD, Patent Owner's distinction of the Standard's TDD regions/channels from the claimed channels because they are not FDD is unavailing. *See* Sur-reply 2–8; PO Resp. 20–27. Dr. Lomp's distinction of the claimed channels from the Standard because they have different frames in Figure 2 is likewise unsupported by the claim language. Ex. 2005 ¶¶ 50–59 (testifying that the Standard has an entirely different frame structure from the frame structure *shown in Figure 2* of the '356 patent).

e) The Standard's "regions" and claimed "channels" are delineated by allocations of time and frequency

Petitioner asserts that the Standard divides frames into *regions* that are delineated by frequency (subchannels) and time (OFDMA symbols) like the claimed channels. Pet. 10–25 (citing Ex. 1003 ¶¶ 45–63), 33–55; Reply 5–8. Petitioner asserts that Figure 215 of the Standard, reproduced below, depicts a typical *region* delineated by frequency-timeslots allocated by a BS. *Id.* at 11.

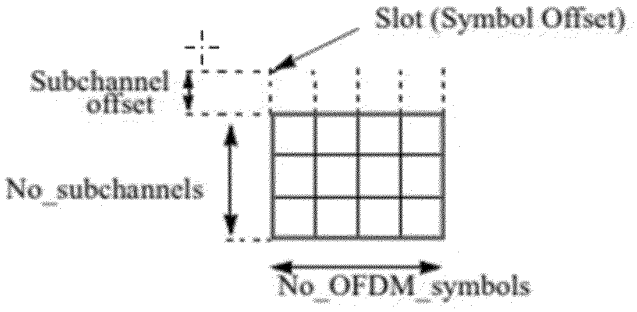


Figure 215—Example of the data region which defines the OFDMA allocation

Figure 215 of the Standard depicts a data *region* allocated as contiguous frequency subchannels and OFDMA time symbols in a 4 x 3 rectangle of slots annotated by Petitioner. Ex. 1005, 496; Pet. 10–11; Ex. 1003 ¶¶ 43–46.

Dr. Akl testifies that a BS allocates "regions" delineated by frequency subchannels and durations of "symbol time" in an uplink frame. A "Ranging subchannel" is allocated to send control transmissions for ranging in a first UL-MAP. Burst regions are allocated to send data transmissions. Ex. 1003 ¶¶ 45–55. Dr. Akl testifies that a BS sends a second UL-MAP to allocate regions in an uplink subframe for SSs to send UL data bursts. *Id.* ¶¶ 57–63. Dr. Akl testifies that the BS allocates regions for an uplink physical control channel, a physical uplink shared channel, a downlink control channel, and a physical downlink shared channel. *Id.* ¶¶ 73–101. Dr. Akl identifies each region with annotations on Figure 218, which is reproduced below.

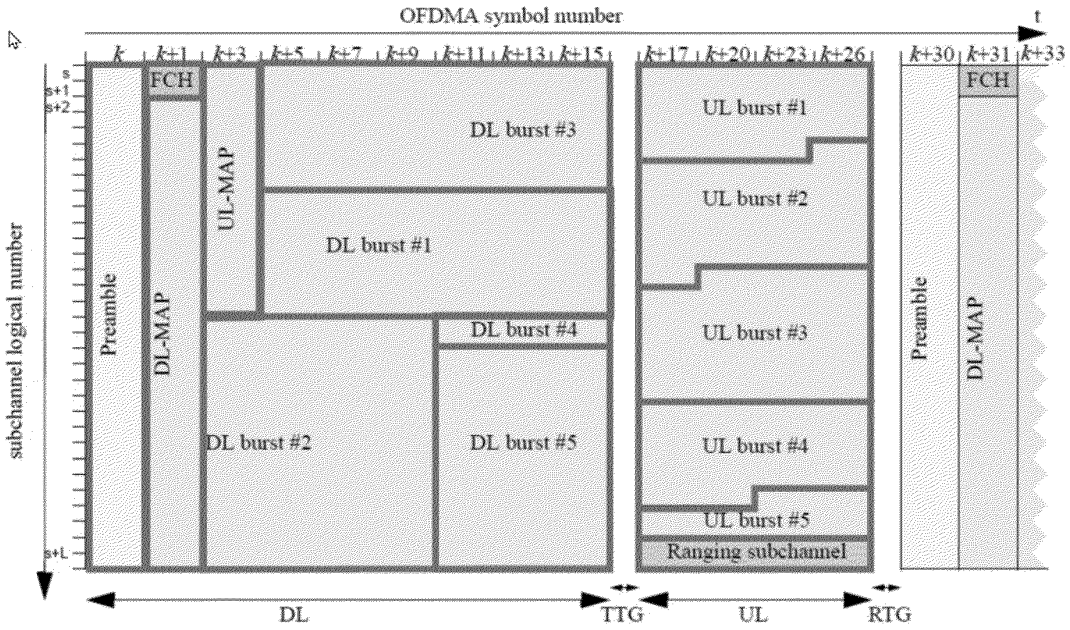


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 illustrates "regions" defined by OFDMA symbols (time (t)) and subchannel numbers (frequency) to send data (UL bursts ##1–5) or controls (Ranging subchannel) in UL subframe and DL bursts ##1–5 and controls (UL-MAP) in the DL subframe as annotated by Dr. Akl. *See* Ex. 1003 ¶¶ 47–63.

Figure 2 of the '356 patent, reproduced below, shows how the claimed "channels" are defined by time and frequency slots to send data and controls.

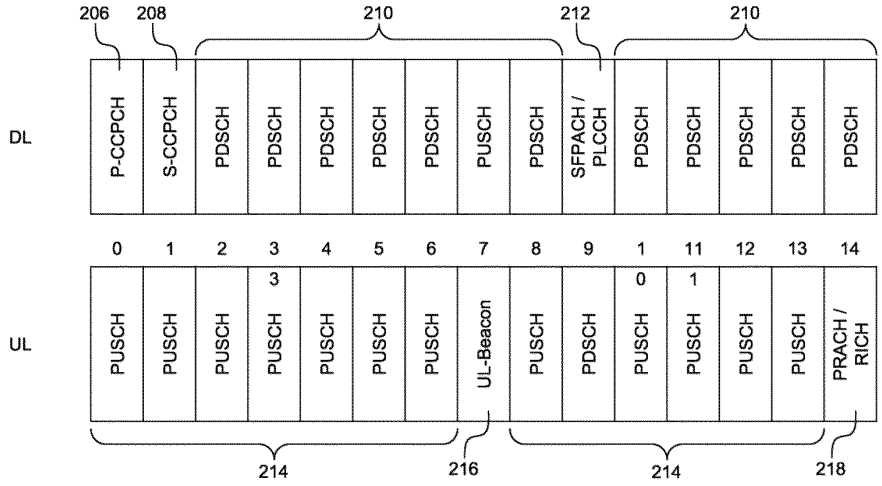


Figure 2 of the '356 patent illustrates uplink physical shared data channels as PUSCH regions 214 of the uplink frame delineated by *timeslots 0–6 and 8–13* in an *uplink (UL) frame frequency*. Figure 2 shows an uplink physical control channel as UL_Beacon region 216 delineated in the *uplink frame frequency* at *timeslot 7* and a downlink control channel as PLCCH region 212 in *timeslot 9* of the *downlink (DL) frame frequency*. Data is sent on a physical downlink shared channel in PDSCH 210 regions defined by *timeslots 2–8 and 10–14* in the *downlink (DL) frame frequency*. Ex. 1001, 5:50–60, 4:5–7; Reply 6–8 (comparing "regions" shown in Figure 218 of the Standard to the "uplink physical control channel," "physical uplink shared channel," downlink control channel," and "physical downlink shared channel" shown in Fig. 2 of the '356 patent to illustrate that both are defined by UL/DL frequency and time).

The Standard's *regions* are defined by time and frequency just like the claimed *channels*. Data and controls are sent in delineated frequency and time regions in the Standard. Ex. 1001, 4:5–7, 5:50–60, Fig. 2; Ex. 1005, 500, 532. "The Standard's regions disclose what the claimed 'channels' **are**—namely, delineations of time and frequency within the frame." Reply 8.

Patent Owner argues that Figure 2 of the '356 patent depicts uplink and downlink channels in an FDD scheme where transmissions occur on different frequencies but within the same time duration, whereas Figure 218 of the Standard transmits at different times in the same frequencies. Sur-reply 5–7.

Claim 22 does not require uplink and downlink channels to be a certain frequency or time frame. Nor are the channels limited to FDD channels when claim 28 indicates that the uplink physical control channel, the physical uplink shared channel, and the downlink control channel of claim 22 may be TDD, FDD, or other schemes. Ex. 1001, 11:54–61; *see Littelfuse*, 29 F.4th at 1380. Thus, the Standard's disclosure of regions in a TDD frame is not a distinction.

Regions like channels are defined by allocations of time and frequency in an uplink or a downlink frame. "The invention is not the language of the [claim] but the subject matter thereby defined." Reply 8 (quoting *ADASA Inc. v. Avery Dennison Corp.*, 55 F.4th 900, 913 (Fed. Cir. 2022)). To anticipate a patent, a prior art reference "need not satisfy an *ipsissimis verbis* test." *Whitserve, LLC v. Comput. Packages, Inc.*, 694 F.3d 10, 21 (Fed. Cir. 2012) (quoting *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009)).

The '356 patent discloses that a channel is defined by frequency. Thus, *channel reciprocity* exists when a user terminal and base station use the *same frequency* to communicate. Ex. 1001, 1:23–33. Because the uplink physical control channel and the physical uplink shared channel are sent in the same uplink frequency channel, they also are delineated by timeslots. The channels are delineated in different timeslots in the uplink and downlink frame channel frequencies. PO Resp. 24–25; Sur-reply 3–10; Ex. 1001, 5:50–60.

To send data/controls over a *channel* in the '356 patent, a UE transmits in the *time and frequency domain* allocated for that channel. Ex. 1001, 2:17–48, 4:1–17, 4:34–60, 5:1–6:31, Figs. 2, 3; PO Resp. 24; Sur-reply 5–7; Reply 6–7; Ex. 1003 ¶¶ 68–70; *see* Sur-reply 5 ("FDD simply means that uplink and downlink transmissions operate in different frequency bands."); 6 ("the downlink and uplink transmissions occur on different frequencies but within the same duration of time"), 7 ("Within each of the timeslots 0, 1, . . . 14 shown in Fig. 2, both uplink and downlink transmissions may occur."); PO Resp. 24–25 (the '356 patent describes a frame structure divided into timeslots shown in Fig. 2; "the downlink (DL) and uplink (UL) transmissions are on different frequencies" that include different types of channels), 25 ("The '356 patent uses a channel structure, such as shown in Fig. 2, to separate, transmit and receive various types of data.").

To send data/controls over a *region* in the Standard, an SS transmits in the *time and frequency domain* allocated for that region. Ex. 1005, 496–500, 577–78, 666, Fig. 218, Table 287; Pet. 10 (regions are formed by slots in contiguous frequency subchannels and symbol time durations), 12 ("The BS informs SSs of how the regions are mapped so that the SSs may transmit, and expect to receive, certain transmissions in certain regions."), 13–14 ("As Figure 218 shows, the BS allocates regions of the downlink subframe for both data transmissions . . . and control transmissions" and "the BS allocates regions of the uplink subframe for both data transmissions . . . and control transmissions"), 14 ("The Standard describes the process by which an SS learns the allocated regions on the uplink and downlink subframes from the BS so that the SS can communicate with the BS."), 14–16 (the UL-MAP "specifies an interval" called the "Initial Ranging Interval" or "Ranging Region" in which new stations join the network by transmitting a Ranging code in a Ranging Slot of the available Ranging Region in an allocated Ranging Subchannel defined by frequency and time); Reply 5–8 (asserting that "regions" and "channels" are delineated by time and frequency); Ex. 1003 ¶¶ 43–63; Ex. 1008, 319–20 (*data regions* are allocated as contiguous slots in the time/frequency domain, and FDD and TDD frames are in this domain).

Even if a channel is defined by data it carries (*see* PO Resp. 24–25; Sur-reply 2–7), the Standard allocates a Ranging subchannel as a region to send control signals in the uplink frame and UL burst regions to send data in the uplink frame just like the uplink physical control channel and physical uplink shared channel. Ex. 1001, 9:40–14:26. *The claimed channels and regions of the Standard are delineated in UL/DL frames in a time/frequency domain to send data or controls*. *Id.* at 4:49–5:8, 5:50–60, 5:15–20; Ex. 1005, 496–500, 577–578, 666, Fig. 218, Table 287; *see* Pet. 9–25, 33–55; Reply 4–8.

As shown in Figure 218, the BS provides an SS with resource allocation information for an uplink physical control channel, as claimed, by allocating Ranging Slots in an available Ranging Region in a UL-MAP for an SS to send a Ranging code to the BS over the Ranging subchannel. Thus, the Ranging subchannel (and Ranging Slots) is allocated as time and frequency resources shown in Figure 218 and Table 121. It is used by an SS to send a Ranging code signal to a BS that uses the Ranging code signal to generate a RNG-RSP message with values for the SS to Adjust Time & Power Parameters. Ex. 1005, 49–51, 154, 175–87, 205–06, 666, Tables 115, 121; Pet. 14–17, 33–37.

As shown in Figure 218 and Table 287, a BS sends different resource allocation information (OFDMA *time* symbols, *frequency* subchannels) to an SS to send UL data bursts ##1–5 in a UL-MAP IE (information element). A UL-MAP "allocates access to the uplink channel" as a "set of information that defines the entire access for a scheduling interval" and defines an allocation of *timeslots* and *frequency subchannels* to send uplink transmissions. Ex. 1005, 11, 43, 47–48, 494–96, 500, 531–33, Tables 121, 278, Fig. 218; Pet. 18–22, 33–37. UL data burst regions ##1–5 are physical uplink shared channels over which SSs send data transmissions to a BS.

Petitioner has shown by a preponderance of evidence that the Standard provides SSs with resource allocation information that delineates *regions* that correspond to the claimed "channels" in elements 22[a]–[d]. As discussed in more detail in our analysis of each individual limitation, regions are used to send data bursts and ranging control signals used to control transmissions of an SS to a BS in the Standard just as the claimed channels are used to send traffic data and signals by an SS (UE) to a BS to receive commands to control the power of a UE on its uplink transmission to a BS terminal. We address Patent Owner's other arguments in the context of each limitation.

f) 22[b]: "sending, by the UE, data over the physical uplink shared channel in assigned time intervals;"

Petitioner asserts that the Standard discloses a UE sending data over a physical uplink shared channel in assigned time intervals as SS sending data in a *region* of an uplink subframe allocated for uplink bursts in time intervals *k*+17 to *k*+26 assigned by a BS via a second UL-MAP message and MAP IE format as shown in Table 287, which is reproduced below. Pet. 18–22, 37–40.

Table 287—OFDMA UL-MAP IE format

Syntax	Size	Notes
UL-MAP_IE() {		
CID	16 bits	
UIUC	4 bits	
if (UIUC == 12) {		
OFDMA Symbol offset	8 bits	
Subchannel offset	7 bits	
No. OFDMA Symbols	7 bits	
No. Subchannels	7 bits	
Ranging Method	2 bits	0b00 – Initial Ranging over two symbols 0b01 – Initial Ranging over four symbols 0b10 – BW Request/Periodic Ranging over one symbol 0b11– BW Request/Periodic Ranging over three symbols
reserved	1 bit	Shall be set to zero
} else if (UIUC == 14) {		
CDMA_Allocation_IE()	32 bits	
else if (UIUC == 15) {		
Extended UIUC dependent IE	*variable*	See subclauses following 8.4.5.4.3
} else {		
Duration	10 bits	In OFDMA slots (see 8.4.3.1)
Repetition coding indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11 – Repetition coding of 6 used
}		
Padding nibble, if needed	4 bits	Completing to nearest byte, shall be set to 0.
}		

Table 287 depicts OFDMA UL-MAP IE that allocates an uplink burst region for SSs to send data to a BS. "OFDMA Symbol offset" sets the burst's start time. "No. OFDMA Symbols" allocates a time interval. "No. subchannels" allocates a frequency for a burst. Ex. 1005, 532–33; Pet. 37–40 (citing Ex. 1005, 8, 10, 11, 103, 176, 500, 533, Table 287, Fig. 218; Ex. 1003 ¶¶ 78–80, 83; Pet. §§ IV, V.A.4), 10–13, 17–22; Ex. 1003 ¶¶ 78–83. UL Bursts ##1–5 are allocated among SSs that share this region. Reply 11–12.

Petitioner asserts that a second UL-MAP allocates different regions of the UL subframe for SSs to send uplink bursts with a Ranging subchannel as show in Figure 218, reproduced below. Pet. 18–22 (citing Ex. 1005, 11, 43, 47, 48, 500, 532–33, Tables 18, 90, 121, 287; Ex. 1003 ¶¶ 58–60), 34–35 (different resources are allocated for a ranging subchannel and uplink bursts).

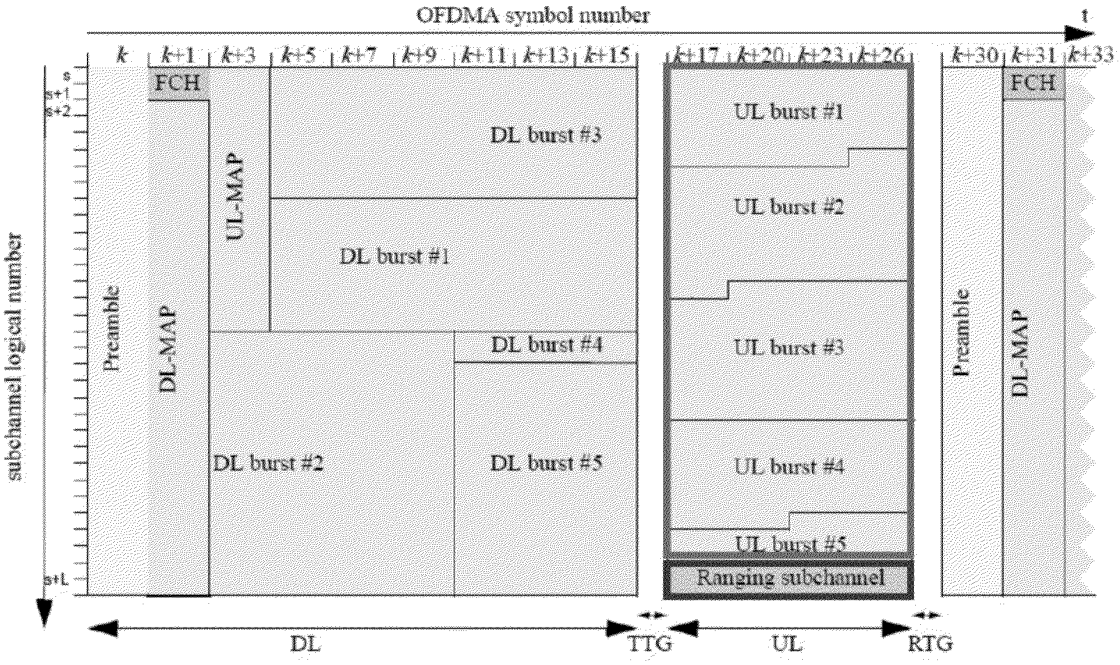


Figure 218—Time plan - one TDD time frame (with only mandatory zone)

Figure 218 illustrates Petitioner's annotation of UL data burst and Ranging subchannel regions of a UL subframe. Ex. 1005, 500; Pet. 21–22, 34–35.

(1) '356 patent describes a fixed-frame structure

Patent Owner argues that the "standard does not have a 'physical uplink shared channel' because it utilizes a frequency channel with a bandwidth from 3.5 MHz to 28 MHz to carry frames which may be variable in size, where the data is mapped to respective regions of the physical channel on a frame-by-frame basis." PO Resp. 22–25. Patent Owner argues that the '356 patent *describes* a fixed-duration frame structure divided into timeslots *in Figure 2*. *Id.* at 24. Patent Owner asserts that the uplink frequency includes a physical uplink shared channel (PUSCH) that carries user data and an uplink physical control channel that carries an uplink beacon (UL_Beacon). *Id.* at 24–25. Patent Owner argues that the downlink frequency has a physical downlink shared channel (PDSCH) that carries user data and a physical logical control channel (PLCCH) for downlink control channel. *Id.*

Claims are interpreted in light of the specification but are not limited to embodiments disclosed therein absent a clear indication in the intrinsic record. *Howmedica*, 540 F.3d at 1345 ("[W]e have repeatedly held that the fact that the specification describes only a single embodiment, standing alone, is insufficient to limit otherwise broad claim language."); *Liebel–Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004) ("[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited.");

Claim 22 is not limited to FDD or a fixed frame structure as confirmed by claim 28 and as discussed above. Reply 8–10. The term "frame" is not used in claim 22. Nor does claim 22 specify a fixed number of time intervals for any claimed channel or a fixed number of time intervals in a particular frame structure.

Patent Owner argues that "the '356 Patent describes a fixed-duration frame structure as shown in Fig. 2." PO Resp. 24 (citing Ex. 2005 ¶ 57 (same)). Yet, Figure 2 is not described as having a fixed frame structure.

> FIG. 2 illustrates an example of a timeslot arrangement supporting the UL_Beacon and its corresponding PLCCH within a TD-CDMA frame structure modified to support FDD. In this example, the PLCCH 212 shares a timeslot with another downlink shared channel. This is possible since normal downlink physical channels are used to transmit the PLCCH. The downlink frame also comprises a downlink beacon timeslot 206, an access control timeslot 208, and normal traffic carrying timeslots 210. The uplink frame comprises a UL_Beacon control timeslot 216, an access control timeslot 218, and normal traffic carrying timeslots 214.

Ex. 1001, 5:50–60; *see Sisvel*, 81 F.4th at 1236 (the intrinsic evidence and the claim language do not limit the claims to particular cellular networks).

Patent Owner does not identify a description of a fixed number of time intervals in a frame, a lexicographical definition of a time interval or a frame, or a clear, unmistakable disclaimer that limits the claimed time intervals to a fixed frame structure. Nor do Patent Owner and Dr. Lomp cite other evidence to support their assertions that claim 22 requires a fixed-frame duration.

That independent claims 1, 22, 43, and 45 are not limited to particular frame structures or schemes is made clear by claims 7, 28, 44, and 46, which recite that the uplink physical control channel and the physical uplink shared channel in claims 1, 22, 43, and 45 can be FDD or TDD (as in the Standard). Ex. 1001, 9:40–14:26. Thus, even if FDD uses a fixed frame structure, the claims are not limited to an FDD scheme. In the Standard, "[a] TDD frame also has a fixed duration and contains one downlink and one uplink subframe" and capacity allocated to the downlink versus the uplink *may vary*. Ex. 1005, 309. A "frame" is "[a] structured data sequence of fixed duration." *Id.* at 8.

(2) channels in the Standard

Patent Owner argues that the Standard uses a single channel, sends data within a region of a frame of that channel, and another frame may be sent over that *same* channel with another configuration. PO Resp. 26. Patent Owner asserts that uplink bursts are not allocations of a region of the uplink subframe because "[t]he uplink bursts are placed *in* the channel . . . on a frame-by-frame basis. They do not constitute channels." *Id.* at 27; *see* Ex. 2005 ¶ 63 (same).

Dr. Lomp testifies that an SS transmits a one-time burst in an assigned region of a frame and then "may be assigned to a totally different region of the UL subframe for a UL-burst, or assigned no burst at all" in the next frame so "[t]hese one-time bursts are not channels." Ex. 2005 ¶ 64. Dr. Lomp asserts that the "Ranging subchannel" would be considered a shared channel by this logic because it "also shares the UL subframe" with the UL bursts. *Id.* ¶ 65.

These arguments are unavailing because claim 22 does not require a fixed frame structure as discussed. The '356 patent describes physical uplink shared channels that vary from frame to frame for fractionation or when a UE sends only control signals over an uplink physical control channel in a frame without sending any data over a physical uplink shared channel in that frame, or terminals are managed actively. Ex. 1001, 2:18–28, 4:20–27, 5:32–6:44.

In the '356 patent, uplink physical control channels and physical uplink shared channels are *placed in* the uplink (UL) frame frequency channel on a frame by frame basis. These channels are placed *in* the UL frame frequency channel in different allocated timeslots in Figure 2. Ex. 1001, 5:50–60, Fig. 2. Data and signals are sent in different regions (timeslots 0–6, 8–13 for data and 7 for UL-Beacon in the UL frequency channel) in Figure 2, just as UL bursts are sent in different allocated time and frequency domain regions of an uplink subframe in the Standard as shown in Figure 218, which is reproduced above.

(3) "sending . . . in assigned time intervals"

Patent Owner also argues that the physical uplink shared channels are "shared on the basis of time slots" but the Standard's UL bursts occupy the identical time slot as shown in Figure 218 of the Standard. Sur-reply 10.

Claim 22 recites "sending, by the UE, data over the physical uplink shared channel in assigned time intervals." Ex. 1001, 11:31–32. Figure 2 of the '356 patent shows data being sent over the physical uplink shared channel (PUSCH 214) in *time intervals 0–6 and 8–13*. Ex. 1001, 5:58–60. Figure 218 of the Standard also shows data sent in UL burst regions of the UL subframe in assigned *time intervals k+17* to *k+26*. Ex. 1005, 500; Pet. 37–40; Ex. 1003 ¶¶ 78–83. The Standard may send data bursts in different time intervals as shown in Figure 8.14 of *Fundamentals of WiMAX*, reproduced below.

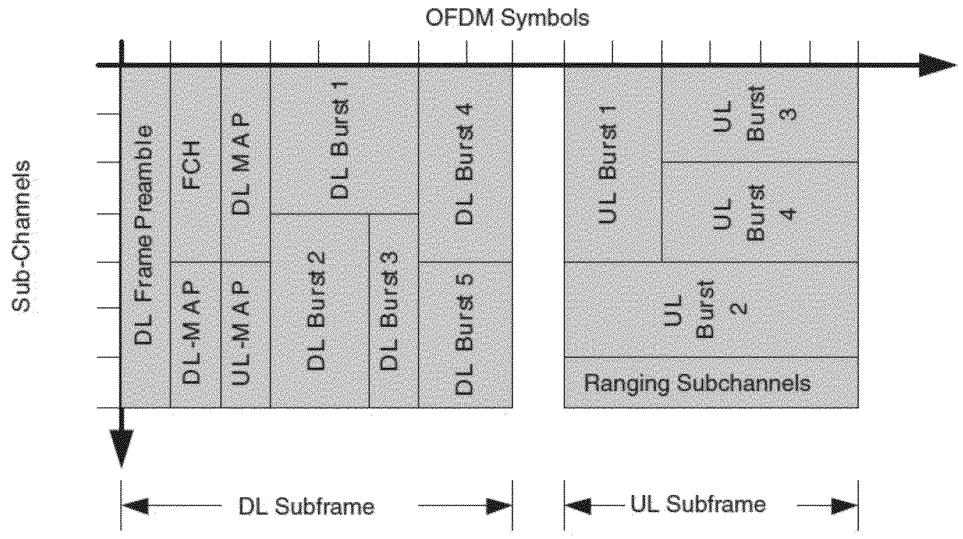


Figure 8.14 TDD frame structure

Figure 8.14 depicts a TDD frame structure that allocates different OFDM time intervals for UL Bursts 1–3 sent in the UL Subframe and the DL Subframe. Ex. 1008, 319–320; *see also* Ex. 1005, 500 (showing DL Burst #2 and #4 sent in different assigned time intervals *k+3 to k+9* and *k+11* to *k+15*, respectively, of a downlink (DL) subframe in Figure 218 of the Standard). Ex. 1005, 500.

Petitioner has shown by a preponderance of evidence that the Standard discloses element 22[b].

> g) *22[c]: "sending, by the UE in a time interval that it is not sending information over the physical uplink shared channel, a signal over the uplink physical control channel based on the received resource allocation information; and"*

Petitioner asserts that the Standard discloses an SS sending a signal as a Ranging Code message in a Ranging Slot of a Ranging Subchannel, which is an "uplink physical control channel." Petitioner asserts that the BS allocates the Ranging Subchannel as an Initial Ranging opportunity in a UL-MAP as shown in Table 121. Petitioner asserts that the Ranging Code message is sent "in a time interval that [the SS] is not sending information over the" uplink bursts "because the SS sends the Ranging code message at a time that the SS is not sending data in its uplink burst" because the SS has not received the second UL-MAP message that allocates the uplink burst region for the SS to send UL data bursts. Pet. 40–42 (citing Ex. 1005, 7, 48–51, 154, 174–75, 178, 205–06, 666, Table 121; Ex. 1003 ¶¶ 84–87; Pet. §§ V.A., V.A.2).

Dr. Akl testifies that the Standard discloses this element as an SS sending a Ranging Code message over the Ranging subchannel based on the Initial Ranging opportunity received as "resource allocation information" from a BS. Ex. 1003 ¶¶ 84, 85 (citing Ex. 1005, 49, 154, 175, 205–06, 666 (a "Ranging subchannel" is "the OFDM subchannel . . . used to transmit the initial ranging message"). Dr. Akl testifies that the SS identifies the Ranging subchannel from the Initial Ranging opportunity and sends the Ranging Code message in a time interval that the SS is not sending uplink bursts because the SS has not received the Second UL-MAP that allocates uplink burst regions to the SS to send data. *Id.* ¶¶ 86, 87 (citing Ex. 1005, 7, 48–51, 154, Table 121).

Patent Owner argues that "[a] ranging subchannel in which a ranging request is sent uplink over an initial ranging interval is not a control channel because such a ranging request does not control anything." PO Resp. 30. Patent Owner asserts that "the ranging subchannel is not a channel but a subdivision of a frame within the much larger channel in the standard." *Id.* at 30–31. Patent Owner argues that the Standard refers to a "Ranging Code" not a Ranging Code message" as Petitioner alleges and the Ranging Code is just a code and nothing more. *Id.* at 31–33. Patent Owner argues that Petitioners do not provide any evidence that the Ranging subchannel and uplink bursts are physical channels. *Id.* at 33–34. Patent Owner argues that the uplink physical control channel is used as part of a feedback loop to maintain the call, whereas a physical random access channel (PRACH) is used to access the network and set the initial transmission power level in the '356 patent. *Id.*

The '356 patent delineates channels by time and frequency. An "uplink physical control channel" is placed in an uplink frame frequency channel. It is delineated by UL_Beacon region 216 at timeslot 7 in the *uplink (UL) frame frequency* channel. It is sent *in* the UL frame channel with physical uplink shared channels (PUSCH 214 at timeslots 0–6, 8–13) and PRACH and RICH channels 218 at timeslot 14. Ex. 1001, 5:50–60, 4:5–10, Fig. 2. The uplink physical control channel may be FDD or TDD (claim 28) so it may be sent on the same or different uplink frequency channels. *See* Ex. 1001, 4:1–7.

The Standard allocates a Ranging subchannel so the SS can transmit an initial ranging message to a BS in an allocated Ranging Slot from an available Ranging Region. In response, the BS sends a RNG-RSP message with "Time & Power Corrections" so the SS can "Adjust Time & Power parameters" to send data to the BS. Ex. 1005, 48–51, 205–06, 666, Table 121. A Ranging Code is sent as a ranging message. *See id.* at 51, 154, 175–78, 205–206, 666.

(1) the Ranging Channel is a control channel

The Ranging subchannel is an uplink physical control channel used to send a Ranging Code to a BS, which sends time and power adjust parameters to the SS to control its uplink transmissions. Ex. 1005, 48–51, 205–206, 666. We reproduce Table 121 in relevant part below to show this feedback control.

Table 121—CDMA initial Ranging and automatic adjustments procedure

BS		SS
[time to send the CDMA Initial Ranging opportunity]		
send map containing CDMA Initial Ranging IE with a broadcast Connection ID	----------UL-MAP---------->	
	<---------Ranging Code-------	Transmit randomly selected Initial Ranging code in a randomly selected Ranging Slot from available Ranging Region
[Receive Ranging Code]		
Send RNG-RSP with Time & Power Corrections and original Ranging Code and Ranging Slot	----------RNG-RSP------->	
Status = Continue		
		Receive RNG-RSP message with Ranging Code and Ranging Slot matching sent values Adjust Time & Power parameters

The portion of Table 121 of the Standard reproduced above illustrates a BS sending a "UL-MAP" with "Initial Ranging IE" (information elements) to an SS. Then, the SS transmits an Initial Ranging code in a Ranging Slot of the Ranging Region that was allocated by the BS. In response to receiving the Ranging Code, the BS sends a RNG-RSP to the SS with "Time & Power Corrections" so the SS can "Adjust Time & Power parameters" for its uplink data transmission(s) to the BS. Ex. 1005, 205–206; Pet. 16–18, 40–41.

(2) Ranging subchannel is a physical channel

A Ranging subchannel is a physical layer channel defined in frequency and time to send a Ranging Code in an Initial Ranging opportunity. Ex. 1005, 154, 167, 174–76. "Via the Initial Ranging IE, the BS specifies an interval in which the new stations may join the network." *Id.* at 154. A Ranging Slot is delineated by OFDMA symbols (*time*) and subchannel (*frequency*). *Id.* at 205. "The BS shall allocate an Initial Ranging Interval consisting of one or more transmission opportunities" and SSs scan a UL-MAP for Initial Ranging Intervals. *Id.* at 174–75. A transmission opportunity is allocated in a UL-MAP for a group of SSs to send Initial Ranging requests. *Id.* at 167.

The Ranging subchannel is a physical channel. The UL-MAP IE is a "*PHY specification.*" "PHY" is the "physical layer." Ex. 1005, 15, 48. IE's define uplink bandwidth allocations. *Id.* at 48. A Ranging code or RNG-REQ message is sent by an SS at initialization to request power changes. *Id.* at 49, 175. "The RNG-REQ message may be sent in Initial Ranging" "when the SS is attempting to join the network." *Id.* The "Ranging Subchannel" indicates OFDMA time symbols and subchannel (frequency) to send the initial ranging message. It is allocated by the MAC layer and UL-MAP. *Id.* at 51, 577, 666.

The Ranging Code and RNG-REQ message are used in a closed loop feedback process to control the uplink transmission of an SS. In response to the Ranging Code or RNG-REQ message, the BS sends a RNG-RSP message that provides "Power Adjust Information" and "Timing Adjust Information." Ex. 1005, 50, 176–77, Table 115. "On receiving a RNG-RSP, the SS shall not transmit until the RF signal has been adjusted in accordance with the RNG-RSP." *Id.* at 178. Thus, the Ranging subchannel is used as an uplink physical control channel by an SS to send signals to a BS in order to receive power and timing settings for the SS's uplink data transmissions over the network.

Claim 22 does not require the uplink physical control channel or the signal sent over the uplink physical control channel to control anything. *Cf.*, PO Resp. 30 (arguing that sending a ranging request in an initial ranging interval over a ranging subchannel is not a control channel because such a ranging request does not control anything). The '356 patent makes clear that the UL_Beacon signal that is sent over the uplink physical control channel does not control anything. The UL_Beacon signal is used by the base station to send power control commands back to a UE to increase or decrease its power based on the power received in the UL_Beacon signal. Ex. 1001, 4:49–5:1. The Standard's ranging code and RNG-REQ message are sent by an SS to a BS, which uses them to control the SS's power and timing settings to transmit for joining the network. 1005, 48–51, 174–78, 205–06, Table 121.

Regarding Patent Owner's and Dr. Lomp's assertions that "Petitioners do not provide any evidence to support such a conclusory statement that a [skilled artisan] would have recognized [the ranging subchannel and uplink bursts] as physical channels" (PO Resp. 33–34; Ex. 2005 ¶ 77), Petitioner has provided such evidence. Dr. Akl testifies that a skilled artisan would have recognized that both channels are transmitted over the air at actual frequencies and times (as opposed to being transport and logical channels) as physical channels. Ex. 1003 ¶ 73. Dr. Akl supports his testimony with citations to the Standard, which discloses frequencies and times for sending Ranging codes over the ranging subchannel and uplink bursts in Figure 218 and describes the OFDMA and these channels as "PHY" implementations where PHY refers to the "physical layer." *Id.* (citing Ex. 1005, 15, 493, Fig. 218) (cited in Pet. 34).

These contentions and citations establish that a ranging subchannel and uplink bursts are physical channels and understood as such by skilled artisans. Pet. 14–17, 40–42; Ex. 1003 ¶¶ 73–87; Ex. 1005, 48–51, 577, 666, Fig. 218.

Dr. Akl also asserts that his level of skill in the art was at least that of a skilled artisan so he is qualified to provide opinions concerning the knowledge and understanding of a skilled artisan at that time. Ex. 1003 ¶ 20.

The Standard's description of generating ranging codes as binary codes and pseudonoise codes to modulate subcarriers in adjacent subchannels as a ranging subchannel (Ex. 1005, 578; PO Resp. 33; Ex. 2005 ¶ 76) evidences that the Ranging subchannel is a physical channel. As discussed above, the Ranging code and RNG-MSG provide data and information to the BS. The BS uses the information in the ranging code sent over the Ranging subchannel to define the transmit power level of the SS and control the power and timing of SSs transmissions to join the network as the Standard makes amply clear. *See* Ex. 1005, 48–51, 174–78, 205–06, 493, 496 (a slot in the OFDMA PHY requires a time and a subchannel dimension), 666, Tables 115, 121, Fig. 287.

The '356 patent describes the UL_Beacon signal sent over the uplink physical control channel being used by the base station to detect the received power and/or other channel information from the UL_Beacon in order to send controlling commands back to each UE terminal. Ex. 1001, 2:17–48, 4:33–5:1, 5:50–60. Claim 22 does not recite any features of the signal sent over the uplink physical control channel. Nor has Patent Owner identified any claimed feature of a signal that distinguishes it from the Ranging code in the Standard.

(3) claim 22 covers ranging before data is sent

Petitioner contends persuasively that "the claims make no distinction between 'initial power control' and a 'feedback loop to maintain the call.' Rather, the claims require only that the 'signal over the uplink physical control channel' be sent 'in a time interval that is not sending information over the physical uplink shared channel.'" Reply 14.

In response, Patent Owner argues that

> Petitioner's argument ignores the explicit statement in the specification of the '356 patent that "[t]he uplink physical control signal is referred to herein as an 'Uplink Beacon' (UL_Beacon)." Ex. 1001, 4:38-40. Although the claims themselves do not recite the term "uplink beacon" or "UL beacon," the claimed "uplink physical control channel" is clearly described in the specification, and it is not the PRACH channel.

Sur-reply 12; PO Resp. 34 (arguing, "the '356 patent has a physical random access channel (PRACH), which is used to access the network and set the initial transmission power level of the PUSCH. . . . The uplink physical control channel is used as part of a feedback loop to maintain the call.").

These arguments are not commensurate with claim 22, which does not recite a method of maintaining a call for a period of time or frames.

Patent Owner's arguments also are inconsistent with the '356 patent specification, which does not limit use of the uplink physical control channel to *maintaining* a call. Indeed, the '356 patent describes the use of the uplink physical control channel for a UE to join a network before it sends any data.

The '356 patent touts embodiments that "transmit the uplink physical channel control signal (UL_Beacon) *independently from the uplink physical channel* [so that] the implementation of *closed loop feedback may operate in the absence of an uplink physical channel*." Ex. 1001, 2:24–28 (emphasis added). An uplink physical control channel is used to estimate uplink channel conditions, and a downlink channel provides feedback control information, but "[t]hese channels may not need an associated data physical channel to be operational." *Id.* at 4:25–27. The '356 patent covers embodiments that send a signal over an uplink physical control channel for feedback control before a UE accesses a physical uplink shared channel to send data just as the Standard sends a Ranging Code allocated in a first UL-MAP before the SS is allocated access to uplink burst channels in a second UL-MAP to send data.

The '356 patent describes its feedback control used by an SS to access uplink channels initially. The Background of the Invention indicates that:

> When access to a limited number of uplink channels is shared between a large population of terminals it is imperative that access to the channels can be switched between terminals with minimal latency. A data terminal that can derive information *needed to access uplink channels* from the downlink transmissions (beacon signals) has a significant advantage over a terminal that relies on the (lengthy) configuration of a dedicated channel in order to establish a feedback channel.

Ex. 1001, 1:37–45 (emphasis added). The invention addresses this issue.

"To obtain *rapid access to the uplink shared channels*, terminals can transmit at the correct power *with their first transmission* so that latency can be kept to a minimum." Ex. 1001, 4:45–48 (emphasis added). "Because the UE is aware of the uplink pathloss conditions from the feedback channel, it *can have instant access to the uplink shared channels*." *Id.* at 6:66–7:2 (emphasis added). This feedback control occurs *before* a UE accesses the physical uplink shared data channel like the initial ranging in the Standard.

The '356 patent uses the uplink physical control channel and signal to control UEs' access to a network so UEs can access the physical uplink shared channel more quickly like the Standard describes initial ranging to enable later UL data bursts. We agree with Petitioner's contention (Reply 14–15) that

> the claims make no distinction between "initial power control" and a "feedback loop to maintain the call." Rather, the claims require only that the "signal over the uplink physical control channel" be sent "in a time interval that is not sending information over the physical uplink shared channel." '356 Patent, 9:48-52. The Ranging Code message is a "signal over" the Ranging Subchannel, and it is sent "in a time interval that is not sending information over the" UL bursts, as explained in the Petition (and further discussed below). Petition, 40-42. The claims require nothing more.

Patent Owner argues that the '356 patent uses a physical random access channel (PRACH) to access a network and set initial transmission power levels for data. PO Resp. 34 (citing Ex. 2005¶ 78), 19. Patent Owner asserts

> the initial ranging code message is more similar to the PRACH in the '356 patent than the uplink physical channel control signal. The initial ranging code is used to establish the initial power level and access the network, as does the PRACH of the '356 patent. The uplink physical channel control signal is different, as it is used as a continuous feedback mechanism during a call, after the initial power level is established for the uplink. A POSITA understands that the PRACH is used to set the initial power level of the PUSCH and that the uplink physical control channel is used afterwards as feedback during the call. Ex. 2005, ¶48.

PO Resp. 19.

Patent Owner asserts that "[a]lthough the claims themselves do not recite the term 'uplink beacon' or "UL beacon,' the claimed 'uplink physical control channel' is clearly described in the specification, and it is not the PRACH channel." Sur-reply 12. This argument is not persuasive.

Claim 22 recites a generic "signal" rather than a UL_Beacon as Patent Owner admits. The '356 patent describes such a signal being used to access a network before an uplink data channel is established for a UE. Claiming a signal indicates some intent to cover initial ranging before a UE accesses an uplink data channel and not to limit the claims to using a UL_Beacon signal, which is not described as being used only to maintain a call in any case.

Even if a PRACH channel sets initial power levels, claim 22 sends a "signal" over the uplink physical control channel. The '356 patent describes such a signal being used to set a UE's power before data is sent on an uplink data channel or before such channel is allocated. Ex. 1001, 2:24–28, 4:25–27. This ranging allows UEs to send data more quickly when they later try to access the physical uplink shared data channel. *Id.* at 4:45–48, 6:66–7:2.

Petitioner asserts that the Standard describes a Ranging code is sent in an allocated timeslot over a Ranging subchannel to establish SS power levels for initial uplink transmissions as illustrated in Table 121. Pet. 40–42. During this initial ranging opportunity, the SS is not sending information in the uplink burst region of the uplink subframe because the uplink data region(s) have not yet been allocated to the SS by the BS. Dr. Akl provides testimony to support these contentions. Ex. 1003 ¶¶ 84–87. Dr. Akl testifies that the SS sends the Ranging Code message in response to the first UL-MAP that is sent by the BS in a ranging slot time interval in which the SS is not sending any data on the UL burst channel because the SS is not allocated an uplink burst channel/slot to send data until it subsequently receives the second UL-MAP. *Id.* ¶¶ 86, 87.

In view of the foregoing analysis and in light of the respective evidence and contentions of Petitioner and Patent Owner, we find the plain language of claim 22 interpreted in light of the '356 patent Specification encompasses a method where the uplink physical control channel is used to send a signal from a UE to a BS to obtain feedback information in element 22[d] as part of an initial ranging process to access a network before a UE is allocated access to the uplink data channel. The UE sends a signal over the physical uplink shared channel in a time interval when the UE is not sending information over the physical uplink shared channel, e.g., because it has not yet been allocated resources to do so. The Standard discloses this arrangement. An SS sends a Ranging Code to a BS to receive power commands to adjust its power settings that it uses subsequently to send its first data burst over the UL Burst region that is allocated in the Second UL-MAP. Ex. 1005, Table 121; *cf.*, Ex. 1001, 4:45–48, 6:66–7:2, 1:40–45. This arrangement promotes the same efficiency and quick access to the uplink data channel that the '356 patent touts for the signal that is sent over the uplink physical control channel as discussed above.

h) 22[d] receiving, by the UE, feedback information from a downlink control channel.

Petitioner contends that the Standard discloses "receiving, by the UE, feedback information from a downlink control channel" in element 22[d] as an SS receiving parameters such as Power Adjust Information in a RNG-RSP message sent in a specific region of the downlink frame from a BS. Petitioner asserts that the SS uses these parameters to adjust power and other parameters of its transmissions to the BS. Petitioner asserts that the RNG-RSP message is sent in a "channel" that is allocated or "mapped" as a dedicated region of the downlink subframe like other medium access control layer (MAC) messages such as the UL-MAP and DL-Map in Table 14 and Figure 218. Petitioner contends that a skilled artisan would recognize this assigned region to be "a downlink control channel" used to transmit RNG-RSP messages as control information. Pet 42–47 (citing Ex. 1005, 9, 31, 45, 46, 50–51, 123, 178, 205, 497, 522–23, 547, 620, Tables 14, 121, Figs. 90, 218; Ex. 1003 ¶¶ 88–92; Ex. 1001, 2:33–48 (describing feedback information); Pet. § V.A.3.).

Petitioner asserts that the Standard discloses the SS receiving feedback information as a UL-MAP IE in a second UL-MAP message that is sent in a dedicated region of the downlink subframe that is allocated to the UL-MAP. Petitioner contends that the UL-MAP allocates access to the uplink channel by including a Map IE that provides "feedback information" because a BS sends the Map IE in response to receiving the Ranging code message from the SS. Petitioner asserts that an SS transmits uplink information according to the Map IE, adjusts its transmission, and sends uplink transmissions in an uplink burst region allocated to it by a BS in a second UL-MAP shown in Figure 218. Pet. 47–52 (citing Ex. 1005, 47, 48, 500, 532–33, Tables 18, 121, 287, Fig. 218; Ex. 1003 ¶¶ 93–97; Ex. 1001, 2:33–48, 5:5–6; Pet. § V.A.4.).

Patent Owner argues that a skilled artisan would not consider a region of the DL subframe allocated to the UL-Map to be a channel or a downlink control channel because the size of the region can vary from frame to frame as the size of the UL-MAP_IE() is variable. PO Resp. 35. Dr. Lomp testifies that the size of the UL-MAP may change as the UL-MAP_IE() has a variable size, and a skilled artisan would not consider a region of the downlink (DL) subframe allocated to the UL-MAP to be a channel or a downlink control channel when its size is variable from frame to frame. Ex. 2005 ¶ 82.

As discussed above, claim 22 does not recite fixed frames or a frame structure size as Patent Owner argues. The '356 patent does not describe the UL or DL frames or the downlink physical layer control channel (PLCCH) as having a fixed size. Indeed, the '356 patent describes PLCCH 212 sharing timeslot 9 with another downlink channel (SFPACH). Ex. 1001, 5:50–54.

Figure 218 discloses the UL-MAP allocated in a region of the downlink subframe at OFDMA symbol number k+3 and several subchannels. Ex. 1005, 500. It shares a timeslot with part of DL burst #2, which is allocated another region of the DL subframe. *Id.* at 48, 205–06, Tables 18, 275, Fig. 218.

Patent Owner does not contest that a BS sends a RNG-RSP message in a region of the downlink subframe like the UL-MAP. The Standard describes RNG-RSP as a MAC management message like DL-MAP and UL-MAP sent in allocated regions/channels of the DL subframe. Ex. 1005, 43, Table 14. This MAC data is mapped to an OFDMA Data Region in the downlink subframe defined by the DL-MAP message. *Id.* at 45, 46, 522–23; *see* Pet. 46–47. Dr. Akl testifies that the Standard discloses an SS receiving feedback information as Power Adjust parameters in a RNG-RSP message and uplink transmission parameters in a second UL-MAP message, and both messages are sent in an allocated region of the downlink subframe. Ex. 1003 ¶¶ 93–97.

i) Must step 22[b] be performed before step 22[c]?

To attempt to limit Petitioner's reliance on the initial ranging in the Standard to disclose element 22[c], Patent Owner asserts that the steps must be performed sequentially with data sent in step 22[b] before a control signal is sent in step 22[c]. PO Resp. 16–19. Patent Owner argues that data is sent over the physical uplink shared channel in assigned intervals in element 22[b] "only after element 22[a] is performed." *Id.* at 16. Patent Owner asserts that without "assigned time intervals" for a physical uplink shared channel in element 22[b], "a time interval that it [the UE] is *not* sending information over the physical uplink shared channel" in element 22[c] is "nonsensical." *Id.* at 17. Patent Owner argues "the specification describes only embodiments of process steps performed in the temporal sequence described above." *Id.*

Petitioner asserts that claim 22 does not recite an order of steps and the claimed steps should not be construed to require an order of steps. Reply 17. Petitioner asserts that the "resource allocation information" in element 22[a] assigns time intervals and nothing in element 22[b] assigns any time intervals. *Id.* at 18. As a result, Petitioner asserts that "once the 'resource allocation' is received in element 22[a], a UE can send a signal "in a time interval that it is not sending information over the physical uplink shared channel," because the resource allocation in element 22[a] tells a UE which timeslots are assigned for the physical uplink shared channel and which are assigned for the uplink physical control channel. *Id.* at 19 ("The claim language reflects this by reciting that the 'signal' in element 22[c] is sent '**based on** the received resource allocation information' that was received in element 22[a]."). Petitioner contends that the '356 patent specification does not require the ordering of steps that Patent Owner proposes. *Id.* at 19–20.

The plain meaning of element 22[a] is that the UE receives resource allocation information so it can send "a signal over the uplink physical control channel based on the received resource allocation information" when it is not sending information over the physical uplink shared channel in element 22[c]. *Id.* at 11:31–36. The uplink physical control channel and the physical uplink shared channel use different resources, but element 22[a] does not allocate resources for a physical uplink shared channel to a UE in this step. Nor is that allocation required to occur before element 22[a]. Ex. 1001, 11:25–38.

Claim 22 does not require the UE to send data before signals. The UE must receive resource allocation information in element 22[a] before it sends a signal in element 22[c], and it must be assigned time intervals before it sends data in element 22[b], but claim 22 does not specify when the UE is assigned time intervals to send data or require time intervals to be allocated to send data before time intervals are allocated in element 22[a]. A UE can send signals as long as a time interval is allocated in element 22[a], before it sends any data.

According to the '356 patent, assigning a time interval to send a signal over an uplink physical control channel enables a UE to send a UL_Beacon signal before or without sending data over the physical uplink shared channel. Thus, "[e]mbodiments of the invention allow a terminal to transmit the uplink physical channel control signal (UL_Beacon) *independently* from the uplink physical channel [so] the implementation of closed loop feedback *may operate in the absence of an uplink physical channel*." Ex. 1001, 2:24–28 (emphasis added). Allocating *resources* to send signals on a physical control channel, as in element 22[a], allows UEs to send signals "independently of their access to the uplink shared channel." *Id.* at 4:49–55. Element 22[a] thus allows a UE to send a signal in element 22[c] without first sending data in element 22[b]. Element 22[c] occurs *independently* of element 22[b].

We disagree that the specification describes only embodiments in the temporal sequence of data sent before signals. PO Resp. 17. To the contrary, the '356 patent specification describes embodiments in which signals are sent on an uplink physical control channel before data is sent on uplink physical channels, as discussed. Ex. 1001, 2:24–28, 4:20–27, 4:45–55.

Nor has Patent Owner provided technical reasons for a UE to send data in element 22[b] before sending a signal in element 22[c]. *See* PO Resp.; Sur-reply 16–18; *cf.*, Reply 18–20. Instead, the '356 patent describes advantages to sending a signal on an assigned channel *before sending data* to a BS over a shared channel because it allows a UE to access the uplink shared channel and send data with minimal latency. Ex. 1001, 1:37–45. The UE can "obtain rapid access to the uplink shared channels, [so] terminals can transmit at the correct power with their first transmission [and] latency can be kept to a minimum." *Id.* at 4:45–48. "Because the UE is aware of the uplink pathloss conditions from the feedback channel, it can have instant access to the uplink shared channels." *Id.* at 6:66–7:2.

Even if a UL_Beacon signal is sent with data, it can be sent before any data is sent over the physical uplink shared channel in the frame. Dr. Lomp testified that there is latitude to when the UL_Beacon is sent. It can be in the first timeslot, i.e., before data is sent. Reply 20 (quoting Ex. 1019, 23:1–19). Patent Owner asserts the testimony answers hypothetical questions (Sur-reply 16), but it comports with the disclosure of many possibilities for arranging a UL_Beacon (Ex. 1001, 5:32–49) and indicates the understanding in the art.

Petitioner has shown by a preponderance of evidence that claim 22 does not require step 22[b] to occur before step 22[c]. Allocating a separate signal channel allows a UE to send a signal independently of, and before, it sends data in a different channel. Ex. 1001, 2:17–34, 4:49–55; *see* Reply 18–20.

Mformation Techs., Inc. v. Research in Motion Ltd., 764 F.3d 1392 (Fed. Cir. 2014), relied on by Patent Owner (Sur-reply 16–17), does not alter the outcome. *Mformation* indicates why claim 22 does not require data to be sent in step 22[b] before the UE sends a signal in step 22[c] in a time interval in which it is not sending information over the physical uplink shared channel.

In *Mformation*, the Court held, "delivering the command [for a wireless device] from the mailbox at the server to the wireless device by establishing a connection between the wireless device and the server" required a connection to be established between the wireless device and server before the server sent the command from the mailbox to the wireless device. *Mformation*, 764 F.3d at 1394, 1399. The Court explained, "the separate sub-step for establishing a connection would become 'superfluous' if we concluded that a connection did not have to be established (completed) before transmission . . . because, . . . establishing a connection is necessarily encompassed in transmitting a command." *Id.* The specification also described "establishing a connection" before commands stored in mailbox 512 are transmitted to device 502. *Id.*

Here, a UE sends a signal over the uplink physical control channel in element 22[c] after resources are allocated *for that channel* in element 22[a]. Because resources are allocated to send signals in element 22[a], the UE can send a signal *independently* of (and before) sending data on an uplink shared channel (Ex. 1001, 2:17–34, 4:20–27, 4:49–55, 6:33–37). This arrangement allows a UE to access uplink data channels with minimal latency. *Id.* at 1:37–45, 4:41–48, 6:64–7:3. Sending signals in element 22[c] before sending data in element 22[b] does not make element 22[b] superfluous. Data is sent later with minimal latency. *Id.* Sending signals in allocated channels means the signals are sent in element 22[c] independently of data in element 22[b], e.g., at registration or re-synchronization. *Id.* at 2:17–34, 4:49–55; Ex. 1005, 620.

j) Sending a signal over the uplink physical control channel in a time interval the UE is not sending information over the physical uplink shared channel

Based on our determination that claim 22 does not require a temporal sequence of element 22[b] to be performed before element 22[c], we disagree with Patent Owner's contention that "Petitioner's interpretation is contrary to the sequence performed according to claim 22." PO Resp. 37.

Patent Owner argues that the Standard describes an SS sending an initial ranging request over the ranging subchannel to the BS and later sending data over the physical uplink shared channel in subsequent frames. PO Resp. 38. Patent Owner argues, "it would be impossible for the SS to transmit data over a physical uplink shared channel *before* the SS transmits an initial ranging request in an attempt to establish a connection with the BS." *Id.* at 39.

Because claim 22 does not require a UE to send data over a physical uplink shared channel before it sends a control signal such as a Ranging code over an allocated Ranging subchannel, Petitioner has established by a preponderance of evidence that the Standard discloses element 22[c] by first sending a Ranging code over a ranging subchannel region allocated in a first UL-MAP before timeslots are allocated to send data and then sending uplink burst data in an uplink burst region of the UL subframe allocated later in a second UL-MAP as Patent Owner recognizes. Pet. 37–42; PO Resp. 38–40.

Based on the evidence and arguments presented by the parties and the analysis discussed above, we determine that Petitioner has established by a preponderance of evidence that the Standard discloses every limitation recited in claim 22, and that the Standard anticipates claim 22.

4. Claim 23

Petitioner contends that the Standard discloses a UE receiving data on a physical downlink shared channel in claim 23 as an allocated downlink burst in a region of the subframe allocated by the DL-MAP and its MAP IE for the SS to receive downlink transmissions from a BS. Pet. 52–55 (citing Ex. 1005, 15, 44, 46, 493–500, 521–22, Table 275, Fig. 218; Ex. 1003 ¶¶ 98, 100, 101; Pet. § V.A.5.). Patent Owner does not address specifically Petitioner's contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 23 is anticipated by the Standard.

5. Claim 25

Petitioner contends that the Standard discloses power control feedback information in claim 25 by sending the RNG-RSP message with Power Adjust Information. Petitioner contends that the SS will adjust its transmission power according to Power Adjust parameters in the RNG-RSP message upon receipt of that message. Pet. 55 (citing Ex. 1005, 50, 176, 178, 205; Ex. 1003 ¶¶ 102, 103). Patent Owner does not address specifically Petitioner's contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 25 is anticipated by the Standard.

6. Claim 26

Petitioner asserts that the Standard discloses a downlink control channel with power control information for plural UEs in claim 26 by sending RNG-RSP messages for each SS using an Uplink Channel ID and different bits to send Power Adjust Information to multiple SSs. Pet. 55–57 (citing Ex. 1005, 33, 50–51, 105, 205–06 Table 20; Ex. 1003 ¶¶ 104–107). Patent Owner does not address specifically Petitioner's contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 26 is anticipated by the Standard.

7. Claim 27

Petitioner contends that the Standard discloses that multiple SSs send a Ranging Code message to the BS on respective ranging slots of the Ranging subchannel, which is an uplink physical control channel in claim 27, by each SS randomly choosing a Ranging Slot of the Ranging subchannel. Pet. 57–58 (citing Ex. 1005, 49, 147–48, 175, 205–06, 666; Ex. 1003 ¶¶ 108–110).

Patent Owner argues that the Standard does not disclose plural UEs sending signals on uplink physical control channels in the time interval in claim 27 "because neither the Petition nor Dr. Akl's declaration . . . identifies any part of the Standard disclosing this limitation." PO Resp. 39.

Relying on testimony of Dr. Akl, Petitioner contends that the Standard discloses an SS sending a Ranging Code message over a Ranging subchannel by randomly choosing a Ranging Slot from the Ranging Region to send the Ranging Code message to the BS. Pet. 58. Dr. Akl testifies that the Standard discloses a BS sending a UL-Map with multiple "ranging slots" so an SS may randomly choose a Ranging Slot to send its Ranging Code message to the BS, and a skilled artisan would recognize that multiple SSs seeking to access the BS in the same time interval would send Ranging Code messages to the BS in a respective ranging slot of the Ranging subchannel. Ex. 1003 ¶¶ 109, 110.

In the Ranging Response message, a BS identifies each Ranging Code that it receives and the Ranging Slot (OFDMA symbol number, subchannel) where the Ranging Code was identified. Ex. 1005, 205–06. A BS confirms receipt of a Ranging Code because *Ranging Codes may collide*. *Id.* at 147–49. "The BS specifies *an interval* in which *new stations* may join the network." *Id.* at 154 (emphasis added). "A transmission opportunity is defined as an *allocation provided in a UL-MAP* . . . for a *group of SSs* authorized to transmit . . . Initial Ranging requests." *Id.* at 167 (emphasis added).

Based on our analysis of the evidence and arguments presented, we determine that Petitioner has established by a preponderance of evidence that the Standard anticipates claim 27.

8. Claim 28

Petitioner asserts that the Standard discloses the Ranging subchannel can be a CDMA channel, the uplink bursts can be TDMA channels, and the uplink and downlink subframes and uplink bursts can be TDD channels as well as the downlink subframe and UL-MAP as recited in claim 28. Pet. 58–60 (citing Ex. 1005, 11, 51, 147–48, 151–53, Fig. 218; Ex. 1003 ¶¶ 111, 112). The Standard discloses that both FDD and TDD duplexing techniques are supported in the PHY type parameter. Ex. 1005, 307–309. Patent Owner does not address specifically Petitioner's contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 28 is anticipated by the Standard.

9. Independent Claim 45

Petitioner contends that the Standard anticipates independent claim 45 by disclosing a method performed by a UE in element 45[p]. Pet. 60 (citing contentions for element 22[p]; Ex. 1003 ¶ 113). Petitioner contends that the Standard discloses receiving by the UE resource allocation information for the uplink physical control channel that has different resources than the physical uplink shared channel in element 45[a]. *Id.* at 61 (citing contentions for element 22[a]; Ex. 1003 ¶ 114). Petitioner also contends that the Standard discloses the UE sending data over the physical uplink shared channel in assigned time intervals in element 45[b]. *Id.* (citing contentions for element 22[b]; Ex. 1003 ¶ 115). Petitioner further contends that the Standard discloses sending a signal over the uplink physical control channel in element 45[c]. *Id.* (citing contentions for element 22[c]; Ex. 1003 ¶ 116).

Petitioner cites its contentions for claim 27 to support its assertion that plural UEs send signals on respective uplink physical control channels in the time interval in element 45[d]. Pet. 61 (citing Ex. 1003 ¶ 117).

Patent Owner argues that the Standard discloses a contention-based initial ranging scheme instead of UEs sending respective signals on respective uplink physical control channels in the time interval. PO Resp. 39–42. Patent Owner asserts that a skilled artisan would not consider contention-based initial ranging as permitting multiple SSs, without restriction, to transmit multiple Ranging Codes within the same time interval. *Id.* at 41 (citing Ex. 2005 ¶ 98). Dr. Lomp provides testimony to the same effect. Ex. 2005 ¶ 98.

The Standard discloses that initial ranging involves an SS transmitting an initial ranging code in a randomly selected Ranging slot "from available Ranging Region." Ex. 1005, Table 121. Petitioner and Dr. Akl assert that more than one SS may transmit an Initial Ranging code in a randomly selected slot of the available Ranging Region. Pet. 58, 61; Ex. 1003 ¶¶ 109–110, 117.

In the Standard, the BS specifies an interval in which new *stations* may join the network. Ex. 1005, 154. The BS provides a UL-MAP that allocates a transmission opportunity "for a group of SSs authorized to transmit . . . Initial Ranging requests." *Id.* at 167. A transmission opportunity provides multiple Ranging Slots. Each SS sends a ranging code in one of the Ranging Slots that is identified by a unique OFDMA symbol number and subchannel. *Id.* at 205. If an SS receives a continue status in a Ranging Response message, it sends other ranging codes chosen from the Periodic Ranging domain to continue the ranging process. A SS randomly chooses a Ranging Slot to perform ranging, which indicates that other SSs send a Ranging Code in other Ranging slots of the predefined interval allocated by the BS in a UL-MAP. *Id.* at 205. Even so, Ranging Codes may collide. *Id.* at 147–149.

Dr. Lomp does not explain how "contention based initial ranging" relates to the sending of Ranging Codes in different timeslots of the same time interval by plural SSs. Ex. 2005 ¶ 98. Dr. Lomp cites the Standard's description of contention opportunities for initial ranging. *Id.* ¶ 99. However, Petitioner has shown that the uplink bursts are sent in a dedicated, allocated region of the uplink subframe based on the second UL-MAP and MAP IE data. Pet. 37–40 (citing Ex. 1005, 8, 10–11, 103, 176, 500, 533, Table 287, Fig. 218; Ex. 1003 ¶¶ 78–80, 83). The Standard describes a UL-MAP defining initial ranging *slots* by OFDMA symbols (time) and frequency subchannels *for a group of SSs*. Ex. 1005, 167, 532–33, Table 287.

The Standard allows each SS to choose an *initial ranging* ***slot*** to send a Ranging code message to a BS to obtain power adjust information to control uplink transmissions. Ex. 1005, 11, 43, 50–51, 205–06, 496, 620, 666. The use of multiple timeslots in a Ranging Interval allows multiple SSs to send a Ranging Code in a randomly chosen *timeslot* of the Ranging Interval to avoid collisions with Ranging codes sent by SSs in other timeslots of that Ranging Interval. Because more than one SSs can send a Ranging Code in a ranging interval, the BS must identify the Ranging Code received from each SS by its Ranging code attributes and must contend with ranging collisions. These disclosures indicate the ranging subchannel allocated in a UL-MAP may be used by multiple SSs to transmit Ranging code messages to the BS in respective timeslots. Ex. 1005, 11, 43, 50–51, 167, 175–76, 205–06.[11]

Accordingly, we determine that Petitioner has established by a preponderance of evidence that claim 45 is anticipated by the Standard.

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[11] The Standard explains that a ranging request RNG-REQ message in OFDMA is called a Ranging Code message. Ex. 1005, 50, 51.

10. Claim 46

Petitioner asserts that the Standard discloses limitations of claim 46 for the same reasons that it discloses the same limitations in claim 28. Pet. 61–62 (citing contentions for claim 28; Ex. 1003 ¶ 118). Patent Owner does not address specifically Petitioner's contentions and evidence, which we find sufficient to establish by a preponderance of evidence that claim 46 is anticipated by the Standard.

E. Grounds 2 and 3: Alleged Unpatentability over the Standard Alone or in Combination with Mohanty

1. Motivation to Modify the Standard (Ex. 1005)

Petitioner contends that the Standard describes user equipment (UE) in the form of a subscriber station (SS) that performs functions performed by the "processor" recited in elements 1[a]–1[d] of claim 1. Pet. 62. Petitioner contends that a skilled artisan would have found it obvious, based on the Standard, to implement the SS with a "processor configured to" perform the claimed functions recited for the SS. *Id.* at 62–63. Petitioner asserts that a skilled artisan would have known that SSs like those described in the Standard were implemented this way. *Id.* at 63 (citing Ex. 1003 ¶ 120). Petitioner and Dr. Akl cite Mohanty as evidence of this knowledge in the art to implement an SS using "a predefined computer language, manner or syntax, for instructing a processor to perform a certain function." *Id.* (citing Ex. 1009 ¶¶ 18, 19).

Petitioner contends that a skilled artisan would have been motivated to use this typical implementation due to the widespread use and availability of processors at the time of the invention and the skill in the art in implementing processors to provide efficient, powerful computing and flexible reprogramming to implement updated or new functions through software updates for predictable results. Pet. 65–66 (citing Ex. 1003 ¶¶ 123, 124).

2. Mohanty (Ex. 1009)

Mohanty describes wireless communication systems comprising nodes that may be implemented as a computer system or subsystem, subscriber station (SS), base station (BS), microprocessor, or a processor such as a general purpose processor, a digital signal processor (DSP), and/or a network processor. Ex. 1009 ¶¶ 12, 18. A node may be implemented as software. *Id.* ¶ 19. Figure 2 is reproduced below to illustrate such a processing system.

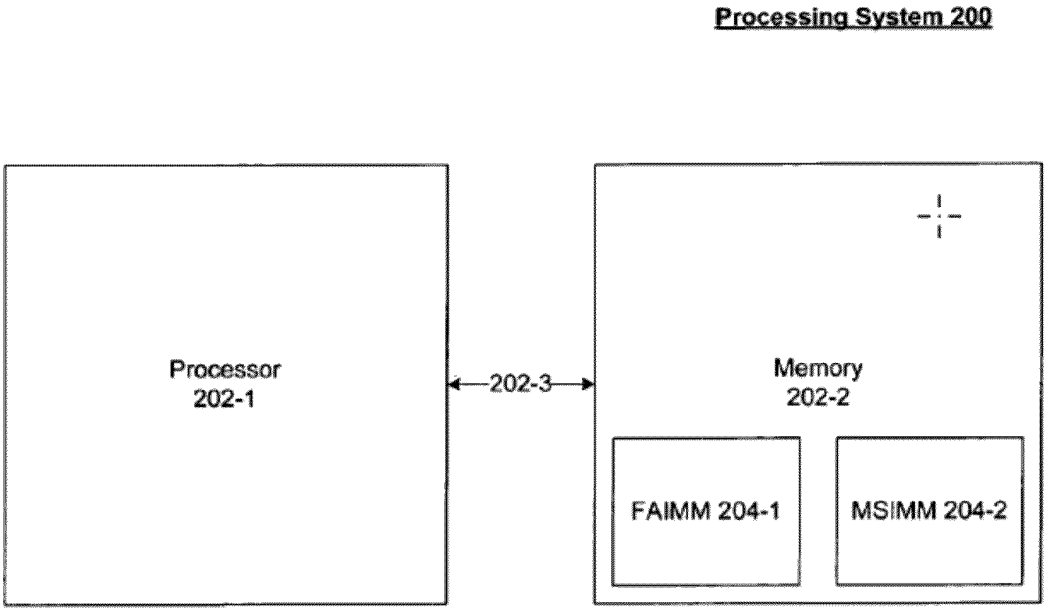


Figure 2 of Mohanty above illustrates processing system 200 as including processor 202-1 and memory 202-2. Ex. 1009 ¶ 59. Processor 202-1 may be implemented as any processor, such as a complex instruction set computer microprocessor, general purpose processor, dedicated processor such as a controller, microcontroller, or DSP. *Id.* ¶ 60. Memory may include machine-readable or computer-readable media capable of storing data such as volatile and non-volatile memory. *Id.* ¶ 61. Mohanty illustrates the predictability of implementing an SS with a "processor configured to" perform SS functions.

3. Motivation to Combine the Standard and Mohanty

Petitioner contends that a skilled artisan would have been motivated by Mohanty's implementation of an SS to implement the SS in the Standard with a "processor configured to" perform the functions described in the Standard for the SS because the Standard does not provide any implementation details of these functions, and Mohanty provides such known implementation details for SS's compatible with the Standard to yield predictable results. Pet. 65–67 (citing Ex. 1009 ¶¶ 18–20, 59–61; Ex. 1003 ¶¶ 123–125).

4. Claim 1

a) [1p]: "A user equipment (UE) comprising:"

Petitioner contends that the Standard discloses "a user equipment" as a "subscriber station" or "SS," which the Standard describes as "[a] generalized equipment set providing connectivity between subscriber equipment and a base station (BS)." Pet. 67 (citing Ex. 1005, 11 (definition); Ex. 1003 ¶ 126). Patent Owner does not contest these contentions for the preamble. PO Resp. 43–44. Based on Petitioner's arguments and evidence summarized above, regardless of whether the preamble is limiting, we determine Petitioner has shown sufficiently that the Standard discloses the preamble of claim 1 ([1p]).

b) 1[a]: "a processor configured to receive resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources:"

Petitioner contends that the Standard discloses an SS "receiving . . . resource allocation information associated with an uplink physical control channel, wherein the uplink physical control channel and a physical uplink shared channel have different resources" as explained for element 22[a]. Pet. 67–69 (citing Ex. 1003 ¶ 127).

Petitioner contends that a skilled artisan would have been motivated and found it obvious from the Standard to implement the SS with a processor configured to perform the SS's functions because a skilled artisan would have known that SSs in the Standard typically were implemented this way within the level of ordinary skill in the art to yield predictable results due to known technical advantages of processors including efficient, powerful computing and the ability to be reprogrammed flexibly. Pet. 68. Petitioner also contends that a skilled artisan would have been motivated and found it obvious to implement the SS in the Standard with a "processor configured to" perform the SS's functions such as receiving the Initial Ranging opportunity associated with the Ranging subchannel based on Mohanty's teaching of such a known implementation of an SS for use with the Standard. *Id.* (citing Pet. § IX.B.1.; Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 127).

Petitioner's contentions are supported by Mohanty's teachings of the use in SSs of processors configured to perform functions of the SS through software implementations. *KSR*, 550 U.S. at 417 ("[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its application is beyond his or her skill [and] a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions."); *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) (an implicit motivation to combine exists not only when a suggestion may be gleaned from the prior art as a whole, but when the "improvement" is technology-independent and the combination of references results in a product or process that is more desirable because it is stronger, cheaper, cleaner, faster, lighter, smaller, more durable, or more efficient).

Patent Owner does not argue these contentions specifically for claim 1 or element 1[a]. PO Resp. 43–44. Based on Petitioner's arguments and evidence as summarized above, including Petitioner's contentions for element 22[a], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[a] alone and in combination with Mohanty.

> *c) 1[b]: "the processor is further configured to send data over the physical uplink shared channel in assigned time intervals;"*

Petitioner contends that the Standard discloses the SS sending data over the physical uplink shared channel in assigned time intervals in element 22[b]. Pet. 69. Petitioner contends that a skilled artisan would have been motivated and found it obvious to implement the SS with a "processor configured to" perform the SS's functions because a skilled artisan would have known that SS's in the Standard are implemented this way, as Mohanty also teaches, and would provide predictable results of more efficient, powerful, flexible, reprogrammable computing. Pet. 69–70 (citing motivation in Pet. § IX.B.1. and for element 1[a]; Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 128). Patent Owner does not contest these contentions specifically for claim 1 or element 1[b]. PO Resp. 43–44. Based on Petitioner's arguments and evidence as summarized above, including Petitioner's contentions for element 22[b], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[b] alone and in combination with Mohanty.

> *d) 1[c]: "the processor is further configured, in a time interval that it is not sending information over the physical uplink shared channel, to send a signal over the uplink physical control channel based on the received resource allocation information; and"*

Petitioner asserts that the Standard discloses element 1[c] as explained for element 22[c]. Pet. 70 (citing Ex. 1003 ¶ 129).

Petitioner contends that a skilled artisan would have been motivated and would have found it obvious to implement the SS with a "processor configured to" perform the SS's functions to include those of elements 1[a] and 1[b] for predictable results of sending a Ranging Code message over the Ranging subchannel based on the received Initial Ranging opportunity in a time interval that the SS is not sending information in uplink bursts for more efficient, powerful, flexible, reprogrammable computing as discussed in § IX.B.1. of the Petition and element 1[a]. Pet. 70–71 (citing Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 129). Patent Owner does not contest these contentions for claim 1 or element 1[c]. PO Resp. 43–44. Based on Petitioner's arguments and evidence summarized above, including contentions for element 22[c], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[c] alone and with Mohanty.

e) 1[d]: "the processor is further configured to receive feedback information from a downlink control channel."

Petitioner asserts that the Standard discloses element 1[d] by receiving Power Adjust Information in a RNG-RSP message sent in a specified region of the downlink subframe and by receiving the uplink MAP IE in the second UL-MAP message sent in a region of the downlink subframe as explained for element 22[d]. Pet. 71–73. Petitioner contends that a skilled artisan would have been motivated to implement the SS with a "processor configured to" perform the SS's functions including in elements 1[a]–1[c] for predictable results of receiving parameters in the RNG-RSP message and second UL-MAP for more efficient, powerful, flexible, reprogrammable computing as described in § IX.B.1. and element 1[a]. Pet. 71–73 (citing Ex. 1009 ¶¶ 18, 19, 59–61, Fig. 2; Ex. 1003 ¶ 130).

Patent Owner does not contest these contentions specifically for claim 1 or element 1[d]. PO Resp. 43–44. Based on Petitioner's arguments and evidence summarized above, including Petitioner's contentions for element 22[d], we determine that Petitioner has shown sufficiently that the Standard teaches and suggests element 1[d] alone and in combination with Mohanty.

Based on all of the arguments and evidence presented, we determine that Petitioner has demonstrated by a preponderance of evidence that claim 1 is unpatentable based on the teachings of the Standard alone or in combination with the teachings of Mohanty.

5. Claim 2

Petitioner asserts that the Standard discloses the SS "receiving data on a physical downlink shared channel" as for claim 23, and a skilled artisan would have been motivated to implement the SS with a "processor configured to" perform its functions, because SSs of the Standard were implemented this way and processors have known technical advantages for use with the Standard as taught by Mohanty's SS implementation. Pet. 73–74. Petitioner asserts that a skilled artisan would have known that the SS would include a processor or would have found it obvious to include a processor to perform SS functions, including those of claims 1 and 2 for predictable results or, alternatively, would have found it obvious from the Standard and Mohanty to use the SS with a "processor configured to" perform functions of the SS by receiving data on its allocated downlink burst. *Id.* at 73–74 (citing Pet. § IX.B.1. and contentions for claim 1; Ex. 1009 ¶¶ 18, 19, 59–61; Ex. 1003 ¶ 131). Patent Owner does not contest these contentions specifically for claim 2. PO Resp. 43–44. Based on Petitioner's arguments and evidence as summarized above, we determine Petitioner has shown by a preponderance of evidence that claim 2 is unpatentable over the Standard alone or with Mohanty.

6. Claim 3

Petitioner contends that the Standard discloses "the downlink control channel and the physical downlink shared channel are time multiplexed" in two ways. Pet. 74. Petitioner contends that a skilled artisan would have been motivated and found it obvious from the Standard to map the region of the downlink subframe allocated to RNG-RSP messages to span different symbol numbers than the SS's allocated downlink burst. *Id.* Petitioner also asserts that the Standard teaches that the specified region of the downlink subframe in which the UL-MAP message is transmitted by the BS is time multiplexed with the SS's allocated downlink burst. *Id.* at 74–75 (citing Ex. 1003 ¶ 132).

Citing its contentions for element 1[d], Petitioner contends that a skilled artisan would have recognized that RNG-RSP messages are sent in allocated regions of the downlink frame like other MAC Management messages. Citing its contentions for claim 2, Petitioner asserts that the Standard teaches that the SS receives data on an allocated downlink burst, such as Downlink burst #4 in Figure 218, and a skilled artisan would have been motivated to time multiplex an allocated region of the downlink subframe for RNG-RSP messages with an allocated downlink burst as a known technique for predictable results. Pet. 75 (citing Pet. § IV.; Ex. 1005, 494, 496, Figs. 215, 218; Ex. 1003 ¶¶ 133, 134).

Petitioner contends that a skilled artisan would have been motivated to time multiplex the claimed regions by mapping the RNG-RSP messages near other MAC Management messages to ensure the RNG-RSP messages are sent on a robust downlink burst at the beginning of the downlink frame with other control information where robustness is greatest to concatenate the control data in a single transmission opportunity for improved efficiency. Pet. 76–78 (citing Ex. 1005, 7, 123, 310; Ex. 1008, 307, 312; Ex. 1003 ¶ 135).

Petitioner asserts that a skilled artisan also would have been motivated to time multiplex the claimed allocated regions to allow the SS to receive parameter corrections in the same downlink subframe that it receives data for its allocated downlink burst because RNG-RSP messages are transmitted by the BS to the SS asynchronously to send corrections based on measurements that have been made so SSs should be prepared to receive an RNG-RSP at any time. Petitioner contends that time multiplex mapping of these regions in the downlink subframe would provide this desired capability as illustrated by the UL-MAP allocated at symbols *k*+3 and DL burst #4 allocated at symbols *k*+11 to *k*+15 as explained for element 1[d] like the downlink control channel 212 and the physical downlink shared channel 210 in Figure 2 of the '356 patent. Pet. 78–80 (citing Ex. 1005, 50, Fig. 218; Ex. 1003 ¶¶ 136–138).

Patent Owner does not contest these contentions specifically for claim 3. PO Resp. 43–44. Based on Petitioner's arguments and evidence presented and summarized above, including Petitioner's contentions for element 1[d] and claim 2, we determine Petitioner has demonstrated by a preponderance of evidence that claim 3 is unpatentable based on the teachings of the Standard alone or in combination with the teachings of Mohanty. *See KSR*, 550 U.S. at 417; *Dystar*, 464 F.3d at 1368.

7. Claim 4–7 and 24

Petitioner assets that claims 4–7 and 24 are unpatentable for the reasons asserted for claims 3 and 25–28. Pet. 80–81 (citing Ex. 1003 ¶¶ 139–143). Dr. Akl provides testimony supported by record citations explaining how the Standard discloses Power Adjust Information in a RNG-RSP message for claim 4/25, for plural UEs in claim 5/26, plural UEs transmit a signal in claim 6/27, the claimed channels may be TDMA, TDD, and FDD in claim 7/28, and time multiplexing in claim 24/3. Ex. 1003 ¶¶ 102–112, 139–143.

Patent Owner does not contest these contentions specifically. PO Resp. 43–44. Based on Petitioner's arguments and evidence summarized above, we determine that Petitioner has demonstrated by a preponderance of evidence that claims 4–7 and 24 are unpatentable based on teachings of the Standard alone or in combination with teachings of Mohanty.

8. Claims 43 and 44

Petitioner contends that the Standard alone or with Mohanty renders claim 43 obvious because it describes an SS that performs processor functions in elements 43[a]–43[c], and a skilled artisan would have been motivated to implement the SS with a "processor configured to" perform the functions as Mohanty describes. Pet. 81–82 (citing Pet. § IX.B.1.; Ex. 1003 ¶ 144).

a) Elements 43[p]–43[d]

Petitioner contends that the Standard teaches elements 43[p]–43[d] for the reasons explained for elements 1[p], 1[a]–1[c], and 45[d]. Pet. 82 (citing Ex. 1003 ¶¶ 145–149). Patent Owner does not contest these contentions specifically. PO Resp. 43–44. Based on Petitioner's arguments and evidence summarized above, we determine that Petitioner has demonstrated by a preponderance of evidence that claim 43 is unpatentable based on teachings of the Standard alone or in combination with teachings of Mohanty.

b) Claim 44

Petitioner asserts that the Standard discloses the limitations of claim 44 for the reasons explained for claim 46. Pet. 82–83 (citing Ex. 1003 ¶ 150). Patent Owner does not contest these contentions specifically. PO Resp. 43–44. Based on Petitioner's arguments and evidence summarized above, we determine that Petitioner has demonstrated by a preponderance of evidence that claim 44 is unpatentable based on teachings of the Standard alone or in combination with teachings of Mohanty.

IV. CONCLUSION

Petitioner has established by a preponderance of the evidence that claims 1–7, 22–28, and 43–46 are unpatentable under Grounds 1, 2, and 3.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has shown by a preponderance of the evidence that claims 1–7, 22–28, and 43–46 are unpatentable;

FURTHER ORDERED that, Patent Owner's Motion to Exclude is *denied*; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

In Summary:

Claims	**35 U.S.C. §**	**Reference(s)/ Basis**	**Claims Shown Unpatentable**
22, 23, 25–28, 45, 46	102(a), (b)	802.16 Standard	22, 23, 25–28, 45, 46
1–7, 24, 43, 44	103(a)	802.16 Standard	1–7, 24, 43, 44
1–7, 43, 44	103(a)	802.16 Standard, Mohanty	1–7, 43, 44

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(12) **INTER PARTES REVIEW CERTIFICATE** (3544th)
United States Patent
Howard

(10) **Number: US 8,811,356 K1**
(45) **Certificate Issued: Apr. 2, 2024**

(54) **COMMUNICATIONS IN A WIRELESS NETWORK**

(75) Inventor: **Paul Howard**

(73) Assignee: **INTELLECTUAL VENTURES II LLC**

Trial Number:

IPR2022-01130 filed Jun. 13, 2022

Inter Partes Review Certificate for:

Patent No.: **8,811,356**
Issued: **Aug. 19, 2014**
Appl. No.: **13/176,298**
Filed: **Jul. 5, 2011**

The results of IPR2022-01130 are reflected in this inter partes review certificate under 35 U.S.C. 318(b).

AS A RESULT OF THE INTER PARTES REVIEW PROCEEDING, IT HAS BEEN DETERMINED THAT:

Claims **1-7**, **22-28** and **43-36** are cancelled.

* * * * *

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/176,298	07/05/2011	Paul Howard	IPW2-USCN191712	4342

3624 7590 04/30/2024

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ABELSON, RONALD B

ART UNIT	PAPER NUMBER
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NOTIFICATION DATE	DELIVERY MODE
04/30/2024	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

eoffice@vklaw.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
13/176,298	30-Apr-2024	08811356

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ELECTRONIC CERTIFICATE OF CORRECTION NOTIFICATION

Your electronic certificate of correction is now available, and can be accessed via Patent Center at https://patentcenter.uspto.gov.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 8,811,356 K1
APPLICATION NO.	: 13/176298
DATED	: April 2, 2024
INVENTOR(S)	: Paul Howard

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The Status of Claims on page 2 of the INTER PARTES REVIEW CERTIFICATE 8,811,356 K1 issued Apr. 2, 2024, has been corrected to state that:

Claims 1-7, 22-28 and 43-46 are cancelled.

Signed and Sealed this
Thirtieth Day of April, 2024

Katherine Kelly Vidal

Katherine Kelly Vidal
Director of the United States Patent and Trademark Office

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:21-cv-1088	10/19/2021	Western District of Texas

PLAINTIFF	DEFENDANT
INTELLECTUAL VENTURES I LLC and INTELLECTUAL VENTURES II LLC	GENERAL MOTORS COMPANY and GENERAL MOTORS LLC

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,832,283	12/14/2004	INTELLECTUAL VENTURES II LLC
2	7,891,004	2/15/2011	INTELLECTUAL VENTURES I LLC
3	9,934,628	4/3/2018	INTELLECTUAL VENTURES II LLC
4	9,291,475	3/22/2016	INTELLECTUAL VENTURES II LLC
5	SEE ATTACHED		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
6/19/23-Order granting joint motion to dismiss. Document 116.

CLERK	(BY) DEPUTY CLERK	DATE
PHILIP J. DEVLIN	NDavis	06/20/2023

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

INTELLECTUAL VENTURES I LLC and INTELLECTUAL VENTURES II LLC,	)	
Plaintiffs,	)	C.A. No. 6:21-cv-1088
v.	)	
GENERAL MOTORS COMPANY and GENERAL MOTORS LLC,	)	**ADDENDUM TO REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**
Defendants.	)	

Patent or Trademark No.	Date of Patent Or Trademark	Holder of Patent or Trademark
7,382,771	6/3/2008	INTELLECTUAL VENTURES II LLC
9,232,158	1/5/2016	INTELLECTUAL VENTURES II LLC
9,602,608	3/21/2017	INTELLECTUAL VENTURES II LLC
10,292,138	5/14/2019	INTELLECTUAL VENTURES II LLC
7,684,318	3/23/2010	INTELLECTUAL VENTURES I LLC
8,953,641	2/10/2015	INTELLECTUAL VENTURES II LLC
9,681,466	6/13/2017	INTELLECTUAL VENTURES II LLC
8,811,356	8/19/2014	INTELLECTUAL VENTURES II LLC