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(12) (B1)

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(11) 10-0953940
(24) 2010 04 13

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H04B 7/26 (2006.01)
(21) 10-2005-0055979
(22) 2005 06 27
2007 11 13
(65) 10-2007-0000320
(43) 2007 01 02
(56)
KR1020020061398 A
KR1020050000202 A
KR1020020008073 A
: 40

(73)
416
(72)
349-123 302
108 501
( )
(74)
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(54)

(57)

OFDM
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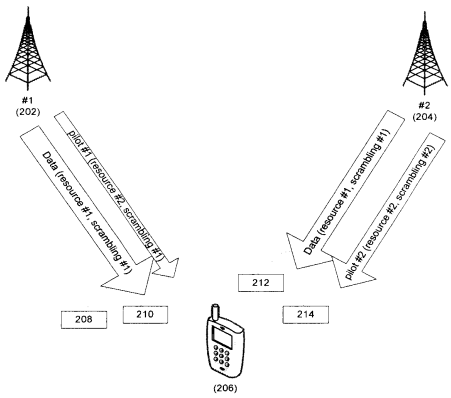
- 2a



(72)

873 LG 1

124 1903

730 304

1

(OFDM)

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1 1

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1 1

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1 1 1

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1 2 -

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1 2 , , ,

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1 , 1 2 , 1 2

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1 , - 1 2

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8

5 , 1 - , 1
3 5 3 , 3
3 2 3
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8 , ,
1 2 - ,
5 3 -
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10

1 , ,
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11

(OFDM)
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1 , 1 1
- ,
, 1 1 1
, 1 2 1
,
- , 1 2 1
1 , - 2 2
2 - ,
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1 2 -
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12

11 , - ,
1 2 , 3 1
.

13

12 , ,
1 2 , , ,
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14

11 , ,
-
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15

11 , 1 2 , 1 2
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16

11 , - ,
1 2 , 4 1
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17

16 , ,
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18

15 , 1 - -
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1 3 5 3
, 3 3 2 3
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19

18 , ,
1 2 - ,
5 3 -
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20

11 , ,
-
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21

(OFDM)
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, 1
2 -
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- 1 1
1 2
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1 - 2

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22

21 , - , 1 2
, 3 1
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23

22 , ,
1 2 , , ,
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24

21 , ,
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25

21 , ,
2 1 1
1 ,
- 2 2 2
2 ,
1 2 ,
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26

21 , ,
- 1 2 4
1 1 2
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27

26 , ,
- 1 2 1
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28

25 ,
1 - , 1 3

5 3 ,

1 - , 3

3 2 3 ,

3 3 ,

3 3 ,

1 2 3

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29

28 , ,

1 2 - ,

5 3 -

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30

21 , 1 1 ,

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31

(OFDM)

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2 -

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- 1 1

1 2

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32

31 , ,

- , 1 2 , 3

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33

32 , ,

1 2 , , ,

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34

31 , ,

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31 , ,

2 1 1

1 , - 2 2

2 2 , 1

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36

31 , ,

- 1 2 4

1 1 2

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37

36 , ,

- 1 2 1

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38

35 ,

1 - , 1 3

5 3 , 1

- , 3 2 3

3 3

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3 1 2

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39

38 , ,

1 2 - ,

5 3 -

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40

31 , 1 1 ,

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[0010] (Orthogonal Frequency Division Multiplexing: OFDM) , .

[0011] (OFDM) . OFDM , (Code Division Multiple Access: CDMA) . OFDM (Multi-Carrier) , (Symbol) (sub-carrier) , (sub-carrier channel) (MCM: Multi Carrier Modulation) .

[0012] 1a 1b OFDM .

[0013] 1a OFDM , (channel coding) (102) . (102) , (Convolutional encoder), (Turbo encoder), LDPC(Low Density Parity Check) . (104) (102) , QPSK(Quadrature Phase Shift Keying), 8PSK(8-ary PSK), 16QAM(16-ary Quadrature Amplitude Modulation), 64QAM(64-ary QAM) . 1a , (102) (104) (repetition) (Puncturing) (rate matching) .

[0014] / (Serial to Parallel) (106) (104) . IFFT(Inverse Fast Fourier Transform) (108) IFFT . IFFT (108) (OFDM) / (110) . CP(Cyclic Prefix) (112) CP , RF(Radio Frequency) (Transmission: TX) (114) CP (112) , RF OFDM .

[0015] 1b OFDM . OFDM OFDM , RF (116) OFDM , CP (118) RF (116) CP . CP (118) / (120) FFT (122) FFT , / (124) .

[0016] (126) , (128) (126) , OFDM (104) QPSK, 8PSK, 16 QAM, 64QAM . (130) . 1b , (128) (130) .

[0017] OFDM , . ,

.

, , (ID)

HARQ(Hybrid Automatic Repeat Request) .

.

[0018] OFDM ,

. ,

SINR(Signal to Interference and Noise Ratio) .

(randomizer) .

(scrambling sequence) . ,

.

[0019]

, .

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[0020] ,

.

(OFDM)

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, 1 1

- ,

1 1 1 ,

1 2 1

, - 1 2 1

1 , - 2

2 2 , 1

2 -

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(OFDM)

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- , , 1

1 1 , 1

2 1 ,

- , 1 2 1 1

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, 1 2 -

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(OFDM)

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2 -

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1 1 2

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(OFDM)

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2 -

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1 1 1 2

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[0021] .

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[0022] OFDM

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[0023] OFDM CP(Cyclic Prefix) ,

CP

. OFDM .

[0024] 2a 2b .

,

.

[0025] 2a , (206) #1(202) #2(204) , (206)

#1(202) . #1(202) (206)

(serving cell) , #2(204) - (non-serving cell) .

#1(202) #2(204) , #1(202)

#2(204) (entity), (Node B)(' (Base

Station)' .) , #1(202) #2(204)

.

(206) OFDM (Radio Access Technology) (202, 204)

, (202, 204) (206) (202, 204)

, (- (time-frequency resource))(

#1) (#1)

(208, 212) . (202, 204) , #2

(210, 214) . (210, 214)

#1,#2 .

[0026] 2b 2a #1(202) #2(204) .

[0027] 2b , #1(202) (206) (208) ,

(208) #1(202) #1(230) ,

(206) #1(222) (208). (206)

#1(202) . #1(222)

(bins) 2b -

, .

[0028] OFDM (time and frequency domain) 2 - . OFDM (sub-carrier)(216) , OFDM (218) . OFDM OFDM , TTI(Transmission Time Interval)(220) . #1(230) #1(202) , 2b #1(230) OFDM OFDM (208) .

[0029] #1(202) (210) #1(230) , #1(202) (210) #2(224) #1(222) . (206) , #2(224) , #1(202) . 2b (210) - , (210) .

[0030] (206) #2(204) #1(202) (212) (206) , #2(204) (212) #1(202) #1(222) . , #1(202) #1(222) #2(204) . #1(202) #2(204) , , #1(202) #2(204) .

[0031] #2(204) , #2(204) #1(202) (212) , #2(204) #2(232) , #1(202) (208) #1(230) #1(222) . #1(202) #2(204) , (208, 212) #1(230) #1(222) , (206) .

[0032] #2(204) #2(204) (214) #2(204) #2(232) , #1(202) (210) #2(224) . , (210, 214) #2(224) , (206) (210, 214) #2(224) .

[0033] , #2(204) (214) #2(232) , #1(202) (210) #1(230) . (210, 214) (202, 204) , (230,232) . #1(202) #2(204) #2(224) (210, 214) , #1(230) #2(232) (randomize) .

[0034] (206) #1(202) (208) #2(204) (212) . , #1(202) #2(204) (208, 212) #1(222) #1(230) , (206) (202, 205) . OFDM . .

[0035] (206) #2(224) #1(202) #1(230) #1(202) (210) , (210) #1(202) . (206) #2(224)

#2(204) #2(232) #2(204)
(214) , (214) #2(204) .

(206) , #1(202) #2(204)
( ) , (206)
. (channel
compensation) (channel equalization) ,
. (Zero Forcing), MRC(Maxium Ratio Combining),
MMSE(Minimum Mean Square Error) .

[0036] ,
. (L1; layer 1)
(L2; layer2 L3; layer3) ,
. .

[0037] 3 .

[0038] 3 , 302
, ,
.
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. 302
304 . 304
.

[0039] , 306
. , (L1;
layer 1) (L2; layer2, L3; layer3) .

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, 308 .

[0040] 308
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,
.

[0041] 310 ,
.

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, .

[0042] 312
. ,
, , , .
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. ,
.
(call setup)
. .

[0043] 310
.
.

(call setup)

.

[0044] 302 , 314 .

[0045] 4 .

[0046] 4 , 402 , n . n , , OFDM .

[0047] 404 . (call setup) . , - , (interpolation) .

[0048] 406 n Ch_Est(1), ... CH_Est(n) . , . 408 . ( ) , MRC, MMSE . 410 , .

[0049] . .

[0050] << 1 >>

[0051] 1 (common pilot) .

[0052] 5 1 , #1(502), #2(504), #3(506) (508) . #1(502) (508) , #2(504) #3(506) - . , , .

[0053] 5 #1(502) #1, #2(504) #2, #3(506) #3 . . 1 , .

[0054] #1(502) (508) (512) , #1(502) (512) #1 (508) #1 . #1 #1(502) #1(502), #2(504), #3(506) . #1 - .

[0055] #1(502) (514) #1 , #2 #1 . (514) (508) #2 #1(802) , (502, 504, 506)

(514, 520) .

[0056] #1(502) (512) (508) , (512) , , , (510) . (510) (508) (502, 504, 506) (502) (510) (512) . (510) #3 (508) (508) . (510) (502) #1 #3 .

[0057] (502) (508) (516) . (516) (508) (502, 504) . (516) (L1; layer 1) (L2; layer2, L3; layer3) . (508) (502, 504, 506) (502) (516) , (-)(504, 506) . (516) , #1(502), #2(504) #3(503) {#1=ON, #2=ON, #3=OFF} .

[0058] (508) #2(504) #1(502) (518) (508) , #1(502) #1 #2(504) . , #1(502) (512) #1 #2(504) . , #1(502) #1 #2(504) .

#2(504) , #2(504) #1(502) (518) #2(504) #2 , #1(502) (512) #1 #1 . #1(502) #2(504) , (512, 518) #1 #1 , (508) , . (502) (510) .

[0059] #2(504) #2(504) (520) #2(504) #2 , #1(502) (514) #2 . , (514, 520) #2 , (508) (514, 520) #2 .

, #2(504) (520) #2 , #1(502) (514) #1 . (514, 520) (502, 504) , #1, #2 . #1(502) #2(504) #2 (514, 520) , #1 #2 .

[0060] #3(506) (502) (508) (512) #1 . , #3(506) #1(502), #2(504) , #3(506) (508) .

[0061] (508) #1(502) (512) #2(504) (518) . , #1(502) #2(504) (512, 518) #1 #1

, (508) (502, 504) . OFDM
.
.

[0062] (508) #2 #1(502) #1
#1(502) (514) , (514)
#1(502) . , -
,
.

[0063] (508) #2 #2(504) #2
#2(504) (520) , (520)
#2(504) .

(508) , #1(502) #2(504)
( ) , (508) .
( ) ,
. , MRC, MMSE
.

[0064] 6 1 .
( ) . ,
- .

[0065] 6 , k , User#1,..., User #k (602, 626)
, (604, 628) (602, 626) .
, , LDPC .
(606, 630) QPSK, 8PSK, 16 QAM, 64QAM . 6 ,
(604, 628) (606, 630)
.

[0066] / (608, 632) (606, 630)
. (Resource mapper)(610, 634) , (654)
. (654) ,

. (612)
(610, 634) .

[0067] , .
,
.

. , (63
6) , (602, 626)
.

[0068] (646) (648) / (650) , (652)
, (654) . (636)
(646) ,
(call setup) .

[0069] (614) , (644) ,
(652) .
,
- , -
.

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[0070] IFFT (616) IFFT . IFFT (616) / (618) . CP (620) CP , RF (622) CP (620) , RF .

[0071] , . , . , (636) , (602) .

[0072] 7 1 .

[0073] 7 , RF (116) OFDM CP (702) . OFDM , . CP (702) OFDM CP , CP (702) / (704) , FFT (706) FFT , / (708) . (718) , (716) .

[0074] (710) , (716) . (716) (712) (714) . (712) / (708) , , . (714) .

[0075] (718) , / (708) , (720) (722) , .

[0076] << 2 >>

[0077] 2 , (dedicated pilot) .

[0078] 8 2 , #1(802), #2(804), #3(806) (808) . #1(802) (808) , #2(804) #3(806) - . (802, 804, 806) , , .

[0079] 8 #1(802) #1, #2(804) #2, #3(806) #3 . . 2 1 . (816, 824) , (808) (810, 826) .

[0080] #1(802) (808) (814) , #1(802) (814)

#1 (808) #1 . #1
#1(802) #1(802), #2(804), #3(806)
. #1 -
.

[0081] #1(802) (816)
#1 , #2 #1 . (808)
(816) #2
#1(802) .

[0082] 1 , (816)
. (808)
(810) (802) #1 #5 .
#5 #1(802)
. #5 #1(802) #1(802), #2(804), #3(806)
.
(810) #5 #2(804) #3(806) .

[0083] #1(802) (814) (808) ,
, , (812) . (812)
, (808) (802, 804, 806)
(802) (812) , (814) .
(812) #3
. (812) (802)
#1 #3 .

[0084] (802) (808) (820) .
(820) (808) (802, 804)
(810) (dedicated pilot
indicator) . (820)
. (808) (802, 804, 806) ,
(802) (820) , (-)(804, 806)
. (820) #1(802), #2(804)
#3(806) , {#1=ON, #2=ON, #3=OFF,
dedicated} , "dedicated" .

[0085] (808) #2(804) #1(802) (822)
(508) , #1(802) #1 #2(804)
. , #1(802)
(814) #1 #2(804) .
, #1(802) #1
#2(804) .

#2(804) , #2(804) #1(802) (822)
#2(804) #2 , #1(802) (814)
#1 #1 . #1(802)
#2(804) , (814, 822) #1 #1
, (808) ,
. (802)
(812) .

[0086] #2(804) , #2(804) (824)
#2(804) #2 , #1(802)
(816) #2 . , (816,
824) #2 , (808) (816, 824)

#2 .

[0087] , #2(804) (824) #2 , #1(802) (816) #1 . (816, 824) (802, 804) , #1, #2 . #1(802) #2(804) #2 (816, 824) , #1 #2 .

[0088] 1 . (808) , #2(802) , (826) #1(802) #1 #5 . #2(804) (802) (810) (810) #5 , .

[0089] #3(806) (802) (808) (814) #1 . , #3(806) #1(802), #2(804) , #3(806) (808) .

[0090] (808) #1(802) (814) #2(804) (822) . , #1(802) #2(804) (814, 822) #1 #1 , (808) (802, 804) . OFDM .

[0091] #1(802) #2(804) , (810, 826) , #1 #5 , (810, 826) (814, 822) (808) . , 1 , (802, 804) .

[0092] (808) (810, 826) #5 (802) #1 #1(802) #2(804) , . (808) ( ) , .

[0093] 2 1 6 7 . , 6 (652) , , . 7 (716) , , , (718) .

[0094] << 3 >>

[0095] 3 1 .

[0096] 9 3 , #1(902), #2(904), #3(906) (908) . #1(902) (908) , #2(904) #3(906) - . (902, 904, 906) , , .

[0097] 9 #1(902) #1, #2(904) #2, #3(906) #3 . . 3 1 . 1 .

[0098] #1(902) (908) (912) , #1(902) (912) #1 (908) #1 . #1(902) (914) #1 , #2 #1 . #1(502) (912) , , , (910) , (902) #1 #3 .

[0099] 9 , #2(904) (918) (902) (912) 1 (combining mode) , #3(906) (924) (902) (912) 2 . 1 #1 (912, 918) , 2 #1, #3 (912, 924) .

[0100] #2(904) (908) (918) (920) 1 . #2(904) (902) (912) #1 , #2(904) (918) (902) (912) 1 . , #1(902) #2(904) , (912, 918) #1 #1 , (908) (912, 918) , . (902) (910) .

[0101] #3(906) (902) (908) (912) #1 . #3(906) , #3(906) #4 #3(906) #3 (924) , #3(906) (926) #3 . #3(906) (926) #2 .

#3(906) (908) (924) , (924) #4 (922) . (922) #5 #3(906) #3 . (922) #5 . (908) #3(906) (924) 2 .

[0102] (908) (902, 904, 906) .

[0103] (908) (902) (916) . (916) , #2(904) (918) (902) (912) 1 , #3(906) (924) (902) (912) 2 .{mode1(#2), mode2(#3)} #1(902) #2(904) (912, 918) #1 #1 , (908) (1). (908) , #1(902) #2(904) (914, 920) , 1 (902, 904) .

[0104] , (908) #2 #1(902)

#1 #1(902) (914) ,
#1(902) (914) #1(902) . (908)
#2 #2(904) #2
#2(904) (920) , #2(904) (920) #2(904)
. (908) , #1(902) #2(904)
, (902, 904)
. ,
. 1 .

[0105] (908) #3(906) (924) 2 #1(902)
#2(904) . , (908) #3(906) (922)
#3(906) (924) #4 . (908) #4
#3 #3(906) (924) . (908) #2
#3(906) #3 #3(906)
(926) , #3(906) (926) #3(906)
. #3(906) (924) , #3(906) .
2 .

[0106] (908) 1 2 (, 2
), #1(902), #2(904), #3(906) .
.

[0107] 3 1 6
7 . , 1 2
. 7 (702 718) ,
1 2 , ( )
.
(720) (722) .

[0108] ,
.
, .

[0109] ,
.

[0110] , OFDM
.
, .

[0001] 1a 1b OFDM

[0002] 2a 2b .

[0003] 3 .

[0004] 4 .

[0005] 5 1 .

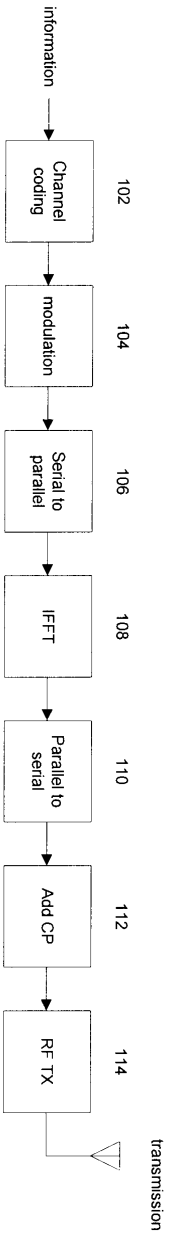
[0006] 6 1 .

[0007] 7 1 .

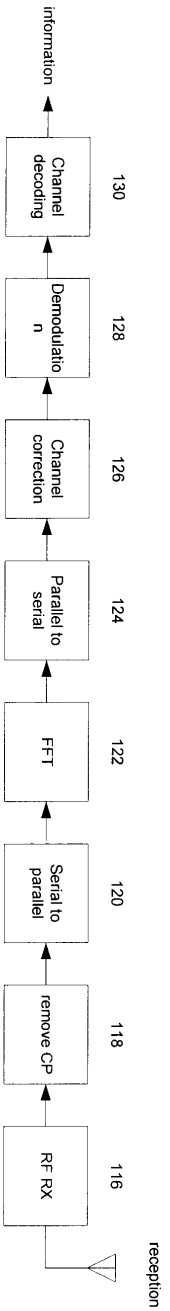
[0008] 8 2 .

[0009] 9 3 .

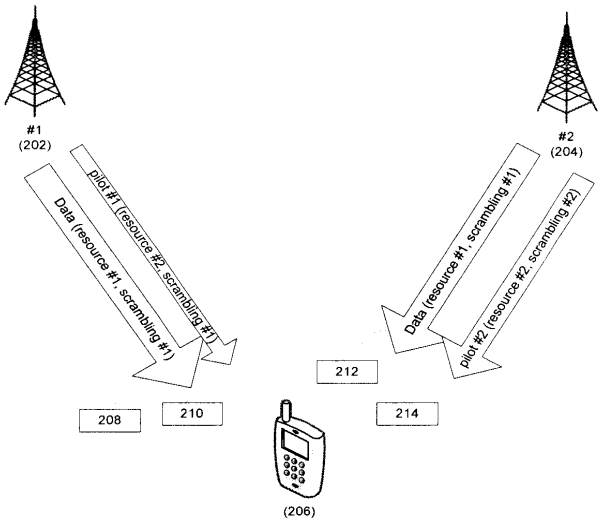
1a



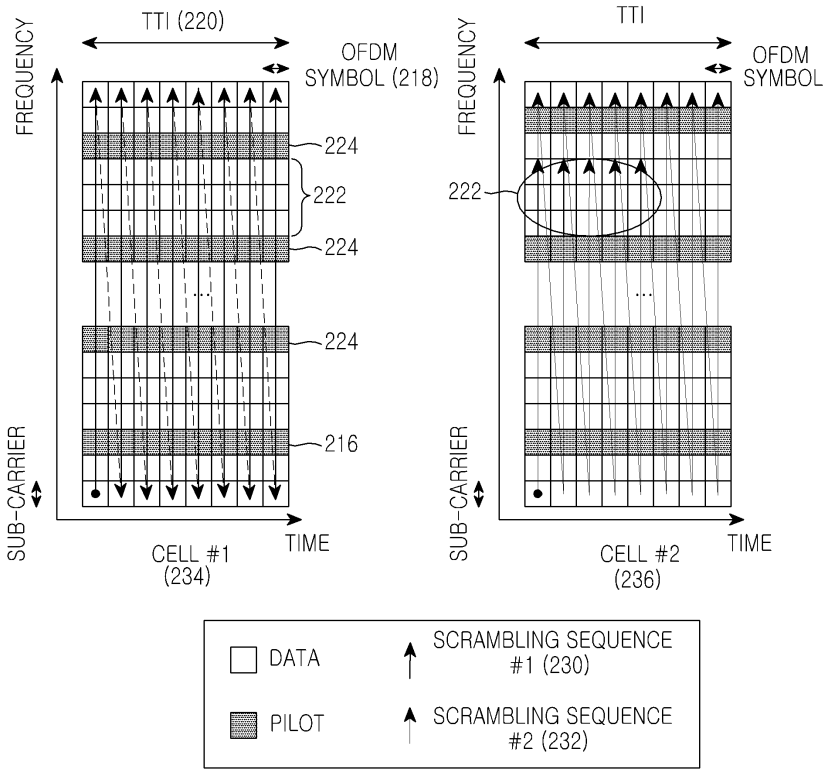
1b


information
Channel decoding
130
Demodulation
128
Channel correction
126
Parallel to serial
124
FFT
122
Serial to parallel
120
remove CP
118
RF RX
116
reception

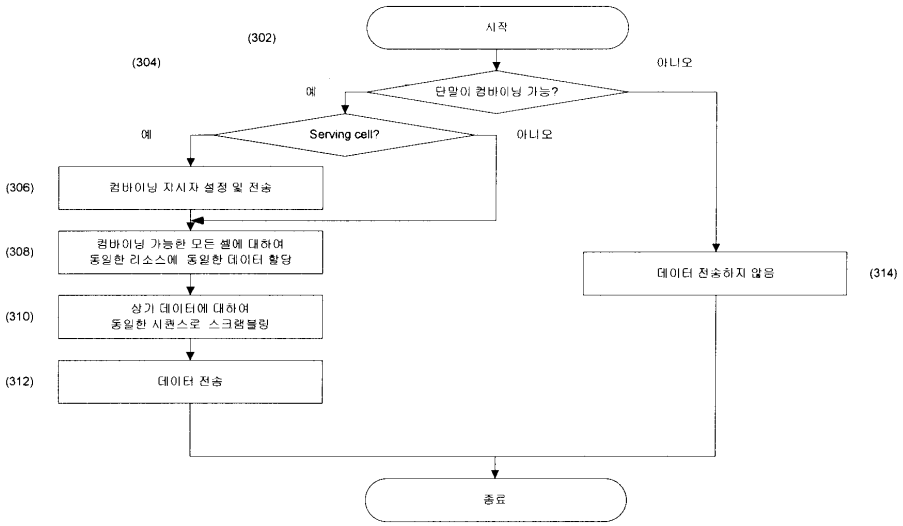
2a


#1
(202)
#2
(204)
pilot #1 (resource #2, scrambling #1)
Data (resource #1, scrambling #1)
Data (resource #1, scrambling #1)
pilot #2 (resource #2, scrambling #2)
212
208
210
214
(206)

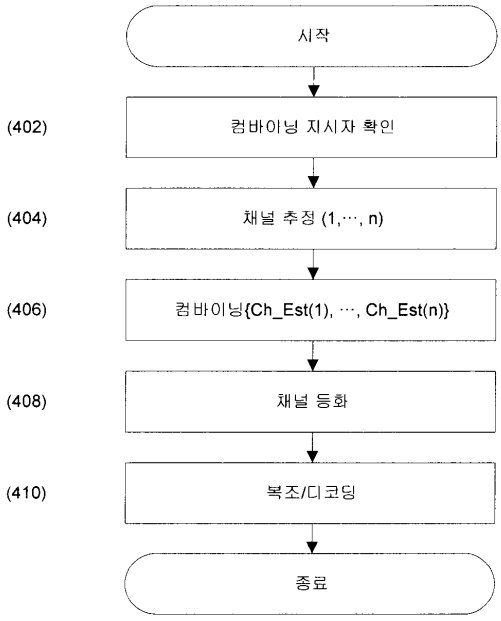
2b


TTI (220)
OFDM
SYMBOL (218)
FREQUENCY
224
222
224
224
216
SUB-CARRIER
CELL #1
(234)
TIME
TTI
OFDM
SYMBOL
FREQUENCY
222
SUB-CARRIER
CELL #2
(236)
TIME
DATA
PILOT
SCRAMBLING SEQUENCE
#1 (230)
SCRAMBLING SEQUENCE
#2 (232)

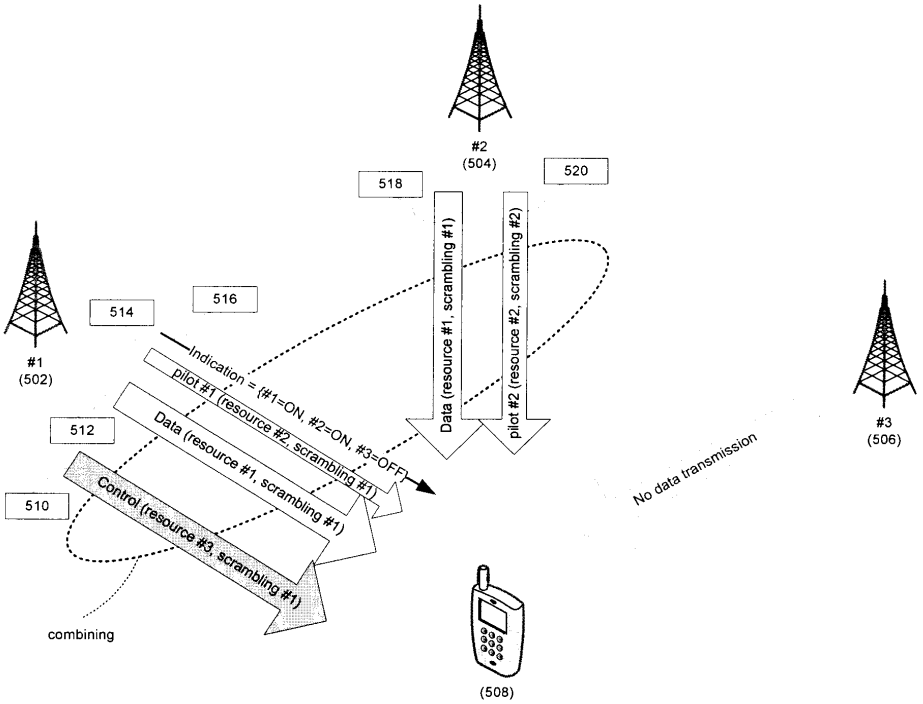
3


시작
(302)
(304)
단말이 컴바이닝 가능?
예
아니오
Serving cell?
예
아니오
(306)
컴바이닝 지시자 설정 및 전송
(308)
컴바이닝 가능한 모든 셀에 대하여
동일한 리소스에 동일한 데이터 할당
(310)
상기 데이터에 대하여
동일한 시퀀스로 스크램블링
(312)
데이터 전송
데이터 전송하지 않음
(314)
종료

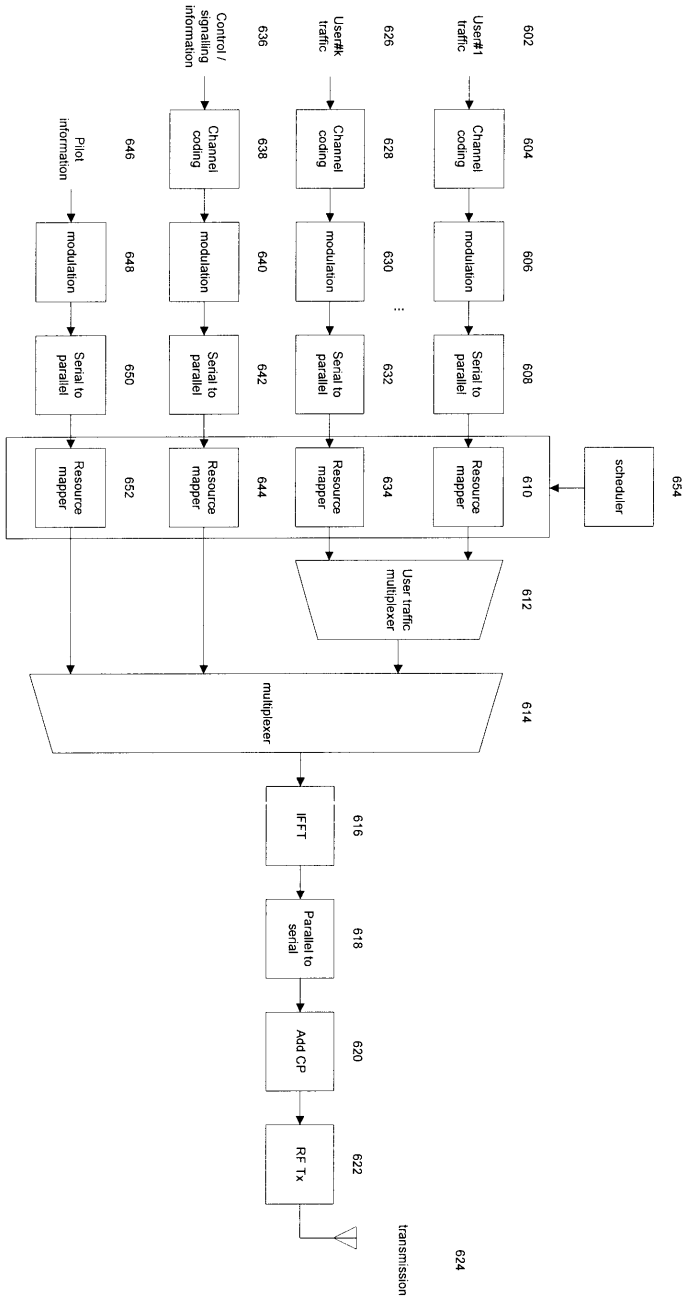
4


시작
(402)
컴바이닝 지시자 확인
(404)
채널 추정 (1,…, n)
(406)
컴바이닝{Ch_Est(1), …, Ch_Est(n)}
(408)
채널 등화
(410)
복조/디코딩
종료

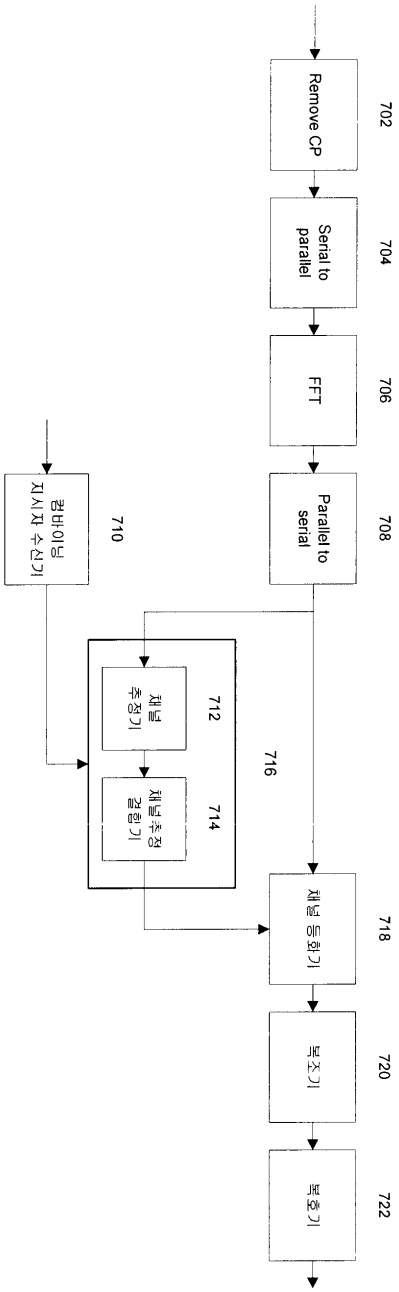
5


#2
(504)
518
520
#1
(502)
514
516
Indication = {#1=ON, #2=ON, #3=OFF}
pilot #1 (resource #2, scrambling #1)
Data (resource #1, scrambling #1)
Data (resource #1, scrambling #1)
pilot #2 (resource #2, scrambling #2)
512
510
Control (resource #3, scrambling #1)
combining
No data transmission
#3
(506)
(508)

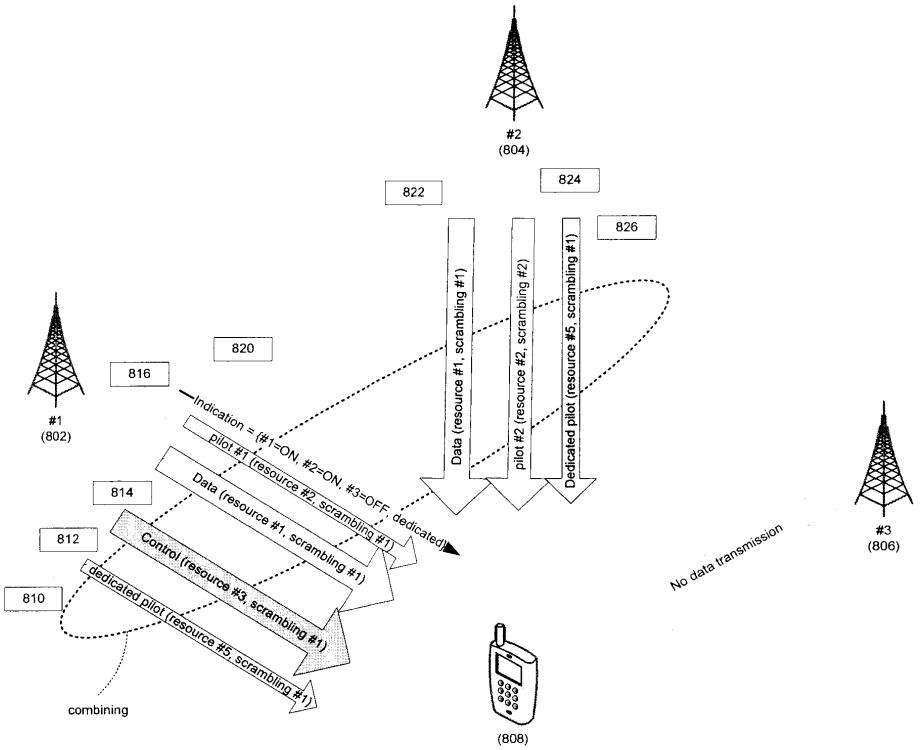
6


User#1 traffic
602
Channel coding
604
modulation
606
Serial to parallel
608
Resource mapper
610
scheduler
654
User#k traffic
626
Channel coding
628
modulation
630
Serial to parallel
632
Resource mapper
634
Control / signaling information
636
Channel coding
638
modulation
640
Serial to parallel
642
Resource mapper
644
Pilot information
646
modulation
648
Serial to parallel
650
Resource mapper
652
User traffic multiplexer
612
multiplexer
614
IFFT
616
Parallel to serial
618
Add CP
620
RF Tx
622
transmission
624

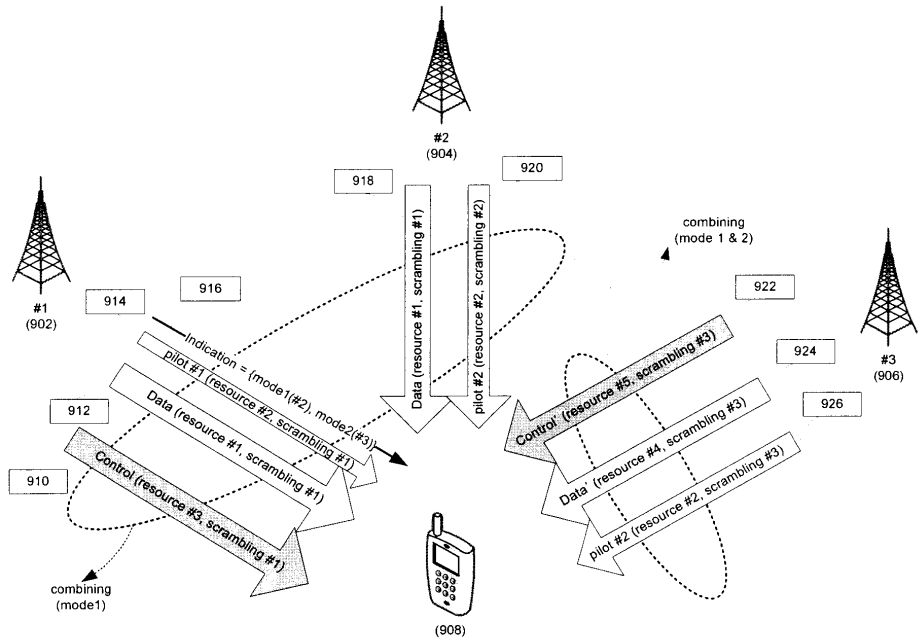
7


Remove CP
702
Serial to parallel
704
FFT
706
Parallel to serial
708
컴바이닝 지시자 수신기
710
채널 추정기
712
채널추정 결합기
714
716
채널 등화기
718
복조기
720
복호기
722

8


#2
(804)
822
824
826
Data (resource #1, scrambling #1)
pilot #2 (resource #2, scrambling #2)
Dedicated pilot (resource #5, scrambling #1)
#1
(802)
820
816
Indication = (#1=ON, #2=ON, #3=OFF, dedicated)
pilot #1 (resource #2, scrambling #1)
814
Data (resource #1, scrambling #1)
812
Control (resource #3, scrambling #1)
dedicated pilot (resource #5, scrambling #1)
810
combining
No data transmission
#3
(806)
(808)

9


#2
(904)
918
920
Data (resource #1, scrambling #1)
pilot #2 (resource #2, scrambling #2)
combining
(mode 1 & 2)
#1
(902)
914
916
922
Indication = (mode1(#2), mode2(#3))
pilot #1 (resource #2, scrambling #1)
924
#3
(906)
Control (resource #5, scrambling #3)
912
Data (resource #1, scrambling #1)
926
Data (resource #4, scrambling #3)
910
Control (resource #3, scrambling #1)
pilot #2 (resource #2, scrambling #3)
combining
(mode1)
(908)