(71)   .   .
                       ,   ,   1

(72)   .
                   ,   5656,   6
                                .
                   ,   5656,   6

(74)

       :

(54)

       (502)   .   (502)
    .   ,   (902)   .   (506)   (502)
                                .   (502)   ,
           .   (912, 1214)   ,
    .

12

, , , ,

(mobile phone handset) .

, (normal mode helix)
(meander line antenna) , - F (PIFA) .

( ) , . ,
10% (fractional bandwidth) . PIFA
.
, . ,
, .

. , . ,
(antenna feed) ,
PCT/EPO1/08550 (PHGB010056) . (matching network)
(radiator) .

.

, . ,
,
.

.
, .

.
, RF IC , .
.

, ,
, - (non- radiating coupling element)
.

.

1 .

2 .

3 .

4 - (capacitively back- coupled) .

5 - .

6 5 MHz f dB S $_{11}$.

7 1000 MHz 2800 MHz 5
(Smith chart) .

8 5 .

9 - , - - .

10 9 MHz f dB S $_{11}$.

11 800 MHz 3000 MHz 9
.

12 , - - .

13 12 MHz f dB S $_{11}$.

14 800 MHz 3000 MHz 12
.

15 12 MHz f dB
S $_{11}$.

16 800 MHz 3000 MHz , 12
.

1
. , 1 (102) , 2 (
104) . (106) . ,
(108) (102, 104)

, (106) ,

.

, 40mm, 1mm 1 (102) 80mm, 1mm 2 (104)
NEC(Numerical Electromagnetics Code) . 2
, (R + jX) (
Ref R Ref X) . . ,
(half- wave resonance) .

, 3 . R_1 jX_1
, R_2 jX_2 . ,
P_1 P_2 .

$$\frac{P_1}{P_2} = \frac{R_1}{R_2}$$

, R_1 . , R_1
0 . , (10
6) -
, .

, 4 . -
. -
(residual reactance) . ,
, Q (
Q 1), 50 Q .

- 5 . (502)
10× 40× 100mm . 2× 10× 10mm (504) (5
02) (508) 2mm , 10× 10mm (506)
. 0.5 pF , [(502) (506)
] [(502) (506)] .
(502) (510) .

(return loss) S$_{11}$ (Ansoft Corporation)
(HFSS) . 1000 MHz 2800 MHz f 6
. 1900 MHz 2 " L" . (90%
) 7dB 600 MHz, 3% ,
. 7
.

(502)   (504)   1900 MHz   3- j90   .
8   HFSS   .
,   PCT/EPO1/08550
.

5   .   .
9   .   , 10mm   (506)
(502)   2m   ,   30mm   1mm   (912)   2m
m   5   .   (912)   (9
)   (506)   .   (912)   1/4   ,   ,   /4, 3 /4
.

50   .   ,
(shunt inductance)   (912)
(excite)   .

,   (912)   (504)   ,
(502)   .   ,   (502)
(912)   ,   ,   (meandering)
.

S_{11} HFSS   .   800 MHz   3000 MHz
10   . 7dB   90 MHz,   4.3%   .
,   Blueto
oth   .

11   .
9   ,   (0)
.
.

(   )   ,
(   )   .   ,   ,
50   .
,   .   ,
.

12   .   , (506)   (912)   (502)
,   (1214)   .   (1214)   1   (912)   ,
73mm   1mm   ,   .

S_{11} HFSS   .   800 MHz   3000 MHz
f   13   .   , 3 ,
.   (912, 1214)   /4   ,   ,
. 1   (1GHz   )   (1214)   /4   . 2   (1.8 GHz   )   (
912)   3 /4   . 3   (2.8GHz   )   (1214)   3 /4   .   ,
GSM, DSC1800   Bluetooth   .

3   7dB   15MHz(1.5%), 110MHz(5.9%),   110MHz(3.9%)
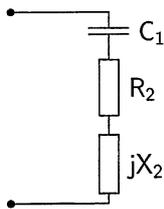   . 1GHz   ,   .
                                    13   .   1
    .

            (912, 1214)   -   (504)   :   (9
12, 1214)   (506)   (shunt inductance)
        .   ,   (912, 1214)   .   ,
                (tapping off)   .
                                            .

                                        .   ,   5   "
L"   12   .   S $_{11}$
800 MHz   3000 MHz   f   15   .   (1.4 GHz   3dB   )
        .   .
                                    16   .

            ,   (radiating element)   .   ,
                            .   EMC   PC
B   .

        ,   .   ,   ,
                                                        ,
                            .

    1.

                    (antenna feed)   ,
                                                                                ,
                                ,   .

    2.

1   ,   (major axis)   ,   .

    3.

1   2   ,   ,   .

    4.

1   3   ,
                    ,   .

    5.

1   4   ,
,   .

     6.

1   5   ,   ,   .

     7.

1   5   ,   ,
     .

     8.

1   7   ,   (matching network)
          ,   .

2

3

4

5

6

7

8

9

506
510 912   502

10

11

12

13

14

15

16