

DUAL BAND ANTENNA

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to an antenna for a portable wireless device, and in particular to a dual band antenna for a portable wireless device which can be suitably used for a cellular phone and a personal communication services(PCS) phone, by improving a spring structure of a helical antenna to have a dual bandwidth of 900MHz of
10 the cellular phone and 1900MHz of the PCS phone.

2. Description of the Background Art

In general, a wireless device employs an antenna to perform wireless communication.

15 The wireless device applies a high frequency signal outputted from a modulating unit to the antenna, thereby transmitting it to the air, and receives an electric wave transmitted from the air through the antenna.

In order to improve the transmission and reception properties of the antenna, it is necessary to match an impedance of the antenna with an impedance of a transmitting

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or receiving device according to the frequency to be transmitted or received, and to reduce a loss by preventing unnecessary radiation.

The antenna is integrated in structure. When received, the antenna is operated as a helical antenna, and when extended, it is operated as a rod antenna.

5 The antenna includes a built-in spring in its lower end portion to improve the receiving property.

Figure 1 illustrates an antenna for a general wireless device, including a main body 10 and an antenna unit 20.

The antenna unit 20 consists of a handle 21 for extending or receiving the
10 antenna; an insulating unit 22; a helical antenna 23 being connected to the main body 10 to be operated when receiving the antenna, and having a built-in spring 25; and a rod antenna 24 connected to the helical antenna 23 to be operated as the antenna when extending the antenna.

Figure 2 illustrates the built-in spring 25 in the helical antenna and a metal rod
15 26 connected to the spring 25.

One-side end of the spring 25 is inserted and fixed into the metal rod 26 by a tightness work.

Figure 3(A) shows a Smith chart in 900MHz, and Figure 3(B) shows a standing-wave ratio in 900MHz. In the Figures 3(A) and 3(B), the vertical and horizontal lines

represent the magnitude of decibel(DB) and frequency, respectively.

Figure 4(A) and Figure 4(B) respectively show a Smith chart and a standing-wave ratio in 1900MHz. Referring to Figure 4(B), resonance does not take place at all in 1900MHz.

5 Figure 5 shows radiation patterns in 900MHz and 1900MHz. A1 denotes the radiation pattern in 900MHz and A2 denotes the radiation pattern in 1900MHz(PCS phone). A2 has a smaller radiation value than A1.

Accordingly, in the conventional wireless devices, the cellular phone employs the antenna of the band of 900MHz and the PCS phone employs the antenna of the band
10 of 1900MHz. That is to say, the antennas of different frequency bands must be used according to the kind of the wireless devices.

SUMMARY OF THE INVENTION

15 Therefore, an object of the present invention is to provide a dual band antenna which can be used in 900MHz, a frequency band of a cellular phone, and 1900MHz, a frequency band of a PCS phone.

In order to achieve the above-described object of the present invention, a dual band antenna for a wireless device wherein a helical antenna has a built-in spring,

includes a spring consisting of: a lower spring fixed to a metal rod of the helical antenna at predetermined spring intervals, for transmitting and receiving a frequency of 1900MHz; and an upper spring having narrower spring intervals than the lower spring, the upper and lower springs being able to transmit and receive a frequency of 900MHz.

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BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become better understood with reference to the accompanying drawings which are given only by way of illustration and thus are not
10 limitative of the present invention, wherein:

Figure 1 illustrates an antenna for a general wireless device;

Figure 2 is a structure view illustrating a spring in a general helical antenna;

Figure 3(A) shows a Smith chart in 900MHz;

Figure 3(B) shows a standing-wave ratio in 900MHz;

15 Figure 4(A) shows a Smith chart in 1900MHz;

Figure 4(B) shows a standing-wave ratio in 1900MHz;

Figure 5 shows radiation patterns in 900MHz and 1900MHz;

Figure 6 is a structure view illustrating a spring of a dual band antenna in accordance with the present invention;

Figure 7(A) shows a Smith chart in 900MHz in accordance with a first embodiment of the present invention;

Figure 7(B) shows a standing-wave ratio in 900MHz in accordance with the first embodiment of the present invention;

5 Figure 8(A) shows a Smith chart in 1900MHz in accordance with the first embodiment of the present invention;

Figure 8(B) shows a standing-wave ratio in 1900MHz in accordance with the first embodiment of the present invention;

Figure 9 shows radiation patterns in 900MHz and 1900MHz in accordance with
10 the first embodiment of the present invention;

Figure 10(A) shows a Smith chart in 900MHz in accordance with a second embodiment of the present invention;

Figure 10(B) shows a standing-wave ratio in 900MHz in accordance with the second embodiment of the present invention;

15 Figure 11(A) shows a Smith chart in 1900MHz in accordance with the second embodiment of the present invention;

Figure 11(B) shows a standing-wave ratio in 1900MHz in accordance with the second embodiment of the present invention;

Figure 12 shows radiation patterns in 900MHz and 1900MHz in accordance

with the second embodiment of the present invention;

Figure 13(A) shows a Smith chart in 900MHz in accordance with a third embodiment of the present invention;

Figure 13(B) shows a standing-wave ratio in 900MHz in accordance with the
5 third embodiment of the present invention;

Figure 14(A) shows a Smith chart in 1900MHz in accordance with the third embodiment of the present invention;

Figure 14(B) shows a standing-wave ratio in 1900MHz in accordance with the third embodiment of the present invention;

10 Figure 15 shows radiation patterns in 900MHz and 1900MHz in accordance with the third embodiment of the present invention; and

Figure 16 shows a comparison result of the radiation pattern in the first and second embodiments of the present invention.

15 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A dual band antenna in accordance with preferable embodiments of the present invention will now be described in detail with reference to the accompanying drawings.

Figure 6 is a structure view illustrating a spring of the dual band antenna. The

spring 30 is fixed to a metal rod 26. Its lower spring 31 has sufficient intervals to transmit and receive a frequency of 1900MHz, and its upper spring 32 has narrower intervals than the lower spring 31. Therefore, the whole spring 30 can transmit and receive a frequency of 900MHz.

5 The operation of the dual band antenna of the present invention will now be explained.

As illustrated in Figure 6, in the built-in spring 30 of the antenna, the lower spring 31 has wider intervals than the upper spring 32 connected to the lower spring 31.

Accordingly, when a PCS phone of 1900MHz is used, a frequency is transmitted
10 and received through the lower spring 31.

In addition, when a cellular phone of 900MHz is used, the whole length of the spring(30) is utilized to transmit and receive the frequency.

Figures 7 and 8 show the results of a first embodiment of the present invention. Figure 7 shows a Smith chart and a standing-wave ratio in 900MHz. Figure 8 shows a
15 Smith chart and a standing-wave ratio in 1900MHz.

Figure 9 shows radiation patterns in accordance with the first embodiment of the present invention. Here, B1 denotes the radiation pattern in 900MHz and B2 denotes the radiation pattern in 1900MHz. For example, B1 represents -45.77dB in the azimuth of -85.00, and B2 represents -50.83dB in the azimuth of -129.00.

Figures 10 to 12 relate to a second embodiment of the present invention. A full length of the first embodiment is adjusted to a CDMA length.

Figures 10 and 11 show the results of the second embodiment of the present invention. Figure 10 shows a Smith chart and a standing-wave ratio in 900MHz. Figure 11 shows a Smith chart and a standing-wave ratio in 1900MHz.

Figure 12 shows radiation patterns in accordance with the second embodiment of the present invention. Here, C1 denotes the radiation pattern in 900MHz and C2 denotes the radiation pattern in 1900MHz. For example, C1 represents -45.83dB in the azimuth of -89.00 , and C2 represents -50.69dB in the azimuth of 44.00 .

Figures 13 to 15 relates to a third embodiment of the present invention. As compared with the second embodiment, a line diameter of the spring 30 is changed from $\phi 0.4$ to $\phi 0.5$, and an outer diameter thereof is changed from $\phi 5.3$ to $\phi 6.3$.

Figures 13 and 14 show the results of the third embodiment of the present invention. Figure 13 shows a Smith chart and a standing-wave ratio in 900MHz. Figure 14 shows a Smith chart and a standing-wave ratio in 1900MHz.

Figure 15 shows radiation patterns in accordance with the third embodiment of the present invention. Here, D1 denotes the radiation pattern in 900MHz and D2 denotes the radiation pattern in 1900MHz. For example, D1 represents -45.81dB in the azimuth of -91.00 , and D2 represents -50.73dB in the azimuth of 139.00 .

Figure 16 shows a comparison result of the radiation pattern in the first embodiment(-45.83dB in the azimuth of -89) and the second embodiment(-45.88dB in the azimuth of -87.00).

As discussed earlier, the present invention improves the spring structure of the helical antenna of the wireless device, and thus the lower spring can transmit and receive the frequency of 1900MHz that is the frequency band of the PCS phone, and the upper and lower springs can transmit and receive the frequency of 900MHz that is the frequency band of the cellular phone. As a result, the dual band antenna of the present invention can be employed for the cellular phone and the PCS phone.

What is claimed is:

1. A dual band antenna for a wireless device wherein a helical antenna
has a built-in spring, comprising:
5 a spring including a lower spring fixed to a metal rod of the helical antenna at
predetermined spring intervals, for transmitting and receiving a frequency of 1900MHz;
and
an upper spring having narrower spring intervals than the lower spring, the
upper and lower springs being able to transmit and receive a frequency of 900MHz.
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2. The dual band antenna according to claim 1, wherein the spring is
rolled to have a line diameter of $\phi 0.4$, and an outer diameter of the spring is $\phi 5.3$.
3. The dual band antenna according to claim 1, wherein the spring is
15 rolled to have a line diameter of $\phi 0.5$, and an outer diameter of the spring is $\phi 6.3$.