

Reelables Antenna Info

Title: A Label/0001: Antenna technical summary
Radiated power and compliance with CFR

Scope

This report provides details of the antenna on Reelables A-Label/0001 product and the maximum field strength that can be generated at a reference distance of 3 m.

1 Description of device and antenna

The device is in the form of aluminium conductors on PET film. A large groundplane area underlies the battery, and a smaller groundplane underlie the electronic components and forms the groundplane against which an antenna, in the form of a meandered quarter-wave monopole, is excited. The antenna is connected to the BLE SOC via a low pass filter formed using etched inductive and capacitive elements in a Pi format.

The overall length of the device is 75 mm, including the NFC antenna, which is unlikely to contribute to radiation of the 2.4-GHz signal. The main groundplane is 62 mm long (0.51 wavelengths at 2.45 GHz). The arrangement provides a dipole-like radiation pattern with its minima aligned with the long axis of the groundplane.

The maximum gain of the antenna is that of a dipole (2.6 dBi) although its efficiency is unlikely to exceed 50%, which is typical for this class of antennas.

Since the antenna is formed on the PET film substrate, no other antenna can be used with the device, in so ensuring compliance with FCC 15.203.

2 Field strength at 3 m

The measured field strength at a distance of 3 m was $95.2 \text{ dB}(\mu\text{V/m}) = 0.06 \text{ V/m}$.

The output power from the modem = $2.5 \text{ dBm} = 1.8 \text{ mW}$.

If 1.8 mW is fed to an antenna with a gain of 0 dBi, the resulting power density at 3 m = $1.8/(4\pi \times 3^2) = 0.078 \text{ V/m}$.

The measured field strength was 0.06 V/m, so the effective gain of the antenna was $0.06/0.078 = 0.77 = -2.3 \text{ dBi}$.

3 Additional note

Also note that the NFC coil also present in the device and mentioned above is a passive device configured to resonate at 13.56MHz and positioned far away

from the 2.4GHz Bluetooth antenna. Therefore it is highly unlikely to contribute to any radiation of the BLE radio.