Technical Disclosure Commons

Defensive Publications Series

May 08, 2017

Single Band Antenna For Ism Remote Controls

Vincent Mei

Peter Bevelacqua

SINGLE BAND ANTENNA FOR ISM REMOTE CONTROLS

ABSTRACT

Disclosed herein is a novel antenna device design that could be applied in hand-held radio band remote controls for devices. Accordingly, the antenna structure uses a unique ground cut-out and capacitive coupling to the ground structure on a PCB that includes a button located on the other side of the antenna. The design utilizes the close proximity of the battery and battery terminal as part of the antenna structure and their relative placement could be tuned to maintain performance. Further, the selection of inductive chokes for the button control pins allows the antenna to continue to operate without significant degradation to radiated efficiency. The design includes comparable performance while in free space as well as when hand-held. Because of the exact placement of the radiating structures, hand holding does not cause the antenna center frequency to detune as seen with other designs.

BACKGROUND

In remote control devices having small form factor, the volume of the antenna and space occupied by the antenna are constrained. Also, the antenna is placed electrically far away from the buttons and near the top of the PCB that degrades the performance of the antenna. This creates a unique challenge where the antenna needs to utilize unique design considerations and also to maintain performance.

DESCRIPTION

A novel antenna device design that could be applied in industrial, scientific and medical (ISM) radio band remote controls is disclosed. The design, while working around industrial design constraints could also maintain antenna performance in free space as well as when held in a hand. Accordingly, as shown in FIG. 1A, the antenna structure uses a unique ground cut-out

and capacitive coupling to the ground structure on a printed circuit board (PCB). This maintains antenna performance while in free space as well as while held in the hand. Further, the button activating the remote is located on the other side of the antenna, thereby meeting both the proximity requirement and industrial design constraints.

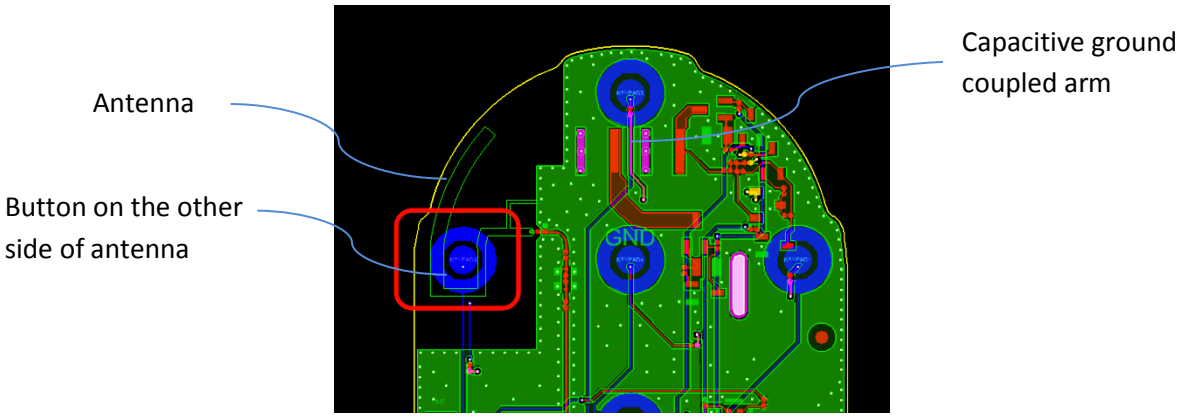

FIG. 1A: Schematic showing unique ground cut-out, capacitive coupling to the ground structure and button located on the other side of the antenna

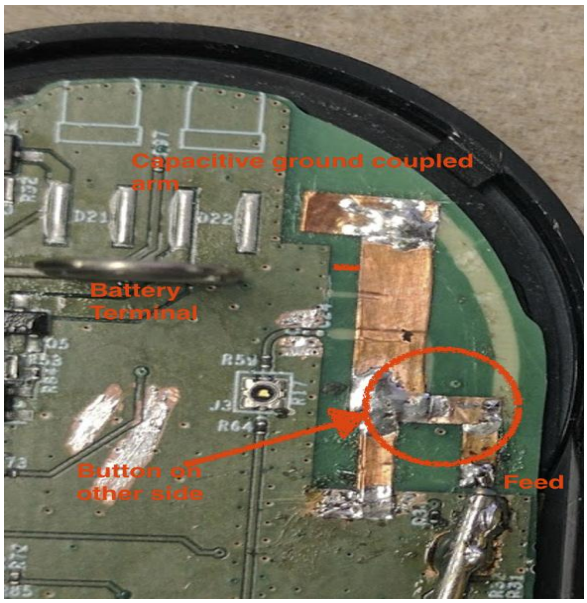

FIG. 1B: Unique ground cut-out, capacitive coupling to the ground structure and button located on the other side of the antenna in the PCB

Additionally, while being held in the hand, the placement of the antenna does not cause

the antenna to detune significantly. The distance of the end of the main arm of the antenna to the ground causes the high electric fields to couple more strongly to the ground structure rather than the hand. The unique feeding location of the antenna also contributes to mitigate the impact of the button while maximizing antenna efficiency. Further, the selection of inductive chokes for the button control pins allows the antenna to continue to operate without significant degradation to radiated efficiency. Furthermore, the design utilizes the close proximity of the battery and battery terminal as part of the antenna structure and their relative placement could be tuned to maintain performance.

The advantages of the antenna design include comparable performance while in free space as well as when hand held. Because of the exact placement of the radiating structures, hand-loading does not cause the antenna center frequency to detune as seen with other designs. The disclosed device design could be incorporated in smart remotes and any small form factor devices with a 2.4 GHz antenna with metal conductors opposite to the antenna structure or in close proximity to metallic interface pins.