

# XM Satellite Radio, Inc

RE: XM Satellite Radio, Inc.

FCC ID: RS2SA10177B

Please review the answer below:

1) The block diagram appears to show 2 different forms of FM couplers (one labeled coupler, one labeled direct). Test photographs suggest an arial antenna coupler and XM coupler. Please explain the differences between these various modes/configurations as necessary (i.e. are they leaky coax, what type of coupling is utilized, is the signal attenuated, length of cable, etc.). For instance, it appears that the FM Direct may replace the FM antenna and therefore be considered a digital device configuration and not actually a wireless configuration. Please comment as necessary and also explain if all variations have been tested? Please ensure this includes a description of operation/function of each.

Answer: There are two modes of getting the FM signal to the user's FM radio. The first is through the FM direct adaptor box which hard-wires the FM modulator signal to the FM radio's FM input, through a switch. The second is by using the FM coupler mechanism, which couples the FM signal directly to the vehicle's FM antenna. In the case of an arial antenna, the FM coupler clip is attached directly to the arial antenna. In the case of an embedded window antenna, the FM coupler clip is attached to a window bracket, which adheres to the window containing the FM antenna.

2) Given the loosely coupled mechanism used in certain configurations and the wide variety of antennas types and placements in a vehicle (window, panel, roof), how was testing performed in effort to obtain worse case data? Have various antenna configurations been investigated? Please detail.

Answer: We performed the arial antenna emissions testing using an aftermarket arial antenna mounted on a large ground plane (3ft x 4ft). The ground plane was attached to the negative terminal of the car battery being used. In each case, all coaxial cables were placed randomly on the table next to the ground plane. For each test frequency, the coaxial cables were randomly moved a minimum of 3 times and the test table rotated to find the maximum emissions. We have tested with other models of arial antennas and found variations to be minimal. Window mount antennas are being discussed with the FCC.

3) Regarding the FM coupler, please explain what happens if the XM antenna is directly connected to the docking port and therefore bypasses the coupling module. Would this yield a leaky coax connection? Is it possible to bypass the coupling module this way?

Answer: Part of the submission data was this scenario. The XM antenna was connected directly to the car dock without an FM coupler attached. As the data shows, we meet the unintentional emissions limit with about 15 dB of margin.

4) Please provide a technical description of operation/function of the FM coupler.

Answer: XM Answer: The FM coupler is designed to deliver the FM modulated signal from the XM Radio receiver to the vehicle FM radio by capacitive coupling the FM signal directly to the vehicle FM antenna. The FM modulated signal is output from the XM Radio receiver on the center conductor of the RF SMB connector which also carries the S-Band XM radio signals received from the XM antenna. The coupler system contains a short section of RF coax which is connected to the XM receiver SMB connector at one end and to a diplexor box at the other end. The diplexor box interfaces also include a SMB connector for connecting the XM antenna and a longer section of coax which is terminated with a spring clip for attachment to the vehicle FM antenna. A discrete filter circuit in the diplexor box provides a low loss path for the S-Band XM radio signals to travel from the XM antenna to the XM receiver while attenuating the XM signals to the long section of coax to the FM antenna. Similarly, the diplexor box provides a low loss path for the FM signals from the XM receiver to travel to the FM antenna along the long section of coax while attenuating the FM signal to the XM antenna. The spring clip at the end of the long section of coax is connected directly to the coaxial center conductor which contains the FM signal. When the spring clip is either clipped onto an aerial antenna or clipped onto the window antenna attachment, the FM energy is transferred to the FM radio through the capacitive coupling at the antenna. In order to reduce the FM signal radiating from the shield of the long coaxial section, two small ferrites are molded onto the coax approximately up to 1 foot from the spring clip.

5) Can better photographs regarding the various devices (i.e. FM coupler/direct, etc.) be provided for clarity purposes?

Answer: Please see attached documents

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