



Radiated Spurious Emissions: *A Primer*

Introduction

Self-interference is the case where electromagnetic emissions from a radio or device are interfering with its own receive performance. The case of self-interference is a special case of the more general phenomena of Electromagnetic Interference (EMI) or Radio Frequency Interference (RFI), which is often described as Radiated Spurious Emissions, or RSE.

Electromagnetic Interference is a related problem to self-interference, except the victim is not necessarily the device itself, but, potentially other devices and radios. In the case of radios, EMI/RFI becomes received Noise, combined with or even overpowering the desired signal as the Signal-to-Noise Ratio (SNR) degrades. Clearly, this problem should be avoided and limited as much as possible. To this end, these emissions are closely regulated by national or international spectrum authorities.

Radiated Spurious Emissions are named as such because (a) they are radiated (uncontained) electromagnetic waves; and (b) often appear as signals in frequency (i.e., on a spectrum analyzer), but are merely noise. Radiated Spurious Emissions generally fall into two categories: intentional radiator and unintentional radiator.

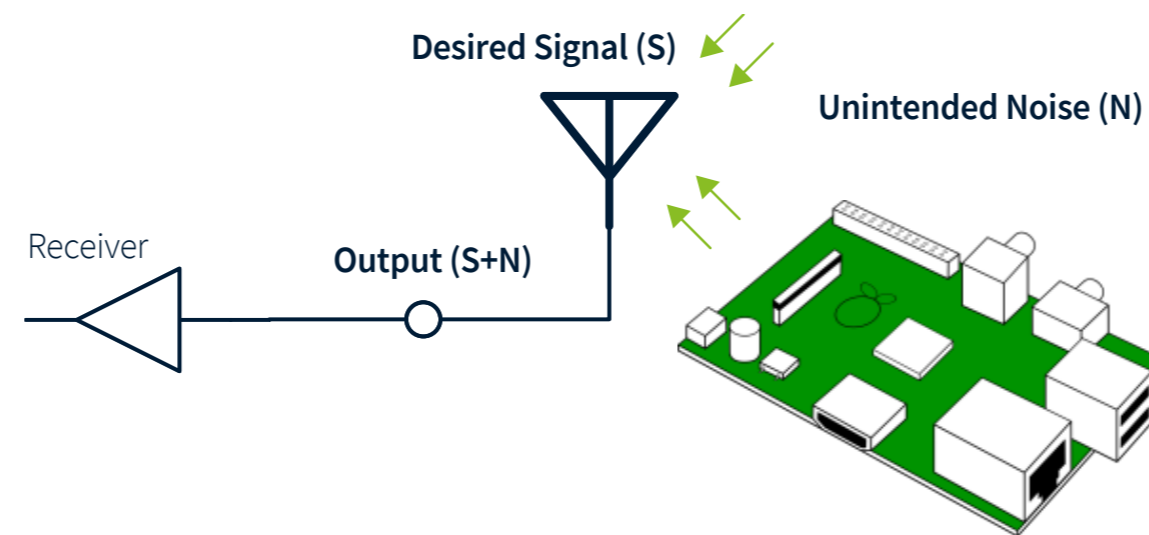


Figure 1: Signal and Noise

Intentional radiator RSE are due to signals associated with a transmitter—a transmitter being an intentional radiator. Most commonly, intentional radiator RSE are due to harmonics of the transmitted signal, though this is not necessarily the case. Unintentional radiator RSE, then, are emissions due to non-transmitter sources, i.e. everything else. Any electronic device can conceivably produce unintentional RSE, though in reality problematic emissions are most often attributed to a handful of common causes.

The electronics which potentially produce unintentional RSE include, but are not at all limited to: microcontrollers; memory interfaces; display interfaces; oscillators/clocks; and switching power supplies. Any of these electronics left unchecked can produce unintentional RSE.

Intentional RSE can be attributed to a number of different causes, such as amplifier or signal chain non-linearity's, a lack of filtering in the signal chain, mixing products, local oscillator leakage, or environmental diode effects.

Common mitigation methods include shielding, signal filtering, and PCB layout techniques.



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