Multi-channel RF level detector

EN2091: Analog project

Department of Electronic and Telecommunication Engineering
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Team MOSFET

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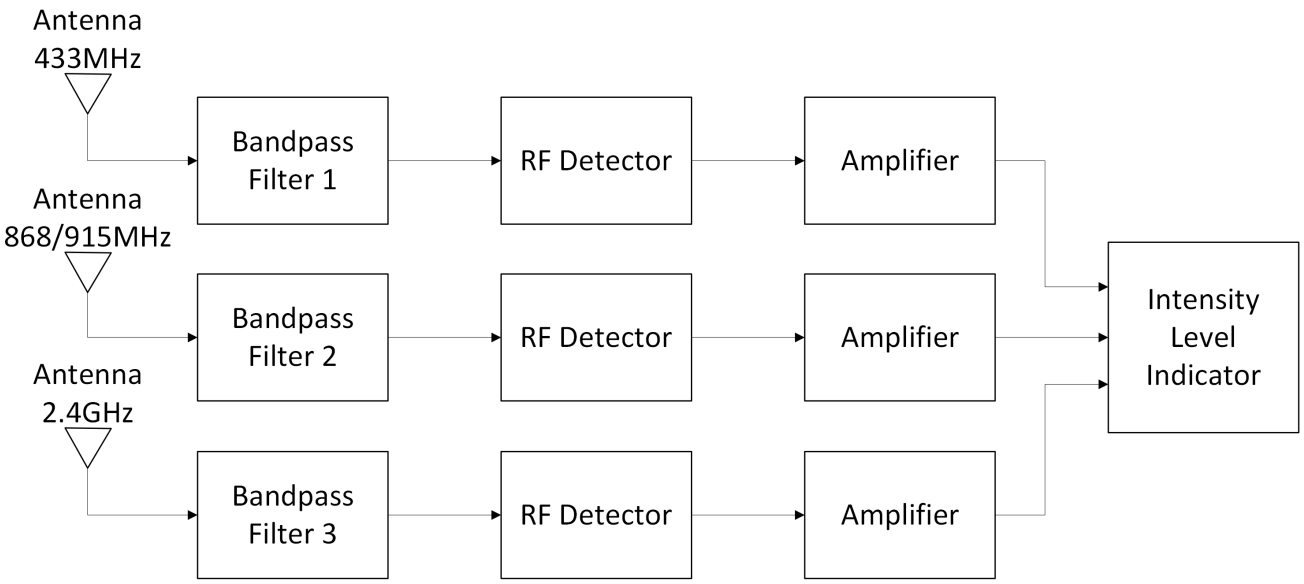
Functionality

The proposal is to build a modular handheld portable multi- channel RF detector that detects the presence and strength of intensities of RF signals in bands 2.4 GHz, 433 MHz and 868/915 MHz in a given environment under the coverage of the antennas used.

The strength or the intensity of the RF signal is given as output by a LED bargraph driven by a level detector.

Block Diagram



Methodology

- The implementation for the three bands is overall similar but differs in certain aspects due to component compatibility.
- The signal is received from a compatible antenna, DC components are blocked, and the signal is filtered using a bandpass filter. It is then fed into a peak detector to convert RF strength into voltage, which drives a LED bargraph.
- The system is planned to be battery-powered, mainly for the amplifier and LEDs.

Micro-products and Interfacing

Micro-product	Application
Antenna block	Receive the interested signal band and cut off any DC component.
Bandpass filter	Filter the signal for further cleaning. The bandpass filter can be implemented in several ways; for these three bands, either a microstrip-hairpin filter or an LC ladder filter is proposed.
RF detector	A peak detector is planned to convert the RF signal to a voltage proportional to its strength to produce an output.
Amplifier	Provides gain to the signal if it attenuates mid-way in the system. (Note: May be used prior to the bandpass filter if necessary.)
Intensity level indicator	Displays the voltage output proportionally using a LED bar-graph.

Group Member Responsibilities

- Antenna block and BPF filter - Elapatha C.D.
- RF detector - Kariyawasam J.H.D
- Amplifier - Gunasekara L.U.A
- Intensity level detector and interfacing - Peiris T.S.R.

References

- A stable low noise and high gain dual-band active band-pass filter
- Constant-K LC Band Pass Filter Circuit Design & Calculations
- Semi-lumped Balun Transformer using Coupled LC Resonators
- US6108527: Wide Range Multiple Band RF Power Detector