radIoQ

Intelligence hiding in plain sight

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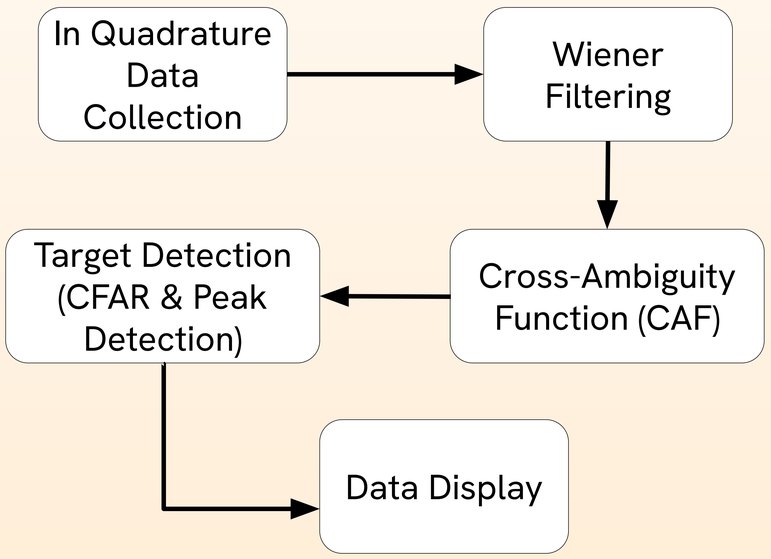
Background

Passive radar uses pre-existing radio signals from sources such as radio broadcasts and cellular networks in order to detect objects: aircraft in the case of radIoQ. By capturing signals directly from the source using a reference antenna and signals reflected off objects using a surveillance antenna, it is possible to detect aircraft using various signal processing techniques.

Design Capabilities

Frequency Range of Operation: 1 kHz – 2 GHz
Selected Illuminators: 546 MHz, 603 MHz
Bandwidth: 2 MHz per RX Channel
Minimum Target Size: 15 cm – 300 km (55 cm @ 546 MHz, 49 cm @ 603 MHz)
Resolution: 75 m
Maximum Range: 15 km

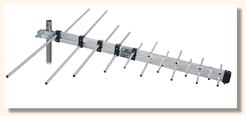
System Block Diagram



Final Design

Figure 1: Fully Assembled System

Hardware / Key Components



Yagi Antennas

2 antennas to receive radio signals with high directional selectivity, which is needed to minimize interference from scattered signals.

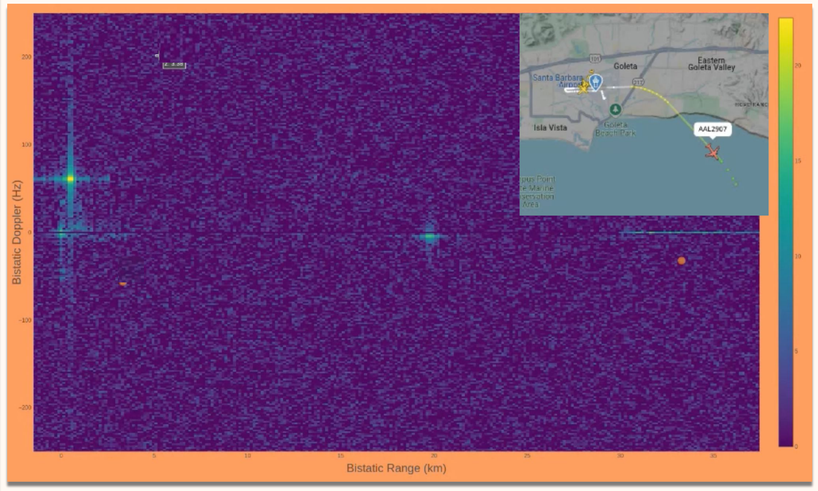
SDRplay RSPDuo

Software-defined radio, allows flexible reception of radio signals through reconfiguration using software. 2 RX channels, used for reference and surveillance.

Laptop

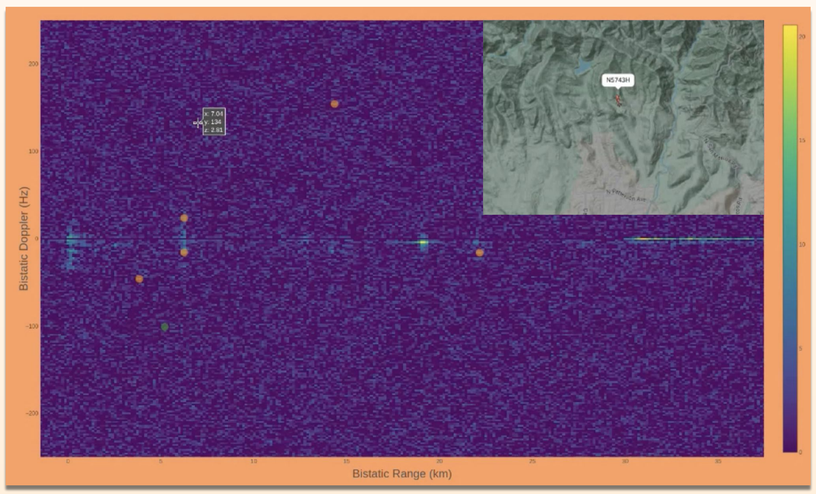
Laptop with Linux OS (Ubuntu) running complex signal processing algorithms and hosting web graphical interface, connected to SDR via USB

Large Passenger Aircraft Detection



Result 1: Detection of a large passenger airplane taking off from Santa Barbara Airport on range-doppler map

Stationary Helicopter Detection



Result 2: Detection of a helicopter flying in a zig zag fashion approximately 6 kilometers away

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HRL LABORATORIES

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