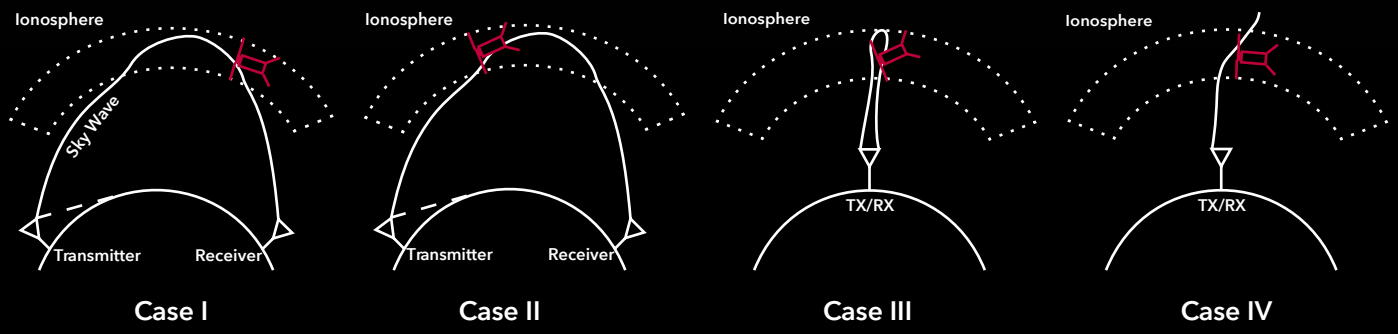
RF Instrument

blair3sat
contact@blair3at.com



Overview

SIRVLAS receives linear frequency modulated ionosondes at a variety of view geometries. Different view geometries must be handled in different ways. For example, if SIRVLAS receives an oblique ionosonde before "reflection," it may deduce a lower bound on charge density at the satellite's altitude, but it has insufficient data to deduce a complete charge density profile. However, if SIRVLAS receives a vertical ionosonde both when the signal goes up and when the signal comes back down, then SIRVLAS may deduce the complete charge density profile above the satellite.

HF Signal Chain

The RF instrument generates a template signal that represents SIRVLAS's best estimate of the transmitted ionosonde signal.

- Mode 1: template matches transmitted ionosonde perfectly
- Mode 2, 3: template is an arbitrary starting guess

The RF instrument mixes the ingested signal with the complex-conjugated template (match filtering), downsamples, and sends the resulting signal to the signal path corresponding to the operating mode:

1. Compute spectrogram (ionogram) and zoom to start time and frequency.
2. Estimate start time using the horizontal-only Hough transform.
3. Estimate start time and chirp rate using the complete Hough transform.

In Mode 1, the output of Signal Path 1 is immediately stored and downlinked. In Mode 2 and Mode 3, once desired parameters are estimated from Signal Path 2 and Signal Path 3, the template is adjusted to match the parameters and the circuit is toggled to Signal Path 1.