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PASSIVE DVB-T SAR USING SPACEBORNE RECEIVERS

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1. INTRODUCTION (MOTIVATION, GOAL & METHOD)

Passive DVB-T SAR using microsatellite spaceborne receivers (CubeSat standards) allows for the drastic reduction of platform costs, potentially allowing the creation of a persistent land-monitoring satellite constellation.

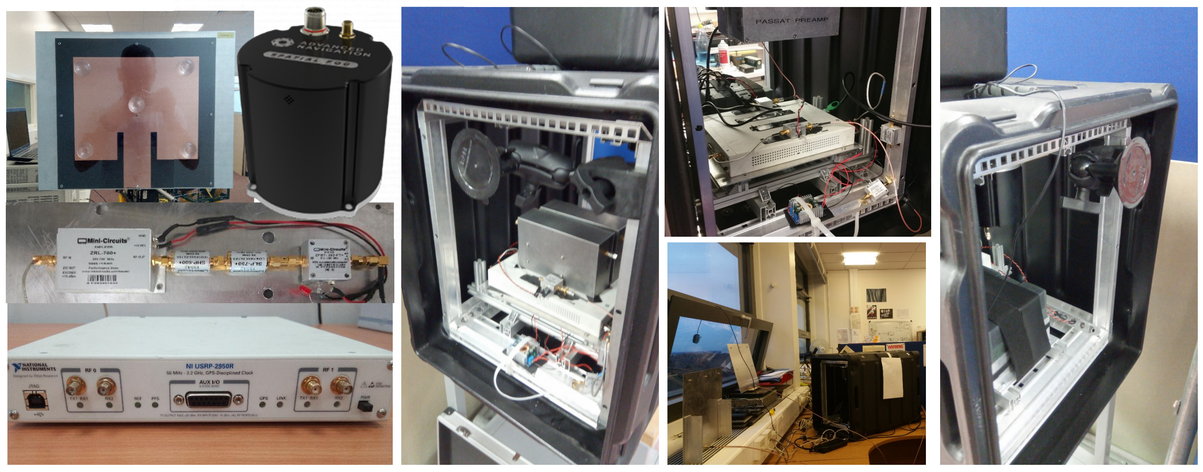
The goal of the project is to understand principles of DVB-T SAR image formation, properties of DVB-T SAR images, and investigate them experimentally using an airborne demonstrator.

Method of investigation is to gradually increase the experimental system complexity to resemble a spaceborne demonstrator as close as possible by first doing ground trials and airborne trials all the while supporting and verifying image formation methods via computer simulations.

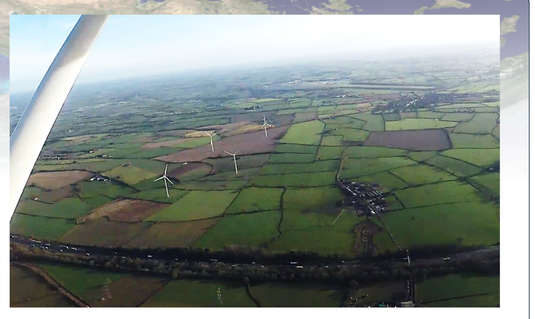
2. EXPERIMENTAL SETUP (AIRBORNE TRIALS)

Flight-ready SAR system consists of USRP, amplifiers, IMU, custom-built patch antennas and batteries to power it all for 2 hours. The whole system is contained within a shockproof and vibration-resistant box.

FLIGHT READY SAR SYSTEM

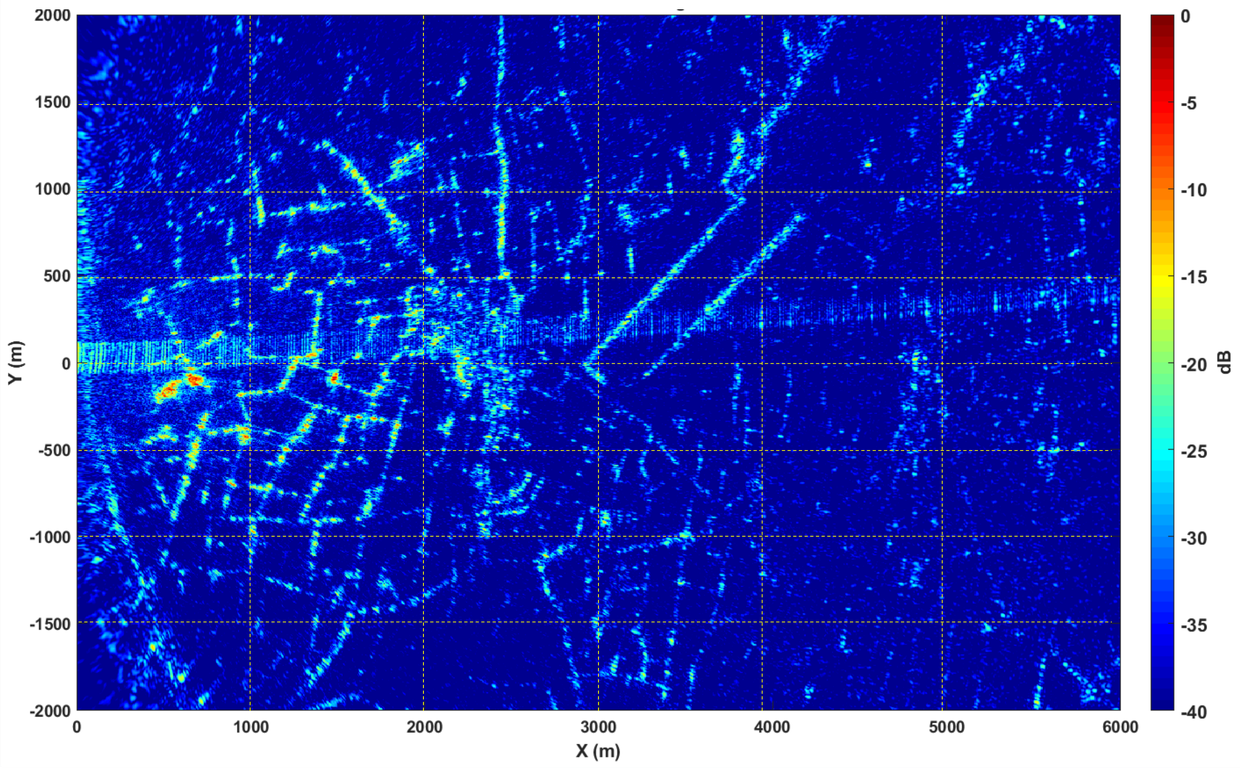


1ST AIRBORNE TRIALS



3. RESULTS (SAR IMAGES)

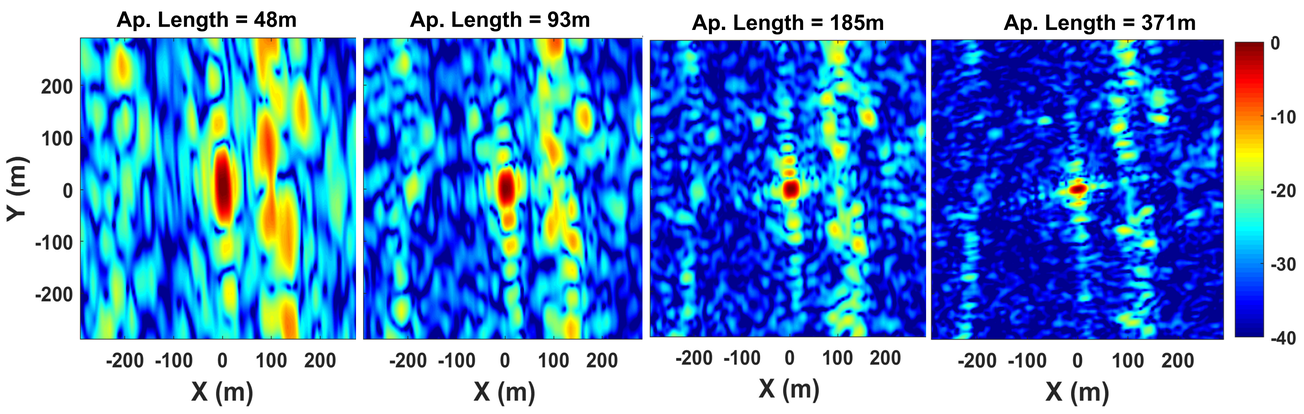
Below is a SAR image obtained from quasi-monostatic measurements made during airborne trials around Brunthingthorpe Aerodrome. Aperture length is about 185 meters which is the result of 2 seconds of coherent integration. The SAR image is presented with a Bing Maps image obtained programmatically by using the aperture centre coordinate and aircraft heading measured from IMU.

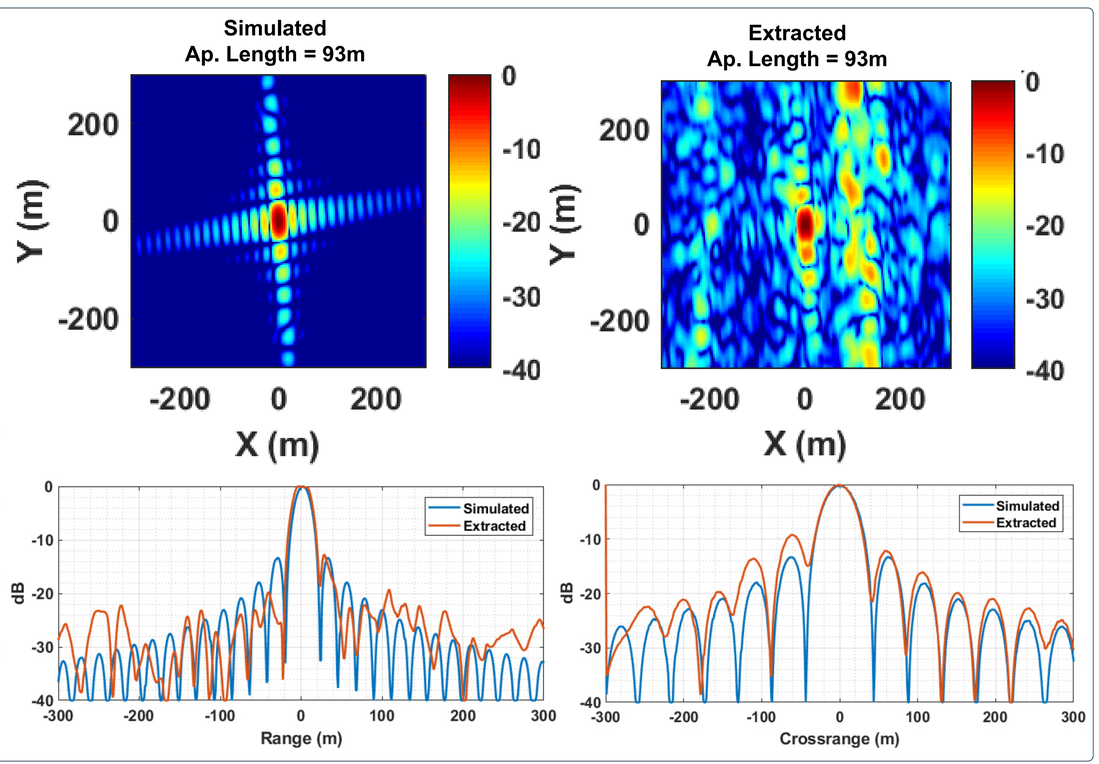


4. ANALYSIS (PSF EXTRACTS)

PSF extracts are shown below clearly showing the improvement with respect to increased integration time. The target shown below is a wind turbine at about 10km range.

And on the right side, side-by-side comparisons of simulated and extracted PSFs can be seen along with their range and crossrange cuts.





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