Performance Assessment of Airborne GNSS Reflectometry Experiments for Triton Satellite Mission

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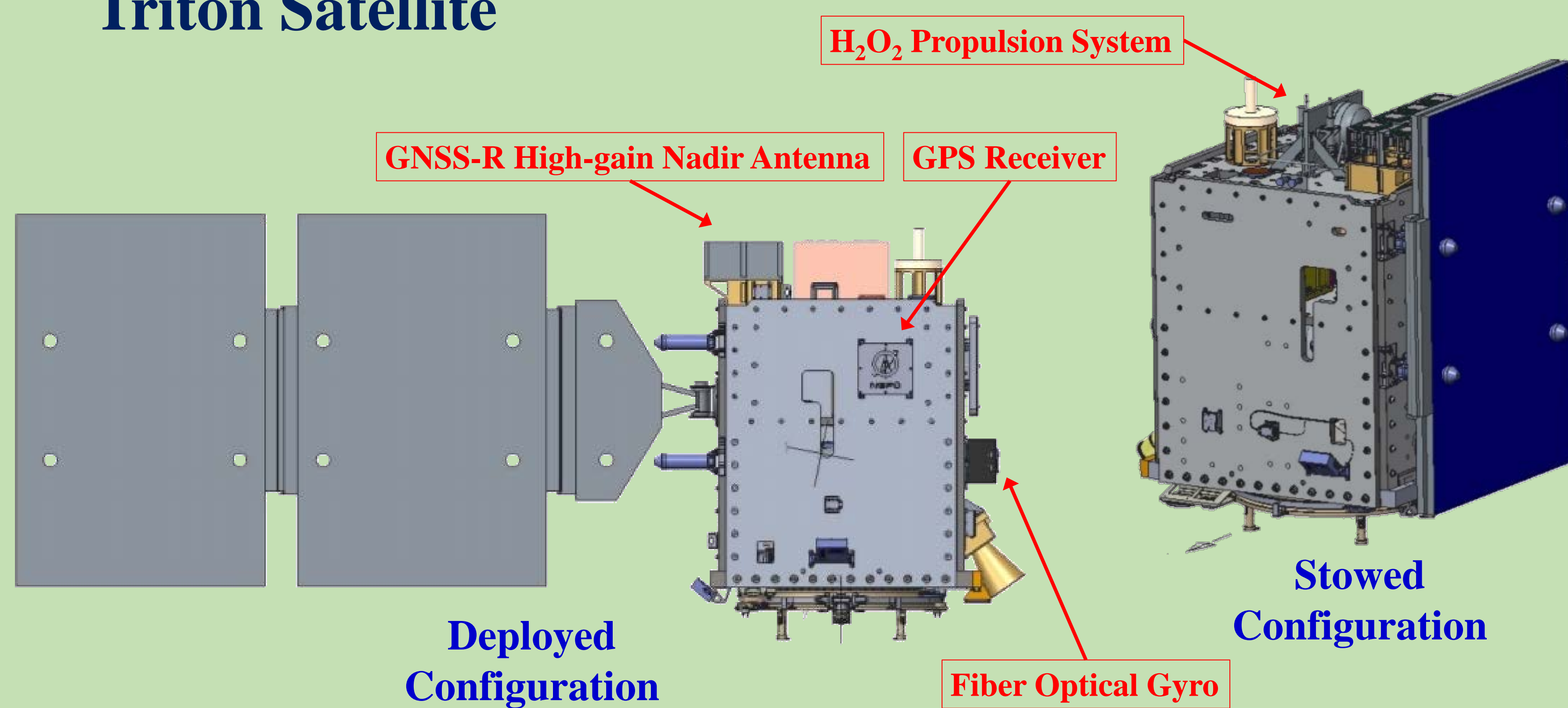[1] National Space Organization (NSPO), HsinChu, Taiwan
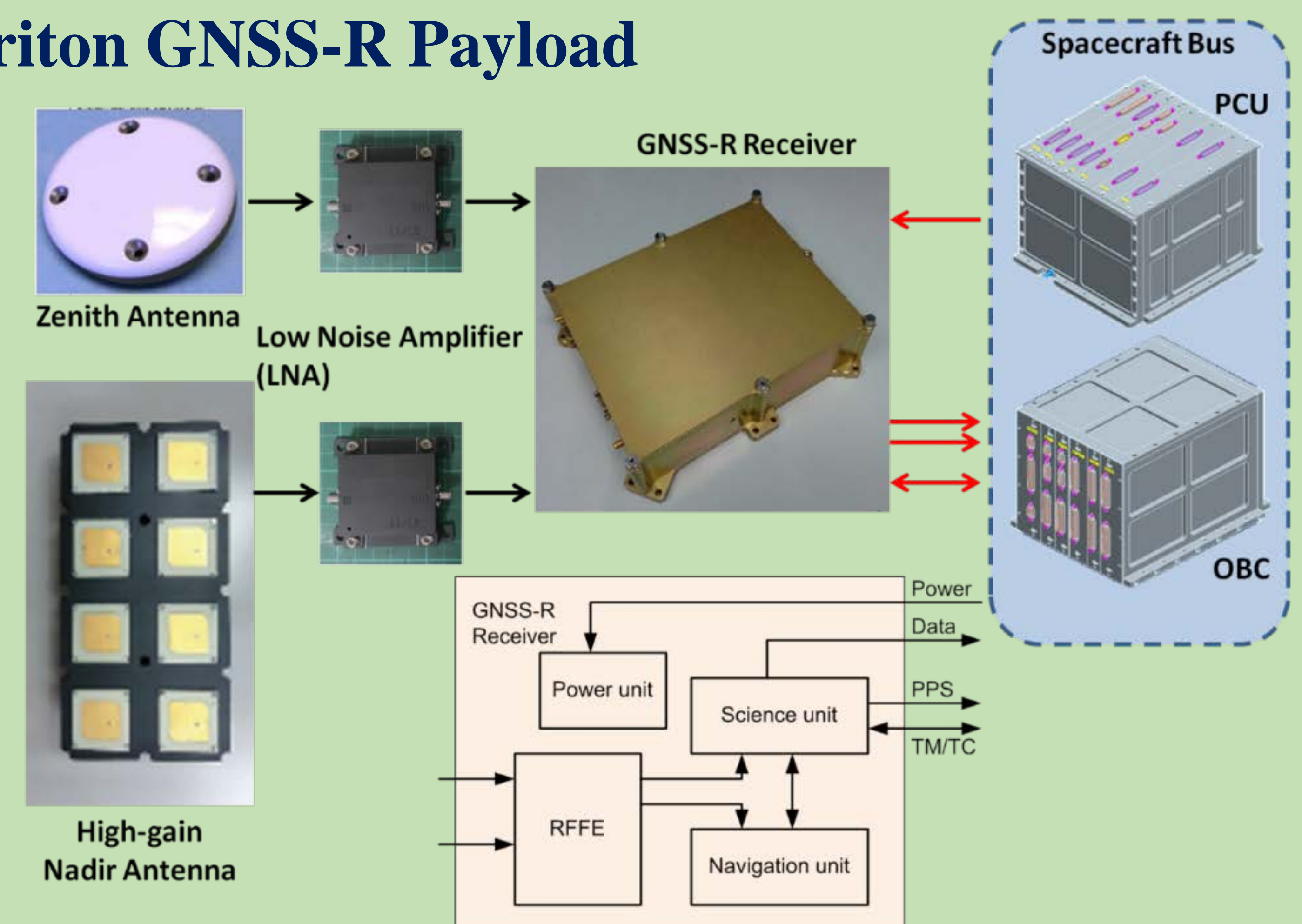[2] National Cheng Kung University, Tainan, Taiwan

Abstract

Beyond the functionality of navigation, Global Positioning System (GPS) or Global Navigation Satellite System (GNSS) is facilitated many remote sensing missions, such as GNSS radio occultation (GNSS-RO) and GNSS reflectometry (GNSS-R). In a GNSS reflectometry mission, the reflected signals are processed to form delay Doppler maps (DDMs) so that the properties including ocean surface roughness, vegetation, soil moisture, and so on can be retrieved. Recently, GPS reflectometry missions are realized by Surrey TDS-1 and NASA CYGNSS to demonstrate the capability of the GNSS-R technique for the measurement of ocean surface wind speed.

The design and development of National Space Organization (NSPO) in-house built GNSS-R receiver for the upcoming Triton satellite mission would be introduced. One distinguishable feature of the Triton GNSS reflectometry mission is its capability to process both GPS and QZSS reflected signals. In order to verify the design and performance of NSPO in-house built GNSS-R receiver, tests are deemed essential. The airborne tests and data analyses of the GNSS-R receiver are then discussed. The conclusions and updated status of the Triton satellite mission are described in the end.
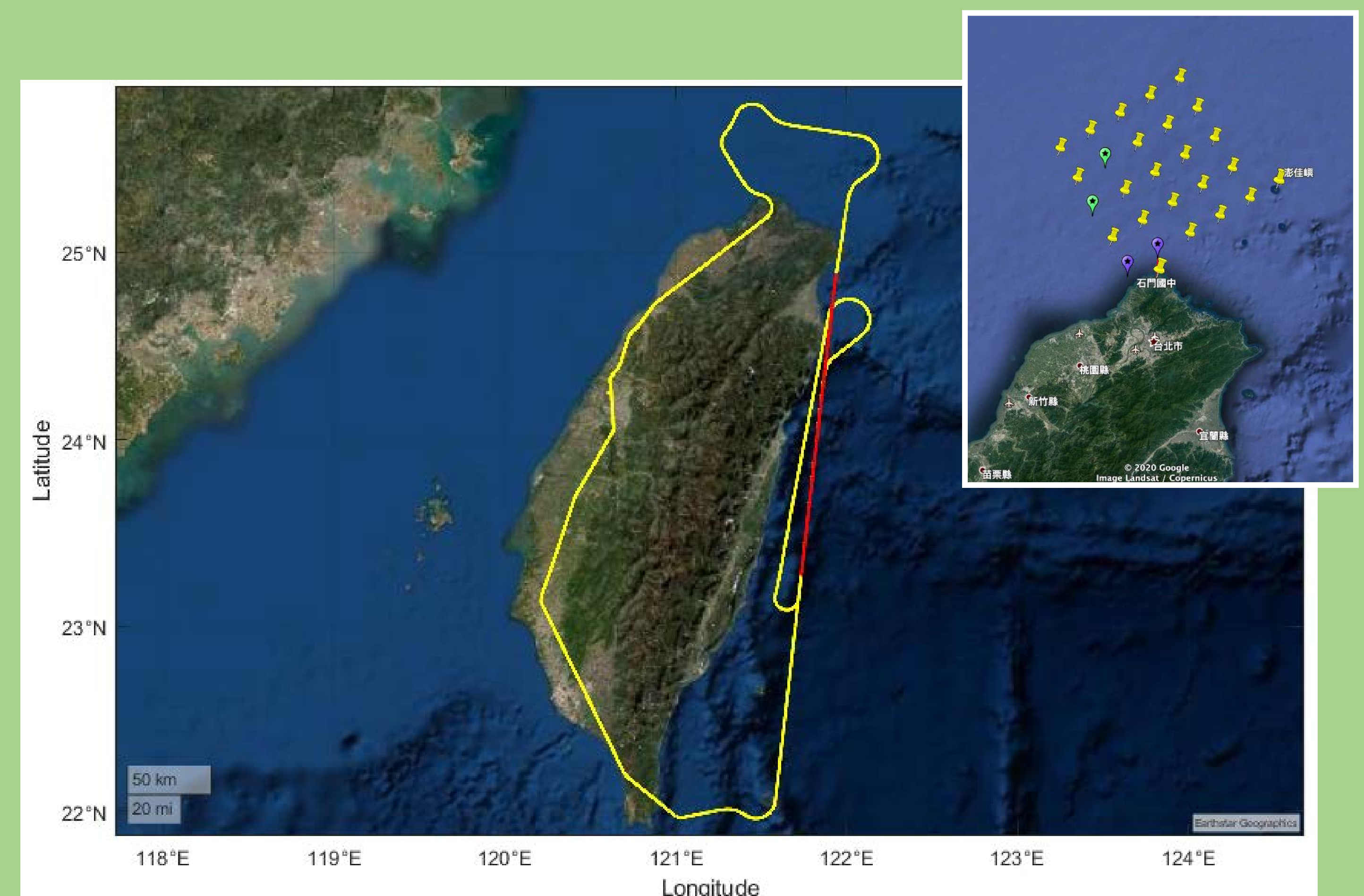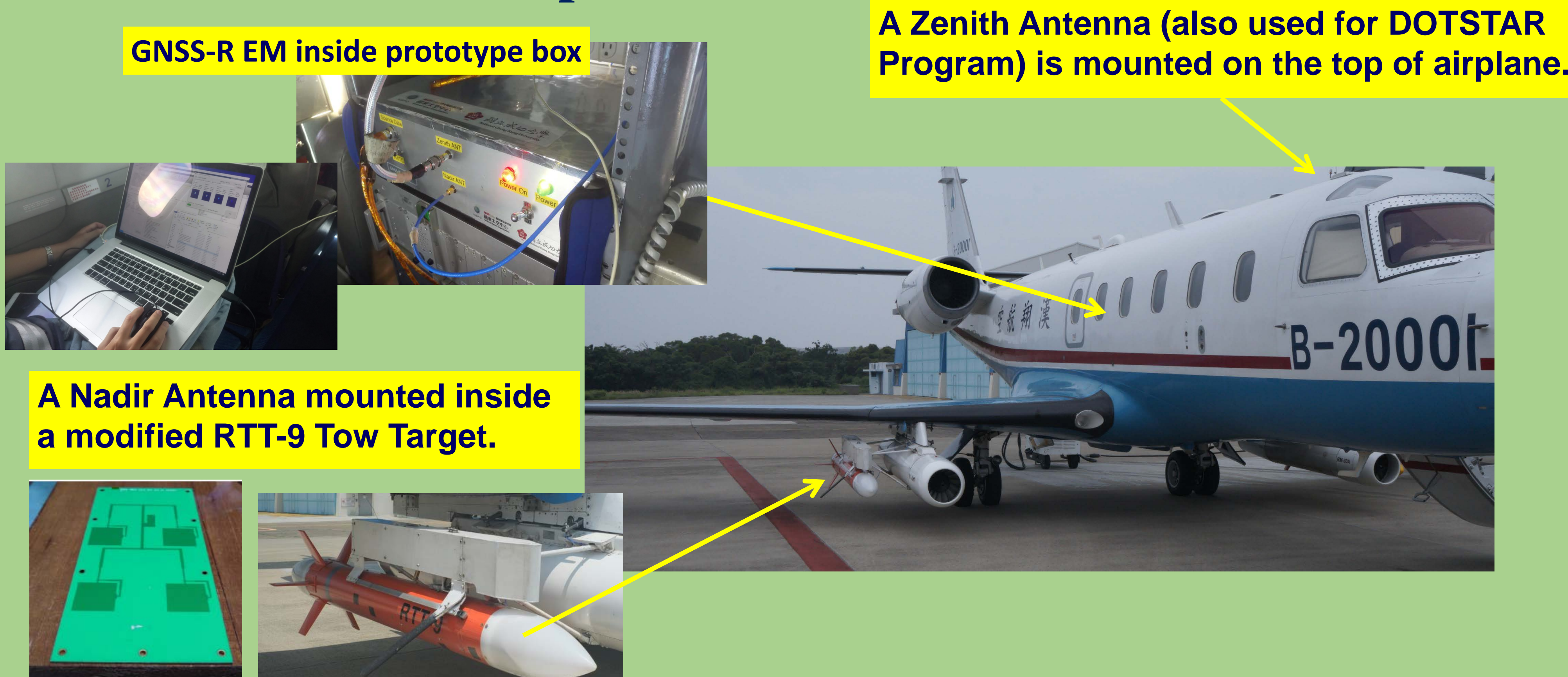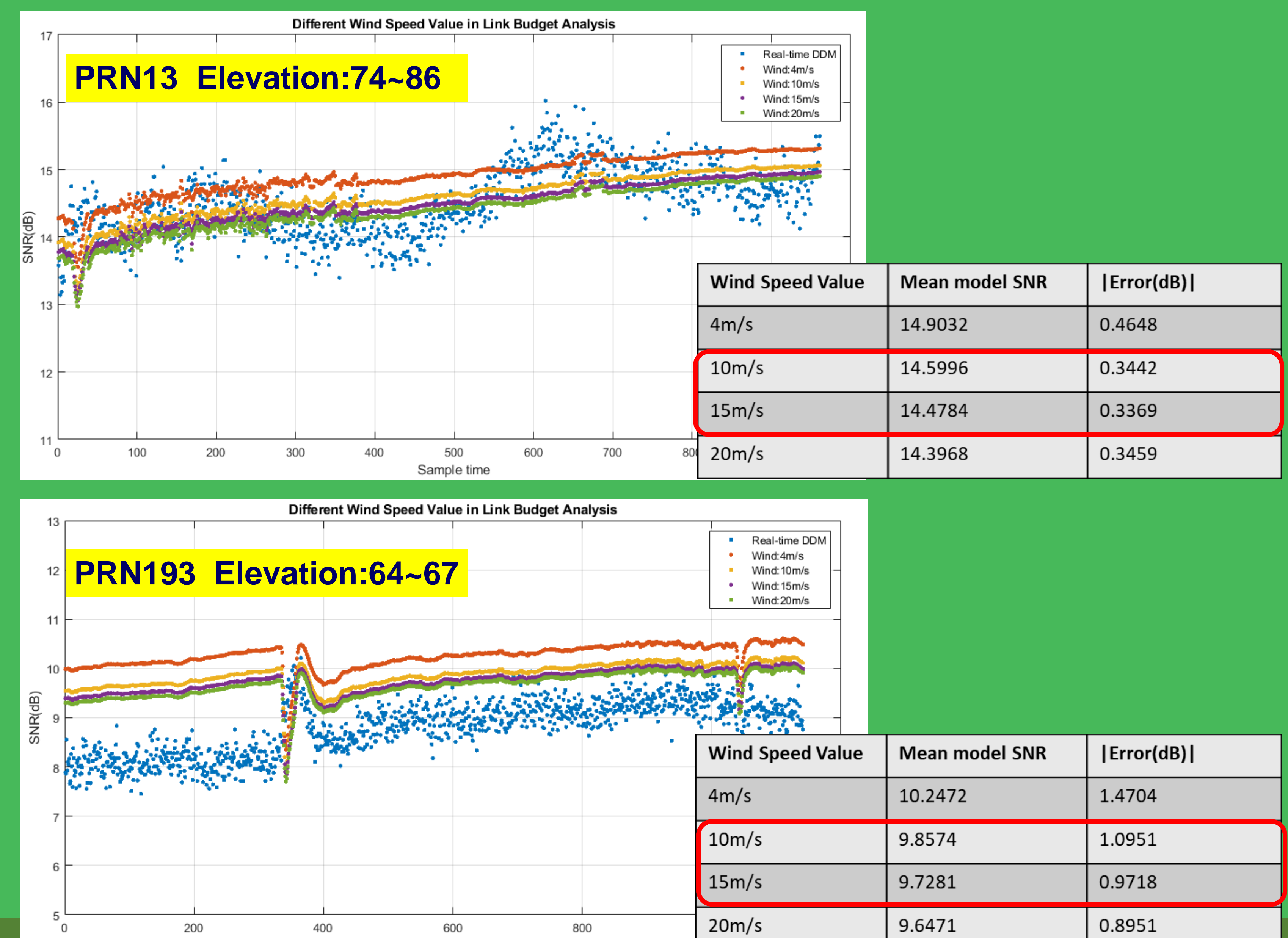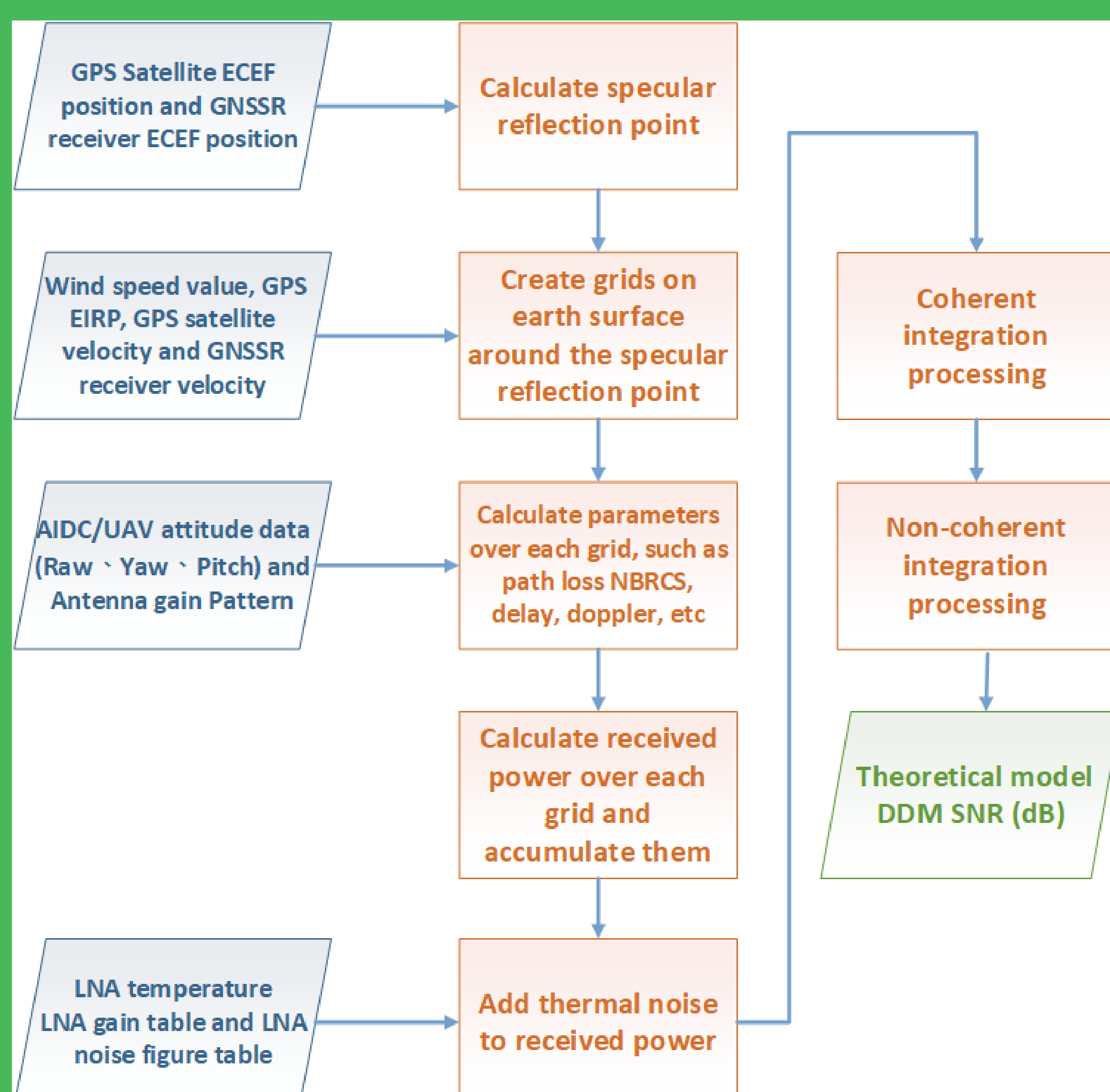
Triton Satellite

Triton GNSS-R Payload

Airborne GNSS-R Experiments

GNSS-R EM inside prototype box

A Zenith Antenna (also used for DOTSTAR Program) is mounted on the top of airplane.

A Nadir Antenna mounted inside a modified RTT-9 Tow Target.

Link Budget Analysis

Flight Direction

PRN13 Elevation:74~86

Wind Speed Value	Mean model SNR	|Error(dB)|
4m/s	14.9032	0.4648
10m/s	14.5996	0.3442
15m/s	14.4784	0.3369
20m/s	14.3968	0.3459

PRN193 Elevation:64~67

Wind Speed Value	Mean model SNR	|Error(dB)|
4m/s	10.2472	1.4704
10m/s	9.8574	1.0951
15m/s	9.7281	0.9718
20m/s	9.6471	0.8951

Conclusion:

1. The trend of model output SNR result is aligned with DDM SNR result.
2. The comparison result is around 1 dB difference.