



Application of NavIC for Precise Baseline Determination for Tandem SAR Satellites operation

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Outline

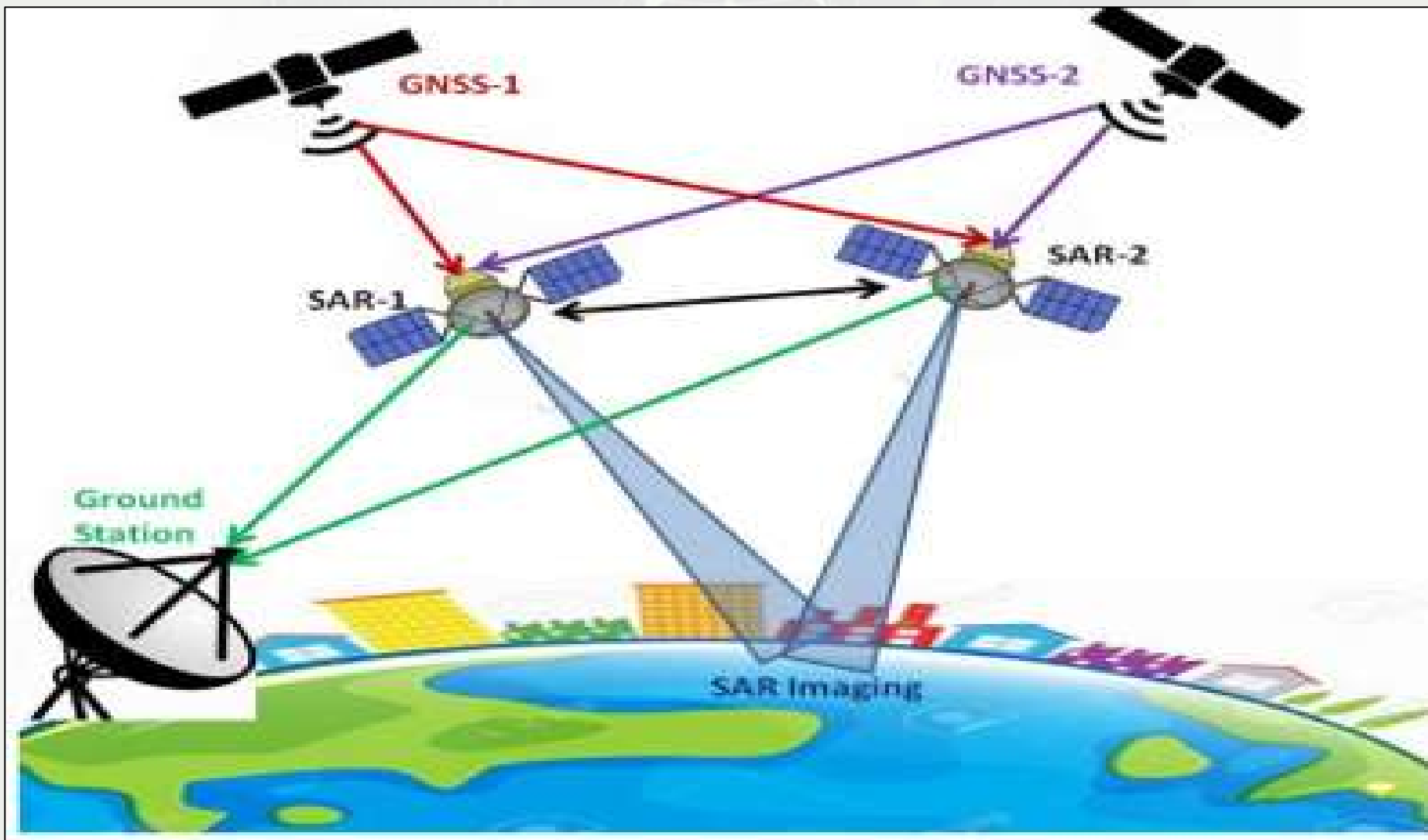
- Principle of Precise Baseline Determination for Tandem SAR satellites
- Operational block diagram
- Salient Features/Specifications
- In-House Hardware development
- Algorithm development for high precision baseline determination

Principle of PBD for Tandem SAR



- Determination of accurate baseline vector between the two satellites is very important for meaningful tandem SAR operation.
- Tandem SAR payloads employ High Precision GNSS Receivers on board for baseline estimation.
- The GNSS receiver on each SAR satellite takes its position reference from the GNSS & NavIC satellites.
- Also, the two SAR satellites are interlinked with each other to share respective positions.
- Further, both the SAR satellites can downlink positional information to ground stations.
- Differential GNSS concept, carrier phase measurement & High precision orbit determination techniques are applied to achieve centimeter level accuracy.

Differential GNSS concept for Tandem SAR

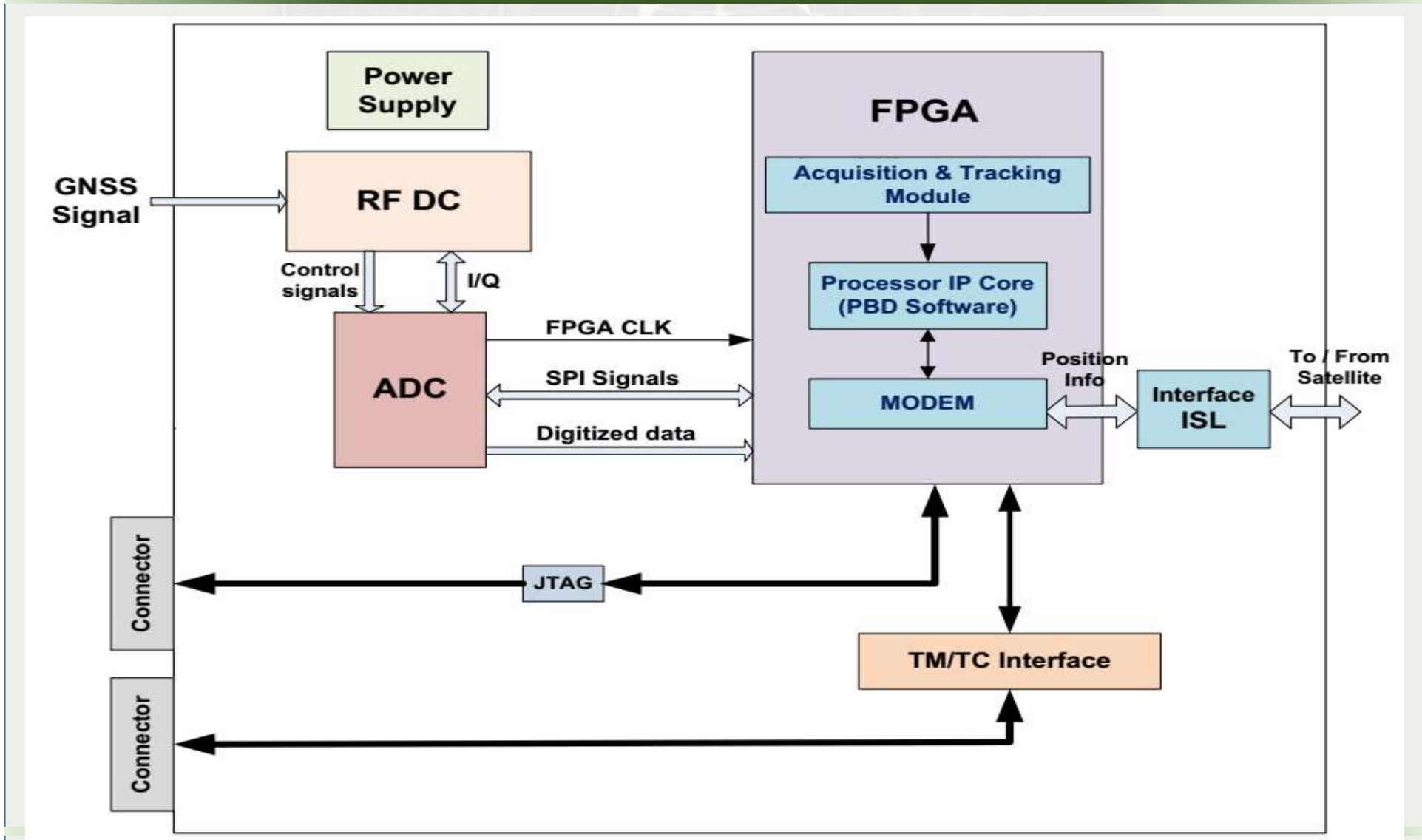


Target Salient Features/Specifications



- Dual frequency Multi-GNSS receiver for precise orbit determination & baseline estimation for Tandem SAR satellites in lower earth orbit.
- Supports GPS & NavIC System; Target Accuracy : < 10cm.
- Provides precise 1 pps timing signal, for operation of other sub-systems.
- System is based on an High density radiation tolerant FPGA with 32 bit fault tolerant processor as IP Core & MIL-STD-1553B IP Core for reliable control interface.
- In-House hardware development with optimized resources.
- Inter-Satellite Link (ISL) for interchange of position between satellites.

In-House Hardware development Approach



High Precision Orbit / Baseline Determination Algorithm

I/P : GNSS & NavIC Observations from on-board GNSS Receiver

O/P : Precise Orbit & Baseline Solution

Major Functional Modules in Algorithm

- Pseudo range & Carrier phase based positioning
- Double differential integer ambiguity resolution
- Implementation Dynamic Force Models
- Numerical Integration of equation of motion & Orbit Propagation
- Dynamic Batch Filter & Extended Kalman Filter

Verification of the Algorithm

- By using Data from Tandem operations like GRACE mission.

