Small SAR Satellite
Using Small Standard Bus

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Contents

1. Concept of Our Small SAR Satellite
2. ASNARO System Outline
3. Small SAR Satellite System
4. Conclusion
1. Concept of Our Small SAR Satellite

- NEC has started the development of a new Small SAR Satellite
- This is one of small earth observation satellite series using our small standard bus “NEXTAR-300L”
2. ASNARO System Outline

- ASNARO is a small low earth orbit satellite for the earth observation.
- The sensor is optical imager and the ground sample distance from 504km altitude is less than 0.5m at panchromatic band.
- Satellite total mass is approx. 450kg (including propellant).
- ASNARO is scheduled to be launched in FY2012 (tentative).
3. Small SAR Satellite System
(1) Outline

- Small SAR Satellite is a small low earth orbit satellite for the earth observation
- The sensor is **SAR** (Synthetic Aperture Radar) and the highest resolution is less than 1m
- Satellite total mass is **less than 500kg** (including propellant)
- Small SAR Satellite is scheduled to be launched in FY2014 (tentative)
3. Small SAR Satellite System
(2) Configuration

- Deployable Parabolic Antenna
- Offset Feed

Standard Satellite Bus "NEXTAR-300L"

Solar Array Paddle

SAR Antenna

Antenna Diameter Approx. 3m

SAR feeder

Data Transmission Antenna

Satellite Bus

SAR Mission Module
3. Small SAR Satellite System

(3) Observation Modes

Observation modes consist of:
- Stripmap Mode
- Sliding Spotlight Mode
- Scan SAR Mode

Stripmap Mode
Conventional mode

Range swath 10km

Sliding Spotlight Mode
for less than 1m resolution

Range swath 10km

Scan SAR Mode
for wide swath

Range swath 30km

Azimuth swath 10km
Range resolution <1m is achieved by adopting the following techniques:

- The Satellite-Mounting Technique (applied to ALOS / PALSAR)
- The Wide Band Signal Generation / Processing Technique (applied to Pi-SAR2)

Azimuth resolution <1m is achieved by adopting the following technique:

- The Sliding Spotlight Observation Technique (applied to Pi-SAR2)
3. Small SAR Satellite System
(4) High Resolution of Less Than 1m (2/4)

The Satellite-Mounting Technique

- NEC has mounted the technique of airborne Pi-SAR on ALOS / PALSAR before.
- This time, we will apply the same method to our new Small SAR Satellite.

Pi-SAR
- X-Band / L-Band Frequency
- Airborne SAR

ALOS / PALSAR
- L-Band Frequency
- Spaceborne SAR
3. Small SAR Satellite System
(4) High Resolution of Less Than 1m (3/4)

The Wide Band Signal Generation / Processing Technique

- High Range resolution for SAR requires Wide Band Frequency
- This technique has already been applied to Pi-SAR2 and is also applied to Small SAR Satellite
- The trial manufacturing for Small SAR Satellite had been developed and the feasibility was confirmed

Pi-SAR2
- X-Band Frequency
- The Highest Resolution 0.3m
- Airborne SAR

Small SAR Satellite
- X-Band Frequency
- The Highest Resolution <1m
- Spaceborne SAR
3. Small SAR Satellite System
(4) High Resolution of Less Than 1m (4/4)

**The Sliding Spotlight Observation Technique**

- High Azimuth resolution is achieved by Sliding Spotlight observation technique
- Sliding Spotlight observation uses beam steering in azimuth direction to increase the illumination time
- This technique has already been achieved by Pi-SAR2

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**Sliding Spotlight Mode** for less than 1m resolution

- Range swath: 10km
- Azimuth swath: 10km
Satellite Total Mass <500kg
is achieved by mounting SAR Mission Module (<200kg) with NEXTAR-300L(<300kg including propellant)

• Reduction of the SAR antenna mass is significant to reduce the mass of the SAR mission module

• It is achieved by adopting a simple and light mass antenna
3. Small SAR Satellite System
(5) Small Mass of Less Than 500kg (2/2)

The Simple and Light Mass Antenna

- SAR antenna of Small SAR Satellite is a Deployable Parabolic Antenna (approx. 30kg)
- This antenna uses the flight proven technique of the Large Deployable Parabolic Antenna adopted for ETS-VIII

ETS-VIII  

1 cell  

Small SAR Satellite
 NEC has started the development of the new Small SAR Satellite using our small standard bus NEXTAR-300L

Small SAR Satellite has the following features;
- High resolution of less than 1m
- Small mass of less than 500kg (including propellant)

Small SAR Satellite observes the earth’s surface with high resolution and high S/N as the same level as those of large or middle size SAR satellites

Small SAR Satellite is expected to be launched in FY2014 (Tentative)
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