

Country Report from Japan

Quasi-Zenith Satellite System

Program Updates

- referring to the JAXA's Official presentation -

The Space-based PNT Advisory Board

5-6 November, 2009 at Alexandria, VA

Hiroshi Nishiguchi

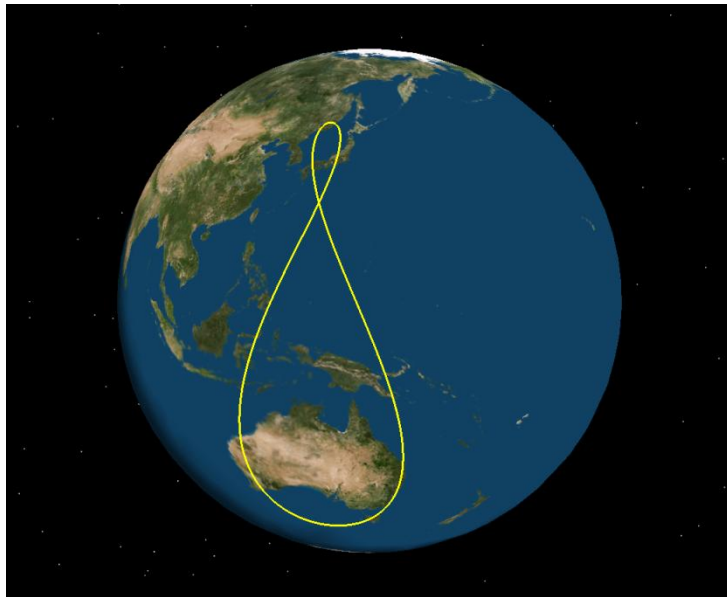
Japan GPS Council

I. System Description



Concept of the QZSS (1/2)

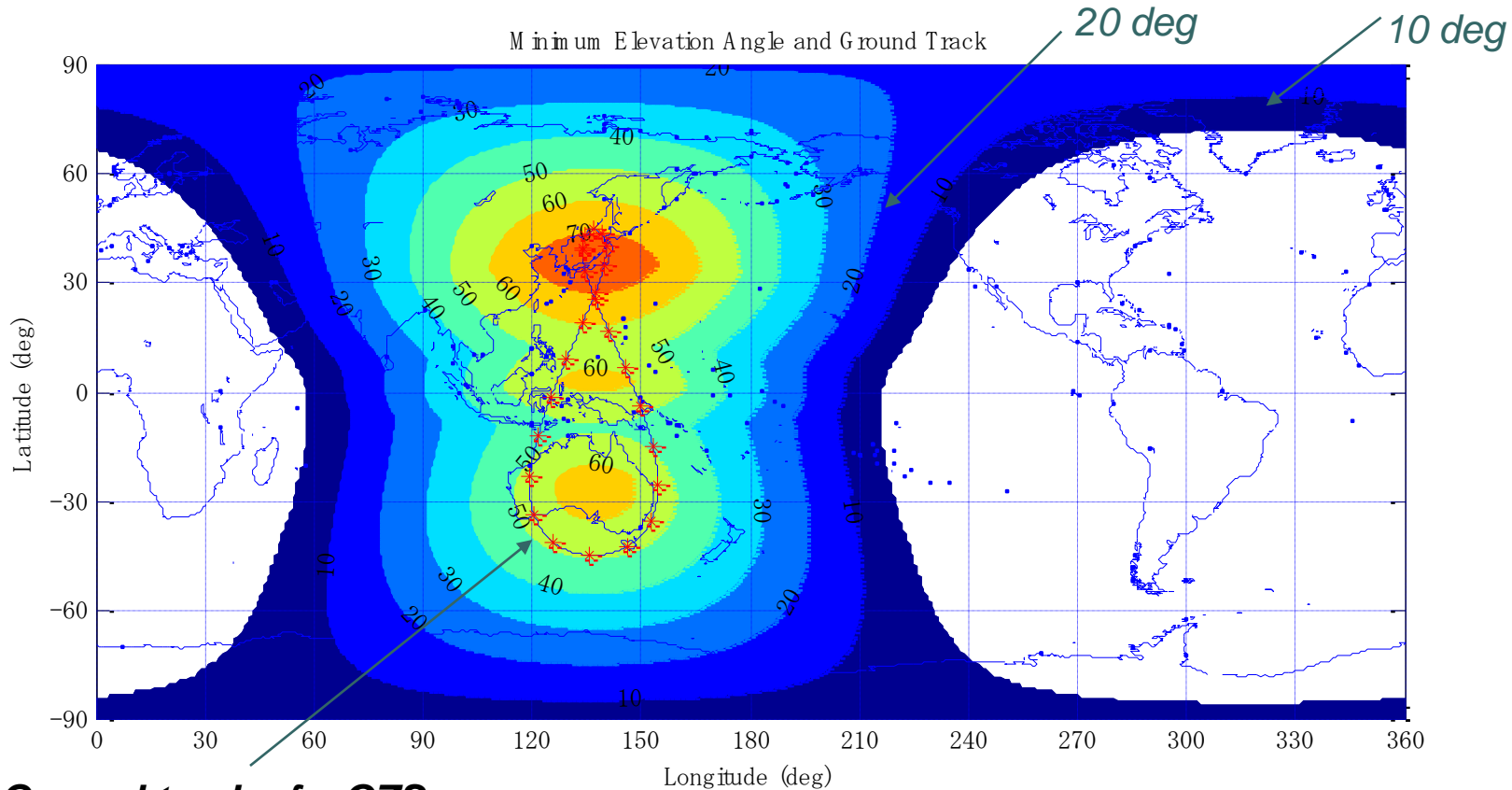
- 3 satellites in elliptical and inclined geosynchronous orbits ($a=42,164\text{km}$, $e=0.06-0.09$, $i=39-47\text{deg}$, $\Omega=120\text{deg}$ apart)
- at least one satellite exists near zenith over Japan



QZSS Ground Track



Expected Performance - Service Area -



Ground track of a QZS

Minimum Elevation Contour for 3 QZS over 24 hours

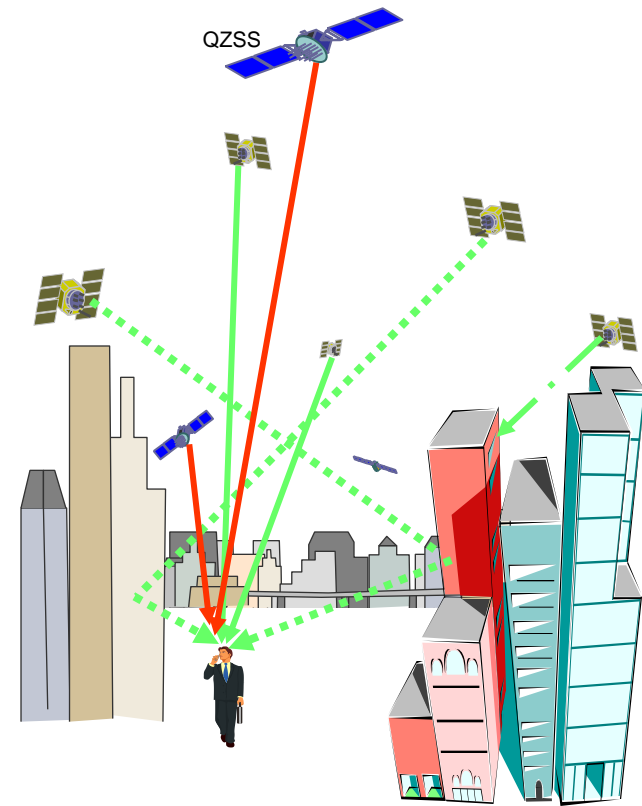
** for maximum elevation of visible satellites*

I. System Description



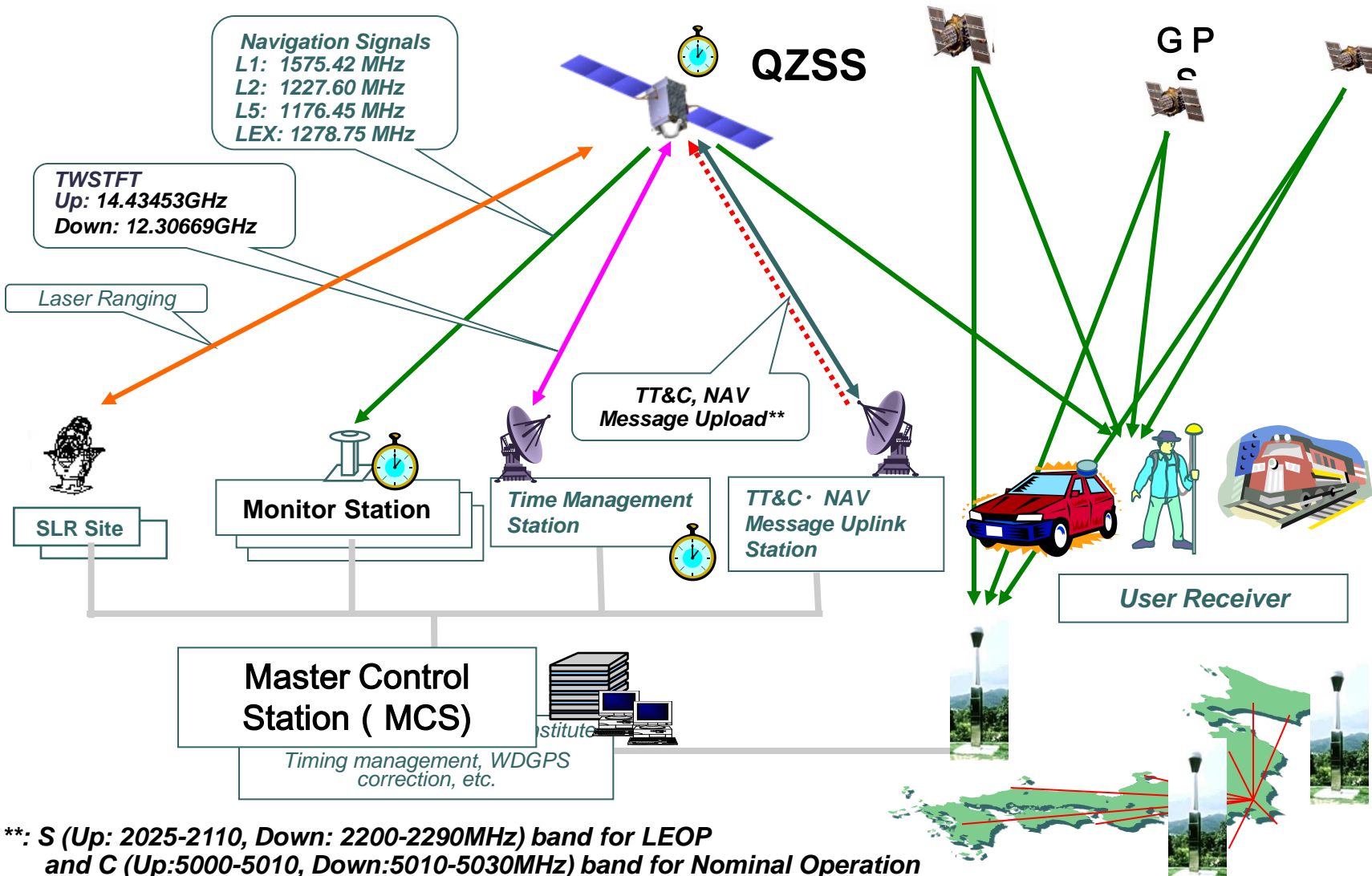
Concept of the QZSS (2/2)

- **seamless** service from high elevation angle
- **Increased PNT availability** (downtown, mountainous areas)



I. System Description

System Architecture



**: S (Up: 2025-2110, Down: 2200-2290MHz) band for LEOP and C (Up:5000-5010, Down:5010-5030MHz) band for Nominal Operation

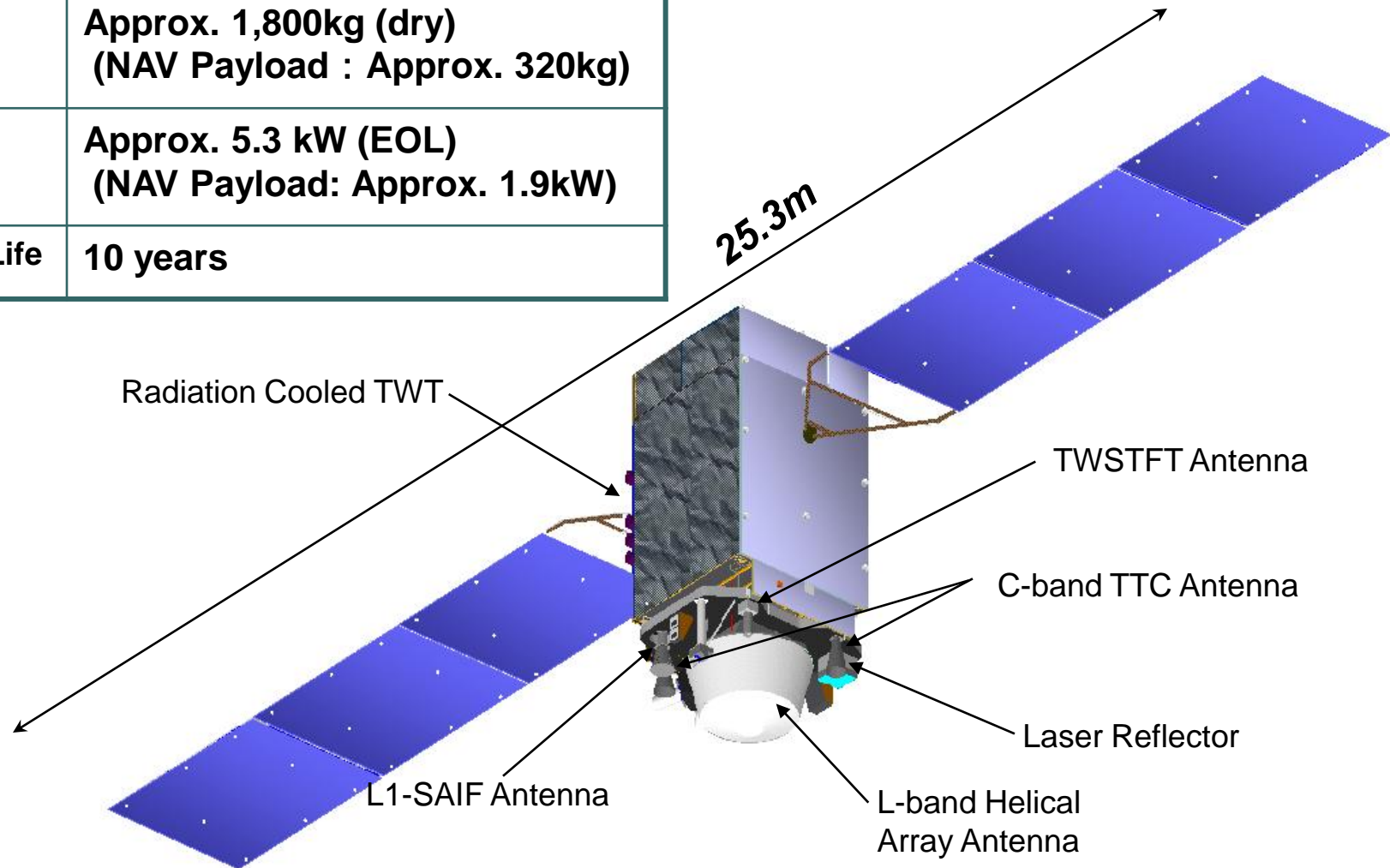
SLR: Satellite Laser Ranging, TWSTFT: Two Way Satellite Time and Frequency Transfer

I. System Description



Space Segment - QZS-1 -

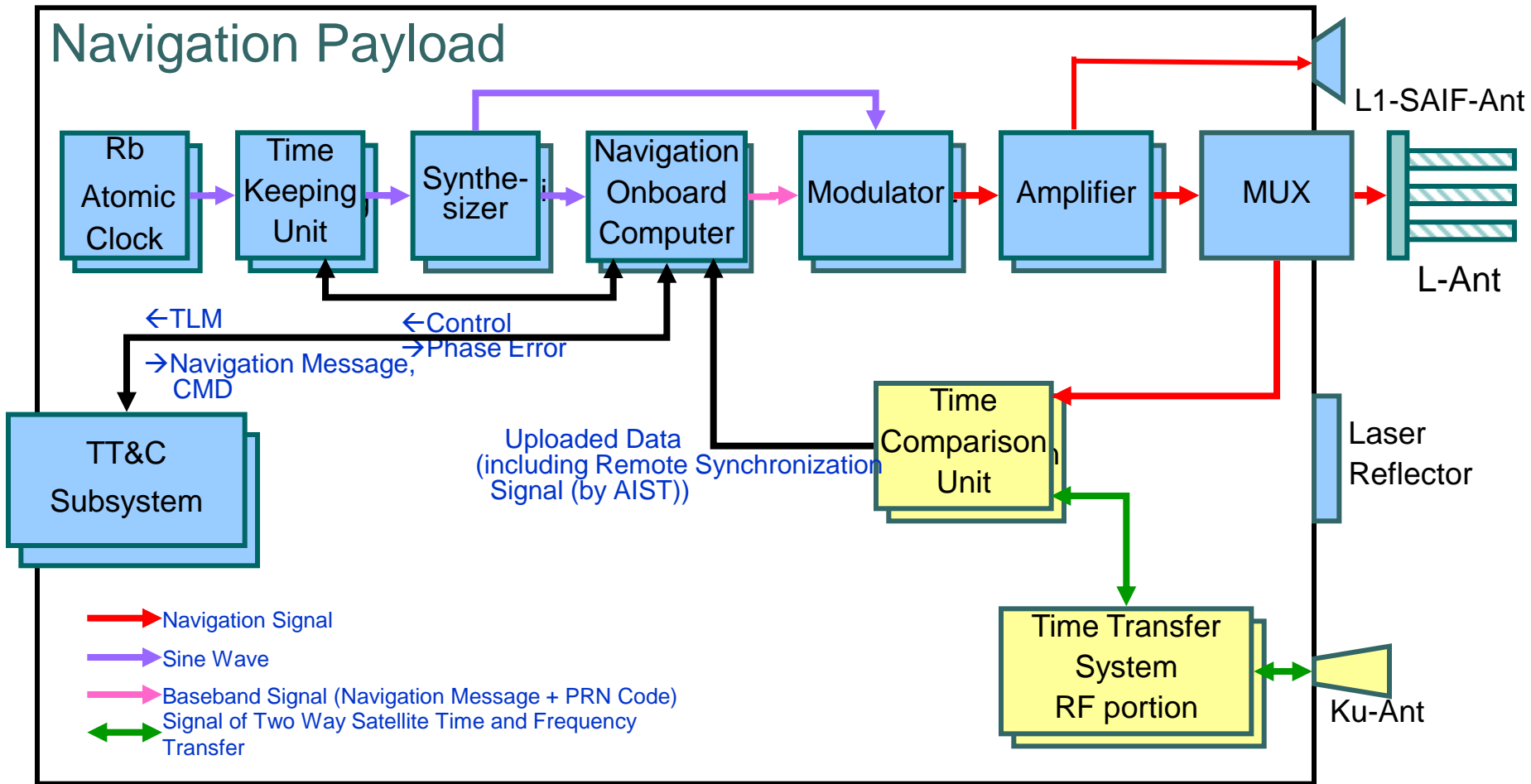
Mass	Approx. 1,800kg (dry) (NAV Payload : Approx. 320kg)
Power	Approx. 5.3 kW (EOL) (NAV Payload: Approx. 1.9kW)
Design Life	10 years



Satellite Configuration on Orbit

I. System Description

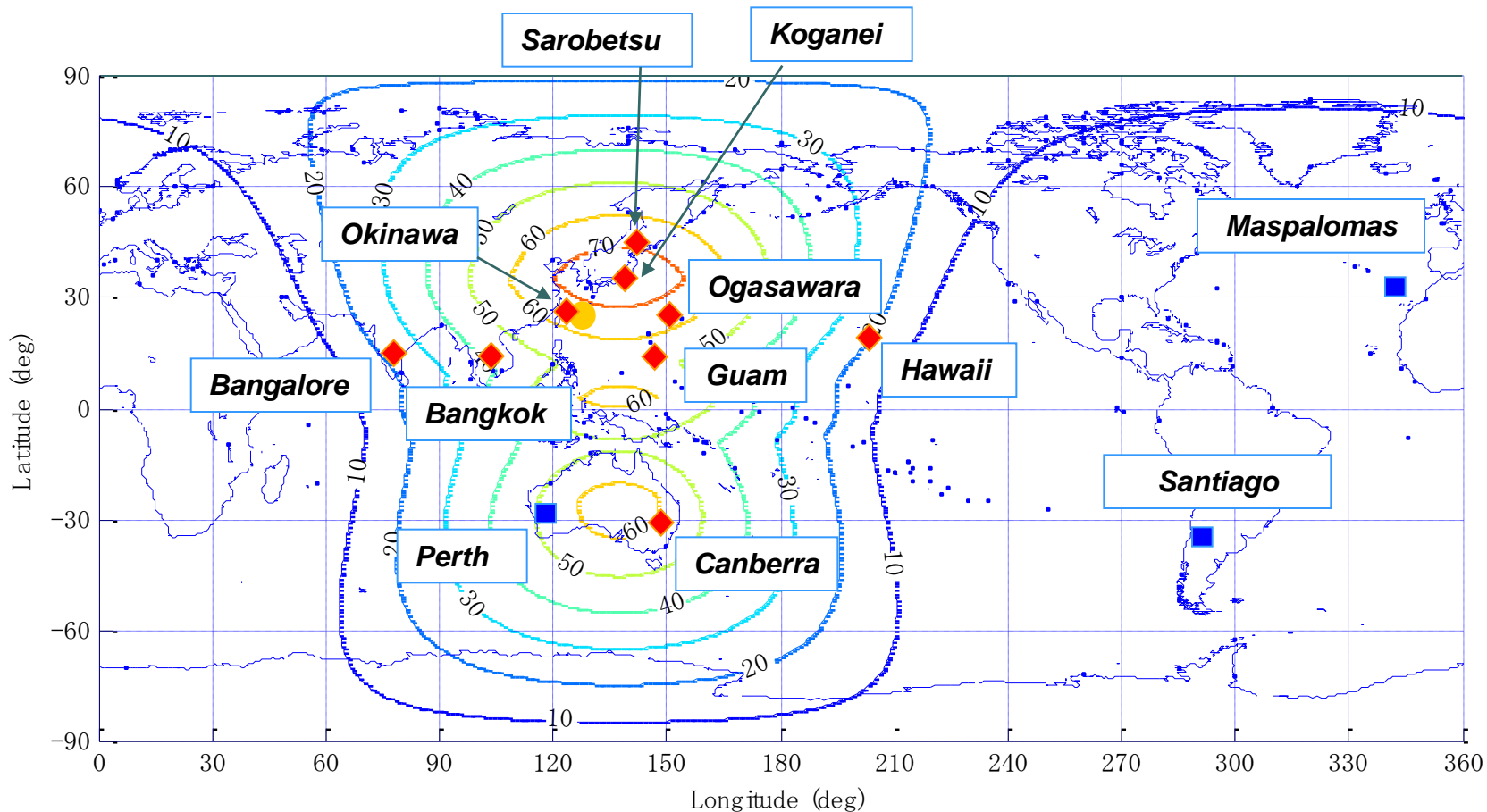
Navigation Payload on the QZS-1



JAXA NICT
(previously: CRL)

I. System Description

Ground Segment



- GPS MS site
- ◆ QZSS & GPS MS site
- TT&C NAV Message Uplink Station

Okinawa is primary TT&C station for nominal operation.

LEOP operation is to be conducted by using JAXA Ground TT&C Network

Planned Signals

	Frequency	Notes
L1-C/A	1575.42MHz	<ul style="list-style-type: none">• Complete compatibility and interoperability with existing and future modernized GPS signals
L1C		
L2C	1227.6MHz	<ul style="list-style-type: none">• Differential Correction data, Integrity flag, Ionospheric correction• Almanac & Health for other GNSS SVs
L5	1176.45MHz	
<i>L1-SAIF*</i>	1575.42MHz	<ul style="list-style-type: none">• Compatibility with GPS-SBAS
<i>LEX</i>	1278.75MHz	<ul style="list-style-type: none">• Experimental Signal with higher data rate message (2Kbps)• Compatibility & interoperability with Galileo E6 signal

* L1-SAIF: L1-Submeter-class Augmentation with Integrity Function

IV. Summary

- ❑ QZSS is a Japanese regional Space-based PNT System
 - ❑ Enhance GPS capability
 - ❑ High level interoperability with GPS
- ❑ QZSS is being developed by step by step manner
 - ❑ First satellite (QZS-1) will be launched in Summer of 2010
- ❑ Proto-Flight test of QZS-1 is in process as planned.
- ❑ The User Interface document, IS-QZSS ver. 1.1 is available on

http://qzss.jaxa.jp/is-qzss/index_e.html.

The US Strong Mind for Sustainability of Consistent GPS Service Policy

- 1996.3 : Clinton PDD
 - Gave us **“Peace of mind”** for GPS Civil Use
- 1998.9 : Clinton/Obuchi Joint Statement
 - Gave us **“Reliability”** for commercialization of GPS applications
- 1998.10 : Gazette of “Commercial Space Law” including PDD
 - Gave us **“Real Trust”** for GPS Civil Use in Worldwide
 - Moved to full bloom of Car-Navi Market cherry blossoms
- 2004.12 : Bush PDD
 - Gave us **“Truth of Unchanged Policy”** even if President Change

Thank you for the US generous contribution to the international GNSS community.