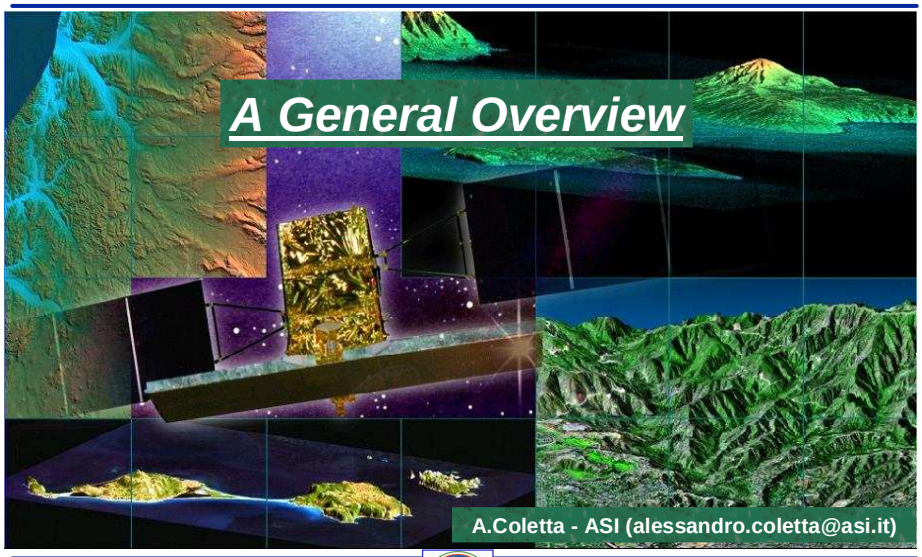
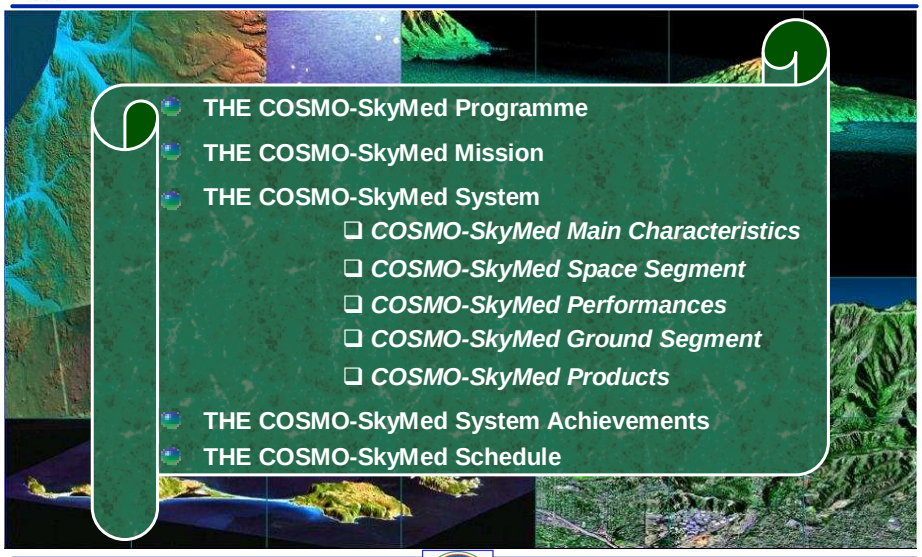
The COSMO-SkyMed System



A General Overview

A.Coletta - ASI (alessandro.coletta@asi.it)

The COSMO-SkyMed System



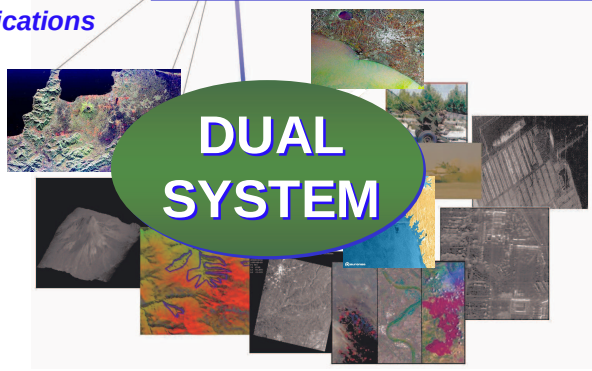
- THE COSMO-SkyMed Programme
- THE COSMO-SkyMed Mission
- THE COSMO-SkyMed System
  - ❑ *COSMO-SkyMed Main Characteristics*
  - ❑ *COSMO-SkyMed Space Segment*
  - ❑ *COSMO-SkyMed Performances*
  - ❑ *COSMO-SkyMed Ground Segment*
  - ❑ *COSMO-SkyMed Products*
- THE COSMO-SkyMed System Achievements
- THE COSMO-SkyMed Schedule

THE COSMO-SkyMed Programme

The Italian Earth Observation Constellation for:

- *Civil Institutional*
- *Defence/Intelligence*
- *Commercial*
- *Applications*

engaging all the state-of-art technologies and engineering solutions, under economical, schedule and political constraints



THE COSMO-SkyMed Programme

COSMO-SkyMed System is:

- A national program funded by Italian Ministry of Research and Italian Ministry of Defence.
- Managed by Italian Space Agency (ASI) in coordination with Italian Ministry of Defence.
- The Radar Component (metric and sub-metric capability) of the IT/FR Intergovernmental Agreement on "*Earth Observation*".
- Developed by the Italian National Industry.

Major USERS
Needs and Indications

THE COSMO-SkyMed Programme
DUAL USE NEEDS

Civilian
- Several Disciplines: Agriculture, Forest, Geology, Environment, Cartography, etc.
- Open and Accessible System

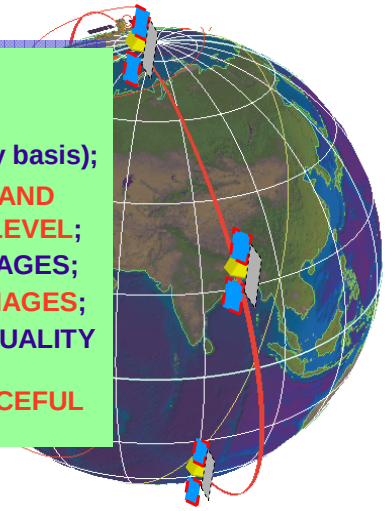
Defense
- Priorities Management
- Confidentiality and Integrity
- Protected System

Common
- Wide information collection (Database)
- Flexibility
  - ✓Multi-mode operation (variety of sizes and resolutions)
  - ✓Agility (reconfiguration and multiple acquisitions on a theater)
- High Reactivity
  - ✓Response / Revisit Time
- Availability & Sustainability of Services

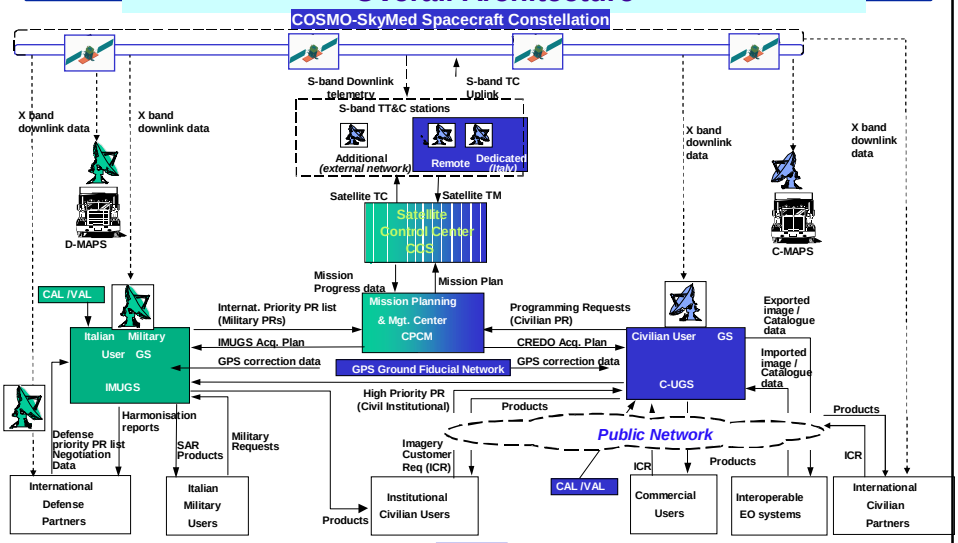
THE COSMO-SkyMed MISSION

MISSION MAIN CHARACTERISTICS

- GLOBAL COVERAGE ALL-WEATHER;
- REVISIT TIME OF FEW HOURS;
- VERY SHORT RESPONSE TIME (on daily basis);
- CONFIDENTIALITY OF MISSION PLANS AND DATA AT BOTH SPACE AND GROUND LEVEL;
- HIGH VOLUME OF DAILY ACQUIRED IMAGES;
- HIGH GEOLOCATION ACCURACY OF IMAGES;
- HIGH RESOLUTION AND HIGH IMAGE QUALITY PRODUCTS;
- STAGGERED DEPLOYMENT AND "GRACEFUL DEGRADATION"

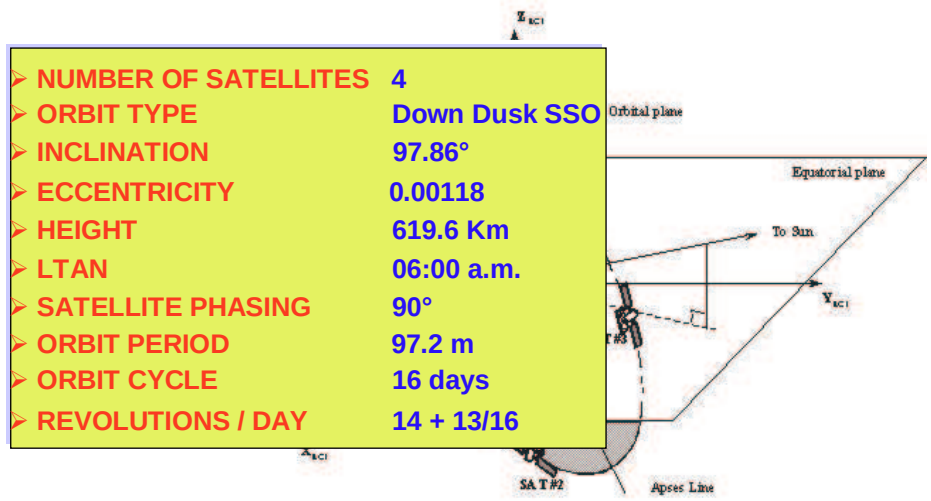


The COSMO-SkyMed System Main Characteristics: Overall Architecture



The COSMO-SkyMed System Main Characteristics: Constellation Snapshots

- NUMBER OF SATELLITES 4
- ORBIT TYPE Down Dusk SSO
- INCLINATION 97.86°
- ECCENTRICITY 0.00118
- HEIGHT 619.6 Km
- LTAN 06:00 a.m.
- SATELLITE PHASING 90°
- ORBIT PERIOD 97.2 m
- ORBIT CYCLE 16 days
- REVOLUTIONS / DAY 14 + 13/16

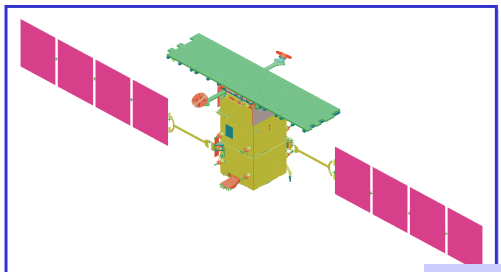


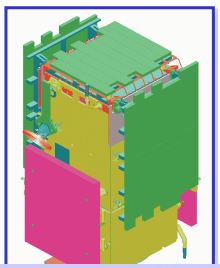
THE COSMO-SkyMed Space Segment

SATELLITE SNAPSHOTS

- SAR PAYLOAD X-BAND (9.6 GHz)
- WET MASS @ LAUNCH 1740 Kg
- ATTITUDE STABILIZATION 3 AXES
- RIGHT / LEFT LOOKING CAPABILITY
- NAVIGAT. & TIME REFER. GPS
- OPERATIONAL AUTONOMY ≥ 24 H
- IMAGING CAPABILITY MULTIMODE
- MAX POINTING ERROR 1 km
- DOWN-LINK DATA RATE 310 Mbps (2x155 Channels)
- ON-BOARD MEMORY 320 Gbit EOL
- S/L OPERAT. LIFETIME 5 YEARS

THE COSMO-SkyMed SPACE SEGMENT

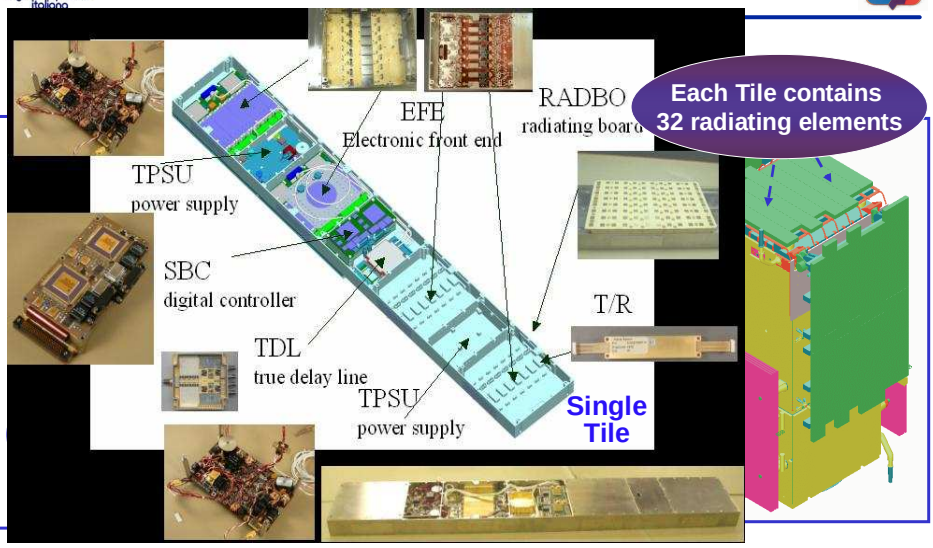




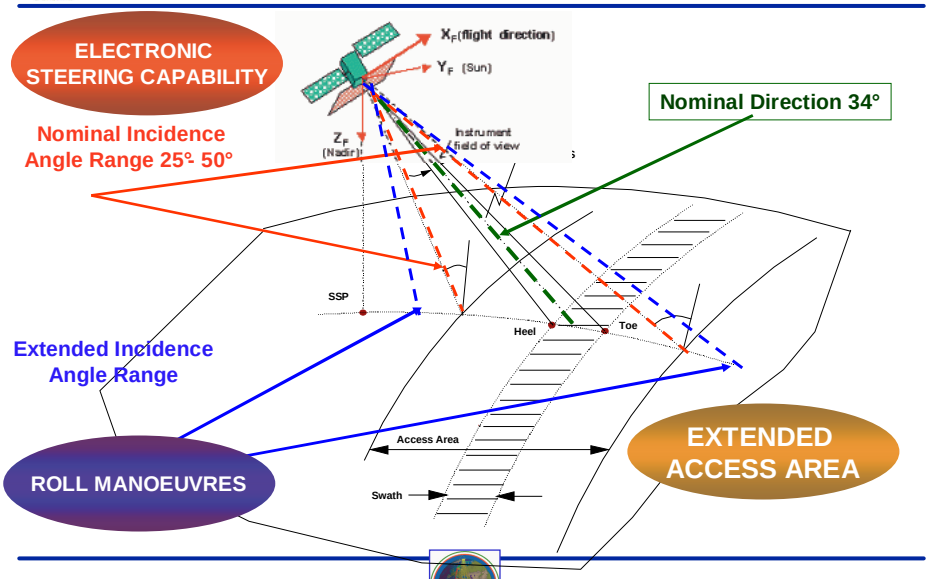
- Satellites with High Capability (agility, pointing, Power/Energy, Memory, Downlink, ...)
- High degree of *on-board flexibility and programmability*
- 2 S/L Models to develop and qualify the design ;
  4 identical Flight models

- Four satellites gradually deployed;
- *State-of-the-art design* for the achievable performances, for what concerns both the SAR P/L (active antenna) and PDHT P/L and Platform which support their operation.
- Synthetic Aperture X-band RADAR, multi-mode, with electronic beam steering and high resolution on different swath sizes and incidence angle

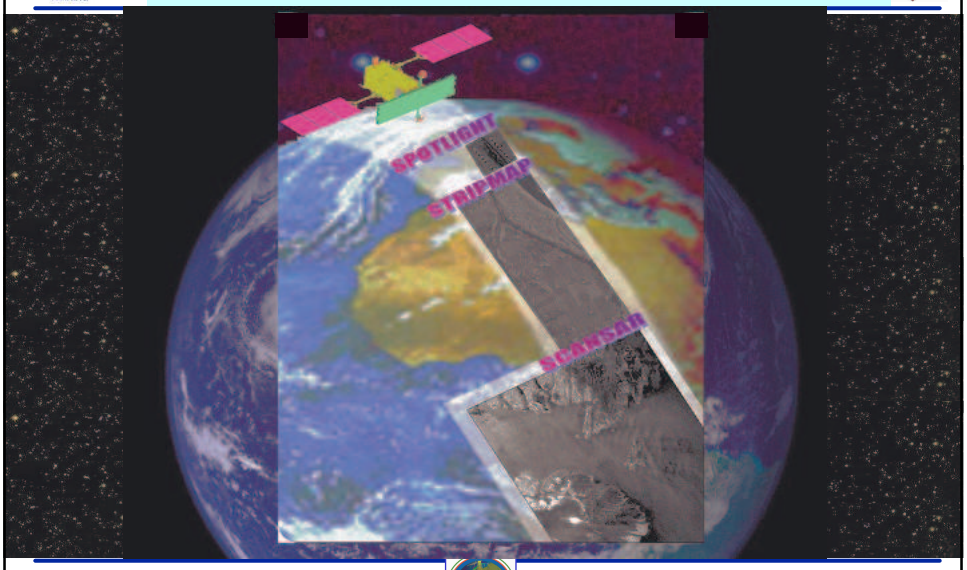
THE COSMO-SkyMed SPACE SEGMENT

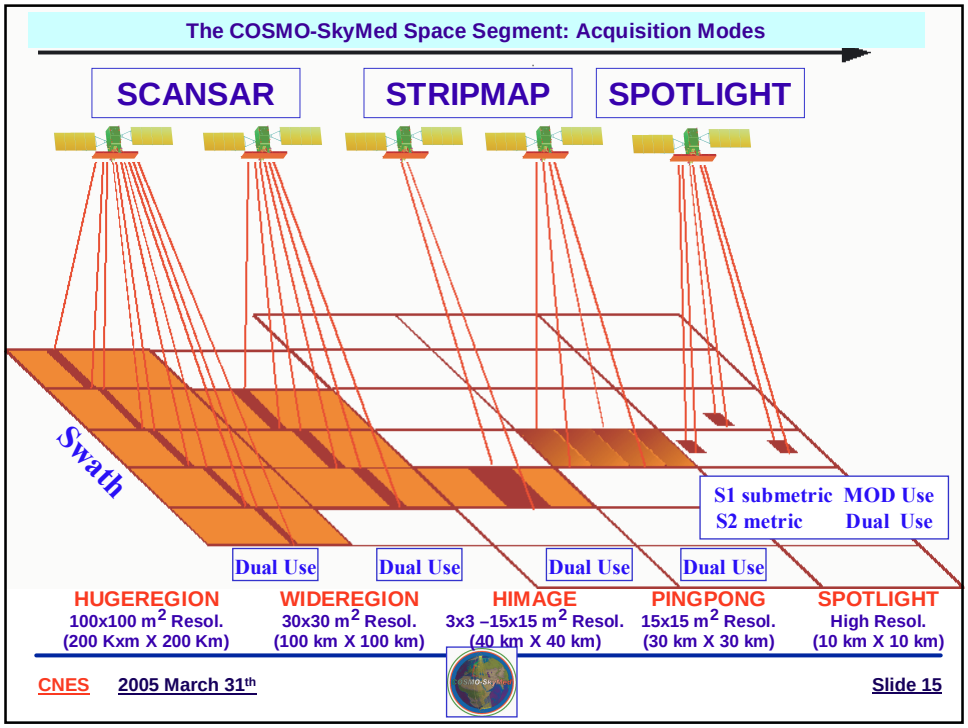


The COSMO-SkyMed Space Segment: Incidence Angle Capability



The COSMO-SkyMed Space Segment: Acquisition Modes




The COSMO-SkyMed Space Segment: Acquisition Modes
SCANSAR
STRIPMAP
SPOTLIGHT
Swath
S1 submetric MOD Use
S2 metric Dual Use
Dual Use
Dual Use
Dual Use
Dual Use
HUGEREGION
100x100 m2 Resol.
(200 Kxm X 200 Km)
WIDEREGION
30x30 m2 Resol.
(100 km X 100 km)
HIMAGE
3x3 –15x15 m2 Resol.
(40 km X 40 km)
PINGPONG
15x15 m2 Resol.
(30 km X 30 km)
SPOTLIGHT
High Resol.
(10 km X 10 km)
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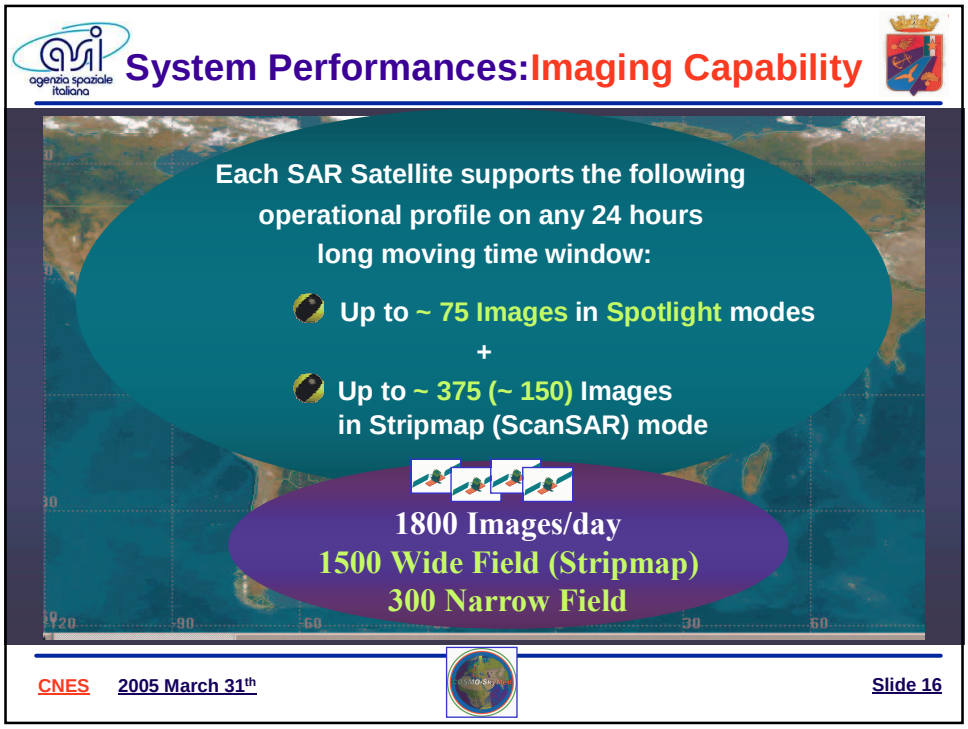
Slide 15


System Performances:Imaging Capability
Each SAR Satellite supports the following
operational profile on any 24 hours
long moving time window:
Up to ~ 75 Images in Spotlight modes
+
Up to ~ 375 (~ 150) Images
in Stripmap (ScanSAR) mode
1800 Images/day
1500 Wide Field (Stripmap)
300 Narrow Field
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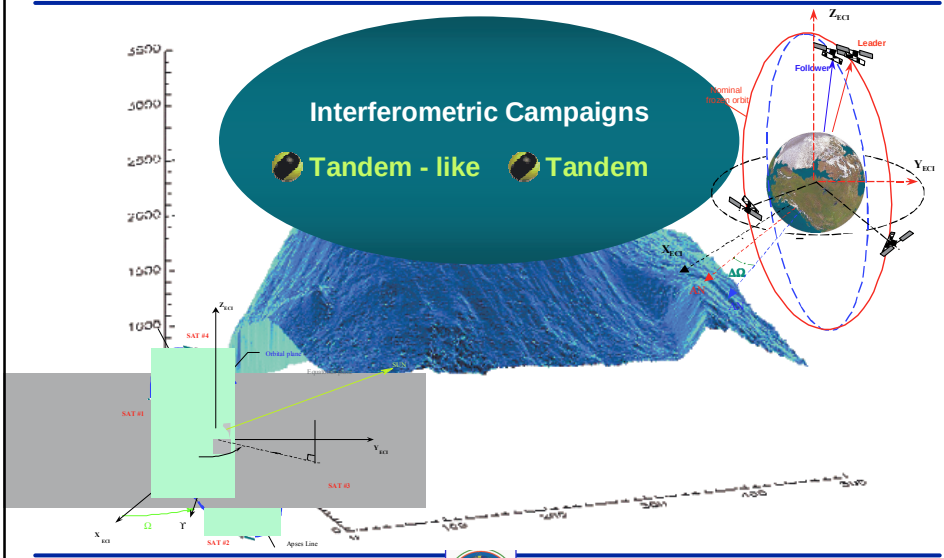
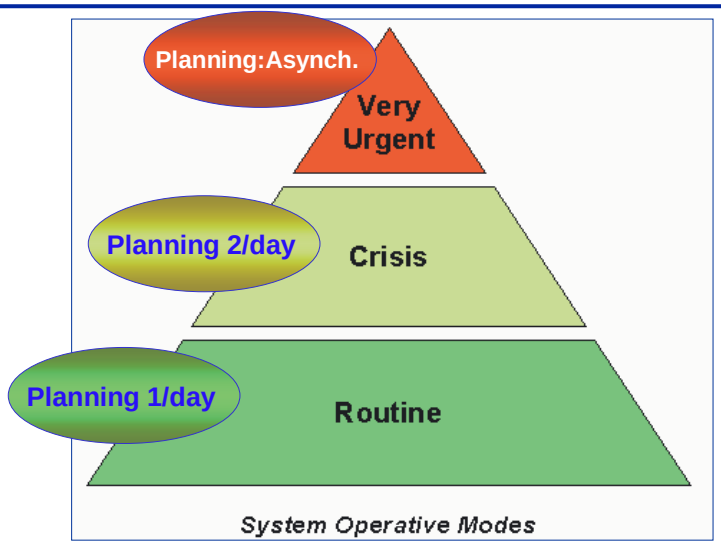
System Performances:Imaging Capability

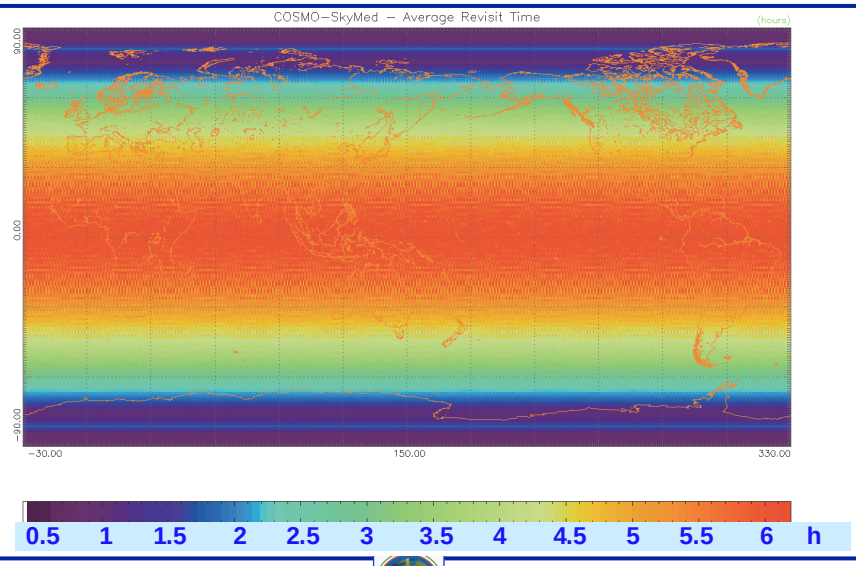


Time Performance



Time Performance (*Revisit Time*)

Right and Left Access within extended Incidence Angle Range



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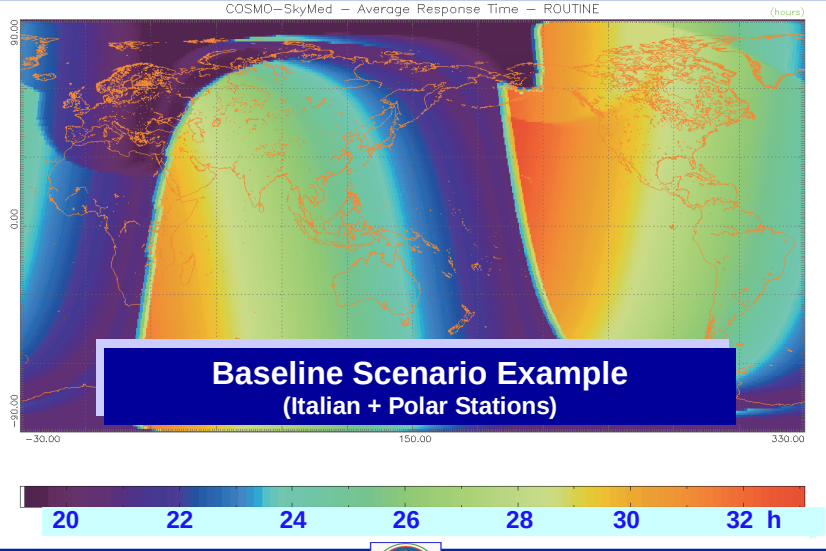
Time Performance (*Response Time*)

Right and Left Access within extended Incidence Angle Range



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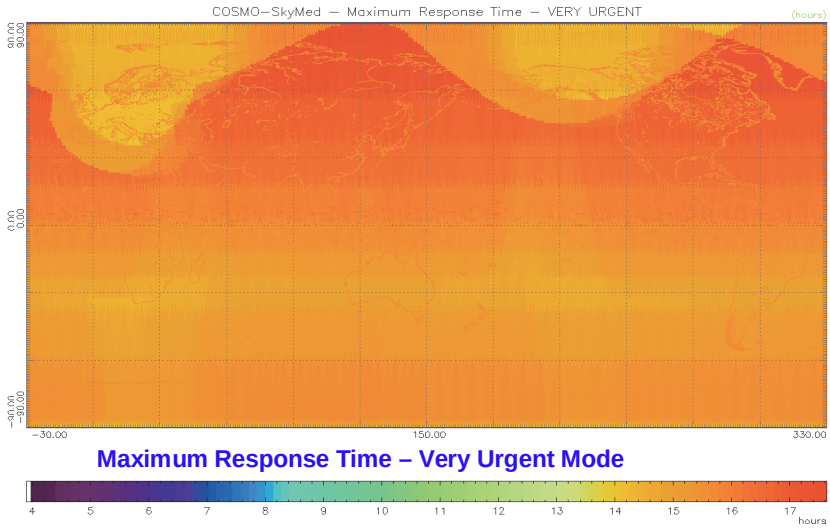
Time Performance (*Response Time*)

Right and Left Access within extended Incidence Angle Range



Maximum Response Time – Very Urgent Mode