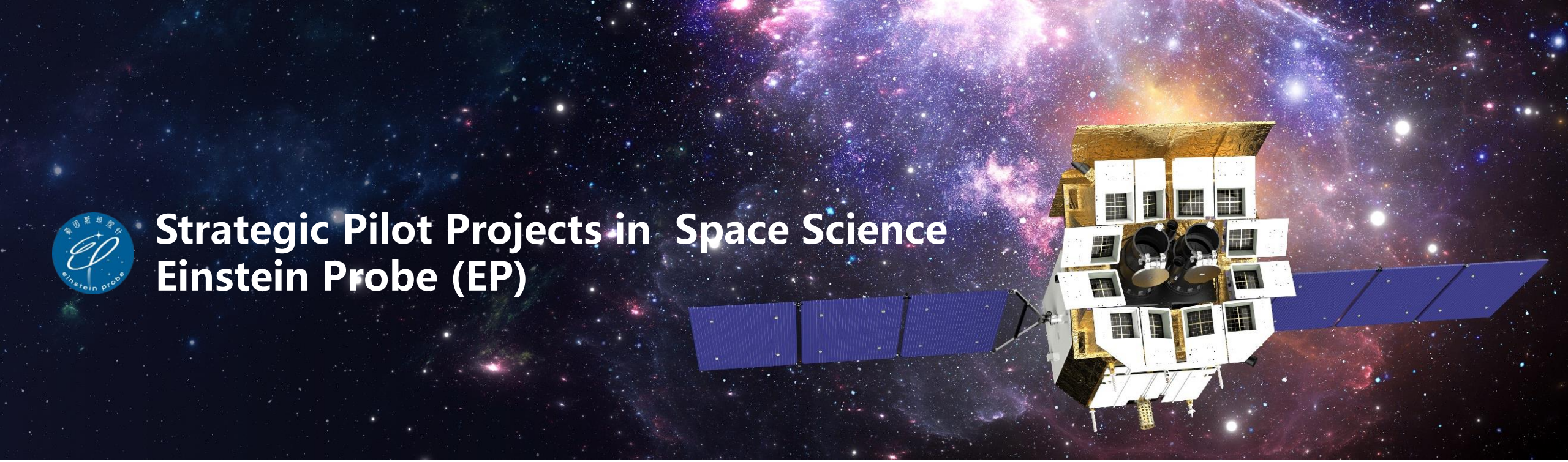


Ground Support System (GSS) general introduction and status

LIU YURONG

2024.04.24

NSSC 中国科学院国家空间科学中心
National Space Science Center, CAS

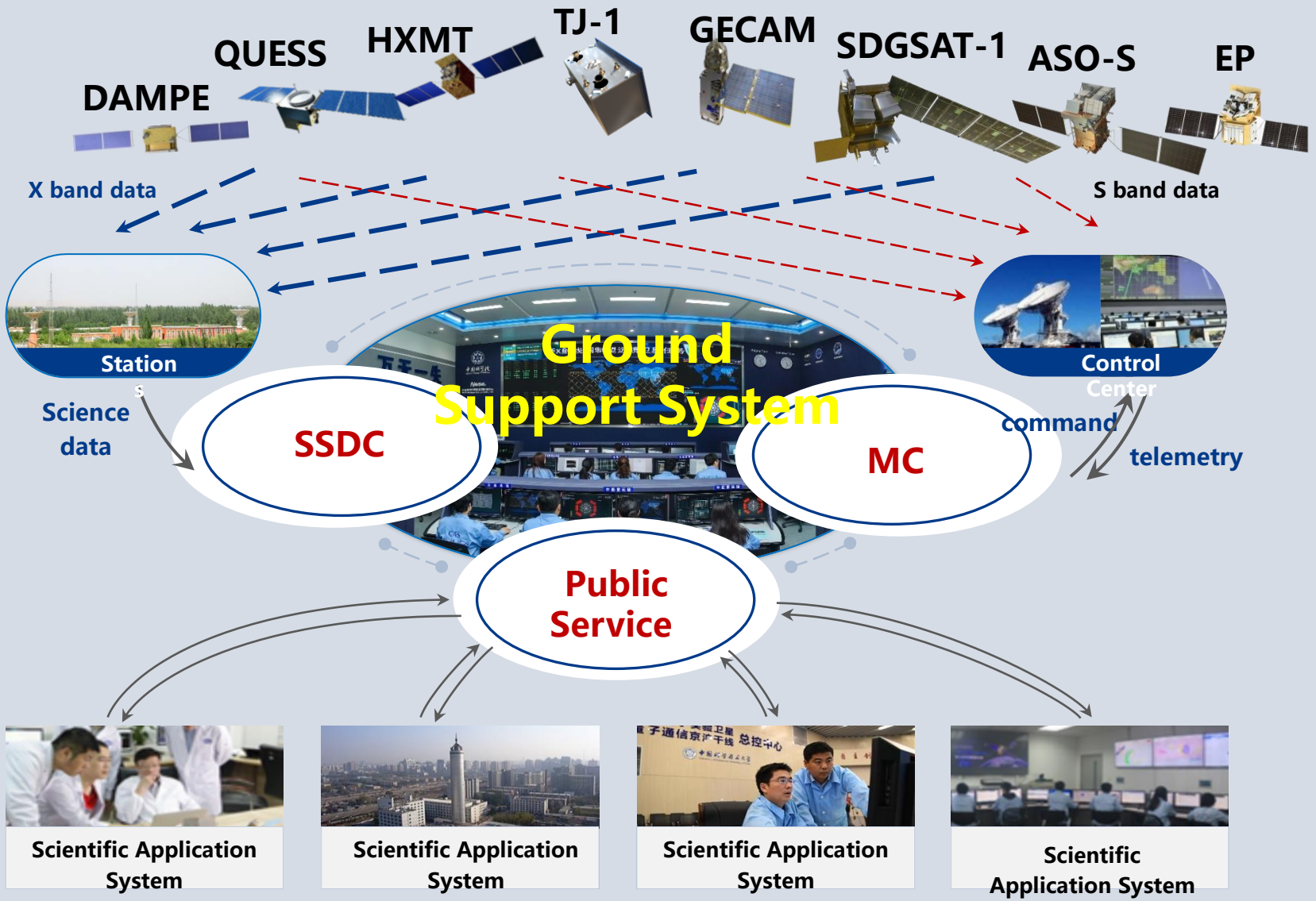
目录

CONTENT

1、General Introduction

2、Commissioning status

System Positioning



- **Generic technology system** for supporting to space science satellites in orbit，and a link between satellite operation and scientists.
- An integrated design **for supporting multi-satellite missions** ,the system structure ‘platform + mission plug-ins’ which can be extend for the new missions.
- **Offer public service** to scientific application system

System Responsibilities

- **Satellite and payloads operations**
- **Science data reception, process and management**
- **Science operations services and Science data services**
- **Overall system design and interface coordination**

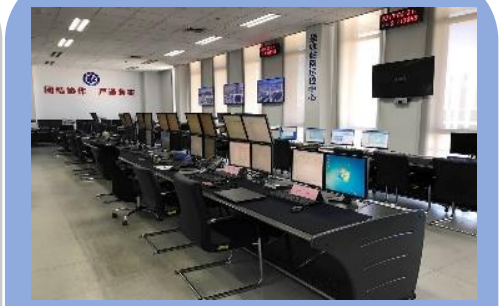
Ground support system

Space Science Data center

Data processing and management subsystem

Mission Center

Mission operation and control subsystem



Ground stations

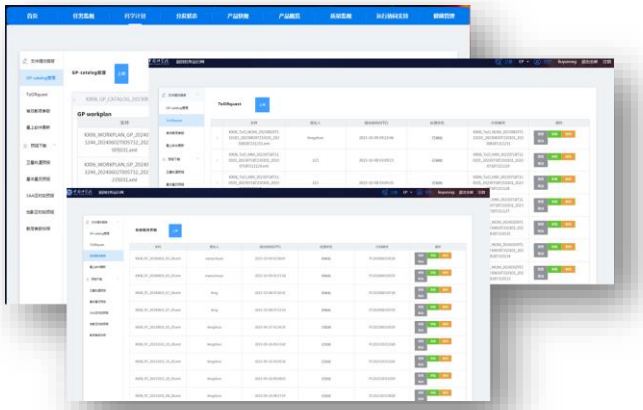
Data reception subsystem

Mission Center

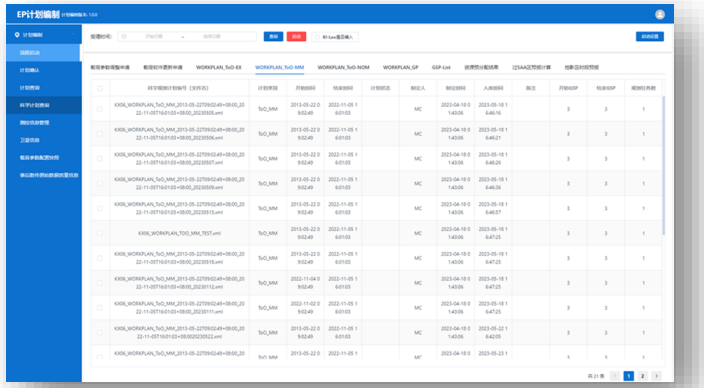
Responsibility

- Mission scheduling and planning, command generating and sending
- Planning the X-band stations pass-plan
- Downlink data real-time processing, payload status monitoring
- Mission situation analysis and decision making, payload on-orbit status analysis
- Scientific operation service

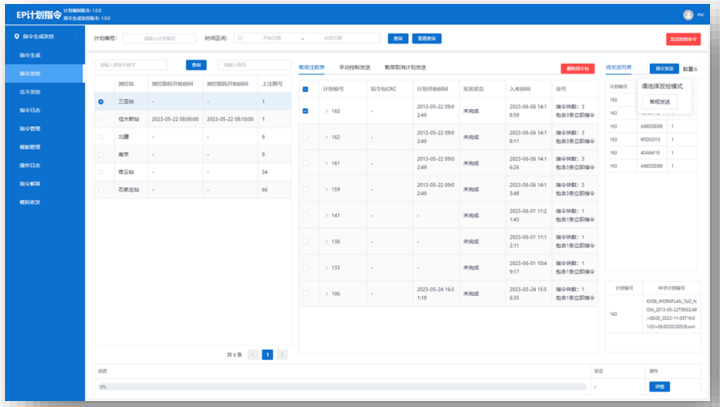
Some Software of MC



Mission Planning



Scheduling



Command Generation and Sending Control

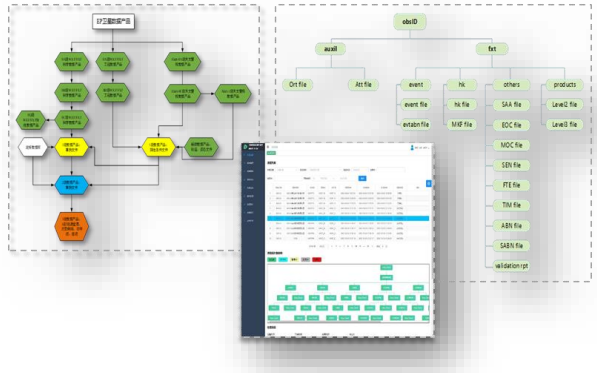
Mission Monitoring (APP)

Space Science Data Center

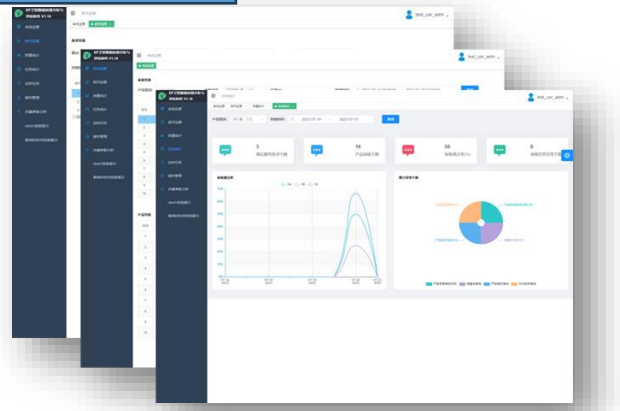
Responsibility

- Data preprocessing and quick-look processing
- Products distribution and collection
- Data archiving and disaster recovery
- Products release and result show
- Storage online and database services
- Scientific data service

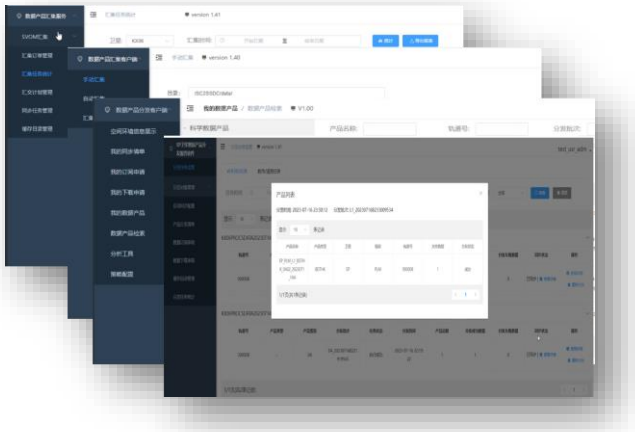
Some Software of SSDC



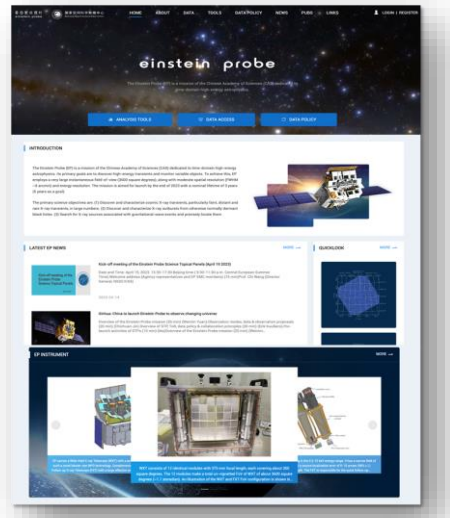
Data Pre-Process and Products Generation



Data quality analysis



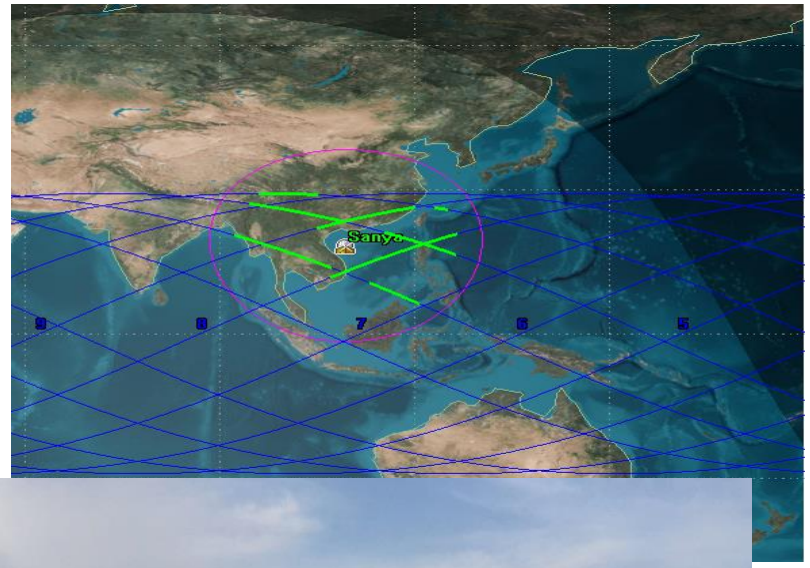
Product distribution



Data product publish

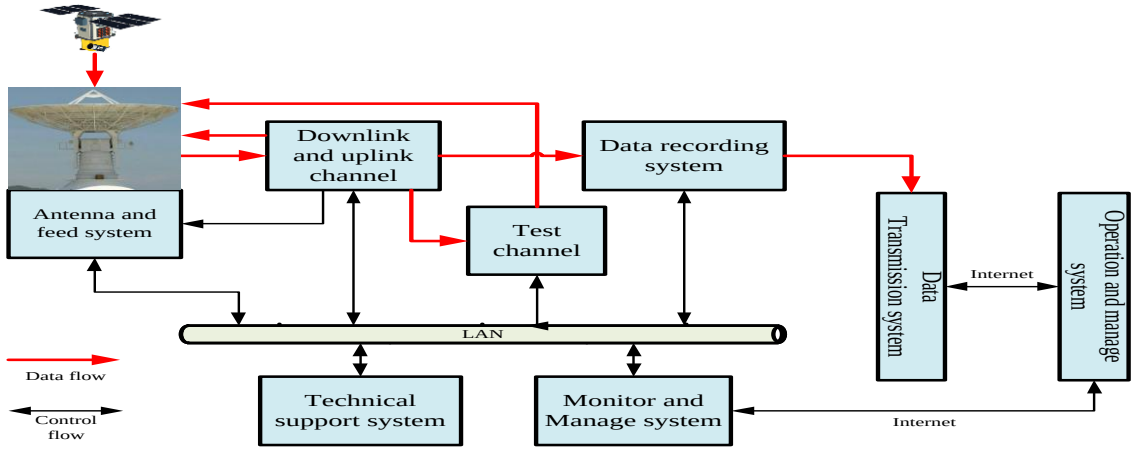
Ground Stations

- **SANYA station undertakes the X-band data receiving task in the mission**

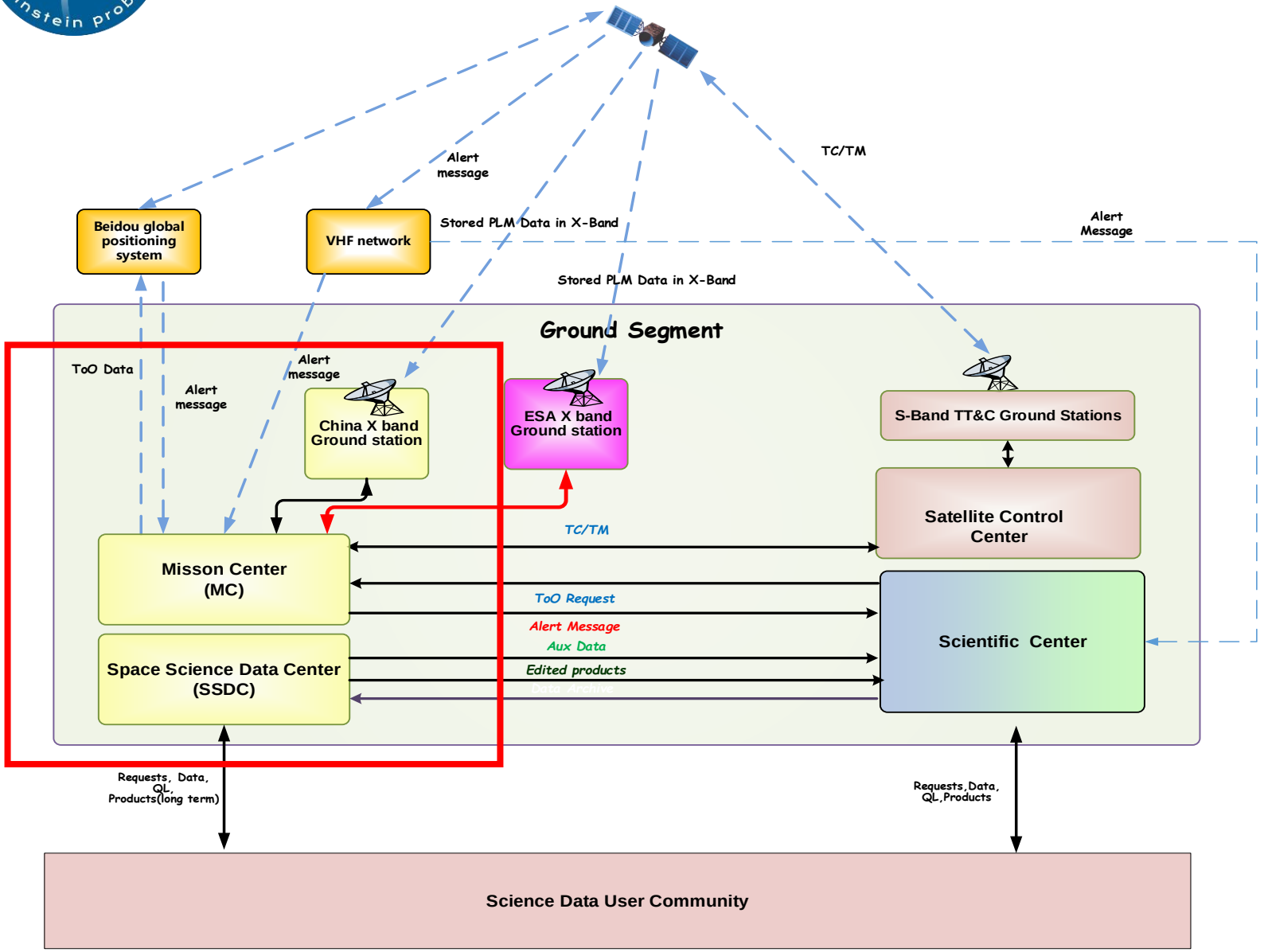


Responsibility

- Kashi,Sanya,Miyun stations-12 meter receiving antenna system
- Scientific satellite tracking
- Date received
- Data recording and output format
- Data transmission

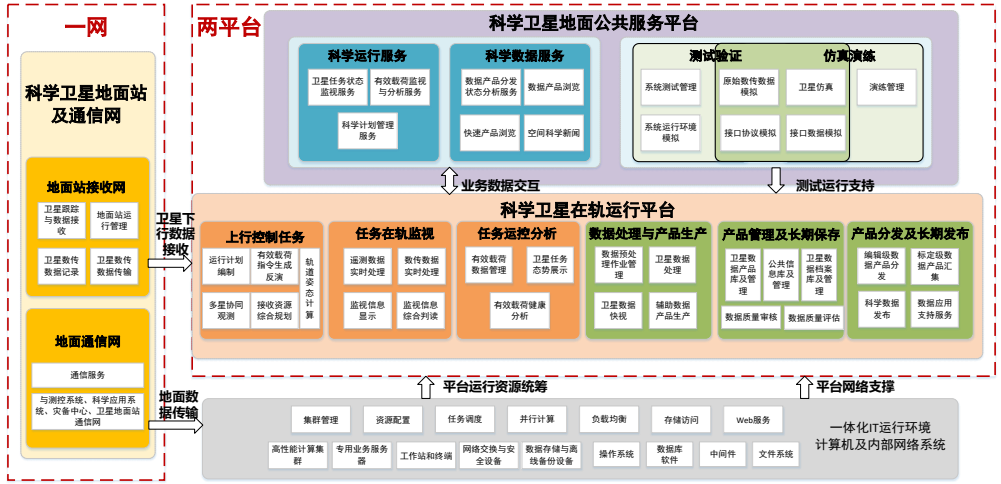


Interfaces

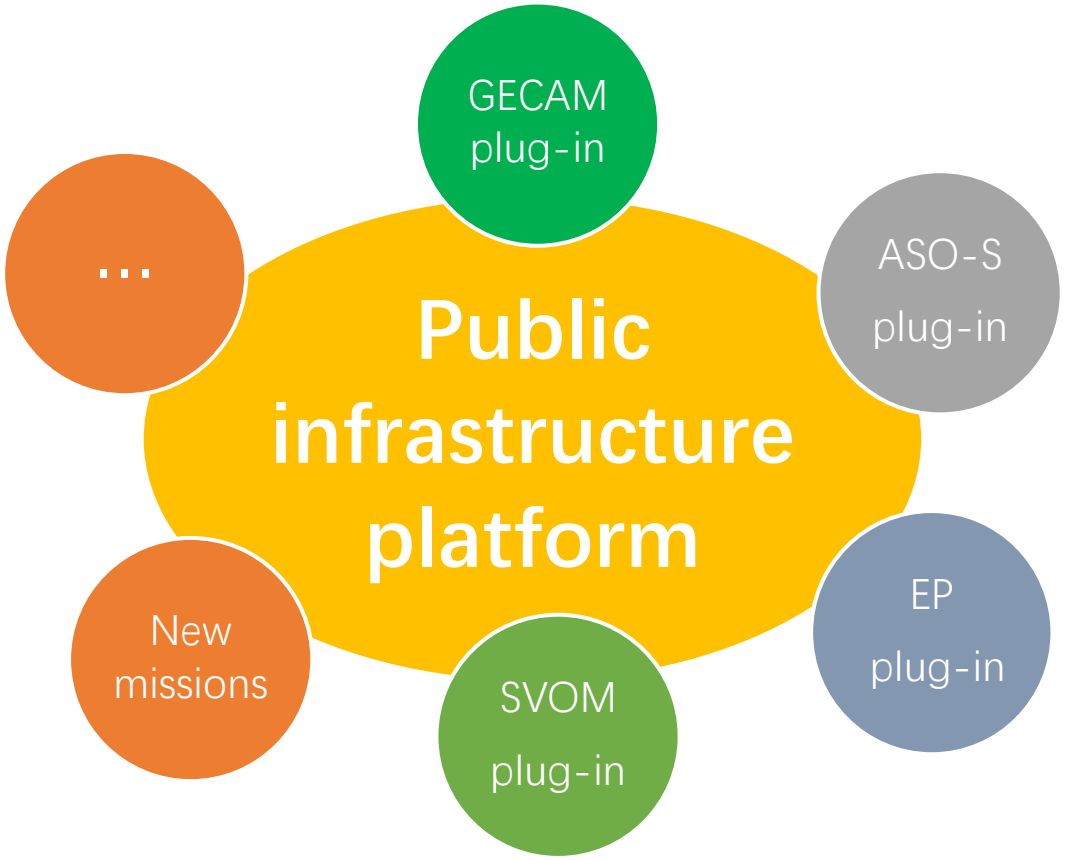


1. Satellite
   - X Band
   - S Band
   - Beidou
   - VHF
2. Scientific Center
3. Control Center
4. ESA X Band Stations
   - Kourou
   - KSATlite Singapore
   - KSATlite Western Australia
5. Science Data User Community

Architecture

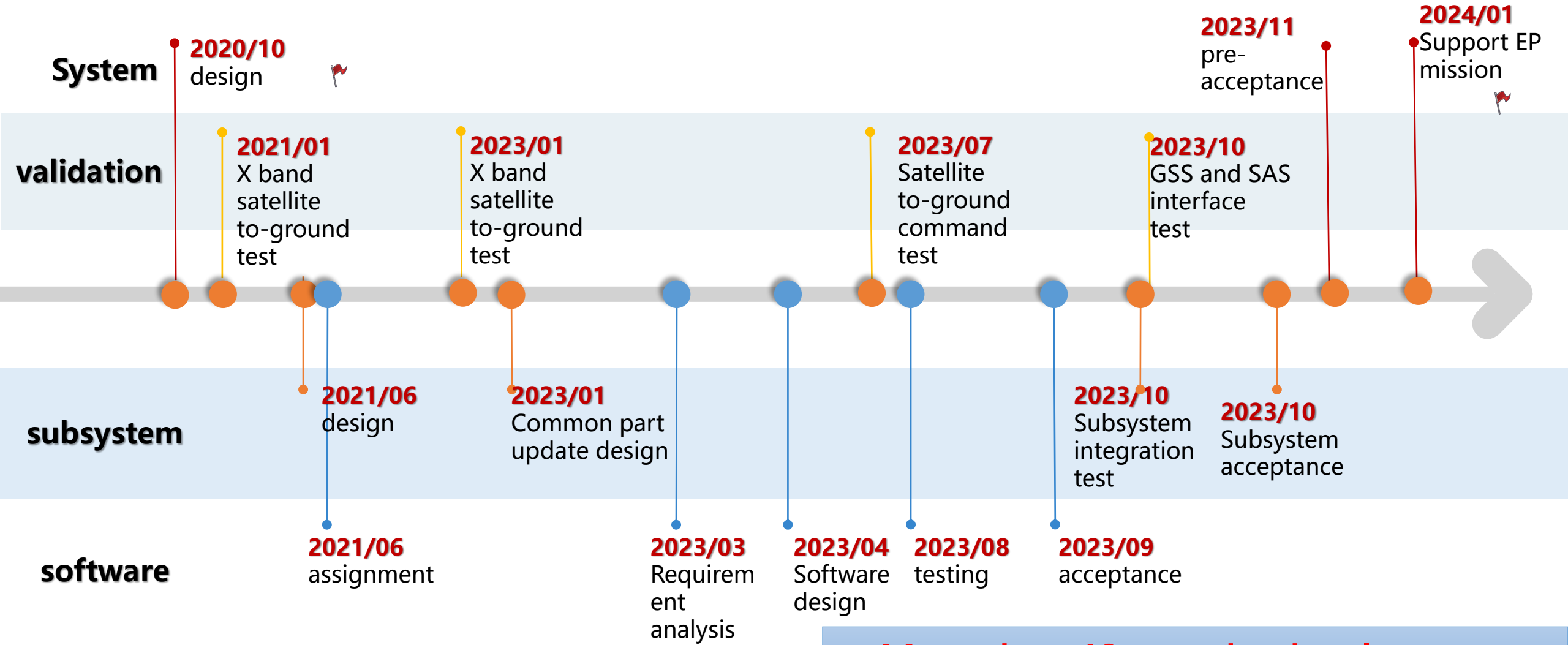


- Scientific satellites Xband stations and Communication networks
- Scientific satellites ground common service platform
- Scientific satellites in-orbit operations platform
- Base environment



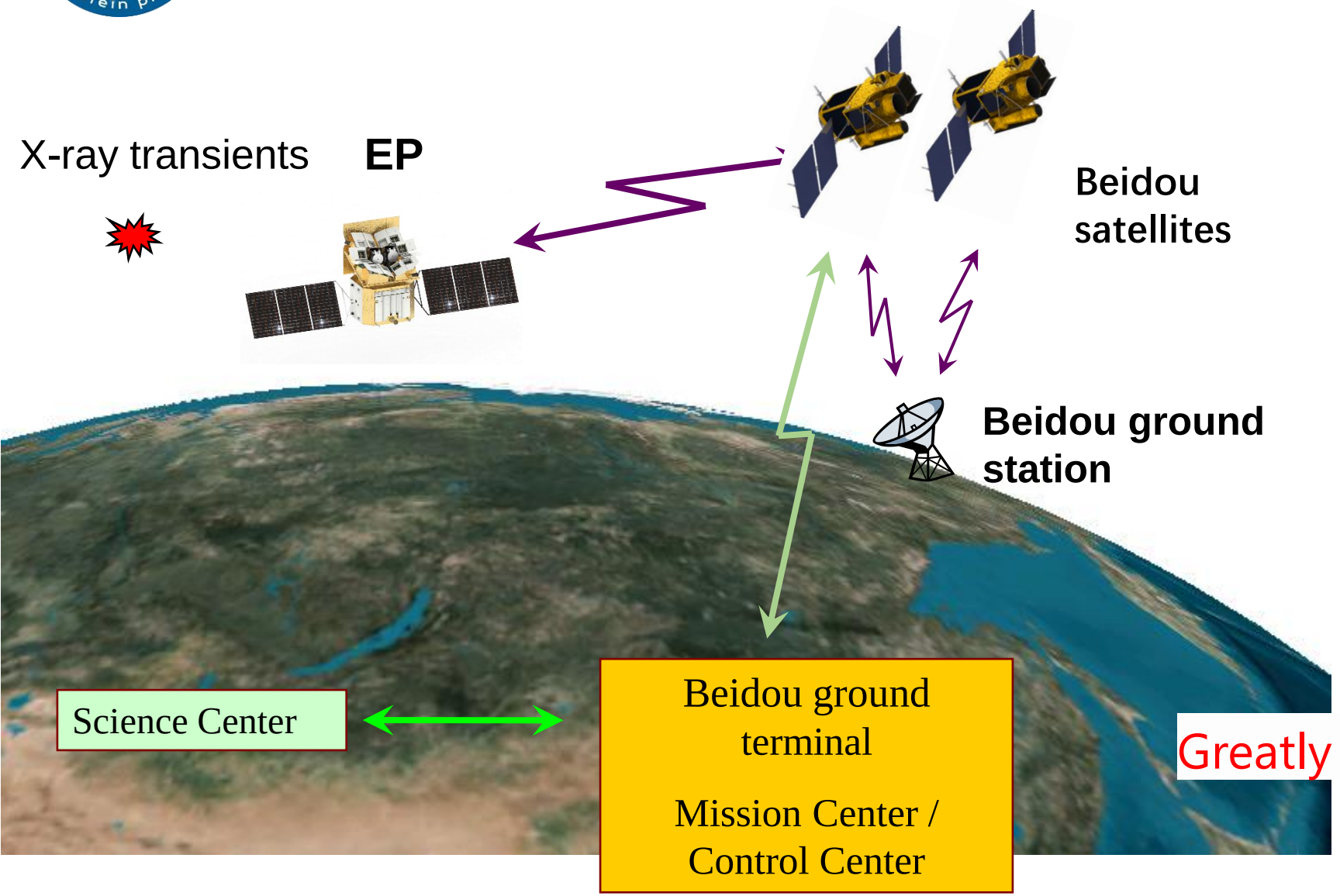
Basic platform + mission plug-ins

Development and milestones



More than 40 months development

Characteristic in EP mission -BEIDOU Download and Uplink



- Uplink ToO-EX， ToO-MM and emergency ToO-Nom
- Download alert message to the ground

Greatly reduced the response time

Characteristic in EP mission
VHF data process and monitoring

- **GSS receive VHF download data from CEA**
- **MC process the data in realtime for monitoring satellite status**
- **SSDC process the data and distribute the data products to SAS (NAOC & IHEP)**

CEA

Data Center

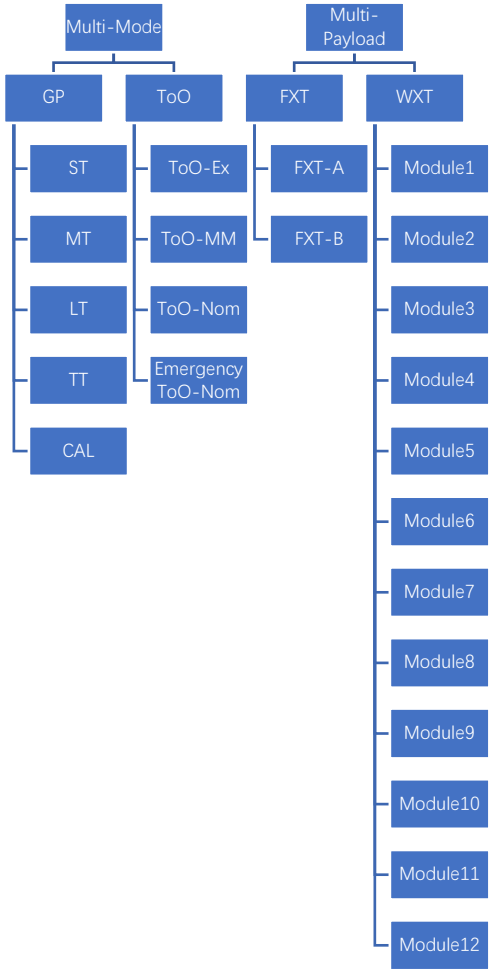
Products

Scientific Application System

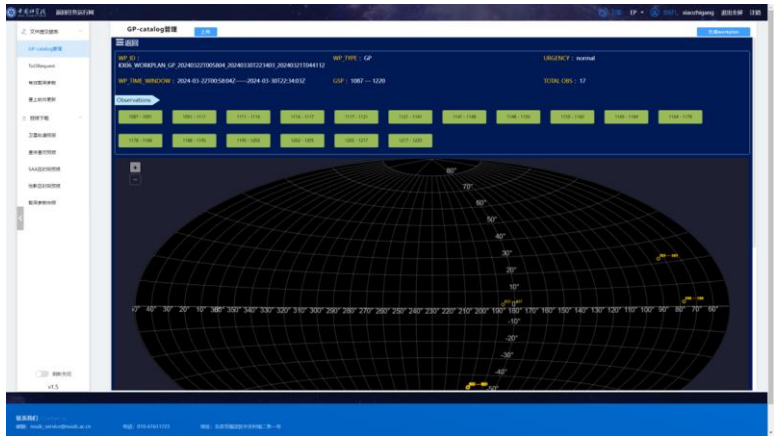
Mission Center

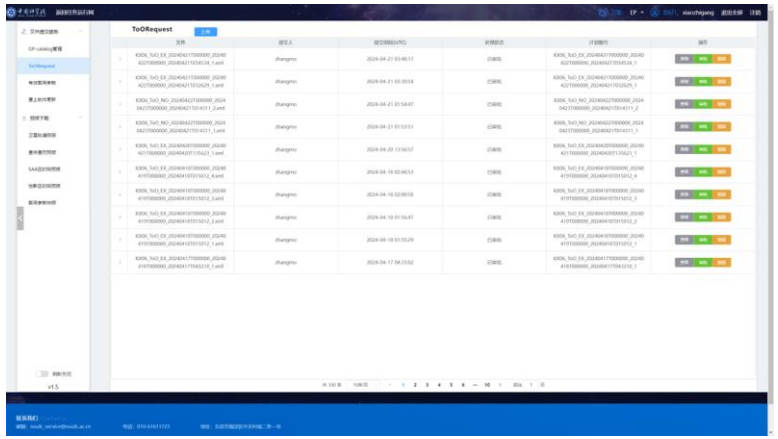
Mission Monitoring

Characteristic in EP mission -scientific observation scheduling

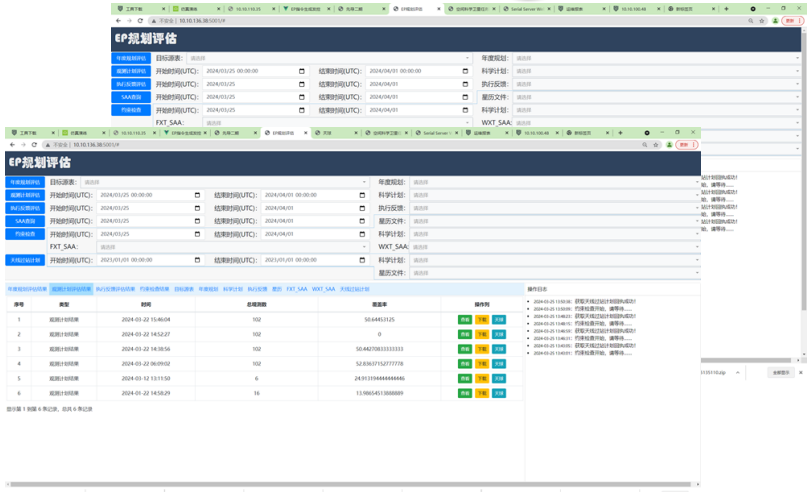


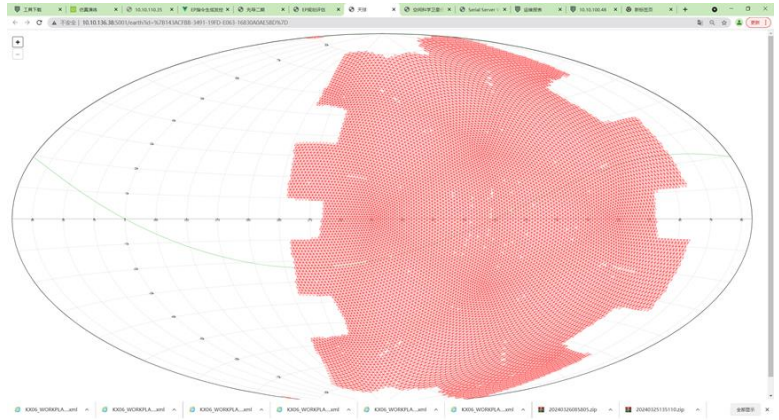
Scheduling requirement





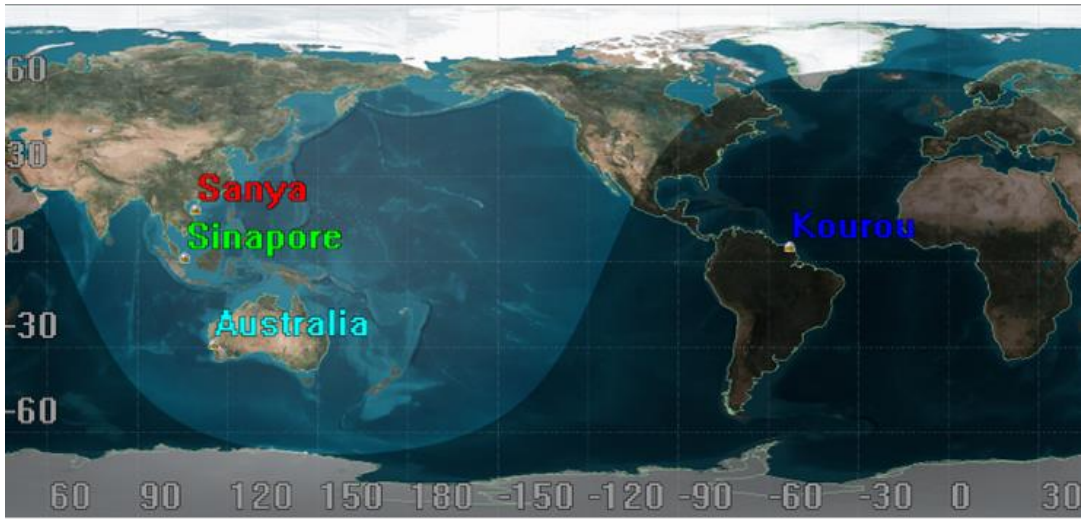
Scientific Planning Services



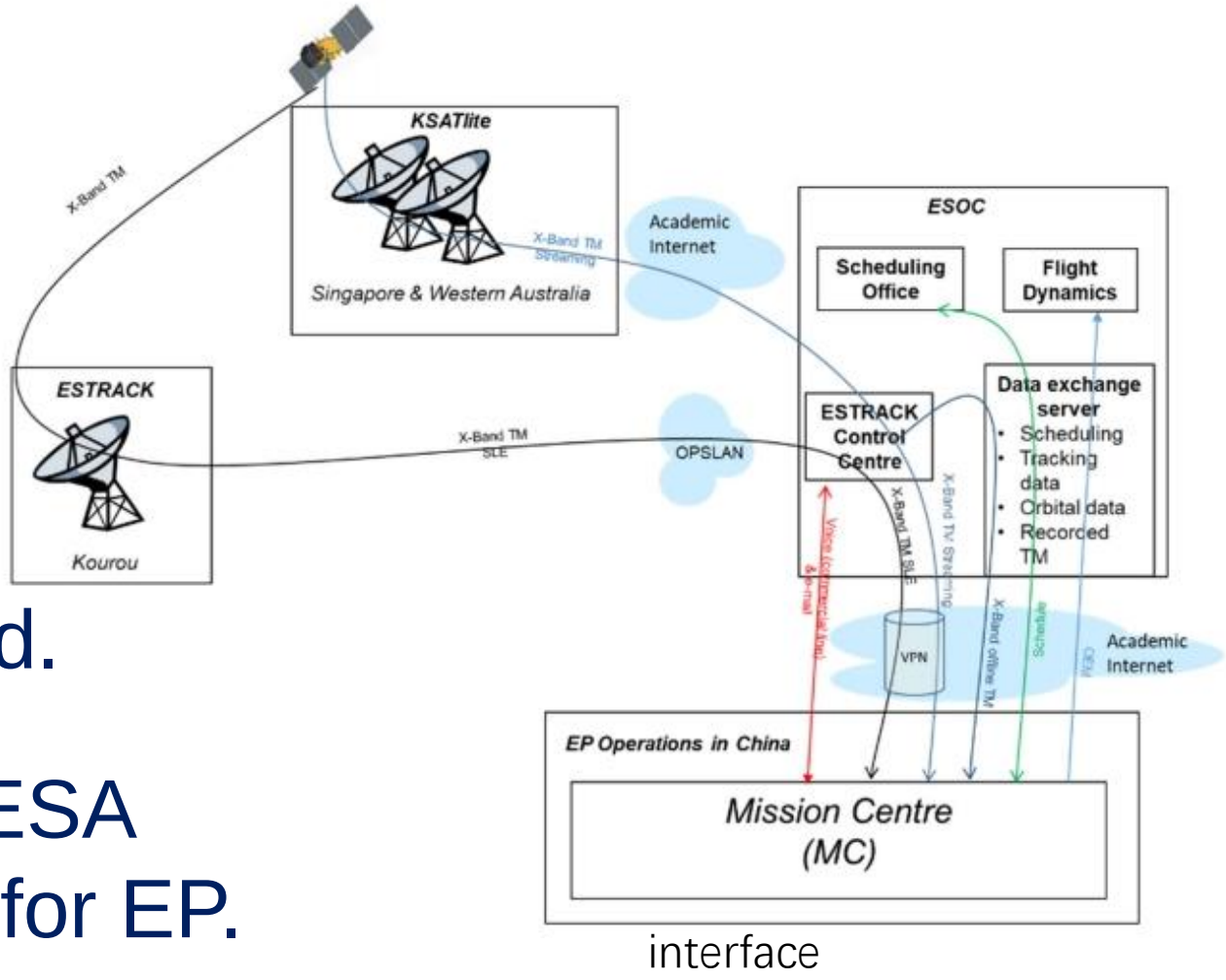


Planning analysis and validation tool

Characteristic in EP mission -Joint Data Reception



Stations



interface

- All the interfaces have tested.
- From March 21, 2024, the ESA stations in normal operation for EP.

目录

CONTENT

1、General Introduction

2、Commissioning status

Commissioning status

- On December 8, 2023, the EP commissioning team organized, with about 150 members
- The ground support system operation team, the Mission Center, the Space Science Data Center, the X-band Station successfully supported the EP satellite commissioning.

Commissioning status -Mission Operations

From launch to Apr.20

- S band data process and monitoring: 513 Orbits
- X band data Process and monitoring: 605 Orbits
- VHF data Process and Monitoring: 229686 Packets
- BEIDOU data Process and Monitoring: 25365 Packets

From launch to Apr.20

- Workplan and Configuration（GP，ToO，PC，SU）：557 times
- Generate command: 3871 Frame TCs
- Uplink the command using Beidou has tested




Commissioning status -Data Product

Data preprocessing

- X-band、S-band、VHF and Beidou raw data
  - X-band raw data 771 files, ~2.67TB
  - S-band raw data 523 files, ~634.10MB
  - VHF raw data 212634 files, ~19.37MB
  - Beidou short messages 25243 files, ~1.68MB
- Data preprocessing and product generation
  - 186 types of engineering products and 18 types of scientific product at 3 levels, ~ 8.3 TB
  - Auxiliary data 168827 files, ~ 70.12GB
- FXT level 1products 2245 observations, all the observation data are complete

Product distribution

- To NAOC:
  - L0A Alert: 397 files, 3.12MB
  - L0B products: 1.08TB
  - L1 products: 4.97TB
  - Auxiliary products: 94.27GB
- To IHEP:
  - L1 products: 4.97TB
- To FXT payload team:
  - L0A products: 232.26GB

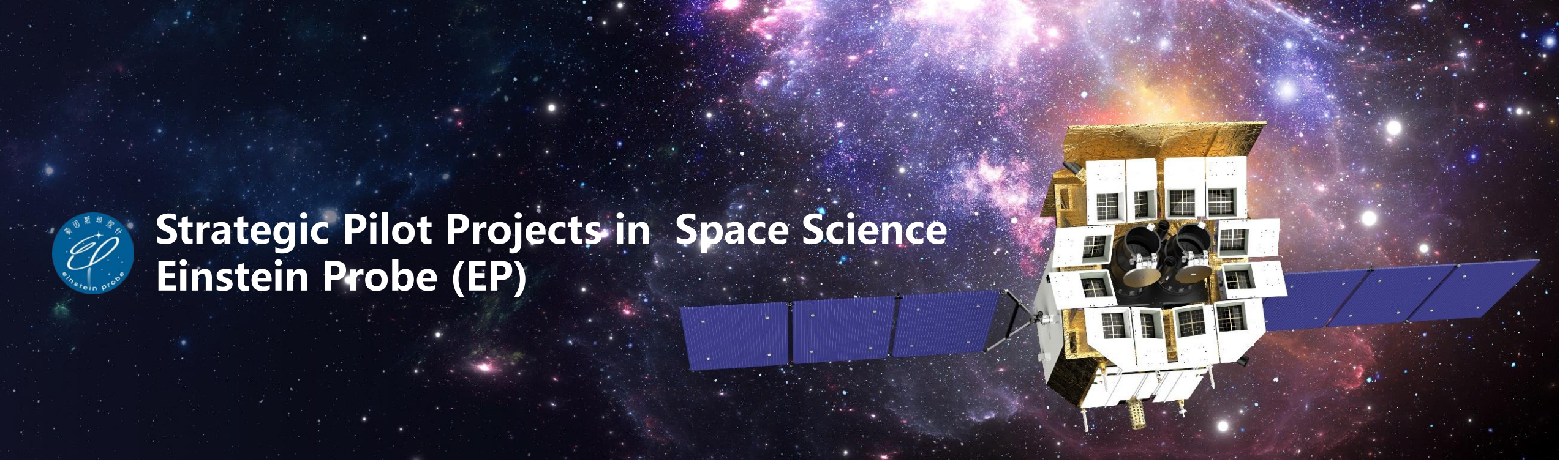
Data archiving

- All the raw data and edited products has been managed by Product Database
- Raw data and edited products has been archived by the end of March

Commissioning status -Data Reception

- On January 10, 2024, first orbit X-band receiving for EP mission successfully.
- In order to further improves the quality of data reception, the ground station adopts the master and backup equipment to receive the data together.
- From January 10 to March 21, 2024, Sanya station implemented 421 passes data reception, with 100% success rate.

the data receiving room of Sanya station



Ground support system will continue to organize and support the EP satellite commissioning, and prepare for the long term normal operations.

Thank you!

中国科学院国家空间科学中心
National Space Science Center, CAS