



Report to CEOS-WGCV 28

# Recent Progress of CAL/VAL Activities for Spaceborne Microwave Remote Sensors

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# Outline

- I. Progress of the Missions**
- II. CAL/VAL activities of Spaceborne Microwave Sensors**





# I. Progress of the Missions

## ■ Recent progress of China's earth observation program with microwave sensors

- ◆ **FY-3**
- ◆ **FY-4**
- ◆ **HY-2**
- ◆ **HJ-1C**

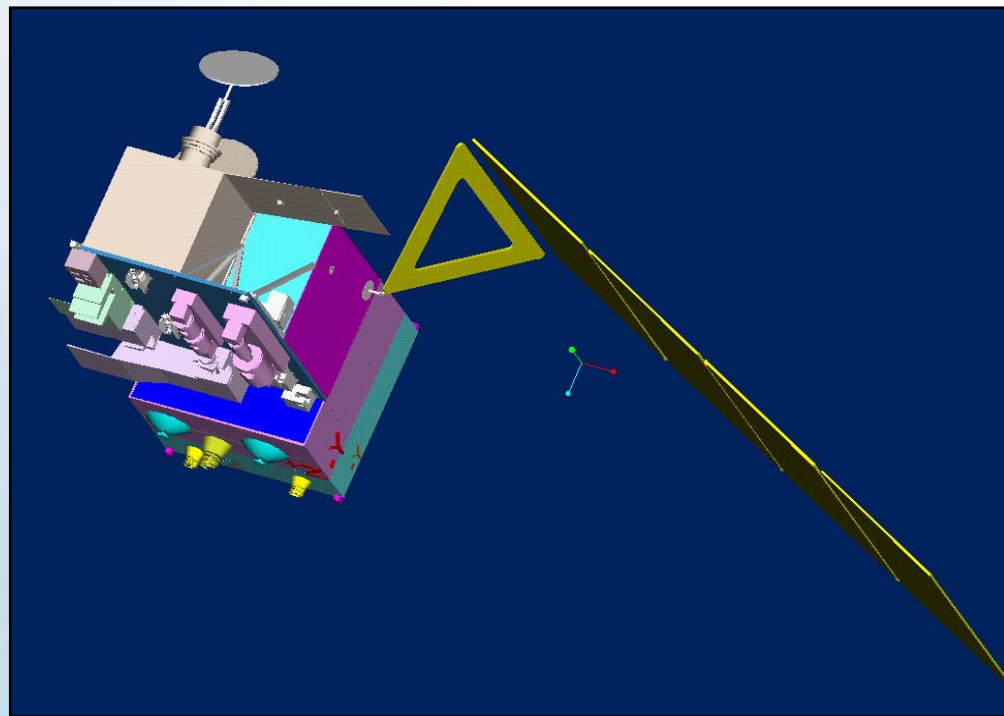






# FY-3

- China's new generation polar-orbit meteorologic satellite.
- FY-3A scheduled to be launched in 1st half of 2008.
- Microwave sensors onboard FY-3
  - ◆ MWTS
  - ◆ MWHS
  - ◆ MWRI





# Microwave Sensors of FY-3

Instrument	No of Channels	Frequency Range	Pixels per scan	Nadir Resolution (km)	Purpose
MWTS	4	50 – 57 GHz	15	50-75	Atmospheric Temperature Contour
MWHS	5	150 – 183 GHz	98	15	Vapor contour, surface properties
MWRI	12	10.65 – 150 GHz	240	15-70	Rain rate, cloud water content, vapor volume, etc





# FY-4

- **China's new generation geostationary orbit meteorologic satellite.**
- **FY-4 will have the optical version (FY-4O) and microwave (FY-4M) satellite.**
- **Development of sensors for FY-4M started.**
  - ◆ **Microwave sensor with real aperture antenna;**
  - ◆ **Microwave sensor with synthetic aperture technique.**

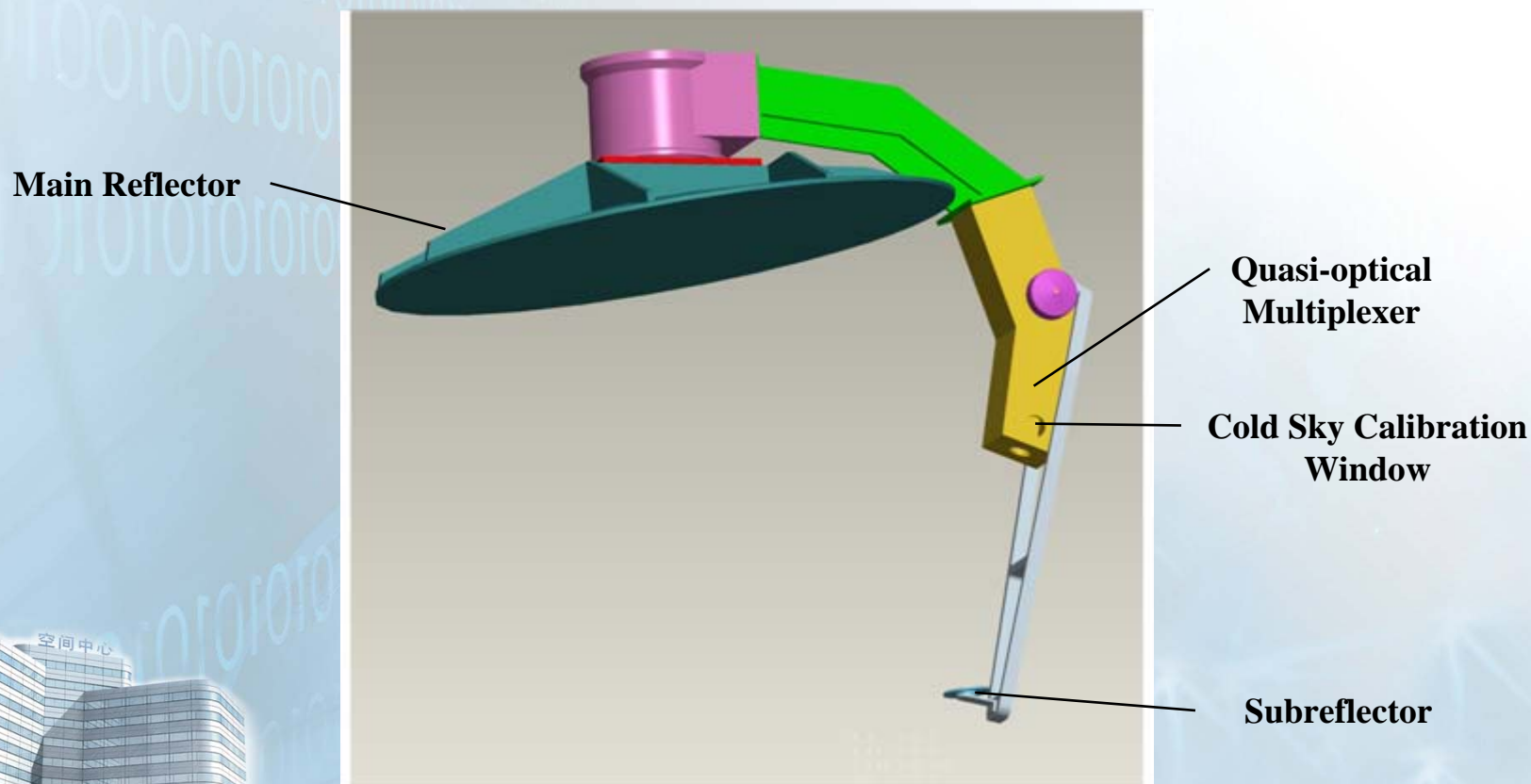






# Microwave Sensor with Real Aperture Antenna

- The diagrammatic sketch of off-axis Cassegrain Antenna





# Main specifications

	Frequency (GHz)	Bandwidth (MHz)	Sensitivity (K)	Antenna Aperture (m)	Nadir Spatial Resolution (km)
Temperature Sounding	118.750 $\pm$ 0.2, 0.4, 0.7, 1.1, 1.5, 2.1, 3.0, 5.0	100~2000	< 1	3	37
	424.763 $\pm$ 0.15, 0.3, 0.6, 1.0, 1.5, 4.0	100~1000			10
Water Vapour Sounding	183.310 $\pm$ 0.3, 0.9, 1.65, 3.0, 5.0, 7.0, 17.0	300~4000			24
	380.197 $\pm$ 0.4, 1.5, 4.0, 9.0, 18.0	200~2000			12
Window Sounding	150GHz	1000			29
	220GHz	2000			20
	340GHz	1000			13



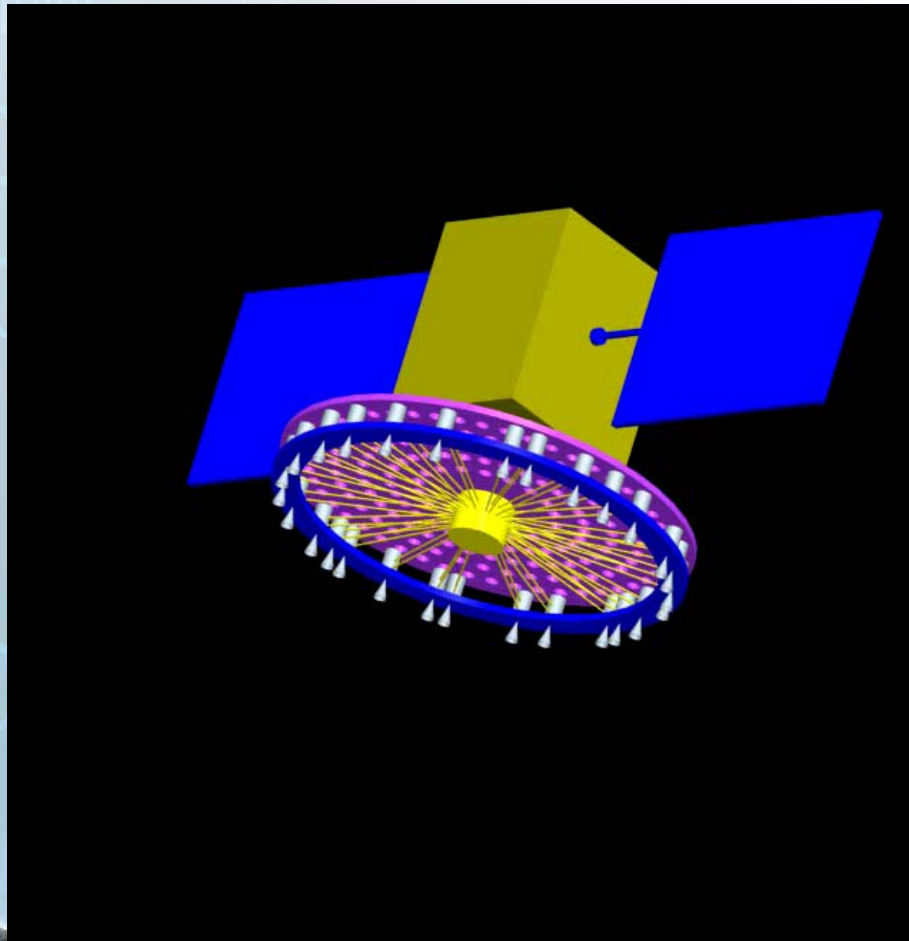


## Real Aperture Antenna Spiral scanning





# Synthetic aperture microwave sensor





# Specifications of the prototype

- **Frequency: 50~60GHz;**
- **No. of Channels: 8-12;**
- **Calibration Accuracy: 1.5K**
- **Surface resolution: 50km**
- **Imaging Interval: 5min**
- **Coverage: 3000 x 3000km**
- **Mass: 280kg**

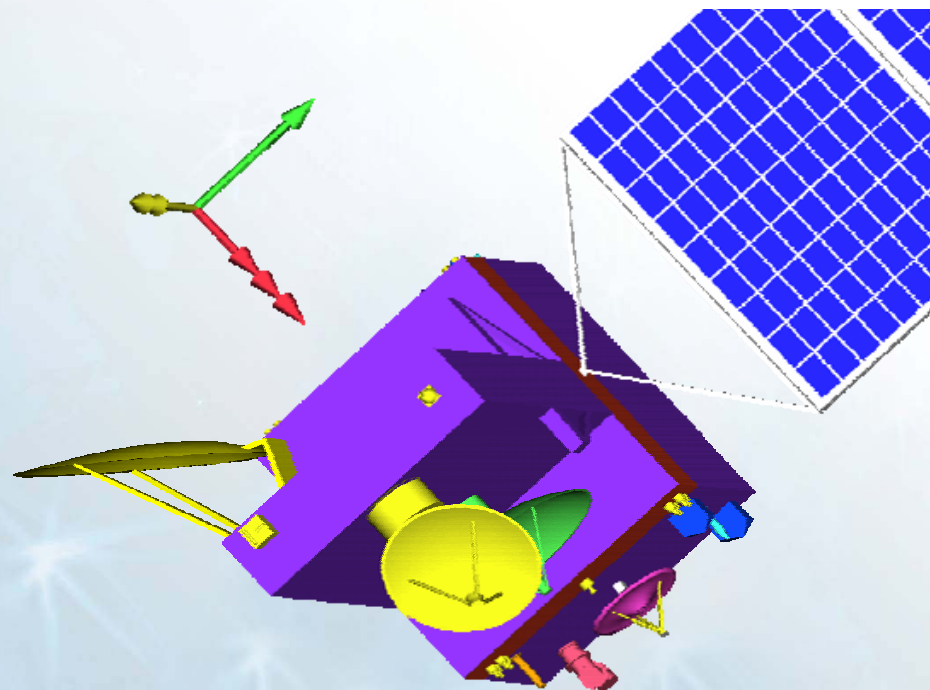






# HY-2

- Ocean dynamic environment measurement satellite;
- Main payload are microwave sensors:
  - ◆ Dual frequency (Ku, C) radar altimeter and the tri-frequency nadir-looking microwave radiometer for atmospheric correction;
  - ◆ Ku-band radar scatterometer;
  - ◆ Multi-frequency microwave imager (6.6GHz-37GHz)
- Engineering model started to build in 2008;
- Expected to be launched around 2010.





# HJ-1C

- ◆ **S-band SAR**

- ◆ **2 observation modes**

- **The normal observation mode: SCANSAR-right side continuous strip imaging mode;**
- **The default observation mode: fix narrow strip imaging mode (single look imaging).**





Launch Structure



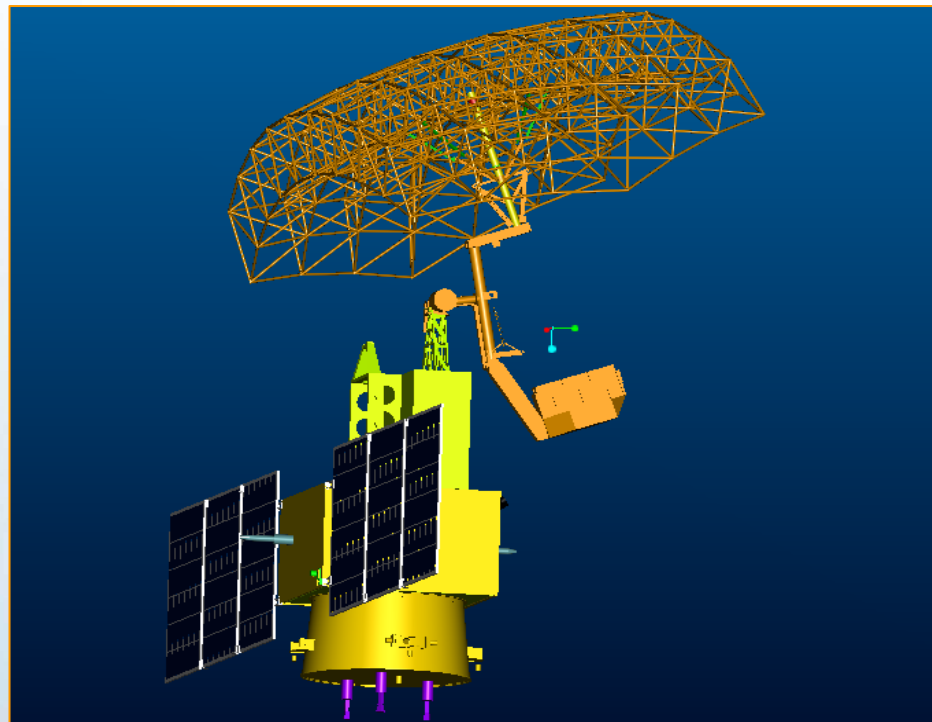
Laboratory Model







Laboratory Model



Operating Structure





## II. CAL/VAL Activities of Spaceborne Microwave Sensors

- Before launch calibration had been done or being considered;
- After launch CAL/VAL being planned.
  - ◆ FY-3
  - ◆ HY-2
  - ◆ HJ-1C





# FY-3

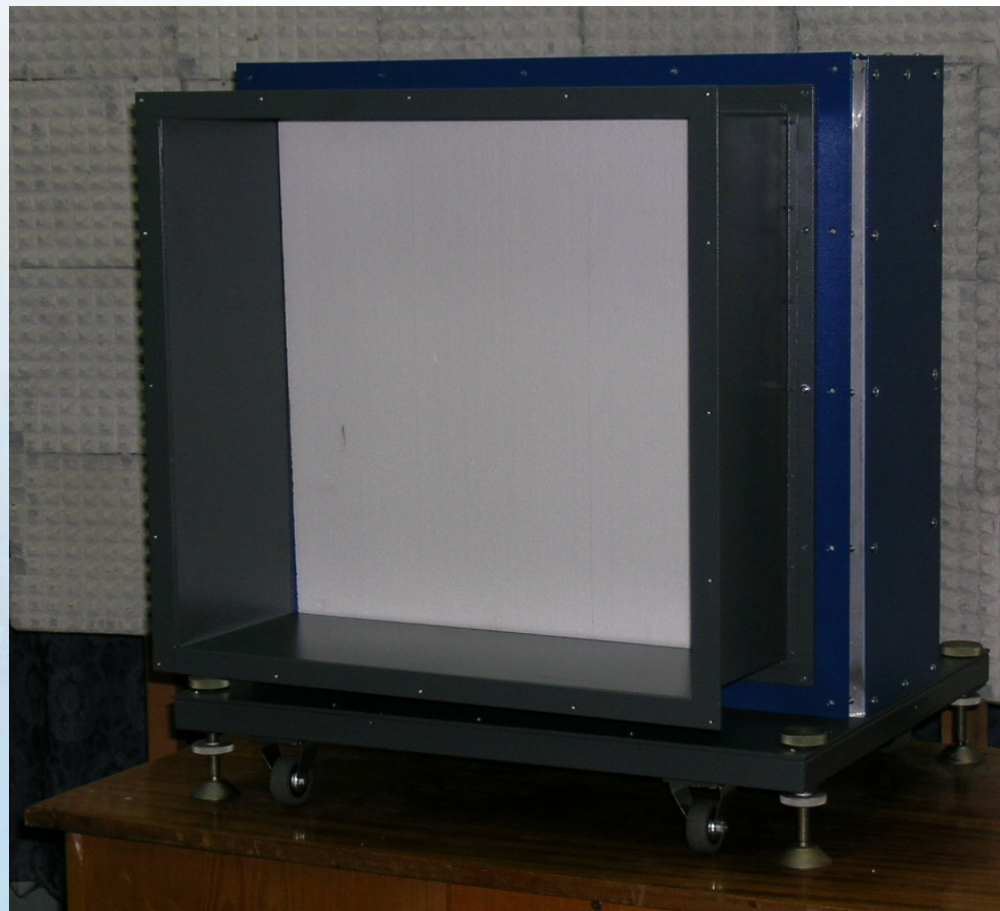
- Airborne campaign had completed to validate the instrument performance;
  - ◆ Dunhuang
    - Comparison with optical emissions
  - ◆ Qinghai Lake
    - To validate the sensor performance
  - ◆ Pu'er (Simao), Yunnan Province
    - To validate the possibility for after launch validation
- After launch validation is planned by use of tropical forest.





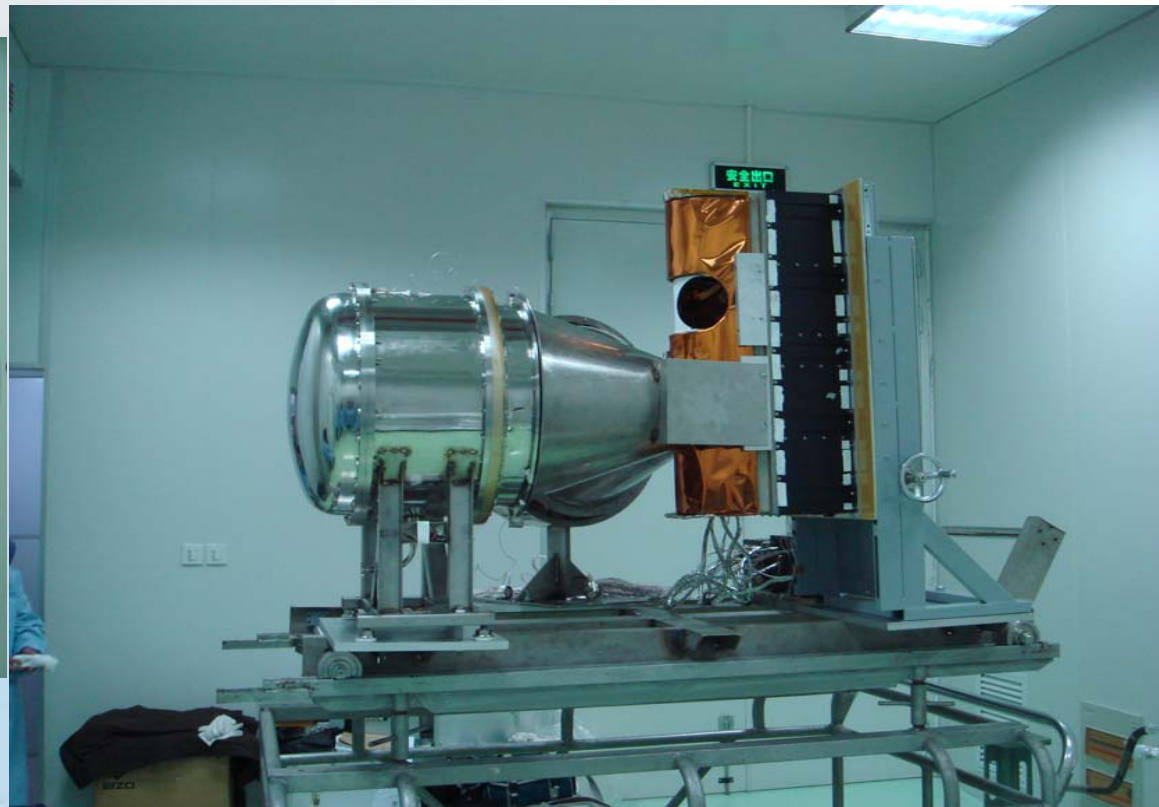


# The blackbodies for calibrations





# HY-3/MHS before-launch calibration







# HY-2

- **Full-wave simulator is being built for before launch calibration and performance assessments;**
- **After launch CAL/VAL has been planned (cf. Dr. Tang's presentation):**
  - ◆ **In-situ instruments started to build and the platform-based system will be integrated by the end of 2008;**
    - **C\X\Ku band radar scatterometer;**
    - **C~Ka band microwave radiometer;**







# HJ-1C

- Data for S-band need to be collected for CAL/VAL purpose;
- Ground-based measurement is planned.
  - ◆ Ground-based S-band scatterometer will be completed by mid-2008;
- Any suggestion from international communities is welcome!





**End!**

**Thanks !**

