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RAS Protection in China

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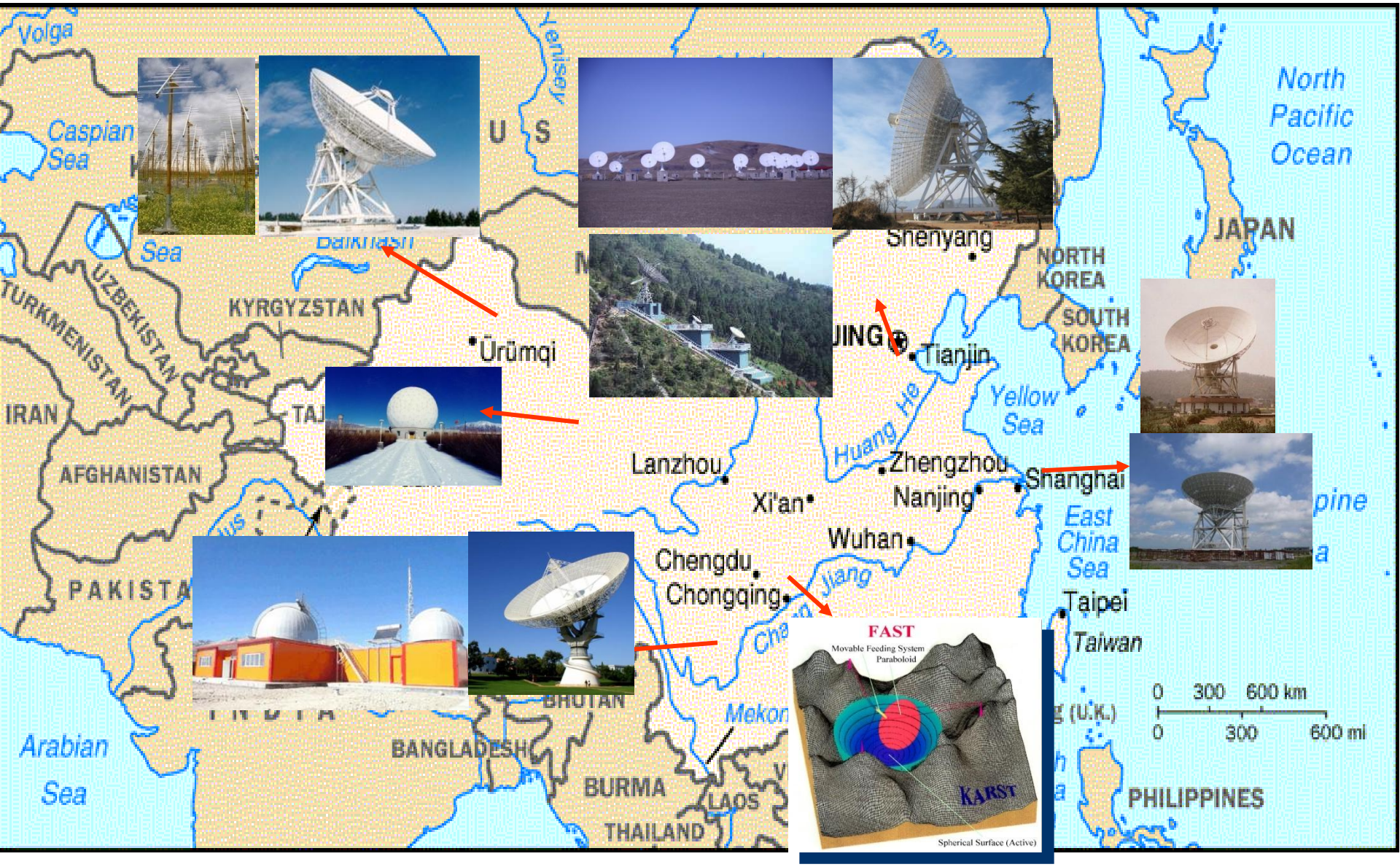
RAS Facilities in China



ITU-R Activities

- ✓ Domestic coordination on Agenda items 1.6 & 1.8 of WRC12
- ✓ APG
- ✓ RAFCAP
- ✓ WP7D & WRC2012

Domestic Activities

- ✓ Revision of the Chinese Frequency Allocation

  Adding the new RAS in CHN11, CHN12 of Chinese Radio Regulation
- ✓ Consultations with active services

  Mobile company, airport administrator etc.

Radio Quiet Zone

CSRH

✓ radius R ≤ 10km

65m telescope

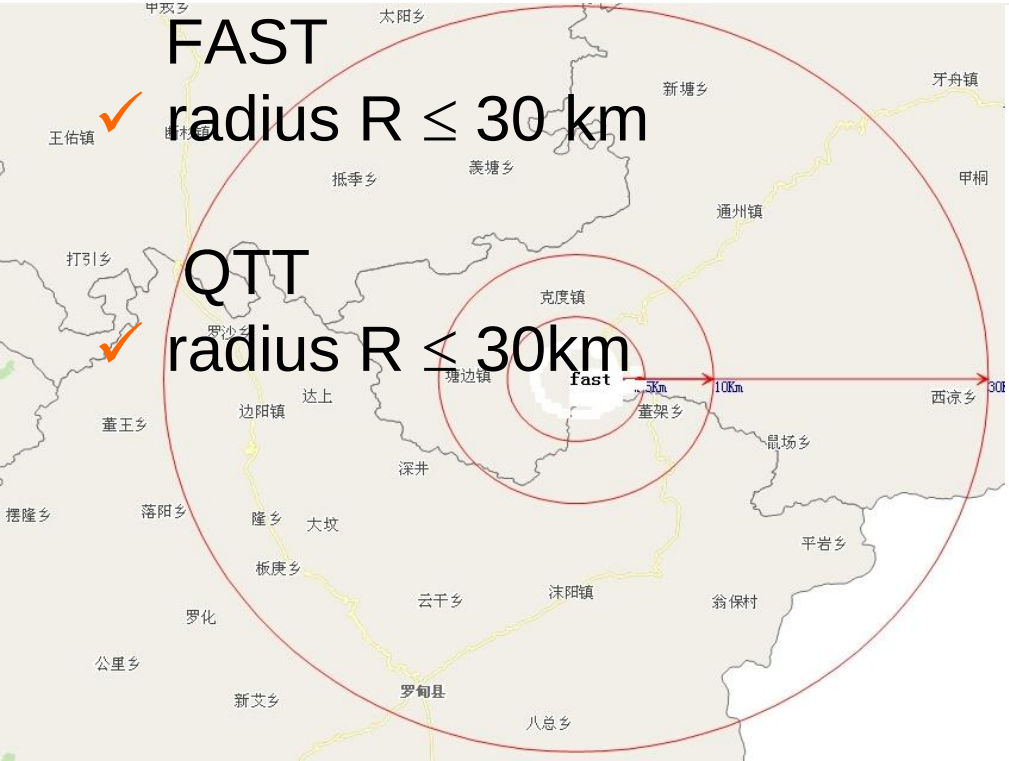
✓ radius R≤ 3km

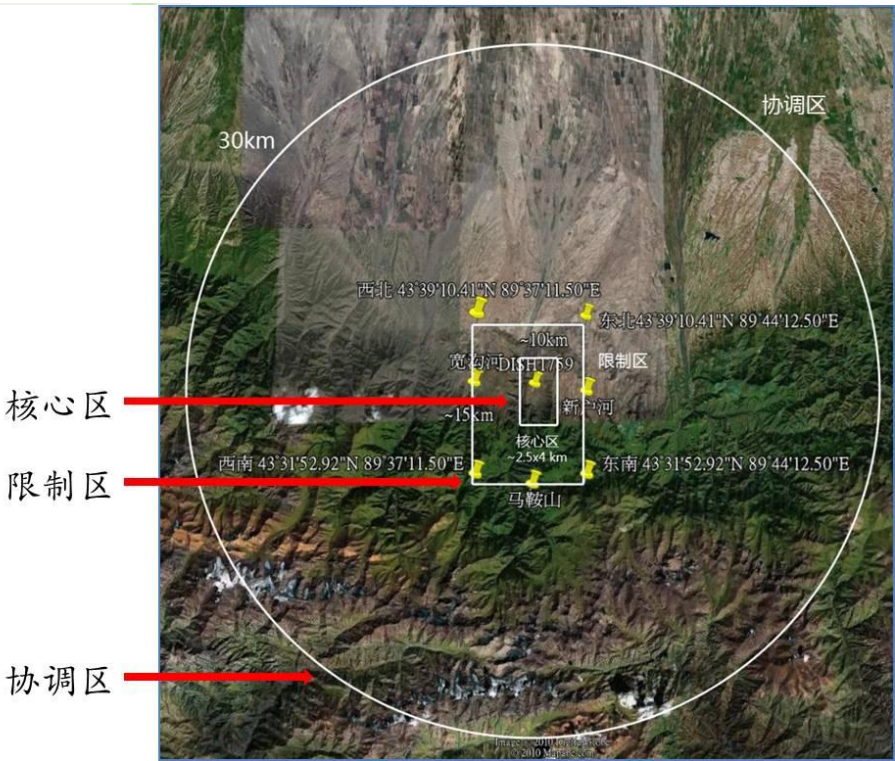
FAST

✓ radius R ≤ 30 km

QTT

✓ radius R ≤ 30km





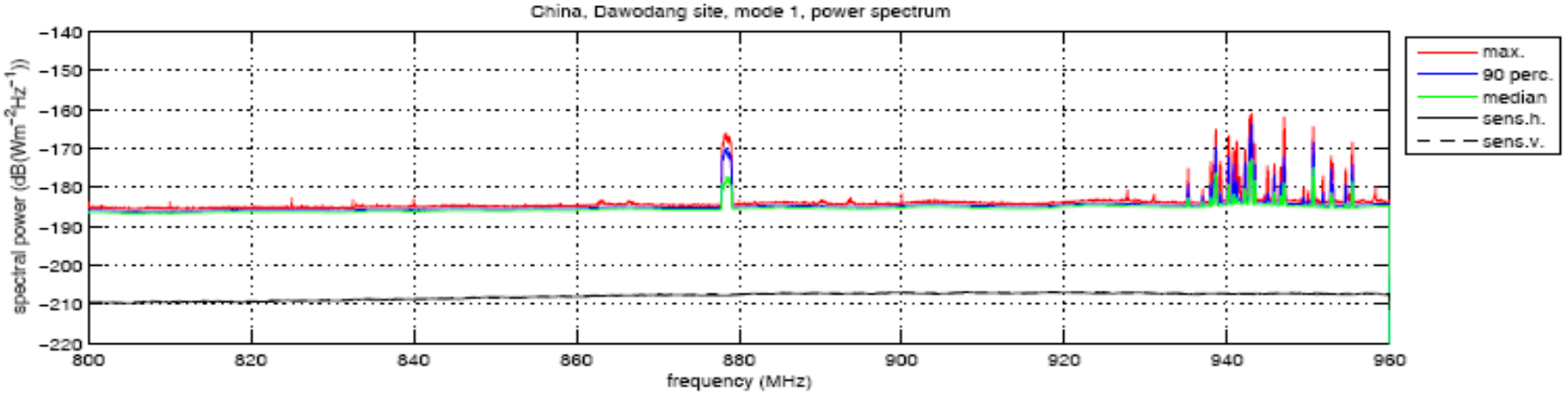
EMC issues of FAST

Goal： Protect RAS from radio frequency interference

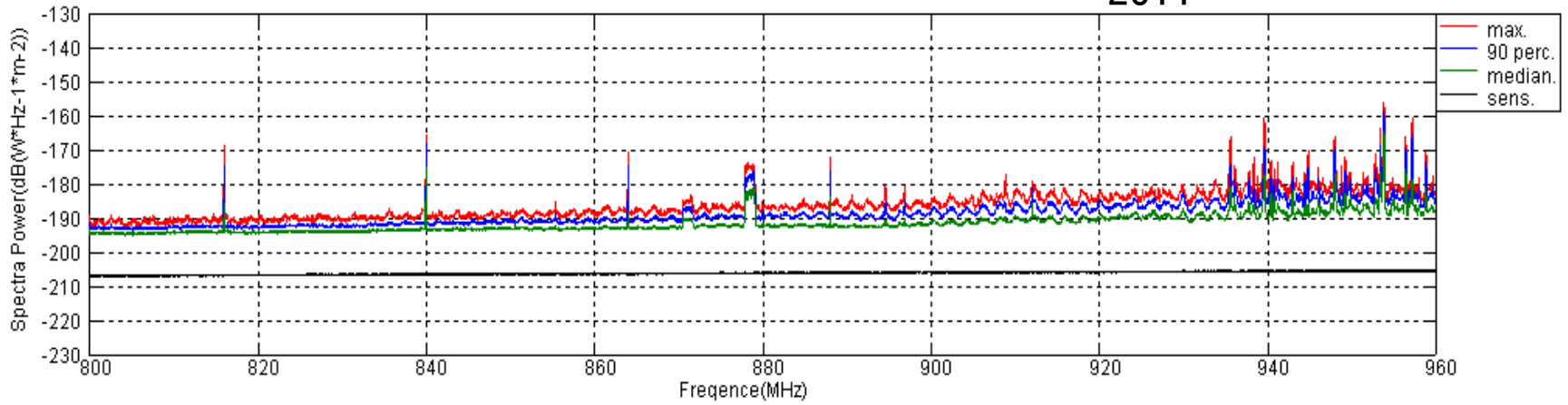
- ✓ **Radio quiet zone**
- ✓ **On site (telescope, observatory)**

FAST site radio environment measurement

2005



2011



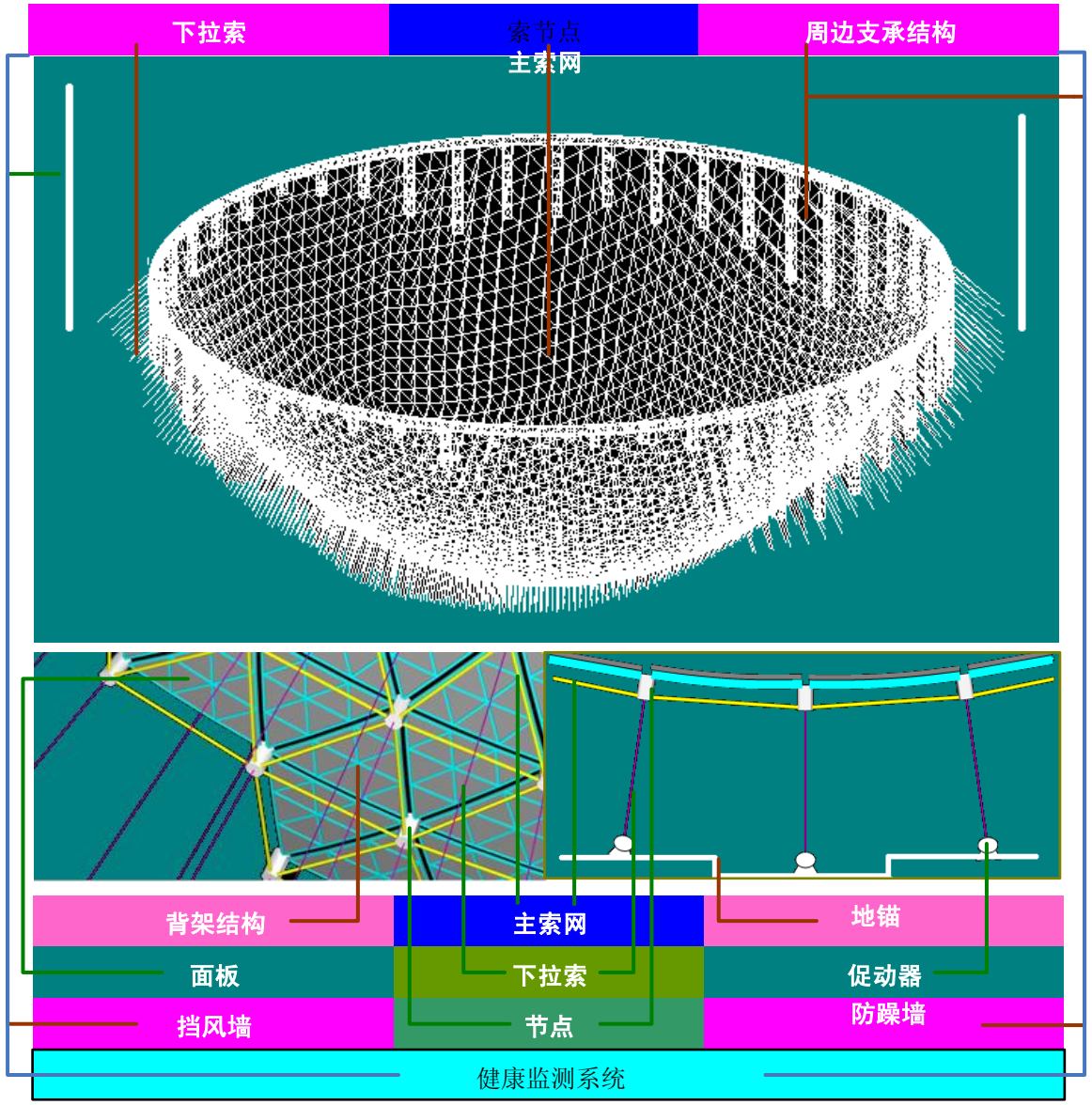
Active Reflector of FAST

Actuator： 2300 sets

Cable-net： about 7000 steel cables

Reflector element: 4600 (Back frames, adjusting bolts, panels)
gap: about 5 cm

Panel: Aluminum, 11m triangular, 1.2mm thickness,
transparency rate: about 50%,



Potential internal RFI sources of reflector

Kind of Devices	Power	Main frequency	Quantity
Server motor	400W	20-30kHz	2230
Computer	200W	3G	5
Controller	10W	30MHz	200
I/O Module	3W	30MHz	2230
Switch power supply	100W	50 kHz	30

Suggested means to fight against to EMI

- ✓ Select device with low EMI.
- ✓ EMC shield by metal box.
- ✓ Shielded wire in metal pipe.
- ✓ isolation for signal and filter for power supply
- ✓ Well to earth

EMC issues

- ✓ How to estimate the shielding effect of the reflector?
- ✓ Any advice on electricity power supply and signal line in the depression, such as underground, through pipes buried or armored cable?
- ✓ How to prevent RFI from the reflector unit controllers or actuator motors to get into the receiver?
- ✓ Design for the reflector actuators and control network

  Two schemes:

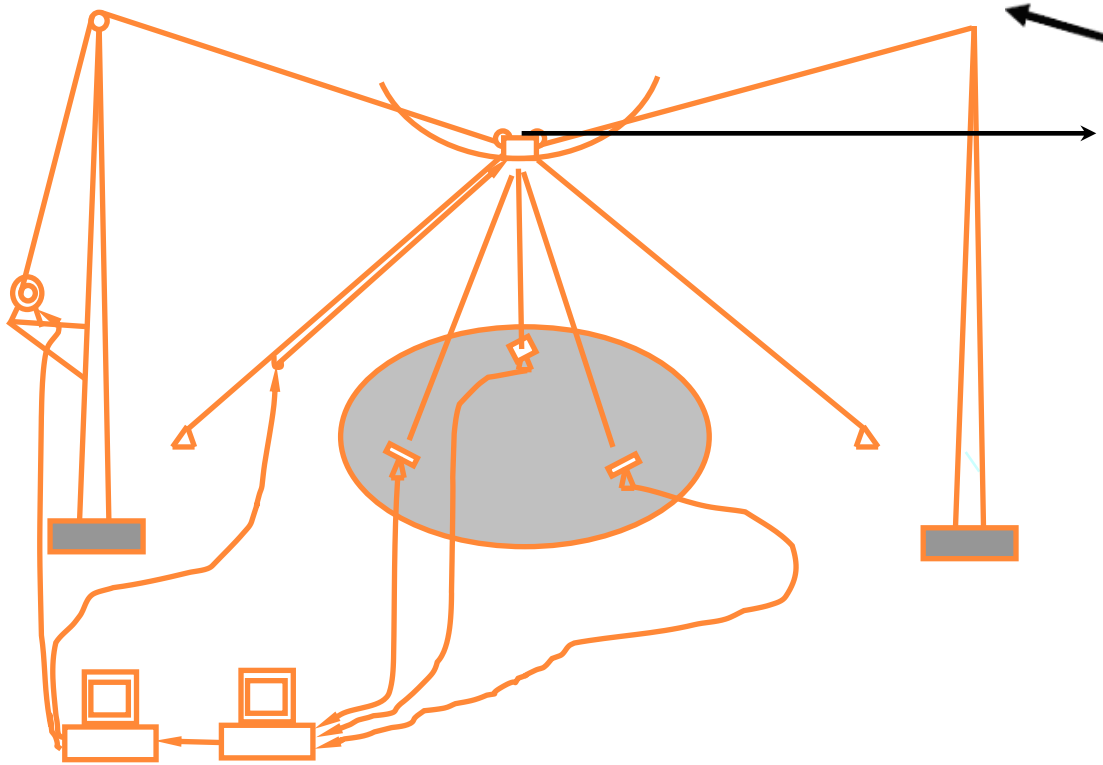
  AC motor & drive ----- Controller with shielded box

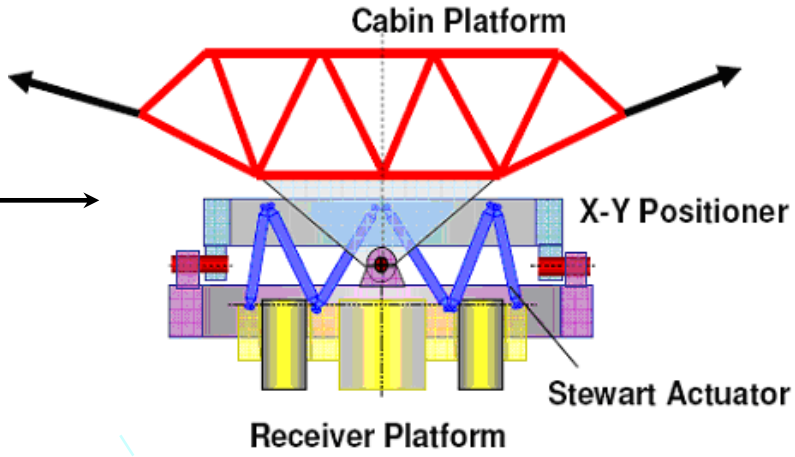
  AC motor ----- Drive & controller with shielded box

Feed support of FAST

Three main parts of cabin suspension

- Cable network - first adjustable system
- Stewart - secondary adjustable system
- Close loop control



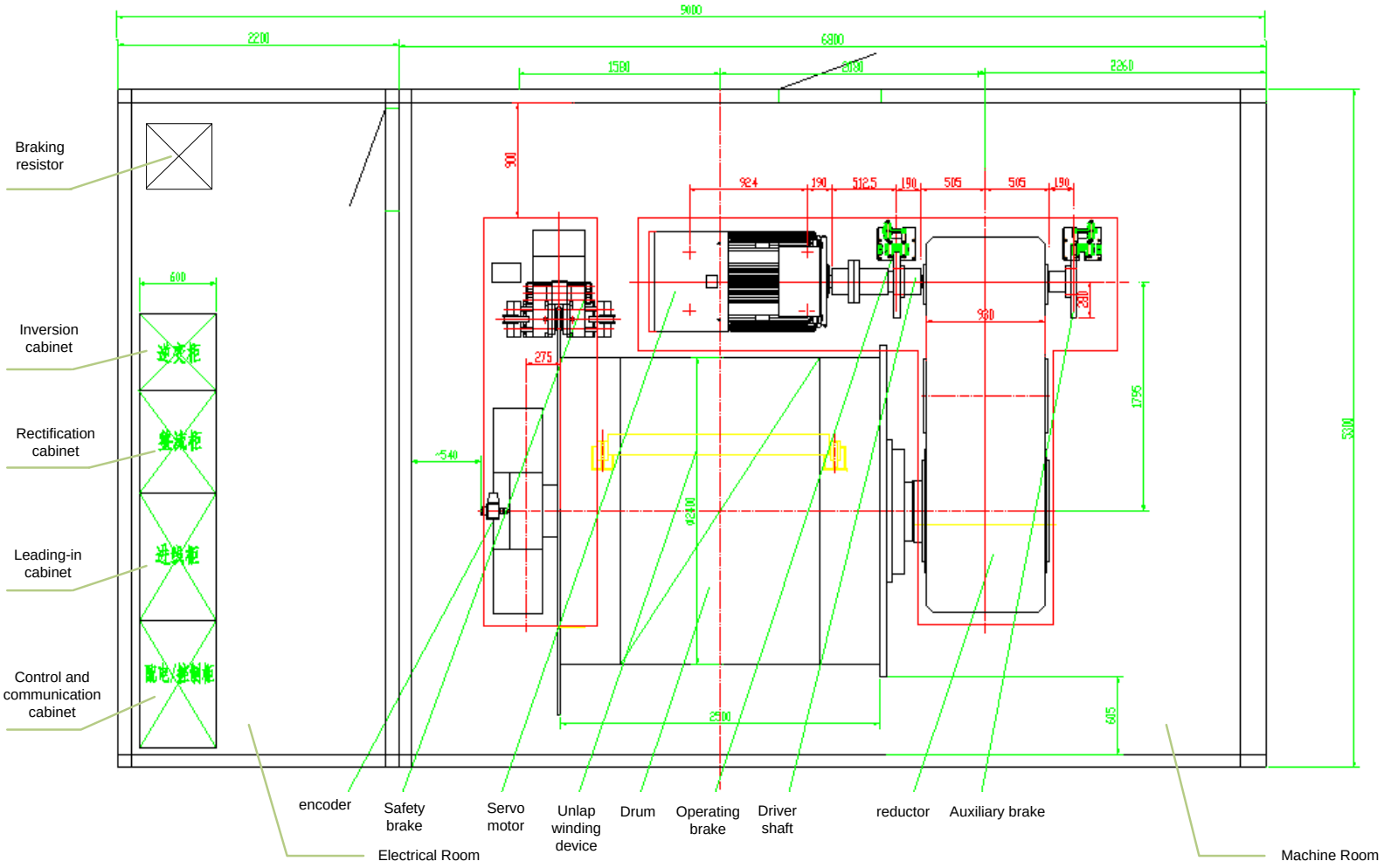


Potential internal RFI sources

Cable suspension system

Kind of Devices	Power	Main frequency	Quantity	Position
Server motor	280KW	0~50Hz	6	Capstan room
Drive	7.2KW	150MHz	6	Electric room
Controller	10W	450MHz	1	Electric room
Industrial TV	70W	50Hz	6	Tower top
Industrial TV	5W	50Hz	6	Tower top
Industrial TV	5W	50Hz	6	Capstan room

Cable suspension



Any suggestion on the attenuation factor of the shielded cabinet and the electric room?

EMC issues

- ✓ Is there any flexible material（wire netting or conductive fabric) which could be used for connecting the moving part (the receiver platform) to the focus cabin? How about its shielding effect?

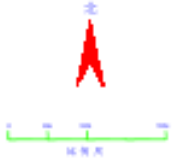
- ✓ How to shield the various motors, drives and receiver instruments on the first stage and secondary stabilized platform, such as cryogenic compressor and LO/IF electronics on the first platform, LNA and servo motor on the secondary platform in the cabin? How about the shielding effect?

- ✓ Is it necessary to shield the power supply wire which is hung under the suspension steel cable?

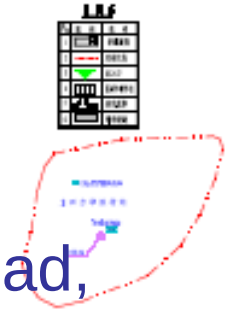
- ✓ The RFI problem of any other electric equipment, such as industrial TV?

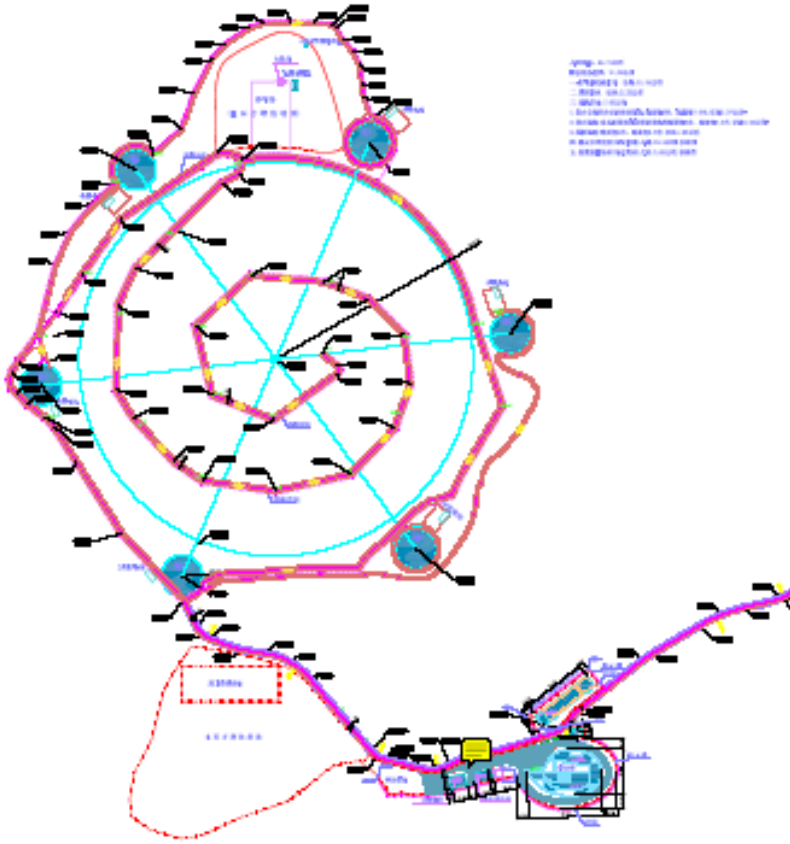
On site (telescope & observatory)

- Region 1： telescope



- Region 2: observatory
  - ✓ Buildings :laboratory, dormitories, cafeteria, visitor center, etc.
  - ✓ Public infrastructure: road, water supply and sewage , power supply, air condition, etc.



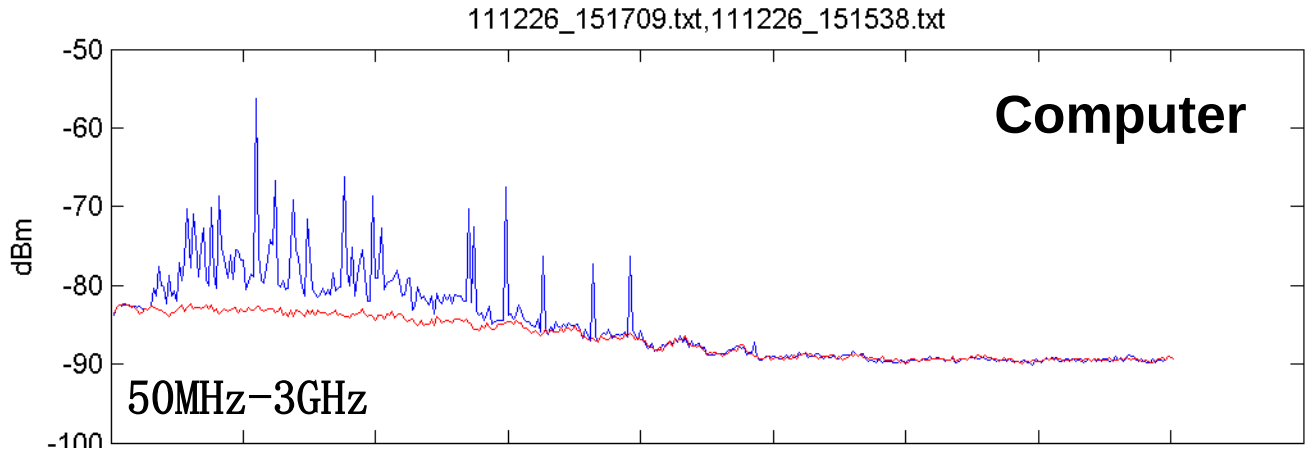


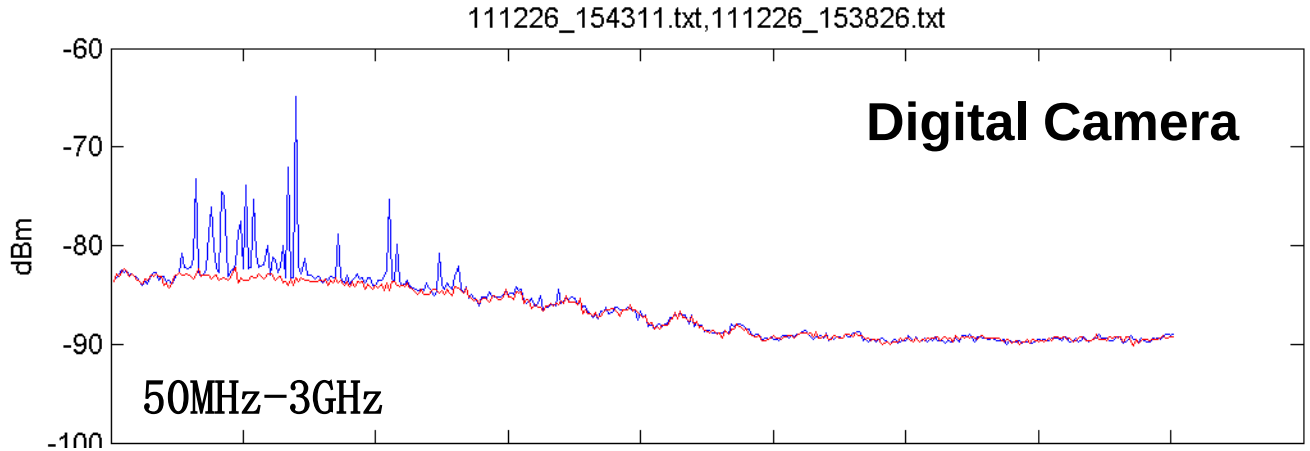
RFI measurements

- Fixed RFI monitoring station
- Moveable RFI monitoring system

Frequency range	50MHz – 8GHz
Tsys	Tsys ≤300K
Sensitivity	-230 dBW/Hzm2 100MHz -215 dBW/Hzm2 2GHz -210 dBW/Hzm2 6GHz

EMC measurements of industrial control computer
Digital camera in electromagnetic shielding room





Future works

- ✓ Study the agendas of WRC15
- ✓ Radio Quiet Zone
- ✓ Coordination with active services
- ✓ Collaboration closely on the joint research on EMC issues and RFI mitigation

Thanks!