

RAS Protection in China



Haiyan Zhang, Zhijun Chen, Jianbin Li, Bin Li,
Maozheng Chen, Yingxi Zuo, Min Wang

Outline

- **Introduction**
- **Radio quiet zone**
- ✓ **FAST**
- ✓ **CSRT**
- ✓ **TMRT**
- **Future work**

Introduction

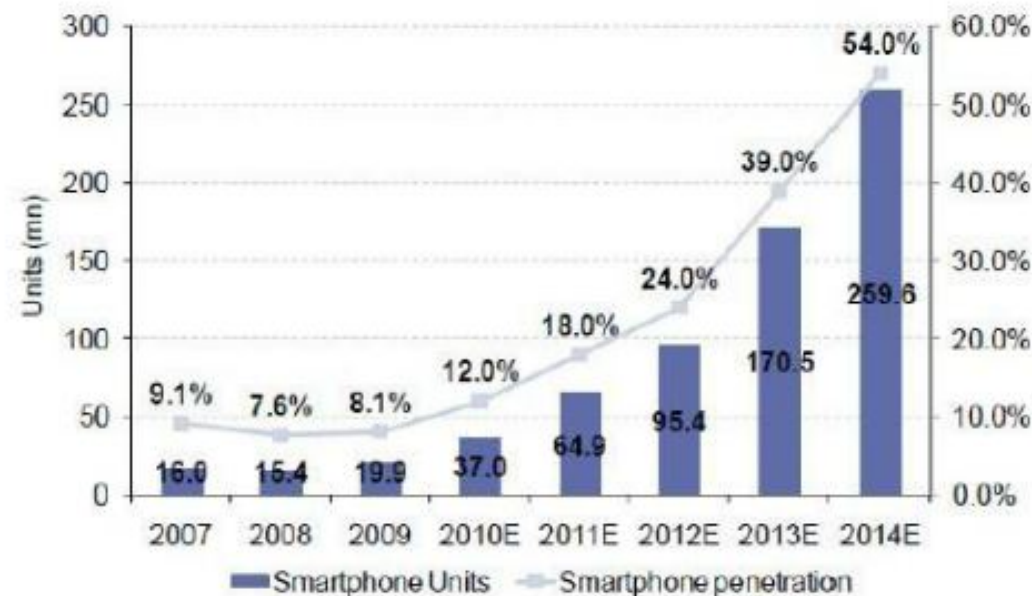
RAS Facilities in China



RAS protection in China

Goal : Protect RAS from radio frequency interference

- ✓ Radio quiet zone
- ✓ EMC on site (telescope, observatory)
- ✓ RFI mitigation



What is FAST



Five-hundred-meter Aperture Spherical radio Telescope

- Unique Karst depression
- Active main reflector
- Cable - parallel robot feed support



FAST general technical specification



Spherical reflector: Radius $\sim$ 300m, Aperture $\sim$ 500m, Opening angle 112.8°

Illuminated aperture: $D_{\text{ill}}=300\text{m}$

Focal ratio: $f/D = 0.4611$

Sky coverage: zenith angle 40°(up to 60°with efficiency loss)
tracking hours 0~6h

Frequency: 70M ~ 3 GHz (up to 8GHz in future upgrading)

Sensitivity (L-Band) : $A/T\sim 2000$, $T\sim 25\text{ K}$

Resolution (L-Band) : 2.9'

Multi-beam (L-Band) : 19, beam number of future FPA >100

Slewing: <10min

Pointing accuracy: 8"

Current status of FAST

- **1994.7** Proposal initialized – 20 yrs ago
- **2006.3** International review and advisory conference
Chaired by Fred Lo and Shuhua Ye
- **2007.7** Funding Proposal finally has been approved by
NDRC
- **2008.10** Feasibility Report approved by NDRC
- **2008.12** Preliminary design reviewed by CAS and GuiZhou
government
- **2008.12** Foundation laid
- **2011.3** Commencement of work
- **2016.9** First light is expected

Dawodang depression in Guizhou



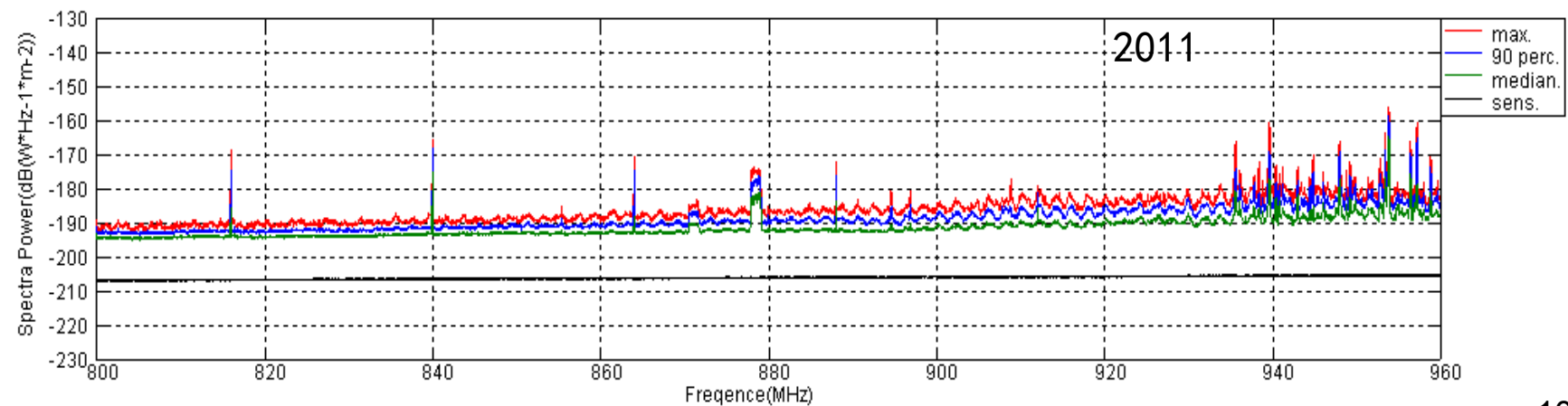
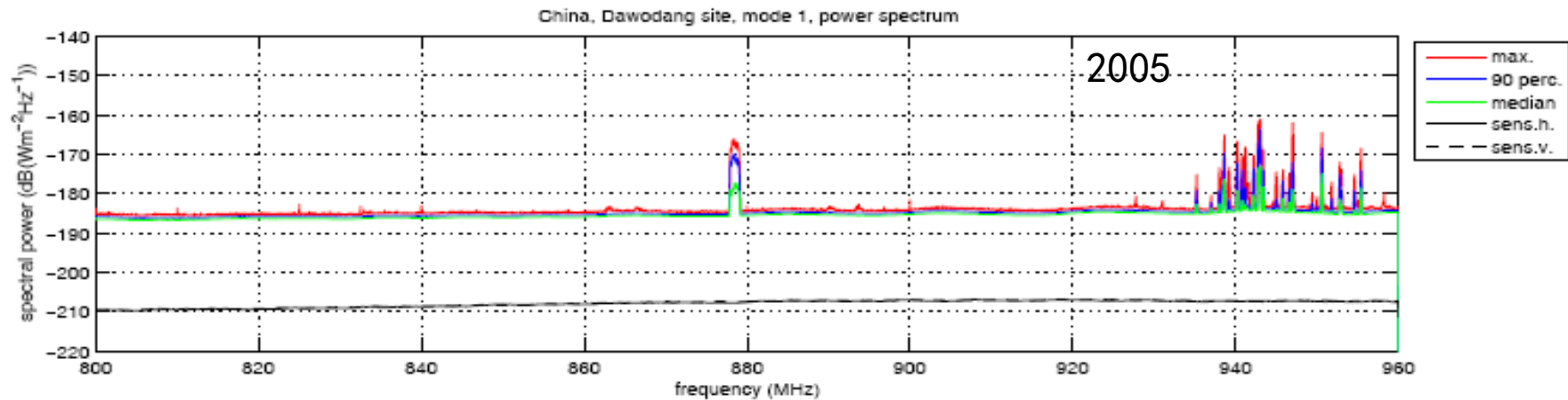
Location: N25.647222° E106.85583°

Site: the Karst region in south Guizhou Province

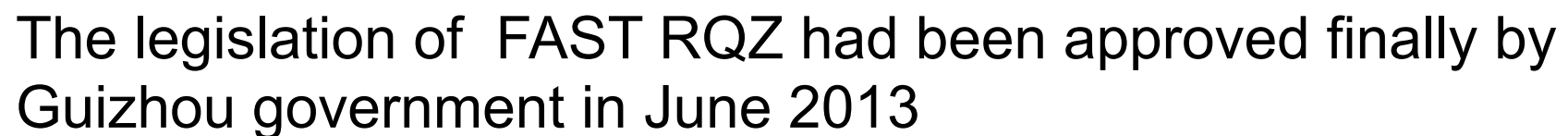
Current FAST site



FAST site radio environment measurements



KLRA
since 1990



Chinese Spectral Radio Heliograph (CSRH)



CSRH general technical specification

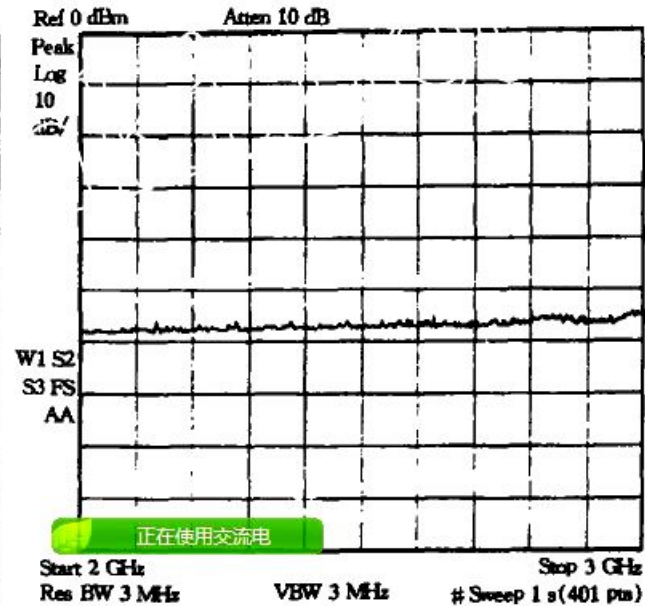
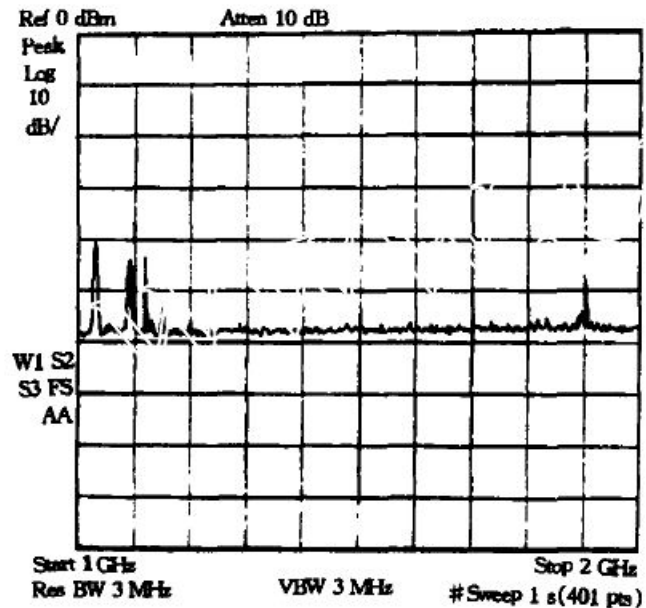
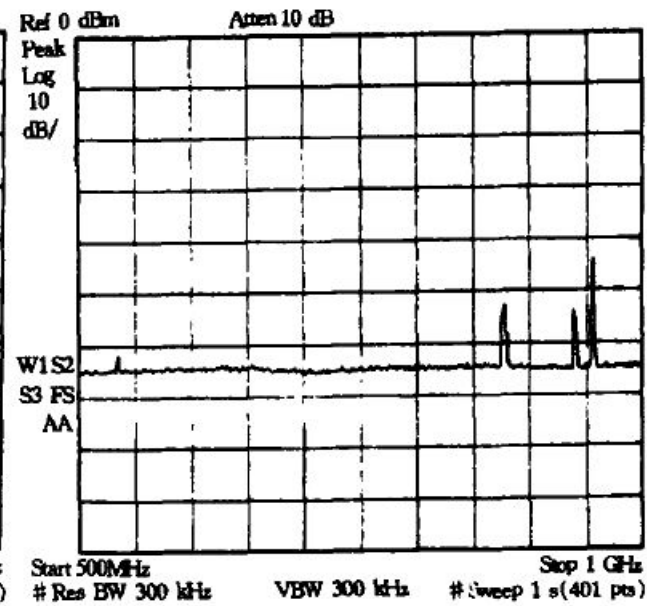
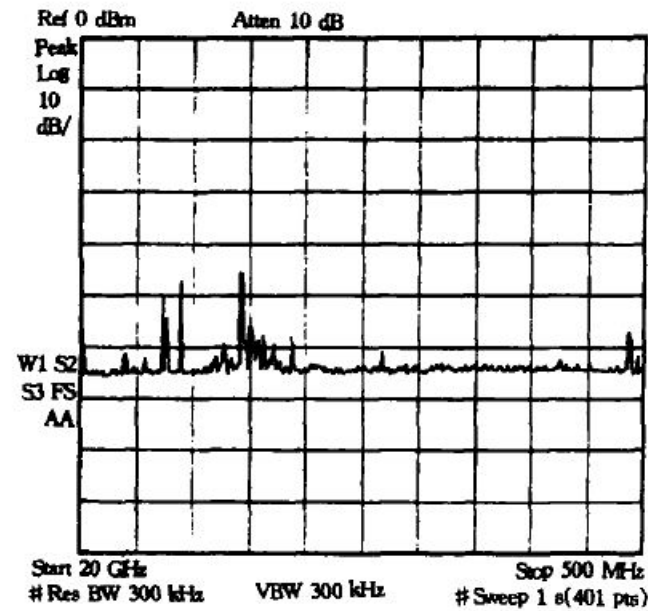


- ✓ CSRH-I: 40 4.5m antennas in 0.4-2.0 GHz
- ✓ CSRH-II: 60 2m antennas in 2-15 GHz
- ✓ Longest baseline: 3 km
- ✓ Field of view: from 0.5 to 7 degree

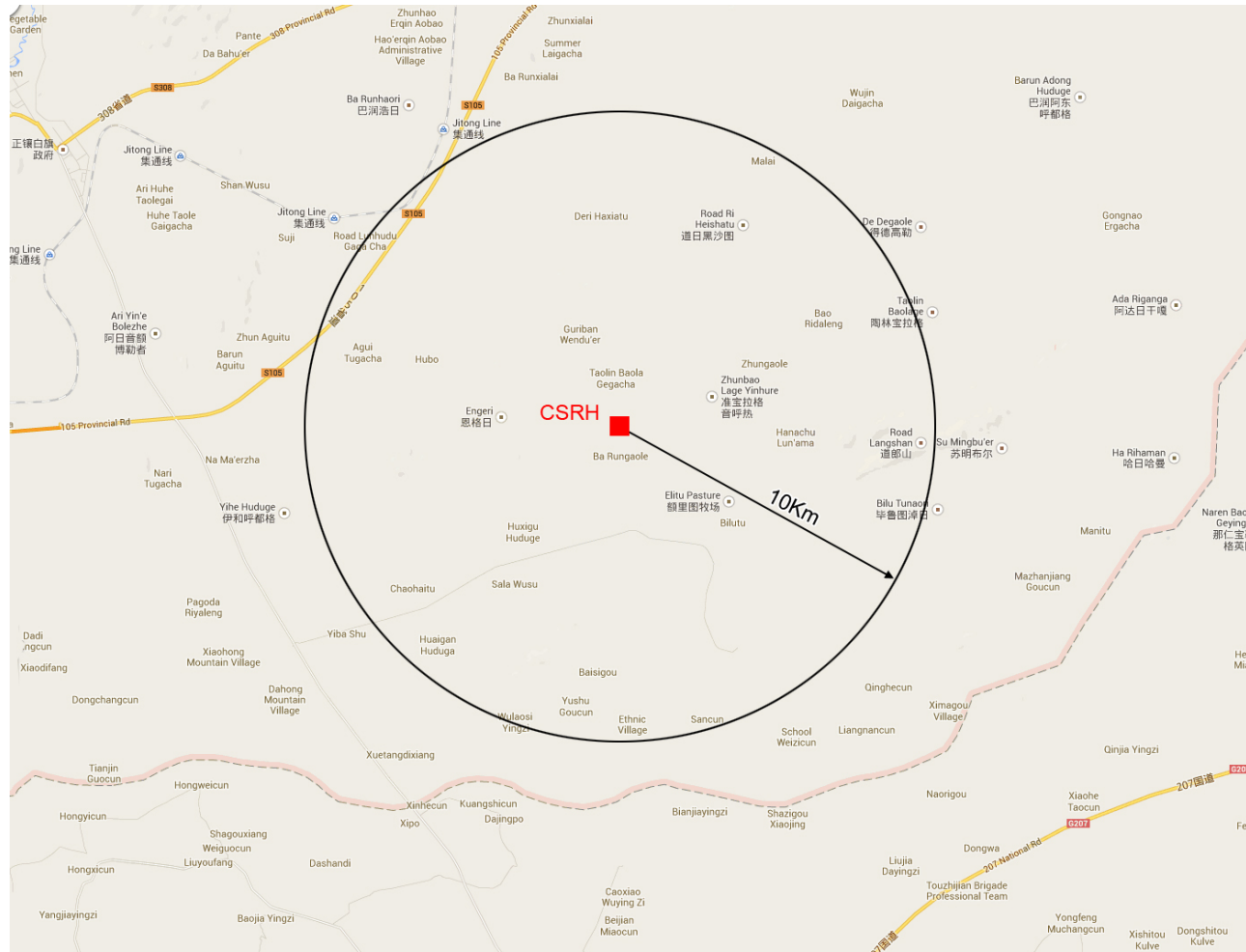
CSRH-I: has been established and starts test observations

CSRH-II: expected to be finished in June 2014

CSRH RFI measurement



KLRA
since 1990



The administrative regulation of CSRH RQZ had been approved by Inner Mongolia spectrum management office in 2008

Tianma Radio Telescope (TMRT)



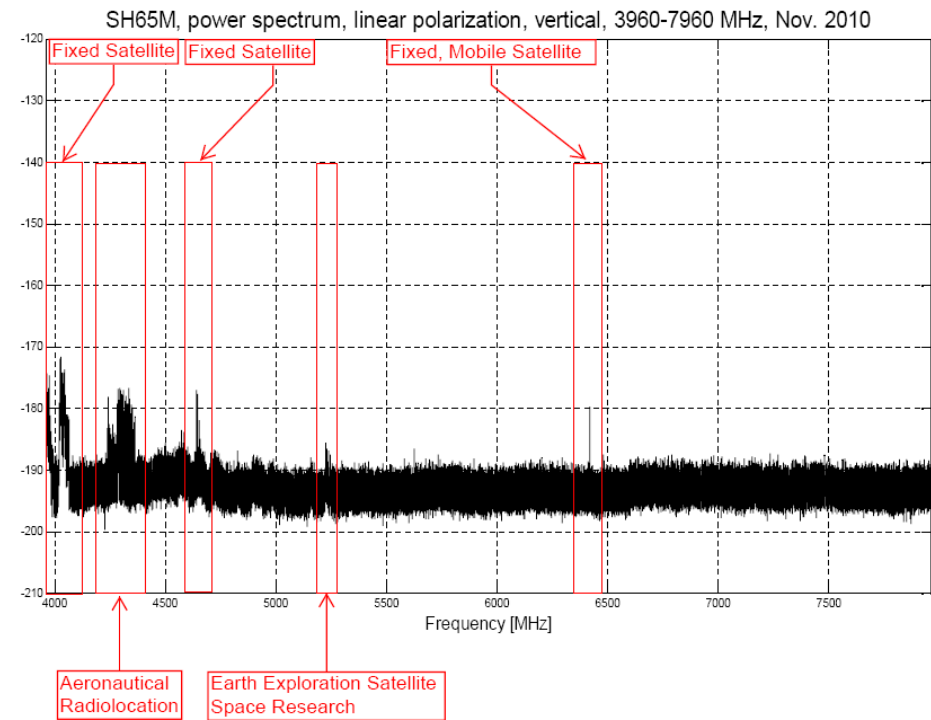
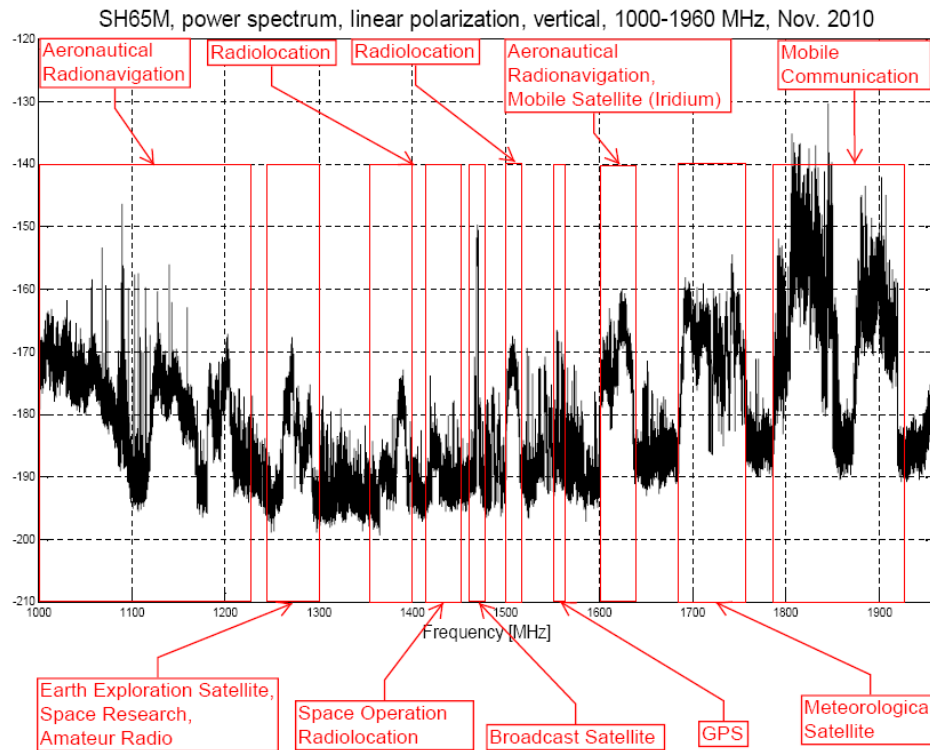
Tianma 65 meter radio telescope near Shanghai had been successfully performed the testing observations in October 2012

TMRT general technical specification

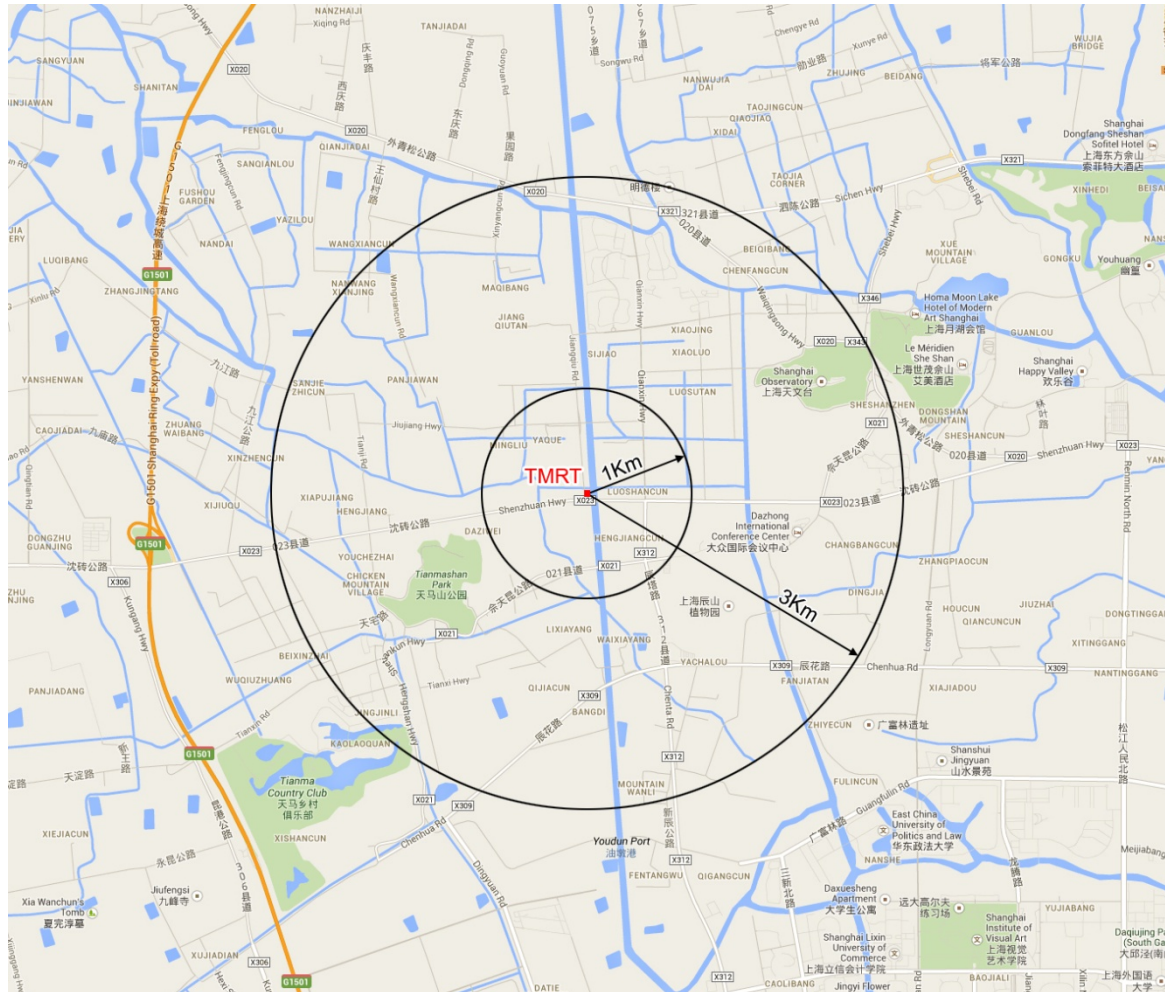


- Position: Songjiang, Shanghai, China
- Frequency coverage: 1~50 GHz
- Primary reflector: 65 m diameter
- Secondary reflector: 6.5 m diameter
- Aperture efficiency:
L/S/C >60%, X >55%, Ku >40%, K >20%
Ka >50%, Q >45%(with active surface)
- First secondary lobes: <20 dB under main
- Elevation limits: 5~90 degree
- Slew rates: 0.5 degree/s azimuth, 0.3 degree/s elevation

TMRT RFI measurement



Radio Quiet Zone around TMRT



The administrative regulation of TMRT RQZ had been approved finally by Shanghai spectrum management office in 2011

International Activities

- ✓ RAFCAP
- ✓ IUCAF
- ✓ APG
- ✓ ITU

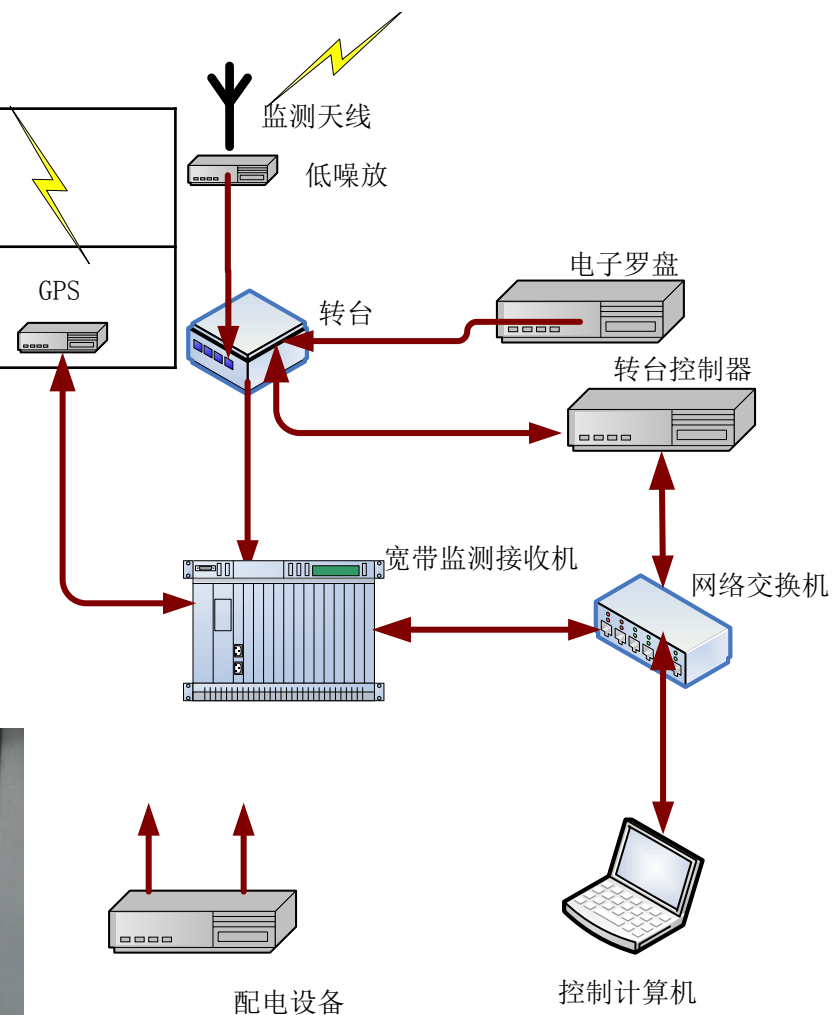
Domestic Activities

- ✓ Domestic coordination on Agenda items 1.1,1.6,1.9.1, 1.10, 1.12, 1.18 of WRC15
- ✓ Revision of the Chinese Frequency Allocation
Adding the new RAS in CHN11, CHN12 of Chinese Radio Regulation
- ✓ Consultation with active service
Mobile company, airport administrator etc.
- ✓ EMC and RFI mitigation techniques study

RFI measurements

- Fixed RFI monitoring station
- Moveable RFI monitoring system

Frequency	50MHz—8GHz
Tsys	Tsys ≤300K



Future works

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

Thanks !

