

Protect Radio Quiet Sky in China

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Content

- **RAS in China**
- **Protect radio quiet sky**
- **Future work**



The diagram illustrates the organizational structure of the Chinese Academy of Sciences (CAS) in the field of astronomy. At the center is the **NATIONAL ASTRONOMICAL OBSERVATORIES CAS**, represented by a blue hexagon with the NAO logo. This central body is connected to seven other institutes, each also represented by a blue hexagon with its own logo and name. The connections are as follows:

- Headquarters** (top): NAO HEADQUARTER (BEIJING)
- YNAO** (top-left): YUNNAN OBSERVATORY
- NIAOT** (top-right): NANJING INSTITUTE OF ASTRONOMICAL OPTICS TECHNOLOGY
- CAO** (right): CHANGCHUN OBSERVATORY
- SHAO** (bottom-right): SHANGHAI OBSERVATORY, CAS
- PMO** (bottom-left): PURPLE MOUNTAIN OBSERVATORY, CAS
- XAO** (left): XINJIANG OBSERVATORY

Double-headed arrows connect the central NAO hexagon to each of the seven peripheral institutes, indicating a two-way relationship or collaboration. The entire structure is set against a light gray background with a subtle circular pattern.

Universities

A collage of various Chinese university logos and emblems. The logos are arranged in a grid-like fashion. The top row features the Shandong University logo (red circle with 'A' and '1901') and the Hebei Normal University logo (blue circle with 'HEBEI NORMAL UNIVERSITY'). The second row includes the Nanjing University logo (purple shield with a tree and '1902'), the Tsinghua University logo (red circle with '1895'), and the University of Science and Technology of China logo (blue circle with a book and '1958'). The third row shows the Jilin University logo (purple circle with '1911'), the Shanghai Jiao Tong University logo (red circle with a gear and '1896'), and the Beijing Normal University logo (black circle with a building and '1902'). The fourth row contains the West China Medical University logo (red circle with a torch and '1936'), the Tianjin University logo (blue circle with a building and '1928'), and the Guangzhou University logo (green stylized figure). The bottom row features the East China Normal University logo (red circle with a building and '1946').

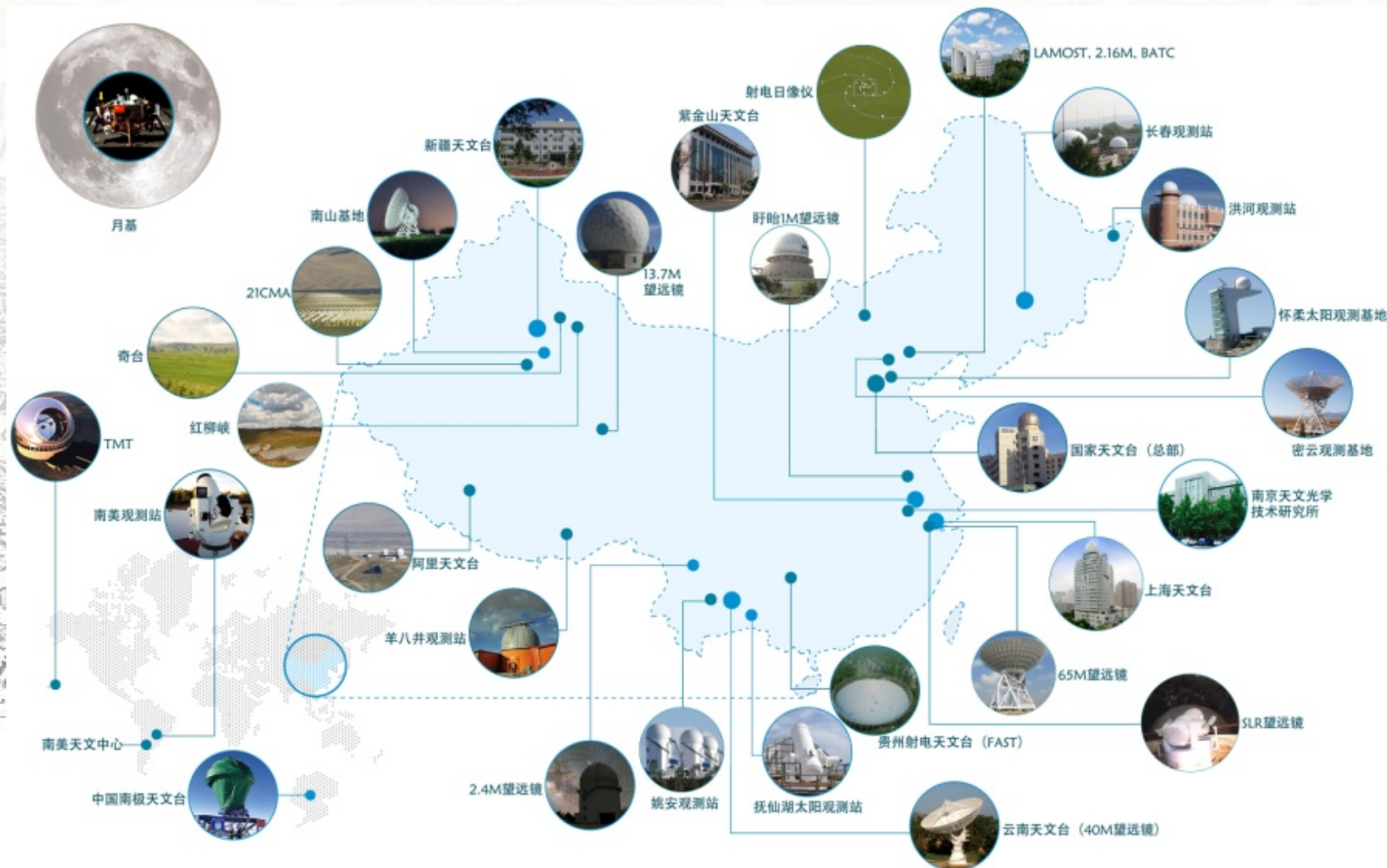
中 国 天 文 学 会 2 0 1 8 年 学 术 年 会

云南·昆明
2018.10.27—31

主办单位：中国天文学会
承办单位：中国科学院云南天文台
云南大学
云南省科学技术协会



Main observatories and facilities in China



Radio Telescopes in China



❑ Open to the world since 31 March 2021

❑ More than 5000 hr each year

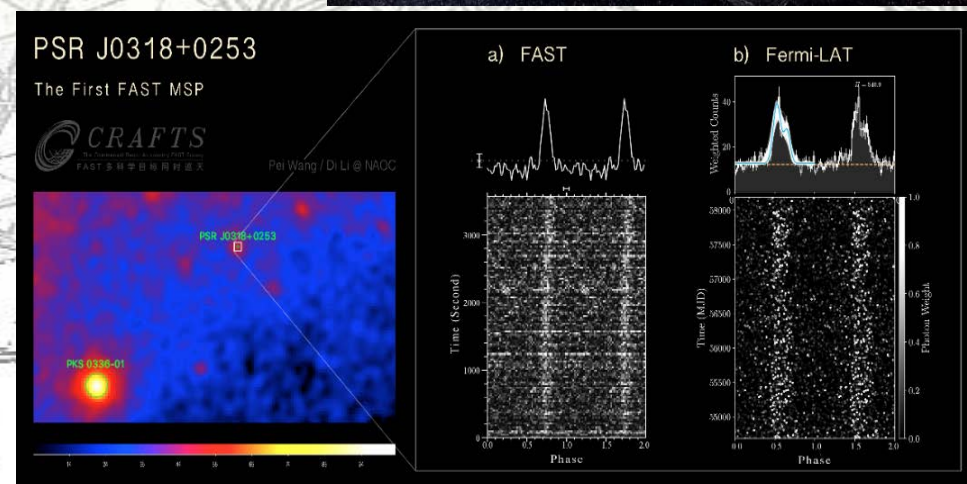
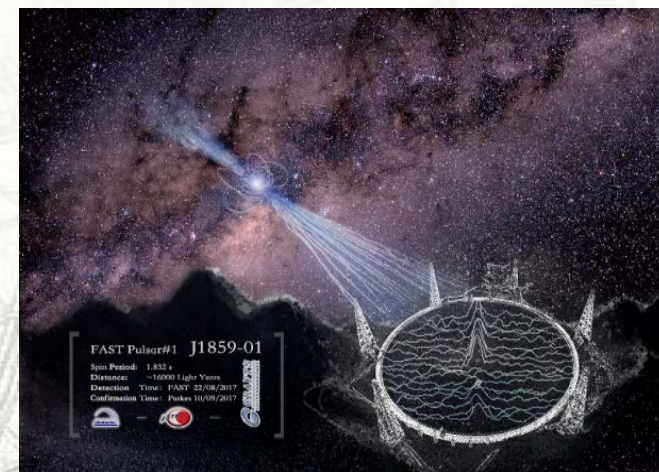
❑ **New Pulsars**

500+ new pulsars discovered

❑ **FRB**

Nature's **Top 10** Scientific

Discoveries of 2020





SKA TELESCOPE

SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

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Square Kilometre Array



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Indian-led Telescope Manager consortium concludes design work on SKA

After four and a half years, the international Telescope Manager (TM) consortium has formally concluded its work on the architectural design of a fundamental part of the software for the SKA: the nervous system of the Observatory.

Indian-led Telescope Manager consortium concludes design work on SKA

French consortium joins SKA Organisation

SKA-Athena Synergy White Paper released

Website Latest

In the press



Team SKA - Meet astrophysicist Prof. Yashwant Gupta



Check out the new SKA info sheets



Team SKA - Meet software engineer Snehal Valame

48%

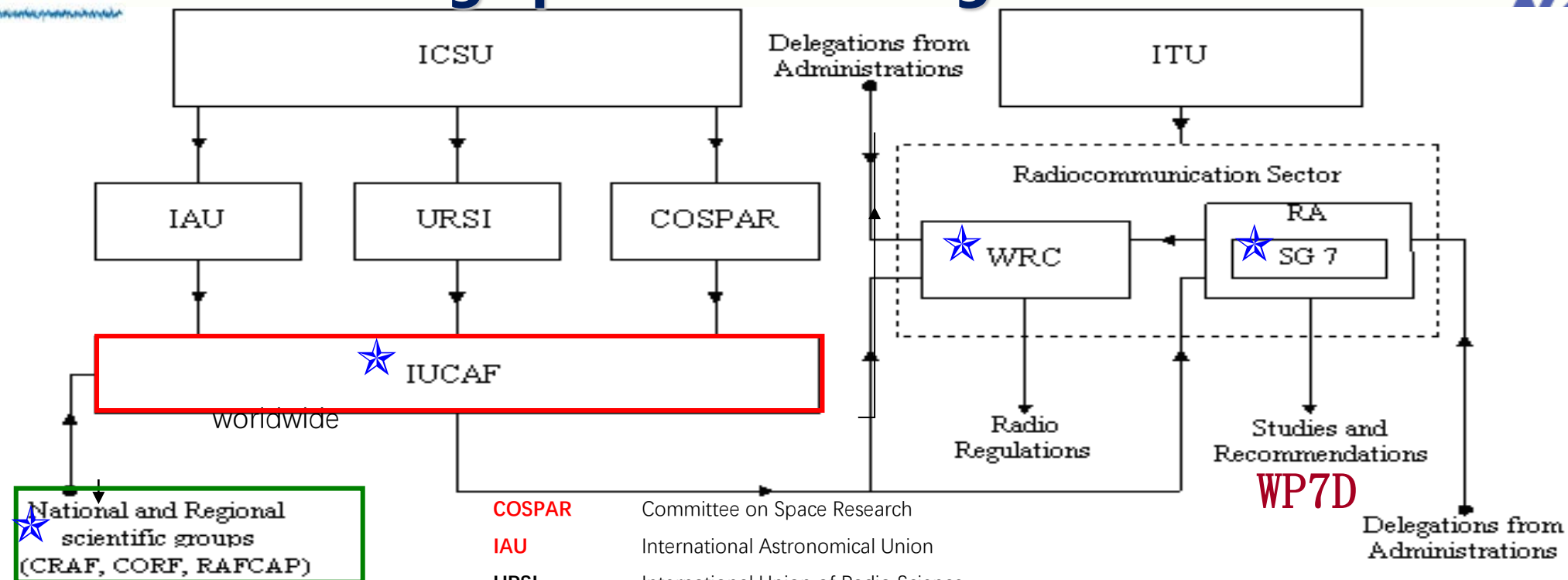
OK/s

OK/s

- Continue spectrum protection cooperation of Radio Astronomy with ITU-R WP7D, IUCAF, RAFCAP etc.
- Join in the activities of protecting dark and quiet sky
- **Establish Radio Quiet Zones (RQZs) around radio telescopes**
- Form a protection group of Radio Astronomy based on the observatories
- Develop Electromagnetic Compatibility (EMC) measures of radio telescopes
- Carry out the study on Radio Frequency Interference (RFI) mitigation technology



Attending spectrum management activities



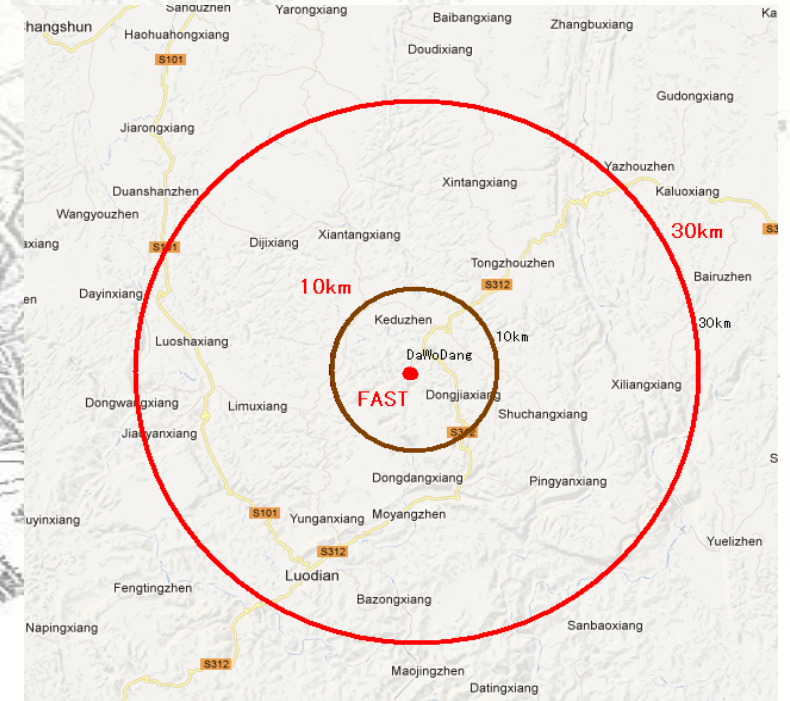
COSPAR	Committee on Space Research
IAU	International Astronomical Union
URSI	International Union of Radio Science
IUCAF	Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science
CORF	Committee on Radio Frequencies (USA)
CRAF	Committee on Radio Astronomical Frequencies (EUR)
RAFCAP	Radio Astronomy Frequency Committee in the Asia-Pacific Region
ICSU	International Council of Scientific Unions
ITU	International Telecommunication Union
RA	Radiocommunication Assembly
SG 7	Radiocommunication Study Group 7
WRC	World Radiocommunication Conference



Join in the activities of protecting dark and quiet skies



- ❑ Regulations of the People's Republic of China on Radio Management
 - ❑ Regulations on the Radio Frequency Allocation, People's Republic of China
 - ❑ Measures for the maintenance of radio quiet zones
 - ❑ ...
- **FAST Radio Quiet Zones: radius ≤ 30 km (2013)**
 - **FAST Airspace Restriction Zone: radius ≤ 30 km (2017)**



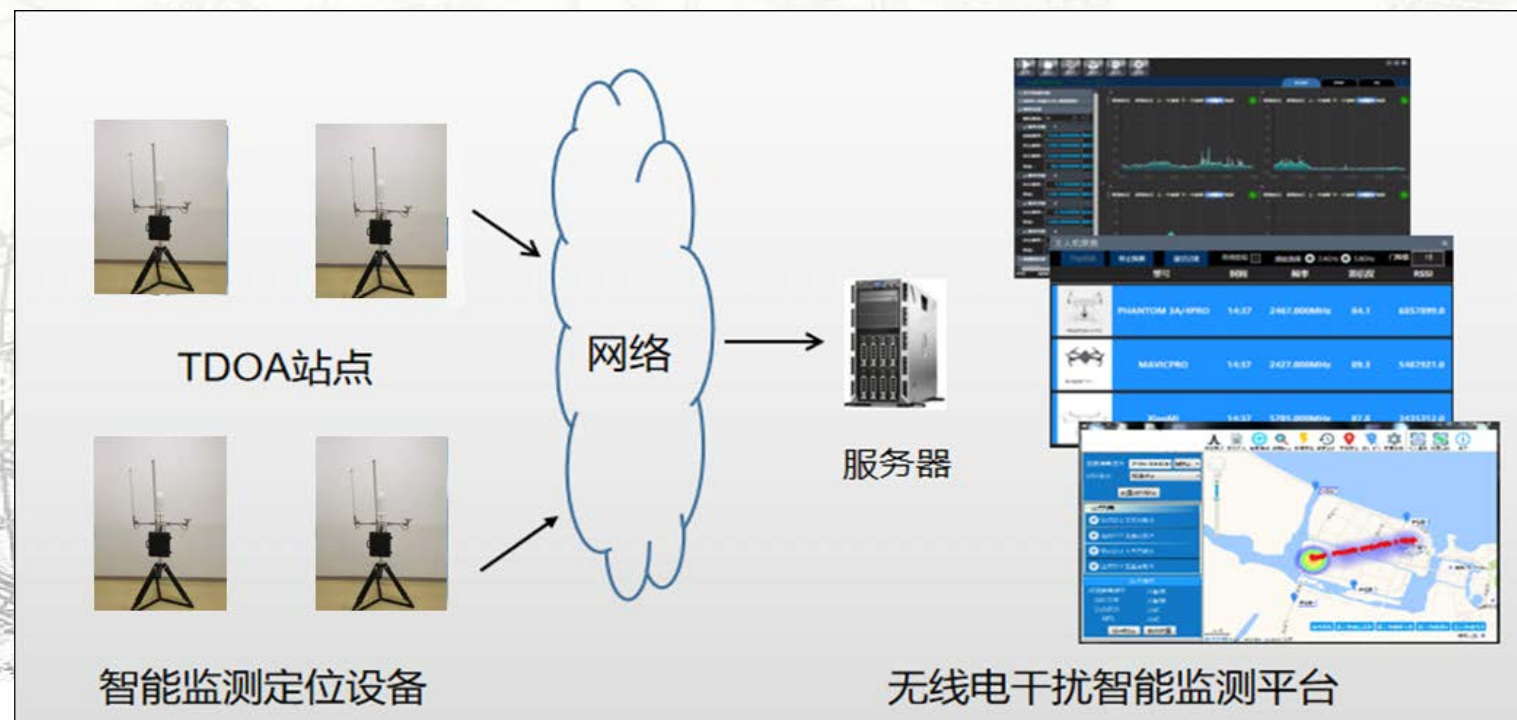
Information summary of RQZs in China

	FAST	MUSER	Delingha	Tianma	QTT
Centre position (Lat. Long)	25°39' 10", 106°51' 20"	42°12'31.3", 115°14'44.7"	37°22'42.5", 97°43'46.7"	31°05'32", 121°08'10"	43°36'04", 89°40'57"
Altitude	841 m	1356 m	3200 m	4 m	1759 m
Date of policy (year)	2013	2007	2015	2012	2018
Restriction zone	~5 km radius	~10 km radius	~11 km radius	~1 km radius	Rectangle 10 × 15 km ²
Coordination zone	5-30 km radius	-	11-26 km radius	1-3 km radius	~30 km radius



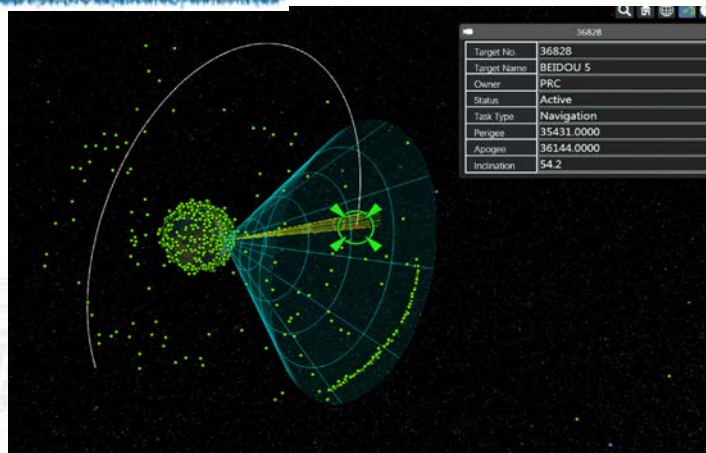


EMC solutions

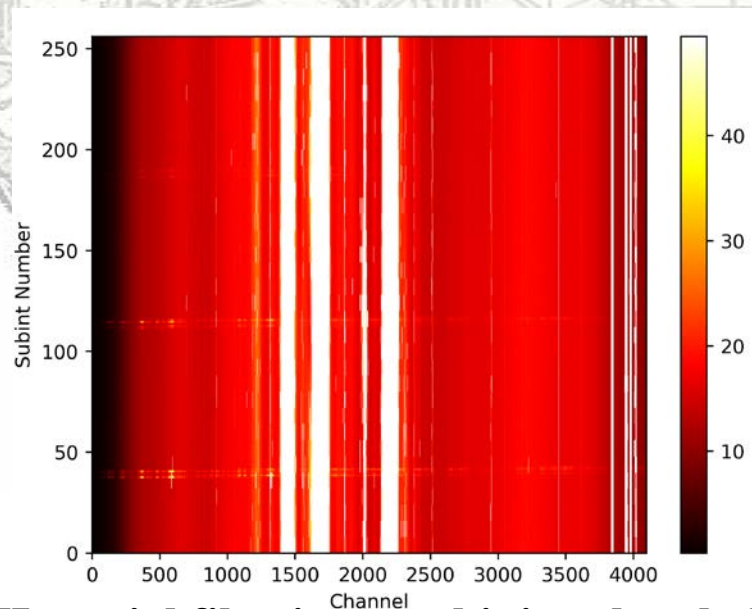


RFI monitoring system

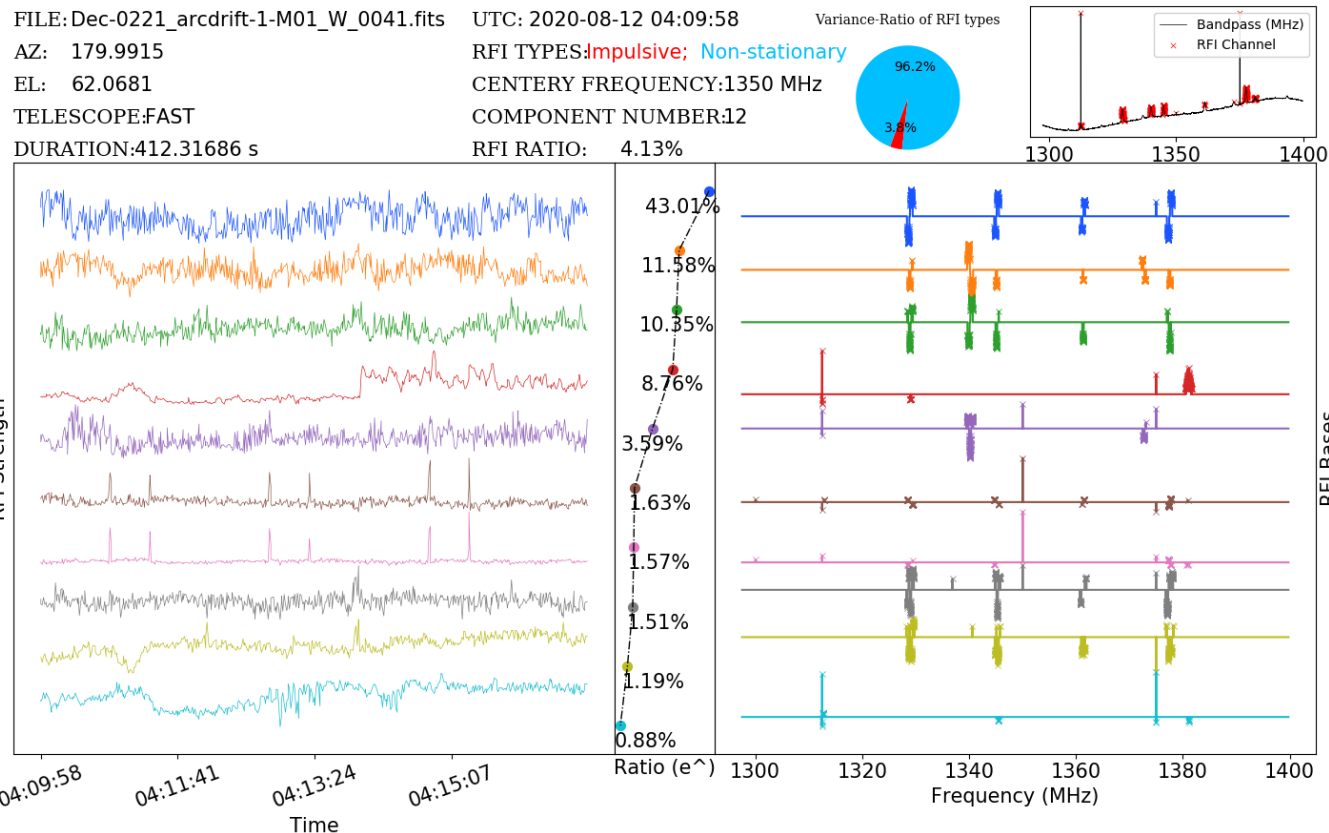




Satellite RFI warning system



RFI spatial filtering combining threshold method



RFI extraction and statistic based on Principal Component Analysis, PCA

- **Actively build new sites for radio astronomy**
- **Continue EMC & RFI mitigation study**
- **Establish & maintain RQZs**
- **Work with the government to create standards and regulations**
- **Engage with the international community to join efforts on RAS protection**

Thanks !

