

PULSARS AND FRBs

Ongoing activities towards the SKA

PULSARS IN THE SKA CONTEXT

- Pulsars and transients are two of the Main Science Drivers for the SKA



The image is a screenshot of a web browser displaying the SKA website. The browser's address bar shows the URL <https://www.skatelescope.org/science/>. Below the address bar, there is a navigation bar with various icons and links, including 'Most Visited', 'Google Calendar', 'Gmail', 'PKS Portal', 'Repubblica', 'Facebook', 'Modulistica OAC', 'Modulistica INAF', and 'SRT V'. The main content area features a heading 'Some Of The Main SKA Science Drivers Include:' followed by three science driver cards. The first card is titled 'Galaxy evolution, cosmology and dark energy' and includes an image of a galaxy and a text block. The second card is titled 'Strong-field tests of gravity using pulsars and black holes' and includes an image of a black hole and a text block. The third card is partially visible and titled 'Was Einstein right about gravity?'. The text 'Strong-field tests of gravity using pulsars and black holes' is circled in red.

Some Of The Main SKA Science Drivers Include:

Galaxy evolution, cosmology and dark energy

How do galaxies evolve? What is dark energy?
The acceleration in the expansion of the Universe has been attributed to a mysterious dark energy. The SKA will investigate this expansion after the Big Bang by mapping the cosmic distribution of hydrogen. [more...](#)

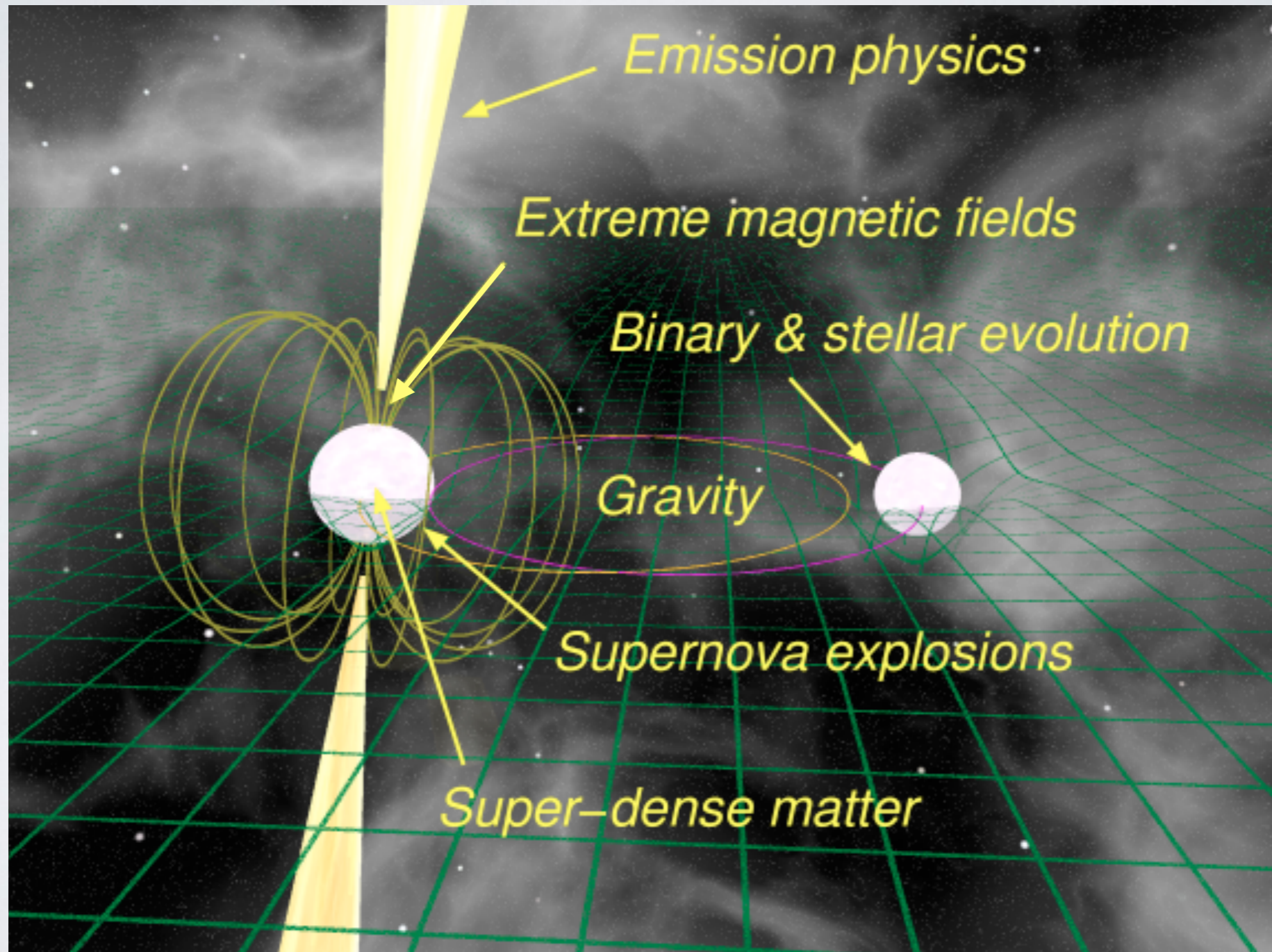
Strong-field tests of gravity using pulsars and black holes

Was Einstein right about gravity? The SKA will investigate the nature of gravity and challenge the theory of general relativity. [more...](#)

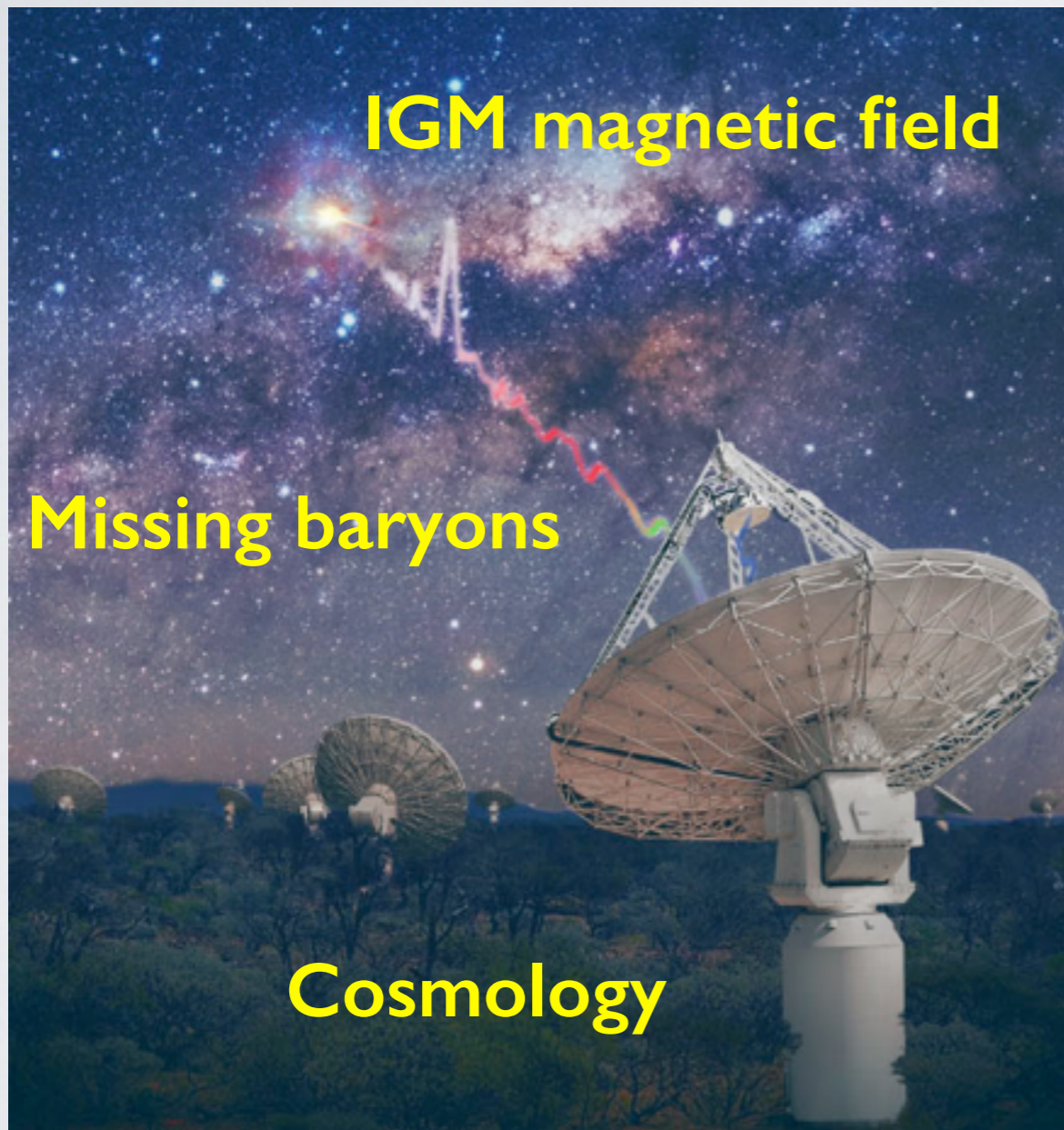
Galaxy evolution, cosmology and dark energy

Strong-field tests of gravity using pulsars and black holes

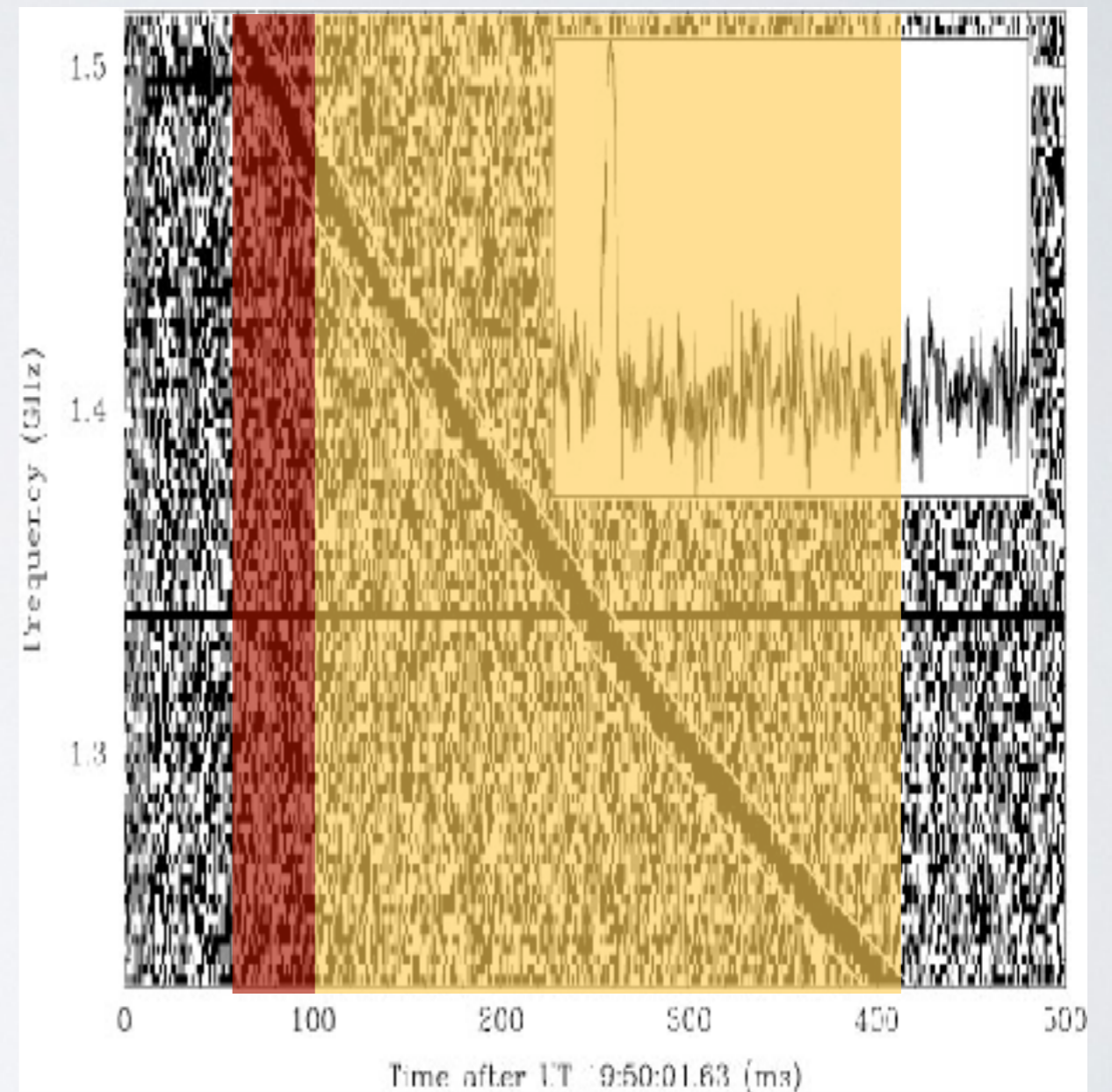
THE SCIENTIFIC IMPACT OF PULSARS



THE SCIENTIFIC IMPACT OF FRBs

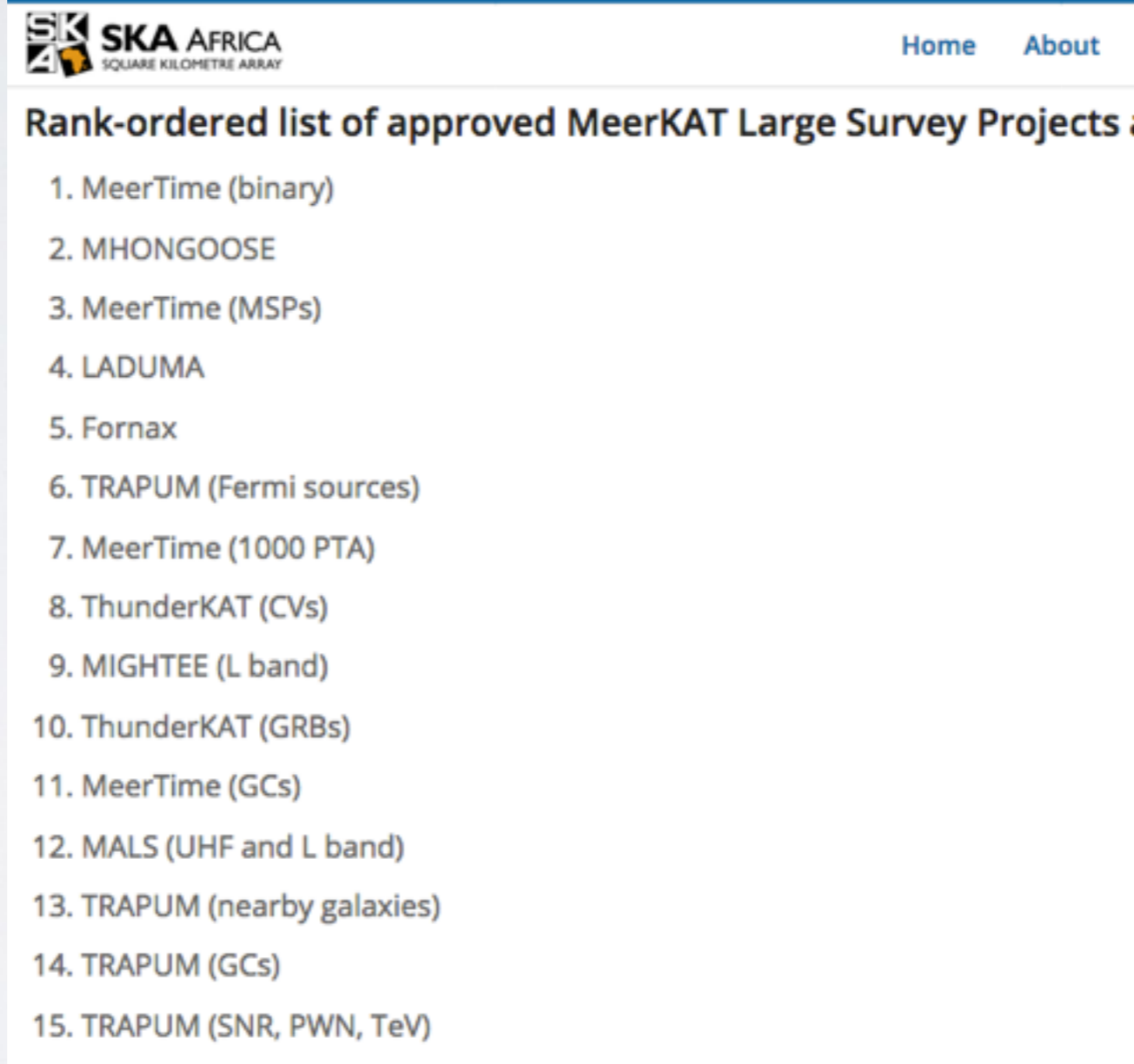


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Lorimer et al 2007

PULSARS AND FRBs WITH THE SKA PRECURSORS



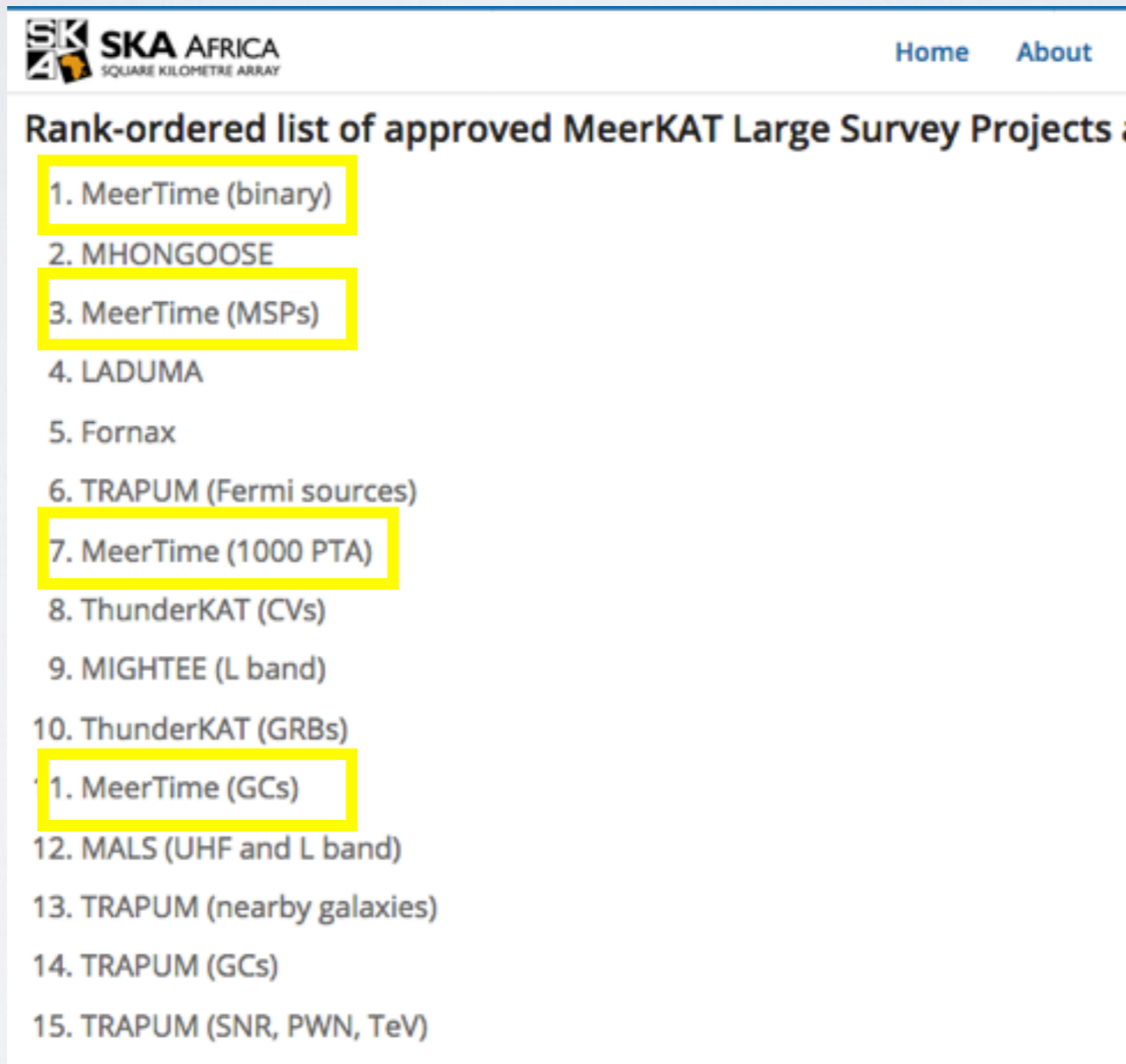
SKA AFRICA
SQUARE KILOMETRE ARRAY

[Home](#) [About](#)

Rank-ordered list of approved MeerKAT Large Survey Projects :

1. MeerTime (binary)
2. MHONGOOSE
3. MeerTime (MSPs)
4. LADUMA
5. Fornax
6. TRAPUM (Fermi sources)
7. MeerTime (1000 PTA)
8. ThunderKAT (CVs)
9. MIGHTEE (L band)
10. ThunderKAT (GRBs)
11. MeerTime (GCs)
12. MALS (UHF and L band)
13. TRAPUM (nearby galaxies)
14. TRAPUM (GCs)
15. TRAPUM (SNR, PWN, TeV)

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PULSARS AND FRBs WITH THE SKA PRECURSORS

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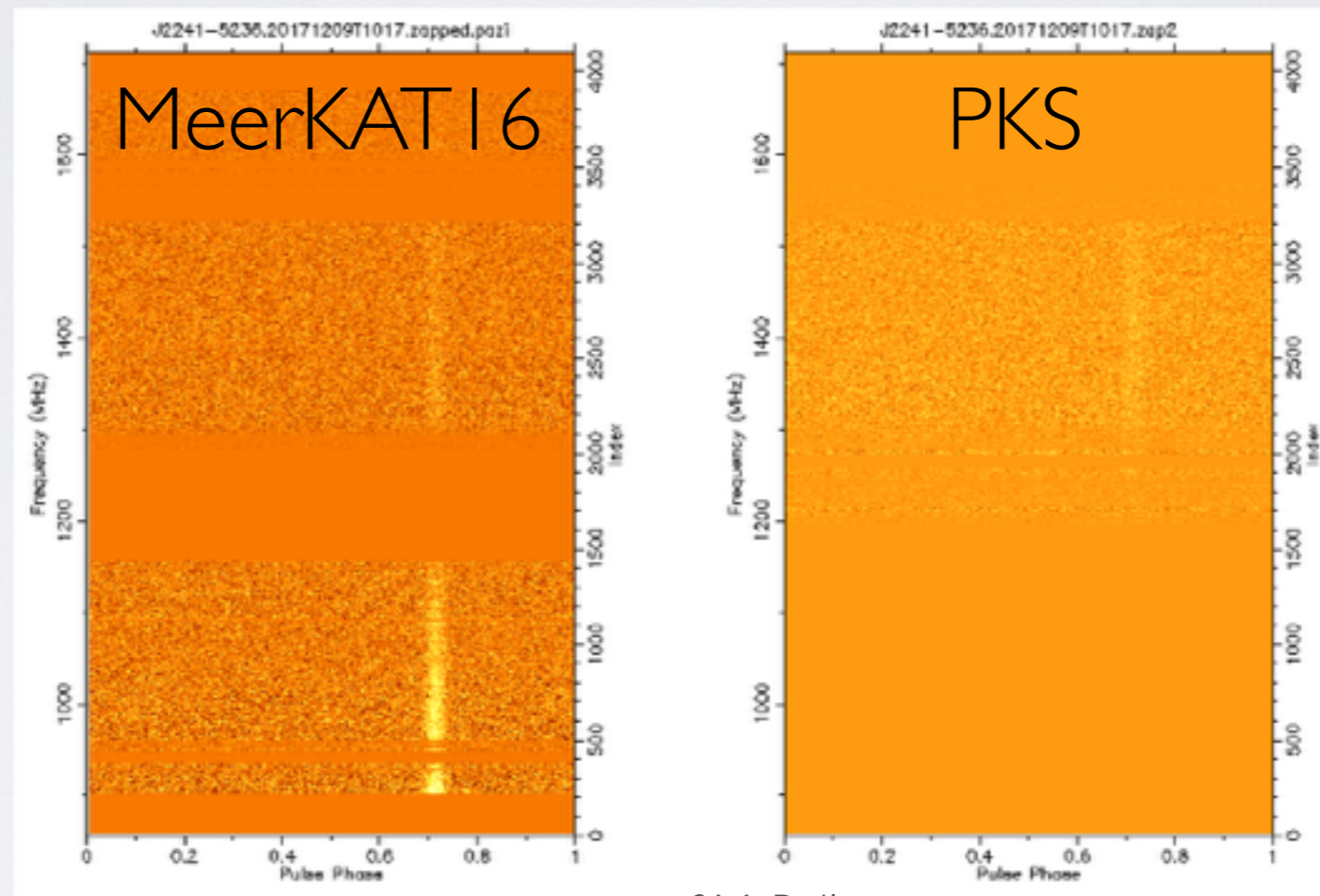
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MEERTIME

MeerKAT KSP on Pulsar Timing - P.I. Mathew Bailes

- Regular timing of ~ 1000 PSRs to
 - study relativistic gravity (GR, masses, EoS...)
 - search for GWs from SMBH binaries
 - study pulsar phenomenology (intermittency, moding, glitches, NS interiors, NS magnetospheres...)
 - study pulsars in GCs (ICM, ICB, binary evolution...)

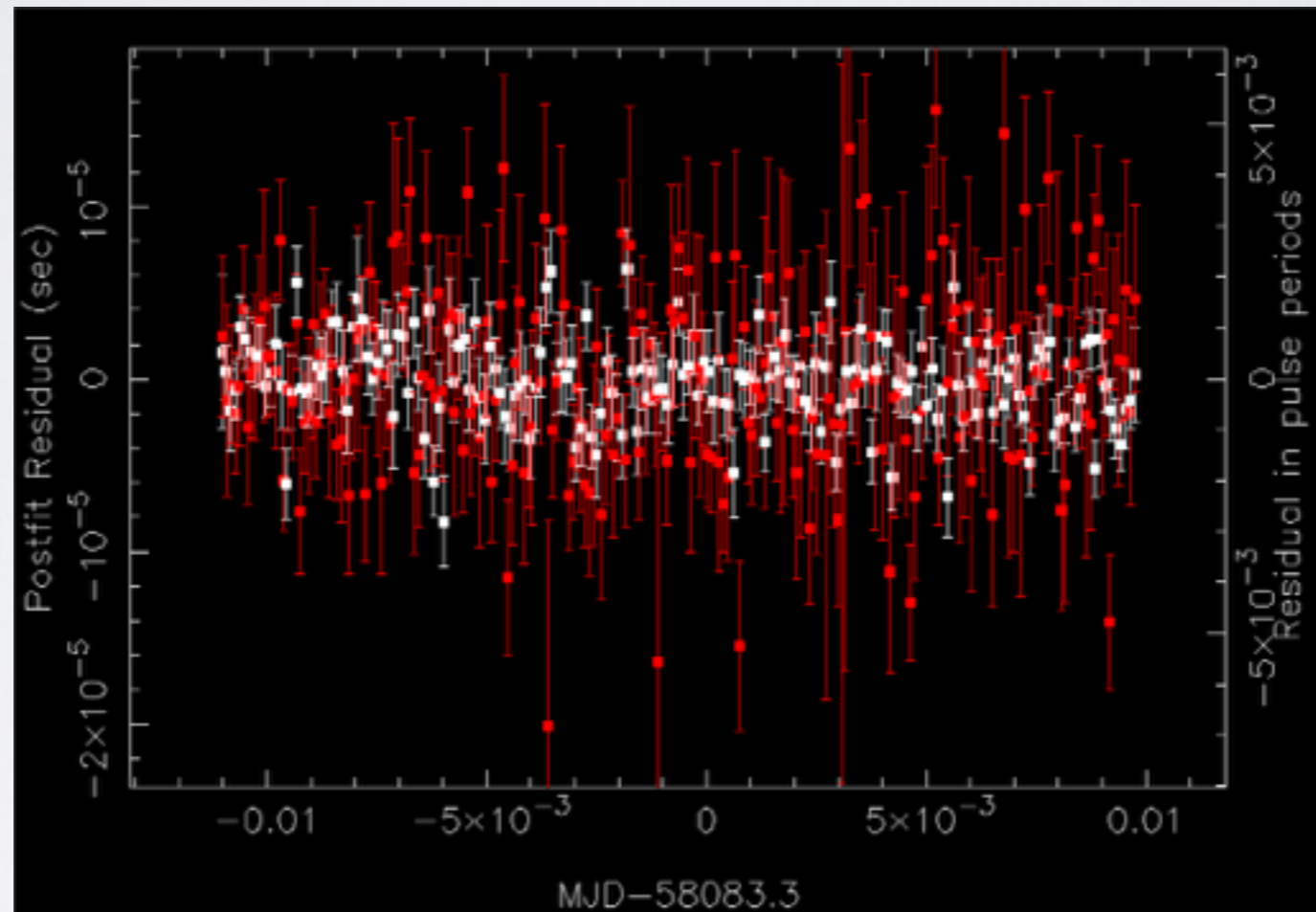
MEERTIME COMMISSIONING



courtesy of M. Bailes

MEERTIME COMMISSIONING

Red = PKS_MB (340 MHz)
White = MeerKAT16 (850 MHz)

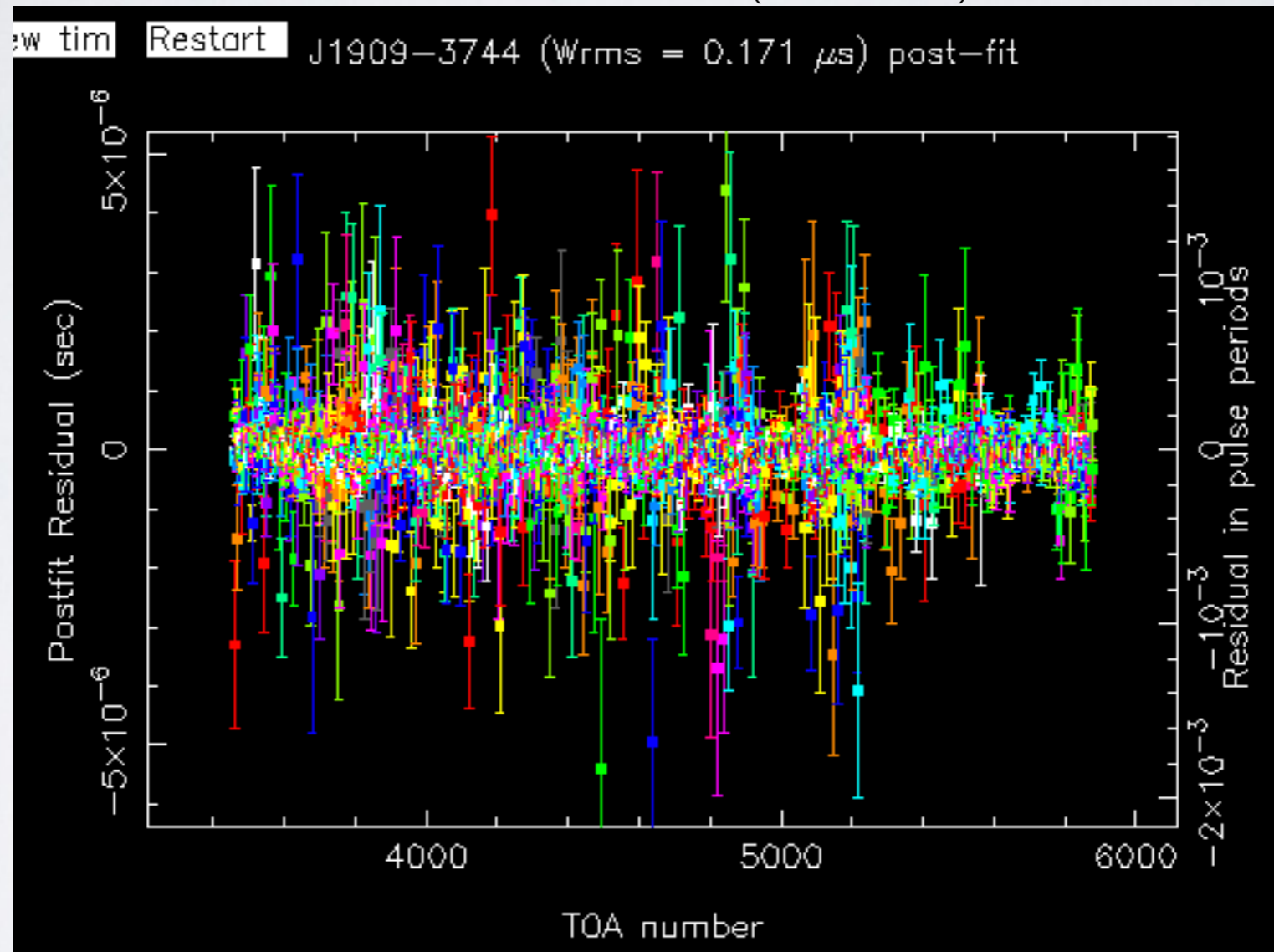


courtesy of M. Bailes

MEERTIME COMMISSIONING

Red = PKS_MB (340 MHz)
White = MeerKAT16 (850 MHz)

Daniel Reardon
on behalf of the Meertime collaboration.



8x Parkes in S/N
64x Parkes in timing efficiency

TRAPUM

TRansients and PUlsars with MeerKAT - P.I. Ben Stappers, M. Kramer

Search targets:

- High-energy point sources (Fermi)
- SNRs, PWN
- Globular Clusters
- Nearby Galaxies

Search for pulsars and fast transients thanks to:

- exceptional sensitivity
- large FoV
- angular resolution through beam-forming

Search for transients:

- commensally, using extra resources (MeerTRAP).
- wide area searches using 64 dishes combined incoherently
- use up to 400 tied-array beams for localisation

INAF INVOLVEMENT

- A. Possenti
 - SKA Pulsar KSP group member
 - MeerTime INAF representative
 - MeerTime GC timing project leader
 - TRAPUM
- M. Burgay,
 - SKA Pulsar KSP group member
 - TRAPUM follow-up project leader
 - MeerTime member
- A. Ridolfi (postDoc)
 - TRAPUM member
 - MeerTime member
- F. Abbate (PhD @MiBicocca)
 - TRAPUM member
 - MeerTime member



+ 27 collaborators distributed over 7 INAF structures,
to fully exploit the MeerKAT investigations across the e.m. spectrum

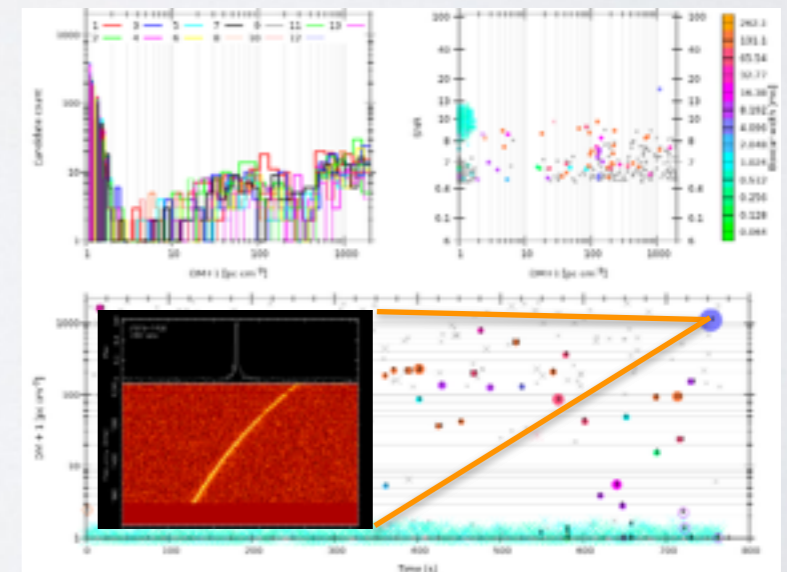
-
- 2 PRIN SKA-CTA projects funded
 - P.I. Giroletti (IRA) - transients, including FRBs
 - P.I. Possenti (OAC) - pulsars with MeerKAT

PSRS AND FRBs IN INAF TOWARDS THE SKA

- Parkes surveys

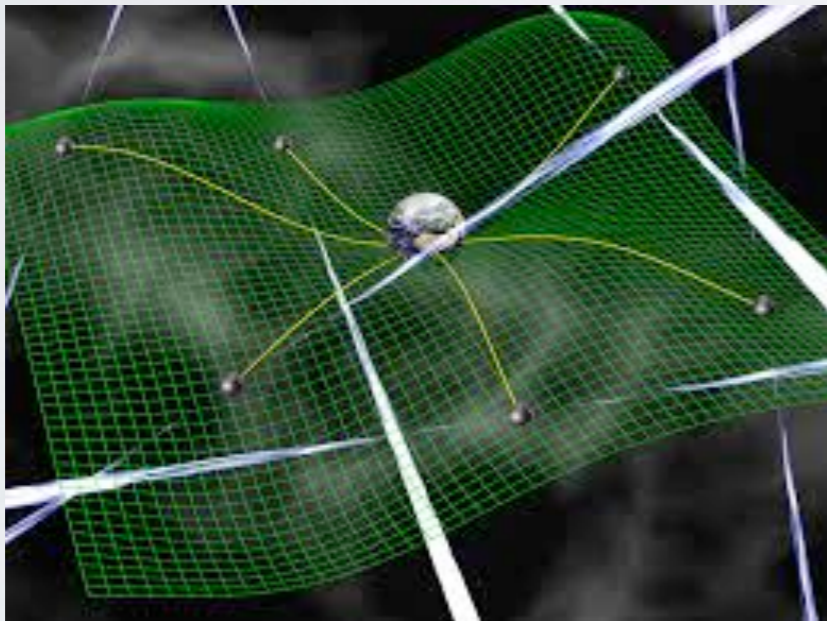


- Found more than 1/2 of all known pulsars
- Discovered Fast Radio Bursts
- Ongoing SURvey for Pulsars and Extragalactic Radio Bursts (SUPERB) finds FRBs in real time



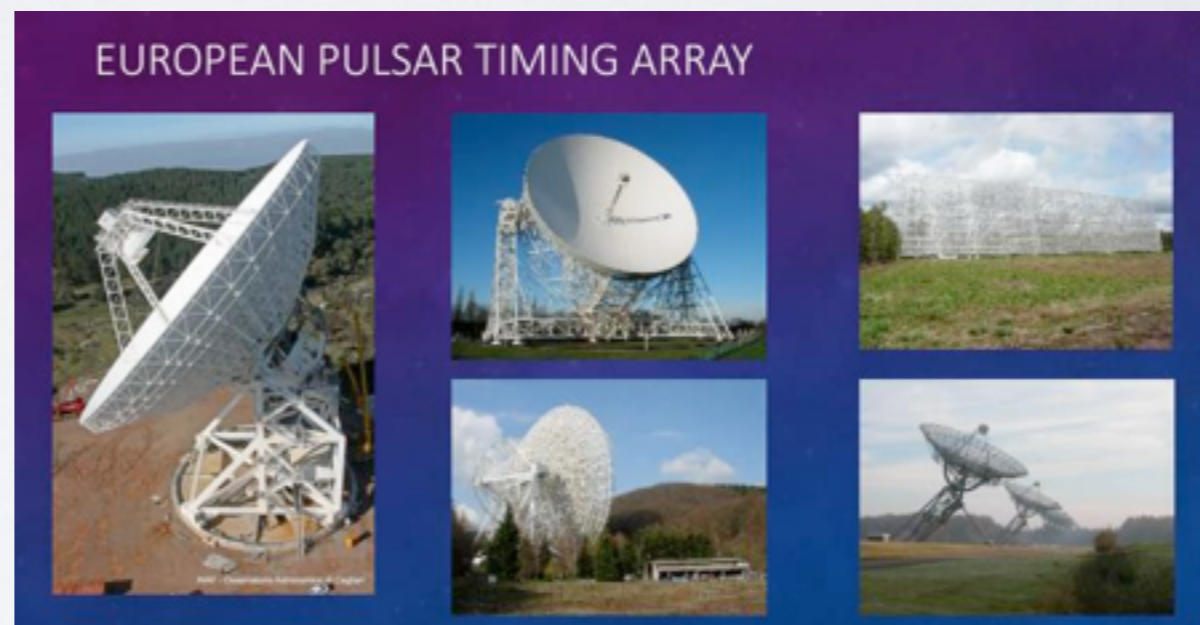
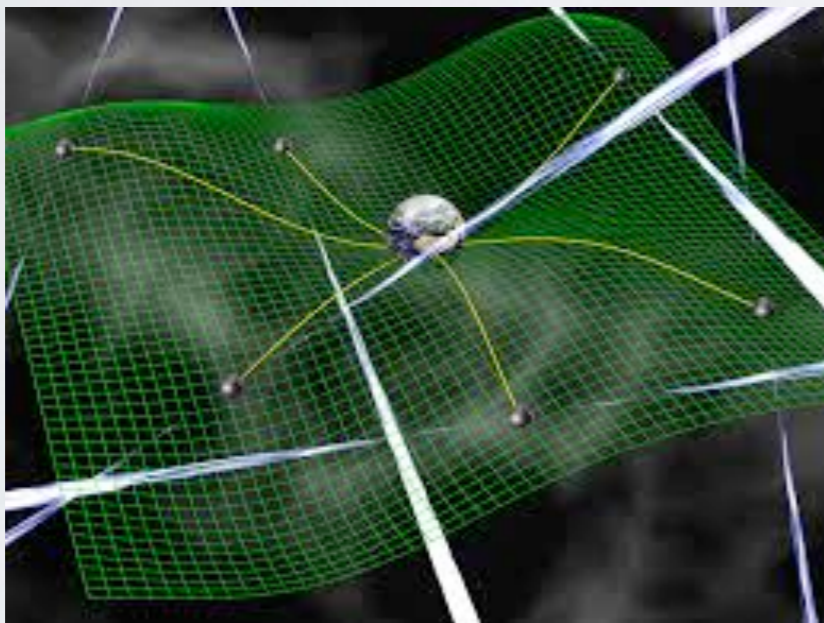
PSRS AND FRBS IN INAF TOWARDS THE SKA

- Pulsar Timing Arrays



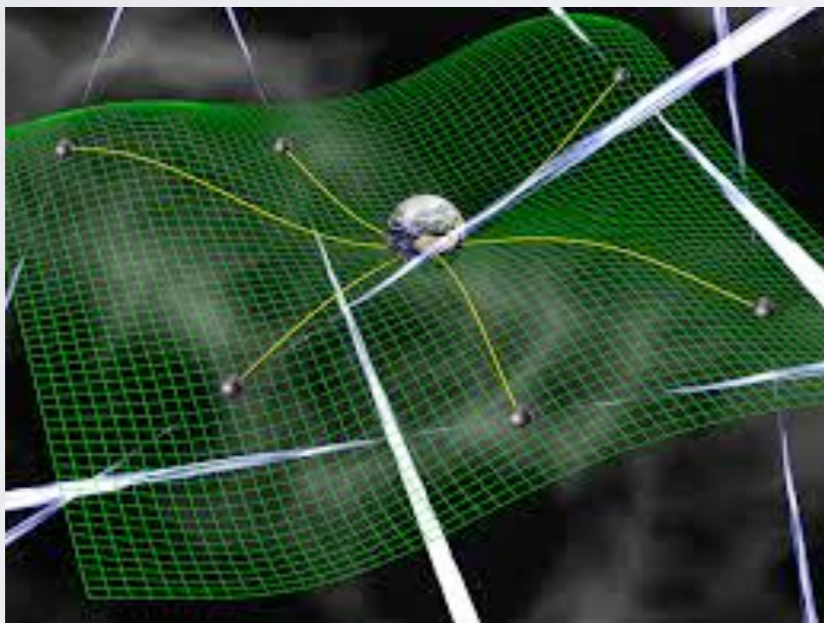
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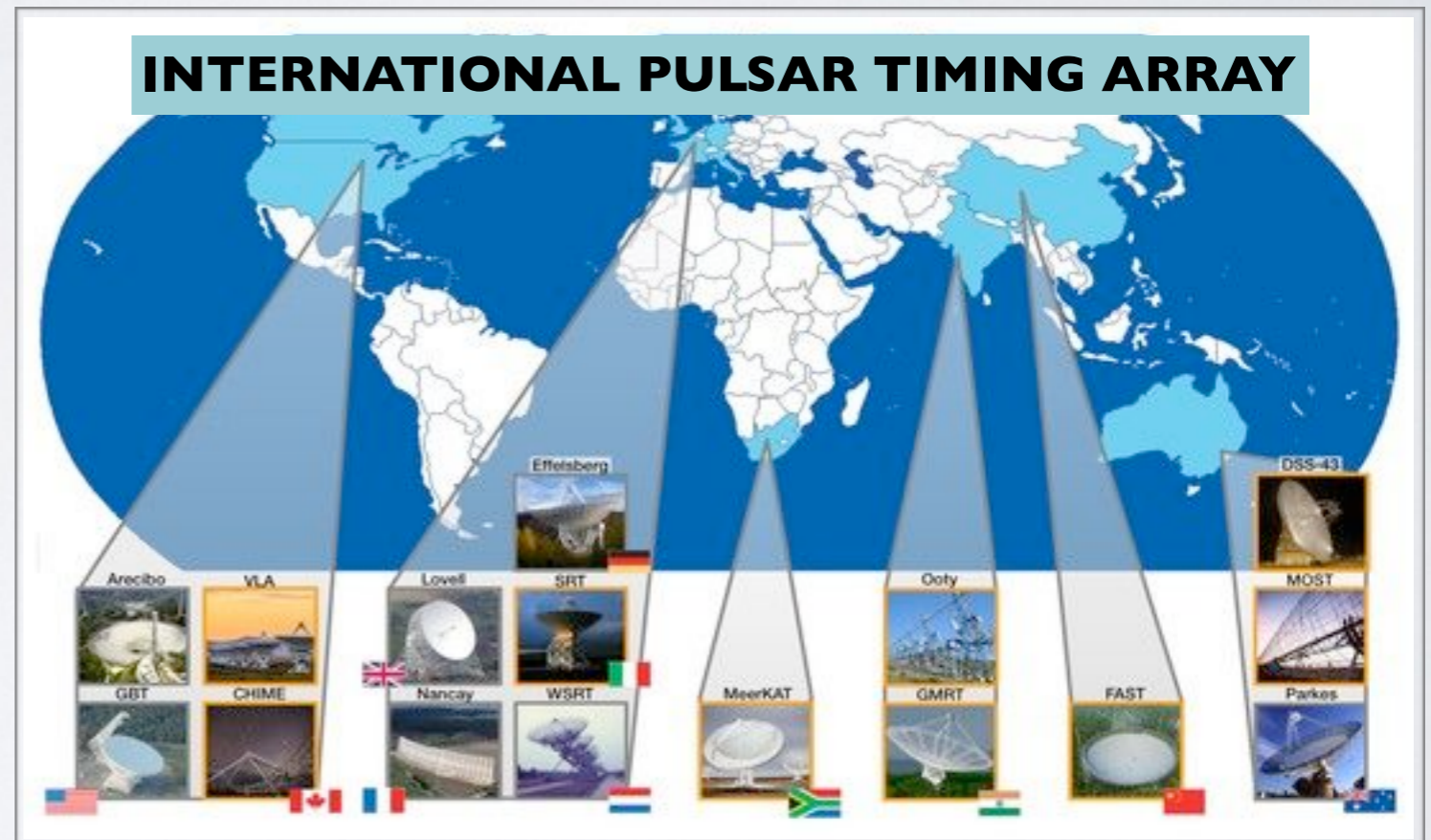
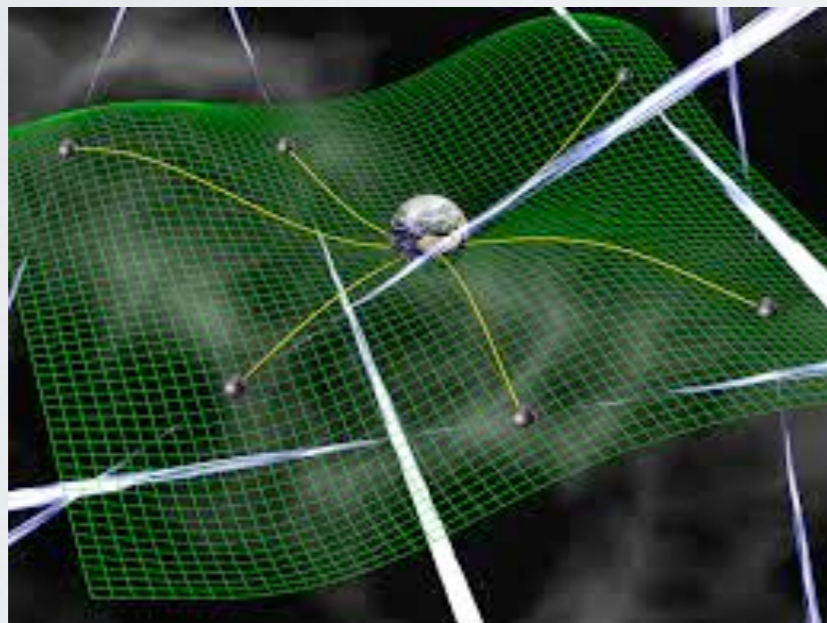
PSRS AND FRBS IN INAF TOWARDS THE SKA

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PSRS AND FRBS IN INAF TOWARDS THE SKA

- Pulsar Timing Arrays



PSRs AND FRBs IN INAF TOWARDS THE SKA

- Sardinia Radio Telescope



Approved PSR/FRB projects this semester

EPTA/LEAP (GW & Rel Binaries)

Eclipsing MSPs (binary evolution)

Fermi point sources

Monitoring FRB 121102

SUMMARY & CONCLUSIONS

- PSRs and fast transients studies will greatly advance thanks to the SKA
- SKA precursors have PSRs and FRBs among their top priorities and the first results obtained with these instruments look, indeed, extremely promising
- INAF is deeply involved in PSR and FRB projects within the SKA framework
- INAF people involved in these projects have a proven expertise and many international collaborations in all major PSR and FRB science topics that the SKA will keep on investigating

We are ready for the SKA challenges!

THANK YOU!