Commissioning proposals from the Transients KSP

- Rapid-response triggering:
  - Internal/External triggering
    - Transient pipeline / piggybacking
    - External facilities / VO Event communication
  - Transient Buffer Boards
- Test all-sky monitoring modes
- Simultaneous obs with Nancay, MWA
- Pulsar/Fast modes (see Ben Stappers)

Triggering modes

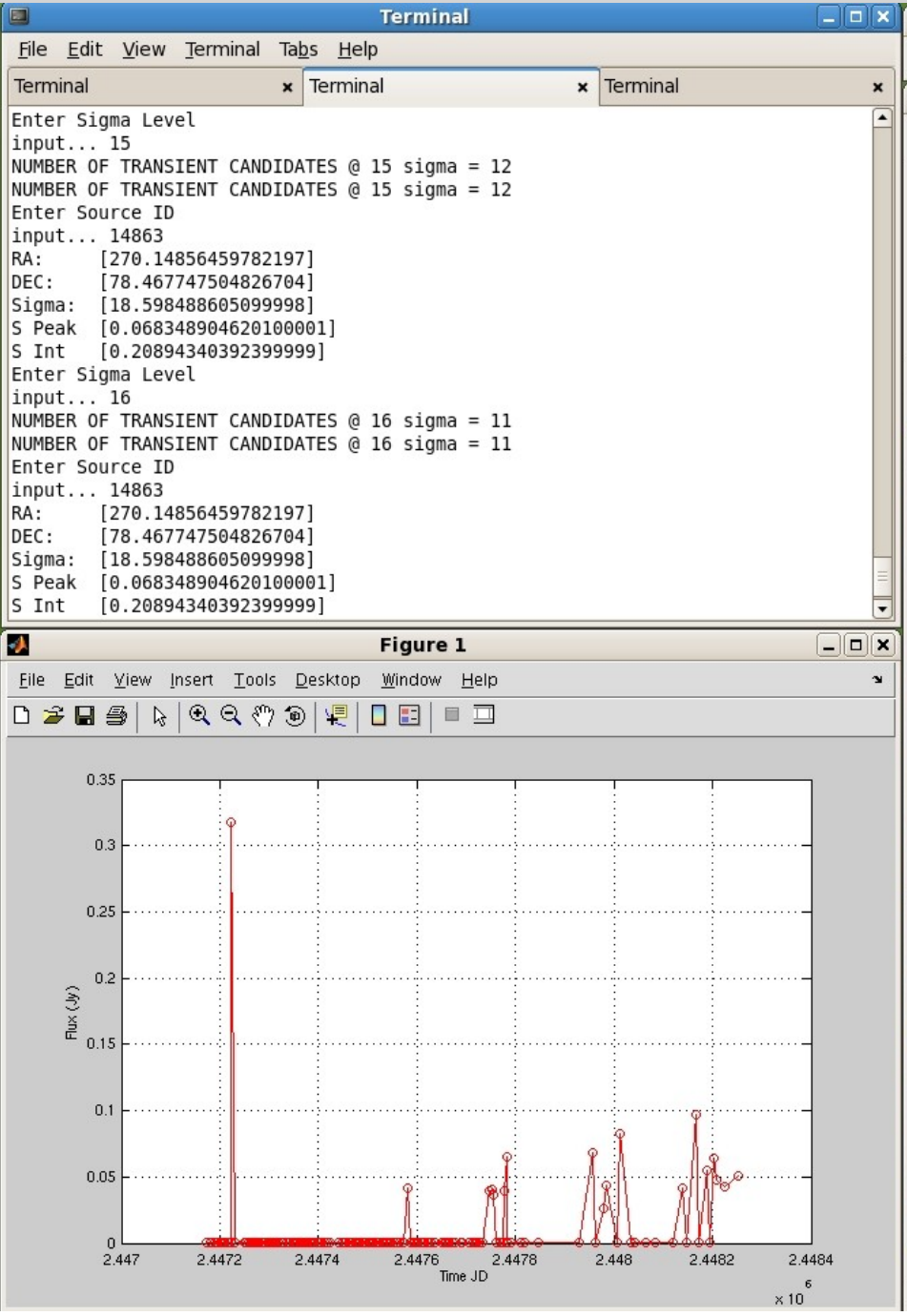
- LOFAR Transients Pipeline

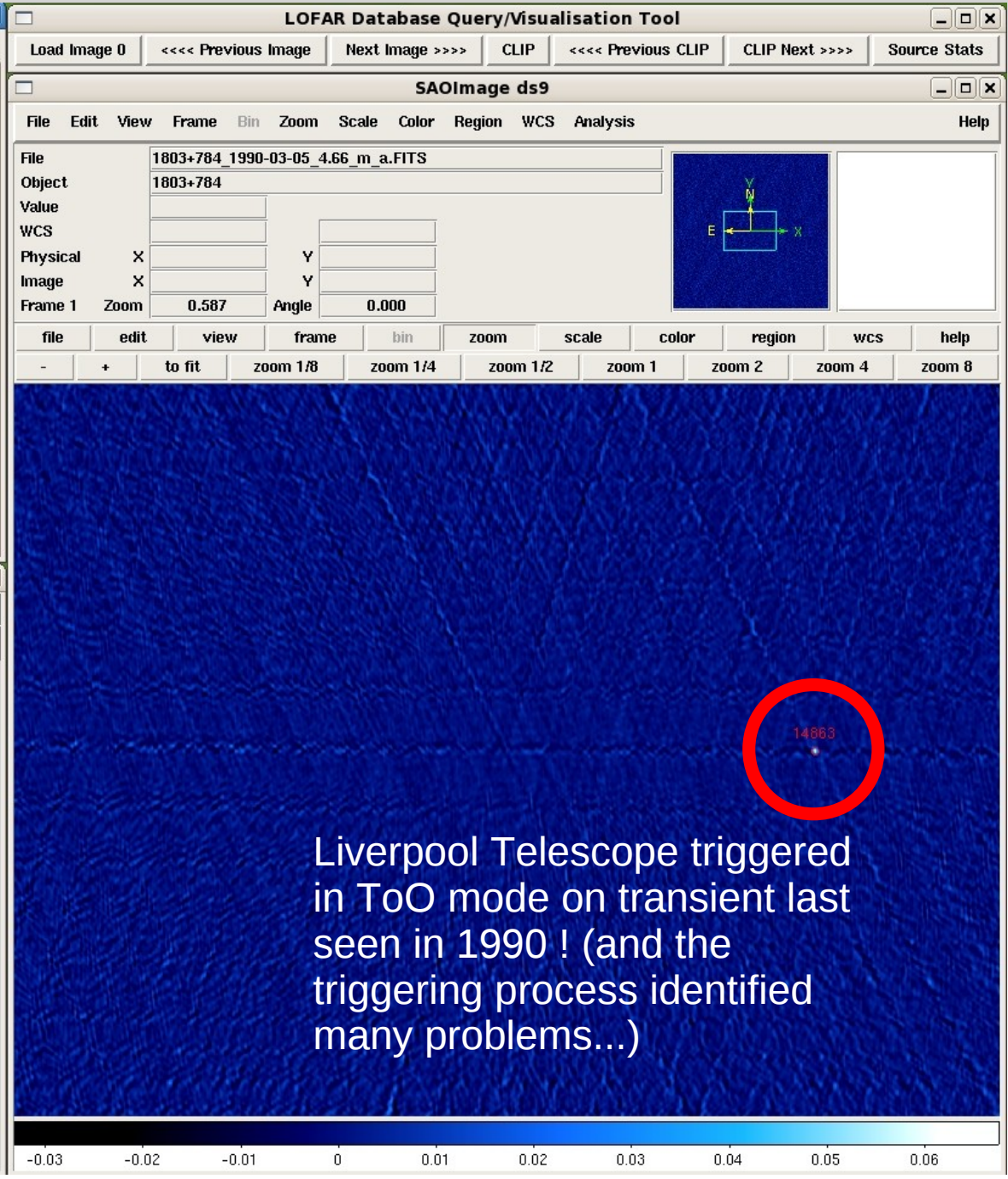
Inspect all data for significantly variable objects. Compile light curves, apply preliminary classification / if above some threshold trigger additional observations (many software tests to be performed e.g. blind tests on fake events)

- Piggybacking

Application of the pipeline to all LOFAR data, in real time *(including MSSS)*

Discovery of radio transient in VLA archive using LOFAR Transients pipeline





Triggering Example

'Standard' data product (e.g. RSM / piggybacking) into Transients pipeline.

(1 sec + possible 'DC delay')

Radio transient found above some level of significance → override mode

[need to look into maximising speed of the imaging pipeline / use 'non-final' calibrations ?]

(10 sec)

MAC/SAS

VO Alert (xml) protocol

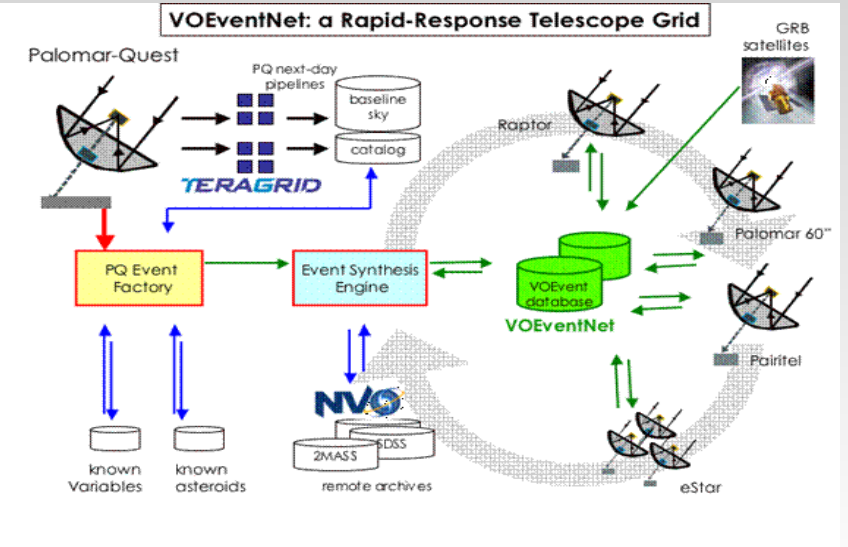
'Self-trigger' LOFAR to bring in long-baselines / get broader spectral and polarisation coverage, and accurately localise transient

Freeze TBBs for future 'dump' and imaging

Trigger external facility (e.g. Liverpool Telescope – guaranteed time already in place)

Many flavours of triggering to be tested → some can be scheduled for 'busy weeks', some not.

Collaborating facilities → 'Multi-messenger' science with LOFAR



www.voeventnet.org

Other radio:

WSRT / e-Merlin / e-EVN / MWA / ASKAP

Optical/infrared:

The Liverpool Telescope / PAIRITEL

X-ray / Gamma-ray:

Fermi, *Swift*, INTEGRAL

GW / Particle:

LIGO / VIRGO
MAGIC / VERITAS / HESS

(10 sec)

VO Alert (xml) protocol

Trigger external facility

- Transient Buffer Boards

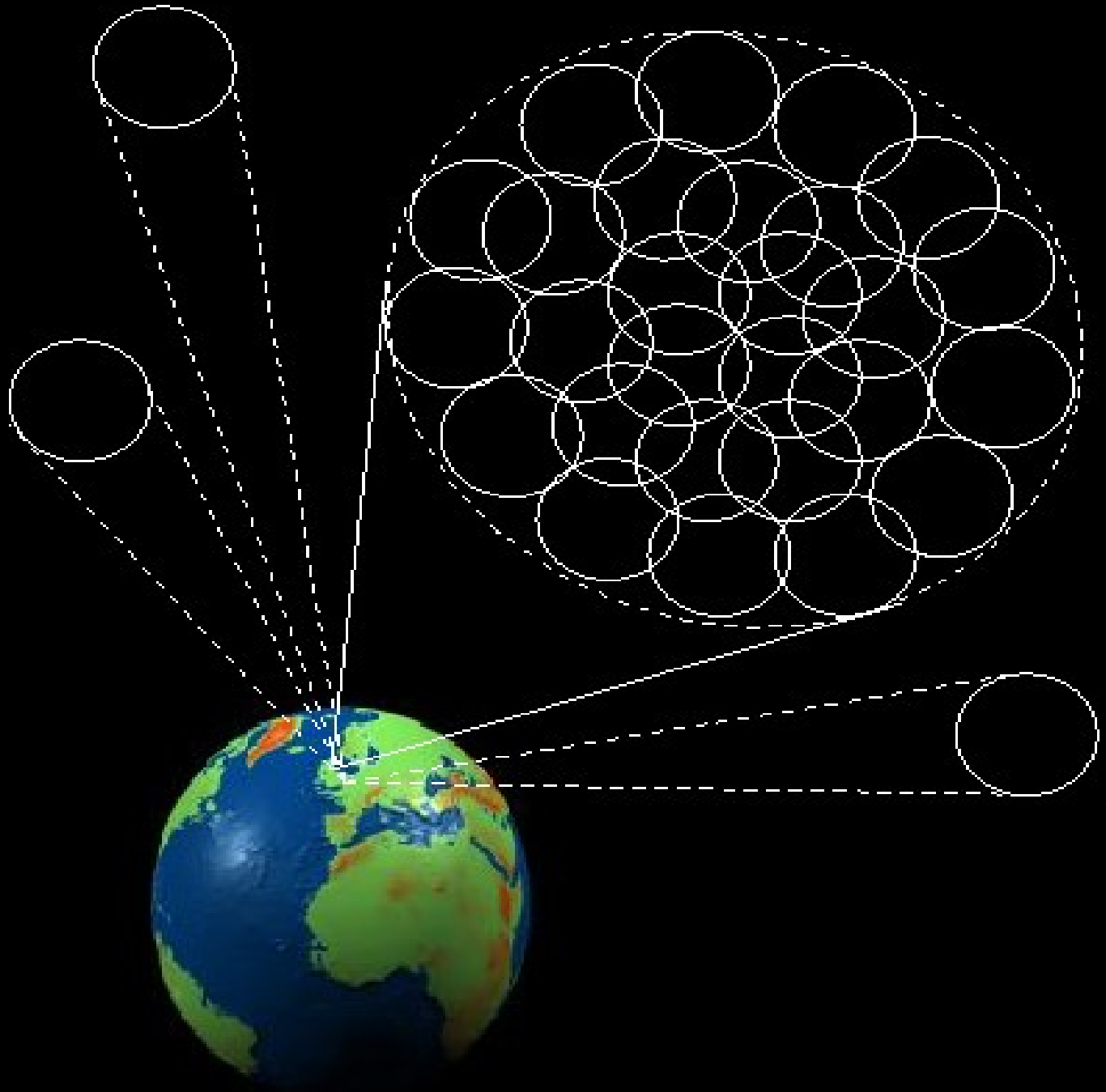
Testing freeze → playback → image modes

Testing frequency – time trade off
(and independent settings of these across a range of stations)

1-sec all-sky survey

CR ↔ Transients dual-operation of TBBs

Radio Sky Monitor modes



Test modes e.g. Repeated zenith / galactic plan pointings

Repeated observations are required to test:

- Stability of flux calibration → how many sources appear to vary / are really varying ?

- Stability of pointing

- Uniformity of tiling multiple beams etc

- Rapid sky sweeps → wide shallow monitor

Testing low-frequency (high time-resolution) imaging with Jupiter

Jupiter can be the brightest source in the sky below 40 MHz when bursting (10 MJy), and its mechanism is the key to prospects of detecting extrasolar planets

It will be a detectable point source for LOFAR as low as **10 MHz**

Emission is strongly elliptically polarized and can be tested against simultaneous observations with Nancay

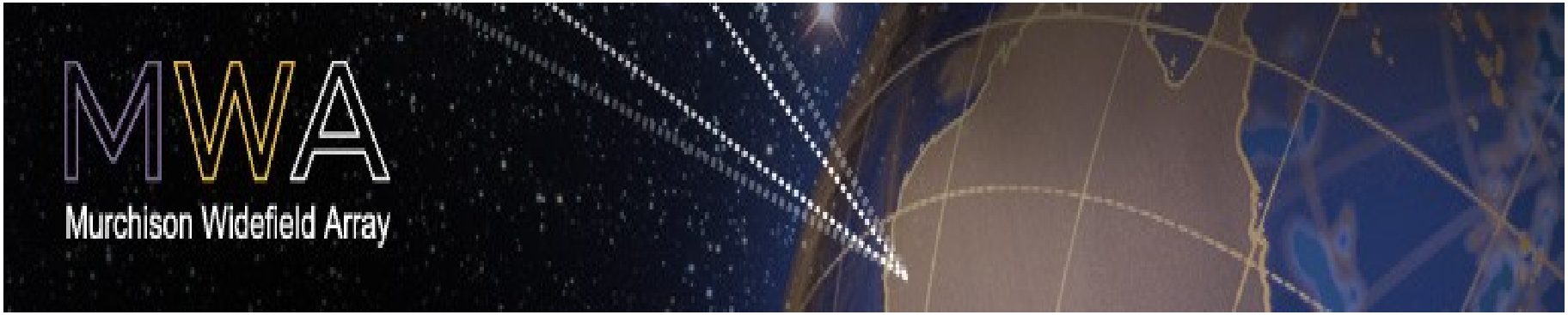
(also Saturn lightning (unpolarised) – a mere 100 Jy – in collaboration with *Cassini* team)

'Simultaneous' observations with MWA

Links already established with MWA transients team

Both teams will propose for overlapping MWA + LOFAR-HBA observation (field at approx. Dec +10)

Excellent calibration (and collaboration) opportunity for both arrays (espec. for low-elevation sources)



Open time proposal . . . . ?

Summary

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- Simultaneous obs with Nancay, MWA
- Pulsar/Fast modes (next)