

*‘Quiquid differat notandum’*

*LOFAR:  
The Transients Key  
Project*

Ralph Wijers,  
On behalf of the TKP

# *Outline*

- ⊕ Brief organisation of TKP
- ⊕ Global goals and strategy
- ⊕ Science update and early results:  
many talks and posters

# Key Projects?

- ⊕ 'Large observing projects that have driven (will drive?) the design and specification of LOFAR'
- ⊕ Now: EoR, SRV, TRA, CR, M, SSW
- ⊕ TRA: fast response, high-rate real-time data processing, flexible configuration,

# Organisation and People

- ⊕ PIs: Fender, Stappers, Wijers
- ⊕ Members [NL, UK, F, D, US]
- ⊕ Science Working Groups
  - ⊕ Jets [synchrotron bombs] - Markoff
  - ⊕ Planets - Zarka
  - ⊕ Pulsars - Stappers
  - ⊕ Flare Stars - Osten
  - ⊕ Serendipity/Follow-up - Wise
  - ⊕ (SETI)
- ⊕ Technical Working Groups
  - ⊕ Hardware - Stappers
  - ⊕ Software - Wise/Swinbank

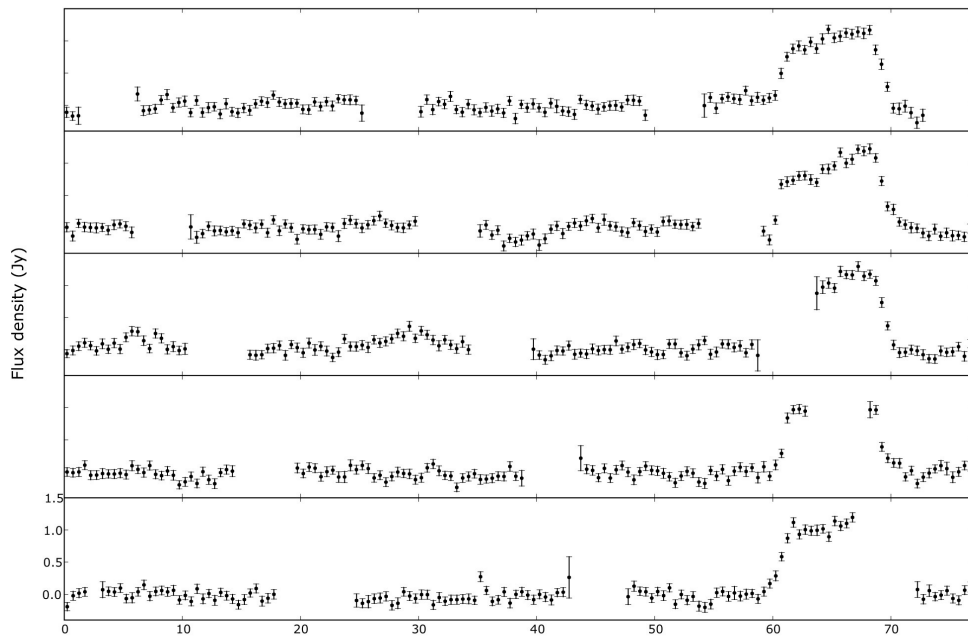
# Goals

- ⊕ Trawl the sky for known and unknown types of variable source, produce triggers and light curves [public!]
- ⊕ Explore extreme astrophysical sources:
  - ⊕ pulsars, black holes, gamma-ray bursts, exoplanets, flare stars,

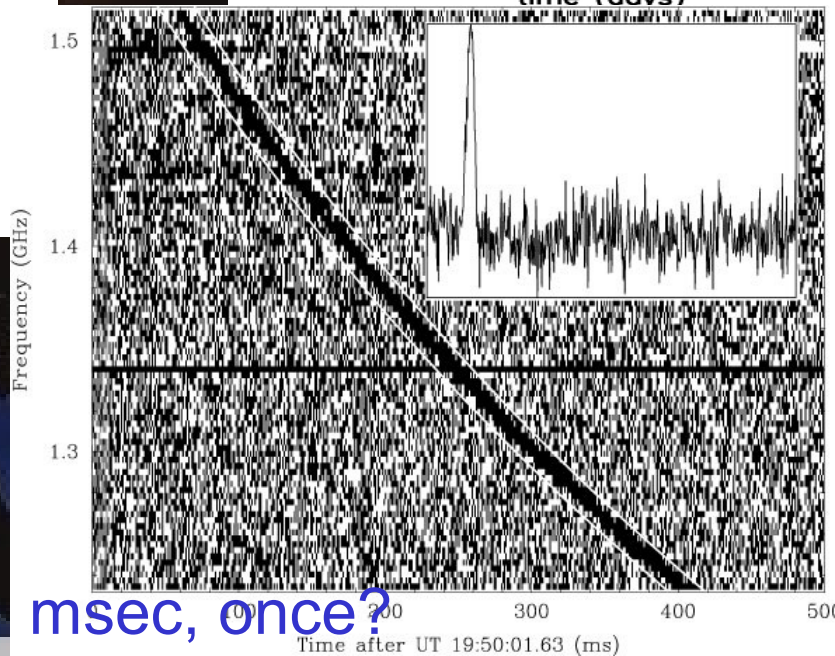
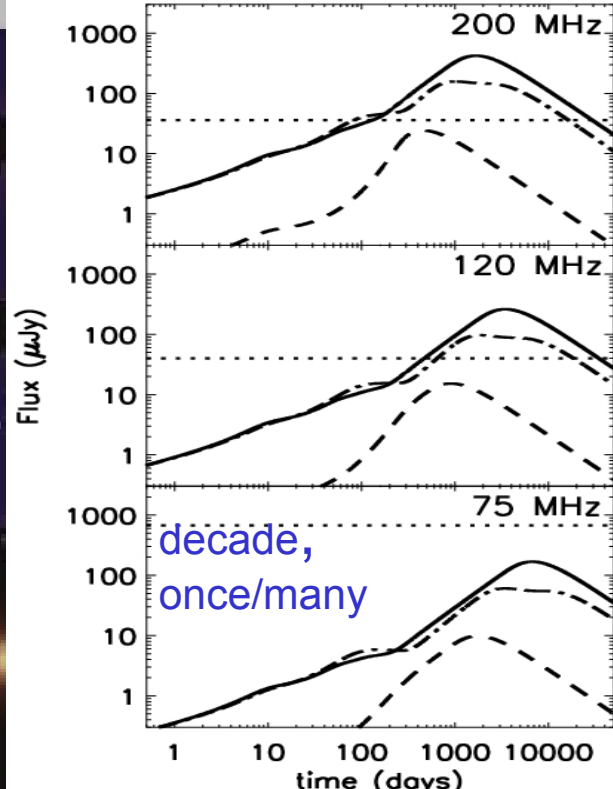
# Big discovery space

## GCRT1745, Spreeuw

The five bursts in the discovery observation of GCRT J1745-3009, folded with 77.012 min period



min-hr, rare but repeating



msec, once?

15-Jan-2009

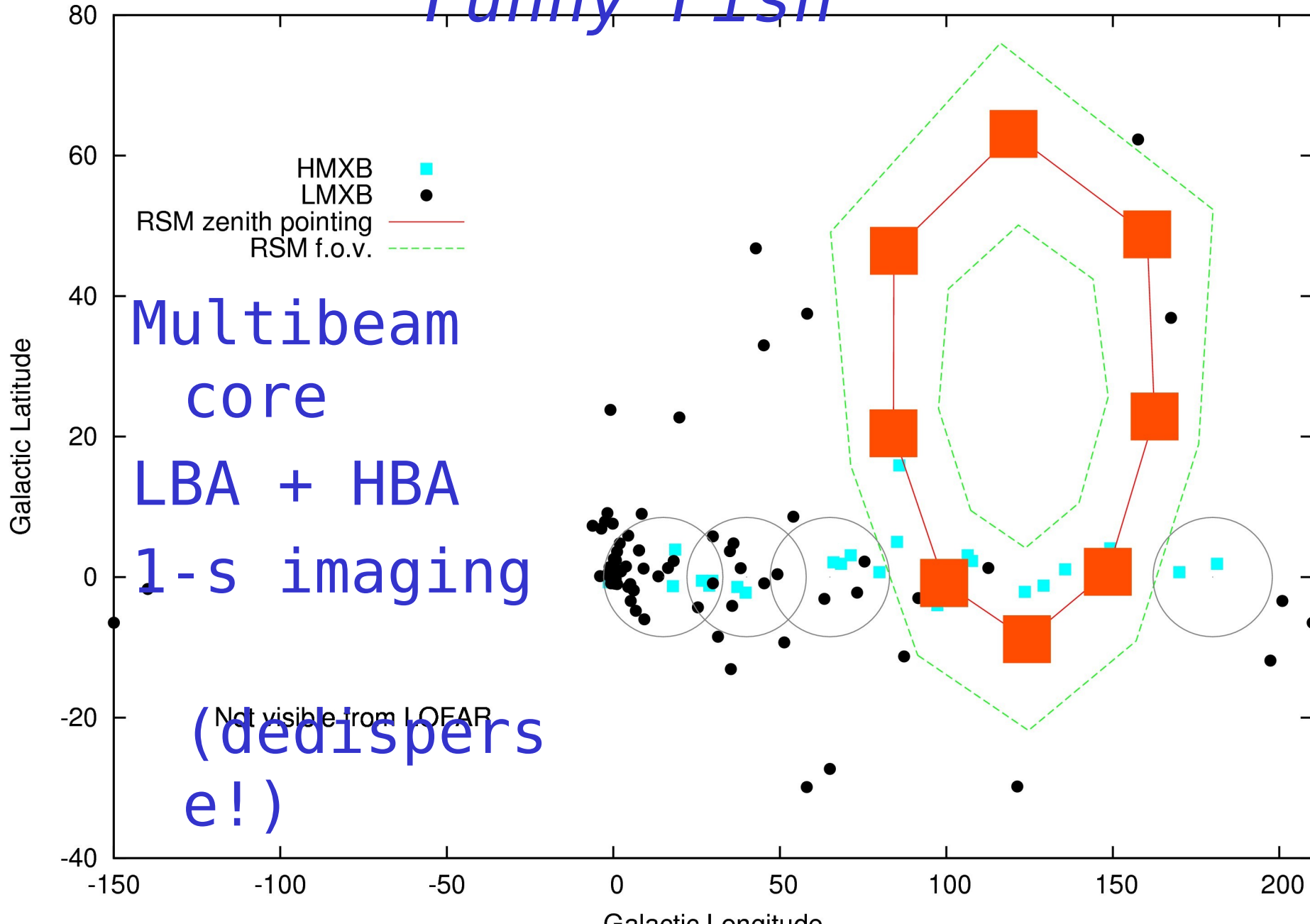
RAMJW



# *Strategies & Use Cases*

- ⊕ Radio Sky Monitor
- ⊕ Piggybacking, on any obs.
- ⊕ Target lists
  - ⊕ XRBs, GRBs, flare stars, exoplanets, AGN
- ⊕ Tied-array modes
  - ⊕ PSRs, RRATs, exoplanets
- ⊕ Internally & externally triggered alerts
  - ⊕ XRB state, new GRB, LorTra, Sun

# Radio Sky Monitor: Trawling Funny Fish





# *Transients Pipeline*

- ⊕ Aim: analyse variability in input on time scales of 1, 2, 5, 10, ... sec, dedispersed, in near-real time
- ⊕ Requires (per source type!):
  - ⊕ Detection
  - ⊕ Recognition
  - ⊕ Action:
    - ⊕ Triggering - alert & followup
    - ⊕ Cataloguing
- ⊕ Real results now coming
- ⊕ Much of framework in place, but details.....

# *Help available?*

- ⊕ Software pipeline: formidable task
  - ⊕ Add some features, expand others
  - ⊕ Parallellise & run automatically
- ⊕ Database exists, more mining tools needed
- ⊕ Expertise on radio searching transients/variables
- ⊕ Resources at other instruments, for triggered & simultaneous observations

# *Science prep TBD*

- ⊕ Survey design in multi-D discovery space [SRV plus duration and cadence]
- ⊕ Per-source type ID and followup plan
- ⊕ Followup and trigger resource planning
- ⊕ Co-observing with Fermi, Swift, Raptor, ...

# *Dream/killer science*

- ⊕ GRB prompt radio emission
- ⊕ Measuring intergalactic  $n_e$ , B with 'Lorimer transients'
- ⊕ Exoplanets
- ⊕ Airport radar on  $\alpha$  Cen
- ⊕ Get all local pulsars, make PTA
- ⊕ Know what makes a jet
- ⊕ ..... WHAAAATTTT!!?? .....

# Recap & Outlook

## ⊕ Goals:

### ⊕ Trawl variable low-frequency radio sky

- ⊕ Generate alerts, make public

- ⊕ Follow-up alerts

- ⊕ Create light curve data mine, public

### ⊕ Detailed studies of classes of object

- ⊕ Pre-selected or from trawling

- ⊕ At all wavelengths

- ⊕ Explore extreme physics

## ⊕ Status:

- ⊕ First pipeline in place, flexible and capable

- ⊕ Much performance and quality testing

TBD

15-Jan-2009

- ⊕ Enhancements TBD (dedisp,

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