

# A new perspective on GCRT J1745-3009

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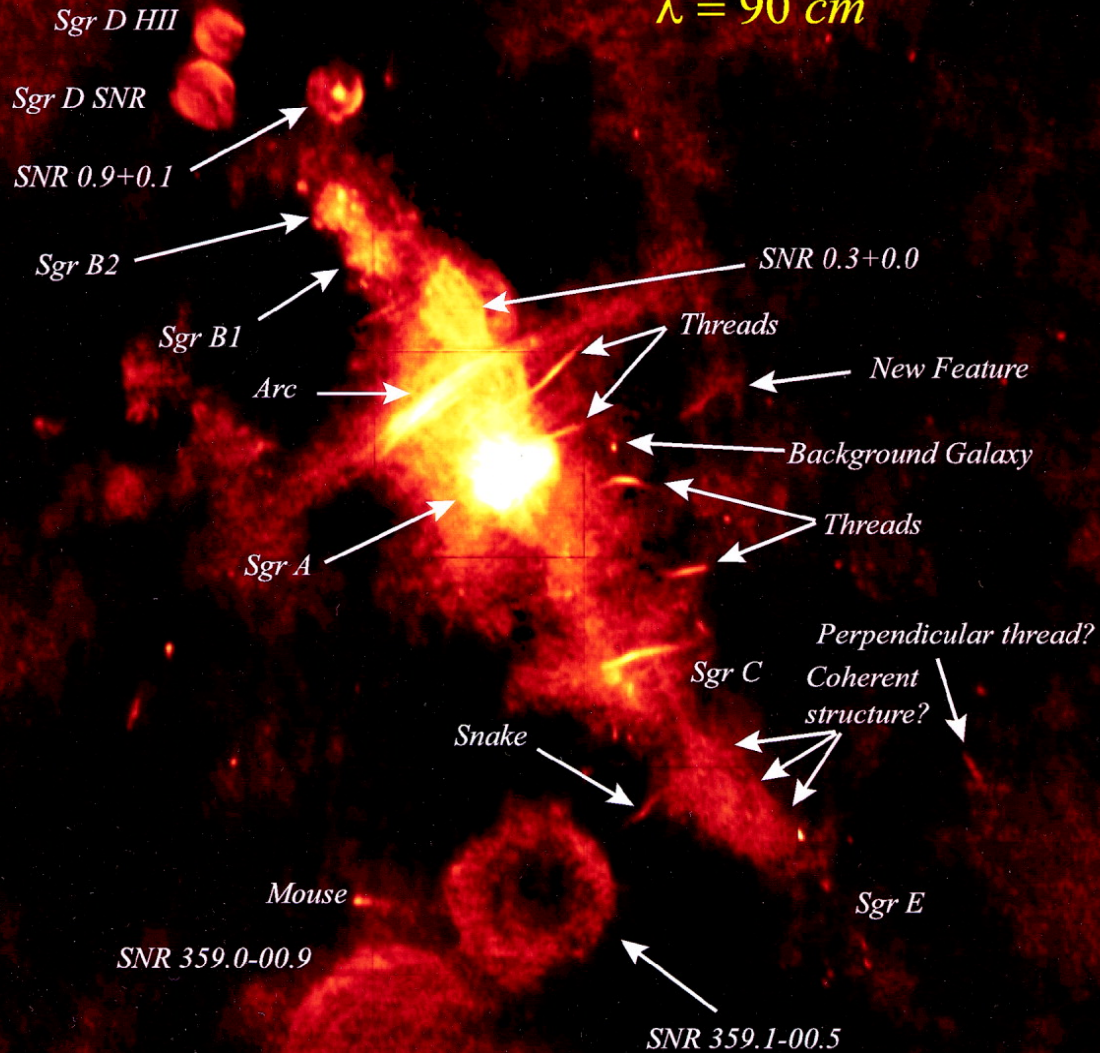
LOFAR and the transient radio sky  
December 16 2008, Amsterdam

- With Bart Scheers, Robert Braun, Ralph Wijers, James Miller-Jones, Ben Stappers and Rob Fender.
- Submitted to A&A



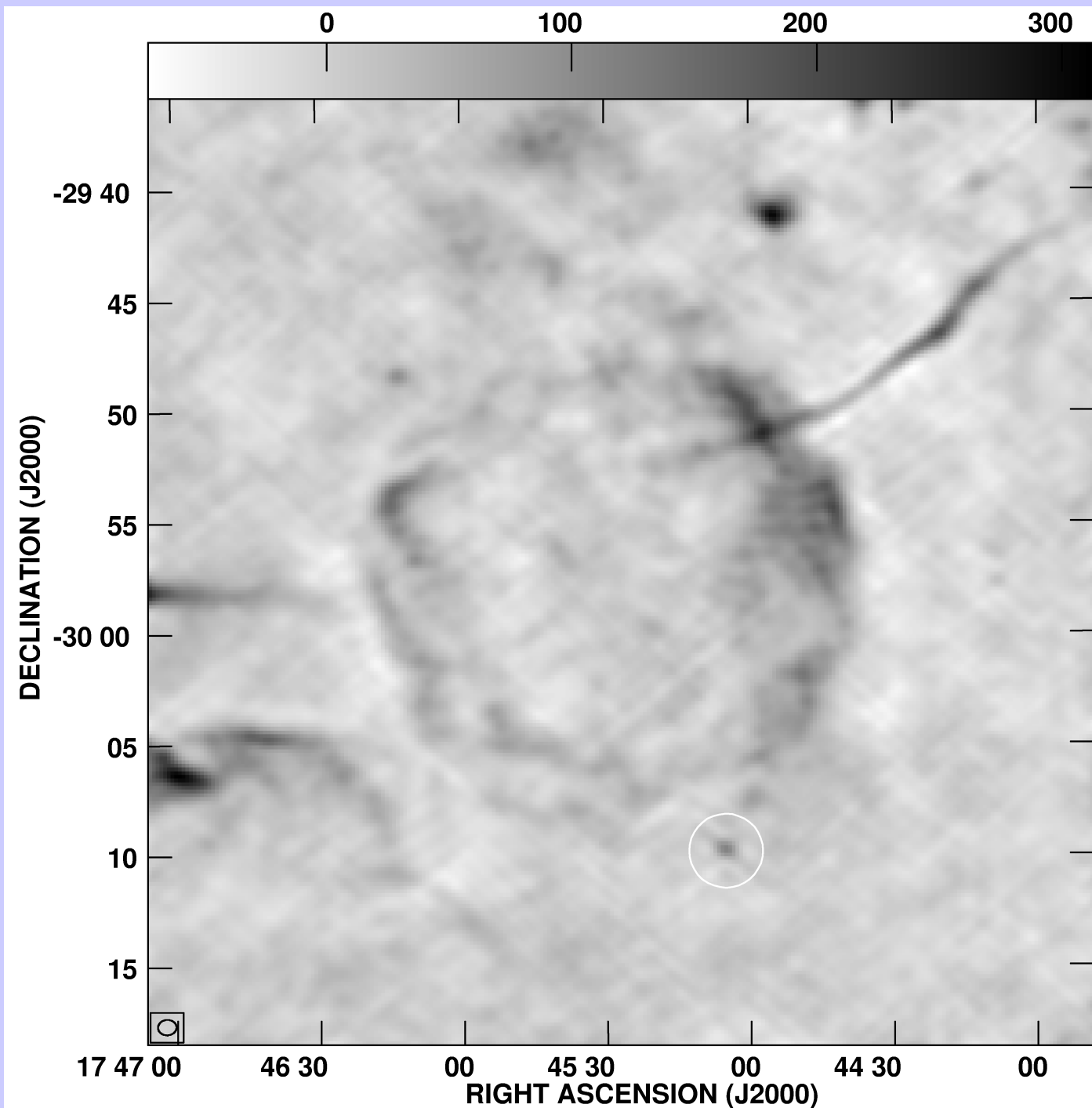
# Wide-Field Radio Image of the Galactic Center

$\lambda = 90 \text{ cm}$



LaRosa et al. (2000)

~0.5°  
~75 pc  
~240 light years



# GCRT J1745-3009 - summary

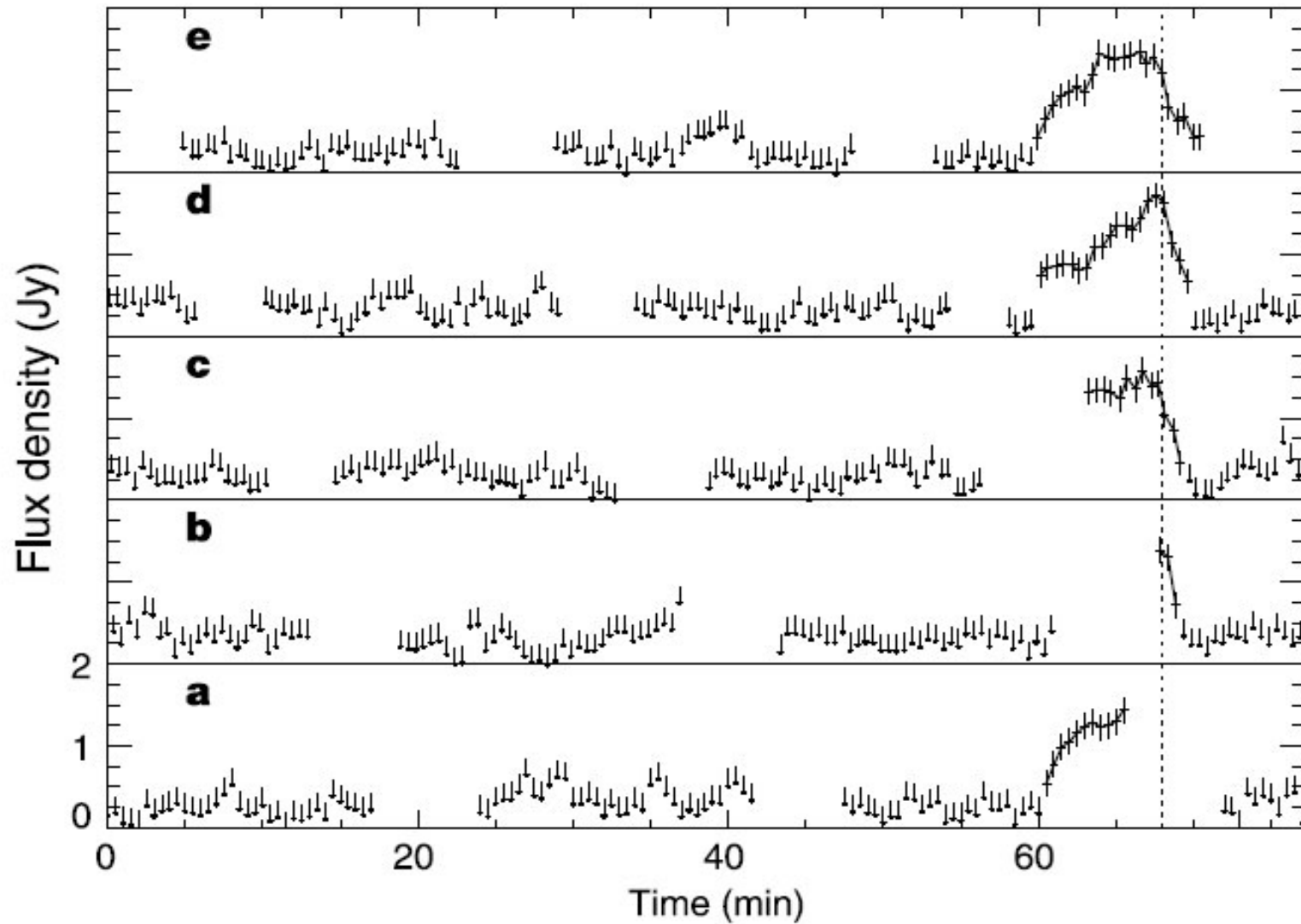
- Detected with the VLA in 2002 at 90cm in a ~6h observation
- Published in Nature, 3 March 2005, by Scott Hyman et al.
- 5 bursts at the Jy level with a ~77 min recurrence.
- Each burst lasts ~10 min.
- Part of a single burst and a faint (~50 mJy) short (~2 min) burst seen in 2003 and 2004 GMRT archival data.
- Evidence for a very steep spectral index,  $\alpha = -13.5 \pm 3.0$
- Only seen these 3 times and only at 90cm despite dozens of observations
- Unresolved
- No evidence for interburst emission ( $5\sigma = 75$  mJy/beam)

# GCRT J1745-3009 – summary (ctd.)

- No obvious optical counterpart
- No obvious near-IR counterpart
- No X-rays
- No distance
- Small angular separation from SNR.

# Lightcurve from discovery dataset

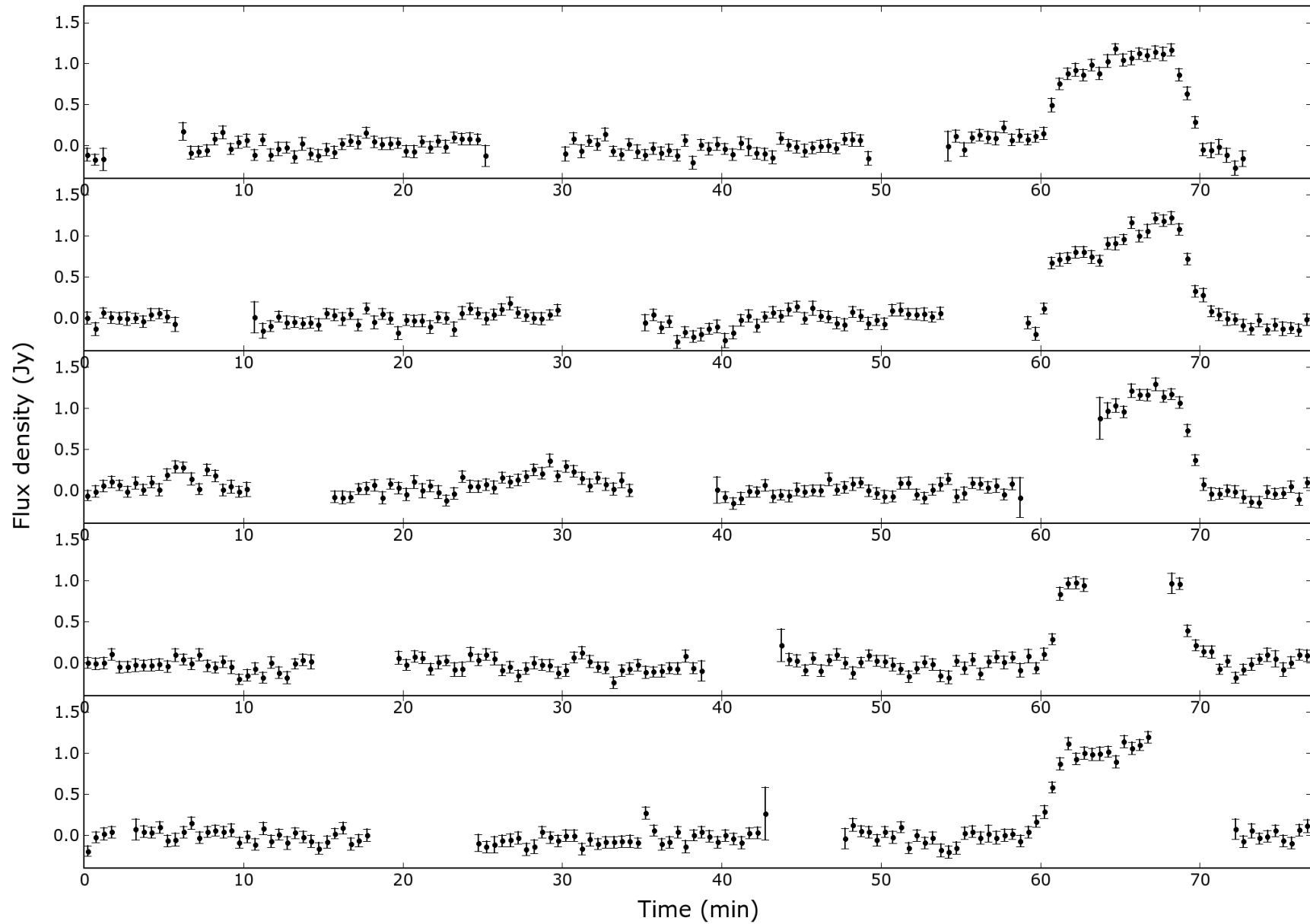
(Hyman et al. 2005)

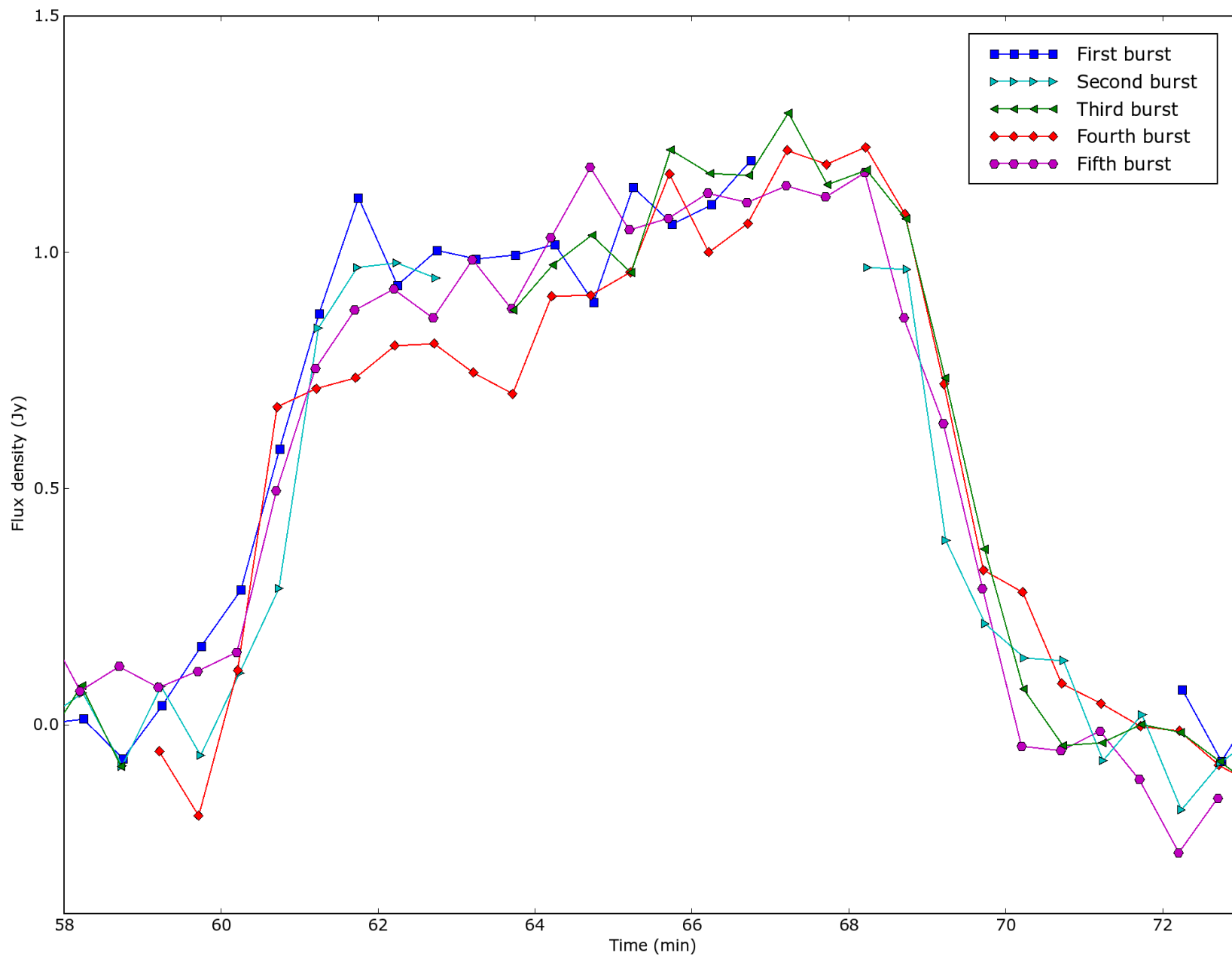


# Derived quantities from lightcurve

- Period of  $77.1 \pm 0.3$  min
- Maximum distance of 70 pc for incoherent synchrotron emitters.

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





# New results

- All bursts are asymmetric, they have a steep rise, a gradual brightening and a steep decay, lightcurve twice as accurate
- Period is  $77.012 \pm 0.021$  min, no evidence for aperiodicity.
- $5\sigma$  upper limit on interburst emission is 33 mJy/beam
- Burst duration varies at the level of a few %.
- Source cannot be much further than the GC
- At beginning of the bursts a source doubling time of 10s.
- If it is an incoherent emitter it must be closer than 14 pc ( $v \ll c$ ).
- A spectral index  $\alpha = -6.5 \pm 3.4$

# Implications

- Asymmetry in the bursts does not favour a lighthouse beam sweeping over the sky.
- Combined spectral index measurements yield  $\alpha = -9.4 \pm 2.1$

# Conclusions and further work

- Incoherent emitter now very unlikely.
- Steep spectral index confirmed.
- Models have to explain asymmetry in bursts.
- Basic model still uncertain.
- Need more detections!
- WSRT-LFFE observation coming next spring.