



LOFAR Single-Station Pulsar Observations

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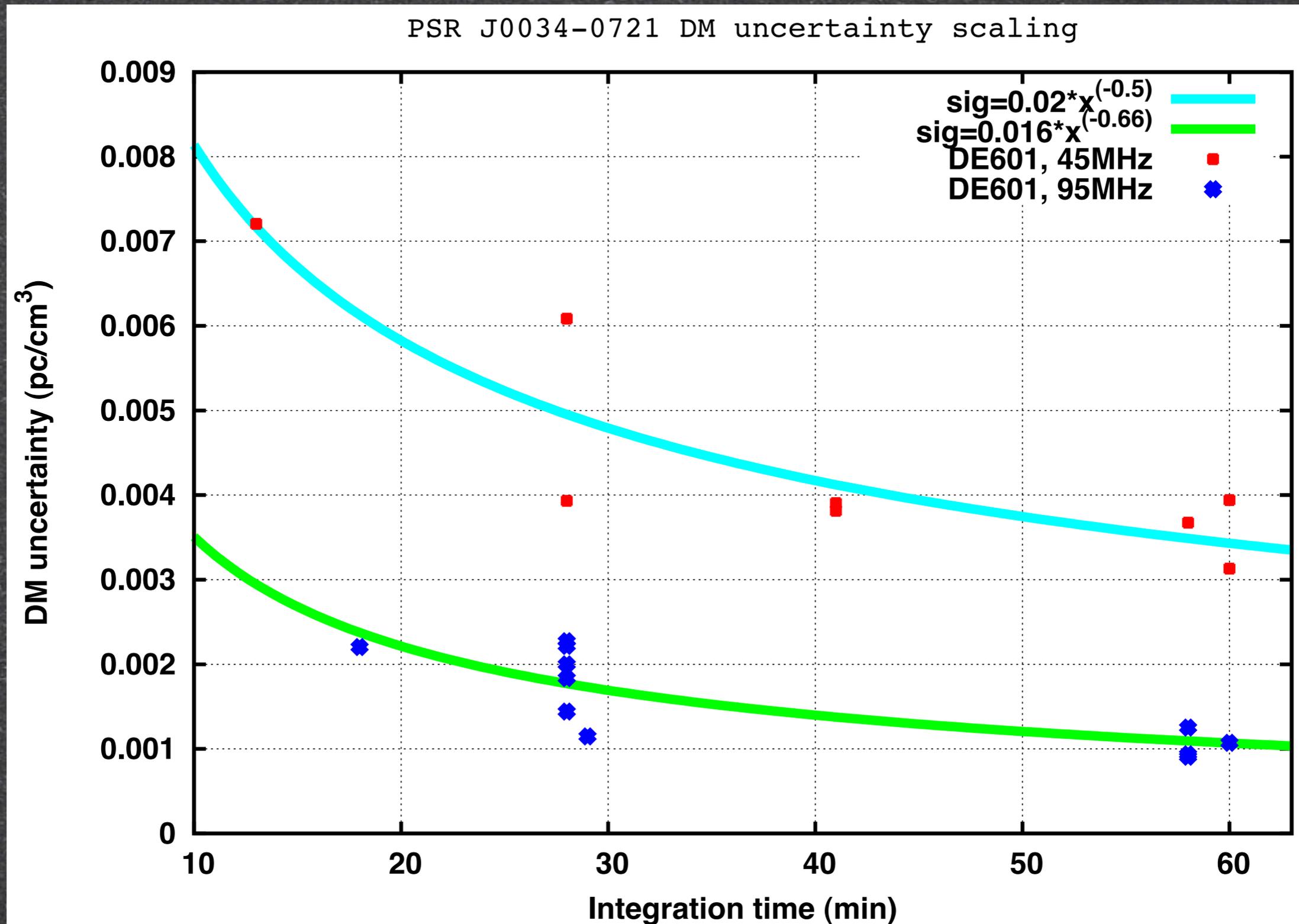
22 January 2014

DE601 Timeline

- Late Oct 2012: calibration table, antenna positions, cable lengths FIXED
- Mid Nov 2012: SyncOptic boards, 5ns-issue FIXED
- Dec 2012: Commencement of “science” observations.
(Initially mostly commissioning: “What do we see?”)

Single Station Progress

📌 Aug 2013: 8-bit mode (LuMP)



Single Station Progress

- December 2013: “GLOW” Mode
- Essentially “Local” mode, but on the German network
- Allows data recording at Bonn, from all German stations (in principle)
- Currently successfully tested with DE605 (Jülich) and DE601 (Effelsberg)

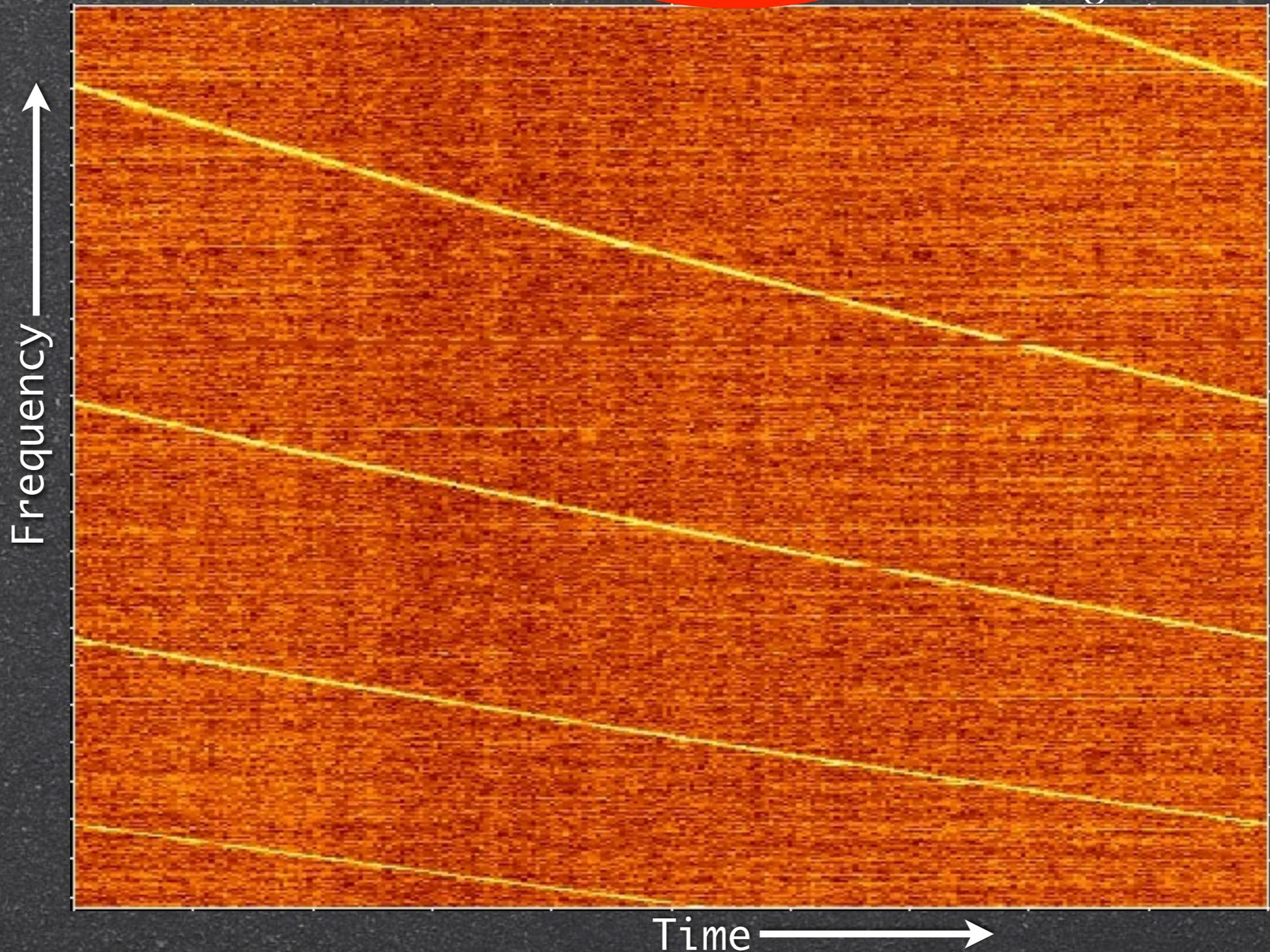
Current Observations

- Detected 100 Pulsars with DE601
- Following most of those with cadence weekly < cadence < monthly
- Currently low time pressure
- Allows long integrations (sensitivity comparable to the core in some cases)

Single-Station Science

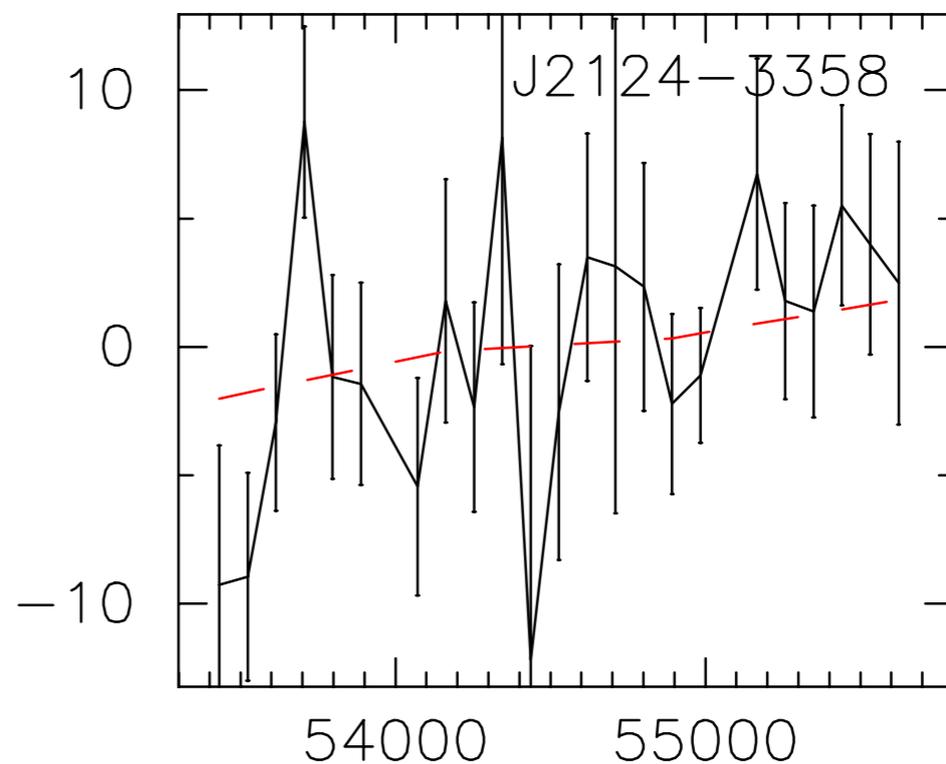
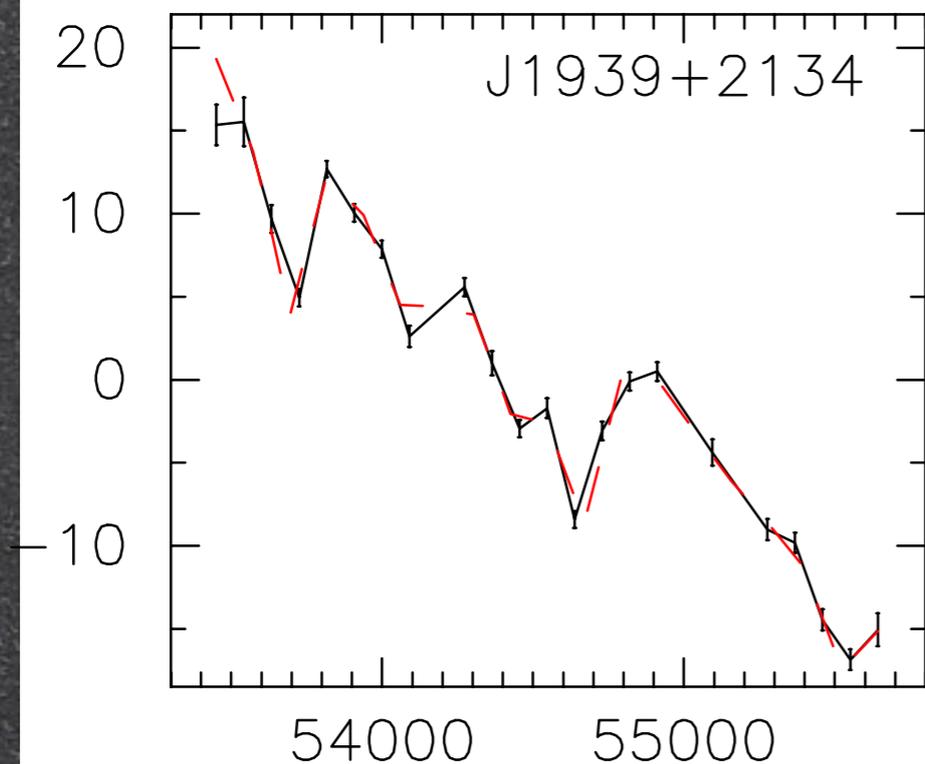
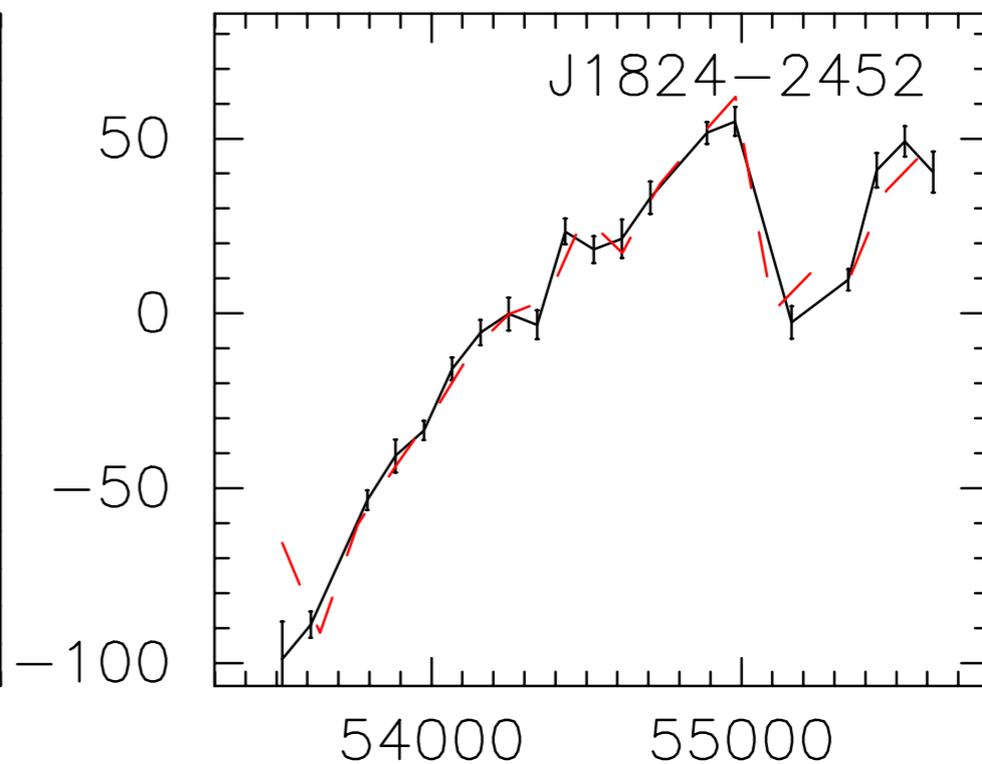
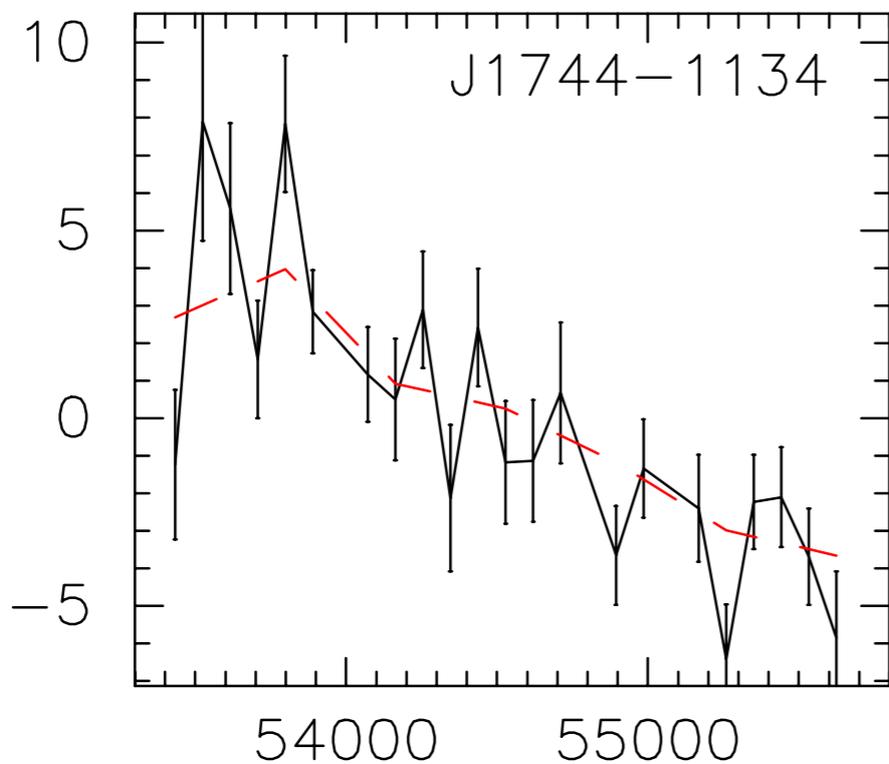
$$\Delta t \approx 4.15 \times 10^6 \text{ms} \times (f_1^{-2} - f_2^{-2}) \times \int_0^d n_e dl$$

Dispersion!



Effect on Timing

↑
Interstellar Dispersion

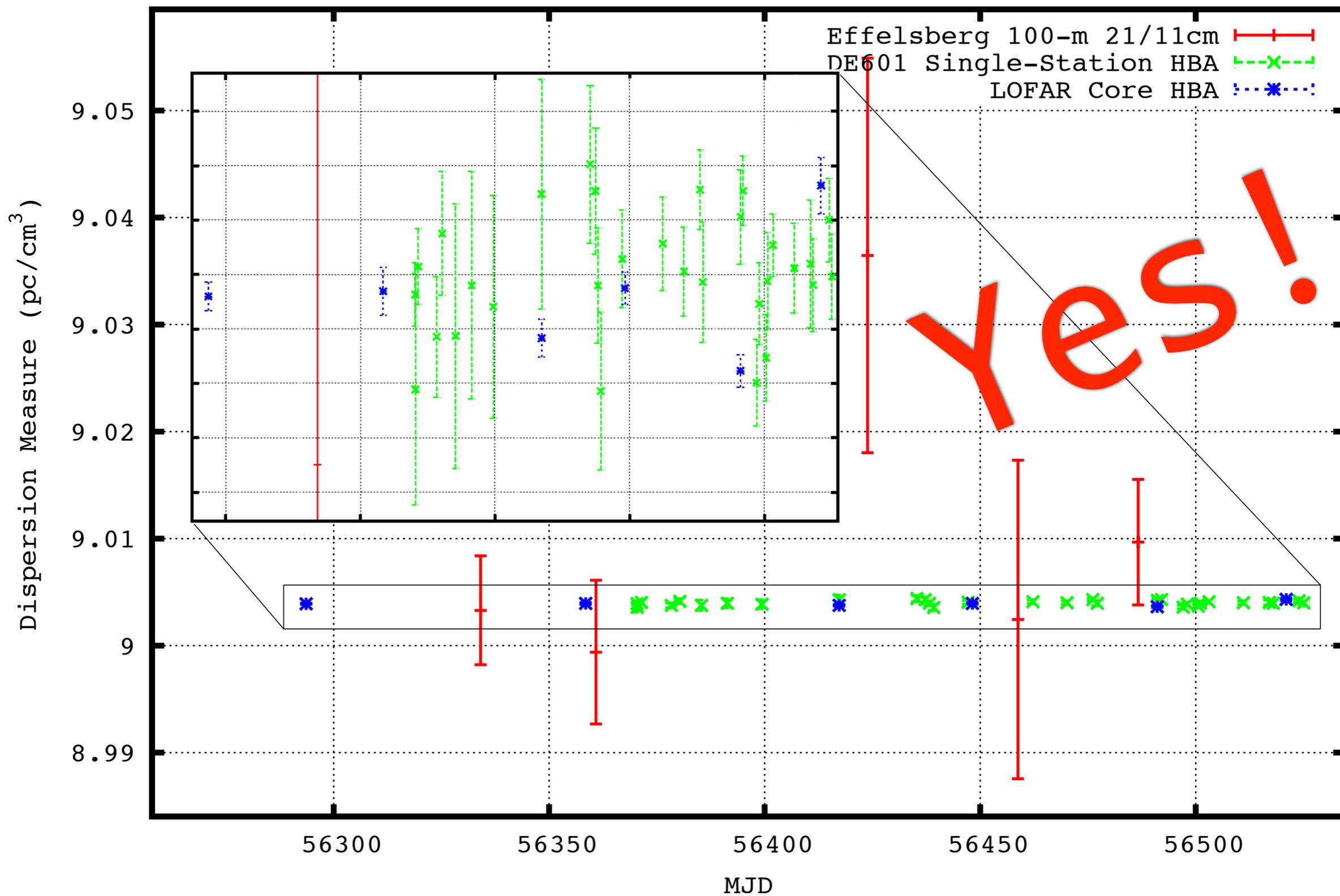


Keith et al., 2013

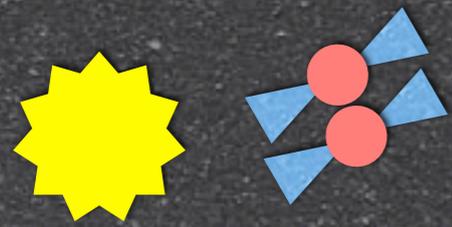
Time →

Does This Actually Work?

PSR J2145-0750 Dispersion Measure Variations

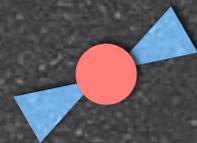


Probing the Solar Wind



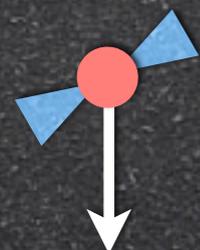
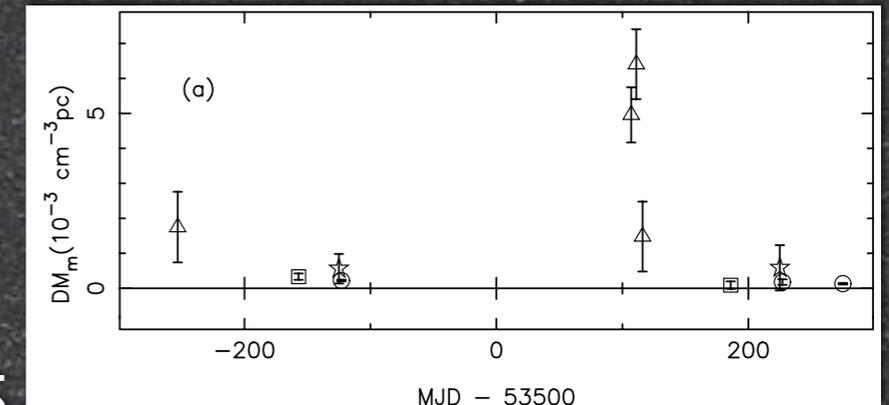
PSR J1801-2304: Ord et al., 2007: $E_{lat} = 0.36$

PSR J1022+1001: You et al., 2007: $E_{lat} = -0.06$



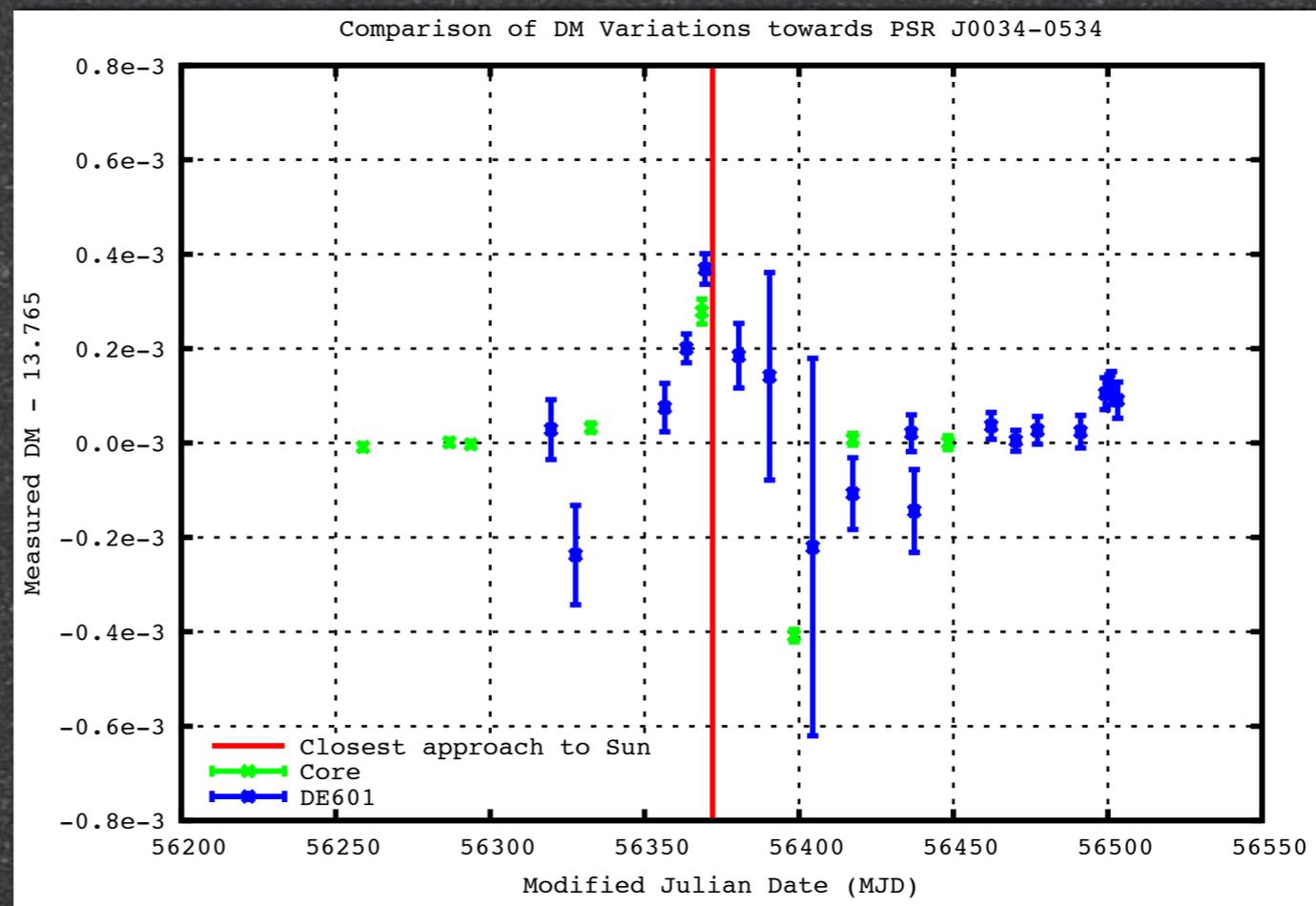
PSR J1824-2452A:

Cognard et al., 1996: $E_{lat} = -1.55$



PSR J0034-0534:

LOFAR: $E_{lat} = -8.53$



Why Single Stations?

- Time pressure at the core
 - Single Stations can be equally sensitive
 - Pulsar timing → Need much on-source time
- Multiple stations
 - Multiple pulsars at once
- Better sampling of events
- Very complementary with Core!