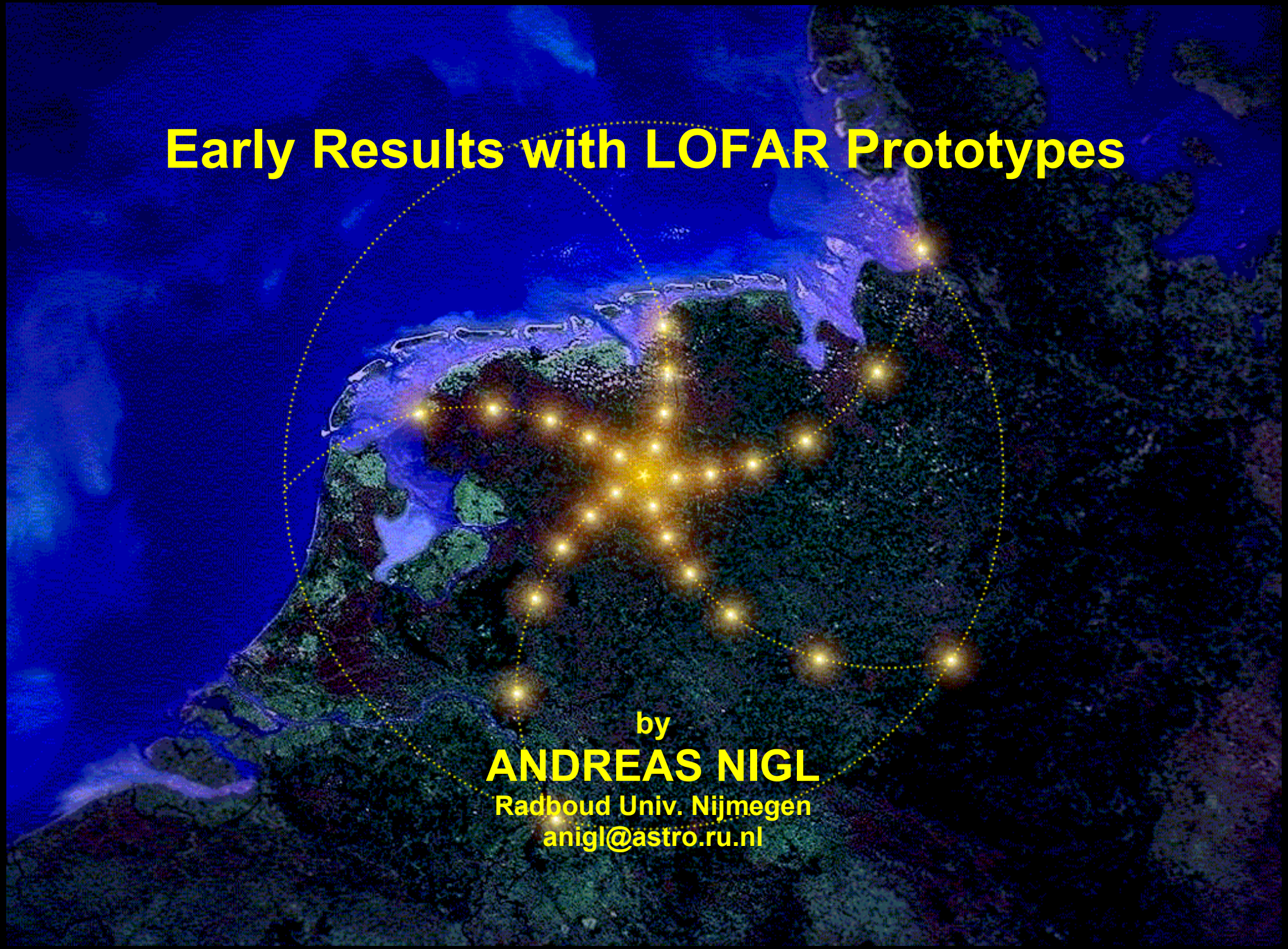


Early Results with LOFAR Prototypes

by
ANDREAS NIGL
Radboud Univ. Nijmegen
anigl@astro.ru.nl

OUTLINE

1. Prototypes
2. Jupiter
3. Faraday
4. VLBI

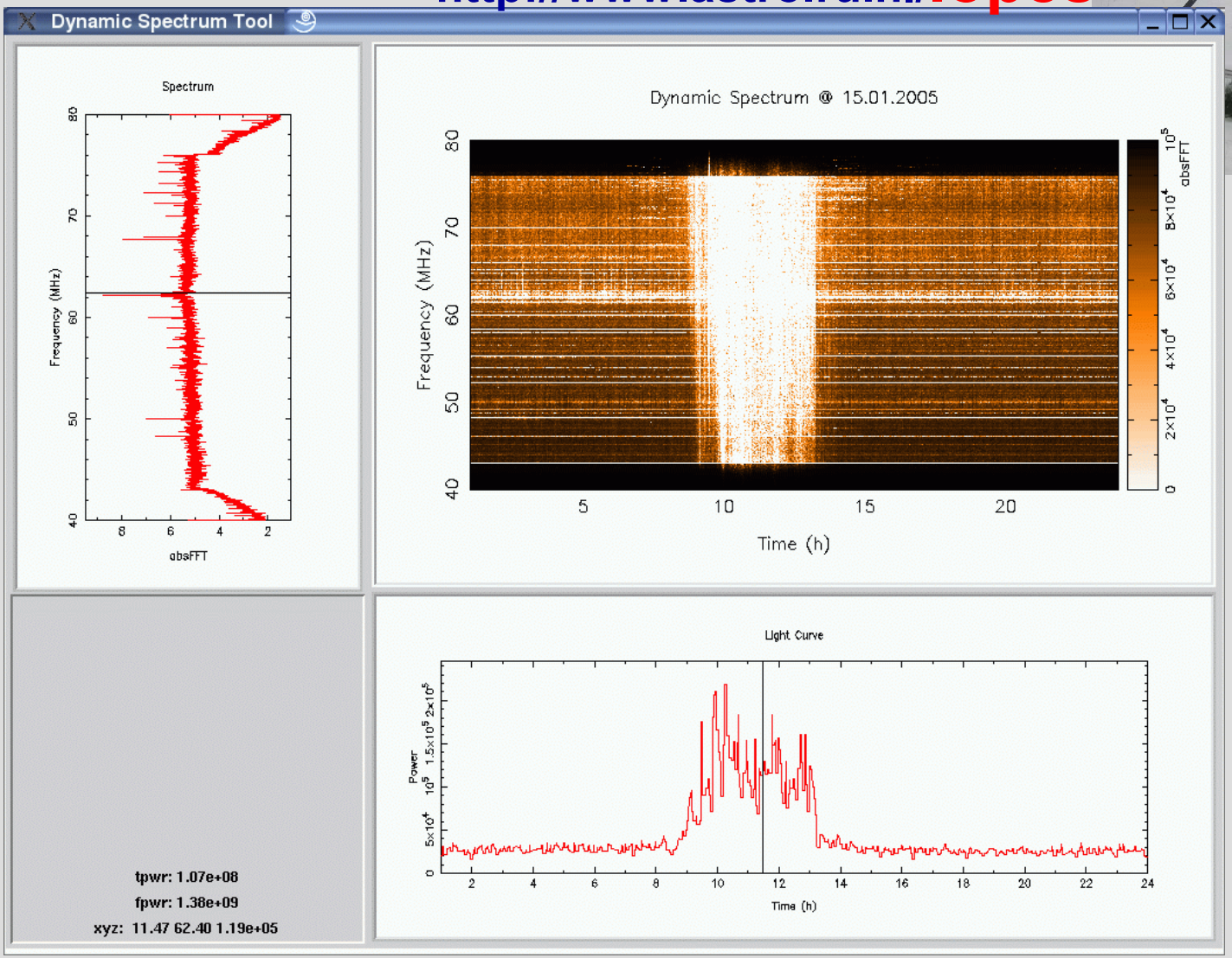
OUTLINE

1. Prototypes
2. Jupiter
3. Faraday

LOPES (30 dipoles)
(LOFAR PrototypE Station)

Nature Paper on CR detection (2005):
correlation between radio pulse height
and muon number detected by particle detectors

http://www.astro.ru.nl/lopes



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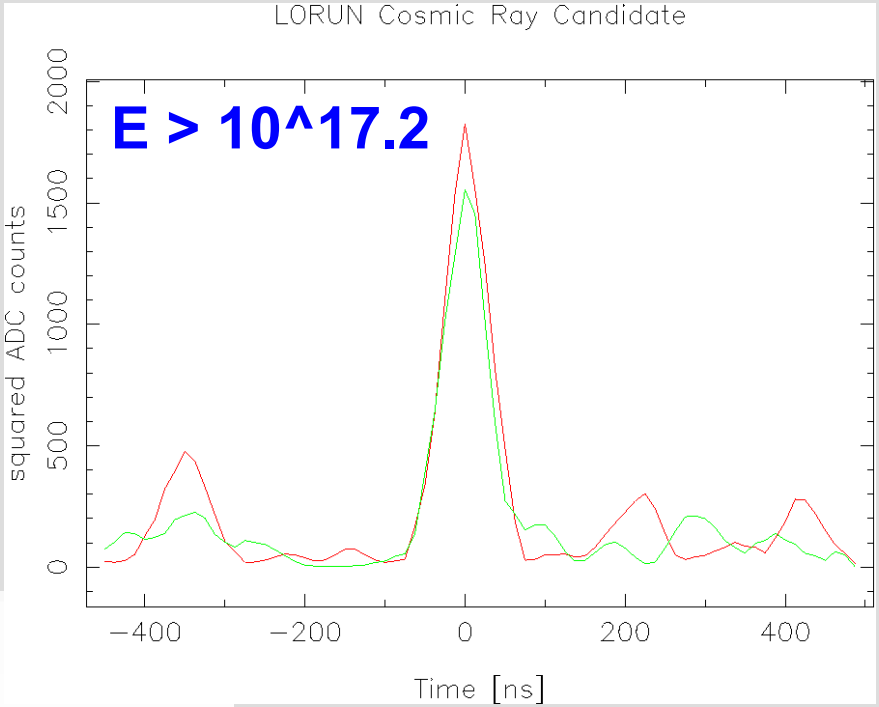

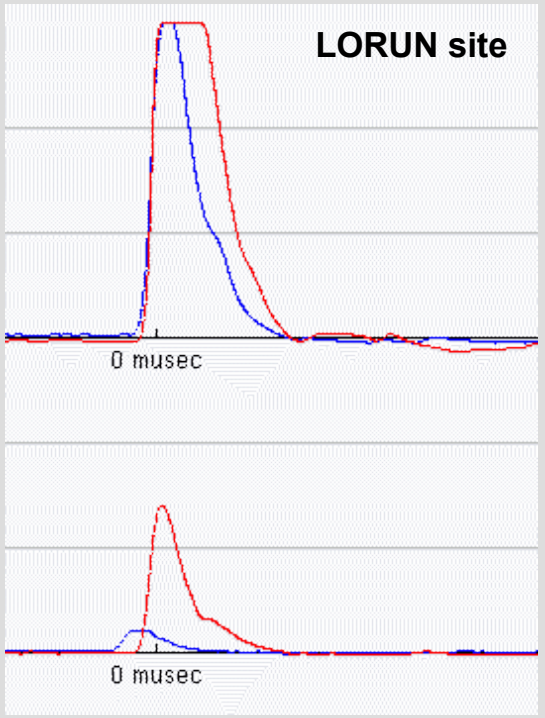

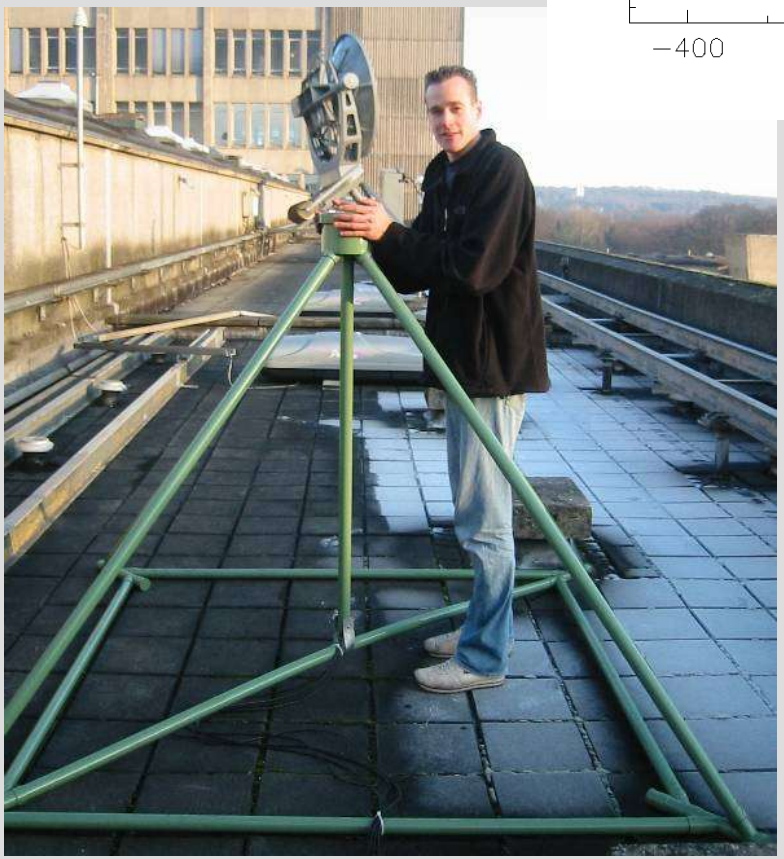

LORUN (4x2 crossed dipoles)
(LOFAR @ Radboud University Nijmegen)

OUTLINE

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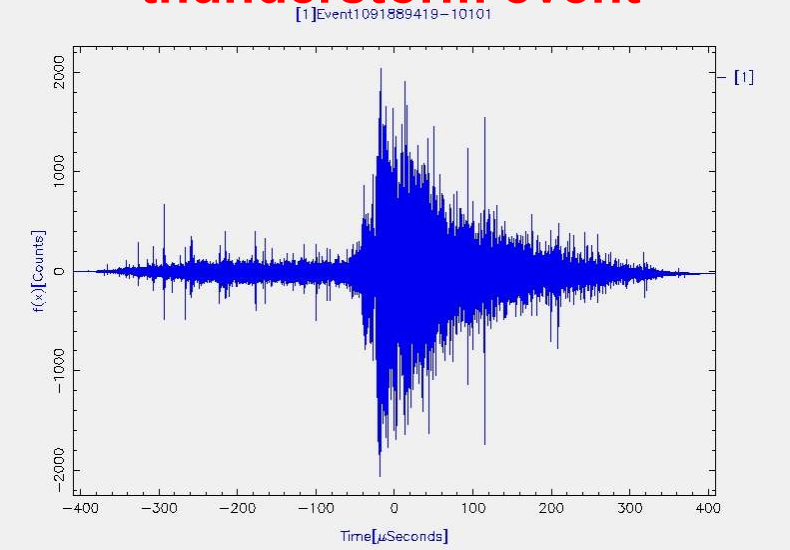
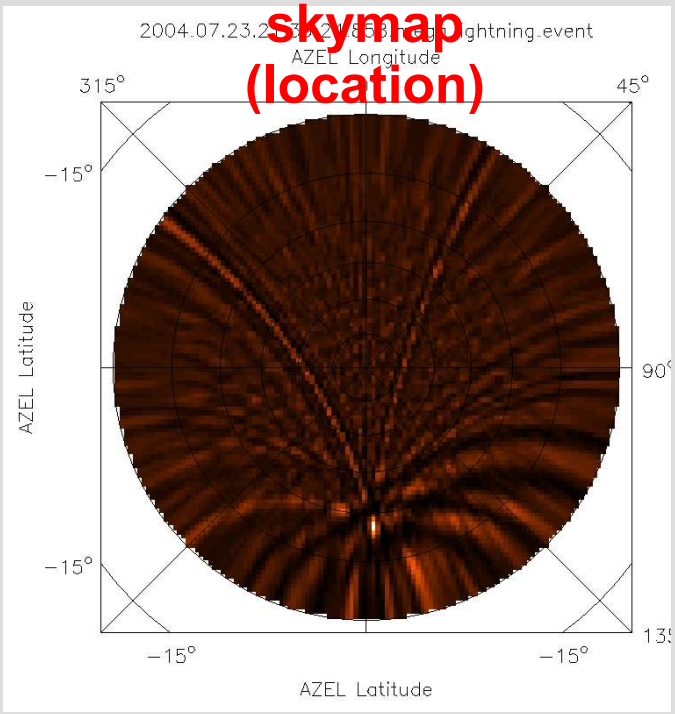
thunderstorm event



skymap (location)



LOFAR/ITS (30x2 crossed dipoles)

(LOFAR Initial Test Station)

ITS

OUTLINE

1. Prototypes
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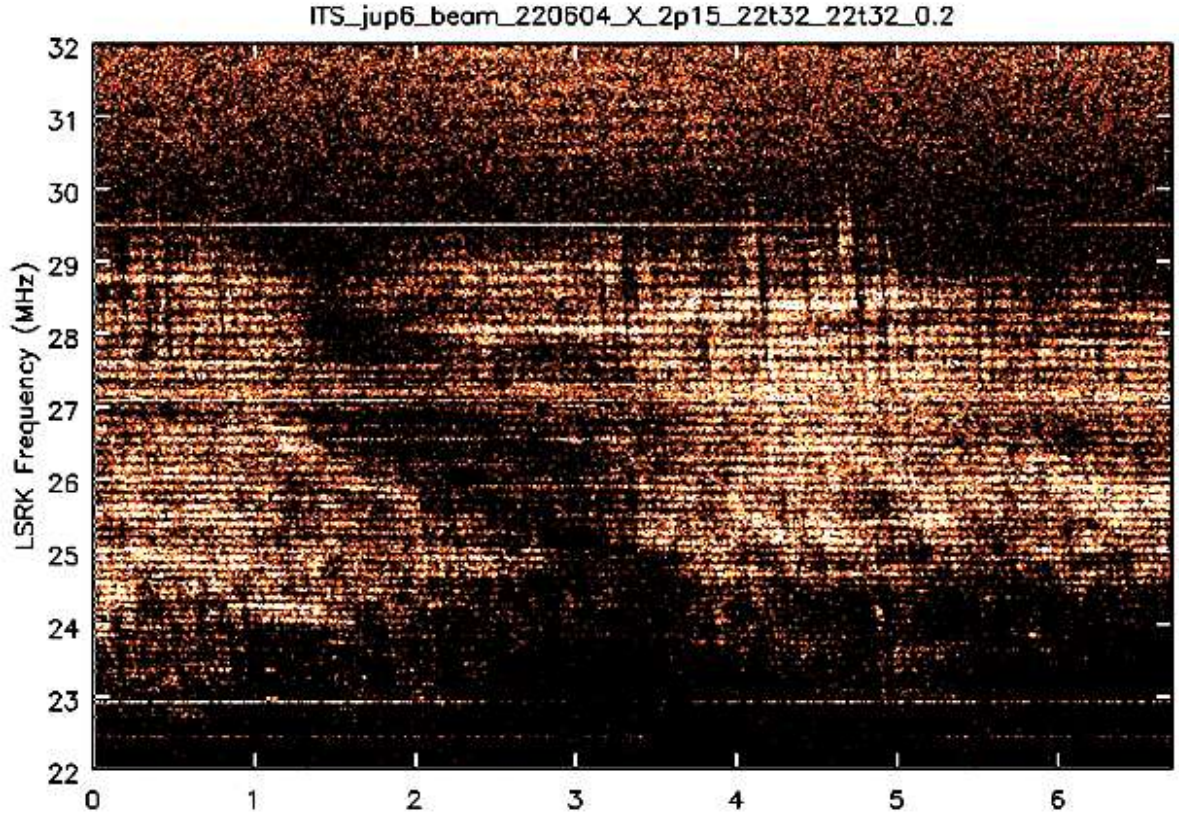
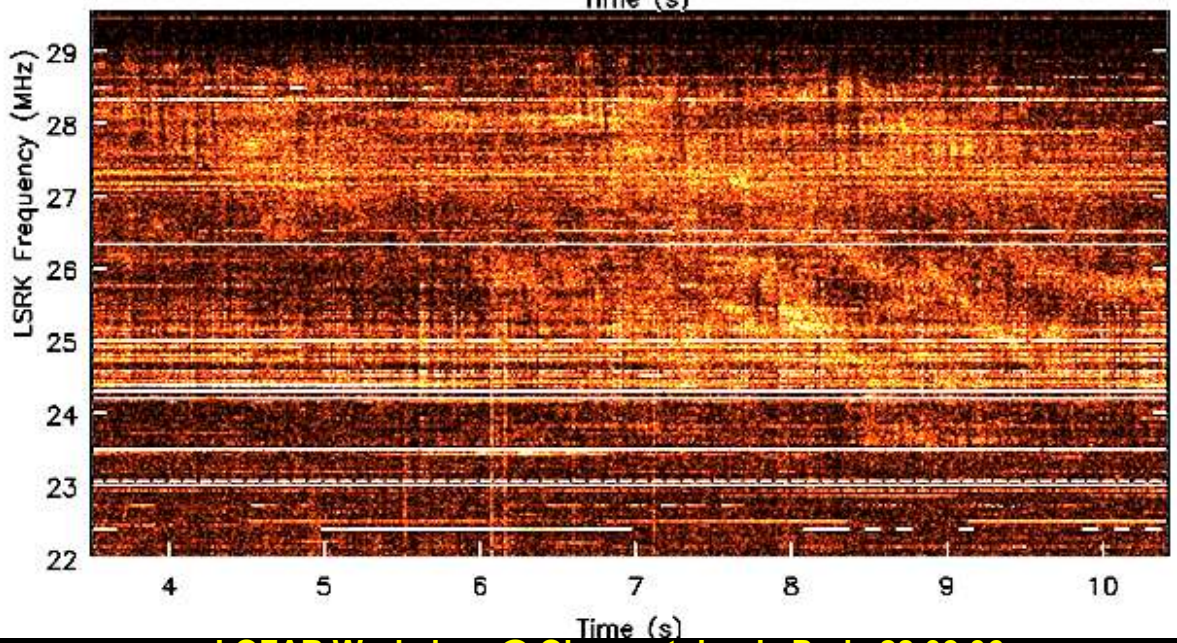
NDA





LOFAR/ITS

OUTLINE

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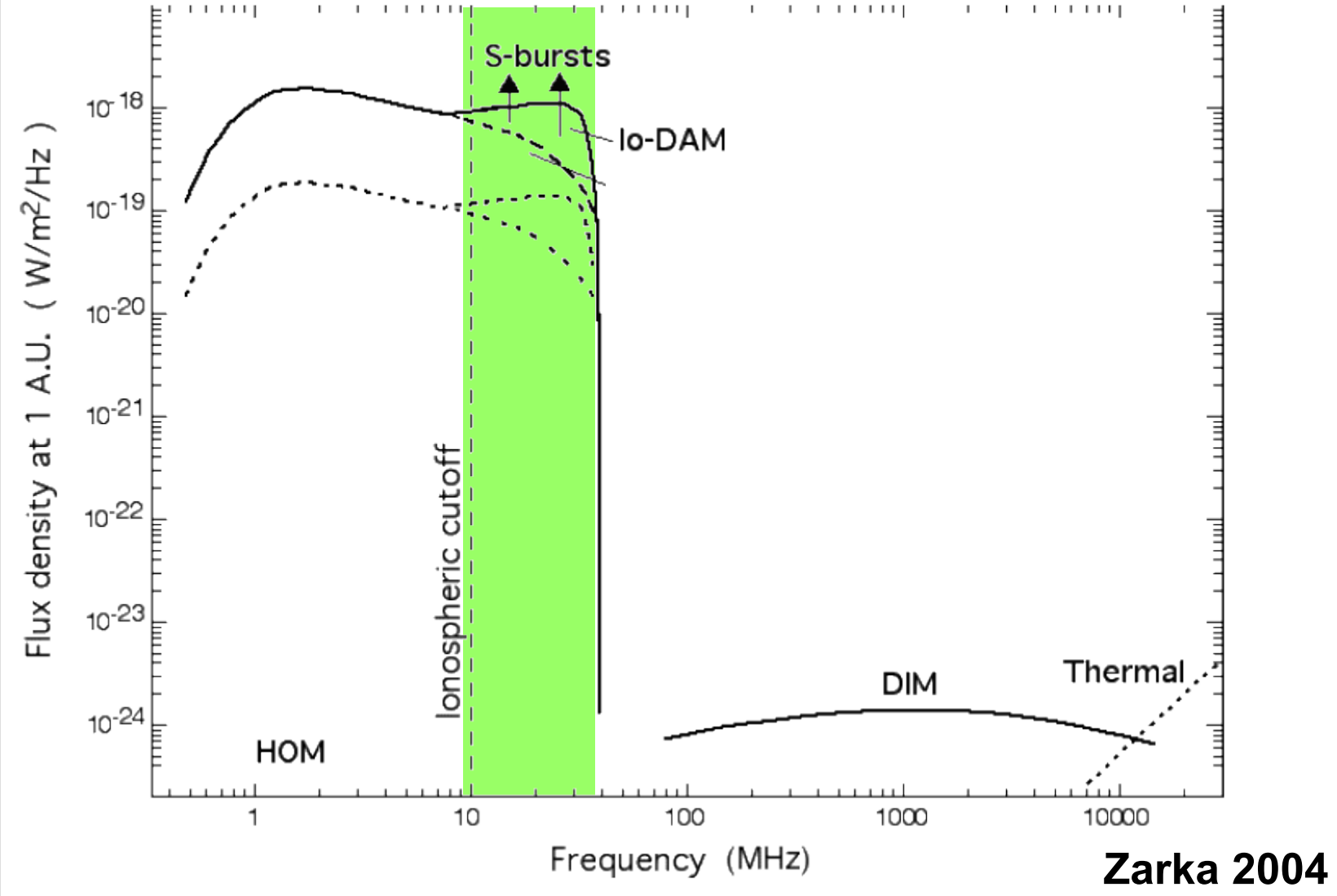
Jupiter - Io - Interaction

elliptically polarized radiation
caused by cyclotron maser instability at the IFT footpoints



Zarka 2004

OUTLINE

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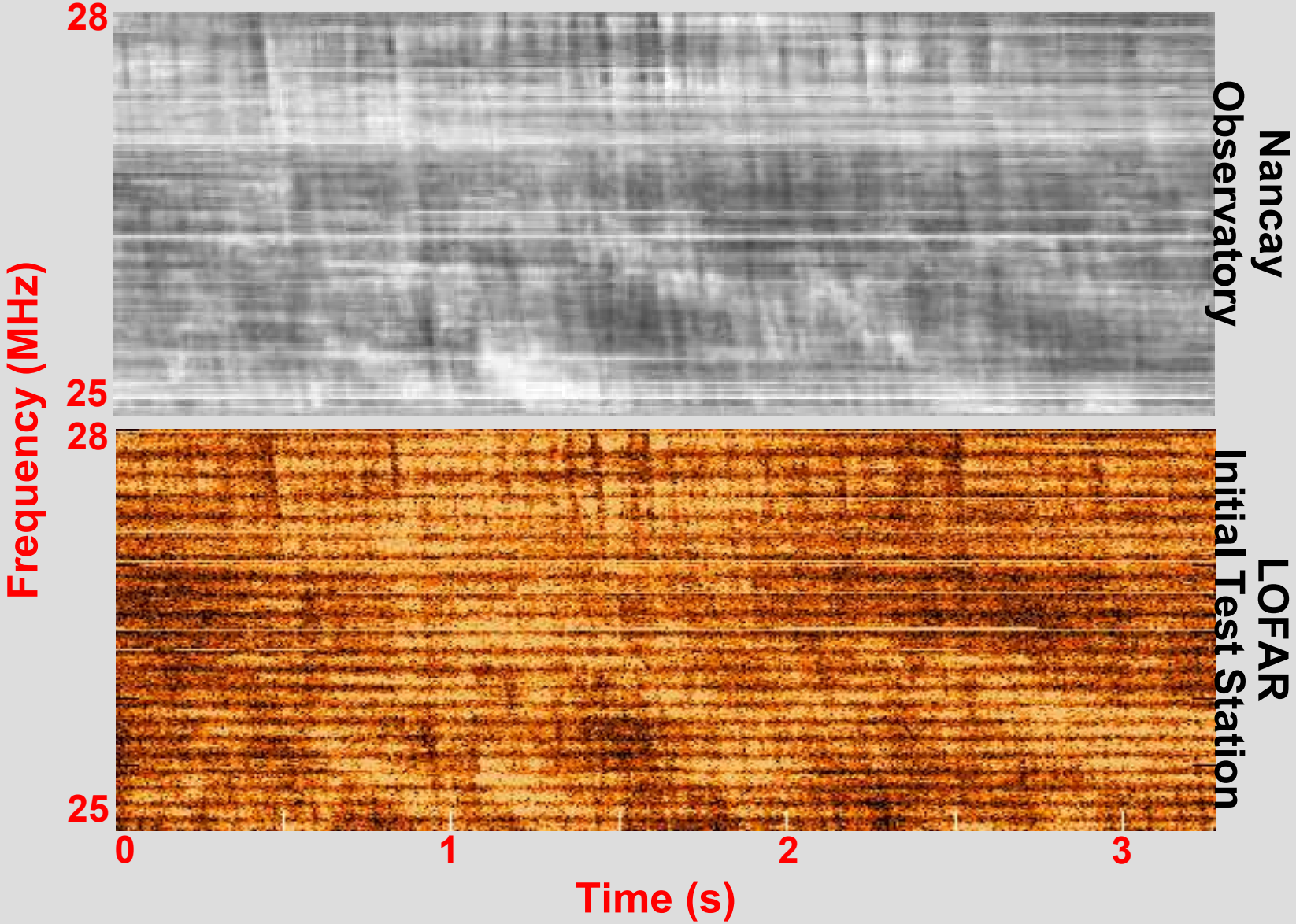
Comparision of Dynamic Spectra

Io-induced emission with s-bursts



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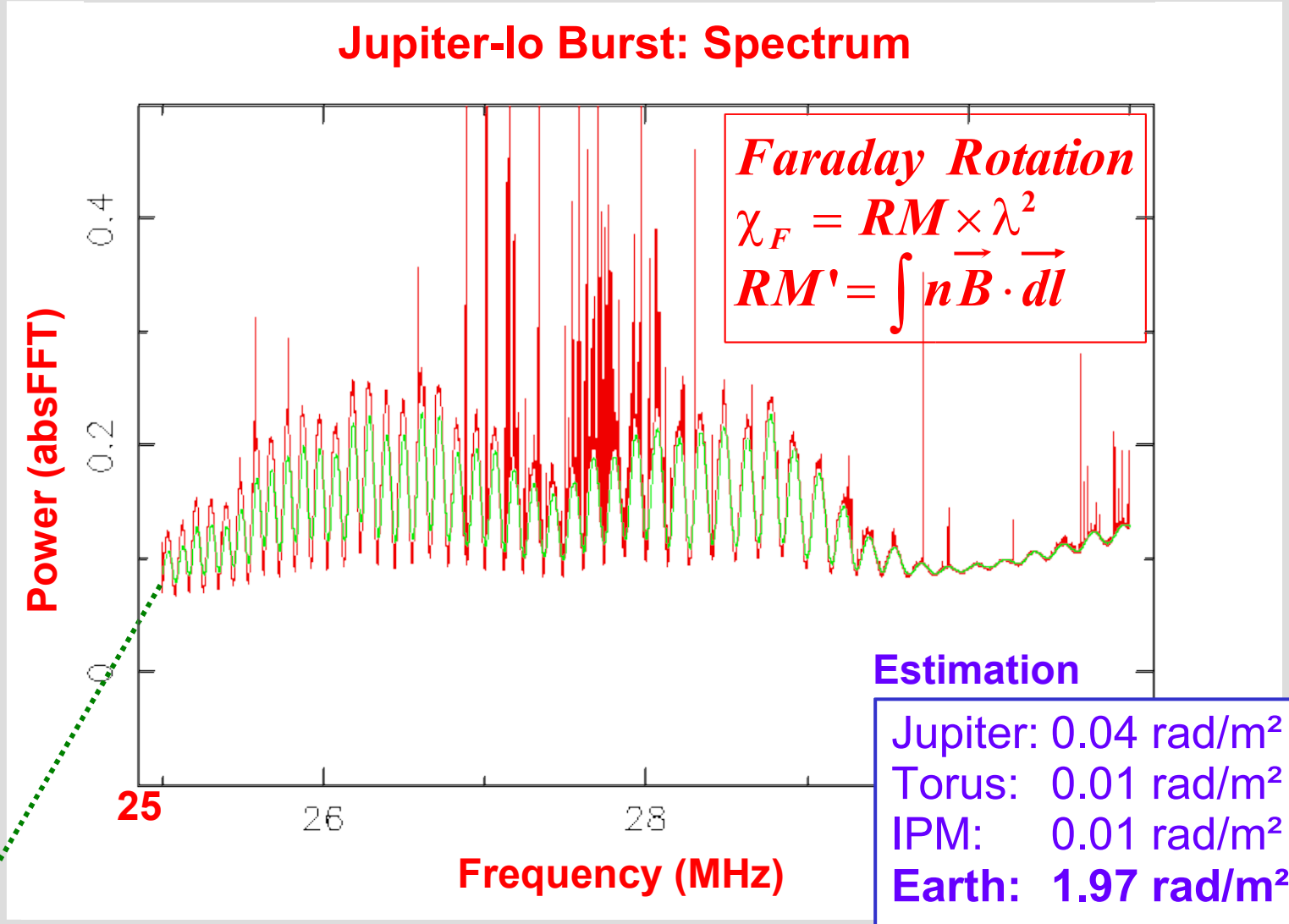
Jupiter-Io Burst: Spectrum



Observation

RM_{obs} = 2.42 rad/m²

Estimation

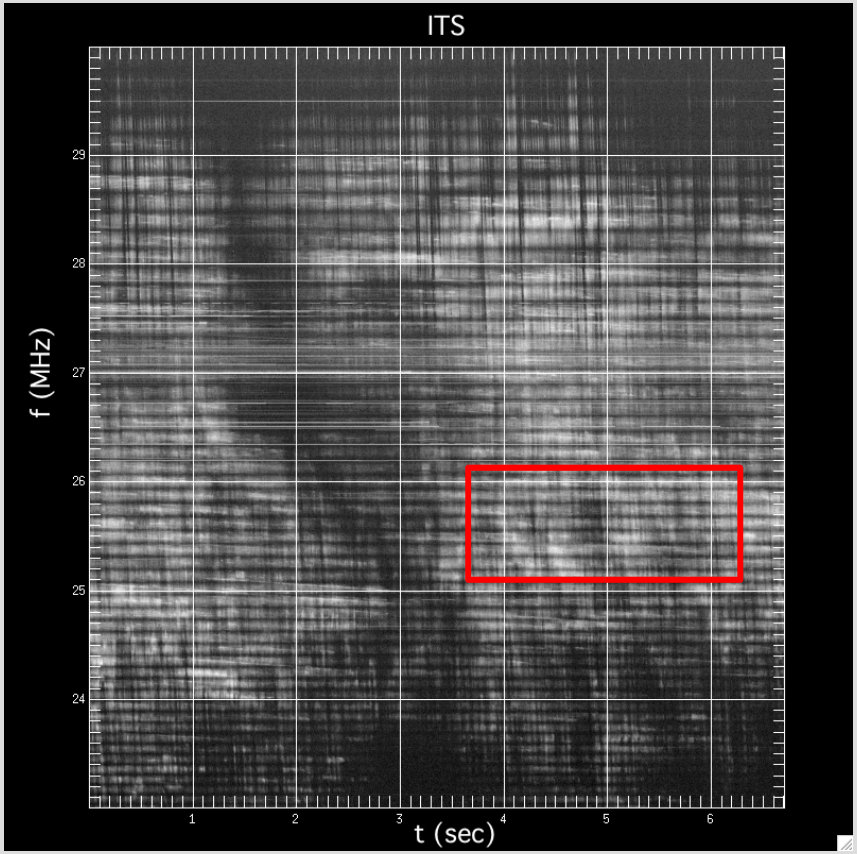
Jupiter: 0.04 rad/m²
Torus: 0.01 rad/m²
IPM: 0.01 rad/m²
Earth: 1.97 rad/m²

RM_{est} = 2.03 rad/m²

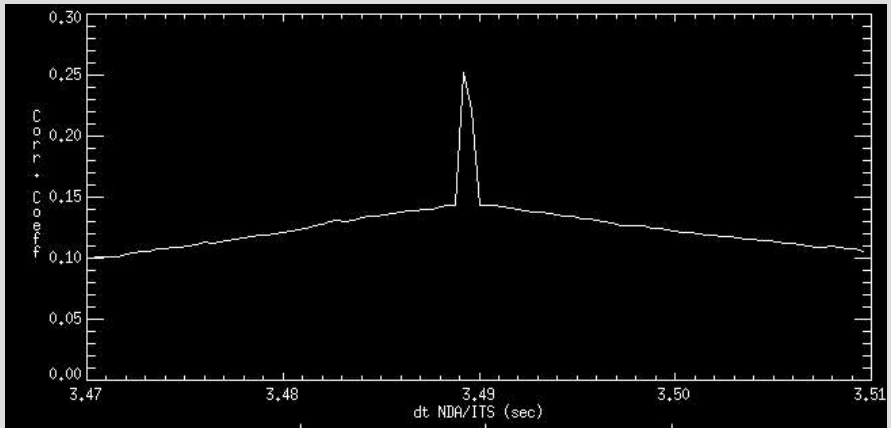
Earth ionosphere dominates RM -> could be used to do deduce DM for LOFAR calibration

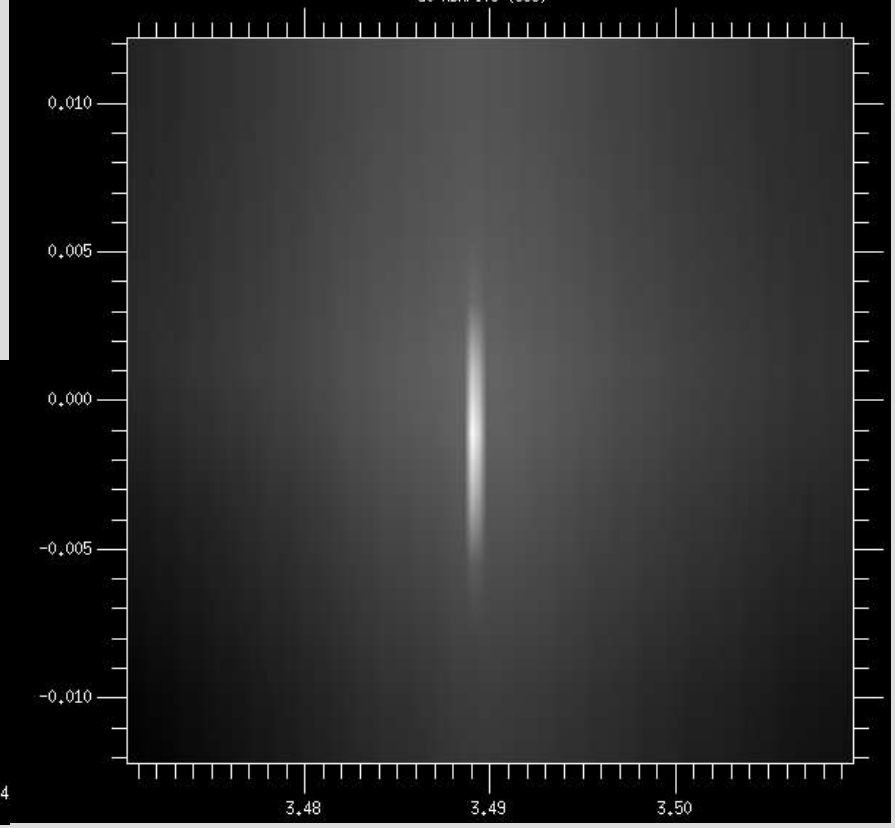
OUTLINE

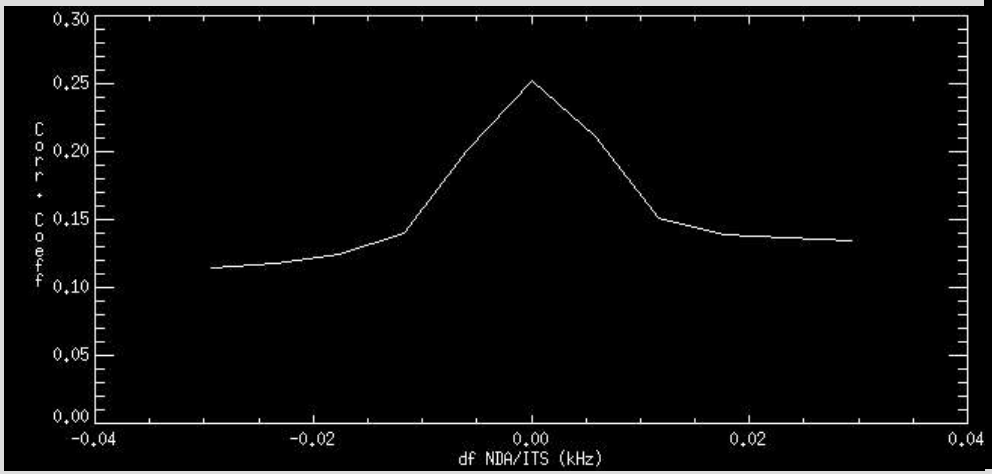
4. VLBI



$\Rightarrow C_{max}>0.25$ @ dt=3.489 s, df=0

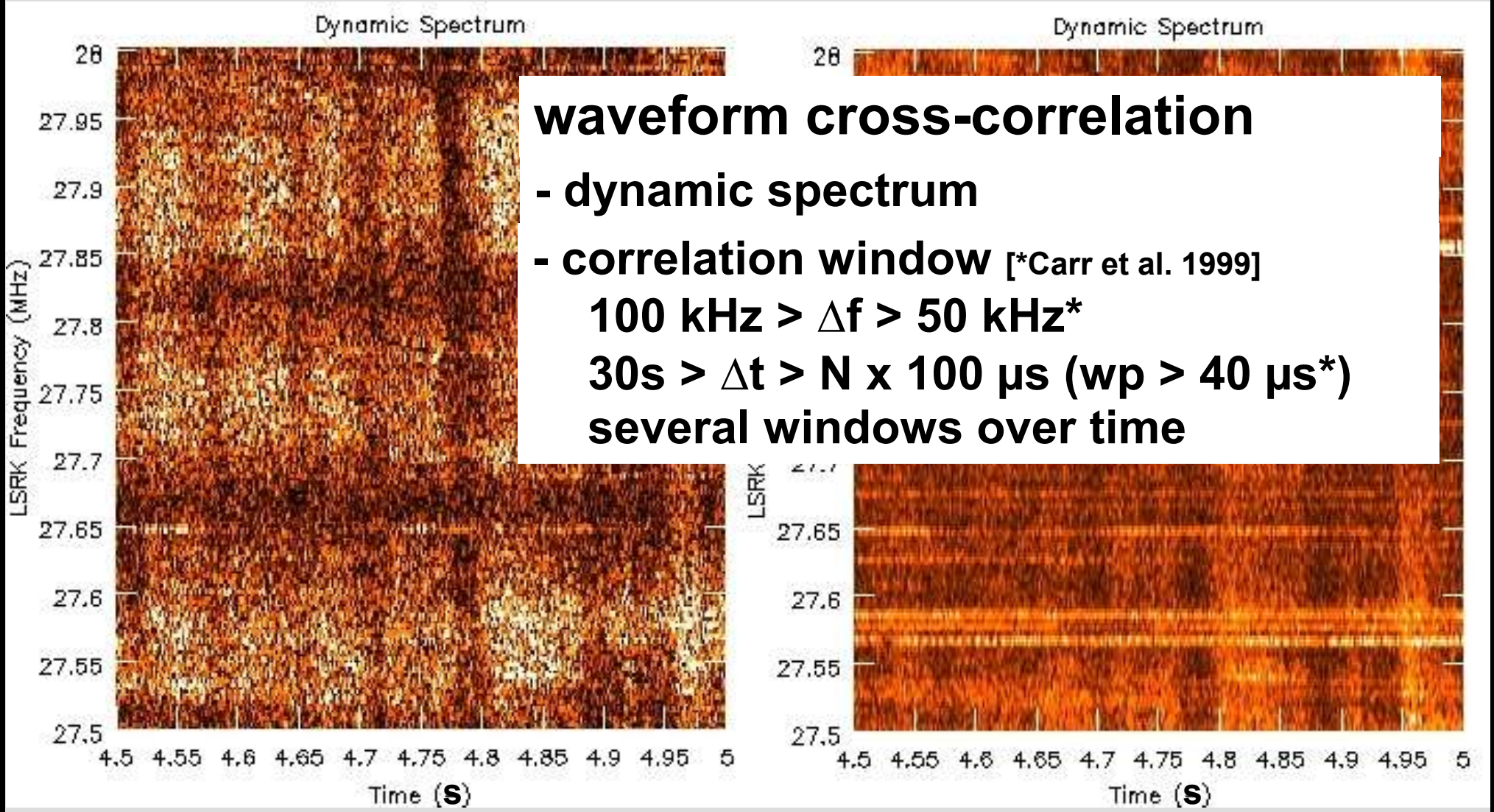






OUTLINE

4. VLBI



waveform cross-correlation

- dynamic spectrum
- correlation window [*Carr et al. 1999]
  - 100 kHz > Δf > 50 kHz*
  - 30s > Δt > N x 100 µs (wp > 40 µs*)
  - several windows over time

Conclusion

What we did

- succesfull demonstration of (multi-)**beamforming** with LOFAR antenna prototypes in a certain direction (Jupiter)
- detection of elliptical polarized **Jupiter emission** and confirmation of Faraday rotation, in this case mainly caused by the Earth ionosphere

To do

- waveform cross-correlation to demonstrate VLBI on long baselines in respect to the influence of the atmosphere
- LOFAR calibration method by deducing DM for the Earth ionosphere from RM observed in linear polarized signals (Jupiter bursts, cosmic ray air showers)

New

- This summer there will be LOFAR/CS1 (Core Station One) available with 96 antennas from, 10-90 MHz and continuous data acquisition


Thank you !
www.astro.ru.nl
www.lofar.org