

# Fringes between Effelsberg, Tautenburg, Unterweilenbach and NL

LOFAR status meeting

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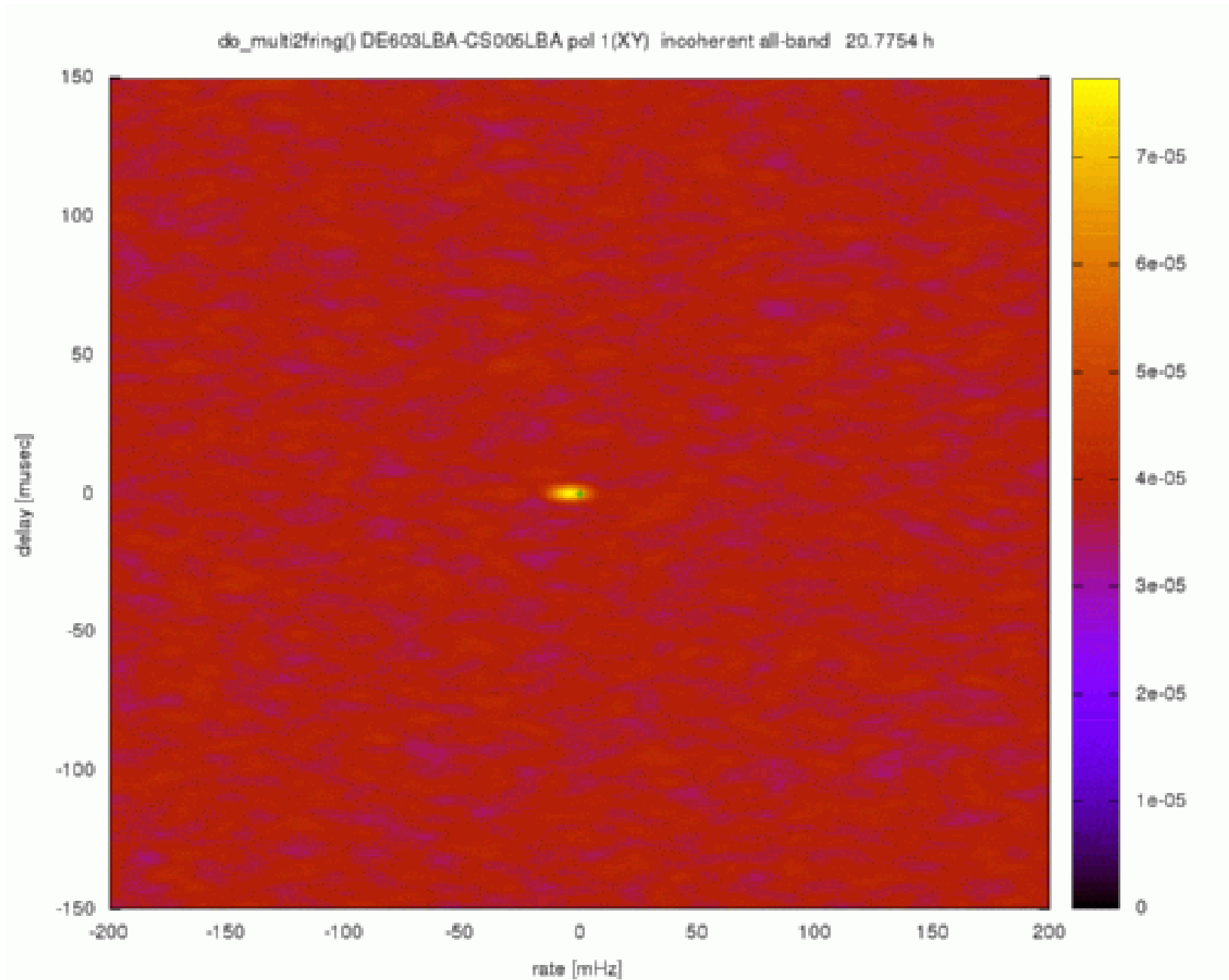
# First Effelsberg fringes 2009

- first long baseline:  $\sim 300$  km
- August/September 2009: fringes found and confirmed
- clock offset  $\sim 1 \mu\text{sec}$
- ionospheric delays: typ.  $\lesssim 0.5 \mu\text{sec}$  at 50 MHz
- phase rates: typ.  $\lesssim 10\text{--}30$  mHz
- can separate dispersive (ionospheric) from non-dispersive (clock and position) effects

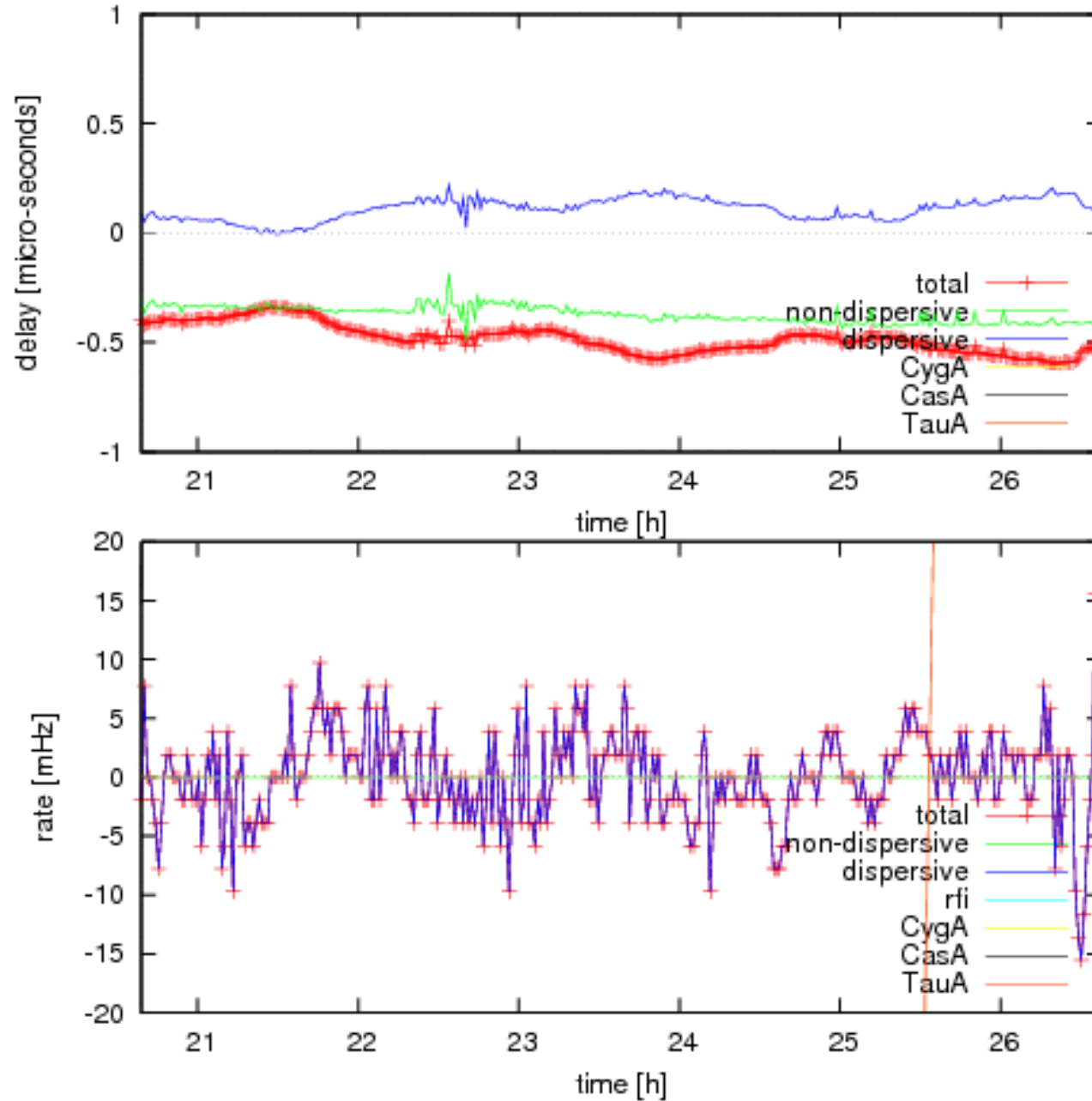
# First Tautenburg fringes

- observation 261 (Heald & Haas)
- 6 h 3C196, 248 subbands, 1 sec
- data set D2010\_16370 (2.4 TB)
- some NL stations + Tautenburg
- fringes to Tautenburg found by Ashish Asgekar, Annette Haas and George Heald
- possibly swapped X/Y polarisation
- additional analysis from me

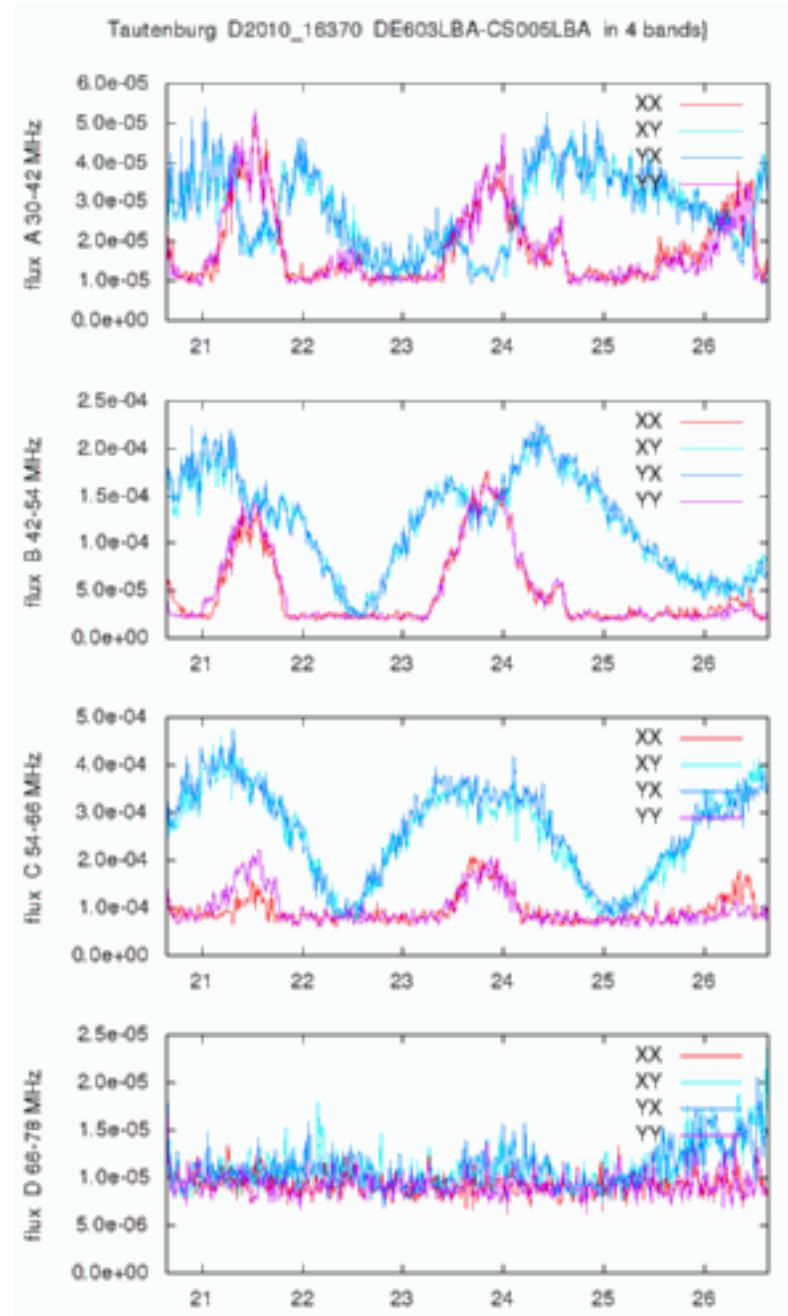
# First Tautenburg fringes: delay/rate spectrum



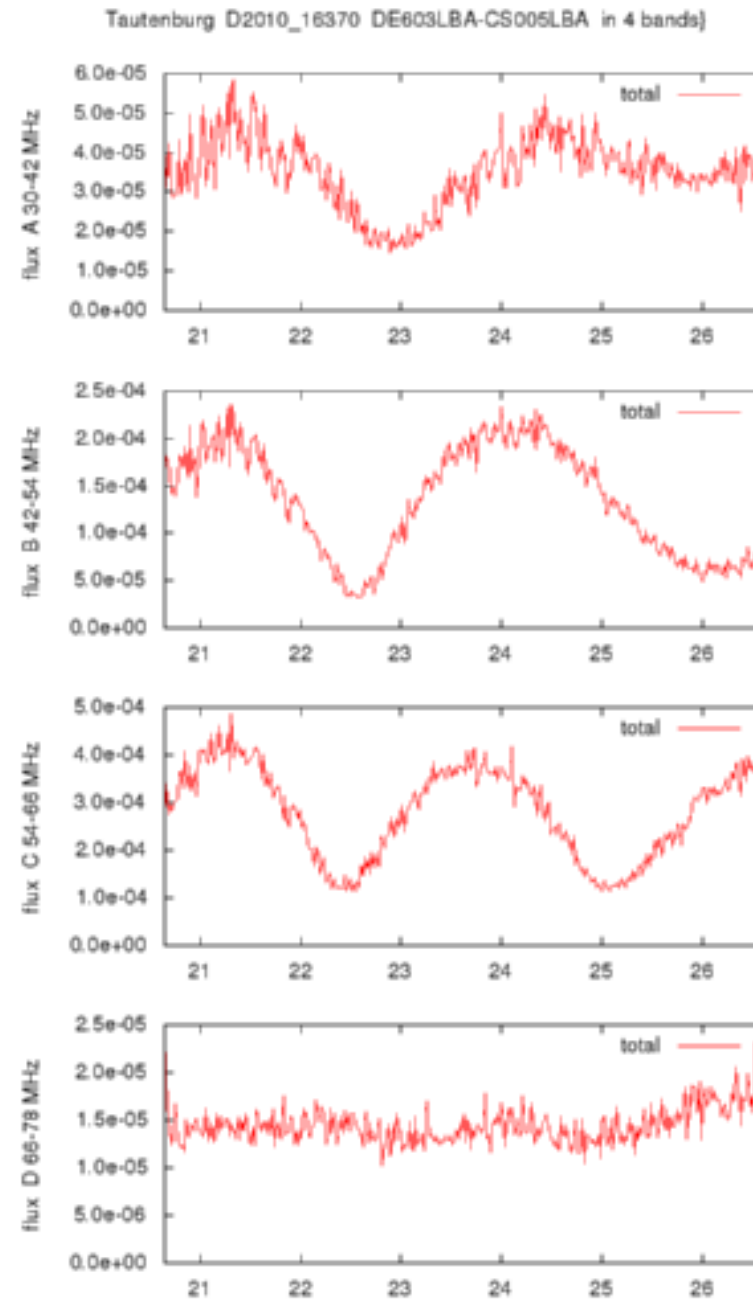
# First Tautenburg fringes: delay and phase rates



# Faraday rotation and swapped polarisations



# Pseudo total intensity: source structure



# Analysis of first Tautenburg fringes

- see USG forum, <http://usg.lofar.org/forum/index.php?topic=228.0>
- fringes confirmed
- clock offset relative to NL  $\sim 0.3 \mu\text{sec}$
- ionospheric delay  $\lesssim 0.25 \mu\text{sec}$  (at  $\sim 50 \text{MHz}$ )
- differential Faraday rotation present
- swapped X/Y most plausible
- nice beating in amplitudes due to source structure



## Second observation

- observation 266 (Haas et al.)
- 8 h 3C196, 248 subbands, 1 sec
- data set L2010\_16473 (8.6 TB !!)
- many NL stations + Tautenburg + Effelsberg
- only partly analysed
- fringes to Tautenburg and Effelsberg
- fringes between Tautenburg and Effelsberg
- continues

## Third observation: with Unterweilenbach

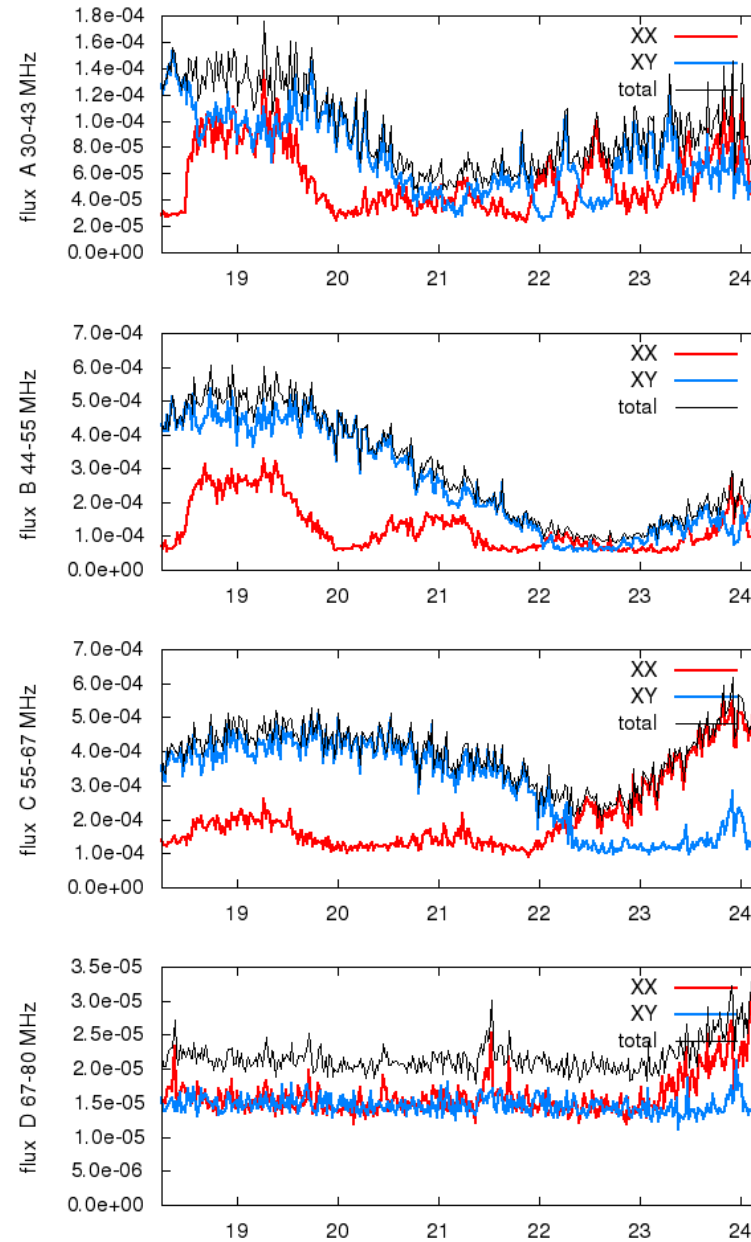
- observation 274 (Polatidis et al.)
- 6 h 3C196, 160 'random' subbands, 1 sec
- data set D2010\_16704 (1.0 TB)
- few NL stations + Tautenburg + Effelsberg + Unterweilenbach
- some technical problems
- but: fringes to and between all German stations!

# Locations



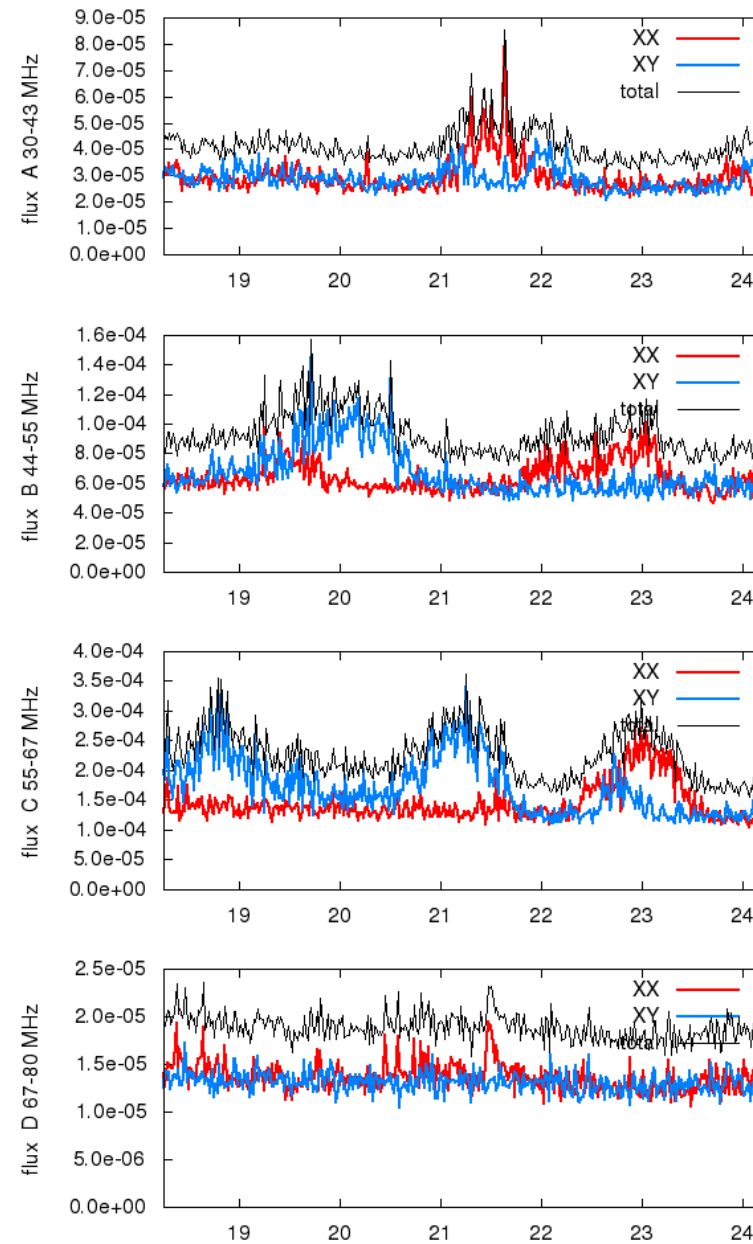
# DE601 - RS307 (Effelsberg - NL)

D2010\_16704 in 4 bands : DE601LBA-RS307LBA coherent



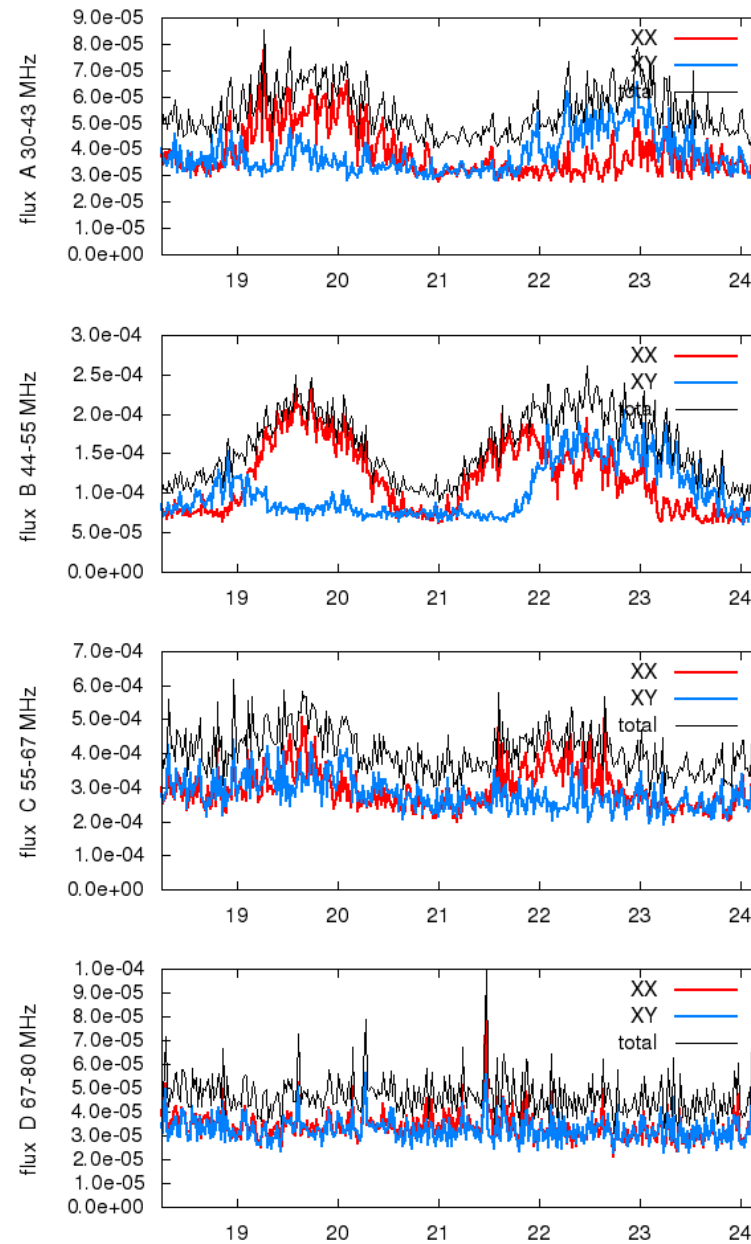
# DE602 - RS307 (Unterweilenbach - NL)

D2010\_16704 in 4 bands : DE602LBA-RS307LBA coherent



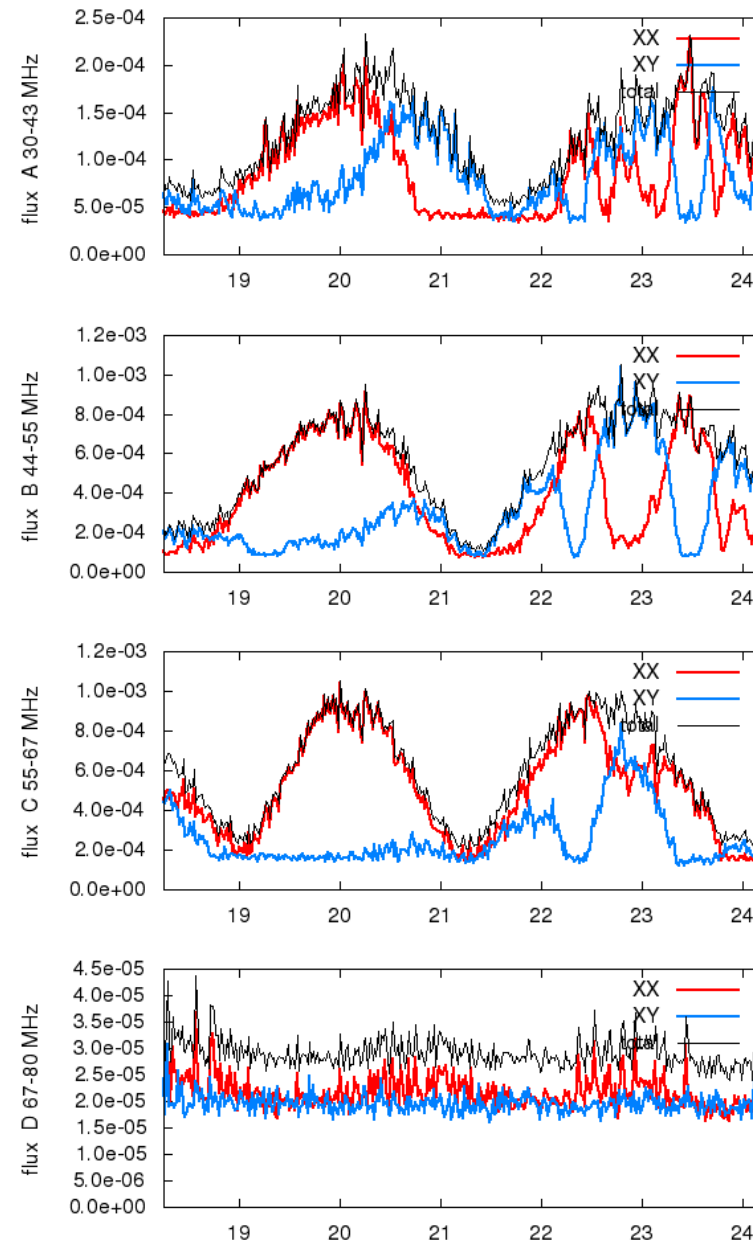
# DE603 - RS307 (Tautenburg - NL)

D2010\_16704 in 4 bands : DE603LBA-RS307LBA coherent



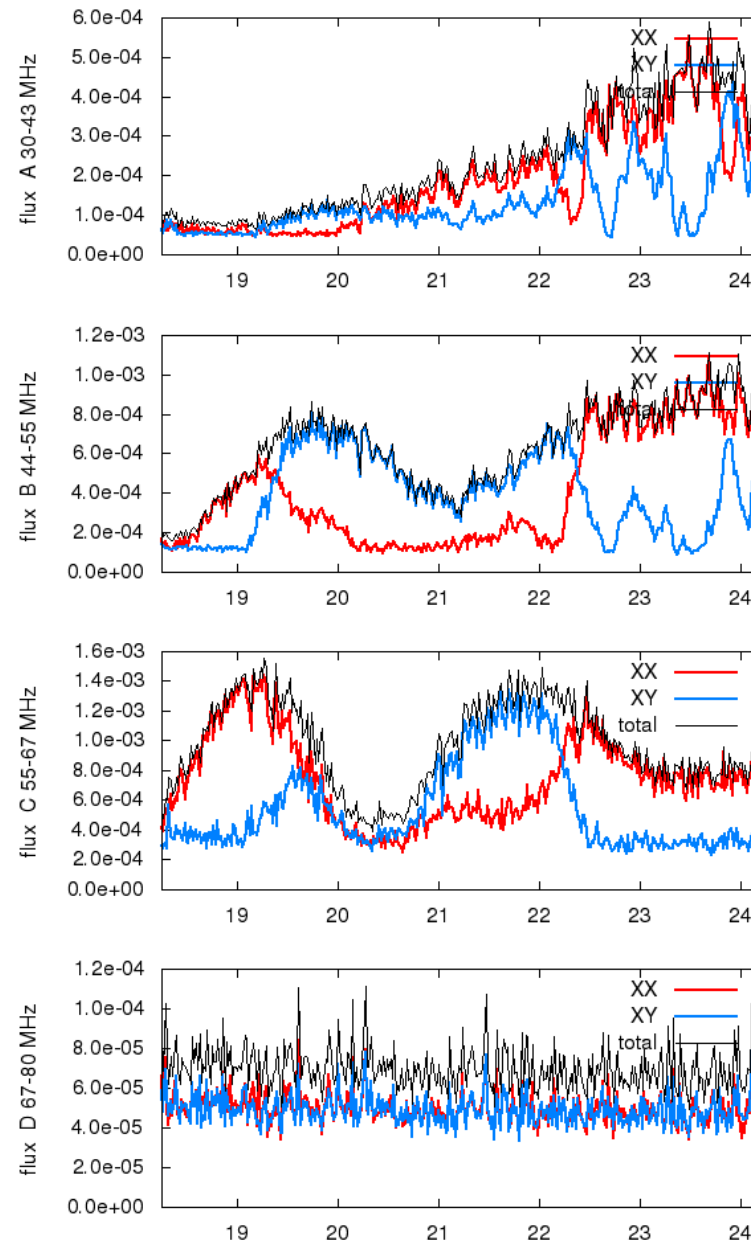
# DE601 - DE602 (Effelsberg - Unterweilenbach)

D2010\_16704 in 4 bands : DE601LBA-DE602LBA coherent



# DE601 - DE603 (Effelsberg - Tautenburg)

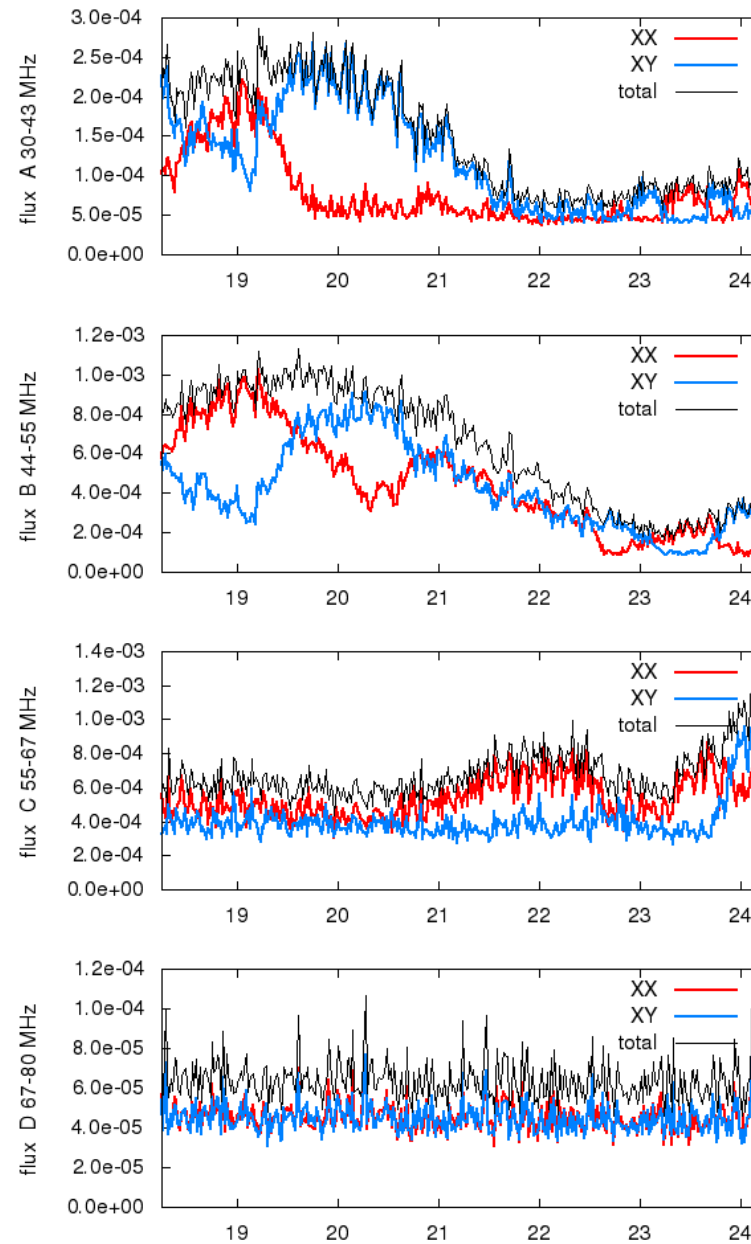
D2010\_16704 in 4 bands : DE601LBA-DE603LBA coherent



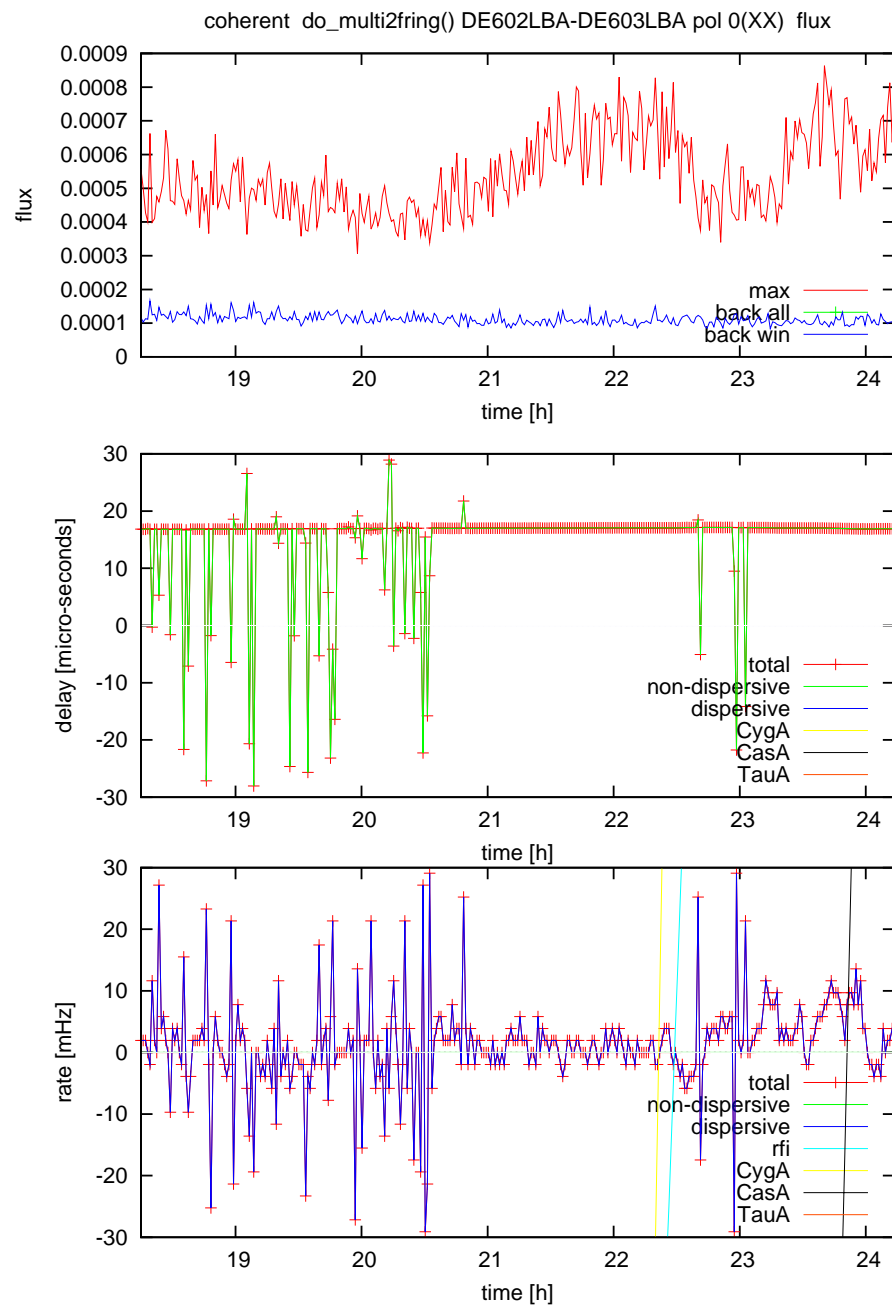


# DE602 - DE603 (Unterweilenbach - Tautenburg)

D2010\_16704 in 4 bands : DE602LBA-DE603LBA coherent



# Delays etc. Unterweilenbach - Tautenburg, band C

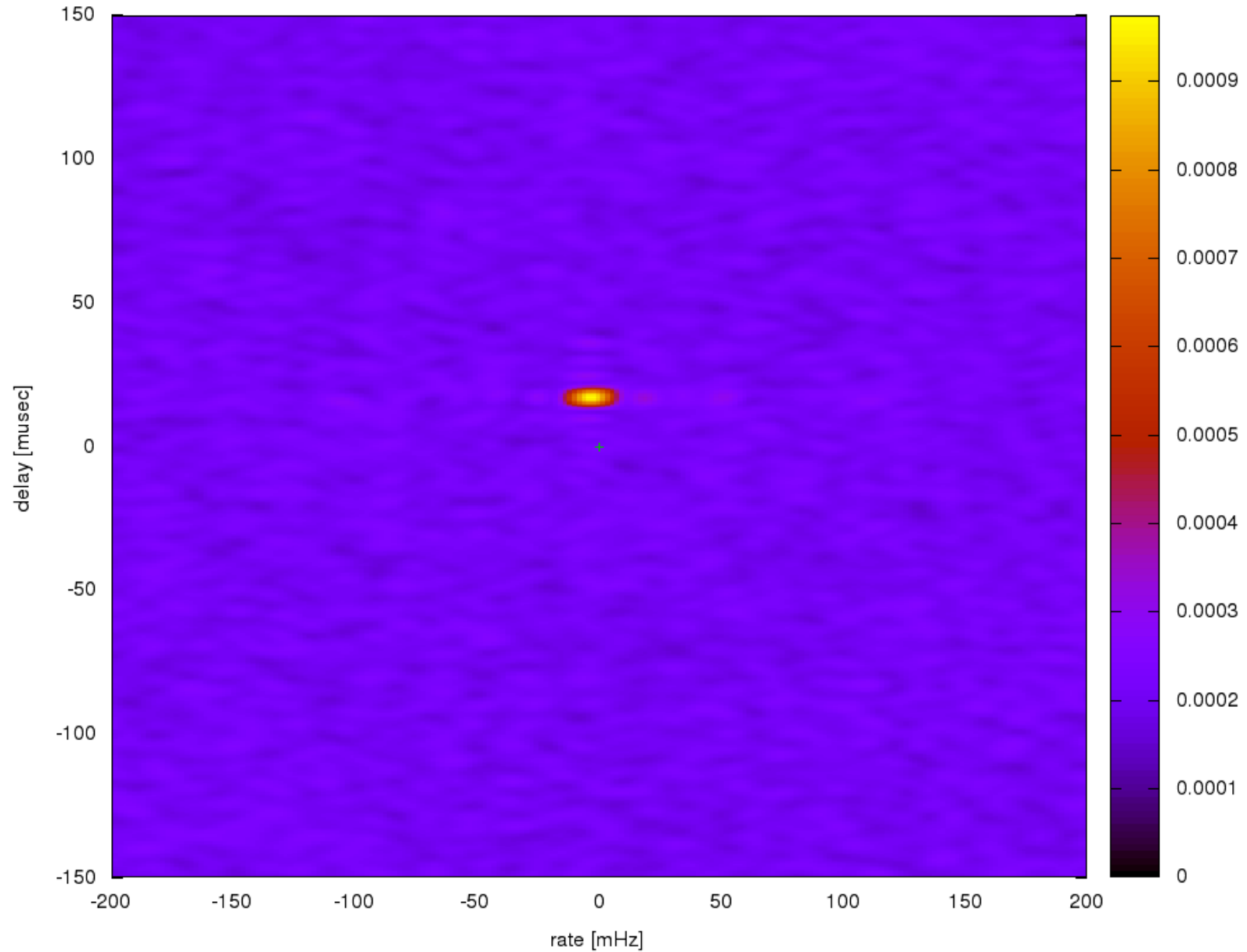


# Conclusions so far

- fringes on all long baselines
- ionosphere well-behaved
- significant Faraday rotation
- swapped polarisations?
- sometimes huge **clock offsets**  
(Tautenburg  $\sim 18 \mu\text{sec}$  !)
- chunks of 25 % subbands have many **synchronous short dropouts** (data transfer?)
- more to come, watch the USG forum

# Delay/rate spectra DE602-DE603

do\_multi2fring() DE602LBA-DE603LBA pol 0(XX) incoherent all-band 18.6081 h



# Contents

- 1 First Effelsberg fringes 2009
- 2 First Tautenburg fringes
- 3 First Tautenburg fringes: delay/rate spectrum
- 4 First Tautenburg fringes: delay and phase rates
- 5 Faraday rotation and swapped polarisations
- 6 Pseudo total intensity: source structure
- 7 Analysis of first Tautenburg fringes
- 8 Second observation
- 9 Third observation: with Unterweilenbach
- 10 Locations
- 11 DE601 - RS307 (Effelsberg - NL)
- 12 DE602 - RS307 (Unterweilenbach - NL)
- 13 DE603 - RS307 (Tautenburg - NL)
- 14 DE601 - DE602 (Effelsberg - Unterweilenbach)
- 15 DE601 - DE603 (Effelsberg - Tautenburg)
- 16 DE602 - DE603 (Unterweilenbach - Tautenburg)
- 17 Delays etc. Unterweilenbach - Tautenburg, band C
- 18 Conclusions so far

- 19 Delay/rate spectra DE602-DE603
- 20 Contents