

Effelsberg-Bonn HI Survey (EBHIS)

Jürgen Kerp¹, Benjamin Winkel², Nadya Ben Bekhti¹, Shahram Faridani¹, Lars Flöer¹, Peter Kalberla¹, Daniel Lenz¹

¹Argelander-Institut für Astronomie

²Max-Planck-Institut für Radioastronomie



7800 m² collecting area
High sensitivity 1.5 K/Jy
Fully steerable
EBHIS starts in August
2008



Max-Planck-Institut
für Radioastronomie



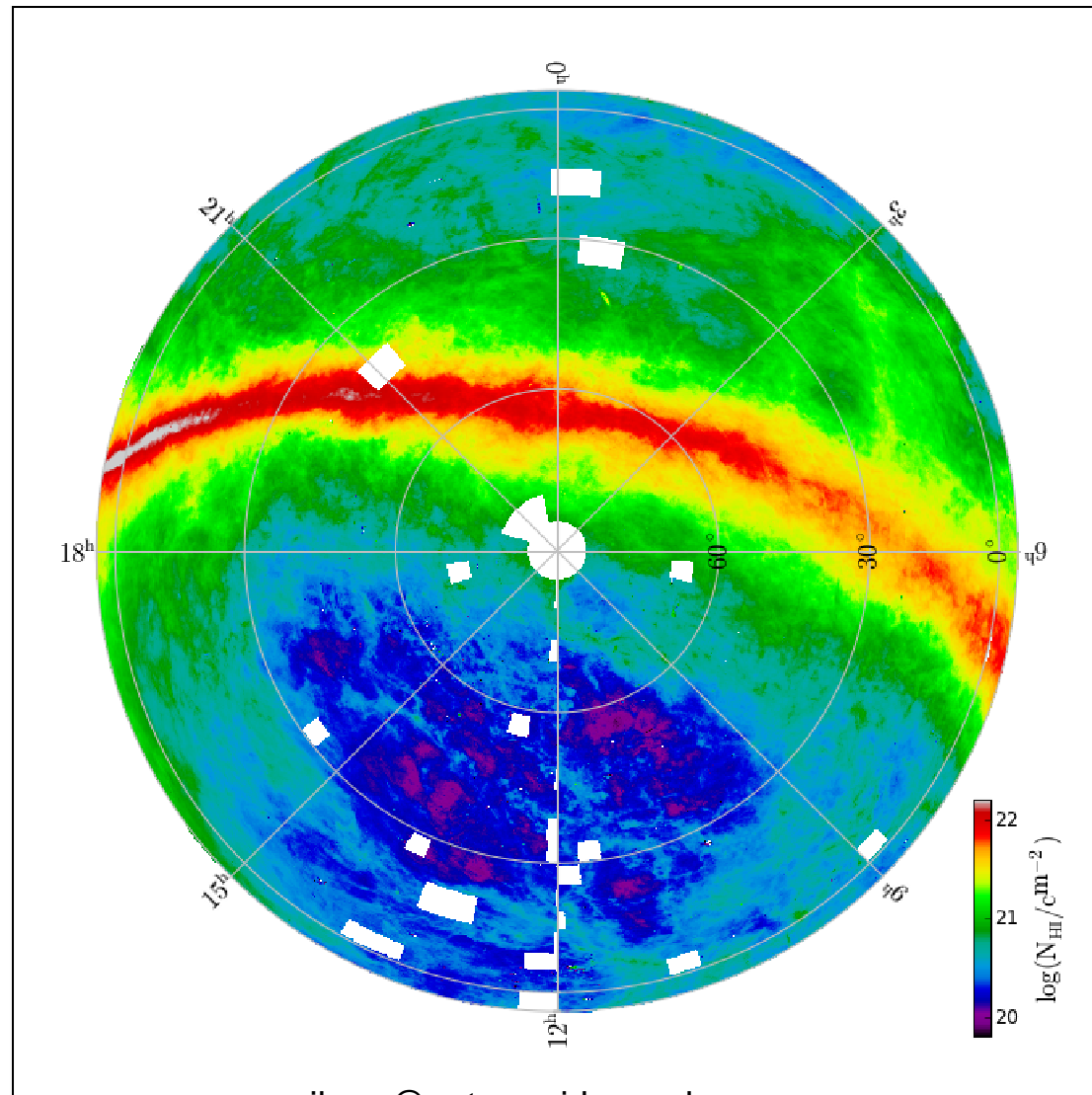
jkerp@astro.uni-bonn.de

universität  **bonn**

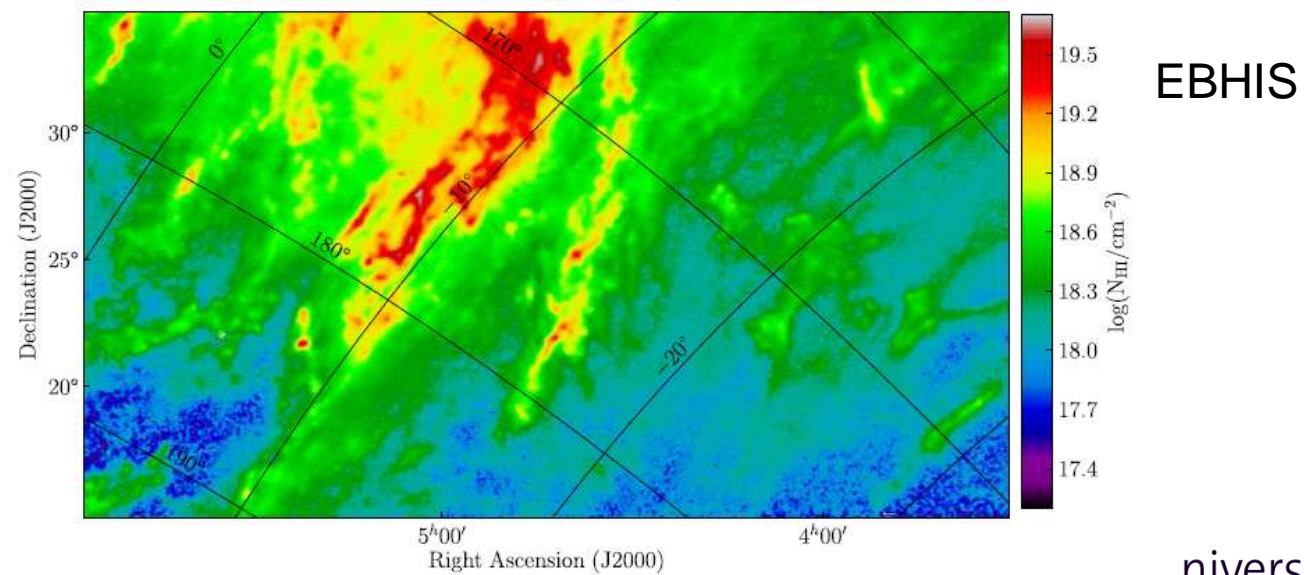
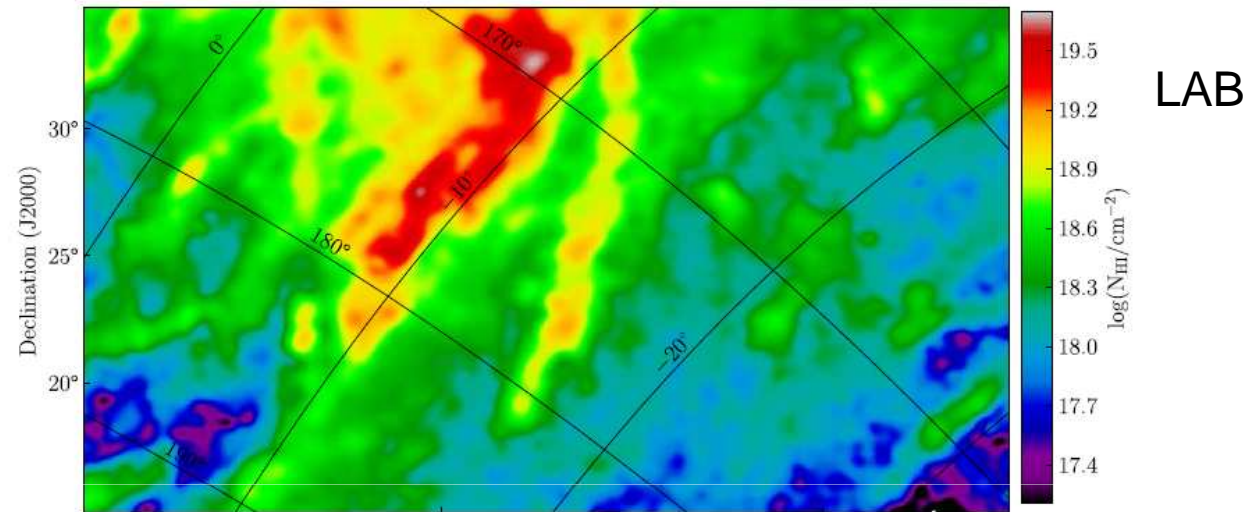
EBHIS concept

- Galactic and extragalactic HI survey in parallel:
 - **21.400 square degrees**
 - **100 MHz bandwidth $z \leq 0.07$ (270 Mpc)**
 - 14 spectrometer with **16384** spectral channels each
- **Milky Way**
 - High angular resolution → fully sampled grid 1/16(44) LAB
 - High spectral resolution → close to 2 kms⁻¹ CNM ($T_{\text{kin}} \approx 100$ K)
 - High speed dumping → 0.5 second RFI mitigation
 - Multiple coverages → stray-radiation correction
- **Extragalactic part**
 - Complementary to other multi-feed survey projects (HIPASS)
 - Mass sensitivity $3 \cdot 10^7 M_{\text{Sun}}$ at Virgo distance ($M = 6.2 \cdot 10^5 \cdot D^2 [\text{Mpc}]$)
 - High spectral resolution (RFI strategy)
 - Large survey area → large number of low mass galaxies (mass function depending on environmental conditions)

EBHIS status 2012: current coverage

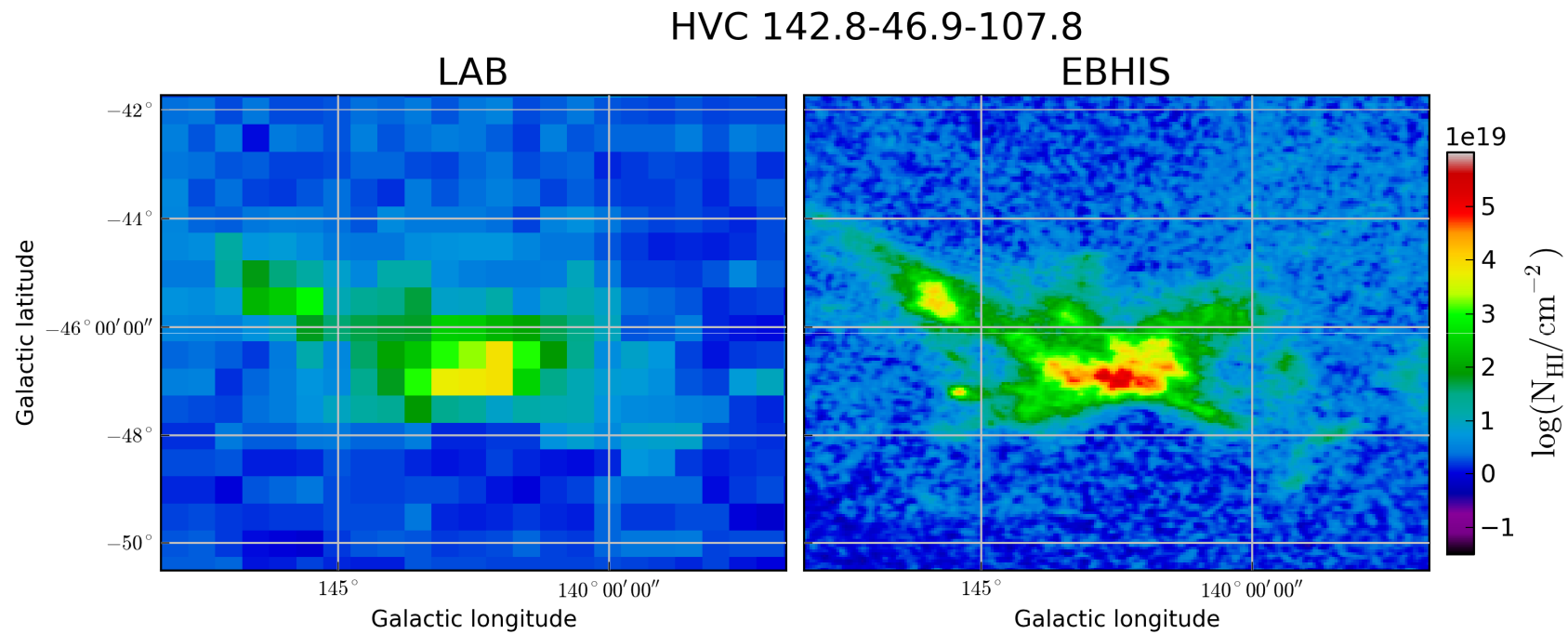


EBHIS status 2012: galactic

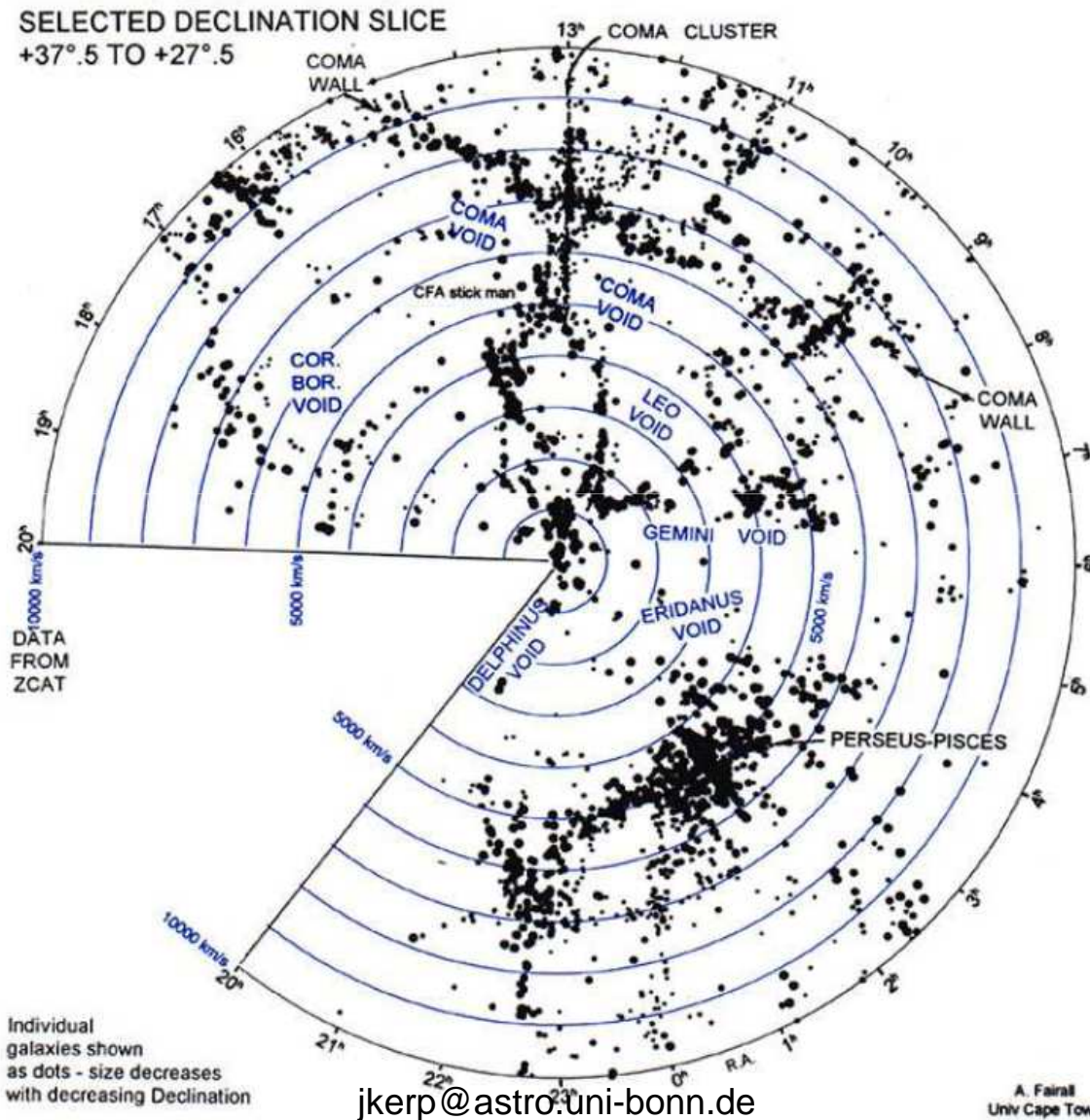


jkerp@astro.uni-bonn.de

EBHIS status 2012: galactic



EBHIS status 2012: extragalactic



EBHIS Status 2012

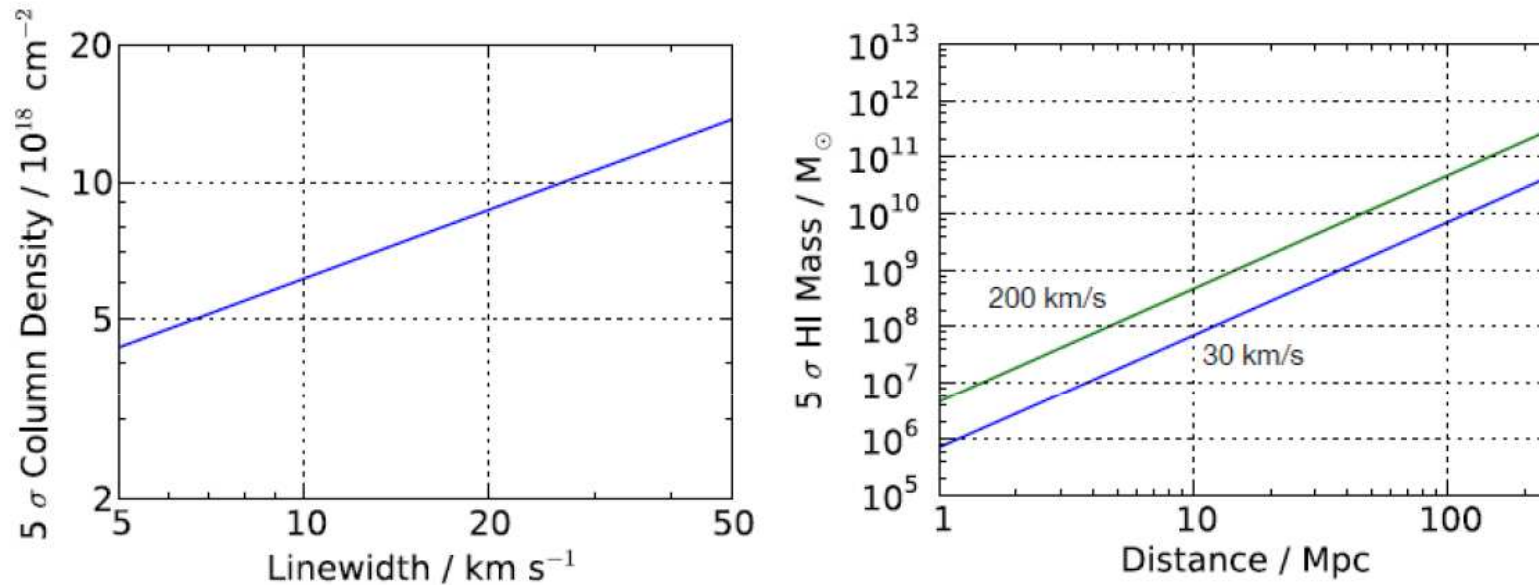


Fig. 2: Performance of the first EBHIS coverage to be finished in autumn 2012. **Left:** column density sensitivity. **Right:** mass sensitivity, assuming $\Delta v = 18 \text{ km s}^{-1}$ at 10.5 arcmin resolution. This corresponds to 20 mJy per beam area.

RFI: extragalactic data

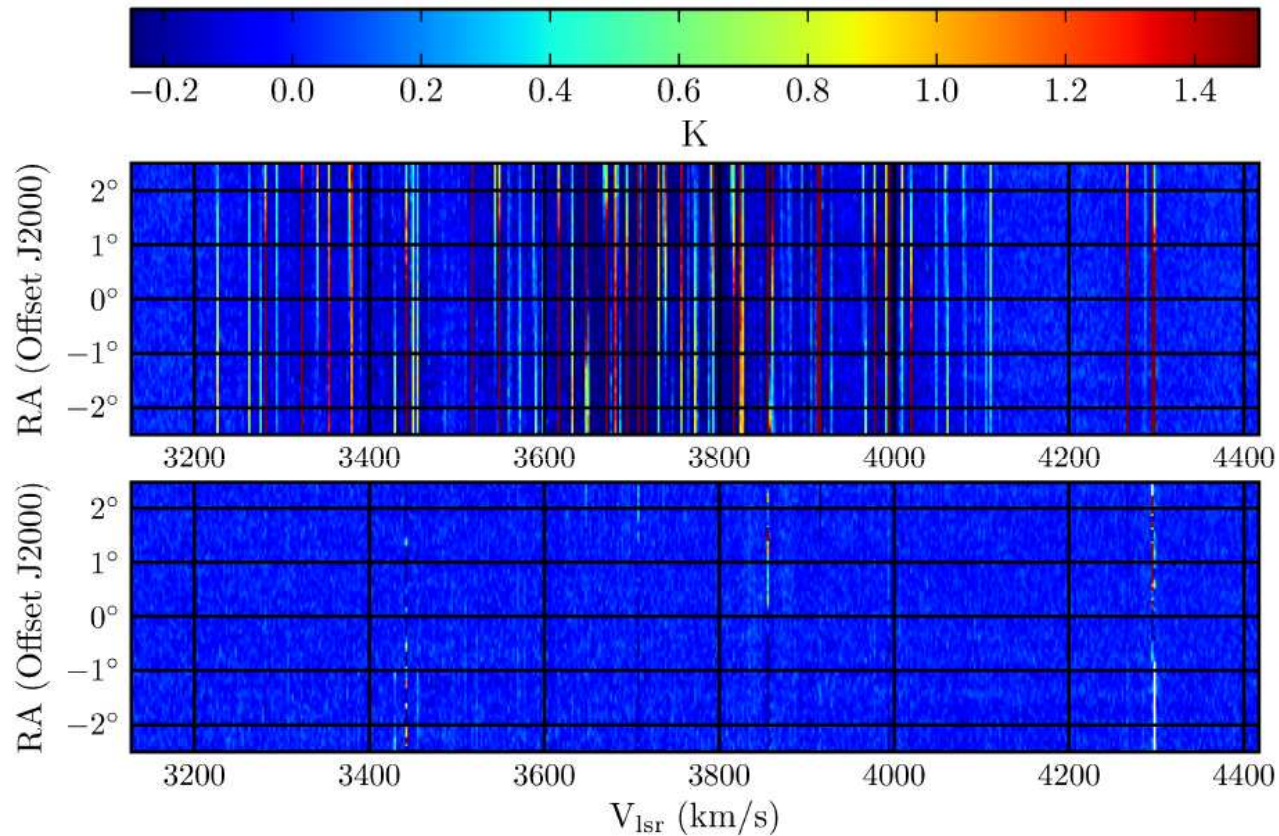


Fig. 6: Position–velocity plot of an EBHIS data cube. The **top panel** shows a region heavily affected with narrow-band RFI that is not only recognized but mostly removed after the application of our RFI mitigation scheme (**bottom panel**).

RFI: extragalactic data

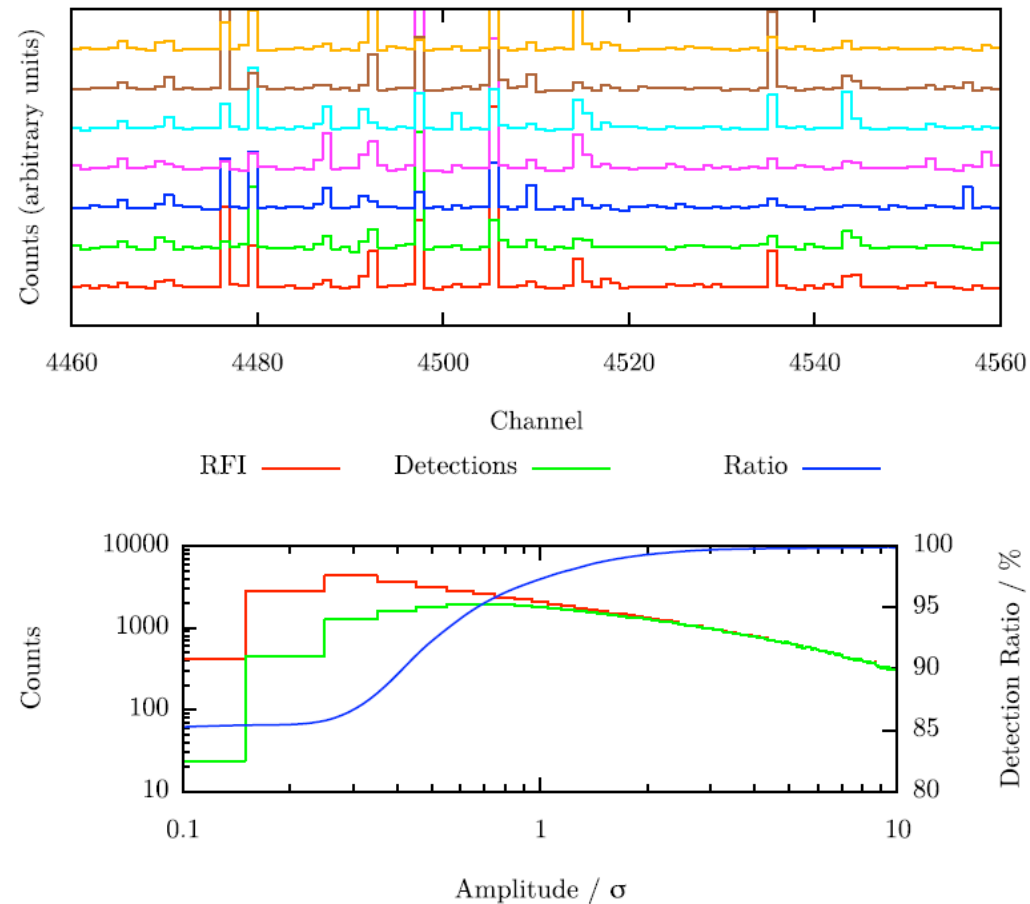


Fig. 4: **Top panel:** the multi-beam receiver allows us to identify RFI by cross-checking the signals from different feeds. **Bottom panel:** simulations show that our procedure detects more than 95% of the RFI on a $1\text{-}\sigma$ level while only producing 1% of false detections.

RFI at different red-shifts

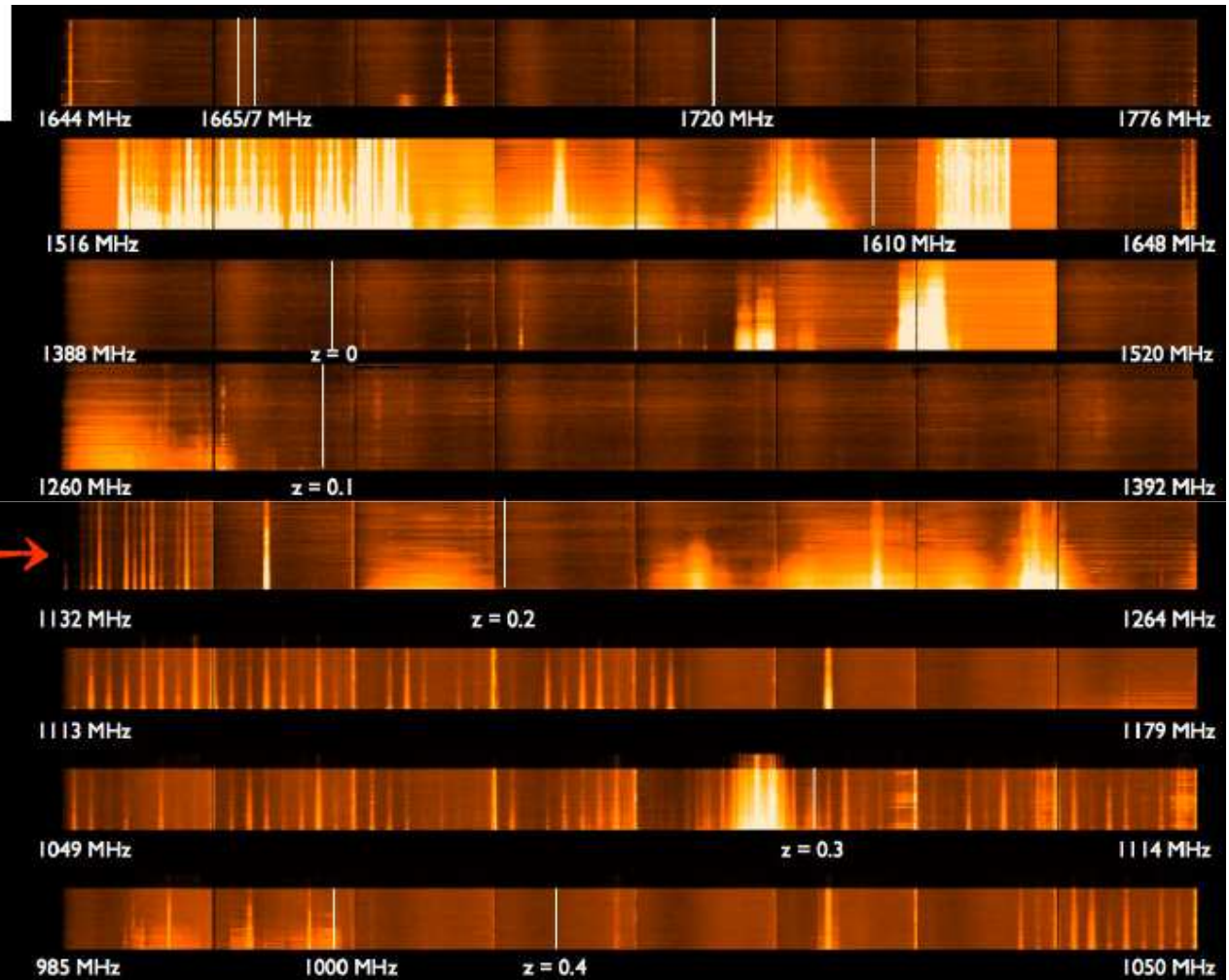
RFI

In the ranges
1180-1300 MHz
and
1450-1600 MHz
there is very serious RFI.

Will get worse

we now stop here! →

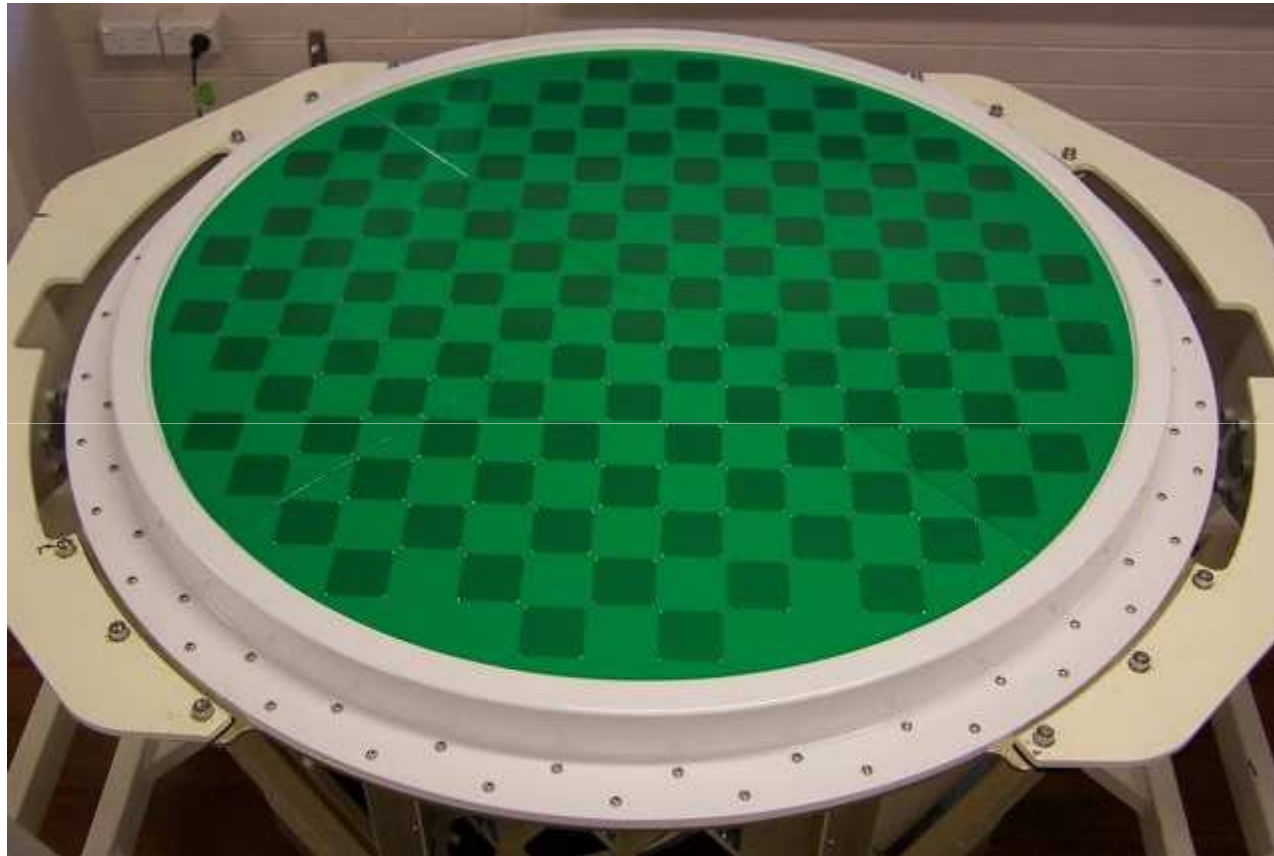
Very significant loss of data.
Not Apertif specific



Tuesday, 20 November 2012

Tom Oosterloo 20.11.2012 Apertif EoI Workshop Dwingeloo
jkerp@astro.uni-bonn.de

Focal Plane Array at Effelsberg 2013/2013



<http://www.nosecone.com.au>

jkerp@astro.uni-bonn.de

EBHIS Summary and outlook

- Full sky coverage close to completion
- Second coverage
 - Scientific driver
 - *PLANCK* FIR emission
 - *PLANCK* Cosmic Infrared Background
 - zero-spacing for APERTIF/EVLA
 - HI Intensity mapping
- Raw data is available and might be reprocessed for special purposes.
- The Effelsberg focal plane array might open a very efficient way to survey most of the northern hemisphere to $z < 0.26$ using adapted EBHIS standard software.