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Simona Righini – UniBo Dipartimento di Astronomia

The new 18-26 GHz multifeed receiver at the Medicina 32-m dish

***Tutor*: Prof. Daniele Dallacasa**

***Supervisors*: Dr. Ettore Carretti**
Ing. Alessandro Orfei

The hardware side…

The new 18-26 GHz multi-beam receiver (for *SRT*)

T_{sys} (El=45°) = 70 K (with τ = 0.1)

Gain (El=45°) = 0.12 K/Jy for the central beam

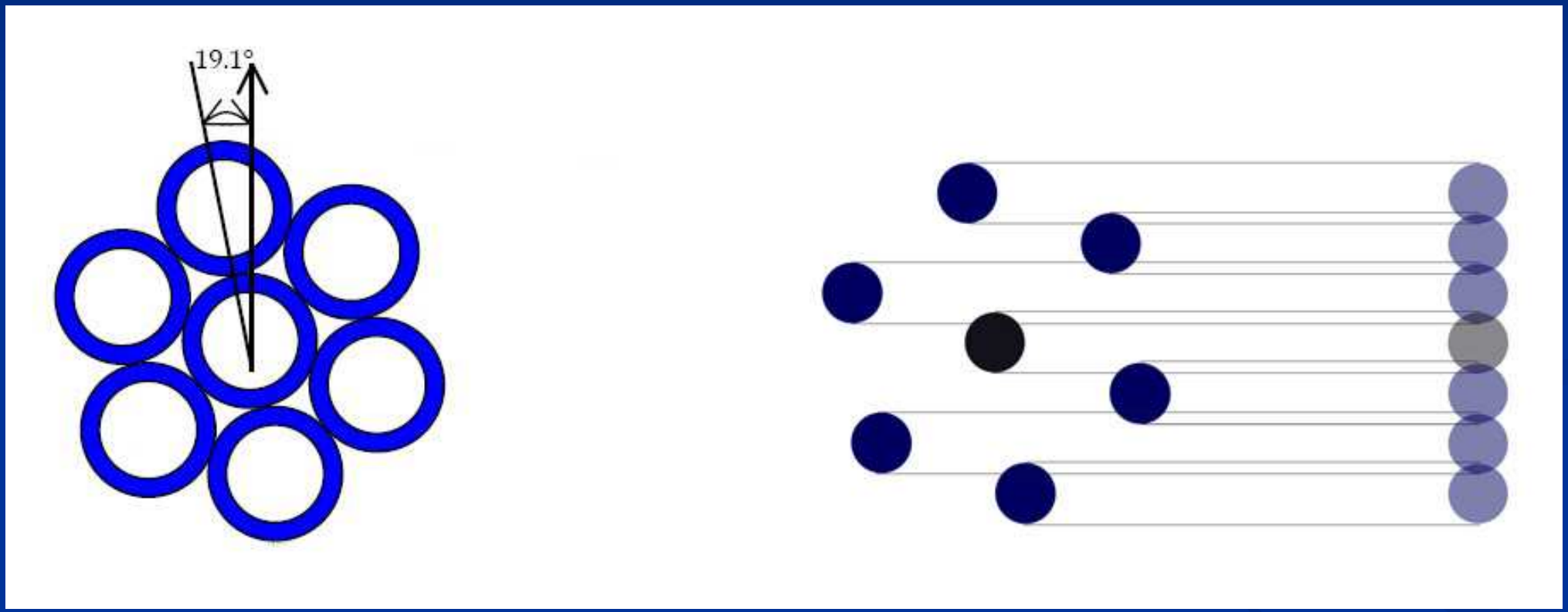
Gain (El=45°) = 0.11 K/Jy for lateral beams

HPBW = 92” for every beam, at 22 GHz

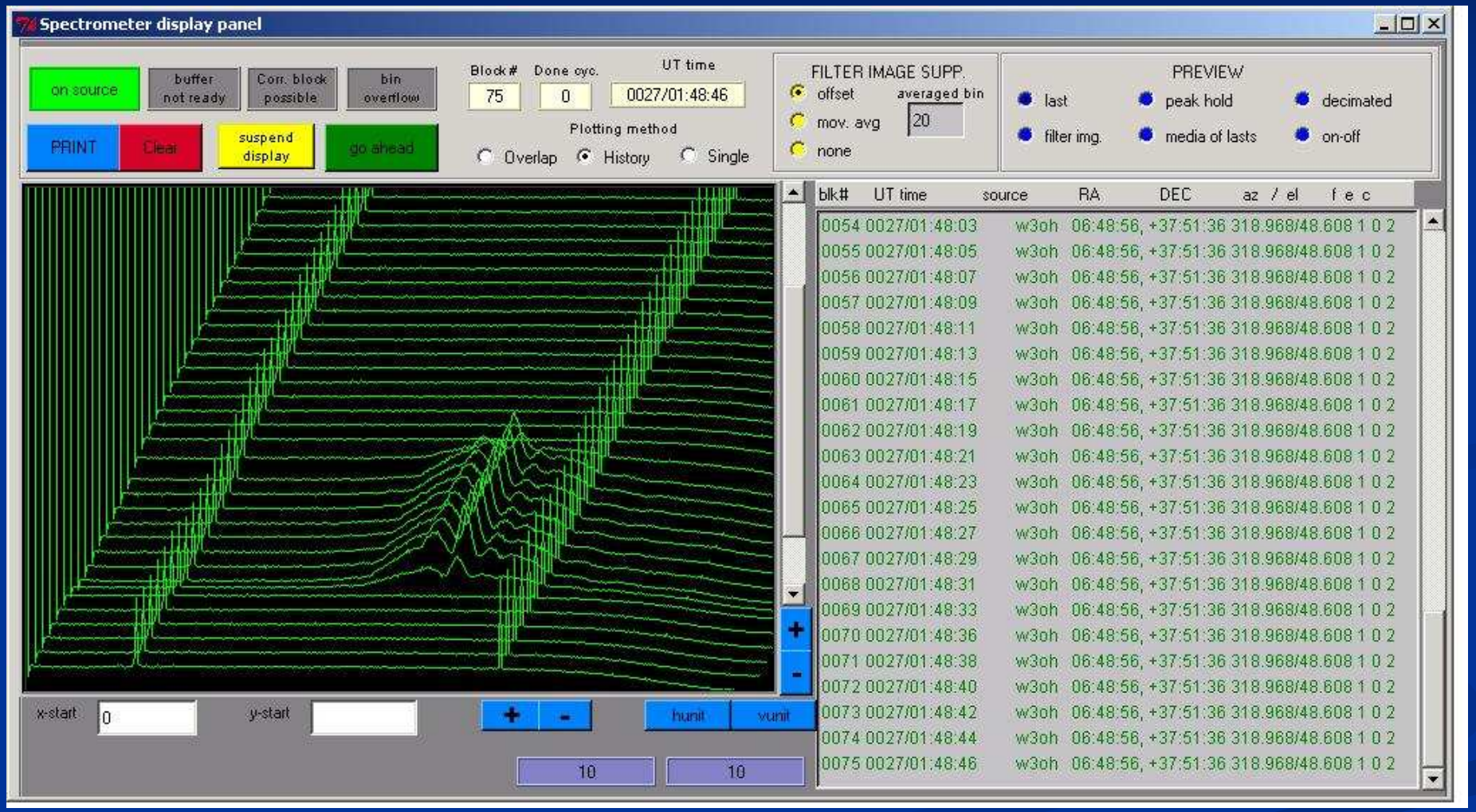
Sky distance between beam couples = 215”

+ Analog continuum backend 14 channels (7 LCP + 7 RCP) with 2 GHz-wide IF band

Multi-beam orientation



First light – March 25, 2008



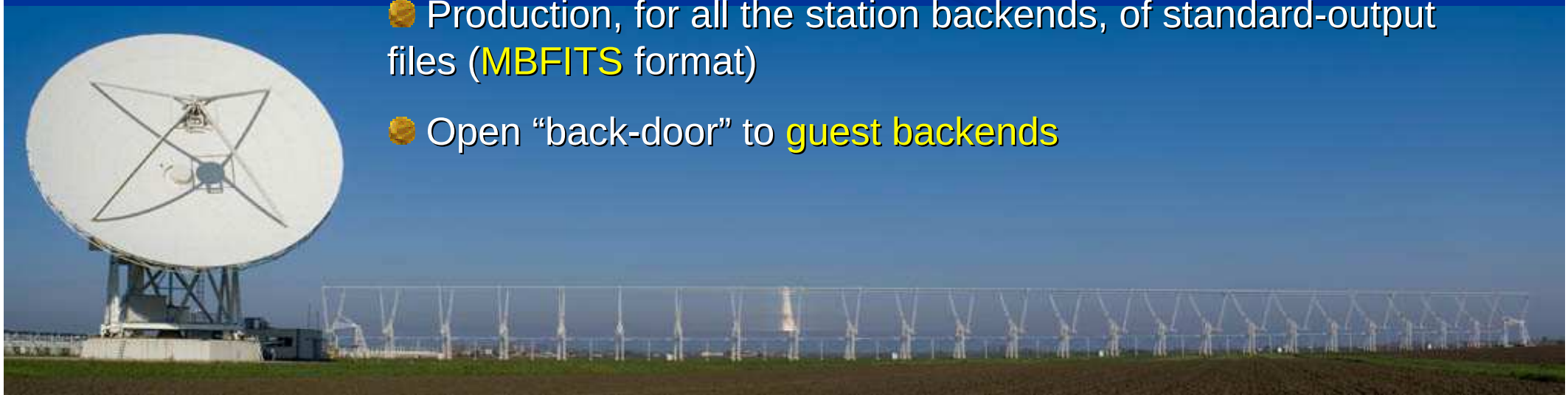
Source: W3OH – Backend: MSpec0 spectrometer – Phase-Cal marks: on.

The software side…

ESCS: Enhanced Single-dish Control System

The ESCS system will include all the necessary tools to effectively employ the 32-m antenna as a single-dish telescope:

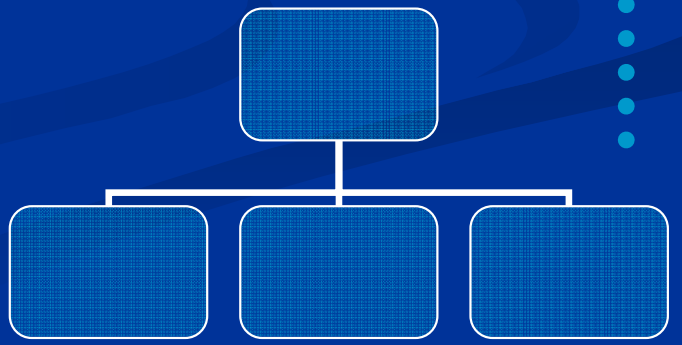
- Antenna pointing and setup for old and new observing modes in continuum, spectrometry and polarimetry
- Comprehensive user-friendly interface to guide novice and expert users along the observation scheduling and execution. Absentee and remotely accessed sessions will then be easier to perform
- Standard calibration procedures and real-time quick-look of the data being acquired
- Production, for all the station backends, of standard-output files (MBFITS format)
- Open “back-door” to guest backends



ESCS design and development instruments

The main software/hardware instruments to develop the ESCS system have been identified in:

- Unix-Linux platform
- **ACS (ALMA Common Software) framework**
- PCs - other machines
- TCP/IP and CORBA communication protocols
- C++ as programming language, Python for scripting
- QT libraries and JAVA for GUI
- Doxygen as automatic documentation tool
- UML (Unified Modelling Language) to schematise the system architecture



My specific tasks in ESCS…

Producing ACS/C++ components for:

- **OTF Scans** (completed and tested… it works!)
- **FITS-SDFITS writing** (completed and tested… it works, too!)
- **MBFITS writing** (undergoing)

+ Quick look and basic operations on FITS data (IDL, done)

Cooperation in the development of the whole system (designing, MBFITS definition, antenna pointing, etc…)

Tests, tests, tests!

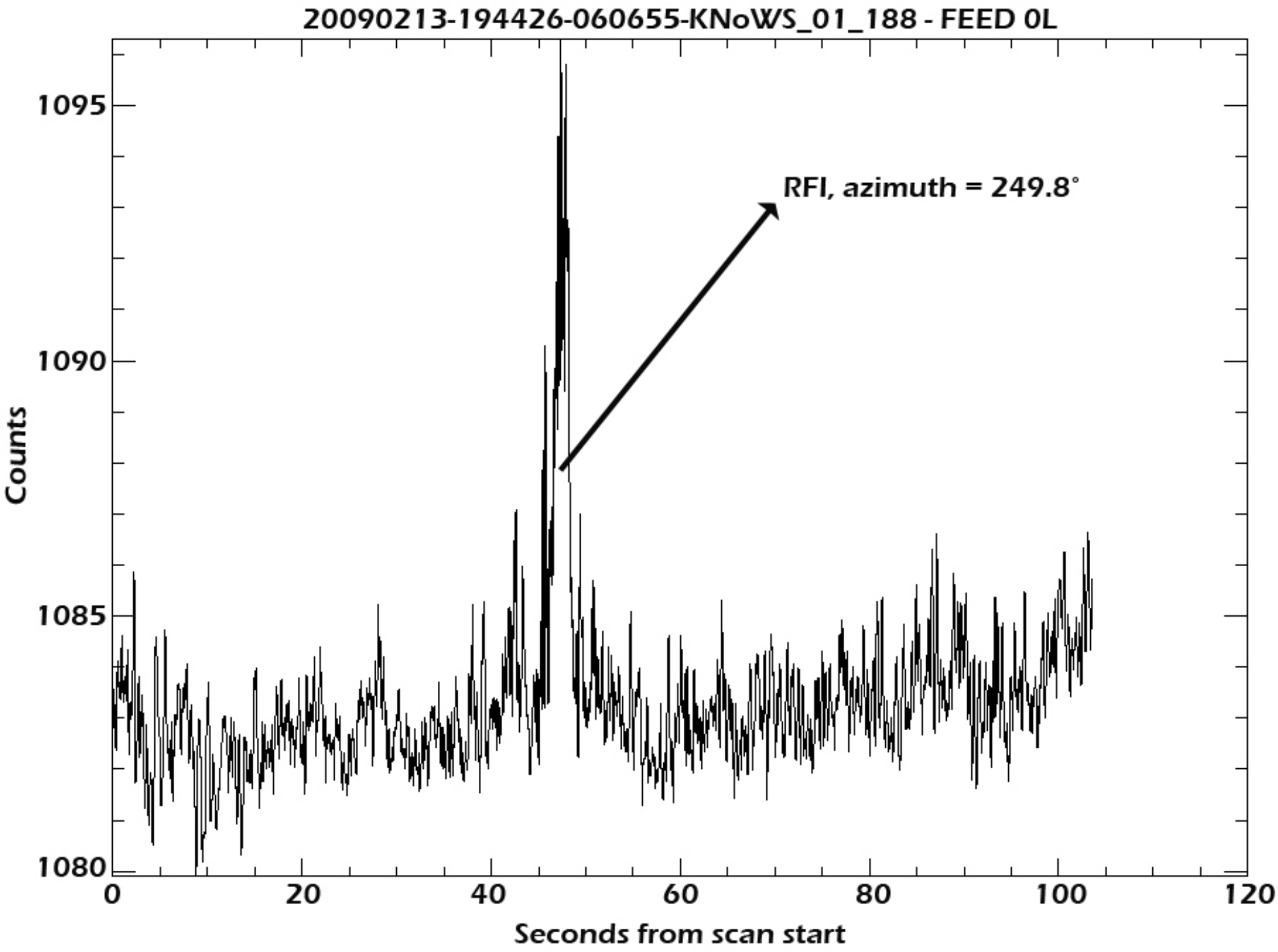
Exploiting ESCS and the new receiver

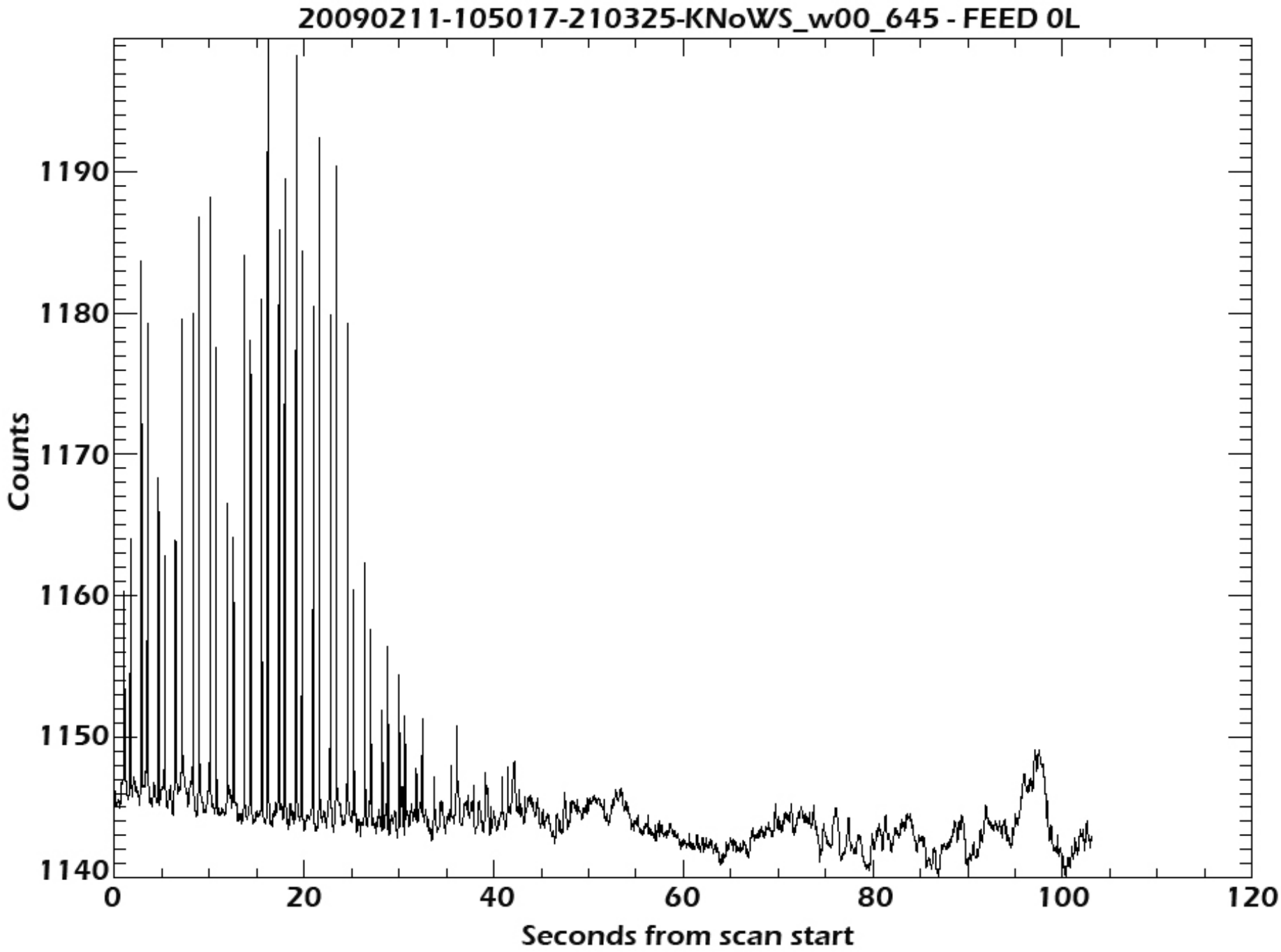
The receiver was optically aligned and characterised - see Rashmi Verma's talk, tomorrow - then test observations took place between Dec.2008 and Mar.2009.

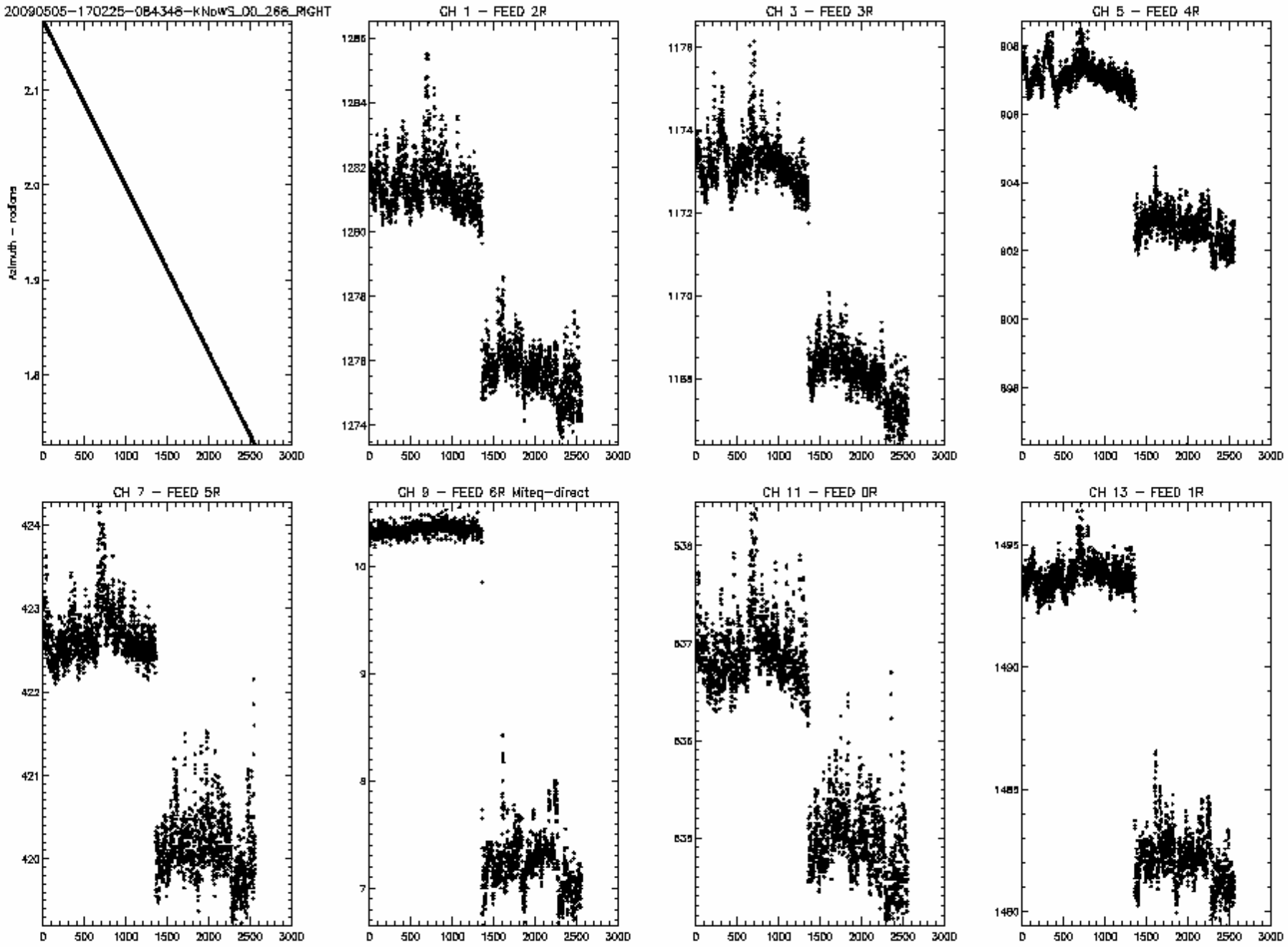
They consisted in continuum OTF fast scans performed across different areas of the sky, mainly a polar cap of about 2000 sq.deg., in the 20-22 GHz band.

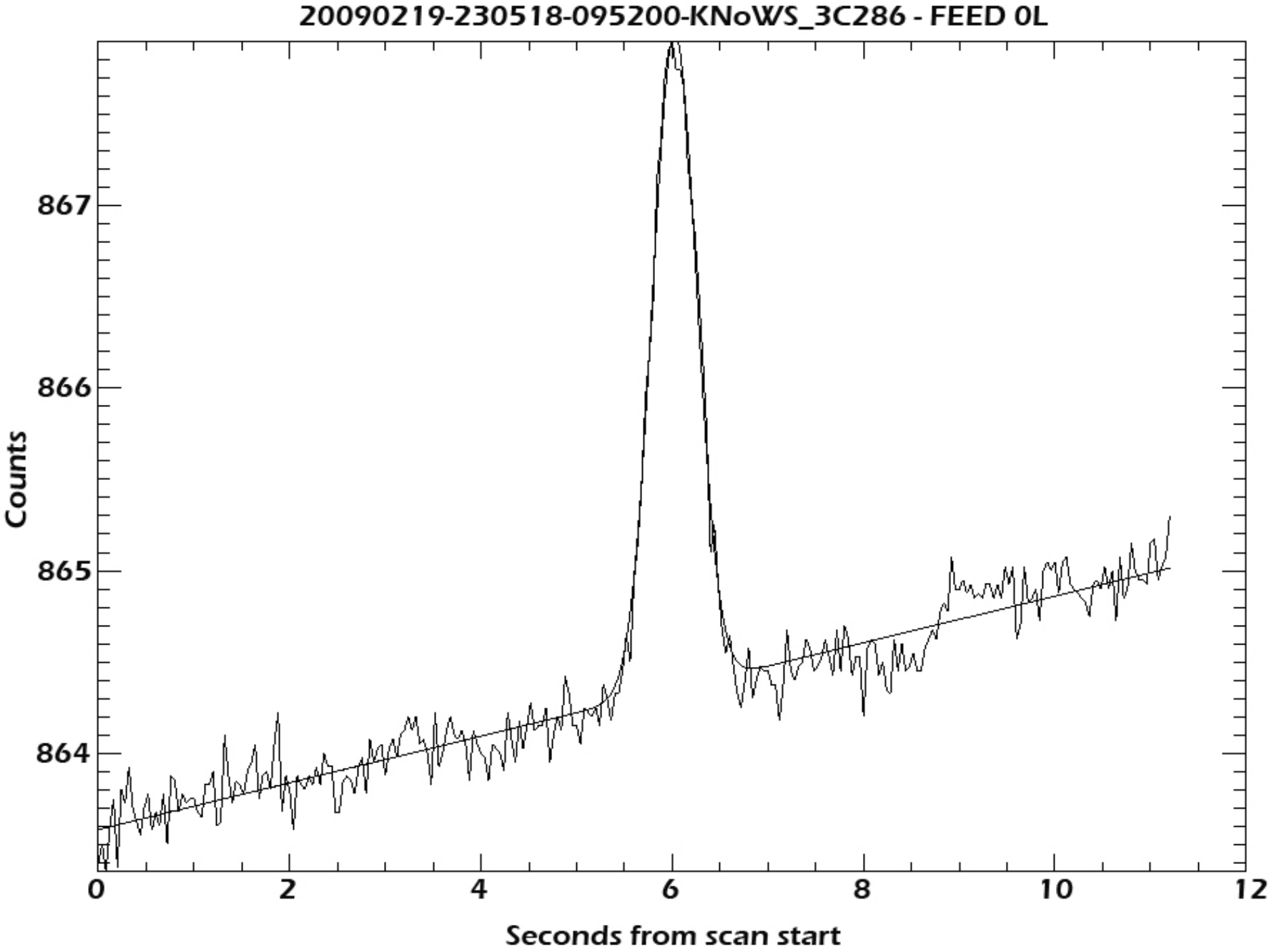
The system has proven to work correctly, but there are evidences of tiny instabilities, some of which seem to be due to LO power fluctuations – tests and signal analysis are still going on.





20090213-194426-060655-KNoWS_01_188 - FEED 0L
RFI, azimuth = 249.8°
Counts
1095
1090
1085
1080
0
20
40
60
80
100
120
Seconds from scan start


20090211-105017-210325-KNoWS_w00_645 - FEED 0L
Counts
1190
1180
1170
1160
1150
1140
0
20
40
60
80
100
120
Seconds from scan start


20090505-170225-084348-KNoWS_00_266_RIGHT
Azimuth - radians
CH 1 - FEED 2R
CH 3 - FEED 3R
CH 5 - FEED 4R
CH 7 - FEED 5R
CH 9 - FEED 6R Miteq-direct
CH 11 - FEED 0R
CH 13 - FEED 1R


20090219-230518-095200-KNoWS_3C286 - FEED 0L
867
866
865
864
Counts
0
2
4
6
8
10
12
Seconds from scan start

The Science side…

The AT20G survey

(All)-southern-sky survey at 20 GHz

About 6000 sources found (|b|>1.5°), with 10 mJy rms

Follow-up observations at 5 GHz and 8 GHz + e-VLBI (GPS)

→ Constitutes a catalogue which is useful for foreground source removal in CMB observations, and to find flux and - possibly - polarisation calibrators.

→ Demonstrates that the high frequency population characteristics cannot be inferred from the low frequency catalogues

Our survey*, named KNoWS, is likely to produce similar results for the northern celestial hemisphere

(* hopefully taking place in winter 2009)

Questions?