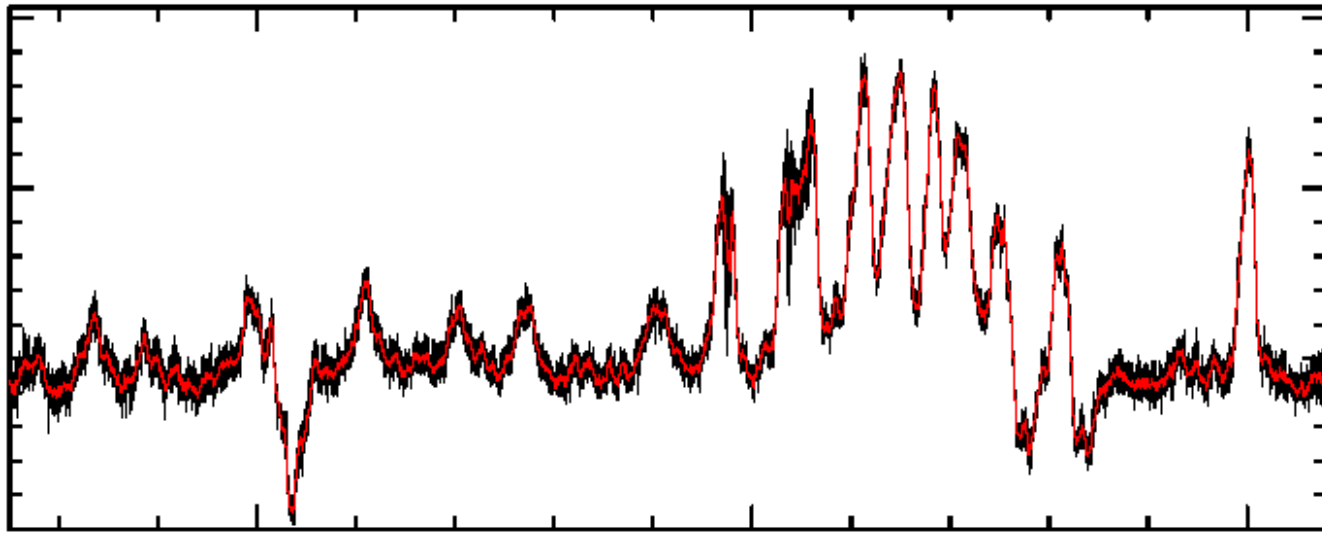


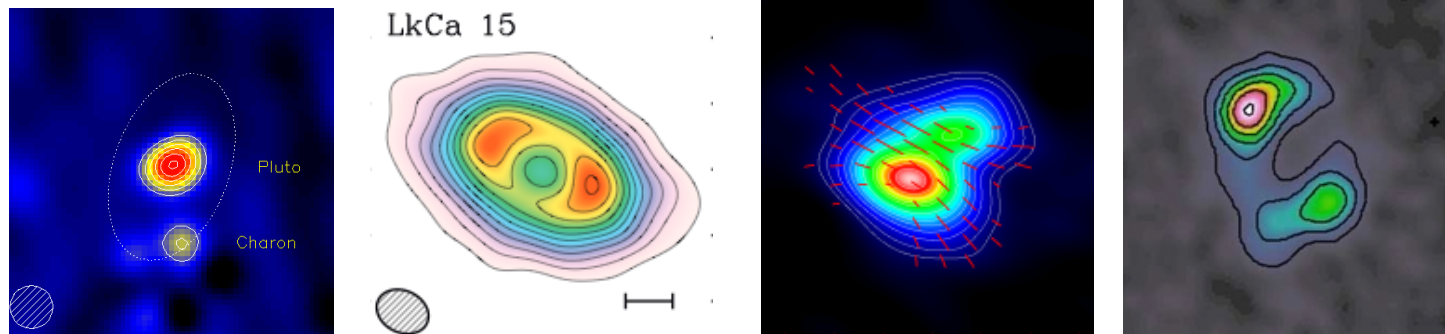
SWARM 'Science Validation' Data

A Preliminary Look at Initial Results

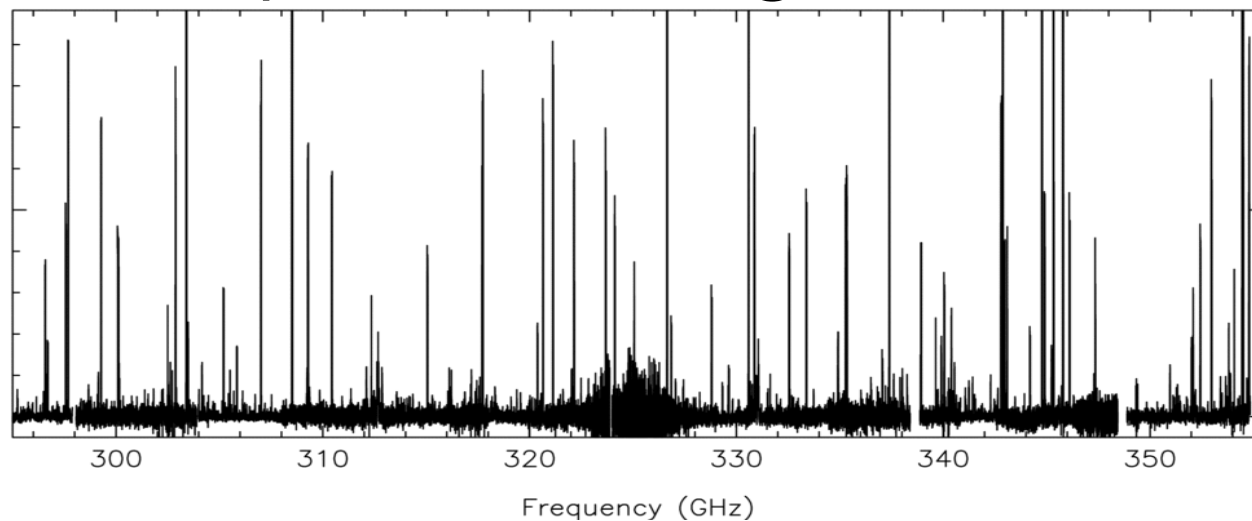


What do we want? More bandwidth

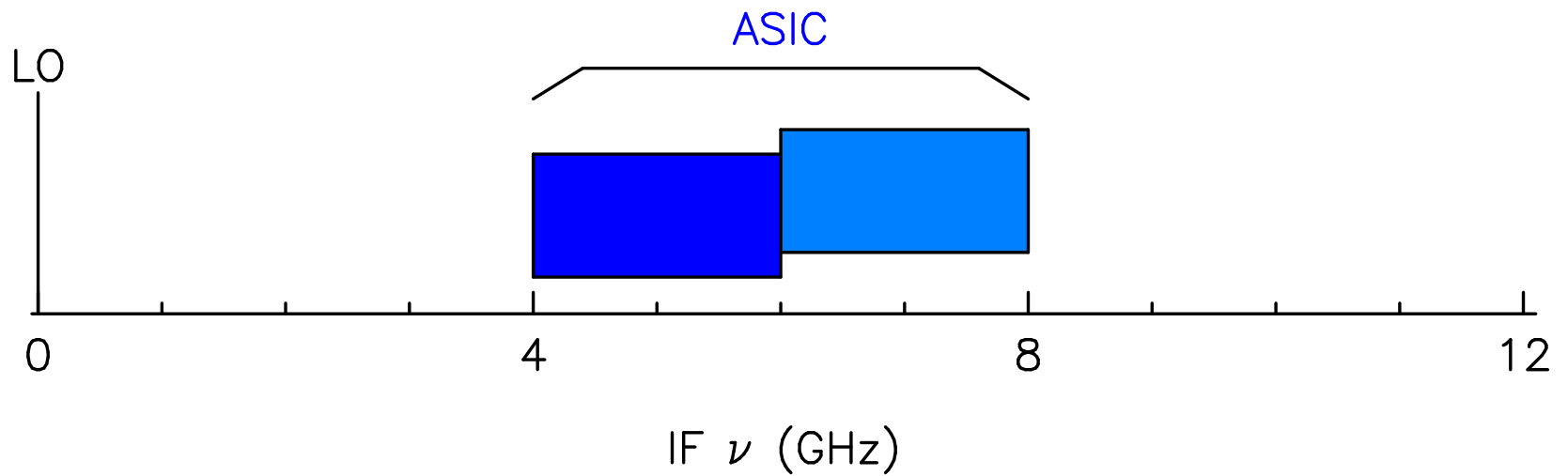
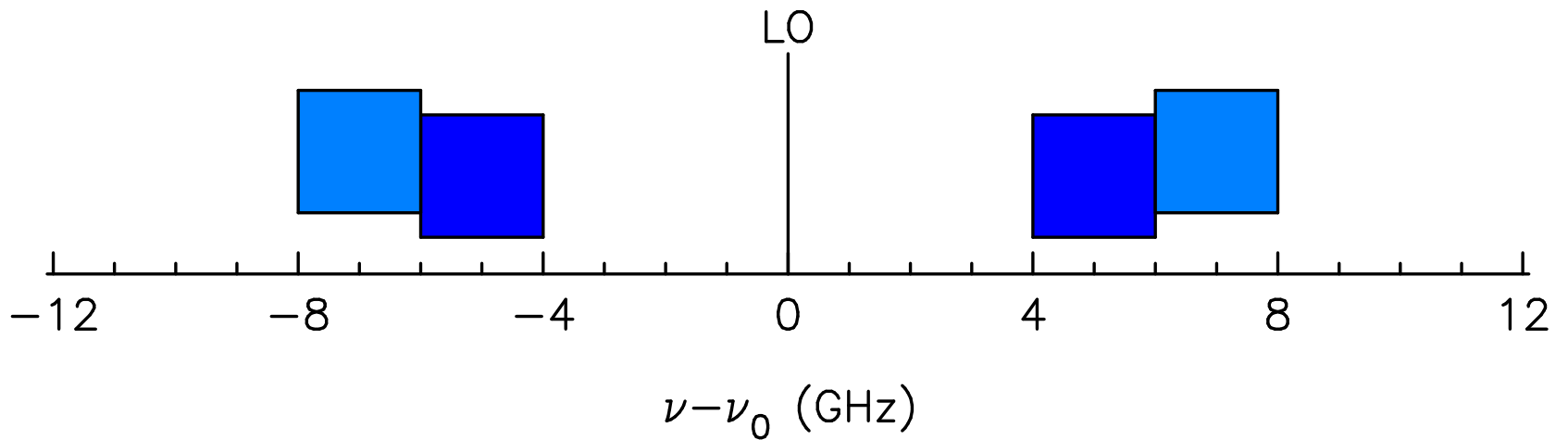
- Increased continuum sensitivity



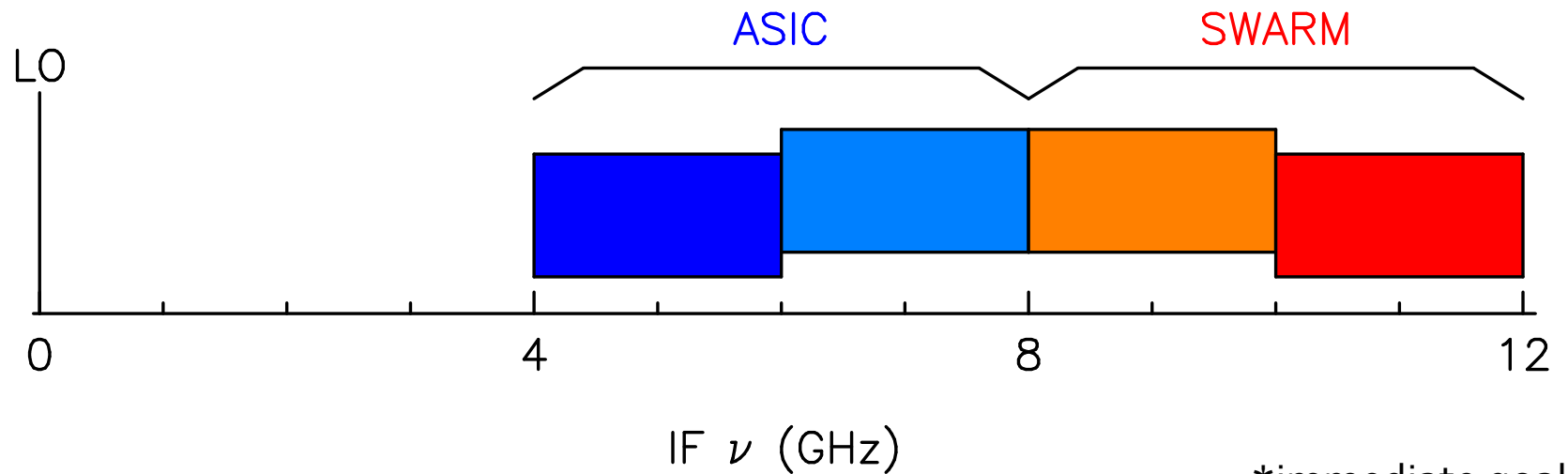
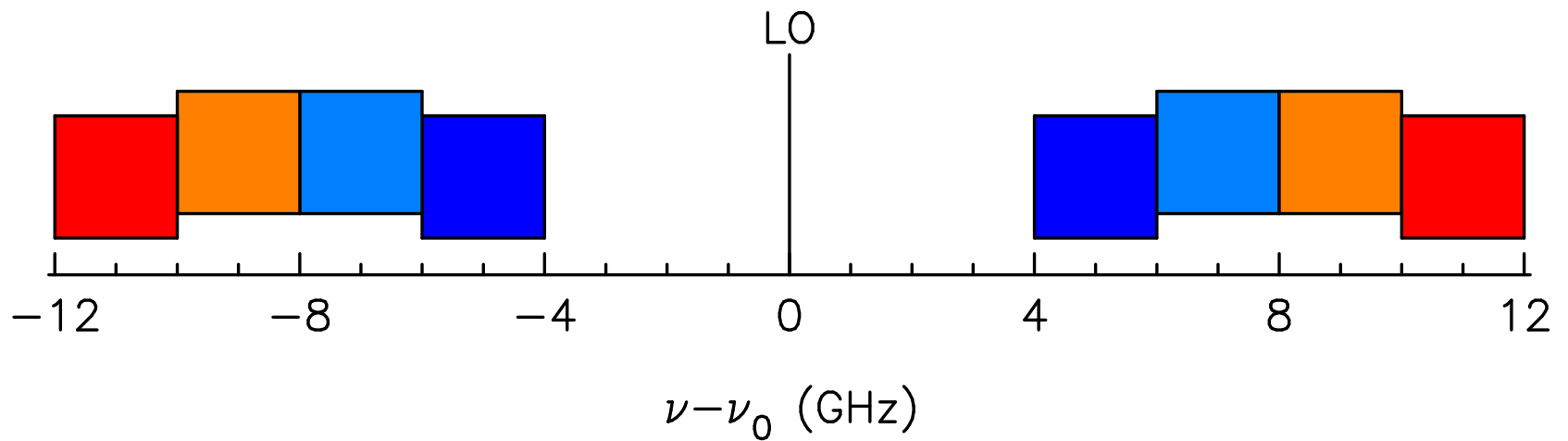
- Increased spectral coverage



SMA ASIC (Original Correlator) SCHEMATIC COVERAGE



SMA ASIC/SWARM SCHEMATIC COVERAGE – GOAL*



*immediate goal

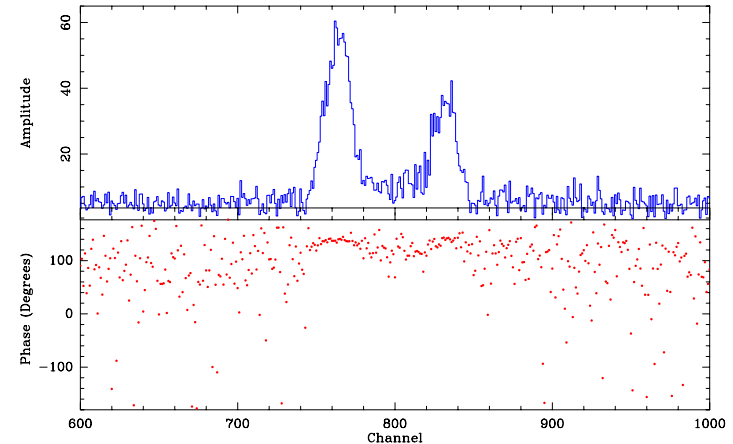
Milestones

February 2013 – First Fringes

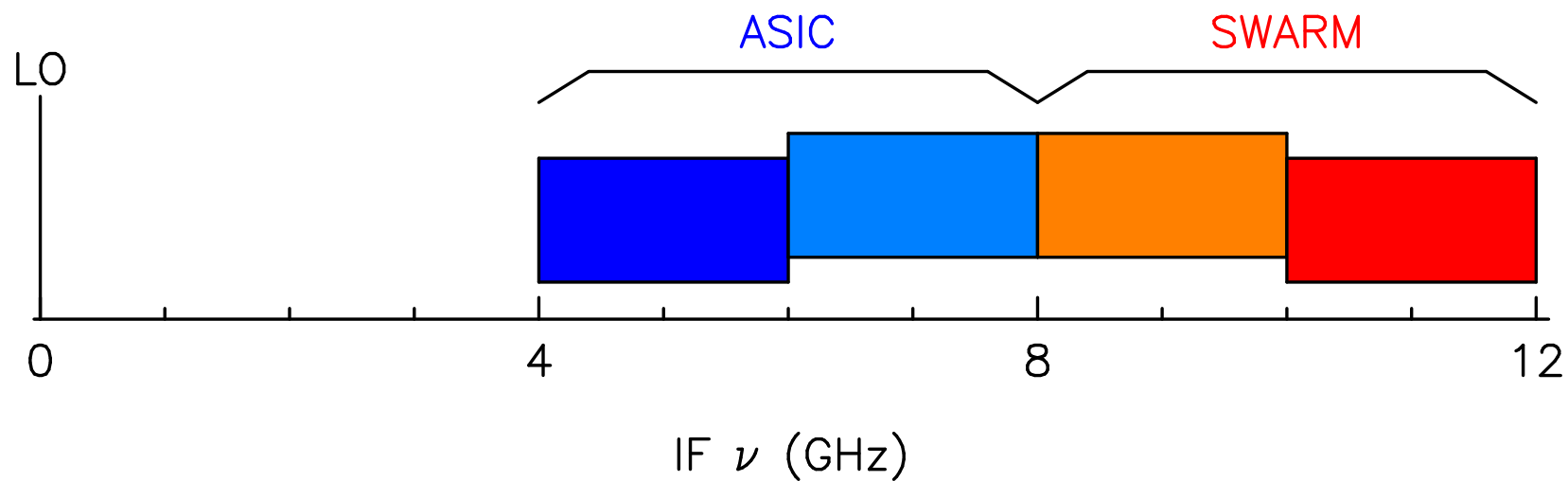
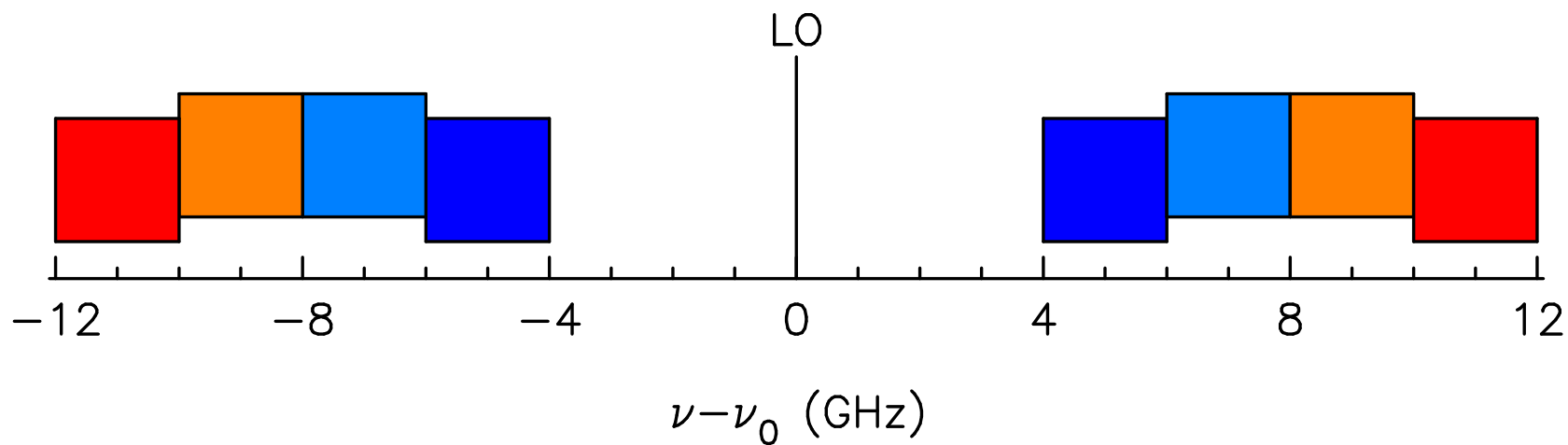
Rapid Progress in 2014:

- 14 Feb – 4 Ants, SSB, 1 SWARM band, phase closure
- 27 Mar – Full featured bitcode used for 1st time
- 11 Apr – All baselines (21), SSB, 1 SWARM band
- 24 Apr – All baselines (21), Dual SB, 1 SWARM band
- 29 May – All baselines (21), Dual SB, 2 SWARM bands!

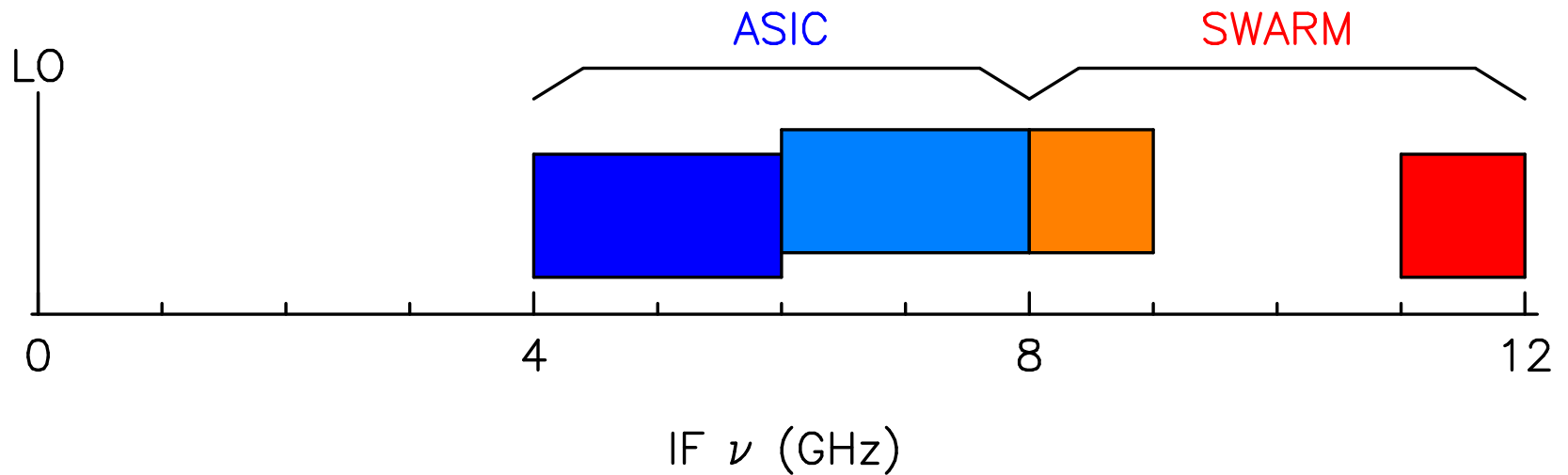
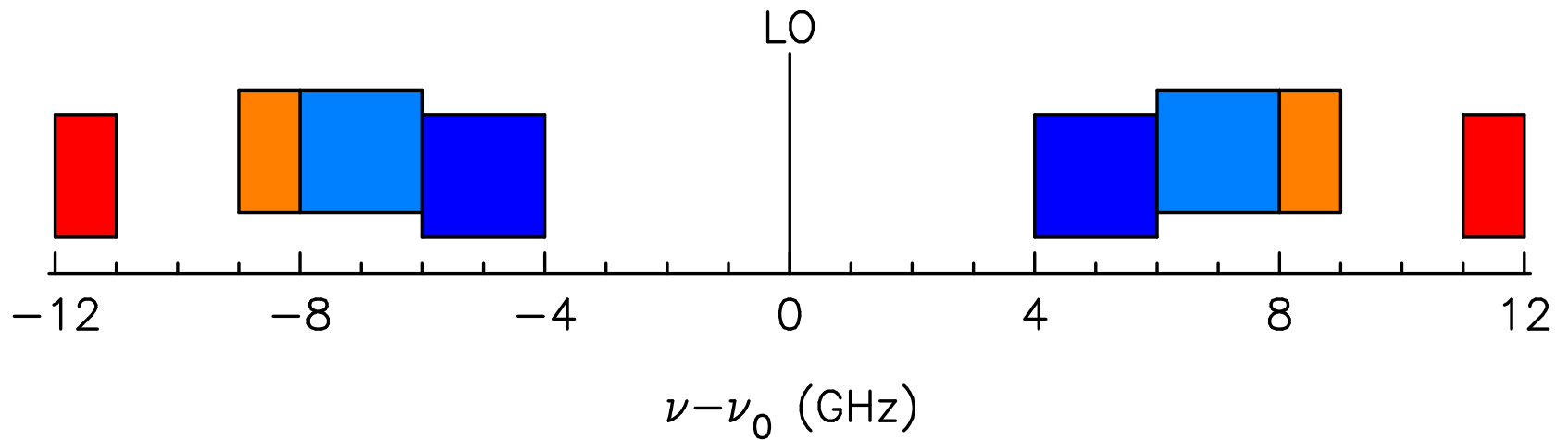
Current limitation– only half bandwidth/band (~1 GHz)



SMA ASIC/SWARM SCHEMATIC COVERAGE – GOAL



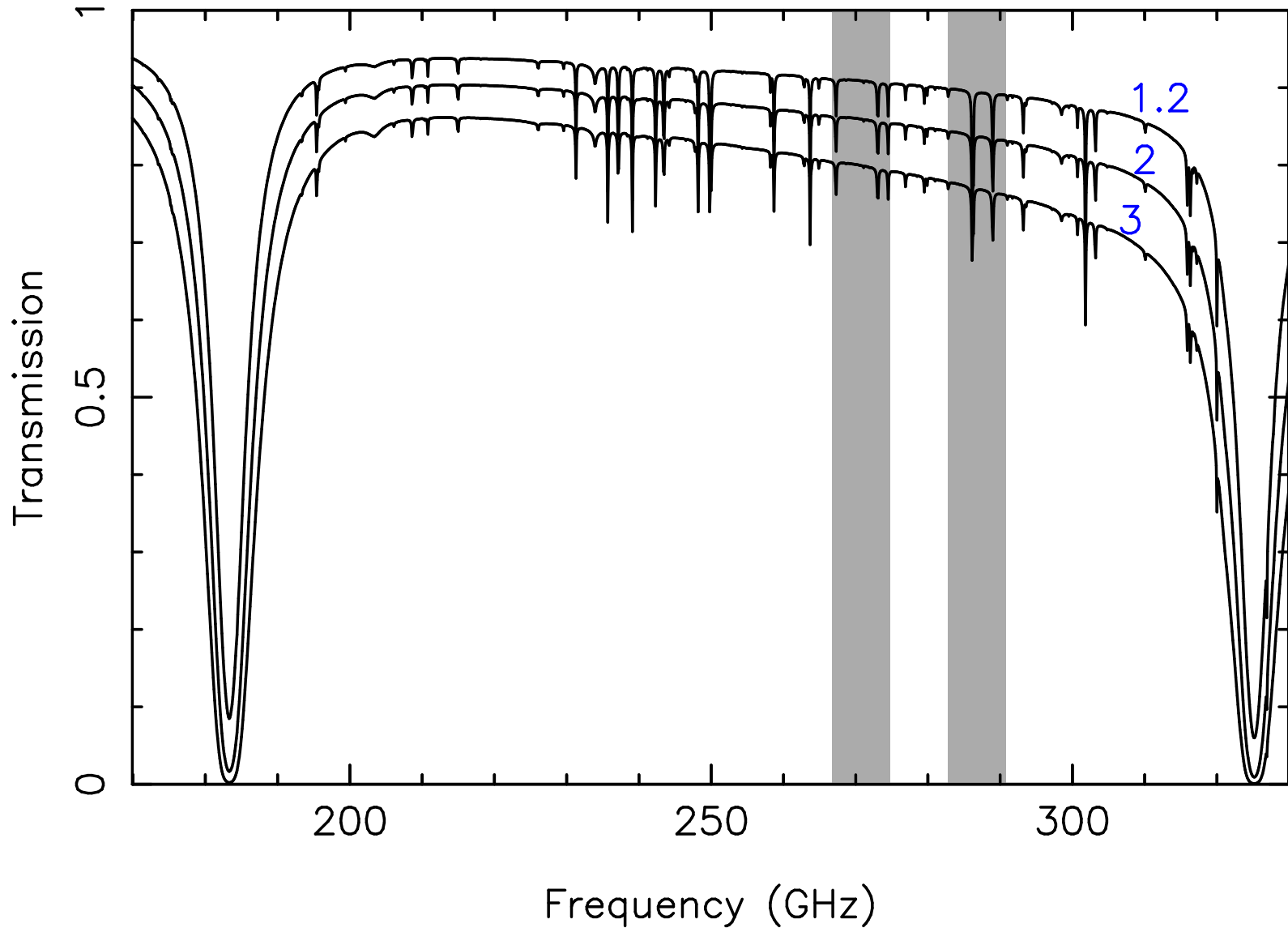
SMA ASIC/SWARM SCHEMATIC COVERAGE – CURRENT



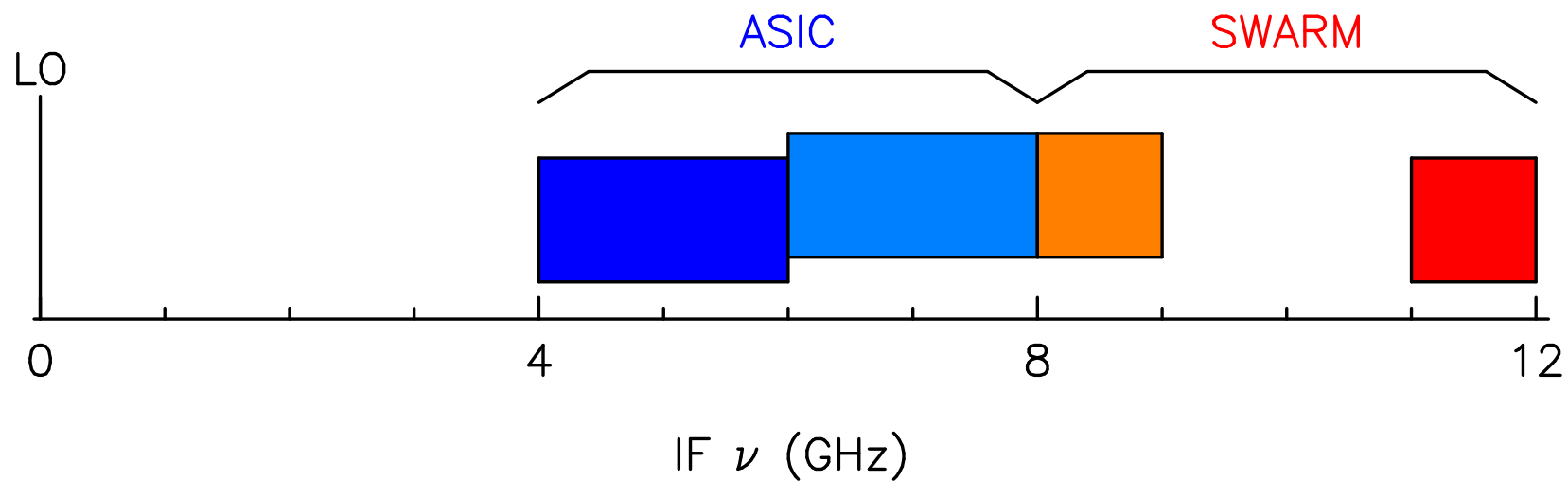
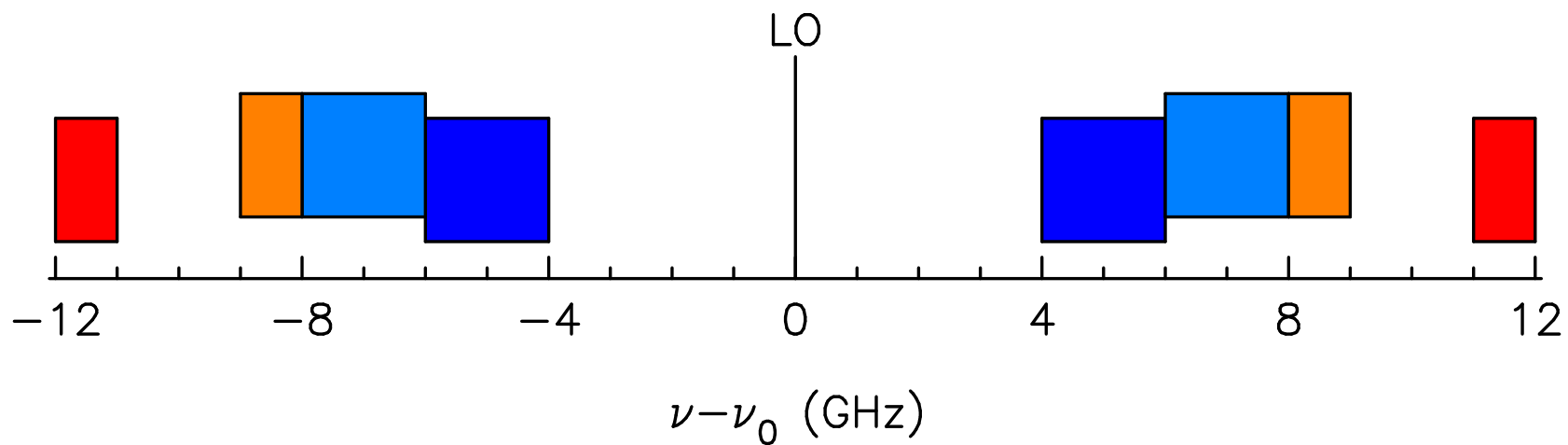
29 May 2014 'Science Validation'

- Initial use of 2nd SWARM band
- Run like a 'regular science' track
 - Full calibration (passband, complex gain cals, flux)
 - Three targets, 1.1mm band
 - IRC+10216 (3C279)
 - IRAS 16293-2422 (J1625-254, J1512-090)
 - Sgr B2(N) snapshot (NRAO530)
- Compare SWARM and ASIC correlators

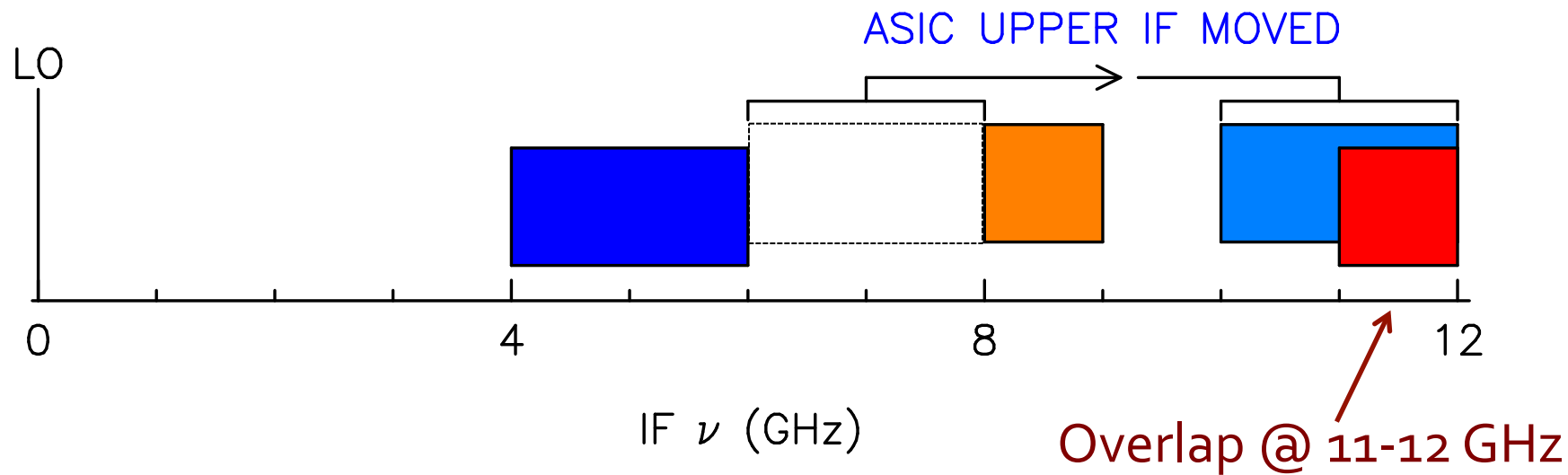
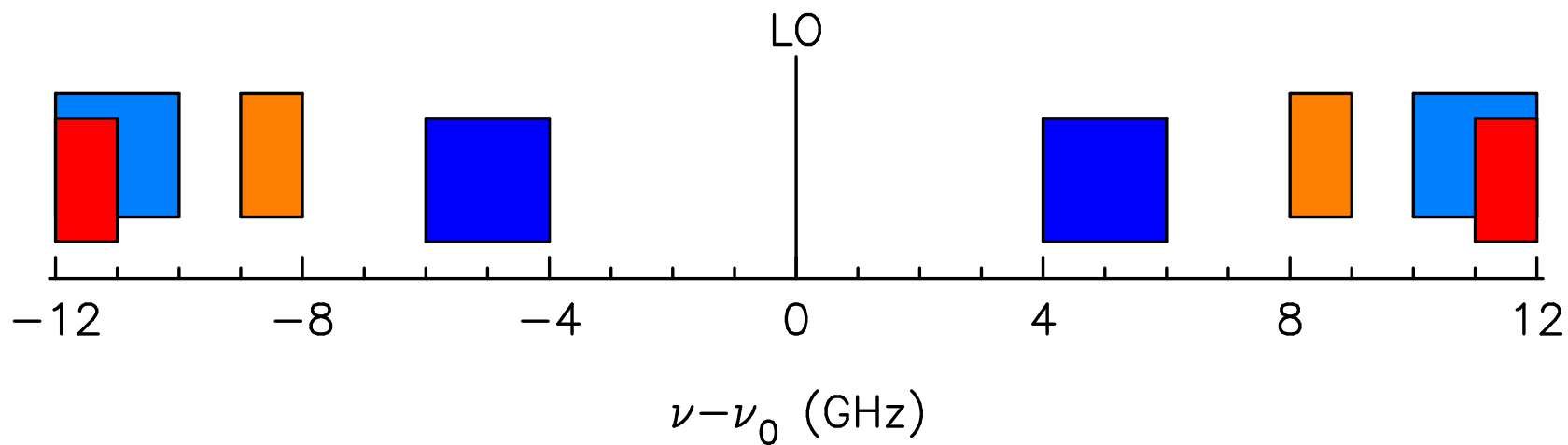
Observing Conditions – 29 May 2014



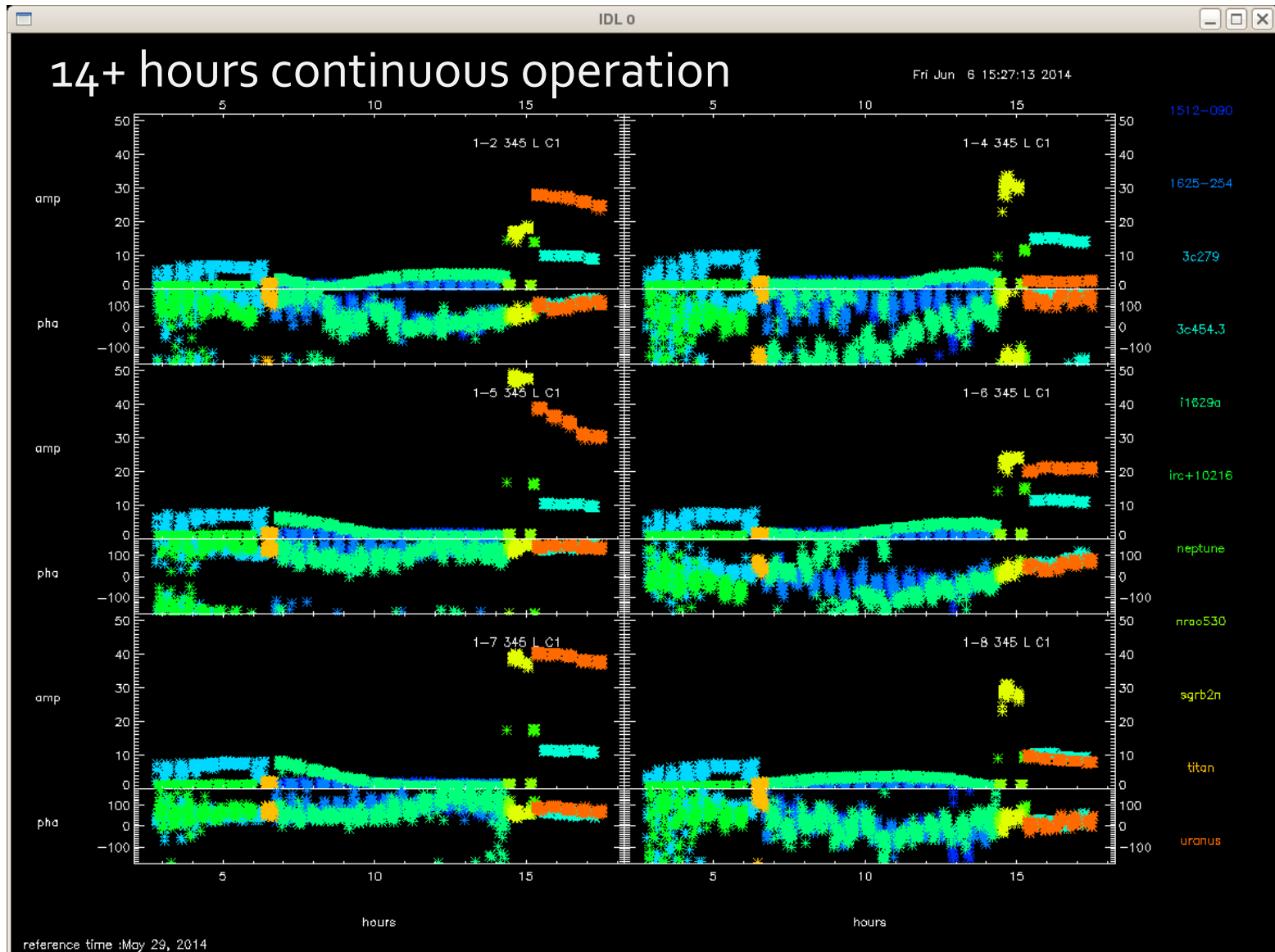
SMA ASIC/SWARM SCHEMATIC COVERAGE – CURRENT



SMA ASIC/SWARM SCHEMATIC COVERAGE – 29 MAY 2014 TEST



Continuum Band Complex Visibility Data vs UT



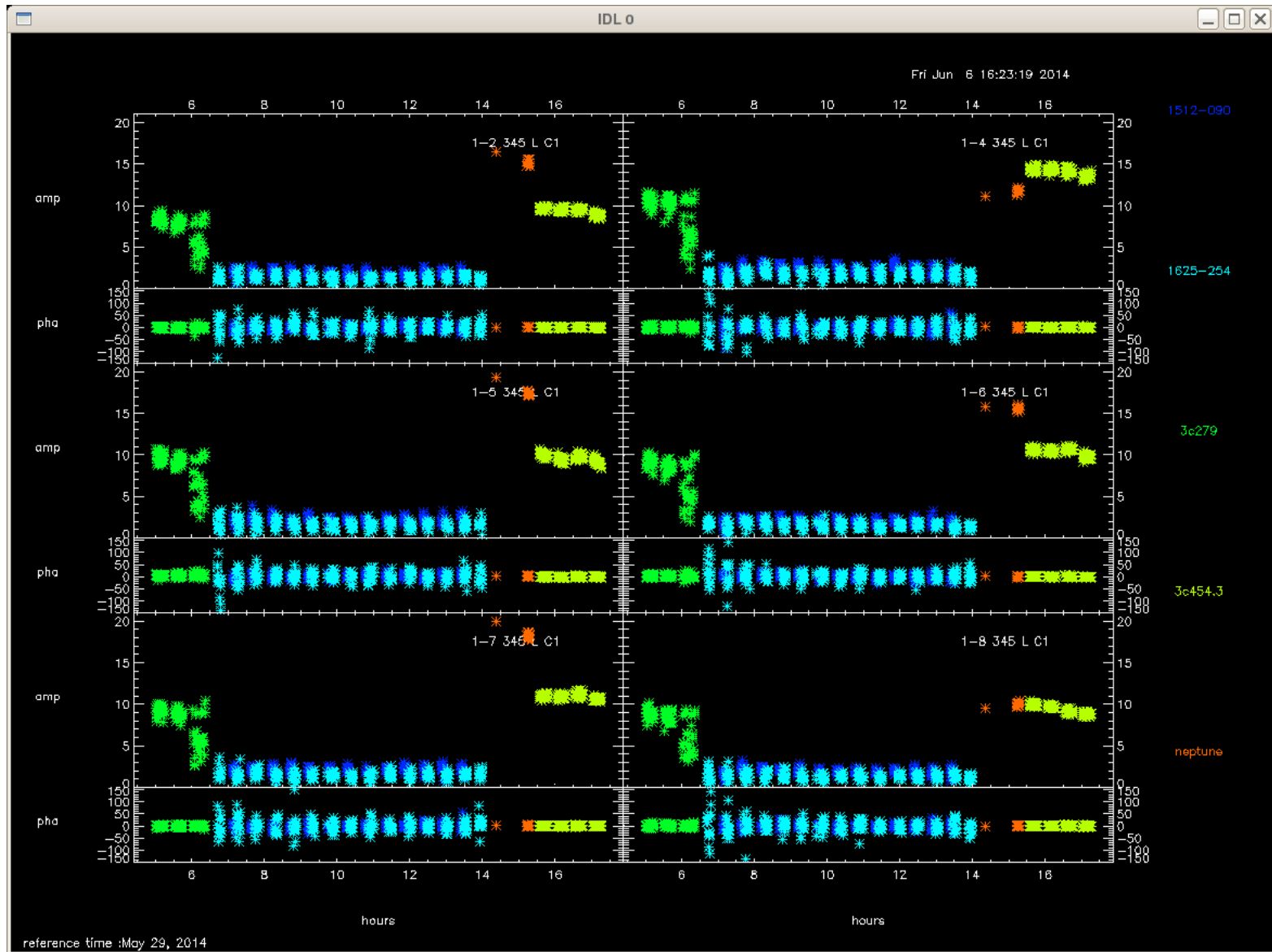
ISSUES #1

Data/header inconsistencies

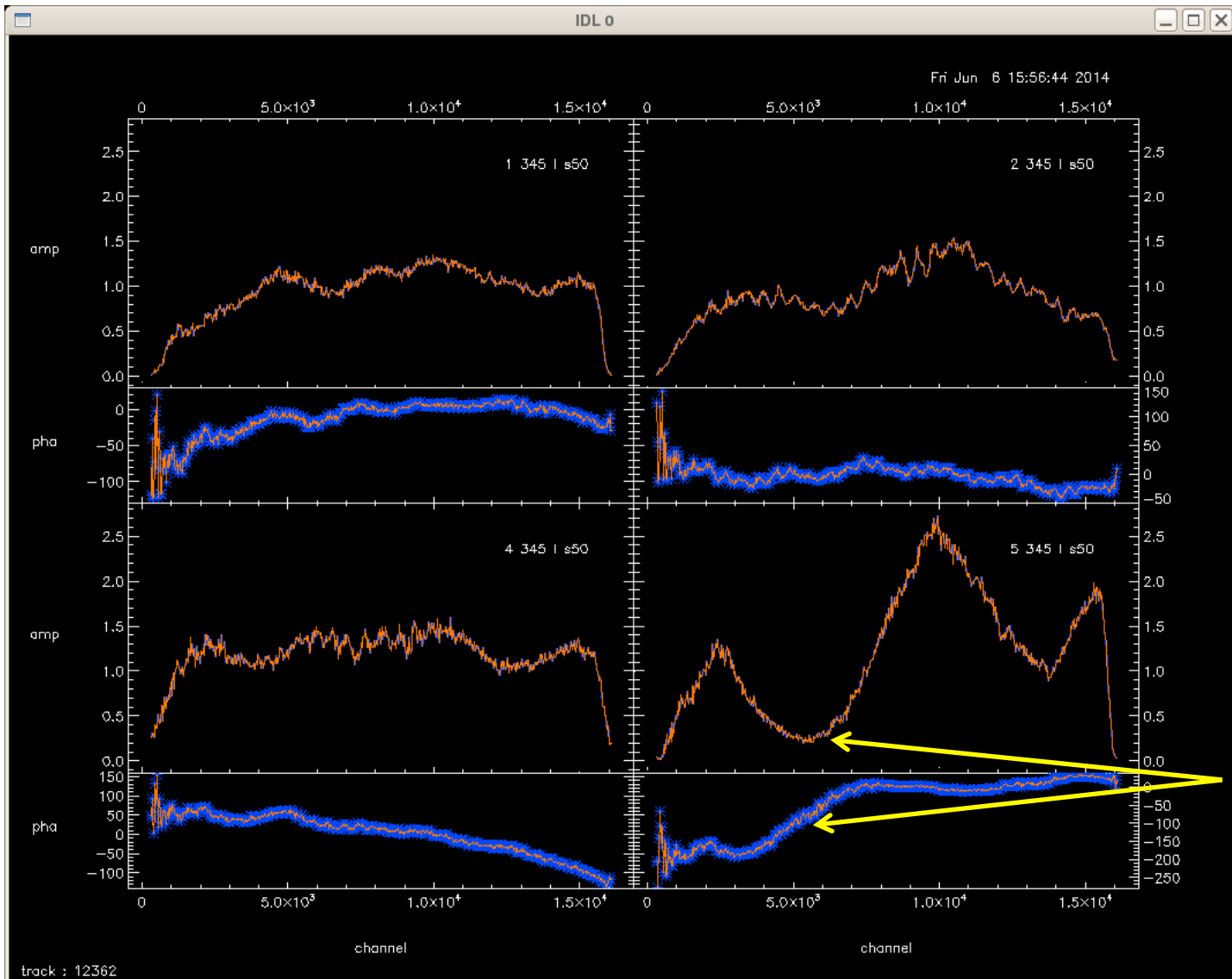
- Phase sense mismatch SWARM 1 & 2
- Phase conjugation not consistent; phase closure lost until corrected (b₄₋₅)
- Channel-frequency mapping 'backwards' for SWARM band 2

Simply & completely fixable in post-processing

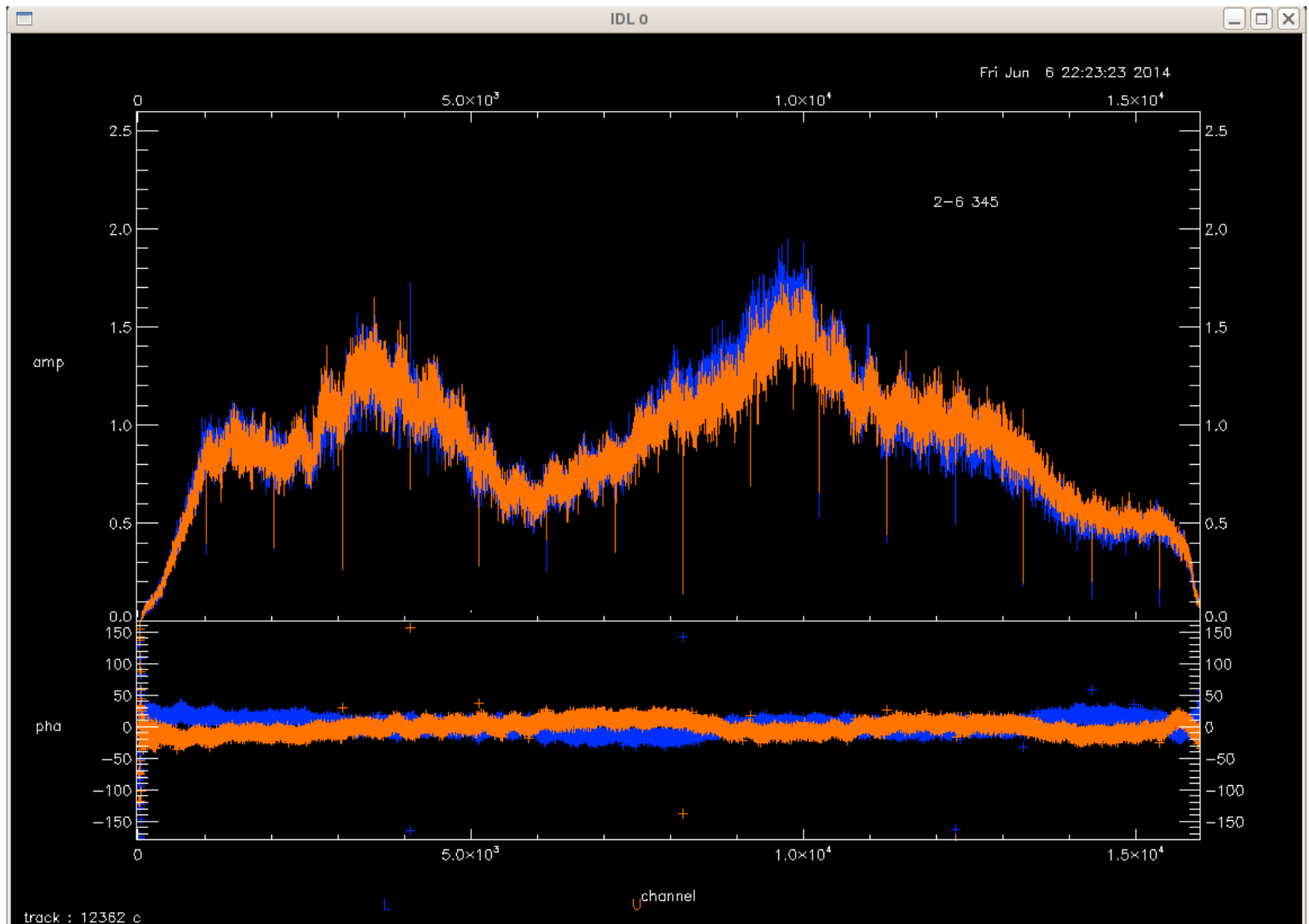
Calibrators after Phase Gain Calibration in SWARM Band 1 Using ASIC



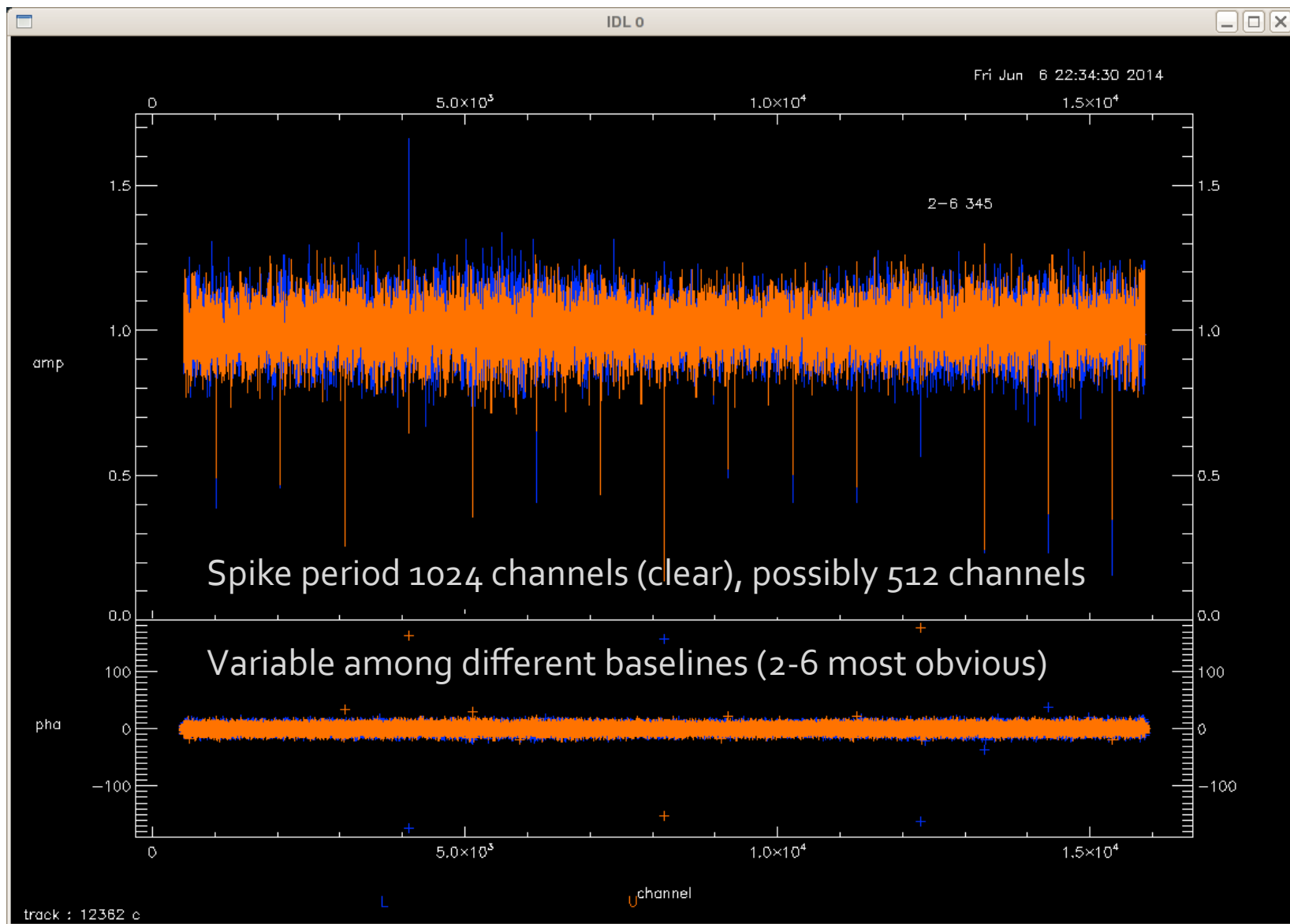
ISSUES #2: Ant 5, SWARM Band 2 Spectral Response



ISSUES #3: Uncompensated ADC Spikes

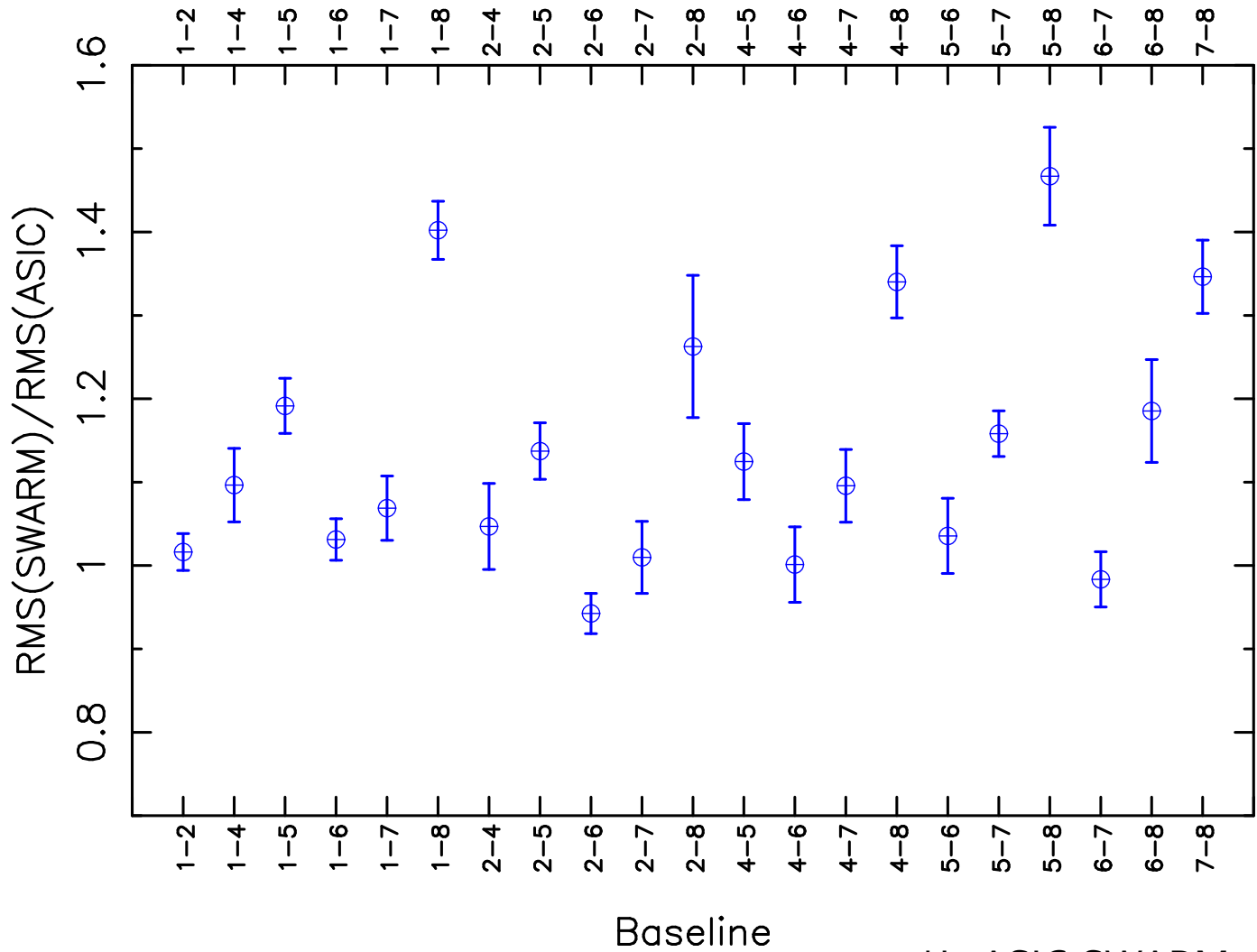


ISSUES #3: Uncompensated ADC Spikes



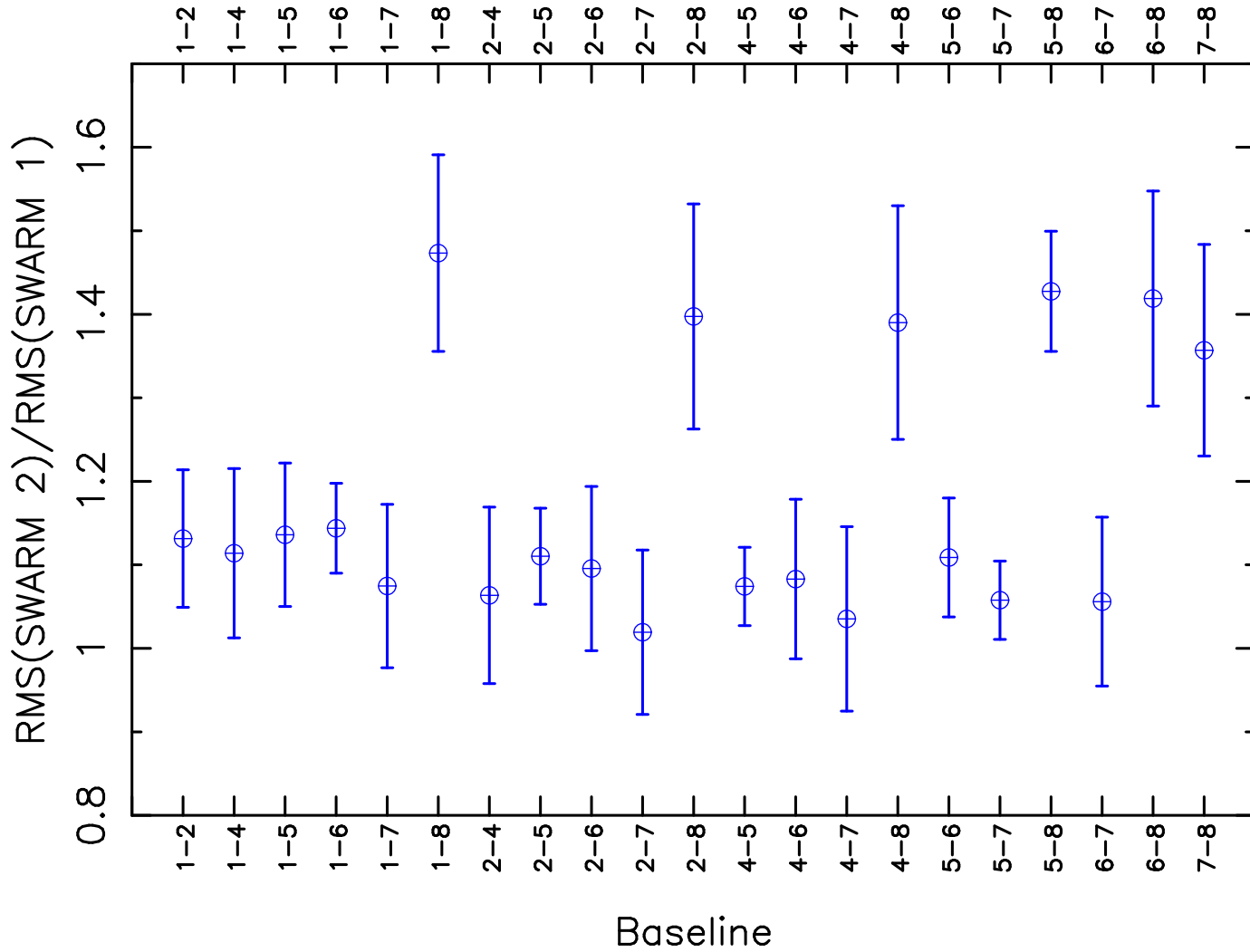
ISSUES #4: Higher RMS SWARM Band 2, Ant 8

NOISE COMPARISON*



*In ASIC-SWARM overlap region

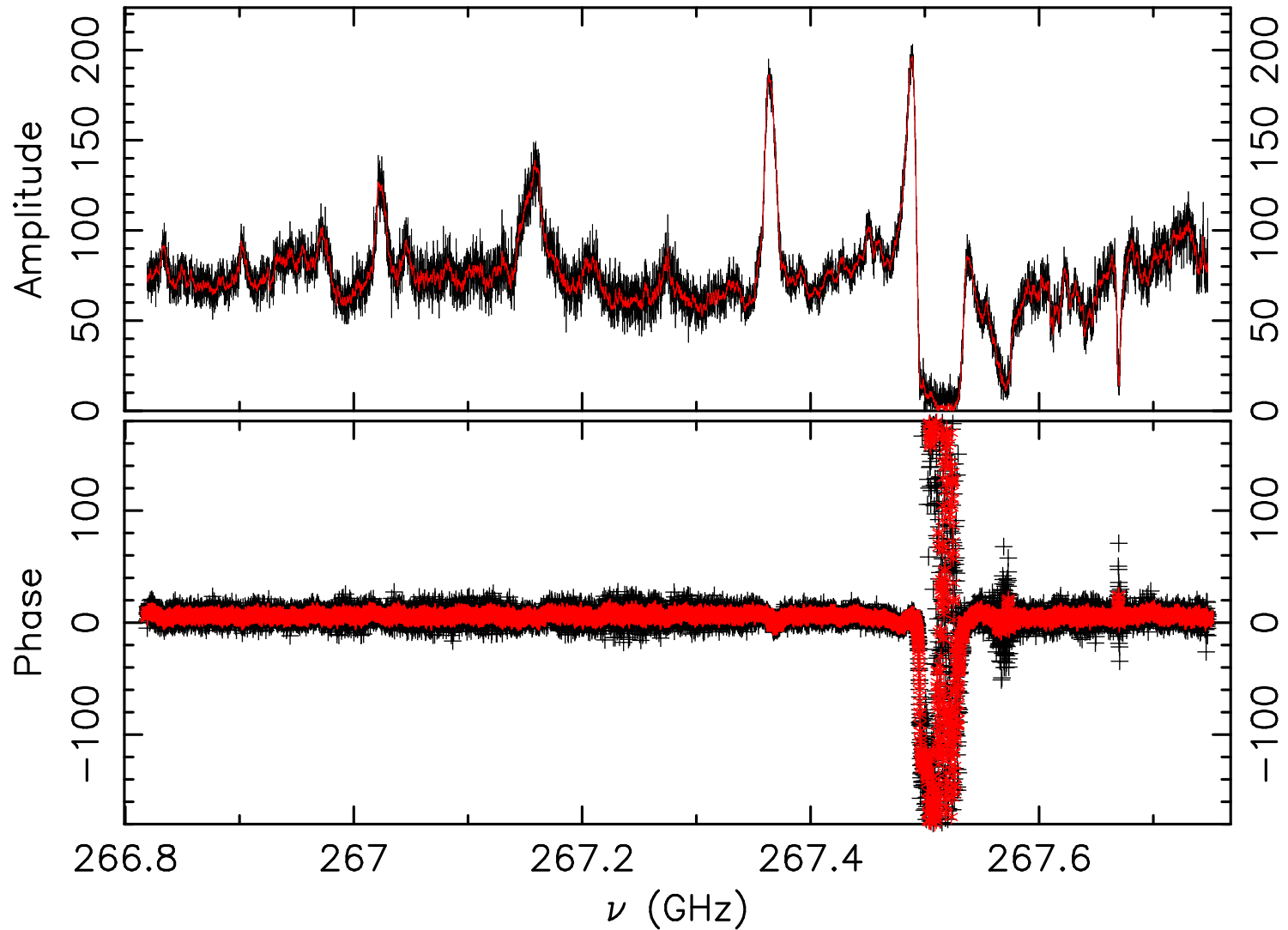
NOISE COMPARISON 2



Despite all that...

1 GHz continuous bands now available!

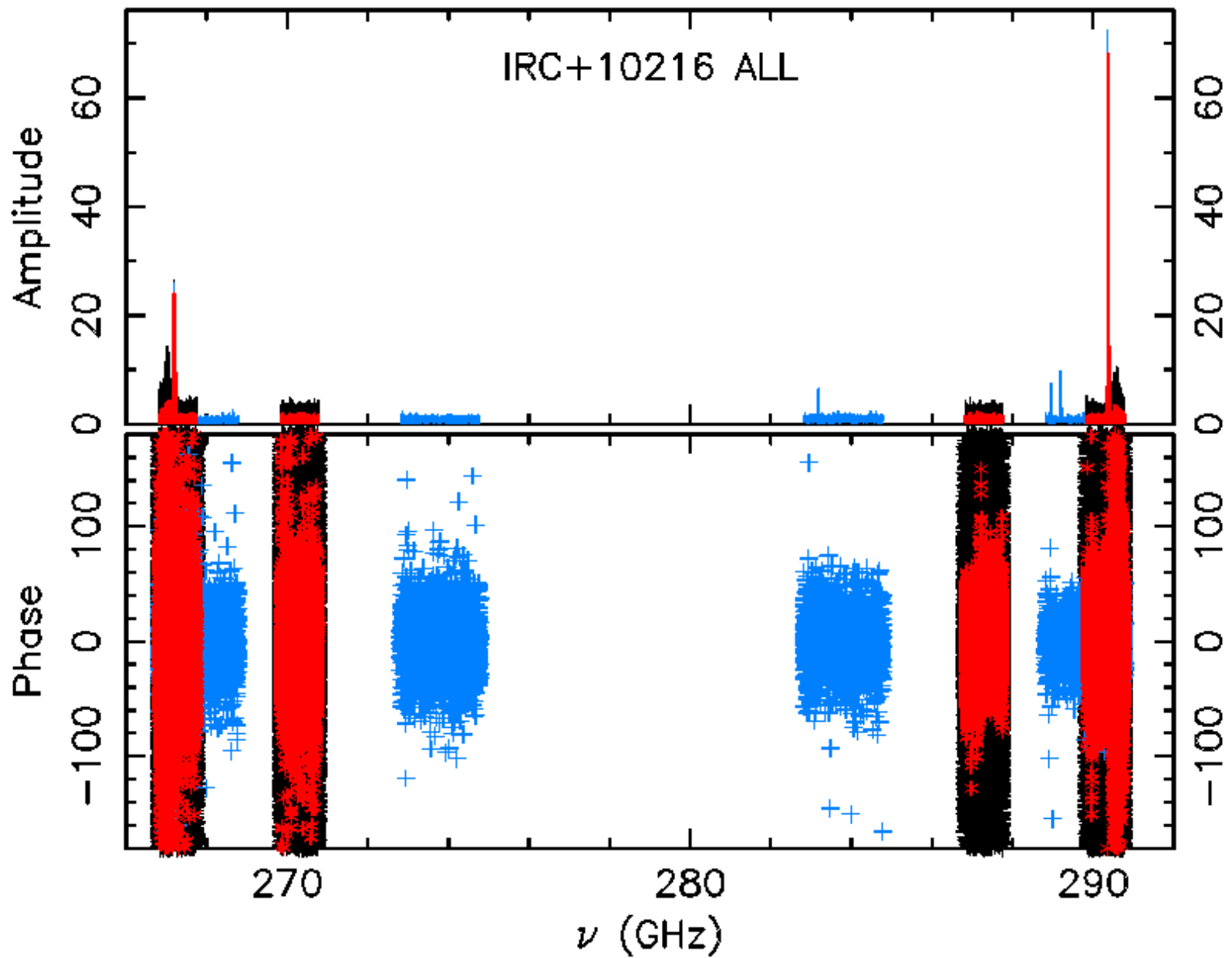
Sgr B2n LSB s50 2-6



ASIC-812.5 kHz

SWARM-70 kHz

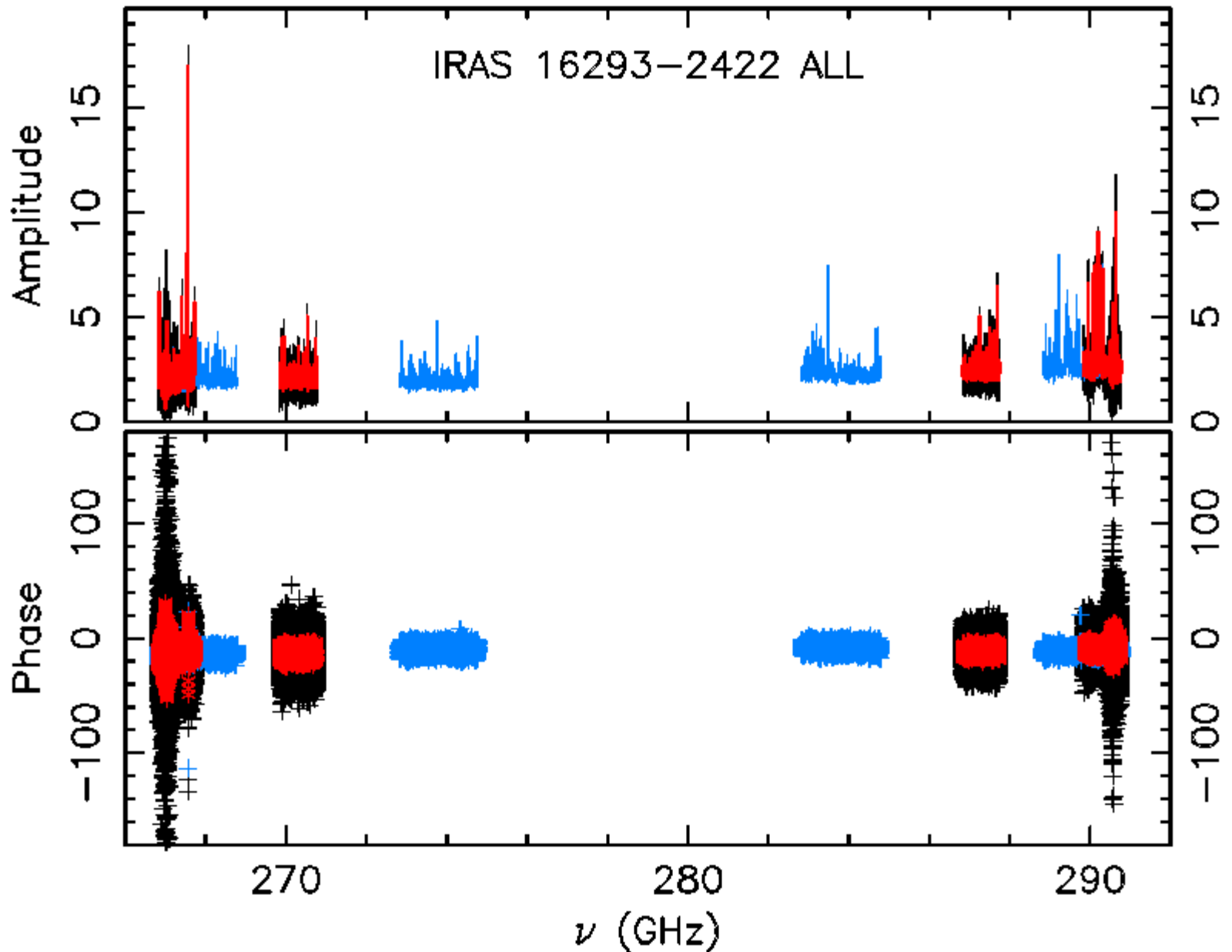
SWARM-812.5 kHz



ASIC-812.5 kHz

SWARM-70 kHz

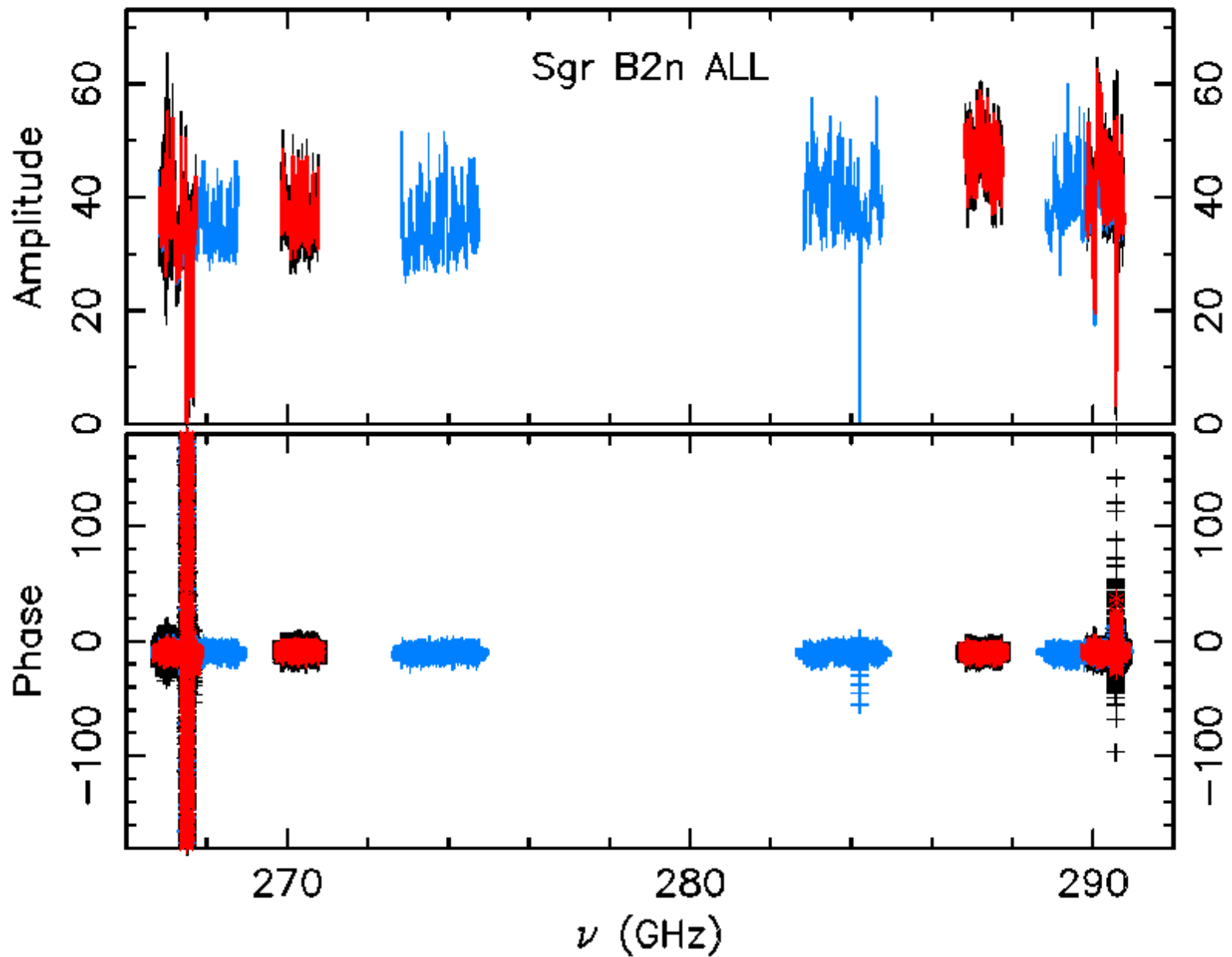
SWARM-812.5 kHz



ASIC-812.5 kHz

SWARM-70 kHz

SWARM-812.5 kHz

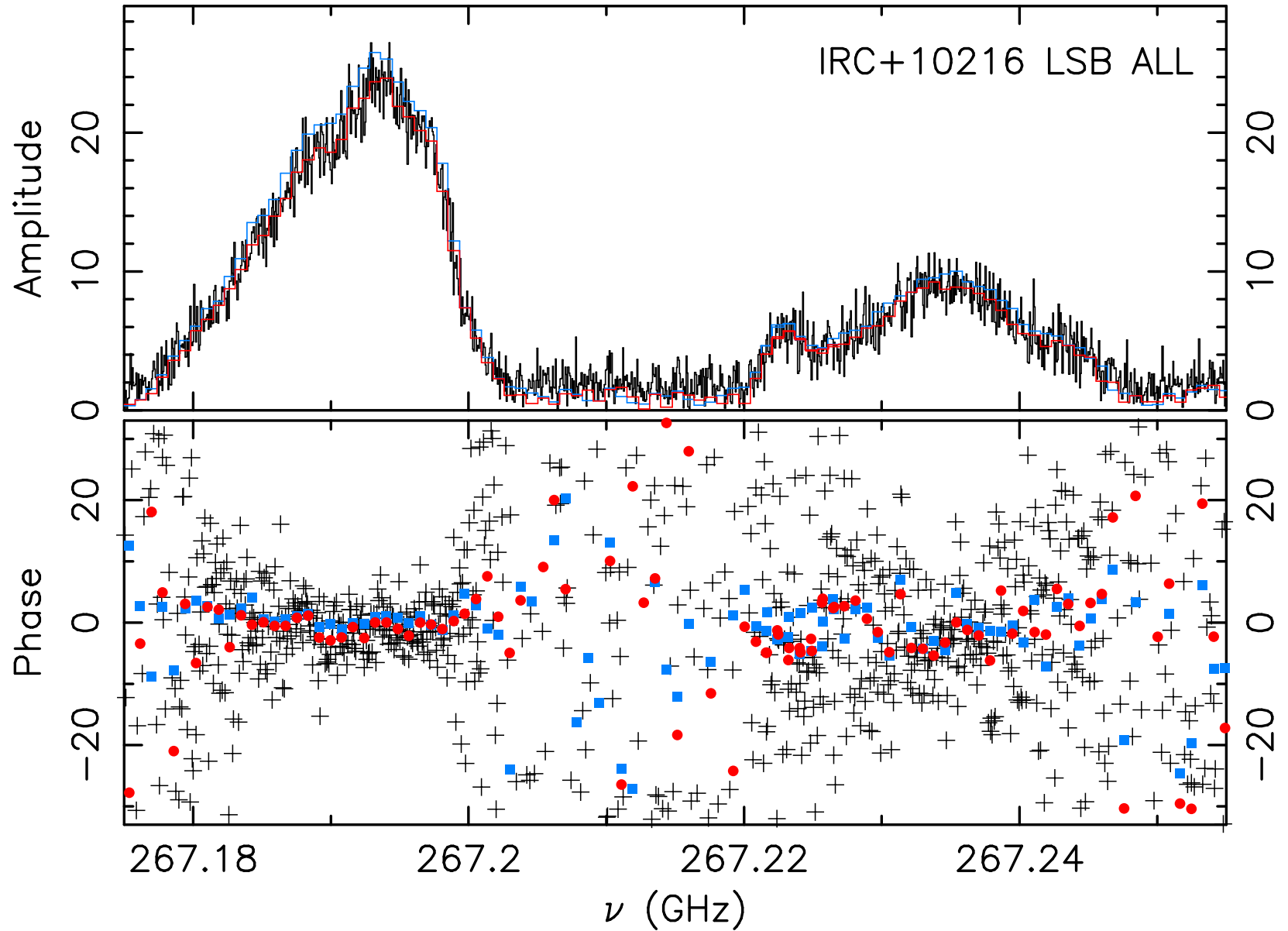


ASIC-812.5 kHz

SWARM-70 kHz

SWARM-812.5 kHz

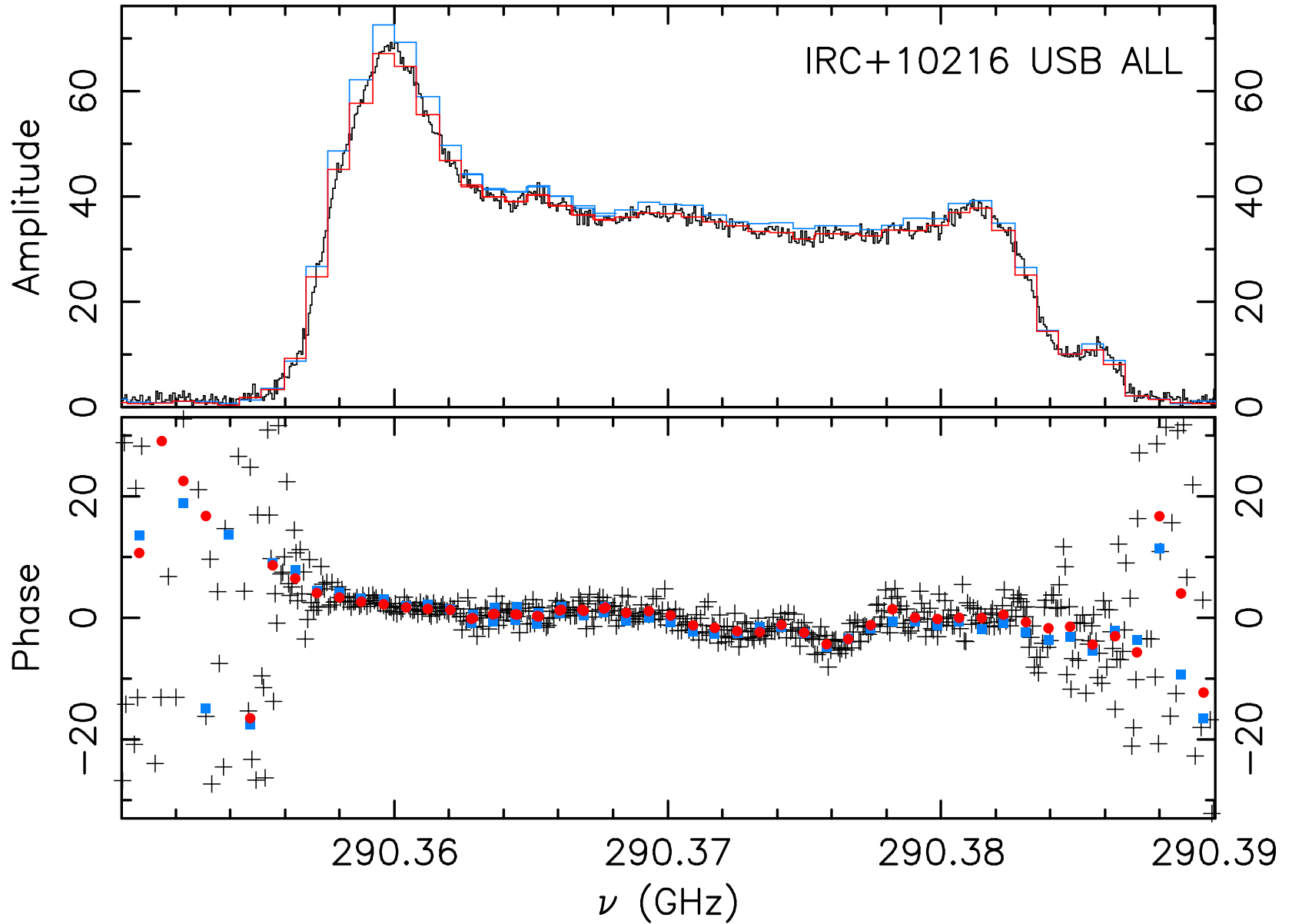
IRC+10216 LSB ALL



ASIC-812.5 kHz

SWARM-70 kHz

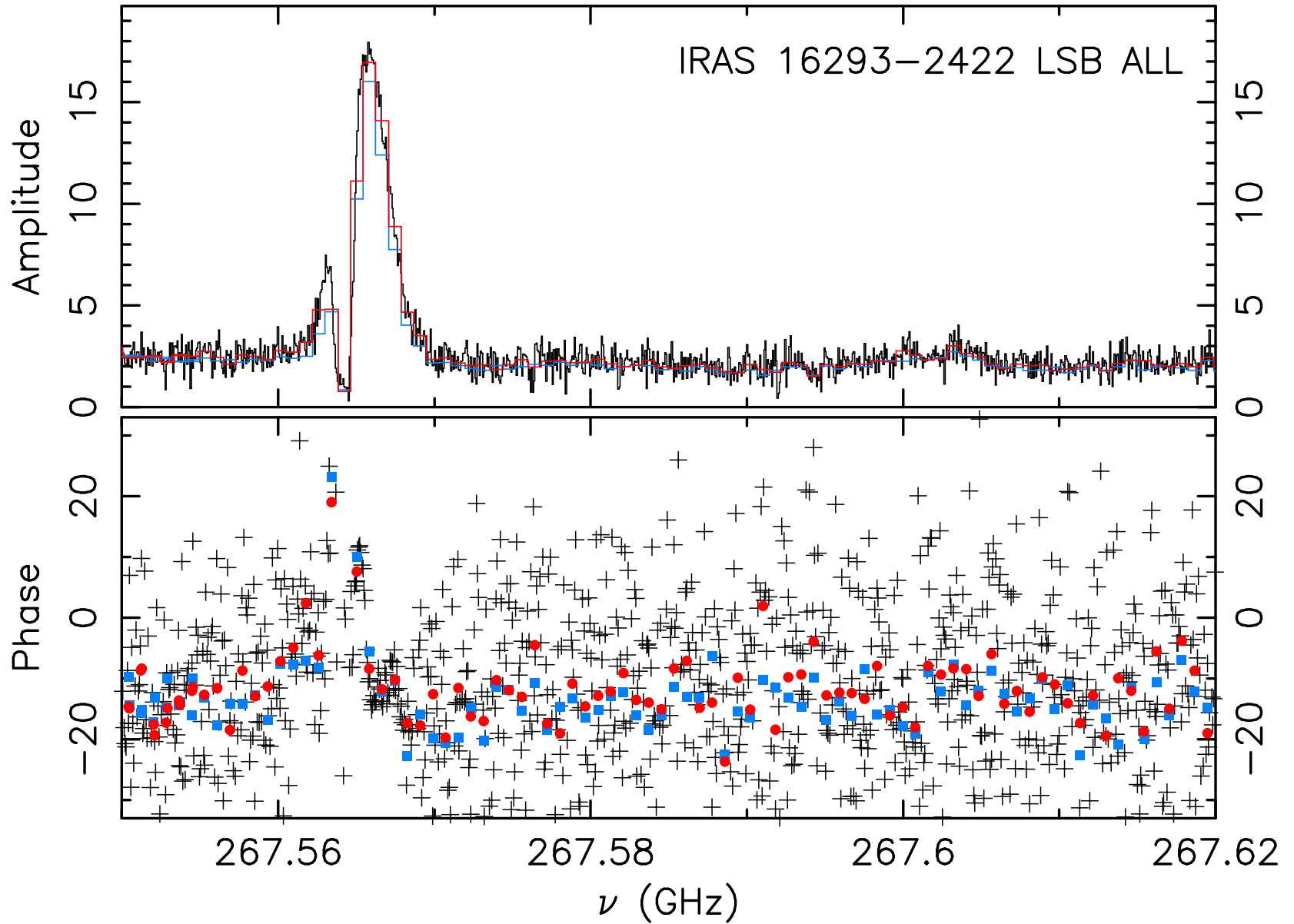
SWARM-812.5 kHz



ASIC-812.5 kHz

SWARM-70 kHz

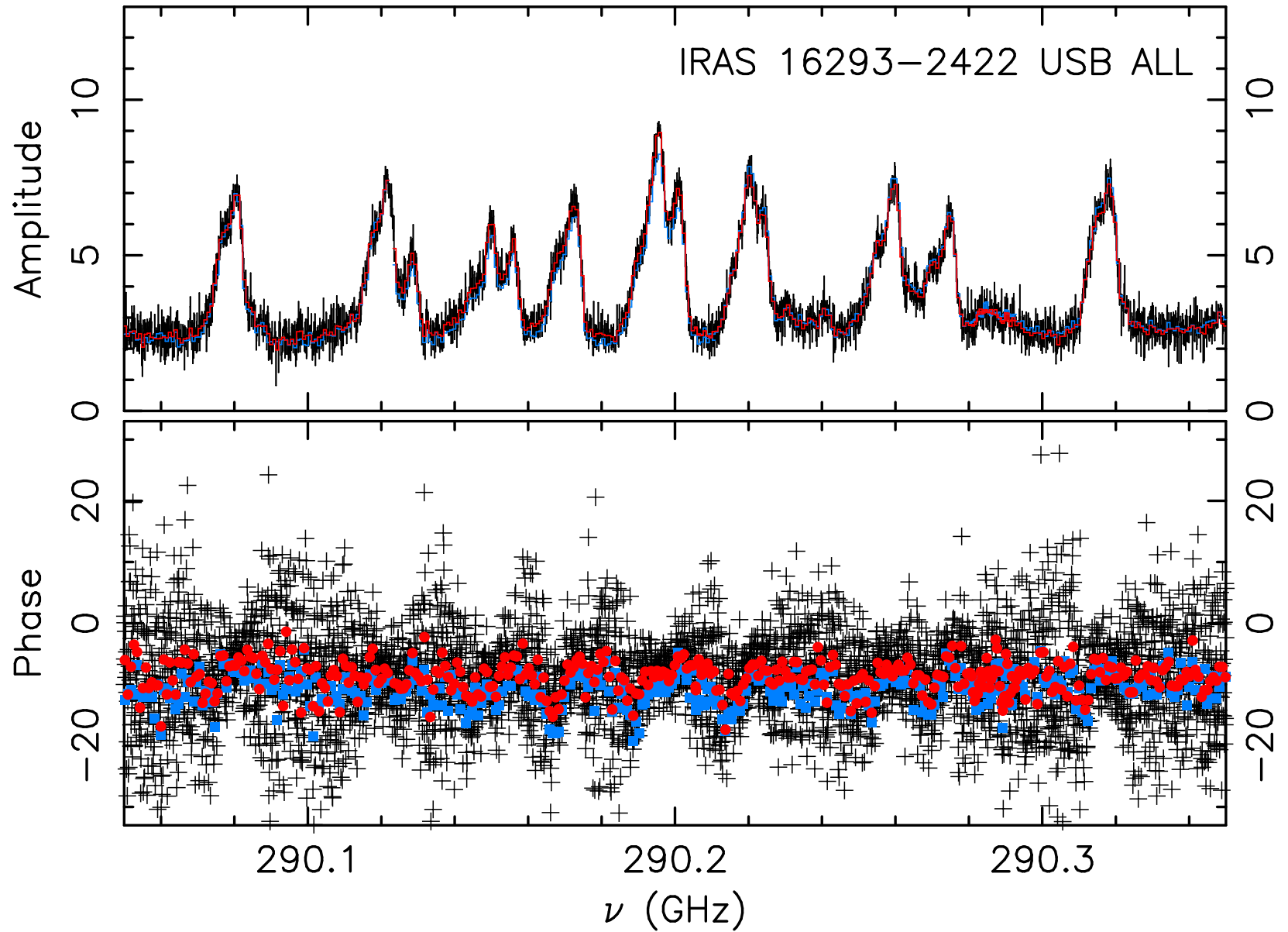
SWARM-812.5 kHz



ASIC-812.5 kHz

SWARM-70 kHz

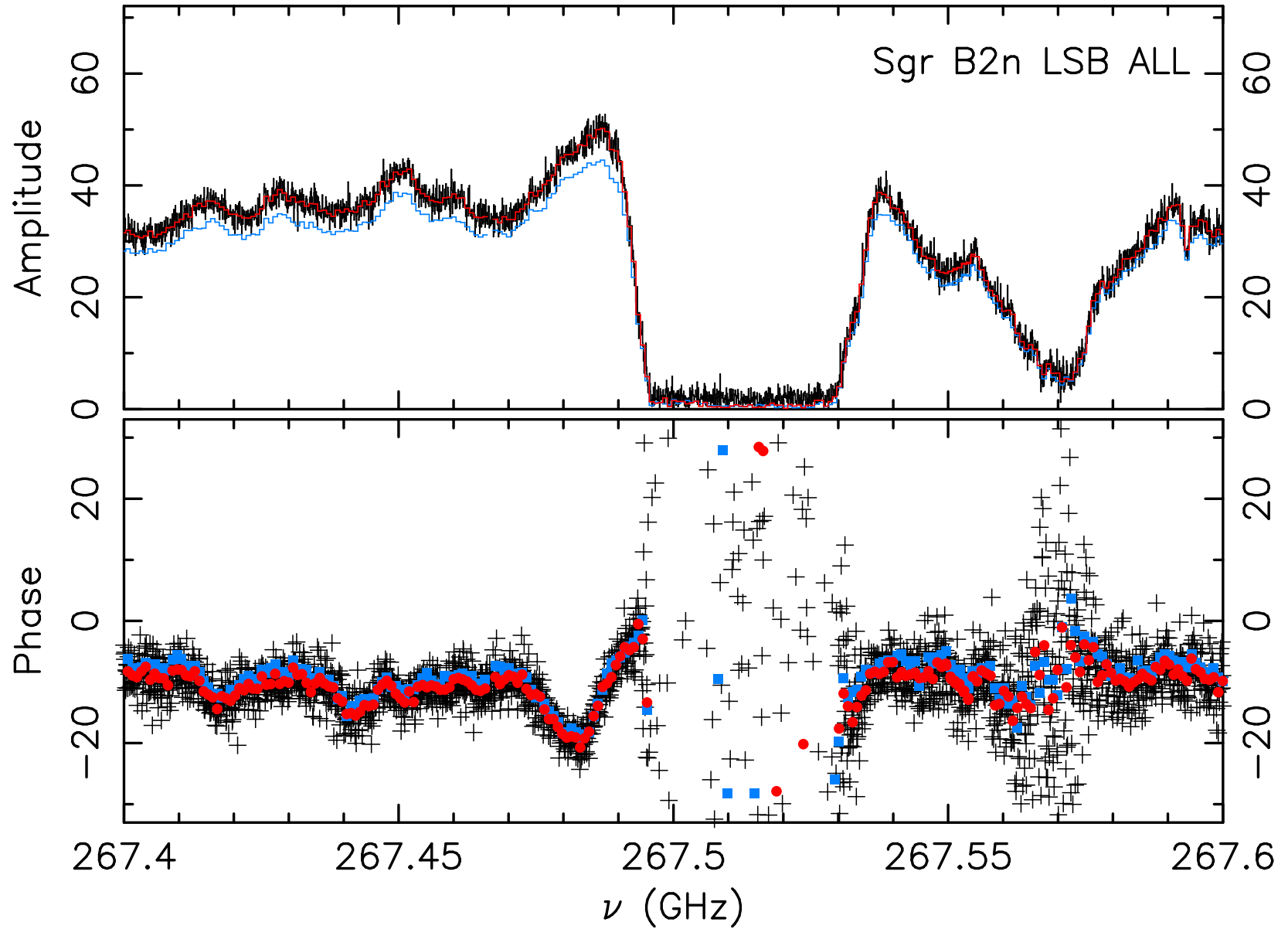
SWARM-812.5 kHz



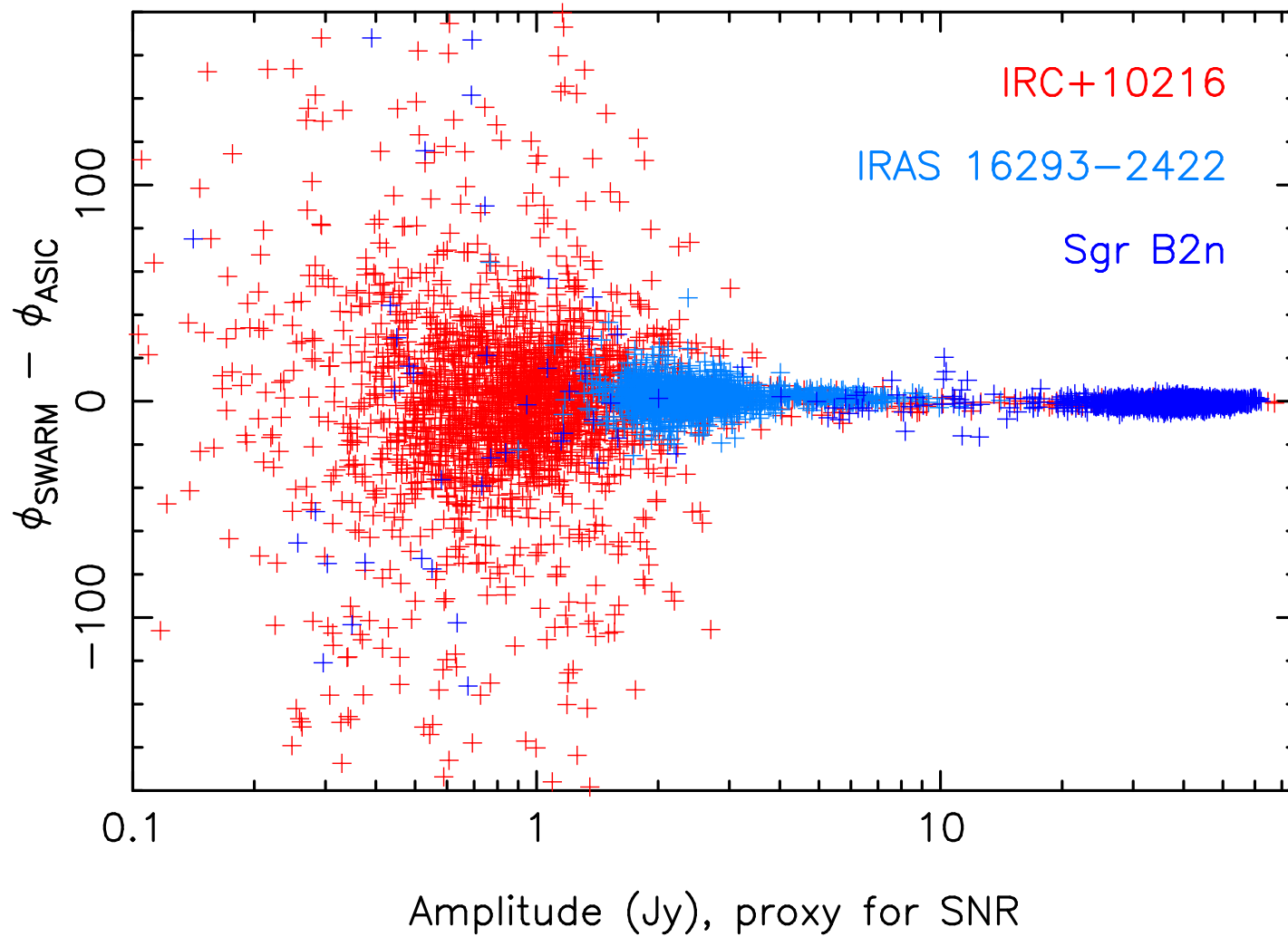
ASIC-812.5 kHz

SWARM-70 kHz

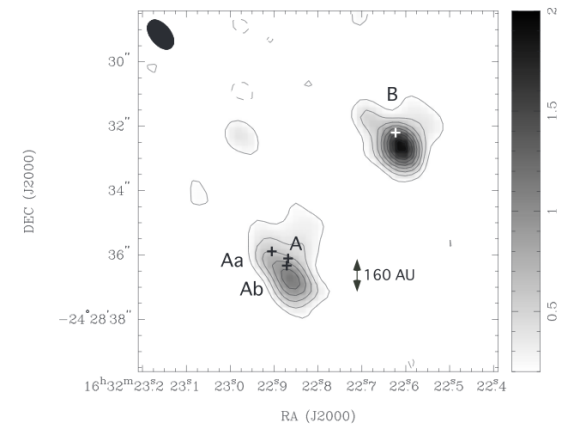
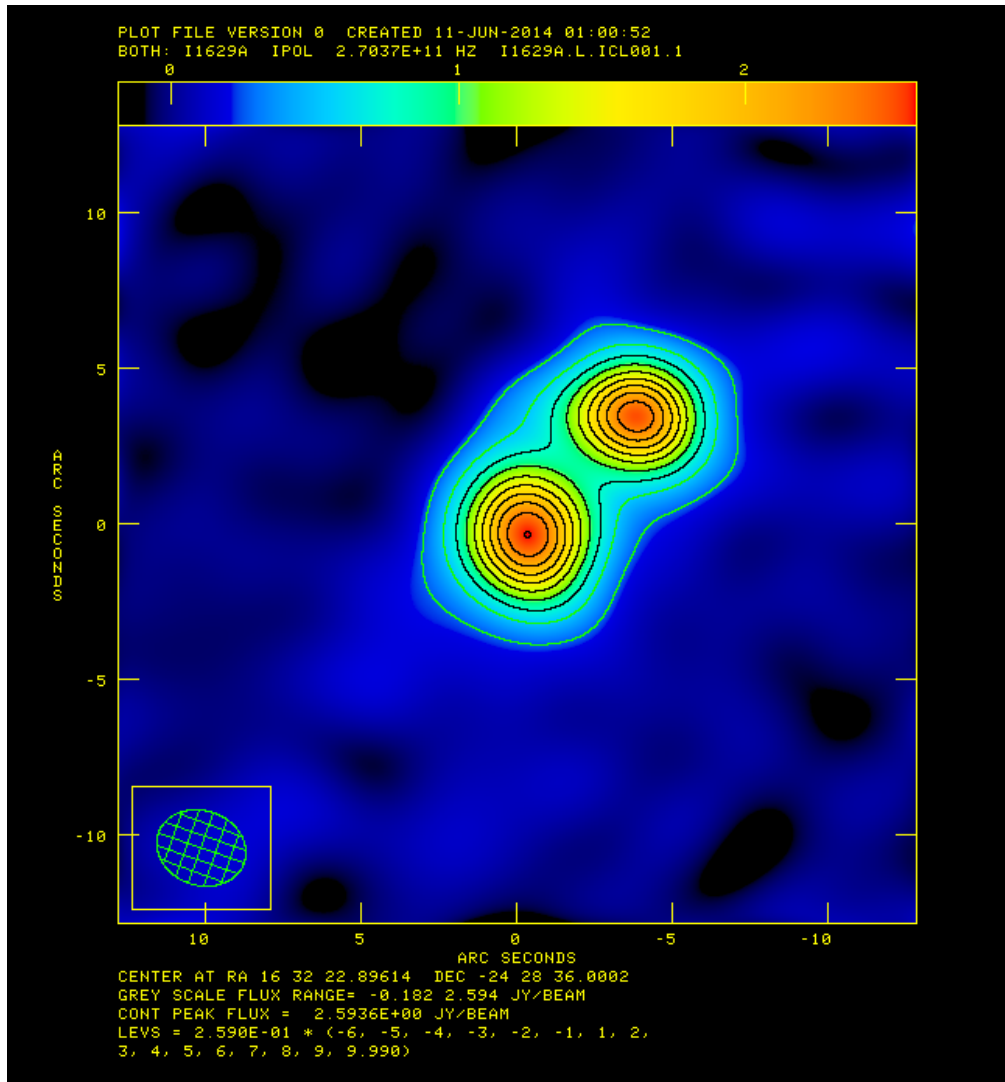
SWARM-812.5 kHz



SWARM – ASIC DIFFERENCE PHASE (812.5 kHz res.)



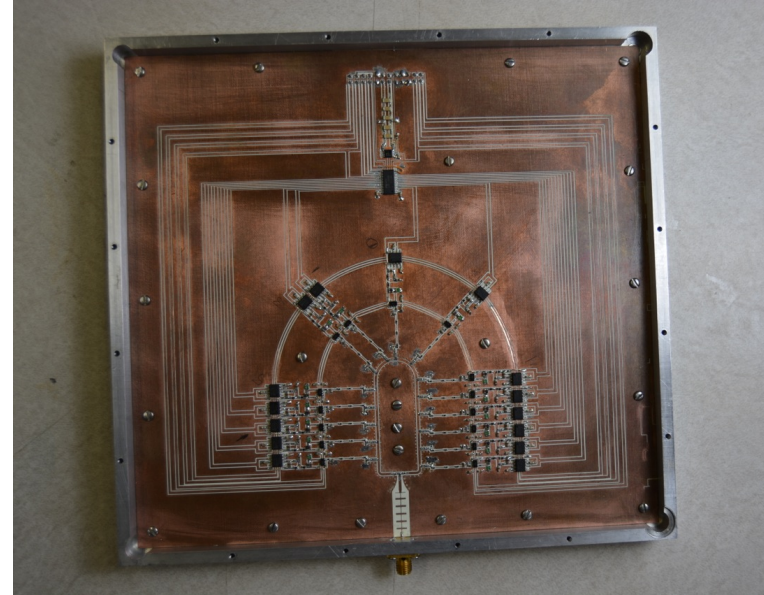
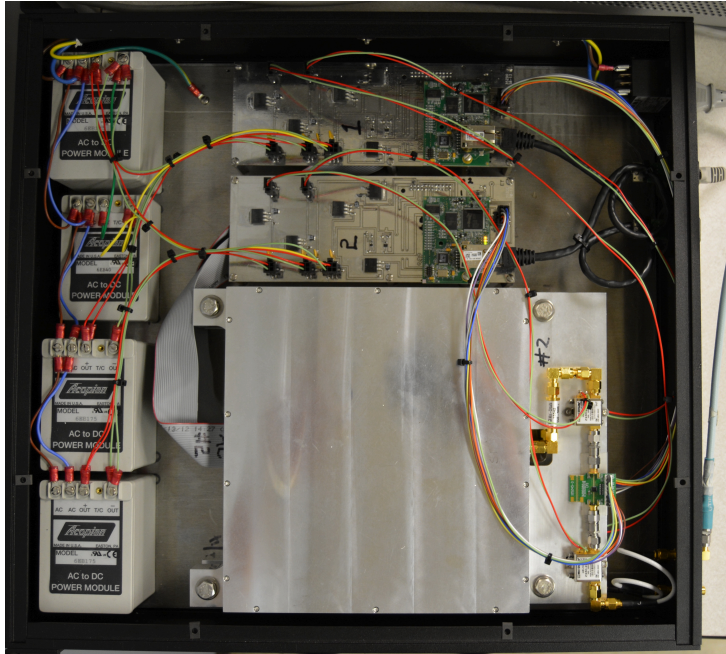
Map— integrated SWARM band 1 LSB IRAS 16293-2422



Takakuwa et al 2007

A couple other points...

4 to 12 GHz Analog Autocorrelating Spectrometer (R. Kimberk et al)



1 GHz resolution across full IF band; improved T_{SYS} calibration of cross-correlation amplitude for correction of atmospheric opacity and initial data weighting.



A note on data size

- SWARM+ASIC data $\sim 2 \times 16\text{k}/6\text{k} + 1 \sim 6.3 \times$ ASIC only
- 29 May a 'real' data set; all calibration, typical cadence, but 21 of 28 baselines, 30s scans.
 - Raw data ~ 12 GB (+3 GB for autocorrelations)
 - MIR/IDL save sets ~ 24 GB
 - Initial read-in ~ 4 min, save set writing to disk ~ 10 min
 - Application of some calibrations ~ 2 -10 min
- 'Full' single polarization data may be 15s/scan, 28 baselines. Data size ~ 60 -70 GB. Not ALMA huge, but big. MIR/CASA paths.

Thank you

