# SPIRE Spectrometer Mapping Calibration

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On behalf of the SPIRE FTS Team

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SPIRE Spectral Mapping

- Normal SPIRE FTS observations have sparse spatial sampling (2 beam separation)

- Mapping observations have either
  - 1 beam spacing (intermediate) = 4 jiggle positions
  - ½ beam spacing (full) = 16 jiggle positions
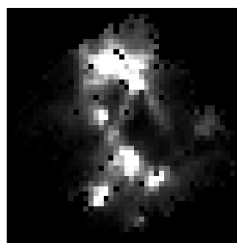
- Calibration is done for each jiggle position separately
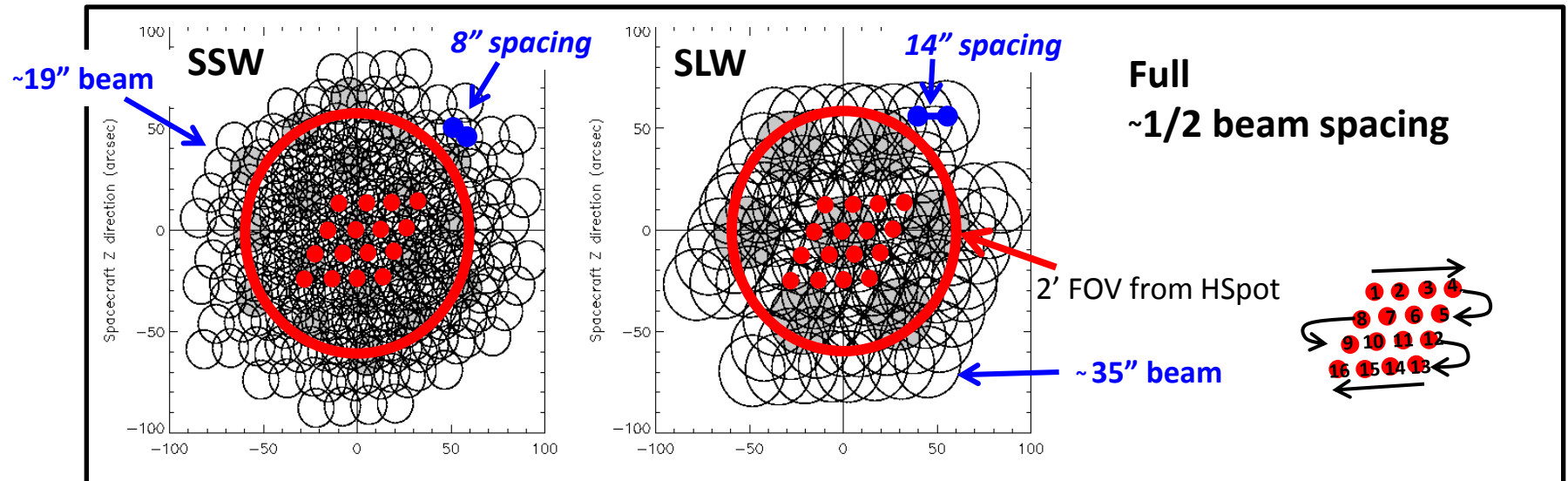
SPIRE Spectral Mapping
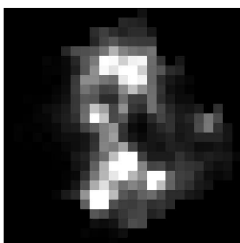
|	**Sparse**	**Int**	**Full**
Actual usage:	75%	17%	8%
Max. reps. HR	234	90	13
(average)		(17 rep)	(4 rep)
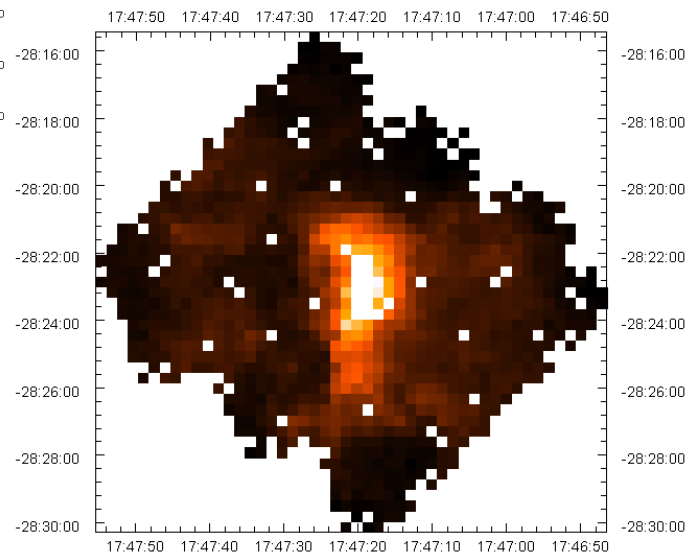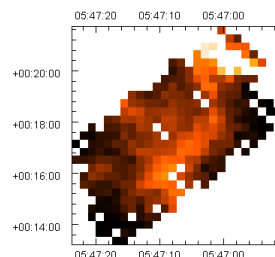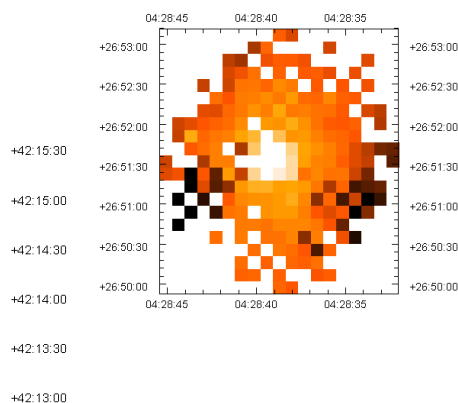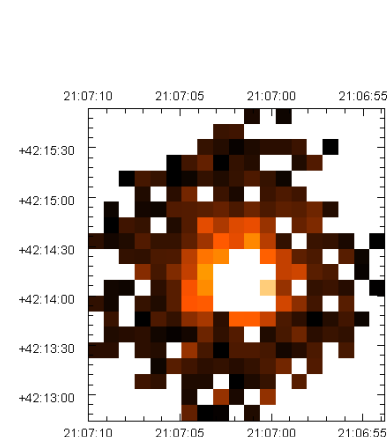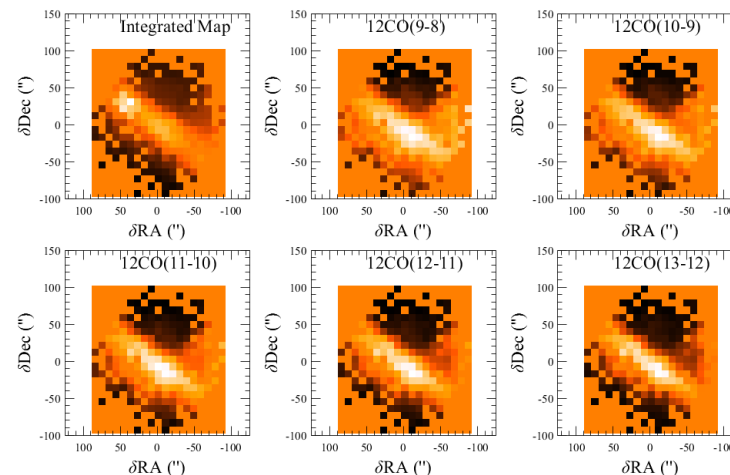
Raster observations constitute 1% of observations
Largest raster 10'x10'

Noise and Sensitivity

- HIPE v9: single dark sky was used to derive mapping RSRFs
- HIPE v10: **all** available observations used

- In HIPE v10, the noise level for each jiggle position is now consistent with sparse mode (i.e. agrees with HSpot)
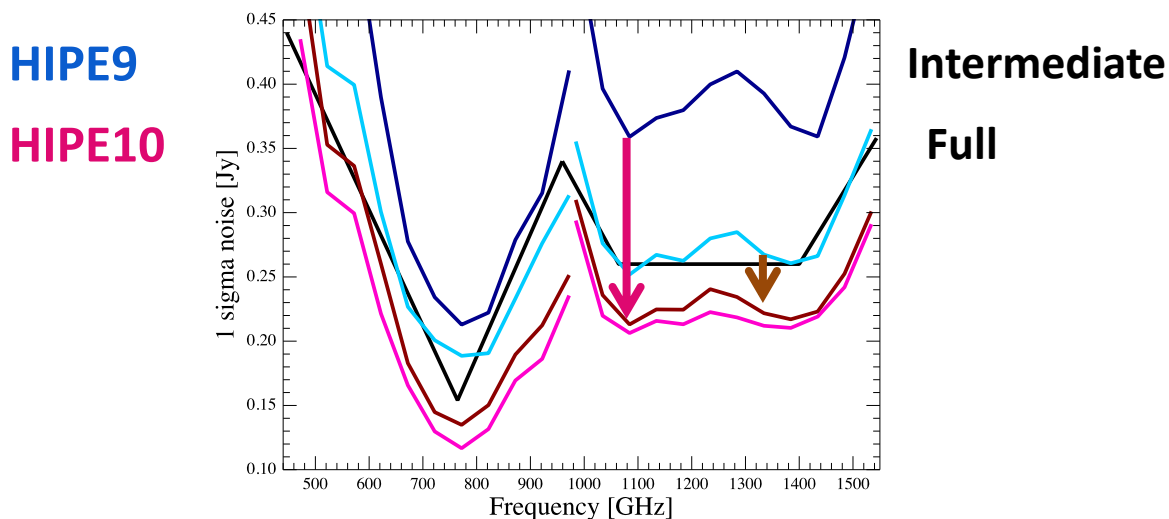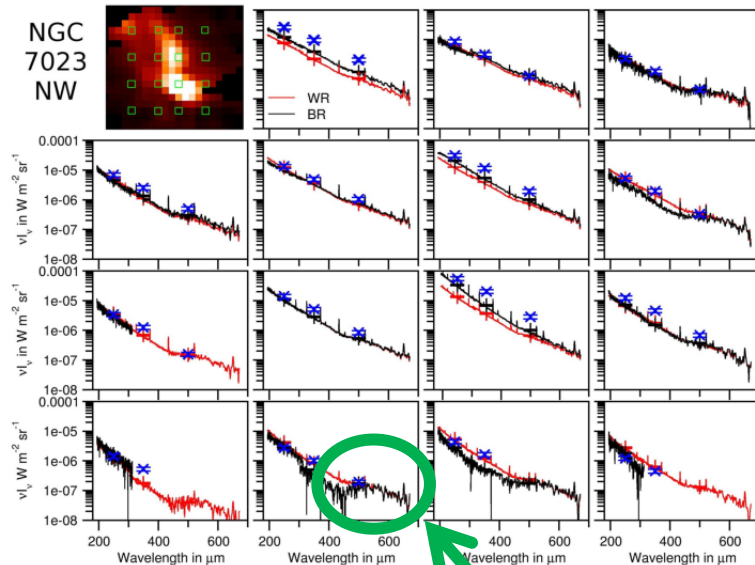

This means that the noise in any cube pixel should correspond to the number of scans in the "coverage"
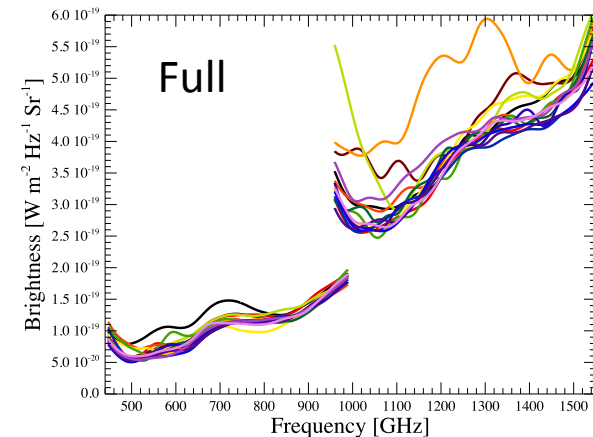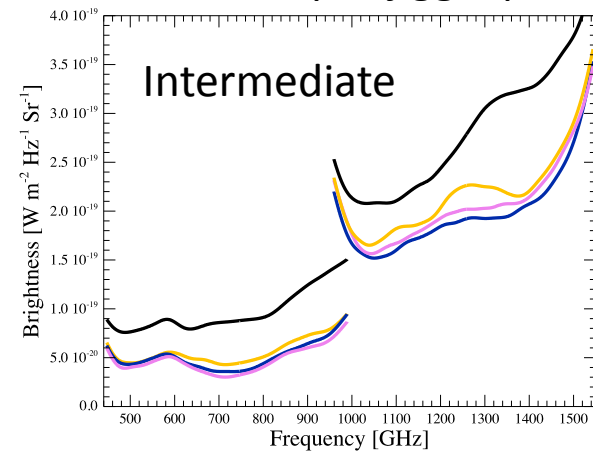
Continuum Offset

- Continuum offset also important for mapping
   (see Ros' talk yesterday for sparse mode)

From HIPE Forum:

Continuum offset per jiggle position

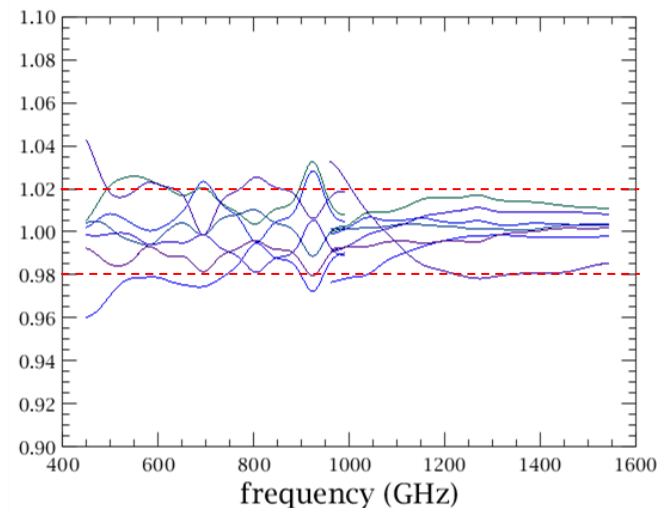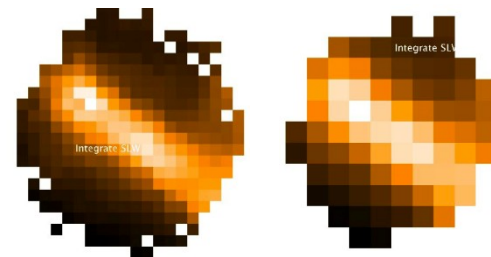Bump due to additive
error on continuum

Relative Calibration

7 maps of the Orion Bar - made every 6 months through the mission

different orientations on the sky – i.e. different detector positions

Calculate the deviation of each obs. from the mean of all 7

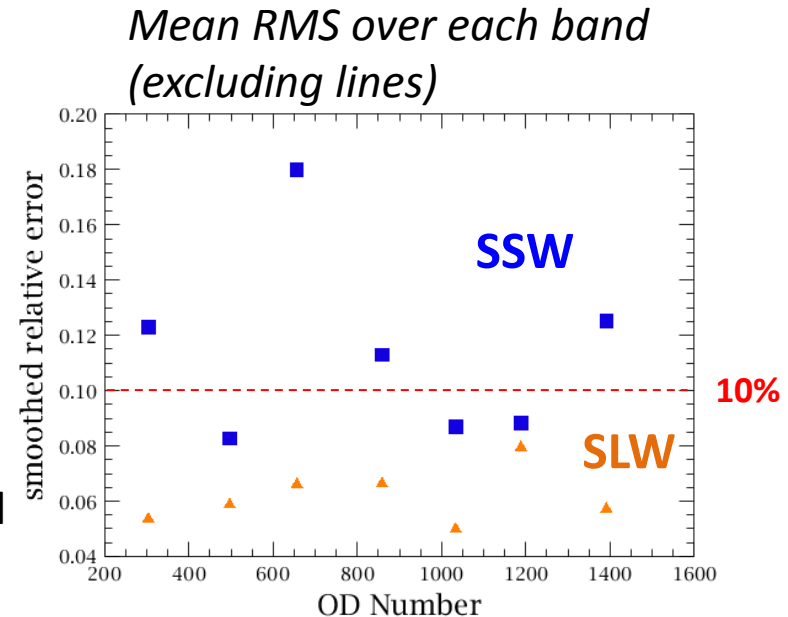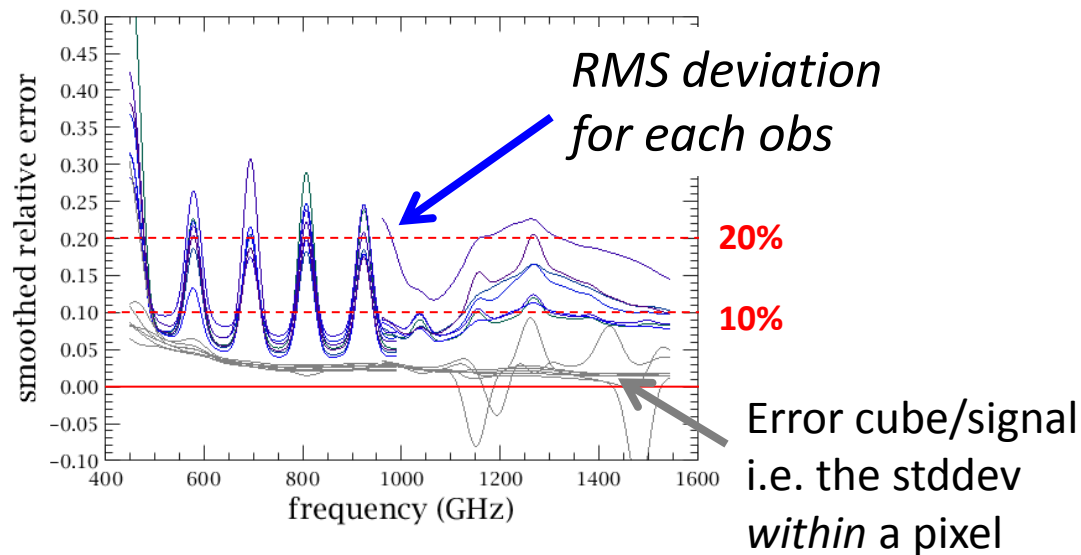The mean **relative deviation**, over all pixels, is within ~2%

No systematic degradation of maps through the mission

Relative Calibration

The "**repeatability**" within a map estimated from the RMS of the relative deviation across all pixels:

SLW: **5-8%**
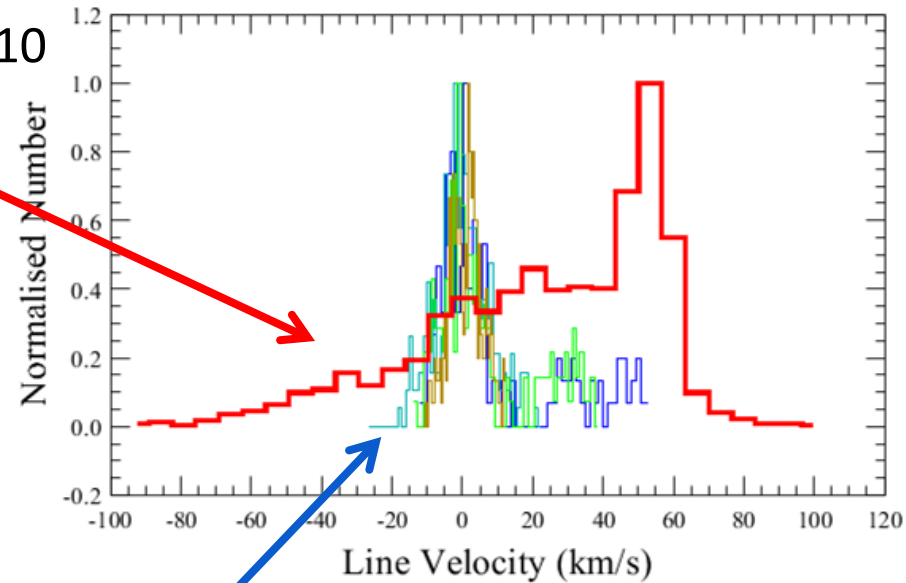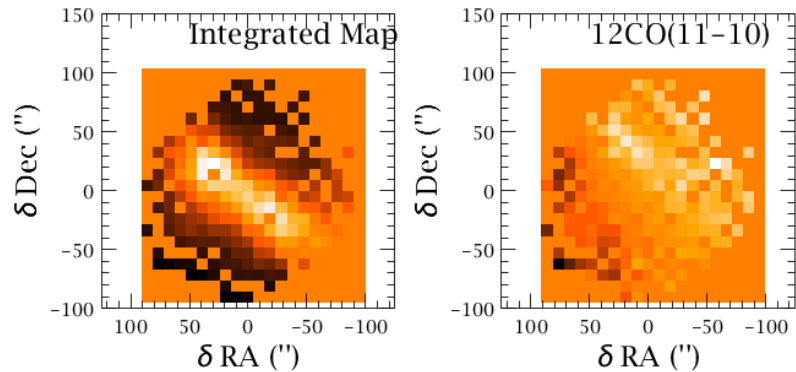
SSW: **8-20%**

Mean RMS over each band (excluding lines)

RMS deviation for each obs

20%

10%

Error cube/signal i.e. the stddev *within* a pixel

SSW

SLW

10%

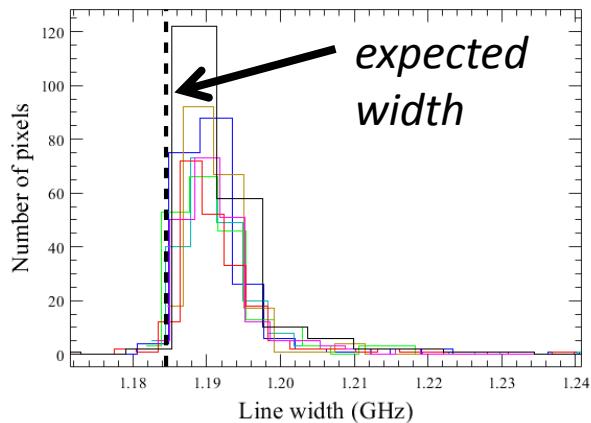Due to **pointing effects** and **detector-detector relative calibration**

Frequency Calibration

7 Orion Bar observations – fit ^{12}CO J=11-10 line in all spectral map pixels

Spread: **±30 km/s**

Integrated Map

12CO(11-10)

Line widths for each obs:

expected width

AFGL2688, **AFGL4106**, **CRL618**, **NGC7027**
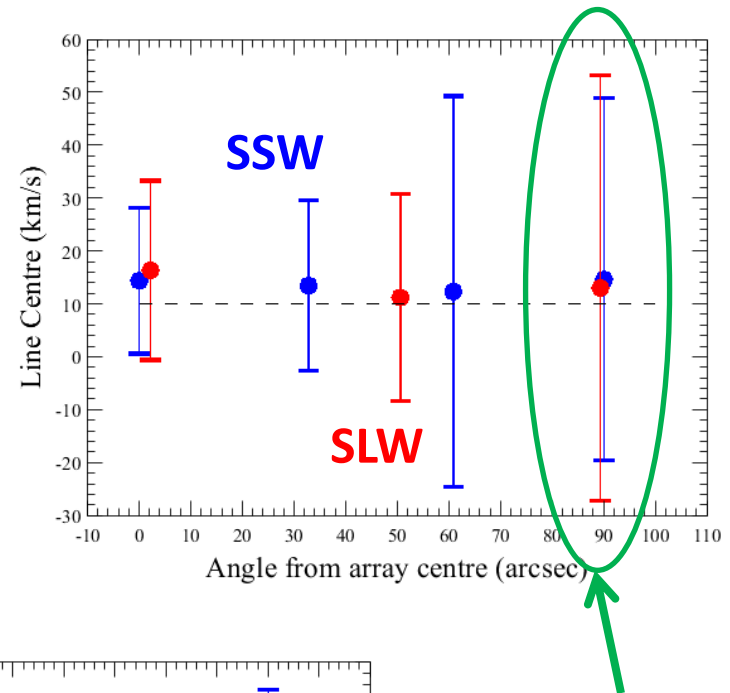^{12}CO lines across both bands
(centre detectors only)

Spread: **±7 km/s**
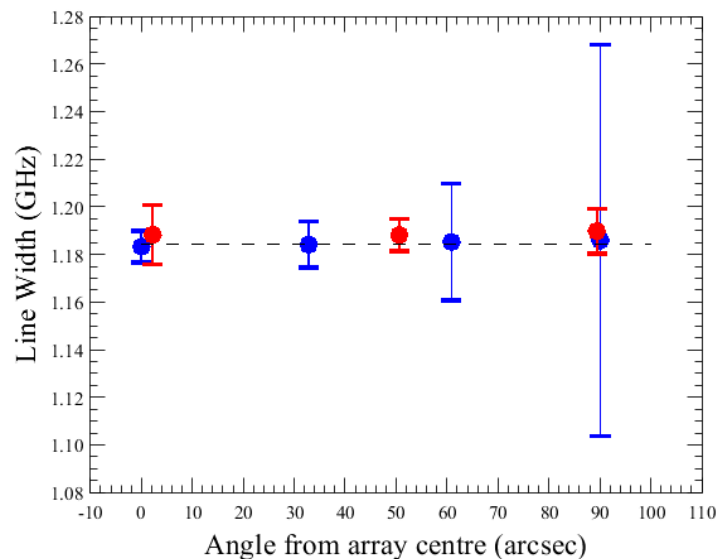*(from results presented by Ros yesterday)*

Frequency Calibration

Reasons for higher spread for mapping?

- Correction for the "stretch" of interferogram off-axis sets the frequency scale
- Spread in velocities increases away from centre

Spread in line width also increases away from array centre for SSW

Vignetted ring of detectors

Future Plans

- More dark sky observations – slightly deeper RSRFs
- Point source calibration from maps
- Understand/improve frequency calibration
- Detector-detector calibration