Q-band Continuum Test for General Observer Mode: Faint Sources

I ran the pipeline on one of my sources CB230, a young binary protostar, for a dataset that I had also done a by hand reduction. The observations were done in full-pol continuum mode, 2 MHz channels and the two 1 GHz basebands were placed consecutively from 40 to 42 GHz. Track 1 had phase jumps in many places in the data and I attempted to flag all bad data by inspecting the phase on a baseline-to-baseline basis. Track 2 needed much less flagging on the whole. There were no deformatter errors during these observations. The observations consisted of two 1 hour Sbs executed consecutively. The phase stability was good the API was reading ~2 degrees during the two hours of observation, there was 30% sky coverage with stratiform clouds. The observations were conducted on Dec 5 UTC, and were initially affected by the timestamp bug. These data are the version that was corrected in the archive. The pipeline version used is the CASA 4.0 version from mid-December.

The image is a bit noisier than expected, for both the manual reduction and pipeline. However, for the first SB, the pipeline did better than my manual reduction and for the second SB, they are about the same. There is likely bad data lurking in the MS that the pipeline picked up, but I did not; in a previous iteration of this document I had only done minimal flagging and obtained a better result.. Therefore, Track 2 is a more fair comparison of the two methods. The OPT indicated that there would be about 11 minutes on source. All 27 antennas were operating, one antenna was flagged for most of Track 1 due to bad pointing. The elevation of the source was between 60 and 50 degree and the 25 -50 degree elevation was assumed for the calculator.
Theoretical RMS: 26 uJy for 27 antennas and 27 uJy for 26 antennas.

Images from the pipeline and manual reductions are shown on the following page. The scaling in the images are the default min-max scaling with the pipeline pixel value ranges also used for the manual reductions. The contours start at 3 sigma and increase by 1 sigma. Cleaning was done with a mask around the two sources and cleaned down to a threshhold of 50 uJy.

There is an offset between flux measurements in Track 2 for the pipeline and manual. The factor is ~1.19. This difference arises from the flux calibrator 3C48 being resolved. The pipeline uses the full uvrange and I only considered baselines shorter than 1000klambda. The pipeline measures a flux density of ~0.63 Jy for the calibrator J2009+7229, while I measure a flux density of ~0.75 Jy.

<u>Track 1- pipeline:</u>
RMS = 43 uJy
peak flux, main source = 345 uJy
total, main source = 575 uJy

peak flux, secondary Source = 154 uJy
total flux, secondary Source = 257 uJy

<u>Track 1- manual:</u>
RMS = 57 uJy
peak flux, main source = 319 uJy
total, main source = 465 uJy

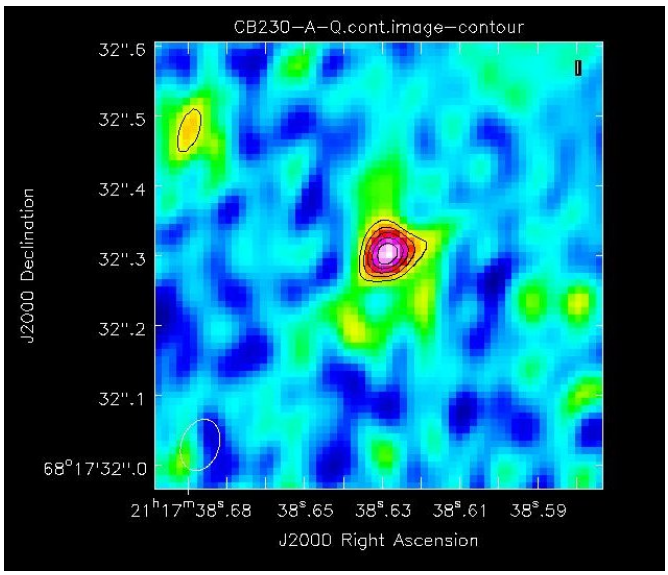
peak flux, secondary Source = 201 uJy
total flux, secondary Source = 475 uJy

<u>Track 2- pipeline:</u>
RMS = 42 uJy
peak flux, main source = 360 uJy
total, main source = 590 uJy

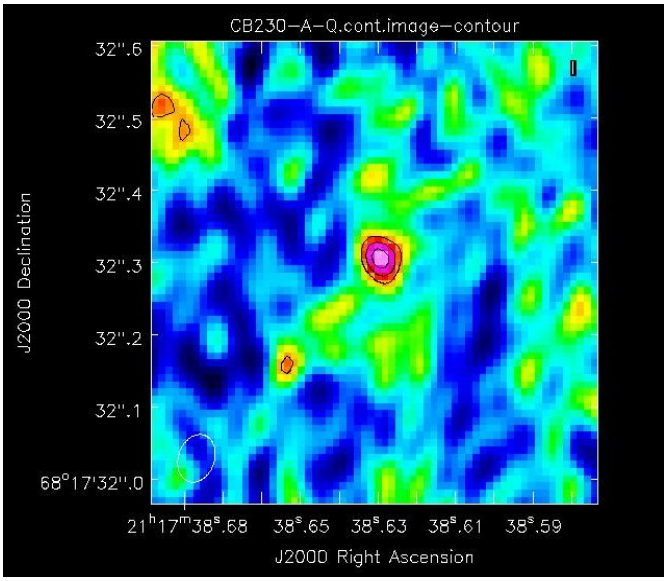
peak flux, secondary Source = 191 uJy
total flux, secondary Source = 327 uJy

<u>Track 2- manual:</u>
RMS = 45 uJy
peak flux, main source = 421 uJy
total, main source = 706 uJy

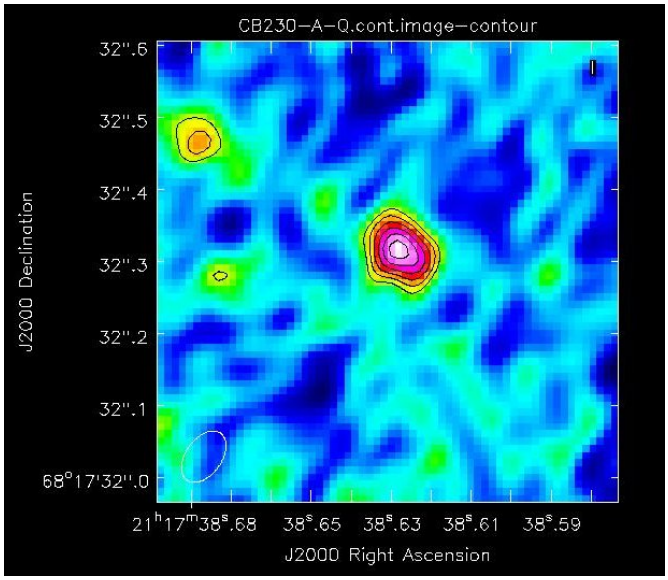
peak flux, secondary Source = 228 uJy
total flux, secondary Source = 333 uJy



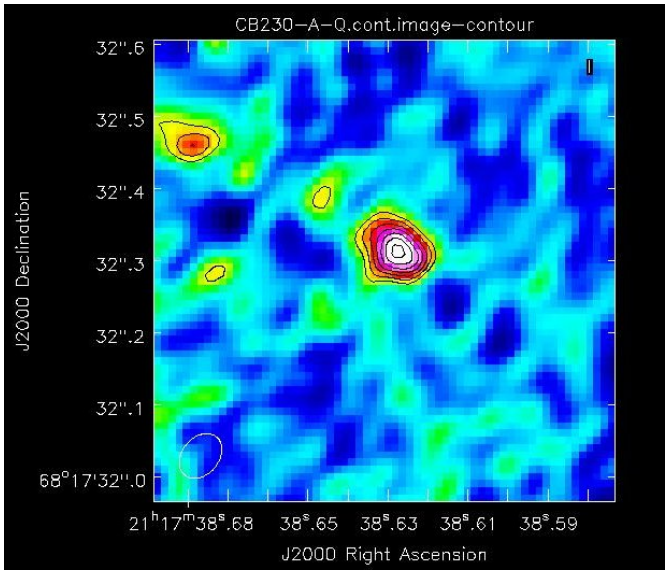
Track 1 pipeline reduction. The contours start at 3 sigma and increase by 1 sigma for all images.



Track 1 manual reduction



Track 2 pipeline reduction.



Track 2 manual reduction.