ALMA Band 2

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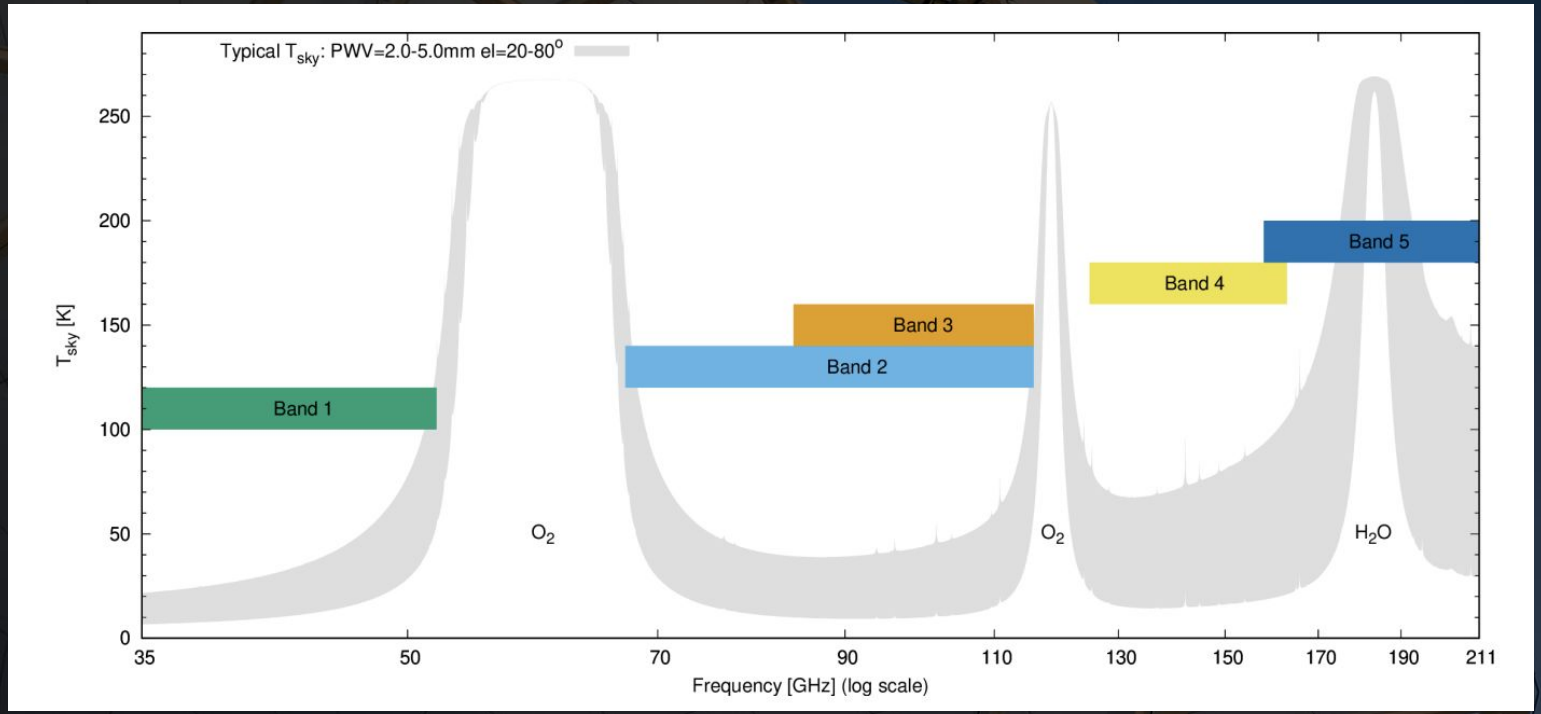
Overview

- The final ALMA Band after ~15 years of observations
- The first WSU Band
- Will be offered for PIs in this Cycle
    - With some important caveats!

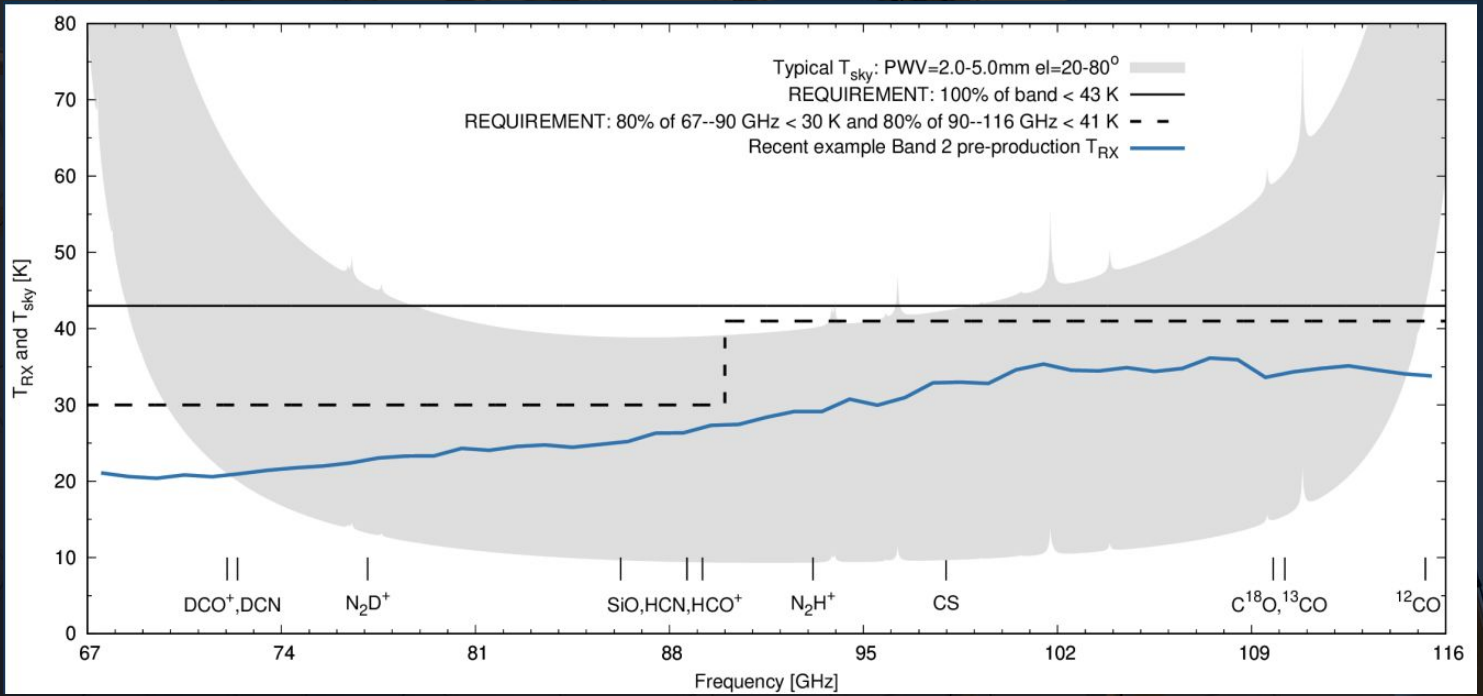
Band 2 Specifications

- Operates from 67-116GHz
- 24GHz total bandwidth (increasing to 36GHz with the WSU)
    - Significantly more than other Bands, so possibility to observe more lines, larger fractional bandwidth for continuum, and bigger spacing between continuum windows
- Basebands are the same as other ALMA bands for now, but more freedom to place within the larger total bandwidth
- Overlaps entirely with Band 3, but extends to lower frequencies

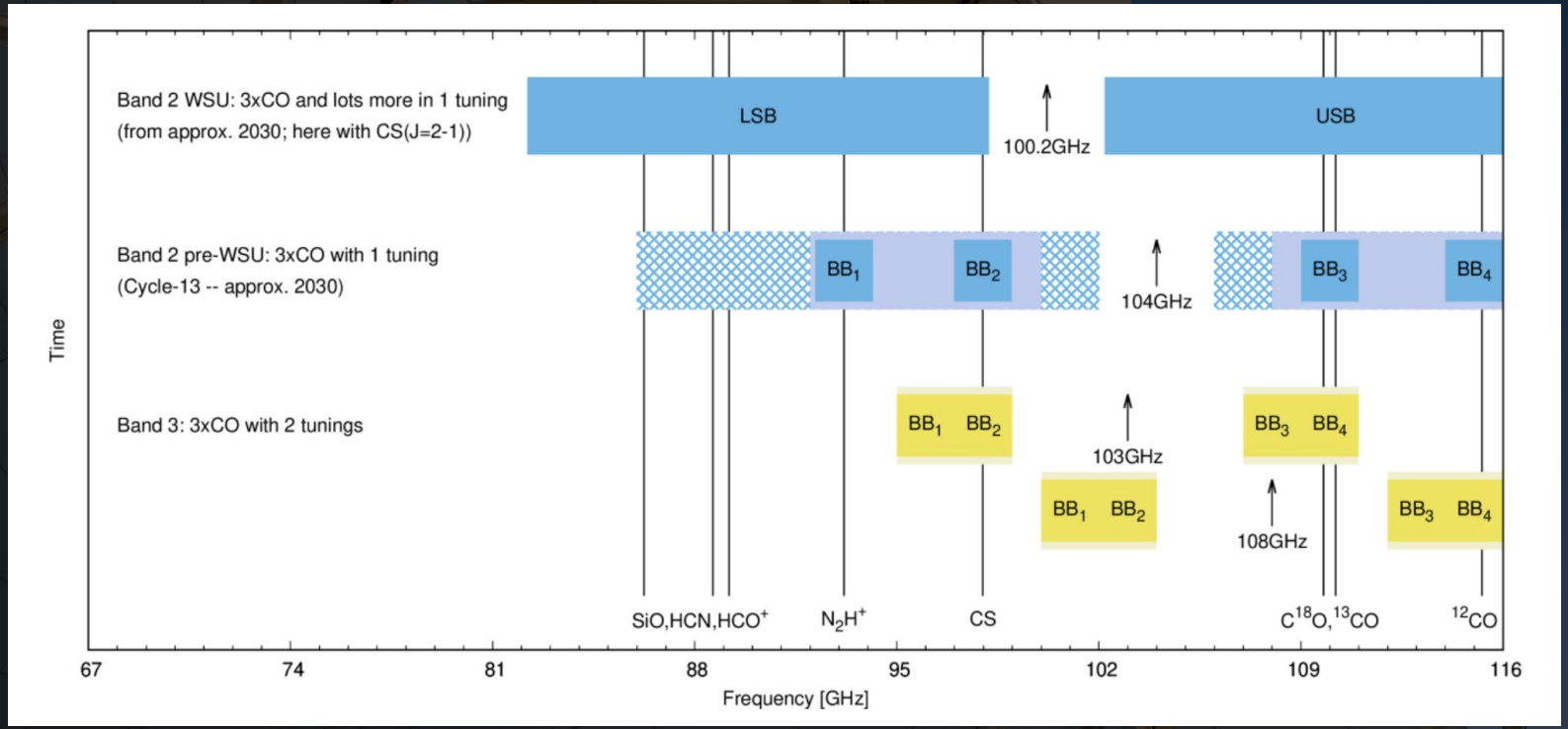
Band 2 Specifications



Noise Characteristics



Can hit more lines in one tuning already



Important Caveat for this Cycle

B2 is only available for 12m observations! No 7m, no TP this cycle

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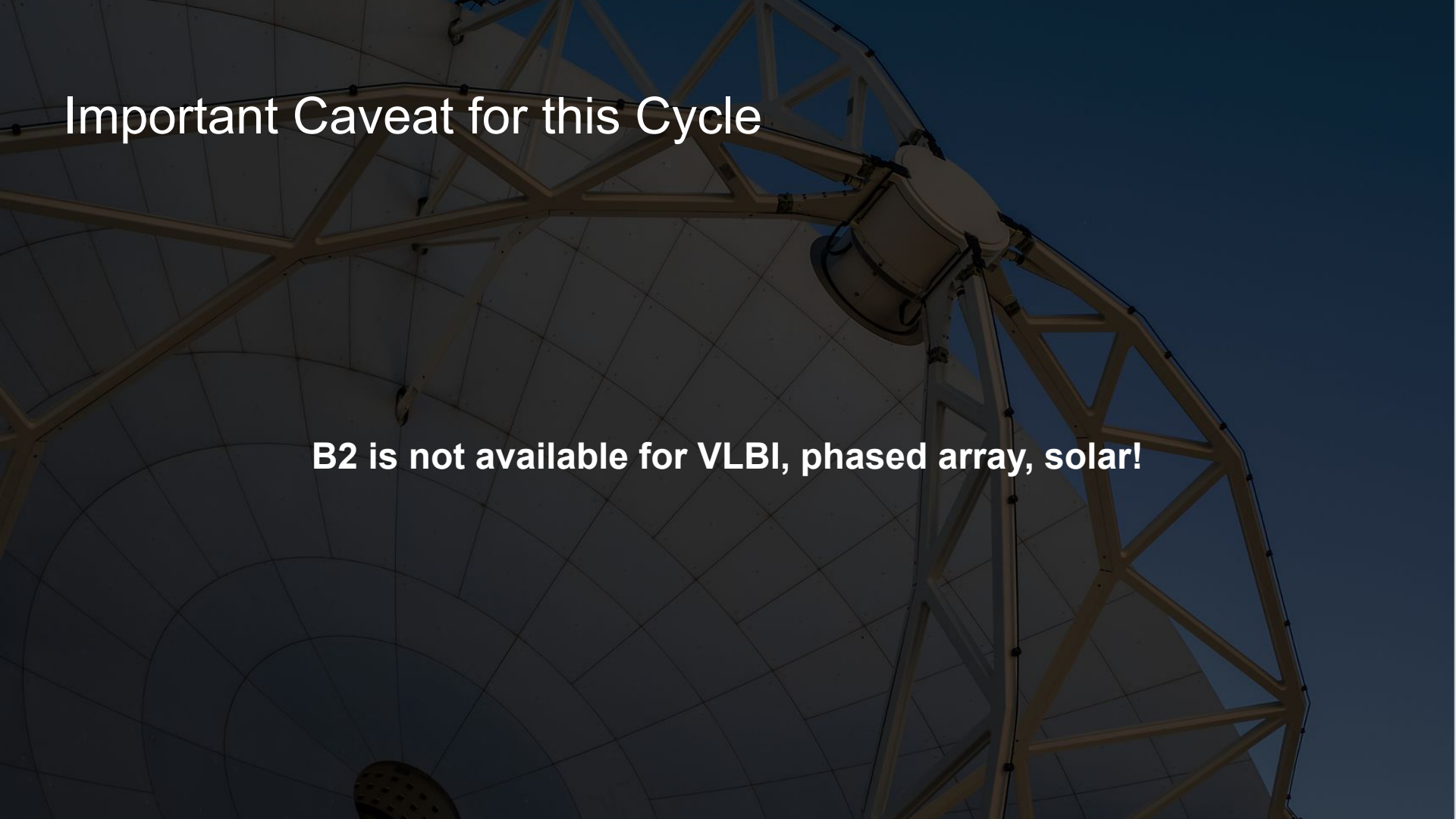


B2 is not available for VLBI, phased array, solar!

Should I use B2 or B3?

- Quick answer: the new OT should decide the best option for you
- If the observations can only be done in B2, then B2 will be chosen
- If they can’t, fall back to B3

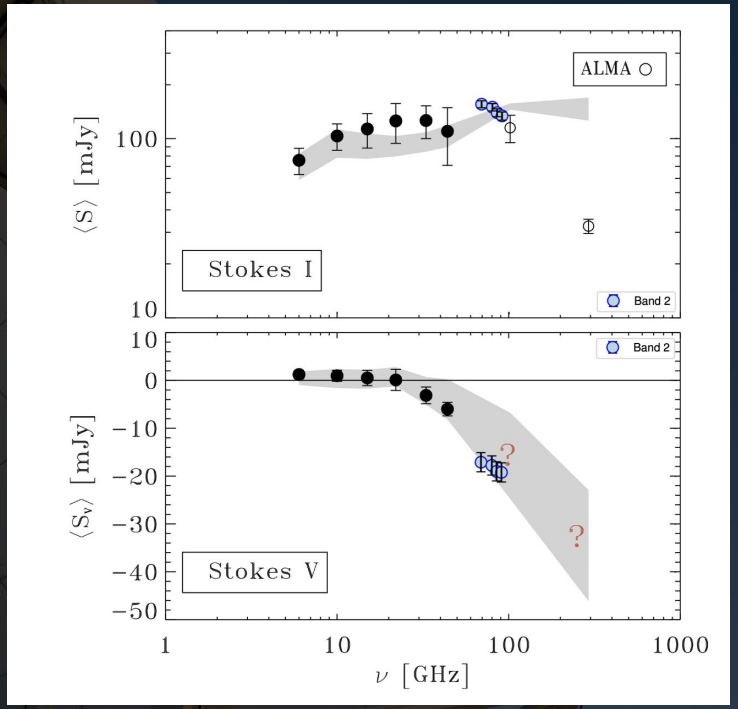
DO NOT PANIC

Science Verification

- B2 science verification took place in Garching, Dec. 2025
  - Dan and I were part of the team
- 4 observations to cover the breadth of potential B2 science
  - Polarization observations of HR5907 (main sequence star)
  - G31.41+0.31, a molecular core near the MW centre
  - Spectral scan of Arp220, a nearby merging galaxy pair
  - Spectral scan of SPT0027-50, a z~3.444 lensed galaxy
- Very successful; data quality was excellent even with only half the antennae being used and relatively short integrations

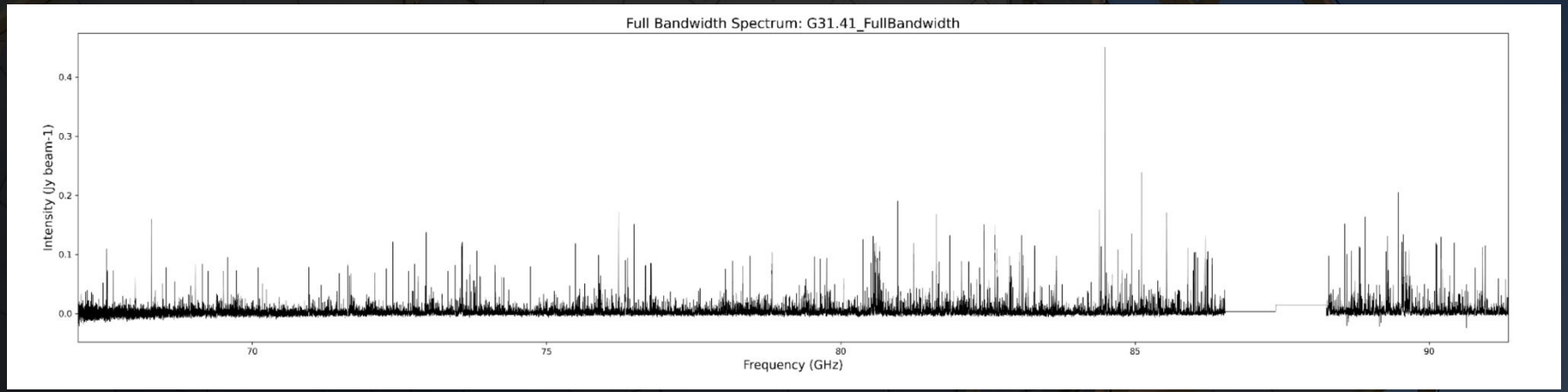
Science Verification - Polarisation

- ALMA B2 extends the SED up to higher frequencies
- Circular polarisation measured at these frequencies
  - Agrees with the models!



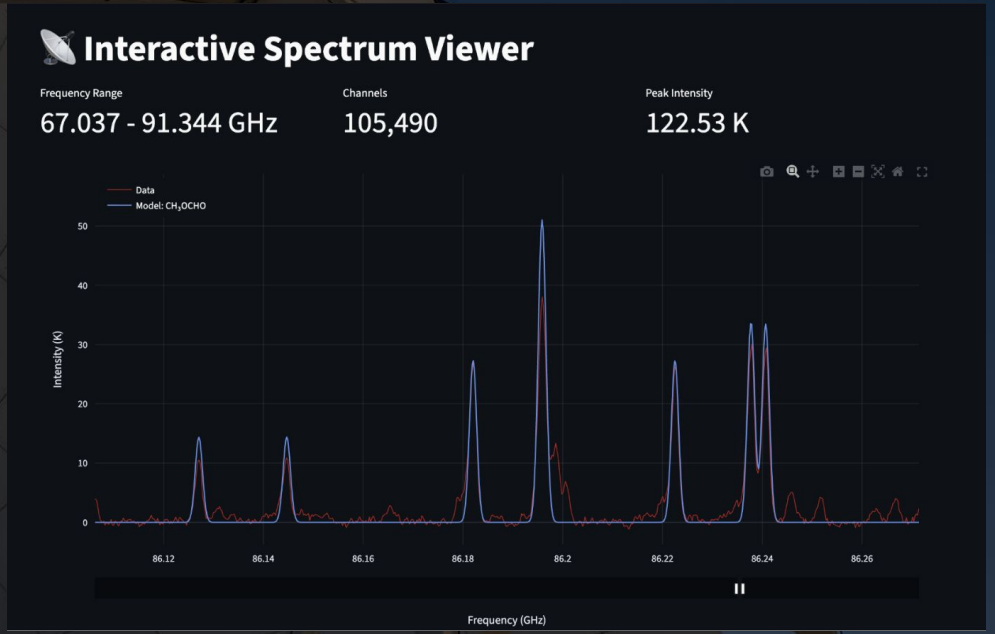
Science Verification - MW core

- Huge amount of spectral complexity seen
  - This is clearly a case where the wide total bandwidth of B2 shines



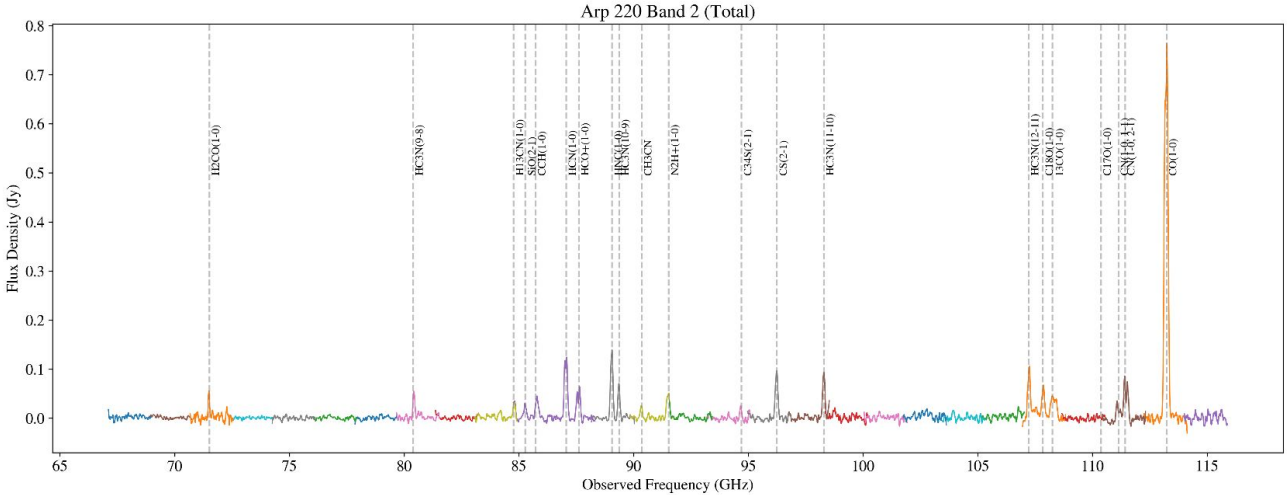
Science Verification - MW core

- Trying to fit with models of complex molecules (3CH3OH, CH318OH, CH3OCHO etc) works pretty well!



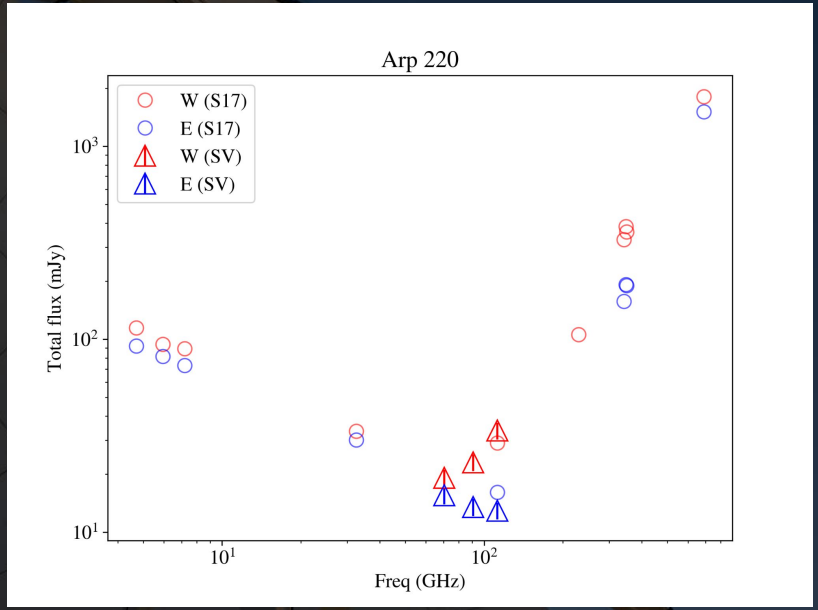
Science Verification - Galaxy Merger

- Again, an impressive amount of spectral complexity seen
- Lines seen down in the Band 2-only frequency range!



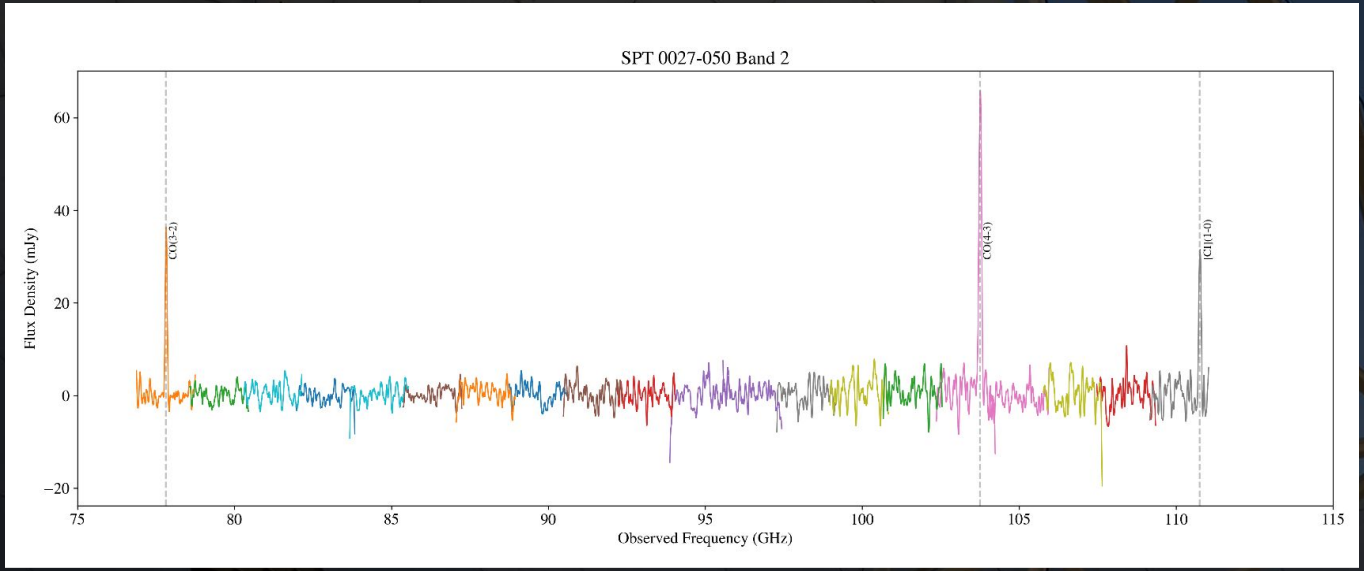
Science Verification - Galaxy Merger

- Can extend the SED between ALMA Band 3/VLA
- Curve seems different between the two merging galaxies, which wasn't obvious pre-B2



Science Verification - high-z lens

- Because of the wider bandwidth, B2 is excellent for pinning down spectroscopic redshifts via multiple line transitions
- Fitted redshift for CO(3-2)/CO(4-3)/[CI](1-0) agree to the third decimal place



Takeaways

- Band 2 is working extremely well, and finally completes the full frequency suite for ALMA
- Increased bandwidth over Band 3 means more scope for line suites, and better continuum
- The OT will decide whether B2 or B3 is more suitable for your observations
- Offered this Cycle for 12m-only, so be aware if you need short spacings