More (last?) gridding3 updates

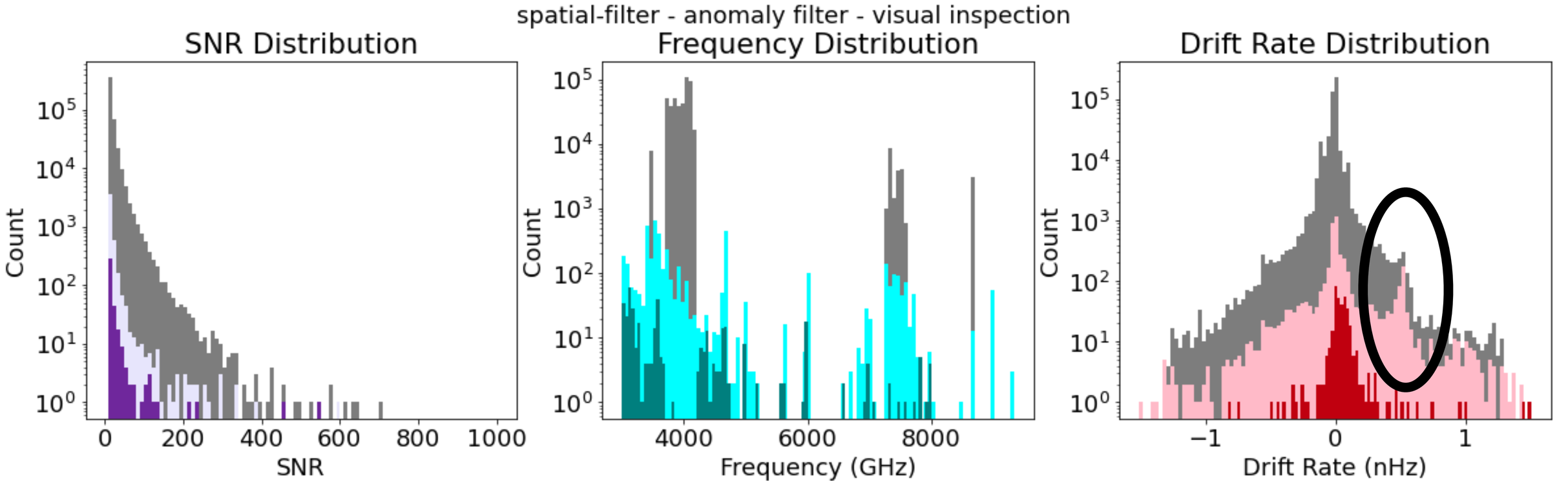
Identification of Drifting RFI, Cross-Correlation Test, and Proposal for Reobservation

Sofia Sheikh - 04/14/2022

ID of Drifting RFI Cluster

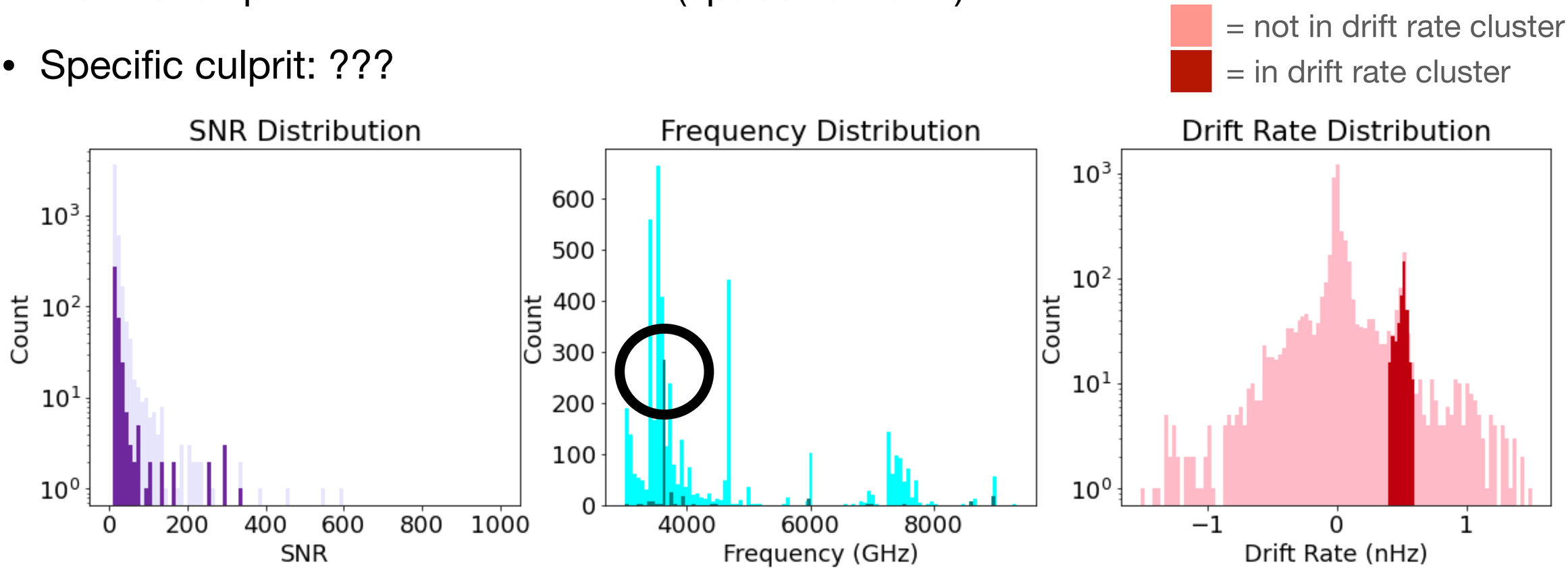
- Last week, Dave pointed out a spike in hits at a particular drift rate
- Are these all associated, and if so, can we attribute them to some particular technology?

= post spatial filter
= post anomaly filter
= post visual inspection



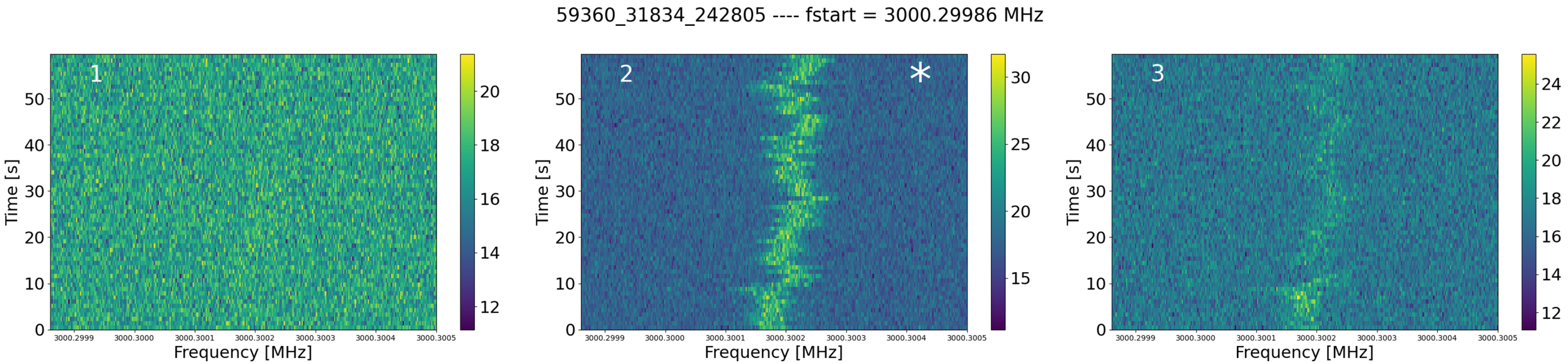
ID of Drifting RFI Cluster

- If we select only hits between 0.4-0.6 nHz…
- We see a spike at **3600-3650 MHz**
- General culprit: "FIXED-SATELLITE (space-to-Earth)”
- Specific culprit: ???



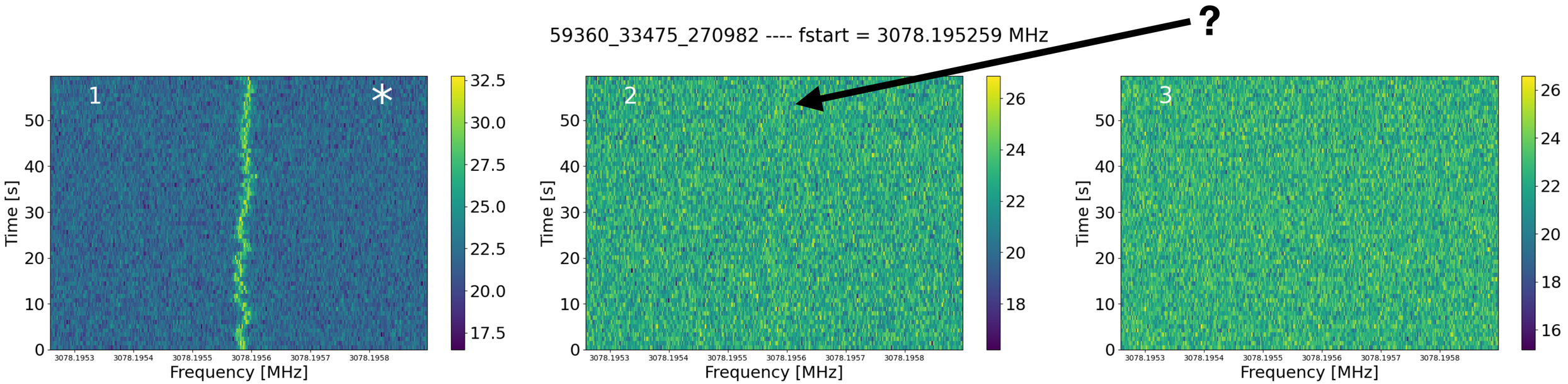
Cross-Correlation Testing

- turboSETI returned ~4500 events that it thought were localized to one beam in gridding3
- It was often wrong



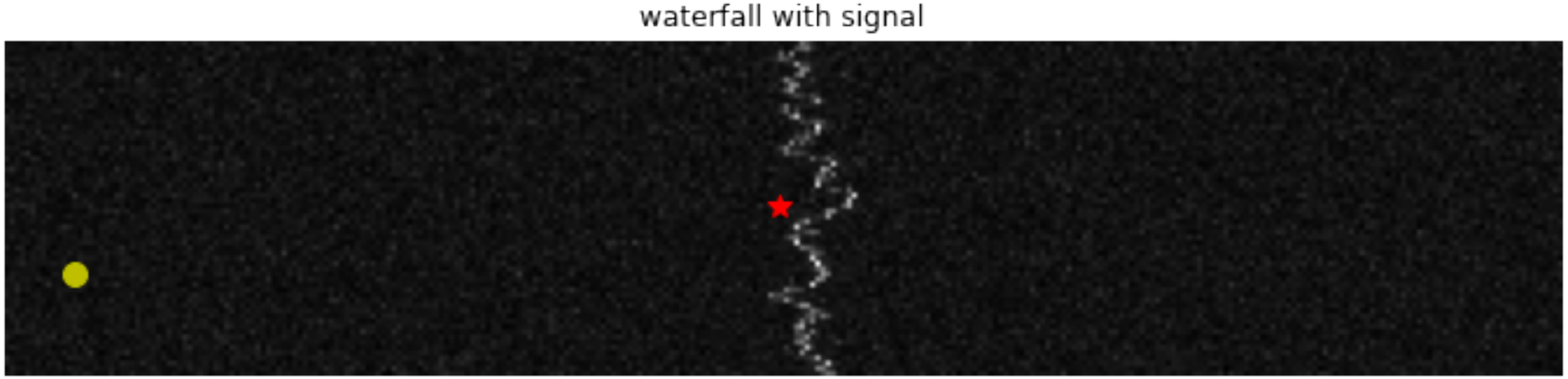
Cross-Correlation Testing

- After visual inspection, got this number down to ~300, but there were still some that seemed to have faint copies in an off-beam
- Cannot tell just by eye!
- Suggestion from last week: do a cross-correlation of the dynamic spectra



Cross-Correlation Testing

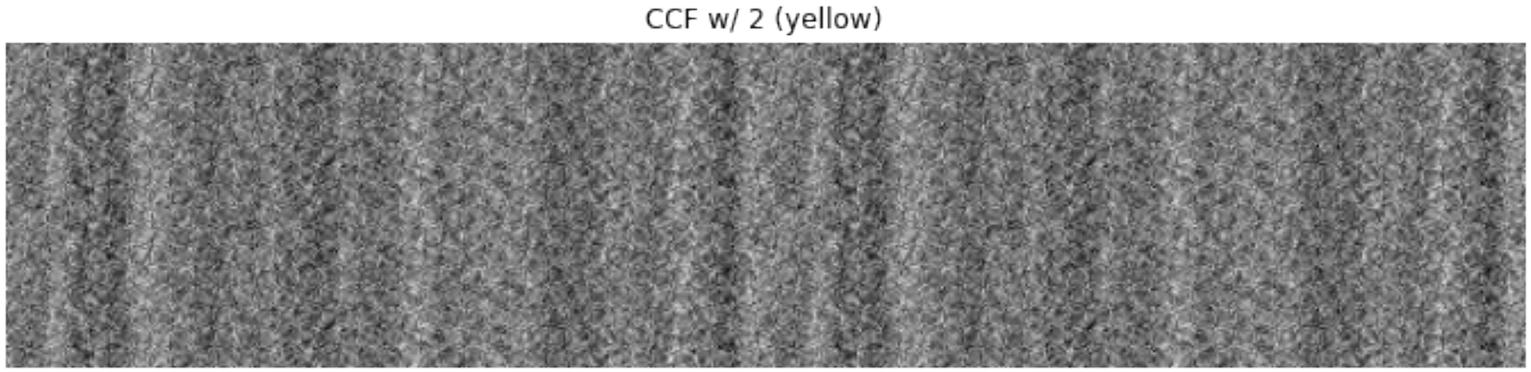
- Suggestion from last week: do a cross-correlation of the dynamic spectra
- Start with dynamic spectrum with the signal in it (ignore yellow and red markers for now



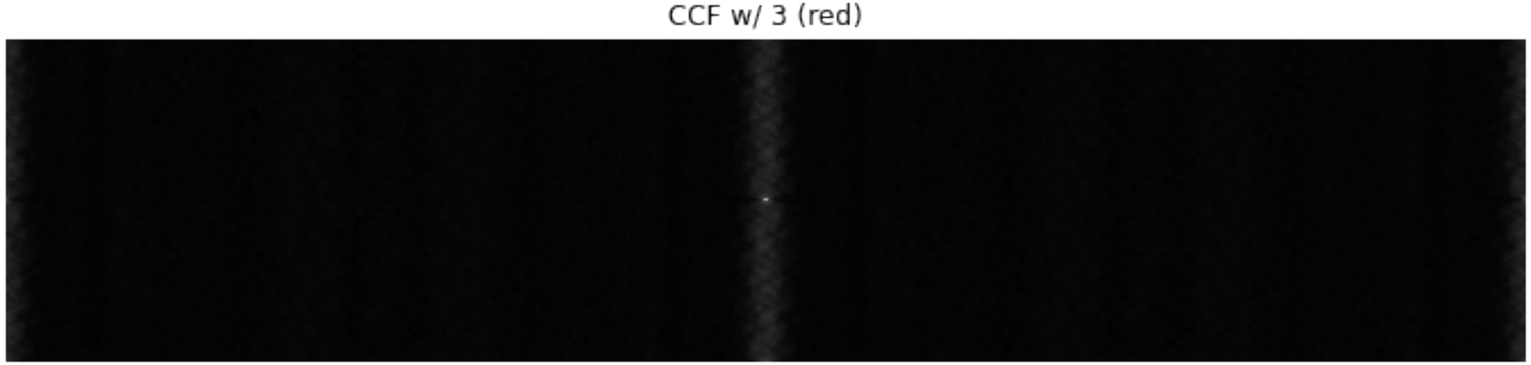
Cross-Correlation Testing

- Cross-correlate that in 2D with the other two beams

No obvious maximum or structure - no match to the signal in beam 2

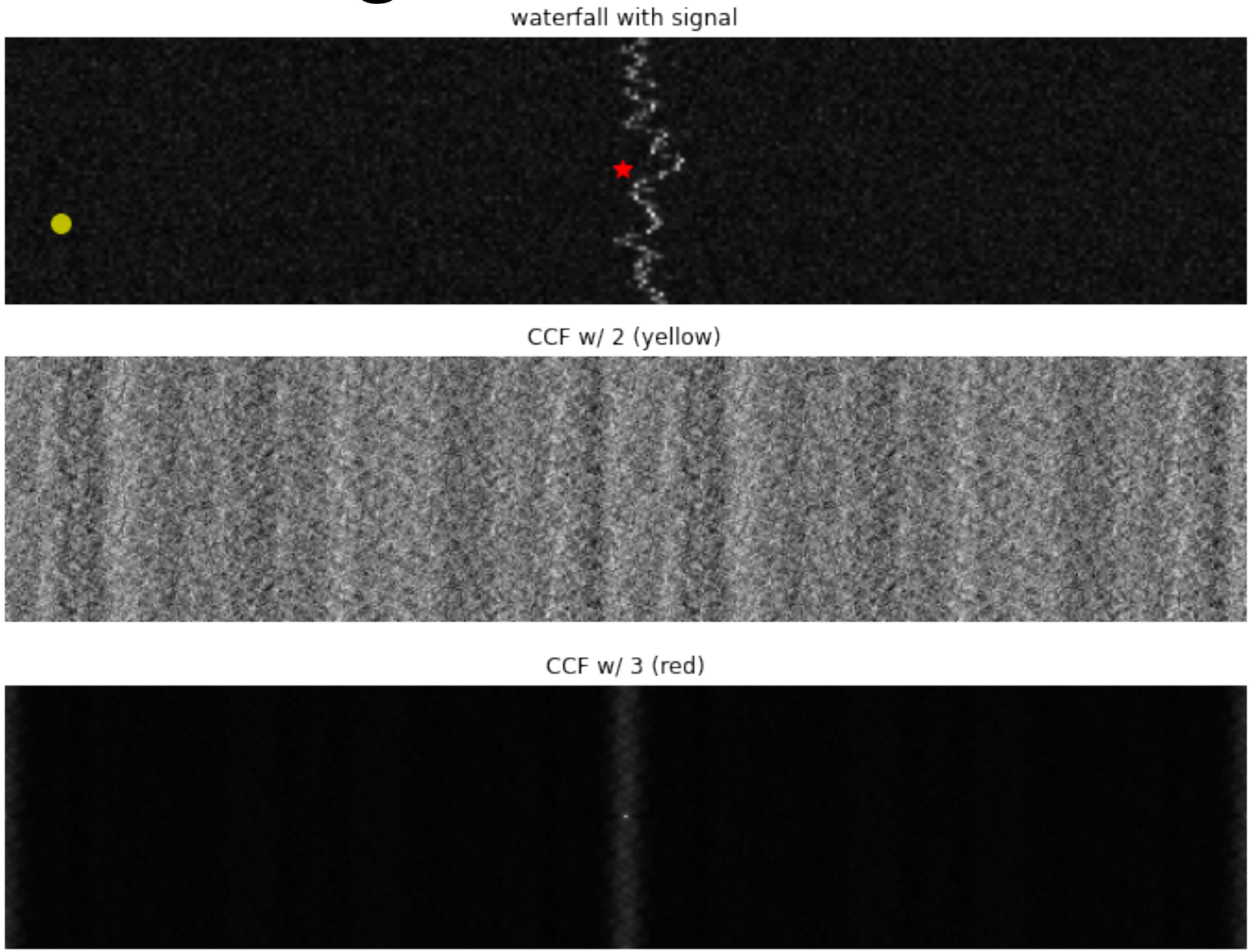


Clear peak at center (location of original signal) - strong match to the signal in beam 3



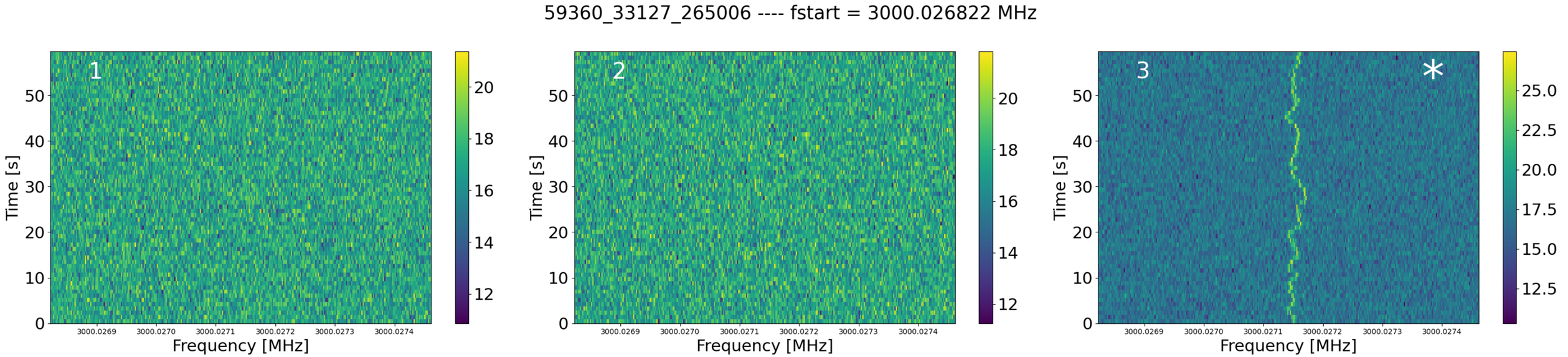
Cross-Correlation Testing

- Yellow dot is the location of the maximum from signal x beam 2 CCF
- Red star is the location of signal x beam 3 CCF
- If yellow, red, or both are centered, *signal is present in another beam and is not localized*



Cross-Correlation Testing

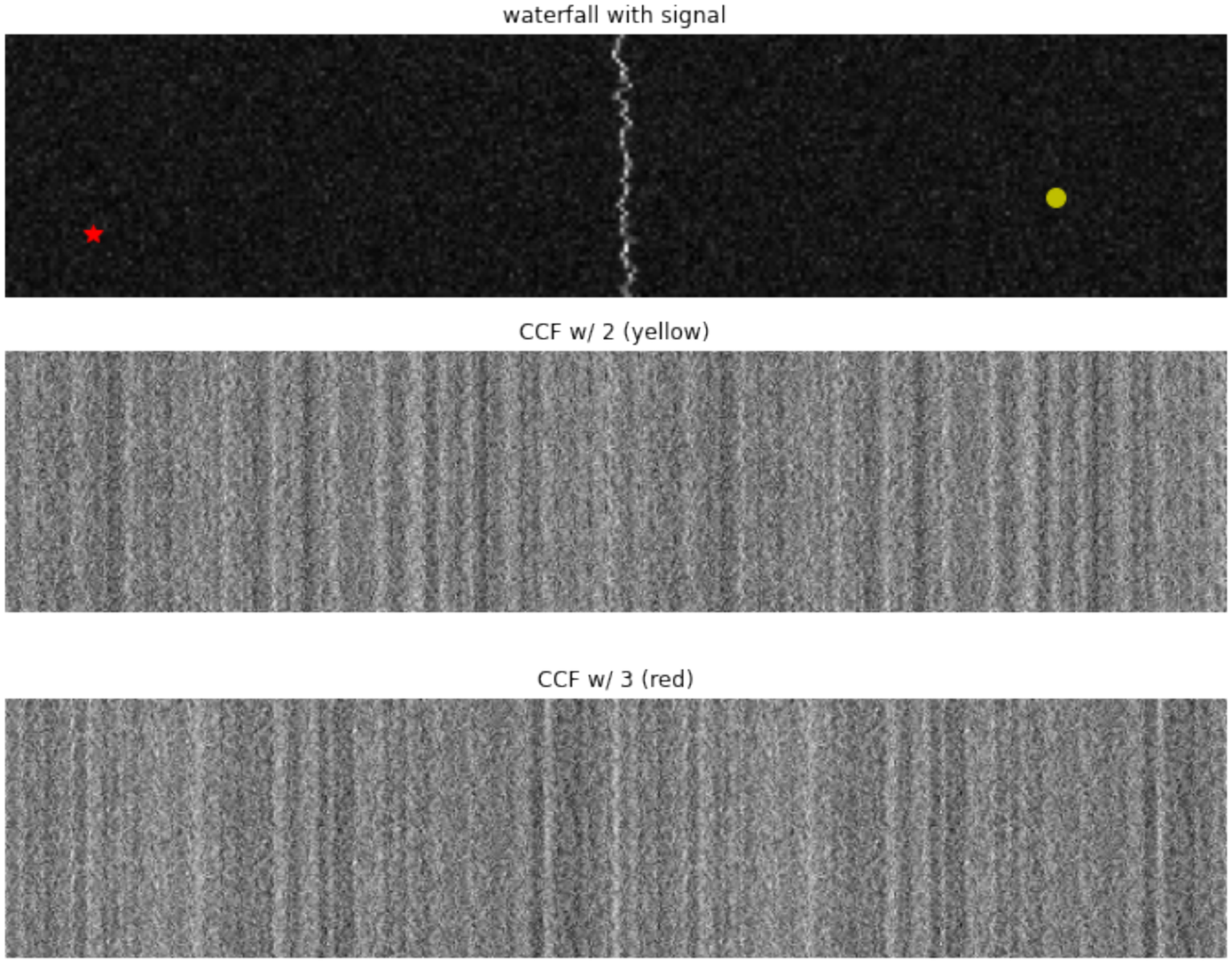
- Comparison to waterfall plots



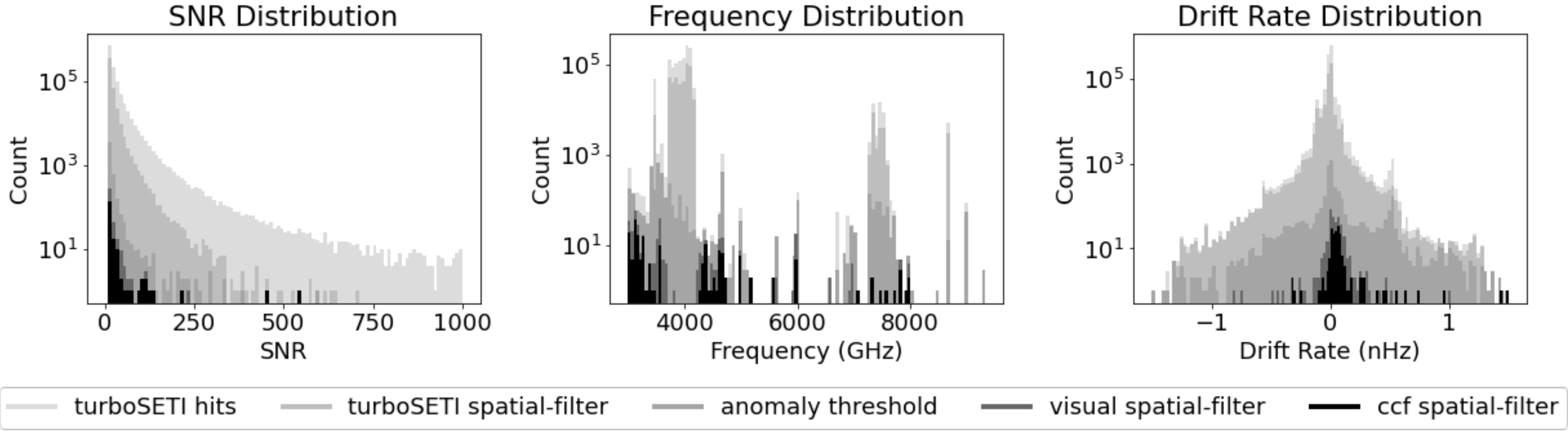
- Picks up things that are not obvious to the eye or turboSETI!

Cross-Correlation Testing

- Applied this technique to all **378** signals I manually flagged
- Returned **179** signals without CCF matches
- Reduced to 47% of original list
- **I think this method shows strong promise for multibeam signal filtering in future work!**
- But… will it work as well in beamformed observations?



We have filtered from 1.2 million hits to 179 signals-of-interest



Reobservations

- What's next?
  - Could keep drilling down into these 179 signals to try to understand them, but diminishing returns for my time investment
  - Proposal: let's just reobserve!
    - First SETI reobservation attempt with the refurbished ATA, can start to sketch out the future process
    - **55 pointing/tuning combos to reobserve**