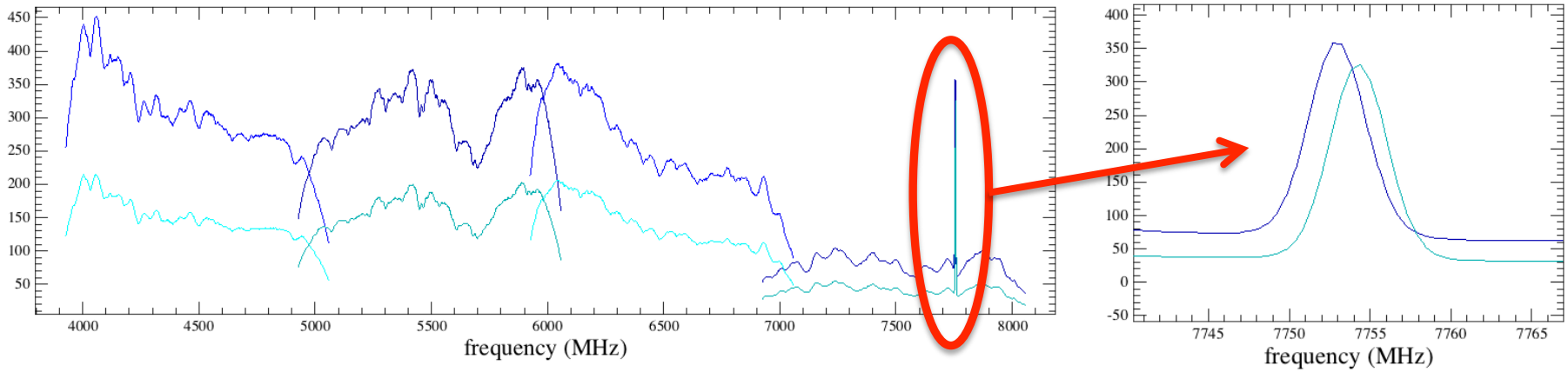
Treating HIFI Artifacts

Flags and Spurs

Overview

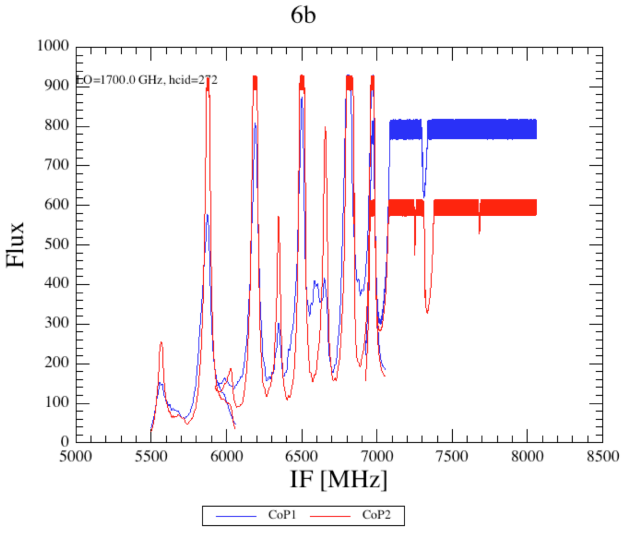
- Artifacts that require attention
- Review of flag types relevant to data processing
- Visualization of flags within HIPE
- Practical example:
  - Spectral scan deconvolution failure
  - Manipulation of flags via scripts
  - Successful deconvolution of cleaned data

Artifacts in HIFI data



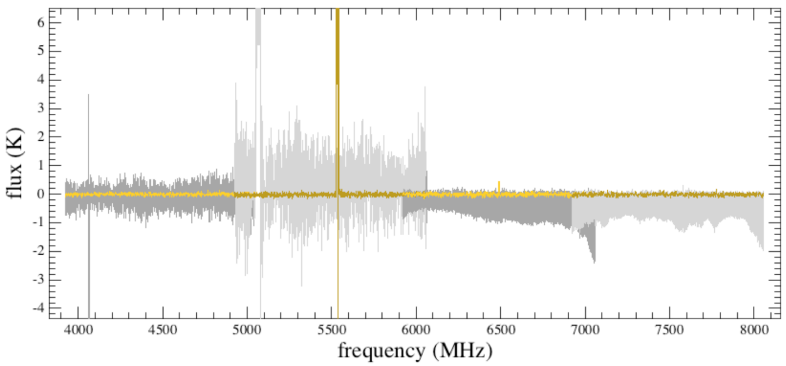
- **Spurs** (above) are features which are generally narrow (<50MHz) and Gaussian in shape and. They can look like astronomical lines, and have the potential to 'fool' users.

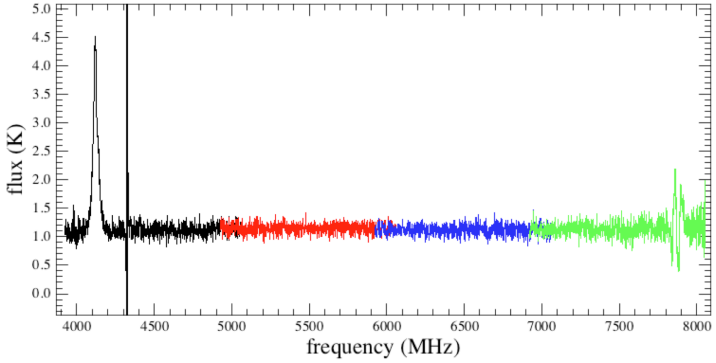
- **Saturations** and underpumped mixers (causing **ringing**) are more obvious (see right)



Spur characteristics and caveats

- Strong spurs, such as the (now fixed) spur in 1a, can knock out an entire dataset.
- Weak spurs can impact only a very narrow region (4b for example)

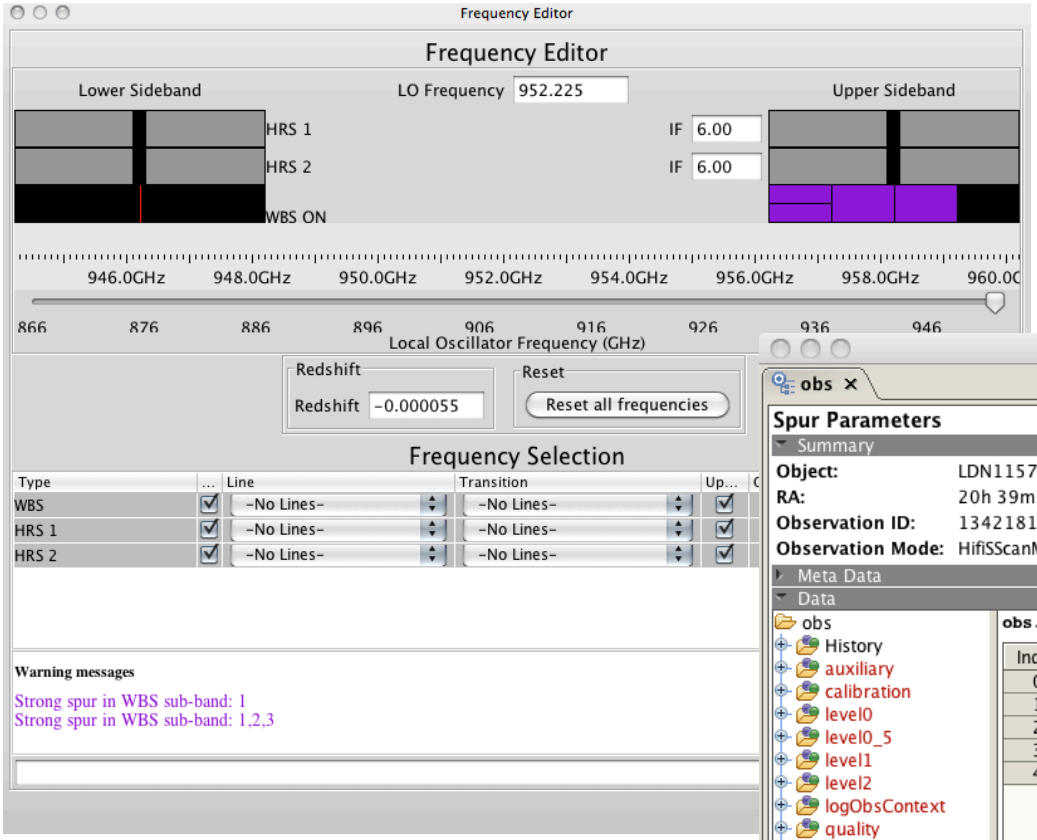




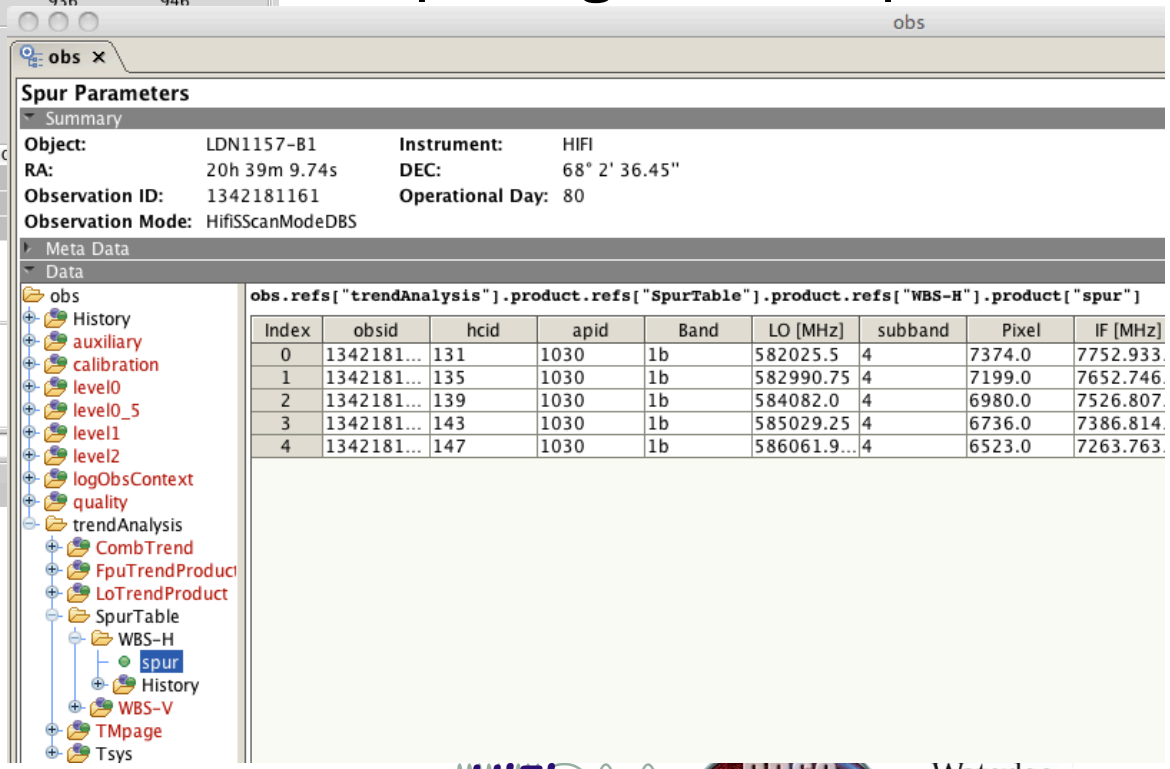
- Since spurs can appear as lines, we only look for them in the loads, and then propagate the flags to the science data.
- They can move in IF over time. If an observation goes on a long time without taking a load observation, the spur can 'migrate' out of the flagged region and complicate data reduction (most notably for spectral scans).
- Spurs can be missed by the algorithm if the load is not as 'smooth' as expected.
- Spurs generally have a predictable position in the IF as a function of the LO frequency.

Spur Reporting

Historical Spur Table



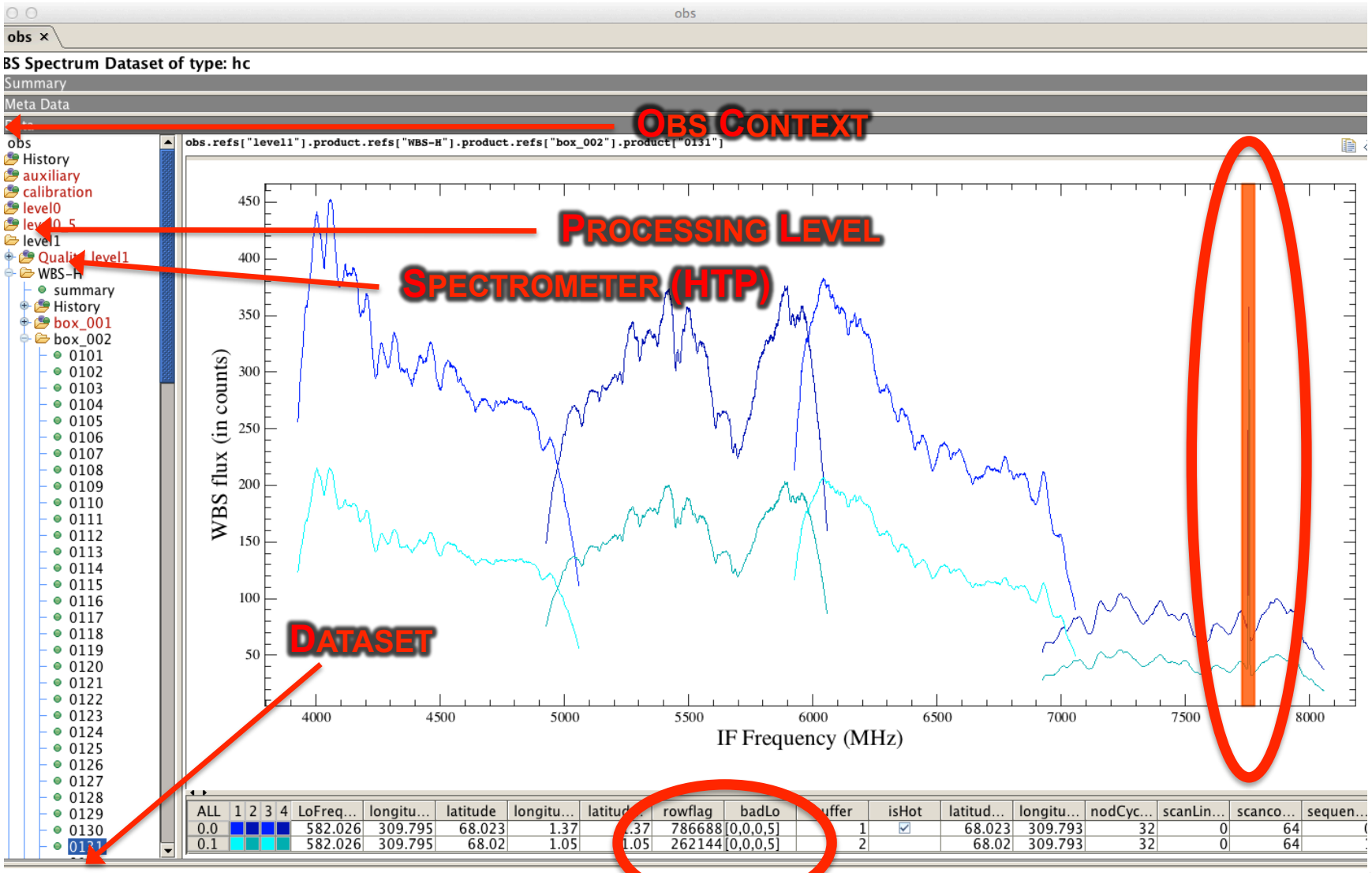
Pipeline generated Spur Table



Flags in HIFI data

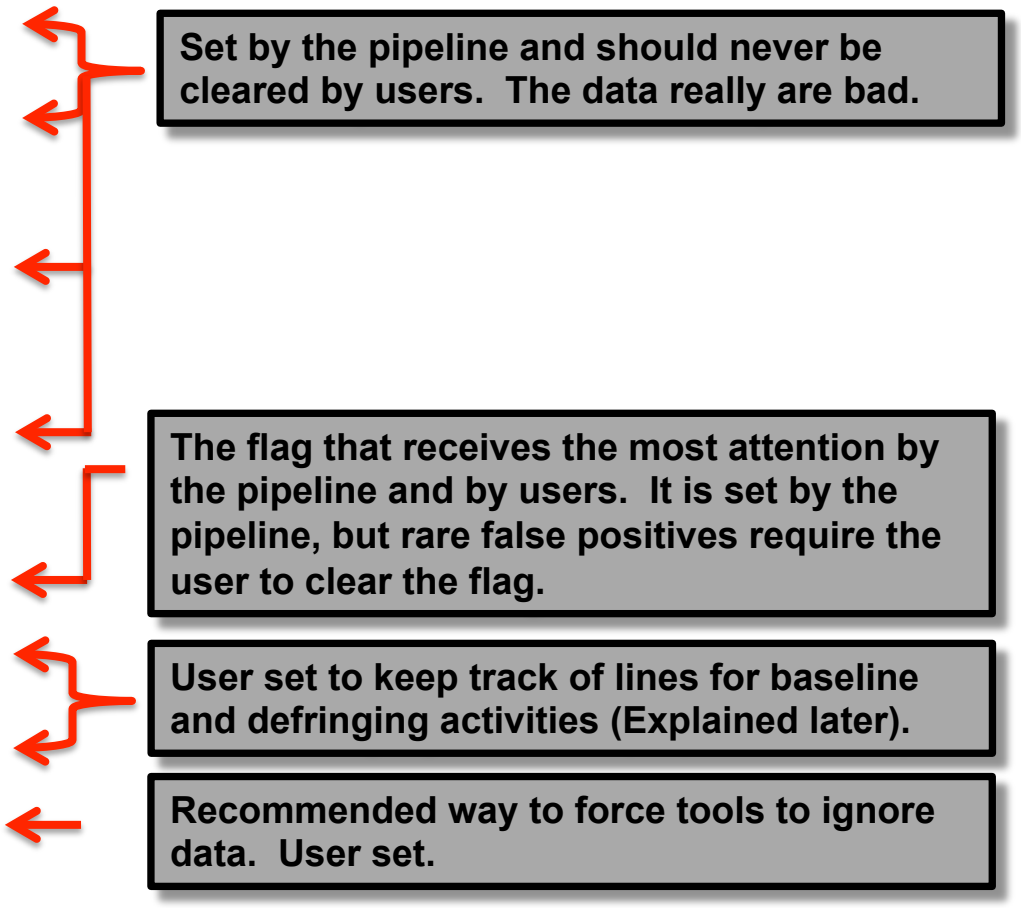
- The pipeline and post-pipeline tools rely mainly on two types of flags
- ROWFLAGS apply to entire datasets
- CHANNEL FLAGS (aka pixel flags) apply to individual data points
- The pipeline sets both types of flags, and while it generally does a good job, it is sometimes necessary to manually intervene

Flag presentation in contexts



Important Pixel Flags

Bit	Software Name
0	HifiMask.BAD_PIXEL
1	HifiMask.SATURATED
2	HifiMask.NOT_OBSERVED
3	HifiMask.NOT_CALIBRATED
4	HifiMask.OVERLAP
5	HifiMask.GLITCHED
6	HifiMask.DARK_PIXEL
7	HifiMask.SPUR_CANDIDATE
28	HifiMask.LINE
29	HifiMask.BRIGHT_LINE
30	HifiMask.IGNORE_DATA



Important Row Flags

Bit	Software Name
18	RowMask.SUSPECT_LO
20	RowMask.IGNORE_DATA
22	RowMask.BAD_DATA

Set by the pipeline based on the historical spur table. Spur is not necessarily present.

Recommended way to force tools to ignore data. User set.

Set by the pipeline when corrupted data is found

- For the SUSPECT_LO flag, there is additional piece of information in the 'badLo' array which identifies which subband is affected.

Tools for flag manipulation

- flagTool: built into HIPE, and useful for setting channel flags.
- Spectrum Explorer. Can operate on datasets but only when detached from the context
- Command line tools based on scripts. Some are packaged with the following:
- HifiFlagVisualizer: available as a plugin

  https://nhscsci.ipac.caltech.edu/sc/index.php/Hifi/HIPI