



# Treating HIFI Artifacts

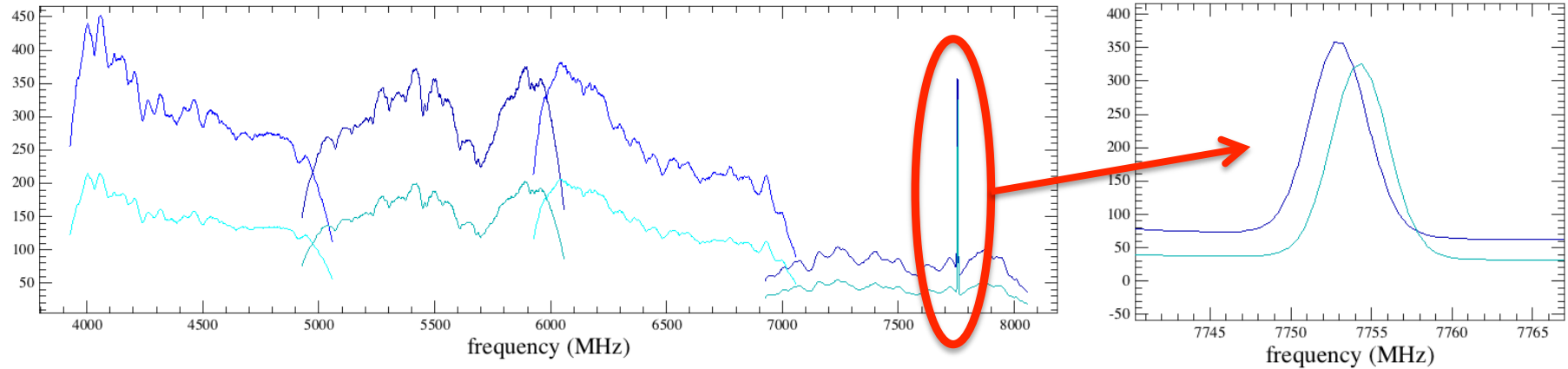
## Flags and Spurs



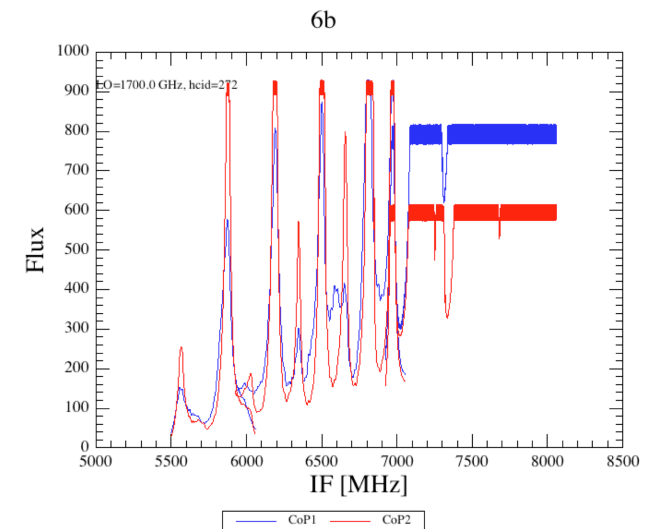
# Overview



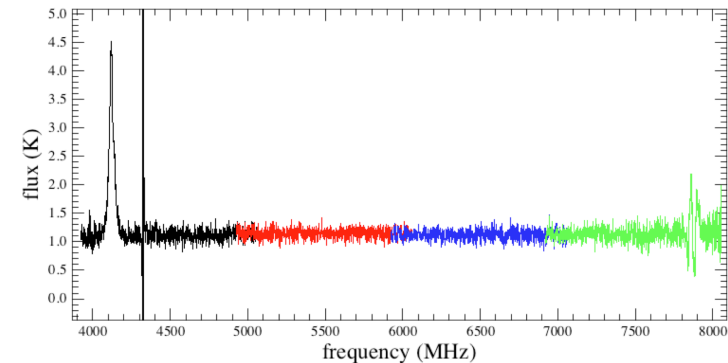
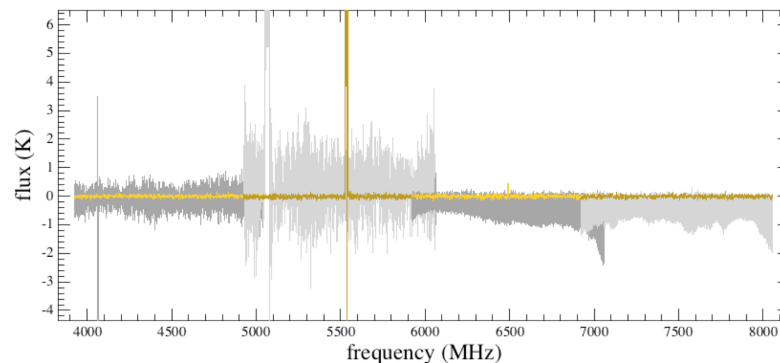
- Artifacts that require attention
- Review of flag types relevant to data processing
- Visualization of flags within HIPE
- Practical example:
  - Spectral scan deconvolution failure
  - Manipulation of flags via scripts
  - Successful deconvolution of cleaned data



- **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)



- 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

Frequency Editor

Frequency Editor

Lower Sideband      LO Frequency 952.225      Upper Sideband

HRS 1      IF 6.00

HRS 2      IF 6.00

WBS ON

946.0GHz 948.0GHz 950.0GHz 952.0GHz 954.0GHz 956.0GHz 958.0GHz 960.0GHz

866 876 886 896 906 916 926 936 946

Local Oscillator Frequency (GHz)

Redshift      Reset

Redshift -0.000055      Reset all frequencies

Frequency Selection

Type	Line	Transition	Up...
WBS	<input checked="" type="checkbox"/> -No Lines-	-No Lines-	<input checked="" type="checkbox"/>
HRS 1	<input checked="" type="checkbox"/> -No Lines-	-No Lines-	<input checked="" type="checkbox"/>
HRS 2	<input checked="" type="checkbox"/> -No Lines-	-No Lines-	<input checked="" type="checkbox"/>

Warning messages

Strong spur in WBS sub-band: 1  
Strong spur in WBS sub-band: 1,2,3

## Pipeline generated Spur Table

obs

obs x

Spur Parameters

Summary

Object: LDN1157-B1      Instrument: HiFi  
RA: 20h 39m 9.74s      DEC: 68° 2' 36.45"  
Observation ID: 1342181161      Operational Day: 80  
Observation Mode: HifiScanModeDBS

Meta Data

Data

obs

- History
- auxiliary
- calibration
- level0
- level0\_5
- level1
- level2
- logObsContext
- quality
- trendAnalysis
  - CombTrend
  - FpuTrendProduct
  - LoTrendProduct
  - SpurTable
    - WBS-H
      - spur
      - History
    - WBS-V
    - TMpage
    - Tsys

Index	obsid	hcid	apid	Band	LO [MHz]	subband	Pixel	IF [MHz]
0	1342181...	131	1030	1b	582025.5	4	7374.0	7752.933
1	1342181...	135	1030	1b	582990.75	4	7199.0	7652.746
2	1342181...	139	1030	1b	584082.0	4	6980.0	7526.807
3	1342181...	143	1030	1b	585029.25	4	6736.0	7386.814
4	1342181...	147	1030	1b	586061.9...	4	6523.0	7263.763

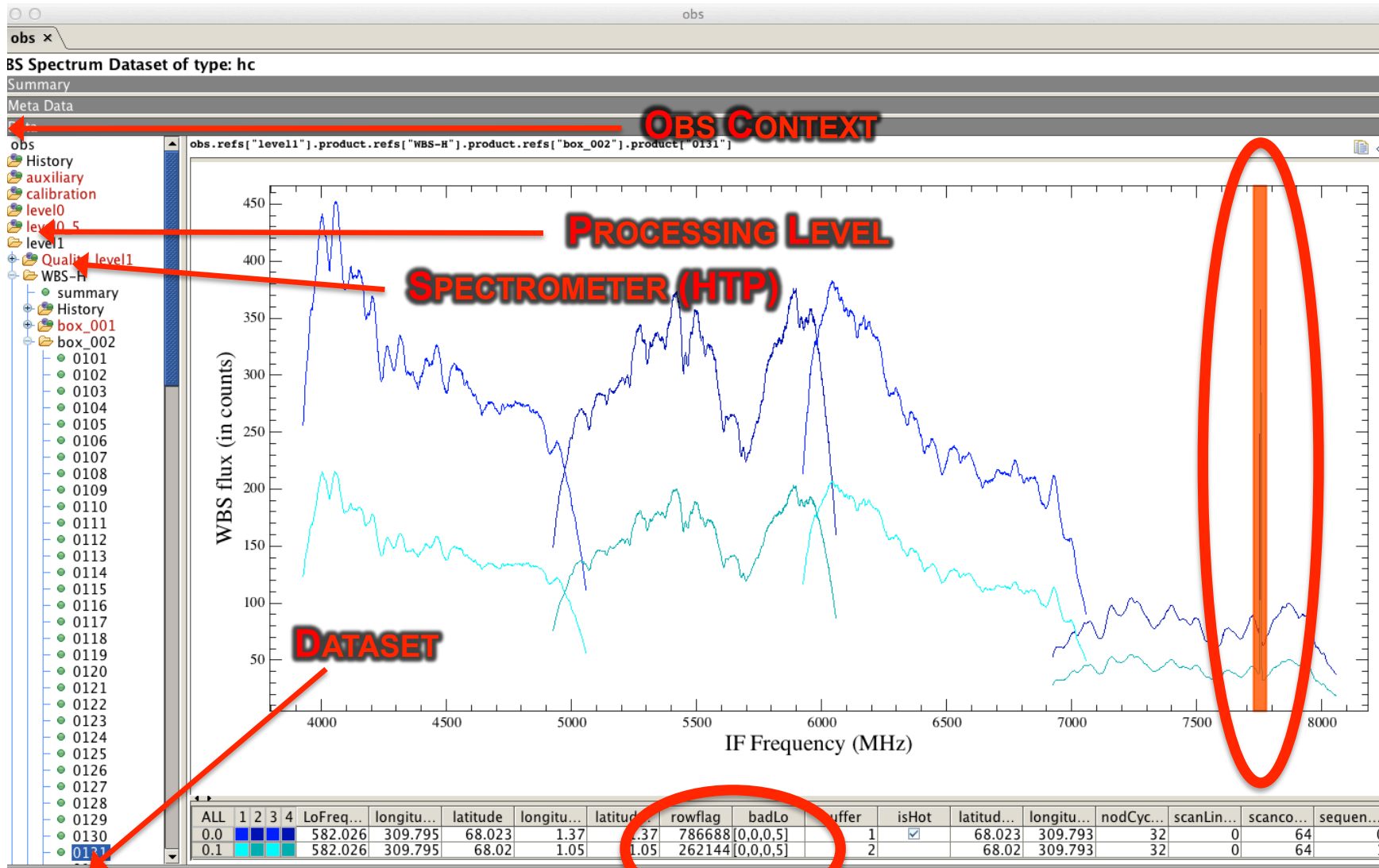




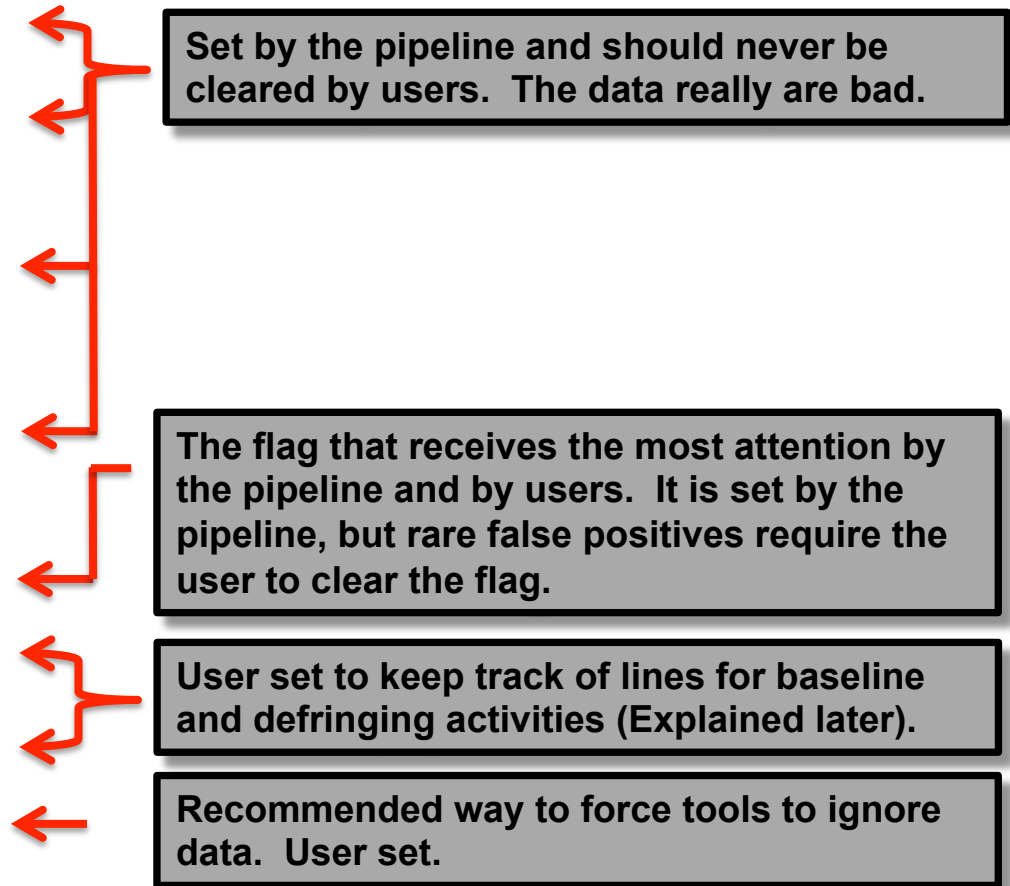
## Flags in HiFi data



- 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



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





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>