RFI in your data

Lower frequencies at the EVLA contain a lot of RFI (worst at L-band).

Plots from a recent RFI sweep : https://science.nrao.edu/facilities/evla/observing/RFI/index

From 1-2 GHz data,
- can get ~500 MHz effective bandwidth (spread out across 1-2 GHz), with very rough flagging
- can get ~750 MHz with careful flagging (manual or auto)

Strategies :

– Our RFI is in-general frequency-dependent, and present on most baselines.

=> Inspect and decide flagging strategies separately per SPW / IF.
Often sufficient to look at only a few baselines. (manual and auto)

– Choose which correlations to operate on (extend flags to others)

=> RL, LR have higher RFI signal-to-noise, and RR and LL have stronger band-shape information (depends on what you're looking for)

– Operate on bandpass-corrected data

=> 'bpass' in a separate step, or use methods that account for uneven bandpass levels.

– Hanning Smoothing
=> when there is very bright RFI with ringing in nearby channels.

Automatic RFI Identification and Flagging in CASA and AIPS

Task “testautoflag” in casapy-test (http://www.aoc.nrao.edu/~rurvashi/TFCrop/TFCrop.html)

(1) For selected data, detect outliers on the 2D time-frequency plane

- Work on 2D data 'chunks' : visibility amplitudes for each source/spw/correlation/timerange.
- Fit a piece-wise polynomial to average spectrum (without RFI), calculate 'fit' and 'stddev_fit'
- Divide out this fitted bandshape ('fit') from the unaveraged data
- Search for outliers – absolute value, or window-sum, or window-stddev > N x (stddev_fit)

(2) Grow or extend flags (across polarization, time, frequency)
(3) Compute flag statistics (% of data flagged per spw, field, etc..), and plot them.
(4) Visualize data and flags at runtime

---- one pass through the data. (many additions on the way....)

Tasks “rflag”/”reflg” in aips

(1) For selected data (bandpass-corrected), detect outliers based on window-rms in time (optionally freq):

- For each channel and few integrations in time, calculate rms of real and imag parts of visibilities
- Calculate mean-rms, and deviations of the rmss from this mean, as a function of channel / SPW
- Search for outliers – local rms > N x (median(rms) + median(deviation)) for each SPW

(2) Grow or extend flags (across polarization, time, frequency, baselines)
(3) Create a compressed list of flag-commands.

---- two passes through the data (additions will appear if Eric/Frazer think they're needed)

AOFlagger (LOFAR software) – available in the building (See CAS-2676)