PSEC-3 Analog Bandwidth

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Quantifying BW

• Previous BW measurement 250-300 MHz (-3dB):

Qualitative observation of attenuation along input line
- function of input frequency?
- can we quantify?

New data: 300 readouts of sine waves at each frequency (50 MHz-2GHz)
Analysis

- Overlay sine data from same cells
- Histogram specified range of cells
- Get amplitudes from peaks of histogram

Example (400MHz):

Sine data over 256 cells -->

From histograms, amplitudes compared for 3 groups of cells:
- 1-5
- 61-65
- 141-145
More examples: (CW from top left 100MHz, 400 MHz, 1.2 GHz, 700MHz)
Bandwidth along input line:

Comments:
- Bandwidth highly dependent on location along input line:
  - First 5 cells have -3dB ~1.3 GHz (excluding 800MHz region)
  - Need to take more data to confirm trend 600-900 MHz
  - Reducing input line resistance should increase BW for later cells
- -3dB of cells 61-65 and 141-145 (~300MHz) agrees with previous measurement
Bandwidth with gain=2 amplifier

Comments:
- On-board amplifier (channel 4) unstable with unity gain – works with gain=2
- -3dB BW ~700 MHz for first cells
Summary

• Take more data in 500-900MHz range
  – Perhaps ADC clock started running faster?
  – Or other issue?
  – Or robust?

• Can extract effect time constant along input line as a function of frequency
  – Get RC along line
  – We know we have high series R – bad
  – Useful for PSEC3-a input line design (basically reduce R as much as possible)

• Can we extend BW of first few cells to entire input line?
  – Intuitively, seems possible with careful design