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Out of Band Noise Source

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This report summarizes the analysis done to understand the transfer function of the Out of Band Noise source circuit. The question of understanding the circuit was brought up when Steven noticed high variance upto 50 MHz in the raw spectra of the calibrator loads collected in the lab with Rcv01 in Oct 2019.

The circuit of the Out of band noise source is essentially the same for Lowband, Midband and EDGES-3 (expect for a few components have different values) and consists of the following three stages:

- Inverting stage 1 - U1
- Low pass filter
- Inverting stage 2 - U2

The circuit was simulated in ADS as follows:

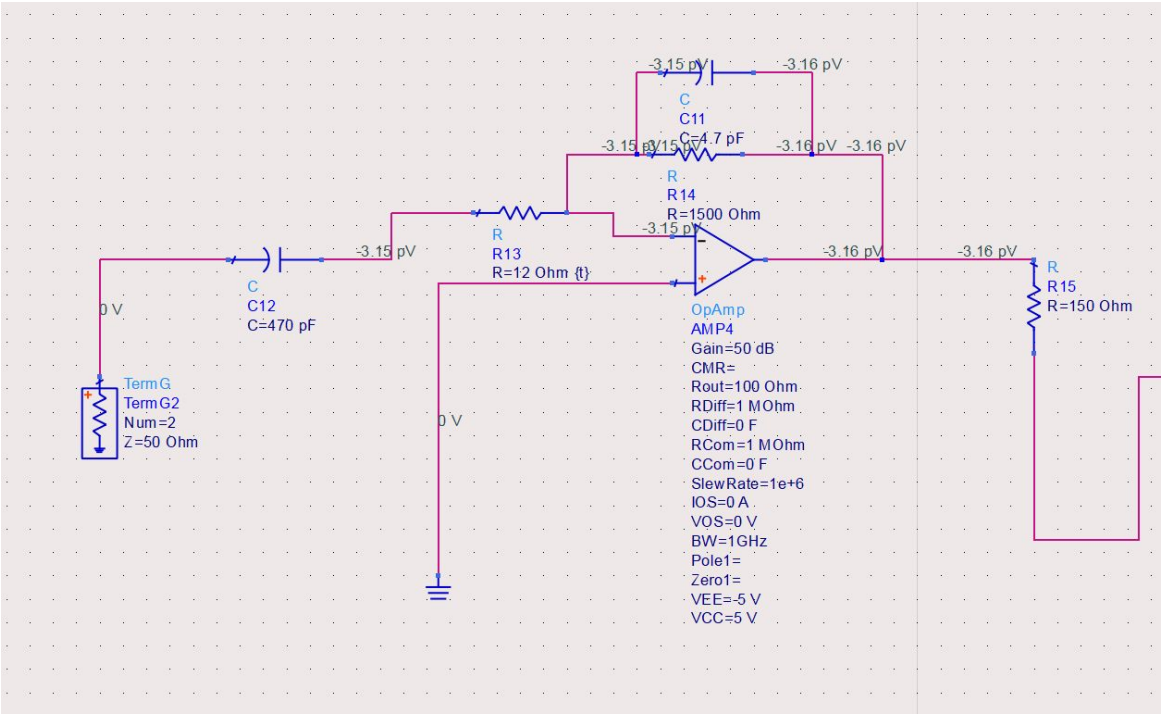


Fig1: ADS simulation of the stage 1 inverting amplifier. The values of the components are taken from Memo 116

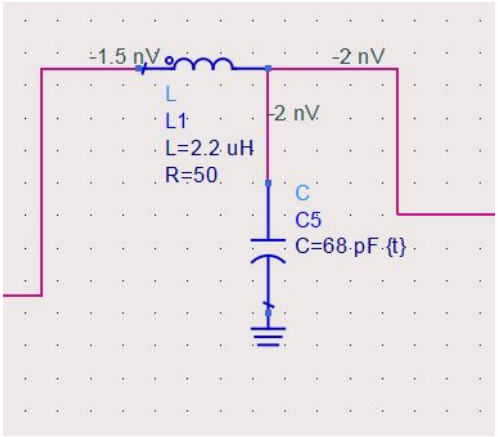


Fig2: ADS simulation of the Low pass filter. The values of the components are taken from Memo 116

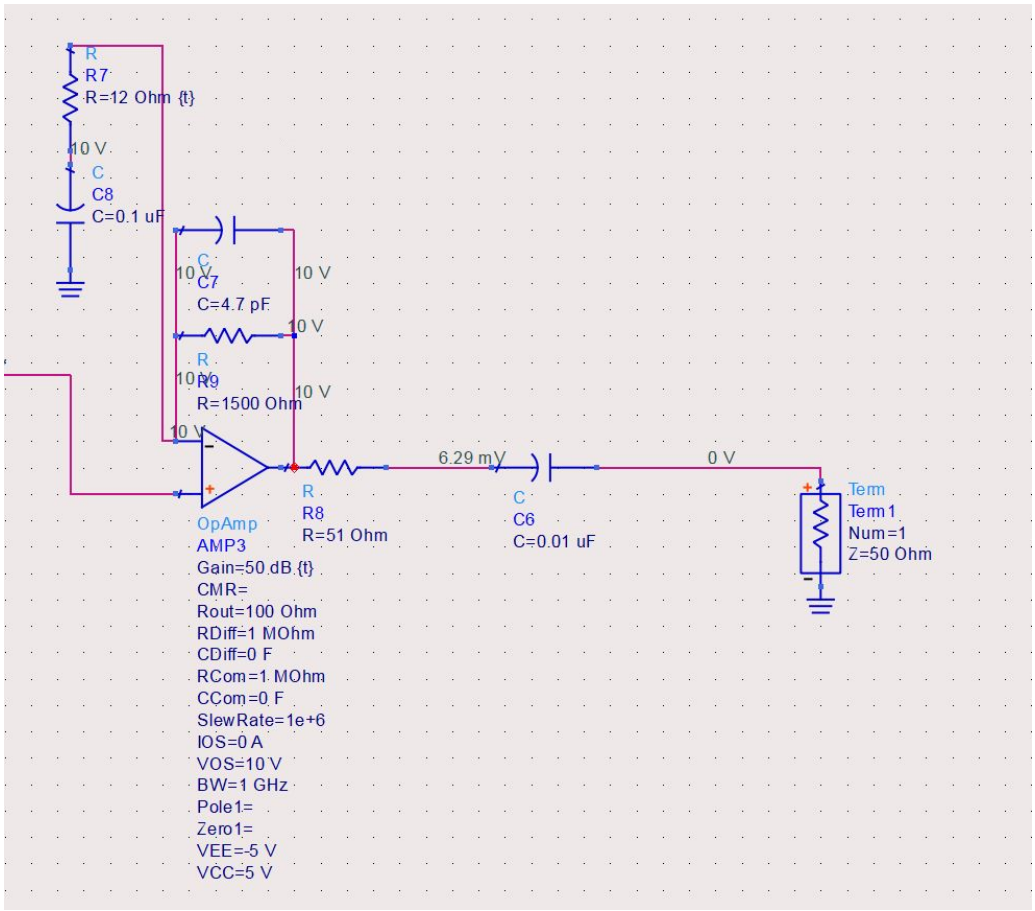


Fig3: ADS simulation of the stage 2 inverting amplifier. The values of the components are taken from Memo 116

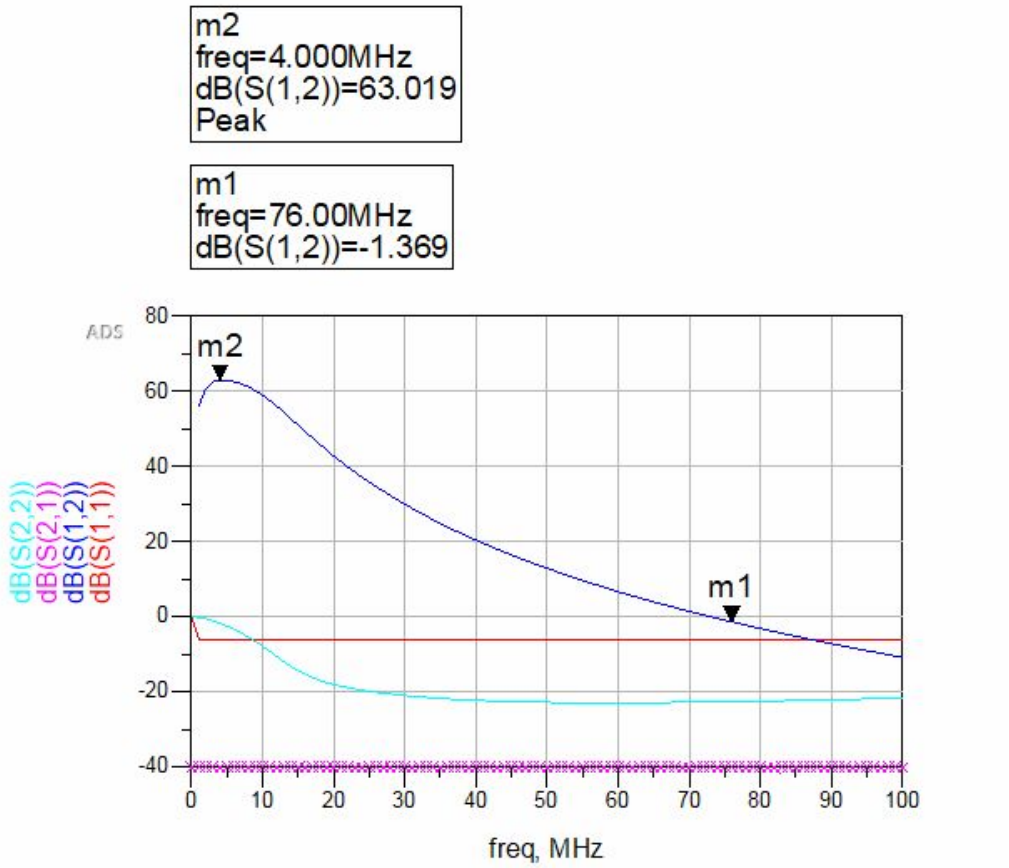
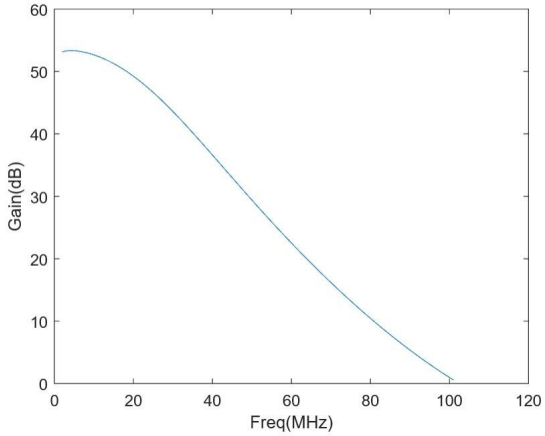


Fig4: The cascaded gain of all the stages combined. The S12 corresponds to the gain since port 2 was defined to be the input port.

For comparison, the below plot shows the gain that was calculated analytically for the same circuit using Alan's code.



We notice a higher peak gain with the ADS simulation compared to the analytical calculations. We also see a cut of the gain (<0dB) at much lower frequency (77 MHz) vs the analytical calculations (~ 100 MHz).

While designing and tuning the circuits we noticed that the gain values and shape depend a lot on the ICs internal parameters. Hence it has to be investigated in detail.