

**IEEE P802.3at Task Force  
Power Via MDI Enhancements  
350uH Ad hoc**

# **Sensitivity of SCM to OCL**

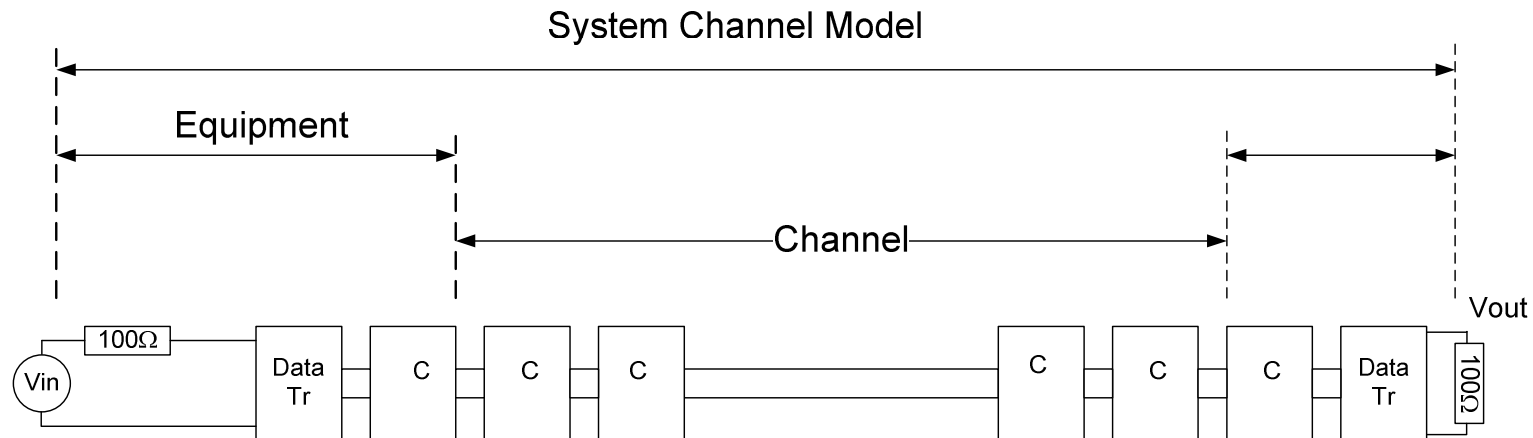
**PRELIMINARY RESULTS**

Yair Darshan / Microsemi Corporation, June 6, 2008



# Terms and abbreviations

- **Channel Model =CM** : Cable + 4 Connectors forming 25 Ohms at 100m round loop on data pairs
- **System Channel Model = SCM**: Channel + 2xData 100BT Transformer connected to signal source with 100 ohm series impedance and loaded with 100 ohm termination
- **Transfer Function =TF**: The ratio between the voltage at the load termination to the signal source as function of frequency. The TF includes the effect of the source and load impedance for simulating the droop effect as function of the inductance of the data transformers
- **Low Frequency Model=LFM**: The System Channel Model used for derivation of the Transfer Function is limited to frequencies <1MHz
- **LM, Magnetizing Inductance**: Data transformer inductance
- **Idc**=The total dc bias current that the transformer is exposed too as a results of the data and the channel imbalance during PSE operation.

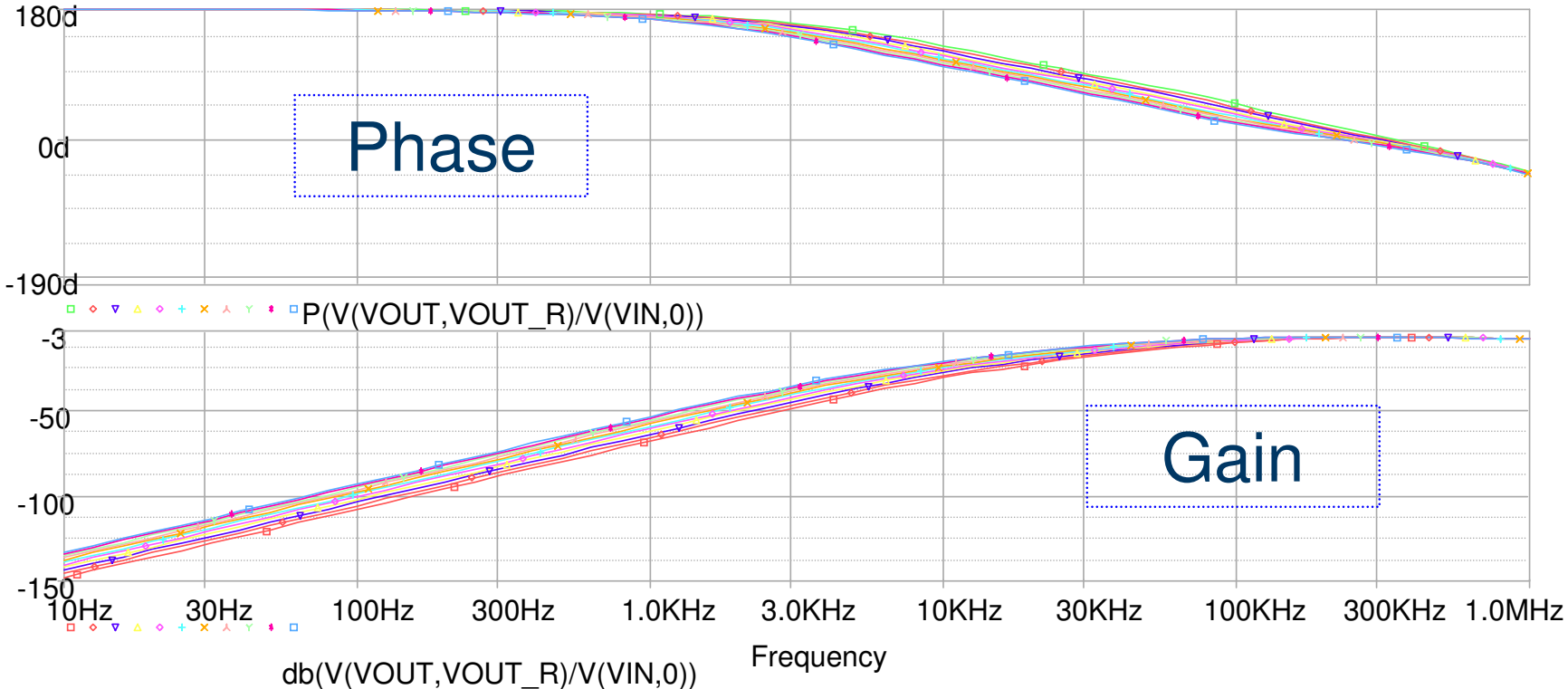


# Finding SCM sensitivity to OCL

- SCM represents the Gain/Phase vs Frequency.
- Its inverse transform should give equivalent Time domain behavior.
- If Gain/Phase changes vs OCL are negligible we determine that SCM time response is sufficient to ensure data integrity under BLW conditions



# System Channel Model Gain/Phase OCL from 150uH to 350uH



# What is the relevant Frequency band

- List of facts
- OCL=350uH was defined at 100KHz min.
  - No requirement below 100KHz and BLW affected by OCL.
- BLW content have frequencies below 100KHz
  - PHY vendors ignore frequency below 100KHz or a bit higher.
- System Channel Specifications require to support maximum attenuation of -32dB at 100MHz and -11dB at 1MHz
  - This limits the possible low frequency limit in the questioned bandwidth to >4KHz
  - From looking at FFT results on BLW signal we can see that low frequency magnitude above 1MHz is higher by ~100% then the magnitude of signals below 100KHz, therefore filtering frequencies below 100KHz is a must in order to process error free data ..
- As a result: practical lower frequency band is 100KHz.



# Preliminary conclusions

- Gain change is negligible at 100KHz.
- Phase change: 25deg. It is the same changes we would get if OCL changes from 1000uH to 350uH which is normal behavior for OCL under dc current for 0 to 15mA.
- Conclusions:
- Gain/Phase representation shows little changes in performance. The time domain representation should show similar negligible effect on performance
- Using Minimum OCL as low as 150uH should not affect the behavior under BLW.



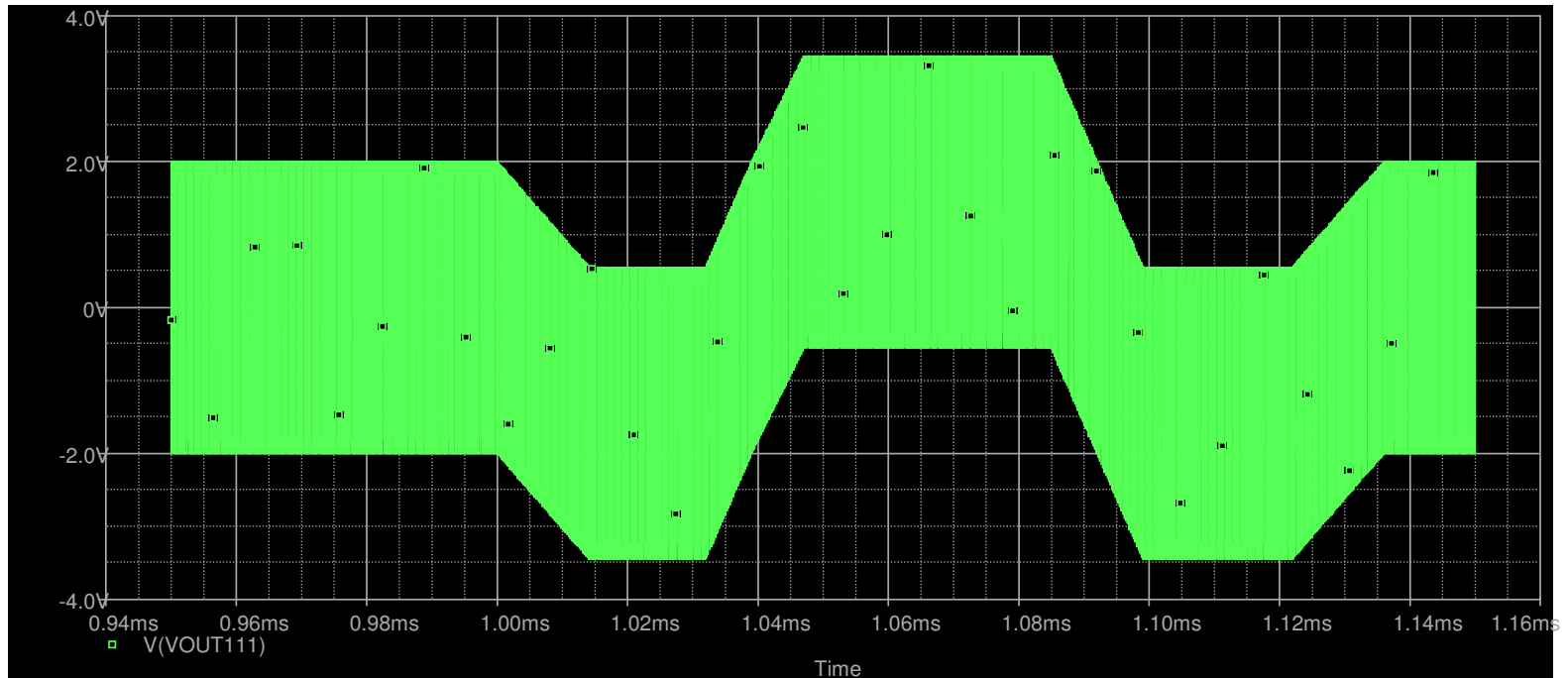
# Reference Material



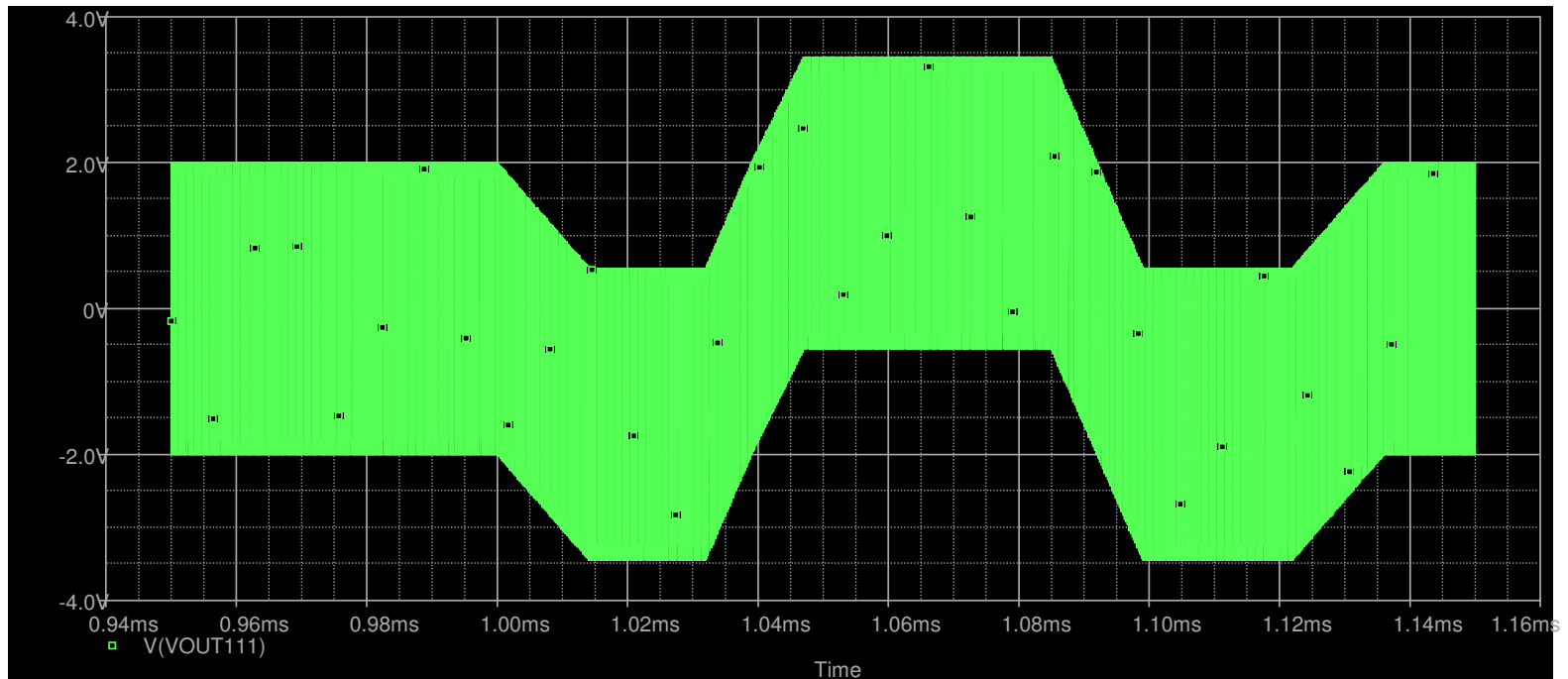




# BLW Time Domain Simulations - Preliminary

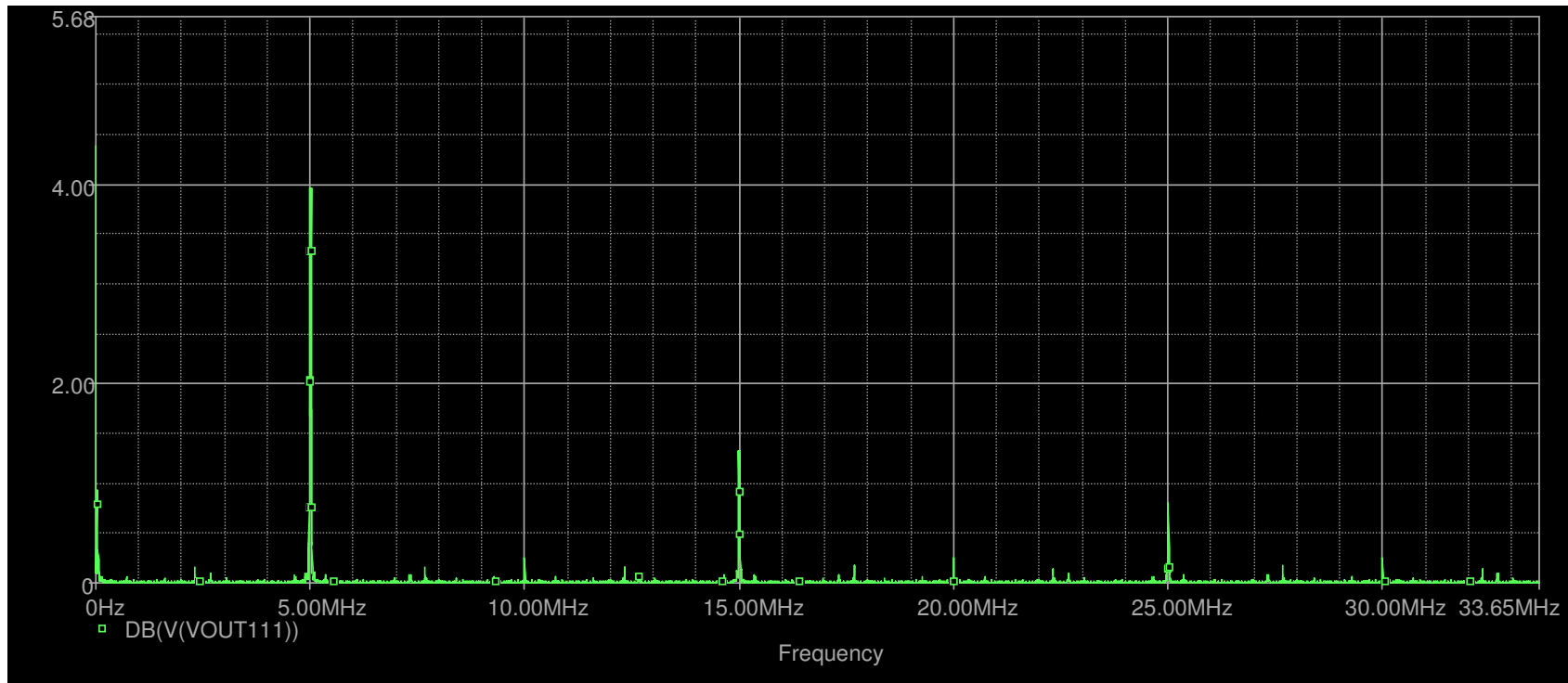


# BLW Time Domain Simulations - Preliminary

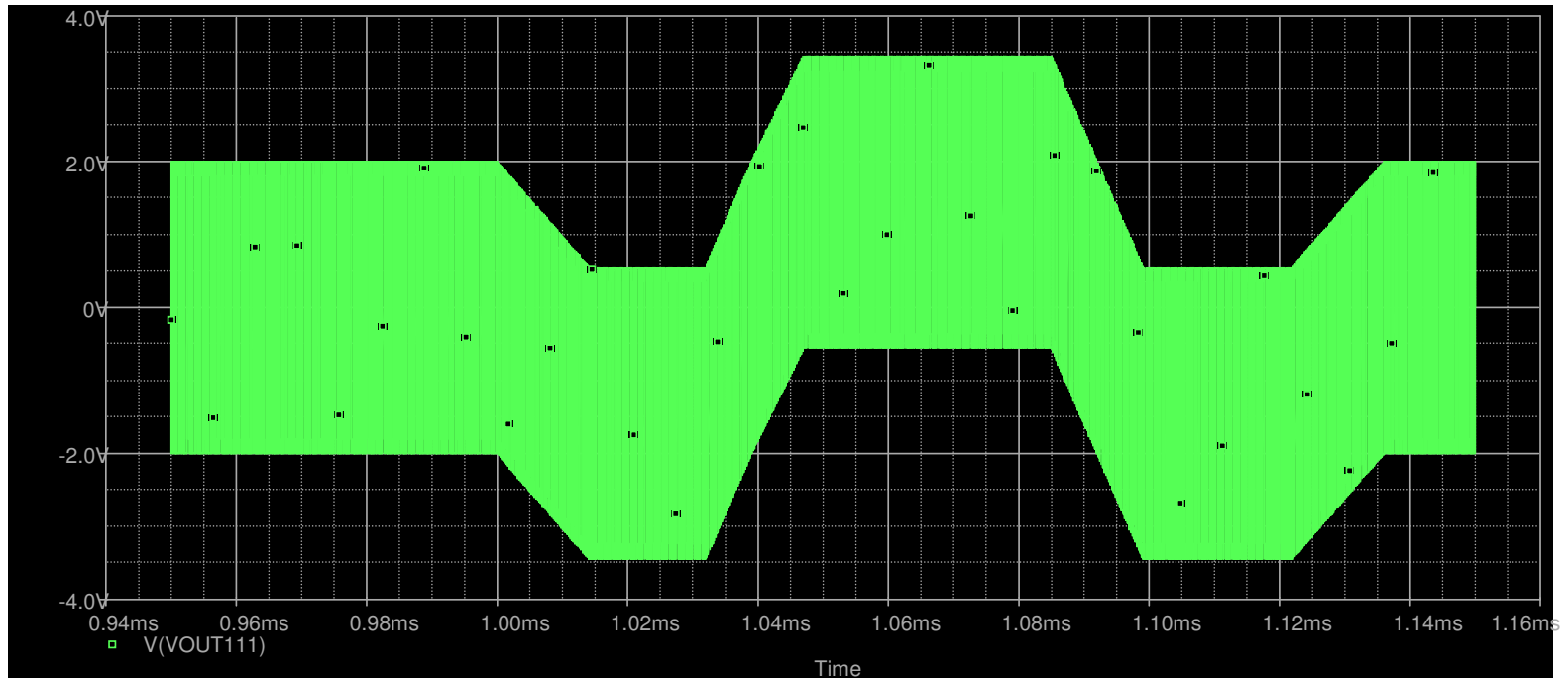


# BLW Frequency Domain Simulations - Preliminary

## Data Bandwidth

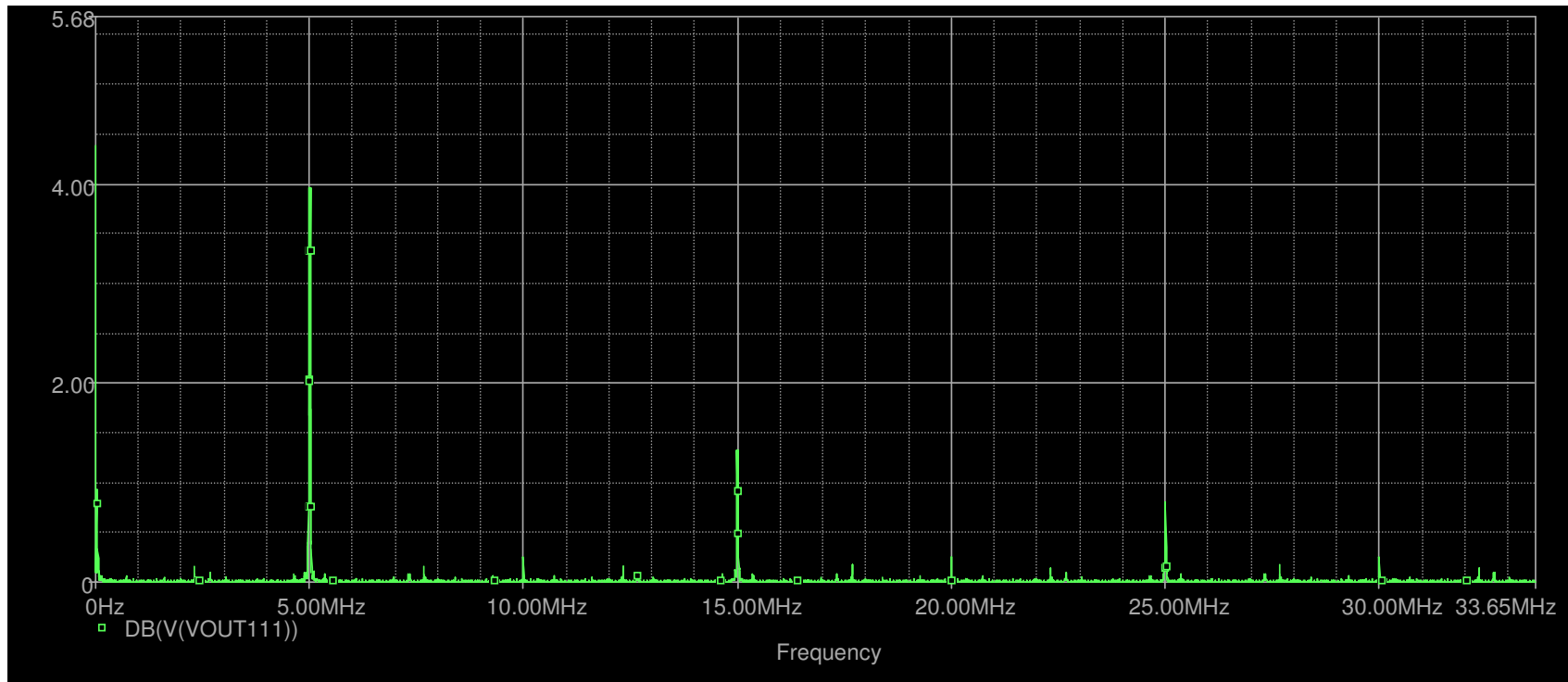


# BLW Time Domain Simulations - Preliminary



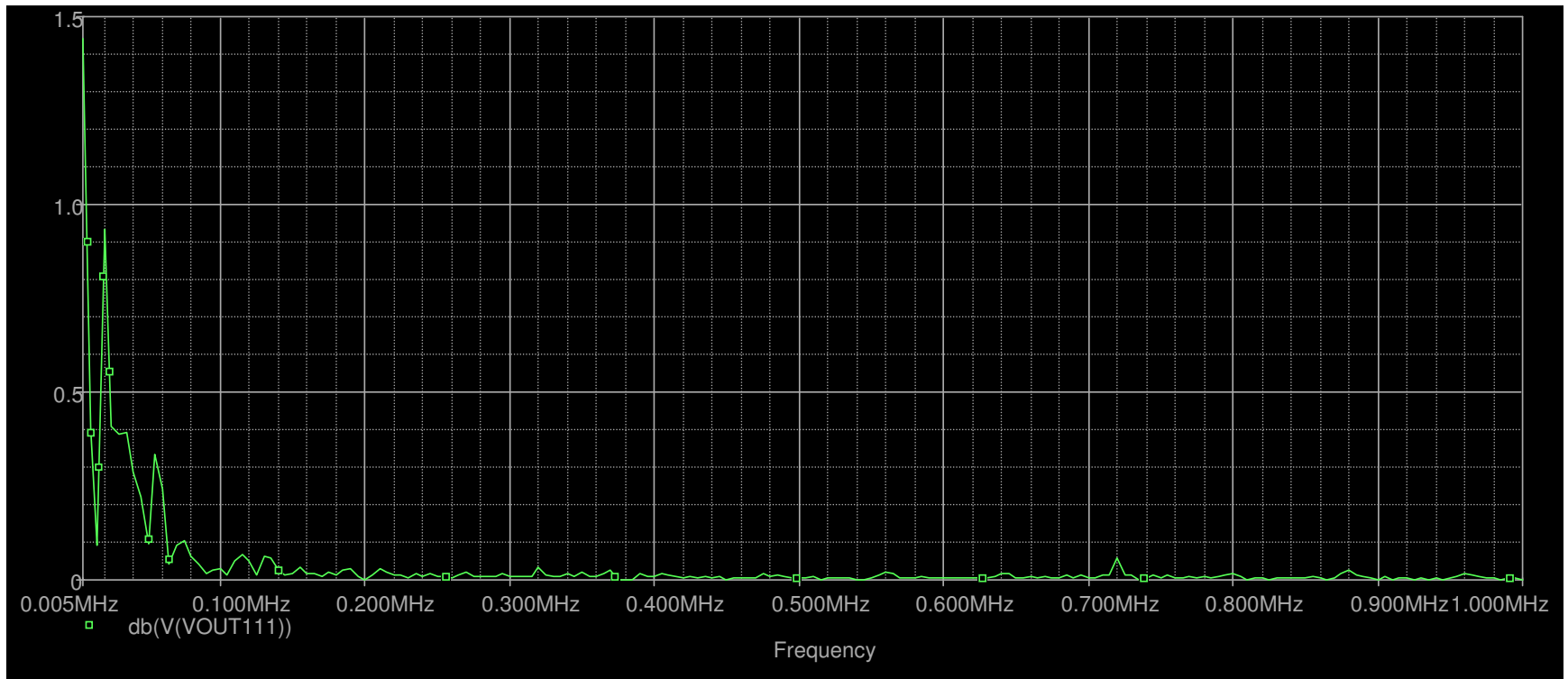
# BLW Frequency Domain Simulations - Preliminary

## Data Bandwidth

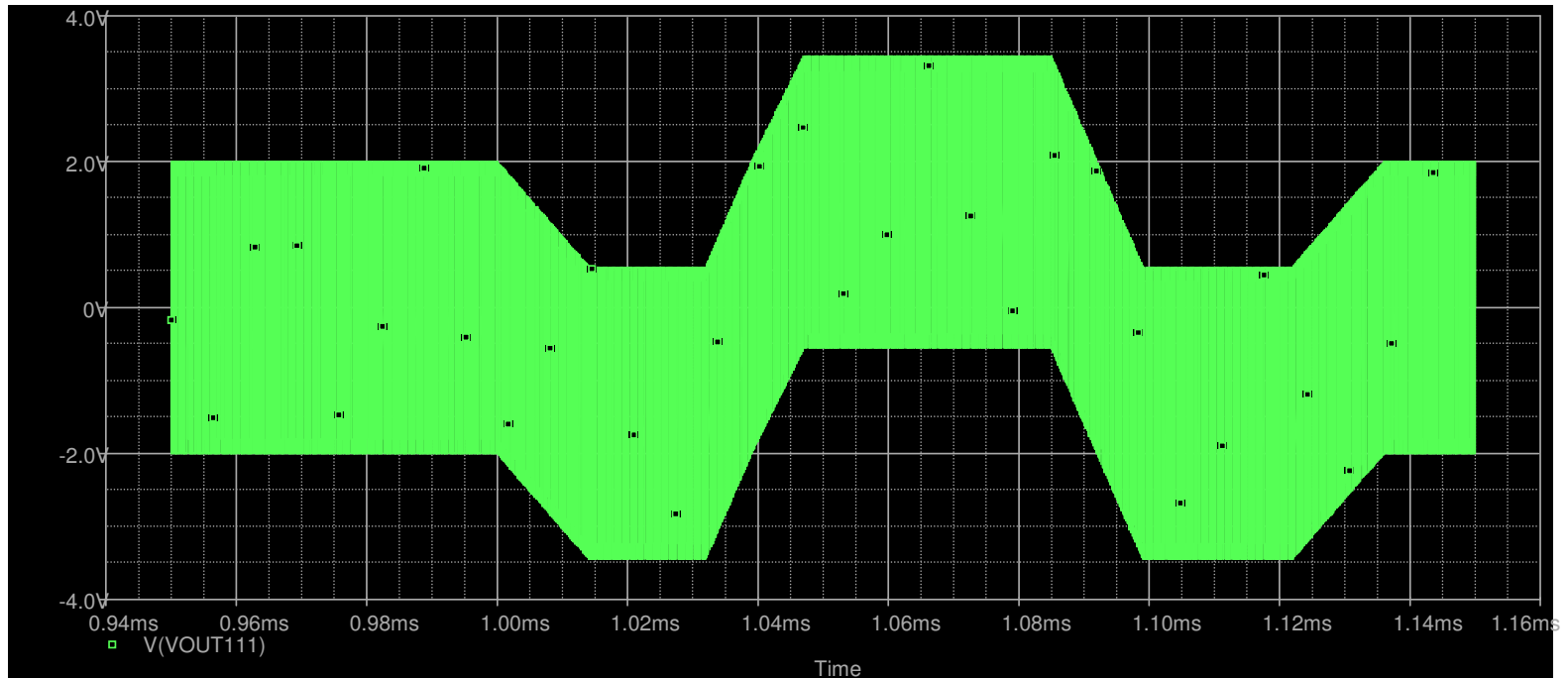


# BLW Frequency Domain Simulations - Preliminary

$\leq 1$  MHz Bandwidth

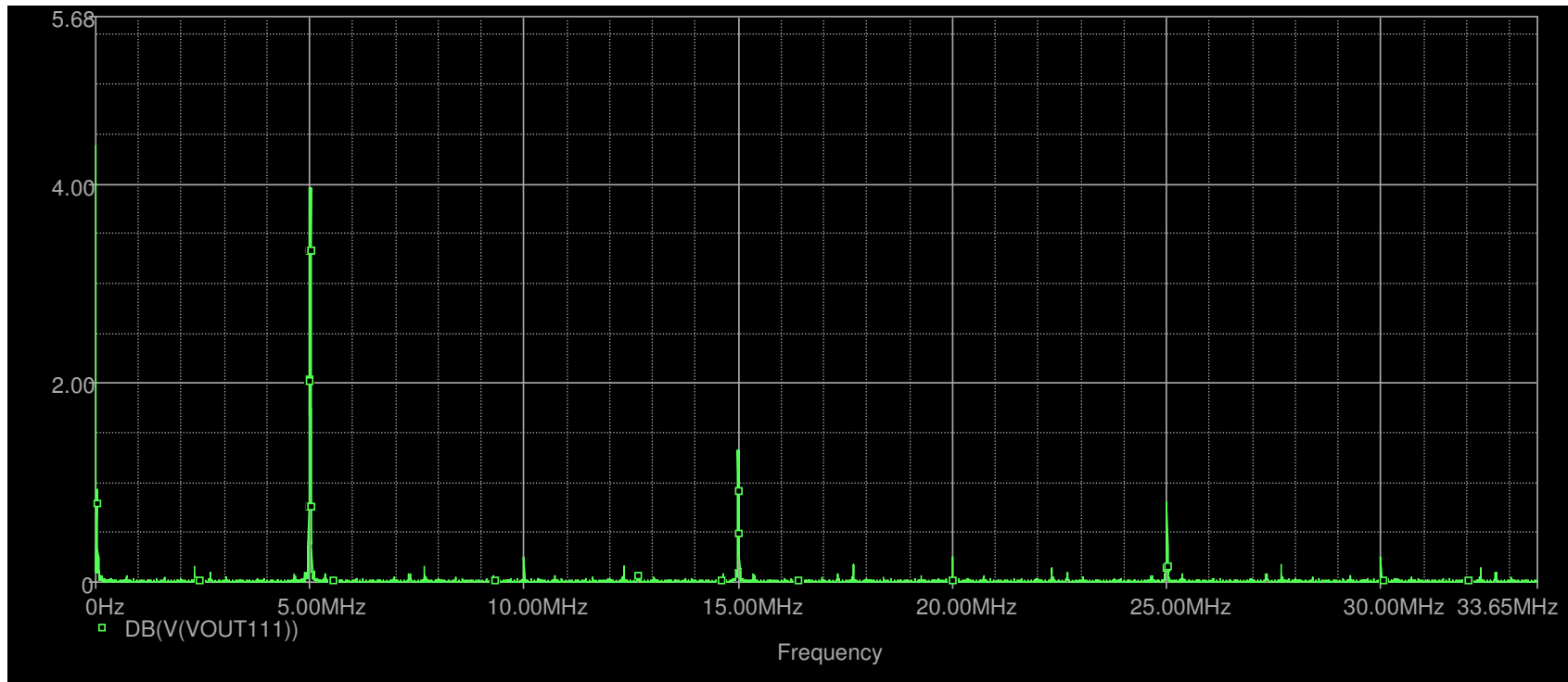


# BLW Time Domain Simulations - Preliminary



# BLW Frequency Domain Simulations - Preliminary

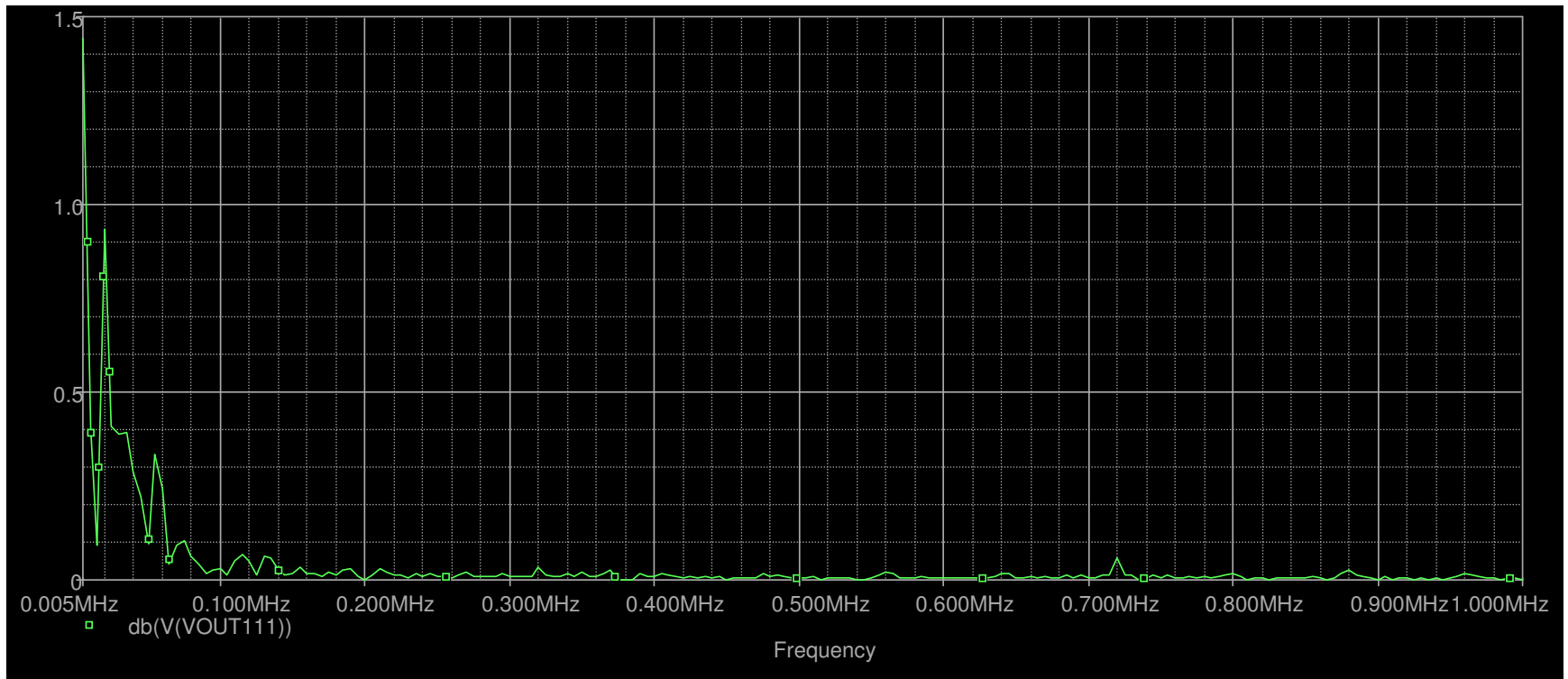
## Data Bandwidth





# BLW Frequency Domain Simulations - Preliminary

$\leq 1$  MHz Bandwidth



# Frequency Domain, <100KHz Data Bandwidth – Simulations

## Preliminary

