

Measurement of AC Cap Impact

For AC Cap/Test Point Discussion Mtg – 4/18

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VNA Setup

Calibration
Points



Using Agilent N5230A

PNA-L Network Analyzer (300kHz-20GHz)

Started with goergen_03_0904 recommended VNA setup

increased max frequency, kept rest as specified

IF Bandwidth: 300Hz

Leveled Output Power: -5dB

Averaging: 4

Freq Range: 50MHz – 20000MHz

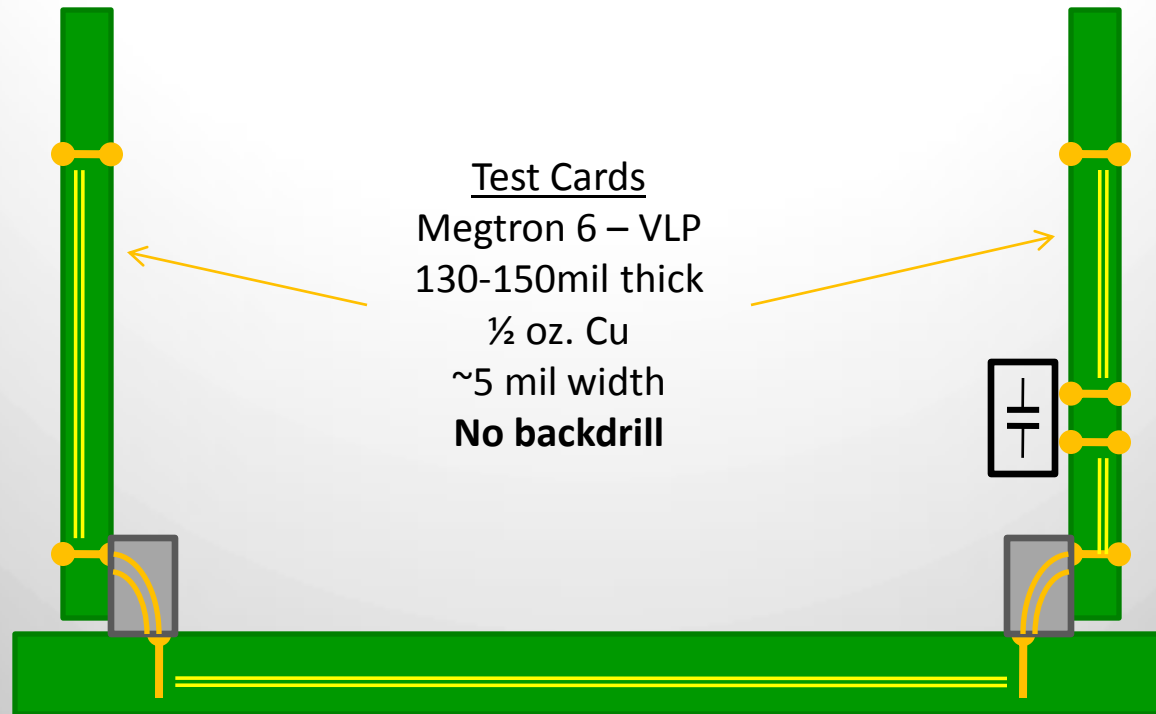
Step Size: 10MHz

Cables & PNA-L are 3.5mm connections (DUT is SMA)

Calibrated with 3.5mm E-Cal(N4433A)

1 2
3 4

Material & Board Specifics



Test Cards

Megtron 6 – VLP

130-150mil thick

½ oz. Cu

~5 mil width

No backdrill

Backplane Test Board

Megtron 6 – HVLP

340-370mil thick

½ oz. Cu

~7mil width

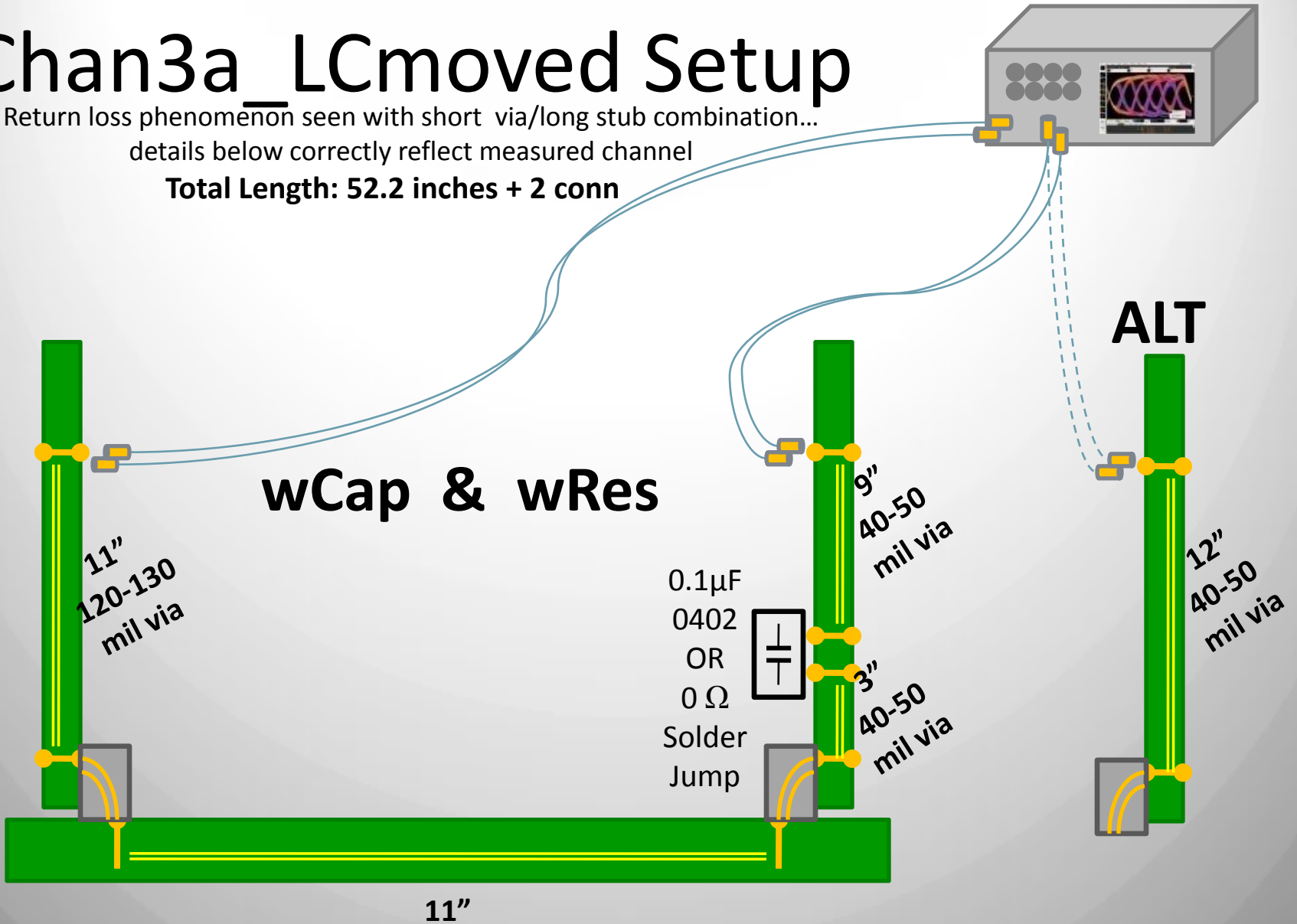
Backdrill giving ≤ 10 mil stub

Chan3a_LCmoved Setup

Return loss phenomenon seen with short via/long stub combination...

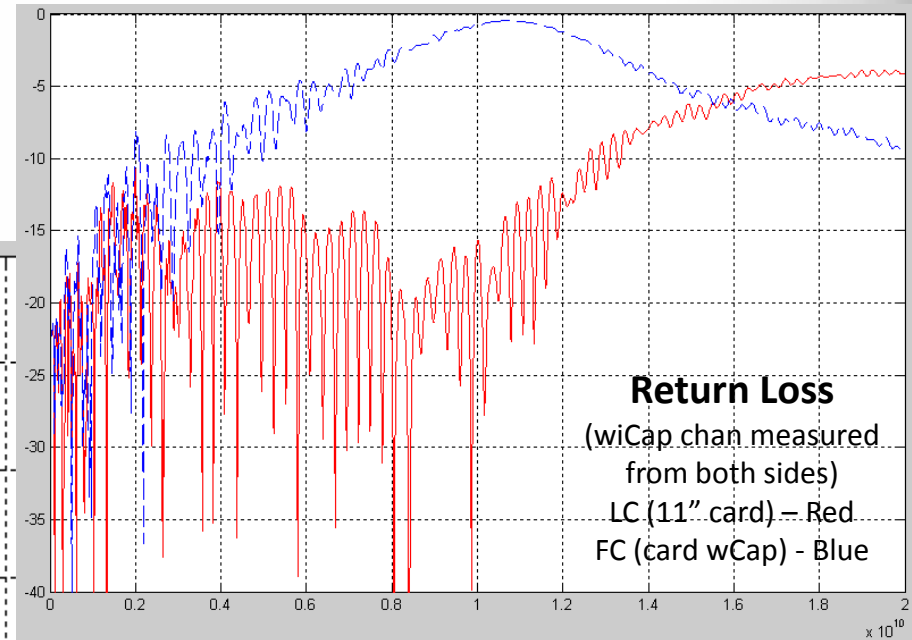
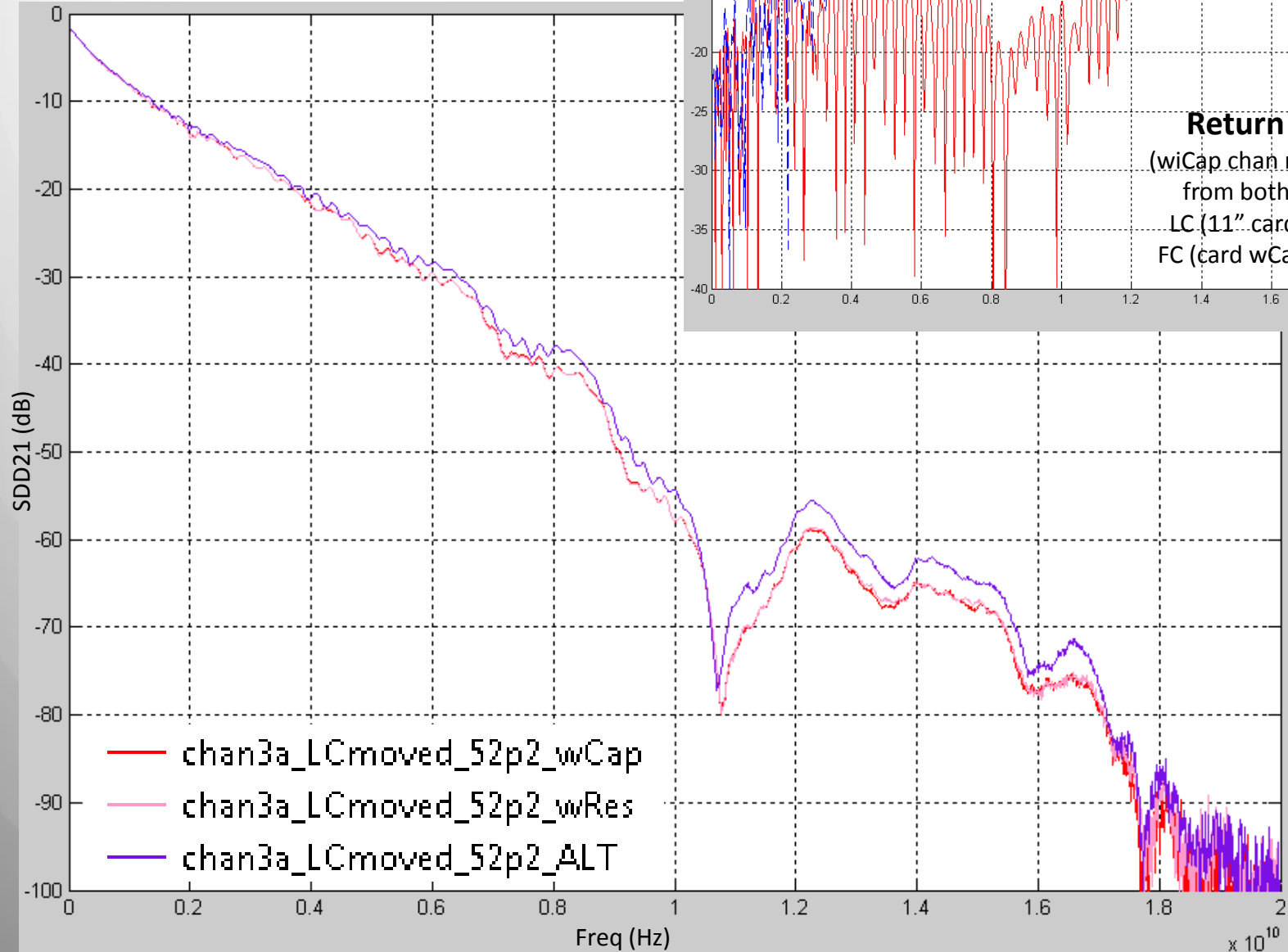
details below correctly reflect measured channel

Total Length: 52.2 inches + 2 conn



Chan3a_LCmoved

Total Length: 52.2 inches + 2 conn

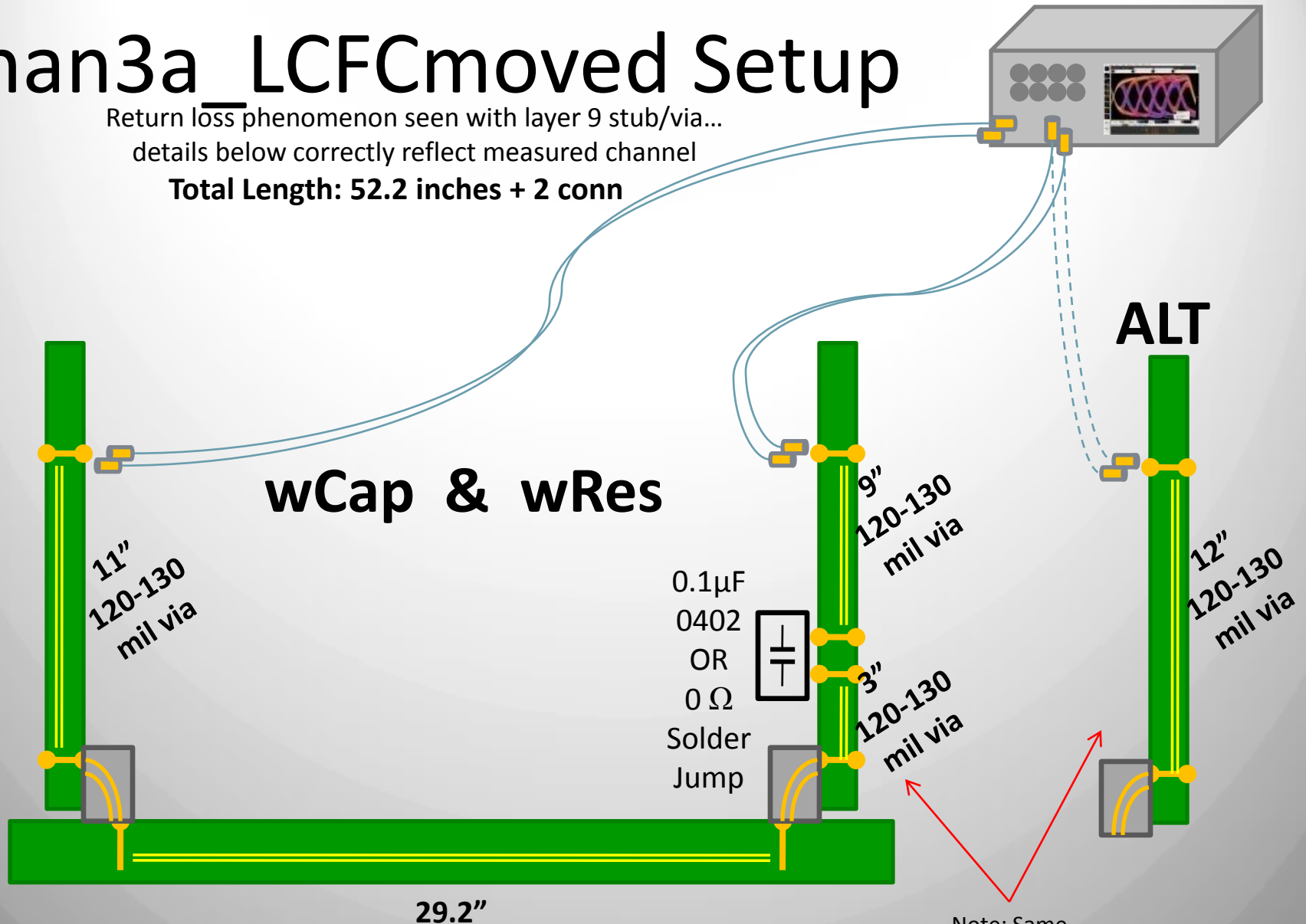


Chan3a_LCFCmoved Setup

Return loss phenomenon seen with layer 9 stub/via...

details below correctly reflect measured channel

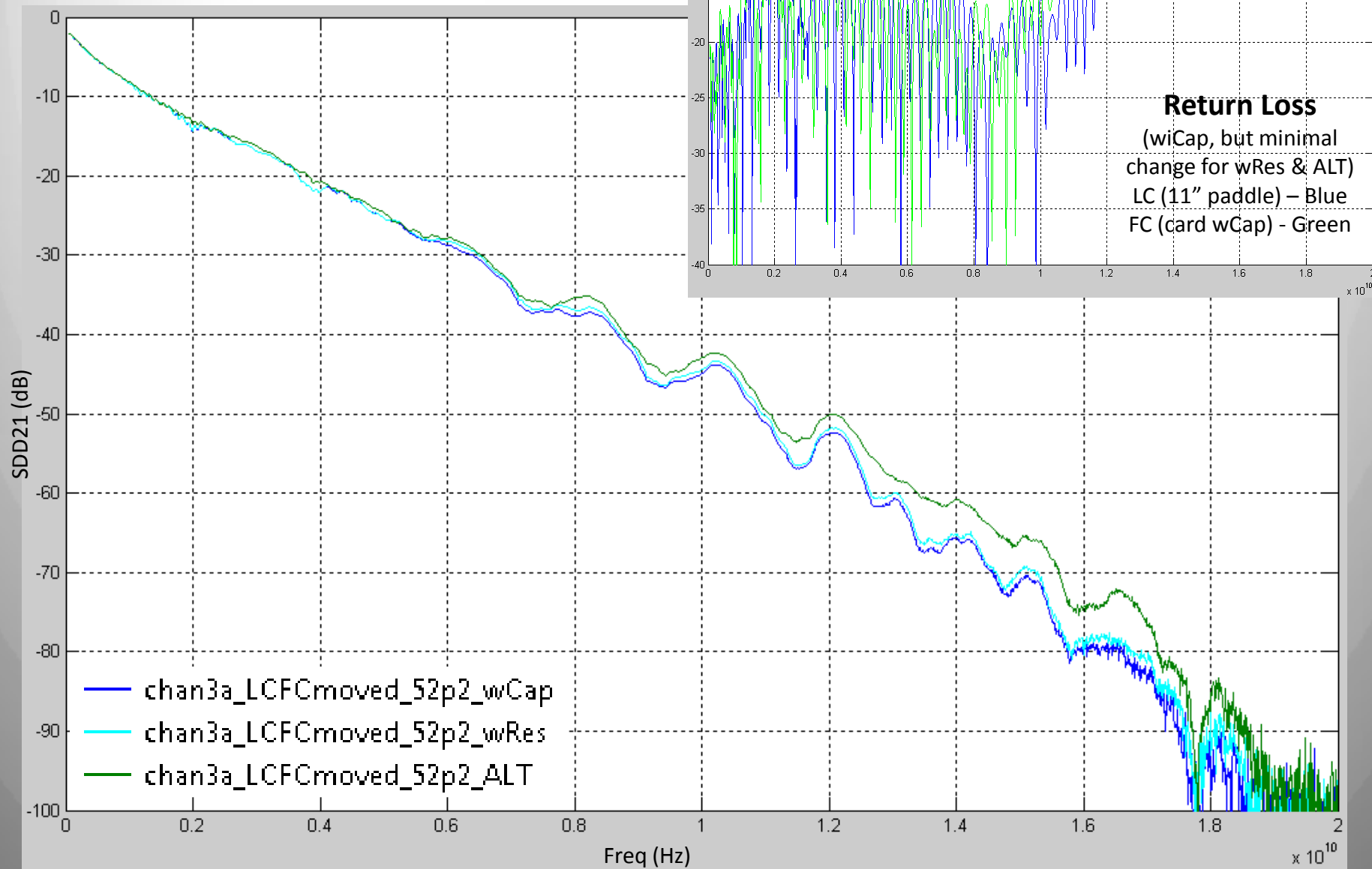
Total Length: 52.2 inches + 2 conn



Note: Same card and ALT card as Chan4

Chan3a_LCFCmoved

Total Length: 52.2 inches + 2 conn

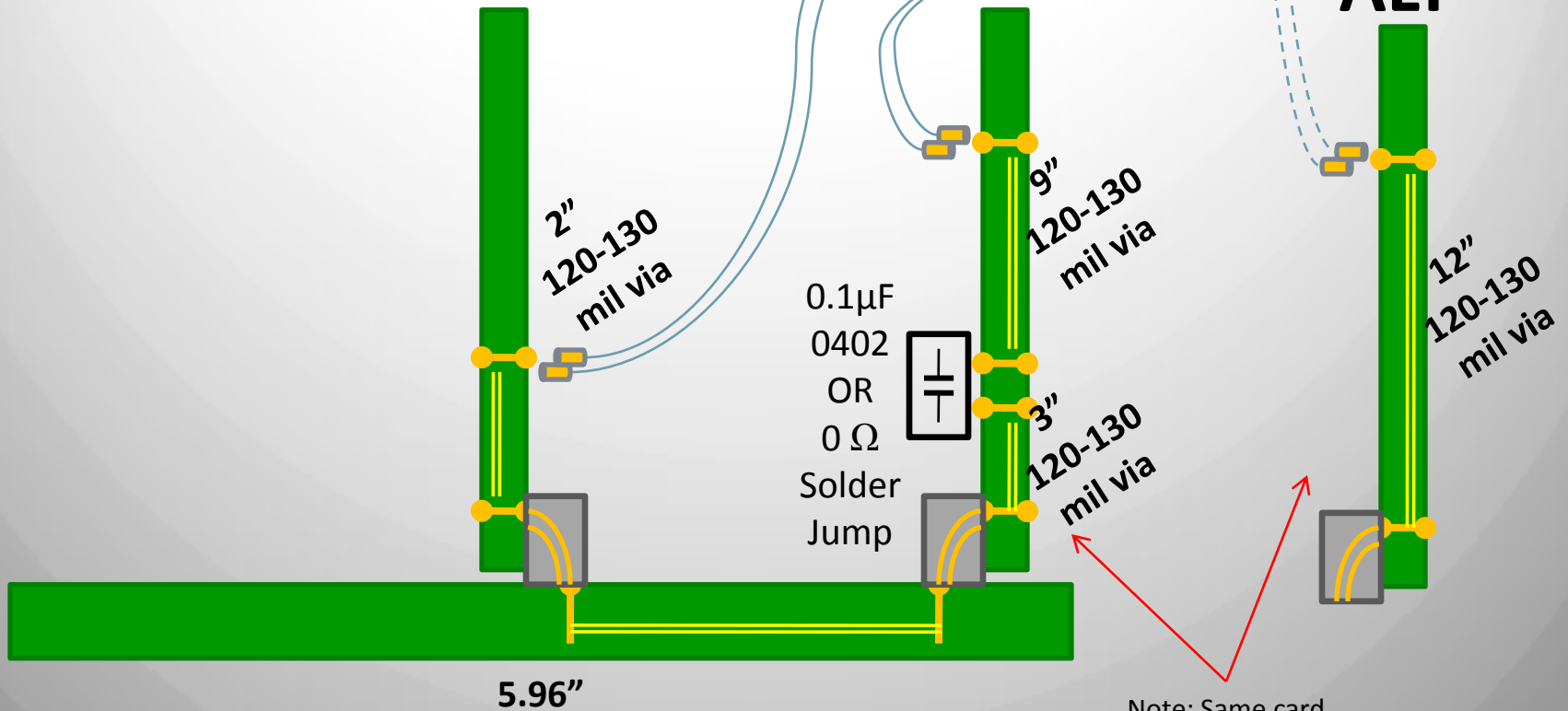


Chan4 Setup

Lay 26 chosen to minimize stub effects

Total Length: 19.96 inches + 2 conn

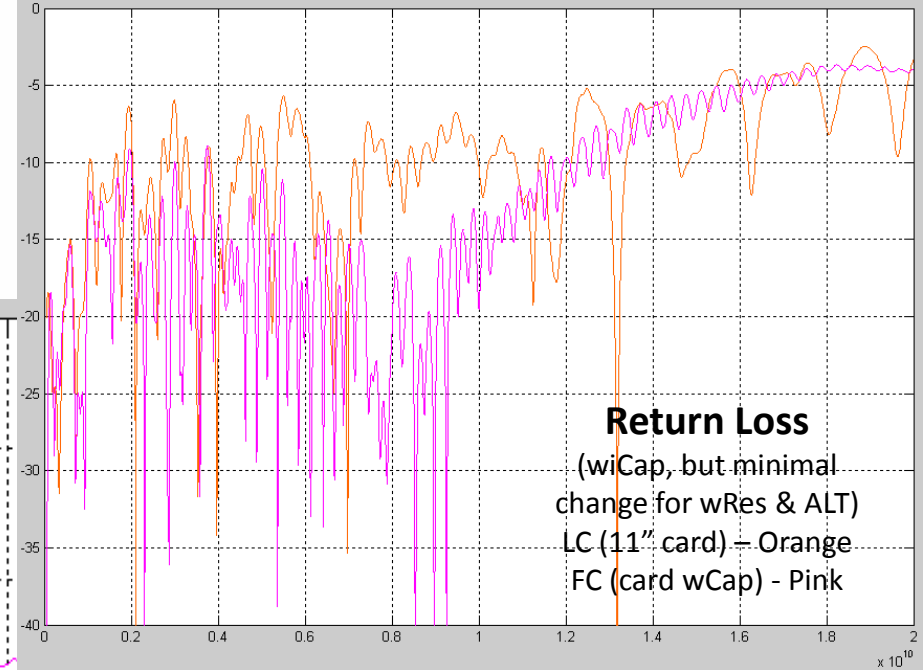
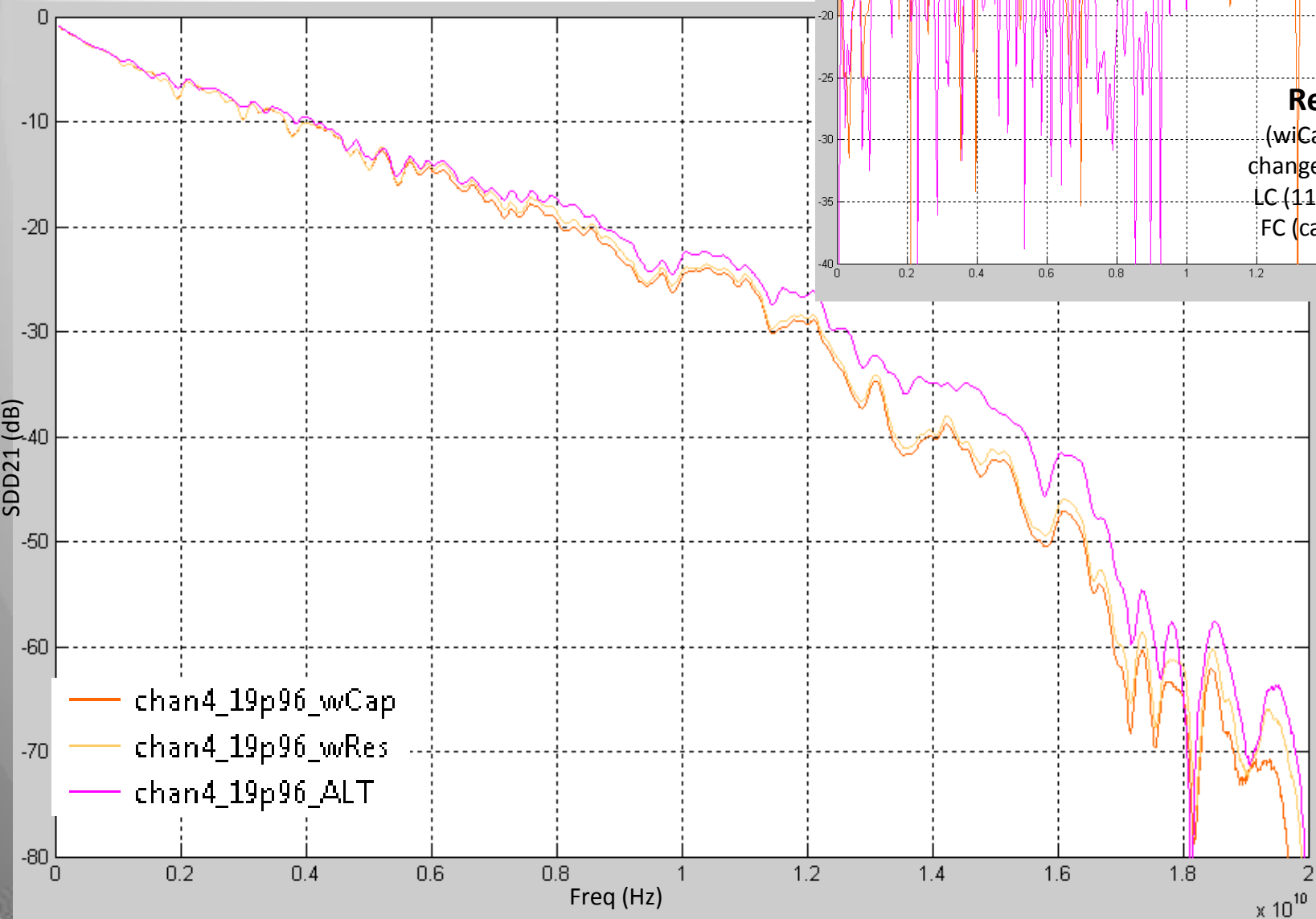
wCap & wRes



Note: Same card
and ALT card as
Chan3a_LCFCmoved

Chan4

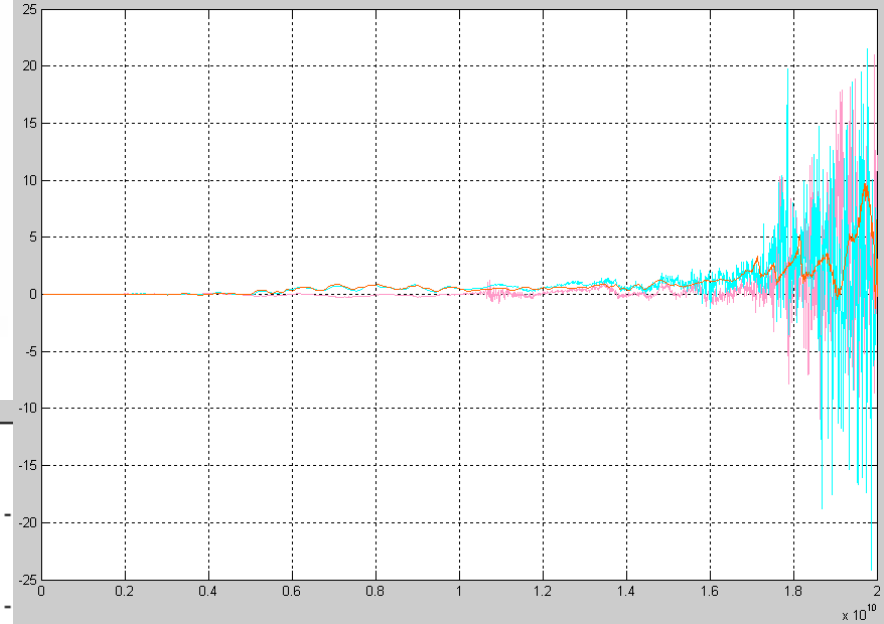
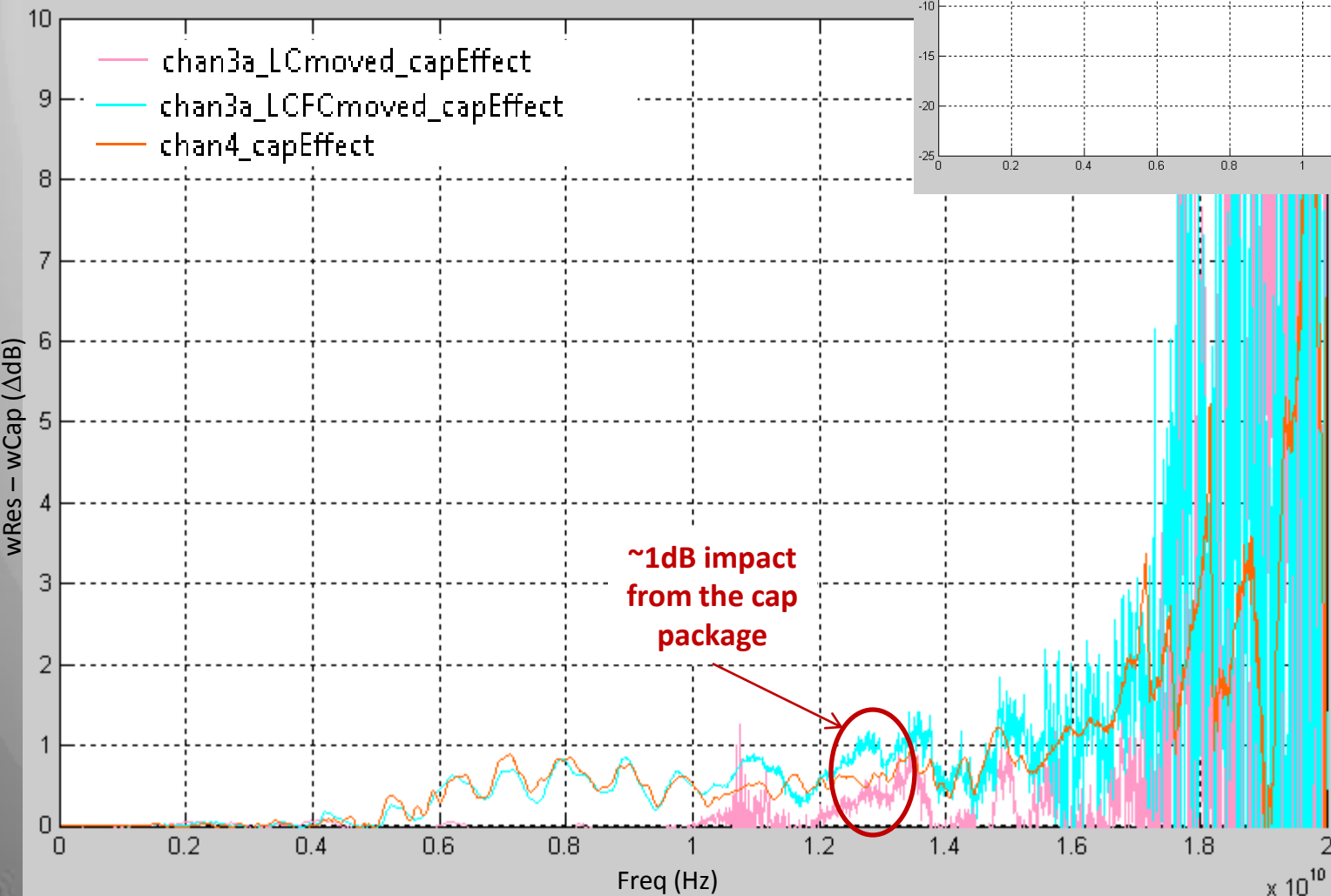
Total Length: 19.96 inches + 2 conn



What's the Impact???

wRes measurement – wCap measurement

Loss due to CAP... compared with 0 Ω resistor



ALT measurement – wCap measurement

NOTE: SCALE CHANGE

ALT - wCap (Δ dB)

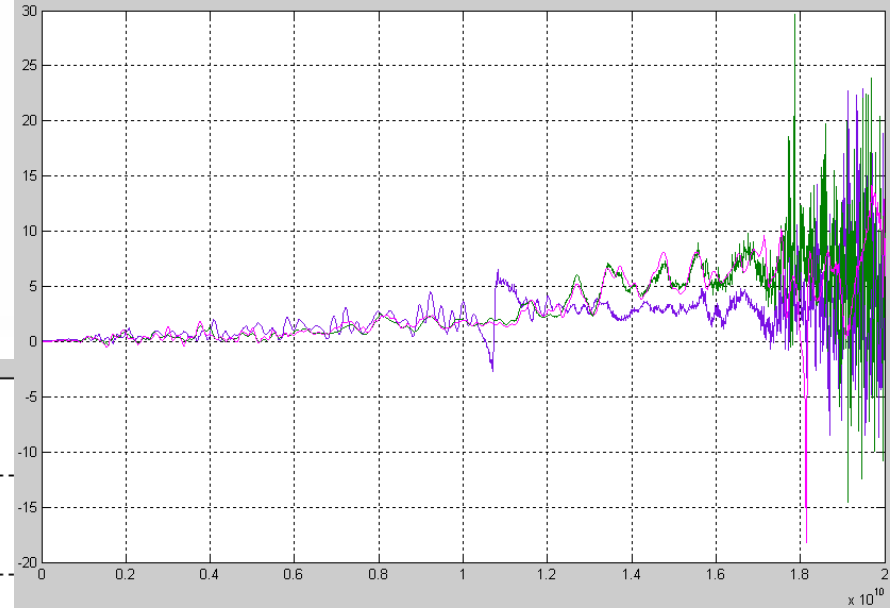
chan3a_LCmoved_fpEffect
chan3a_LCFCmoved_fpEffect
chan4_fpEffect

~1.5dB impact at 7G

40-50mil Via w/stub ~3dB

120-130 Via ~4-4.5dB
NOTE: some implementations will be slightly longer

Freq (Hz)



Summary

- Capacitor alone shows 0.5-1dB loss impact
- Capacitor plus footprint shows ~1.5dB impact on channel loss at 7GHz... and can show 3dB-5dB impact on channel loss ~13GHz
- It is unrealistic to assume that system vendors will do board implementations for 25G AC caps