

LumiCal fanout capacitive coupling

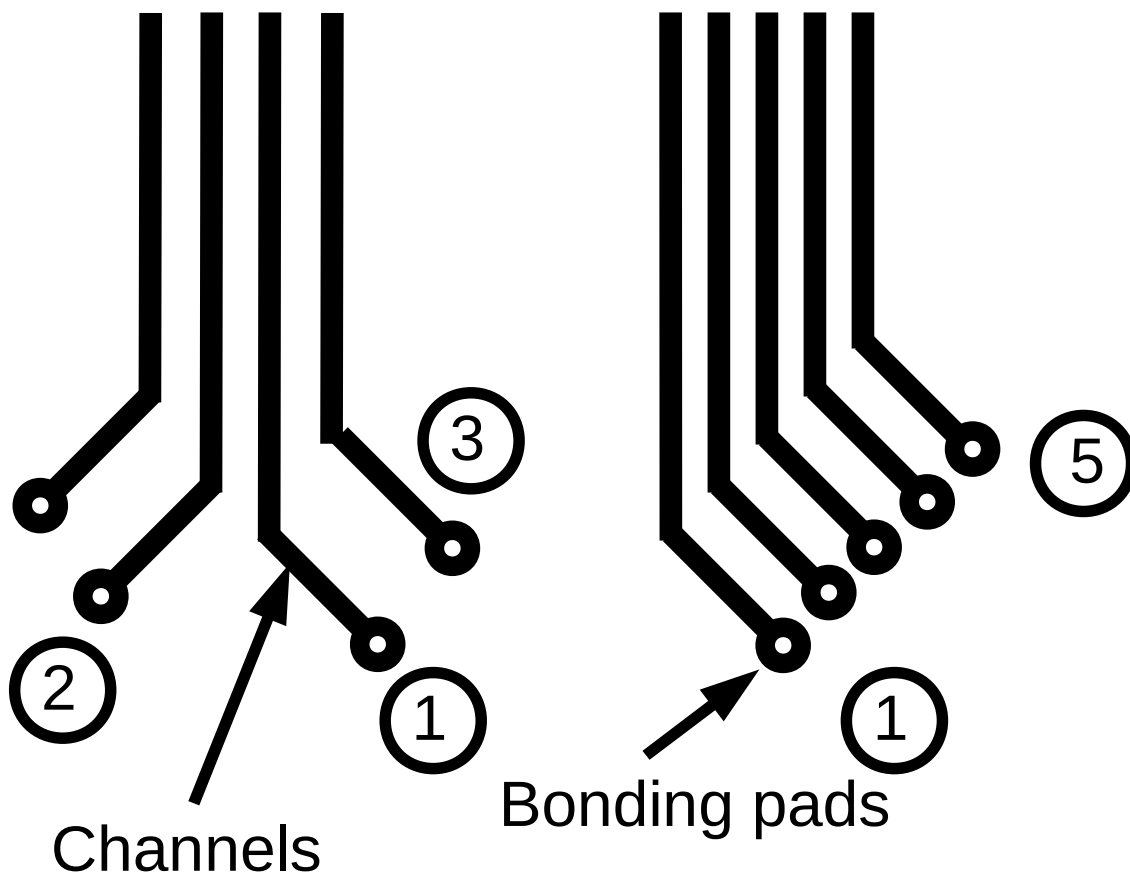
Jonathan Aguilar
AGH-UST

Fanout design

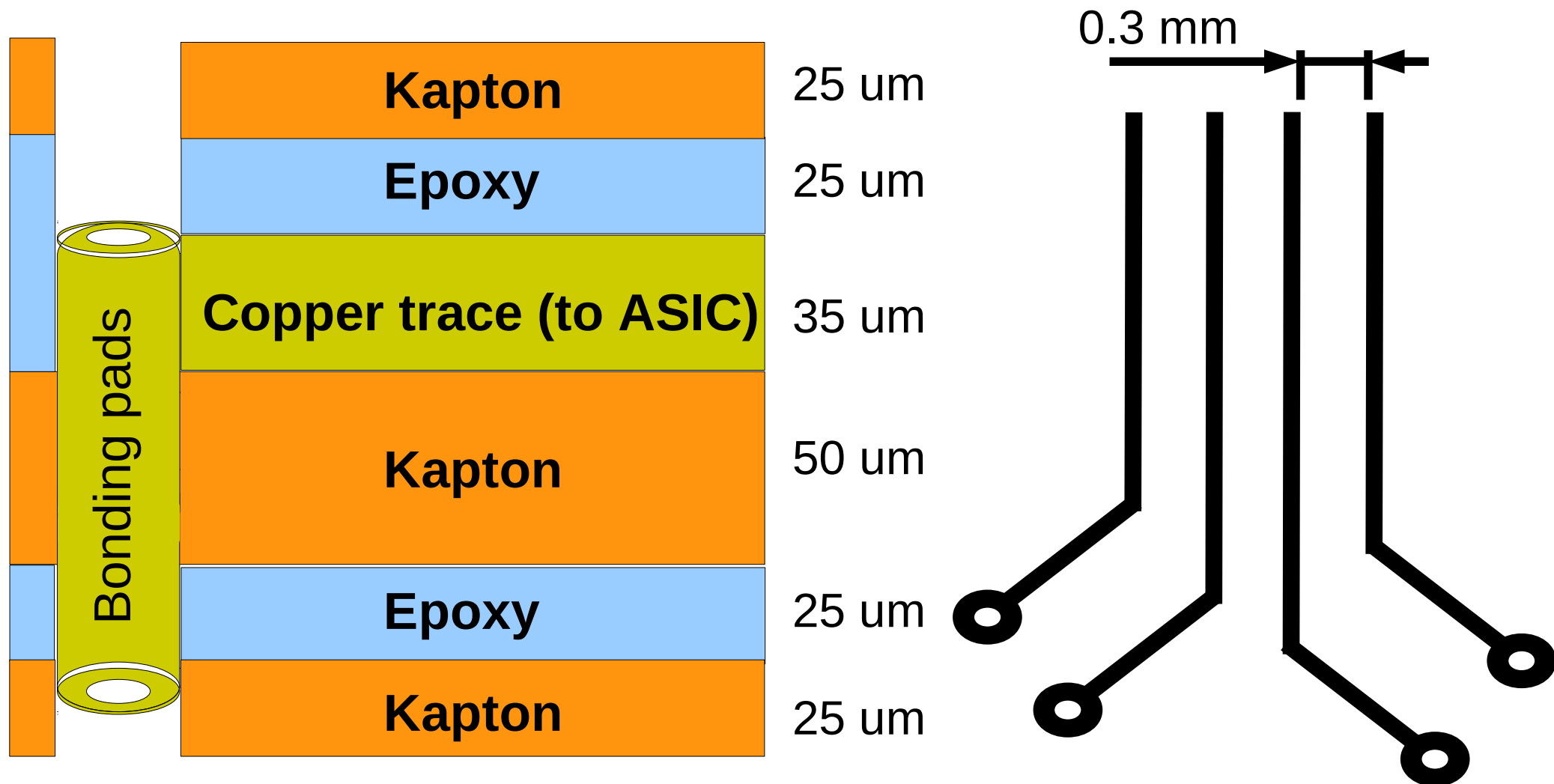
- Purpose: carry signal from sensors to electronics
- 64 channels in 2 designs: "alternating" and "one-side"
- If one 32-bit ADC fails, do we want:
 - one half of the pads unreadable?
 - every other pad unreadable?

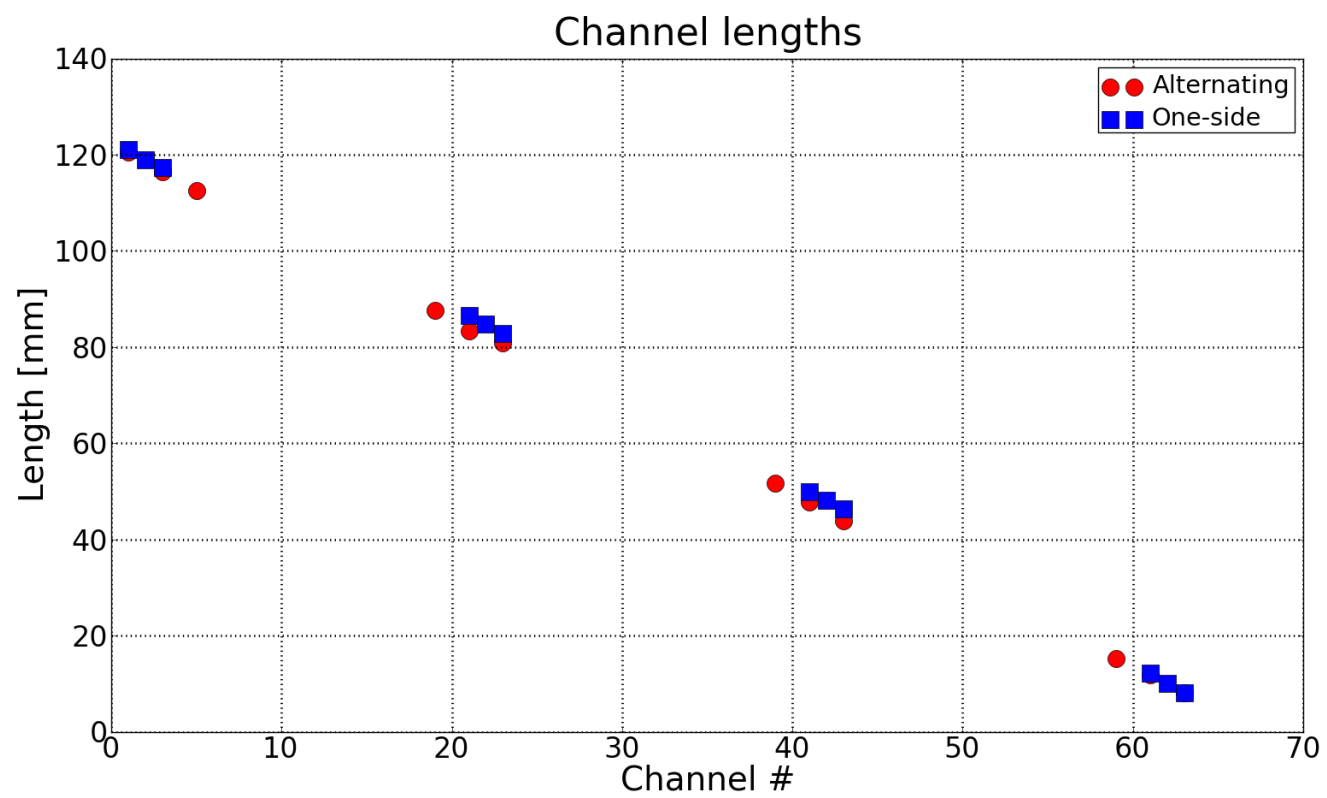
Alternating

One-side



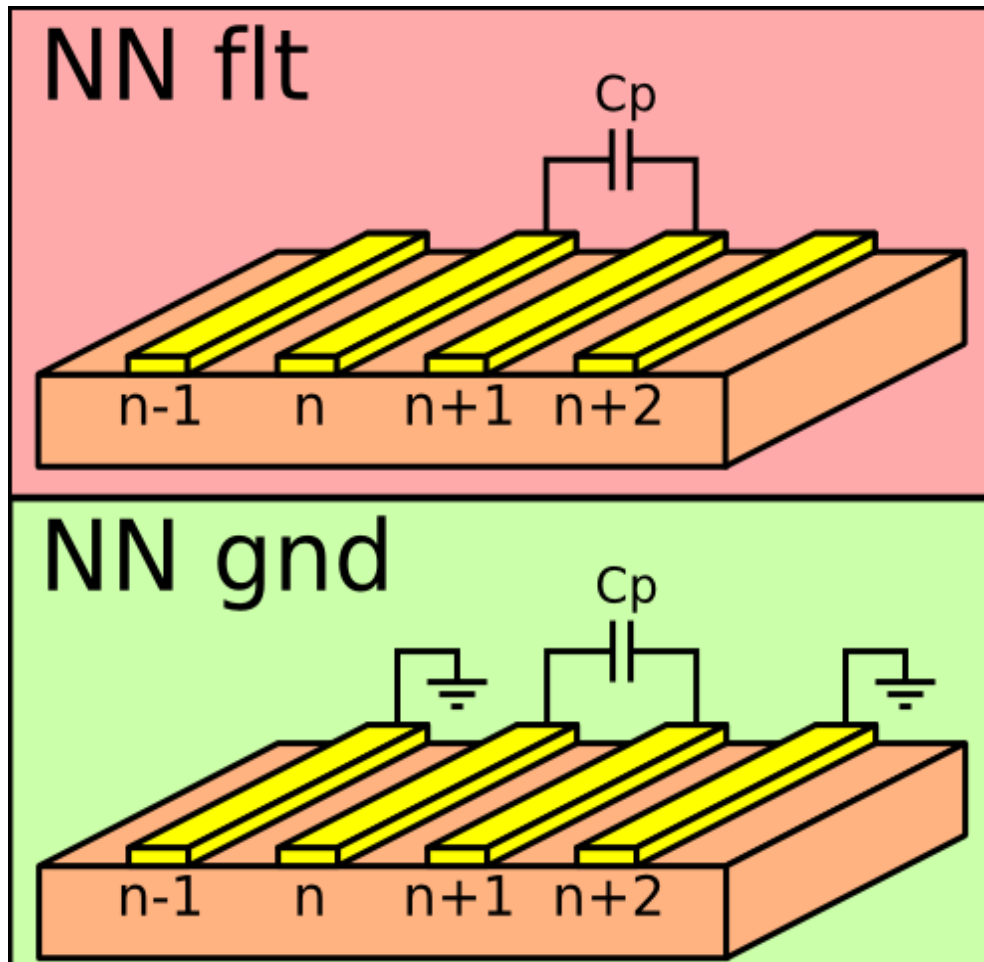
Cross-section



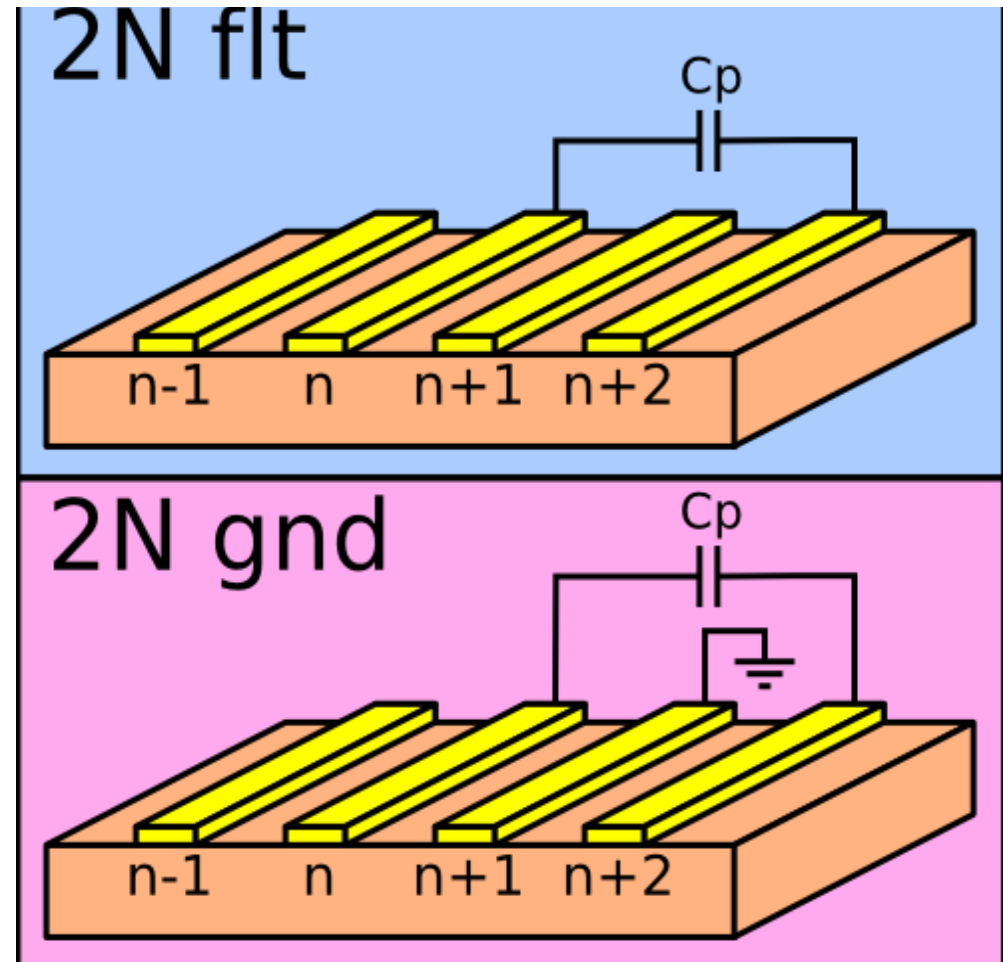


Measurement configurations

Nearest neighbors

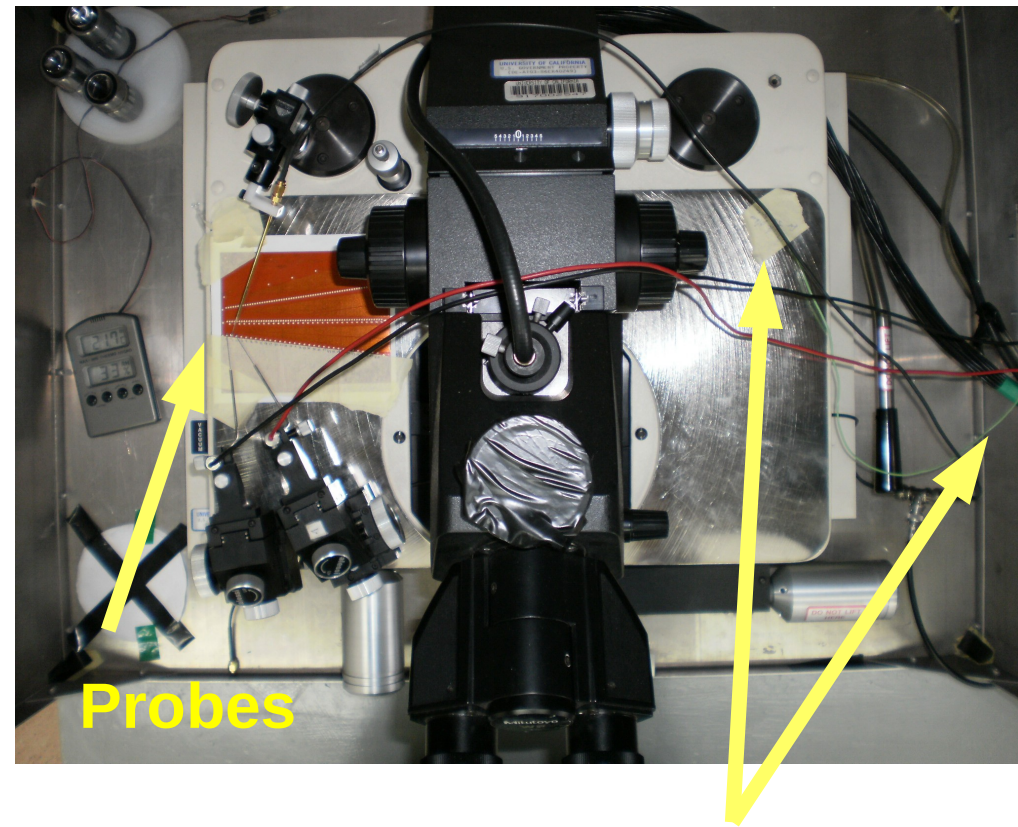
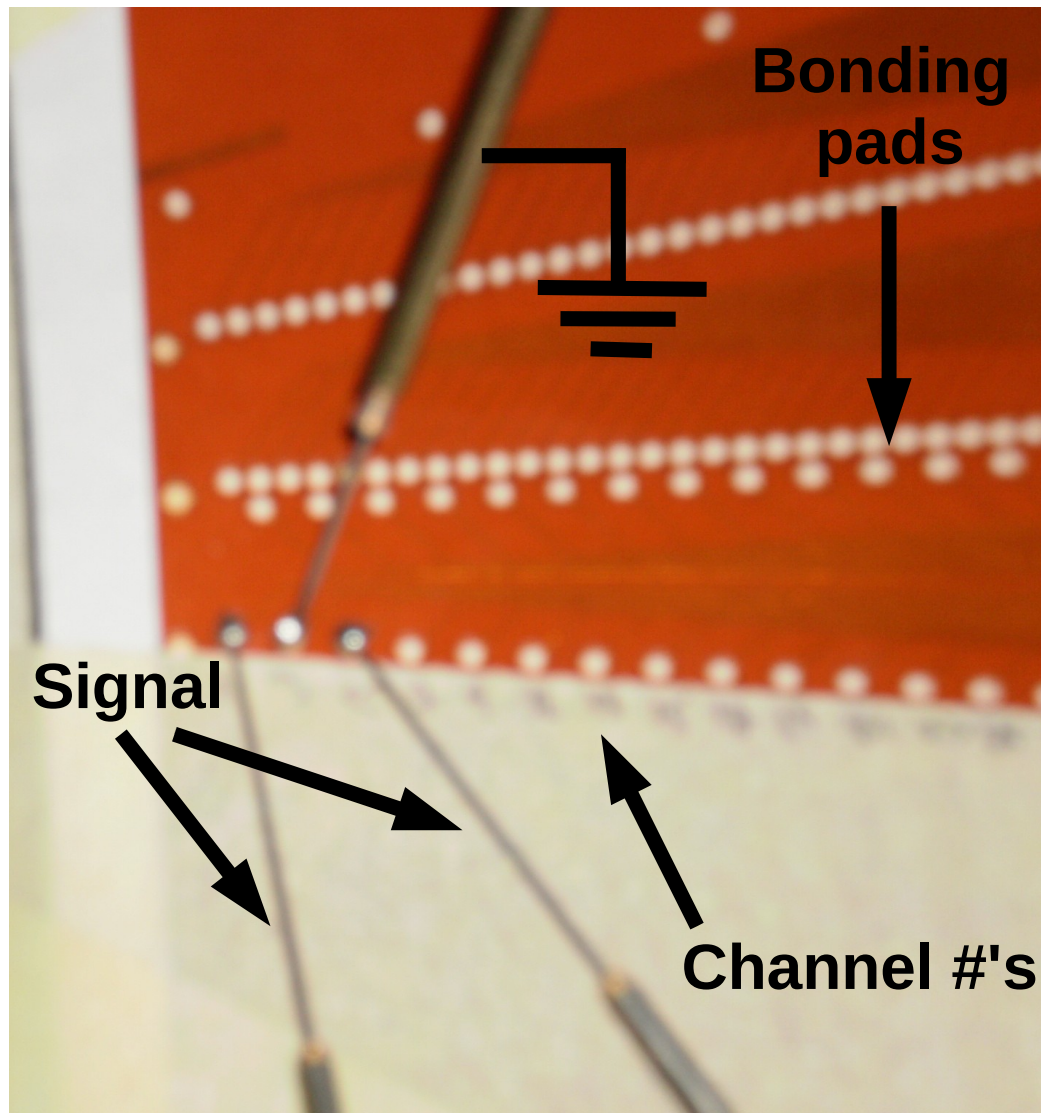


Second-nearest neighbors



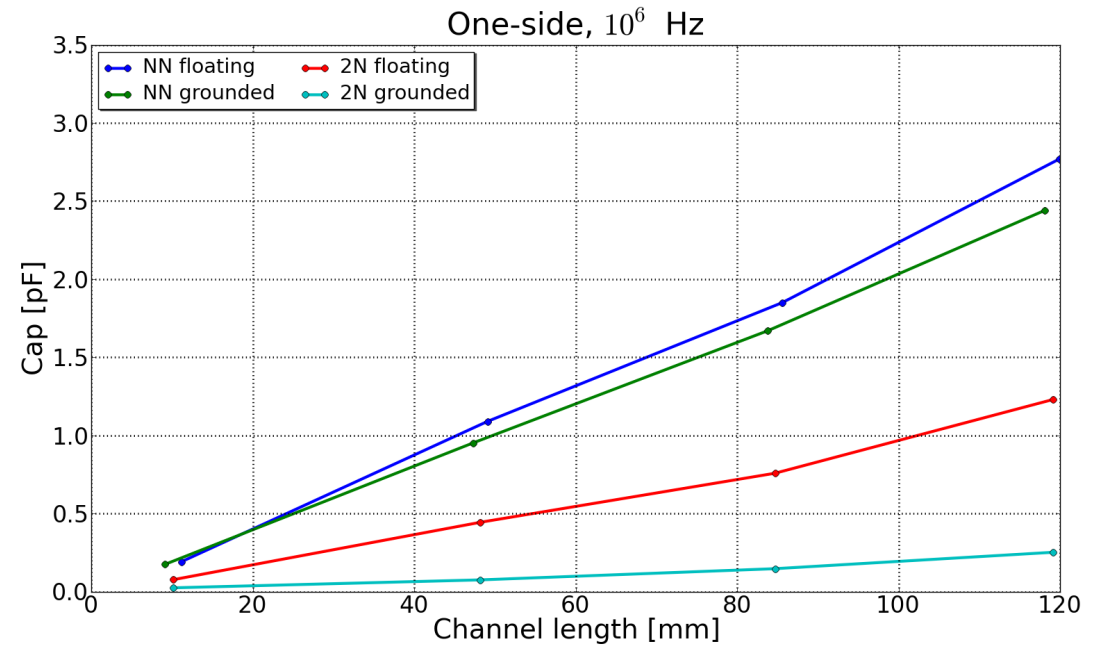
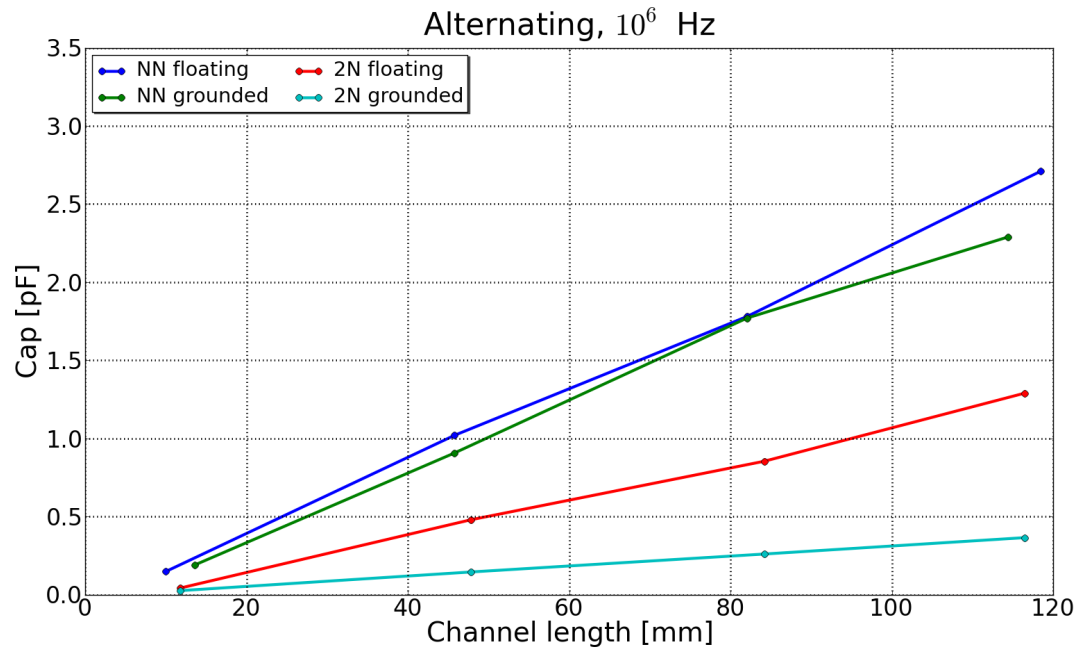
Setup

(2nd-neighbor grounded configuration)

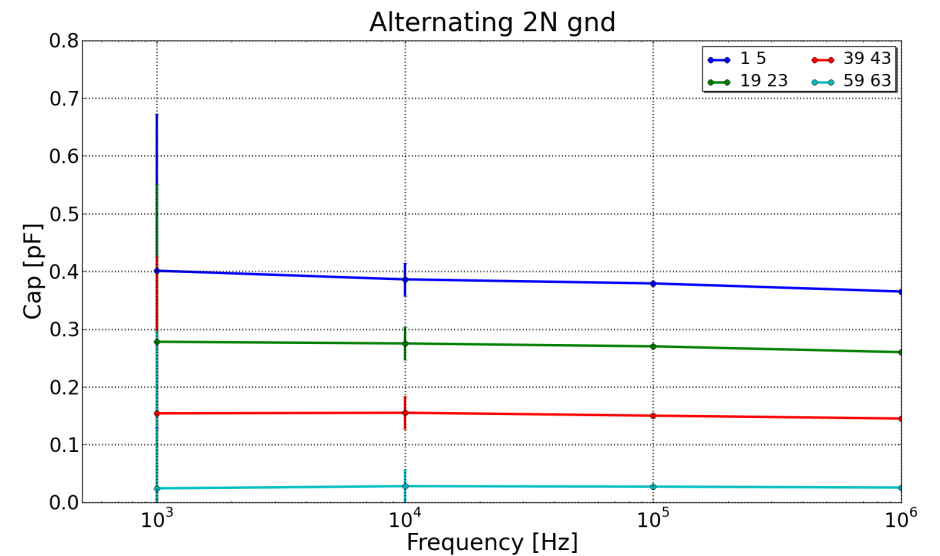
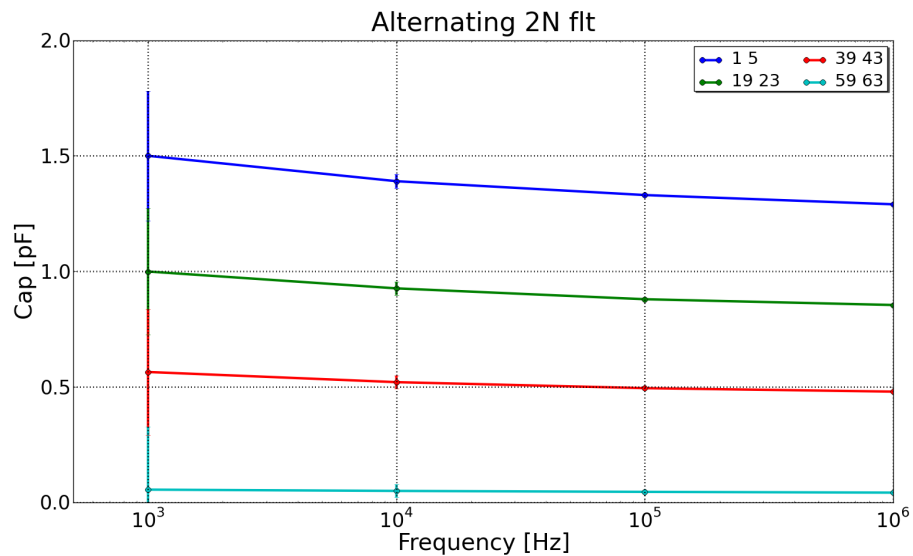
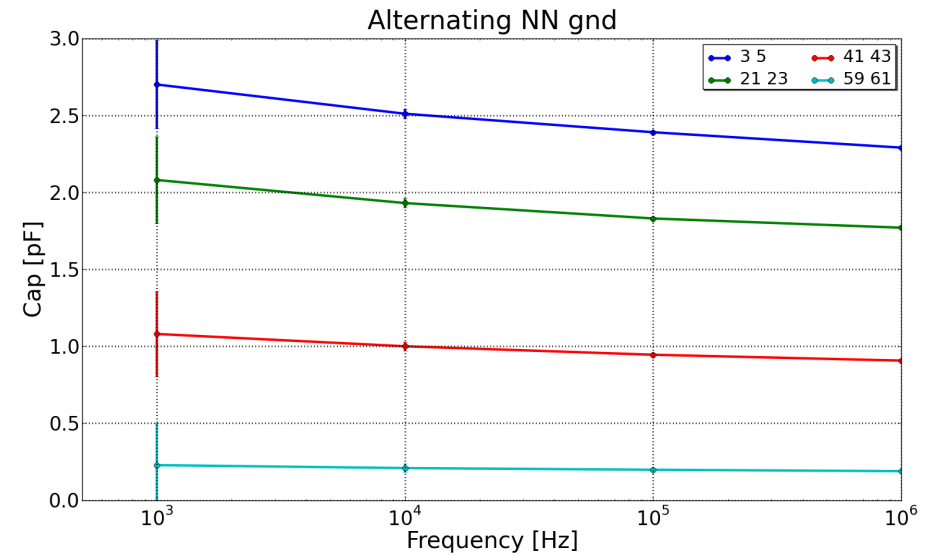
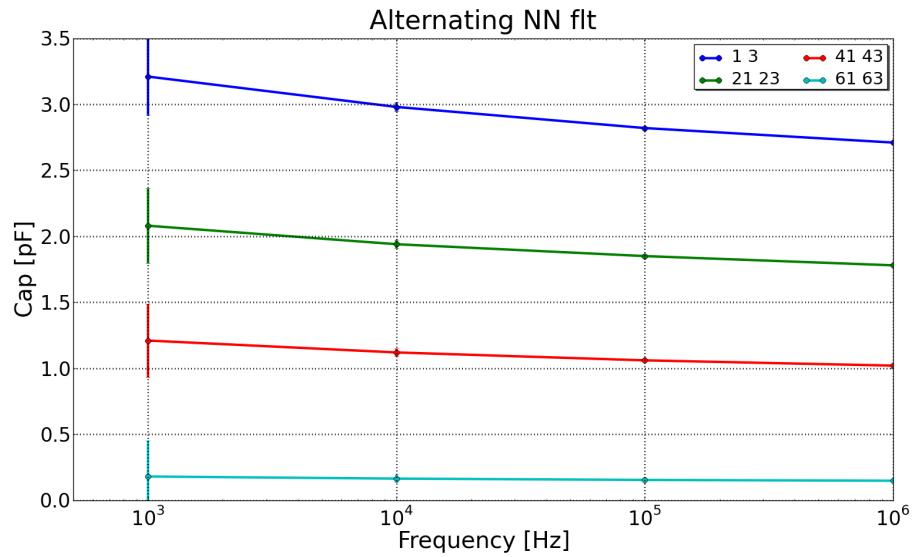


Instrument: HP 4824A High-Precision LCR

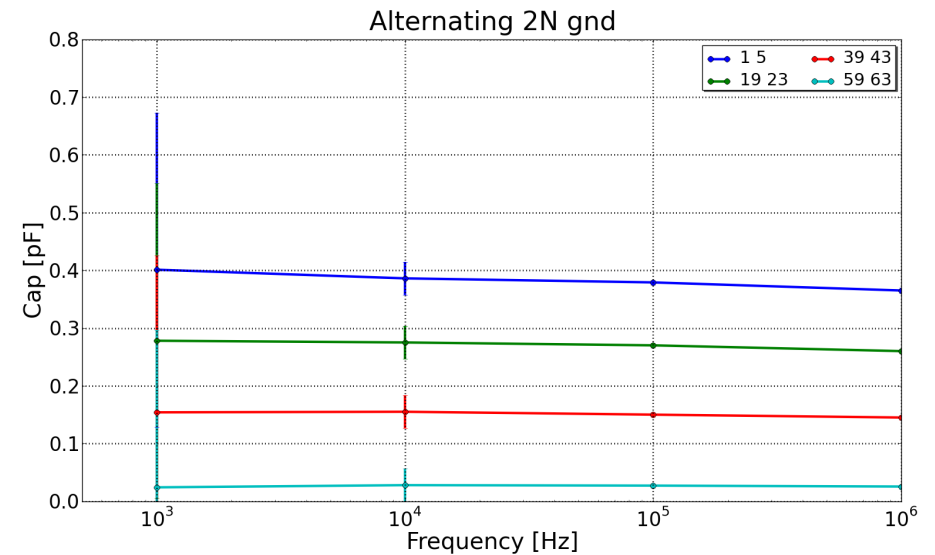
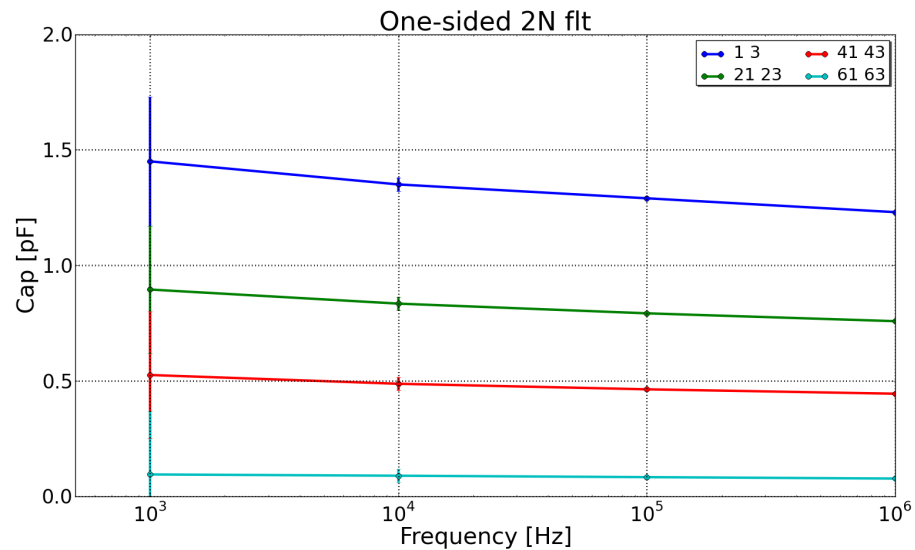
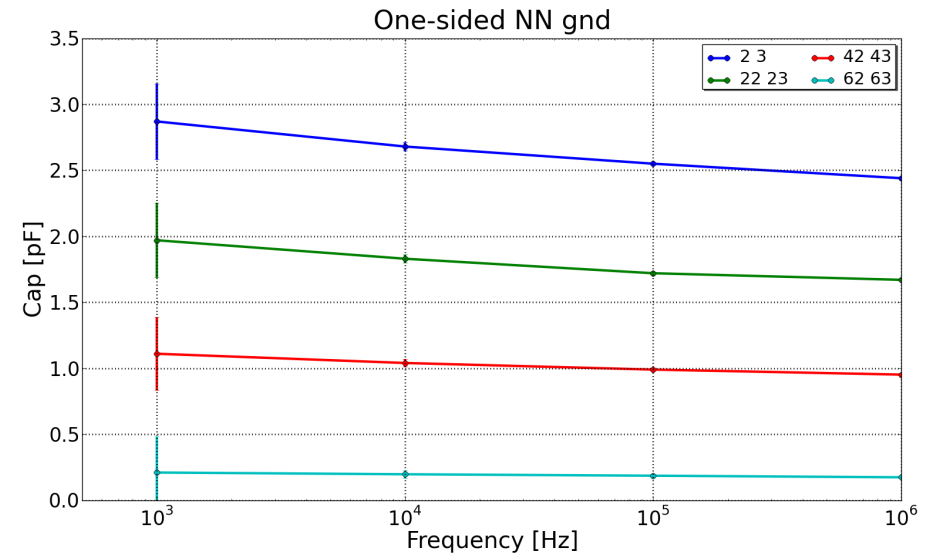
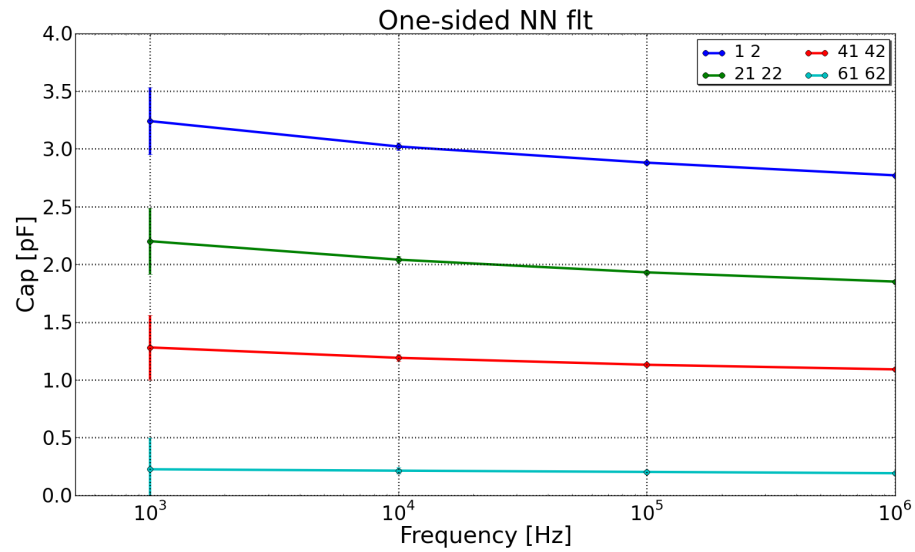
Results, 1 MHz



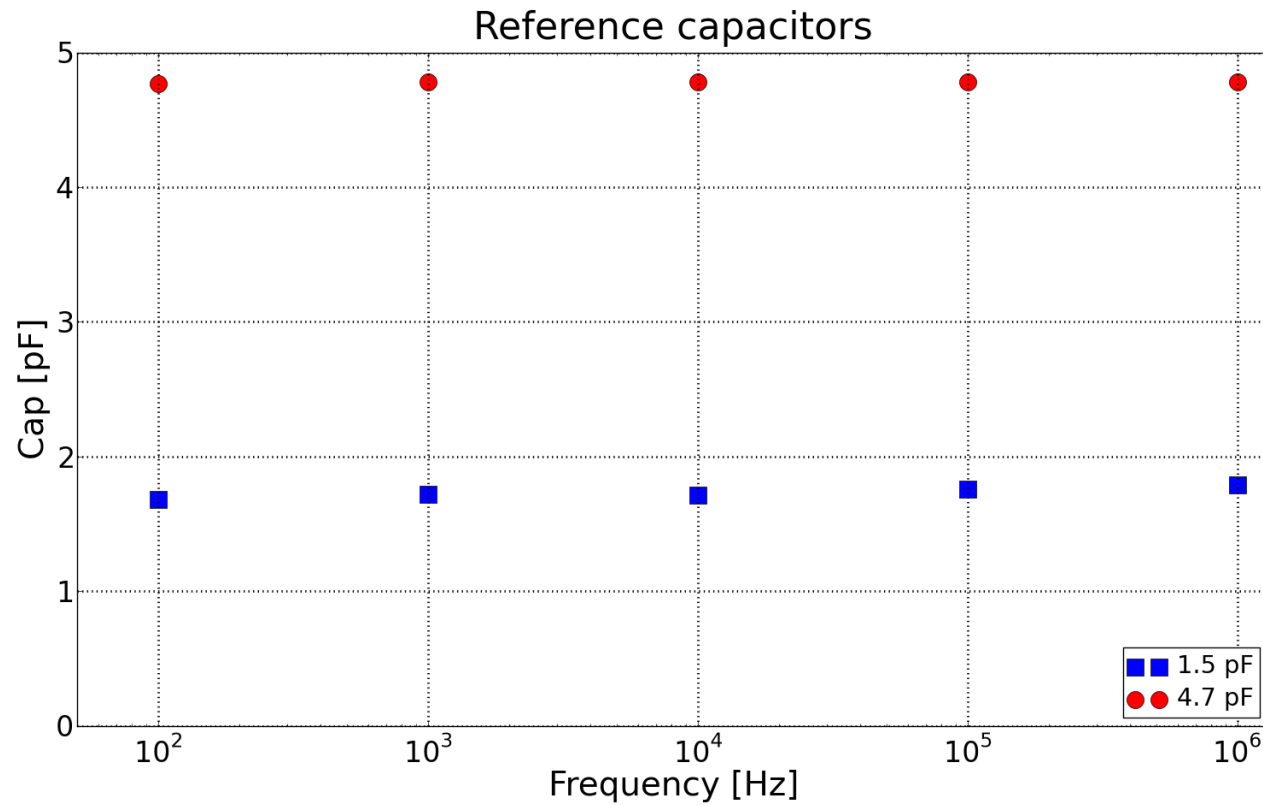
Alternating Configurations



One-side configurations

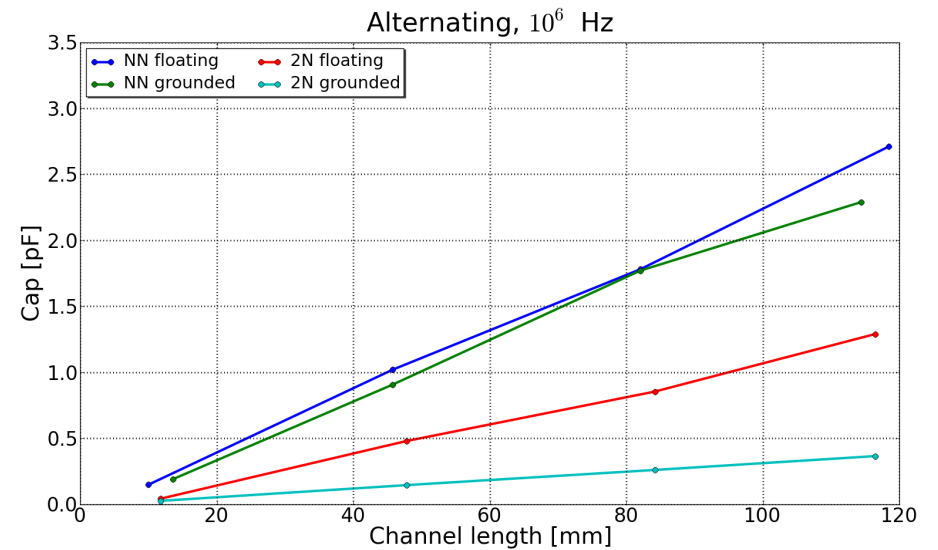
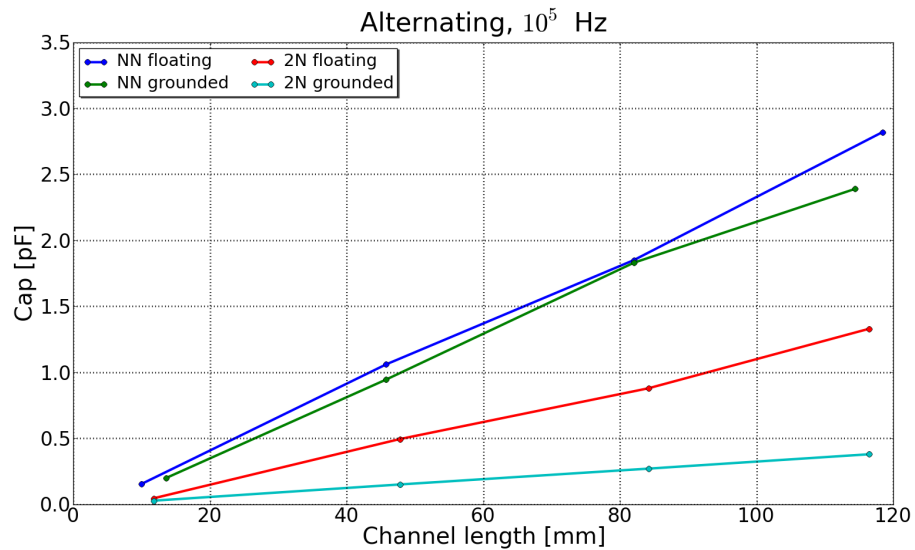
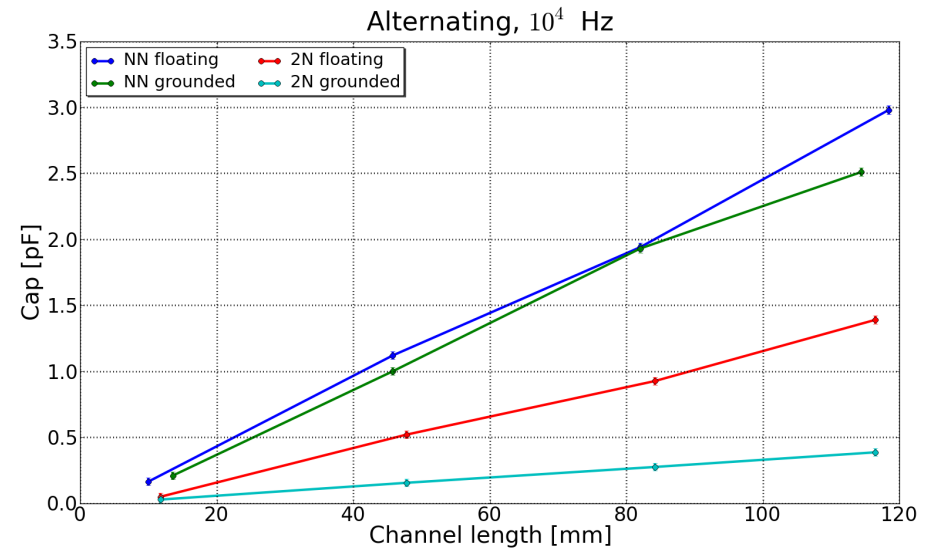
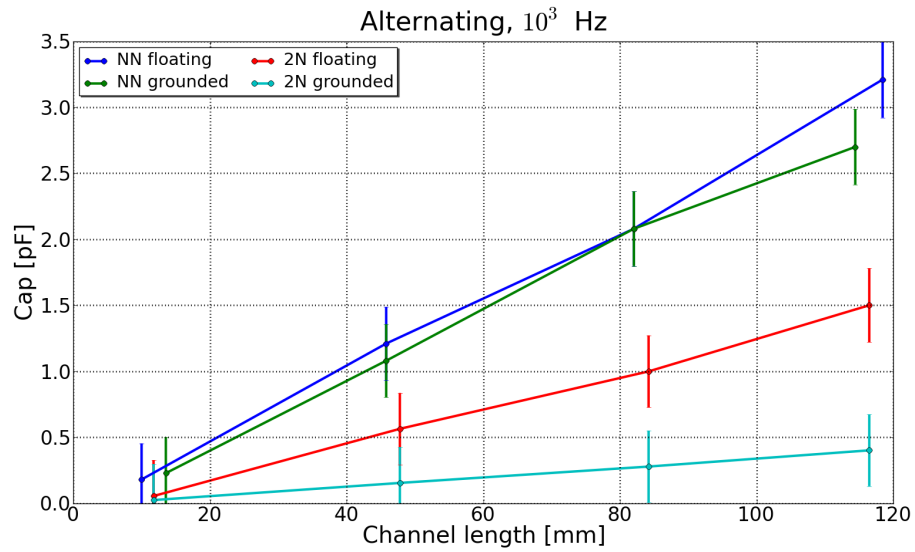


Verification - Capacitors

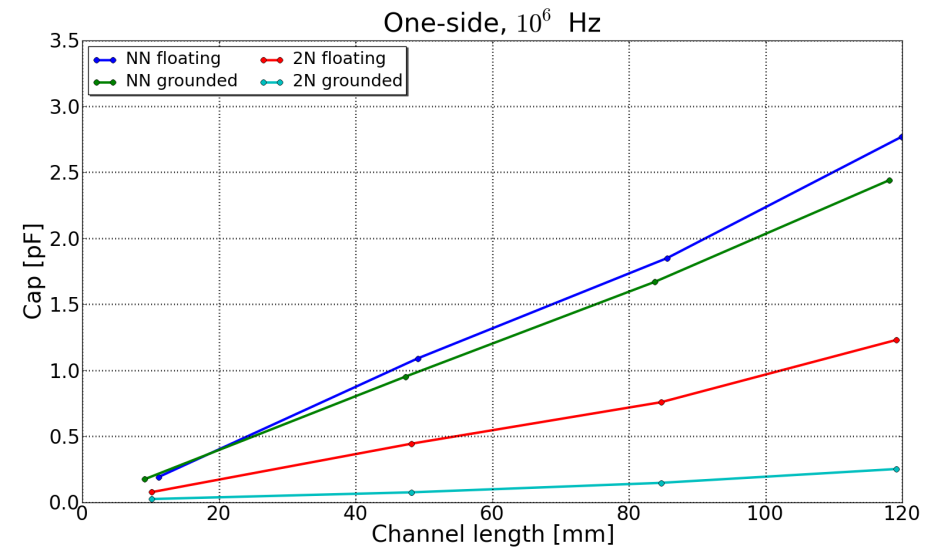
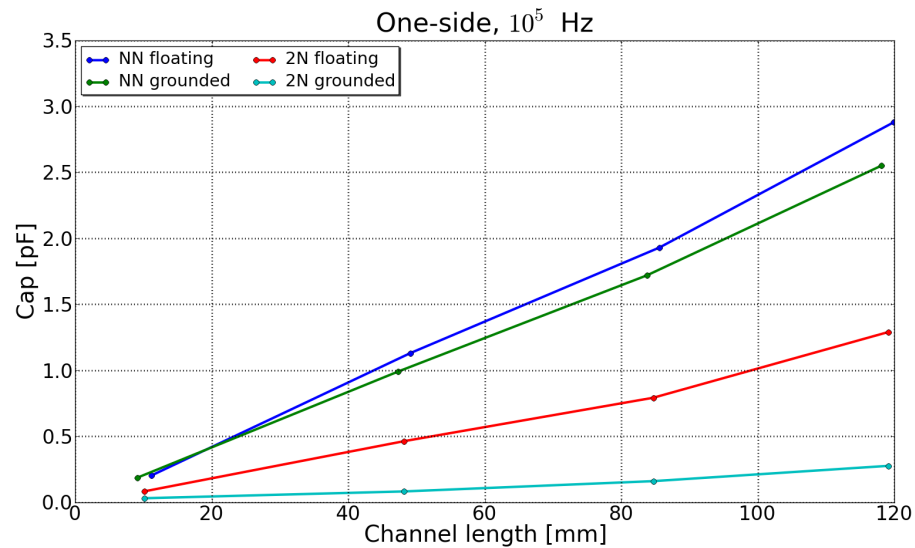
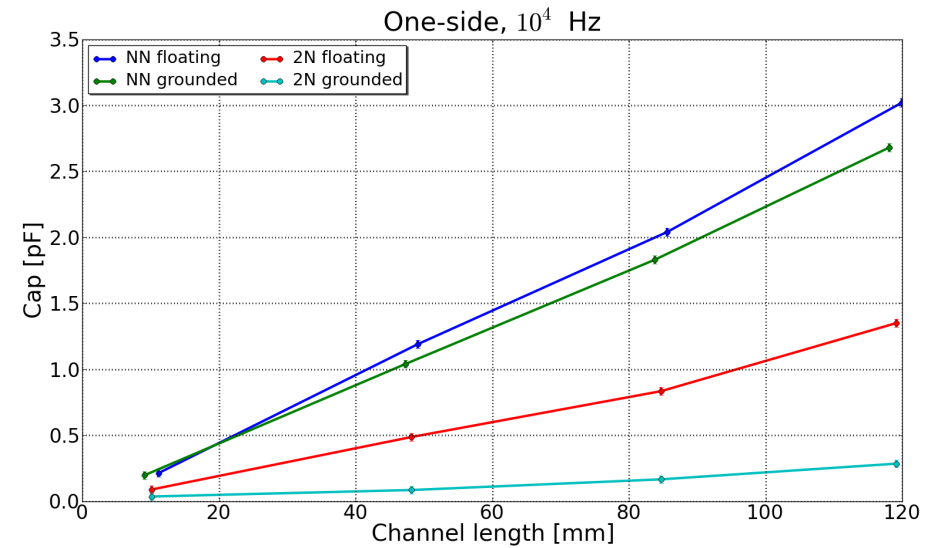
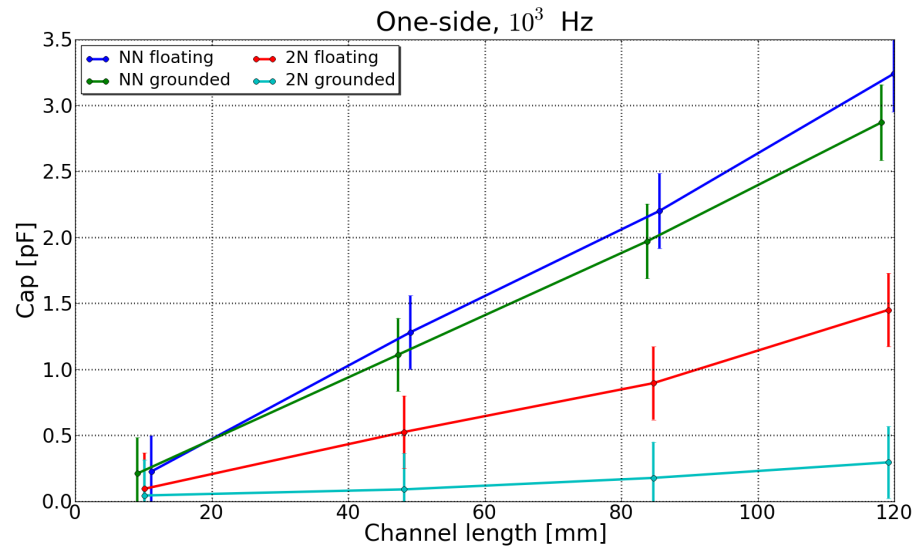


Backup

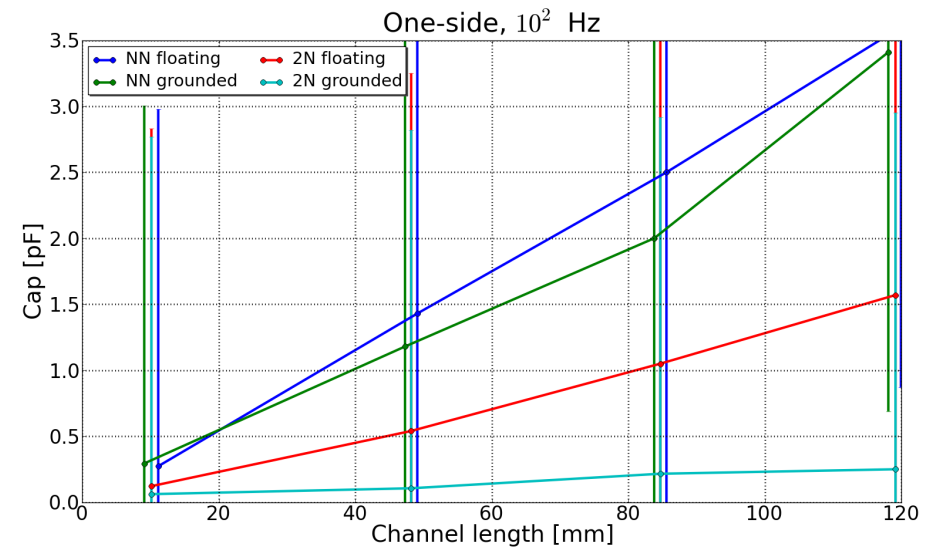
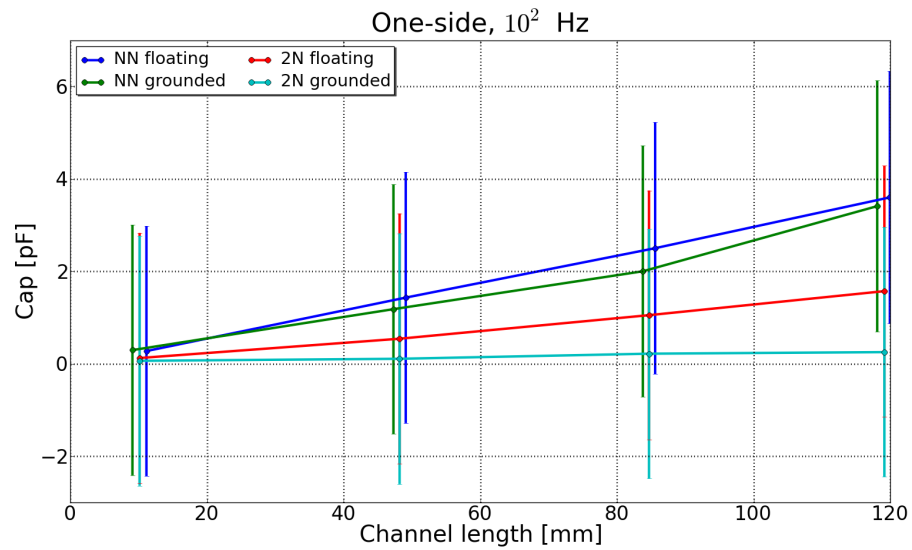
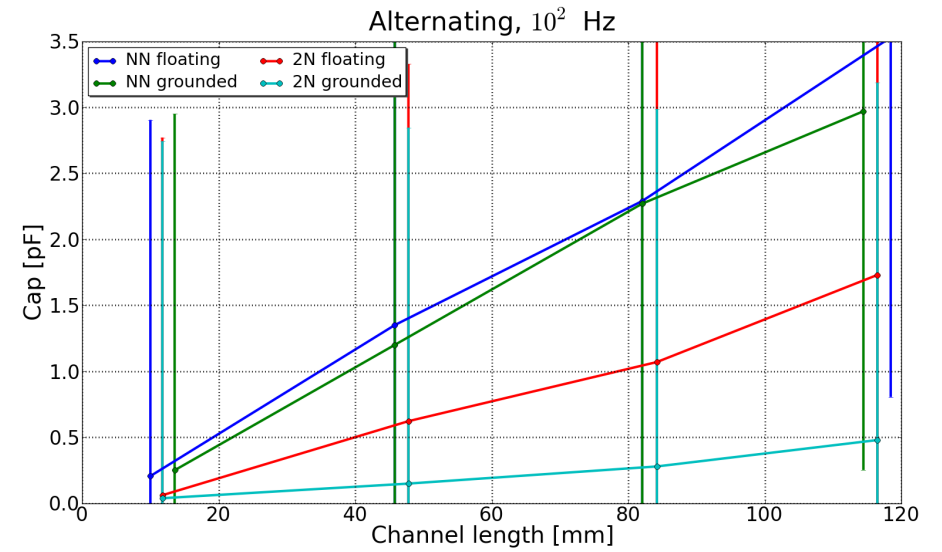
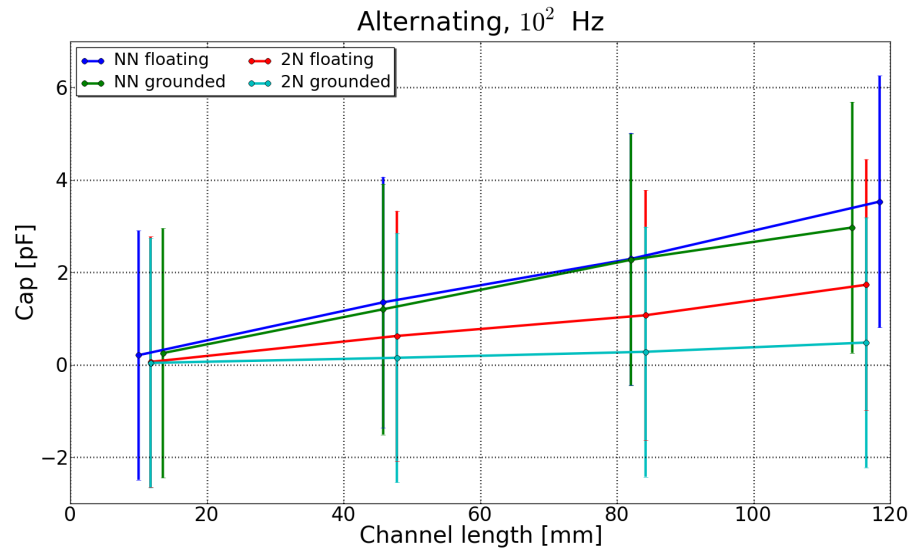
Alternating vs Length



One-side vs Length



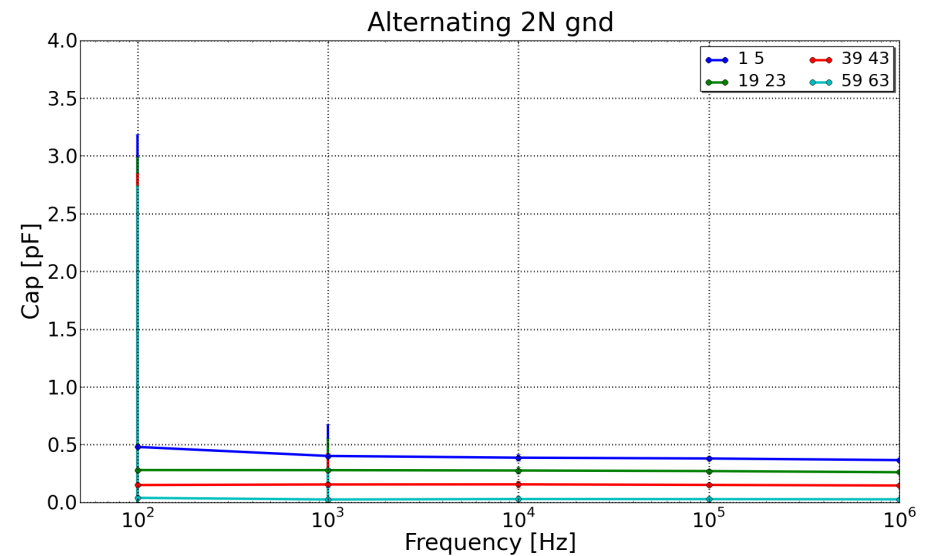
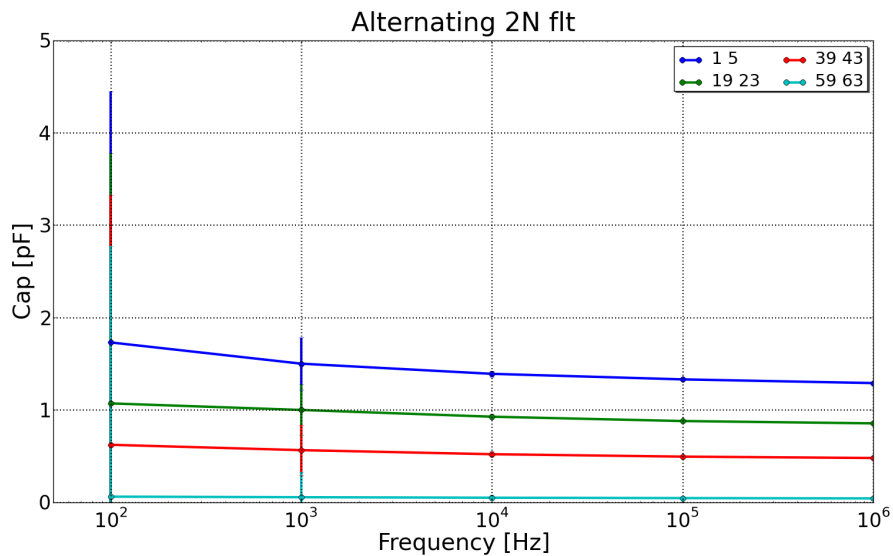
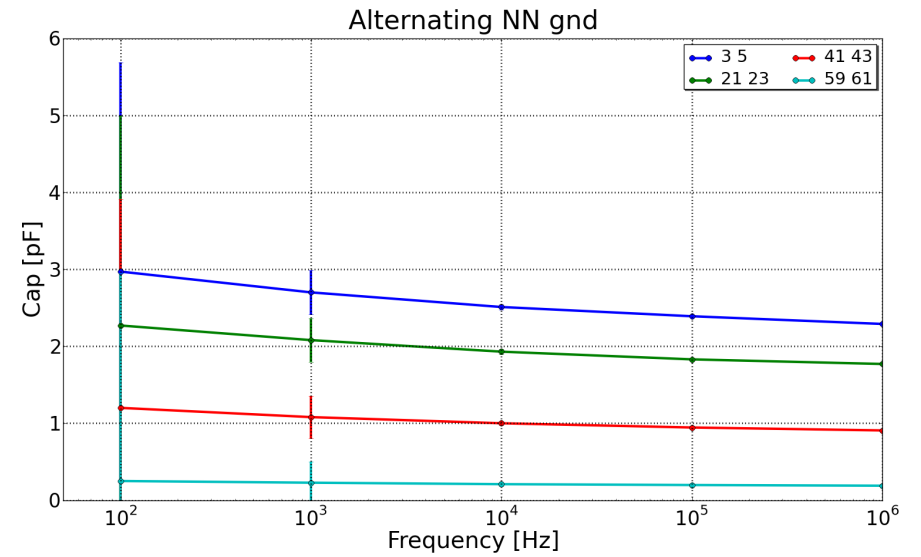
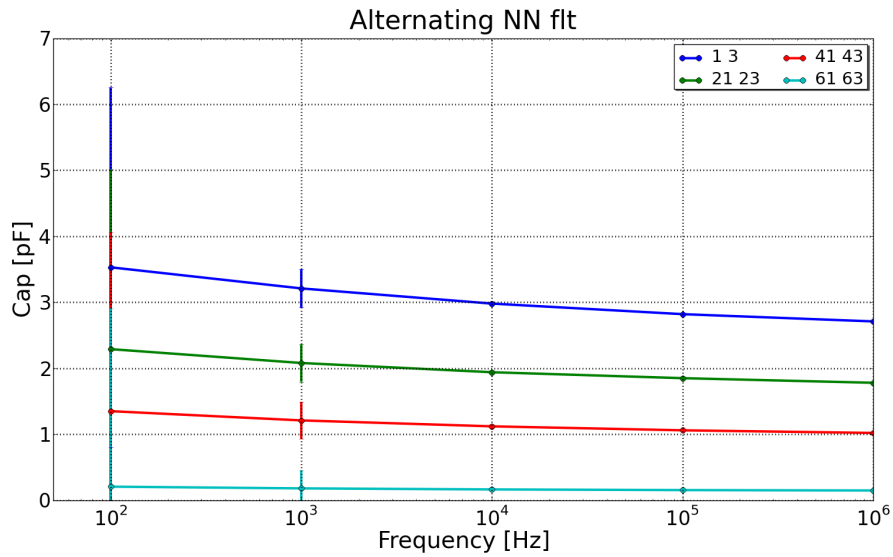
100 Hz



Error equation

$$A_{\text{rel}}(\%) = \pm [(\text{Basic accuracy}) + \\ (\text{Impedance proportional factor}) + \\ (\text{Impedance proportional factor}) * (\text{Cable length factor 1}) * 100 + \\ (\text{Cable length factor 2})]$$

Alternating, all data



One-side, all data

