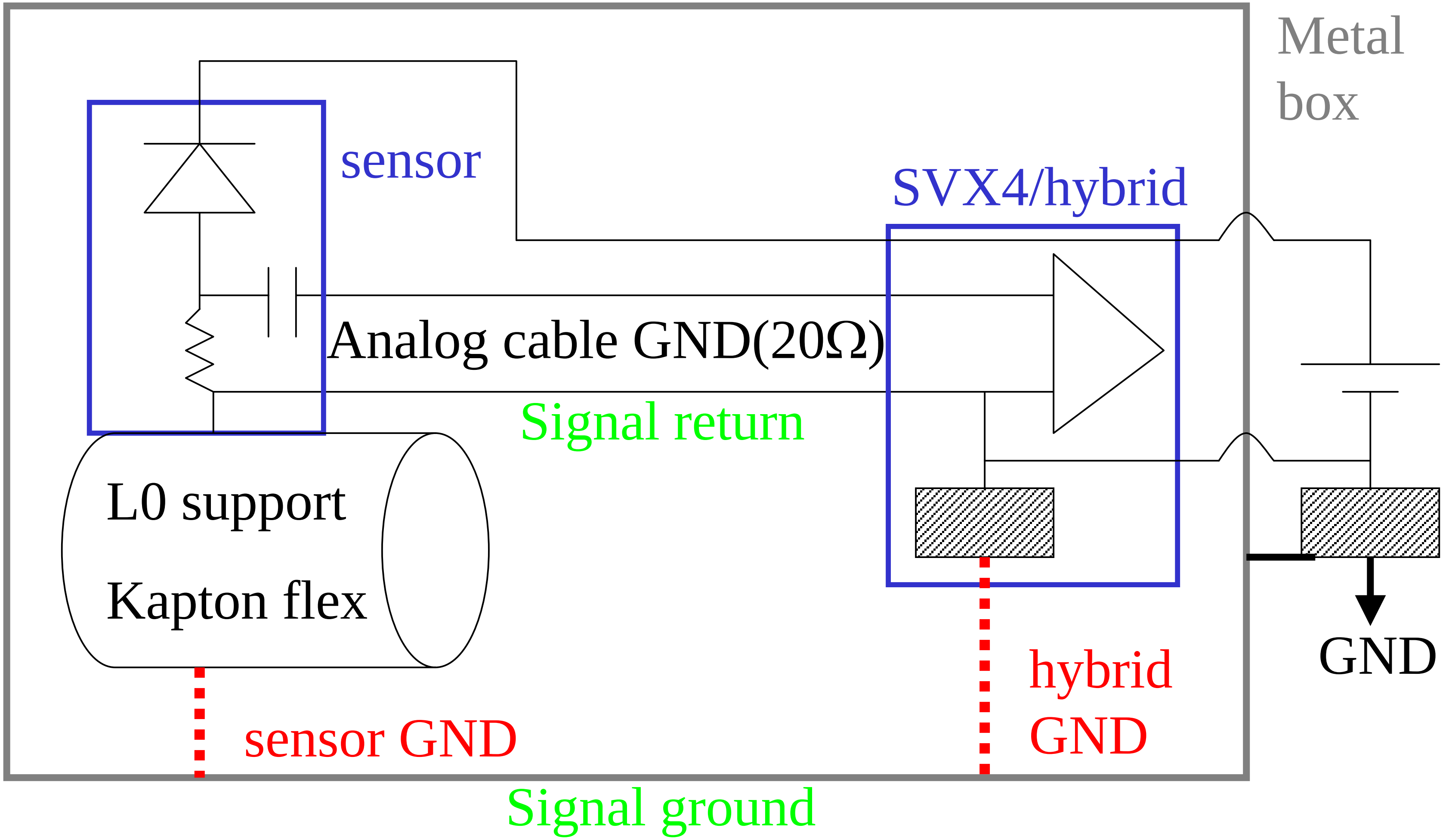
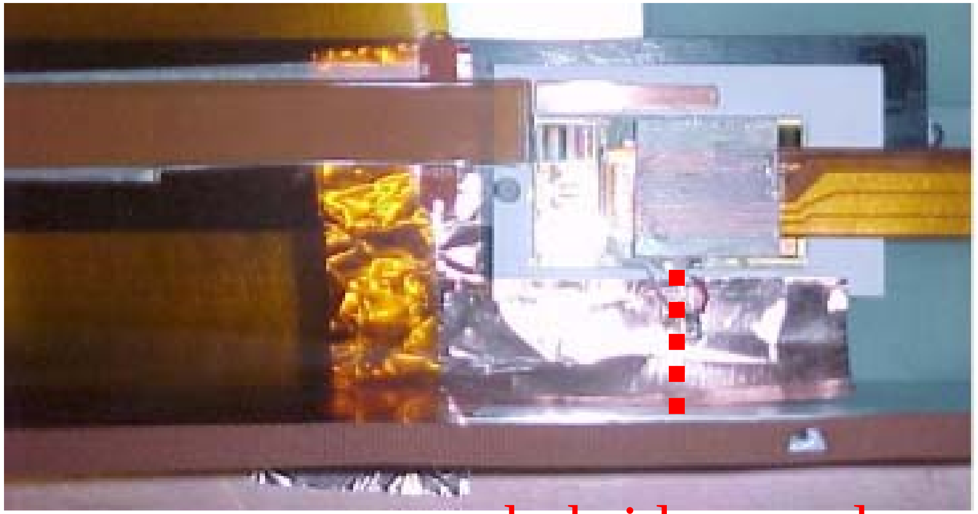
Grounding Studies



L0 prototype module

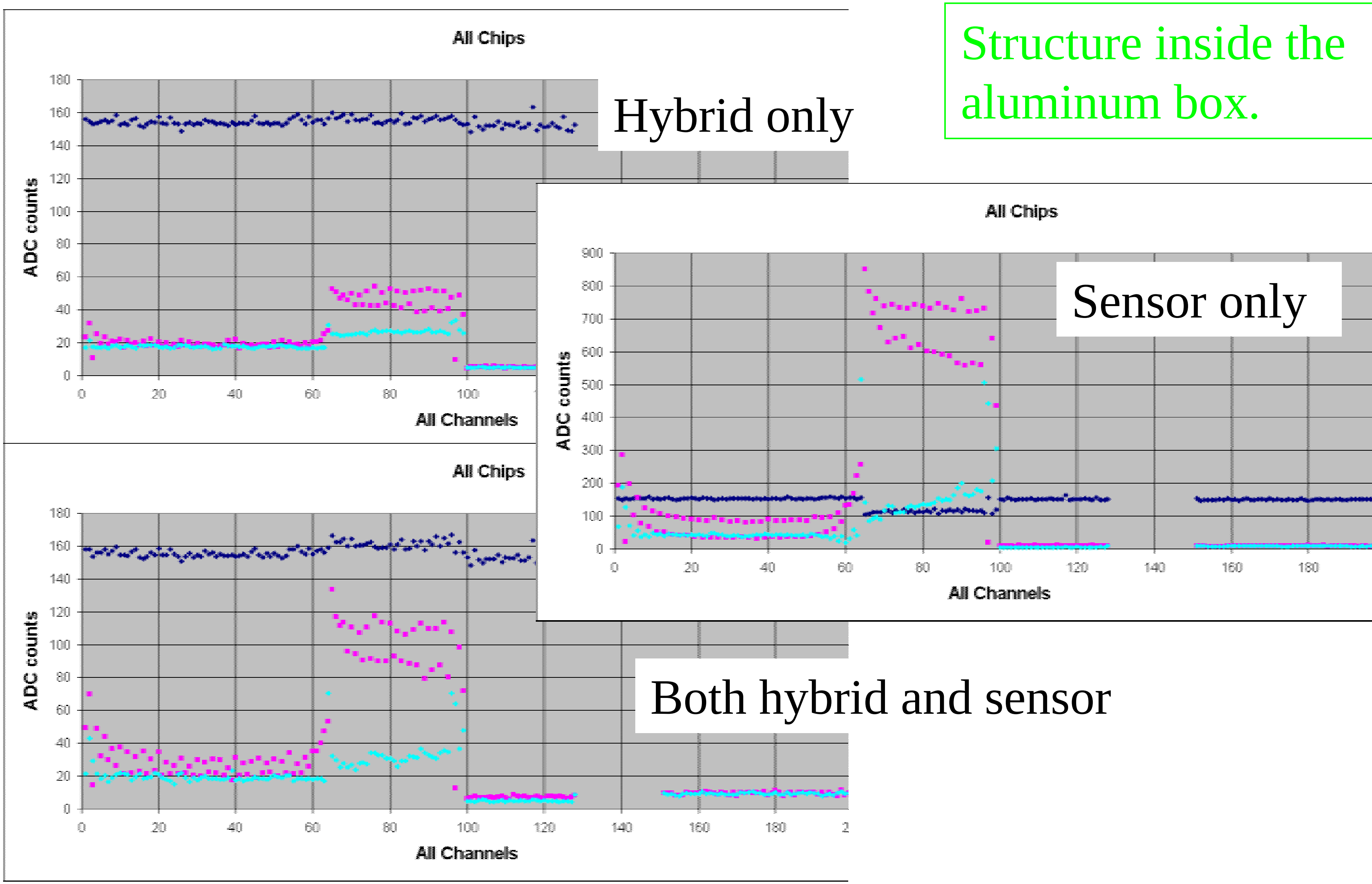
sensor ground



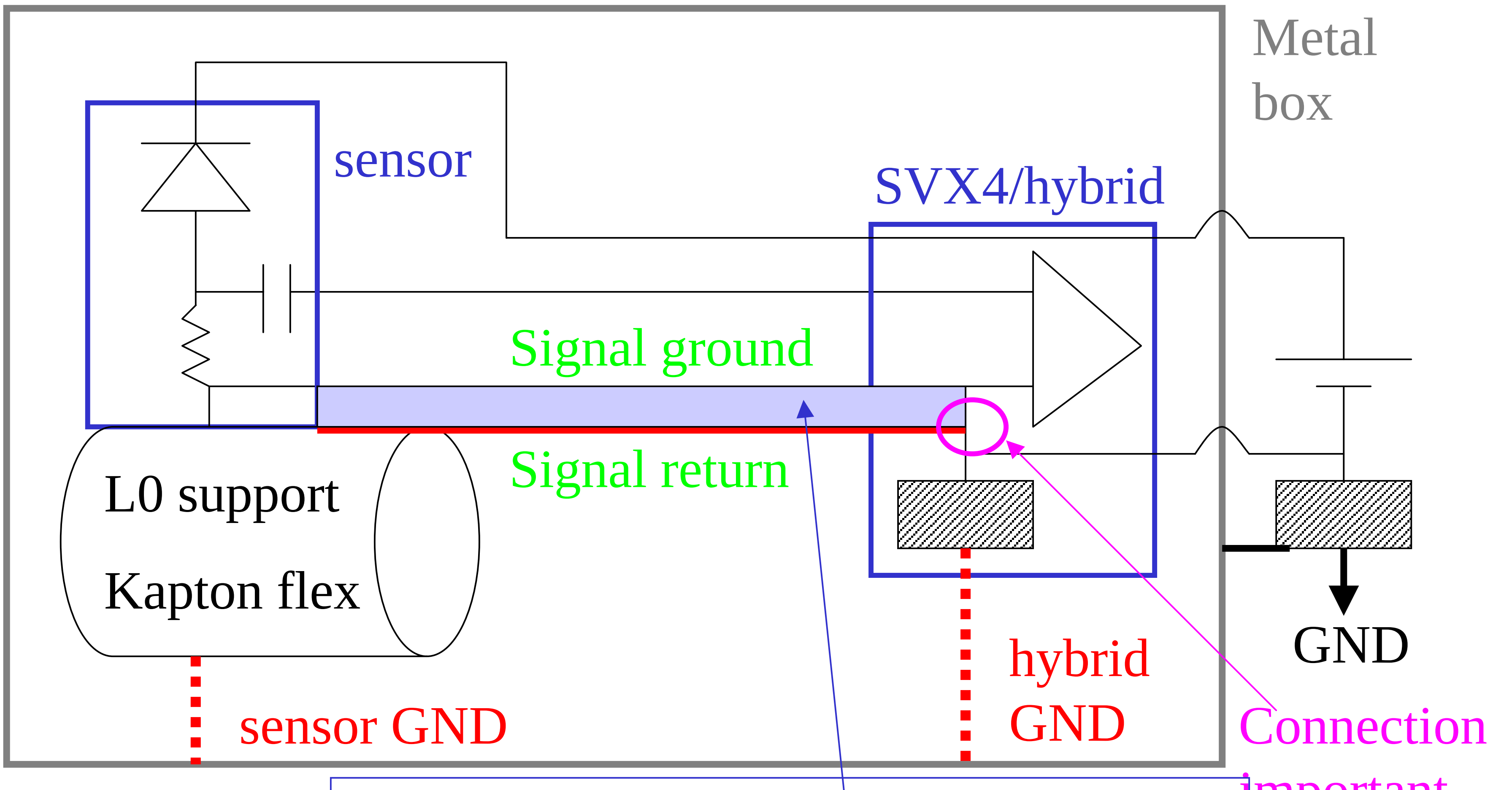
hybrid ground

Effect of Grounding

Structure inside the aluminum box.



Equivalent (?) circuit (cont'd)

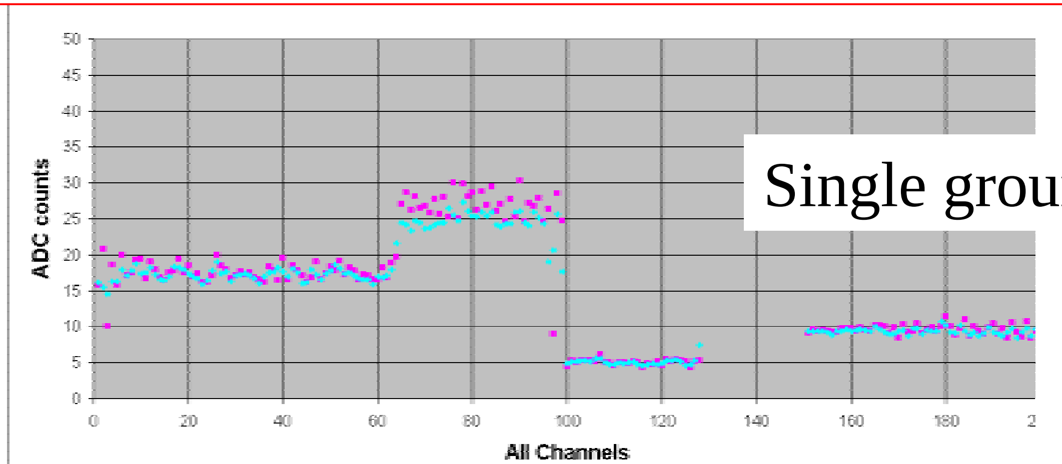


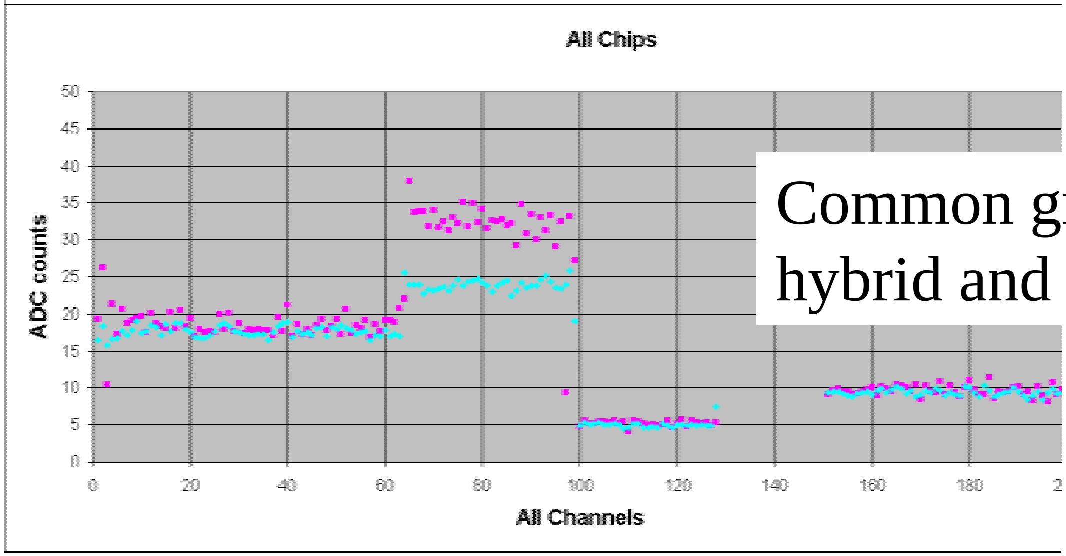
Smaller inductance (or smaller loop)

Least impedance = least inductance
for high frequency (not resistance).

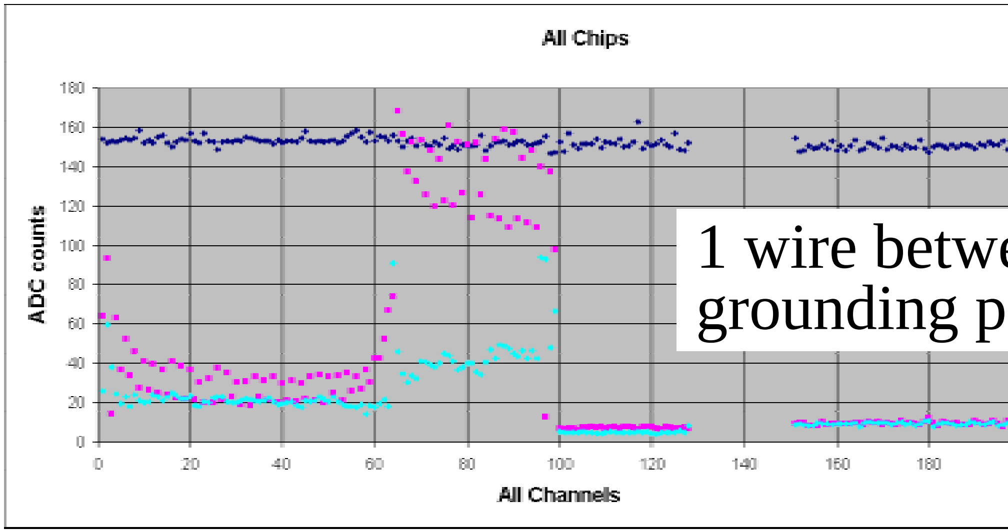
After putting extra grounding plane

Note! Still the hybrid grounding is not perfect in terms of getting low inductance… but the effect of the extra ground plane is clearly seen.



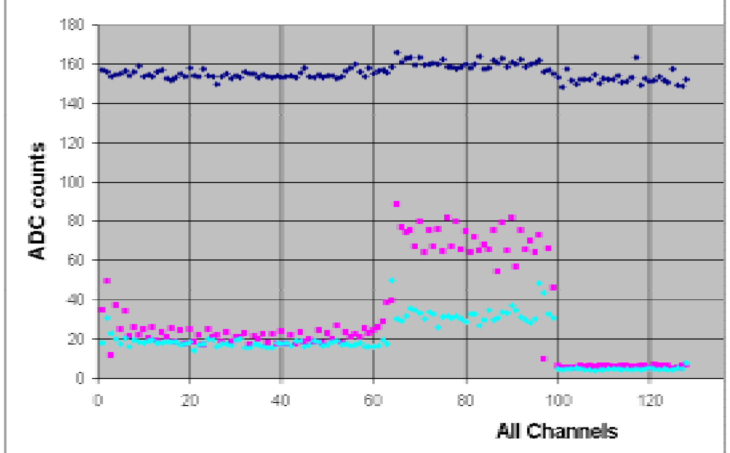


Importance of low inductance connection

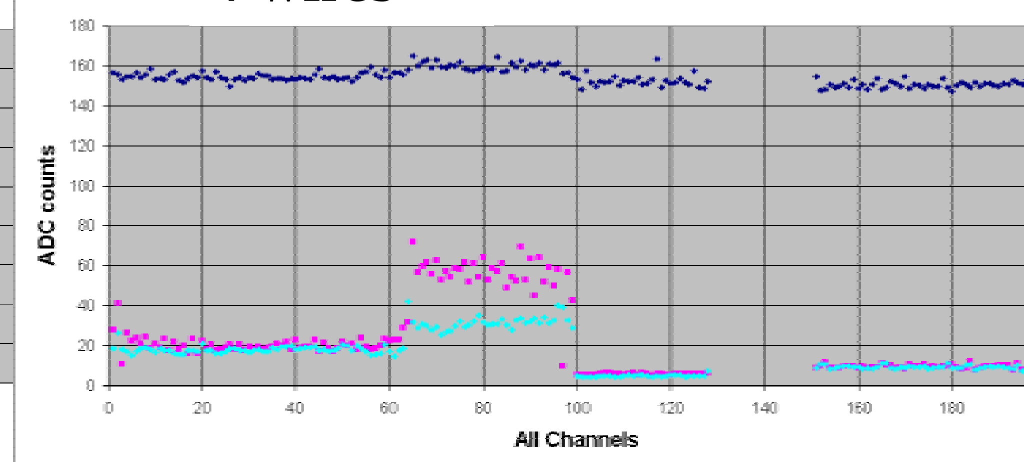


1 wire between hybrid and the extra grounding plane.

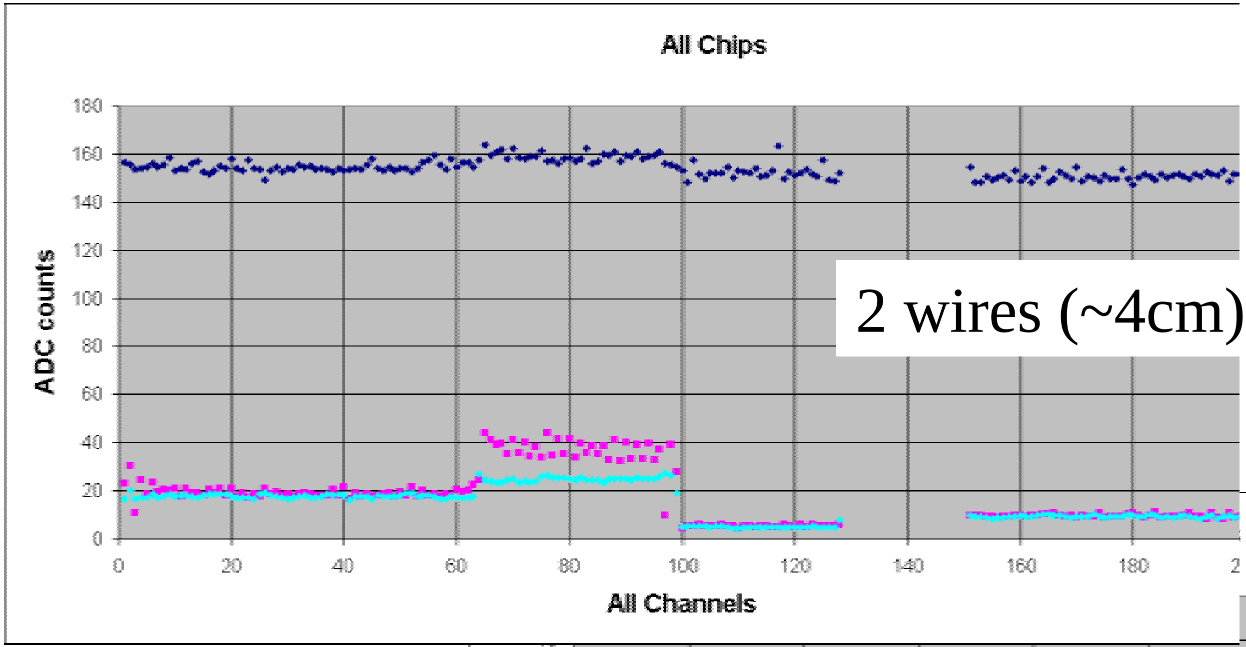
3 wires

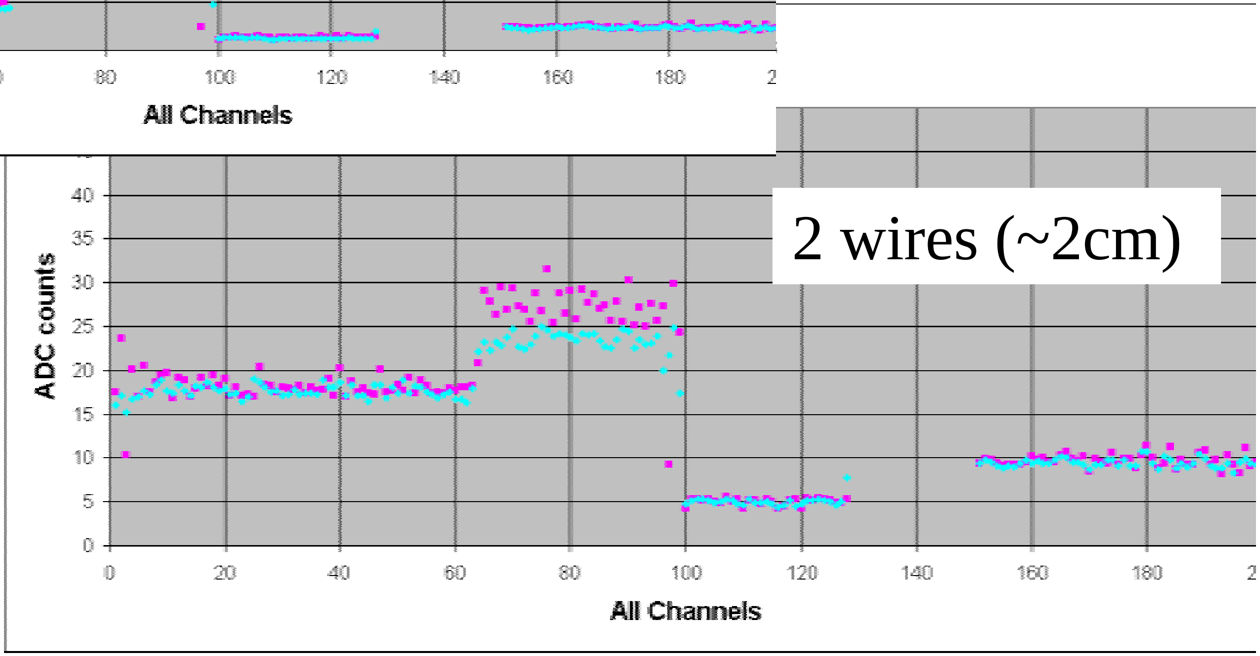


4 wires



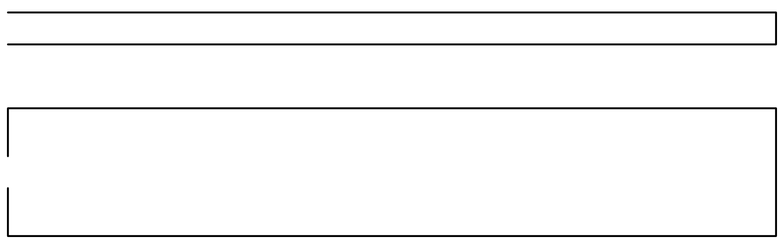
Low inductance connection (cont'd)





Reducing the inductance

- Having lower inductance connection to GND seems crucial.
- L ~ (wire) length/radius: $M=\mu l/2\pi[\log(2l/r)-1]$
- $L = \Psi/I$
- Ψ ~ area of the closed circuit

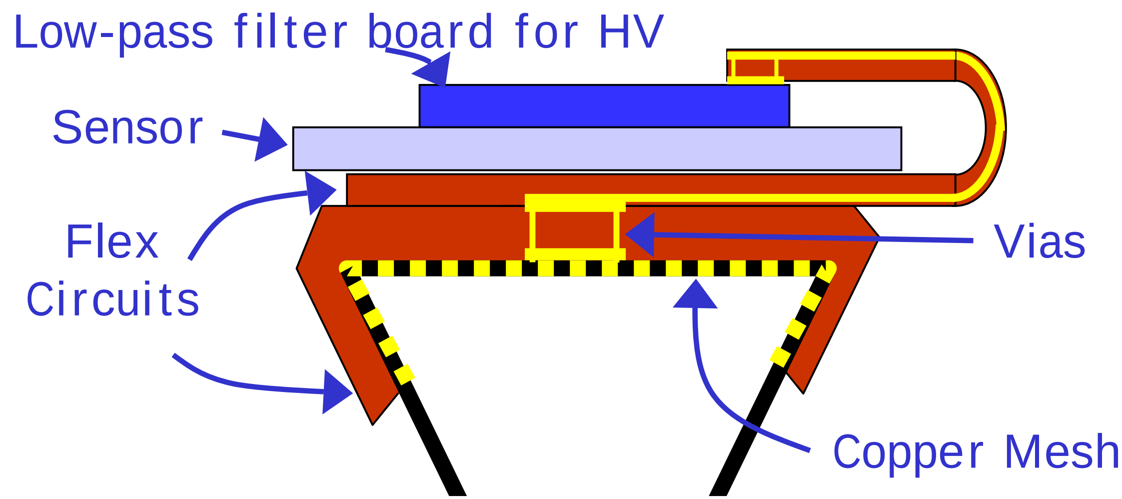


better

- People know these rules well, but sometimes forget to apply.
- But these rules are always critical for any grounding connections, both locally and generally.

How do we achieve????????????

- Sensor grounding.



- The sensor and hybrid need to be connected through rigid ground plane. This should work also as a shielding. 🡨 extension of kapton flex with copper mesh embedded.
- Need to decide; multi point ground vs single point ground at hybrid end. 🡨 Marvin prefers multi point ground to avoid an accidental (capacitive) coupling which screws up the single point grounding scheme.

Grounding scheme for hybrid

- Low inductance grounding connection to hybrid is very important (let me repeat).
- Direct connection to the support structure. ← minor concern on the L0B hybrids.
- Another option? Hybrid support rail as grounding plane.