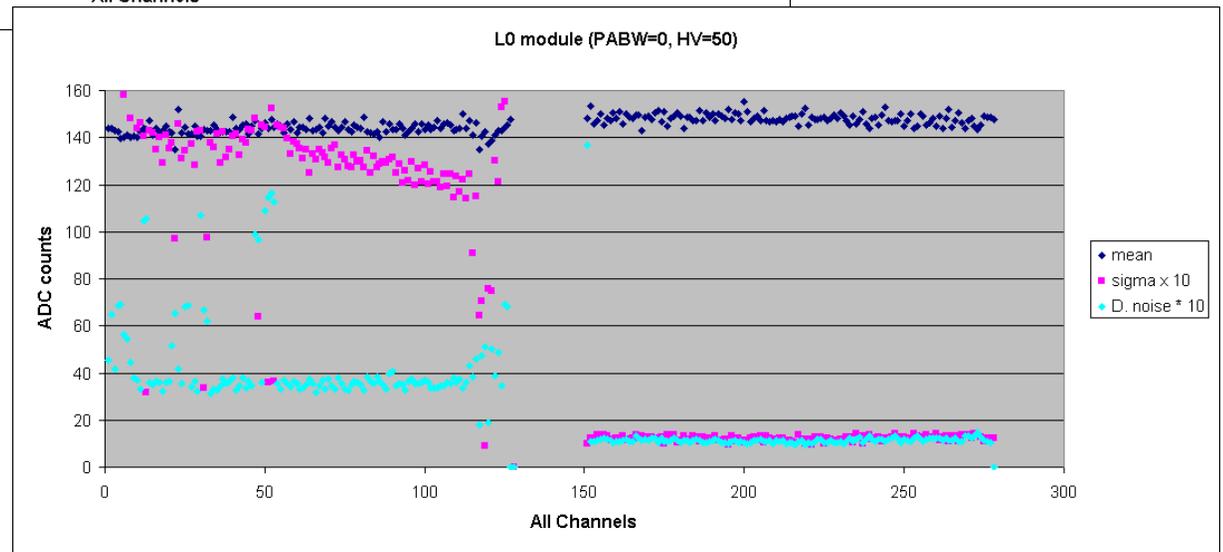
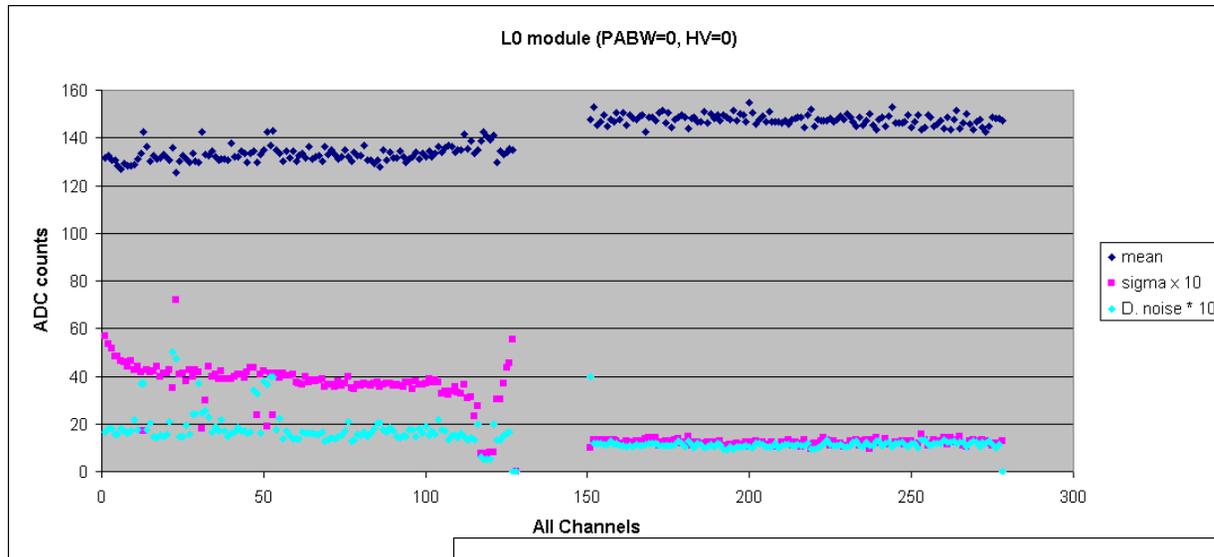


Update of L0 Noise Studies

Kazu Hanagaki / Fermilab

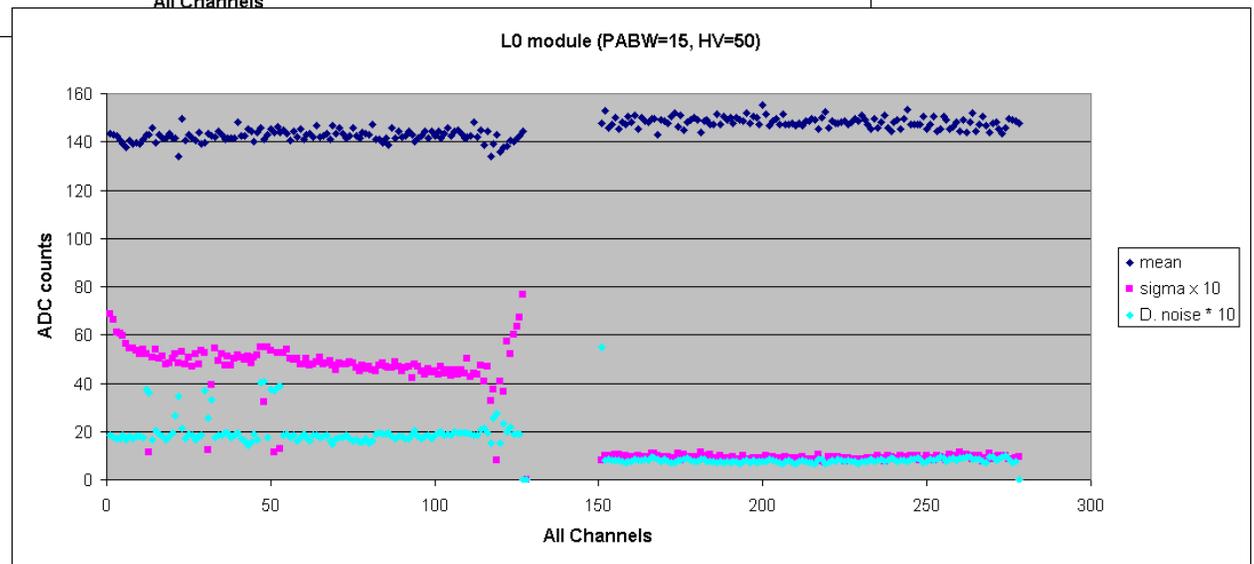
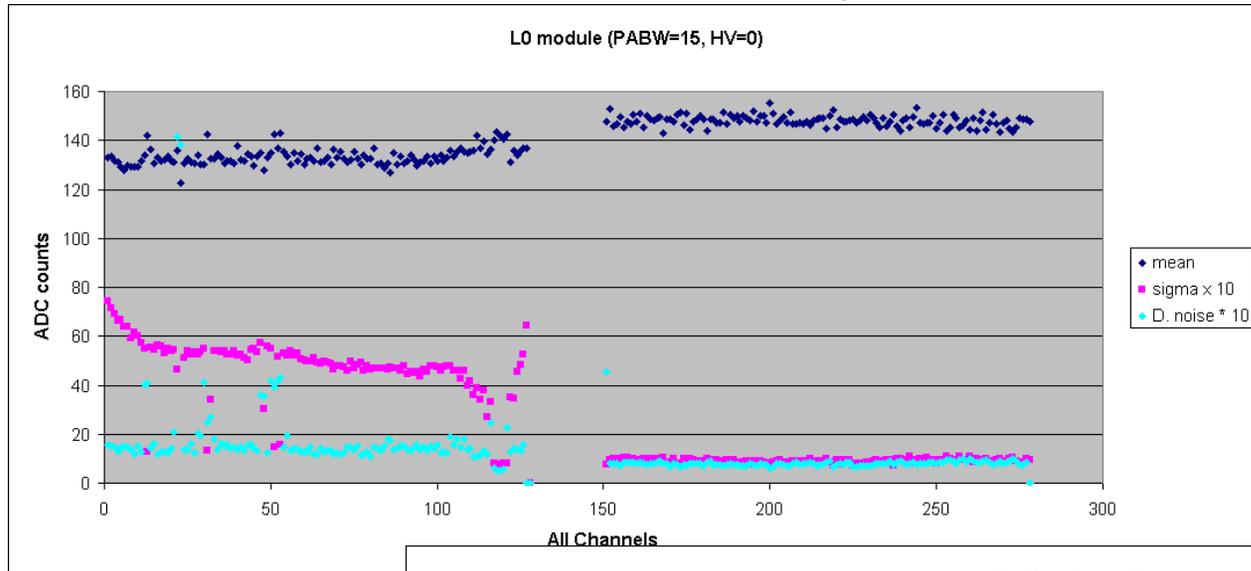
- New prototype (=4th prototype) with SVX4 on the L1 hybrid reads out signal via the analog cable!
- Noise studies using the 3rd prototype with SVX2.
 - Mystery --- nearby metal (with grounded) does not affect the noise level???
 - shielding/grounding scheme.

First results by SVX4



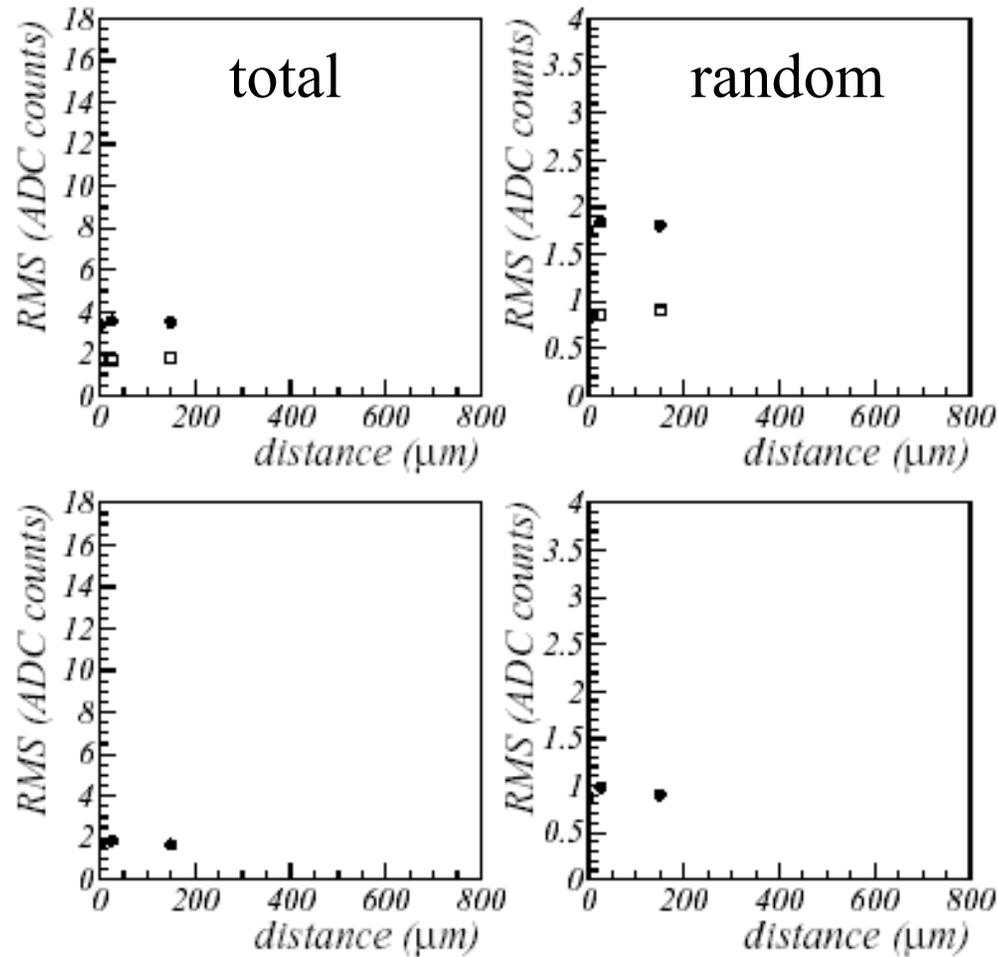
Huge noise from HV or grounding loop of HV lines???

First results by SVX4



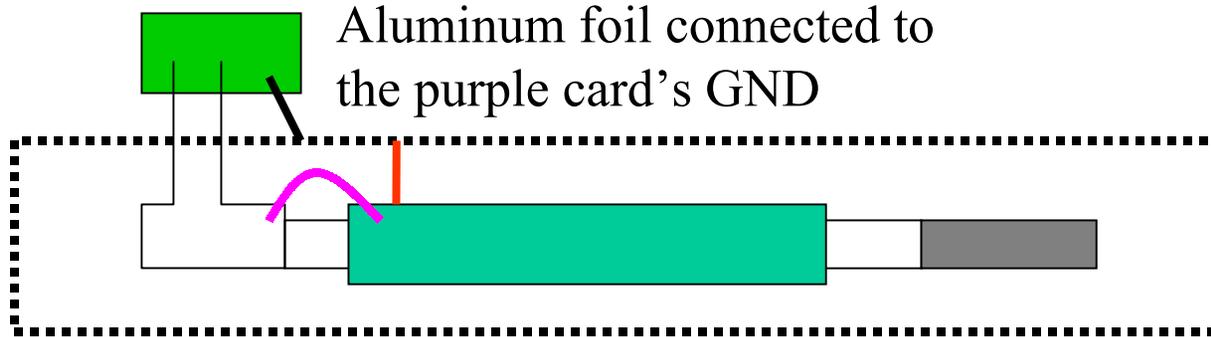
➔ We really need to understand the noise.

Noise dependence on the spacer thickness

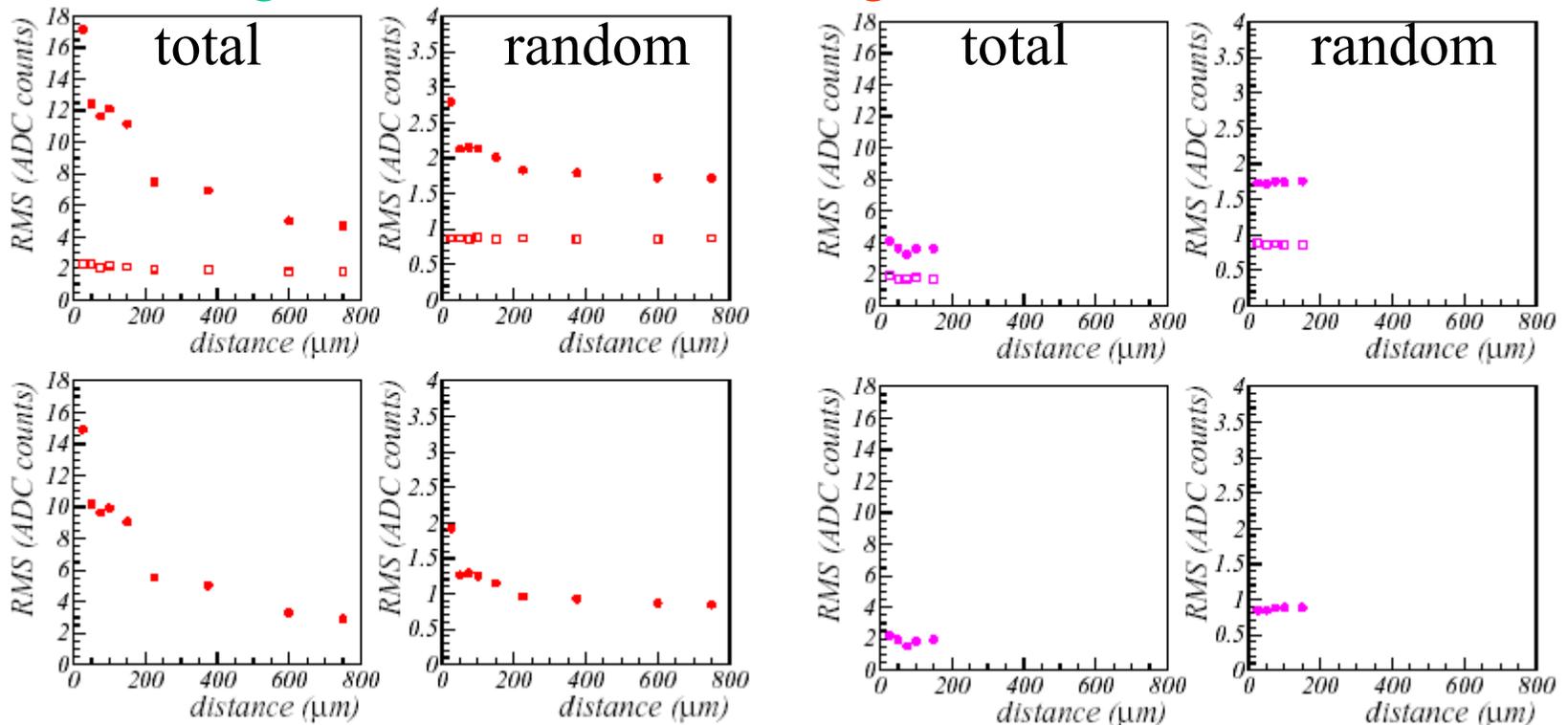


➔ Again no effect on either the total or random noise.

The Puzzle – metal near the analog cable.

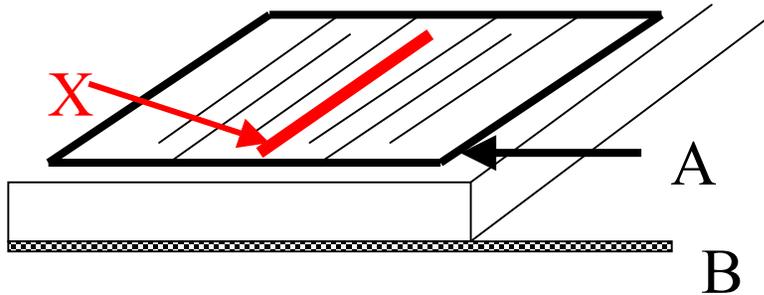


Shielding metal connected to the grounded box or the HDI.



Capacitance consideration

(For the very first prototype cable.)



	Meas	FE calc
X-A w/o B	0.355	0.322
X-(A&B)	0.472	0.421

ANAYS calc for the current prototype

D (μm)	C (pF/cm)
Far away	0.338
200	0.543
100	0.578

With naïve calculation...
(for 43 cm long strip)



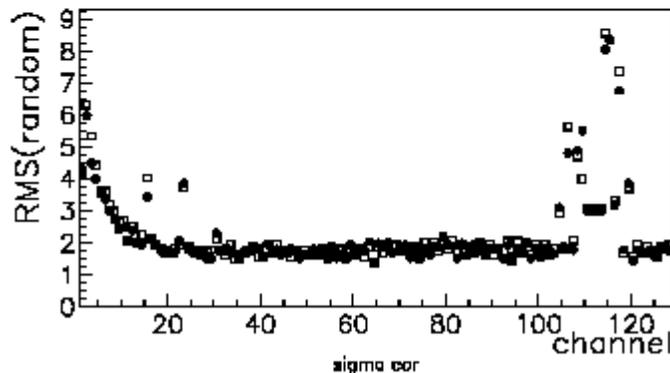
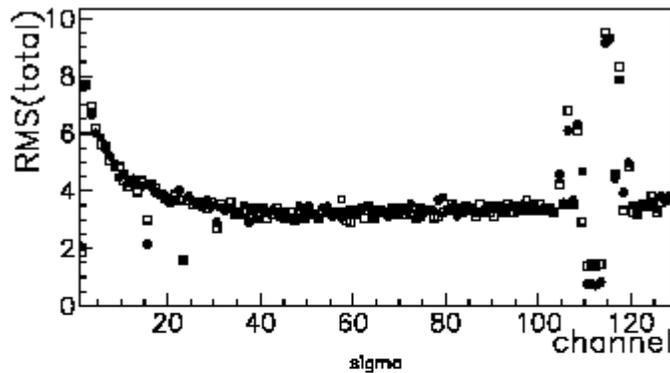
$$C = \pi\epsilon_0 / (\ln(d/r)) \sim 10\text{pF}$$



$$C' = 2\pi\epsilon_0 / (\ln(2h/r)) \sim 6\text{pF}$$

Shielding Scheme 1

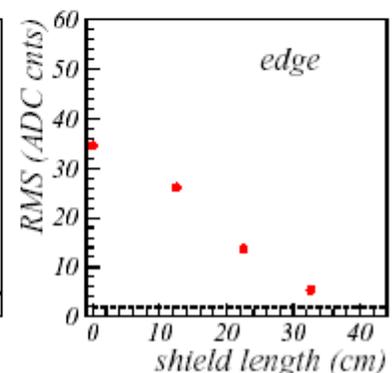
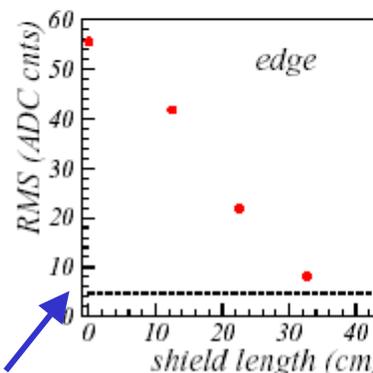
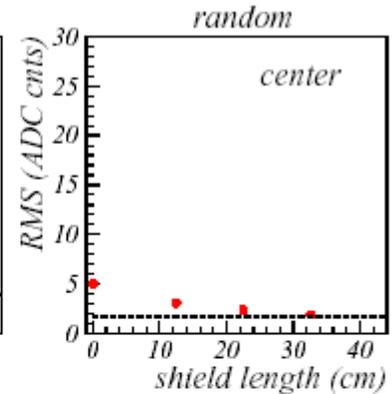
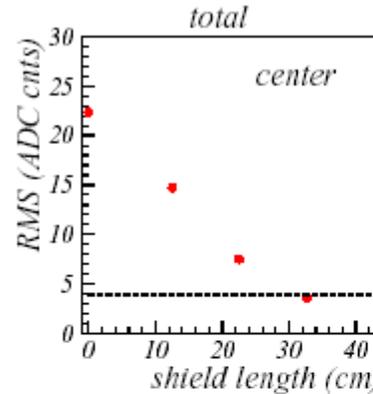
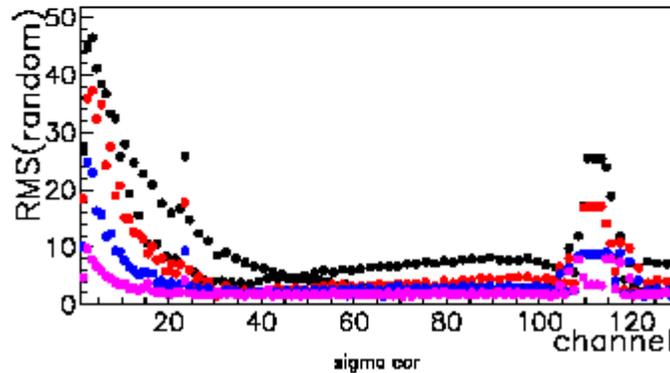
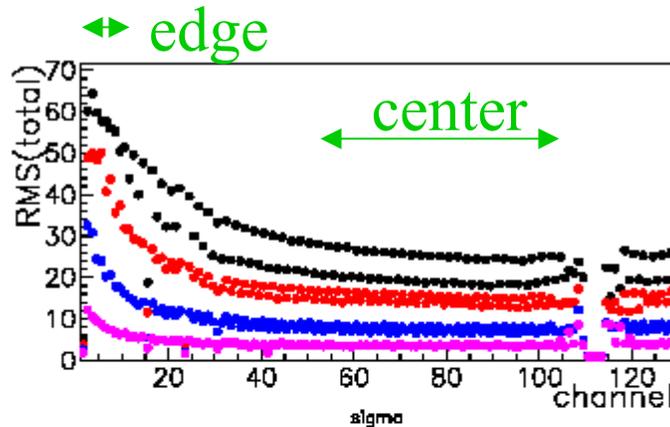
- We learned anyway that grounding to HDI is better.
 - ➔ tried more realistic shielding scheme (= no external shielding around the box, but only the internal shielding connected to the HDI).



- Cables wrapped by aluminum foil.
- Aluminum foil only on top and bottom of cables.

1. It works! (compare the previous slides)
2. No difference between the two scheme.

Shielding Scheme 2

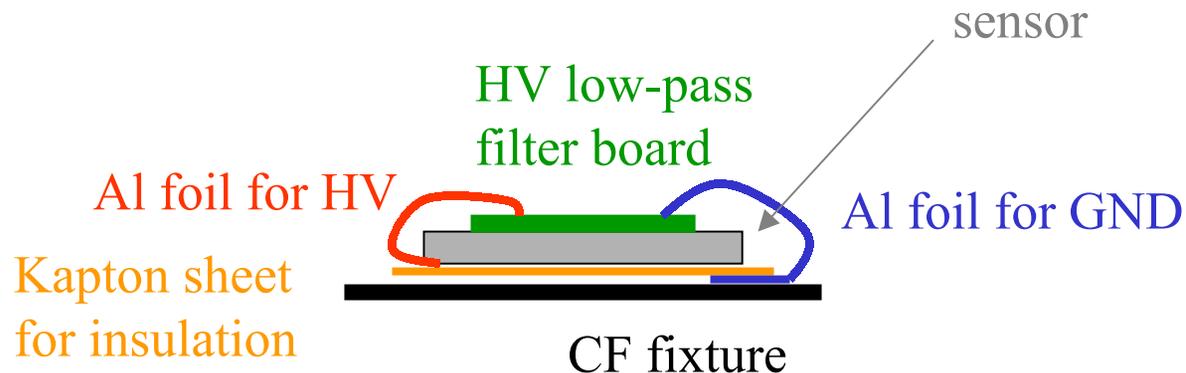


Noise level with external shielding

- Noise reduction looks proportional to the shielded area (because the noise we are seeing is RF pickup).
→ obviously covering whole area is needed.

Next things to do

- Repeat and confirm the same effect by the new prototype with SVX4.
- Shielding effect for external noise source
← frequency dependence.
- Miniature of L0 module, probably with using the L1 hybrid (or even the newest prototype?).



- Area of the aluminum strip to the CF fixture will be tested.