Wrong polarity signal study

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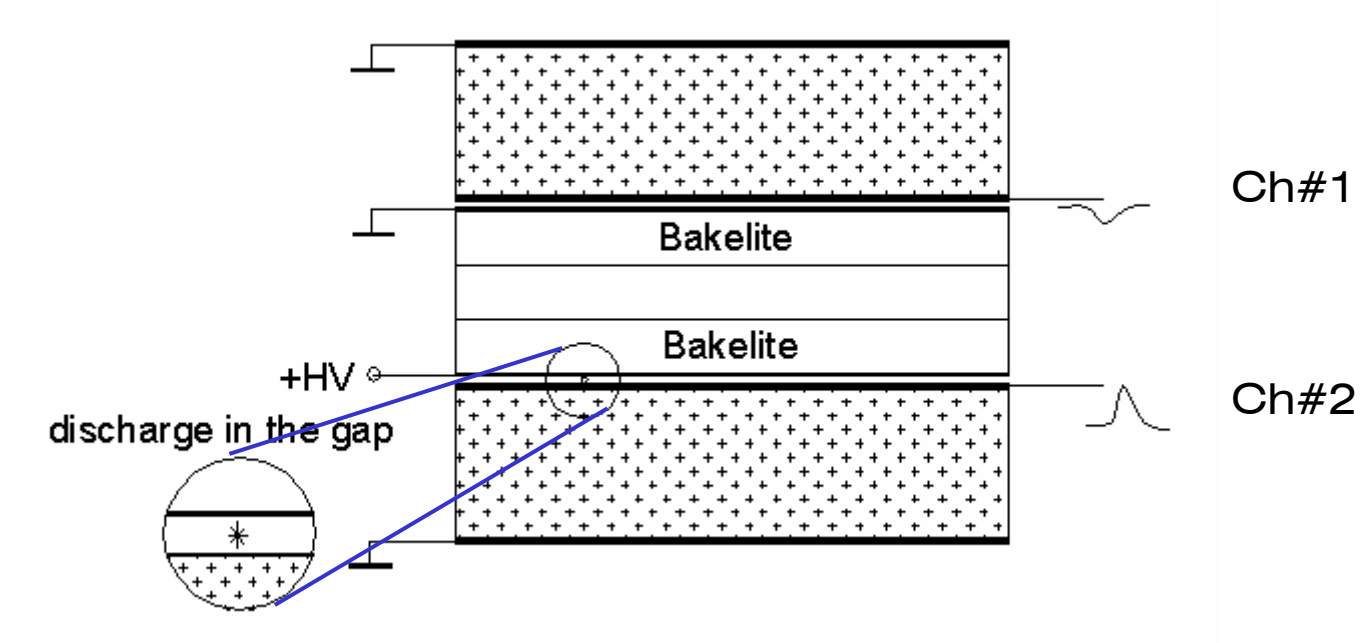
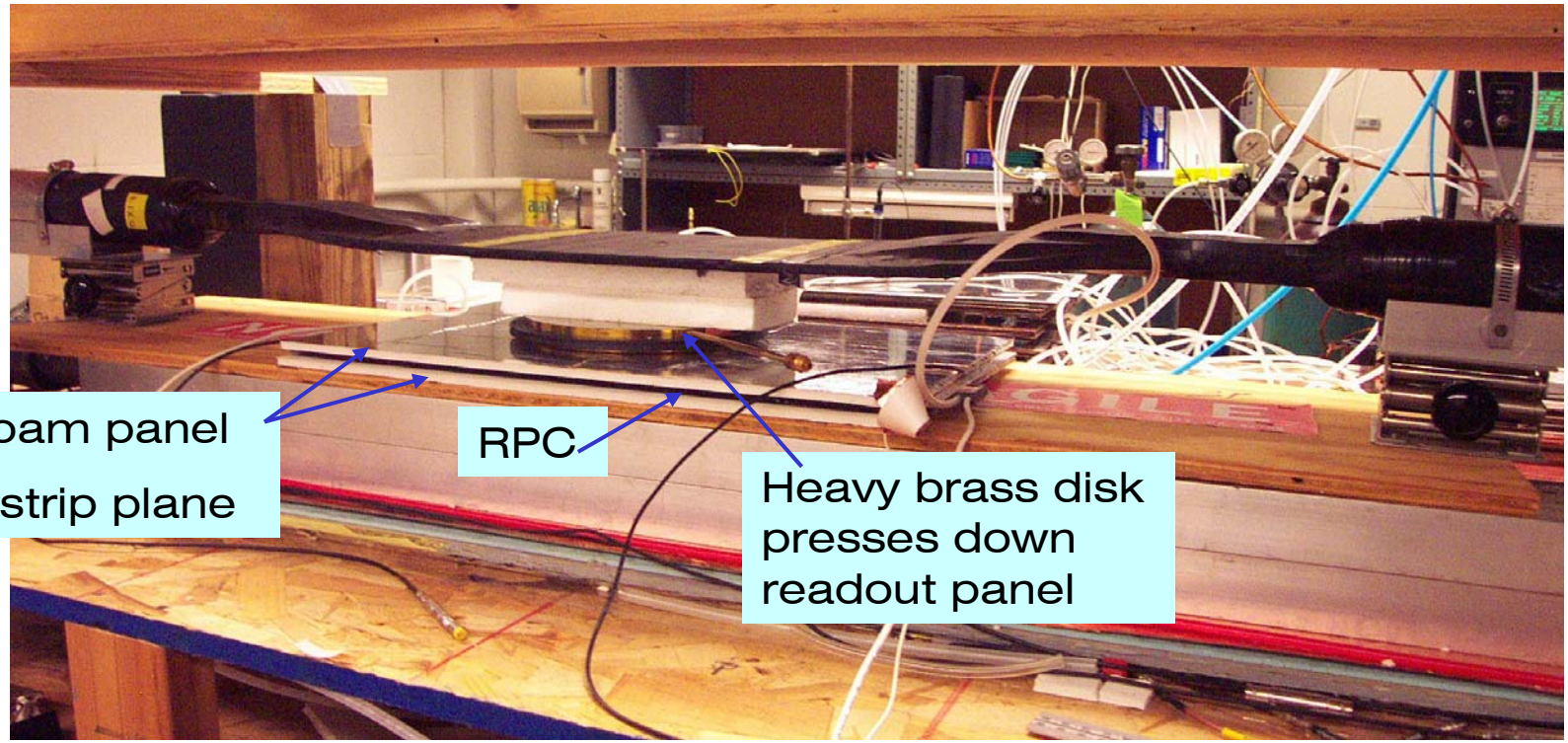
How a wrong polarity signal formed – a hypothetic explanation

I used a 25 x 50 cm2 prototype RPC for this study (see next slide).



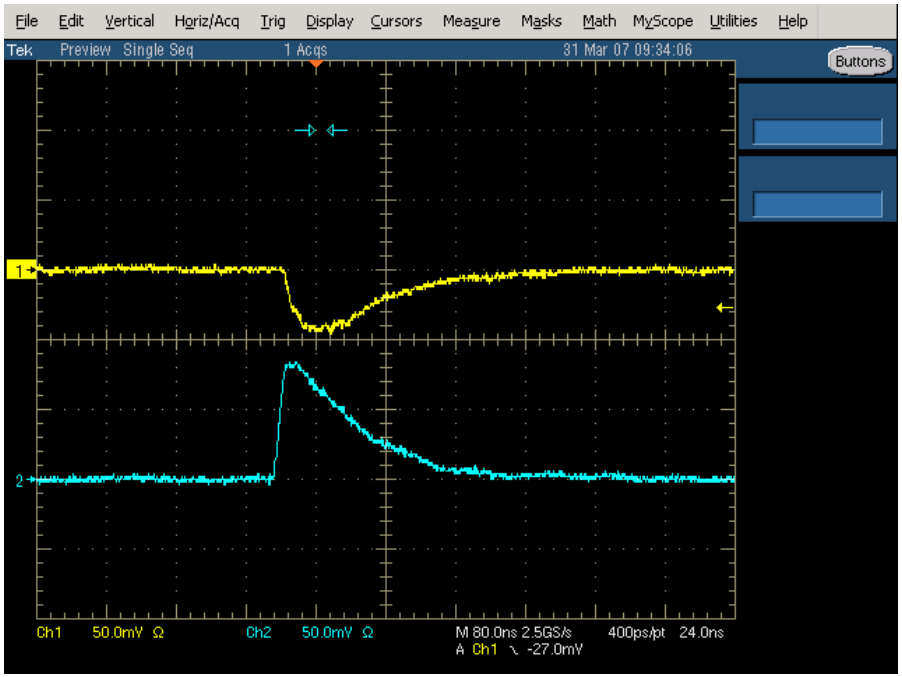
The air gap between HV side of the graphite coating and the pickup strip may produce discharge, the induced signal on the strips have wrong polarity and unsymmetrical characteristic.

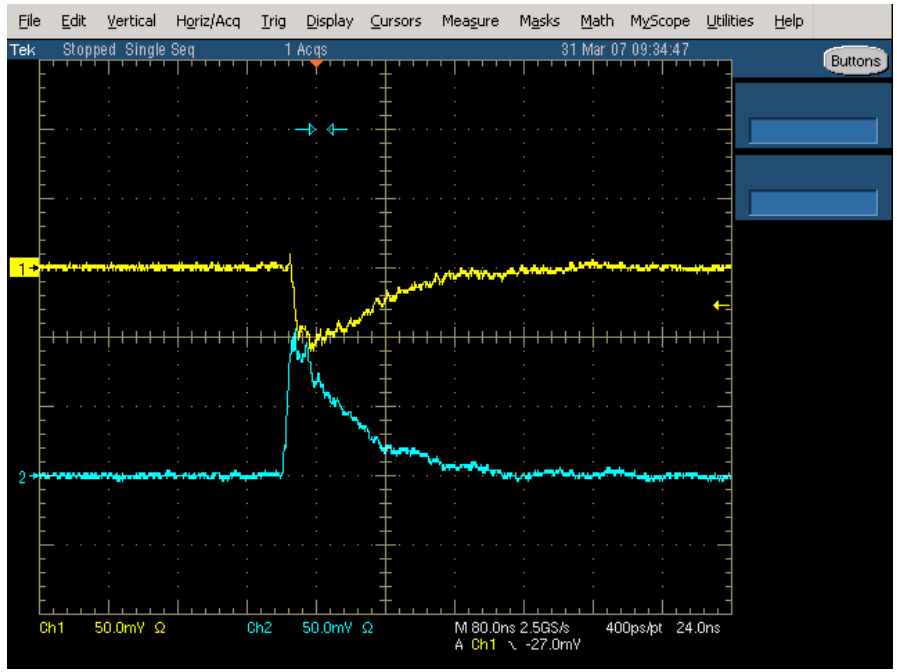
Test setup


¼” foam panel
And strip plane
RPC
Heavy brass disk
presses down
readout panel

Scope observation of wrong polarity pickup

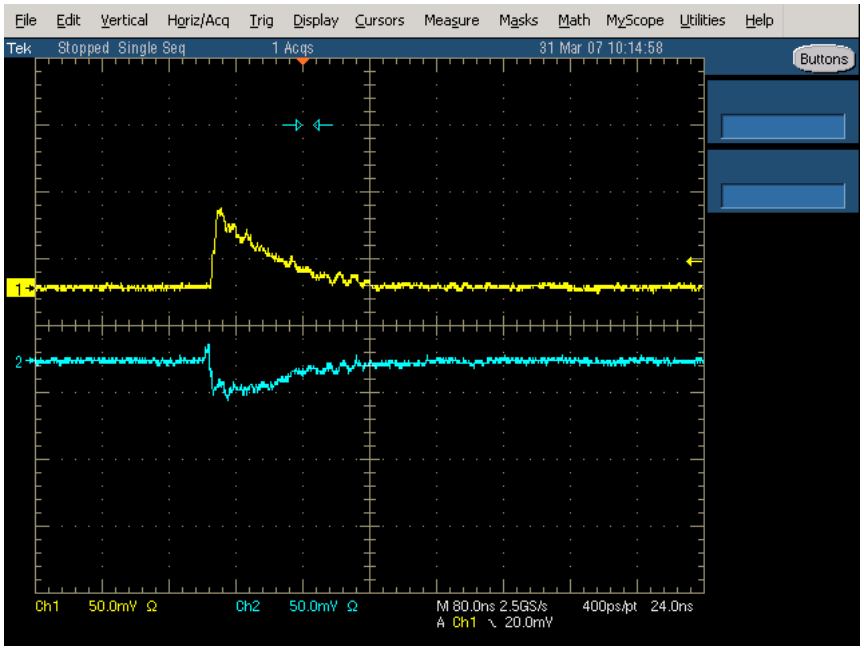
Channel #2 (bottom side): +HV side strip, normally should be negative going pulse; channel #1 (top side): ground side strip, normally should be positive going pulse.

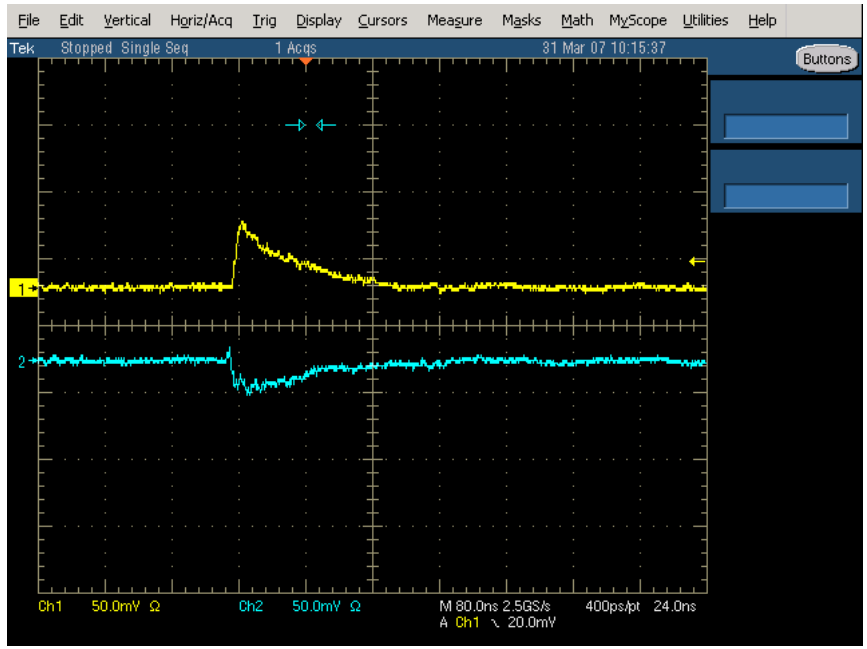




... Scope observation of wrong polarity pickup

Swap +HV and ground side: +HV connect to top side, ground to bottom side.

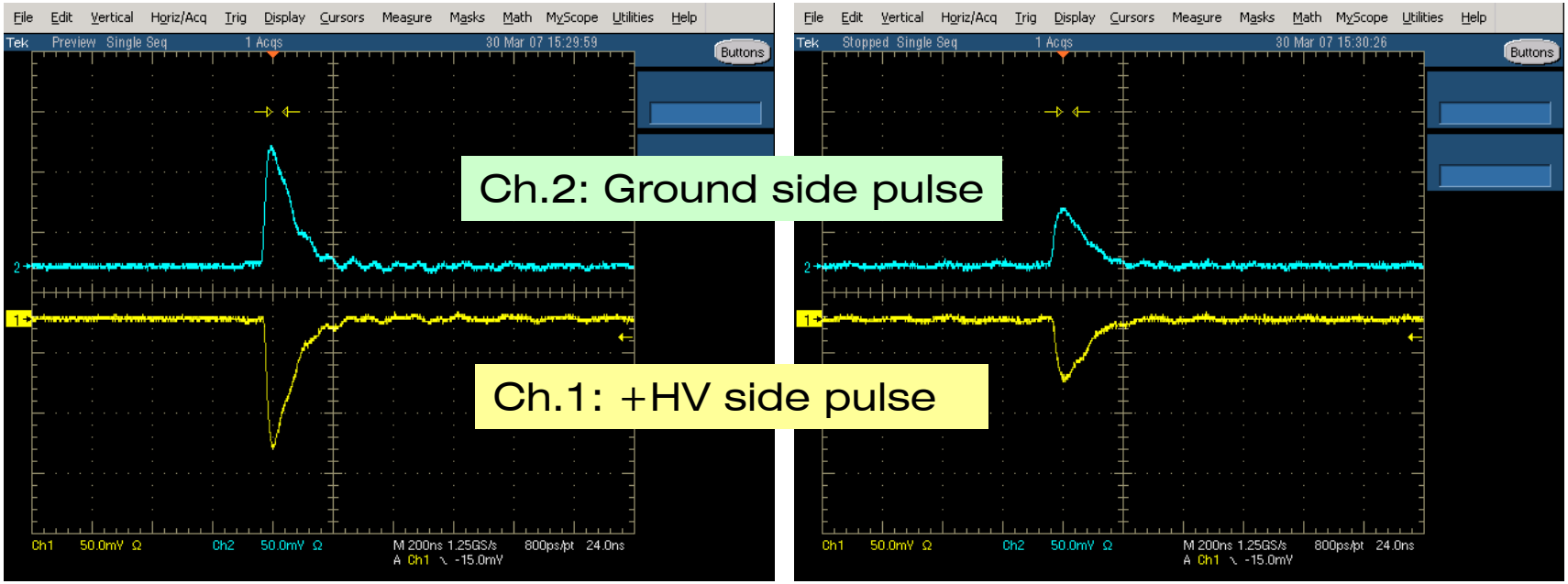




Channel #2 (bottom side): ground side strip; channel #1 (top side): +HV side strip. This unsymmetrical pulse shape is still there.

Normal pickup signal

If the source of the induced signal is coming from RPC gas gap, two sides should have same shape and opposite polarity signals. +HV side: negative pulse, ground side: positive pulse.



Conclusion

Wrong polarity pickup signal is not coming from the RPC streamer, it might be due to the discharge between HV graphite coating layer and the pickup strip (there is insulating film and air gap).

In my test if the scope triggered by the cosmic ray, I didn't see wrong polarity signal. If triggered by strip signal itself, I did see the wrong polarity signal as shown in the previous screen capture.

Houston saw more wrong polarity signal events, could it be due to their uneven foam surface?