## Getting components in House for MWPC Construction

- Order has been placed for 50 preamp boards and 50 HV bias boards.

- After the order was placed, we discovered a problem with the preamp board design, …

Description of Circuit Board Issue

There is excess copper trace defined on the top layer of the board, which will affect the functionality of the two middle amplifier channels
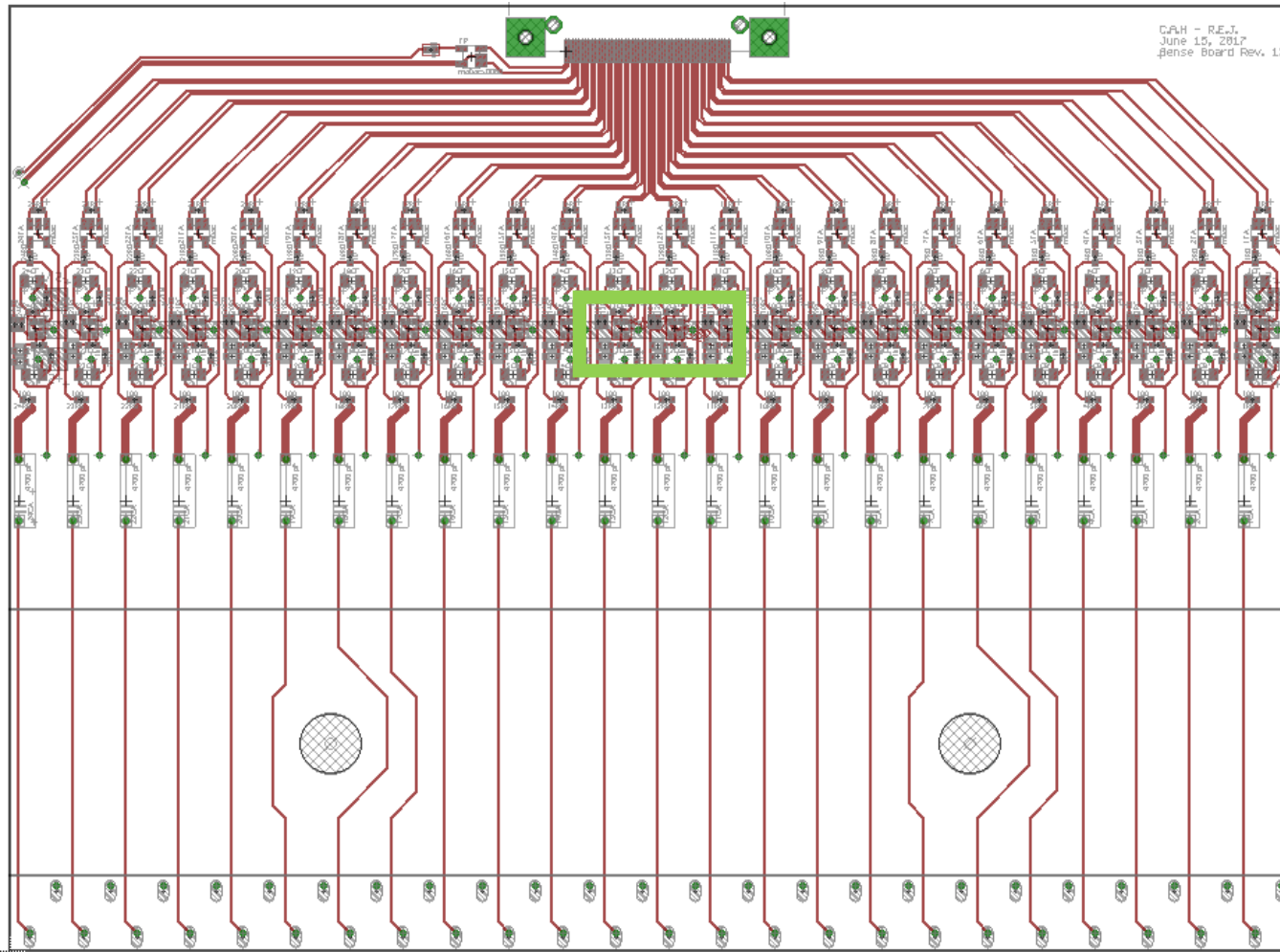
Description of Circuit Board Issue

Below is a zoomed in image of the region in the green square above. There must have been a technical mistake in creating the boards which created a measurement indication on the copper layer. In the CAD environment for designing these boards this measurement tool is easy to accidentally select and must have been randomly selected after checking the boards over and before sending the files to Advanced Circuits. This error will cause shorts between various parts on the circuit on channels 12 and 13. Channel 11 is also affected, but it would be so simple to cut the extra trace shorting channels 12 and 11 that it will not be considered an issue here.

Channel 13   Channel 12   Channel 11
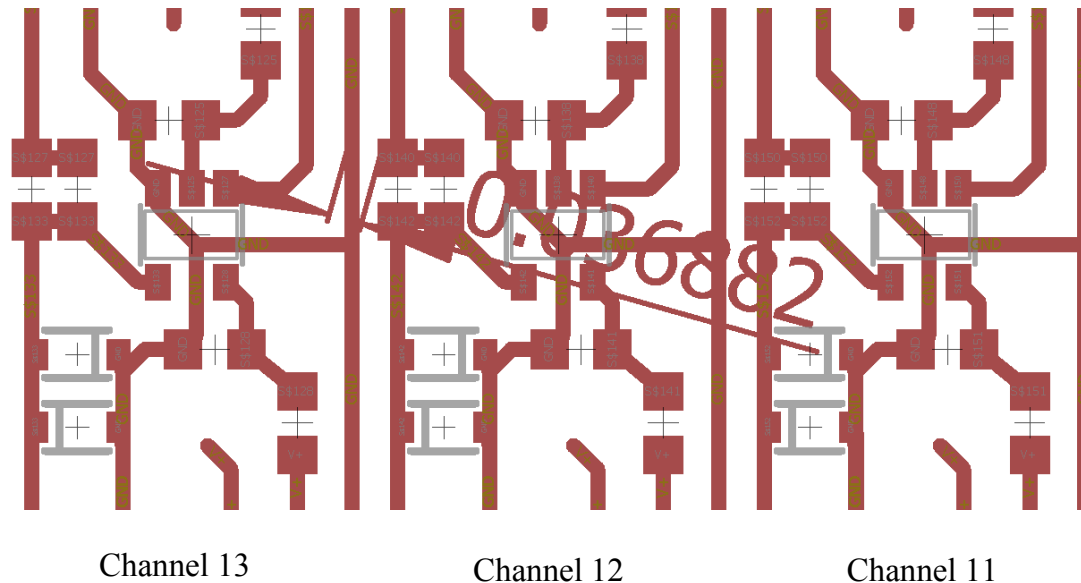
Getting components in House for MWPC Construction (continued)

… but the manufacturer caught the problem and removed the extraneous traces before making the PCB.

- Order has been placed for 7 sets of honey-comb plates. We have another set in-house.

- Machine shop is setting up to make the G10 slats. There are 4 different slat designs that go into the MWPC. The machinists want to finish all of the slats of one type before going on to the next slat design. Once they start the job, they plan to work on it until completed. This makes their process more efficient. Downside for us: slats will be coming to us late, and all at once.

Detector Construction

Electronics delivery probably in 2 weeks:

i. Test the 50 preamp cards with test pulse
ii. Solder HV capacitors to the cards

Honey-comb plates:

i. Prepare top and bottom plates for G10 slat attachment, with grounding attachments on cathode surfaces (new)
ii. Epoxy G10 slats onto top and bottom plates
iii. Paint G10 surfaces that are in contact with o-ring with an epoxy:acetone paint, 2:1 by mass. (new)

Detector Construction (continued)

Top plate:

i. "Top plate" = plate with the ¼-20 tapped thru-holes, carries the wires and electronics (new)
ii. Trim PCB's to fit the top plate
iii. Thoroughly clean top plate, bring top and bottom plates into clean room
iv. Epoxy PCB's to the G10 slats.
v. String wires.

Bottom plate:

i. "Bottom plate" = plate with the o-ring (new)
ii. Thoroughly clean bottom plate, bring bottom and top plates into clean room

Detector Construction (continued)

Closing detector
i.   Mount greased o-ring on bottom plate
ii.   Top plate (wire frame) closes on top of the bottom plate (frame with the o-ring) (new)
iii.   Do ground, LV and HV hook-ups
iv.   Flow gas, test detector

Update on Large Prototype MWPC

- We believe that all of the bad carbon tubes have been replaced, found 4 bad wires. Continue to check for faults: our experience has been that biasing to 500 V with the detector open to the air will trigger the problem

- During the last detector testing we saw 2 "hot wires" that operated normally, i.e. were fully sensitive to cosmic rays, but also with a discharge signal present running at about 1 kHz. These wires were replaced.

- Today: cleaning the wire frame with HEPPA vacuum cleaner.

- Today: paint surfaces on the wire frame in contact with the o-ring with epoxy:acetone paint.

- Wednesday: close the detector. Start HV and gas testing.

Building Small MWPCs for Beam-line Tests

- Print detector parts with UMass 3D printer

- Cathode planes = 1/8" thick aluminum (≈ same plate thickness as big MWPCs).   Make these plates at an outside CNC job shop (China?)

- Modify existing PCB designs

- Gang about 10 wires into one output preamp channel, SMA or BNC connection

- Sensitive area about 5" x 5"

- No bolts or o-rings, everything glued together once we know detector works

- Uses SHV HV connector, and LV connections (+5, -5, ground)

- Maybe make 4 of these detectors