

Drift cage electrical elements production and QA

protoDUNE Design and Production Review
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Outline

- Drift cage HV Divider Board Pre-Production Procedure and QA
- Production Status
- Conclusion

DP FC HV Divider Board Pre- Production Procedure/QA

1. Receipt inspection of the components for QA
2. Testing each component both in warm and in cold
3. Test bare and assembled Board in warm and cold
4. Packaging and Shipping

HV Divider Board Production: Receipt Inspection/QA

- Inspect resistors, varistors, nuts, washers for their structural integrity
 - broken or damage in resistors and varistors
- Visual Inspection of the divider board for dimensional and mechanical qualification
 - Check the traces, holes, copper tap.

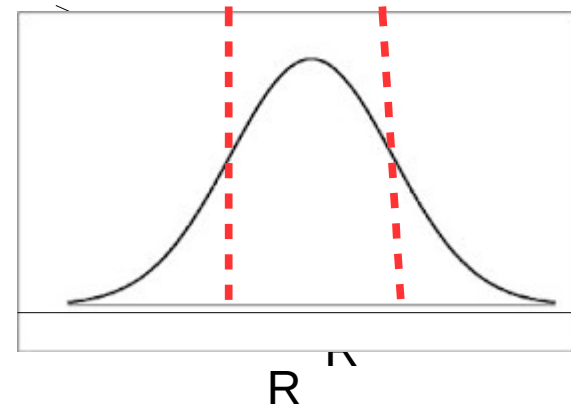
Testing of electrical components /QA

Test the divider boards, resistors, and varistors both in warm and cold.

- **Testing plan**

Resistors :

- Measure the resistance from I-V curve both in warm and cold for each individual resistors, repeat the process 3 times.
- Test the resistors at a maximum voltage of 10 kV in 0.5kV steps
- Make a distribution of the resistance in cold and select the resistance as specified in the requirement.



Testing of electrical components/QA

- **Varistors :**
 - Measure the resistance from I-V curve both in warm and cold for each individual resistors, repeat the process 3 times.
 - Measure the clamping voltage and select the proper one according to the requirements.
- **Divider Board:**
 - Test the bare board both in warm and in cold
 - Mount the resistors and varistors on the board in proficient manner.
 - Check assembled boards both in warm and in cold.
 - Apply minimum of 6 kV in each stage (60 kV total) and test in cold.

Packaging and Shipping

- This process will be done in a 100,000 clean room.
- Packaging process will be done as follows:
 - Collect zip-lock bag for nuts, washers
 - Collect zip-lock bag for Divider board mounted with all components
 - Put parts into crates starting with the Divider board first, followed by the smaller items and bags.
 - Place parts into the crates in a neat and organized manner and securely to prevent movement, rubbing, and etc.
 - Using the checklist, ensure the correct quantity of parts is placed into the crate
 - Place lid on crate
- Ship it to CERN.

Production Status

- Divider board design has been finalized and signed off.
- Placed order for Resistors and varistors

components	# required	# ordered	Lead time
Resistors	400	600	4-5 weeks(100 on hand)
Varistors	800	1000	on hand

- Placed an order for divider board.
 - In contact with manufacturer for final quotation

Production status

- Prototype testing board

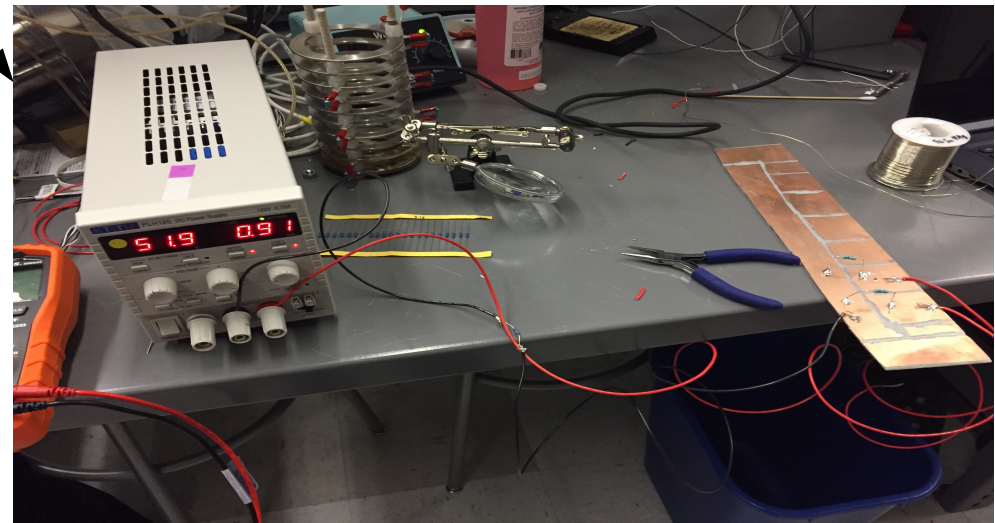
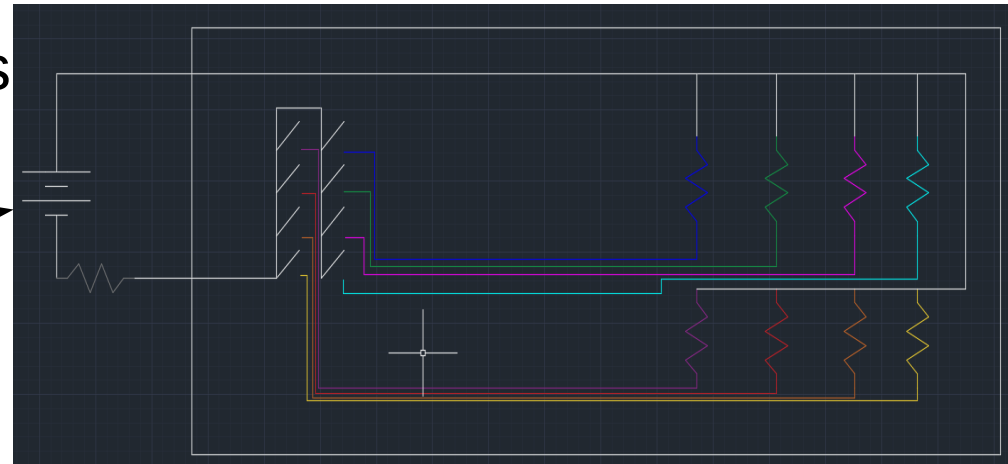
- 3 undergraduate students are working to design testing board and test all components.

- Cold bath and power supply is in place

- Circuit diagram for test

- Test of the circuit diagram

- Electrical Components for the test arrive within 2 weeks



Conclusions

- Design of the HV Divider Board is finalized and signed off.
- Place order for the components, Varistors and 100 resistors on hand.
- In a process to get final quotation for divider board
- In a stage to start testing the components.