**HV connectivity tests after Barrel connection**

*Procedure 1.2.8*

**Abstract**

This document describes the tests performed after the initial HV harnesses connection to the TRT barrel.

- Introduction
- HV Layout
- Test Procedures

**Prepared by:**

Chihho Wang

**Checked by:**

Jack Fowler
Harold Ogren
Seog Oh
Anatoli Romaniouk

**Approved by:**
Distribution List
<table>
<thead>
<tr>
<th>Rev. No.</th>
<th>Date</th>
<th>Pages</th>
<th>Description of changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.01</td>
<td>02/11/2006</td>
<td>6</td>
<td>Steps: 1 connector at a time.</td>
</tr>
</tbody>
</table>
Table of Contents

- Introduction
- HV Layout
- Test Procedures
- Appendix 1: HV Mapping from HV PS Channels to Straws
1 **Introduction:**

This procedure covers the TRT barrel HV check after the HV connection is made. Testing of harnesses from USA15 to PPB1 is described in procedure 1.1.4 and should have been performed before hand. This procedure extends the tests to the detector itself. All tests are performed remotely from USA15. Some repair and trouble shooting may require access to detector front.

2 **HV Layout**

A brief description of the TRT barrel HV connections is available in procedure 1.1.4. Detailed pin-out and mapping informations are available at TRT Barrel Twiki page [https://uimon.cern.ch/twiki/bin/view/Atlas/TrtBarrelHV](https://uimon.cern.ch/twiki/bin/view/Atlas/TrtBarrelHV).

From PPB1, a HV harness splits into individual HV coax cables and feed into 6 fuse boxes; 2 for each type of module. There are 22 HV coax for a stack of 3 modules: 6 for type 1, 6 for type 2 and 10 for type 3. Inside a fuse box, after a filter circuit, a HV line fans out to several fuses, ranging from 6 to 10 depending on module type and line position. Each fuse serves one trace on the module HV Kapton that feeds 8 straws. The HV ground in the fuse box are commoned after filter circuits and connected to the module tension plate through module HV kapton. A capacitor between tension plate and HV plate separates the high voltage on the straws from its ground. The tension plate ground is also electronics analog ground and is common to all barrel modules through space frame. Individual grounds in HV coax are also commoned at USA15 on the face of HV PS crate. Some reference drawings and mapping information at the detector side are listed in Appendix 1

2.1 **Pre-condition**

Complete and final connection of HV harnesses to TRT barrel.

3 **Test procedures**

After HV harnesses are connected to TRT barrel the followings are tested from USA15 for the barrel HV integrity:

1. A capacitance and resistance measurement to check HV connectiveity from HV PS to straws.
2. A HV test at 500V to check sense wire wellness.

3.1 **Capacitance measurement**

Tools:

1. Capacitance meter
2. Lemo connector distribution box (Figure 1)
3. Excel spread sheet for data recording.
Figure 1, Lemo distribution box

Steps:
1. Disconnect lemo connectors from HV PS and connect to distribution box.
   - The connector and the HV PS should have been clearly marked. If not they should be marked before continuing
   - Make sure that the distribution box is properly grounded to the rack
   - Do 1 connector at a time. Leave the rest of the connectors on the rack connected to the HVPS
   - The 8th connector is a mix from 3 stacks (Appendix 1)
2. Measure capacitance for each HV line with capacitance meter
3. Record in excel spread sheet.
4. Switch meter to resistance and check that resistance is infinity.
6. Repair any broken wire, or fuse.

Comments:
- The capacitance value measured should be (SR1 data) + (procedure 1.1.4) – 1.6nF (type 2 cable capacitance)
- If capacitance is above normal → possibility of connected HV islands.
  - Check passport for record of connected HV islands
  - Measure resistance between HV lines (should be infinity if no connection)
- If capacitance is below normal (by 1-2 nF) → possibility of broken fuse.
  - Apply 50V and measure from dummy fuse box side to determine which fuse causes problem.
  - Open fuse box to check/repair fuses
- If capacitance is very low → possibility of broken line or bad resistors in the fuse box.
  - Since all ground lines are commoned at the distribution box, and at the detector front. No line should show a broken ground symptom, e.g. < ~8 nF. At this stage it’s most likely a broken HV line unless all ground lines from this stack are broken!
3.2 HV test

Tools:
1. HV PS crate and control software
2. Current readout and recording mechanism (excel spread sheet)

Steps:
1. Check interlock for proper connection.
2. Raise HV to 500V for each stack
3. Record/observe current draw for 10 sec.
4. Diagose and repair any short circuit or excessive current draw

Comment:
- Measure resistance from dummy side HV trace to ground to find out which HV island is shorted.
- The only way to find out which wire is broken is through electronics readout, or remove roof board!!
Appendix 1: **HV Mapping from HVPS channels to Straw:**

The mapping table is available in excel format at TRT Barrel Wiki page:
Naming convention in the table and the actual locations are explained in the following supporting figures. The HV PS side of mapping is explained in procedure 1.1.4 appendix 1.

**Fuse box mounting**