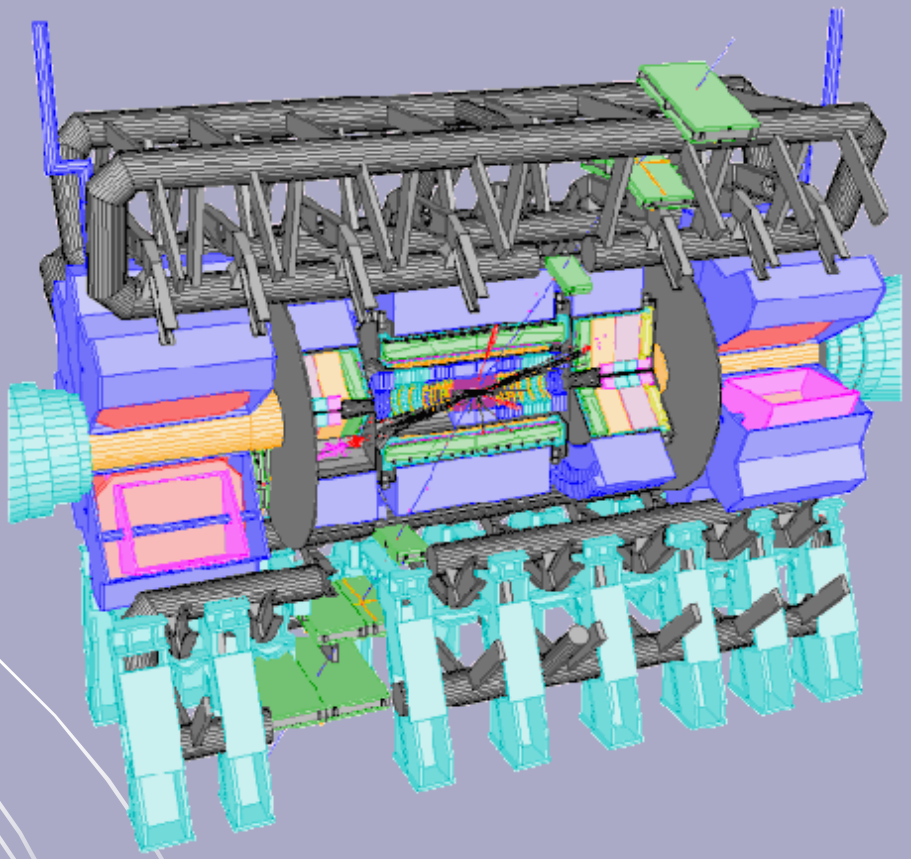
ATLAS TRT-Barrel

Module Acceptance Testing

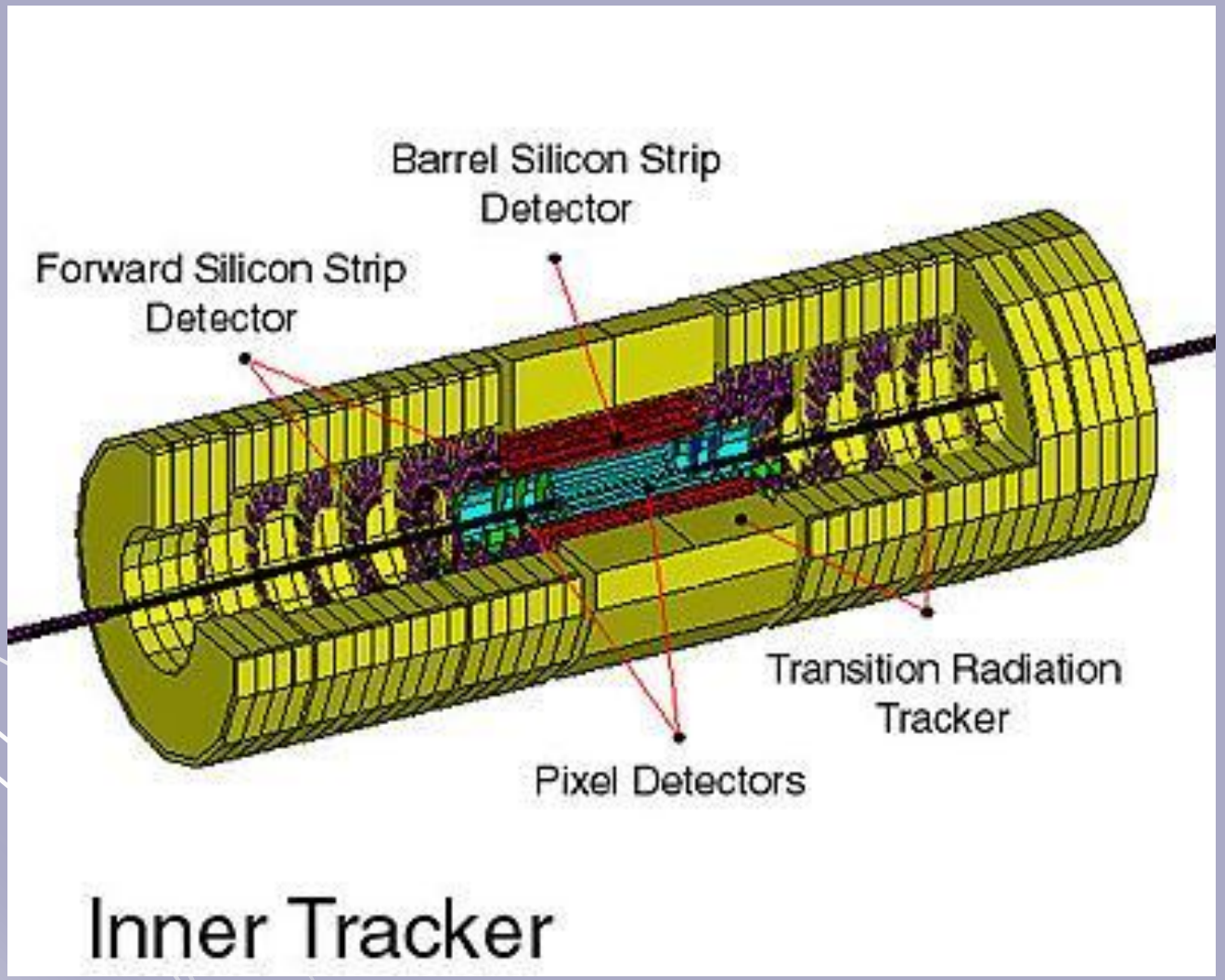
What does TRT stand for?

- The barrel Transition Radiation Tracker (TRT) is part of the ATLAS inner detector. The TRT is designed to measure the position of particle tracks and measure the amount of transition radiation they produce.

Position of TRT-Barrel in ATLAS

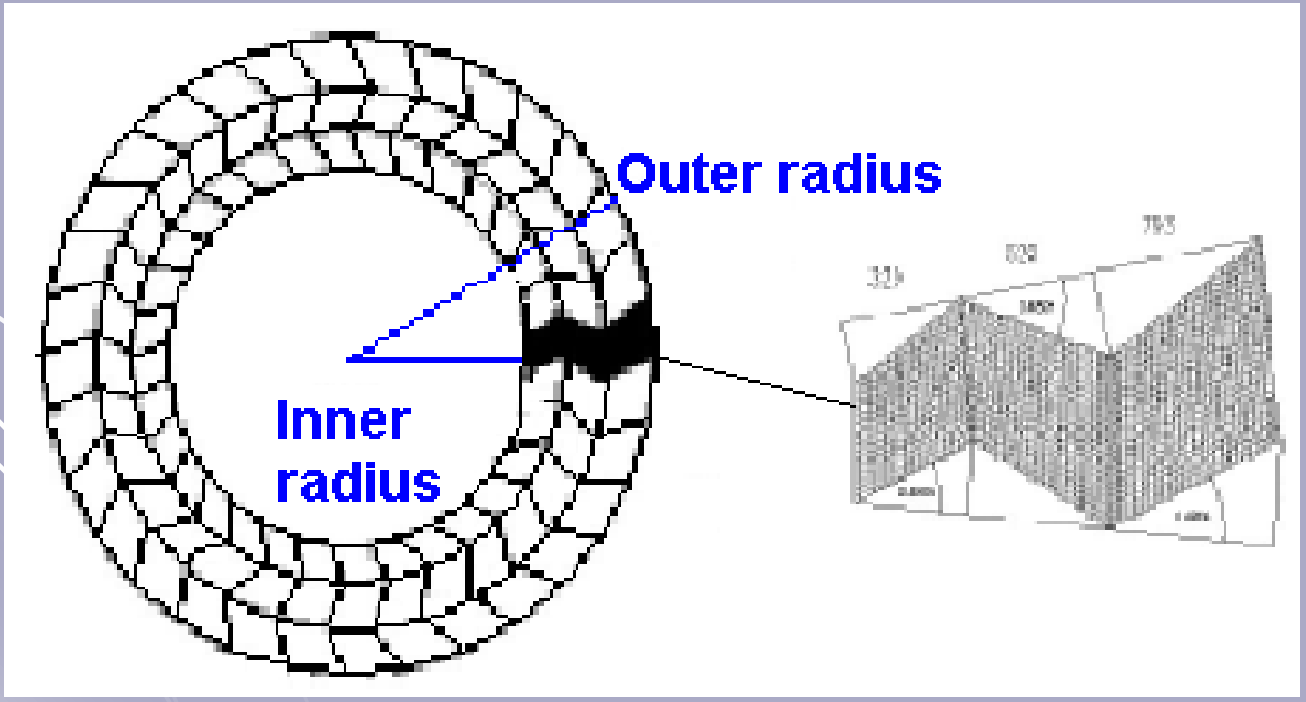


Position of TRT-Barrel in ATLAS



Barrel

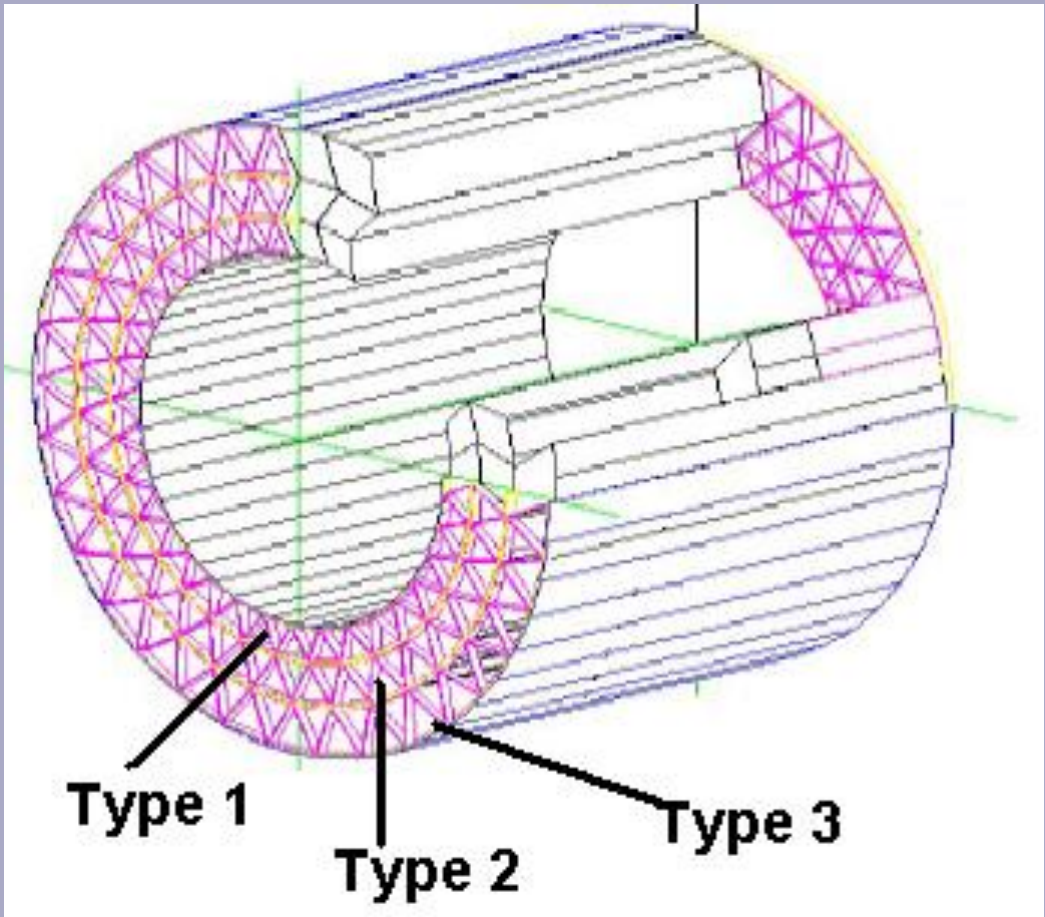
- Inner radius = 560mm
- Outer radius = 1070mm
- 96 modules in total
- 32 of each type



3 types of modules

- Type 1: 329 wires
- Type 2: 520 wires
- Type 3: 793 wires

105,088 wires in total



Life of a Module

- Built in American institutes:
- Duke University, Indiana University and Hampton University.
- Shipped to CERN for testing in acceptance lab
- Shipped to the SR building for assembly

Barrel Modules

- 1.5m in length
- Contain straws (4mm diameter) which holds a wire (30μm diameter)
- HV is distributed to a group of 8 straws called “Pads”

Straws and Wires

- Straws: Drift tubes made of kapton with a conductive coating so it acts as a cathode

→ kept at high voltage of negative polarity

- Wires: 30μm diameter gold-plated tungsten sense wire

→ wire held at ground

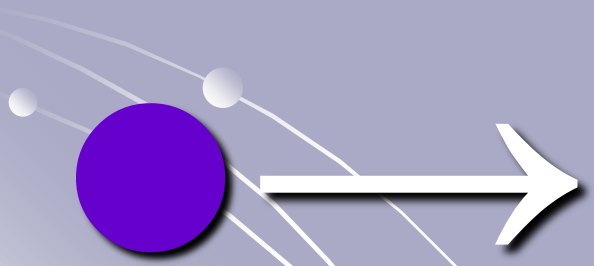
Acceptance Testing

- Dimension
- Wire Tension
- Gas Leak Test
- High-Voltage Test
- Gain Mapping
- Long-term High-Voltage test
- Final Gas Leak Test

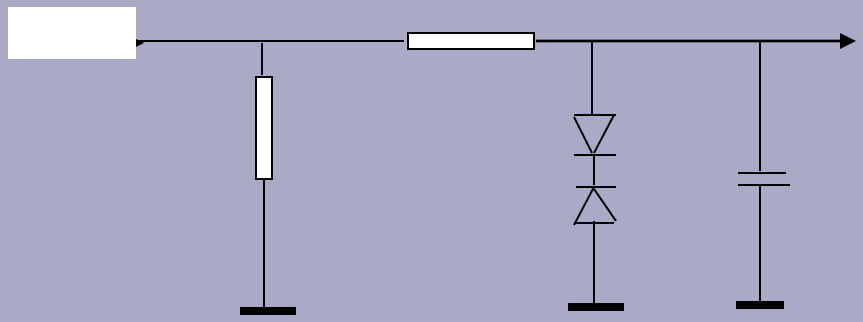
Shipped to the Assembly hall

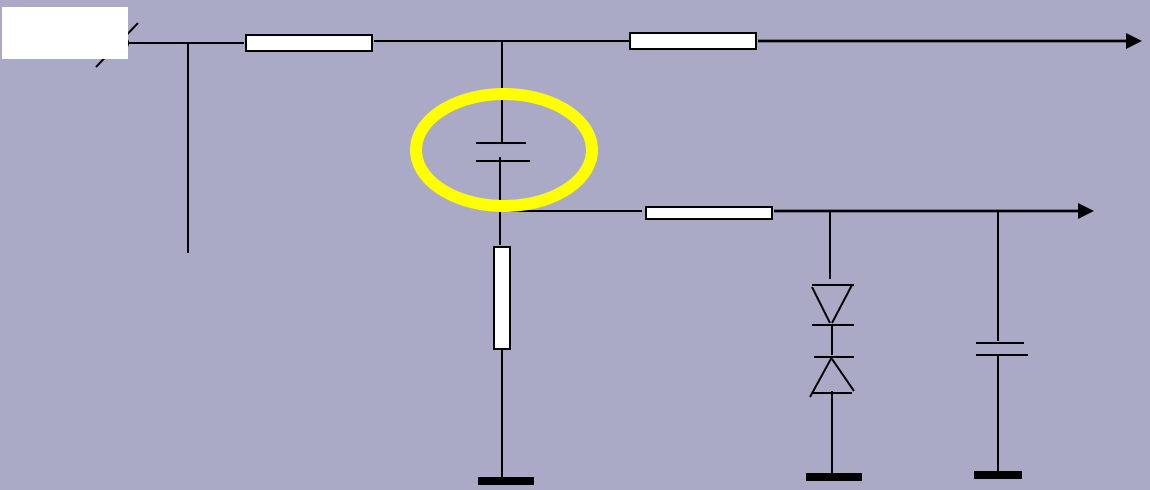
The Test!!

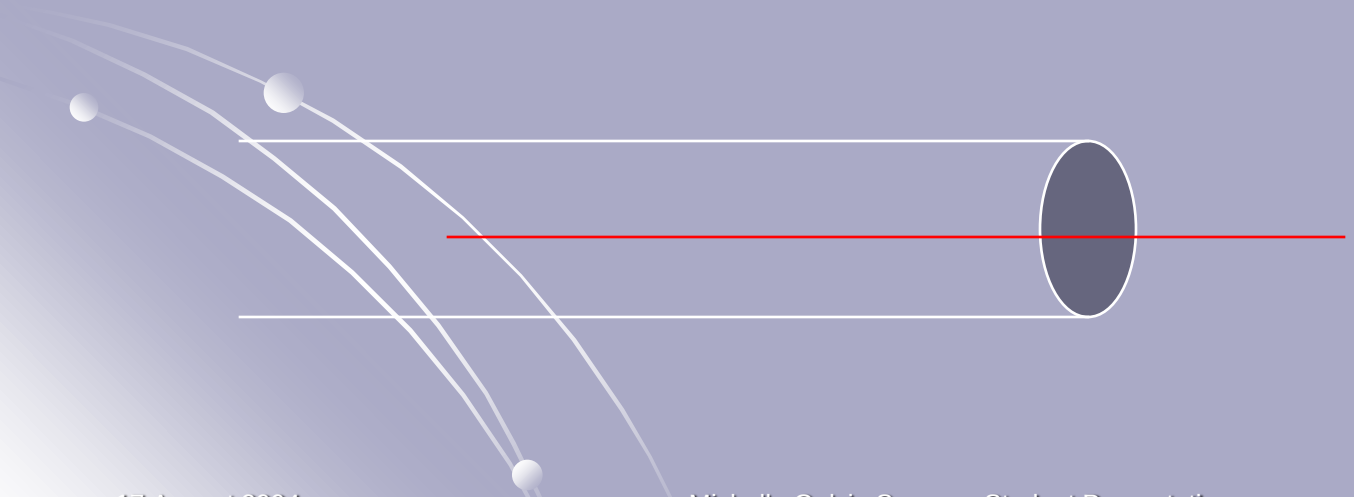
- Apply 1550V
- Monitor each pad between 16 channels
- Current > 2μA



TRIP!!!







Now What?

- Redistribute pads
- Wait…
- → TRIP!!!
- Put each wire onto an individual channel
- Wait….
- → TRIP!!!

RESULT!!!

High Voltage Test – Why?

- On average 36 wires are crossed by a track
- Accept only 1% dead channels ~1050 wires removed

Conclusion

1. Need to write EVERYTHING down
2. Be Patient
3. Systematic
4. Wear Rubber Gloves