Barrel Beam test setup and plans

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Beam test Plans

- First large scale system test of Barrel TRT!!!
- Every thing must be ready by July 5 months away!! (not much time)
- Need equipment and personnel from all 4 US TRT institutions… while not stopping production and parts check at CERN.
- Need to use *Production or pre-series* parts … This is our only chance for this type of test before integration into the space frame.

System Test Plan

Items to investigate

- Electronics readout
- Shielding/Noise
- Grounding
- Cooling flow rates and temperatures
- Active Gas flow rates
- CO2 flow rates

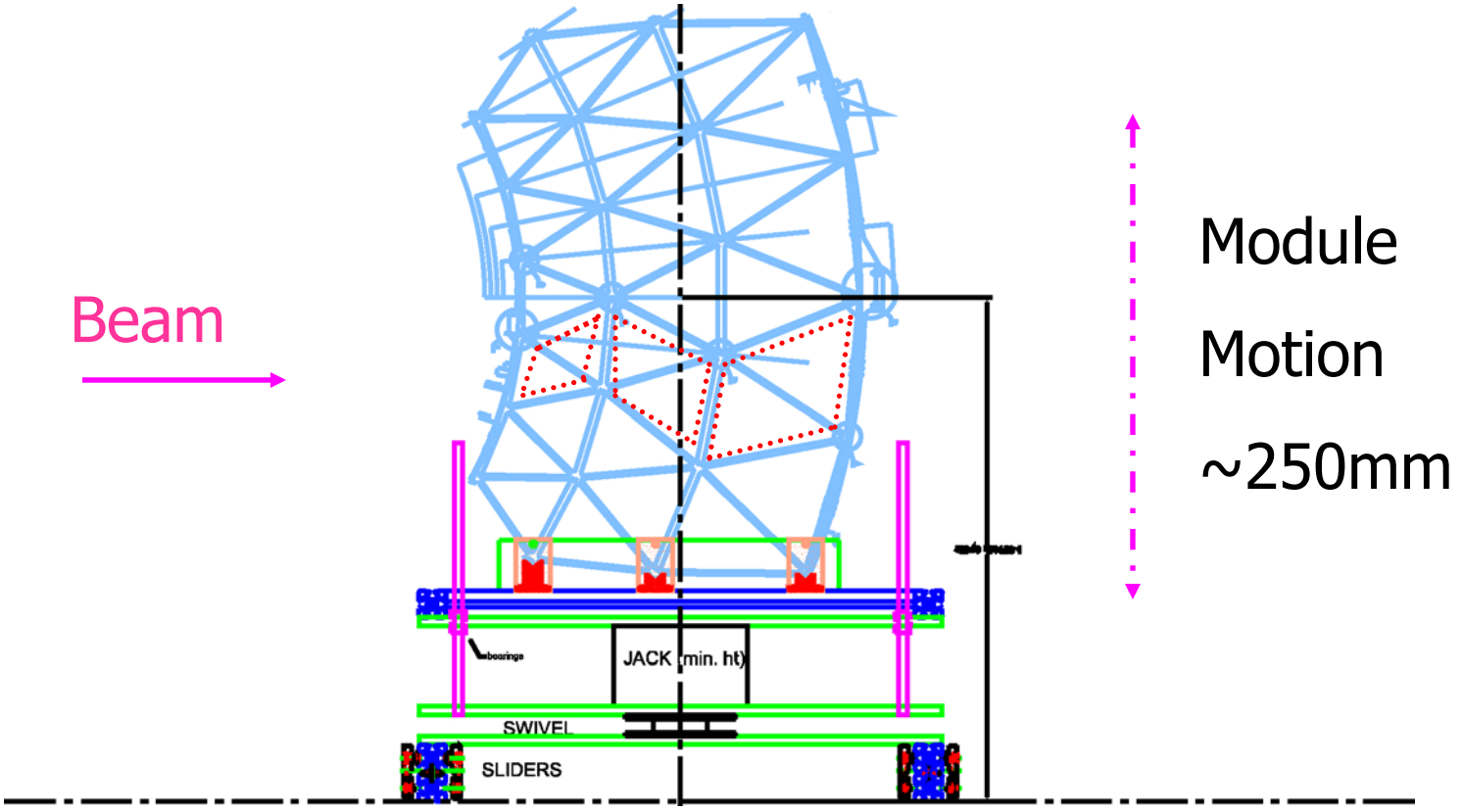
Parts needed

- 3 Modules (each type) – Hampton
- Electronics – Penn/Lund
- Gas systems – IU
- Space frame + supporting structure – Duke

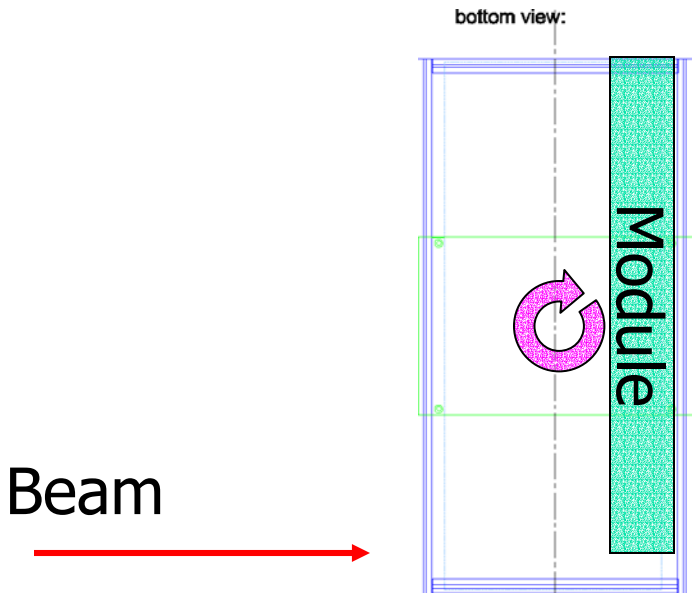
Parts Status

- Modules – (Hampton)
  - Hampton has enough modules (~ dozen) from Duke and Hampton to gain map …
  - Hampton needs production certification of Gain Map station (setup, results and procedures)
  - Hampton will identify 3 sets of modules.
- Space frame and setup (Duke)
  - Conceptual design complete – working on details (to be shown at CERN) – Should be ready **Apr '03**
  - Only have 1 space frame! Need other one…
  - Need to work on Faraday cage – developing a plan for use of copper tape

Beam Test Setup (Side View)



Beam Test Setup (Plan View)

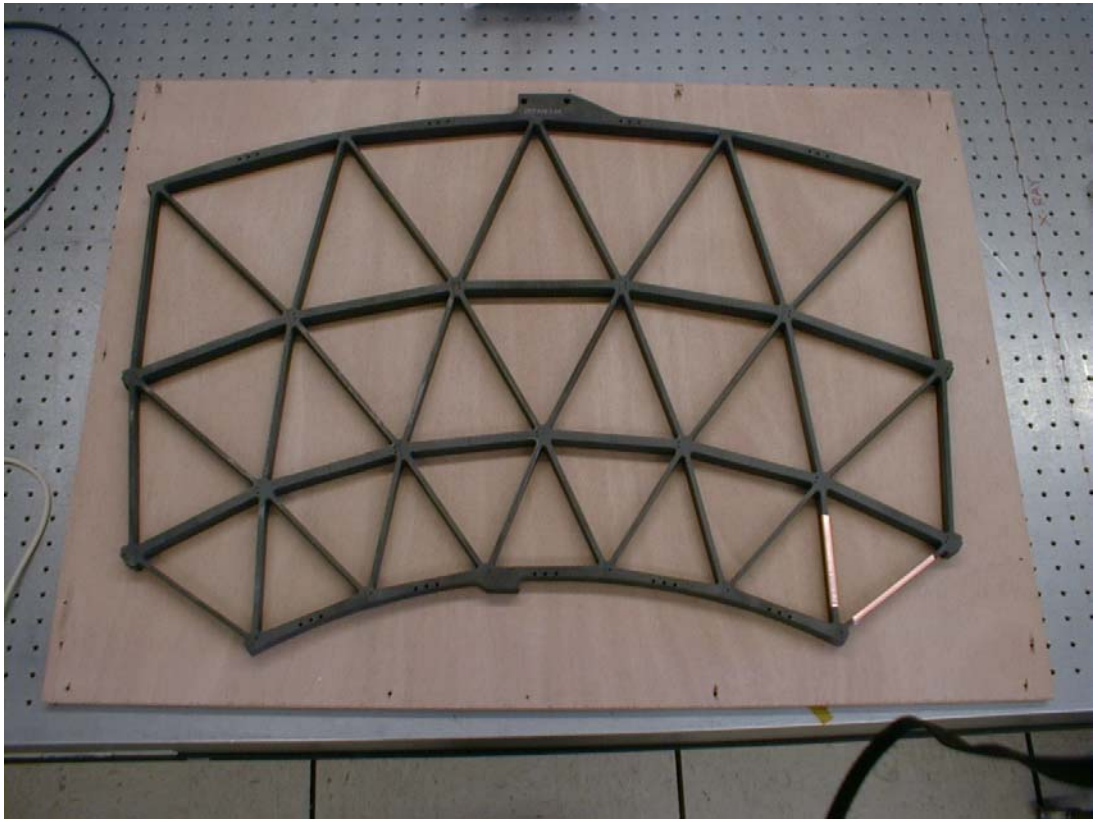


Module motion

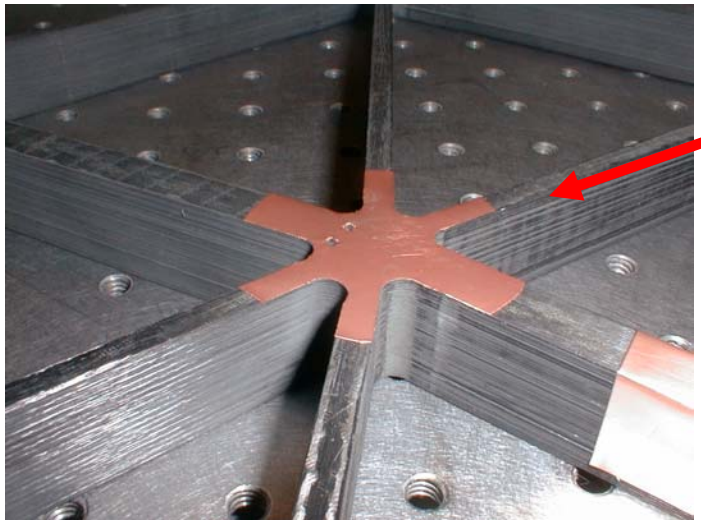
- rotation in plane of module

Beam Test Space Frame

- 1/8 Space Frame
- 3 module in beam
- Test Faraday Cage concepts

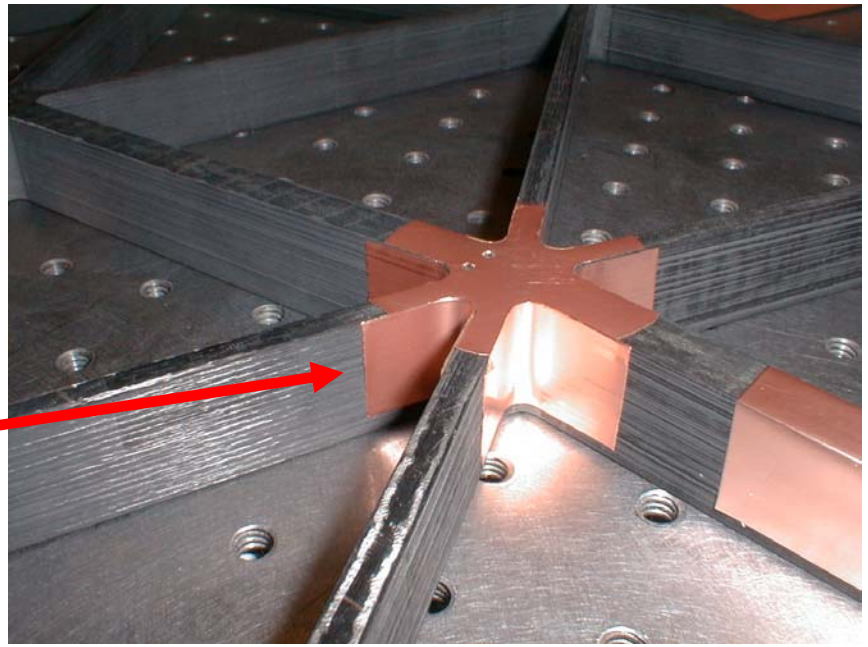


Shielding Proposal

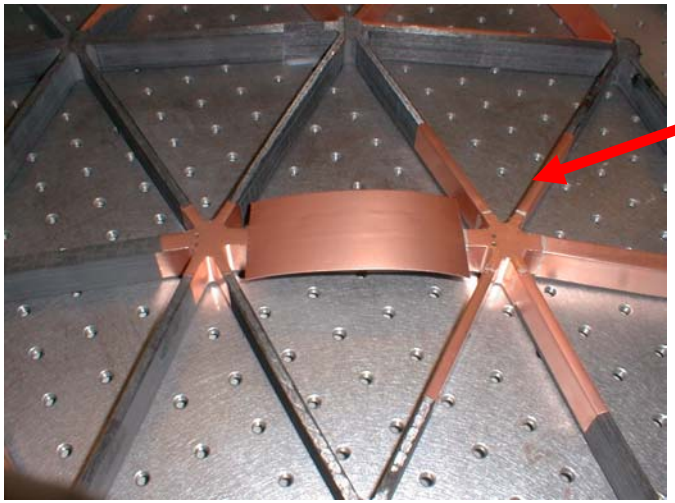


Step 1 – Add tape to top – punched out

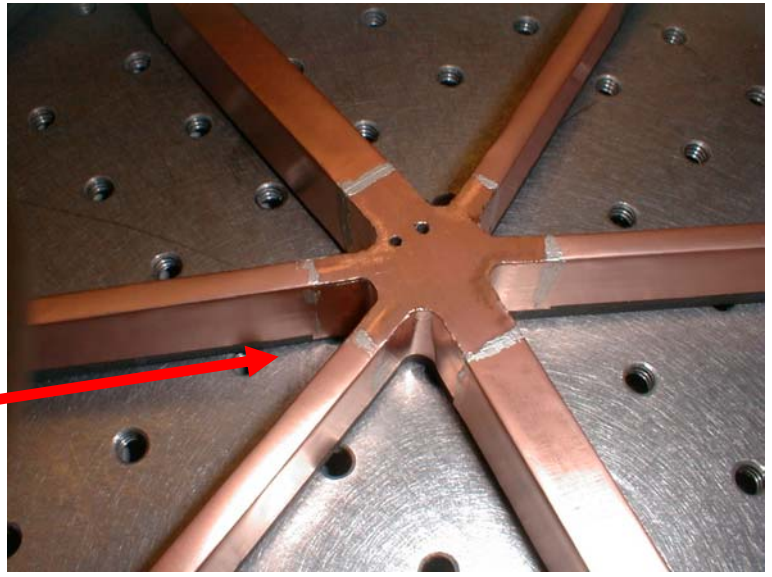
Step 2 – Add tape to corners



Shielding Proposal (Cont)



Step 3 – Add tape to sides – covering existing pieces



Step 4 – seal tape edges w/ Structural epoxy

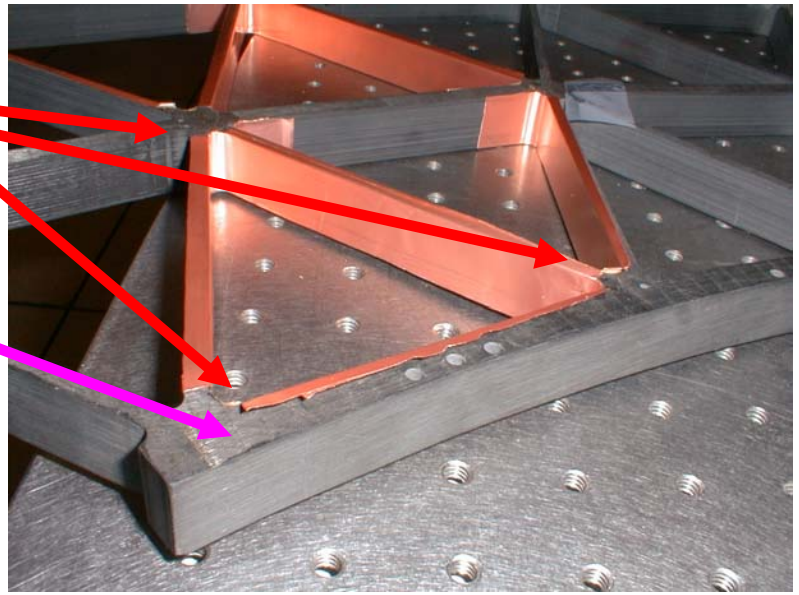
(silver epoxy shown)

Shielding Proposal (beam test setup only) (Cont)

- Will add Aluminum sheets (0.635mm) as shielding and to simulate the cylinders in the beam test setup
- Add Cu clad Kapton sheets to the top and bottom in the frame.
- Will add empty triangles will be filled in with the fake cooling plates with RF fingers
- Will avoid using silver epoxy. *Can we use only the conductive adhesive to make contact between copper tapes (even if the final space frame)?*

Shielding Issues

- Can we use structural epoxy to keep the tape from peeling up?
- How do we handle the region of the space frame near the inner and outer cylinders
- Is the conductive adhesive sufficient for maintaining contact between the pieces of tape?



Parts Requirements and Status (Cont.)

- Cooling (IU)
  - Cooling plates each type (4 each)
  - Sector cooling manifold (designed for 6 modules – plug some holes)
  - Cooling test system (rack) and piping
- GAS (IU)
  - Active gas manifolds (2) w/ PPB1 connectors, Ventilation gas manifolds (2)
  - Interconnect tubing (PEEK) and fittings
  - Active and ventilation gas test systems (1/2 rack each) and flexible piping

Parts Requirements and Status (Cont.)

Electronics (Penn/ Lund)

- Chips --- plenty by April
- Back end –
  - currently only 3 mini-rods (total read out 72 DTMROC's) – need to read out 104 –
  - With current patch panel design – can only readout 12 DTMROC's per "big ugly"
  - Need cables (not easy to make)
  - Power supplies (from where?)

Parts Requirements and Status (Cont.)

Electronics (Penn/ Lund)

- Boards ---
  - Final boards several months away – waiting on chips
  - Expect 3-5 triangles (boards) by beam test
  - The available triangles with be a mix of Active and Passive boards – exact mix to be determined
  - Design time and chip availability drives schedule
- Need to get patch panels and interface cables
- Need to develop assembly techniques for the chip stack and cooling tabs
- Software –
  - Need help from Europe with the required system software

Other issues

- Need to develop assembly techniques for the entire system as precursor to final assembly
- What tests do we want w/ beam - how many different configurations?
- Need to test everything together before the beam test at CERN – Where?

Where Do We First Put Everything Together?

CERN

- Needs to be at CERN eventually
- If electronics is late might have to be @ CERN anyway
- Better DAQ systems software support
- But… not as well stocked with test equipment from US (will need it eventually)
- Any significant delay (2-4 weeks) requires assembly @ CERN

US (IU)

- Relatively easy to travel from home institutions
- US TRT engineering support on site
- Site of gas system support (piping and routing)
- Might expect it is easier to get test equipment
- Disassemble and ship to CERN

Conclusions

- Beam test – first large scale systems test of barrel TRT
- Plan to use pre-series or production parts
- Setup should allow us to make plenty of measurements in the beam
- Much work to do. Many parts to get!
- Schedules are tight – especially the electronics.. But several other items could take significant time.