

Test of Valencia 23 cm OTE Band at Liverpool – 24 Nov 2005

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Construction of Band

23 cm band of Aluminised Kapton / 8 mm Airex / Cu-Kapton, including a beveled edge.
The finish of the surfaces was very good – much better than the earlier prototype.
The quality of the beveled edge was good.

Metrology:

	Nominal (mm)	Actual (mm)
OD of Support Cylinder [1] (RAL)	1166 (upper lim)	1165
ID of Band (Valencia)	1196.75 -0 +1	1197.1
Δ (diameter)	30.75	32.1
Radial height for Rails	15.4	16.0

[1] Main area, not Inserts/Closeouts, which add an extra 1 mm to diameter

Installing the Rails

The (temporary) Ground-sheet bobbins were removed.

The Rails proved fairly easy to install – care was needed to not disturb the fibres/wires at D9 end, which were still being routed.

The nominal height for the Rails was to have been ~15 mm ΔR above the Support Cylinder surface in order to clear the services (especially the Polycarbonate LMT Clips and the as-yet uninstalled Nitrogen Return Pipe). However, since the Support Cylinder is 0.5 mm in ΔR within its envelope, it seemed reasonable to allow up to 16 mm.

The one surprise was that the Donuts used for the location of the Disc Fixation Inserts had not been allowed for, since they did not appear on the drawings.

Luckily these were around 10 mm in height, causing the height of the Rail to be around 16 mm.

So the Long Rails which went over the Donuts were set to a height of 16 mm, while the Short Rails were set to 15 mm.

Testing the Band

Because the End-cap is supported at both ends, the Band had to be slit at one place. (Not needed for the proper OTE Integration.)

There was sufficient flexibility in it to allow it to be opened and placed around the End-cap.

The two sides of the slit were held tightly together over a Rail and the Band was taped as tightly as possible. The gap on the outside circumference was estimated to be 1.5 mm.

The Band was then moved up and down on the Rails from around Disc 1 to some where near the centre. It was not sensible to go further towards the Rear due to the services which were being placed on the Cylinder and were not yet held down.

Observations

The Band tended to a tear-drop shape, with a cusp at the slit.

Because it had lost its shape somewhat, there were regions over the Rails where it was quite tight and other regions where there were gaps of a few mm.

With several people carefully moving the Band, it was fairly easy to move it up and down the Cylinder. There did not appear to be any obstructions. A Cooling Interconnect Bracket was placed on the Cylinder – this looked fine. We were unable to test the LMT Cooling Foil Clips, but these should be fine by design. While the Polycarbonate Clips are very close to the OTE, they did not cause a problem – if needed, they could always be bent down a bit more.

It was considered good that the leading edge when moving towards the Rear (as would be the case when integrating the OTE to the End-cap) is beveled, although I don't think we relied on this.

After the trial, the Band was examined and found to have no scrapes or scars from the Rails, implying the Rails are smooth and the Aluminised-Kapton is well adhered to the Foam.

The Band only represented $\sim 1/8$ th of the total OTE length, so the friction experienced for the final OTE will be higher, although the fact that it should be more circular will help.

Since the gap at the slit was 1.5 mm at the outer circumference, if it were necessary to compress the Band to close the gap, the radial change would be $1.5\text{mm}/(2\pi) \approx 1/4 \text{ mm}$ – probably an overestimate, since there would be some stretching of the Cu-Kapton. Whatever, any changes corresponding to the complete (unslit) OTE would be negligible.

Conclusions

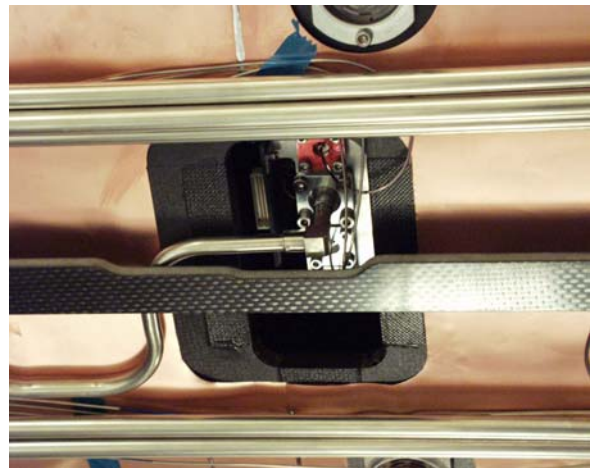
1. The Band was very nicely made – clearly Valencia have greatly improved their techniques.
2. Valencia have measured the Band and it is within the nominal tolerances.
3. If they can make a complete OTE with the same tolerances, then we believe it will fit within the SCT Envelope (with respect to the TRTT) and will be able to be integrated without damaging the SCT Services.

Thanks to Valencia for getting Band to Liverpool and to Tim, Richard and Neil in Liverpool.

Rails

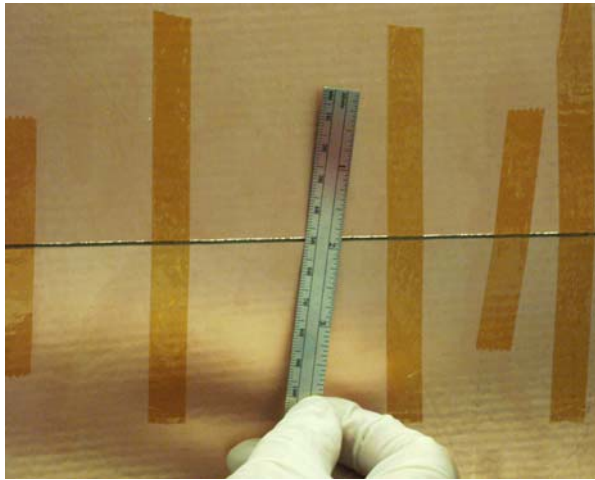


Long Rail: D9 end.

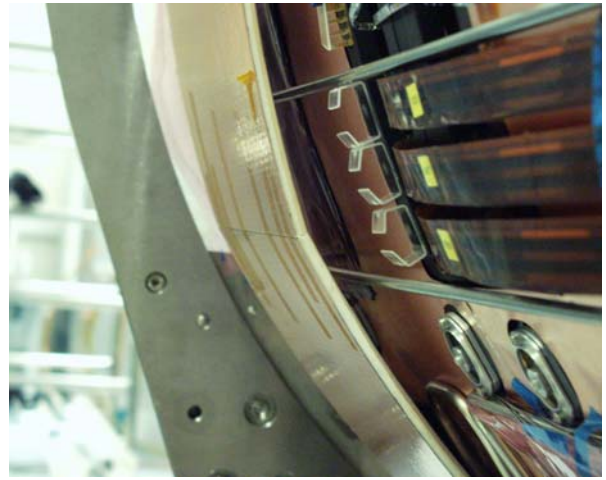


Short rail, with cut-outs around Cooling PPF0.

Split

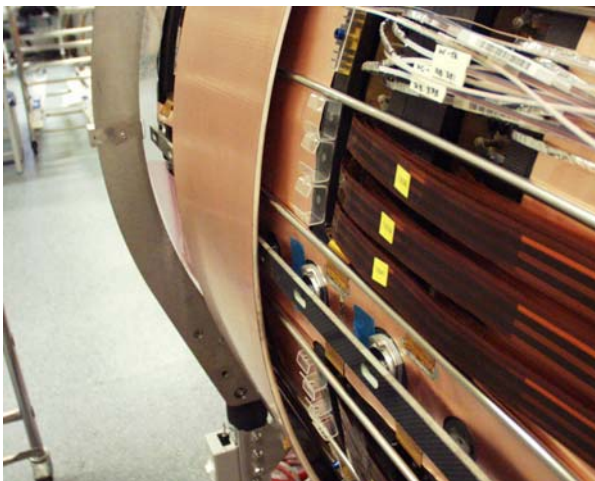
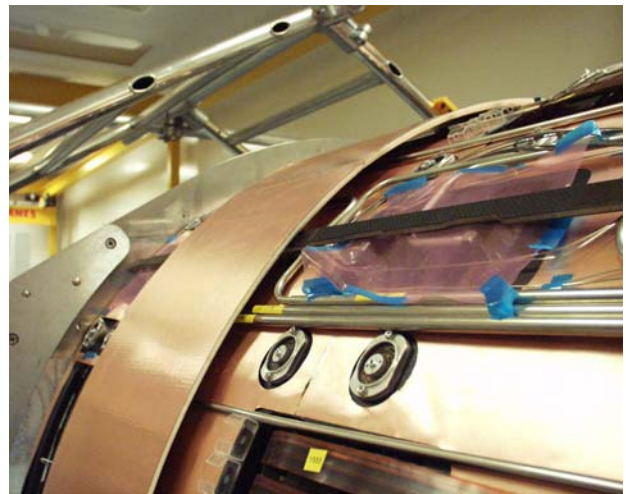
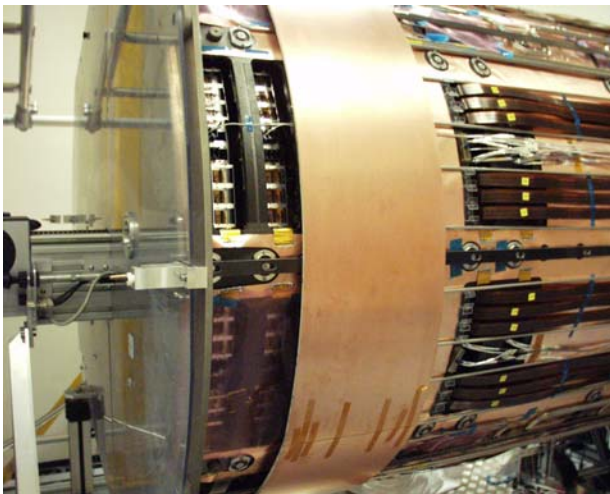


Gap is ~1.5 mm.



Note tear-drop shape due to join.

Band on End-cap



The Donut under the Rail can be seen at LH edge of Band