SUMMARY OF MEETING ON FITTING HELD AT CERN on Oct. the 10th 2001
And some update over the last week

ACTIONS: in **bold**

- Decided to adopt Castolin 157 (4% Ag) alloy for soldering/brazing.
- Proposal to connect a flexible temporary piece on each stave cooling termination to avoid damage during testing. **Eric to make a conceptual design** and to talk to Stefano to see whether this could be made compatible with stave gluing tool. If not this will be connected to the fitting after the stave has been assembled and machined to the final shape.

1. Brazing of stave end fitting on Al tube.

Status:

- 4 pieces got form DATA: Ni coated Al tube + Cu/Ni fitting
- 2 are being tested in Marseille, 2 at CERN (4 fittings) with full test protocol (this will require 1 week).
- 1 sample broken in Marseille and 1 at CERN during fitting tightening. There is a suspect that a brittle rupture might be happened. Has the Al tube been annealed after swaging? **Eric to check**.
- 1 sample tested in Marseille: traction tests and some thermal cycles showed no problem, sample still leak tight.
- First test at CERN were positive as well.
- **Jocelyn/Georg please circulate a short report** on the test results as soon as the full test protocol will be completed.

Next steps: ***NOTE THIS HAS THE HIGHEST PRIORITY AS IT'S STOPPING THE STAVE PRODUCTION***

- Order to DATE as soon as possible (**Eric**) 20 samples of stave tubes with 2 brazed fittings each (Al with 3-4 microns Ni coating).
- **Eric to circulate** the new drawings of fittings and stave tube+fitting assembly by mid Nov.
- 10 assemblies will go to Marseille and 10 to CERN.
- They all will be subject to the full qualification test protocol.
- Is it possible to make some irradiation tests with samples immerged in C3F8 at LBNL? **Neal to check**

2. Status of welding tests of Al tubes and Al fittings

Italy (RTM):

- first laser welding tests showed some problems due to micro-cracking. Tests will be repeated using a continuous laser beam always with 6060 Al fittings
- Stave Tube material has been confirmed to be 6060 Al alloy

CERN:

- First e-beam tests on 6060 tube and fittings showed some difficulties due to the difference in terms of mass between tube and fitting. Need to change the joint design

and to improve the control of the concentricity of the welding ribbon wrt the tube. **Jocelyn to follow up**.

LBNL:

- Some micro-cracking problem with tube of last delivery
- Problem identified: wrong tube material 3003 alloy instead of pure Al 1060. Will order new 1060 and repeat the tests.
- Tests on stave will go ahead with 6060 material for fittings as it is unwise to make them out of 1060 due to its poor machinability. In fact there is no reason to go to 3003 alloy, which has a Si content similar to 6060 and hence should bring to similar results.
- **Eric to prepare and send to Neal** 10 6060 stave fittings to made laser tests in US.

3. Stave U-link

- 5 assembly of U-link with Cu/Ni pieces soldered with Castolin 157 will be **made by Jocelyn and tested** according to the agreed test protocol (test no.2).
- **Eric to update drawings** (discussion with Jocelyn is needed) of U-link pieces and U-link assembly.
- Eric to check overall length of the stave+U-link and to send model to Genoa for integration (**Stefano)** into bi-stave assembly model.
- In parallel 10 U-link assemblies with Ni coated 6060 parts (except the bellow) will be made by DATE (**Eric to follow up**). **Al parts to be prepared by Jocelyn**. These assemblies will be submitted to the test protocol n.2 (**Jocelyn). Deadline for end of the year.**

4. Fittings

Mating-de-mating (MDM) specification

All fittings will have to be qualified at least against 25 assembly-disassembly sequences. Mating and de-mating forces/moments have to determined and should be low enough to prevent damage to local supports.

Luer-lock (LBNL)

- Al/Al type have been showing acceptable results (although the leak rate is higher then the In ones)
- First de-mating tests are showing acceptable forces
- Need to assess coating (parylene, Ni?)
- Concerns about material
- **Neal to circulate** a drawing of the lightest luer-lock design fitting
- **Eric to check** whether small luer-lock could fit with bi-stave design
- Need to qualify against DMD spec **(Neal)**

In type (CERN)

- After positive leak tightness test according to common protocol, long term creep test at a pressure of 20 bar is ongoing
- Need to check de-mating forces (**Jocelyn**)
- Need to qualify at least 5 connectors against MDM spec.

5. PP0 fittings and type0/1 tubes

- Commercial fittings at PP0 are preferred, possibly with no separate item that might fall down during assembly
- Jocelyn has identified a vendor having out-of-shelf Al fittings which are of a potential interest: http://www.goodridge.net/index.html
- Internal tube sizes have been agreed as follow:
  - Capillary for disk and stave: ID tbd (0.4-0.8), s=0.2, CuNi (Al under study)
  - Type 0 return for disks and staves: 4 ID, s=0.35, Al
  - Type 1 inlet for disks and staves: 2 ID, s=0,35, Al
  - Type 1 return for disks and staves: 8 ID, s=0.4, Al