

# LHC Collimation PHASE II

## 11<sup>th</sup> Design Meeting - 03/10/2008

*Present:* Gonzalo Arnau Izquierdo, Arnaud Pierre Bouzoud, Roger Perret, Samuli Heikkinen, Roberto Losito, Oliver Aberle, Rhodri Jones, Marek Gasior, Bernd Dehning, Alessandro Bertarelli (chairman), Alessandro Dallochio (scientific secretary).

The meeting was entirely devoted to the issue of beam monitoring devices to be included in the jaw assembly inside vacuum.

### 1. BPM integration

*Bouzoud* presented the design solution studied to integrate BPMs into the collimator jaws:

- Dimension, shape and position of the buttons with respect to the jaw.
- Position adjustment system for each BPM.
- Cables layout.
- Electrical connections done via 2 flanges placed on the side of the vacuum tank.

#### 1.1. BPM sensors (buttons)

*Jones* and *Gasior* preliminary approved the present design.

It was decided to prepare a document based on present design with a list of requirements and submit it to a supplier (probably MEGGITT?) in order to have a feasibility study.

#### 1.2. BPM cables

BPM cables are usually filled with inert gas, this is a potential problem for UHV in case of leak. *Gasior* and *Jones* will evaluate the possibility of having no gas inside coaxial cables.

*Bouzoud* remarked that a support must be designed in order to stiffen the connection between button and cable to avoid excessive loads due to jaw movements.

The minimum bending radius allowed for the cables must be verified.

*Jones* proposed to change the design of flanges to integrate fast electrical connections (similar to TV cable).

*Jones* remarked that long cables connecting the collimator supports to the electronic equipments for the signal processing have a large diameter (~33mm). *Losito* and *Aberle* stressed potential problems there could be to install such cables in the tunnel.

*Jones* remarked that future tests, necessary to validate the BPM system, require a circulating beam. It is clear that the facility (beam test stand) is not useful in this case. Tests should be carried out in the SPS (LHC?) ring or in a dedicated test bench.

### 2. BLM integration

Dehning evoked the idea of using SEM (secondary emission monitor) to be installed on each jaw. The compatibility of such design with jaw space constraints is a major concern. Besides the cost of such a system could be very high.

Further analyses should be carried out to assess the benefit of a in-vacuum BLM system. For the time being jaw design is continued without BLMs.

### 3. Action list.

ACTION	MANAGED BY	OPENED	CLOSED
Tests on Mo plate and tube: machining, welding, bending dimensional stability after baking out.	G. Favre G. Arnau	19/06/2008	In progress
Identify one or more ceramics with the following properties: Resistivity :1-100 $\Omega$ m Diel. Const: as low as possible (up to 5) Loss factor: < 1E-2 Brazeability to metal support. High density	G. Arnau	19/06/2008	In progress
Once ceramic identified do brazing and machining tests	G. Arnau G. Favre	19/06/2008	Standby
Thermo-mechanical calculations using Cu-diamond and Al-diamond to confirm its interest	A. Bertarelli A. Dallochio	3/07/2008	In progress
Contact BNL for radiation tests	G. Arnau	3/07/2008	To be done
Verify with R. Assmann the collimation efficiency in case of ceramic jaws.	A. Dallochio	17/07/2008	Standby
Contact CADFEM to fix a "bug" found in ANSYS WORKBENCH	A. Dallochio A. Bertarelli	05/09/2008	Closed
Prepare a document for PLANSEE including design specifications of the back-stiffener	A. Bertarelli	05/09/2008	In Progress
Follow the preparation of a mockup of the cooler (EPFL): Inox pipes back-casted in Al-CD	G. Arnau Izquierdo	05/09/2008	In Progress
Purchase Zr pipes (8mm id 10mm od) and prepare a bent cooling circuit for EPFL	G. Arnau Izquierdo	19/092008	Closed
Prepare a prototype of cooler: machined pipes + brazed / welded cover.	Bouzoud Perret	19/09/2008	In Progress
Contact PSI and B. Dehning for integration of BLM	Dallochio	19/09/2008	Standby
Energy deposition studies (FLUKA analyses) for different materials and design (accident scenarios: direct impact on TCSM + impact on TCP and shower on TCSM):	L. Lari F. Cerutti	19/09/2008	In Progress
Prepare plans of BPM and cables.	G. Arnau	03/10/2008	To be done
Prepare list of specifications for BPM system to submit to the supplier for the feasibility study.	Jones, Gasior, Bertarelli, Dallochio	03/10/2008	To be done

Modify flanges for BPM electrical connections	Bouzoud Jones	03/10/2008	To be done
Verify minimum bending radius of BPM cables	Jones	03/10/2008	To be done
Ralph to give his principle agreement on installation constraints of long and thick coaxial cable in the tunnel	R. Assmann	03/10/2008	To be done
Verify how to perform evaluation tests of the BPM system (ring or specific test bench)	A. Bertarelli / R.Assmann	3/10/2008	To be done
Evaluate the cost / benefit ratio of the in-vacuum BLM solution to possibly include it in jaw design	R. Assmann / B. Dehning	3/10/2008	To be done