LHC RF Meeting

14th May 2003

Present:

Luca Arnaudon, Philippe Baudrenghien, Olivier Brunner, Edmond Ciapala, Sylvain Girod, Roberto Losito, Jean-Claude Perrier, Maurice Prax, Joachim Tückmantel, Volker Rödel, Claude Ruivet.

The meeting was devoted to practical details concerning the installation and future access to equipment around the ACS modules. Space will be tight due to waveguides, QRL and cable trays. The following points arose:

- Space needs to be found for the power coupler ventilators (tunnel floor?) (**Action:** Claude)
- Mounting of waveguides around the cavity - The waveguide system will be installed before the module. Once the module is in place the heavy waveguide transformer will be slid into place from above and bolted in place (support & lifting gear has been studied by Pablo)
- Antenna cables will be connected without intermediate patch panels. The flexwell cables from the cable tray on top of the QRL will need to be carefully aligned and cut to fit squarely on their connectors. For ring 1 these connections are on the transport side, for ring 2 they are on the waveguide side. The routing and any possible interference (e.g. with waveguides) needs to be checked. (**Action:** Claude, Sylvain)
- The two large 55-way controls cables (internal sensors) will fit directly on the cavity, without use of a patch panel.
- Electron current, vacuum and HV bias connections will be directly to the coupler.
- A patch panel will be mounted on the module for the following cables, to group them into a single cable: window Pt100, window heaters, bath heater, He level gauges and He pressure gauges. This will be fixable on either side of the module, so as to be on the accessible transport side for both Ring 1 and Ring 2 modules. (**Action:** Maurice, Roberto)
- The present tuner cable is connected to the side of the tuner frame, at 90° to the module axis, making access difficult from the other side of the tuner. It would be better fixed at the rear of the box, allowing access from either side. Similarly the tuner limit switch, on one side of the tuner frame, could be fixed centrally on the top or bottom to facilitate the access needed during tuner setup. (**Action:** Maurice, Roberto)
- HOM Coupler Cables. There are 4 HOMCs per cavity, each with two 50 ohm power outputs which must be terminated. Fundamental power measurement and interlocking is needed for each coupler, using one of the two outputs. At present no need is seen to have a patch panel on the cavity. From LEP experience (see Appendix 1) lossy cables are preferred to loads for dissipation of HOM power. The maximum power expected is 1 kW. At the same time there is interest in being observe HOM spectra with minimum dispersion and attenuation. The various possibilities with respective pros and cons are given in Appendix 2) A solution will be worked out in a smaller group. (**Action:** Joachim et al)
- If access around the cavity requires climbing onto and standing on the platform mounted on the cavity, improved protection of the HOMC outer parts may be needed.
- The positioning of the forward and reflected directional couplers on the waveguides to the cavity needs to be decided. Does this need to be close to the cavity for any other reason other than minimum phase shift with temperature? (**Action:** Olivier)
- Suspension of waveguides. The study is ongoing and drawings being made. (**Action:** Pablo, Olivier, Sylvain)

A procedure for the installation of all equipment – cavities, waveguides, cables etc should be defined and documented. C. Ruivet should coordinate this, with input from all those responsible. (**Action:** Volker & Claude)

E. Ciapala, 19th May 2003

Appendix 1) HOMC connections in LEP:

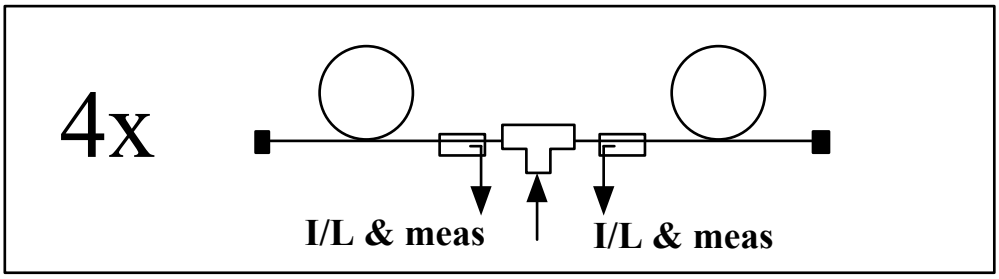
There were 2 HOMCs per cavity, each with two outputs. One output from each was taken by RG213 to a patch box behind the cavity then via a CR50 Huber Suhner cable (semi-rigid foam filled) to an attenuator in the racks in the klystron gallery where it was used for signal observation and HOMC fundamental power measurement and interlock. The other HOMC output was connected directly by RG213 to a load in the tunnel. These 200 W loads and attenuators used thick film resistors and were prone to damage from high peak power. The attenuators were later replaced by 100 m of RG213 plus 31.5 m HTC 50.3.3 terminated in 50 ohm. This cable was coiled up on top of the racks. The loads were replaced by 100 m of RG213 plus 100 m HTC 50.3.3, short circuited at the end and coiled up behind the cavities in the tunnel.

(E.C. with input from P. Brown, S. Grillot, E. Peschardt, G. Geschonke)

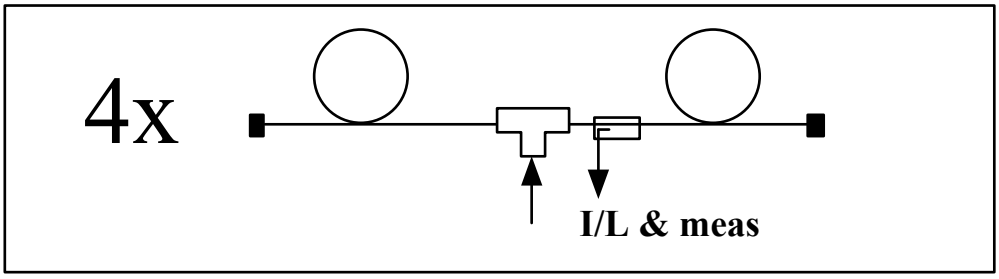
Appendix 2) HOM Connectic for ACS J.T. 14/5/03

Constraints:

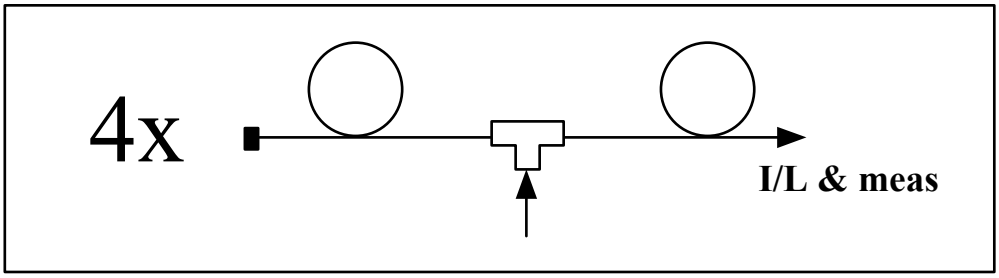
• Output power: Up to 1 kW HOM power should be allowed without destroying equipment
• Interlock: The leakage of the 400 MHz stop-filter should be interlocked for each coupler
• (Interlock): Temperature of 'load' should be checked?



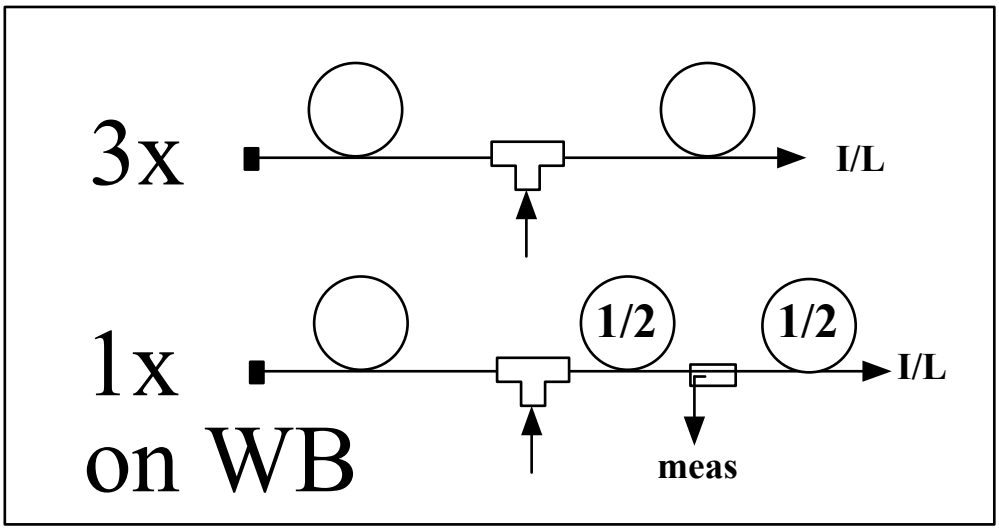
Design 1: One interlock/measurement line over directional coupler per HOM-T outlet. Problem: Normal directional couplers do not support 1 kW, using type N connectors. Wide band transfer function of directional coupler?



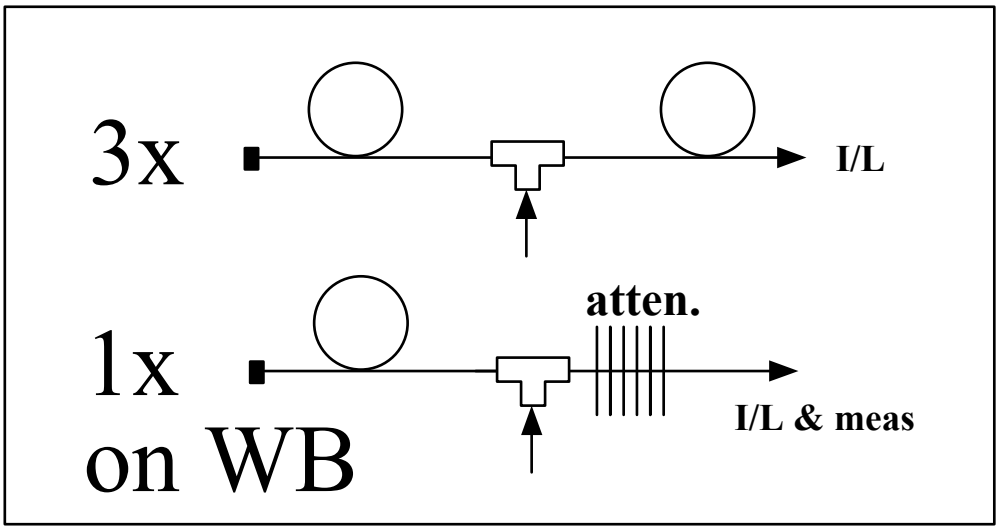
Design 2: One interlock/measurement line over directional coupler per HOM, the second branch of the T assumed identical to first one. Problem: as above. If the second arm 'breaks', first still assures half of HOM damping. Needs check of cables once per year ?



Design 3: Avoids problem of power and wide band transfer function of directional coupler, but cable frequency characteristic is not flat either. Cheaper since no directional coupler used.



Design 4: 3 couplers as above for interlocking, one coupler with split attenuating cable. The first (half-) roll gets the power down to a level the directional coupler can handle but the higher frequencies are not yet damped too much. Frequency characteristic of directional coupler fully involved, cable role only half. Is it worthwhile compared to design 3?



Design 5: As above but with power attenuator in one line. Frequency characteristic is about perfect (except the cable from the load to the measurement head). Is it worth the money and risk (power attenuators in HOM lines with stop-filters tend to break)?