

Summary of the 4th session Cavities

Chairman : Jörn Jacob

Several cavity R&D projects are going on, which are of great interest for the light source community. The meeting received interesting news from the EC-funded 500 MHz HOM-damped cavity, the new 100 MHz system for MAX II, III and IV, from the Super3HC cavity now in operation at Elettra as well as other exciting information as detailed here below.

In the first contribution, Ernst Weihreter presented the status of the EC-funded 500 MHz HOM-damped cavity. The high power prototype is now almost ready for the final tuning and assembly by electron beam welding. Some minor problems, all on the way to be solved, have been reported. Even though the present version already exhibits very low HOM impedances, some improvements are expected from homogeneous ridged waveguide dampers with internal loads. Corresponding investigations are under way.

After RF conditioning and power tests at BESSY late this year, the cavity prototype will be transferred to DELTA, where everything is prepared to receive and test the EC cavity with beam. As reported by R. Heine in the second presentation, the DELTA storage ring operated at low energies down to 542 MeV constitutes an ideal test bench to detect low residual HOM impedances. Corresponding diagnostics have been implemented for a full analysis of occurring CBI. R Heine has applied these diagnostics for a complete HOM evaluation of the installed DORIS cavity.

From the discussions following E. Weihreter's presentation, it turned out that the RF community is keen on the test results with the EC-funded cavity. There are already potential applications for this HOM damped cavity such as the projected 600 MeV storage ring to be built by BESSY for the Physikalisch Technische Bundesanstalt (PTB) close to BESSY or the planned Australian Light Source.

Åke Andersson reported on MAXlab's development of a new 100 MHz accelerating cavity to replace the existing 500 MHz cavity on MAXII (mid 2004), for MAXIII (end of 2004) and for the future MAXIV. The reduction of the RF frequency by a factor of 5 represents a cheap solution to increase the RF acceptance and thereby the dominating Touschek lifetime on MAXII, without increasing the RF power. Based on the experience with the present 1500 MHz harmonic cavity, no special measures have been taken to control the HOM level of the new 100 MHz cavity. Instead, it is planned to install a 500 MHz (5th harmonic) pillbox cavity to elongate the bunches by up to a factor of 3, thereby providing Landau damping of coupled bunch instabilities

and contributing at the same time to the increase in Touschek lifetime. The first 100 MHz cavity is ready for bake out and RF power tests.

In the discussions J. Jacob suggested to check whether sufficient Landau damping can still be expected from a harmonic cavity on the 3 GeV MAXIV ring: according to the numerical study carried out by V. Serrière at the ESRF, Landau damping is expected to be less effective for higher energy machines.

Michele Svandrik reported on the somewhat difficult but at last very successful commissioning of the superconducting 3rd harmonic cavity Super3HC at ELETTRA. After initial problems mainly with the cryogenic plant but also with the mechanical tuning system, the harmonic cavity has brought a dramatic improvement of the standard operation conditions at ELETTRA since July 2003. The lifetime has been increased by up to a factor of 3.5, giving room for less frequent refills at 2 GeV (every 36 h instead of every 24 h). Also for 140 mA operation at 2.4 GeV, 50 % of lifetime could be gained. Moreover, the harmonic cavity provides enough Landau damping to suppress the residual HOM driven longitudinal coupled bunch instabilities and it has allowed to store for the first time up to 320 mA of completely stable beam at 2 GeV.

The audience asked ELETTRA as well as the other light sources who operate a cryogenic plant to trace their day-to-day problems with the cryogenics and report at the next ESLS RF meeting.

The presentation by Marco Pedrozzi of highly precise 500 MHz and 3 GHz phase shifters and IQ demodulators was a typical example of what the ESLS RF meetings is also meant for: SLS has developed these nice systems and is now offering to the remaining community to benefit from their design. At SLS, it has been very useful to stabilize the Linac beam.