

EC Contract ERBFMGECT980102

"Development of a Combined Synchrotron Radiation and VUV Free-Electron Laser Facility"

Minutes of the 6th Project Meeting, held during the International Free-Electron Laser Conference, DESY Laboratory, Hamburg, on the 24th August 1999.

Participants -

Sincrotrone Trieste:	R. Roux, M. Trovò, R.P. Walker (RPW)
CEA	M.E. Couprie (MEC), D. Garzella, E. Renault
CLRC Daresbury:	A. Chesworth, M.W. Poole (MWP)
Univ. Dortmund:	M. Hirsch, D. Nölle, H. Quick, K. Wille
ENEA Frascati:	G. Dattoli, A. Renieri
MAX-lab:	S. Werin

1. PROJECT MANAGEMENT

The draft minutes of the 5th Project Meeting (Daresbury, June '99) were approved without correction.

RPW reminded all participants about the existence of the project web page. MEC requested that copies of the minutes also be sent by e-mail as an attached file.

RPW confirmed that the Annual Report has been submitted to Brussels and that a request has also been made for the maximum intermediate payment in order to ease cash-flow problems.

The final version of the status report on the Project, compiled by R. Roux, has now been submitted to the FEL Conference, after having been circulated for comments.

2. TASK A: OPTICAL CAVITY

MWP said that some delay has been experienced with the mirror chambers since priority had to be given to repair a vacuum leak in the SRS storage ring that occurred during the shutdown, so interrupting critical vacuum processing work. The schedule shows completion of Assembly A on October 8th followed by Assy. B on Oct. 17th. After packing and transportation, delivery of the 2 chambers is foreseen for Oct. 25th. Assembly A is presently on schedule, while Assy. B is in delay by 10 days, however it is hoped to recover this time since assembly of the second chamber should go more quickly than the first. No major technical problems have been encountered, only minor ones such as non UHV compatible piezo units, addition of a support for the transfer arm, the need to coat the mirror holders with tungsten disulphide to avoid abrasion, and the addition of a transition piece for the piezo feedthroughs. The present plan is to ship the units fully assembled, under vacuum, as normally done for monochromators. Two technicians will be sent to assist with the installation. The work plan for installation and tests has yet to be defined.

MWP said that CLRC has now determined that VAT is not payable on EC contracts and that VAT paid earlier will be able to be recovered.

3. TASK B: MIRRORS

MEC summarised the problems that RSA le Rubis had encountered in supplying the sapphire substrates, partly because of the larger size and radius of curvature. The strategy that was agreed is that RSA will produce 10 rough sapphire substrates that will be sent to Maris-Delfour for polishing (in fact they have already been sent). At the same time Maris-

Delfour will also polish 10 silica substrates. A single radius of curvature of 17.5 m will be used for both upstream and downstream mirrors. An agreement has been reached with Makowski (INPL, Lyon) for coating a first batch (5 silica + 5 sapphire) in October for use at 350 nm, with 0.1% transmission. Delivery of these first mirrors to Trieste is therefore expected by the end of October. RSA will also supply 10 polished sapphire substrates at the end of November.

MEC strongly suggested installing the mirrors under a laminar flow unit. DN said that this was not done at DELTA without any negative consequences, but MEC confirmed that a reduction in mirror damage was observed after starting to use a laminar flow unit at LURE. RPW agreed to investigate whether this could be done at Trieste.

MEC also expressed concern about the use of liquid InGa as interface between mirror and holder, because of the possibility of damaging the mirror surface, and recommended instead In thread which has been used successfully at LURE together with a clamping on the outside of the mirror. RPW pointed out that such a clamping is not compatible with the agreed holder arrangement in which the mirror is retained loosely by clips on the surface. He agreed however to try to gain some further experience with InGa before finally deciding; if doubt remains, some mirrors could be installed with, and some without, InGa.

RPW opened a discussion on the strategy to be adopted for the preparation of mirrors for wavelengths below 350 nm, other than the ST initiative to try Al coated mirrors. In view of the limited time available, he indicated his intention to try various possibilities from various suppliers in parallel. It was agreed that since 250 nm and 300 nm require similar materials, that the next step should be directly to 250 nm. MEC suggested alternatively that the second batch of mirrors could be optimised for high output power at 350 nm, after establishing lasing and confirming the gain etc. RPW agreed that this could be a useful development since high output power is one of the project goals, provided this was in parallel with attempts to go to shorter wavelengths. MEC said however that no money would be left over at LURE for shorter wavelengths after polishing and coating the 350 nm mirrors. DN also said that Dortmund could not help finance such a development, but agreed to interface with IOF, considered at the moment to be the only possible European supplier of 250 nm mirrors, with whom they are jointly developing an optics test facility. RPW committed himself to obtain any extra funding that may be needed to support the procurement of short wavelength mirrors within Sincrotrone Trieste.

4. TASK C: UNDULATOR AND FRONT-END

RPW summarised the present status of the undulator, vacuum chamber and front-end installation programme (see attached sheet).

5. TASK E: THEORY

GD commented briefly on the work that was being presented in a poster on the use of crossed circularly polarized undulators; he said that the problem was complicated and that the Madey theorem was violated: in contrast to spontaneous emission, pure linear polarization is not obtained in the oscillator case. Studies are also continuing of pulse propagation effects in the optical klystron configuration.

6. TASK F: FEL COMMISSIONING

RPW said that if all goes according to plan, first lasing attempts could be Nov. 14-15th, but since this is immediately after a shutdown more likely dates are Nov. 26-28th and Dec. 10-12th, which he hoped could be largely dedicated to FEL shifts.

RPW presented the draft ELETTRA shift schedule for 2000 which as far as possible took into account the needs of the FEL project: 6 accelerator physics periods of 3 days (i.e. 72 h), each of which include or are close to a week-end, and 6 of 2 days, during Runs; longer start-up periods after shutdowns may also allow some accelerator physics activity depending on circumstances; the possibility may also exist to shorten the 8-day typical shutdown to 5 days if no major installation work is planned.

RPW stressed that the limited time available for the FEL project, which has to compete also with other ELETTRA machine development projects, must be used efficiently. DN suggested that if continuous periods are available an efficient solution is two teams running 12 h shifts. RPW agreed to keep people informed of the shift schedule and the allocation of FEL shifts.

7. CONCLUSION

It was agreed that for convenience the next Project meeting should be held in conjunction with FEL commissioning shifts at Trieste, at a date yet to be determined.

SUMMARY OF MAIN ACTIONS:

- documentation required for shipment of mirror chambers to Trieste (CLRC, ST)
- define work plan for installation and tests of mirror chambers (CLRC, ST)
- investigate possibility of using a laminar flow unit during mirror installation (ST)
- further tests of InGa (ST)
- prepare optical cavity alignment strategy (ST)

R.P. Walker
Trieste, 14th March, 2000

Status

Undulator : FEL1 undulator – complete, tested, almost ready for installation
FEL 2 undulator – assembly of magnets 3/4 complete
modulator – in construction (SigmaPhi); delivery September;
power supply delivered

Front-end – complete and installed up to shielding wall
back-end – main component (stopper) delivered; rest in construction, delivery
mid September

Vacuum chambers : ID – installed
downstream BM 1.2 – installed
upstream BM 1.1 – delivered; vac. lab. tests to start soon

Diagnostics : ordered; many components arrived, rest by end September

Hutches : all ordered; front-end radiation hutch installed

Cable ways : front-end installed

Installation Programme

mid. September	modify SR/FEL diagnostics hutch (before 15/9) install back-end radiation hutch
Shutdown Sep. 20-29	complete front-end installation and bake-out install vac. chamber BM 1.1 install back-end and bake-out install IDs and modulator
October	commission IDs and modulator with beam (possibility to mount switching mirror, make-up tubes, windows and transmit visible radiation into exptl. area)
end October	install front laser hutch; complete optics installation arrival of mirror chambers (<i>to be confirmed</i>)
Shutdown Nov. 1-12 mirror	install and align mirror chambers and switching mirror bakeout mirror chambers and switching mirror install mirrors mirror alignment

Possible FEL shifts

Nov. 14, 15

Nov. 26, 27, 28

Dec. 10, 11, 12