PS Irradiation Request for theT7 Irradiation Facility in 2002

By

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The primary users of the T7 Irradiation facility are EP-TA1-SD, ATLAS Pixels and ATLAS SCT, and this beam request is a joint request by all three groups, as all three groups can run simultaneously.

Request for beam time in T7 with 24GeV/c protons

All requests are based on the beam time necessary for an ATLAS SCT scanning run. A scanning run is assumed to be a 2 week period, which with a target intensity of 40×10^{10} protons per spill, and at least 1.7 spills per super cycle for (averaged over a 24 hour day). Such a scanning run gives a uniform dose of 3×10^{14} protons/cm^{2}over the detector area of 7.5x7.5cm^2.

We request 6 irradiation periods spread evenly over the year. Further, we would like to request that the first of these periods be immediately after the startup of the East Hall (due to issues of quality assurance), and that the last of the 6 periods be at the end of the East hall running (again for quality assurance issues). The other beam time slots can be arranged to fit in with the needs of the other users, and with the schedule. We only ask that these five periods be evenly spaced over the year's running. Note that if possible, having T7 beam time immediately after a technical stop is desirable for us, as it then allows our irradiation area to "cool down" so that we reduce the amount of dose received by those that do the installation of our samples in the primary zone. Of course, to further reduce the dose received by T7 irradiation persons who have to enter the primary zone, we would greatly appreciate having (when possible) the start of our beam time periods immediately after a MD.

Specifics of the Different User Programs at the T7 Irradiation Facility in 2002

ATLAS SCT

Silicon micro-strip detectors

As part of the ongoing detector quality control, small samples of silicon strip detectors need to be irradiated to 3×10^{14}p/cm^2. The detectors will be arriving in batches throughout 2002, so that we request regularly spaced periods for detector irradiation throughout the PS running. In particular, we request beam time both at the very start and the very end of the PS schedule, so to best cover the quality assurance issues arising over the winter shutdown.

Modules

With the successful completion of the ASIC PRR in July of 2001, which included irradiation radiation hardness results on the ABCD3T ASIC, focus turns to the irradiation hardness of the full SCT modules. The SCT barrel modules have undergone a full irradiation program in 2001, and most issues have been settled, so that the irradiation need concerning the Barrel SCT modules is primarily one of QA. However, for the Forward SCT modules, recent design changes mean that the verification of the design in terms of radiation hardness has not been achieved, and hence considerable beam time is necessary for this verification. Once this is established, the forward modules will proceed to an FDR and PRR, and any radiation harness issues raised by these reviews are to be answered using the

T7 facility. Once the design and production process has been approved the Forward SCT module program will move into a QA phase, and again regularly spaced irradiation runs are requested.

ATLAS Pixels

The irradiation of the Atlas Pixel electronics and sensors requires with the respect to the innermost location of the Pixel Detector the fluence of about $2x10^{15}p/cm^2$ (considering 24GeV protons from PS). This gives approximately the dose of 55Mrad(SiO_2) in the electronics. The irradiation program of the ATLAS Pixel group for the year 2002 will be focussed on 4 different topics (listed bellow). There will be as well irradiated other "tiny" different samples used for the detector assembly which are not mentioned here (kapton pieces, various glues, evaporated metals, etc.).

***FE-I and MCC-I*:** (Front-End pixel readout chip and Module Control Chip, both implemented in 0,25µm IBM radiation hard technology), these chips will replace former pixel electronics implemented in DMILL technology. The delivery of the chips from IBM is expected in January. The irradiation will be done in the cooling box (an access needed for the installation). For these irradiation we assume to use 2 irradiation periods; 1stone starting as soon as PS operation allows.
***VDC-I, Doric-I*:** (the chips used for the data transfer via optical links, both implemented in 0,25µm IBM radiation hard electronics). The irradiation of these chips successfully started in September 2001 and will continue in 2002 with new version expected to be delivered in January. We assume 1 or 2 dedicated irradiation periods using both the cooling box (an access needed) and the shuttle system.
Pixel Module: The modules will certainly not be available for irradiation before July 2002. We assume to perform this rather complicated irradiation in a September or October period. A two-week irradiation period is needed, and it can be coincident with the SCT and TA1-SD irradiation runs. The target fluence required for this pixel module irradiation of a pixel module of about 2cm x 8.5 cm is $2x10^{15}p/cm^2$.
Silicon Sensors: The production of sensors will start early next year and we assume to use for the quality assurance monitoring all irradiation periods during the PS run in 2002. The shuttle system will be used only.

EP-TA1-SD

The T7 shuttle service maintained by Maurice Glaser and Michael Moll (EP-TA1-SD) offers a proton irradiation facility for a variety of users. Typically samples of size 2cm x 2cm or smaller are handled. An access to the primary zone is not needed and therefore the shuttle system offers the possibility to irradiate many samples to different fluences at the same time.

In 2001 during 87 days of beam time 571 different samples have been irradiated for 32 users coming from 22 different institutes and working for 18 different LHC-experiments. Compared to the year 2000 the number of irradiated samples has increased by 36% while the days of beam time have been reduced by almost a factor of two. For the year 2002 a similar number of irradiation requests for the shuttle systems as in 2001 is expected so that a further decrease in beam time would be difficult to handle.

The T8 shuttle system (neutron irradiation) is working in parasitic mode of DIRAC. The beam time requested by DIRAC will be sufficient to serve all user requests.