

N.2: Distribution of Training, Qualification and Licensing certificates for operation of Indus facility

RRCAT has indigenously designed, developed and commissioned two synchrotron radiation (SR) sources Indus-1 and Indus-2 which are operational in round-the-clock mode since Feb 2010 and serving users as a national facility. Indus-1 is a 450 MeV, 100 mA electron storage ring for radiation of mid-IR to soft x-ray range. Indus-2 is a 2.5 GeV booster cum electron storage ring for the production of radiation in soft and hard x-ray regions. With its circumference of 172.47 m, Indus-2 is presently the largest particle accelerator in the country with the highest energy.

Operation of both the SR sources is carried out by an operation team which is well trained on different technical aspects of accelerator operations as well as stringent safety requirements stipulated by Atomic Energy Regulatory Board (AERB).

Indus accelerators are very complex machines comprising many sub-systems needed for operating the accelerators. Machine operation requires precise optimization of parameters to keep the beam confined within the vacuum envelope. High radiation field exists in the ring and the beamline hutches. Knowledge of various sub-systems is essential for operation of the accelerators in a safe and efficient manner. Major sub-systems of the Indus machines are magnets and magnet power supplies, beam diagnostics system, UHV system, RF system, controls, cooling system, radiation safety system, radiation monitoring, electrical and many auxiliary systems like compressed air system, heating ventilation and air conditioning system, fire safety, civil and electrical systems.

It is evident that the accelerator operation is a multi-disciplinary activity and in order to operate the machine safely and efficiently, it is essential that operating staff is trained in all the subsystems and procedures. AERB and the Safety Review Committee for Operating Plants (SARCOP) also recommended for having a trained operation team for Indus operation. In view of the above and to operate the Indus facility in round-the-clock mode a Training, Qualification and Licensing Committee (TQLC) was constituted by Director, RRCAT in 2008. In its report, the TQLC chalked out a comprehensive training programme on the lines similar to what is followed in plant operation at other DAE units. The Committee defined the procedure for licensing of various levels of operators and also various issues related to the operation of Indus accelerators like, duties and responsibilities of operation staff, organization chart for three

shift operation, syllabi for various levels of operators' training in all aspects of accelerator viz., operation of all subsystems, field checklists, access controls, fire protection system, emergency operating procedures.

The first batch of such trained manpower was ready to operate the Indus machines in 2009. The second and third batches were trained and licensed in 2010 and 2014 respectively. On November 10, 2017 a function was organized to give away the Licensing certificates for Indus operations for trained manpower of third batch and license renewal certificates for batch-1 and batch-2 trained manpower. Dr. P. A. Naik, Director, RRCAT awarded the certificates and addressed the batch.



Dr. P. A. Naik, Director, RRCAT awarding the certificate (above) and addressing the batch (below).

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