

E.1: Status report on operation of Indus-1 and Indus-2 synchrotron radiation sources

The synchrotron radiation sources, Indus-1 and Indus-2, maintained excellent operational performance during second half of 2025. These machines, constituting a national facility, provided SR beam to the users from Indian universities, research institutes, national laboratories and industries on round-the-clock basis.

In the said period, both the machines were operated smoothly following prescribed safety procedures. Three planned shutdowns totaling 15 days were taken for preventive maintenance and upgradation activities. Taking this into account, the machines were operated for 169 days in round-the-clock mode. Beam availability for users in Indus-2 was 3182 hrs (~18.8 hrs/day) whereas in Indus-1, it was 3863 hrs (~22.8 hrs/day).

With this, in calendar year 2025, there were 337 days of RTC operation. Figures E.1.1 and E.1.2 shows beam availability for users in recent years.

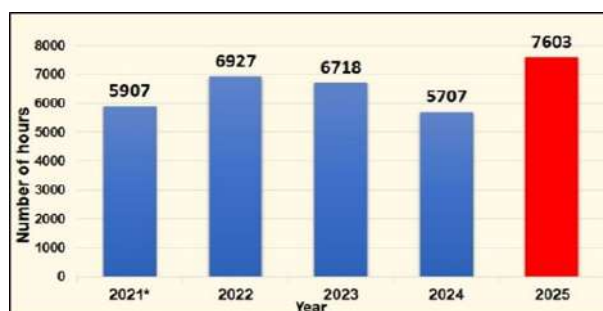


Fig. E.1.1: Indus-1 beam availability

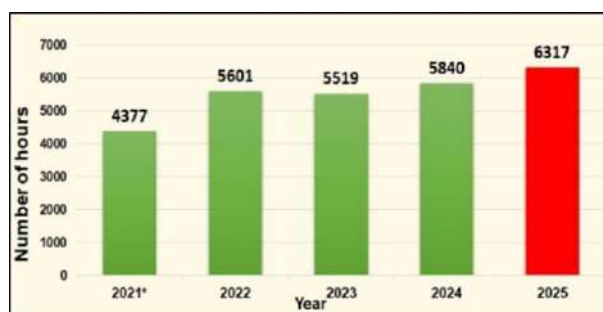


Fig. E.1.2: Indus-2 beam availability

Improvement in Indus-2 beam lifetime with skew quadrupoles: Since July 2024, the Indus-2 facility is being operated in low-emittance mode, wherein the emittance of electron beam is improved to 45 nm.rad, as compared to the 135 nm.rad earlier. This led to the improvement in flux by ~50% at fine focus beamlines. However, the beam lifetime gets significantly reduced in the low-emittance operation. Since October, 2025, the skew-quadrupole coils on the sextupole magnets in Indus-2 are being energized routinely using newly installed power converters that improved the beam life time from ~50 hours to ~70+ hours (Fig. E.1.3).

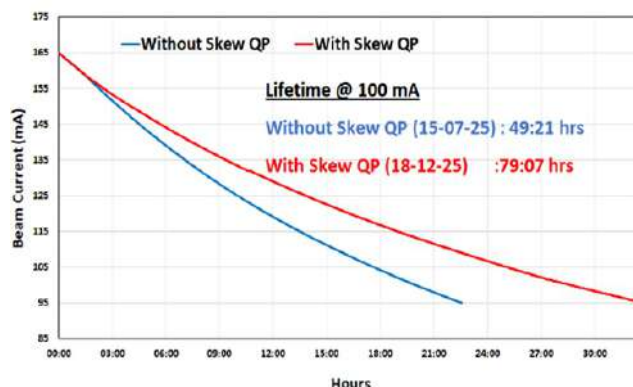


Fig. E.1.3: Improvement in beam lifetime by energizing skew-quadrupole

Utilization: A total of seven beamlines in Indus-1 and twenty beamlines in Indus-2 are operational. Users from a number of universities, research institutes and industries carried out experiments at these beamlines. More details on beam utilization on Indus beamlines is given in report E.2.

Machine Studies: During two days per month reserved for machine experiments, calculation of alignment offsets of BPIs using BBA technique and the improvement of beam lifetime in Indus-2 with skew quadrupole was completed successfully.

Major Upgrade and Upkeep Activities: During scheduled shutdowns of the machine, beamline frontend components of BL-11 and BL-12, namely, water-cooled shutter and fixed mask, were replaced.

Training Qualification and Licensing (TQL) Programme: The training of 6th batch of operators under TQL programme was completed successfully in September. Twenty four personnel have been trained and qualified for operation of Indus facility at qualifying levels 3, 4 and 5 (Fig. E.1.4). This team of dedicated operation crew is now shouldering round-the-clock operation of the machine.



Fig. E.1.4: 6th batch of TQLP staff for operation of Indus facility

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