



A.1: Enhancement in Indus-2 Performance

Round the clock operation of Indus-2 was started in February, 2010. Its operation at 2 GeV beam energy, 100 mA beam current was first achieved in March 2010. Subsequently, orbit correction was implemented. This augmentation and continuous operation have resulted in enhancement of Indus-2 performance. The beam lifetime at 2 GeV beam energy, 100 mA beam current has increased to 19 hours and long term uninterrupted availability of the beam increased to 41 hours. Next, experiments performed to store higher beam current resulted in accumulation of 200 mA at the injection energy of 550 MeV. Further, the RF power was supplemented with in-house developed solid state RF amplifiers. With additional RF power, Indus-2 has been operated at 2.2 GeV beam energy, 103 mA beam current and at 2 GeV beam energy, 127 mA beam current.

Due to continuous operation, the vacuum in the ring improved from 5.0×10^{-9} mbar in September 2010 to 2.3×10^{-9} mbar in August 2011. In addition to this, the closed orbit distortion (COD) was also corrected to provide extra aperture to the beam. Fig. A.1.1 shows the beam current decay with time on three different dates over a period of one year. The beam lifetime increased from 7.2 hours in September 2010 to 11.2 hours in March 2011 and to 19 hours in August 2011.

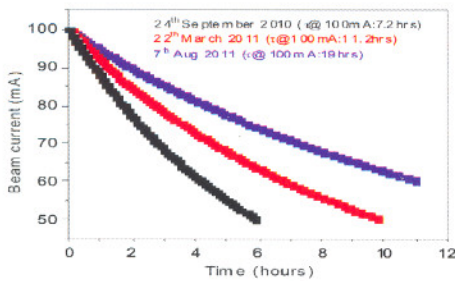


Fig. A.1.1: Beam current decay with time

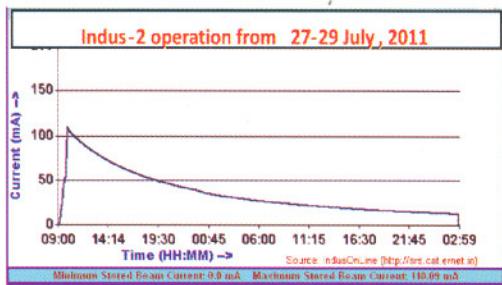


Fig. A.1.2: Temporal profile of stored beam current at 2 GeV

This improvement in beam lifetime has also greatly enhanced uninterrupted beam availability of the photons to

the users. An example of this is shown in Fig. A.1.2 in which a 2 GeV beam was kept stored for 41 hours.

Keeping in view our next objective of operating Indus-2 at 2/2.5 GeV beam energy with more than 100 mA beam current, experiments were performed to accumulate higher beam current at the injection energy. Fig. A.1.3 shows the result of one such experiment where 200 mA beam current was accumulated.

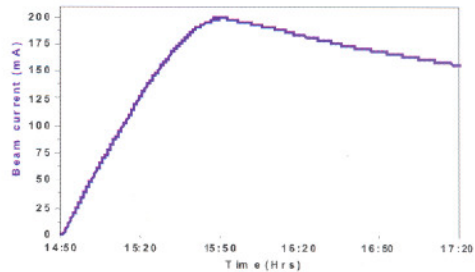


Fig. A.1.3: Accumulation of 200 mA beam current

Indus-2 RF power system has 4 RF cavities operated by 4 RF power stations each equipped with a klystron of 64 kW output power at 505.8 MHz. Since only two klystrons are functional at present, Indus-2 operation has been constrained to 2 GeV beam energy, 100 mA beam current. In view of uncertainty in the availability of the required klystrons from foreign suppliers, an initiative has been taken by RF Systems Division of RRCAT to build high power solid state amplifiers as an alternative source. A 15 kW solid state amplifier was developed and deployed to operate RF Station #1 providing an accelerating voltage of 150 kV. With the availability of this additional voltage and 375 kV each from RF Stations #2 and #4, Indus-2 was operated at 2.2 GeV beam energy with 103 mA beam current as illustrated in Fig. A.1.4.

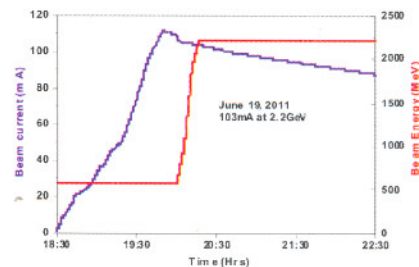


Fig. A.1.4: Indus-2 operation at 2.2 GeV, 103mA

Alternatively, Indus-2 was operated at 2 GeV beam energy with 127 mA beam current. It is planned to further augment the RF power from solid state amplifiers to achieve Indus-2 operation at 2.5 GeV beam energy, 100 mA beam current.

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