Riunione Progetti DA

 $\mathsf{DA}\Phi\mathsf{NE}$ Run for SIDDHARTA-2

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$DA\Phi NE$ Run Dates

DAΦNE has **started operations in February 2021** and, after a first ramp-up period, was regularly in collision mode by the end of April. Meanwhile, SIDDHARTA completed the set-up operations and was ready to take data in the SIDDHARTINO configuration.

The goal of the run was to achieve the best highest possible integrated luminosity and background minimization compatible with the lowest background level.

The **run has ended on July 18th**. After, the Dafne LINAC has been operated for one further week.

DA Φ NE **operations are planned to resume on October 18th**. This two-and-a-half months shutdown is motivated by the request of concentrating DA efforts on the installation of the TEX facility, on the upgrade of Sparc and on the need of urgent maintenance works on the LINAC building.

This time has been also used to work on the installation of the full Siddharta2 detector, and on the full maintenance of the DA Φ NE hardware.

Summary of the DA Φ NE Run for SIDDHARTINO

- Average machine uptime has been slightly lower than 80%. Failure rate was mainly due to: water leaks from the wiggler magnet cooling system, LINAC faults, power supply failures, and some voltage dips of the electrical power distribution line.
- Maximum stable currents stored in collision have been 1 A for electrons and 800 mA for positrons. Limitations are mainly due to feedback system setup and configuration still not optimal, although clearly improved along time. This will require dedicated machine development time during next run. Another limitation comes from the fact that the LINAC has operated at a 25 Hz repetition rate, a conservative choice to prevent possible hardware failures.
- Peak instantaneous luminosity, L_{peak}, observed so far is about 8x10³¹ cm⁻²s⁻¹. This value is confirmed, with good agreement, by two independent measurements, one based on Bhabha scattering the other on Kaon trigger rate. L_{peak} is about a 30% less than the estimated geometrical luminosity, and about a factor of 2 lower than the one measured in 2008-9, with similar currents in collision, but after one year of machine studies and optimization, though.
- Crab waist sextupoles are not yet set to the nominal value. Their strengths are a factor 2.45 and 1.54 lower for electrons and positrons beam, respectively.

Summary of the DA $\Phi \rm NE$ Run for SIDDHARTINO

- Background levels are monitored by two independent measurements provided by the experiment. A fast counter based on Kaon/Mip rate, and a second based on SDD counts/kaon rate. They provide results in good agreement and scale linearly with what is measured by a more detailed offline analysis based on X rays counting on the SDD system.
- Based on these counters, background has been lowered by a factor of 2-2.5 from the beginning of the run, by increasing progressively the strength of the Crab- Sextupoles, optimizing the main rings working point in terms of the betatron tunes (now: Qx = 0.1082 Qy = 0.1533 for electrons, Qx = 0.0972 Qy = 0.1648 for positrons), refining collimator insertion and the lead shielding around the detector. This background is only slightly higher than what obtained during the first Siddharta run (at a higher luminosity though) and reasonably good for physics data taking.
- Siddharta has acquired about 54 pb⁻¹ of data from June 1 to July 18, out of which about 30 pb⁻¹ with the He target
- Several different combinations of the degrader thickness and of the He target density have been studied to determine the best configuration in terms of kaonic helium yield.
- Using 16 pb⁻¹ of data taken with the "high density" target, a clear peak of kaonic helium can be observed. A very preliminary fit to the data provides a measurement with a 3 eV statistical uncertainty, a result that can be considered already worth of publication.

Maintenance Activities

Cooling

- WGLs water hoses replaced (1184 hoses)
- DVRTL001 water hoses are damaged due to radiation replaced
- Cooling unit in the DAFNE hall have been maintained
- Air conditioning failure in the LINAC modulator hall, and in the DR PS hall have been fixed

Vacuum

Problem affecting 3 SIP in the TLs have been fixed Vacuum gauge VUGEL103 repaired

Diagnostics FBK Kickers

Water leakage from the circulator of the longitudinal positron FBK has been fixed A power amplifier of the longitudinal positron FBK has been repaired

Control System

- Some monitors in the CR have been replaced
- Procedure to implement automatic restart of the II level of the DAFNE CS is
- completing the debugging phase
- communication problems between the CS and new Danfisik control panel have been understood and fixed

Magnets and PS

- **General maintenance**
- Order to purchase new spare parts (control panel, IGBT, DCCT) for Danfisic PS have been issued

LINAC

General maintenance New TDK solid state amplifier installed on the Mod C Installation of the new UFS PSs has been completed (Magnets -PS and CS groups involved) Maintenance of the LINAC building is on schedule (should end by Oct 10th) Some water and vacuum leak are going to be fixed Periodical safety checks for LINAC, BTF1, and BTF2 are scheduled for October 18 -19 . Klystron C still has unresolved issues

2022

In 2022 SIDDHARTA-2 should complete data taking

800 pb⁻¹ with the full SIDDHARTA-2 apparatus setup with an optimized machine configuration

DAFNE operation schedule should be discussed in the framework of the general LNF programs

Anyway operating DAFNE implies: dedicated manpower assistance for the collider subsystems Support from colleagues working as Run Coordinators

Critical Issues

Scientific manpower

Presently dedicated manpower is a main issue for many relevant topics: optics, beam dynamics, background studies, luminosity diagnostics.

A procedure to recruit a new scientist is still in progress

We have qualified people interested to apply to the post doc positions

The collaboration with CERN about the FCC-ee Injection design is becoming really demanding

Operation Group

Provides assistance to all the accelerator infrastructures in the LNF Presently it counts 29 members (-1 retirement + 2 new entries) organized in 7 crews

Operators will be 28 on December 1st and 27 on Jan 2022.