Status of LNF

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LNF: the Frascati National Laboratory

DAΦNE: $e^+e^-$ collider running @ $M_\phi$
BTF: beam test facility ($e^-$, 50-500 MeV)
DAΦNE-Light: sincroton radiation facility
SPARC: free electron laser (500 nm)
The DAΦNE complex

- $e^+e^-$ collider @ $\sqrt{s} = M_\phi$
- 2 interaction regions
- Separate $e^+e^-$ rings
- 105+105 bunches
- 2.7 ns bunch spacing
- $I_{\text{peak}}^-/I_{\text{peak}}^+ \sim 2.4/1.5$ A
- $\theta_{\text{cross}}$: $2 \times 12.5$ mrad

2008, new interaction scheme:
$L_{\text{new}} \sim 3 \times L_{\text{old}}$

Best performances (1999-2007):
- $L_{\text{peak}} = 1.4 \times 10^{32}$ cm$^{-2}$ s$^{-1}$
- $\int Ldt = 8.5$ pb$^{-1}$/day
The KLOE experiment at DAΦNE

Drift chamber
- Gas mixture: 90% He + 10% C<sub>4</sub>H<sub>10</sub>
- $\delta p_t / p_t < 0.4\%$ ($\theta > 45^\circ$)
- $\sigma_{xy} \approx 150 \mu$m; $\sigma_z \approx 2$ mm

Electromagnetic calorimeter
- lead/scintillating fibers
- 98% solid angle coverage
- $\sigma_E / E = 5.7\% / \sqrt{(E(\text{GeV}))}$
- $\sigma_t = 57$ ps / $\sqrt{(E(\text{GeV}))}$ $\oplus$ 100 ps
- PID capabilities

KLOE data taking ended on March 2006
- 2.5 fb$^{-1}$ on tape @ $\sqrt{s} = M_\phi$ (8×10$^9$ $\phi$)
- ~10 pb$^{-1}$ @ 1010,1018,1023,1030 MeV
- 250 pb$^{-1}$ @ 1000 MeV

KLOE-2 upgrade in progress
- Expected 5-10 fb$^{-1}$ in three years running
KLOE-2: IR detector upgrades

**INNER TRACKER**
- 4 layers of cylindrical triple GEM
- Better vertex reconstruction near IP
- Larger acceptance for low $p_t$ tracks

**QCALT**
- $W + $ scintillator tiles + SiPM/WLS
- QUADS coverage for $K_L$ decays

**CCALT**
- LYSO + SiPM
- Increase acceptance for $\gamma$’s from IP ($21^\circ \rightarrow 10^\circ$)
CCALT assembling

12 LYSO crystals in each module

PCB housing SiPM and calibration LED housed by a 3D-printed ABS case

Beam Position Monitor

Copper coil for IR cooling

QDo
QCALT assembling

Both QCALT installed on the IR

Each module is read out using 80 SiPM channels positioned with 0.05 mm precision on aluminum dioxide PCB

Each PCB has 4 front end boards with 20 channels each with HV regulator, preamplifier and splitter
In February the last layer of the IT has been completed.

Starting from the outermost one, all layers have been inserted one into the other.

- 90 FEE channels per side
- The heat power created is 100W per side
- General air-cooling for the IR region and a dedicated water-cooling for the IT FEE
IR equipped with all the detectors

Before cable dressing...

Now fully cabled... ready for the insertion (this week)
Perspectives

The installation of the new DAΦNE IR is in progress. New detectors for the KLOE-2 upgrade successfully assembled on it
  - Insertion inside KLOE expected this week
  - Machine commissioning will start in September

In the meanwhile, studies are going on to discuss the future of the LNF area after KLOE-2. After the Italian government ended the SuperB project, two alternative projects are under study:
  - a tau-charm factory with polarized beam and a luminosity of \(10^{35} \text{ cm}^{-2} \text{ s}^{-1}\)
  - IRIDE (Interdisciplinary Research Infrastructure with Dual Electron linacs and lasers) working group is studying an infrastructure for fundamental and applied physics research
Spares
Modifications of IR components

- New IP Spherical vacuum chamber
- New beryllium shields
- New BPMs
- Moving devices for quadrupoles QF
- Cooling of IP vacuum chamber added
- Cooling of Y vacuum chambers added
- Lead toroidal shields added
- New Cylindrical vacuum chamber support
- Improvements on alignment tools
- H supports reinforced with plates
- Modification of tail support of the girder
- Temperature probes added
Test of CCALT

Test performed with the embedded calibration LED

Support flange for IT
Test of QCALT

- Every channel has been tested after cabling to check SiPM working point and discriminator/scaler chain.

- SiPM procedure will be done only using scaler (no ADC present) looking at the variation of rate when moving discriminator threshold.

Now we are preparing the set up with final crate to perform long cosmic run using KLOE final data format.
IT cosmic ray test

- All layers cabled and tested
- Check of all FEE/HV connections tracking cosmic rays
- To complete the scan, scintillator trigger moved in 6 positions
- 600 cosmics (1 ÷ 4 hours) per each position are enough

Test of Layer1 completed last week
New DAΦNE spherical vacuum chamber

- Single vacuum chamber tapered
- New bellows with improved design
- 2 BPMS around the IP
- Water cooling added
- New beryllium screens