

What next LNF: Perspectives of fundamental physics at the Frascati Laboratory

Notes from a workshop held 10-11 November 2014 at INFN - Laboratori Nazionali di Frascati

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This meeting was intended to discuss possible future activities in the fields of Nuclear, Subnuclear and Astro-Particle Physics to be pursued at LNF, making use of presently working facilities and of new facilities to be built within the laboratory's domain. I attended most of the first day and will report only on the talks I heard, mainly on the accelerator facilities.

The DAFNE collider at LNF is a high luminosity, low-energy, e^+e^- factory and has been operating since around 2000 for particle (KLOE) and nuclear physics (FINUDA, DEAR, SIDDHARTA) experiments exploiting its copious production of kaons.

In the constant quest for higher luminosity performance, it has operated in a variety of configurations and implemented many features to improve its performance, including advanced feedback systems, wigglers, and clearing electrodes. The most notable development from the point of view of accelerator physics was the implementation of an interaction region incorporating the large Piwinski angle and crab-waist concepts for the SIDDHARTA experiment in 2008-9. This was a breakthrough of considerable significance for the field and the scheme (sometimes without the crab waist) has been adopted in almost all high-luminosity e^+e^- collider designs since.

On completion of the SIDDHARTA programme, the KLOE detector was re-installed and has been upgraded as KLOE2 to exploit the higher luminosity expected from the new scheme, now with the additional complications of a large detector with its strong solenoid acting on the beams. Although the beam physics potential appears to be there, this has not been realised due to a combination of factors, some external to the lab, and some relating to the need for consolidation ageing equipment. However this is under way and the lab has plans to continue the KLOE2 programme and also exploit its unique capabilities for understanding the strangeness sector of QCD in interactions of kaons with nuclei (AMADEUS experiment, with carbon target inside KLOE). Detailed presentations on the physics programme were given.

DAFNE is one of only two colliders in Europe, the other being the LHC. Being much smaller, and having high-intensity beams, it has some potential as a test facility for other projects, eg, testing superconducting RF cavities at high beam current (talk of F. Zimmermann). However further study of the detailed possibilities and constraints is required.

LNF also hosts the SPARC Free Electron Laser installation and FLAME laser. A substantial upgrade programme, providing a real user facility and studying

concepts for future accelerators, may possibly culminate in the realisation of a high gradient plasma based pilot user facility at 5 GeV (EuPRAXIA).

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