

WIGGLE 05

LNF, 21-21 February 2005

LNFA Accelerators

- **DAFNE** Υ -factory $e^+ e^-$ double ring .51 GeV collider. Running for the KLOE experiment to measure CP violation in Υ meson decay.
- **SPARC** e^- photoinjector for SASE FEL and R&D on high brightness beams. Under construction.

WIGGLERS

- W wigglers are largely used in storage rings:
 - To increase radiation damping
 - To control emittance
 - From one wiggler inserted in a straight section to wiggler dominated rings they allow a wide flexibility in the choice of design parameters making the emission of radiation independent on the radius and energy of the ring.

Wigglers are used in different type of rings :

- Synchrotron light sources
 - increase the energy and flux of the emitted radiation
 - reduce emittance
- Low energy colliders
 - increase radiation damping
 - increase emittance
- Damping ring for the linear colliders
 - reduce damping time
 - reduce emittance

PROS and Drawbacks

- Increasing radiation damping reduces beam instabilities
- Nonlinear terms in the wiggler field can reduce the dynamic aperture
- Can be an accumulation point for e-cloud in e⁺ rings.

TESLA DR wiggler

$$\square \quad \square C/U_0 \quad ; \quad U_0 = \square^2 \square B^2 dl$$

$$\square = 28 \text{ ms @ } 5\text{GeV}$$

$$C = 17 \text{ Km}$$

$$U_{0,\text{arc}} = 1.1 \text{ MeV} \quad ; \quad U_{0,\text{wig}} = 20 \text{ MeV}$$

$$F_w = U_{0,\text{wig}} / U_{0,\text{arc}} = 17.5$$

$$\square B^2 dl = 605 \text{ T}^2\text{m} \quad \square \quad B = 1.6 \text{ T}, L \sim 400 \text{ m}$$

This workshop

- The motivation is the need to optimize the wiggler parameters and design for the LC damping rings.
- exchange experience between the different communities: light sources, colliders and damping rings.
- discuss the following items:
 - Optimization of magnet design
 - Best field modelling for simulation programs
 - Comparison of measurements and simulations
 - Methods to reduce harmful effects and improve dynamic aperture.

- The workshop is under the auspices of **ELAN** European Linear Accelerators Network. Coordinate european R&D on electron linear accelerators and colliders.
- **EUROTeV** European Design Study on TeV LC aims to form the linac technology independent part of the European Regional Design Group of the ILC.
- Within the EUROTEV DR Work Package one task is dedicated to wiggler field modeling and dynamic aperture optimization.
- We expect that the workshop could provide useful tools for this task.

BUON LAVORO!

Some practical informations

- Bus:
 - today 18:30 to: Villa Campitelli, Frascati.
 - Tuesday 8:30 Frascati, Villa Campitelli, LNF.
- Lunch at ENEA (look at your map)
- 20:00 Dinner at Zaraza', Frascati downtown (look in the map)
- Who needs tickets for the train Tor Vergata Roma Termini ask Manuela!

Emittance for a wiggler dominated ring

$$F_w = U_{0,wig} / U_{0,arc} = 17.5$$

$$\epsilon_x = \epsilon_{arc} / (1 + F_w) + \epsilon_{wig} F_w / (1 + F_w)$$

$$F_w \gg 1 \quad \epsilon_x \sim \epsilon_{arc} / F_w + \epsilon_{wig}$$

$$\epsilon_w \propto B_{wig}^3 \epsilon^2 \langle \epsilon \rangle$$