ABSTRACT

In analogy with the discovery of the W and Z with hadrons and the subsequent study of the Z resonance in the pure s-state with LEP, the recent discovery of the Higgs particle of 125 GeV has revised the interest in the so-called second generation Higgs factory. However the direct production of the $H^0$ scalar resonance in the s-state has a remarkably small narrow width, since $\Delta E/E < 4 \text{ MeV} / 125 \text{ GeV} = 3.2 \times 10^{-5}$. We describe here a $\mu^+\mu^-$ collider at a modest energy of 62.5 GeV and the adequate cooled muon intensity of about $6 \times 10^{12}$ muons of each sign, a repetition rate of 15-50 p/s and $L \approx 10^{32} \text{ cm}^{-2} \text{ s}^{-1}$, corresponding to about 10'000 $H^0$ for each detector $x$ year. Its partial widths can be studied with remarkable accuracies. With the help of the decay frequency of the polarized $\mu \rightarrow e \nu \nu_\mu$ decay electrons, the $H^0$ mass itself can also be measured to about $\pm 100 \text{ keV}$, i.e. $\Delta m/m \approx 10^{-6}$.

The next modest step, prior to but adequate for the subsequent $H^0$ physics programme, could be the practical realization of an appropriate muon cooling demonstrator. Starting from a conventional pion beam, the required longitudinal and transverse emittances are achieved with a cascade of two unconventional but very small muon rings of few meters radius. Low momentum muons of about 250 MeV/c, initially with $\Delta p/p \approx 0.1$, are cooled in a first ring, extracted and ionization cooled to about 70 MeV/c, and cooled ultimately in a second small ring up to a longitudinal momentum spread of 0.7 MeV/c r.m.s. The operation of the demonstrators may be initially explored and fully demonstrated with the help of a modest muon beam already available in a number of different accelerators.

The additional but relatively conventional components necessary to realize the facility with the appropriate muon current and luminosity should then be constructed only after this initial cooling experiment has been successfully demonstrated. The ultimate $\mu^+\mu^-$ collider for a Higgs Factory may be situated within the existing CERN site or elsewhere.

Organised by: Rolf Heuer, Livio Mapelli.................................
**Tea and Coffee will be served at 15h30**