



Contribution ID: 193

Type: Oral

High Energy Channeling and the Experimental Search for the Internal Clock Predicted by L.de Broglie

Wednesday, 8 October 2014 09:30 (15 minutes)

After a short review of the past and recent activities of the Lyon group on high energy particle channeling (with heavy ions, electron and positron beams) and applications, in particular a powerful positron source dedicated to linear colliders using axial channeling radiation, we will concentrate on the experimental investigation of the internal clock, predicted for any particle by Louis de Broglie in 1924, by using high energy electron channeling. A preliminary experiment was performed in France, at Saclay in 1980, by using the ALS facility and then successive tests were performed recently in Italy, at Frascati, at the LNF-BTF facility. In these experiments the resonant behaviour of channelled electron distributions at frequency m_0c^2/h , was explored by making small steps of the beam energy, which requires very good optical properties for the incident electron beam. Two other methods are now proposed to cross this resonant frequency by tilting the crystal at a fixed incident beam energy. The first was originally developed by S.Datz for the resonant coherent excitation of atoms, by tilting the target crystal in order to perturb the electrons by the frequency with which they pass atoms lying in ordered planes. This planar method is presently experimented by Y.Takabayashi et al at SAGA-LS. The second method could consist in varying the collision frequency by small steps in exploring a series of high index axial directions.

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Session Classification: S4: Charged Beams Shaping