

ACCELERATOR TOUR FOR SMP STUDENTS

COCKROFT-WALTON GENERATOR :

- 1) Point out the capacitors, resistors, diodes (in circular dome vessel) in the two vessels, dome and cube-shaped.
- 2) Point out the two voltage supplies to the dome-shaped vessel.
- 3) From bottom to top : -750 kVolts.
- 4) Cube-shaped dome contains hydrogen bottle for producing H⁻ ions. A foil-strip attaches an electron onto each H atom at the exit of the dome and starting of the LINAC tube.

LINAC :

- 1) Configuration is made up of drift tube cavities (~ first half) and side-coupled cavities (~ second half). The side coupled cavities were introduced in the 1980's for boosting the energy output of the LINAC from 200 MeV to 400 MeV.
- 2) Drift tube cavities : The electric field outside the cavities is ~ 5 MW. There are quadrupoles inside the drift tubes for focussing the beam.
- 3) Point out the power amplifiers for the drift tube cavities. 5-6 of them along the LINAC.
- 4) Particles only experience acceleration, between two cavities. Inside a cavity they are shielded from the electric field, which is on its decelerating slope (remember sine curve for E-field ?)
- 5) Side coupled cavities : For increasing energy output of LINAC to 400 MeV.
- 6) Point out the Klystrons - they are power amplifiers for side coupled cavities of LINAC.

BOOSTER :

- 1) H⁻ ions are stripped to H⁺ ions at the entrance to the Booster.
- 2) Layering of beam : A nickel (?) strip present at the entrance of the Booster strips two electrons from each H⁻ ion to turn it into a H⁺ ion. The beam of H⁺ ions circulates one turn of the Booster, comes back to the entry point and mixes with the incoming beam of H⁻ ions. This is called "layering of the beam" even though the two beams are not distinct in their layers, they are mixed. The H⁺ ions do not impact the stripping off of the H⁻ ions.
- 3) Booster can have a maximum of 17 turns. The 17 comes from the max output of the LINAC. Usually the Booster is run with 10-12 turns.
- 4) At the end of the Booster, the particles are traveling at 99.9% the speed of light. The energy is 8 GeV. So no more need for increasing speed, need in energy needed now.

MAIN INJECTOR :

- 1) Point out the model of a MI dipole magnet. The MI dipole magnets are typically 12 ft long.
- 2) Beampipe is of stainless steel. The copper pipes are the power bus to MI. They are at a voltage of 13.8 kV and not shielded. That's why MI cannot be accessed easily. The power bus supplies power to the Copper coils of the dipole and quadrupole magnets of the MI.

- 3) The power bus and the Copper coils of the MI magnets carry LCW (low-conductivity water) inside their bores. This is for cooling purposes.
- 4) Point out the Copper coils on display in the gallery when proceeding to MCR.