AbstractID: 11985 Title: The Proton Beam Therapy Facility at PSI

The centre for proton therapy at the Paul Scherrer Institute was expanded recently following the commissioning of a new superconducting-magnet cyclotron (COMET) dedicated to patient treatment. The accelerator was built by ACCEL Instruments GmbH (Varian), based on a design from the National Superconducting Cyclotron Laboratory (Michigan State University). The cyclotron is specified to provide a 500 nano-Ampere beam of protons at a fixed energy of 250 MeV. The large magnetic field (~ 3T) required at extraction is provided by the superconducting coils. A high power radio-frequency system, operating at 72.8 MHz (second harmonic of the cyclotron frequency) provides the required acceleration of protons following their emission from a cold-cathode ion source. The facility has also been up-graded with the addition of new gantry (Gantry-2) for patient treatment and a new beam line dedicated to eye treatments (OPTIS2). A novel feature of COMET is the high beam extraction efficiency (> 80%). This limits component irradiation and facilitates the regular maintenance periods which are an important consideration for any patient treatment center where high reliability and availability are required. We will describe the modes of operation of PROSCAN and, in particular, the spot-scanning technique used to irradiate tumours. Magnetic elements permit rapid transverse deflection of a pencil beam for two dimensional scanning. An energy “degrader” allows rapid scanning in energy over the range of 70 – 238 MeV. This results in a variable depth of penetration of the beam, thus permitting a complete three dimensional scan. The beamlines which transport protons from COMET towards the two patient gantries and to OPTIS2 will also be discussed. They require sophisticated diagnostics for safe and reliable use of the facility. The various diagnostics include ionization chambers, secondary emission monitors and multi-leaf Faraday cups. They are used to measure beam current, profile, position, halo and loss. The role of the diagnostics as interlocks for safe operation of the beamlines will also be described.

Learning objectives:

1. Understanding the principle of the spot scanning technique.

2. Understanding the issues concerning diagnostics for safe beam-line operation.