Contribution ID: **868**   Type: **Poster**

Energy deposition of protons in silicon sensors at MedAustron

MedAustron is a hadron synchrotron primarily designed and built for cancer tumor treatment. Besides its clinical purpose, it is equipped with a dedicated beam line for non-clinical research. This beam line can be used for beam tests utilizing protons with an energy of up to 252 MeV at the moment, but 800 MeV will be available through 2019 as well as Carbon ions.

In order to understand the usability of this beam line for testing Silicon detectors we conducted first beam tests at MedAustron. This includes the design and commissioning of a trigger setup based on scintillators and PMTs, which is meant to stay permanently there. Moreover, the beam intensity had to be reduced from the nominal rate for clinical treatments of up to 10^{10} particles per second down to 10^4. This allowed us to measure the beam profile utilizing silicon strip sensors read out by the ALiBaVa system. The nominal beam energy was varied between 52 and 252 MeV and was verified by determining the specific energy loss of protons in Silicon. As these energies are rather low compared to the typical HEP beam tests, the proton beam through the setup was simulated to determine necessary energy correction caused by losses through matter and air in front of the Si sensor. These approaches yielded good agreement with reference data from NIST, so MedAustron is considered as a reliable facility for future beam tests.

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Session Classification: Poster Session A

Track Classification: Semiconductor Detectors