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Beam Response to Extreme Operating Conditions

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Beam stability is an important issue when operating a medical accelerator. To obtain an early indicator of the machine condition we have established a morning beam performance check taking place prior to the formal quality assurance of the medical physics experts. On the basis of the recorded data we have observed that the beam position in the HEBT, represented by the position on a profile grid shortly downstream the synchrotron extraction, depends on the operating conditions of the previous night. This suggests assigning the beam position variations to a temperature effect. For further investigations we distributed several self-made climate data loggers in our building and connected them to our control system. Equipped with this new set of data loggers and the existent access on cooling water data we dedicated a complete night shift to an accelerator stress test by running half a shift (4 hours) high energy (430 MeV/u) carbon beam to the gantry (heating phase) and half a shift idle (cooling phase). We found strong correlations between room temperature and beam position. The causal relationship, however, is not so obvious and still under investigation.

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