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Investigation of the leakage beam from the RF chopper using the BSM

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The Japan Proton Accelerator Complex (J-PARC) linac is operated with a peak current of 50 mA to deliver the 1-MW beam to the neutron target through the rapid cycling synchrotron (RCS). One of the source of the beam loss to limit the beam power is a leakage beam from an radio-frequency (RF) beam chopper at the frontend of the linac. Since the leakage beam is presented in the unintended RF bucket, it becomes the beam loss the during the acceleration in the RCS. Recently, the bunch-shape monitor (BSM) dedicated for the low-energy beam has been developed to measure longitudinal profiles after an radio-frequency quadrupole linac (RFQ)*. It is useful to investigate the leakage beam because the BSM is located at just after the chopper. Asymmetric longitudinal profiles were observed with the BSM, but the sensitivity should be improved to observe the leakage beam. Measuring the induced current from the target probe by using the BSM in the same way as the wire-scanner monitor, the leakage beam was observed in the horizontal profile measurement. Latest results are presented with discussing the classification of the leakage beam with respect to its time scale and source.

Footnotes

- R. Kitamura et al.,"Measurement of the longitudinal bunch-shape distribution for a high-intensity negative hydrogen ion beam in the low-energy region", Phys. Rev. Accel. Beams, 26, 032802 (2023).

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