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An improved procedure for energy matching between PS and SPS at CERN

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Energy matching between two hadron synchrotrons is the adjustment of the magnetic bending fields and beam momentum to obtain a correct transfer between the two. Conventionally, energy matching is achieved by turning off the RF system and measuring the revolution frequency of the de-bunching beam in the receiving accelerator. For an ideal circumference ratio, the orbits would then be centred in the two rings. However, this procedure is non transparent, seen that the de-bunched beam cannot be accelerated anymore. Thanks to the Low-Level RF (LLRF) upgrade in the Super Proton Synchrotron (SPS) during the 2019-2021 long shutdown, most LLRF signals have become available in digital form, allowing easy online display, analysis, and storage. In this contribution, we look at the possibility of performing energy matching between the PS and the SPS in a more transparent way, without disabling the RF system. The signals from the beam phase and synchronization loops reveal information on the energy of the beam injected into the SPS. This allows to continuously monitor the transfer frequency error, as well as identify and correct potential long-term drifts.

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Footnotes

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