

## Proton bunch compression studies for the AWAKE experiment in the CERN SPS

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The proposed proton-beam driven, plasma wake-field acceleration experiment AWAKE at CERN requires proton bunches with a high peak current and small transverse emittances extracted from the SPS at (300–400)-GeV. We present measurement results of bunch compression on the SPS flat top achieved by bunch rotation in longitudinal phase space for two optics available in the SPS. With the lower transition-energy optics, bunches with the same longitudinal emittance are more stable, but to obtain a similar bunch length, more RF voltage is required. Peak currents of up to 67-A at intensities above  $3 \times 10^{11}$ -p have been achieved. Longitudinal beam instabilities and the maximum available RF voltage limit to what degree the bunches can be shortened. Furthermore, due to potential-well distortion, the bunch length is increasing with intensity. First simulations give an estimate on how much could be gained from the planned upgrades of the RF systems and alternative bunch compression methods.

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