Contribution ID: **358** Type: **Poster**

Measurement of phase-space density evolution in MICE

Friday 6 July 2018 20:15 (15 minutes)

The Muon Ionization Cooling Experiment (MICE) collaboration will demonstrate feasibility of ionization cooling, the technique proposed to cool the muon beam at a future neutrino factory or muon collider. The muon beam parameters are measured on a sample built on a particle-by-particle basis, before and after the cooling cell using high precision sci-fibre trackers in a solenoid magnetic field. Position and momentum reconstruction of each muon in MICE allows to developo
several alternative figures of merit in addition to beam emittance. Contraction of the phase-space volume of the sample, or equivalently the increase in phasespace density at its core, is an unequivocal cooling signature. Single-particle amplitude, defined as a weighted distance to the sample centroid, can be used to probe the change in density in the core of the beam. Alternatively, non-parametric statistics provide reliable methods to estimate the entire phase-space density
distribution and reconstruct probability contours. The aforementioned techniques, robust to transmission losses and sample non linearities, are ideal candidates for a cooling measurement in MICE. Preliminary results are presented here.

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Session Classification: POSTER

Track Classification: Posters