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Hadron Production Measurements with the T2K Replica Target in the NA61/SHINE Experiment for the T2K Neutrino Flux Prediction

We present latest results of the measurements of hadron production with the T2K replica target in the NA61/SHINE experiment at CERN SPS. They aim to further improve the precision on the T2K neutrino flux prediction.

The current method applied in the T2K experiment to reduce uncertainties on the flux predictions is based on re-weighting of hadron cross sections in the interaction vertices. As an input, this method uses data for 31~GeV/c protons on thin carbon target (4% interaction length) measured by NA61/SHINE. This allows to constrain ~60% of the neutrino flux, the other 40% being due to re-interactions within the target material and in surrounding support structure, thus model dependent. Direct measurements of the hadrons exiting from the surface of the T2K replica target (1.9 interaction length) should allow to constrain up to 90% of the flux. These measurements are the ultimate goal in order to achieve precise neutrino flux predictions.
Comparisons of the flux predictions tuned with thin target data and the T2K replica target data will provide information on the re-interatcions of particles in the target.

Three different data-sets were recorded.
The pilot data-set taken in 2007 demonstrated the capabilities of the spectrometer with the T2K replica target and was analyzed to establish analysis techniques, while 2009 and 2010 runs have been used in order to record much higher statistics.
The latest 2009 results on pion spectra are presented in this poster. The experimental data are compared to model predictions.

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