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AGS booster beam-based main quadrupole transfer function measurements

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Physics models, particularly for online operations, such as for our MAD-X or Bmad models, depend on a good understanding of the magnet characteristics. While we often measure the magnets or some subset of the magnets, those measurements are only meant to verify that the magnets meet specifications before being installed. We often have magnets that are not precisely understood. As a result, we end up adjusting the coefficients in our models to match beam-based measurements with little or no theoretical basis. In this work, we present a new method for deriving these coefficients using orbit response matrix (ORM) methods. This new approach utilizes a neural network (NN) surrogate model to establish the mapping between ORM measurements and quadrupole kicks. The NN model is trained to identify quadrupole kick as a source of error by observing the difference between measured ORM and model ORM with no quadrupole kick. With actual kick values from the NN model and power supply current values from the control system, we can calculate the magnet transfer function coefficients using a polynomial fit. We will present results from preliminary beam studies in the AGS Booster.

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Footnotes

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