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Model-Independent Analysis of Turn-by-Turn BPM Measurements in Storage Rings

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Coherent transverse beam oscillations in the Tevatron were analyzed with the Model-Independent Analysis (MIA) technique. This allowed to obtain the model-independent values of coupled betatron amplitudes, phase advances and dispersion function around the ring from a single kick measurement. In order to solve the MIA mode mixing problem a new criterion of betatron mode independence was proposed. Furthermore, we describe a MIA-based technique to locate vibrating magnets in a storage ring. Also MIA data analysis was applied to the data from LHC dipole kick measurements (at injection optics). In order to identify focusing errors the measurements were compared to the LHC design MAD-X model via calculation of local transport matrix elements and initial Twiss parameters for every pair (or triplet) of BPMs in the LHC. This allowed to obtain beta-functions not only in BPMs but everywhere in several long sections of LHC which are free of large focusing errors.

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