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MIDB: Users and Uses

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The Main Injector Magnet Database (MIDB) is intended to be a source of "final" magnet measurement data. It is intended that it make the data available easily and efficiently to scientists, engineers and others who are not database experts and who normally do not need to concern themselves with the more detailed magnet data that result from the measurement and manufacturing processes.

It is imperative that MIDB not be cut off from the more detailed data available to MDTF. To this end, MIDB will maintain links to the more extensive tables of raw and reduced data maintained by MDTF. Such links ensure that the needed data are always available to the more sophisticated user of magnet measurements. At the same time, it is useful to provide the data in database tables rather than providing programs and scripts to retrieve and process the more detailed data because one can attach comments and assessments to the processed data and provide standard interfaces to the most useful data formats.

The Fermilab Accelerator Division utilizes a variety of conventional (nonsuperconducting) magnets. The data on these many magnets are not always conveniently available. With the longer term needs of AD in mind, MIDB may serve as a prototype for a more inclusive database of all Accelerator Division magnets.

The Users

The Magnet Development and Test Facility (MDTF) maintains extensive databases on all aspects of magnet development, manufacture and testing.

While these databases contain most of the data that one might wish to know regarding magnets, the very quantity of detail makes them less useful for physicists and others more interested in the operation of accelerators than in the manufacture of magnets. With this in mind, the current database was conceived, to more directly service the needs of the end-user. The users of this database are expected to include

- physicists and engineers interested in
  - accelerator physics calculations
  - tracking
  - operational algorithms
- magnet reviewers, interested in:
  - quality control
  - magnet performance
  - selection for installation and replacement
- operations personnel
  - magnet performance
  - magnet replacement

This list is not intended to be exclusive but rather to indicate the general character desired. See Table 1 for a different view of the users.

Typically, the users of the magnet data will be concerned with the most recent data, the data that refer to the most recent incarnation of the magnet. However, some users such as physicists studying machine data may need earlier magnet data. The database must provide easy access to data from previous reworks of magnets.

Accelerator Physics Calculations

Magnet data are essential for a variety of accelerator physics calculations. Tracking studies rely on the harmonics data. The integrated strength data are required to estimate corrector strengths. Excitation data are the basis for defining ramp curves.

Table 1: Summary of database access required by users and/or applications. It is assumed that all users will require some standard reports.

Typical users and uses	Write access	Program interface	Ad hoc queries
Measurers	Y	N	N
Magnet reviewers	Y	N?	Y
Measurement reviewers	Y	N	Y
Quality control	Y	?	?
Beam physicists; tracking or sorting	N	Y	Y
Constructing algorithms to drive hardware	N	Y	?
Writing beam control and correction algorithms	N	Y	?
Mechanical support	N	N	N
MI personnel to find magnet replacement	N	?	Y
Magnet production	Y	N	N?

Engineering Calculations

For the stage which we consider here, the engineering calculations refer primarily to electrical considerations and especially to power requirements.

Magnet Reviewers

Magnet reviewers buy magnets from the production organization for the Accelerator Division and assign them to appropriate locations in the accelerator. They are concerned with, i.a., the harmonic structure of the field, field quality as a function of excitation, the integrated strength as a function of excitation, and basic electrical characteristics such as hipot voltage. Details of the excitation history (ramp) during measurement must be provided to facilitate interpretation of the data

Operations Personnel

Inevitably, magnets fail and must be replaced. The task of selecting replacements falls to operations personnel (technicians and engineers), supported by accelerator physicists. Among the properties considered when selecting replacements are strengths of harmonics, the integrated strength, and field quality. Electrical characteristics which must be considered include hipot voltage, inductance, resistance, etc.

Data Formats and Access

Many users will require only tabular data in standardized reports. Such standardized reports can be defined and easily implemented using database utilities such as the Report Writer. Other standardized reports which require further processing of the data may be implemented as scripts or as programs which directly access the database. We expect that standardized reports which include graphic presentations are essential.

Users may require fits versus some common parameter, for example excitation current. We will attempt to provide programs and/or scripts to ensure that common starting points will be available. But in any case the data being fitted will be available and the users will be free to wander where he or she will.