**Magnet Measurement Test Plan**

LTB/BTS quadrupole measurements – Rev 0

**Logistic Info**

|  |  |
| --- | --- |
| **Person Responsible** | Domenico Dell’Orco – Robert DiMattia (x5457) |
| **Phone #** | 650-926-8683 (cell. 510-219-0378) |
| **Start Date** | 07-13-2010 |
| **Finish Date** |  |
| **Acct # for alignment** | TBD |

Magnet Designation and Type

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Name** | | | LTB/BTS quadrupole measurements | |
| **Magnet Type** | | | Focusing Quadrupole | |
| **Magnet Name/Number** | | | Spare magnet | |
| **Serial # / PC #** | | | N/A | |
| **Trim Coils** | Yes | **Trim Types** | | Solid/ indirectly cooled |
| **Magnet gap or diameter (mm)** | | | | 60 mm |

**Alignment**

|  |  |
| --- | --- |
| **Precision (0.05 mm)** | |
| **Has the magnet been fiducialized** | NO |
| **If it has not been fiducialized, what is origin point of the magnet, what is its coordinate system and what surfaces should be used for alignment?** |  |
| **+ Z direction of magnet**  **(Please provide drawing)** | From Trim coil leads to Main coil leads |

**Special Alignment Tolerances**

|  |  |
| --- | --- |
| **X** |  |
| **Y** |  |
| **Pitch** |  |
| **Yaw** |  |
| **Roll** |  |

**Water and Power.**

|  |  |  |
| --- | --- | --- |
| **Water Pressure** | No cooling required (keep main current ≤10 A, trim ≤1.5 A). Monitor coil temp, shut magnet if temp >45C | PSI |
| **Water Flow** | NONE | Gpm |
| **Maximum Current Main** | 10 | Amps |
| **Max Current Trims** | 1.5 | Amps |

**Polarity**

|  |  |
| --- | --- |
| Main Coil Polarity.  (Nearest North pole to Horizontal look in +z direction) | * Focusing quadrupole |
| 1st Trim Polarity  (Nearest North pole to Horizontal look in +z direction) | Vertical field dipole and Horizontal field dipole |
| 2nd Trim Polarity  (Nearest North pole to Horizontal look in +z direction) | N/A |

**Temperature Tests**

|  |  |
| --- | --- |
| **Temperature and Resistance Test** | No, Protect magnet using thermostats |
| **Areas to be measured** |  |
| **Currents (Amps)** |  |
| **Check water flow** |  |

**Standardization**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Magnet warm up. ? time (mins) @ ? current (Amps) | | |  | |
| Conditioning Standardization Cycles Performed before measurements: | | |  | |
| **Number of Stdz cycles** | |  | | |
| **Ramp Rate (A/s)** | 10 A/s | **Minimum Current (A)** | | 0 |
| **Settle Time (sec)** | 30 s | **Maximum Current (A)** | | 10A |
| **Ramp Type 🡪Linear or Three Linear or Cosine** | | | Linear | |

**Measurements**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Integrated Strength** | **Main** | Yes | | **Trims** | Yes | |
| **Currents:** |  | | |  | | |
| **Harmonics** | **Main** | | Yes | **Trims** | | Yes |
| **Currents:** |  | | |  | | |

**Harmonic Tolerances (as % of main, Main =100 %)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Dipole**  **n = 1** | **Quadrupole**  **n = 2** | **Sextupole**  **n = 3** | **Octupole**  **n =4** |
|  |  |  |  |

**Field Map**

|  |  |
| --- | --- |
| **Type of map? (Transverse, axial, 3D, Locate Center)** |  |
| **Dimensions ( X, Y, Z)** |  |
| **Spacing between step (X, Y, Z)** |  |

**Notes and Additional Tests:**

1. Measure the quadrupole magnetic length at 10A.

2. Hysteresis Loop: measure integrated gradient with I from 0A to +10A, then to -10A, then to 10A in steps of 1 A

3.1. Repeat standardization and measurements 3 times

Standardization #1: Start from 0A , raise to 10 A, decrease to -10A, then go back to 0 A. Repeat standardization 3 times.

Measure  integrated gradient at I=0A, 2A, 4A, 6A, 8A, 10A.

3.2. Repeat standardization and measurements 3 times

Standardization #2: Start from 0A , raise to 10 A, decrease to -10A, then go back to 0 A. Repeat standardization 5 times.

Measure  integrated gradient at I=0A, 2A, 4A, 6A, 8A, 10A.

3.3. Repeat standardization and measurements 3 times

Standardization #3: Start from 0A , decrease to -10 A, raise to 10A, then go back to 0 A. Repeat standardization 3 times.

Measure  integrated gradient at I=0A, -2A,- 4A,- 6A,- 8A, -10A.

3.4. Repeat standardization and measurements 3 times

Standardization #4: Start from 0A , decrease to -10 A, raise to 10A, then go back to 0 A. Repeat standardization 5 times.

Measure  integrated gradient at I=0A, -2A,- 4A, -6A,- 8A, -10A.

3.5. Repeat standardization and measurements 3 times

Standardization #5: Start from 0A , raise to 2 A then go back to 0 A. Repeat standardization 3 times.

Measure  integrated gradient at I=0A, 2A, 4A, 6A, 8A, 10A.

3.6. Repeat standardization and measurements 3 times

Standardization #6: Start from 0A , raise to 2 A then go back to 0 A. Repeat standardization 5 times.

Measure  integrated gradient at I=0A, 2A, 4A, 6A, 8A, 10A.

3.7. Repeat standardization and measurements 3 times

Standardization #7: Start from 0A , raise to 6 A then go back to 0 A. Repeat standardization 3 times.

Measure  integrated gradient at I=0A, 2A, 4A, 6A, 8A, 10A.

3.8. Repeat standardization and measurements 3 times

Standardization #8: Start from 0A , raise to 6 A then go back to 0 A. Repeat standardization 5 times.

Measure  integrated gradient at I=0A, 2A, 4A, 6A, 8A, 10A.

4.1 Measure ∫BdL secondary coils wired as vertical dipole at I=-1.5A, -1A, -0.5A, 0.5A, 1A, 1.5A,

4.2 Measure ∫BdL secondary coils wired as horizontal dipole at I=-1.5A, -1A, -0.5A, 0.5A, 1A, 1.5A