# - 3eata <br> Jefferson Lab Alignment Group Data Transmittal 

TO: D. Kashy, O. Pastor
DATE: 27 Aug 2015
FROM: Kelly Tremblay
Checked:
\# : B1664

## DETAILS:

The Torus magnet was surveyed on August $25^{\text {th }}$ and $26^{\text {th }}$. The results of the survey are shown below.

## Hub data:

The coordinates below show the located upstream and downstream hub and the ideal design zero position for the coils based on drawing B00000-04-01-1101. The local system has $+z$ downstream, $+x$ to the beam left and $+y$ up vertically. The found angles are in degrees and are in the upstream to downstream direction. Additionally, the coordinates in the overall CEBAF coordinate system are shown. The angles for the found hub are also shown relative to the local system.

| Hub Line Data |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | :--- | :--- | :--- | :---: |
| Local System $(\mathrm{mm})$ |  | Cebaf Coordinate System |  |  |  |  |  |  |
|  | $\mathrm{x}[\mathrm{mm}]$ | $\mathrm{y}[\mathrm{mm}]$ | $\mathrm{z}[\mathrm{mm}]$ |  | $\mathrm{x}[\mathrm{M}]$ | $\mathrm{y}[\mathrm{M}]$ | $\mathrm{z}[\mathrm{M}]$ |  |
| Design zero | 0.00 | 0.00 | 0.00 | Design zero | -80.60000 | 103.35526 | -401.18852 |  |
| Upstream | -0.88 | -4.07 | 457.83 | Upstream | -80.59912 | 103.35119 | -401.64635 |  |
| downstream | -0.52 | 0.66 | 2508.07 | downstream | -80.59948 | 103.35592 | -403.69659 |  |


| Found Angles | Yaw | Pitch |
| :--- | :--- | :--- |
|  | 0.0101 | 0.1322 |

## Angle Data:

Angles between the surveyed hub and upstream / downstream tooling balls on individual cryostats:

Using the lines formed from the found tooling balls to the found hub line, the adjacent angles were calculated for each cryostat in the upstream and downstream positions. The ideal angles should be $60^{\circ}$.

| Upstream |  | DownStream |  |
| :--- | ---: | :--- | ---: |
|  | degrees |  | degrees |
| A to B | 60.0206 |  | A to B |
| B to C | 59.9805 |  | B to C |
| 60.0024 |  |  |  |
| C to D | 60.0109 |  | C to D |
| D to E | 59.9697 | D to E | 59.9774 |
| E to F | 60.0121 | E to F | 59.9951 |
| F to A | 60.0061 | F to A | 60.0096 |
|  |  |  |  |
| Sum | 359.9999 | Sum | 360.0000 |

## Coil case outer fiducial data :

A relative coordinate system based on holding the hub line (upstream and downstream points as noted above) and coil D for rotation was established. A 60ond $120^{\circ}$ rotation about the hub line was used to determine relative systems for coils E and F. The coils D/A, $B / E$ and $F / C$ were matched to determine the relative coordinates for opposite pairs.

The found positions are shown below. The yaw angle describes the 'twist' for each cryostat relative to the found hub. The pitch angles are shown also, from upstream to downstream. The ideal pitch between fiducial points is $35.9974^{\circ}$. The dPitch is the difference for each cryostat.

| Cryostat Outer Edge Fiducial Data |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Relative Coordinates [mm] |  |  |  | Resulting Angles |  |  |
|  |  |  |  | $\begin{array}{lr}\text { ideal pitch } & 35.9974 \\ \text { ideal yaw } & 0.0000\end{array}$ |  |  |
|  | x | $y$ | z | dYaw | pitch | dPitch |
| A_us | 0.40 | 3206.13 | -958.15 |  |  |  |
| A_ds | 0.58 | 4212.61 | 426.54 | 0.0073 | 36.0121 | 0.0147 |
| D_us | 0.28 | -3208.86 | -955.31 |  |  |  |
| D_ds | 0.70 | -4214.02 | 430.22 | 0.0176 | -35.9598 | -0.0376 |
| B_US | -0.75 | 3206.65 | -957.66 |  |  |  |
| B_DS | -2.18 | 4213.07 | 427.02 | -0.0591 | 36.0105 | 0.0131 |
| E_us | -1.43 | -3207.21 | -957.31 |  |  |  |
| E_ds | -0.93 | -4213.35 | 427.41 | 0.0205 | -36.0023 | 0.0049 |
| C_us | 0.33 | 3208.08 | -955.93 |  |  |  |
| C_ds | -2.36 | 4213.68 | 429.04 | -0.1114 | 35.9826 | -0.0148 |
| F_us | -0.74 | -3206.06 | -958.12 |  |  |  |
| F_ds | -1.28 | -4212.70 | 426.35 | -0.0222 | -36.0207 | 0.0233 |

