

Fieldmap Updates

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HPS Software Meeting, 09/03/15

Field Map for 2015 Engineering Run

- Received updated field maps from JLab
- 3D field maps simulated with TOSCA corrected with Primex measurements for fringes by Greg Kalicy (gkalicy@jlab.org)
- Needed to scale field to our running conditions and unfold into all four quadrants
- Created new detector
 - HPS-EngRun2015-Nominal-v2-fieldmap

Corrections

Hi Norman,

Procedure was as follows:

1) First I corrected all simulated files to get rid of the weird jump in “y” axis that we discovered some time ago. Discussions with person responsible for generating this maps and closer look to the B:z for different x and y combinations showed me that it appeared to only some combinations of “X” and ”Y” - without any noticeable pattern and there was no physical reason for it. That is why I used good shape of B:z with x/y closest to the ones with jump to correct the shape.

2) **To correct fringe field we used experimentally obtained maps.** Stepan had Primex results published some time ago. To make sure that the values are still valid **we remeasured several points** with Mthieu Ehrhart and FX. Values were in good agreement. I took three maps that overlapped in case of settings with our TOSCA maps (5k, 9k, 13k Gauss). I approximated TOSCA simulation values at x:y:z points of PRIMEX maps and generated correction function that I used to correct 3 TOSCA maps.

3) By using difference between uncorrected B values in simulation files from 3k to 13k and corrected 5k map I calculated corrected B values for 3k to 13k settings. I saved all this values in the root tree together with originally calculated 9k and 13k corrected values to crosscheck if my approximation was fine. They agree very good.

4) I saved maps per each setting from 3k to 13k.

Let me know if you need some more information, or changes in the maps.

Cheers, Greg

Map processing

- Selected file closest to our running and scaled the field values.
 - $0.24/.3003 = 0.7992$
 - Converted to Geant4 natural units
 - Flipped sign of B_y
- Expanded map into remaining 7 octants
 - Flipped sign of B_x and B_z as appropriate
 - Could save some space by doing this in software that reads the map

Unfolding

```
> java UnfoldFieldmap BmapCorrected3D_3k.txt 0.7992  
Reading in field map BmapCorrected3D_3k.txt  
Scaling field map by 0.7992
```

```
-----  
    Reading Magnetic Field map BmapCorrected3D_3k.txt  
    Scaling values by 0.7992  
    Flipping sign of By  
-----
```

```
---> ... done reading  
---> assumed the order: x, y, z, Bx, By, Bz  
---> Min values x,y,z: 0.0 0.0 0.0 cm  
---> Max values x,y,z: 25.0 7.0 150.0 cm  
Maximum Field strength: 3051.6921903601974  
---> The field will be offset by 0.0 0.0 0.0 cm  
  
---> Range of values x,y,z: 25.0 7.0 150.0 cm in z
```

```
-----  
230265
```

File Location

- In compact.xml field is defined as:

```
<field
```

```
  type="FieldMap3D"
```

```
  name="HPSDipoleFieldMap3D"
```

```
filename="fieldmap/125acm2_3kg_corrected_unfolded_scaled_0.7992.dat"
```

```
  xoffset="2.117*cm"
```

```
  yoffset="0.0*cm"
```

```
  zoffset="45.72*cm"
```

```
/>
```

- Fieldmap DOES NOT SHIP with hps-java jar file
- Needs to be located in directory “fieldmap” relative to job executable location.

File location

- File is currently at:

<http://lcsim.org/resources/hps/fieldmap/>

Field Map wrt to SVT

- $B_y/|B_{y_max}|$ vs z for $(0,0,z)$ and $(25,7,z)$
- Overlaid are z positions of SVT sensors
 - (length & position of lines not to scale)

