Tracker Geometry

the XML description

- XML description fundamentals
- Description of tracker
- Restrictions and problems

Geometry Document Structure

- Primary constants
  - material names
  - integer constants (counts)
  - floating point constants (dimensions, offsets)
- Derived constants (mostly offsets)
- Build and nest volumes
- Identifier constraints – not of interest here

Constants

To see constants and their values, go to
http://www-glast.slac.stanford.edu/software/detector_description/

and click on one of the links for combined all-subsytem constants, which will bring you to a page like this one.

The list is divided into categories by **type** (materials, integers, floating point) **subsystem** (TKR, CAL, ACD, NAD – Not A Detector, and global) and Primary versus Derived.

Building the geometry

- Define primitive (uniform material, simple shape) volumes
- Assemble into stacks along an axis *or*
- Position individually in a composition volume.
- Compositions always have an explicit envelope volume; stacks never do.
- May have arbitrary levels of nesting.
- Dimensions and offsets appearing in the source volume descriptions are ***always*** referred to by name as previously-defined primary or derived constants. Literal numeric constants are never used.

Typical volumes

Primitive volume (box). Has a name, material and dimensions. May also be marked as sensitive.

```
<box  name="TKRCloseoutRegLong"
    XREF="TKRCloseoutLen"
    YREF="TKRCloseoutWidth"
    ZREF="TKRCloseoutThick"
    materialREF="TKRCloseoutMat“
 />
```

Typical volumes

Stack along z-axis. Since components are immediately adjacent and are all centered in transverse dimensions, no explicit offsets are required.

```
<stackZ name="trayBot" >
 <axisPos volume="TKRFaceMin" >
   <idField name="fTKRTrayCmp" valueREF="eTKRBotFace" />
 </axisPos>
 <axisPos volume="TKRCoreOuterBottom" >
  <idField name="fTKRTrayCmp" valueREF="eTKRCoreClose" />
 </axisPos>
  <axisPos volume="TKRTopFaceReg" >
   <idField name="fTKRTrayCmp" valueREF="eTKRTopFace" />
  </axisPos>
  <axisPos volume="SiLayerYMeas" >
    <idField name="fTKRTrayCmp" valueREF="eTKRSiTop" />
  </axisPos>
</stackZ>
```

Typical volumes

Composition of core+closeout+MCM boards. Core is centered, needs no offsets.

```
<composition name="TKRCoreReg" envelope="TKRCoreRegEnv">
  <posXYZ volume="TKRCoreRegBox">
    <idField name="fBorderCmp" value="eCenter" />
  </posXYZ>
  <posXYZ volume="TKRCloseoutRegLong"     YREF="TKRCloseout_dt">
    <idField name="fBorderCmp" value="eTop" />
 </posXYZ>
 <posXYZ volume="TKRCloseoutRegLong"       YREF="TKRCloseout_dtn">
    <idField name="fBorderCmp" valueREF="eBottom" />
   ....  (more closeout pieces go here)
 <posXYZ volume="TKRMCM"    YREF="TKRMCM_dtn"     ZREF="TKRMCMint_dzn" >
    <idField name="fBorderCmp" valueREF="eFarBottom" />
 </posXYZ>
 <posXYZ volume="TKRMCM"     YREF="TKRMCM_dt"    ZREF="TKRMCMint_dz">
    <idField name="fBorderCmp" valueREF="eFarTop" />
 </posXYZ>
</composition>
```

Tracker volumes

All geometry description source files can be found in the package xmlGeoDbs. Several physical files can be assembled into a single XML **document** (which is what the application sees) by using **external entities**.

The top file usually used for LAT geometry is

xmlGeoDbs/xml/flight/flightSegVols.xml

Tracker volumes are defined in the file

xmlGeoDbs/xml/flight/flightTKROneTkr.xml

Tracker volumes (2)

Each tray consists of (approximately) box-shaped volumes of glue, closeout material, tungsten converter, silicon, etc. A new box must be defined

- whenever a volume is made of a different material from a similarly-shaped box.
- whenever any dimension differs from a previously-defined box.
- (sometimes) when a rotated version of a pre-existing box is needed.

..so it should come as no surprise that the tracker requires lots of boxes.

Limitations

- The description includes some simplifications:
  - perfect boxes (or cylinders) for all volumes
  - some thin layers combined into invented average material
- Currently no good way to position a stack at the edge of its containing volume.
  - need to know extent of stack along stacking axis; sometimes we don't

Recent problems

- Towers were too high. This was just inattention on my part, easily fixed once discovered.
- As of 11/02 I had “fixed” problem of ACD side supports colliding with grid by raising ACD, making it too high relative to tracker. In May instituted a much more acceptable fix: moved side supports outwards slightly, put ACD back down.
- CAL and TKR were centered in stay-clear boxes rather than positioned towards plane z = 0. TKR still has wrong z-offset.