

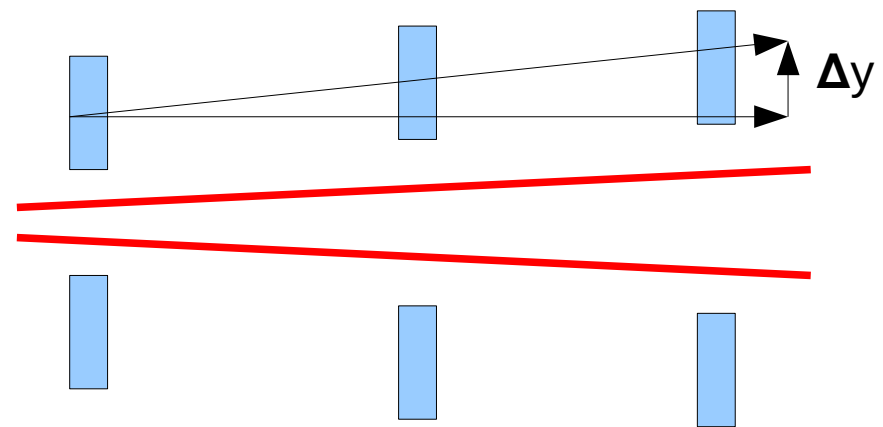
OT Geometry Bug Fixes

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- First dowel pin is at 170mm (A-Side)/86mm (C-Side) from edge
- Module Pitch = 340mm + 1.25mm
 - C-Side: $S3 \rightarrow S1 = 0.5 \cdot 172\text{mm} + 1.25 + 0.5 \cdot 340$
 - Stereo $\rightarrow \text{pitch}/\cos(\phi_s) = 342.554\text{mm}; \phi_s = 0, 5, -5, 0$
- Prescription C-Side:
 - First module: Position at origin, rotate by ϕ_s , translate by $0.5 \cdot 172\text{mm}/\cos(\phi_s)$
 - Second module: $0.5 \cdot 172\text{mm}/\cos(\phi_s) + 0.5 \cdot 172\text{mm} + 1.25\text{mm} + 0.5 \cdot 340\text{mm}$
 - Rest: ..., ..., translate in \mathbf{x} by $(0.5 \cdot 172\text{mm} + 0.5 \cdot 172\text{mm} + 1.25\text{mm} + 0.5 \cdot 340\text{mm} + (8 - m) \cdot 341.25\text{mm})/\cos(\phi_s)$
- Prescription A-Side:
 - ..., ..., translate in \mathbf{x} by $(0.5 \cdot 340\text{mm} + (9 - m) \cdot 341.25\text{mm})/\cos(\phi_s)$

Bug was, e.g. A-Side,
 $(0.5 \cdot \mathbf{341.25\text{mm}} + (9 - m) \cdot 341.25\text{mm})/\cos(\phi_s)$, i.e. an extra term of 0.625mm

- **z** – coordinates
 - Values used were for detector frame
 - $z_{\text{LHCb}} = y_{\text{DET}} * \sin(3.601\text{mrad}) + z_{\text{DET}} * \cos(3.601\text{mrad})$
 - Correction of ~60 microns in **z**
- C-Frames are tilted in LHCb frame, and not the Stations!!
 - Two rails per station: {XU} and {VX}
 - Height of rails are adjusted such that the centre of a C-Frame lies in the LHCb **xz** - plane
 - Rotate layers about **x**-axis by 3.601mrad
 - Correct for layer positions in C-Frame in LHCb frame
- **y** – coordinates of S2/S3 modules
 - Different per station; Beam pipe cone is wider at T3 than at T1
 - $\Delta y \sim 14\text{mm}$
- Last but not least module lengths
 - Should be equal to wire lengths
 - Consistently off by 40 mm
- New feature:
 - Alignment conditions for quarters
 - Needed to abuse new feature of alignment framework



- Fixed X-centres of modules
- Fixed “Tilt”, i.e. going from survey frame to LHCb frame. Stations to “C-Frames”
- Fixed Y-centre of S2/S3 modules
- Got rid of replica volumes
 - Apply mis-alignments in Gauss
 - Deform detector at module level
- Antonio and I (Survey vs Software) are double checking all the numbers. So far we've found ~micron differences. Tracking them down, or at least trying to understand them
- Come full circle: Begins with geometry ends with geometry
- Alexandr Kozlinskiy will take over as OT software responsible soon

