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Roman Pot geometry

As the Roman Pot detectors are movable (and thus at a different position in each run), their geometry description is a little bit more complex. Consequently, there are four levels of RP geometry.

- **Ideal geometry.** This is the common base-line for all other geometries. At this level, all RPs are identical and are placed at a nominal position with respect to the beam. This geometry is described by conventional DDL files which can be found in `src/Geometry/TotemRPData/data`.
- **Measured geometry.** At this level, each RP can be different - which reflects better the reality. For example, it could include measured distances between RP and detector edges.
- **Real geometry.** This is the geometry used for reconstruction. It can be obtained by various methods, such as track-based alignment. Geometrical parameters (position, orientation, ...) can be adjusted for each sensor.
- **Misaligned geometry.** This geometry is used only for alignment studies.

The geometries are built in a hierarchical manner by applying alignments (i.e., geometrical corrections). These alignment corrections are stored as XML files (the structure is described here, standard location in SVN is `src/TotemAlignment/RPData/LHC`) and are loaded with the help of the `TotemRPIncludeAlignments` plugin. The corrections are applied in this order:

1. ideal geometry + "measured" alignments -> measured geometry
2. measured geometry + "real" alignments -> real geometry
3. measured geometry + "misaligned" alignments -> misaligned geometry

The Geant4-based simulations use the measured geometry. All reconstruction modules use the real geometry.

**Use cases.**

- You want to perform simulation and reconstruction using the same alignment files: put them into the `MeasuredFiles` field of the `TotemRPIncludeAlignments` plugin.
- You want to perform a reconstruction of real data given some alignment files: put them into the `RealFiles` field of the `TotemRPIncludeAlignments` plugin.
Two DDL descriptions of the RP system

Each of the geometries can be described in various ways; one of them is Detector Description Language (DDL). This language permits to describe an object that is copied to various places in the geometry. Such an approach was applied in the original description of the RP system that is loaded by file

`Configuration/TotemCommon/python/geometryGlobal_cfi.py`

That is, one RP is copied to all units and stations and therefore, by definition, all RPs are identical. However, this doesn't correspond to reality where each RPs has its own misalignments. Therefore an updated version of the DDL description was made:

`Configuration/TotemCommon/python/geometryGlobal_real_cfi.py`

Use this file if you want to specify per-RP alignments in measured geometry and pass them into a Geant4-based simulation.

NB: there are no problems to introduce per-RP alignments in the real and misaligned geometries, since the DDL language is not involved in the transition from the measured geometry.

-- JanKaspar - 21-Jun-2012