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Multiple-view, multiple-selection visualization of simulation geometry in CMS

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Fireworks, the event-display program of CMS, was extended with an advanced geometry visualization package. ROOT's TGeo geometry is used as internal representation, shared among several geometry views. Each view is represented by a GUI list-tree widget, implemented as a flat vector to allow for fast searching, selection, and filtering by material type, node name, and shape type. Display of logical and physical volumes is supported. Color, transparency, and visibility flags can be modified for each node or for a selection of nodes. Further operations, like opening of a new view or changing of the root node, can be performed via a context menu. Node selection and graphical properties determined by the list-tree view can be visualized in any 3D graphics view of Fireworks. As each 3D view can display any number of geometry views, a user is free to combine different geometry-view selections within the same 3D view. Node-selection by proximity to a given point is possible. A visual clipping box can be set for each geometry view to limit geometry drawing into a specified region. Visualization of geometric overlaps, as detected by TGeo, is also supported.

The geometry visualization package is used for detailed inspection and display of simulation geometry with or without the event data. It also serves as a tool for geometry debugging and inspection, facilitating development of geometries for CMS detector upgrades and for SLHC.

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