Yet another geometry description technique for MARS15

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Why one more geometry?

- Geo models created for MARS can be used with others MC codes (at least GEANT3/4).
- One can use the ROOT models created for GEANT4 (CMS model as an example) with MARS15.
- Large set of geometrical elements (primitives), possibility to produce composite shapes.
- Ready to use 3D visualization.

To use ROOT geometry :

1. Put calls of following functions to REG1

- **tgeo_add_substance** – put MARS material to ROOT. Not need to be touched.
- **tgeo_init** – used to create geometry (read from root file). Have to be written by user.
- **tgeo_blmat** – used to associate material indexes with non standard zone numbers (fills IMUN array). Not necessary to touch it.
- **tgeo_find** – return zone number for given (x,y,z)

With these functions in REG1 one has pure non standard geometry

2. Enable ROOT powered boundary crossing algorithm in MARS.INP, put 19=T in INDX card

Geometry initialization in REG1

```
include  'azwmat.inc'
.....................
IF(IND(19)) THEN    ! ROOT
  DO i=1,NREMA
     call tgeo_add_substance(RTMED(I),
ZTMED(1,i),ATMED(1,i),WTMED(1,i),NMIX(i),
ATNAME(i))
   END DO
   call tgeo_init();  ! Describe your geometry inside
   call tgeo_blmat(IMUN,M_MAX) ! Fill IMUN
END IF
..........................
```

tgeo_init() - geometry description (C++)

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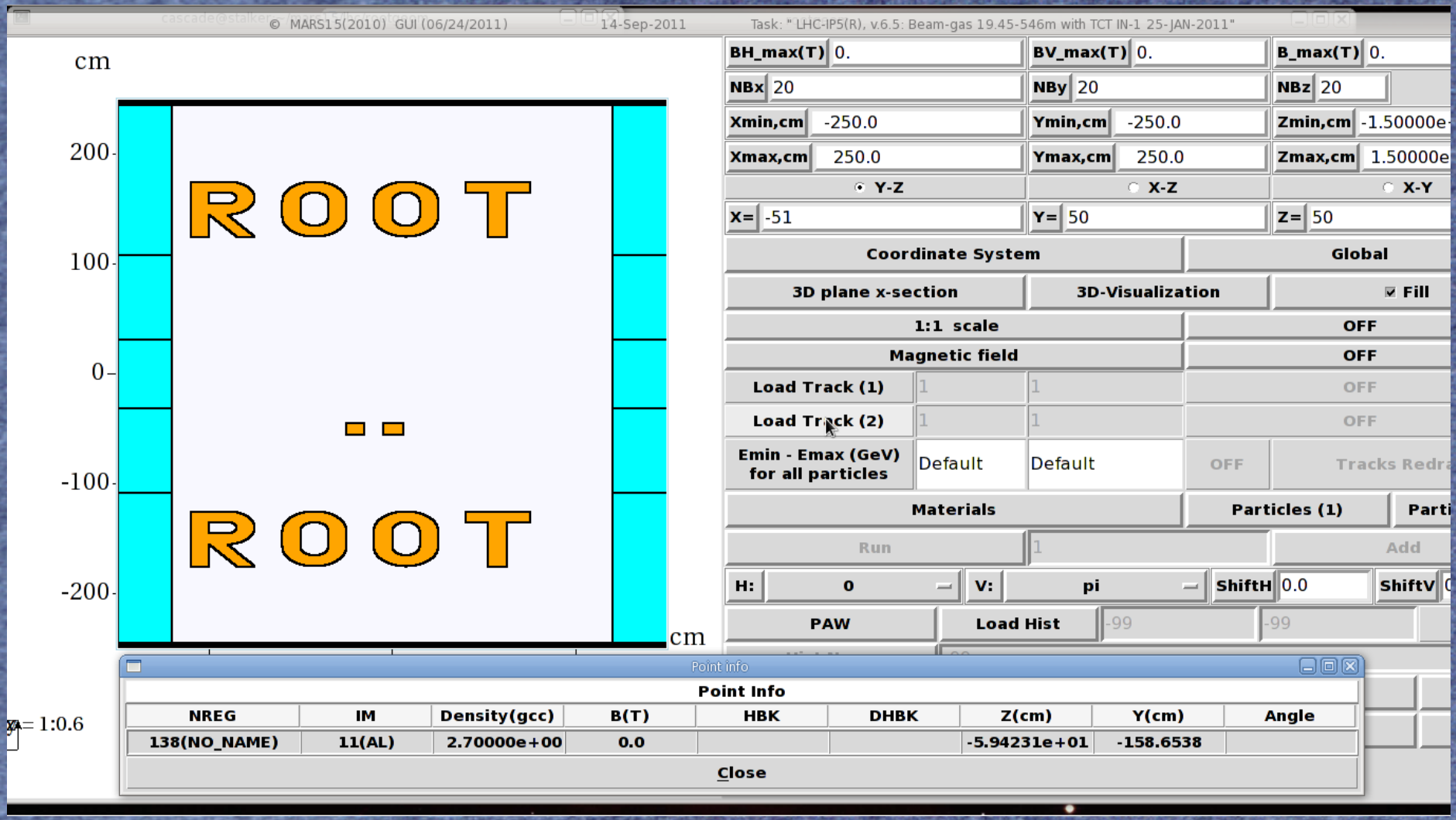
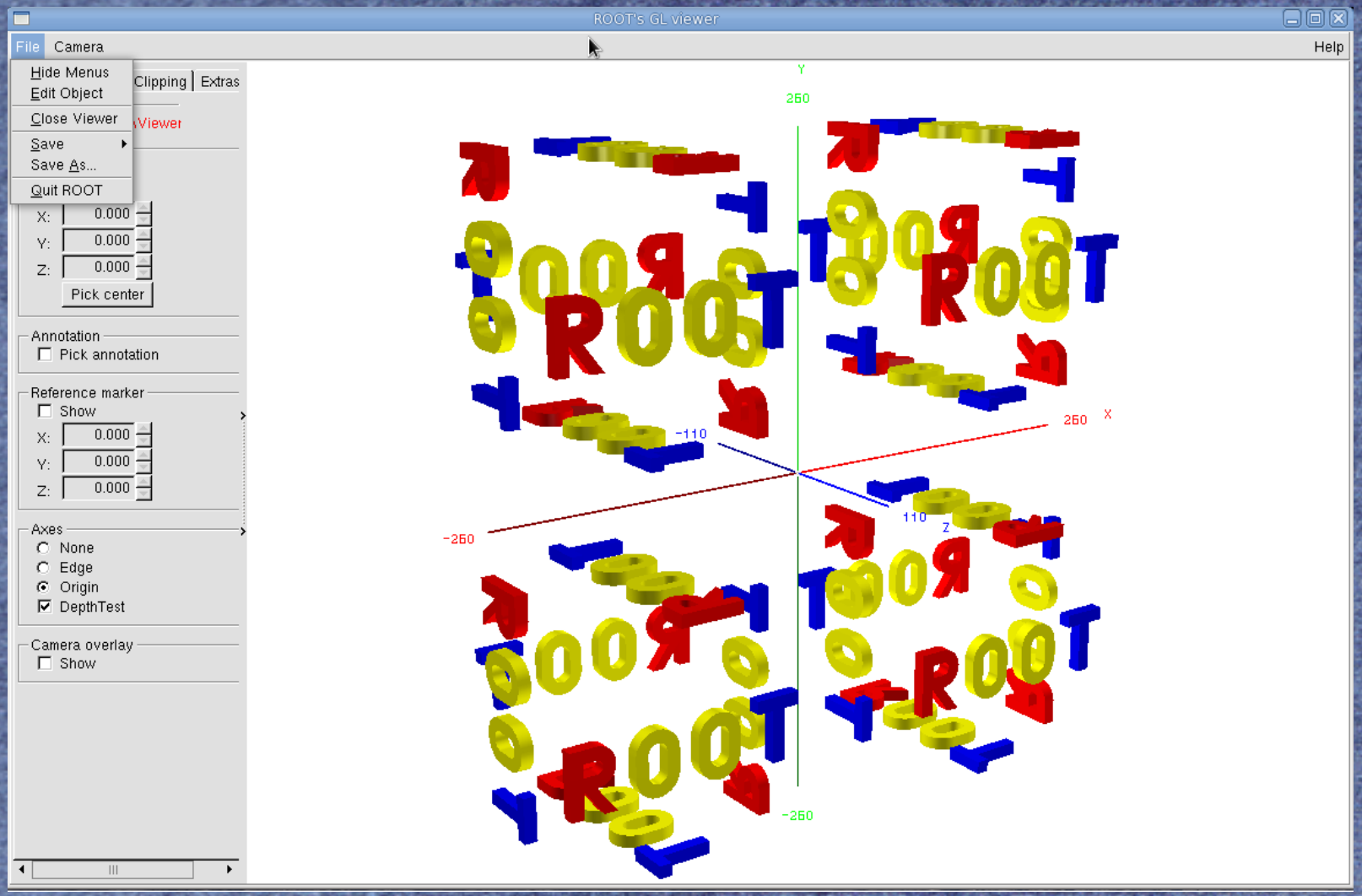
```
#include "TROOT.h"
#include "TGeoManager.h"
#include "TGeoMaterial.h"
#include "TGeoBBox.h"
#include <TGeoArb8.h>
...
extern "C" {
  void tgeo_init_()
  {
    TGeoManager *geom = gGeoManager;

    TGeoMedium *Vacuum = gGeoManager->GetMedium("GVAC");
    TGeoMedium *Al = gGeoManager->GetMedium("AL");
    //--- define the transformations
    ... text of  rootgeom.C from ROOT source tree,
    ... see  description on http://root.cern.ch/download/doc/18Geometry.pdf, p.300
    geom->CloseGeometry();
    geom->Export("MyGeom.root"); // Save geometry in root file
  }
}
```

http://root.cern.ch/download/doc/18Geometry.pdf

Simple example of ROOT geometry, MARS view



Simple example of ROOT geometry, 3D ROOT visualisation with OpenGL viewer



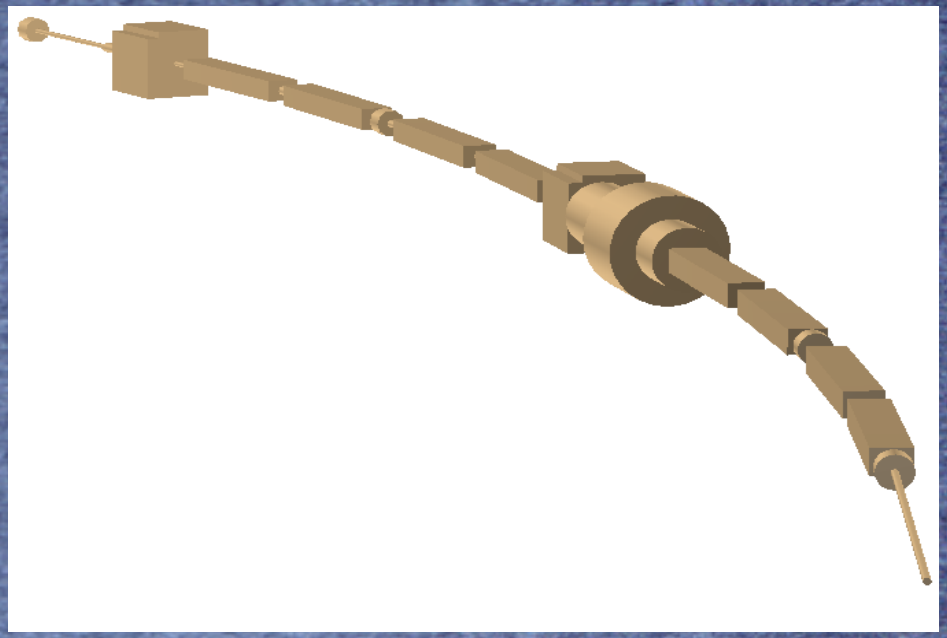
ROOT based MAD-MARS beamline builder (Beta)

Set of functions (classes) for building beam lines, like MMBLB for non standard MASR geometry

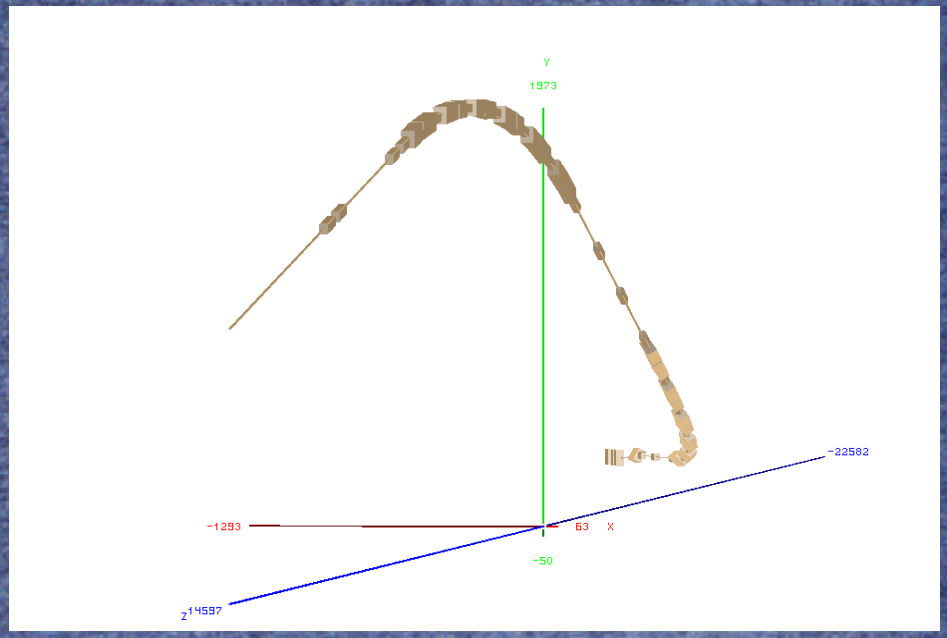
Advantage as compared with MMBLB: eliminates possibility to miss small volumes at the tracking time, in the same way as extended geometry does.

Currently used for implementation models of

Booster



LBNE primary beamline



LHC IR5(CMS) , M2E beamline (by I.Rakhno)