Chicane Shielding in MARS

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IDS-NF phone meeting

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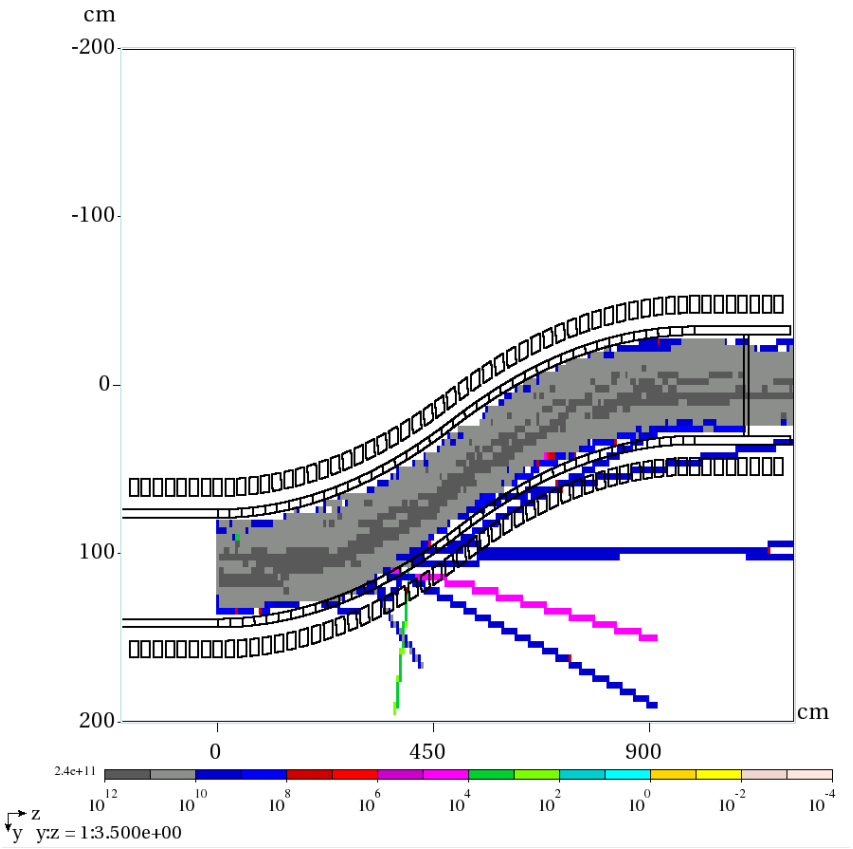
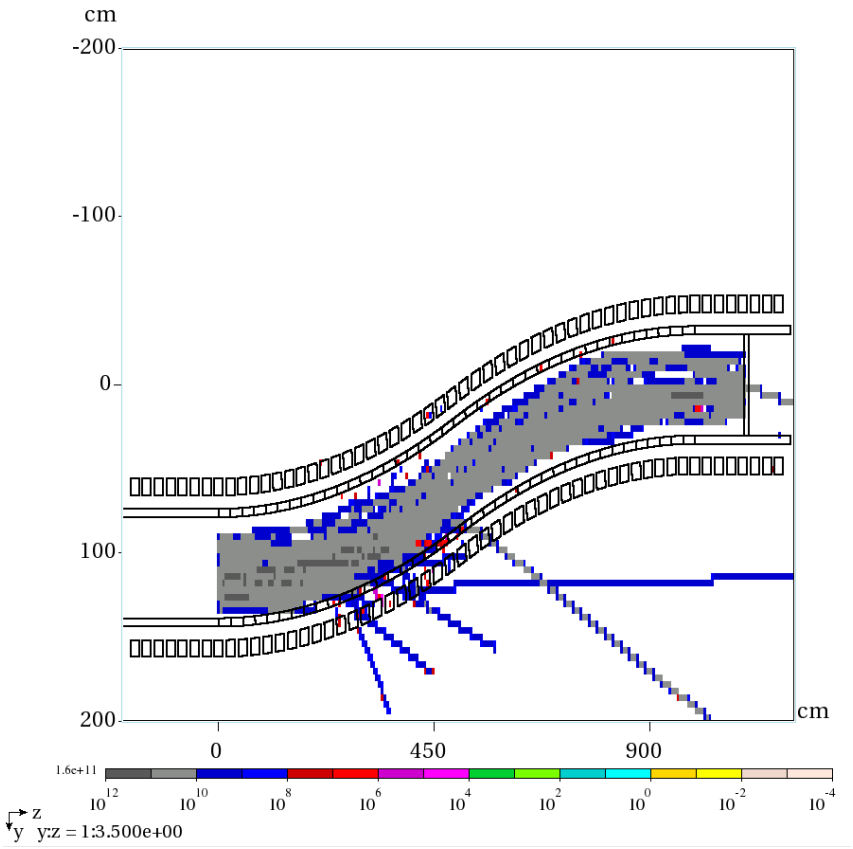
First glance at shielding

…seems like it is the same old chicane in MARS, but… (next slide)

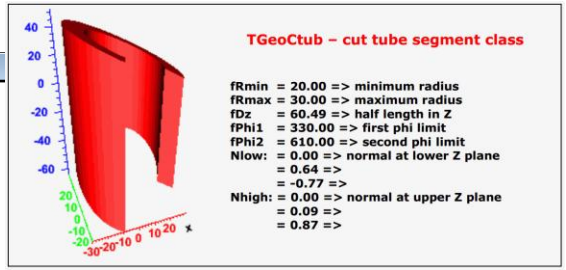


Muon flux, low statistics



Muon flux, low statistics

ROOT-based geometry



snopok@heimdall:~/roottest

```
#include "TROOT.h"
#include "TGeoManager.h"
#include "TGeoMaterial.h"
#include "TGeoTube.h"
#include "TGeoBBox.h"
#include "TGeoMatrix.h"
#include "TMath.h"

#include <iostream>
extern "C" {

  void tgeo_init_()
  {
    // Substances
    TGeoMedium*  GVAC  = gGeoManager->GetMedium(0);
    TGeoMedium* CU = gGeoManager->GetMedium(1);
    TGeoMedium* BE = gGeoManager->GetMedium(2);
    TGeoMedium* FE = gGeoManager->GetMedium(3);

    Int_t coils = 20; // number of coils
    double a = 0.625; // coil angle, degree
    double degrad = TMath::Pi()/180;
    double a_rad = a * degrad; // rad
    double L = 25; // distance btw coils, cm
    double R = L/a_rad; // curvature radius, cm
    double half_length = R * TMath::Sin(a_rad/2.0);
    Int_t addl_coils = 8;

    // Declare Volumes
    TGeoVolume* World = gGeoManager->MakeTube("world",GVAC,0.,200.,1400.);
    TGeoVolume* ctub1 = gGeoManager->MakeCtub("ctub1",FE,30.,35.,half_length,
                        0.,360.,0.,-TMath::Sin(a_rad/2),-TMath::Cos(a_rad/2),
                                   0.,-TMath::Sin(a_rad/2),TMath::Cos(a_rad/2));
    TGeoVolume* ctub2 = gGeoManager->MakeCtub("ctub2",FE,30.,35.,half_length,
                        0.,360.,0.,TMath::Sin(a_rad/2),-TMath::Cos(a_rad/2),
                                   0.,TMath::Sin(a_rad/2),TMath::Cos(a_rad/2));
    ctub1->SetLineColor(kRed);
    ctub2->SetLineColor(kRed);
    TGeoVolume* shield = gGeoManager->MakeTube("shield",FE,30.,35.,L*addl_coils/2);
    shield->SetLineColor(kRed);
    TGeoVolume* coil = gGeoManager->MakeTube("coil",CU,43.,53.,9.);
    coil->SetLineColor(kRed);
    TGeoVolume* absorber = gGeoManager->MakeTube("absorber",BE,0.,30.,5.);
    absorber->SetLineColor(kRed);

    // Positioning volumes

    double x,z,x_coil,z_coil;
    double x0 = 2 * R * (1 - TMath::Cos(coils * a_rad));
    for(Int_t n=1;n<=coils;n++) {
[shine] colorscheme #120 of 153. previous: sienna
```

- This new MARS geometry is based on ROOT (3D visual below produced by ROOT)
- Allows for all the ROOT conveniences + standard C syntax
- Geometry is straightforward to read/comprehend/modify as needed
- A wide variety of basic volumes made available by the ROOT TGeo module (“libGeom”)
- Most important for seamless shielding is the TGeoCtub elementary volume (cut tubes with arbitrary entrance/exit angles)
- Next: larger statistics, different shielding materials/parameters, radiation impact on coils
- Longer-term plan: full channel with RF cavities, etc.