

The Hidden Secrets of the Geometry World

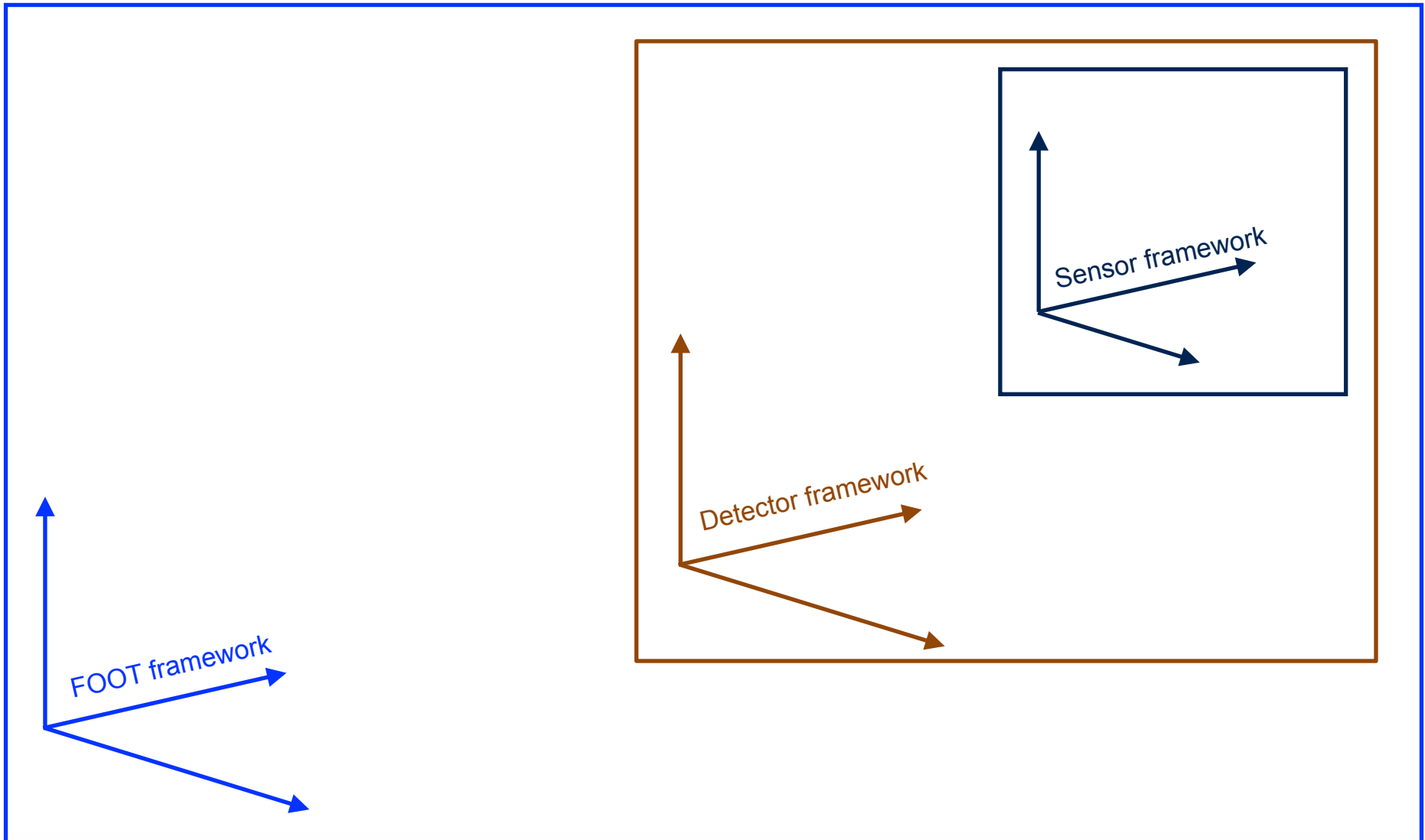
Introduction

Detectors

FOOT

Introduction

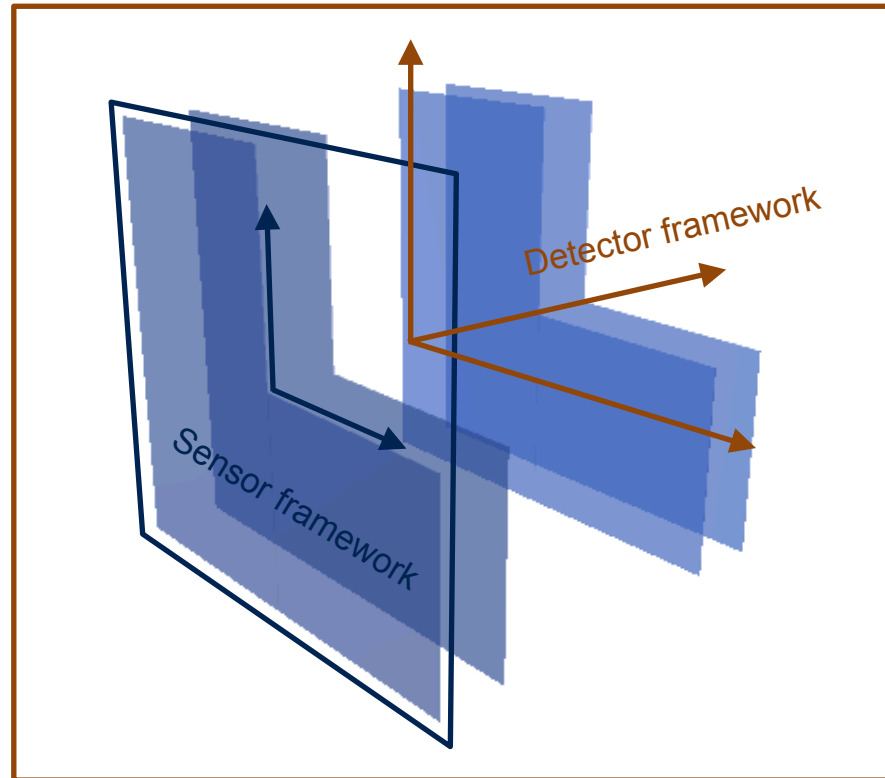
□ Frameworks:



Detectors

Detector Geometry (i)

☐ Sensor - detector framework:

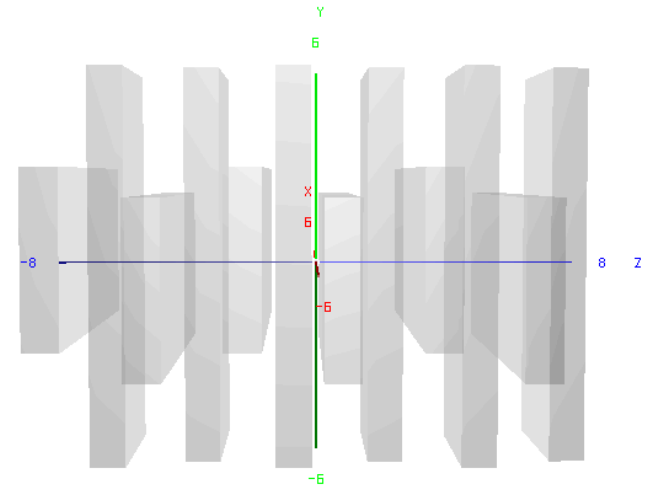
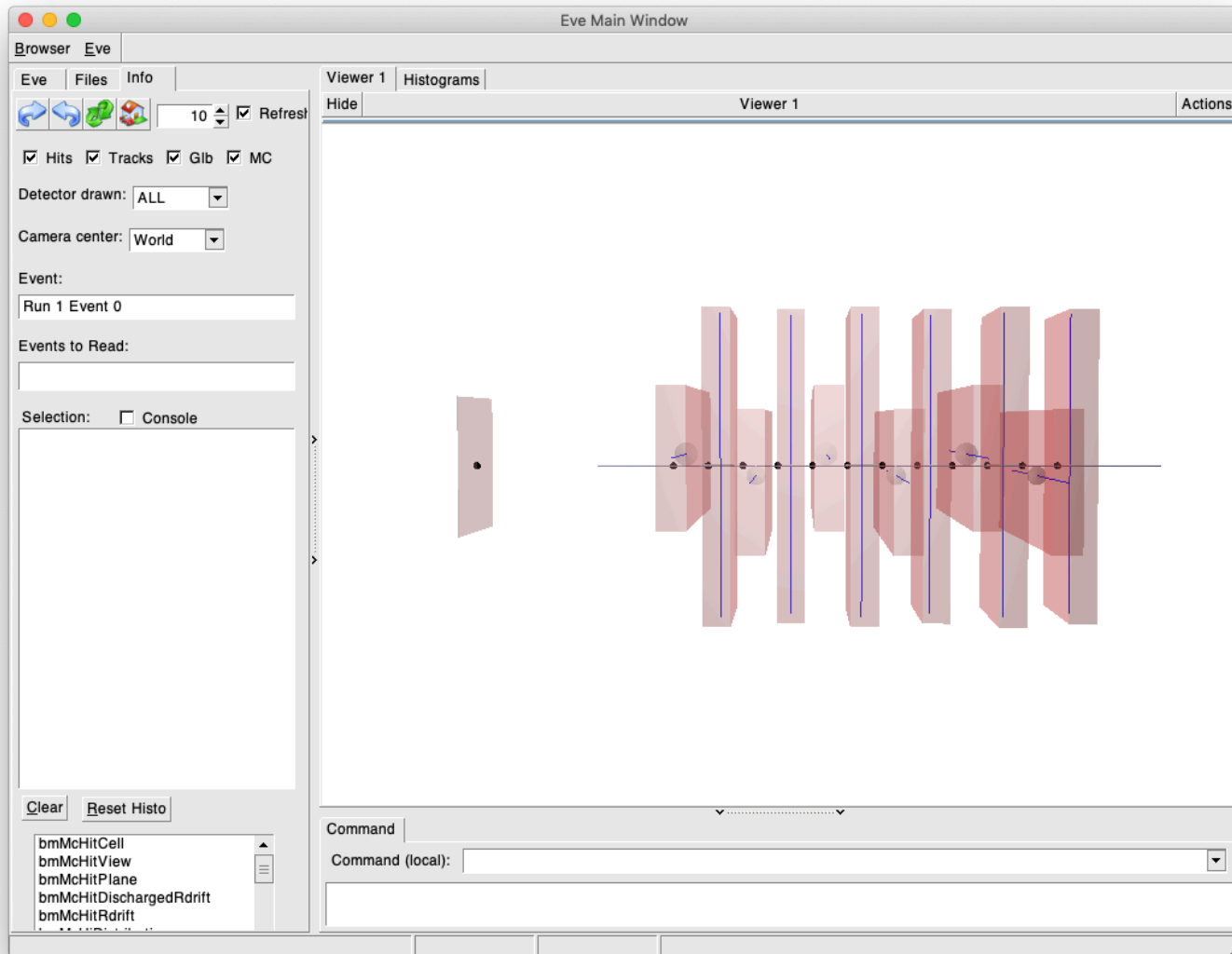


• Transformations:

- $TVector3 TA*parGeo::Sensor2Detector(..., TVector3 vec)$, from sensor to detector
 - $TVector3 TA*parGeo::Detector2Sensor(..., TVector3 vec)$, from detector to sensor
- ➔ Detector's geometry built in the detector framework

Detector Geometry (iv)

- Start counter and beam monitor event display



Detector Geometry (via)

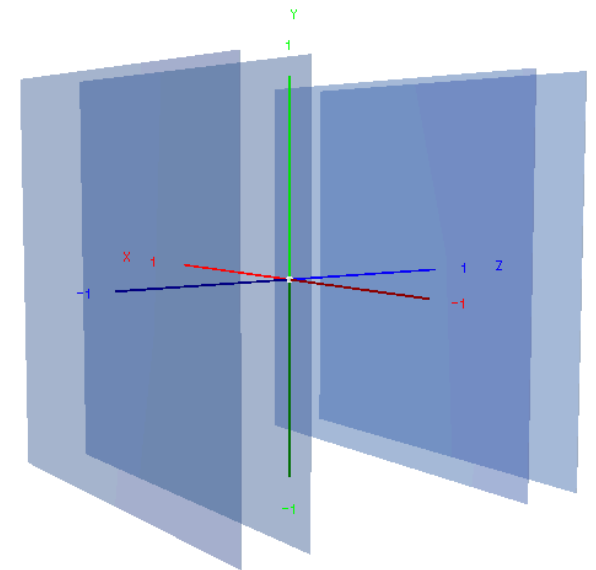
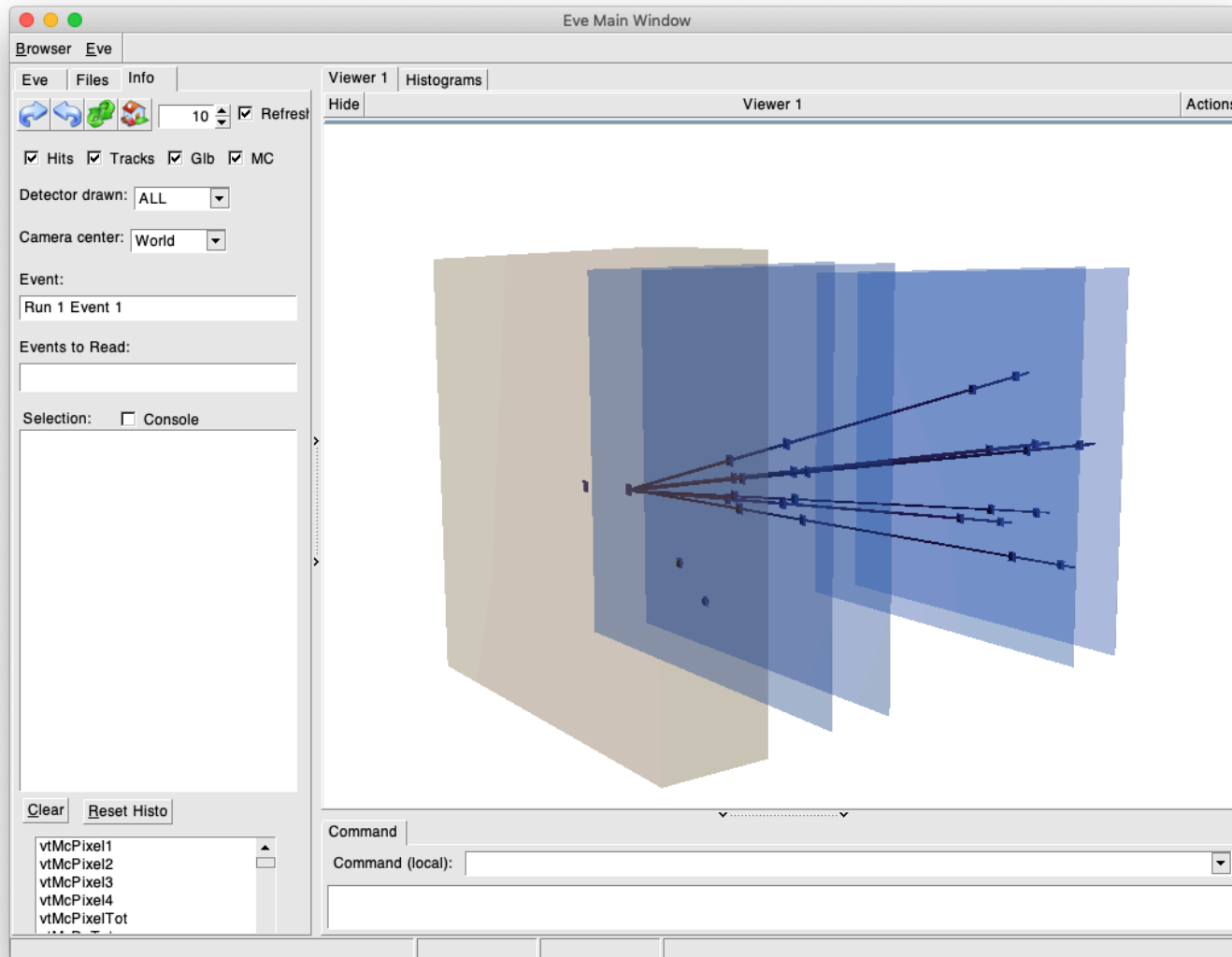
- Example for VT geometry: TAVTdetector.geo (ii)

```
SupportInfo:      3
//
EpoxyMat:         "Epoxy"
EpoxyMatDensity:  1.18
EpoxyMat:         "Eg"
EpoxyMatDensity:  2.61
PCBMat:           "Epoxy/Eg"
PCBDensities:     "2.61/1.19"
PCBProp:          "0.6/0.4"
PCBDensity:       1.85
PCBSizeX:         6.95   PCBSizeY:      9.8   PCBSizeZ:      0.13
PCBOffsetX:       0.0   PCBOffsetY:    0.000   PCBOffsetZ:    0.0
PCBHoleSizeX:     1.9884 PCBHoleSizeY:  1.92096   PCBHoleSizeZ:  0.13
BoxMat:           "Al"
BoxDensity:        2.7
Box1SizeX:        19.8   Box1SizeY:    19.8   Box1SizeZ:     2.5
Box2SizeX:        19.8   Box2SizeY:    19.8   Box2SizeZ:     0.2
BoxOffX:          0.0   BoxOffY:      0.0   BoxOffZ:       0.0
BoxHole1X:        2.2   BoxHole1Y:    2.2   BoxHole1Z:     0.3
BoxHole2X:        5.0   BoxHole2Y:    5.0   BoxHole2Z:     0.2
. . .
```

Support properties

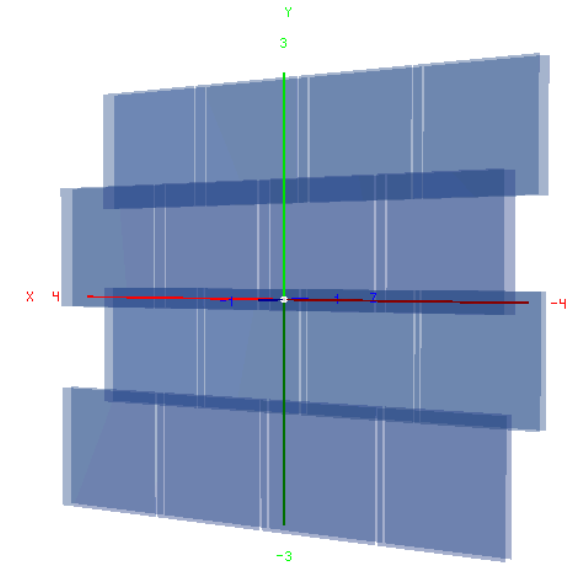
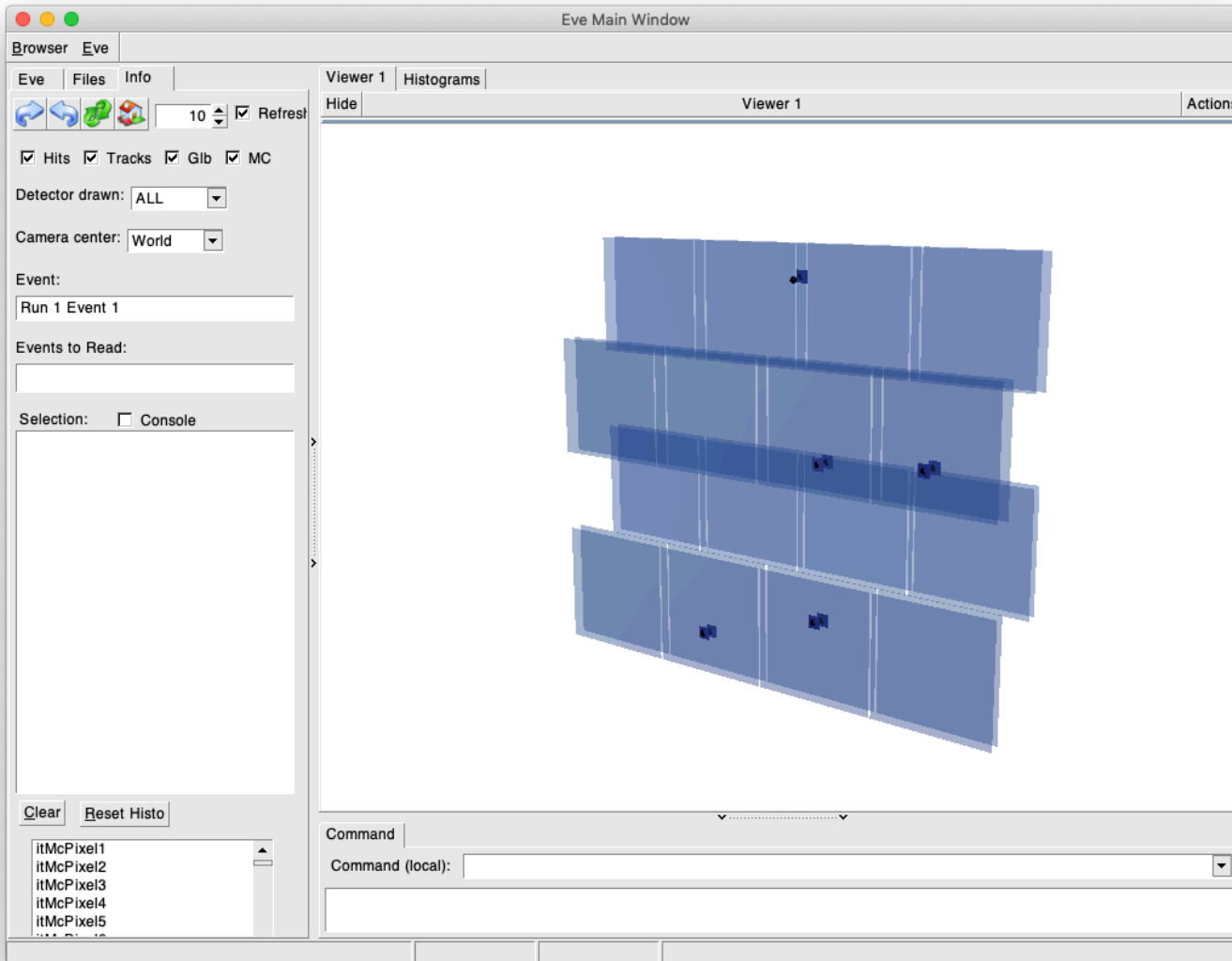
Detector Geometry (vii)

Target and Vertex display



Detector Geometry (ix)

Inner Tracker display



Detector Geometry (xb)

- Example for MSD geometry: TAMSDdetector.geo (ii)

SupportInfo: 3

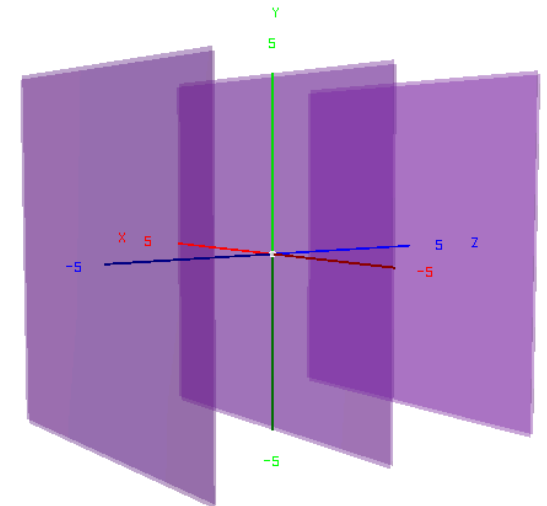
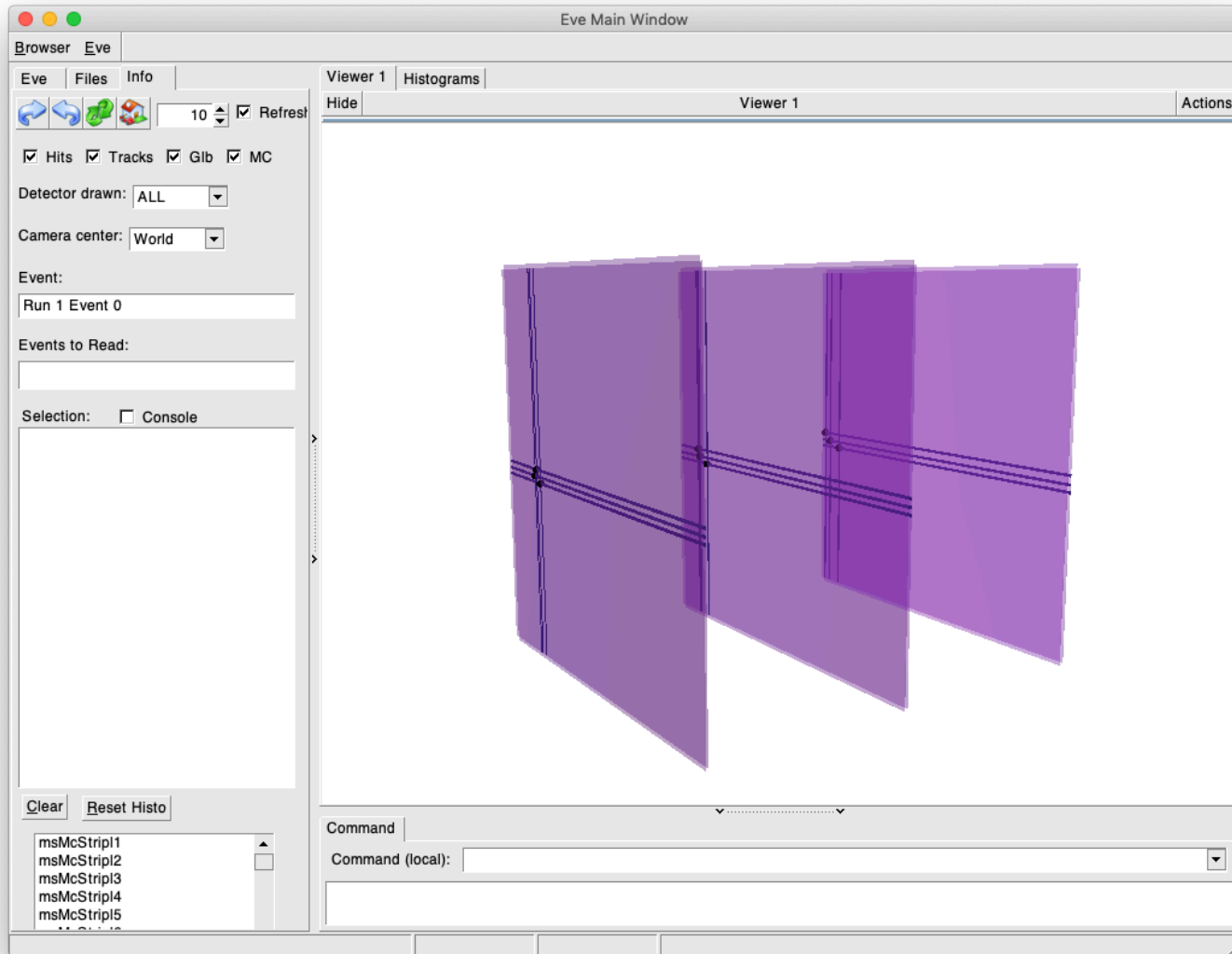
```
PCBoardThickness: 0.16
PCBoardMat: "Epoxy/Eg"
PcbBoardDensities: "2.61/1.19"
PcbBoardProp: "0.6/0.4"
PCBoardDensity: 1.85
PCBSizeX: 16.5 PCBSizeY: 13.66 PCBSizeZ: 0.16
PCBOffsetX: 1.37 PCBOffsetY: 0.0 PCBOffsetZ: 0.0
PCBdHoleSizeX: 9.2 PCBdHoleSizeY: 9.6 PCBdHoleSizeZ: 0.16
```

Support properties

```
BoxMat: "Al"
BoxDensity: 2.7
BoxOutSizeX: 21.0 BoxOutSizeY: 19.50 BoxOutSizeZ: 8.2
BoxInSizeX: 20.6 BoxInSizeY: 19.10 BoxInSizeZ: 6.8
BoxOffX: 0.0 BoxOffY: -0.25 BoxOffZ: 0.0
BoxHoleSizeX: 9.2 BoxHoleSizeY: 9.6 BoxHoleSizeZ: 0.70
BoxHoleOffX: 0.2 BoxHoleOffY: 0.0 BoxHoleOffZ: 0.0
```

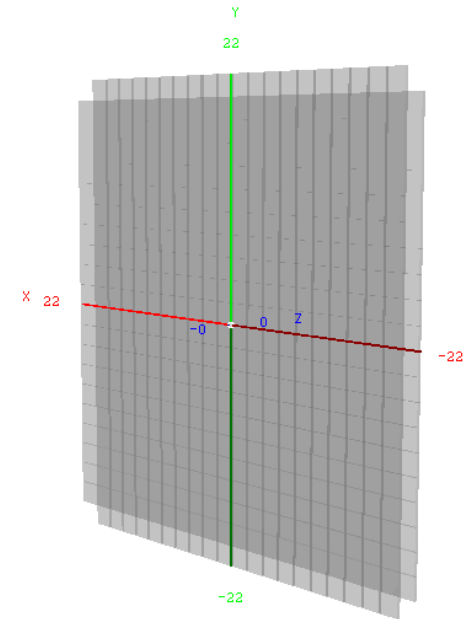
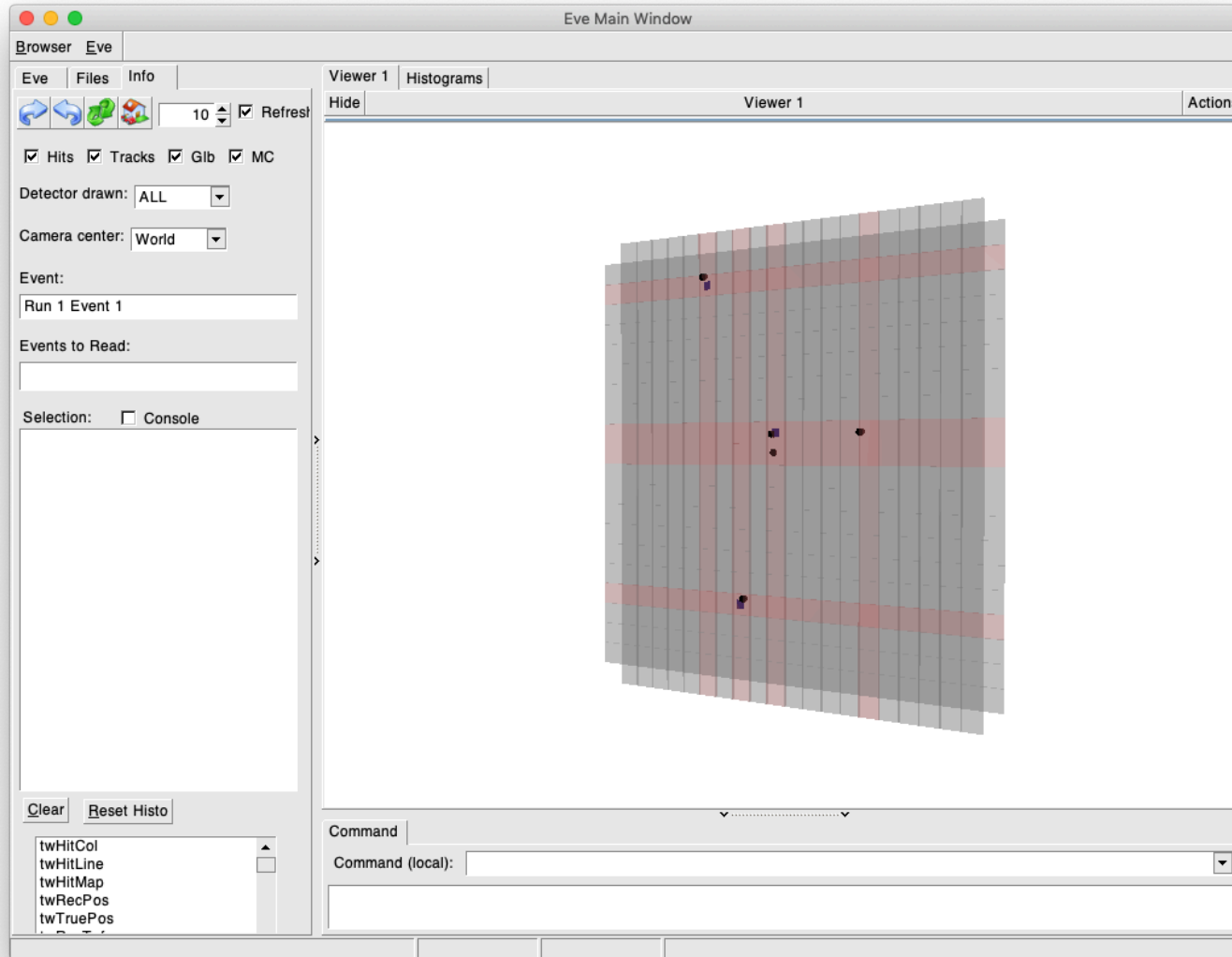

Detector Geometry (xi)

Micro strip detector display



Detector Geometry (xiii)

Time of flight wall display



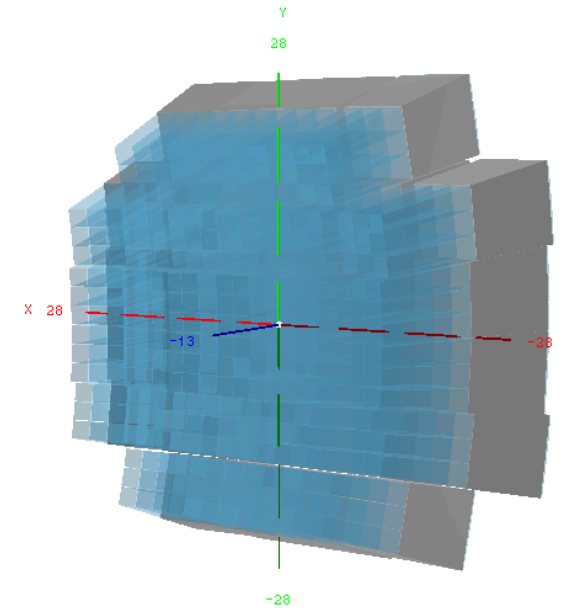
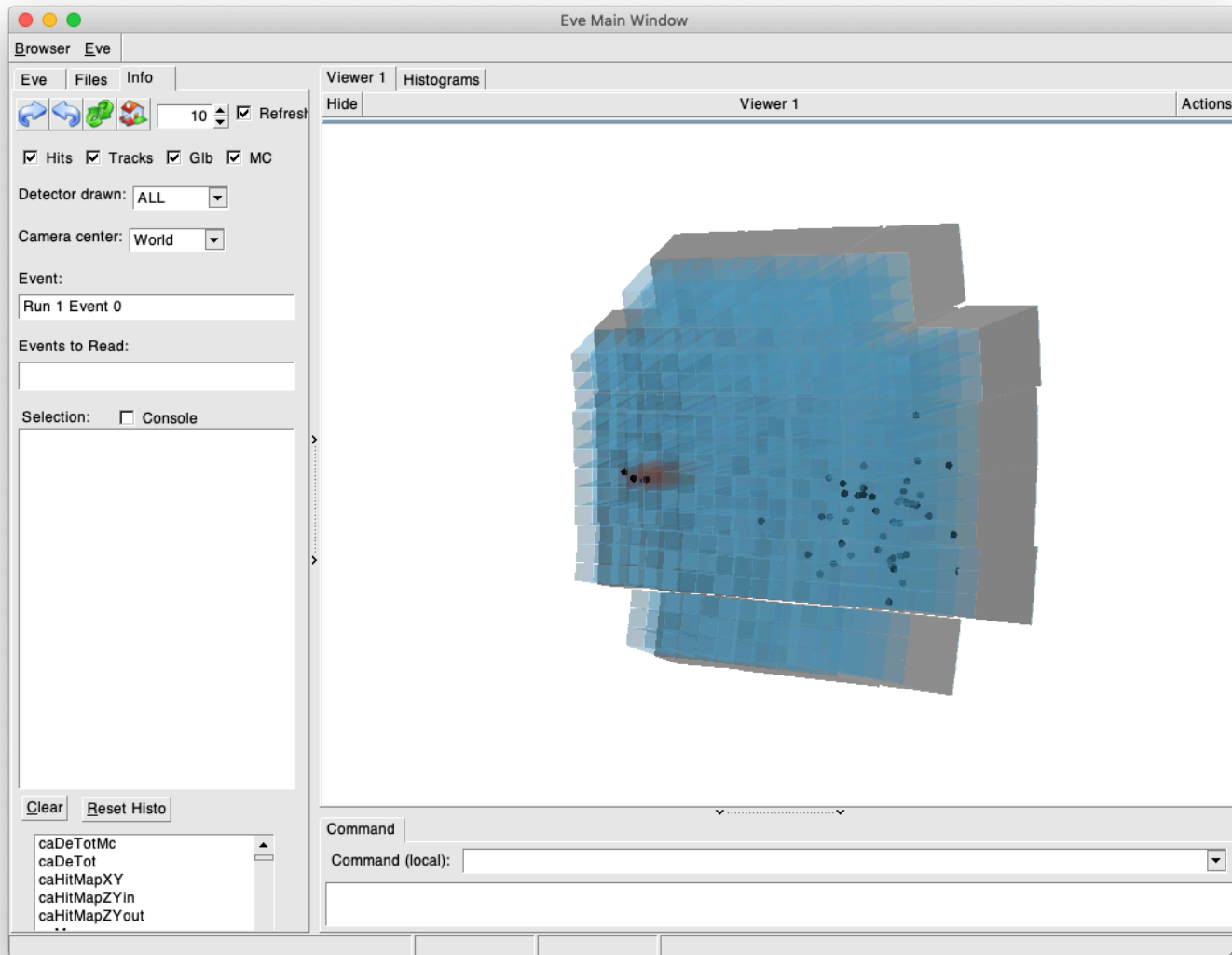
Detector Geometry (xivc)

❑ Example for CA: TACAdetector.geo (iii)

```
CrystalN: 324
ModulesN: 36
// +-----+
// Parameter of the crystals used in the run
// +-----+
CrystalId: 0
PositionX: -22.251808401451   PositionY: 22.065196527293   PositionZ: -6.375634205423
TiltX: -16.948710300548     TiltY: -15.754700182705     TiltZ: 2.509272722975
CrystalId: 1
PositionX: -19.741209390455   PositionY: 22.163063977142   PositionZ: -5.708221223127
TiltX: -16.801804362103     TiltY: -13.927234695328     TiltZ: 1.935805714418
CrystalId: 2
PositionX: -17.209012109484   PositionY: 22.235638225993   PositionZ: -5.124410098417
TiltX: -16.674687932428     TiltY: -12.098449385969     TiltZ: 1.371345163214
CrystalId: 3
. . .
```

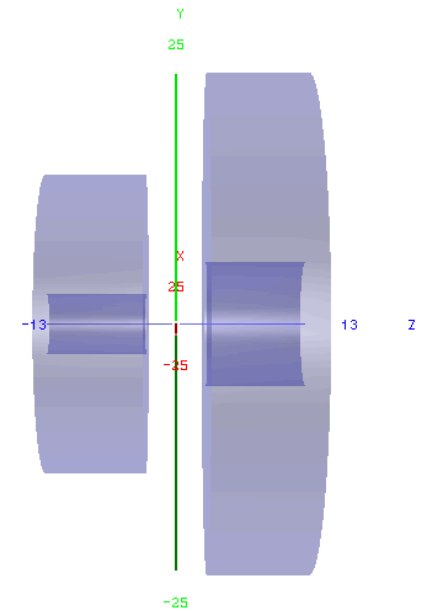
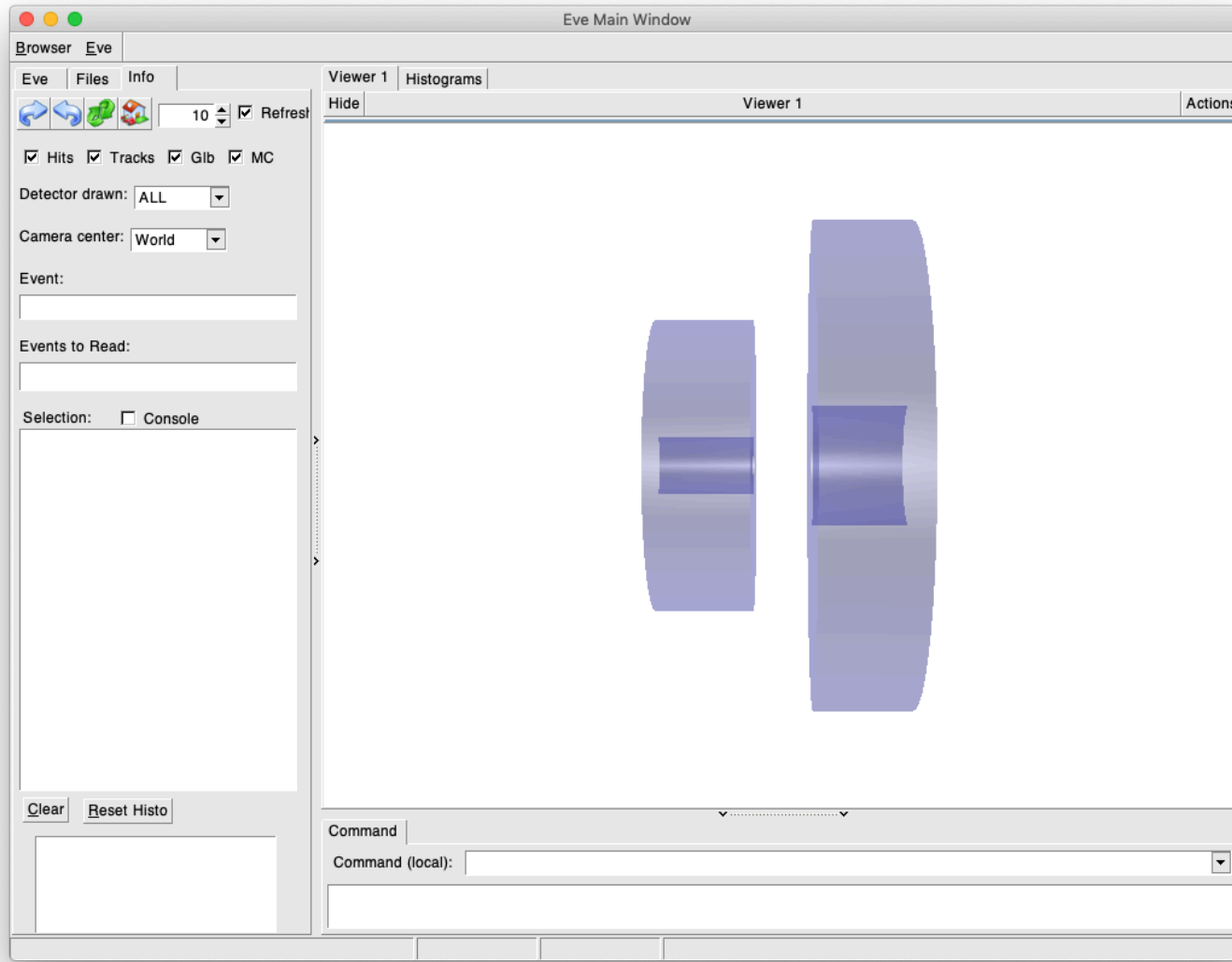
Detector Geometry (xv)

Calorimeter display



Detector Geometry (xvii)

□ Dipole magnet display



FOOT

Global FOOT Geometry (i)

Global transformation: FOOT.geo (i)

```
// X,Y,Z and angles
StartBaseName: "ST"
StartPosX: 0. StartPosY: 0. StartPosZ: -29.
StartAngX: 0. StartAngY: 0. StartAngZ: 0.

TargetBaseName: "TG"
TargetPosX: 0. TargetPosY: 0. TargetPosZ: 0.
TargetAngX: 0. TargetAngY: 0. TargetAngZ: 0.

BmBaseName: "BM"
BmPosX: 0. BmPosY: 0. BmPosZ: -14.
BmAngX: 0. BmAngY: 0. BmAngZ: 0.

VertexBaseName: "VT"
VertexPosX: 0. VertexPosY: 0. VertexPosZ: 1.5
VertexAngX: 0. VertexAngY: 0. VertexAngZ: 0.

MagnetsBaseName: "DI"
MagnetsPosX: 0. MagnetsPosY: 0. MagnetsPosZ: 14.
MagnetsAngX: 0. MagnetsAngY: 0. MagnetsAngZ: 0.

InnerTrackerBaseName: "IT"
InnerTrackerPosX: 0. InnerTrackerPosY: 0. InnerTrackerPosZ: 14.
InnerTrackerAngX: 0. InnerTrackerAngY: 0. InnerTrackerAngZ: 0.

MultiStripBaseName: "MSD"
MultiStripPosX: 0. MultiStripPosY: 0. MultiStripPosZ: 29.
MultiStripAngX: 0. MultiStripAngY: 0. MultiStripAngZ: 0.
```

Global FOOT Geometry (ii)

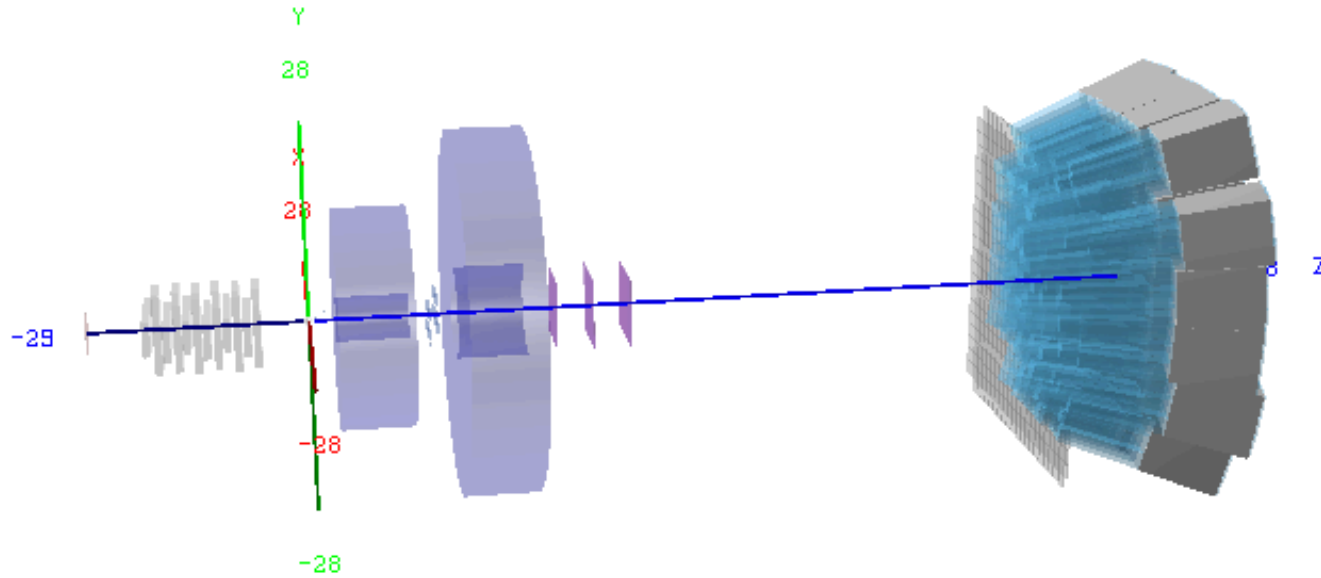
□ Global transformation: FOOT.geo (ii)

```
TofWallBaseName: "TW"  
TofWallPosX: 0. TofWallPosY: 0. TofWallPosZ: 99.7  
TofWallAngX: 0. TofWallAngY: 0. TofWallAngZ: 0.  
  
CaloBaseName: "CA"  
CaloPosX: 0. CaloPosY: 0. CaloPosZ: 110.8  
CaloAngX: 0. CaloAngY: 0. CaloAngZ: 0.
```

- Global transformation from FOOT.geo file read by TAGgeoTrafo class
- Transformations :
 - TVector3 TAGgeoTrafo::FromGlobalTo*Local(TVector3 vec), from global to detector
 - TVector3 TAGgeoTrafo::From*LocalToGlobal(TVector3 vec), from detector to global
- (*) for ST-BM-VT-IT-DI-MSD-TW-CA
- ➔ All geometry files are specific to a campaign name
- ➔ Overlapping volumes NOT checked !!

Global FOOT Geometry (iii)

□ FOOT framework



- Origin at the center of the target
- ➔ All detectors built in detector framework and then placed in the FOOT framework

End