Double Target for CLAS12

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Universidad Técnica Federico Santa Maria (UTFSM)

CLAS collaboration meeting

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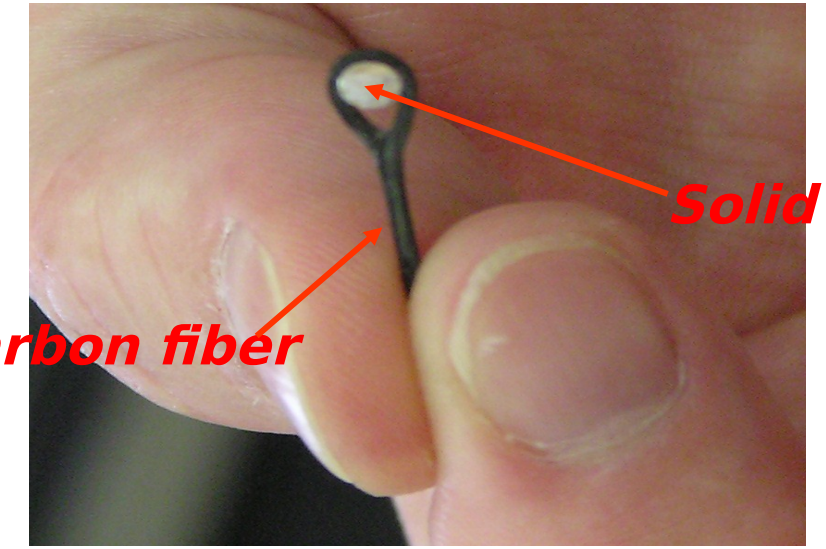
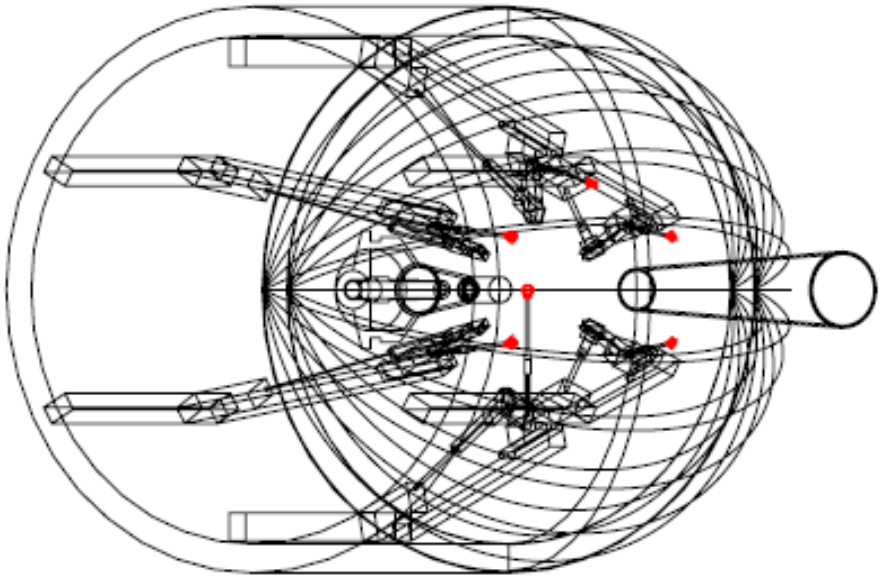
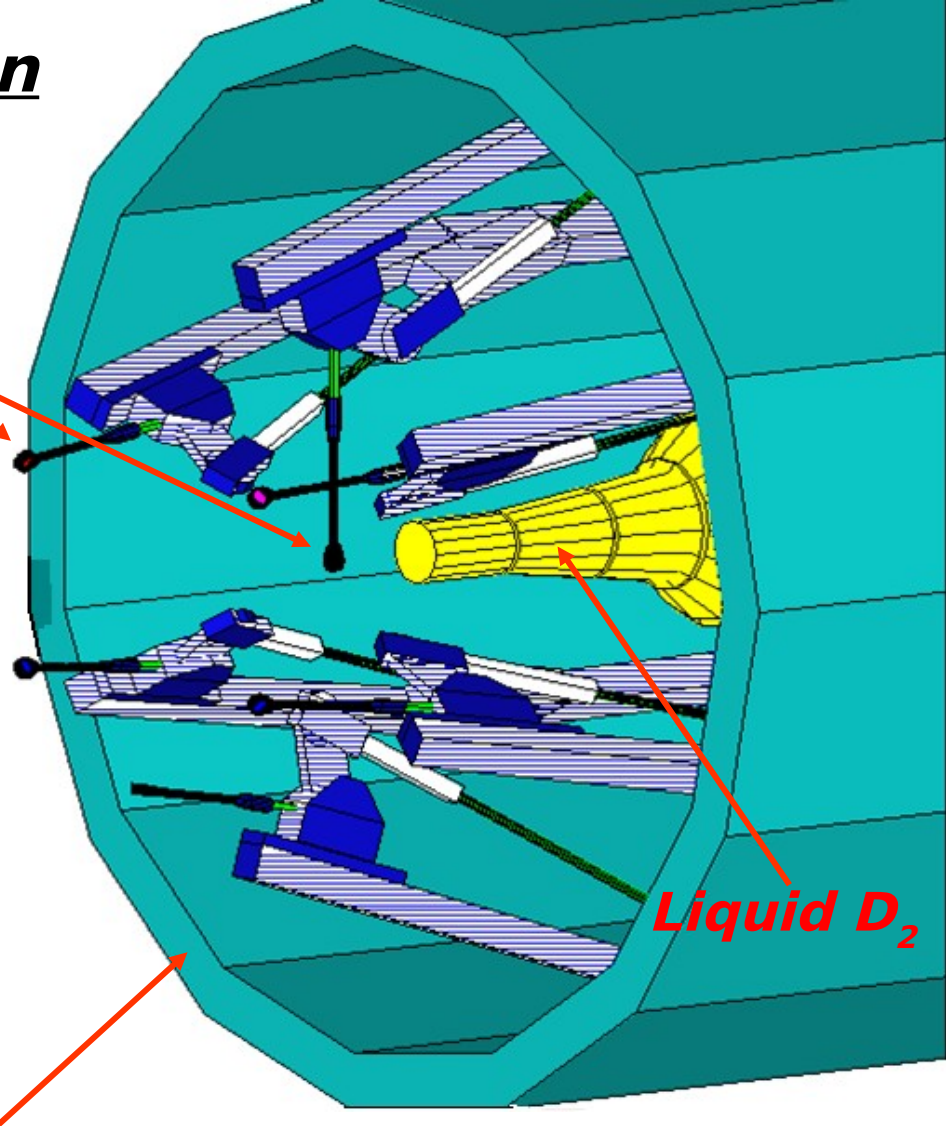
Double Target in CLAS

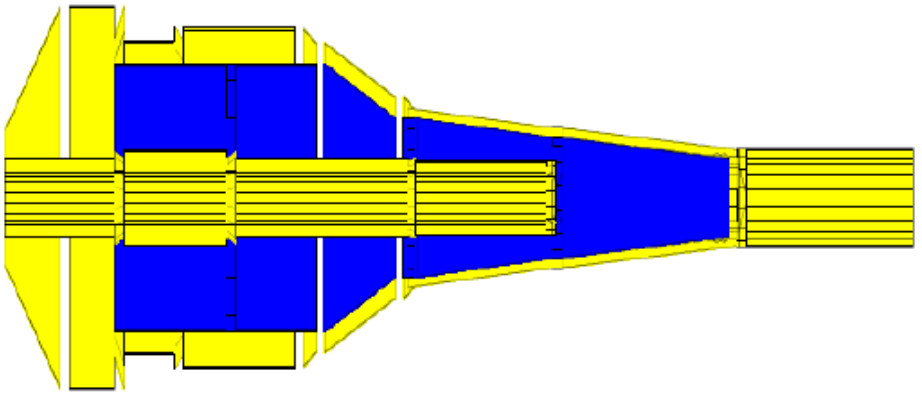
Experimental details of Eg2 run







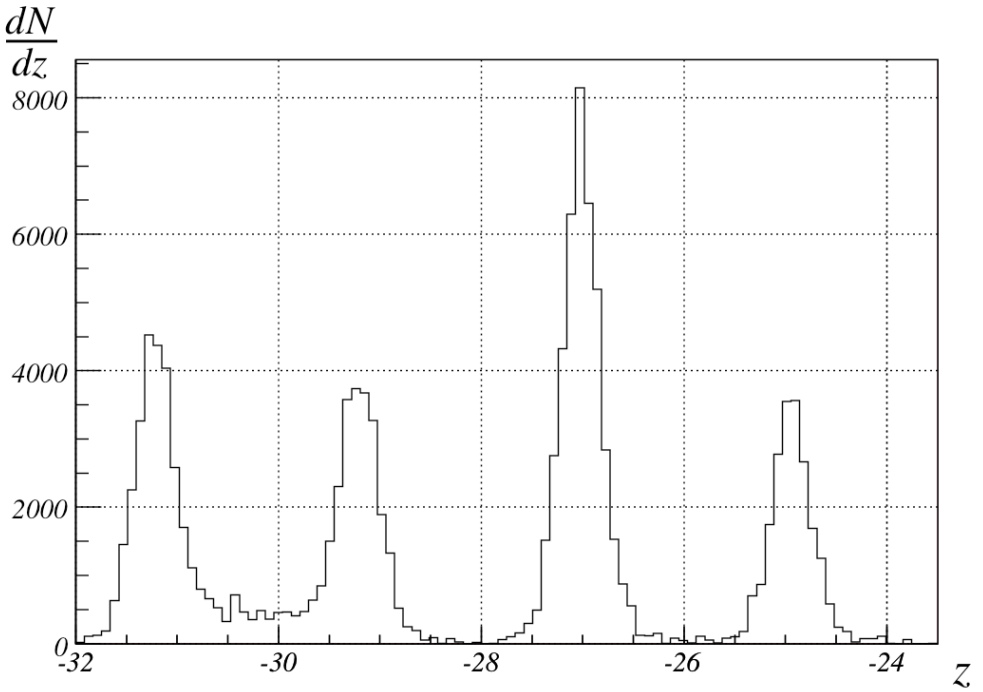
EG2 Experiment target in GEANT3
Solid (C, Al, Fe, Sn, Pb) target
simultaneously with deuterium target



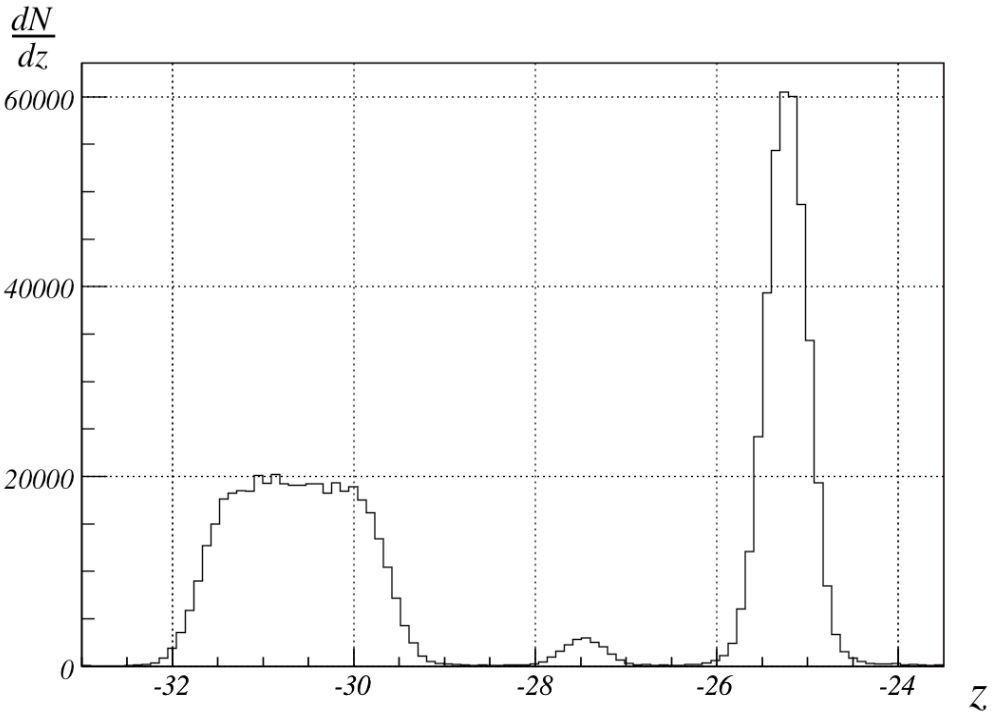
D_2 cell in GSIM

Real CLAS data

Liquid target empty



Liquid target full

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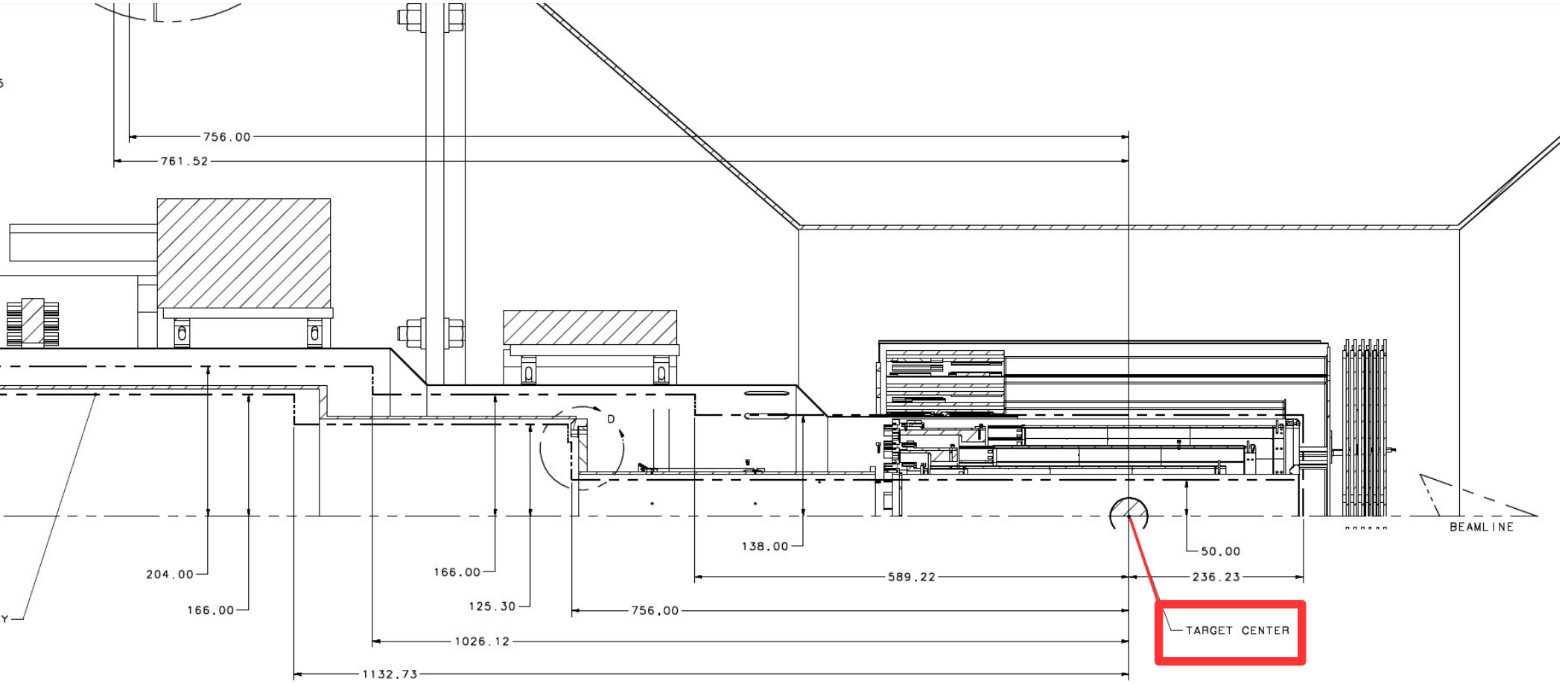
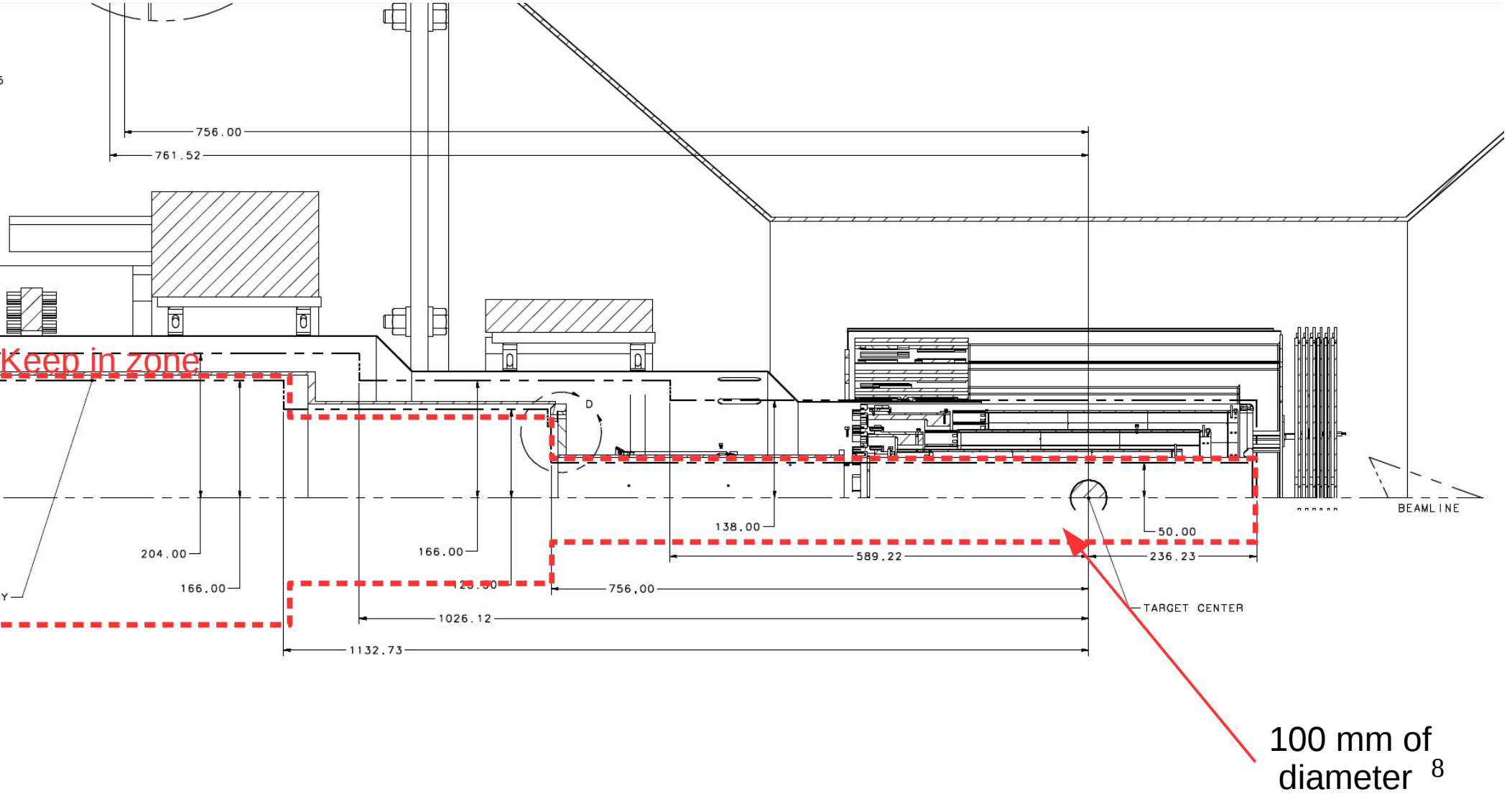
D

Double Target in CLAS12

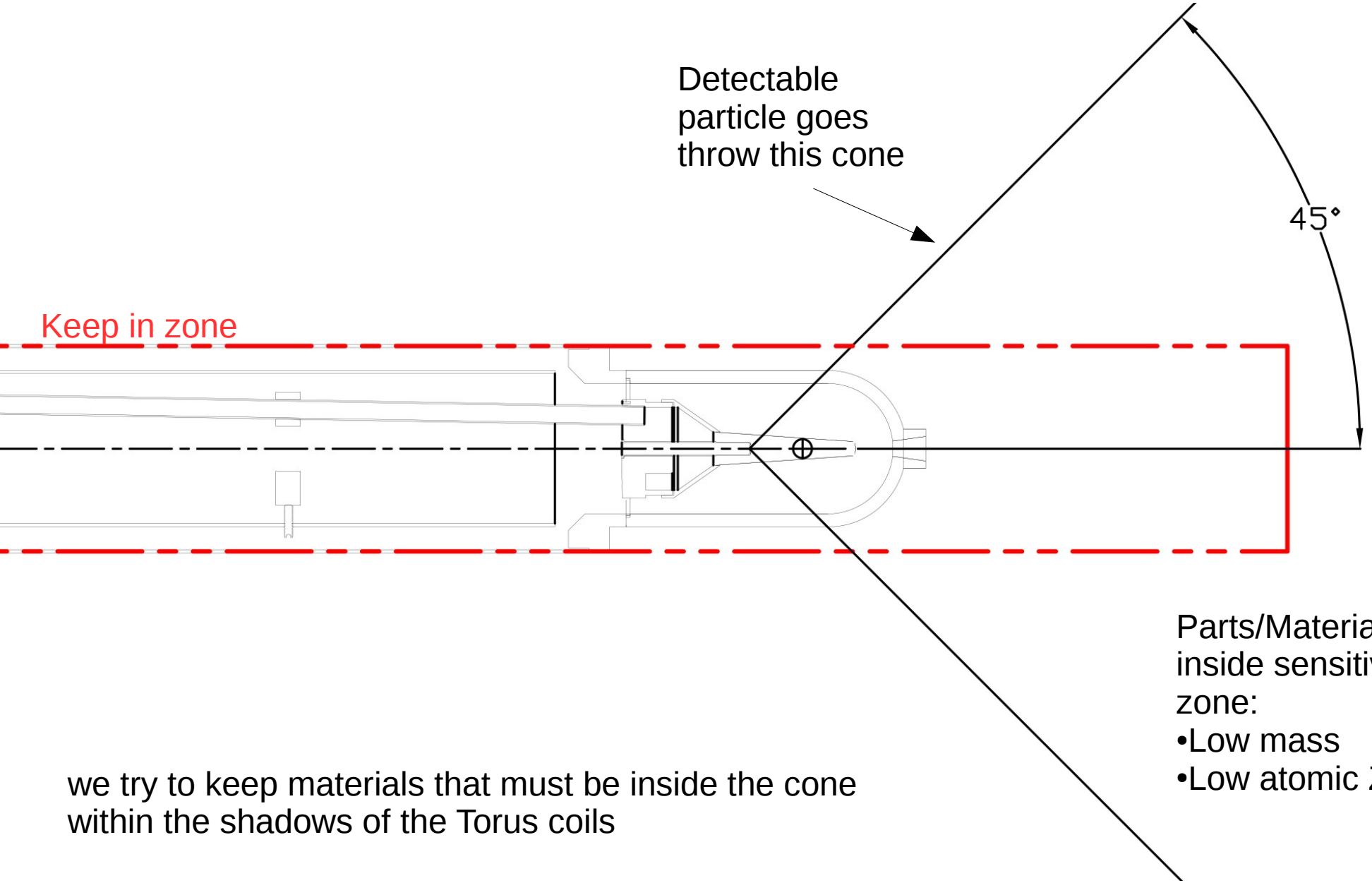
Partial Section View of the SVT, MVT, target center and beam pipe



Keep in zone – beam pipe



Detector Acceptance Region



Parts/Materials inside sensitive zone:
- Low mass
- Low atomic Z

we try to keep materials that must be inside the cone within the shadows of the Torus coils

Extreme Conditions

- High Vacuum (6x10E-6 mbar) → low gas loads materials
- Magnetic Field (5 Tesla) → Non-magnetic materials
- Cryotarget (30 °K) → Low temperature resistant
- Radiation Hardness

The problem to solve is to generate precise movement (to exchange targets) in these extreme conditions.

Types of Solid Targets

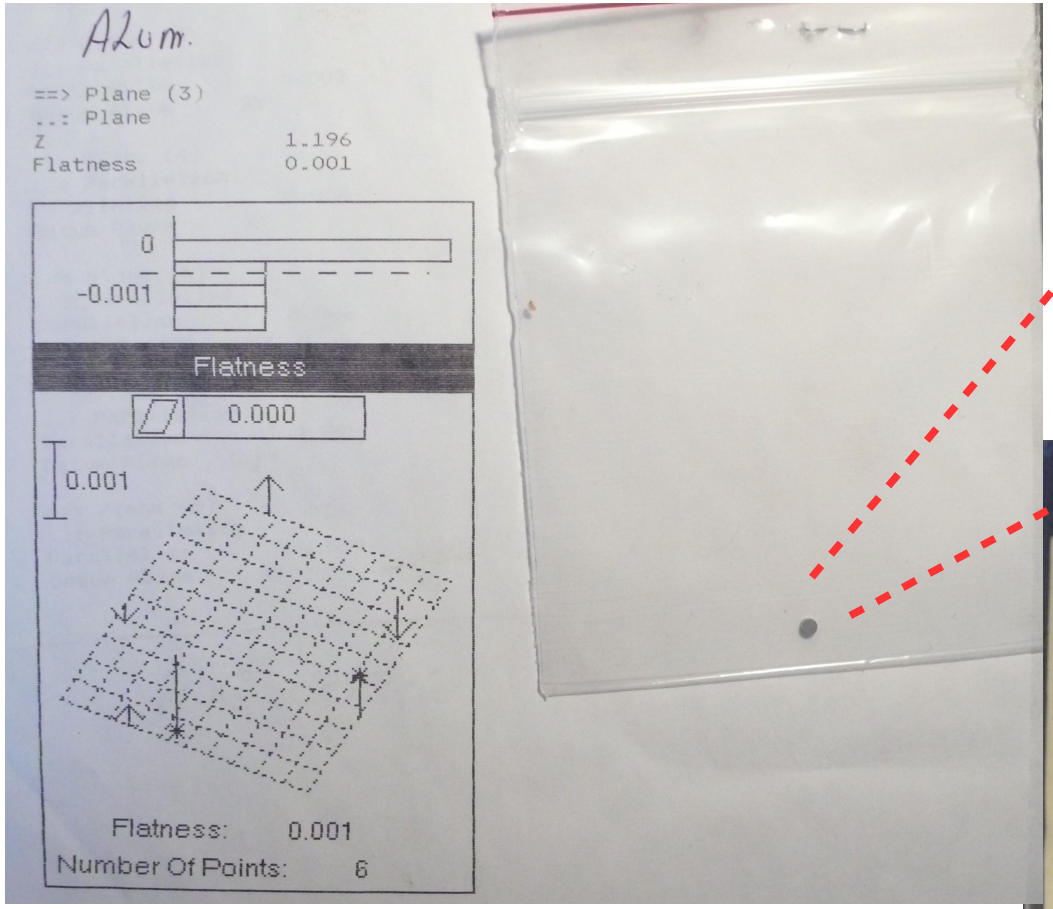
Properties of the solid targets

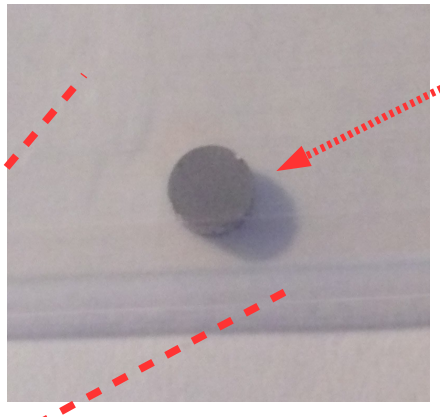
Target	Longitudinal thickness			Transverse thickness
	Dimension	Areal density (g/cm^2)	Radiation lengths	Areal density (g/cm^2)
Carbon	1.7 mm	0.38	0.009	0.33
Thin Aluminum	15 μm	0.00	0.000	0.41
Thick Aluminum	0.58 mm	0.16	0.007	0.41
Iron	0.40 mm	0.31	0.023	1.2
Tin	0.31 mm	0.23	0.026	1.1
Lead	0.14 mm	0.16	0.025	1.7

- Diameter: 3 mm

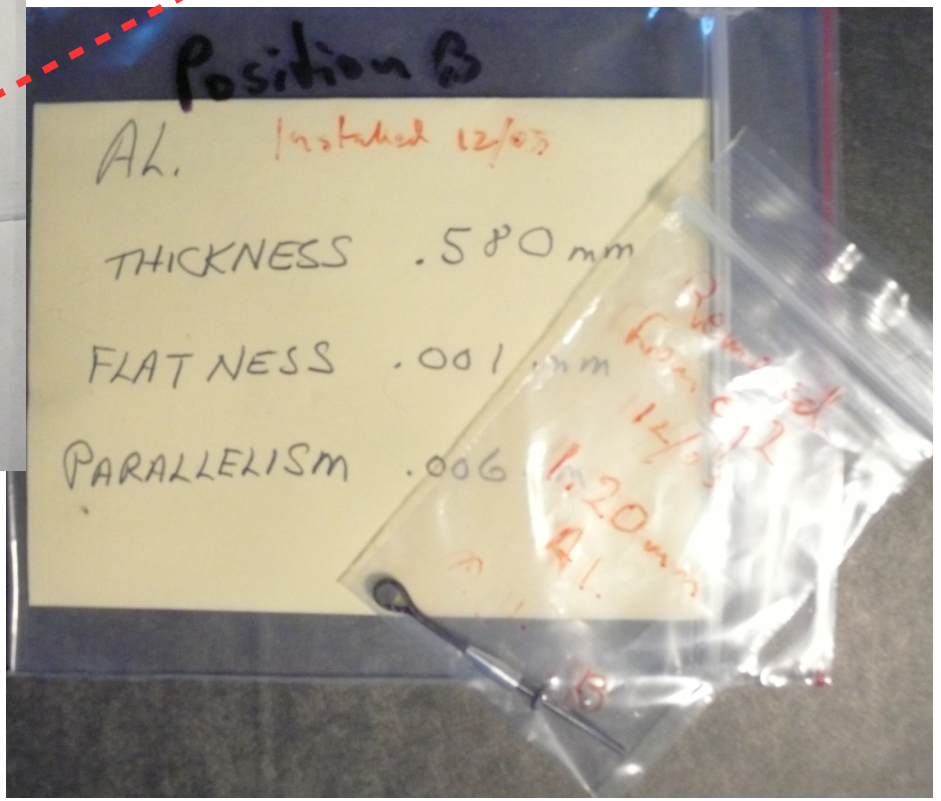
New targets types will include: 4He, C, O, Ar, Pb and others. Unfortunately no Fe.

Original Solid Target



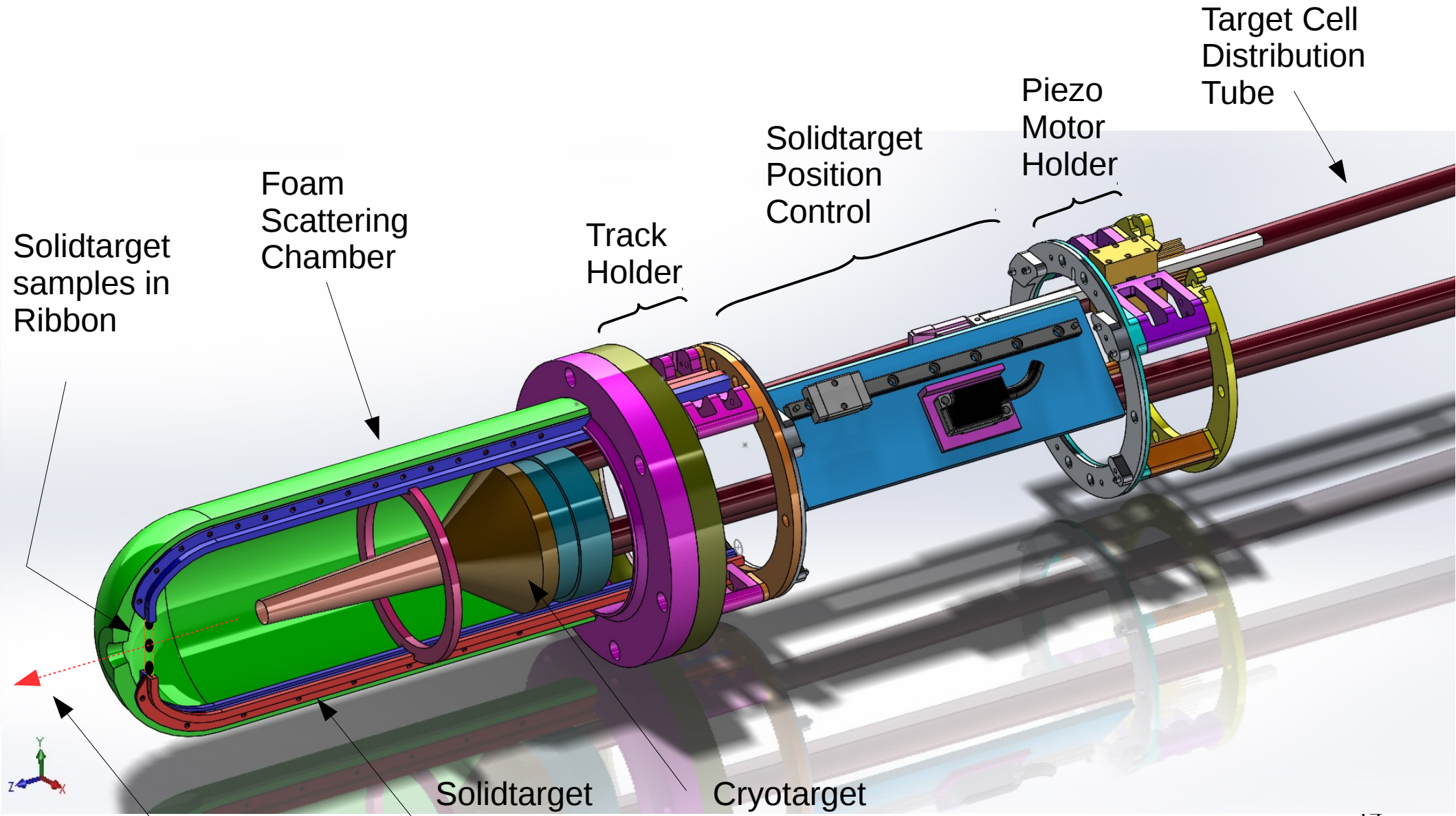


Al solid target
3 mm diameter

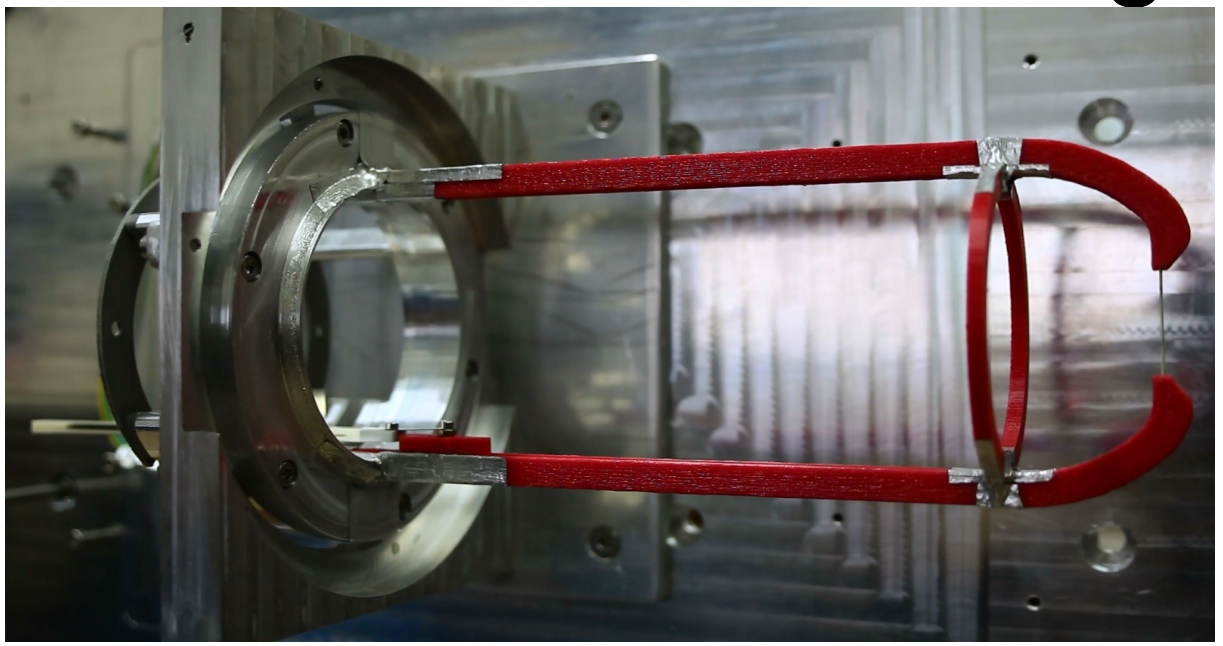


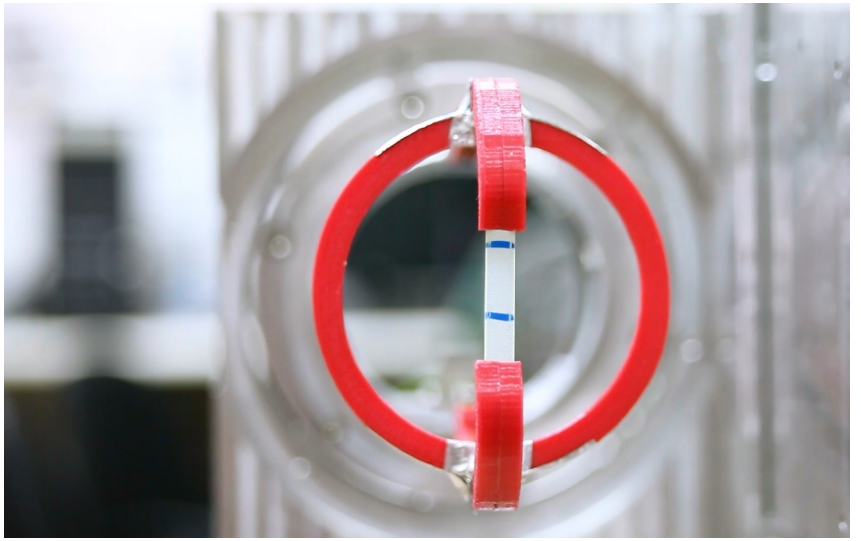
Materials for Cryocell fabrication

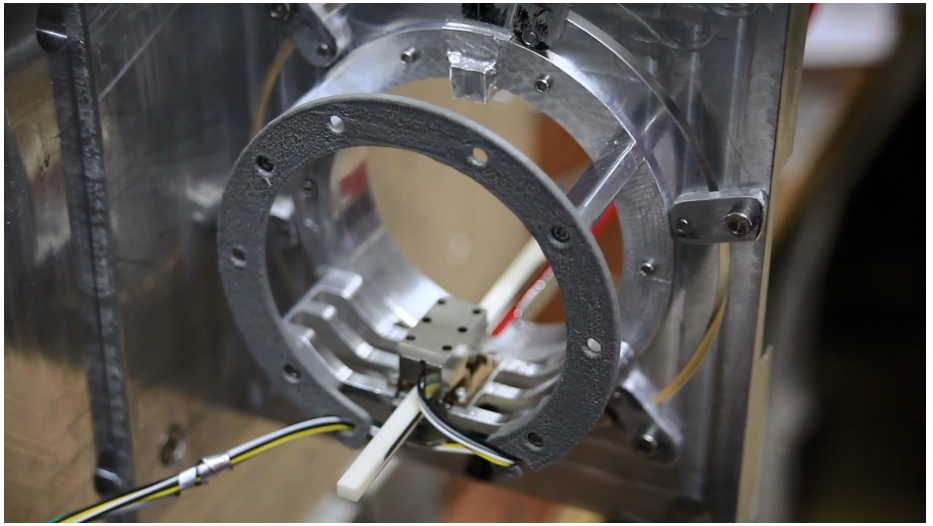
Full Assembly



Solid Target
1:1 working model







Materials and parts for high vacuum & magnetic field

- Materials for ribbon track
- Optic sensor for position control
- Optics connector
- 3 piezo motors + motor controller
- Kapton HN sheets
- Torlon raw pieces

Tests to perform

- Develop a control system for the movement precision and the mechanical robustness (in UTFSM)
- Test the target in the vacuum (in UTFSM)
- Test the target in the vacuum and high magnetic field (in JLab)

Mechanical Calibration

- Solid target Position Compensation
- Displacement of parts
- Foam Scattering Chamber seal

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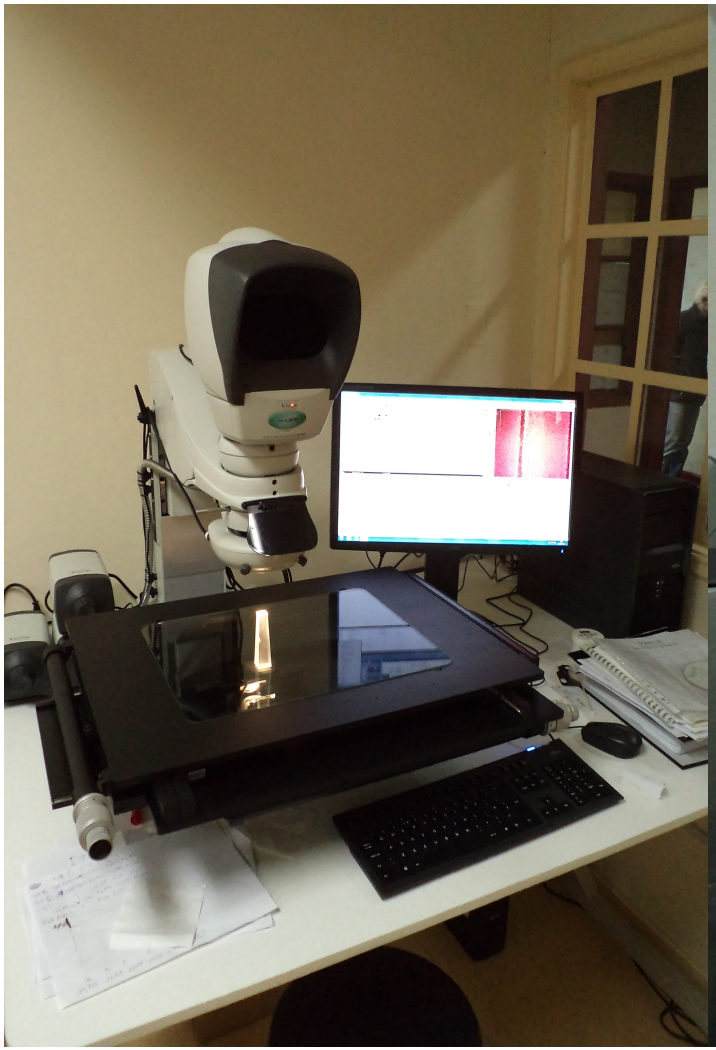
- Temperature operation
- Vacuum operation
- Magnetic field operation

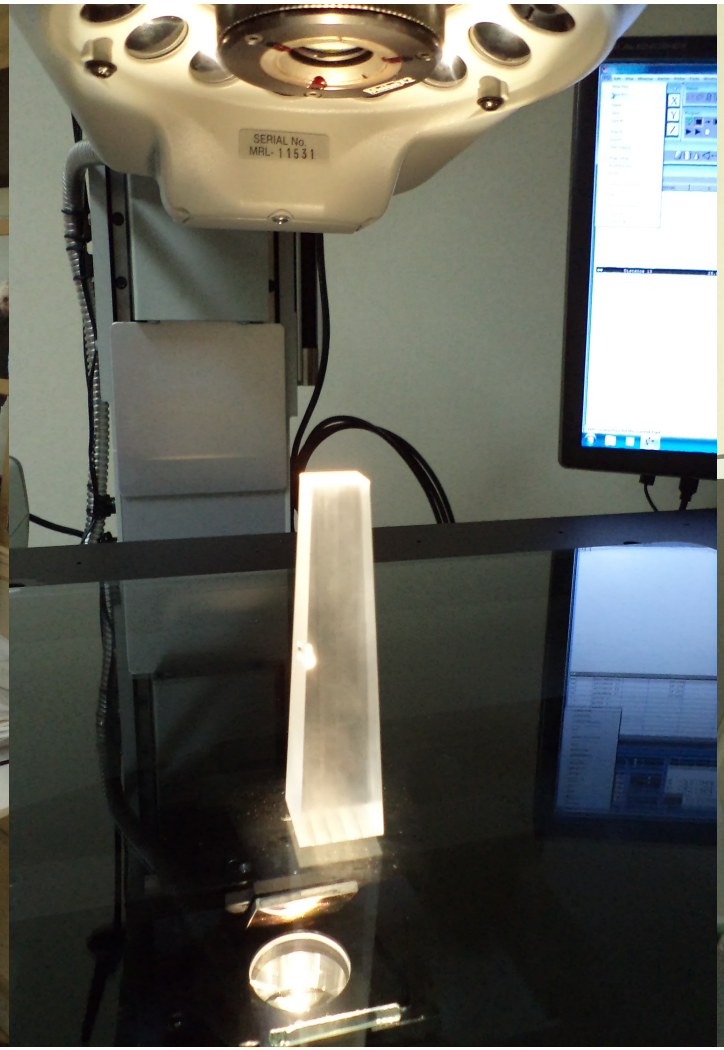
Encoder, high vacuum and no ferromagnetic materials configuration

+ Agreement with HEIDENHAIN GmbH for free use and testing of device in high vacuum and high magnetic field.

Encoder LIF 481V

Stage 3 (quality control)





Vision engineering Hawk 5000 monodynascope

Provides measurements with 3mk accuracy

While light guides can have ~127mk tolerance

QC5000 Part:LG-A_polished

File Edit View Measure Datum Probe Tools Windows Help

DRO

0.000 X

0.000 Y

0.000 Z

Datum

Program

Measure

Results

1X 5X 10X 50X 100X 200X AX UX

Video

25%

33%

50%

100%

Program

Program | Features

Status	Cx	Tol	Action	Data
			Program Properties...	
			Initial settings...	
			Open template "C:\QC5000\Templates\Projects\Lightguides\LG-cotas.5	
			Set @Sn. = or the user's response to "Ingrese numero de serie"...	
			Show the message "Cara de mppc arriba y perforacion a la izquierda	
		=	Create "Part"	
			Secondary Alignment on "Line 1"	
			Measure "Line 2"	
			Measure "Line 3"	
			Measure "Line 4"	
		•	Construct "Point 5"	
		•	Construct "Point 6"	
		•	Construct "Point 7"	
		•	Construct "Point 8"	
		↔	Construct "e"	
		↔	Construct "g"	
		•	Construct "Point 17"	
		↔	Construct "d"	
			Construct "angulo mppc"	
			Show the message "Cara de fibras arriba y perforacion a la izquier	
			Secondary Alignment on "Line 15"	
			Measure "Line 16"	
			Measure "Line 17"	
			Measure "Line 18"	
		•	Construct "Point 22"	
		•	Construct "Point 23"	
		•	Construct "Point 24"	
		•	Construct "Point 25"	
		•	Construct "Point 27"	
		↔	Construct "a"	
		↔	Construct "b"	
		↔	Construct "c"	
			Construct "angulo fibras"	
			Show the message "Montar guia de luz en machina y perforacion haci	
			Secondary Alignment on "Line 31"	
			Measure "Perforacion"	

Part View

Top

28-9-12 | Cartesian | MM | Ved Probes | 2X_VED | XY | Temp | DD | NLEC On | Auto Enter Off | editing

13:54

BAND (Back Angle Neutron Detector)

with Iñaki Vega, Milan Ungerer, William Brooks & collegues from ODU, TAU y MIT