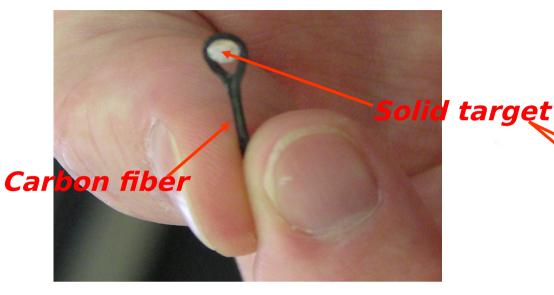
Double Target for CLAS12

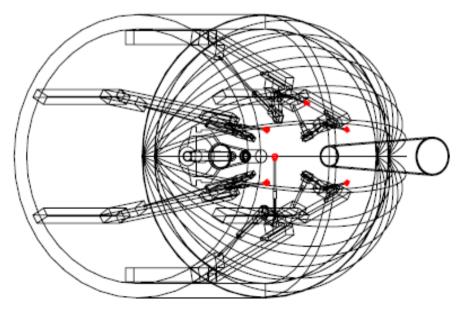
William Brooks, Hayk Hakobyan, Alejandro Peralta, Milan Ungerer, Juan (Iñaki) Vega Universidad Técnica Federico Santa Maria (UTFSM)

CLAS collaboration meeting June, 2017

Double Target in CLAS

Experimental details of Eg2 run

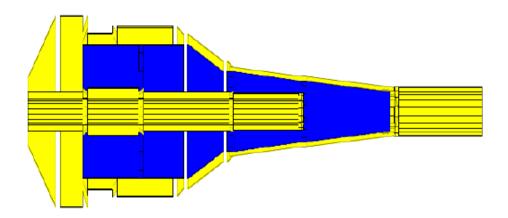




Rohacell foam scattering chamber

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

Liquid D,

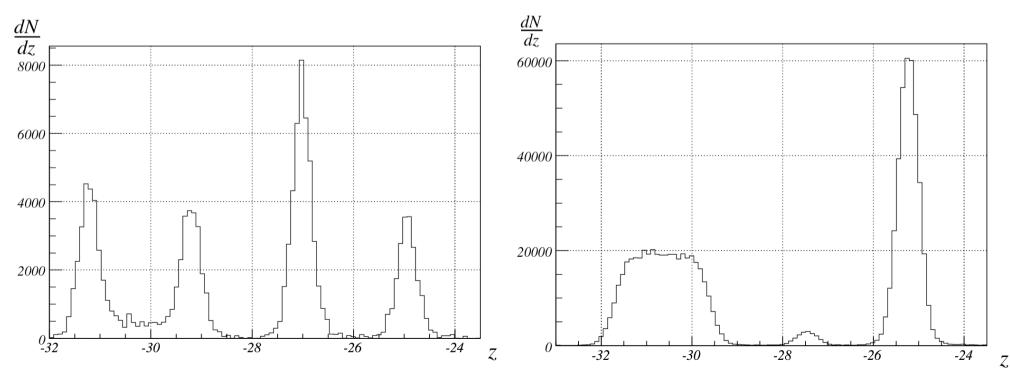


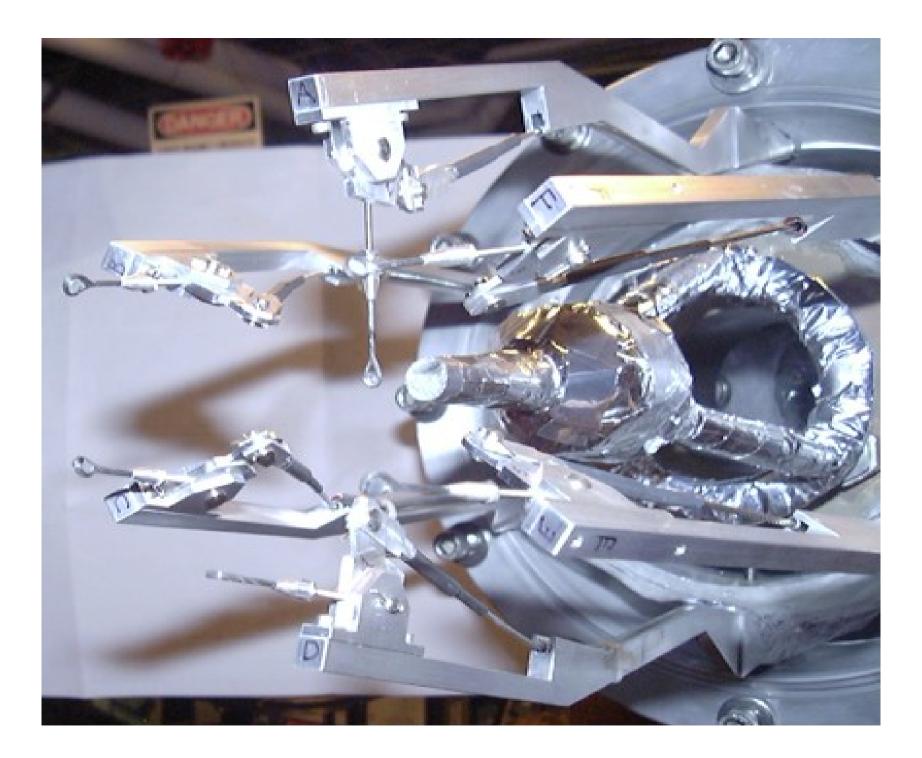
D_2 cell in GSIM

Real CLAS data

Liquid target empty

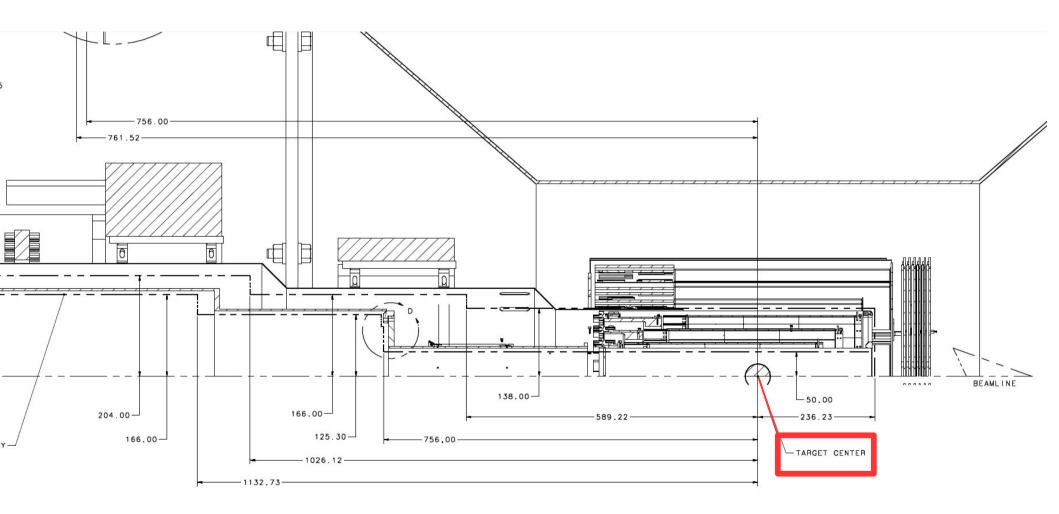
Liquid target full



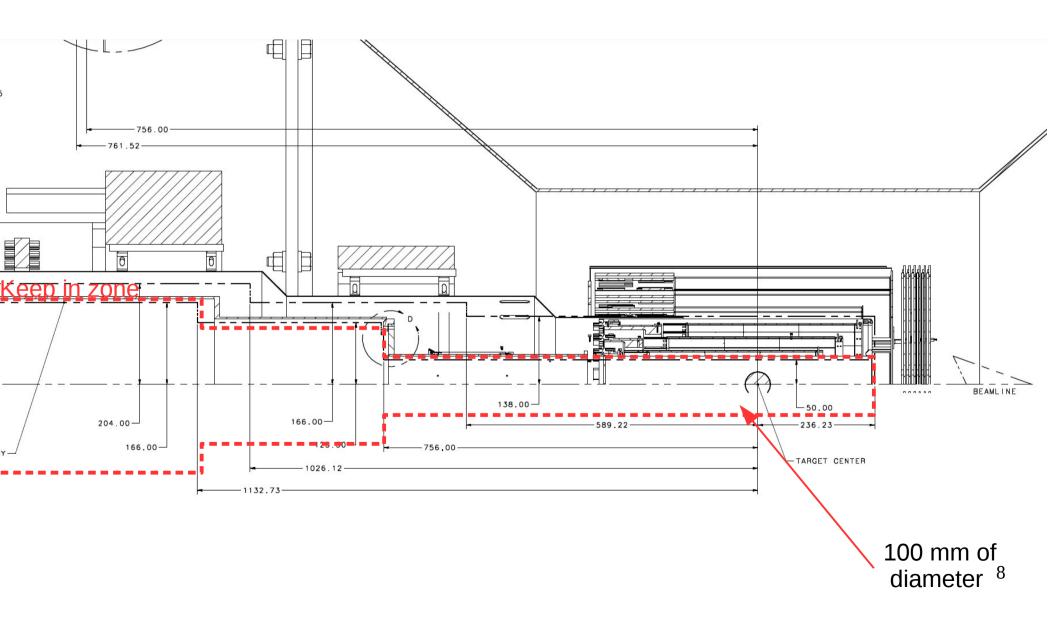


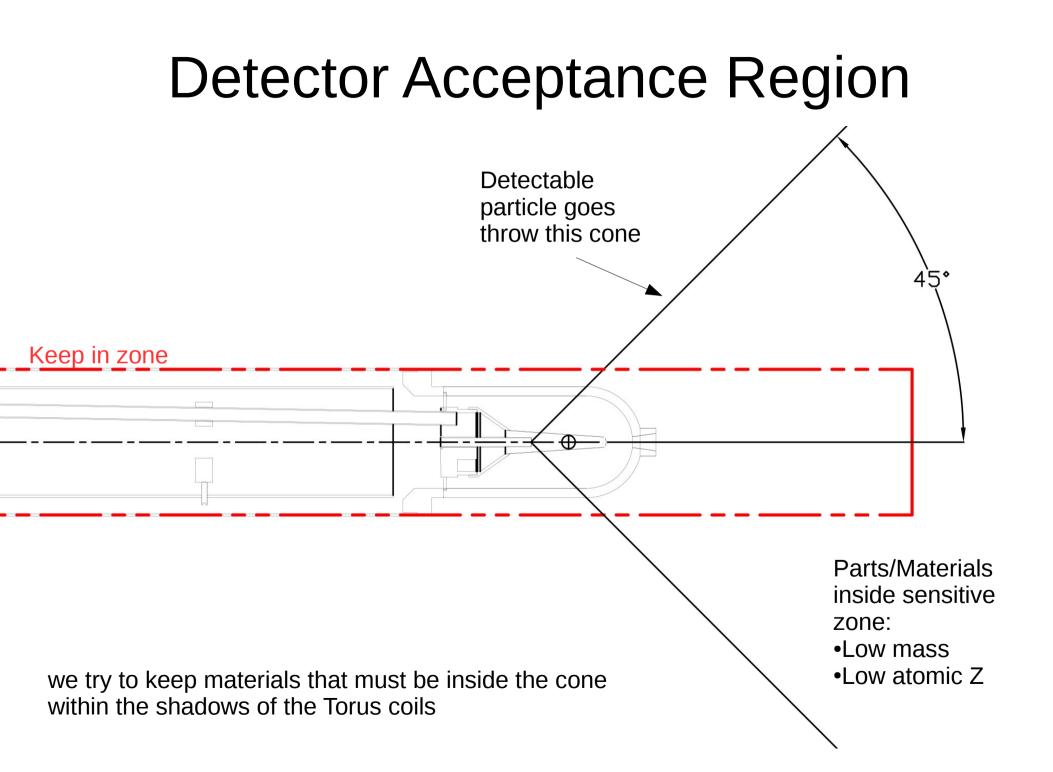
Double Target in CLAS12

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



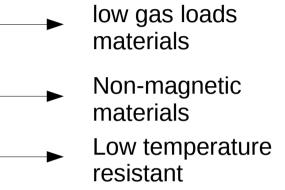
Keep in zone – beam pipe





Extreme Conditions

- High Vacuum (6x10E-6 mbar)
- Magnetic Field (5 Tesla)
- Cryotarget (30 °K)
- Radiation Hardness



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

Types of Solid Targets

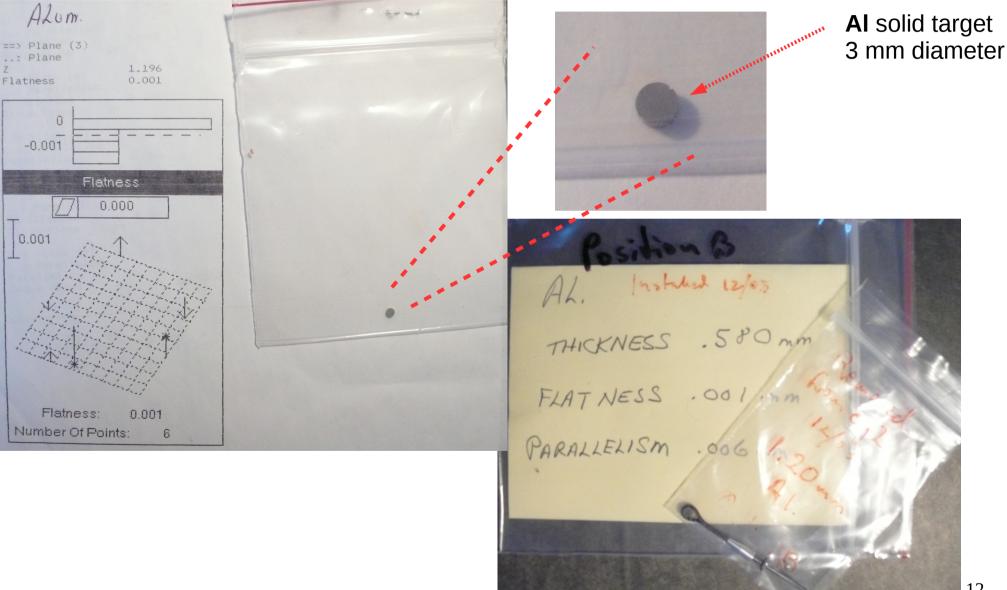
Properties of the solid targets

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

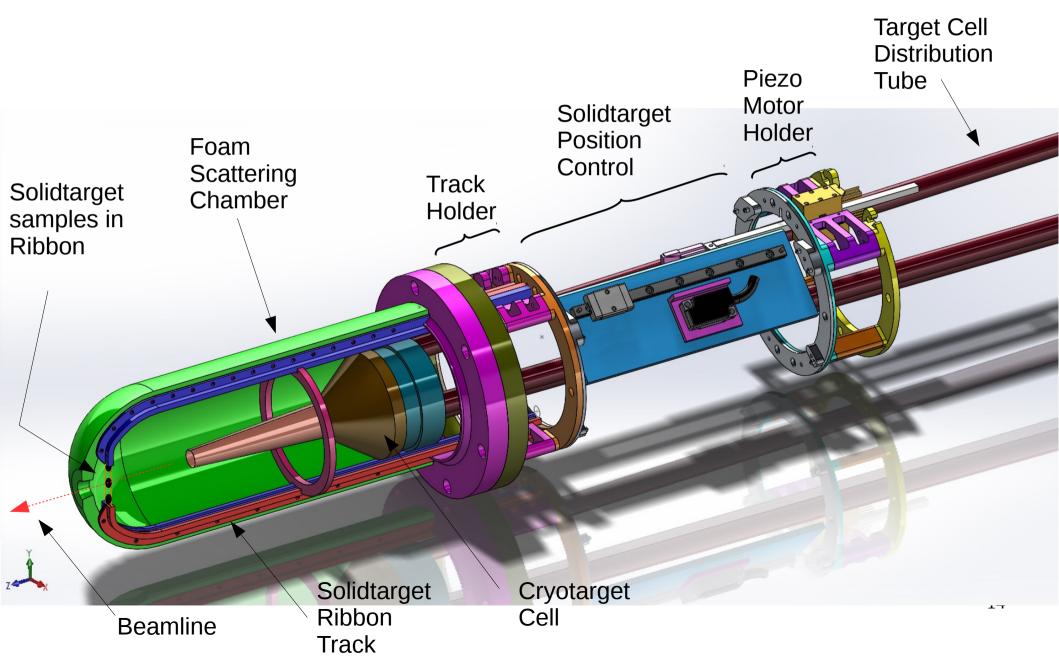


Materials for Cryocell fabrication

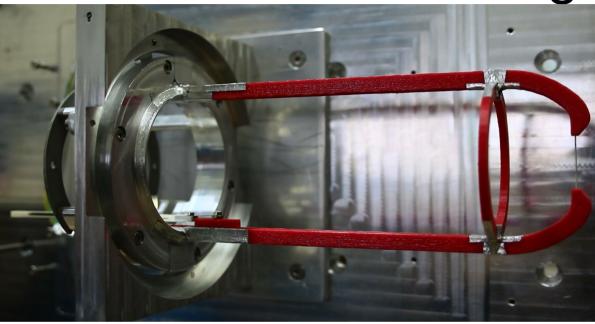


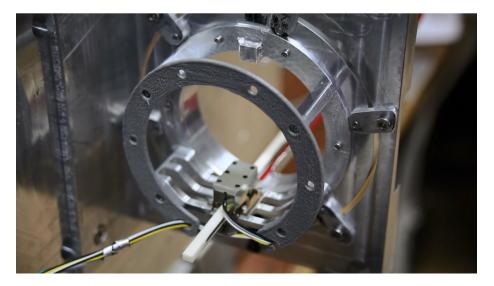


Full Assembly



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

- Temperature operation
- Vacuum operation
- Magnetic field operation ¹⁸

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 tolegance

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BAND (Back Angle Neutron Detector) with Iñaki Vega, Milan Ungerer, William Brooks & collegues from ODU, TAU y MIT

