MUSE Task 5

Design and Construction of a
Liquid Hydrogen Target

Overview

- LH2 targets are a known technology
- LH2 target for MUSE is a basic geometry that has been used at Saclay, LAMPF, TRIUMF, MAX-lab and MAMI.
- MUSE LH2 - “low-power” target
- MUSE LH2 – “low-pressure” system

--› Safety and Operating Procedures well-known

GW Cryogenics Laboratory
Exploration Hall
Room 133

Cryogenics Lab

- Refitting of lab will begin with approval of funding
- Former DC Deputy Chief of Safety and Wellness William Flint - now director of the Office of Health and Safety at GW will assure safe operating environment for all students, staff and faculty.
- Estimate 3 months to bring Lab to operating conditions.
- New shop just completed 25 meters from lab

Experts Consulted in Preparation of Lab Design and Target Construction

- Kurt Hansen – MAX-lab
- Christopher Keith – JLab
- David Kendellen – Duke
- Greg Smith – JLab
- Andreas Thomas – MAMI

--› provided their actual costs and helpful hints

--› will draw on some of these for consultation

Cryogenics Lab Staffing

- William Briscoe – Faculty
- TBN – Technician
- William Rutkowski – Chief Machinist
- TBN – Associate Machinist
- TBN – ½ Post-Doc (shared)
- Saif Ahmad – GRA (finishing coursework)
- TBN – GRA (3rd year student)
- TBN – Hourly undergraduate as needed

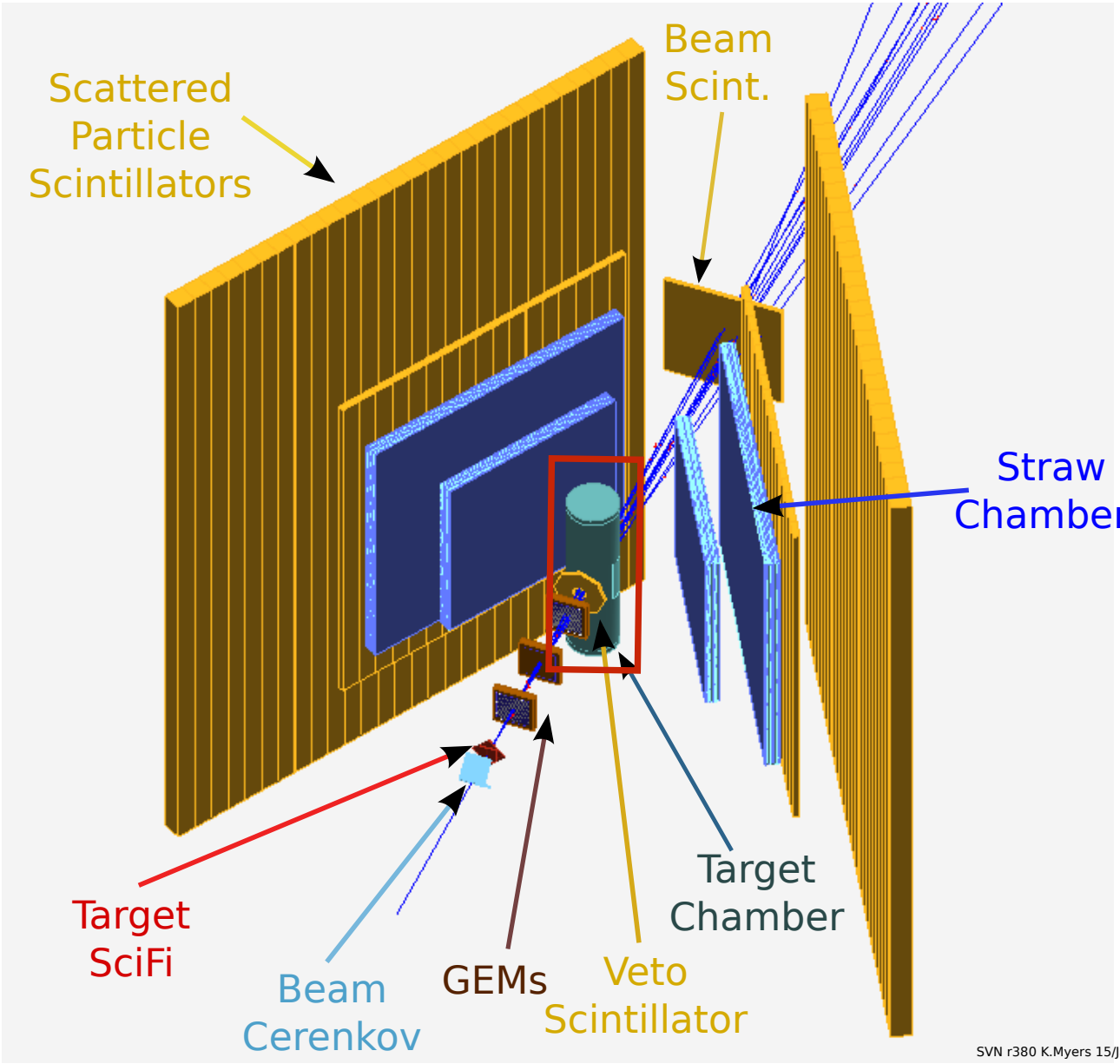
Work Summary

- Bring Cryolab to Safe Operating State 1-May-2014 1-Aug-2014
- Design Drawings 1-May-2014 1-Aug-2014
- Order Instrumentation, Hardware, and Monitoring Devices 1-Jul-2014 1-Sep-2014
- Order Cryopump - Cold Head 1-Jul-2014 1-Sep-2014
- Order Components of Motion System 1-Jul-2014 1-Sep-2014
- Order Material/Supplies for Scattering Chamber, Cell, Target Ladder, Holders and Railings 1-Jul-2014 1-Sep-2014
- Prototype Cells and Cell Holders Machining and Assembly 1-Sep-2014 1-Nov-2014
- Build Test Stand Chamber 1-Sep-2014 1-Nov-2014
- Pressure, Vacuum, Destructive Tests of Cell Prototypes 1-Nov-2014 1-Jan-2015
- Evaluation - Design Modification 1-Jan-2014 1-Feb-2015

Work Summary

- Prototype of Modified Cells 1-Feb-2015 1-Mar-2015
- Second Round of Tests - Cold Test of Cells 1-Mar-2015 1-Apr-2015
- Final Review of Design and Modifications 1-Apr-2015 1-May-2015
- Construction of Scattering Chamber 1-May-2015 1-Jul-2015
- Construction of Cells 1-May-2015 1-Jul-2015
- Tests of Cells and Scattering Chamber 1-Jul-2015 1-Sep-2015
- Evaluation - Modifications 1-Sep-2015 1-Oct-2015
- Second Round of Tests of Scattering Chamber and Cells Including motion test and test of emergency conditions 1-Oct-2015 1-Dec-2015
- Evaluation and Readiness Review 1-Dec-2015 1-Jan-2016
- Construct Boxes for Shipping and Packing 1-Jan-2016 1-Feb-2016
- Shipping, Receiving and Unpacking 1-Feb-2016 1-Mar-2016
- In Situ Assembly and Testing 1-Mar-2016 1-Apr-2016
- PSI Safety Engineering Review and Modifications to Make Compliant 1-Apr-2016 1-May-2016
- Turn over to PSI 1-May-2016 1-Jun-2016

Target


Scattered
Particle
Scintillators
Beam
Scint.
Straw
Chambers
Target
SciFi
Beam
Cerenkov
GEMs
Veto
Scintillator
Target
Chamber
SVN r380 K.Myers 15/Jan/2014

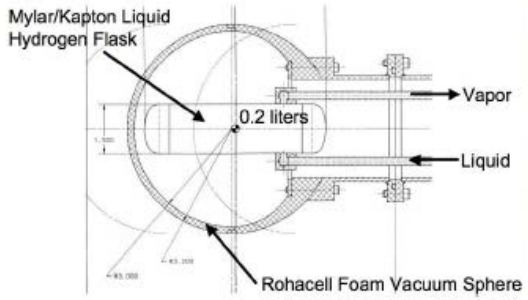
Target Parameters from Guy Ron

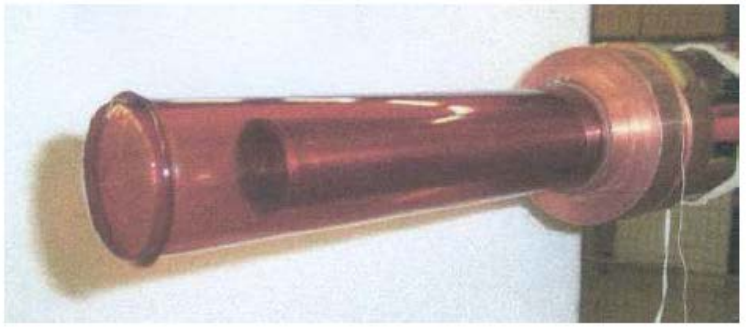
LH_2 target cell

- Thin windows to limit backgrounds
- Small enough to limit multiple scattering
- Big enough so all but tails of beam go through cryogen, not side walls.
- Current plan - 4 cm wide x 8 cm high x 4 cm long.

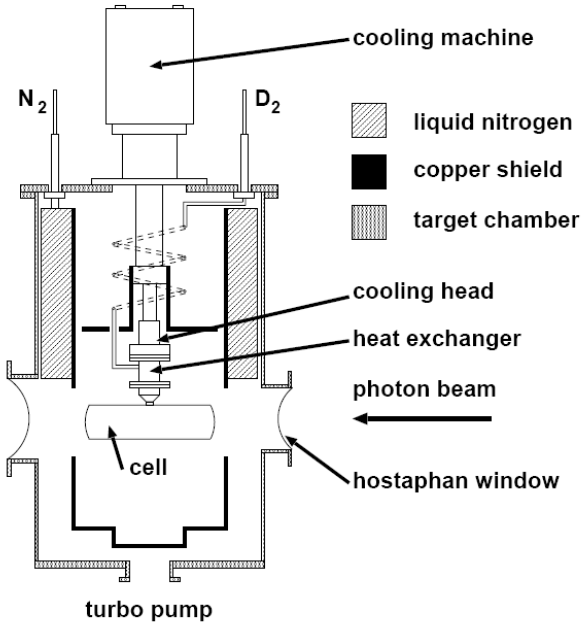
Low power system

- LN_2 baffles reduce heating.
- Snow prevention using baffles + extra space.





MAX-lab Target



Target Ladder Elements Requested by Spokespersons

- Full Target
- MT Target
- Dummy with 6 X thickness of Kapton walls
- Carbon Foil
- Blank

Budgetary Considerations (Excluding Travel)

Item	Direct Cost	Indirect Cost	Contingency	Total
Materials & Supplies	$135K	$70K	$53K	$258k
Equipment	$65K		$17K	$82K
External Labor	$49K	$26K	$19K	$94K
Technician	$191K	$99K	$58K	$348K
Post-Doc	$80K	$42K	$12K	$134
Students	$67K	$35K	$11K	$113K
Total	$587K	$272K	$170K	$1,029K

Summary

- Preparations begin with promise of funding
- Search and hiring of personnel in parallel
- Safety and security issues top priority
- Known technology with several available consultants from other recent projects
- Two-Years from start to turn key delivery
- PSI takes over after delivery