Calcium Target for use during PREX

Dustin McNulty
Idaho State University
mcnulty@jlab.org

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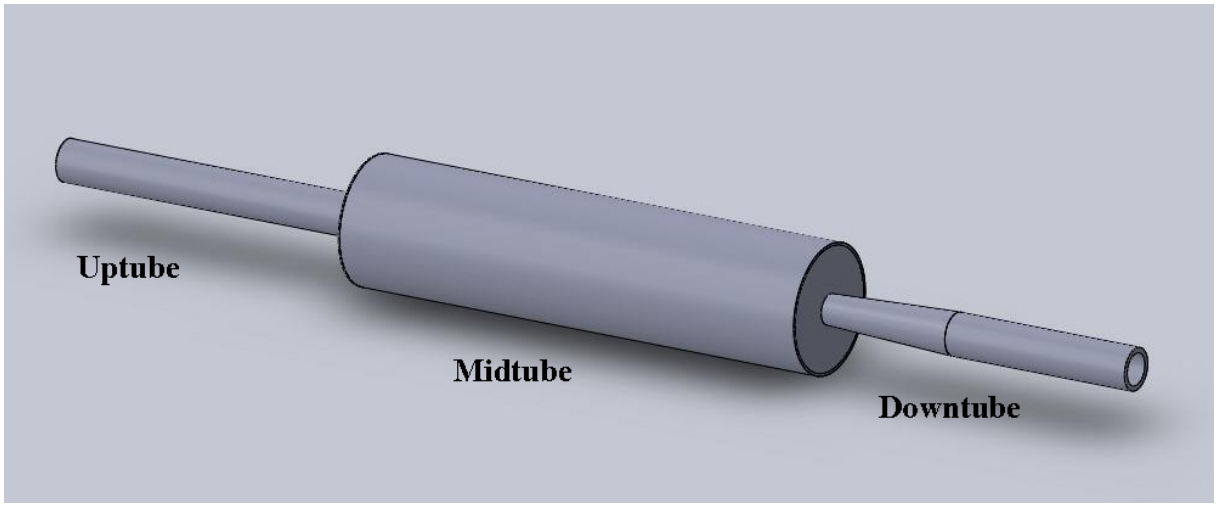
CREX ^{48}Ca Target Details

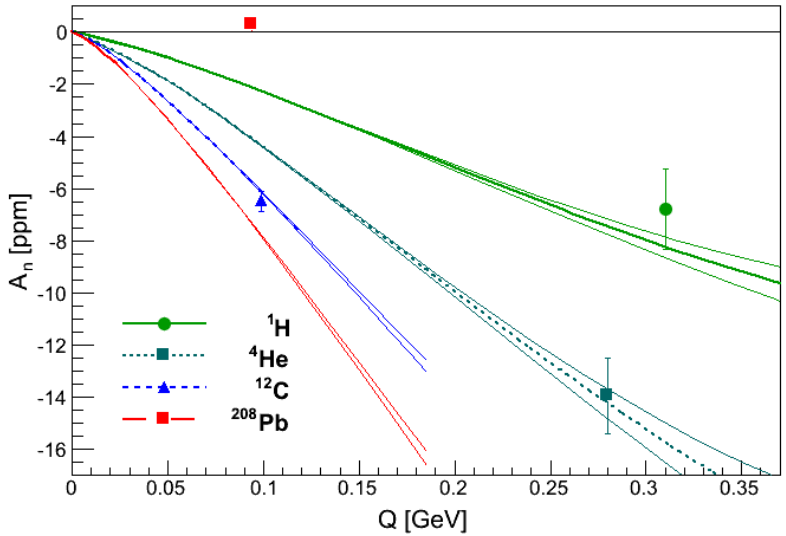


- 1g/cm^2 (~6.5mm thick $\Rightarrow$ 6.2% X_0) isotopically pure ^{48}Ca puck. Cost est. \$400k - \$500k (can lease for \$10,000/year according to Dave Meekins)
- Note that the ^{48}Ca puck from E08014 (which Dave still has) closely matches our requirements.

Why Calcium-40 for PREX?

- Measure beam-normal, single-spin asymmetry (A_n)
- Perform thermal stress test at 150μA (proposed CREX current)

^{40}Ca A_n Measurement



- No calculations yet (C. Horowitz and X. Roca Maza agreed to do these at PAVI)
- If coulomb distortions and dispersion corrections do not play strong role here, then expect $A_n^{Ca} \sim 7$ppm at $\sqrt{Q^2} \sim 0.1$ GeV
- What thickness ^{40}Ca target do we want for this publishable physics measurement? Balance rate and precision
- Note we also want this same target for CREX—to measure A_n^{Ca} at $\sqrt{Q^2} \sim 0.15$ ... to accompany our ^{48}Ca A_n meas. at same Q^2

Thermal Stress Test

- For this test, we want the full 1g/cm^2 thickness of CREX production target

- Need to think about best way to mount target for meaningful tests:
  - –Windows/cell walls? Are these important for the power/heat loads? Note we will not be able to fully replicate CREX cell
  - –Mimic CREX's thermal coupling to frame (most important?)
  - –Run long enough to achieve steady state at 150 μA. Do we need any special diagnostics here?

American Elements: High purity Calcium-40 foil

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Calcium Foil

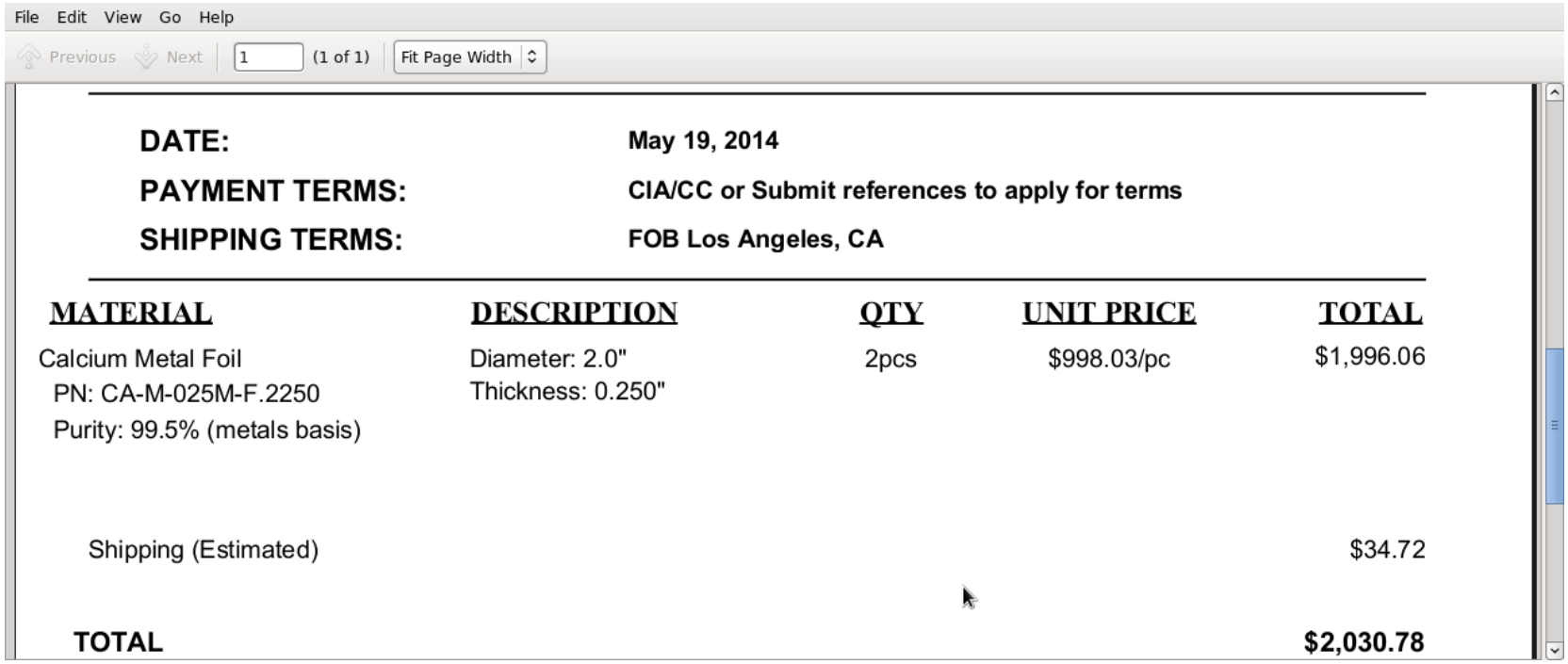
High Purity Ca Foil
CAS 7440-70-2

Product	Product Code	Order or Specifications
(2N) 99% Calcium Foil	CA-M-02-F	Contact
(2N5) 99.5% Calcium Foil	CA-M-025-F	Contact
(3N) 99.9% Calcium Foil	CA-M-03-F	Contact
(3N5) 99.95% Calcium Foil	CA-M-035-F	Contact
(4N) 99.99% Calcium Foil	CA-M-04-F	Contact
(5N) 99.999% Calcium Foil	CA-M-05-F	Contact

CHEMICAL IDENTIFIER	Formula	CAS No.	PubChem SID	PubChem CID	MDL No.	EC No	Beilstein Re. No.	SMILES Identifier	InChI Identifier	InChI Key
	Ca	7440-70-2	24852872	5460341	MFCD00085314	231-179-5	4241647	[CaH2]	InChI=1S/Ca	OYPRJOBELJOOCE-UHFFFAOYSA-N

PROPERTIES	Mol. Wt.	Appearance	Density	Tensile Strength	Melting Point	Boiling Point	Thermal Conductivity	Electrical Resistivity	Eletronegativity	Specific Heat	Heat of Vaporization	Heat of Fusion	MSDS
	40.07	Silvery	1.55 gm/cc	N/A	839°C	1484°C	2.01 W/cm/K @ 298.2 K	3.91 microhm-cm @ 0 °C	1.0 Paulings	0.156 Cal/g/K @ 25°C	36.74 K-Cal/gm atom at 2467°C	2.23 Cal/gm mole	Safety Data Sheet

American Elements Quote



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DATE: May 19, 2014

PAYMENT TERMS: CIA/CC or Submit references to apply for terms

SHIPPING TERMS: FOB Los Angeles, CA

MATERIAL	DESCRIPTION	QTY	UNIT PRICE	TOTAL
Calcium Metal Foil PN: CA-M-025M-F.2250 Purity: 99.5% (metals basis)	Diameter: 2.0" Thickness: 0.250"	2pcs	$998.03/pc	$1,996.06
Shipping (Estimated)				$34.72
TOTAL				**$2,030.78**

Summary Discussion

- High chemical purity Ca-40 targets are cheap. $1k for thick puck; Need to contact other vendors for thinner target possibilities
- Is 99.5% pure good enough? Probably, but what are impurities? How does vendor deal with oxidation (packaging/shipping)?
- How will we deal with the oxidation problem? Various options discussed with Dave here: Store in mineral oil...can install without windows, clean oil off and pump-down, ...
- How many targets to purchase for this? 2 thick, 2 thin
- What else?