Tagger/shield cost studies

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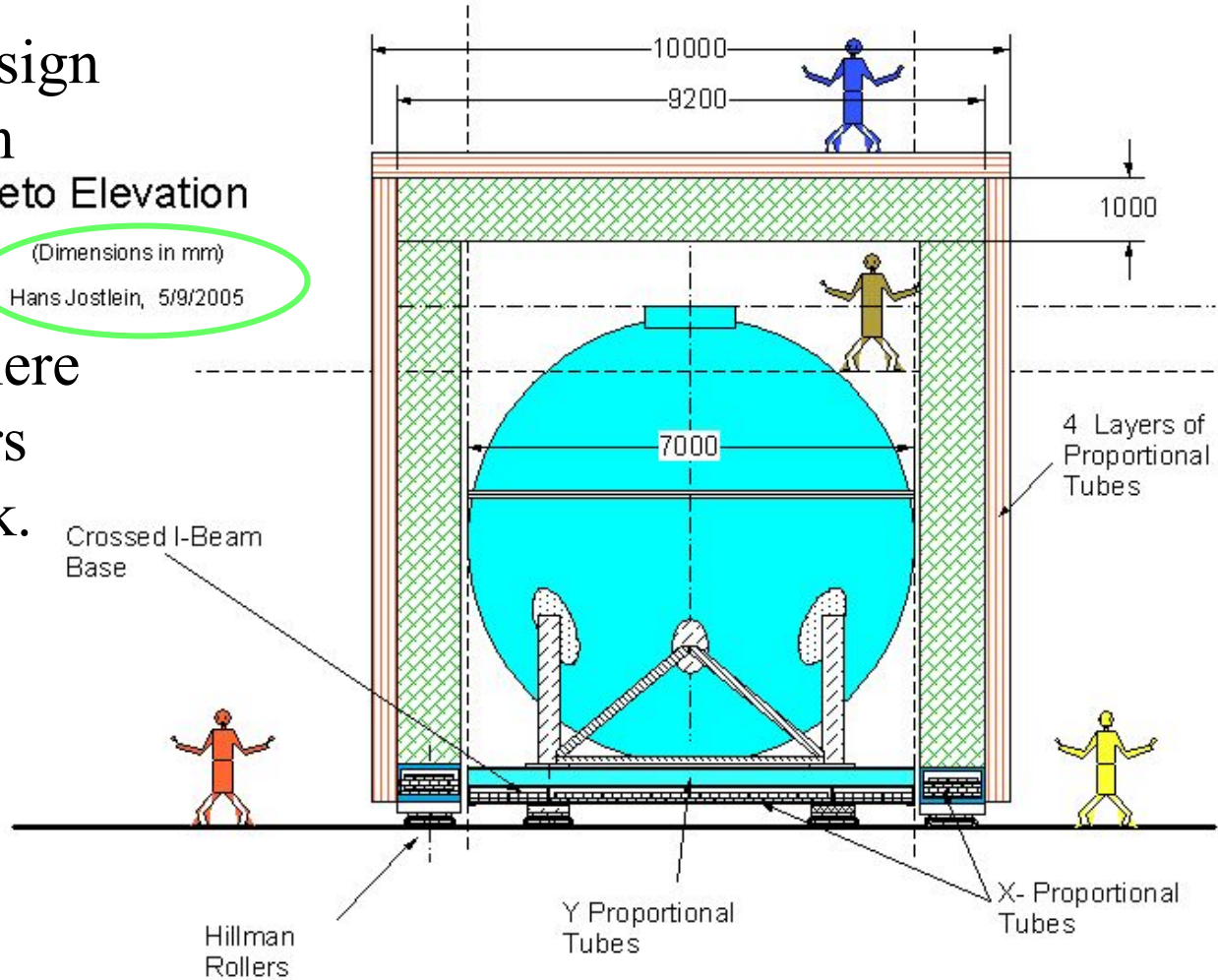
(showing work of Hans Jostlein, Jon Link, SD, Dick Yammamoto, Peter Fisher, and Steve Biller)

Design Requirements, Options

- Requirements
  - ✓Hermetic!! (at least 99% efficiency over ~400m^2!)
  - ✓Position resolution ~20cm on all sides (mod. res. tracking)
  - ✓Access to neck to insert sources
  - ✓At least 7 attenuation lengths for neutrons
- Working Design- Passive shielding + position detectors
  - -~1m CHESS concrete (half of weight is iron)
  - -Successful use at Cornell
  - -Requires hermetic position detectors (e.g. RPC's)
- Alternate design- Active shielding
  - -2m water or liquid scintillator
  - -Perhaps more challenging technology
  - -Measure position and energy

Box design

- Most straightforward design
  - ✓1m shielding shown
- 2 xy layers shown here
  - ✓Design still in flux
  - ✓Prop tubes shown here
  - ✓4 RPC double layers outside should work.
- Shows minimal space inside shielding
  - ✓'Inside' layers still under study
- neck access from inside veto box



Cost Analysis

- Ongoing process, gradual changes (mostly increases) in last 6 months
  - Use physicist's estimates for structural costs
  - At least all categories now identified
- Some quotes from vendors, shops
  - Iron pellet vendor (Quebec-Cartier mining)
  - RPC experience of Belle
  - 'Oxford' quote for active scin tanks
- Engineering help to make firm estimates required!
  - Right now, contingency~60% recommended

Latest cost estimates

- Most numbers from quotes or previous work
- Estimated based on similar experience (need engineer help)
- We can stay within proposal guidelines (so far)
- Large construction project for detectors (~3-4 groups for 1-2 yrs)
- Shipping cost for hematite significant
- Liquid scin very expensive

Configuration	CHESS Concrete with RPC's	CHESS Concrete with tubes filled with liquid scintillator or water	water tanks with PMTs
Overview			
Shield thickness	1 m	1 m	2 m
Detection process	Gas ionization	Scin or Cerenkov	Cerenkov
Detector layers	4	1	1
Total channels readout	6136	1092	300
Shield			
Labor	$50,000	$50,000	$50,000
Materials	$219,604	$219,604	$990,000
Frame	$60,000	$60,000	$350,000
Tagger Detector			
Factory setup	$100,000	$100,000	$0
Materials	$135,130	$500,000	$261,000
Construction labor	$414,000	$100,000	$0
Readout+HV	$110,448	$144,000	$47,000
Consumables, purification	$11,325	$0	$100,000
Mounting	$40,000	$10,000	$30,000
Total Cost per detector	**$1,140,507**	**$1,183,604**	**$1,828,000**

What's next?

- Continue to improve simulations (required)
  - ✓ Addition of tagger/shield to RAT nearly complete
- Develop core idea – passive shielding+RPC's
  - ✓ Existing design builds on past success
    - ➢ Heavy concrete at CHESS (Cornell)
    - ➢ Glass RPC's at BELLE (see my note)
  - ✓ Engineering help on design/cost (required)
  - ✓ Eng issues not trivial, cost will increase
  - ✓ Build prototypes/test long term properties
- Continue prototyping work on active shielding