Feasibility Study II
Enclosure and System Design

(Target Support Facility)

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Outline

- Component lifetimes
- Target and decay channel magnet arrangement
- Design and interface issues
- Remote handling considerations
- Conclusions

Target Support Facility Design

The facility arrangement will be based on:

- handling highly activated, Hg contaminated components
- meeting the operating availability (10^7 s/y)
- incorporating sufficient shielding for personnel and the environment
- minimizing facility cost drivers

Component Lifetime Estimate

(from Mokhov and Zeller)

Fluence in target region: 2.55×10^{14} p/s x 10^{-1} n/pot-cm^2 x 10^4 cm^2/m^2 x 70 Mgy/7 x 10^{21} n/m^2 x 10^7 s/y =

2.55×10^{10} Gy/y

for Cu @ 10^{12} Gy: $10^{12}/2.55 \times 10^{10} = 39$ y

for steel structure @ 10^{11} Gy: 3.9 y

Fluence @ 10^{-6} n/pot-cm^2 (5<Z<18m): 10^{10} Gy/2.55×10^5 Gy/y = 39,000 y

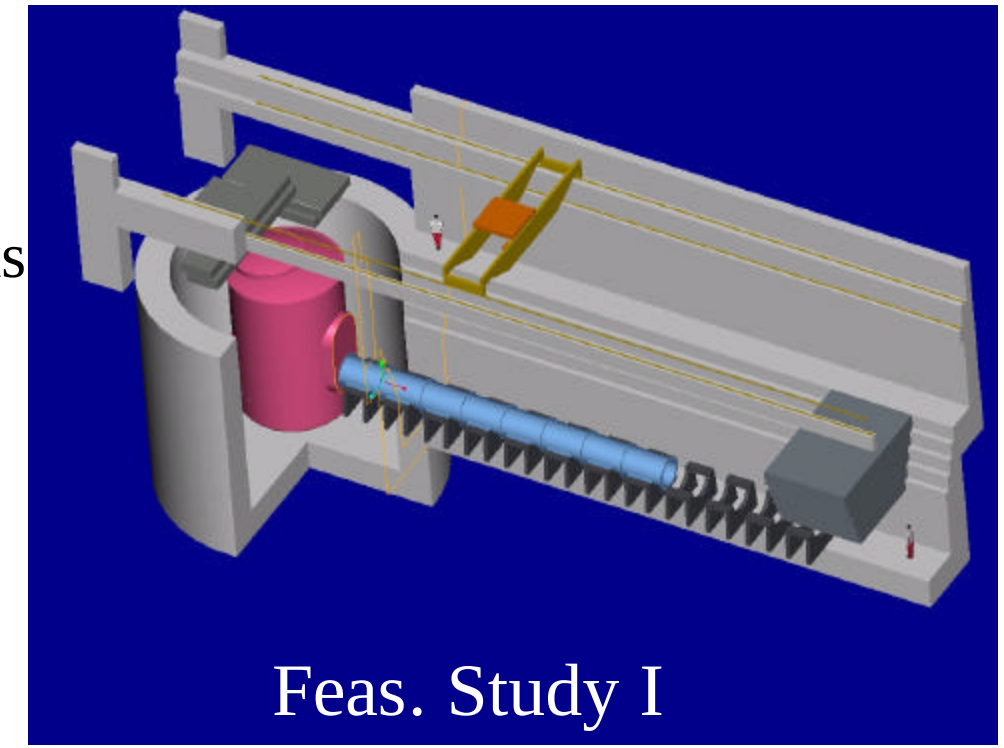
Component Lifetime (cont,)

- Except for the Hg target equipment in the 20T solenoid, all components appear to be life-of-the facility

Component	Life (yrs)
Hg Target Nozzle	< 1
Proton Beam Wind.	~ 1
HC Solenoids	>40
Beam Absorber	?
Low Field Solenoids	>40

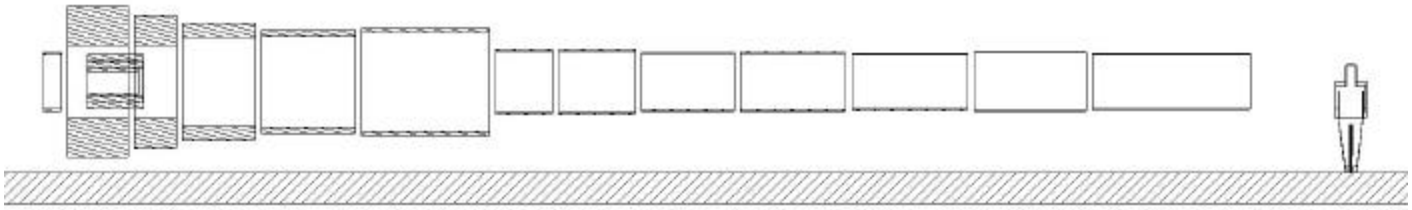
Facility Design (cont.)

- target system config.
- Hg containment and recycling
- target/capture solenoids
- shielding for environment
- shielding for people
- remote handling



Target & Transition Region Solenoids (conductor only)

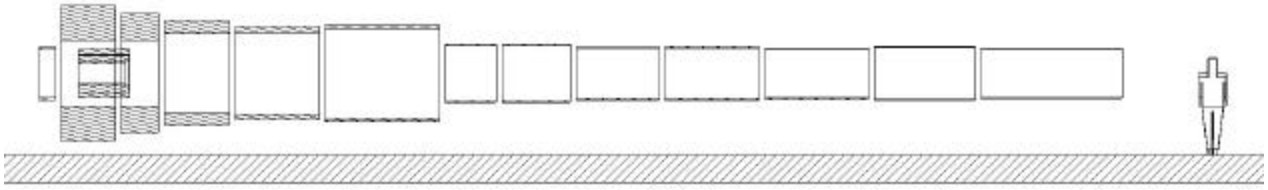
- Iron Plug 700 lbs
- HC 1-3 1300 lbs
- SC 1 17,100 lbs



- SC 2 8300 lbs
- SC 5 3300 lbs
- SC 7 450 lbs

Solenoids (cont.)

- The longest coil in the capture region is SC #12 @ 260 cm
- Can SC #7-12 be combined into three or four longer coils?



- The beam absorber may be combined with SC #6, and is located at 3 o'clock @ Z=6 to 7m

Solenoids (cont.)

- The decay region (Z = 18-48 m) contains 59 “small” coils that are ~ .5 m long

- Can they be consolidated into 10 coils?

Next Steps

- Confirm component lifetimes
- Calculate component weights/sizes
  - coil conductor + structure
  - W-C shield (target region)
  - steel shield (decay channel) ??
- Develop integrated design
  - incorporate “final” coil configuration
  - add beam absorber
  - fix tunnel size
  - add Hg target system (feed, collection, storage, …)
  - incorporate bio-shield
  - develop interface w/ PB window and induction linac
  - incorporate hot cell, cranes, RH equipment

Needed Information

- The target support facility requires several major design inputs
  - Hg target system concept (upsteam and downstream of Z=0)
  - who's doing the beam absorber concept design
  - interfaces w/ the proton beam and the induction linac

Conclusions

- Some of the major components are almost ready to be baselined (coils, shielding, building size, bio-shield, ...)
- The target support facility design is ready for ProEngineer modeling
- The target system conceptul design is needed
- The upstream and downstream interfaces need to be established

Feas. Study I Config.