ISAC Target Reliability from Design to Implementation to Long Term Service

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• Introduction to ISAC

• **Past:** Phase I – on-line testing
  • one target module
  • more target modules

• **Present:** Phase II – off line testing
  • ISAC target life cycle

• **Future:** Phase III – remote connect & disconnect
ISAC = Isotope Separation and Acceleration
Phase one

• Two target stations
• One target module

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Machine shop
6 - 12 months
ISAC Target Life Cycle

- **Machine shop**: 6 - 12 months
- **Target (material)**: 1 – 8 weeks
Target and target tube
ISAC Target Life Cycle

Machine shop 6 – 12 months

Target material 1-8 weeks

Target assembly and baking 5 days
• In house made target
  1 - 8 weeks
• Target assembly & baking
  5 days
ISAC Target Life Cycle

Machine shop
6 - 12 months → Target material
1 – 8 weeks → Target assembly and baking
5 days

Test stand
1 week
ISAC Target Life Cycle
Target assembly goes to the Test stand.
ISAC Target Life Cycle

- Machine shop: 6 - 12 months
- Target material: 1 - 8 weeks
- Target assembly and baking: 5 days
- Test stand: 1 week
- Target installed in Target Module: 2 days
Hot Cell (HC) – Target remote installation into the Target Module (TM)
ISAC Target Module
ISAC Target Life Cycle

1. Machine shop
   6 -12 months

2. Target material
   1 – 8 weeks

3. Target assembly and baking
   5 days

4. Test stand
   1 week

5. Target installed in Target Module
   2 days

6. Conditioning Station
   2 days
Conditioning station
ISAC Target Life Cycle

- Machine shop: 6 -12 months
- Target material: 1 – 8 weeks
- Target assembly and baking: 5 days
- Test stand: 1 week
- Target installed in Target Module: 2 days
- Conditioning Station: 2 days
- Target preparations for production: 2 days
- Beam Delivery: 2-4 weeks
- Post mortem analysis and storage
Phase I & II

Machine shop
6 -12 months

Target material
1 – 8 weeks

Target assembly
and baking
5 days

Test stand
1 week

Target installed in
Target Module
2 days

Conditioning
Station
2 days

Target preparations
for production
2 days

Beam Delivery
2-4 weeks

Post mortem
analysis and storage

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Documenting & Improving

- Target travel document
  - Learn from failures
  - Learn from success
- Standardized parts
- Dedicated target reliability engineer
• **Present: manual connect/disconnect**
  - Cool-down for one week after beam off
  - Beam off during manual dis/re-connect
  - Personnel dose

• **Future: remote connect/disconnect**
  - No cool-down necessary
  - Dis/Re-connect can be done while delivering beam from the other station
  - No dose to personnel
Machine shop 6 - 12 months → Target material 1 – 8 weeks → Target assembly and baking 5 days

Test stand 1 week → TRG installed in Target Module 2 days → Conditioning Station 2 days

Target preparations for production 2 days → Beam Delivery 2-3 weeks → Post mortem analysis and storage
• **Problems:**
  
  • Manufacturing problems
  
  • During baking:
    • Target legs warping
    • Target tube warping
  
  • During conditioning
    • Electrical short
    • Vacuum leaks
    • Water leaks
• Phase I $\Rightarrow$ II
  • Gain: $\sim$ 9 days beam availability and improved reliability

• Phase II $\Rightarrow$ III
  • Gain: $\sim$11 days beam availability and further improved reliability
Thank you!
Merci!

Questions?