HDice Target

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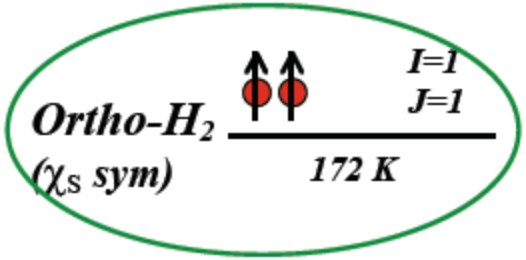
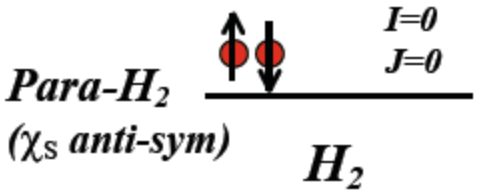
Motivation

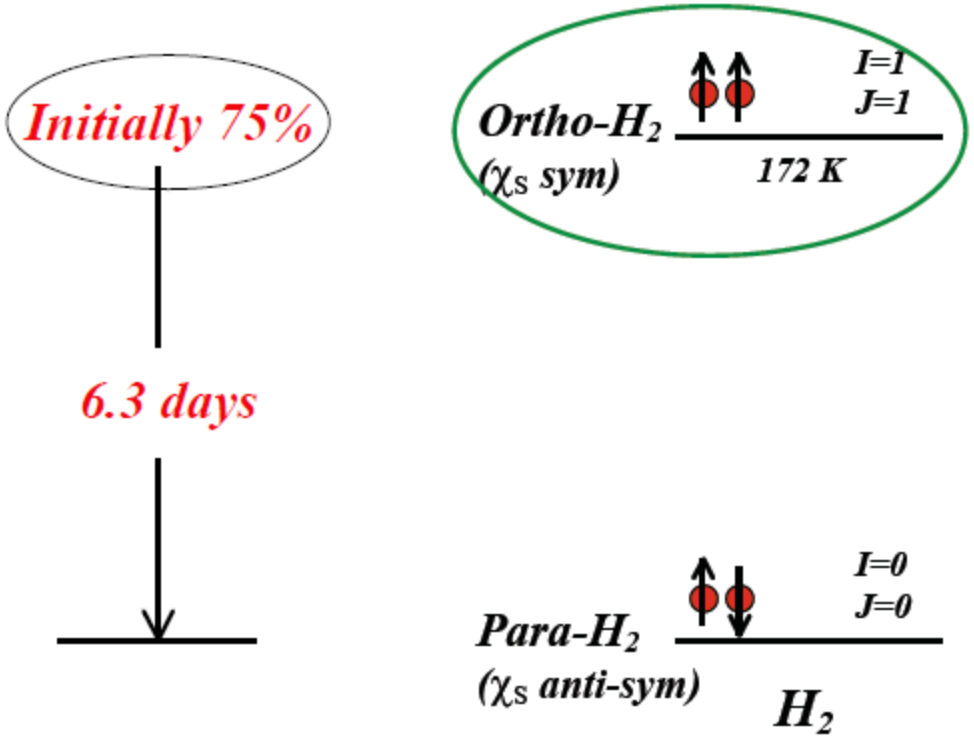
- Missing states in the baryon spectrum
- Broad and overlapping resonances
- Simple, Low Background, Portable

How the HD target work

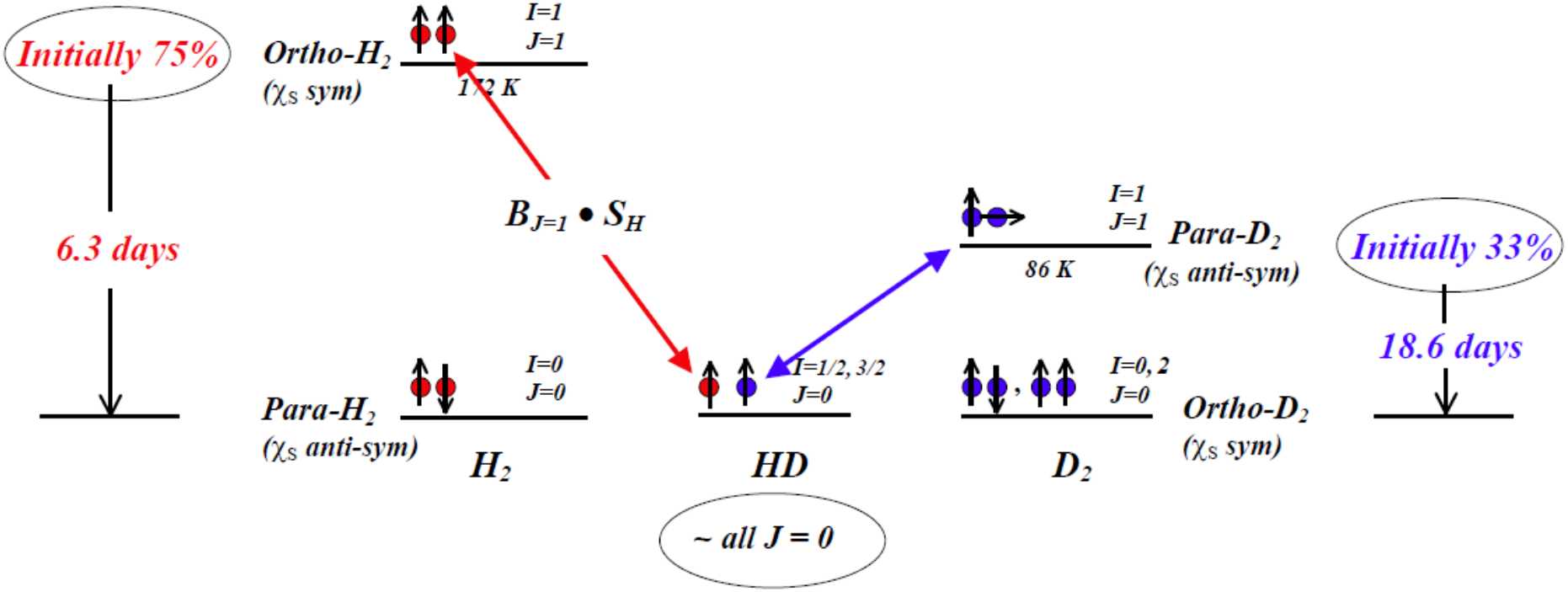




How the HD target work



How the HD target work



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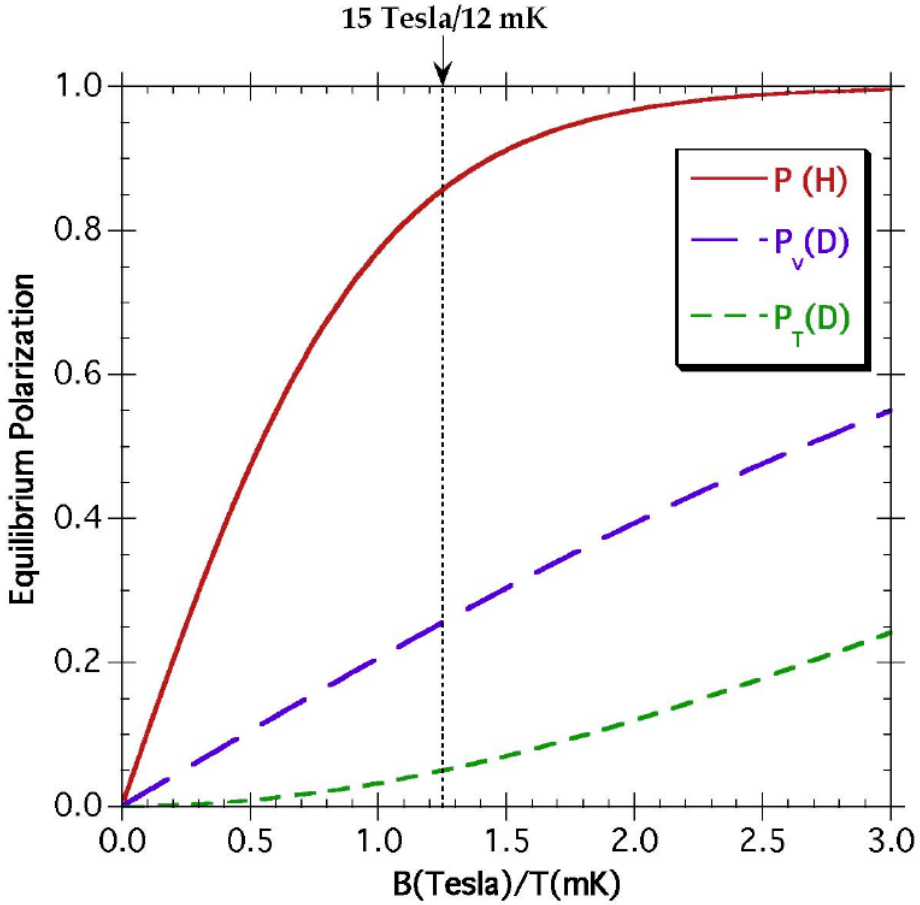
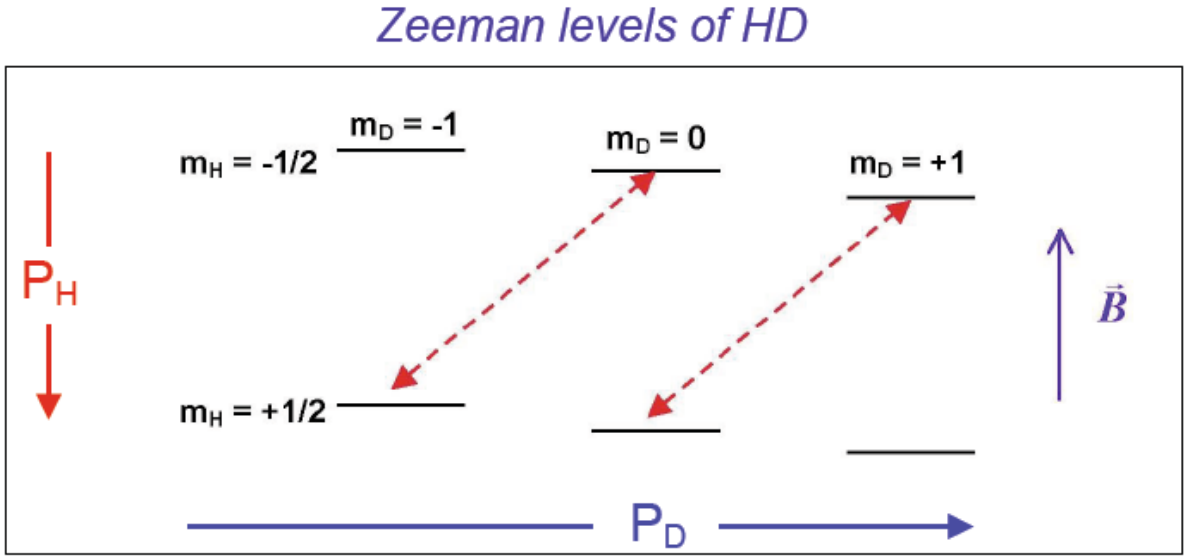


$$P(x;J) = \frac{2J+1}{2J} ctnh\left(\frac{2J+1}{2J}x\right) - \frac{1}{2J} ctnh\left(\frac{x}{2J}\right), \quad \text{where } x = \frac{\mu B}{k_B T}$$

How the HD target work

1st forbidden adiabatic fast passage (**FAFP**) to invert state populations

RF transfer
P(H) → P(D)



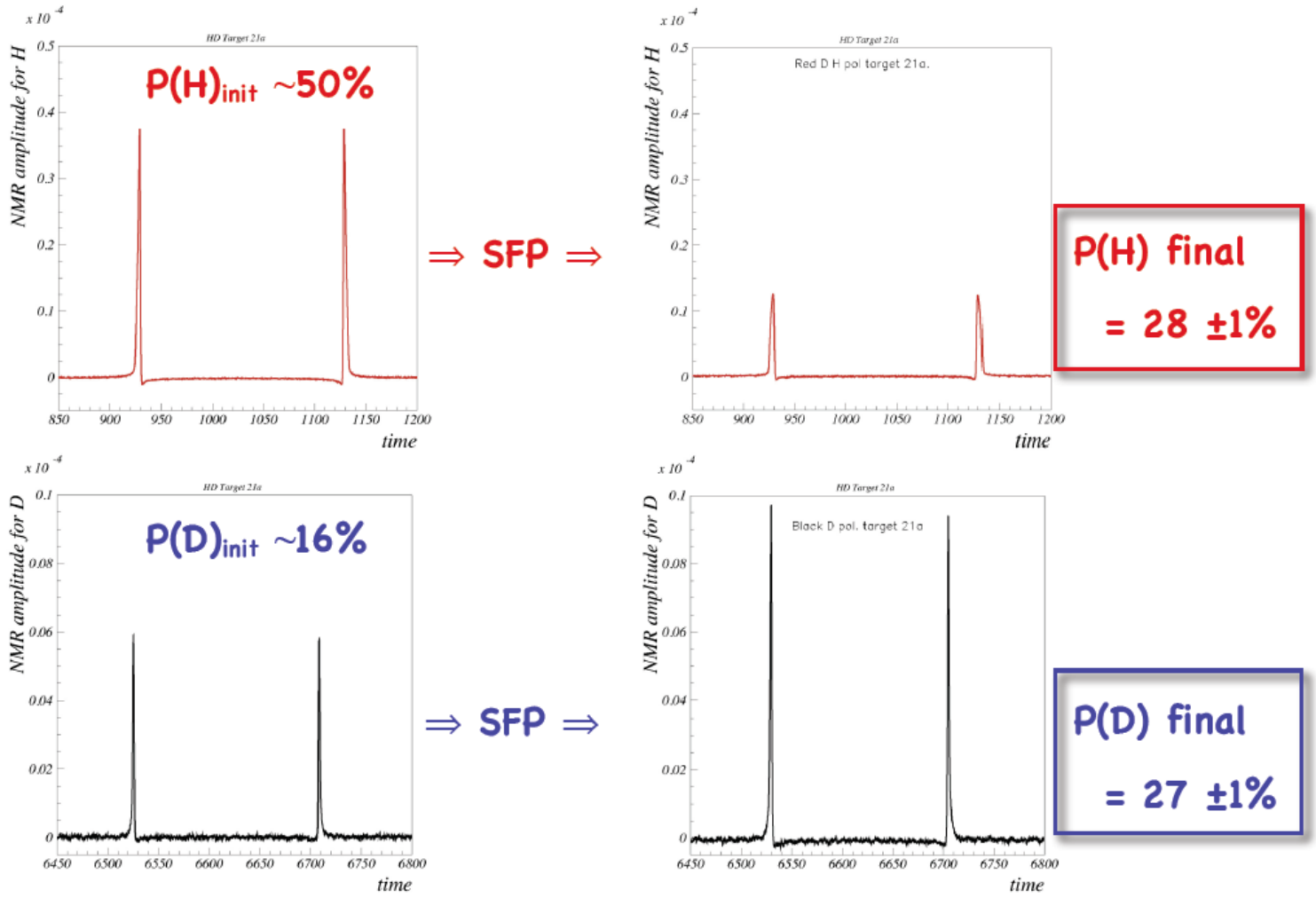
- requires high RF powers and very uniform fields

alternative: ***saturate the FAFP transition***

→ equalize $\{ m_H = +1/2;\ m_D = -1, 0 \} \Leftrightarrow \{ m_H = -1/2;\ m_D = 0, +1 \}$

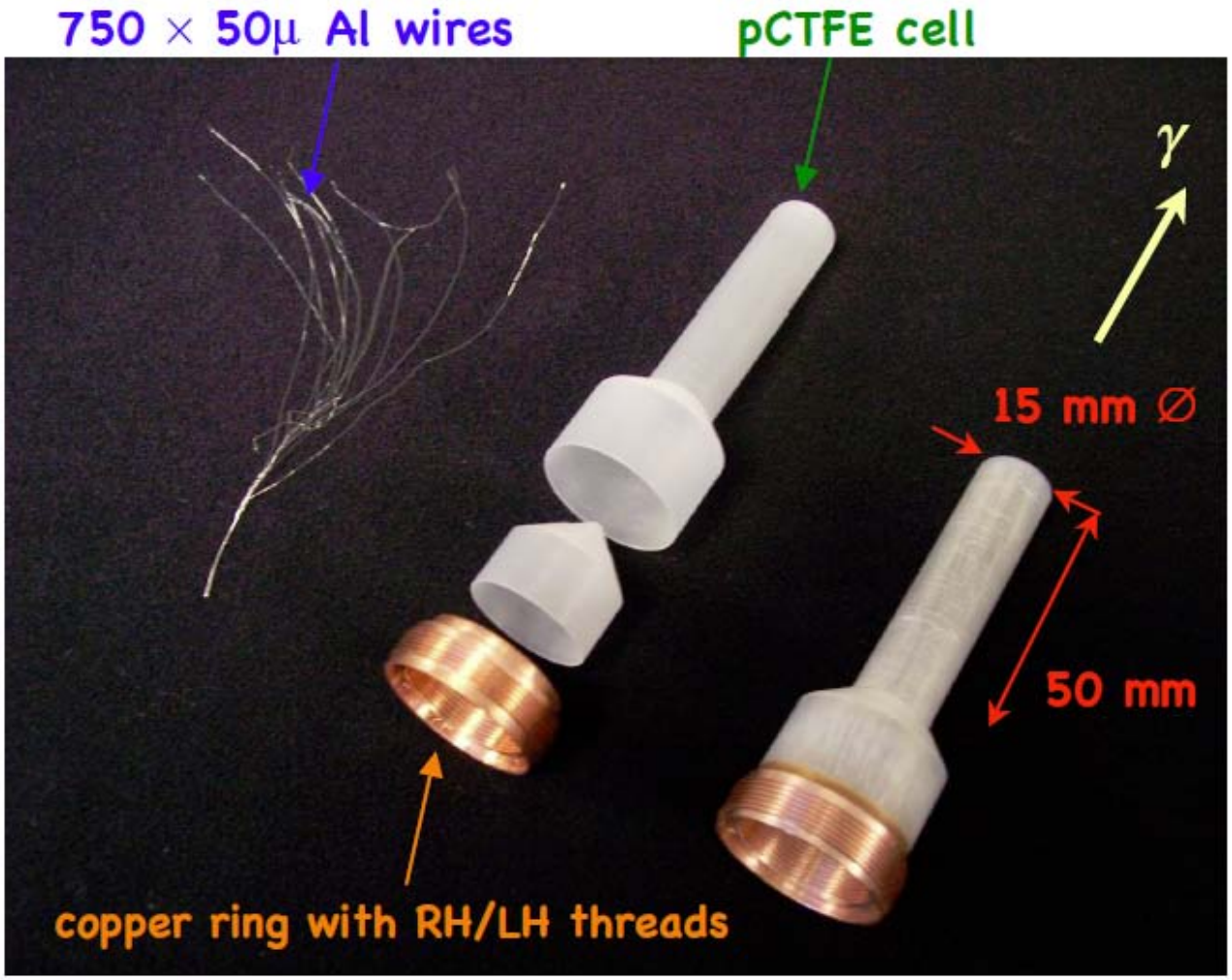
How the HD target work

Saturated Fast Passage on HD target 19b in IBC:



- Alexandre Deur

What the HD target look like



Material in the beam path: 77% HD + 17% Al + 6% pCTFE (vertex cut)

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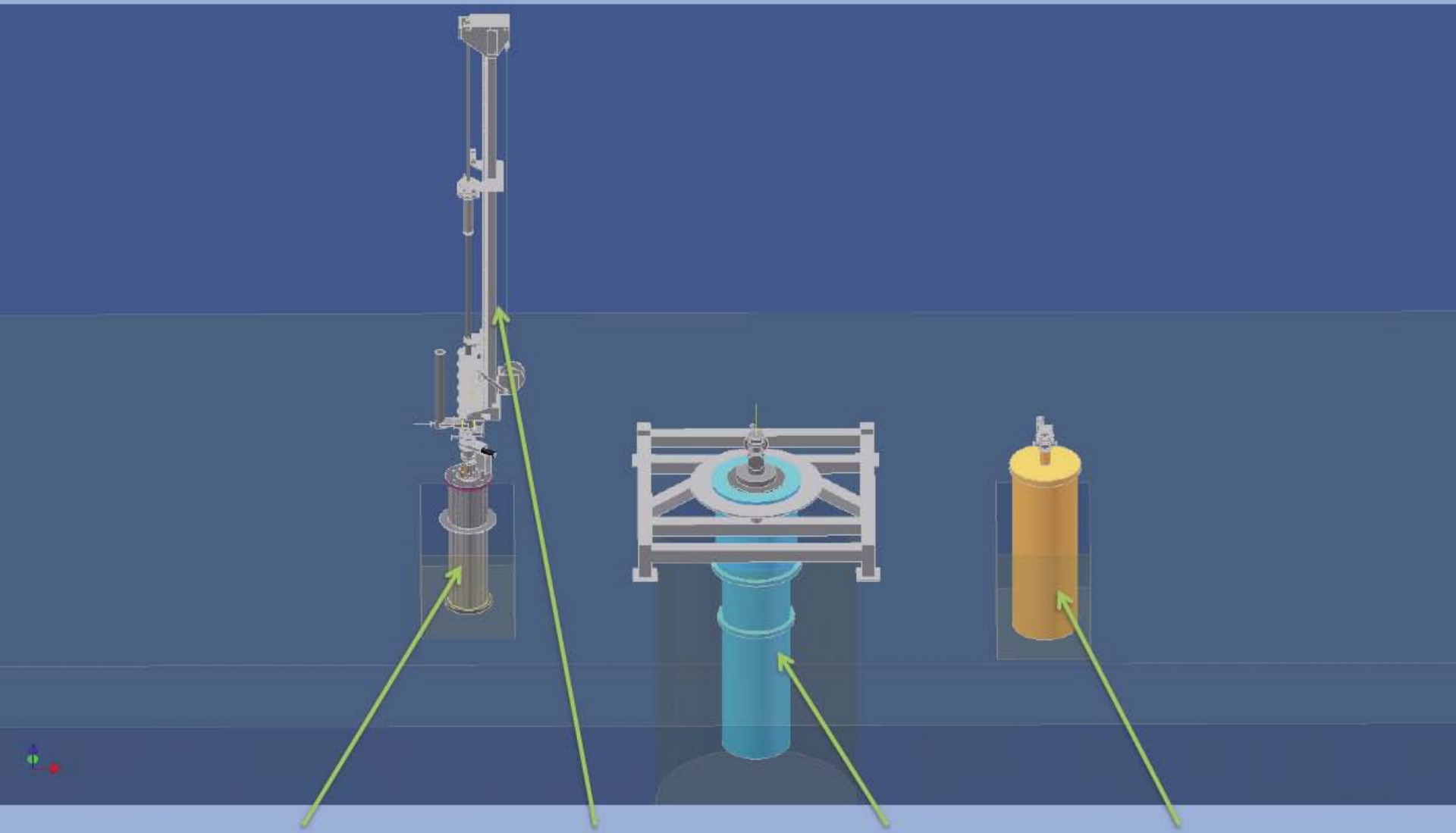
Cryostats used in HD Target Production



Production **D**ewar **T**ransfer **C**ryostat **D**ilution **F**ridge **S**torage **D**ewar

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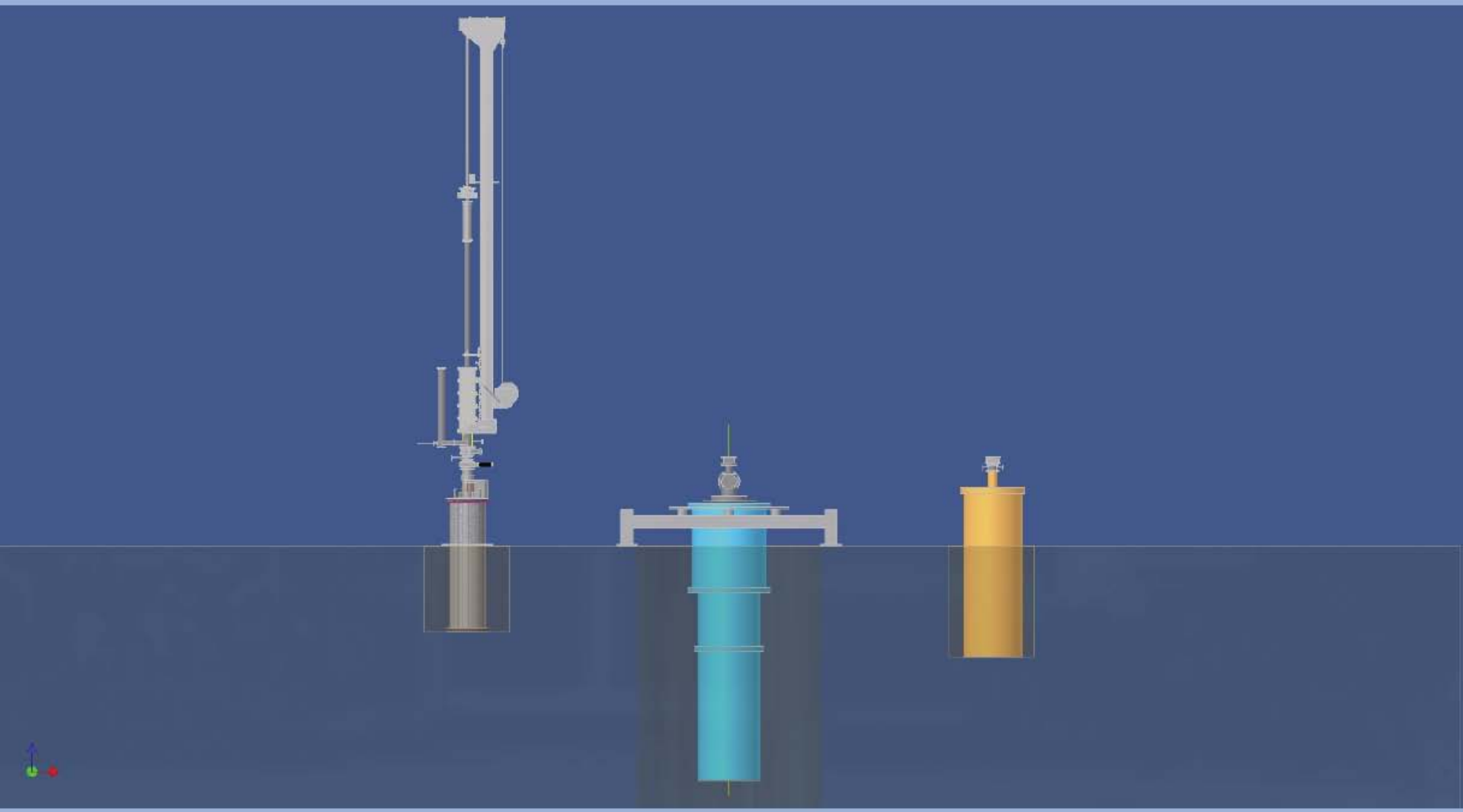
Condense solid HD into **P**roduction **D**ewar (PD);
Calibrate NMR with Thermal Equilibrium measurement at 2 K and 0.3 T



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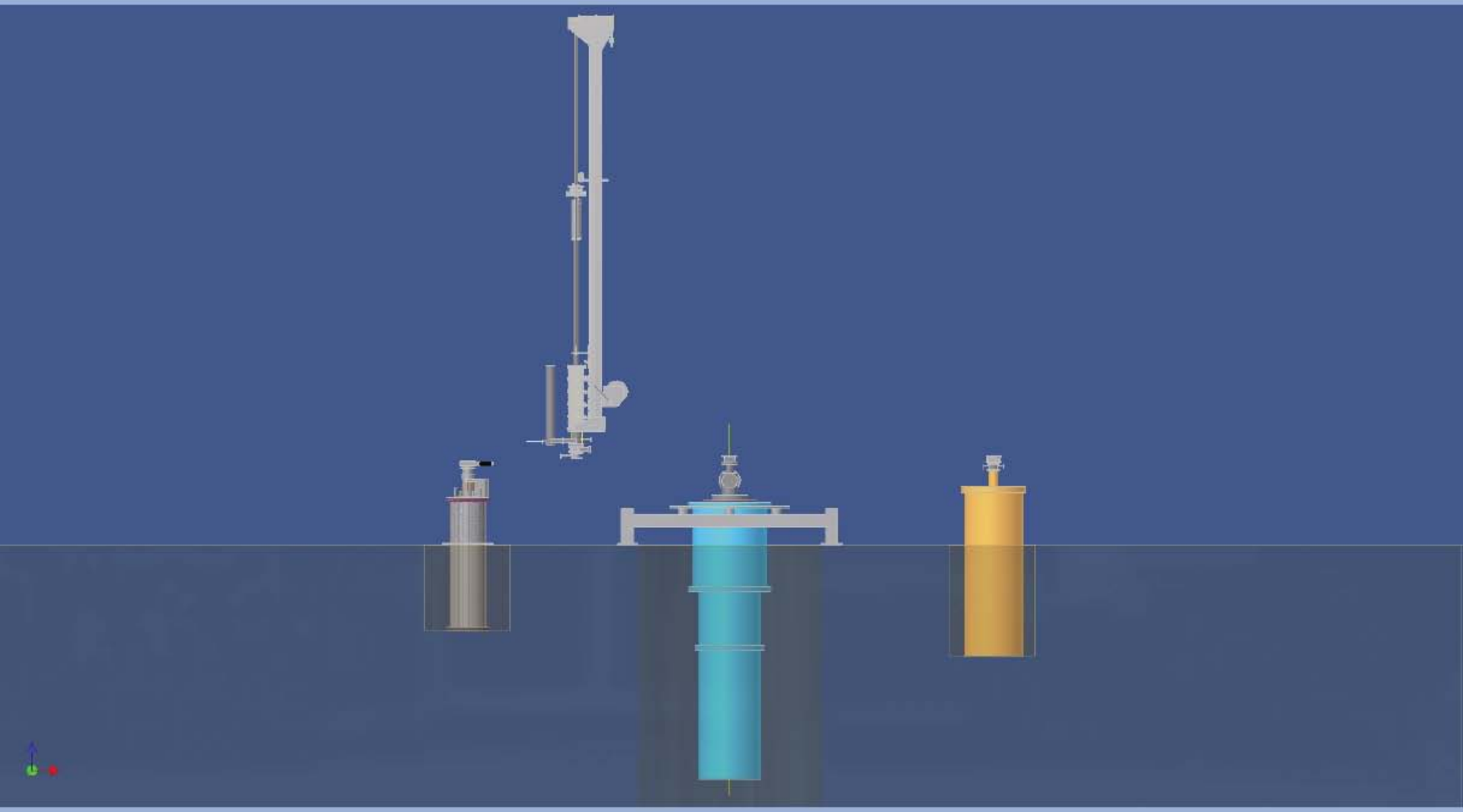
Extract target into 2K, 0.1 T **T**ransfer **C**ryostat; move solid target to **D**ilution **R**efrigerator (DF) for polarization



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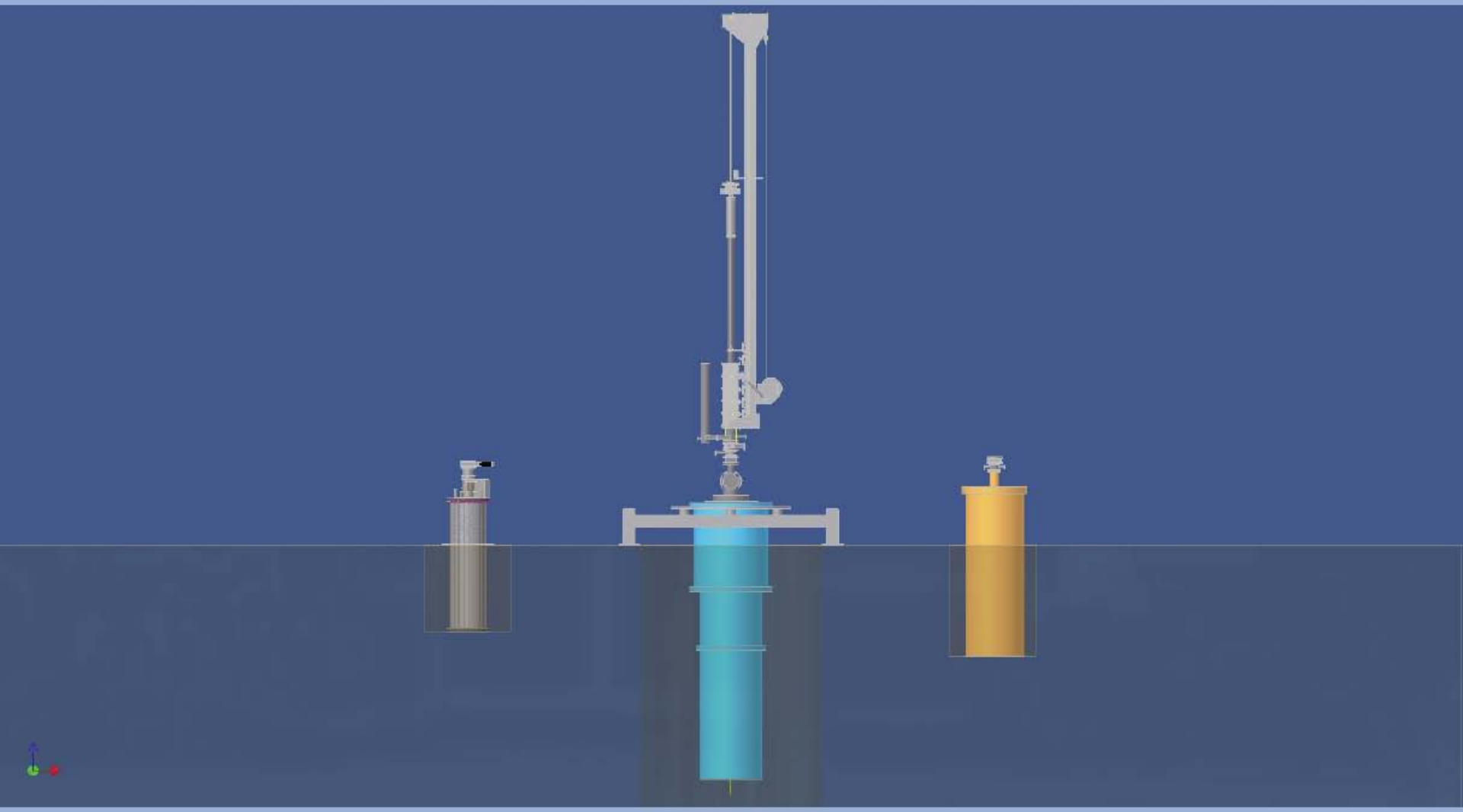
Load target into Oxford **D**ilution re**F**rigerator; polarize at 0.011K, 15 T; hold to reach frozen-spin state



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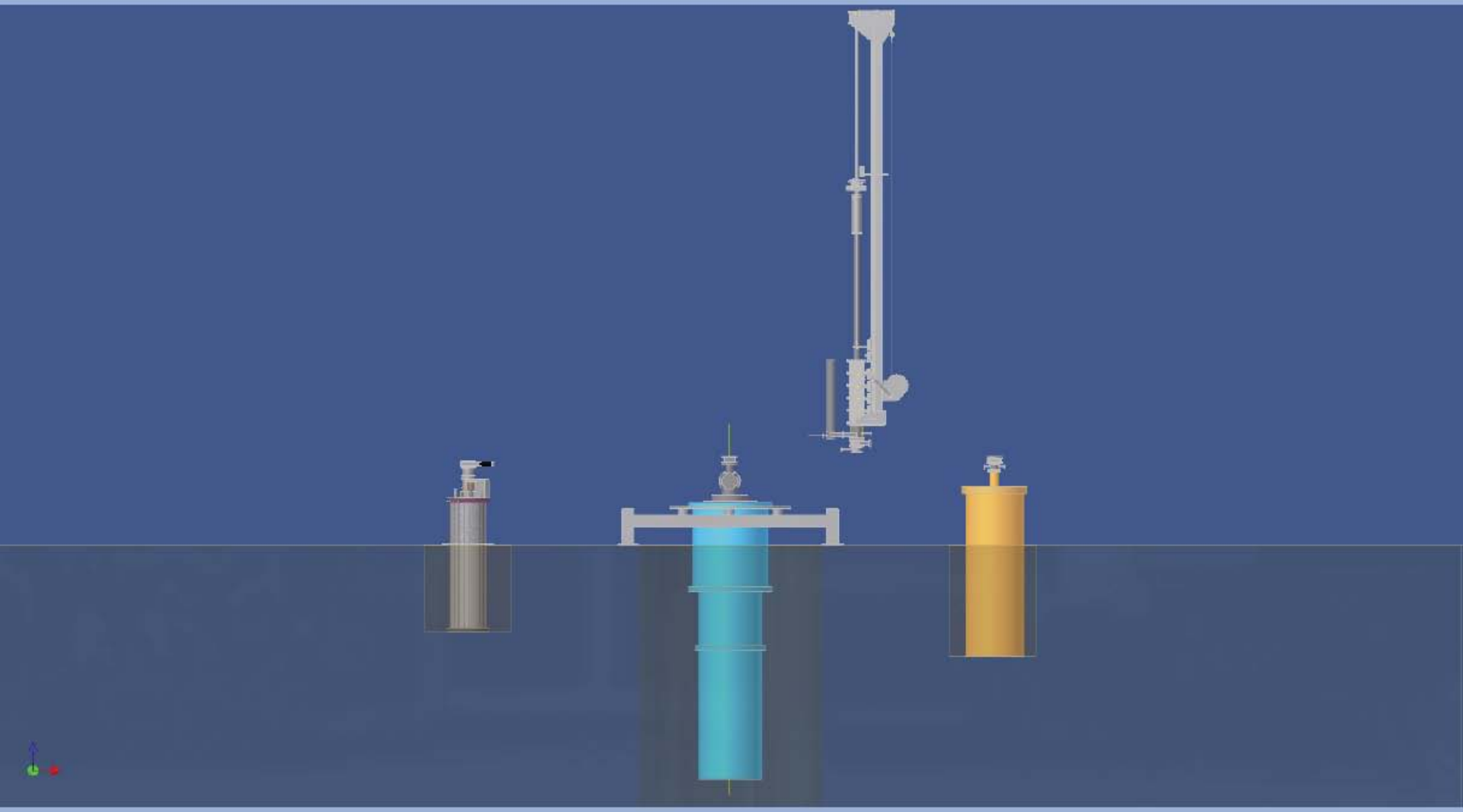
Move target to **S**torage **D**ewar



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Load into Storage Dewar (SD) for transport to Hall B