

HB 2023

Beam dynamics study of a 400 kW D⁺ linear accelerator to generate fusion-like neutrons for breeding blanket tests in Korea

Yoo-Lim Cheon¹,

Hyun Wook Kim¹, Mu-Young Ahn¹, Seungyon Cho¹,
Emre Cosgun², Seok-Ho Moon², Donghyun Kwak², and Moses Chung^{2*}

¹Korea Institute of Fusion Energy (KFE),

²Ulsan National Institute of Science and Technology (UNIST)



1. Introduce the author: Dr. Yoo-Lim Cheon



- Ph.D from Ulsan National Institute of Science and Technology (UNIST), South Korea
 - “Mitigation of 4th order resonance and envelope instability by beam angular momentum”(HB2021)
- Postdoc at Korea Institute of Fusion Energy (KFE)
 - This talk (HB2023)
- Postdoc at FRIB/MSU (starting this November)
 - Maybe... (HB2025)

2. Motivation of the work: Fusion Energy at a Turning Point



Administration

MARCH 15, 2022

Fact Sheet: Developing a Bold Vision for Commercial Fusion Energy

[OSTP](#) [BRIEFING ROOM](#) [PRESS RELEASES](#)

Fusion Science and Technology are at a Turning Point

A fusion reaction in which more energy is produced than is consumed always seemed to be decades in the future. Recent advances, building on 70 years of groundbreaking fusion science and technology by DOE National Laboratories and other agencies, universities, and industry, demonstrate that we are closer than ever to a viable reaction. **Just in the past year, there have been many technical achievements reported in the media. For example:**

- a privately-funded U.S. fusion company demonstrated its prototype 20-tesla high-temperature-superconducting magnet, opening up an exciting new high-field, compact approach to commercial fusion energy,

ITER (\$6.1B initially) (cf, ~\$6.7B for LHC)
> 75% construction (finally \$45B - \$65B)



12.01.2021

Commonwealth Fusion Systems Raises \$1.8 Billion in Funding to Commercialize Fusion Energy

CFS

Commonwealth Fusion Systems (CFS) announced it has closed on more than \$1.8 billion in Series B funding to commercialize fusion energy. This includes capital to construct, commission, and operate SPARC, the world's first commercially relevant net energy fusion machine. In addition, it will enable the company to begin work on ARC, the first commercial fusion power plant, which includes developing support technologies, advancing the design, identifying the site, and assembling the partners and customers for the future of fusion power.



nature

[Explore content](#) [About the journal](#) [Publish with us](#) [Subscribe](#)

[nature](#) > [news explainer](#) > [article](#)

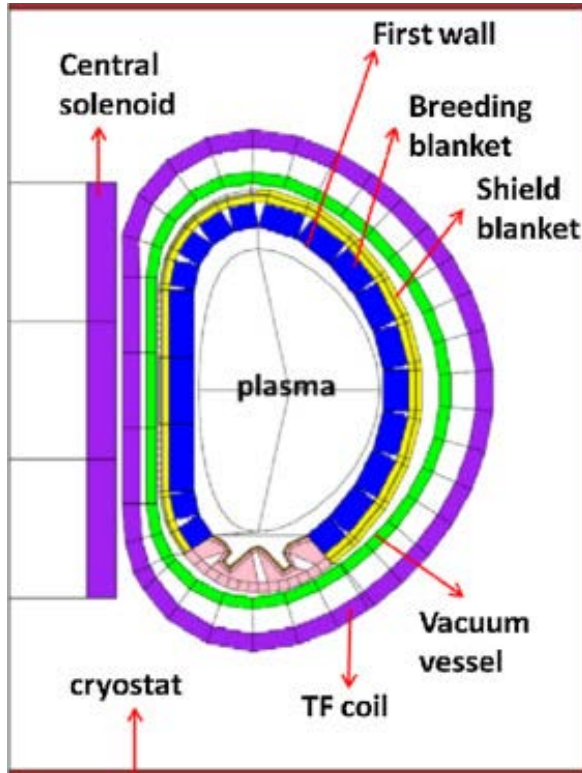
NEWS EXPLAINER | 13 December 2022

Nuclear-fusion lab achieves 'ignition': what does it mean?

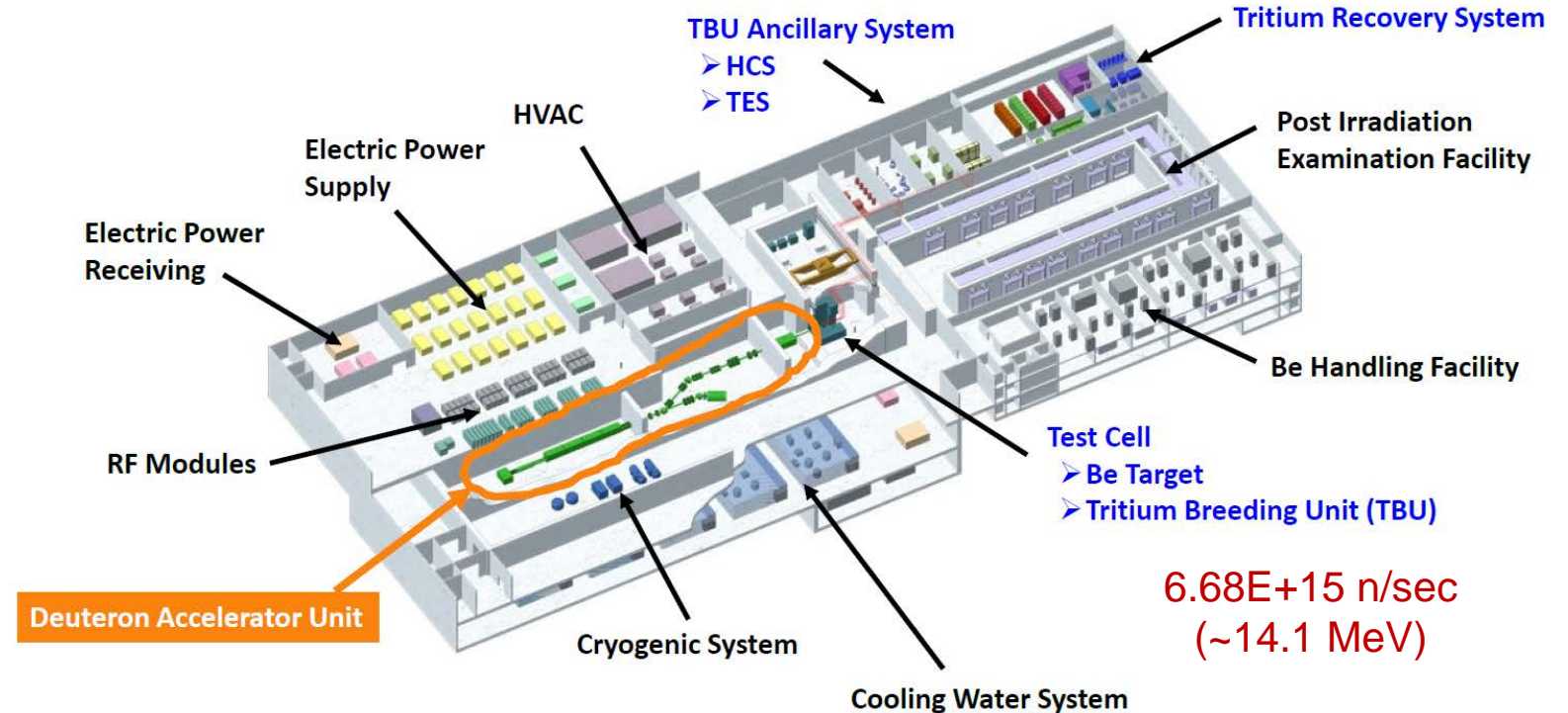
Researchers at the US National Ignition Facility created a reaction that made more energy than they put in.

3. Breeding blanket: One of the gap technologies for commercial reactor

→ Integrated Breeding Test Facility (IBTF) proposed by KFE



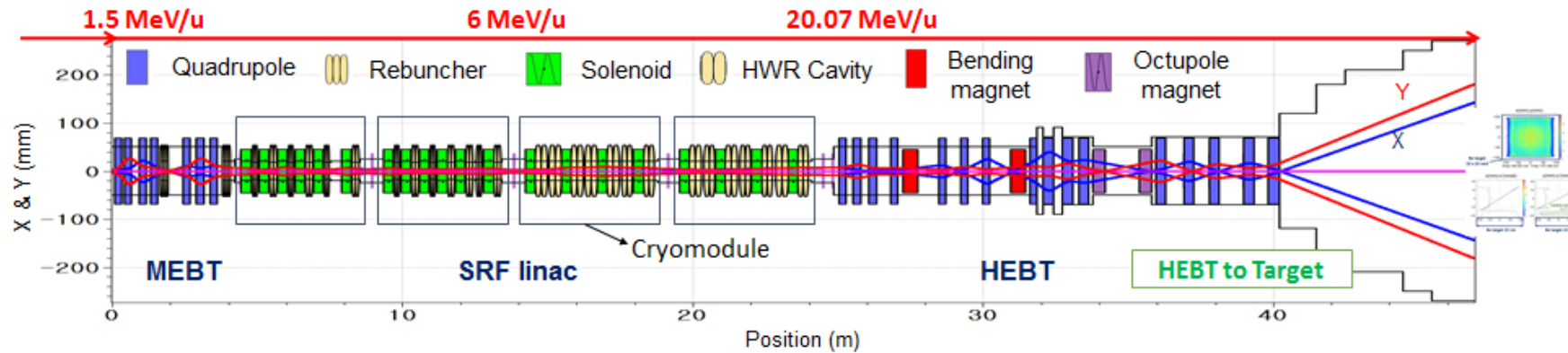
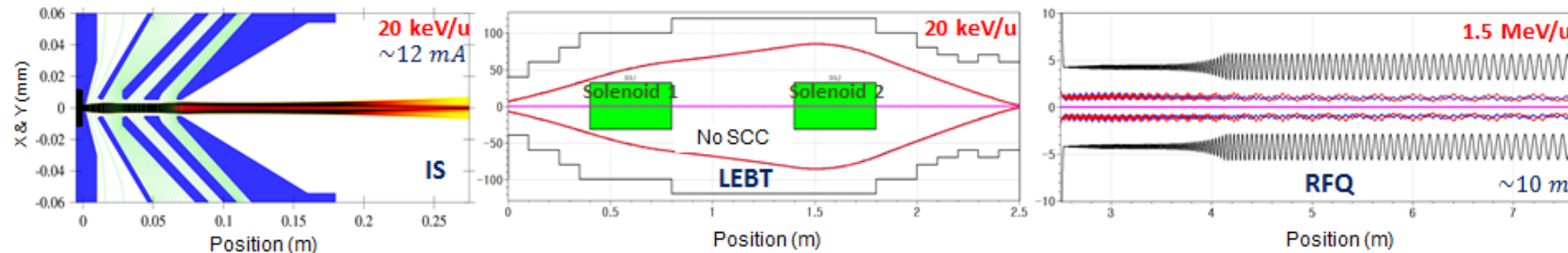
- Fuel production
- Shielding and Heat exchange



D+
40 MeV (20 MeV/u)
Max 10 mA CW
400 kW

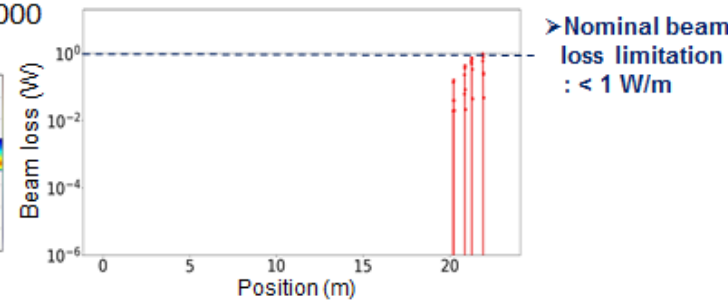
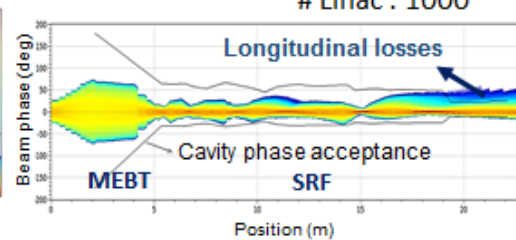
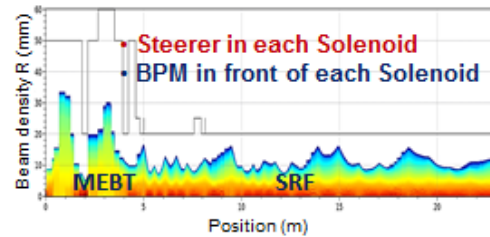
4. Design study of a 400 kW D+ linear accelerator

Start-to-end simulation



Error study of MEBT + SRF Linac

macro-particle = 1,000,000
Linac : 1000



For more details on machine specifications and issues:
See me at the poster session (THAFP06)