HFLSM

April 12&13, 2021

強磁場センターユーザーミーティング
HFLSM user meeting

Contents

1. User program under a pandemic of COVID-19
2. Magnet operation plan in 2021FY

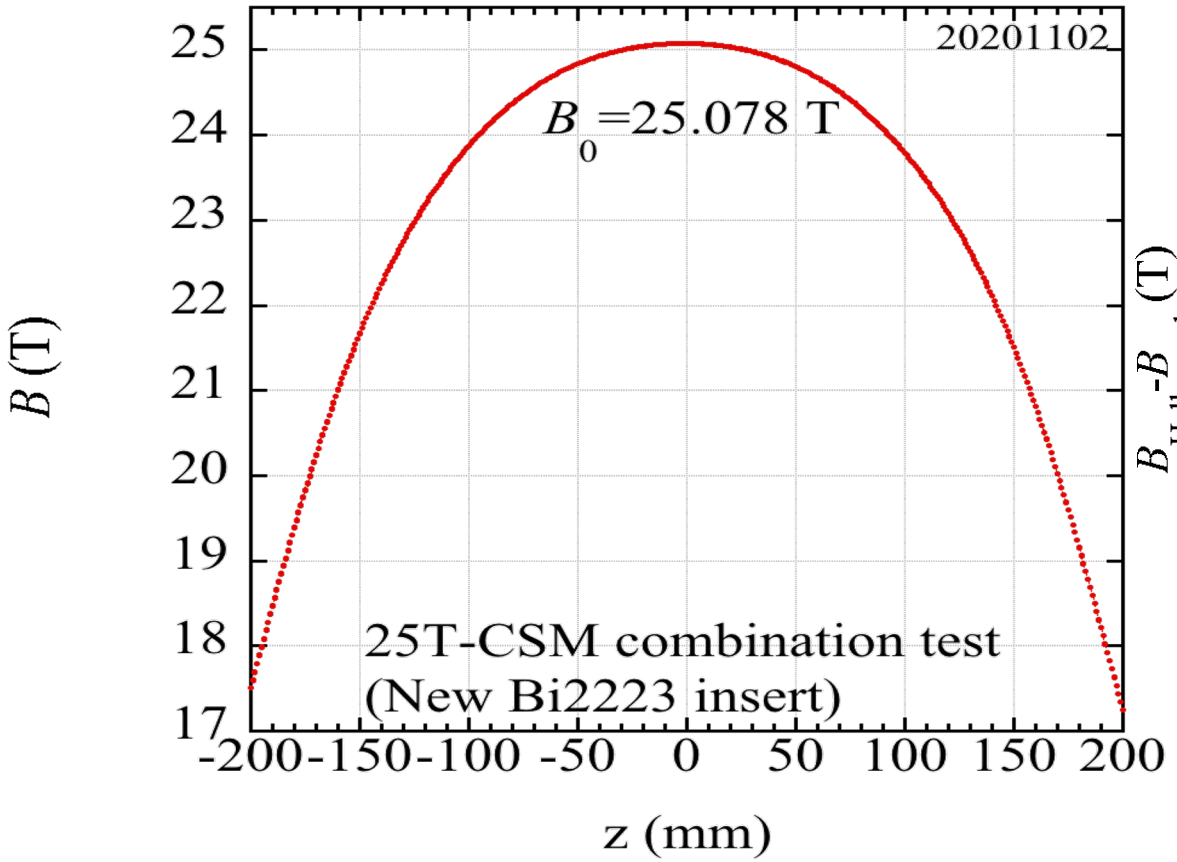
2021FY magnet operation plan

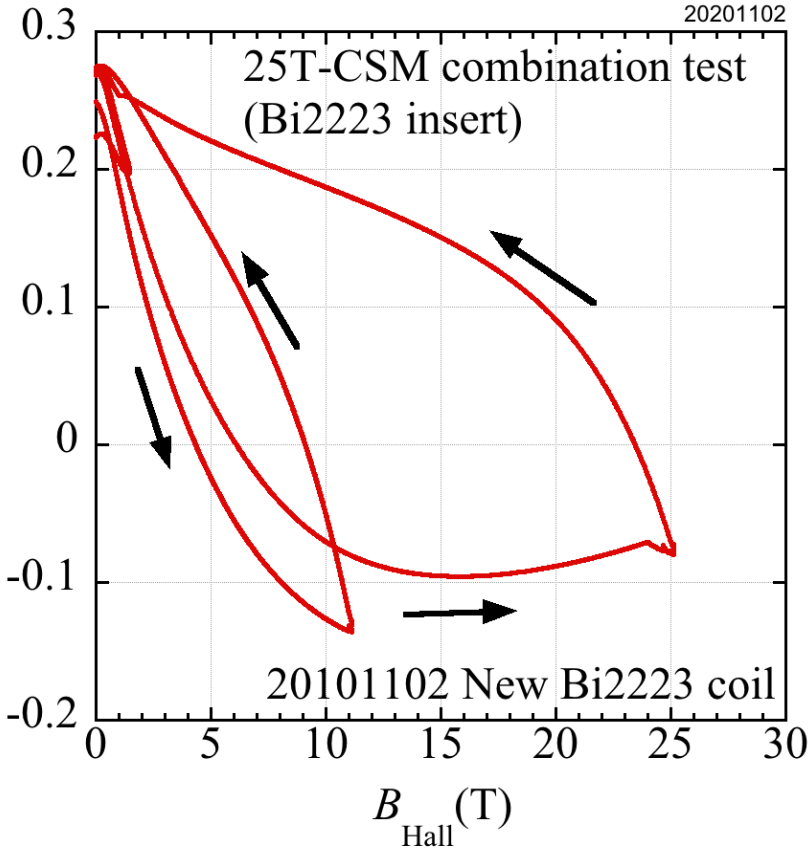
- 2021 Dec – 2022 Mar: 低温センター液化機更新のため液体Heの供給を停止します。Suspension of LHe due to a replacement of Liquefier at Low Temperature Science Center.
- 2021 Oct – 2022 Sep: HM/CHMの運転は左記の期間の予定です。Operation of HM and CHM.

	2021									2022		
	Apr	May	JUN	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
HM/CHM							Operation HM/CHM -> 2022 Sep					
25TCSM					Maintenance							
20TCSM									Maintenance			
18T-SM /15T-SM									Unavailable			
Other CSMs					Maintenance				Experiments w/o LHe			
LHe					Summer Short Brake				Suspension of LHe at IMR			
Electricity					8/8 Blackout							

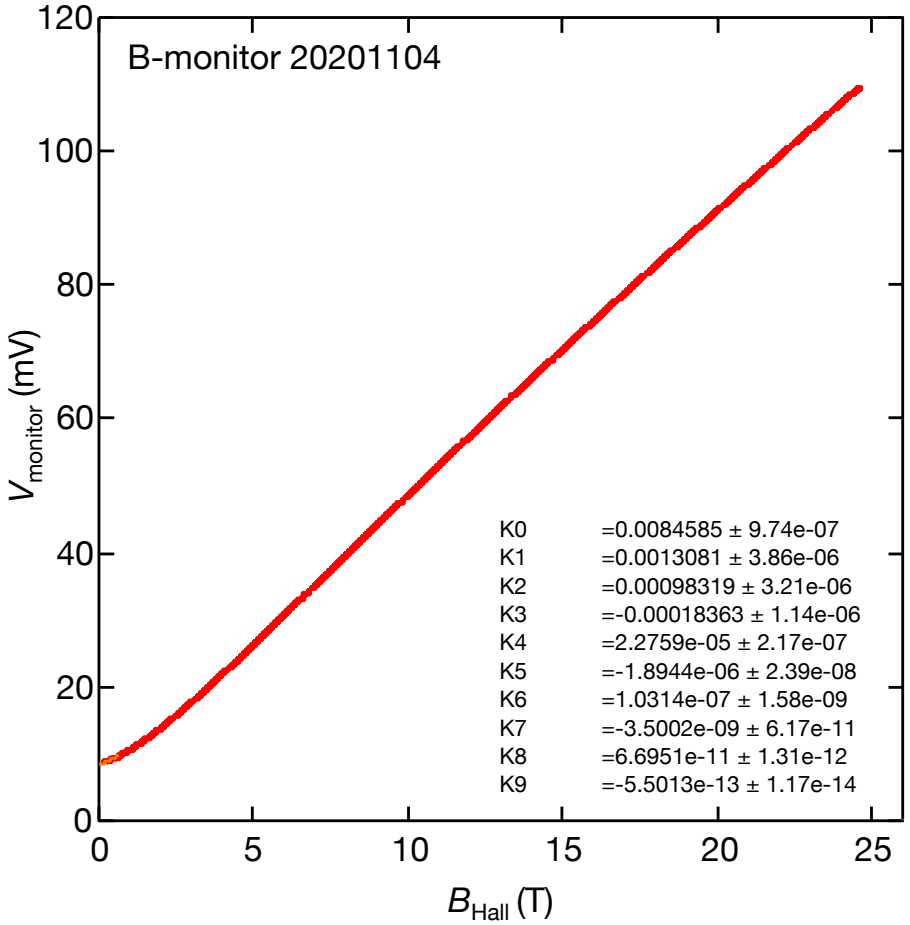
*For 2021 Dec- 2022 Feb, LHe will be arranged partly for 25T-CSM and 28T-CHM.

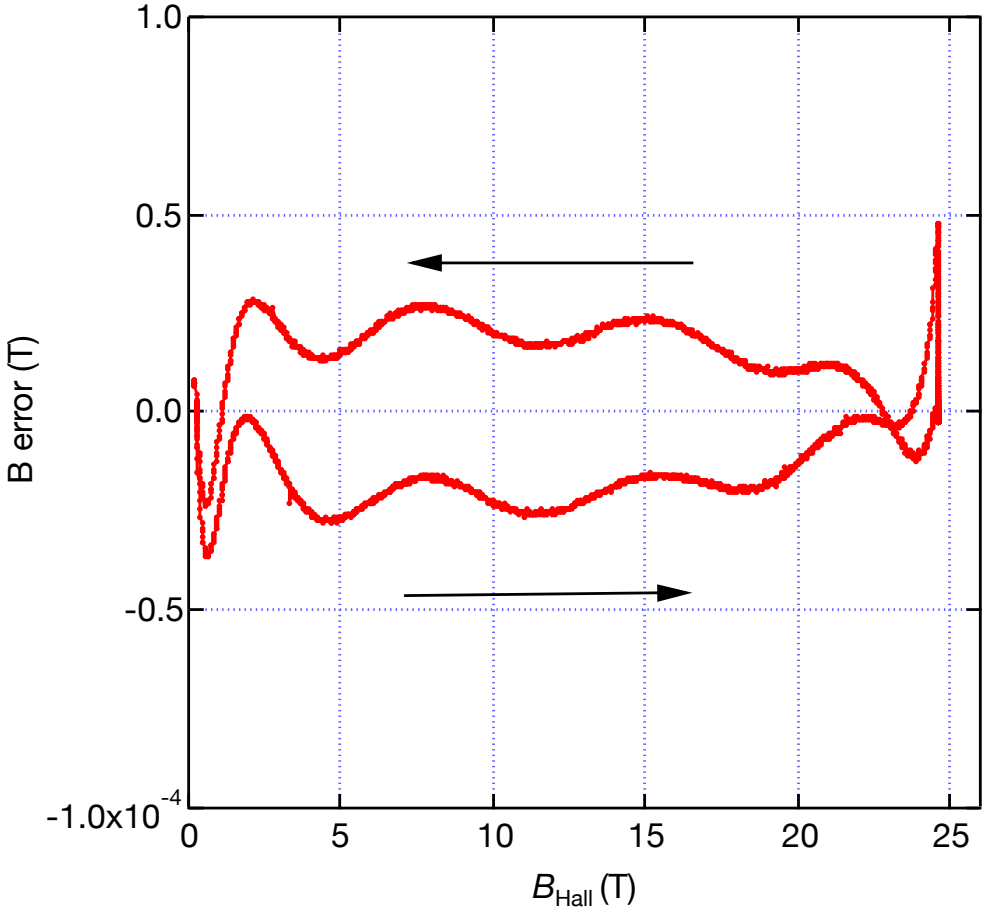
25.1 T magnetic field



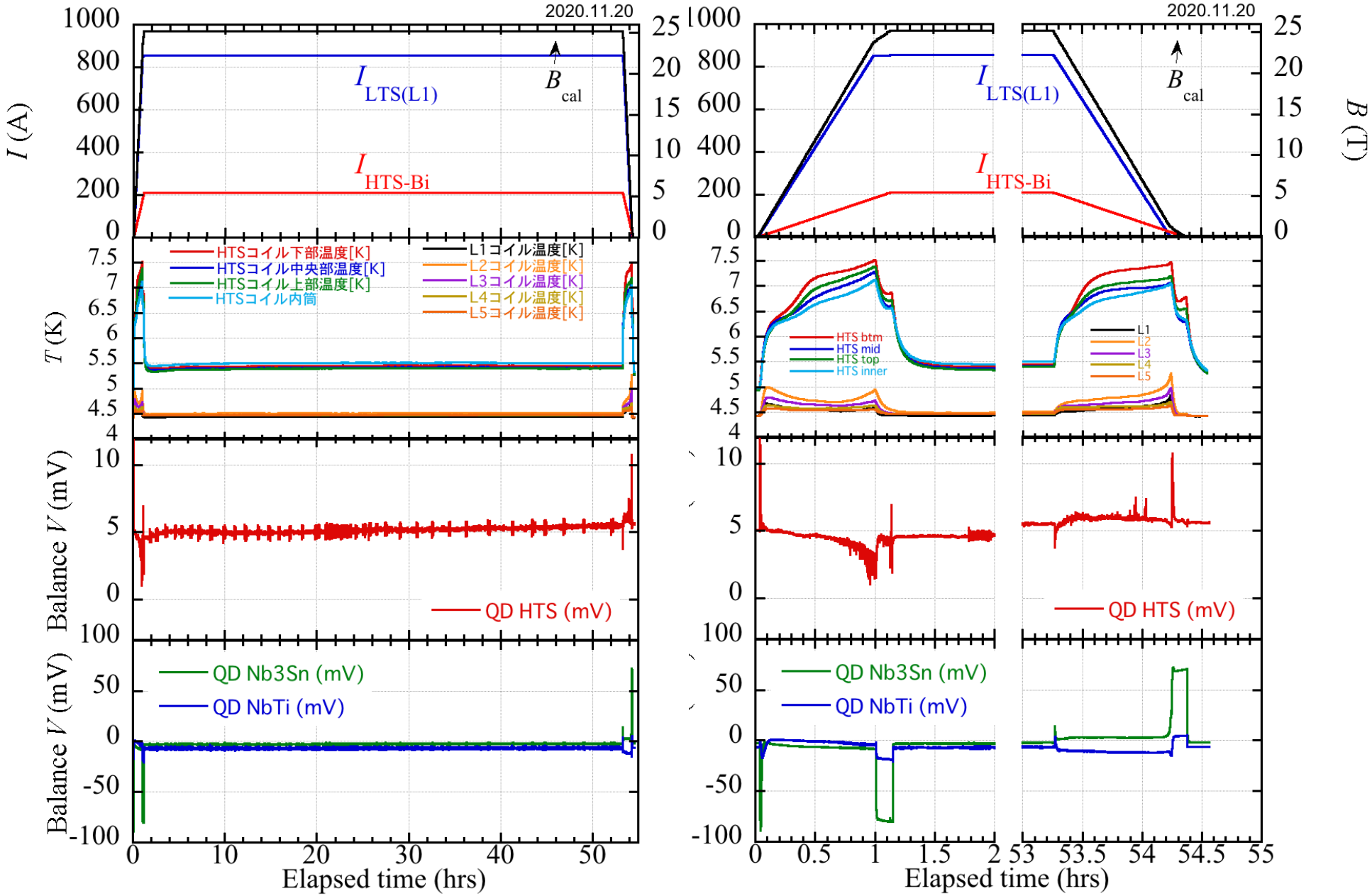


Field monitor





50h hold at 25.1 T



Operation of 25T-CSM

- 日中の磁場掃引時のスタッフ立ち会いは不要となりました。
- 20T以上の磁場掃引は平日の日中（9時-20時）のみとし、20T以下の磁場掃引とホールドは深夜及び週末も可とします。 最大磁場は24.1Tとします。 25Tの磁場が必要な場合には淡路にご相談ください。

- User can operate the 25T-CSM w/o HFLSM staff in daytime.
- Ramping magnetic field beyond 20T is permitted only in daytime (9:00-20:00) on weekdays. If HFLSM staff stays together, the ramping beyond 20T is accepted anytime.
- The maximum field of 25T-CSM is 24.1T usually. But if you need more than 24 T, please ask Awaji in advance.

Magnet and Equipment at HFLSM

Magnet		31T-HM	28T-HM	28T-CHM	25T-CHM	20T-SM	18T-SM	15T-SM	25T-CSM	20T-CSM	15T-CSM	10T-CSM	11T-CSM	8T-CSM	6T-CSM	5T-CSSM
Effective bore (mm)		32	52	32	52	52	52	52	52	52	52	100	52	220	220	52×10
Central field (T)		30	27	27	24	20	18	15	25.1	20	14	10	11	8	6	5
Equipments																
Magnetic levitation		○	○	○	○				○							
Heat treatment			○		○				○	○	○	○				
X-ray diffraction																○
Specific heat						○			○							
Thermal conductivity								○								
Thermal analysis			○		○				○	○	○	○				
Very low temperature	^{3}He		○		○	○	○	○	○	○						
	^{3}He-^{4}He			○	○	○										
Ultrasonic				△	△				○							
Transport properties	Resistivity	○	○	○	○	○	○	○	○	○	○	○		○	○	○
	Hall effect	○	○	○	○	○	○	○	○							
Critical curent	up to 1500A		○		○											
	up to 500A	○	○	○	○		○	○	○	○	○	○		○	○	
Biology·Chemistry									○	○	○			○	○	
Spectroscopy (visible light)		○	○	○	○		○	○	○	○						
NMR		○	○	○	○	○	○	○	○	○	○					
ESR						○	○	○	○	○						
Magnetization (Low-T)	VSM	○	○	○	○				○	○	○	○				
	SEM	○	○	○	○	○	○	○			○	○				
	AC		○		○	○	○	○			○	○				
Magnetization (High-T)	VSM		○		○				○	○	○	○	○			

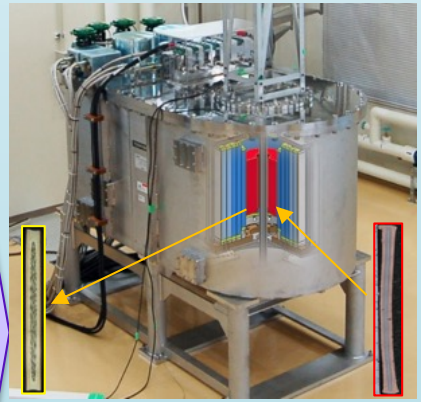
(C)HM: (Cryogen-free) Hybrid Magnet, SM: Superconducting Magnet, CSM: Cryogen-free Superconducting Magnet

High Field Magnet Development at HFLSM
- Load map -

2015
25 T cryogen-free Superconducting Magnet (25T-CSM)

- 24.6 T in a 52 mm RT bore with 1 hour ramping
- Advanced high strength Nb_3Sn technologies and high strength Bi2223 (Type HT-Nx (SEI))
- World highest field in CSM
- Open for users since 2016 (250 days operation in 2018)
- Long time, high precision experiments
- J_c-B-T-θ of HTS, transport, NMR, high pressure, etc.

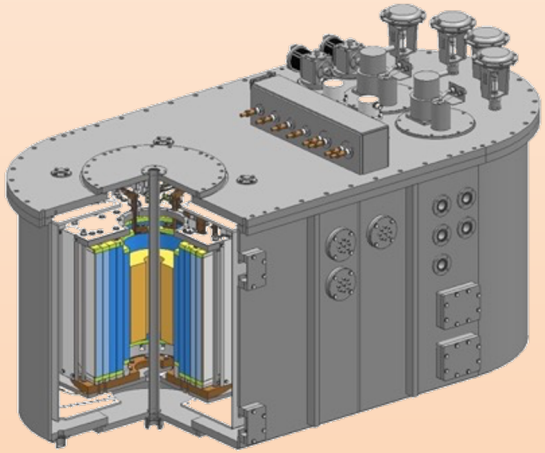
2018-2022
Upgrade to 30T-CSM (JSPS project)



- Replace from Bi2223 insert to REBCO one.
- R&D toward to 33T

2022-
NEW 33T-CSM

- High strength Nb_3Sn
- REBCO conductors
- Adv. HTS coil technol.

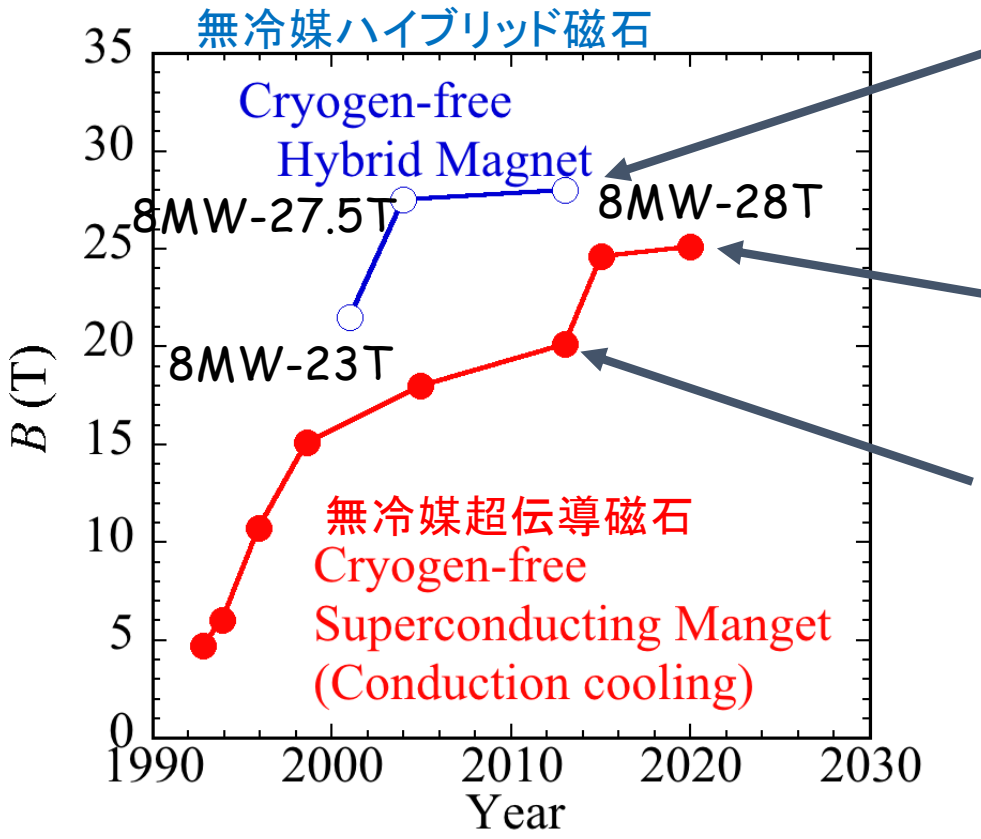


Superconducting magnet technology beyond 40 T

50T Superconducting magnet

Under "High Magnetic Field Collaboratory Japan" project

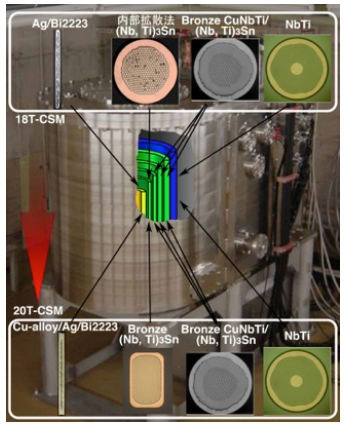
強磁場センターにおける無冷媒超伝導磁石開発



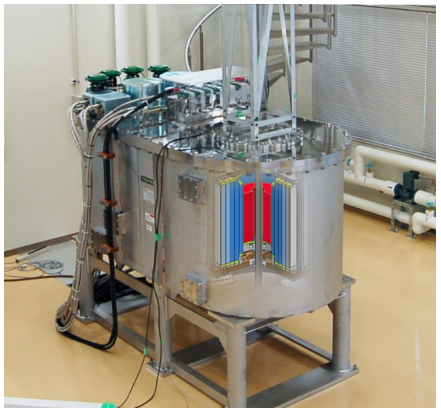
28T-CHM (ϕ32RT)

ϕ360-9T-CSM
+ ϕ32-19T-WM

20T-CSM(ϕ52RT)



25T-CSM(ϕ52RT)



無冷媒超伝導磁石のメリット

- 電力使用少ない一大学予算の逼迫に対応
- 長時間連続運転が可能一強磁場利用時間が2桁増大
- ヘリウムを消費しない
- 超伝導応用機器への技術移転が期待される