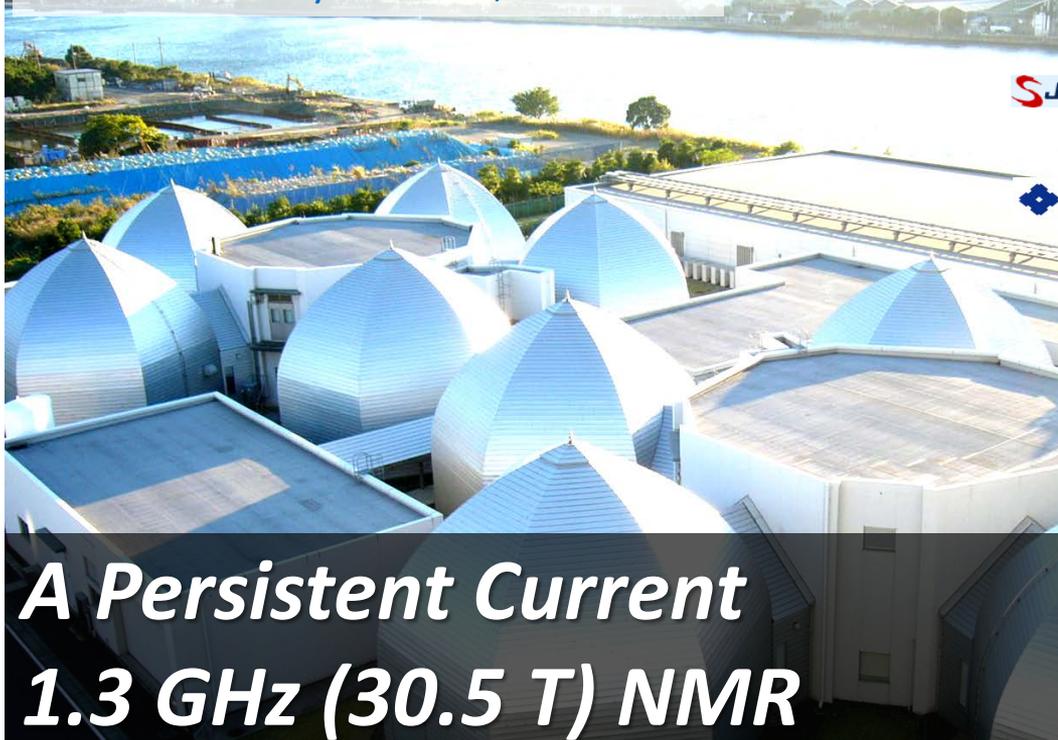


## The NMR Facility of RIKEN, Yokohama



# A Persistent Current 1.3 GHz (30.5 T) NMR

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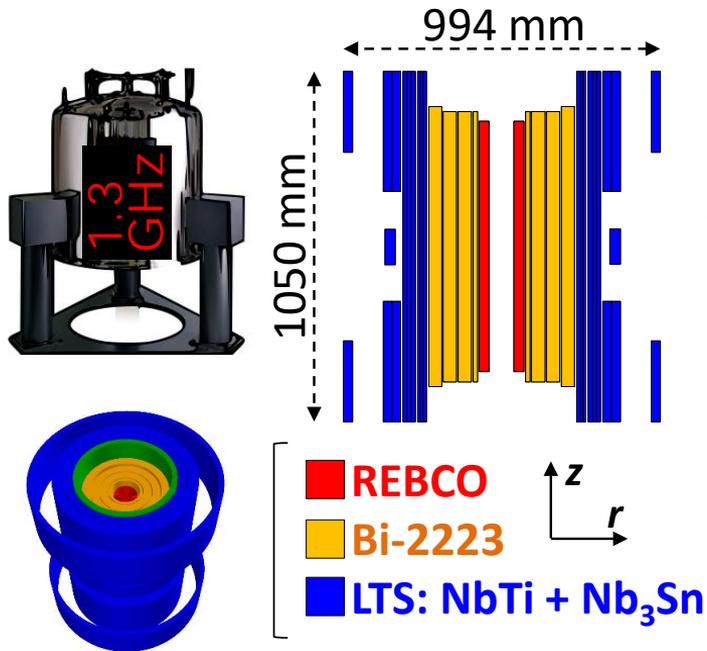


**MT25**  
25<sup>th</sup> International Conference  
on Magnet Technology

RAI - Amsterdam  
August 27 - September 1, 2017



# A PERSISTENT CURRENT 1.3 GHz NMR



- 30 T-class persistent current magnet with **SUPERCONDUCTING JOINTS**
- Analysis of human brain amyloid to address **ALZHEIMERE'S DISEASE** 
- The technologies are open to be used for much **HIGHER FIELD (35-50 T)** and **HIGHER TEMPERATURE (~77 K)**

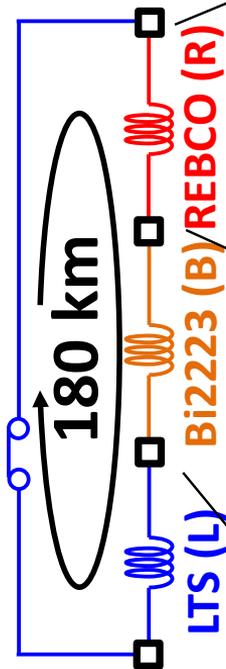
Connected in series,  $L \sim 1000$  H

One of the preliminary designs by  
Dr. M. Hamada of JASTEC

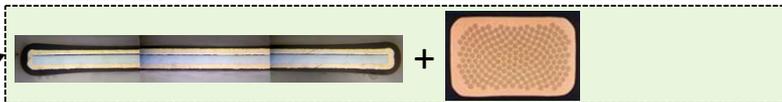
# The Challenge: "PERSISTENT CURRENT MARATHON"

$R_{TOTAL}$

$\sim 0.1 \text{ n}\Omega$



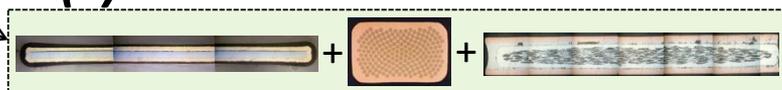
$RL \times 1$



$RR \times 16$



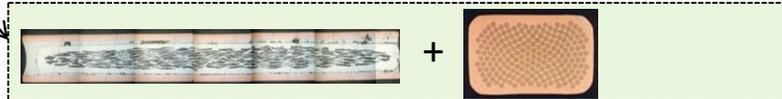
$R(L)B \times 1$



$BB \times 60$

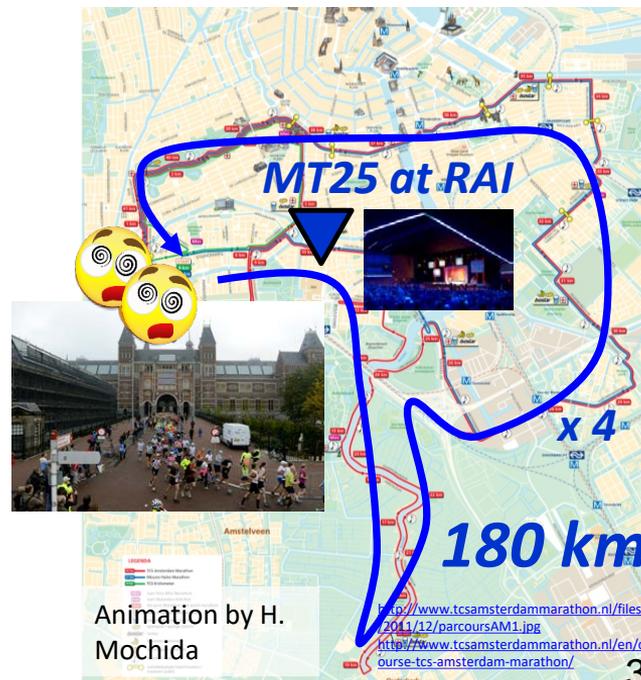


$BL \times 1$



$< 10^{-12} \Omega / \text{joint}$

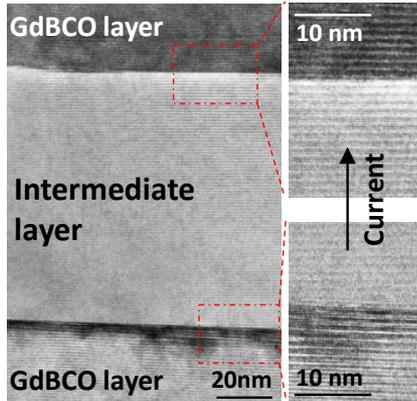
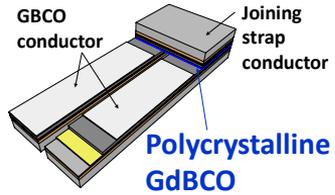
Cooper-pair runs 4 Amsterdam full marathons through **oxide** and metal circuit with  $0.1 \text{ n}\Omega$ !



# The Marathon Has Started

## Intermediate Grown Superconducting (iGS) joint

Sumitomo Electric

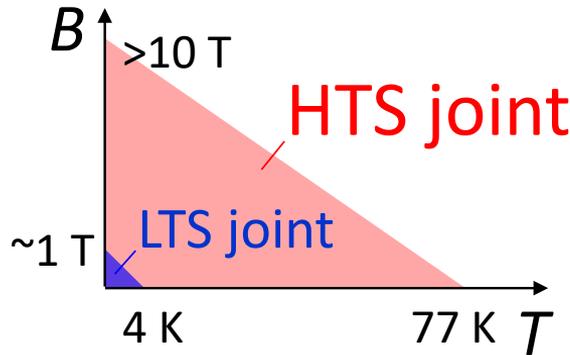


JFCC and Univ. of Tokyo

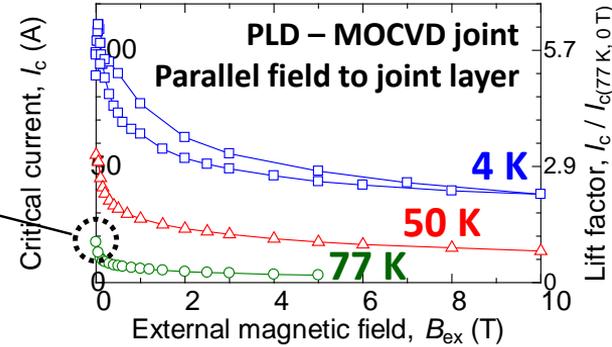
K. Ohki et al., *Supercond. Sci. Technol.* in press.

Persistent current decay:  
 $3 \times 10^{-12} \Omega$   
 $- 5 \times 10^{-13} \Omega$

RIKEN and Sophia Univ.



Park et al. *NPG Asia Mat.* **6** (2014) e98  
 Jin et al. *SuST* **28** (2015) 075010  
 Nagaishi et al., 1st Asian ICMC and CSSJ 50th Anniversary Conf., 3A-p02, Nov. 7-10, 2016



NIMS, Sumitomo and RIKEN

### NEWS!

#### Bi-2223 / NbTi joint

R. Matsumoto, H. Iwata, S. Yamashita, H. Hara, G. Nishijima, M. Tanaka, H. Takeya, and Y. Takano,  
 "Superconducting joints using Bi-added PbSn solders"  
*Applied Physics Express* **10**, 093102 (2017)



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## Persistent current 1.3 GHz NMR:

One of the most challenging goals of MT, making a huge impact on coping with Alzheimer's disease.



The persistent current marathon  
with superconducting joints  
has started towards **MT30 (2027)**!