



# Energy Frontier Strategic Planning Meeting

Summary of ICHEP 2018 accelerator sessions  
July 4-11 2018



# Accelerator Sessions at ICHEP – Day 1

		Thu 05/07	Fri 06/07	Sat 07/07	All days					
						Print	PDF	Full screen	Detailed view	Filter
14:00	<b>First Ever Ionization Cooling Demonstration in MICE</b>					Chris Rogers	<a href="#">📧</a>			
	205, COEX, Seoul					14:00 - 14:30				
	<b>Recent results from MICE on multiple Coulomb scattering and energy loss</b>					Scott Wilbur	<a href="#">📧</a>			
	205, COEX, Seoul					14:30 - 15:00				
15:00	<b>Progress on the 650MHz/800kW CW klystron development at IHEP</b>					Shengchang Wang	<a href="#">📧</a>			
	205, COEX, Seoul					15:00 - 15:30				
	<b>Progress on stabilising relativistic lepton beams for future colliders</b>					Philip Nicholas Burrows	<a href="#">📧</a>			
	205, COEX, Seoul					15:30 - 16:00				
16:00										
	<b>Status of SuperKEKB phase-2 commissioning</b>					Akio Morita for SuperKEKB commissioning team et al.	<a href="#">📧</a>			
	205, COEX, Seoul					16:30 - 16:54				
17:00	<b>First Muon RF Acceleration for the Muon g-2 Experiment at J-PARC</b>					Dr Masashi Otani	<a href="#">📧</a>			
	205, COEX, Seoul					16:54 - 17:18				
	<b>Fermilab Accelerator Complex: Status, Progress, and Near-and Far- Future Upgrade Plans</b>					Phil Adamson	<a href="#">📧</a>			
	205, COEX, Seoul					17:18 - 17:42				
	<b>LBNF Beamline</b>					Heidi Marie Schellman et al.	<a href="#">📧</a>			
	205, COEX, Seoul					17:42 - 18:06				
18:00	<b>Status of the Fermilab Muon g-2 experiment</b>					Dr Selcuk Haciomeroglu	<a href="#">📧</a>			
	205, COEX, Seoul					18:06 - 18:30				

- Over 40 talks and a dozen of posters on accelerators facilities and future accelerators

# Accelerator Sessions at ICHEP – Day 2



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09:00	<b>Superconducting RF Cavities R&amp;D Towards Future High Energy Accelerators</b> <i>105, COEX, Seoul</i>	<i>Mattia Checchin</i>	09:00 - 09:22
	<b>SQUID-based BPM for proton EDM experiment</b> <i>105, COEX, Seoul</i>	<i>Selcuk Haciomeroglu</i>	09:22 - 09:44
10:00	<b>LUCID: The ATLAS Luminosity Detector</b> <i>105, COEX, Seoul</i>	<i>Dr Federico Lasagni Manghi</i>	09:44 - 10:07
	<b>Van der Meer calibration of the CMS luminosity detectors in 2017</b> <i>105, COEX, Seoul</i>	<i>Dr Moritz Guthoff et al.</i>	10:07 - 10:30
11:00	<b>Storage ring proton Electric Dipole Moment Experiment with <math>10^{-29}</math> e<math>\cdot</math>cm sensitivity</b>	<i>Yannis Semertzidis</i>	
	<b>Design study of a Split-Coaxial RFQ for IsoDAR</b> <i>105, COEX, Seoul</i>	<i>Jungbae Bahng</i>	11:22 - 11:44
	<b>Status and prospects of the AWAKE experiment</b> <i>105, COEX, Seoul</i>	<i>Mr Fearghus Keeble</i>	11:44 - 12:07
12:00	<b>Super Charm-Tau Factory in Novosibirsk</b> <i>105, COEX, Seoul</i>	<i>Prof. Eugene Levichev</i>	12:07 - 12:30
	13:00		
14:00	<b>Physics at the FCC: a story of synergy and complementarity</b> <i>205, COEX, Seoul</i>	<i>Alain Blondel</i>	14:00 - 14:21
	<b>Heavy resonance searches at the FCC-hh</b> <i>205, COEX, Seoul</i>	<i>Clement Helsen</i>	14:21 - 14:36
	<b>Status of the FCC-hh design studies</b> <i>205, COEX, Seoul</i>	<i>Daniel Schulte</i>	14:36 - 14:57
15:00	<b>Magnet design studies for future hadron colliders</b> <i>205, COEX, Seoul</i>	<i>Vadim Kashikhin</i>	14:57 - 15:18
	<b>HTS Technology R&amp;D for Future High Energy Accelerators</b> <i>205, COEX, Seoul</i>	<i>Qingjin XU</i>	15:18 - 15:39
	<b>An Energy Recovery Linac for energy-frontier DIS at CERN: the LHeC and the FCC-eh</b> <i>205, COEX, Seoul</i>	<i>Daniel Schulte</i>	15:39 - 16:00
16:00			



# Accelerator Sessions at ICHEP – Day 3

< Thu 05/07 | Fri 06/07 | **Sat 07/07** | All days >

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09:00	<b>The FCC-ee Lepton Collider: Design Status and Operation Concept</b>	<i>Evgeny Levichev</i>	
	105, COEX, Seoul		09:00 - 09:18
	<b>CEPC Accelerator CDR and R&amp;D towards TDR</b>	<i>Jie Gao</i>	
	105, COEX, Seoul		09:18 - 09:36
	<b>R&amp;D status of CEPC Accelerator key technologies</b>	<i>Dr YUNLONG CHI</i>	
	105, COEX, Seoul		09:36 - 09:54
10:00	<b>CEPC Injector Linac design</b>	<i>Dr Cai Meng et al.</i>	
	105, COEX, Seoul		09:54 - 10:12
	<b>Machine-Detector Interface at the CEPC</b>	<i>Sha Bai</i>	
	105, COEX, Seoul		10:12 - 10:30
11:00	<b>Recent ILC R&amp;D status</b>	<i>Prof. Shinichiro MICHIZONO</i>	
	105, COEX, Seoul		11:00 - 11:24
	<b>The CLIC accelerator project status and plans</b>	<i>Daniel Schulte</i>	
	105, COEX, Seoul		11:24 - 11:48
12:00	<b>An 3-15 GeV electron beam facility at CERN for particle physics and accelerator R&amp;D</b>	<i>Stelner Staphes</i>	
	105, COEX, Seoul		11:48 - 12:09
	<b>Low energy e+e- collider to search and study of mu+mu- bound state (dimuonium)</b>	<i>Prof. Eugene Levichev</i>	
	105, COEX, Seoul		12:09 - 12:30

# Directors Round Table at ICHEP



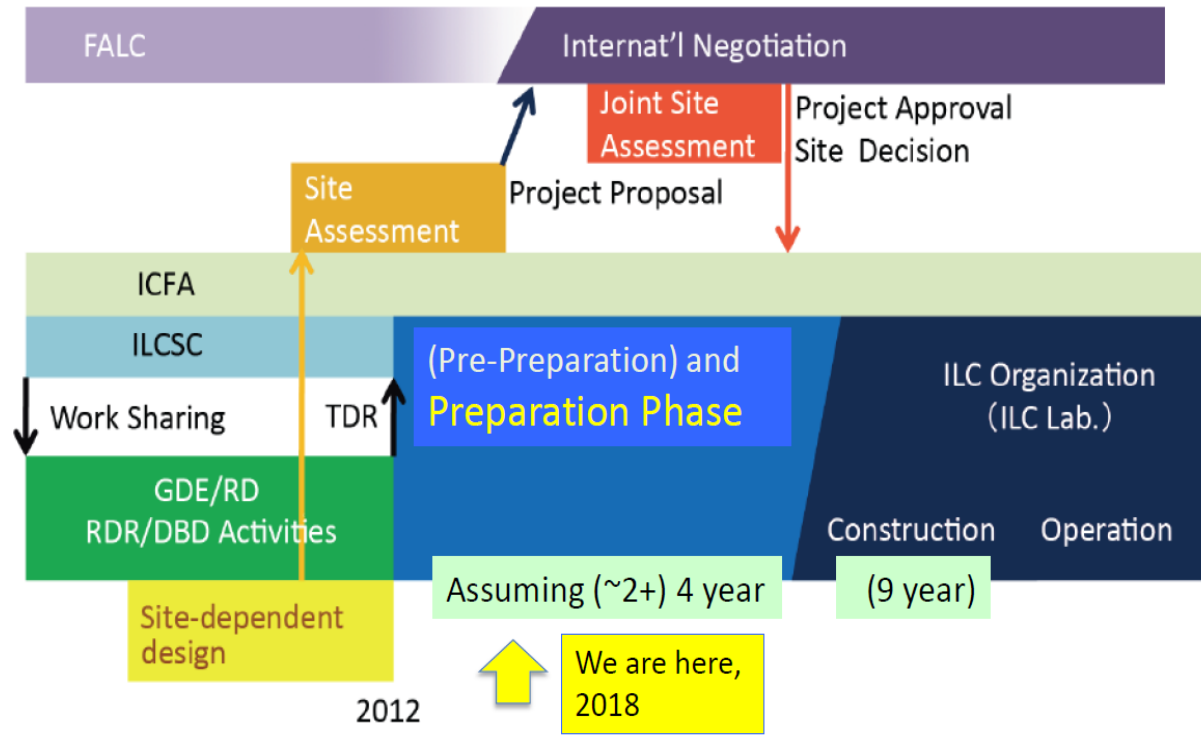
- An hour long session with brief intro by each director and then Q/A sessions
  - China: design/construction of CepC is the main goal in addition to JUNO construction
    - 100km ring opens path toward 100 TeV machine
  - CERN: HL-LHC is the main goal for the next ~10 years
    - European strategy in 2020 is expected to “narrow down” number of future collider options
  - KEK: ILC design/construction is the goal, in addition to running SuperKEKB
    - ILC decision is expected in 2018
  - Fermilab: HL-LHC and DUNE/LBNF are to main medium term programs
    - Answer on the question if US is planning to consider domestic energy frontier facility during coming Snowmass was “Yes”

# ILC Status Talk

*ShinMICHIZONO*  
*KEK/Linear Collider Collaboration (LCC)*

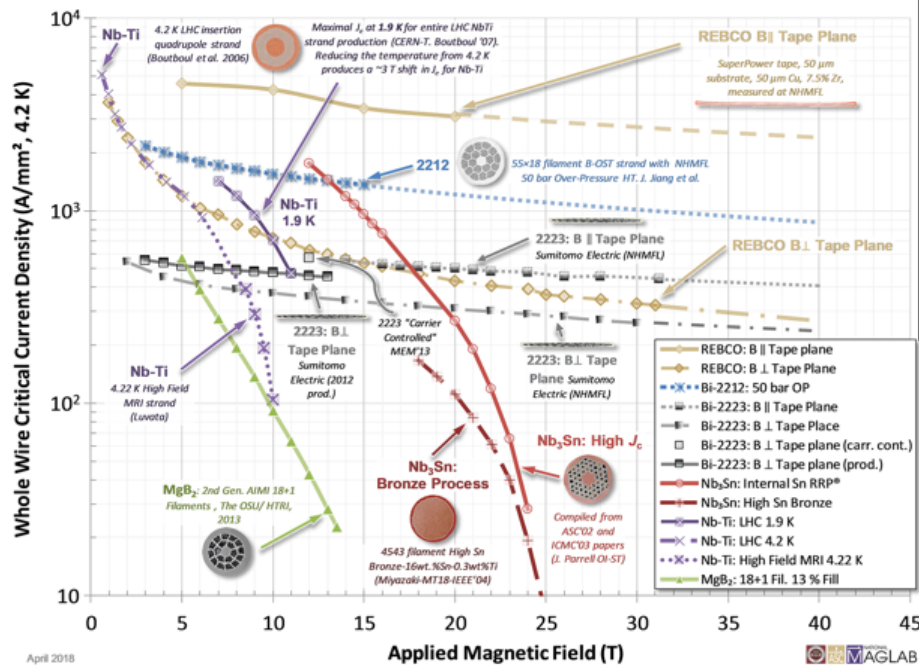
- 250GeV ILC
- Nano-beam R&D
- Cost reduction SRF R&Ds
- Directly sliced Nb material
- N-infusion
- SRF accelerators
- Fukuoka Statement/ILC symposium

## ILC Time Line: Progress and Prospect



# High Field Magnets - Kashikhin

## Available superconducting materials



### Key messages

- No one is going to use any HTS conductor if they can use Nb-Ti or Nb<sub>3</sub>Sn.
- All HTS conductors are 7-15 times the (volumetric cost) of Nb<sub>3</sub>Sn.
- High Field or High Temperature use are key

Magnet builders much prefer round conductors with high conductor metal around the filaments

This is expensive. Bi-2212 offers – in many architectures with  $J_c$  well below Nb<sub>3</sub>Sn from about 12 T up

**D. Larbalestier – FCC2018**

NbTi and Nb<sub>3</sub>Sn – round wire:

→ Rutherford cable.

Bi-2212 – round wire:

→ Rutherford cable???

REBCO – tape:

→ CORC → Rutherford cable???

→ Roebel cable.

Present volumetric cost ratios:

Nb<sub>3</sub>Sn/HTS = 1/10 (average value, subject to fluctuations);

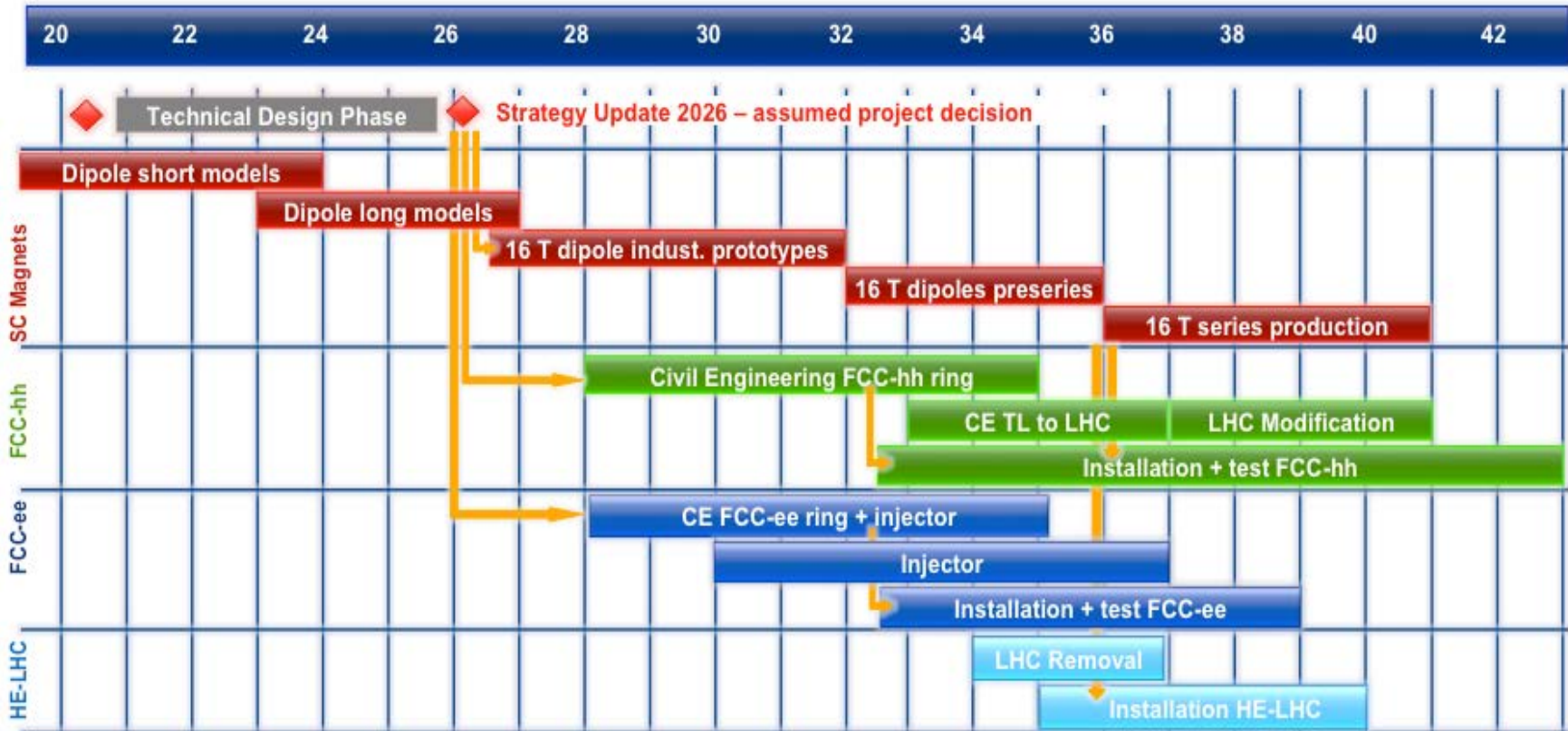
NbTi/Nb<sub>3</sub>Sn = 1/10 (has been relatively stable in the past 10-15 years).

- Excellent overview of the potential and challenges of Niobium based magnets
  - Complex and expensive for 16+ Tesla
  - Combination of NbTi and NbSn and HTS coils are discussed



# FCCee, hh, HE-LHC

## Technically limited schedule



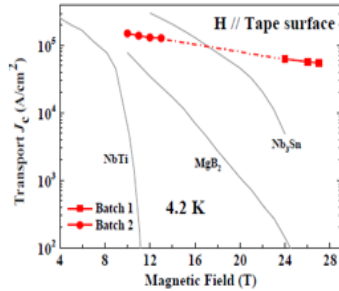
- FCC designs are actively progressing
  - Magnets, civil construction, accelerators design, cost estimates
  - Schedule is flexible, decision is expected around 2026 (next European Strategy)



## Progress on IBS wires

Supercond. Sci. Technol. 31 (2018) 015017

Y. Ma (IEECAS) et al.



**Latest transport property of IBS tape (2017):**

**Short tape (~4 mm wide, 0.3 mm thick):**  
 $I_c \sim 423 \text{ A}$  ( $J_c > 1450 \text{ A/mm}^2$ ) @ 4.2 K, 12 T

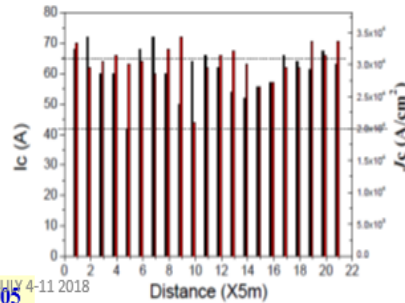
**100 meter long tape:**  
 $J_c > 200 \text{ A/mm}^2$  @ 4.2 K, 12 T



115 meter long 7-core tape



IEEE TAS 27 (2017) 7300705



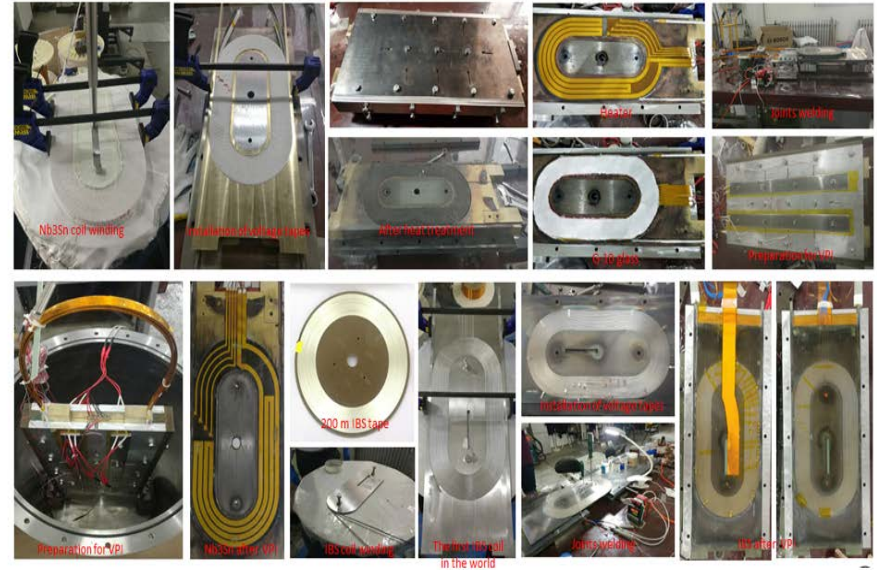
## IBS – Iron Based Superconductors

- Nb based magnets are “too expensive”
  - Bet on developing HTS technology on ~10 years time scale

## R&D of 12T Twin-aperture Dipole Magnet

**Fabrication of the 2<sup>nd</sup> model dipole magnet**

Two new Nb<sub>3</sub>Sn coils and one IBS coil have been fabricated



**The 2<sup>nd</sup> magnet to be tested in the end of July 2018**



- Next Higgs factory and next pp energy frontier collider are on top of HEP community discussions
  - Except in US
- Many excellent physics talks on future colliders
  - Precision and discovery potential of the Z/W/Higgs/top factory
  - Potential of ~100 TeV pp collider
- Technology is developing to make next generation of colliders affordable
  - Accelerating structures: SCRF, drive beams
  - High field magnets
- Fast developments in the energy frontier world-wide plans are expected over next 1-2 years!