KEK
High Energy Accelerator Research Organization

ILC Decision Timeline in Japan (KEK/JAHEP) and Asian LC overview

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2017 International Workshop on Future Linear Colliders (LCWS2017)

October 23, 2017, Strasbourg, France

Outline of this talk

- Current status of ILC project in Japan
  MEXT/JAHEP/KEK
- Expected decision timeline in Japan
- LC activities in Asia

MEXT ILC advisory Panel

In May 2013, MEXT asked Science Council of Japan (SCJ) for advice concerning hosting ILC in Japan.
In September 2013, SCJ sent a report to MEXT.
"conduct intensive studies and discussions … for the next two to three years."
"In parallel, it is necessary to to have discussions with the research institutes and the responsible funding authorities of key countries and regions involved outside of Japan"
http://www.scj.go.jp/ja/info/kohyo/pdf/Report%20on%20ILC_Exective%20Summary.pdf

In May 2014, MEXT set up ILC Advisory Panel to investigate issues to host the ILC in Japan. The panel set up four WG and produced three reports up to now:

- "Summary of ILC Advisory Panel's Discussions to Day" (June, 2015)
- "Report on Measures to Secure and develop Human Resources for the ILC" (July 2016)
http://www.mext.go.jp/component/b_menu/shingi/toushin/__icsFiles/afieldfile/2016/08/29/1374377_2.pdf
- "ILC Advisory Panel Report on ILC Organization and Management" (July 2017)

Summary of ILC Advisory Panel's Discussions to Day

June 2015

http://www.mext.go.jp/component/b_menu/shingi/toushin/__icsFiles/afieldfile/2015/08/05/1360596_3.pdf

- Recommendation 1: **Share the cost internationally** and **Find a clear vision on the discovery potential of new particles.**
- Recommendation 2: **Closely monitor and analyze the development of the LHC experiments** and **Mitigate cost risk.**
- Recommendation 3: **Obtain general understanding by the public and science communities.**

Report on ILC Organization and Management

July 2017

http://www.mext.go.jp/component/b_menu/shingi/toushin/__icsFiles/afieldfile/2017/10/06/1393957_02.pdf

- Organizational and management issues are investigated and the results of the study is presented in the report.
- Inputs to the WG deliberation
  - Revised ILC-Project Implementation Planning (PIP) by LCB (July 2015)
  - Project Design Guideline toward ILC (PDG) by ILCSC (Sept. 2012)
  - KEK-ILC Action Plan (Jan. 2016)
  - Survey on international projects (CERN, ITER, ALMA, etc.)
- The report is useful for discussions with partners outside of Japan.

US-Japan Discussion Group on ILC

- First meeting on May 25, 2016 at Washington D.C
  - Attended by Deputy Director-General, Research Promotion Bureau, MEXT, and Director, Office of Science, DOE.
  - Agreed on item of discussion
- Working level meeting on August 8, 2016 at ICHEP venue in Chicago
  - Attended by Director, Basic Research Promotion Div., MEXT, and Associate Director for HEP, DOE.
  - Heard from KEK and FNAL on the proposal of the joint R&D for cost reduction.
- Second meeting on October 18, 2016 by video
  - Attended by Deputy Director-General, Research Promotion Bureau, MEXT, and Director, Office of Science, DOE.
  - Agreed to begin the joint R&D from April 2017.
- Discussion group activity continues. The report on ILC Organization and Management is an input to this activity.

Consensus on ILC250 in JAHEP

The Japanese HEP community (JAHEP) set up a subcommittee to deliberate the scientific significance of the 250GeV ILC. Its report(*) was presented at the JAHEP meeting in July 2017, and based on its deliberation, JAHEP decided to release a new statement: "Scientific Significance of ILC and Proposal of its Early Realization in light of the Outcomes of LHC Run 2 " http://www.jahep.org/files/JAHEP-ILCstatement-170816-EN.pdf

the scientific significance and importance of ILC has been further clarified considering the current LHC outcomes. ILC250 should play an essential role in precision measurement of the Higgs boson and, with HL-LHC and SuperKEKB, in determining the future path of new physics. Based on ILC250's outcomes, a future plan of energy upgrade will be determined so that the facility can provide the optimum experimental environment by considering requirements in particle physics and by taking advantage of the advancement of accelerator technologies. It is expected that ILC will lead particle physics well into the 21st century.

To conclude, in light of the recent outcomes of LHC Run 2, JAHEP proposes to promptly construct ILC as a Higgs factory with the center-of-mass energy of 250 GeV in Japan.

The conclusion was reported to the LCB meeting in August 2017.
This proposal is a core of recommendations in "The final report of the committee on Future Projects of High Energy Physics" recently approved by JAHEP.

(*) http://www.jahep.org/files/ILC250GeVReport-EN-FINAL.pdf

KEK efforts for the ILC promotion

- KEK will work closely with LCC and LCB to realize the ILC hosted in Japan.
- KEK will cooperate with various sectors/organizations that promote the ILC project vigorously in Japan; Federation of Diet members, the industrial sector (AAA), local sectors, etc.
- KEK will provide the ILC Advisory Panel in MEXT with appropriate information to help their timely conclusion.
- KEK will promote activities to obtain general understanding by the public and scientific communities.
- KEK will cooperate with international physics communities to facilitate discussions between governments and funding authorities.
- KEK efforts for the ILC promotion are coordinated at the Planning Office for the ILC headed by KEK-DG.

Expected decision timeline in Japan

- At the 7th ILC Advisory Panel in July 2017, items to be considered were listed.
  - ✓ CERN experiment status
  - ✓ The updated plan by the international researchers' community
  - ✓ Results of external survey researches in FY2017 (regulations/risks concerning ILC, Cost reduction of large international accelerator projects)
- If ICFA endorses the plan of ILC 250, these considerations by the Panel can be concluded in half a year timescale.
- If the Panel's conclusion is favorable for pursuing the ILC in Japan, then the next year becomes a real critical time for realization of the ILC.
- In parallel, we would like to facilitate discussions between the Japanese Government and foreign partners beyond US-Japan.
- Serous discussions need to be started before the next round of future planning of HEP in various regions (ex. Update of the European strategy for particle physics) .

LC Activities in Asia

Thanks to S. Michizono, J. Gao, S. Datta, S. Joshi, and S. Stapnes

ILC R&D at KEK

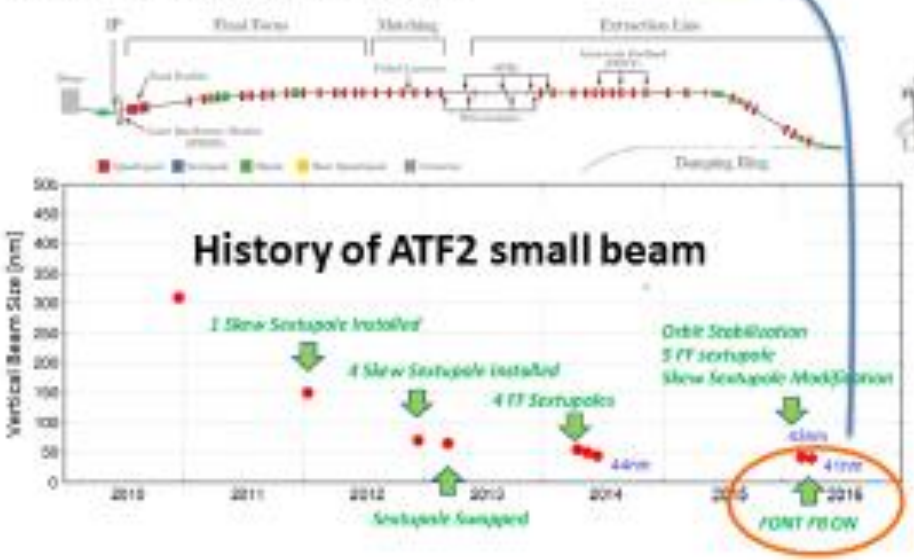
ATF
Nano-beam R&D

ATF2: Final Focus Test Beamline

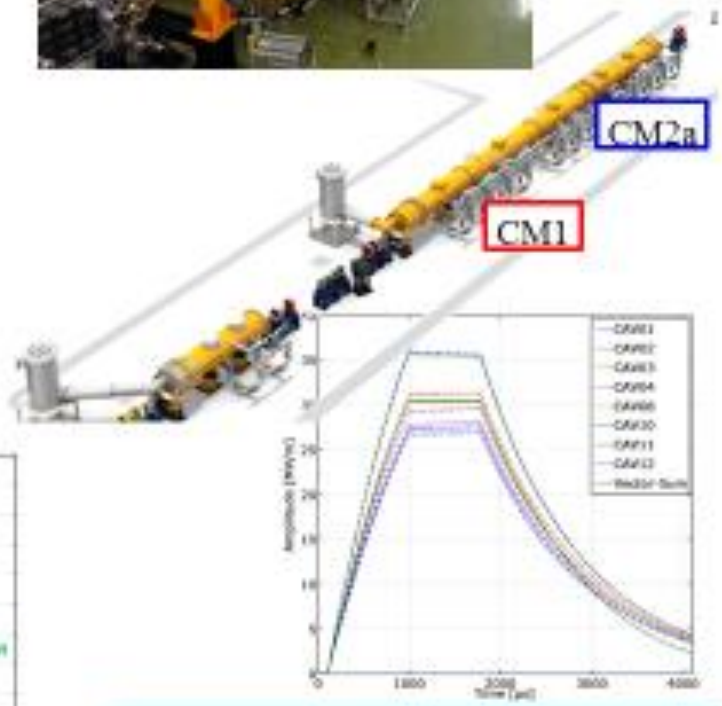
Goal 1:Establish the technique for small beam

ATF2 Goal : **37** nm (equivalent to ILC **6** nm)

Goal 2: Stabilize beam position

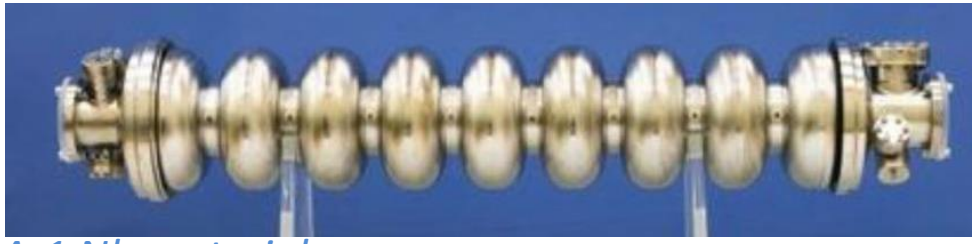


STF
SRF R&D



8 Cavities were operated at 31MV/m.

US-Japan cost reduction R&D



Cost reduction by technological innovation

A-1 Nb material:

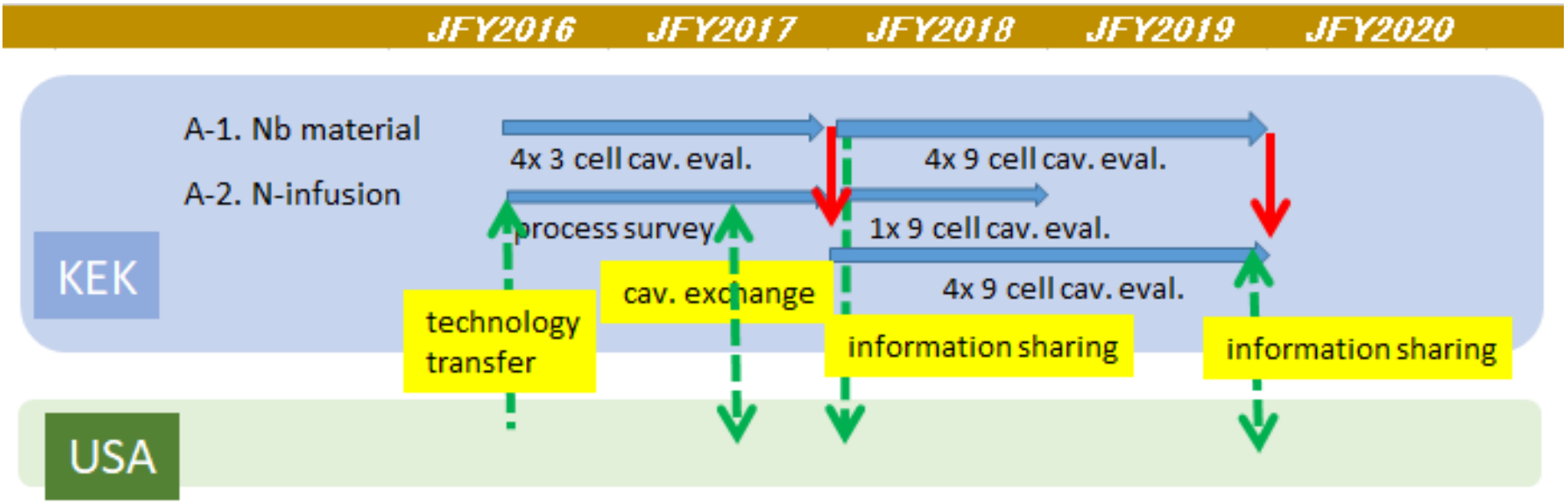
Innovation of Nb (superconducting) material process: decrease in material cost

evaluation of 3 cell cavities are ongoing.

A-2 Nitrogen infusion (N-infusion)

Innovative surface processing for high efficiency cavity by FNAL: decrease in number of cavities

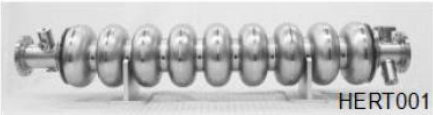
procurement of the vacuum furnace for N-infusion is ongoing

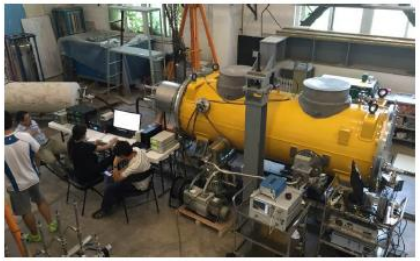


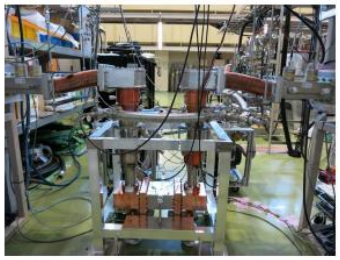
IHEP-KEK collaboration (I)

IHEP-KEK 1.3 GHz ILC SCRF Technology Collaboration

Since 2005-now

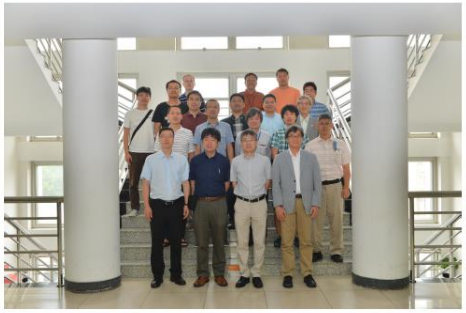
2016	9-cell **TESLA**, fine grain cavity with HOM, by HERT, **24 MV/m**	
2014	9-cell **TESLA-like**, fine grain cavity with HOM, 16.8 MV/m by EP,	
2012	9-cell **Low Loss**, large grain cavity with HOM, 20 MV/m by EP	
2010	9-cell low-loss, large grain cavity without HOM, 20 MV/m by BCP	
2006 ~ 2008	single cell low-loss large and fine cavity 48 MV/m by EP 40 MV/m by BCP	





IHEP-KEK SCRF Collaboration Meetings (since 2006)

The 6th meeting was held at IHEP in July 2017.

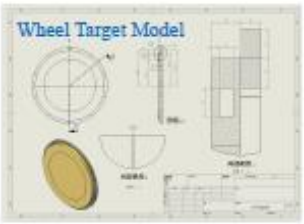


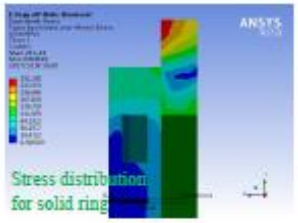
6th Meeting, July 15, 2017

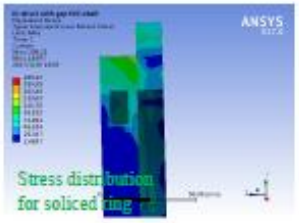
IHEP-KEK collaboration (II)

IHEP-KEK ILC Positron Source and ATF2 Collaboration

- Mainly focused on thermal stresses simulation for conventional e+ source rotation target for ILC;
- Studies carried out on following topics by ANSYS Workbench:







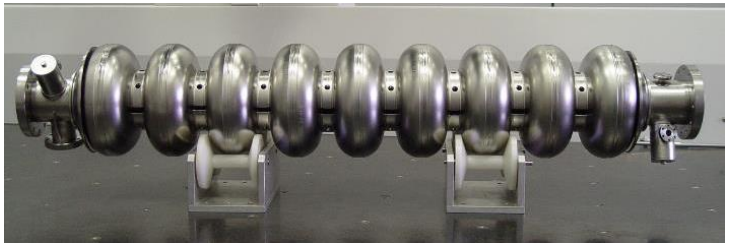
ILC positron source target studies

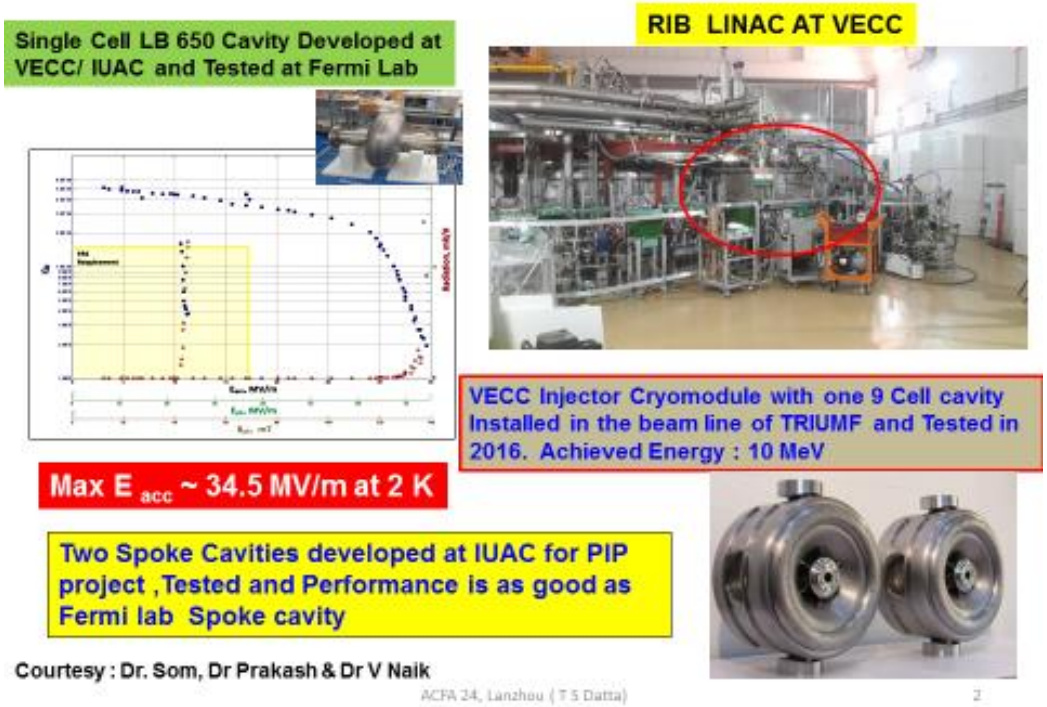
ATF2

SRF activites in India relevance to ILC

1. **Superconducting LINAC at IUAC. Delhi**
2. **ADS Programme at RRCAT, Indore & VECC. Kolkata with FERMI Lab Collaboration**
3. **RIB LINAC AT VECC (TRIUMF Collaboration)**

RRCAT Vertical Test Stand Facility

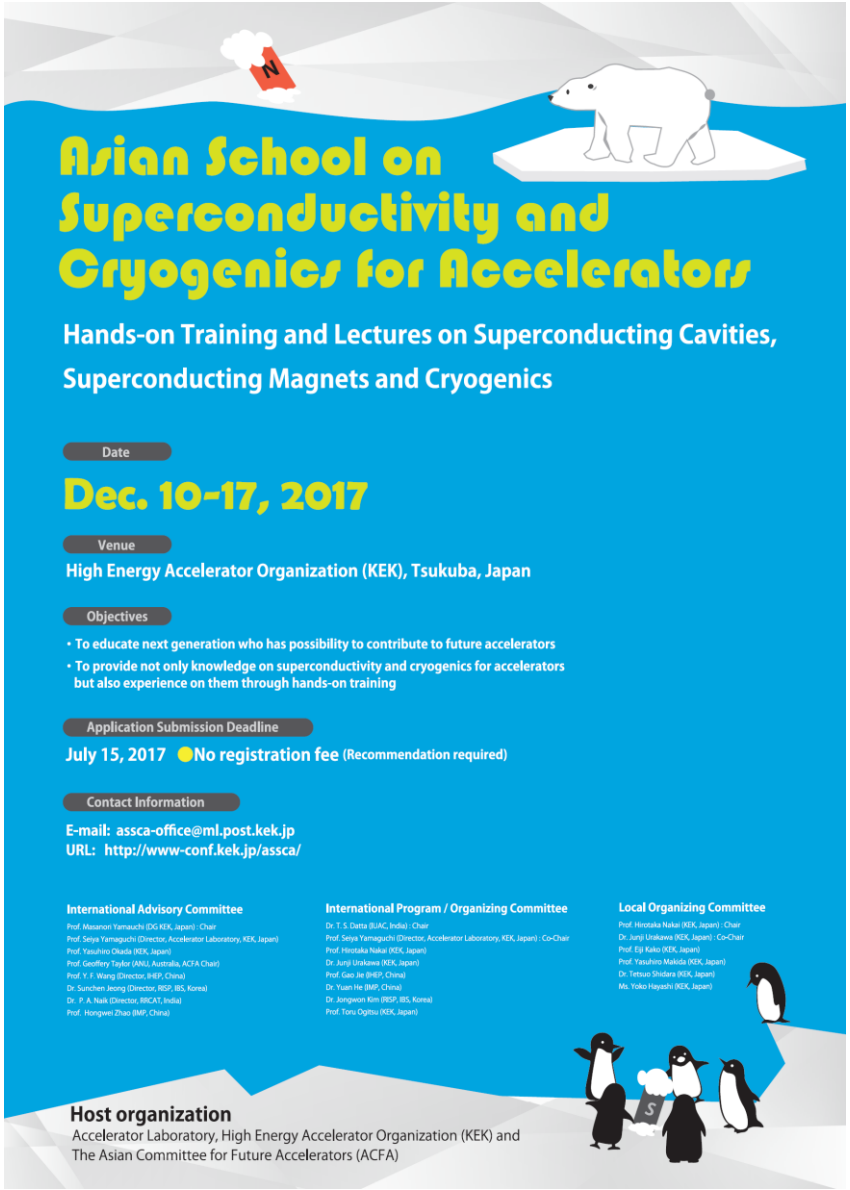




First Indian 1.3 GHz nine cell (ILC type) SCRF cavity

ASSCA 2017

"Asian School on Superconductivity and Cryogenics for Accelerators"
is organized by KEK and ACFA



Asian School on Superconductivity and Cryogenics for Accelerators

Hands-on Training and Lectures on Superconducting Cavities, Superconducting Magnets and Cryogenics

Date

Dec. 10-17, 2017

Venue

High Energy Accelerator Organization (KEK), Tsukuba, Japan

Objectives

- To educate next generation who has possibility to contribute to future accelerators
- To provide not only knowledge on superconductivity and cryogenics for accelerators but also experience on them through hands-on training

Application Submission Deadline

July 15, 2017 ●No registration fee (Recommendation required)

Contact Information

E-mail: assca-office@ml.post.kek.jp
URL: http://www-conf.kek.jp/assca/

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Host organization

Accelerator Laboratory, High Energy Accelerator Organization (KEK) and
The Asian Committee for Future Accelerators (ACFA)

KEK
High Energy Accelerator Research Organization

CLIC in Asia (I)

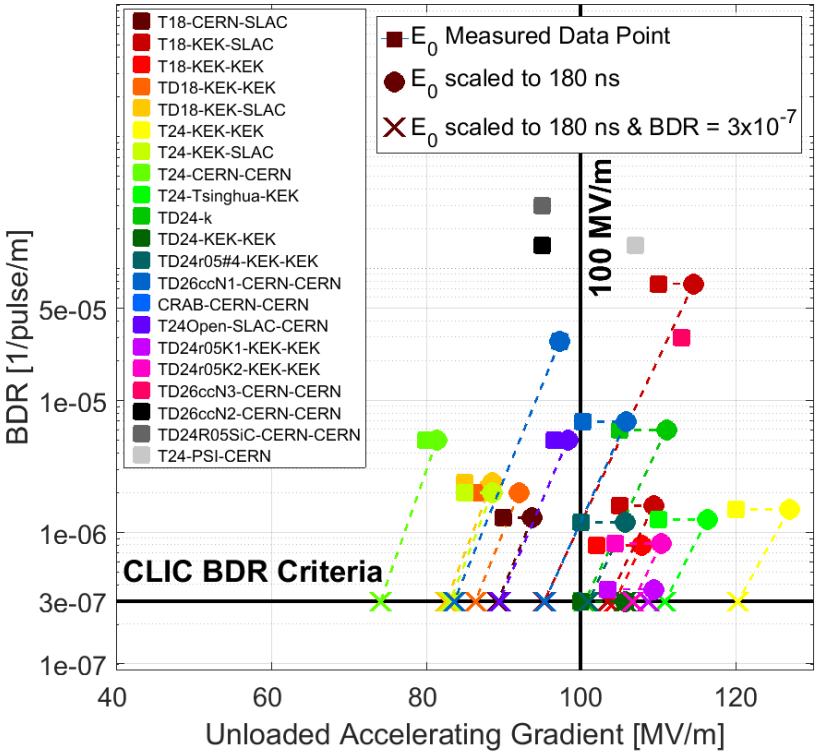
Accelerator collaboration with ~50 institutes
Detector collaboration with ~29 institutes

Place	Activity	Xband RF power	Status
CERN	XBox-1 test stand	50 MW	Operational, connection to CLEAR planned
	Xbox-2 test stand	50 MW	Operational
	XBox-3 test stand	4x6 MW	Operational
Trieste	Linearizer for Fermi	50 MW	Operational
PSI	Linearizer for SwissFEL	50 MW	Operational
	Deflector for SwissFEL	50 MW	Design and procurement
DESY	Deflector for FLASHforward	6 MW	Design and procurement
	Deflector for FLASH2	6 MW	Design and procurement
	Deflector for Sinbad	tbd	Planning
Tsinghua	Deflector for Compton source	50 MW	Installation and commissioning
	Linearizer for Compton source	6 MW	Planning
SINAP	Linearizer for soft X-ray FEL	6 MW	Design and procurement
	Deflectors for soft X-ray FEL	3x50 MW	Design and procurement

X-band activities in Asia: KEK, Tsinghua, SINAP - and Australian cluster preparing facility (see table)

Australia	Test stand	2x6 MW	Proposal submission
Eindhoven	Compact Compton source, 100 MeV	6 MW	Design and procurement
Valencia	S-band test stand	2x10 MW	Installation and commissioning
KEK	NEXTEF test stand	2x50 MW	Operational
SLAC	NLCTA test stand	2x50 MW	Operational
SLAC/CERN	Design of high-efficiency X-band klystron	30 MW	In progress
Daresbury	Linearizer	6 MW	Design and procurement
	Deflector	tbd	Planning
	Accelerator (CLARA extensions)	tbd	Planning
Frascati	XFEL, plasma accelerator, 1 GeV	4(8)x50 MW	CDR
	Test stand	50 MW	Planning
Gronigen	1.4 GEV XFEL Accelerator, 1.4 GeV	tbd	NL roadmap, CDR

CLIC in Asia (II)



Brief overview:

X-band activities in Asia: KEK, Tsinghua, SINAP - and Australian cluster in progress:

- Xband test stand (NEXTEF) at KEK has provided large part of the benchmark performance numbers (figure right), also testing structures for our Chinese collaborators
- Tsinghua are now coming online for in-house testing

ATF2 is very important for CLIC – as well as for ILC

Active and very fruitful collaborations with groups in India, Pakistan and Iran covering a number of studies, examples: PETs, Damping Rings, Drivebeam front end, etc

- Partly carried out locally and partly with personnel from these institutes coming to CERN