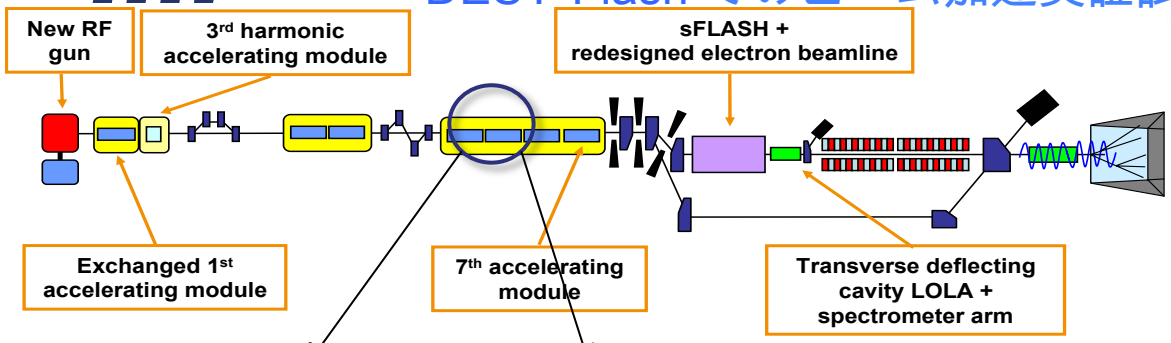
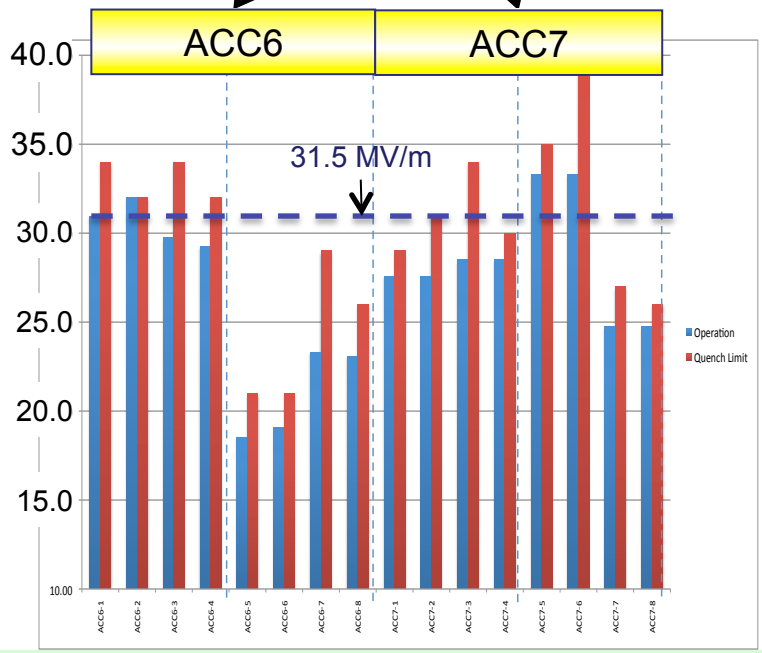
DESY-FLASH Beam Test

DESY-Flash でのビーム加速実証試験





← ILC ビーム電流実証

- ✓ ILC-like beam (3, 6 and 9mA)
- ✓ Energy stability (<10^{-3})
- ✓ Control of heavy beam loading
- ✓ Control of cavity Lorentz force detuning
- ✓ Active tuning for large gradient spread operation
- ✓ Operation
  - ✓ Auto
- ✓ Controls
- ✓ Klystron
- ✓ General
  - ✓ Fast
  - ✓ Deal (prot

Parameters	Value
C.M. Energy	500 GeV
Peak luminosity	1.8 x10^{34} cm^{-2}s^{-1}
Beam Rep. rate	5 Hz
Pulse duration	0.73 ms
Average current	5.8 mA (in pulse)
E gradient in SCRF acc. cavity	31.5 MV/m +/-20% Q_0 = 1E10

- ➢ Runs 24/7 as VUV SASE user facility
- ➢ Primary SRF systems tests for ILC TDR (dedicated 9mA experiment runs)

IPAC14: Courtesy: H. Weise

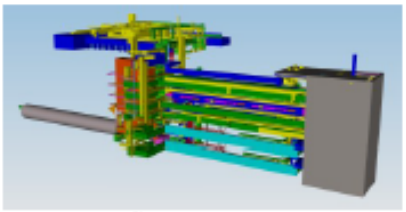
European XFEL

An Accelerator Complex for 17.5 GeV

100 accelerator modules

800 accelerating cavities
1.3 GHz / 23.6 MV/m

25 RF stations
5.2 MW each



E-XFEL: 欧州・X線自由電子レーザー・光科学施設・建設中：2016年稼働予定
800台の超伝導加速空洞をRI, Zanon 社で工業生産、CEA-Saclay, DESY で組み立て・試験

IPAC14: Courtesy: H. Weise

European XFEL

An Accelerator Complex for 17.5 GeV

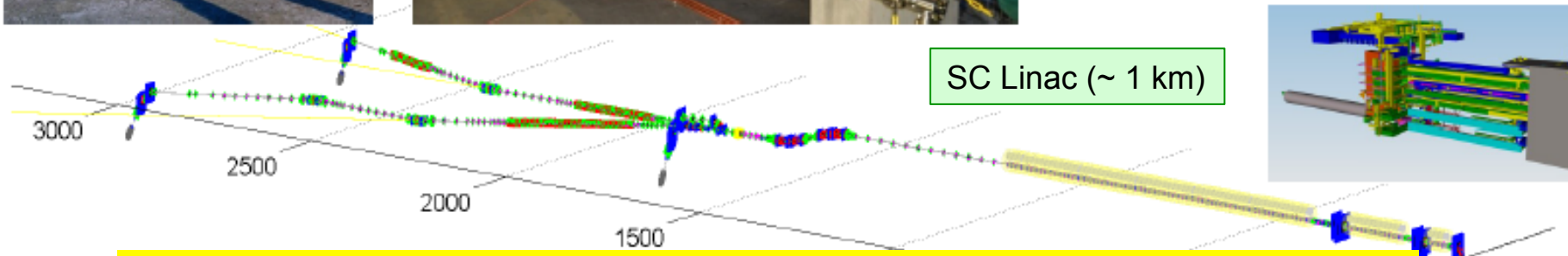
100 accelerator modules

Some specifications

- Photon energy 0.3 - 24 keV
- Pulse duration ~ 10 - 100 fs
- Pulse energy few mJ
- Superconducting linac. 17.5 GeV
- 10 Hz (27 000 b/s)

800 accelerating cavities
1.3 GHz / 23.6 MV/m

25 RF stations
5.2 MW each



SC Linac (~ 1 km)

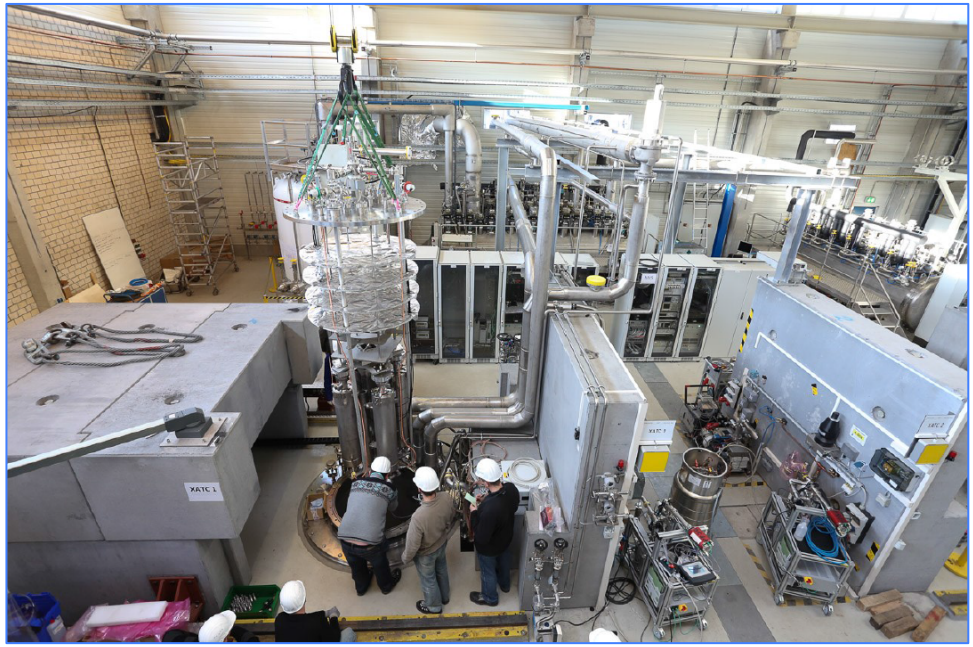
EXFEL: 1/20 Scale Project on going, Industrialization being verified !!
EXFEL: 1/20 スケール実計画、進行中→工業化技術を実証中

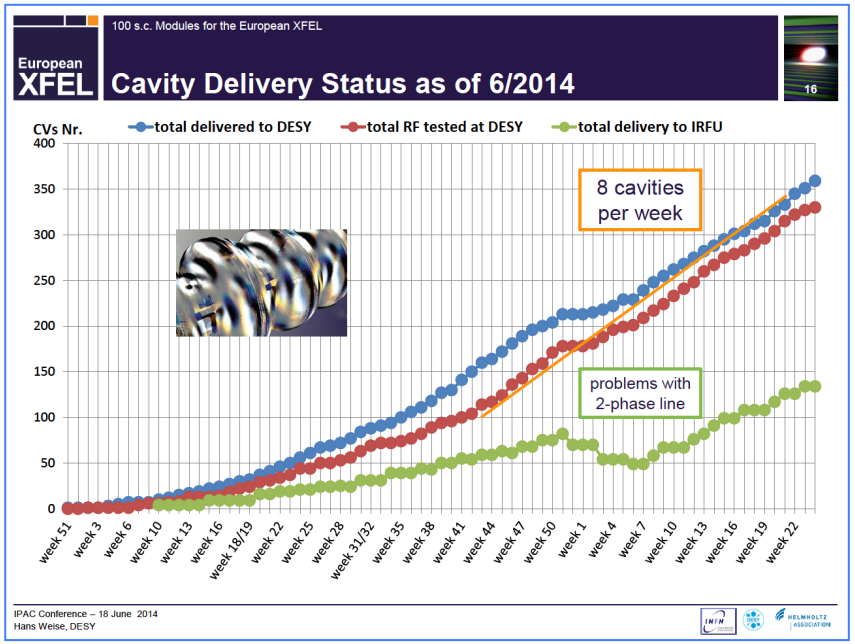
HELMHOLTZ ASSOCIATION

IPAC14: Courtesy: H. Weise

SCRF Cavity Production

超伝導加速空洞・製造(RI, ZAON)と試験実績 (DESY)





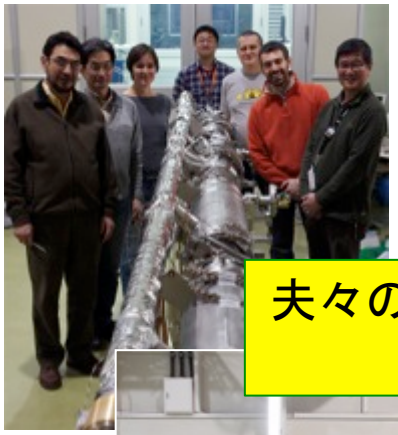
- **Gradients** in average above specification (almost 300 cavities tested)
  - Average usable gradient after delivery (26.8 ± 7.1) MV/m
  - 2/3 of cavities can be used w/o further treatment
  - 1/3 is getting additional treatm. -> usable grad. increased to (29.6 ± 5.1) MV/m

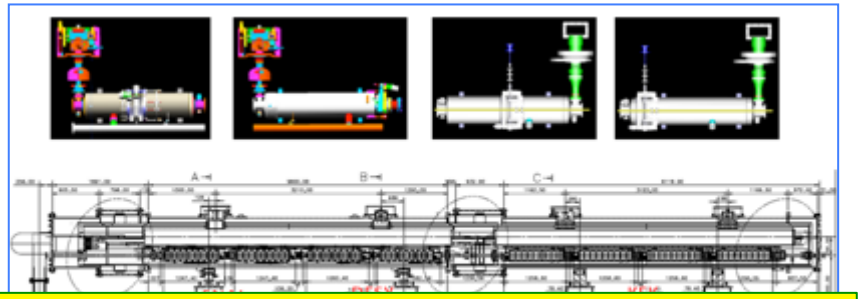
2014.6現在：空洞製造・試験 ＞300 台。 使用可能電界、~＜30＞MV/m

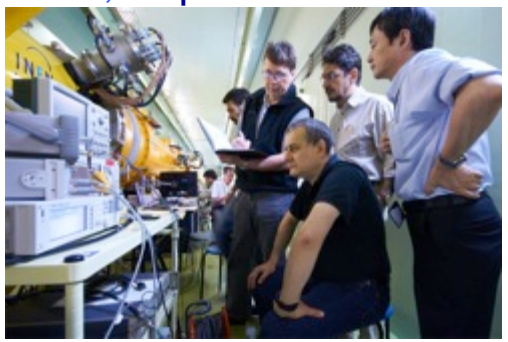
S1-Global hosted at KEK:
国際協力による共同作業、空洞相互整合性、評価試験

DESY, FNAL, Jan., 2010

DESY, Sept. 2010







FNAL & INFN, July, 2010

夫々の設計による空洞を持ち寄り、お互いに評価
協調した運転に成功

INFN and FNAL Feb. 2010

March, 2010

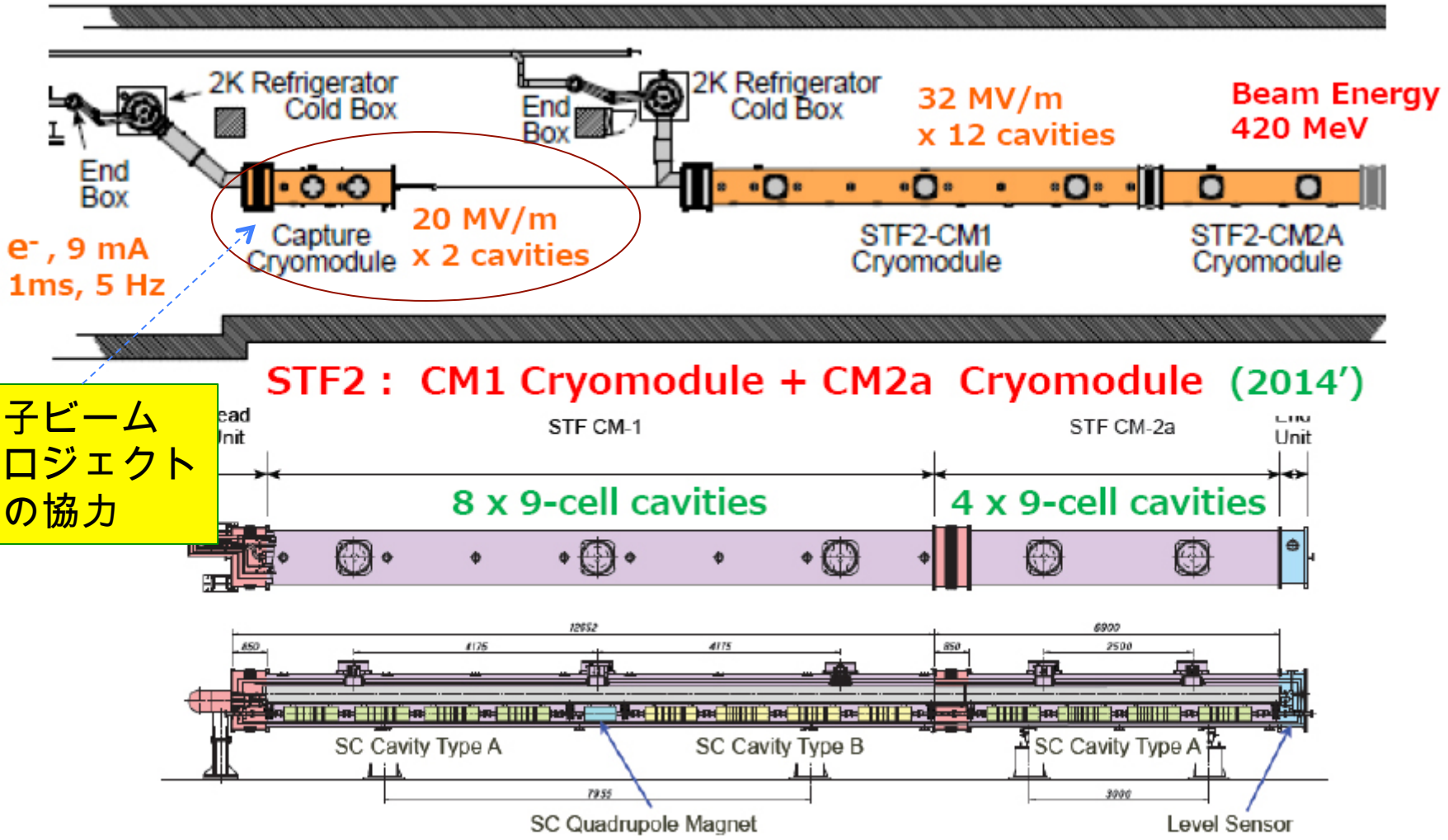
DESY, May, 2010

June, 2010 ~

E. Kako, Dec. 2013

10 year Evolution of STF at KEK

KEK-STF: 10年をかけた超伝導RF 試験加速器の進展



量子ビームプロジェクトとの協力

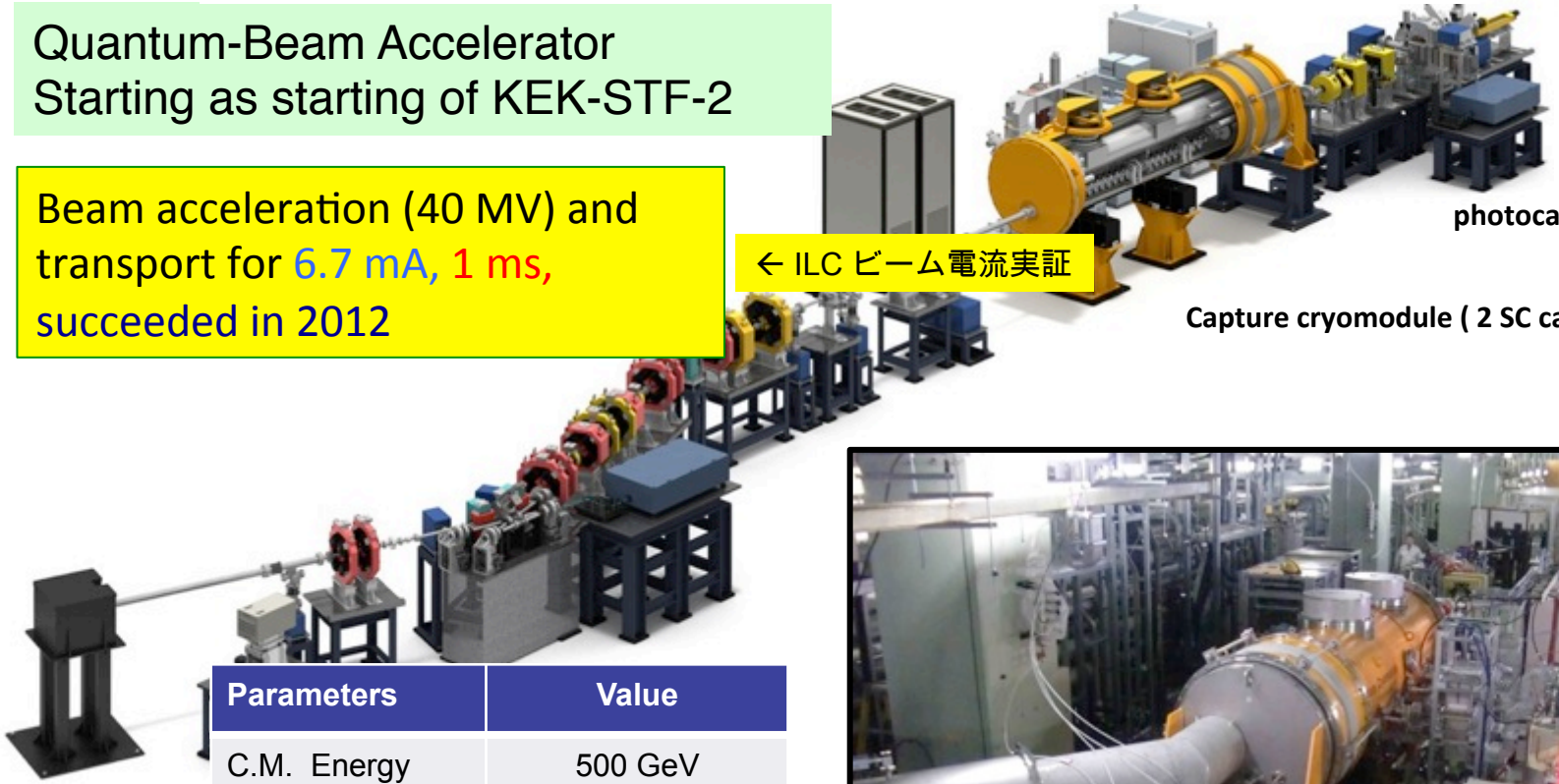
up to ~ 420MeV

ILC beam Acceleration at KEK STF

KEK-STF でのビーム加速実証試験

Quantum-Beam Accelerator
Starting as starting of KEK-STF-2

Beam acceleration (40 MV) and transport for 6.7 mA, 1 ms, succeeded in 2012

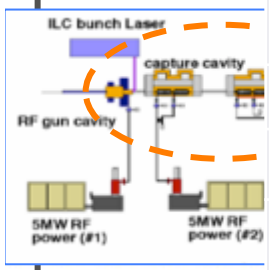


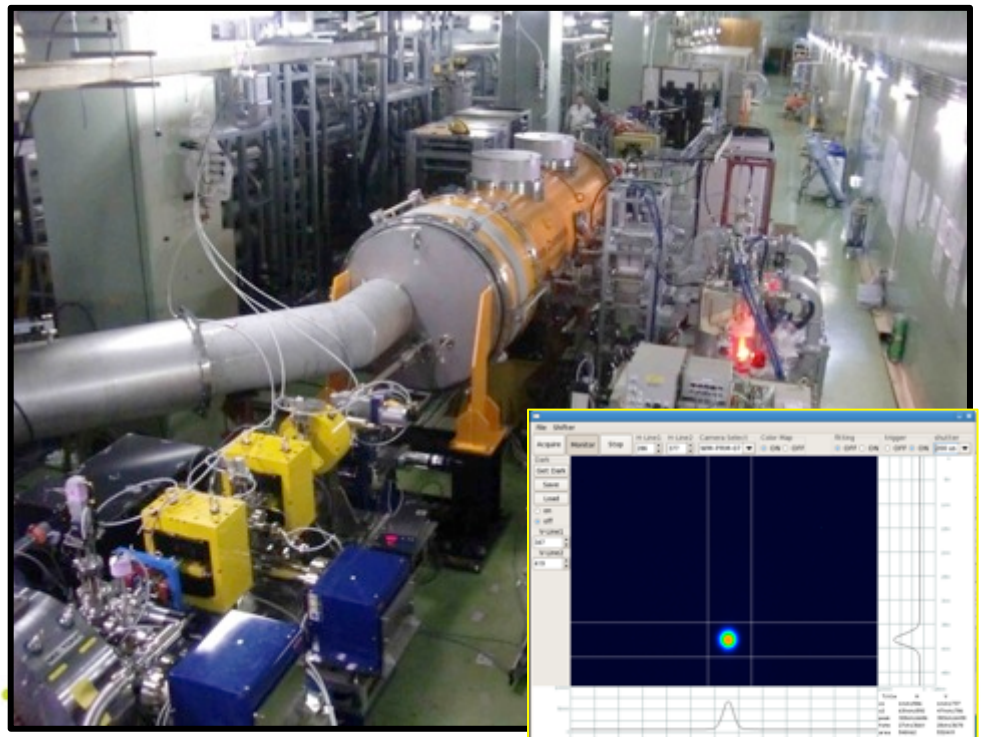
photocathode RFgun

← ILC ビーム電流実証

Capture cryomodule (2 SC cavities)

Parameters	Value
C.M. Energy	500 GeV
Peak luminosity	1.8 x10^{34} $cm^{-2}s^{-1}$
Beam Rep. rate	5 Hz
Pulse duration	0.73 ms
Average current	5.8 mA (in pulse)
E gradient in SCRF acc. cavity	31.5 MV/m +/-20% Q_0 = 1E10

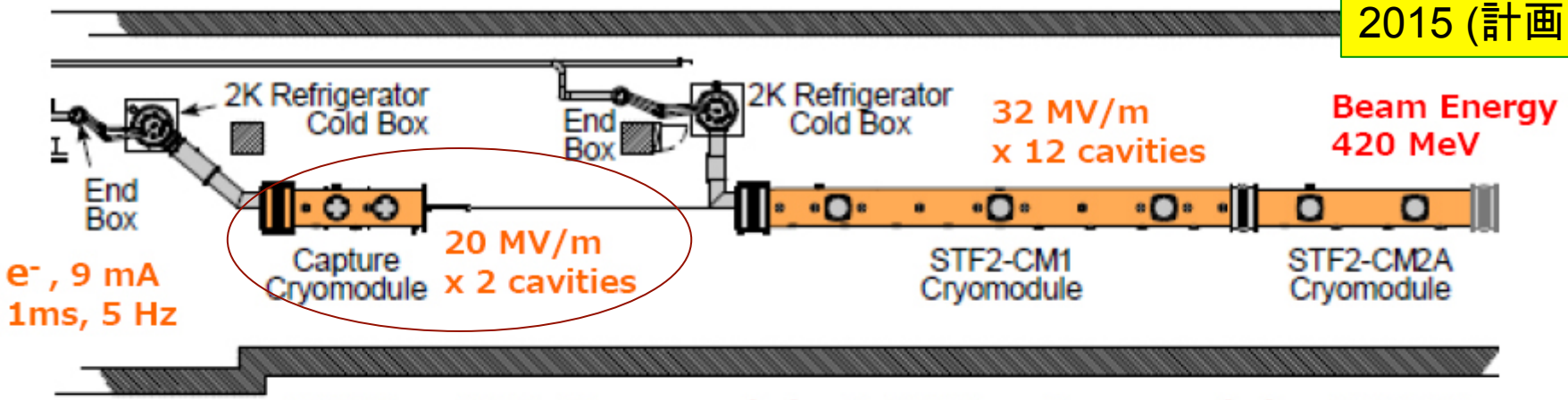




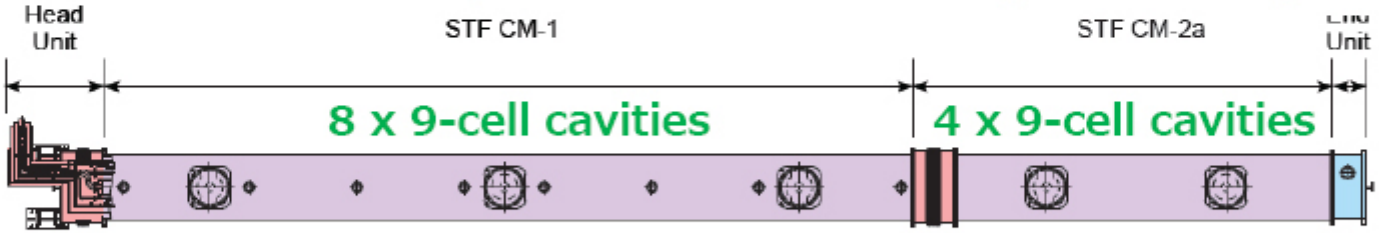
10 year Evolution of STF at KEK

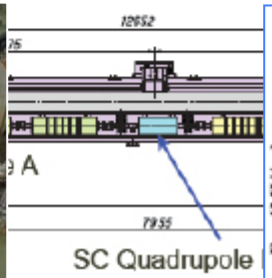
KEK-STFでの10年をかけた進展

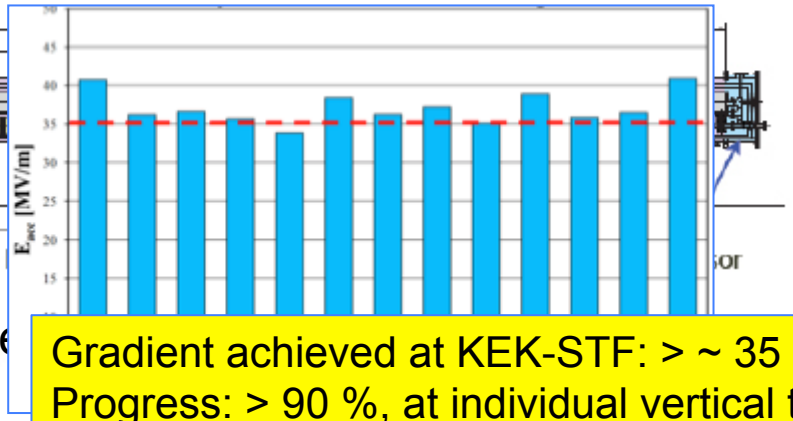
ビーム加速
2015 (計画)



STF2 : CM1 Cryomodule + CM2a Cryomodule (2014')







up to ~ 420Me

Gradient achieved at KEK-STF: > ~ 35 MV/m
Progress: > 90 %, at individual vertical test

Cooperation of ILC host- and hub-laboratories with worldwide industry (proposed)