

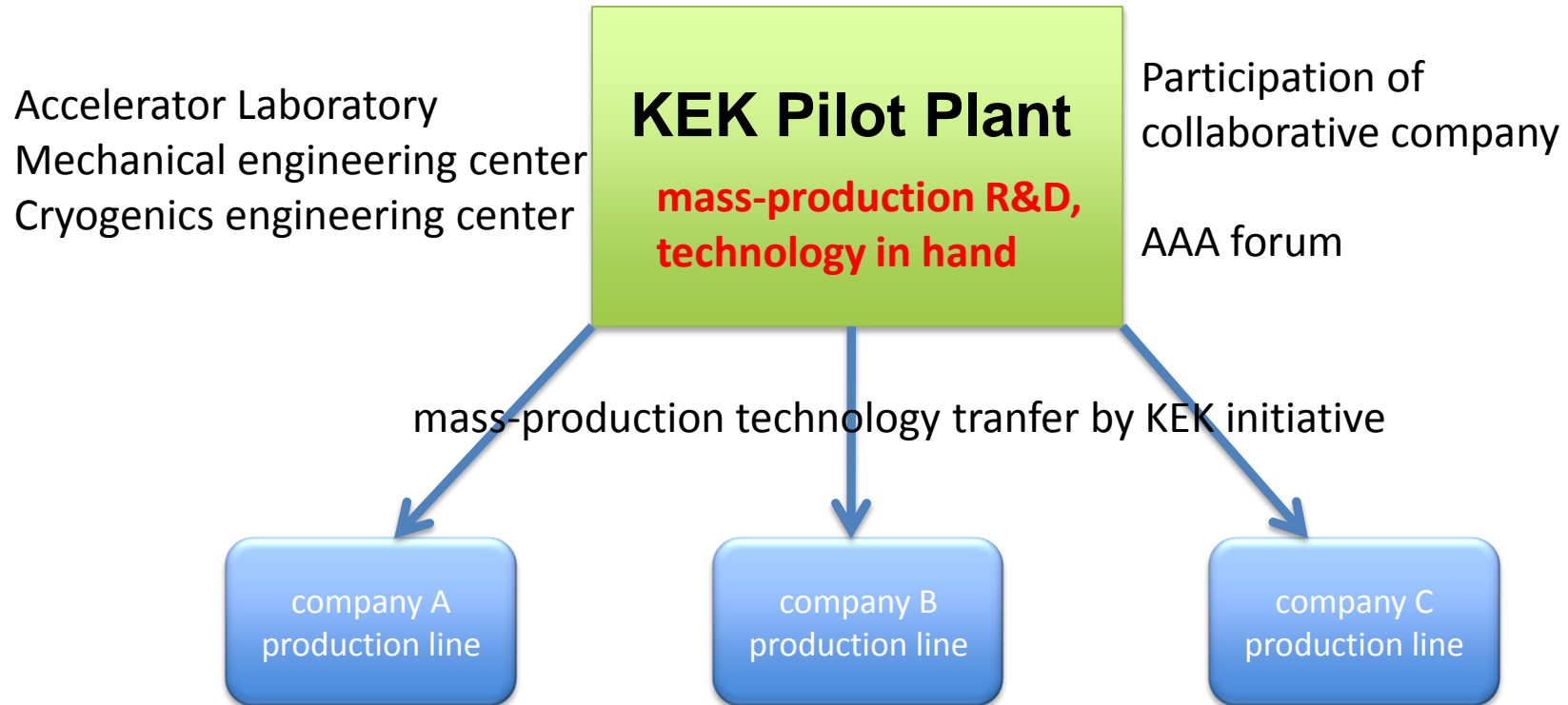
Status of cavity fabrication facility at KEK

Cavity Industrialization Study at KEK

H. Hayano, KEK 05232010

Industrialization of Cavity Fabrication

start preparation of ILC mass-production technology development



KEK Pilot Plant: main R&D

Center cell

EBW Quality Control Technology

multi-dumbel, multi-cell, multi-cavity Jigs for EBW

Endgroup

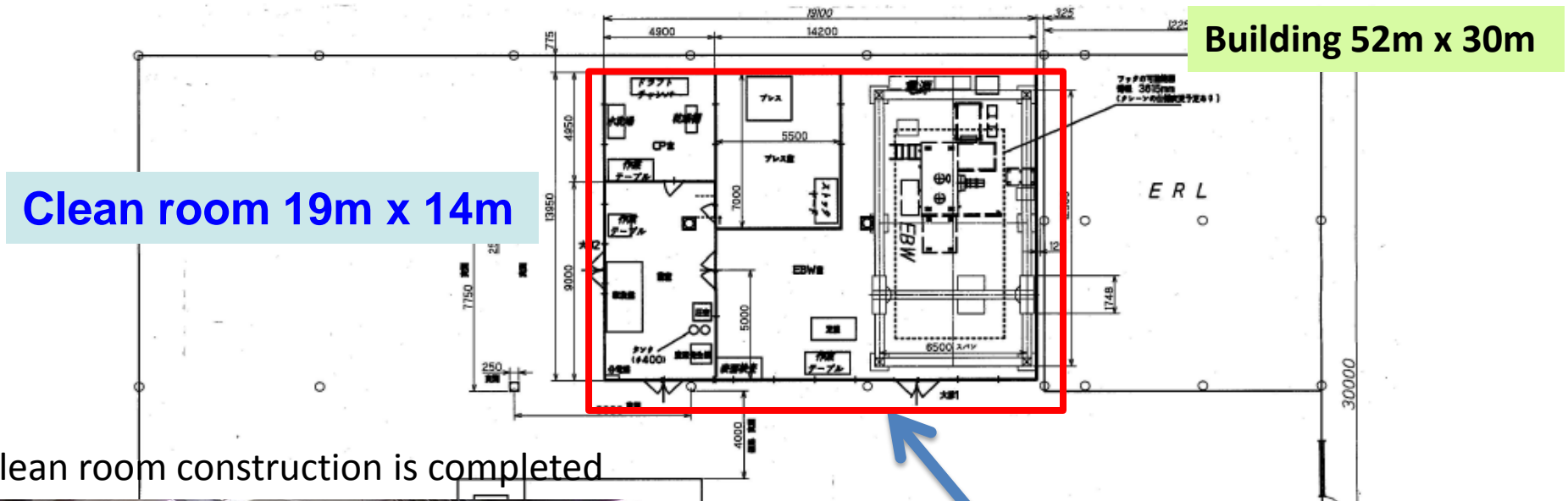
Deep Drawing Technology

Fine-blanking and Press-forming Technology

End-group Jigs for EBW

R&D Place in KEK

Refurbishment of 'P.S. energy center' building was completed.

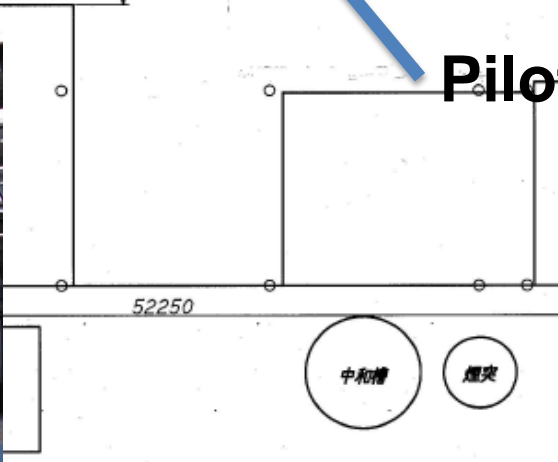


Clean room 19m x 14m

Building 52m x 30m

clean room construction is completed

Pilot plant area

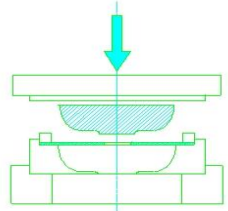


Pilot plant clean room

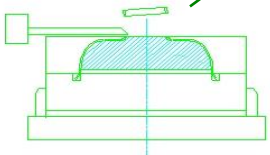
Chemical Polish room

19m x 14m ISO class-5 clean room

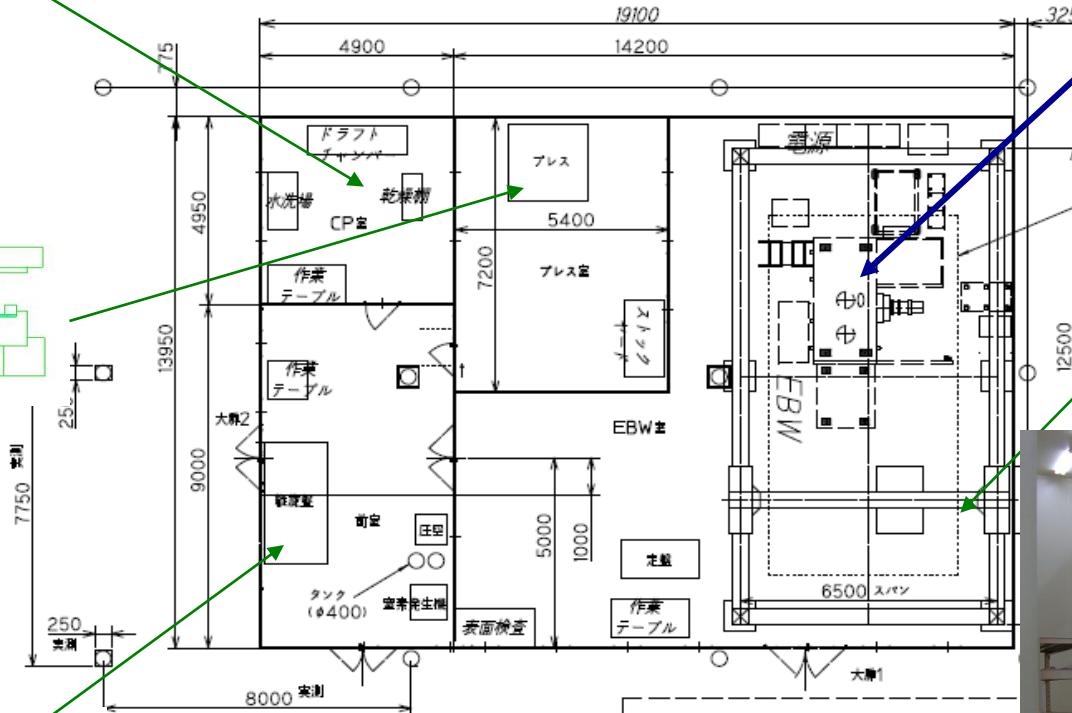
Electron Beam Welder



Press machine



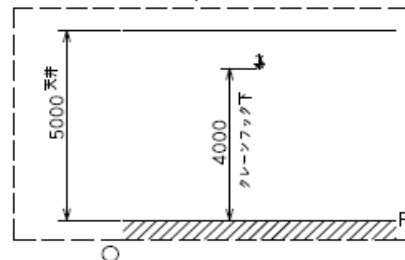
Triming machine



crane 2.8t

フックの可動範囲
挿性 4000mm

クリーンルーム
 プレハブパネル本体 硬質ウレタンサンドイッチパネル
 断熱パネル 厚さ42mm
 内外装カラー鋼板 塗色アイポリー
 プレス室の壁および前室、EBW室の柱も同パネルで囲う
 大扉1,2の開口部は開口2m以上、高さ4m以上でエアタイトであること



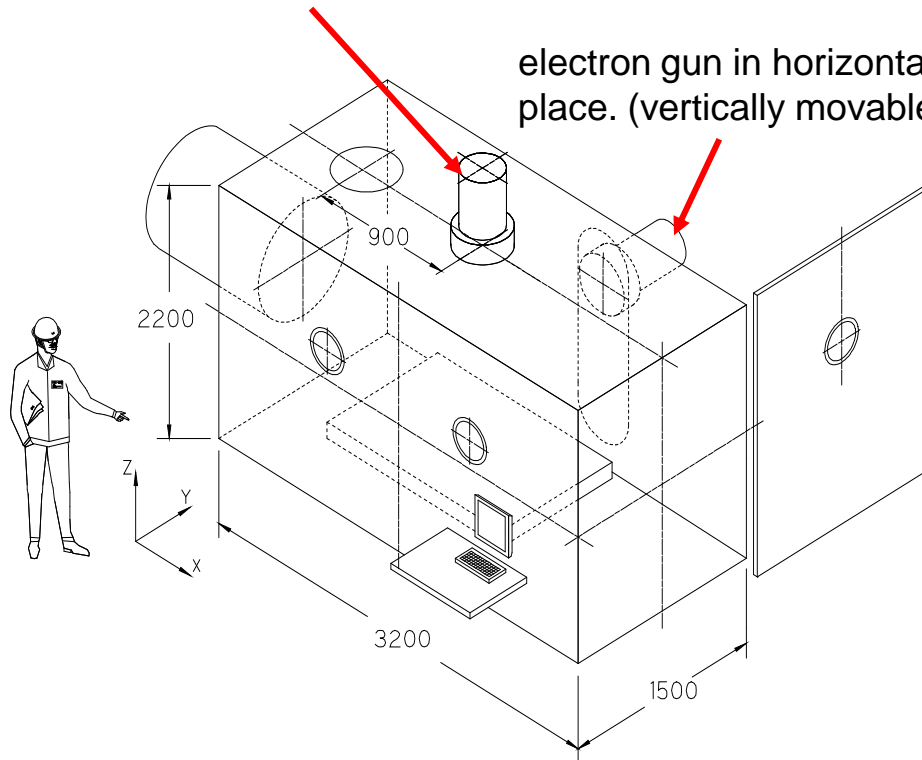
EBW place and crane girder

Main facility: Electron Beam Welder

we spent one year for survey of cavity EBW machine.
After bidding, one EBW machine was ordered.

electron gun

electron gun in horizontal place. (vertically movable)



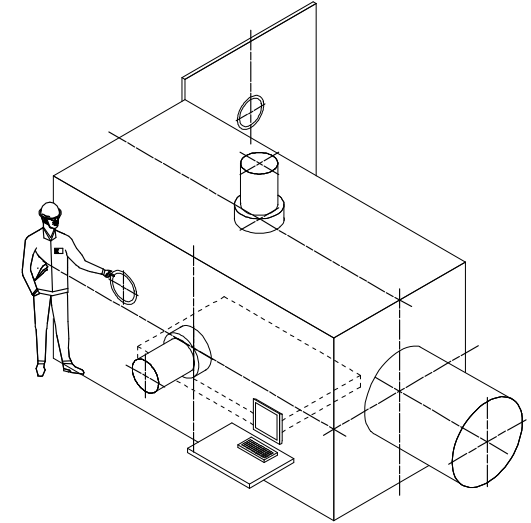
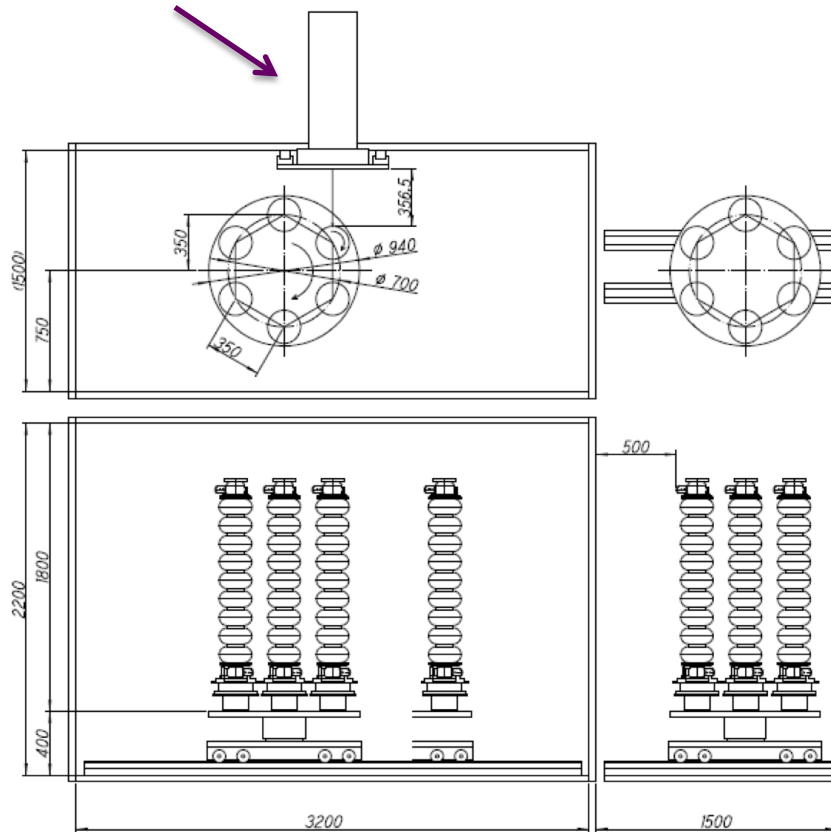
DESY EBW; the same company

Steigerwald 150kV 15kW machine will be delivered in March 2011.

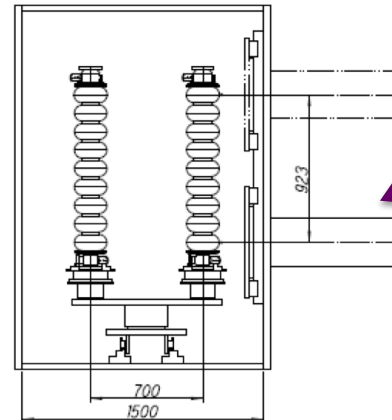
Plan of multi-cavity welding

6 cavities welding plan in the final process

electron gun from side wall



gun moves vertically



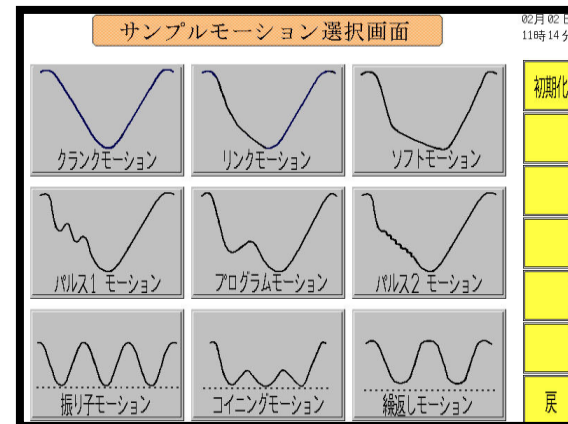
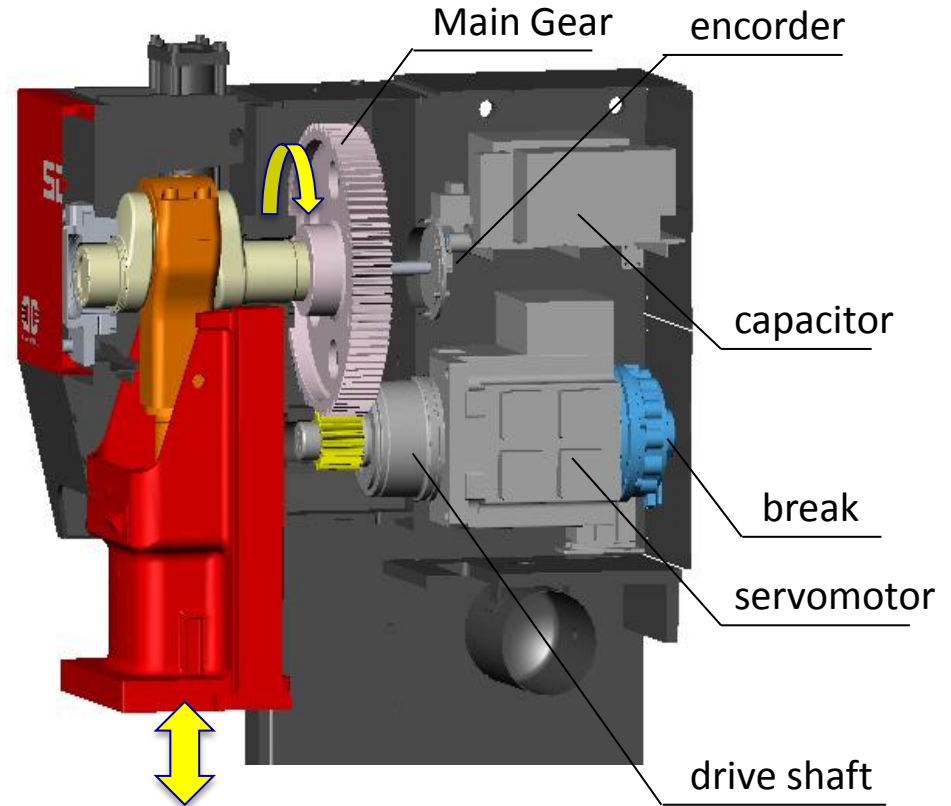
Digital servomotor Press machine

combination of servomotor and crank mechanism

max. 150t



from Amada presentation



press motion controls

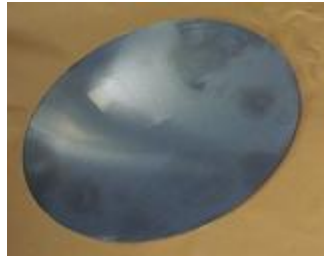
Deep drawing of cup; for example

conventional press

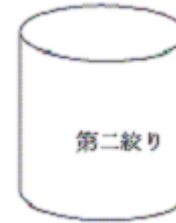
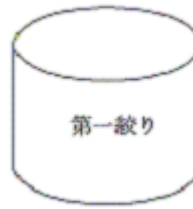
TPL150



①plate
Φ165 0.5 t



→ ②1st deep drawing → ③2nd deep drawing → ④3rd deep drawing



SDE1522



①plate
Φ160 0.5 t

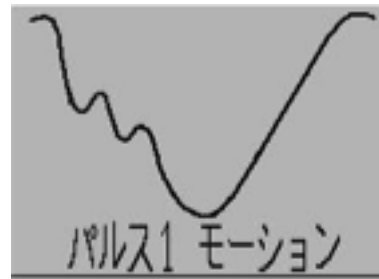


→ ② one deep drawing

モーシヨソ設定	パルス1モーション
上昇移動量	0.1 mm
追い込み移動量	1 mm
繰り返し回数	30 回
加工ストローク数	10 min-1



no shock-line

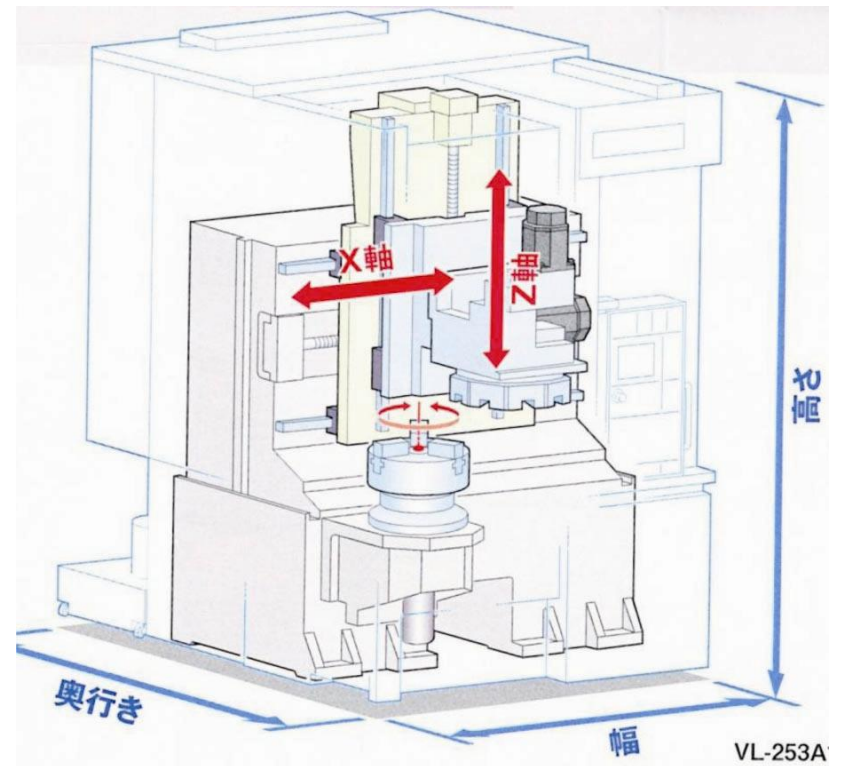


digital servomotor press

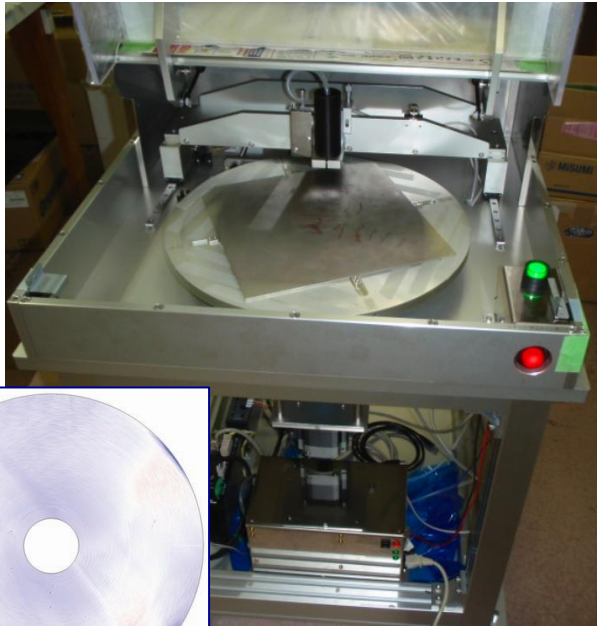
Cell trimming machine



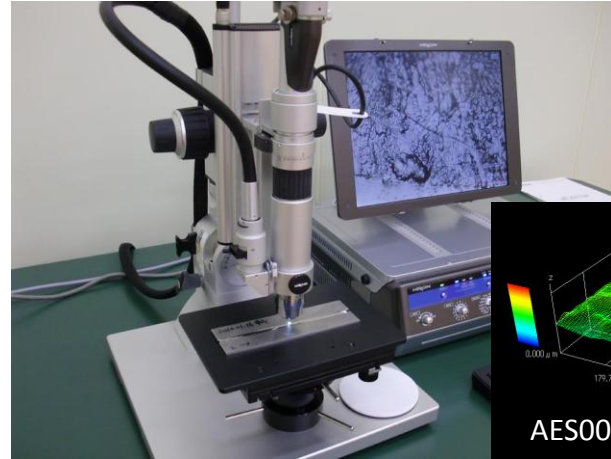
cell cup is held in horizontal plane, and rotate.



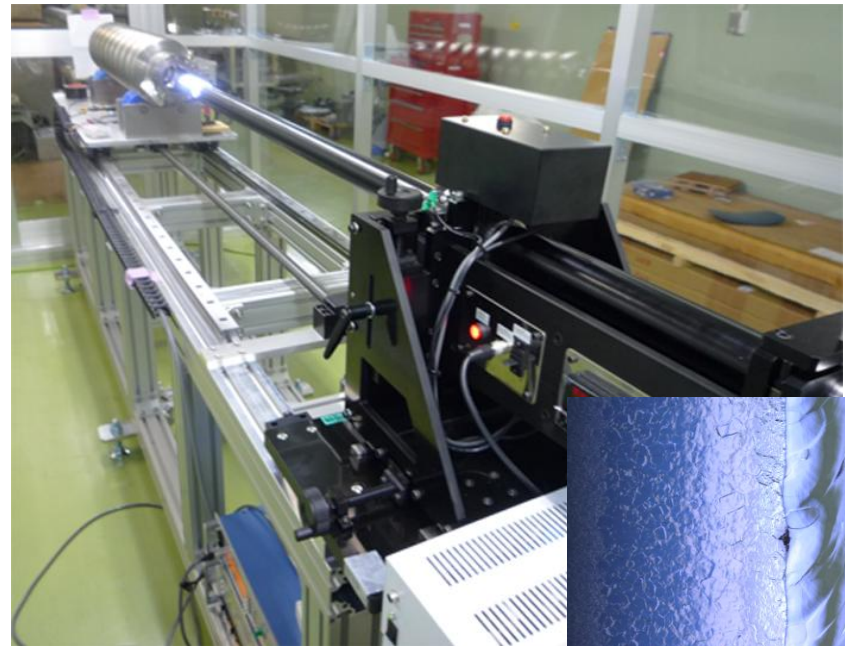
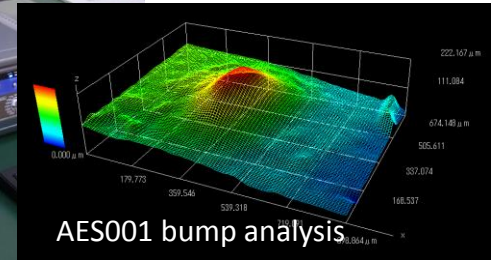
inspection instruments for fabrication support



eddy current scanner



optical 3D profiler

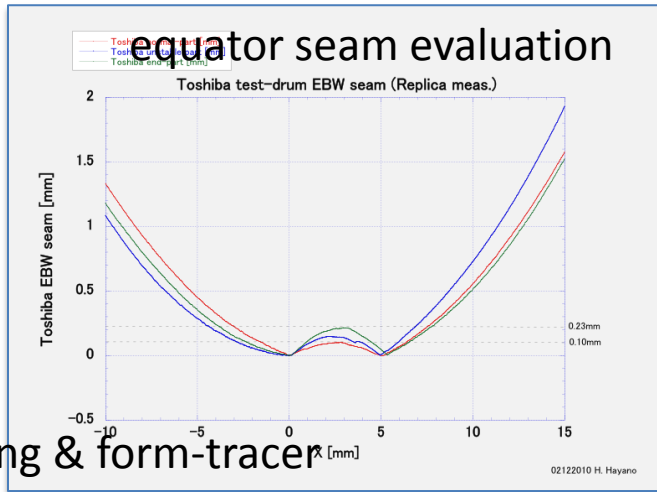


inner surface inspection



MHI008

equator seam evaluation



molding & form-tracer

2009 installation

Clean room construction

EBW performance survey and bidding, then order
press machine

trim machine

optical instruments, eddy current scan for inspection
infra-structure (water, compressed-air, N₂-gas, etc)

2010-2011 installation

EBW

Jigs of EBW

Chemical Polish system

Burring machine

3D coordinate machine

microwave measurement system

control & data-base system

EBW R&D was started

using EBW Job-shop



Tosei-electrobeam co. SST EBW



Tosei-electrobeam co.
Mitsubishi-EBW



- Nov. 2009 SST-EBW V=150 kV / 60 kV
EBW test on Nb plate (t=2mm) , EBW test on two-plate join (t=2mm)
- Dec. 2009 Mitsubishi-EBW V=60 kV
EBW test on Nb plate (t=2mm) , EBW test on two-plate join (t=2mm)
- Jan. 2010 Mitsubishi-EBW V=60 kV
EBW test on Nb plate (t=2mm) , EBW test on two-plate join (t=2mm)
two-plate hook-edge join (t=2mm)

one cavity fabrication before EBW delivery

空洞製造工程表

日程	コメント	数量	2010(FY)											
			4	5	6	7	8	9	10	11	12	2011/1	2011/2	2011/3
レギュラーセル+スティフナー														
材料入手	1本分あり													
プレス金型製作	2種類	2set	→											
プレス加工	レギュラーセル	16		→										
トリミング	レギュラーセル	16			→									
スティフナー		8set				→								
レギュラーセル+スティフナー-CP処理	KEK	16+8					→							
EBW-ダンベル(iris)	東成-SST	8set						→						
EBW-ダンベル(スティフナー)	東成-SST	8set							→					
EBW-ダンベル8(マルチセル化)	東成-SST	1本								→				
エンドグループ														
材料入手		1set	→											
ビームパイプ	Nb,ID80,t5	2		→										
ビームパイプパーリング					→									
ビームパイプフランジ	NbTi,OD124,t14	2				→								
エンドセル	Nb,t3.7	2			→									
インプットカプラポート(パイプ)	Nb,ID60	1					→							
インプットカプラ用フランジ	NbTi,OD102,t13	1						→						
モニタカプラポート用パイプ	Nb,ID14	1							→					
モニタカプラポート用フランジ	NbTi,OD50,t10	1								→				
Tiエンドプレート	Ti,OD242,ID109	2									→			
Nbエンドプレート用パイプ	Nb,OD109,ID80	2										→		
HOM/パイプ	Nb,OD48,ID41	2											→	
HOMキャップ	Nb,OD48,t15	2												→
HOMピックアップポート用フランジ	NbTi,OD50,t10	2												→
HOMピックアップポート用フランジ用パイプ	Nb,OD22,ID14,L25	2												→
アンテナ	Nb,70x38,t9	2												→
化学研磨	KEK	1set												→
エンドグループ組立て+EBW	東成-SST	1set												→
全体組立														
EBW	マルチセル+エンドグループ	1set												→
EBW	東成-SST	1set												→
試験、評価	KEK	1set												→

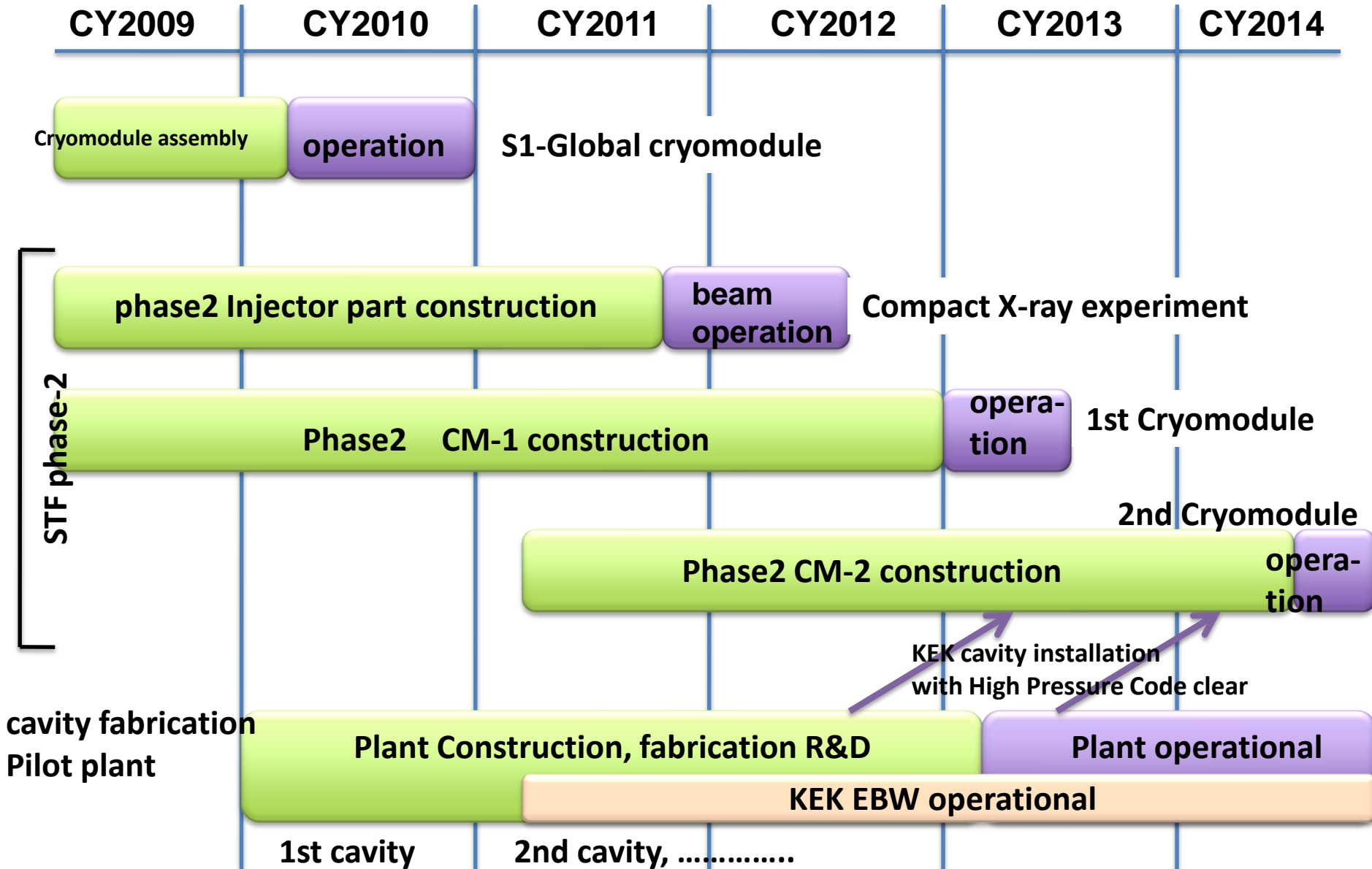
center cells

end group

HOM will be skipped for this fabrication.

Hopefully, one 9 cell base-line cavity will be completed in Feb. 2011

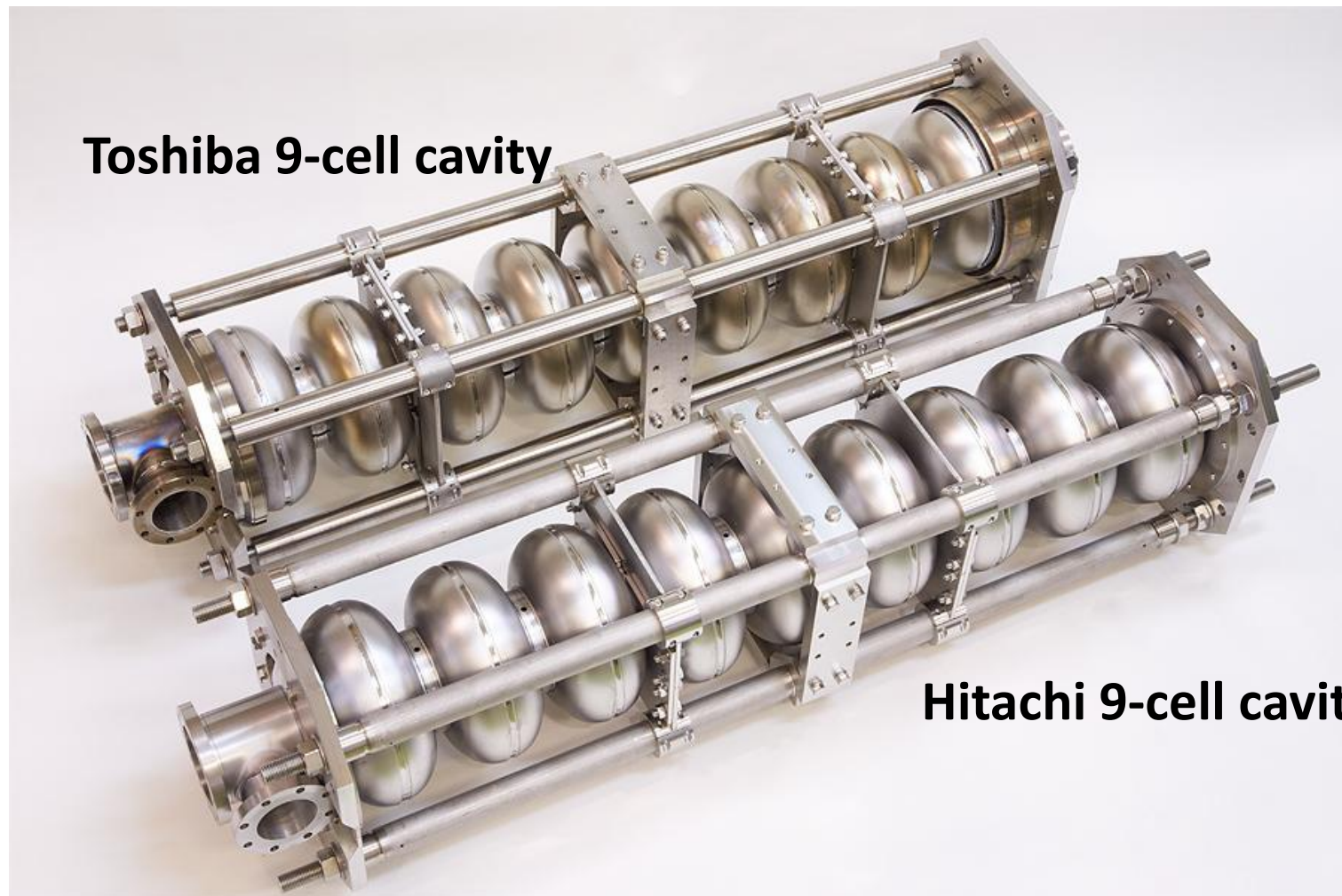
STF Plans for 5 years (under discussion)



KEK-industry collaboration

2009-2010 two years program

Toshiba 9-cell cavity



Hitachi 9-cell cavity

Press; in the company, EBW; other job-shop company
KEK: inspection, vertical test and technical advice

KEK-IHEP collaboration

IHEP cavity fabrication; EBW by chinese company
KEK: vertical test collaboration and technical advice



IHEP facility
CBP,
BCP,
tuning machine,
clean room,
VT(He supply issue)

LL-shape 9 cell without HOM,
CBP and BCP process, then VT. VT is scheduled on June

Summary

KEK cavity fabrication facility (R&D of EBW and press(deep drawing))

Project was started in 2009,

Housing was completed, Press machine and trimming machine was delivered.

EBW machine delivery is scheduled on March 2011.

produce 1 cavity by using EBW Job-shop in 2010.

produce several by KEK EBW, then put into STF phase2 cryomodule.

Collabration with industries

Hitachi, Toshiba: 2009-2010 two years collaboration

(MHI:total 11 cavities fabricaton by contract, 6 more is under fabrication.)

Collaboration with IHEP

cavity evaluation and technical discussion collaboration