

**Construction Scenario
for Super-KEKB Main Ring**

February 17, 2004

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Vacuum System

Terms / Fiscal year	2003	2004	2005	2006	2007
Optics	Design				
Vacuum system					
Modification of cooling system	Design			Modification	
LER ducts for outer ring	Design	Production	Receive, bake and hold		Installation
LER ducts for inner ring in Nikko and Oho area		Design (mask design is included)	Production	Receive, bake and hold	Installation
HER ducts for outer ring	Design	Production	Receive, bake and hold		Installation
HER ducts for inner ring in Nikko and Oho area		Design (mask design is included)	Production	Receive, bake and hold	Installation
Ducts for crab cavities			Production		
Movable masks		Test HOM absorber	Design	Production	Receive, bake and install
Beam abort chambers			Design	Production	Installation
Ducts for septum magnets			Design	Production	Installation
Ducts for Fuji beam crossing area		Interference with beam cross mag. is examined	Design	Production	Receive, bake and install
Ducts for Tsukuba straight section		Interference with local corr. mag. is examined	Design	Production	Receive, bake and install
Ducts for IR		Solve HOM and Bellows problem	Design	Production	Receive, bake and install
Bellows	Test	Test for small cross section	Production	Production	Installation
Gate valves and beam stoppers			Inform quantity after design of bellows	Production	Installation
NEG pumps	Inform quantity	Purchase			
BPMs			Should be supplied		

Magnet System

Terms / Fiscal year	2003	2004	2005	2006	2007
Magnet system					
Product. of 6 p.s. + modification of 2 p.s. for crab cavity installation in Nikko	Design	Production	Installation		
Magnet production HER-Qsc (19+1) at Nikko LER-Qrf (2) at Oho StV, BC-mag (~458+4) Sextupole-mag. (48+1)			Design	Production	
Work on magnets for ante-chamber replacement Remove upper halves of Q,Qk,Sx (886+20+212) and put them back Remove upper halves of Wig-mag. (76), replace spacers, and put them back in Nikko Replacement and alignment of vertical St-mag. (~450), BC-mag. (8) Removal of Wig-mag. (76) in Oho Adjustment of coil supporting spacers for B-mag.				Product. of Wig-mag spacers	Removing, opening, and closing magnets
Replacement of 19 HER-Qrf with Qsc-mag. in Nikko					
Replacement of 7 LER-Q with Qrf-mag. in Oho					
Replacement of 48 Sx-mag. with stronger ones					
Rearrangement of magnet position in Tsukuba					
Reversal of power supply (p.s.) polarity for energy switching					
Reversal of QCS polarity for energy switching					

RF System

Terms / Fiscal year	2003	2004	2005	2006	2007
RF system					
Production of klystrons		Production of 14 klystrons (Two of them are for crab cav. in Nikko)			
Production of power supplies (p.s.)		Product. of a p.s. (for Nikko crab cav.)		Product. of 6 p.s.	
High Power / Low Level system		Product. of 2 sets (for Nikko crab cav.)		Product. of 14 sets	
Cooling system				Modification	
Modification of ARES-AC for 20 LER-ARES in Fuji		Product. of prototype and beam test		Preparation of parts	Product. and install. of 20 cavities
Superconducting Cavities (SCC) in Nikko					Replacement of beam pipes
R&D ARES-HOM ARES plating SCC-HOM Treatment of coupler surface Control / feedback					

BPM System

Terms / Fiscal year	2003	2004	2005	2006	2007
Beam monitoring system					
BPM		←	Production	→	Installation
SR monitors			←	Production	→
Bunch feedback system			←	Production	→
DCCT				←	Production
PIN photo-diode beam loss monitors				←	Production
R&D		←			→
BPM					
SR monitors					
Bunch feedback					

IR Vacuum

IR vacuum system and BPMs					
Design	←		→		
Production		←		→	
Installation					←

IR Magnets

Terms / Fiscal year	2003	2004	2005	2006	2007
IR-QCS					
Design	←————→				
R&D for QCS and corrector coils		←————→			
Purchase of additional sensors and controllers			←————→		
Preparation for magnetic field measurement			←————→		
Improvement of cryogenic test facility			←————→		
Magnet production				←————→	
Additional piping for cryogenic system				←————→	
Modification of cryogenic system					↔
Magnet replacement and test operation					↔
Magnet field measurement after installation					↔
IR special Q-magnets					
Design	←————→				
Production of power supplies		←————→			
Production of magnets			←————→		
Preparation for magnetic field measurement		←————→			
Magnetic field measurement				←————→	
Magnet replacement					←————→

Utilities

Terms	Fiscal year	2003	2004	2005	2006	2007
Utilities						
	Modification of cooling system for vacuum system					
	Facility on the surface (pumps, cooling towers, coolers, etc.)			← Modification of 8 stations →		
	Piping in the tunnel					← Addition and modification →
	Utilities for RF system					
	Expansion of D4, D7, D8 and D10 buildings			← →		
	Modif. of cooling sys. (for cavities, klystron collectors, bodies, dummy loads)			← →		
	Modification of electric power stations (transformers, filters, etc.)			← →		
	1GeV damping ring and BT (LTD, DTL)					
	Building, tunnel			← →		
	Electric power station (about 1MW)			← →		
	Cooling system, Air conditioner, etc.			← →		
	Maintenance of old utilities					
	Roof of electric power buildings			← →		→
	Cooling system (cooling tower fans, pumps, controllers)			← →		
	Coolers			← →		

Year 2008 - 2014

↓ Terms / Fiscal year →	2008	2009	2010	2011	2012	2013	2014
Magnet and vacuum system							
Reversal of magnet polarity for energy switching			↔				
Reversal of QCS polarity for energy switching			↔				
Replacement of 6 LER-Q with LER-Qrf at Oho		↔					
Replacement of beam ducts with large cross section ones in LER at Oho	↔ Product.	↔ Install.					
RF system							
Product. of 18 klystrons	←						→
Product. of 8 power supplies	←						→
Product. of 16 sets of High Power / Low Level	←						→
Modification of cooling system	←						→
Surface facility for crab cav. at Tsukuba	←	Construction		→			
Modification of ARES-AC for 20 LER cav. at Fuji							
Addition of ARES at Oho	↔ Product. of 10 ARES	↔	↔ Install. of six ARES		↔ Install. of four ARES		↔ Install. of four spares
Addition of 4 SCC at Nikko			↔ Product.		↔ Install.		
Replacement of couplers		←					→
Product. of spares of dampers, etc.		←					→

Is it realistic to replace all the vacuum chambers in 14 months ? (July 2007 - August 2008)

Available days are about 290 days.
(Saturday, Sunday and holidays are excluded)

Remove upper halves of about 1,500 magnets	$1,500 / (2*8) = 94$ days
Remove about 2,000 beam pipes	$2,000 / (2*15) = 67$ days
Install about 2,000 new beam pipes	$2,000 / (2*10) = 100$ days
Re-install upper halves of about 1,500 magnets	$1,500 / (2*6) = 125$ days

Total 386 days

But as each job can overlap in some part, necessary time will be about 260 days.

**The answer will be YES !
But the time schedule is tight.**