

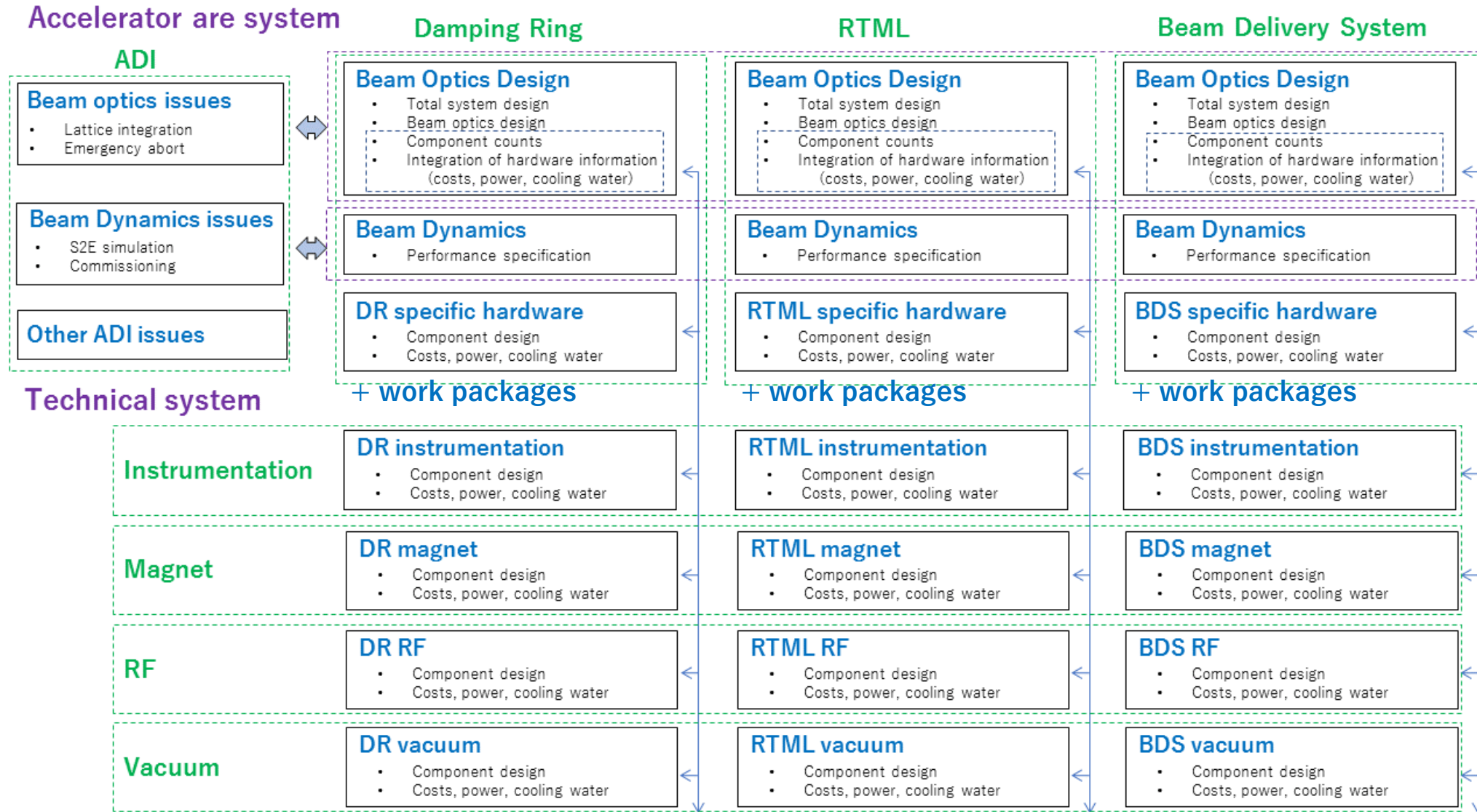
# Discussion of WBS for DR/RTML/BDS area systems

2021/04/28

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IDT WG2 DR/BDS/DUMP group meeting

# Simple WBS in Pre-Lab period (to write the ILC EDR)



# Technical preparation document

Ver-3: 2021/Jan/26

**Technical Preparation and Work Packages (WPs)  
during ILC Pre-lab**

IDT-WG2

# Engineering design document

## Engineering design documentation

IDT-WG2  
(Ver.2,2021-Jan-06)

### Outline:

One of the main missions of the ILC Pre-lab on the engineering front is to complete an engineering design report (EDR), that is derived from the TDR published in 2013. The EDR will represent the “technical readiness” for the actual construction of the ILC and will also be expected to serve as a critical material to be evaluated in certain countries in the context of formal project approval. The EDR will include basic specifications and drawings for manufacturing and construction. Cost-estimate confirmation, scheduling, and preparation for mass production will also be included in this report.

### Timeline:

1<sup>st</sup> year: Work on TDR-based cost-estimate confirmation that has been started by an international team centered at the Pre-lab.

2<sup>nd</sup> year: Complete the cost-estimate confirmation based on progress in technical preparation plans and conduct an internal review in the latter half of the 2<sup>nd</sup> year. The review will also report on the progress of resolving the technical problems encountered during the preparation period.

3<sup>rd</sup> year: Conduct an external review and complete the scrutiny of costs and risks; complete the draft of Engineering Design Report (EDR).

4<sup>th</sup> year: Publish the EDR (in the first half of the year), report on the progress in resolving the technical problems encountered, and prepare for starting each large bid.

### Items:

- Engineering design and documentation based on WBS
- Cost-estimate confirmation/update, tender, and purchase preparation
- Plans for mass production and transportation, QA.
- Schedule follow-up and construction schedule preparation
- Resource follow-up and planning

### Expected FTE:

<i>Contents (based on TDR Vols. 3–II)</i>	<i>Human Resources (FTE-yr)</i>
<i>Accelerator design</i>	3
<i>Main Linac and SCRF*</i>	20
<i>Sources</i>	5
<i>Damping ring</i>	5
<i>BDS</i>	5
<i>Beam dump</i>	2
<i>RTM</i>	2
<i>Conventional facilities and siting</i>	5
<i>Control</i>	3
<i>Construction schedule, commissioning, and operations</i>	3

\* includes cryogenics, RF system (high-power and low-level RF)

The number of HR will be updated (by Shin at the last WG2 meeting.)

# Damping Ring

- List up all items for EDR related to DR
- Picked up the WP related items from the to-do-list of both area and technical systems and categorized.

## DR area system

- 3 WPs
- Remaining items of original area systems

## Technical system

- Remaining items of original technical systems
- To be integrated the item of each technical category for all area systems

Work packages	Items	Deliverables	Related area and technical systems	
WP-12	DR cell design, based on present ILC optics (WP-12)	Beam optics design	DR(WP-12)	
	DR cell design (further small emittances) (WP-12)	Beam optics design	DR(WP-12)	
	Dynamic aperture survey (WP-12)	Beam optics design; Performance specification	DR(WP-12)	
	SC wiggler magnets (WP-12)	Component design; costing; power, cooling water	DR(WP-12)/SCmagnet	
	Design of PM (WP-12)	Component design; costing; power, cooling water	DR(WP-12)/PMmagnet	
	PM prototyping (WP-12)	Performance specification	DR(WP-12)/PMmagnet	
	NC magnets (WP-12)	Component design; costing; power, cooling water	DR(WP-12)/Magnet	
	Ion trapping and fast ion instability (WP-13)	Performance specification	DR(WP-13)	
	Electron cloud instability (WP-13)	Performance specification	DR(WP-13)	
	Fast FB system design (WP-13)	System design; costing	DR(WP-13)/Instrumentation	
	Fast FB test (WP-13)	Performance specification	DR(WP-13)/Instrumentation	
	Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification	DR(WP-13)/Vacuum (basic design was in TDR)	
	System design of fast injection/extraction system (WP-14)	System design;	DR(WP-14)	
	Fast kicker devices (WP-14)	Component design; costing;	DR(WP-14)	
	Fast kicker power supplies (WP-14)	Component design; costing; power, cooling water estimation	DR(WP-14)	
	WP-13	System design of injection kicker for E-driven PS (WP-14)	System design;	DR(WP-14)
Injection kicker device for E-driven PS (WP-14)		Component design; costing;	DR(WP-14)	
Injection kicker power supplies for E-driven PS (WP-14)		Component design; costing; power, cooling water estimation	DR(WP-14)/Source	
WP-14		DR cell design, based on present ILC optics (WP-12)	Beam optics design	DR(WP-12)
		DR cell design (further small emittances) (WP-12)	Beam optics design	DR(WP-12)
		DR straight section optics design (for WP-14)	Beam optics design	DR
		System design of the beam diagnostics	Beam optics design	DR
		ILC lattice integration	Beam optics design	ADI/DR
		Contact part with ADI for the beam optics issues	Beam optics design	DR/ADI
		Integration of the hardware components in DR	Component counts; costing; power, cooling water estimation	DR/TechnicalSystems
		System design of emergency abort	System design	ADI/BeamDump/CFS/DR
		Dynamic aperture survey (WP-12)	Beam optics design; Performance specification	DR(WP-12)
		Small emittance tuning	Performance specification	DR
		Tolerance evaluation for each device	Performance specification	DR
		Ion trapping and fast ion instability (WP-13)	Performance specification	DR(WP-13)
		Electron cloud instability (WP-13)	Performance specification	DR(WP-13)
	Space charge effects	Performance specification	DR	
	Impedance driven instability	Performance specification	DR	
	Tune shift by quadrupole wake for E-driven PS	Performance specification	DR/Source	
Area system	Contact part with ADI for the beam dynamics and tuning	Performance specification	DR/ADI	
	System design of fast injection/extraction system (WP-14)	System design;	DR(WP-14)	
	Fast kicker devices (WP-14)	Component design; costing;	DR(WP-14)	
	Fast kicker power supplies (WP-14)	Component design; costing; power, cooling water estimation	DR(WP-14)	
	System design of injection kicker for E-driven PS (WP-14)	System design;	DR(WP-14)	
	Injection kicker device for E-driven PS (WP-14)	Component design; costing;	DR(WP-14)	
	Injection kicker power supplies for E-driven PS (WP-14)	Component design; costing; power, cooling water estimation	DR(WP-14)/Source	
	Optics design and system integration	Items	Deliverables	Related area and technical systems
		Fast FB system design (WP-13)	System design; costing	DR(WP-13)/Instrumentation
		Fast FB test (WP-13)	Performance specification	DR(WP-13)/Instrumentation
		Beam position monitors	costing	Instrumentation/DR
		Beam current monitor	costing	Instrumentation/DR
		Tune monitor	costing	Instrumentation/DR
		Beam size/profile monitors	costing	Instrumentation/DR
		Slow orbit FB	Component design; costing	Instrumentation/DR
		Polarimeters	Component design; costing	Instrumentation/CFS/DR
Cabling and monitor station		Component counts; costing; power, cooling water estimation	Instrumentation/CFS/DR	
SC cavities, cryostat, He transfer		Component design; costing	SCRF/DR	
RF source, waveguide		Component design; costing; power, cooling water estimation	HLRF/DR	
LLRF		Component design; costing	LLRF/DR	
SC wiggler magnets (WP-12)		Component design; costing; power, cooling water estimation	DR(WP-12)/SCmagnet	
Cryostat, He transfer		Component design; costing	SCmagnet/DR	
Power supplies, and cabling for SC magnet		Component counts; costing; power, cooling water estimation	SCmagnet/DR	
Beam dynamics and tuning	Design of PM (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/PMmagnet	
	PM prototyping (WP-12)	Performance specification	DR(WP-12)/PMmagnet	
	NC magnets (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/Magnet	
	Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation	Magnet/DR	
	Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification	DR(WP-13)/Vacuum (basic design was in TDR)	
	Regular vacuum components (pump etc.)	Component counts; costing; cooling water estimation	Vacuum/DR	
	Impedance calculations	Performance specification	Vacuum/DR	
	Photon stopper from wigglers	Component design; costing; cooling water estimation	Vacuum/CFS/DR	
	System design of DR alignment system	System design	Alignment/CFS/DR	
	Magnet support	System design; costing	Alignment/Magnet/DR	
	Chamber support	System design; costing	Alignment/ADI/CFS/DR	
	Cryogenics	System design; costing; power, cooling water estimation	Cryo/CFS/SCRF/SCmagnet/DR	
	Cooling water system and distribution	System design; costing; cooling water estimation	CFS/Magnet/Vacuum/HLRF/DR	
	Magnet power supply station	System design	CFS/Magnet/DR	
	System design of device installation procedures	System design	CFS/SCRF/SCmagnet/Magnet/DR	
	Fast kicker	Items	Deliverables	Related area and technical systems
Fast FB system design (WP-13)		System design; costing	DR(WP-13)/Instrumentation	
Fast FB test (WP-13)		Performance specification	DR(WP-13)/Instrumentation	
Beam position monitors		costing	Instrumentation/DR	
Beam current monitor		costing	Instrumentation/DR	
Tune monitor		costing	Instrumentation/DR	
Beam size/profile monitors		costing	Instrumentation/DR	
Slow orbit FB		Component design; costing	Instrumentation/DR	
Polarimeters		Component design; costing	Instrumentation/CFS/DR	
Cabling and monitor station		Component counts; costing; power, cooling water estimation	Instrumentation/CFS/DR	
SC cavities, cryostat, He transfer		Component design; costing	SCRF/DR	
RF source, waveguide		Component design; costing; power, cooling water estimation	HLRF/DR	
LLRF		Component design; costing	LLRF/DR	
SC wiggler magnets (WP-12)		Component design; costing; power, cooling water estimation	DR(WP-12)/SCmagnet	
Cryostat, He transfer		Component design; costing	SCmagnet/DR	
Power supplies, and cabling for SC magnet		Component counts; costing; power, cooling water estimation	SCmagnet/DR	
Technical system Instrumentation	Design of PM (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/PMmagnet	
	PM prototyping (WP-12)	Performance specification	DR(WP-12)/PMmagnet	
	NC magnets (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/Magnet	
	Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation	Magnet/DR	
	Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification	DR(WP-13)/Vacuum (basic design was in TDR)	
	Regular vacuum components (pump etc.)	Component counts; costing; cooling water estimation	Vacuum/DR	
	Impedance calculations	Performance specification	Vacuum/DR	
	Photon stopper from wigglers	Component design; costing; cooling water estimation	Vacuum/CFS/DR	
	System design of DR alignment system	System design	Alignment/CFS/DR	
	Magnet support	System design; costing	Alignment/Magnet/DR	
	Chamber support	System design; costing	Alignment/ADI/CFS/DR	
	Cryogenics	System design; costing; power, cooling water estimation	Cryo/CFS/SCRF/SCmagnet/DR	
	Cooling water system and distribution	System design; costing; cooling water estimation	CFS/Magnet/Vacuum/HLRF/DR	
	Magnet power supply station	System design	CFS/Magnet/DR	
	System design of device installation procedures	System design	CFS/SCRF/SCmagnet/Magnet/DR	
	Magnet	Items	Deliverables	Related area and technical systems
Fast FB system design (WP-13)		System design; costing	DR(WP-13)/Instrumentation	
Fast FB test (WP-13)		Performance specification	DR(WP-13)/Instrumentation	
Beam position monitors		costing	Instrumentation/DR	
Beam current monitor		costing	Instrumentation/DR	
Tune monitor		costing	Instrumentation/DR	
Beam size/profile monitors		costing	Instrumentation/DR	
Slow orbit FB		Component design; costing	Instrumentation/DR	
Polarimeters		Component design; costing	Instrumentation/CFS/DR	
Cabling and monitor station		Component counts; costing; power, cooling water estimation	Instrumentation/CFS/DR	
SC cavities, cryostat, He transfer		Component design; costing	SCRF/DR	
RF source, waveguide		Component design; costing; power, cooling water estimation	HLRF/DR	
LLRF		Component design; costing	LLRF/DR	
SC wiggler magnets (WP-12)		Component design; costing; power, cooling water estimation	DR(WP-12)/SCmagnet	
Cryostat, He transfer		Component design; costing	SCmagnet/DR	
Power supplies, and cabling for SC magnet		Component counts; costing; power, cooling water estimation	SCmagnet/DR	
RF	Design of PM (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/PMmagnet	
	PM prototyping (WP-12)	Performance specification	DR(WP-12)/PMmagnet	
	NC magnets (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/Magnet	
	Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation	Magnet/DR	
	Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification	DR(WP-13)/Vacuum (basic design was in TDR)	
	Regular vacuum components (pump etc.)	Component counts; costing; cooling water estimation	Vacuum/DR	
	Impedance calculations	Performance specification	Vacuum/DR	
	Photon stopper from wigglers	Component design; costing; cooling water estimation	Vacuum/CFS/DR	
	System design of DR alignment system	System design	Alignment/CFS/DR	
	Magnet support	System design; costing	Alignment/Magnet/DR	
	Chamber support	System design; costing	Alignment/ADI/CFS/DR	
	Cryogenics	System design; costing; power, cooling water estimation	Cryo/CFS/SCRF/SCmagnet/DR	
	Cooling water system and distribution	System design; costing; cooling water estimation	CFS/Magnet/Vacuum/HLRF/DR	
	Magnet power supply station	System design	CFS/Magnet/DR	
	System design of device installation procedures	System design	CFS/SCRF/SCmagnet/Magnet/DR	
	Vacuum	Items	Deliverables	Related area and technical systems
Fast FB system design (WP-13)		System design; costing	DR(WP-13)/Instrumentation	
Fast FB test (WP-13)		Performance specification	DR(WP-13)/Instrumentation	
Beam position monitors		costing	Instrumentation/DR	
Beam current monitor		costing	Instrumentation/DR	
Tune monitor		costing	Instrumentation/DR	
Beam size/profile monitors		costing	Instrumentation/DR	
Slow orbit FB		Component design; costing	Instrumentation/DR	
Polarimeters		Component design; costing	Instrumentation/CFS/DR	
Cabling and monitor station		Component counts; costing; power, cooling water estimation	Instrumentation/CFS/DR	
SC cavities, cryostat, He transfer		Component design; costing	SCRF/DR	
RF source, waveguide		Component design; costing; power, cooling water estimation	HLRF/DR	
LLRF		Component design; costing	LLRF/DR	
SC wiggler magnets (WP-12)		Component design; costing; power, cooling water estimation	DR(WP-12)/SCmagnet	
Cryostat, He transfer		Component design; costing	SCmagnet/DR	
Power supplies, and cabling for SC magnet		Component counts; costing; power, cooling water estimation	SCmagnet/DR	
Vacuum	Design of PM (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/PMmagnet	
	PM prototyping (WP-12)	Performance specification	DR(WP-12)/PMmagnet	
	NC magnets (WP-12)	Component design; costing; power, cooling water estimation	DR(WP-12)/Magnet	
	Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation	Magnet/DR	
	Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification	DR(WP-13)/Vacuum (basic design was in TDR)	
	Regular vacuum components (pump etc.)	Component counts; costing; cooling water estimation	Vacuum/DR	
	Impedance calculations	Performance specification	Vacuum/DR	
	Photon stopper from wigglers	Component design; costing; cooling water estimation	Vacuum/CFS/DR	
	System design of DR alignment system	System design	Alignment/CFS/DR	
	Magnet support	System design; costing	Alignment/Magnet/DR	
	Chamber support	System design; costing	Alignment/ADI/CFS/DR	
	Cryogenics	System design; costing; power, cooling water estimation	Cryo/CFS/SCRF/SCmagnet/DR	
	Cooling water system and distribution	System design; costing; cooling water estimation	CFS/Magnet/Vacuum/HLRF/DR	
	Magnet power supply station	System design	CFS/Magnet/DR	
	System design of device installation procedures	System design	CFS/SCRF/SCmagnet/Magnet/DR	

Resource of technical preparation

Resource of EDR

- List up all items for EDR related to RTML

## RTML area system

Area system  
Optics design and system integration  
Beam dynamics and tuning

Items	Deliverables	Related area and technical systems
Optics design of RTML	Beam optics design	RTML
Optics design of LTR, RTL beamline	Beam optics design	RTML
Optics design of tuning dump line	Beam optics design	RTML
Spin rotator in LTR	Beam optics design	RTML/Source
Spin rotator in RTML end	Beam optics design	RTML (basic design was in TDR)
System design of the beam diagnostics	System design	RTML
System design of the orbit FB/feed forward at turn around	System design	RTML
I/LC lattice integration	Beam optics design	ADI/RTML
Contact part with ADI for the beam optics issues	Beam optics design	RTML/ADI
Integration of the hardware components in DR	Component counts; Costing; Power, cooling water estimation	RTML/TechnicalSystems
System design of emergency abort	System design	ADI/CFS/RTML
Low emittance transport (alignment, space charge, SR, CSR, wake)	Performance specification	RTML
Tolerance evaluation for each device	Performance specification	RTML
Effect of the stray/external field	Performance specification	RTML
Effect of the ground motion	Performance specification	RTML
Beam polarization preservation	Performance specification	RTML/MDI
SZE simulation (RTML part)	System design; Performance specification	ADI/RTML
Contact part with ADI for the beam dynamics and tuning	Performance specification	ADI/RTML

## Technical system

Technical system  
Instrumentation  
Magnet  
RF  
Vacuum  
⋮

Items	Deliverables	Related area and technical systems
Beam position monitors	Costing	Instrumentation/RTML
Beam current monitor	Costing	Instrumentation/RTML
Beam size/profile monitors	Costing	Instrumentation/RTML
Orbit FB/feed forward (turn around)	System design; Costing	Instrumentation/RTML
Polarimeters (?)	System design; Costing	Instrumentation/ADI/MDI/CFS/RTML
Cabling and monitor station	Component counts; costing; power, cooling water estimation	Instrumentation/CFS/RTML
SC solenoid magnet and cryostat for spin rotators	Component design; costing; power, estimation	SCmagnet/RTML
He transfer	Component counts; costing	SCmagnet/RTML
Power supplies, and cabling for SC magnet	Component design; costing; power, cooling water estimation	SCmagnet/RTML
NC magnets	Component design; costing	Magnet/RTML
Power supplies, and cabling for NC magnet	Component design; costing; power, cooling water estimation	Magnet/RTML
Chamber, vacuum pump etc.	Component counts; costing	Vacuum/RTML
Tuning beam dump	Component design; costing; cooling water estimation	Beam dump/CFS/ADI/RTML
System design of RTML alignment system	System design	Alignment/CFS/RTML
Magnet support	System design; costing	Alignmet/Magnet/ADI/CFS/RTML
Chamber support	System design; costing	Alignmet/ADI/CFS/RTML
Cryogenics	System design; costing; power, cooling water estimation	Cryo/CFS/Magnet/SCmagnet/RTML
Cooling water system and distribution	System design; costing; cooling water estimation	CFS/Magnet/Vacuum/RTML
Magnet power supply station	System design	CFS/Magnet/RTML
System design of device installation procedures	System design	CFS/Magnet/SCmagnet/RTML

Resource of EDR

- To be integrated the item of each technical category for all area systems

# Beam Delivery System

- List up all items for EDR related to BDS
- Picked up the WP related items from the to-do-list of both area and technical systems and categorized.

## BDS area system

- 2WPs
- MDI related items
- Remaining items of original area systems

## Technical system

- Remaining items of original technical systems
- To be integrated the item of each technical category for all area systems

### Work packages

WP-15  
WP-16

MDI

### Area system

### Optics design and system integration

### Beam dynamics and tuning

### Technical system

### Instrumentation

### Magnet

### RF

### Vacuum

Items	Deliverables	Related area and technical systems
Correction of higher order optics aberration (WP-15)	Performance specification	BDS/WP-15
Beam tuning study with machine learning technique (WP-15)	Performance specification	BDS/WP-15
ATF3 beam test (WP-15)	Performance specification	BDS/WP-15
Short range static wakefield effect (WP-15)	Performance specification	BDS/WP-15
Short range dynamic wakefield effect (WP-15)	Performance specification	BDS/WP-15
System design of the intra-train orbit FB (WP-15)	Performance specification	BDS/WP-15
Cavity BPMs (WP-15)	Performance specification; Costing	BDS/WP-15/Instrumentation
IP intra-train FB (WP-15)	Performance specification; Costing	BDS/WP-15/Instrumentation
Upstream intra-train FB (WP-15)	Performance specification; Costing	BDS/WP-15/Instrumentation
Wakefield minimization for vacuum components (WP-15)	System design; Performance specification; Costing	BDS/WP-15/Vacuum
QDQ SC magnet and crystal package (WP-15)	Component design; Costing; Power estimation	BDS/WP-16/SCmagnet/MDI
Service cryostat and He transfer to FD package (WP-16)	Component design; Costing; Power estimation	BDS/WP-16/SCmagnet/MDI
QDQ vibration test (WP-16)	Performance specification	BDS/WP-16/SCmagnet/MDI
Polarimeters	Performance specification; Costing	BDS/MDI/Instrumentation/ADI/MDI
Energy spectrometers	Performance specification; Costing	BDS/MDI/Instrumentation/ADI/MDI
Anti-DID (detector solenoid)	Component design	BDS/MDI/SCmagnet/MDI
System design of push-pull scheme	System design	BDS/MDI/CFS/ADI/MDI
System design of Packman	System design	BDS/MDI/CFS/ADI/MDI
Optics design of final focus beam line (for WP-15)	Beam optics design	BDS
Optics design for QDQ package design (for WP-16)	Beam optics design	BDS/SC magnet/MDI
Optics design for QF1 package design (for WP-16)	Beam optics design	BDS/SC magnet/MDI
Optics design for Crab cavity (for WP-3)	Beam optics design	BDS/SCRF/MDI/ADI
Optics design of beam diagnostic system	Beam optics design	BDS
Optics design of beam collimation system	Beam optics design	BDS
Optics design of main beam dump line	Beam optics design	BDS
Optics design of tuning beam dump line	Beam optics design	BDS
System design of the beam diagnostics	System design	BDS
System design of Muon collimation	System design	BDS/MDI/ADI
ILC lattice integration	Beam optics design	ADI/BDS
Contact part with ADI for the beam optics issues	Beam optics design	BDS/ADI
Integration of the hardware components in DR	Component counts; Costing; Power, cooling water estimation	BDS/TechnicalSystems
System design of emergency abort	System design	ADI/BeamDump/CFS/BDS
L* and crossing angle	System design	ADI/CFS/MDI/BDS
Correction of higher order optics aberration (WP-15)	Performance specification	BDS/WP-15
Beam tuning study with machine learning technique (WP-15)	Performance specification	BDS/WP-15
Tolerance evaluation for each device	Performance specification	BDS
Effect of the ground motion	Performance specification	BDS
Long range static wakefield effect (resistive wall)	Performance specification	BDS
Vacuum chamber diameter and magnet bore design	Performance specification	BDS
ATF3 beam test (WP-15)	Performance specification	BDS/WP-15
Short range static wakefield effect (WP-15)	Performance specification	BDS/WP-15
Short range dynamic wakefield effect (WP-15)	Performance specification	BDS/WP-15
System design of the intra-train orbit FB (WP-15)	Performance specification	BDS/WP-15
Collimation and detector background evaluation (incl. Muon)	Performance specification	BDS/MDI/ADI
Radiation loss evaluation in dump line	Performance specification; System design	BDS/ADI/CFS
SZE simulation (BDS part)	Performance specification; System design	ADI/BDS
Contact part with ADI for the beam dynamics and tuning	Performance specification	ADI/BDS
Cavity BPMs (WP-15)	Performance specification; Costing	BDS/WP-15/Instrumentation
IP intra-train FB (WP-15)	Performance specification; Costing	BDS/WP-15/Instrumentation
Upstream intra-train FB (WP-15)	Performance specification; Costing	BDS/WP-15/Instrumentation
Beam current monitor	Costing	Instrumentation/BDS
Beam size/profile monitors (laserwire)	Performance specification; Costing	Instrumentation/BDS
Polarimeters	Performance specification; Costing	BDS/MDI/Instrumentation/ADI/MDI
Energy spectrometers	Performance specification; Costing	BDS/MDI/Instrumentation/ADI/MDI
Laser station for polarimeters and laser wire monitors	System design; Costing; Power, cooling water estimation	Instrumentation/CFS/BDS/MDI
Cabling and monitor station	Component counts; Costing; Power, cooling water estimation	Instrumentation/CFS/BDS
Crab cavities, crystal (WP-3)	Component design; Costing; Power estimation	SCRF/WP-3/BDS
Crab cavities, RF beam	Component design; Costing; Power estimation	SCRF/WP-3/BDS
He transfer for crab cavity	System design; Costing	SCRF/WP-3/BDS
RF source, waveguide for crab cavity	Component design; Costing; Power, cooling water estimation	HLRF/SCRF(WP-3)/BDS
QDQ SC magnet and crystal package (WP-16)	Component design; Costing; Power estimation	BDS/WP-16/SCmagnet/MDI
Service cryostat and He transfer to FD package (WP-16)	Component design; Costing; Power estimation	BDS/WP-16/SCmagnet/MDI
QDQ vibration test (WP-16)	Performance specification	BDS/WP-16/SCmagnet/MDI
QF1 SC magnet and crystal package	Component design; Costing; Power estimation	SCmagnet/MDI/BDS
He transfer line (from cryogenics to service cryostat)	Component design; Costing; Power estimation	SCmagnet/MDI/BDS
Power supplies, and cabling for SC magnet	Costing; Power, cooling water estimation	SCmagnet/BDS
Anti-DID (detector solenoid)	Component design	BDS/WP-16/SCmagnet/MDI
NC magnets	Costing; Power, cooling water estimation	Magnet/BDS
Power supplies, and cabling for NC magnet	Component counts; Costing; Power, cooling water estimation	Magnet/BDS
Qualified construction for service cryostat (WP-16)	Component design; Power, cooling water estimation; Costing	Vacuum
Vacuum components (pipe, bellows, pump etc.)	Component counts; Costing	Vacuum/BDS
BDS Collimator (spoiler, absorber)	System design; Performance specification; Costing	BDS/CFS
MPS collimators	System design; Performance specification; Costing	BDS/CFS/MDI
Muon spoiler and muon wall	Component design; Costing; Cooling water estimation	BDS/Magnet/MDI
Beam sweeper for dump, cabling and PS	Component design; Costing; Power, cooling water estimation	BeamDump/Magnet/BDS
Tuning beam dump	Component design; Costing; Cooling water estimation	BeamDump/CFS/ADI/BDS
Alignment for BDS; Costing; Cooling water estimation	System design	Alignment/CFS/BDS
System design of BDS alignment system	System design	Alignment/MDI/CFS/BDS
Alignment for two beamlines around detector area	System design	Alignment/Magnet/BDS
Magnet support	System design; Costing	Alignment/Magnet/BDS
Chamber support	System design; Performance specification; Costing	Alignment/Vacuum/BDS
Cryogenics	System design; Costing; Power, cooling water estimation	Cryo/CFS/SCRF/SCmagnet/BDS
Cooling water system and distribution	System design; Costing; Cooling water estimation	CFS/Magnet/Vacuum/HL RF/BDS
Magnet power supply station	System design	CFS/Magnet/SCmagnet/BDS
System design of device installation procedures	System design	CFS/SCRF/SCmagnet/Magnet/BDS
System design of push-pull scheme	System design	BDS/MDI/CFS/ADI/MDI
System design of Packman	System design	BDS/MDI/CFS/ADI/MDI

Resource of technical preparation

Resource of EDR

# WBS of DR area system in the Pre-Lab period

## (A) Workpackage oriented

- Easy to manage the resources in Pre-Lab period.

## (B) Work item oriented (all WP items belong to area system)

- Some items in are/technical systems are moved to the WP groups.  
( Works for SC wiggler/cryostat/PS are in same group.)
- Representative of WPs will cover some group leaders in area system.
- Easy to manage the design work in Pre-Lab period.

## (C) Work item oriented ( some WP items will do technical system)

- All of magnet design will be done in the technical system, not area system.
- The resource of WP-12 will be managed by area system, and divided to magnet group in the technical system.
- Easy to manage the design work of the technical system.

## (A) Workpackage oriented

System coordinator (Area systems)		Items	Deliverables	Resource	
Group Leader	Optics design System design Beam dynamics Beam tuning System integration	DR straight section optics design (for WP-14)	Beam optics design	EDR	
		System design of the beam diagnostics	Beam optics design	EDR	
		ILC lattice integration	Beam optics design	EDR	
		Small emittance tuning	Performance specification	EDR	
		Tolerance evaluation for each device	Performance specification	EDR	
		Space charge effects	Performance specification	EDR	
		Impedance driven instability	Performance specification	EDR	
		Tune shift by quadrupole wake for E-driven PS	Performance specification	EDR	
		Integration of the hardware components in DR	Component counts; costing; power, cooling water estimation	EDR	
		Contact part with ADI for the beam optics issues	Beam optics design	EDR	
		Contact part with ADI for the beam dynamics and tuning	Performance specification	EDR	
		DR cell design, based on present ILC optics (WP-12)	Beam optics design	TP-WP12	
		DR cell design (further small emittances) (WP-12)	Beam optics design	TP-WP12	
		Dynamic aperture survey (WP-12)	Beam optics design; Performance specification	TP-WP12	
SC wiggler magnets (WP-12)	Component design; costing; power, cooling water	TP-WP12			
Design of PM (WP-12)	Component design; costing; power, cooling water	TP-WP12			
PM prototyping (WP-12)	Performance specification	TP-WP12			
NC magnets (WP-12)	Component design; costing; power, cooling water	TP-WP12			
Representative for WP-13	WP-13	Ion trapping and fast ion instability (WP-13)	Performance specification	TP-WP13	
		Electron cloud instability (WP-13)	Performance specification	TP-WP13	
		Fast FB system design (WP-13)	System design; costing	TP-WP13	
		Fast FB test (WP-13)	Performance specification	TP-WP13	
		Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification	TP-WP13	
Representative for WP-14	WP-14	System design of fast injection/extraction system (WP-14)	System design	TP-WP14	
		Fast kicker devices (WP-14)	Component design; costing	TP-WP14	
		Fast kicker power supplies (WP-14)	Component design; costing; power, cooling water estimation	TP-WP14	
		System design of injection kicker for E-driven PS (WP-14)	System design	TP-WP14	
		Injection kicker device for E-driven PS (WP-14)	Component design; costing	TP-WP14	
		Injection kicker power supplies for E-driven PS (WP-14)	Component design; costing; power, cooling water estimation	TP-WP14	
		(Technical systems)	Items	Deliverables	Resource
		DR magnets (Hardware)	Cryostat, He transfer	Component design; costing	EDR
			Power supplies, and cabling for SC magnet	Component counts; costing; power, cooling water estimation	EDR
			Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation	EDR
	Magnet support	System design; costing	EDR		

## (B) Work item oriented ( all WP items belong to area system )

Damping Ring Area System

System coordinator (Area systems)	Items	Deliverables	Resource		
Group Leader	System design Beam tuning System integration	System design of the beam diagnostics	Beam optics design EDR		
		ILC lattice integration	Beam optics design EDR		
		Small emittance tuning	Performance specification EDR		
		Tolerance evaluation for each device	Performance specification EDR		
		System design of emergency abort	System design EDR		
		Integration of the hardware components in DR	Component counts; costing; power, cooling water estimation EDR		
		Contact part with ADI for the beam optics issues	Beam optics design EDR		
		Contact part with ADI for the beam dynamics and tuning	Performance specification EDR		
		Representative for WP-12 Group Leader	WP-12 Optics design DR magnets (Hardware)	DR cell design, based on present ILC optics (WP-12)	Beam optics design TP-WP12
				DR cell design (further small emittances) (WP-12)	Beam optics design TP-WP12
				DR straight section optics design (for WP-14)	Beam optics design EDR
				Dynamic aperture survey (WP-12)	Beam optics design; Performance specification TP-WP12
				SC wiggler magnets (WP-12)	Component design; costing; power, cooling water TP-WP12
				Cryostat, He transfer	Component design; costing EDR
Power supplies, and cabling for SC magnet	Component counts; costing; power, cooling water estimation EDR				
Design of PM (WP-12)	Component design; costing; power, cooling water TP-WP12				
PM prototyping (WP-12)	Performance specification TP-WP12				
NC magnets (WP-12)	Component design; costing; power, cooling water TP-WP12				
Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation EDR				
Magnet support	System design; costing EDR				
Representative for WP-13 Group Leader	WP-13 Beam dynamics	Ion trapping and fast ion instability (WP-13)	Performance specification TP-WP13		
		Electron cloud instability (WP-13)	Performance specification TP-WP13		
		Fast FB system design (WP-13)	System design; costing TP-WP13		
		Fast FB test (WP-13)	Performance specification TP-WP13		
		Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification TP-WP13		
		Space charge effects	Performance specification EDR		
		Impedance driven instability	Performance specification EDR		
		Tune shift by quadrupole wake for E-driven PS	Performance specification EDR		
		Representative for WP-14	WP-14	System design of fast injection/extraction system (WP-14)	System design TP-WP14
				Fast kicker devices (WP-14)	Component design; costing TP-WP14
Fast kicker power supplies (WP-14)	Component design; costing; power, cooling water estimation TP-WP14				
System design of injection kicker for E-driven PS (WP-14)	System design TP-WP14				
Injection kicker device for E-driven PS (WP-14)	Component design; costing TP-WP14				
Injection kicker power supplies for E-driven PS (WP-14)	Component design; costing; power, cooling water estimation TP-WP14				
(Technical systems)	Items	Deliverables	Resource		

## (C) Work item oriented ( some WP items in technical system )

Damping Ring Area System

System coordinator (Area systems)	Items	Deliverables	Resource		
Group Leader	System design Beam tuning System integration	System design of the beam diagnostics	Beam optics design EDR		
		ILC lattice integration	Beam optics design EDR		
		Small emittance tuning	Performance specification EDR		
		Tolerance evaluation for each device	Performance specification EDR		
		System design of emergency abort	System design EDR		
		Integration of the hardware components in DR	Component counts; costing; power, cooling water estimation EDR		
		Contact part with ADI for the beam optics issues	Beam optics design EDR		
		Contact part with ADI for the beam dynamics and tuning	Performance specification EDR		
		Representative for WP-12 Group Leader	WP-12 Optics design DR magnets (Hardware)	DR cell design, based on present ILC optics (WP-12)	Beam optics design TP-WP12
				DR cell design (further small emittances) (WP-12)	Beam optics design TP-WP12
				DR straight section optics design (for WP-14)	Beam optics design EDR
				Dynamic aperture survey (WP-12)	Beam optics design; Performance specification TP-WP12
				SC wiggler magnets (WP-12)	Component design; costing; power, cooling water TP-WP12
				Cryostat, He transfer	Component design; costing EDR
Power supplies, and cabling for SC magnet	Component counts; costing; power, cooling water estimation EDR				
Design of PM (WP-12)	Component design; costing; power, cooling water TP-WP12				
PM prototyping (WP-12)	Performance specification TP-WP12				
NC magnets (WP-12)	Component design; costing; power, cooling water TP-WP12				
Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation EDR				
Magnet support	System design; costing EDR				
Representative for WP-13 Group Leader	WP-13 Beam dynamics	Ion trapping and fast ion instability (WP-13)	Performance specification TP-WP13		
		Electron cloud instability (WP-13)	Performance specification TP-WP13		
		Fast FB system design (WP-13)	System design; costing TP-WP13		
		Fast FB test (WP-13)	Performance specification TP-WP13		
		Vacuum chambers to reduce SEY for positron DR (WP-13)	Performance specification TP-WP13		
		Space charge effects	Performance specification EDR		
		Impedance driven instability	Performance specification EDR		
		Tune shift by quadrupole wake for E-driven PS	Performance specification EDR		
		Representative for WP-14	WP-14	System design of fast injection/extraction system (WP-14)	System design TP-WP14
				Fast kicker devices (WP-14)	Component design; costing TP-WP14
Fast kicker power supplies (WP-14)	Component design; costing; power, cooling water estimation TP-WP14				
System design of injection kicker for E-driven PS (WP-14)	System design TP-WP14				
Injection kicker device for E-driven PS (WP-14)	Component design; costing TP-WP14				
Injection kicker power supplies for E-driven PS (WP-14)	Component design; costing; power, cooling water estimation TP-WP14				
(Technical systems)	Items	Deliverables	Resource		
DR magnets (Hardware)	SC wiggler magnets (WP-12)	Component design; costing; power, cooling water	TP-WP12		
	Cryostat, He transfer	Component design; costing	EDR		
	Power supplies, and cabling for SC magnet	Component counts; costing; power, cooling water estimation	EDR		
	Design of PM (WP-12)	Component design; costing; power, cooling water	TP-WP12		
	PM prototyping (WP-12)	Performance specification	TP-WP12		
	NC magnets (WP-12)	Component design; costing; power, cooling water	TP-WP12		
	Power supplies, and cabling for NC magnet	Component counts; costing; power, cooling water estimation	EDR		
	Magnet support	System design; costing	EDR		

Part of WP12 resources



# Opinion of Andy Lankford

- Any of the three structures is manageable during the Pre-lab phase.
- I think that one of the work item oriented structures (B) or (C) will work best. I believe that the decision between (B) and (C) needs to be consistent with how the division between area systems and technical systems for other area systems.
- If the DR magnets are going to be designed by the magnet technical system to DR area system specification, then I would think that (C) is better than (B).
- Also, if the SC wiggler magnet design, cryostat design, and wiggler power supply design are split among technical systems, then I believe that the coordination of these designs should probably live in the DR area system (or possibly the magnet technical system).
- Another consideration is how the RTL WBS is defined. I think that there should be a **consistent philosophy to the structure for both DR and RTL (and probably BDS as well)**.



# WBS of BDS area system in the Pre-Lab period

## (A) Workpackage oriented

- Easy to manage the resources in Pre-Lab period.

## (B) Work item oriented (all WP items belong to area system)

- Representative of WPs will cover some group leaders in area system.
- Easy to manage the design work in Pre-Lab period.

## (A) Workpackage oriented

Beam Delivery System Area System

System coordinator	(Area systems)	Items	Deliverables	Resource		
Group Leader	System design System integration	Optics design of final focus beam line (for WP-15)	Beam optics design	EDR		
		Optics design for QD0 package design (for WP-16)	Beam optics design	EDR		
		Optics design for QF1 package design (for WP-16)	Beam optics design	EDR		
		Optics design for Crab cavity (for WP-3)	Beam optics design	EDR		
		Optics design of beam diagnostic system	Beam optics design	EDR		
		Optics design of beam collimation system	Beam optics design	EDR		
		Optics design of main beam dump line	Beam optics design	EDR		
		Optics design of tuning beam dump line	Beam optics design	EDR		
		System design of the beam diagnostics	System design	EDR		
		System design of Muon collimation	System design	EDR		
		ILC lattice integration	Beam optics design	EDR		
		Integration of the hardware components in DR	Component counts; Costing; Power, cooling water estimation	EDR		
		System design of emergency abort	System design	EDR		
		L* and crossing angle	System design	EDR		
		Contact part with ADI for the beam optics issues	Beam optics design	EDR		
		Group Leader	Beam dynamics	Tolerance evaluation for each device	Performance specification	EDR
				Effect of the ground motion	Performance specification	EDR
Long range static wakefield effect (resistive wall)	Performance specification			EDR		
Vacuum chamber diameter and magnet bore design	Performance specification			EDR		
Collimation and detector background evaluation (incl. Muon)	Performance specification			EDR		
Radiation loss evaluation in dump line	Performance specification; System design			EDR		
S2E simulation (BDS part)	Performance specification; System design			EDR		
Contact part with ADI for the beam dynamics and tuning	Performance specification	EDR				
Representative for WP-15	WP-15	Correction of higher order optics aberration (WP-15)	Performance specification	TP-WP15		
		Beam tuning study with machine learning technique (WP-15)	Performance specification	TP-WP15		
		ATF3 beam test (WP-15)	Performance specification	TP-WP15		
		Short range static wakefield effect (WP-15)	Performance specification	TP-WP15		
		Short range dynamic wakefield effect (WP-15)	Performance specification	TP-WP15		
		System desing of the intra-train orbit FB (WP-15)	Performance specification	TP-WP15		
		Cavity BPMs (WP-15)	Performance specification; Costing	TP-WP15		
		IP intra-train FB (WP-15)	Performance specification; Costing	TP-WP15		
		Upstream intra-train FB (WP-15)	Performance specification; Costing	TP-WP15		
		Wakefield minimization for vacuum components (WP-15)	System design; Performance specification; Costing	TP-WP15		
		QD0 SC magnet and cryostat package (WP-16)	Component design; Costing; Power estimation	TP-WP16		
Representative for WP-16	WP-16	Service cryostat,a and He transfer to FD package (WP-16)	Component design; Costing; Power estimation	TP-WP16		
		QD0 vibration test (WP-16)	Performance specification	TP-WP16		
Group Leader	MDI	Polarimeters	Performance specification; Costing	EDR		
		Energy spectrometers	Performance specification; Costing	EDR		
		Anti-DID (detector solenoid)	Component design	EDR		
		System design of push-pull scheme	System design	EDR		
		System design of Packman	System design	EDR		
	(Technical systems)	Items	Deliverables	Resource		
BDS magnets (Hardware)	QF1 SC magnet and cryostat package	Component design; Costing; Power estimation	EDR			
	He transfer line ( from cryogenics to service cryostat)	Component design; Costing; Power estimation	EDR			
	Power supplies, and cabling for SC magnet	Costing; Power, cooling water estimation	EDR			
	NC magnets	Costing; Power, cooling water estimation	EDR			
BDS Dump and collimator	Power supplies, and cabling for NC magnet	Component counts; Costing; Power, cooling water estimation	EDR			
	BDS Collimator (spoil, absorber)	System design; Performance specification; Costing	EDR			
	MPS collimators	System design; Performance specification; Costing	EDR			
	Muon spoiler and muon wall	Component design; Costing; Cooling water estimation	EDR			
	Beam sweeper for dump, cabling and PS	Component design; Costing; Power, cooling water estimation	EDR			

## (B) Work item oriented

Beam Delivery System Area System

System coordinator	(Area systems)	Items	Deliverables	Resource		
Group Leader	System design Optics design System integration	Optics design of final focus beam line (for WP-15)	Beam optics design	EDR		
		Optics design for QD0 package design (for WP-16)	Beam optics design	EDR		
		Optics design for QF1 package design (for WP-16)	Beam optics design	EDR		
		Optics design for Crab cavity (for WP-3)	Beam optics design	EDR		
		Optics design of beam diagnostic system	Beam optics design	EDR		
		Optics design of beam collimation system	Beam optics design	EDR		
		Optics design of main beam dump line	Beam optics design	EDR		
		Optics design of tuning beam dump line	Beam optics design	EDR		
		System design of the beam diagnostics	System design	EDR		
		System design of Muon collimation	System design	EDR		
		ILC lattice integration	Beam optics design	EDR		
		Integration of the hardware components in DR	Component counts; Costing; Power, cooling water estimation	EDR		
		System design of emergency abort	System design	EDR		
		L* and crossing angle	System design	EDR		
		Contact part with ADI for the beam optics issues	Beam optics design	EDR		
		Group Leader	Beam dynamics	Tolerance evaluation for each device	Performance specification	EDR
				Effect of the ground motion	Performance specification	EDR
Collimation and detector background evaluation (incl. Muon)	Performance specification			EDR		
Radiation loss evaluation in dump line	Performance specification; System design			EDR		
S2E simulation (BDS part)	Performance specification; System design			EDR		
Contact part with ADI for the beam dynamics and tuning	Performance specification			EDR		
Representative for WP-15 Group Leader	WP-15 Beam tuning Collective effect	Correction of higher order optics aberration (WP-15)	Performance specification	TP-WP15		
		Beam tuning study with machine learning technique (WP-15)	Performance specification	TP-WP15		
		ATF3 beam test (WP-15)	Performance specification	TP-WP15		
		Short range static wakefield effect (WP-15)	Performance specification	TP-WP15		
		Short range dynamic wakefield effect (WP-15)	Performance specification	TP-WP15		
		System desing of the intra-train orbit FB (WP-15)	Performance specification	TP-WP15		
		Cavity BPMs (WP-15)	Performance specification; Costing	TP-WP15		
		IP intra-train FB (WP-15)	Performance specification; Costing	TP-WP15		
		Upstream intra-train FB (WP-15)	Performance specification; Costing	TP-WP15		
		Wakefield minimization for vacuum components (WP-15)	System design; Performance specification; Costing	TP-WP15		
		Long range static wakefield effect (resistive wall)	Performance specification	EDR		
Representative for WP-16 Group Leader	WP-16 Final Focus Magnets	Vacuum chamber diameter and magnet bore design	Performance specification	EDR		
		QD0 SC magnet and cryostat package (WP-16)	Component design; Costing; Power estimation	TP-WP16		
		Service cryostat,a and He transfer to FD package (WP-16)	Component design; Costing; Power estimation	TP-WP16		
Group Leader	MDI	QD0 vibration test (WP-16)	Performance specification	TP-WP16		
		QF1 SC magnet and cryostat package	Component design; Costing; Power estimation	EDR		
		He transfer line ( from cryogenics to service cryostat)	Component design; Costing; Power estimation	EDR		
		Power supplies, and cabling for SC magnet	Costing; Power, cooling water estimation	EDR		
Group Leader	(Technical systems) BDS magnets (Hardware) BDS Dump and collimator	Polarimeters	Performance specification; Costing	EDR		
		Energy spectrometers	Performance specification; Costing	EDR		
		Anti-DID (detector solenoid)	Component design	EDR		
		System design of push-pull scheme	System design	EDR		
		System design of Packman	System design	EDR		
		NC magnets	Costing; Power, cooling water estimation	EDR		
		Power supplies, and cabling for NC magnet	Component counts; Costing; Power, cooling water estimation	EDR		
		BDS Collimator (spoil, absorber)	System design; Performance specification; Costing	EDR		
		MPS collimators	System design; Performance specification; Costing	EDR		
		Muon spoiler and muon wall	Component design; Costing; Cooling water estimation	EDR		
		Beam sweeper for dump, cabling and PS	Component design; Costing; Power, cooling water estimation	EDR		

Should BDS collimator and Muon spoiler be managed by dump group ??

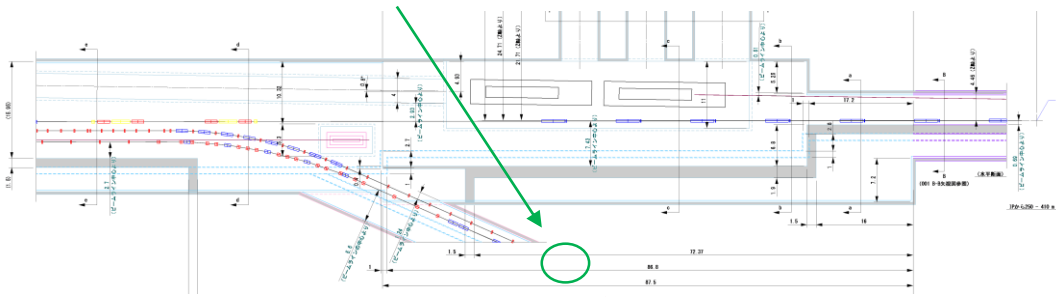
# Magnet technical system for DR/RTML/BDS area system

- Source and ML (BS and warm section) also have NC magnets.
- Source also has SC undulators.
- We'd better to consider how to make WBS by taking account of Source and ML area system, too.

Other NC and MC magnets ??

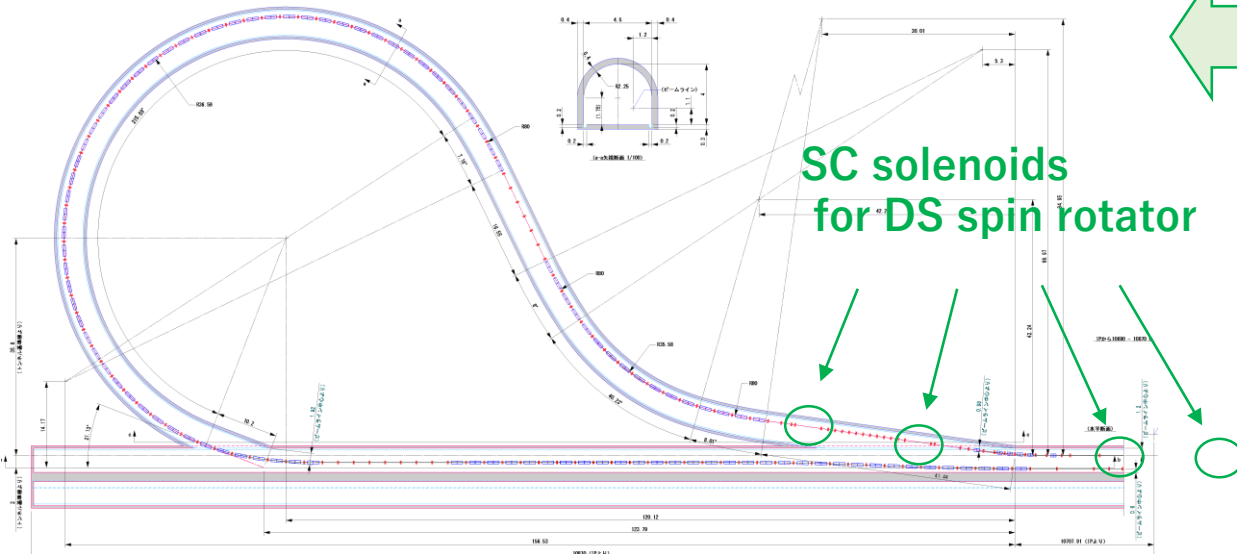
Better to be managed by DR area system ?

SC solenoids for upstream spin rotator



DR

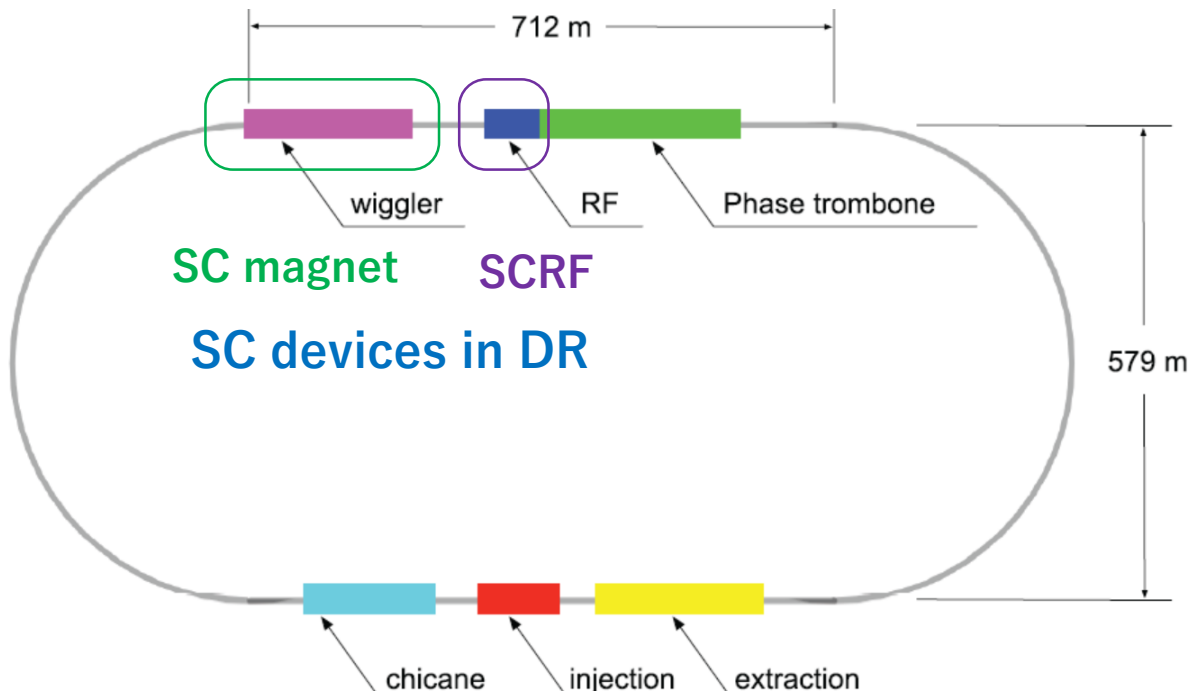
SC solenoids for DS spin rotator



## To do list for magnet technical system

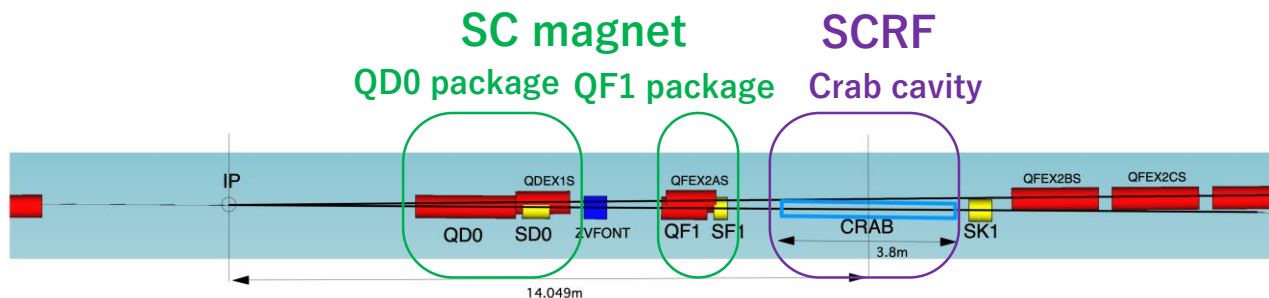
Damping ring	Items	
DR magnets	SC wiggler magnets (WP-12)	SC
	Cryostat, He transfer	SC
	Power supplies, and cabling for SC magnet	SC
	Design of PM (WP-12)	PM
	PM prototyping (WP-12)	PM
	NC magnets (WP-12)	NC
	Power supplies, and cabling for NC magnet	NC
DR cryogenics	Cryogenics	SC (common to DR SCRF)
RTML	Items	
RTML magnets	SC solenoid magnet and cryostat for spin rotators	SC
	He transfer	SC
	Power supplies, and cabling for SC magnet	SC
	NC magnets	NC
	Power supplies, and cabling for NC magnet	NC
RTML cryogenics	Cryogenics	SC
BDS	Items	
BDS magnets	QD0 SC magnet and cryostat package (WP-16)	SC
	Service cryostat, a and He transfer to FD package (WP-16)	SC
	QD0 vibration test (WP-16)	SC
	QF1 SC magnet and cryostat package	SC
	He transfer line ( from cryogenics to service cryostat)	SC (common to crab cavity)
	Power supplies, and cabling for SC magnet	SC
	NC magnets	NC
	Power supplies, and cabling for NC magnet	NC
BDS cryogenics	Cryogenics	SC (common to crab cavity)

# SC technologies for DR/RTML/BDS area system



Damping ring	Specifications	Component	
DR SC RF system	$f=650\text{MHz}$ , $V=6.1\text{MV/m}$ ( $N=10/\text{ring}$ )	SC cavities, cryostat	
	$P=2\text{ MW}$	RF source, waveguide	
	$T=4.5\text{ K}$	LLRF	
		He transfer line	
DR SC magnets	$B=2.16\text{T}$ , $L=1.875\text{m}$ , $\text{Gap}=7.6\text{cm}$ ( $N=30/\text{ring}$ )	SC wiggler magnets	
		Cryostat	
		Power supplies, and cabling	
	$T=4.5\text{ K}$	He transfer line	
DR cryogenics	for SC RF and SC wiggler	Cryogenics	
RTML	<b>Specifications</b>	<b>Component</b>	
	$B=5\text{T}$ , $L=5.2\text{m}$ ( $N=1/\text{beamline}$ )	SC solenoid and cryostat at LTR line	
	$B=5\text{T}$ , $L=2.6\text{m}$ ( $N=4/\text{beamline}$ )	SC solenoid and cryostat at turn-around end	
	No temperature description	Power supplies, and cabling	
		He transfer line	
RTML cryogenics	for 4 SC solenoid locations	Cryogenics	
BDS	<b>Specifications</b>	<b>Component</b>	
	BDS SC RF system	SC crab cavities, cryostat	
		LLRF	
		RF source, waveguide	
	BDS SC magnets	$T=1.9\text{K}$	QDO SC magnet and cryostat package
		$T=1.9\text{K}$	QF1 SC magnet and cryostat package
		$T=4.5\text{ K} \Rightarrow 1.9\text{ K}$	Service cryostat, a and He transfer to FD package
$T=4.5\text{K}$		He transfer line ( from cryogenics to service cryostat)	
		Power supplies, and cabling	
BDS cryogenics	for crab cavities and FD package	Cryogenics	

## SC devices in BDS



Cryogenics and He transfer lines should be common for the SC magnets and SCRF.

It is very important how to coordinate the SC technology. But, I think it is not matter for our group.

# Next group meeting

Date and time : May 12<sup>th</sup> (WED) 22:00 JST

We would like to discuss the WBS of the BDS area system.

- Are there any other items that should be included in the to-do-list?
- What items in the list would be more efficient to handle in the same group as WP?

I would be happy if the following people could present their views from their respective positions.

- Angeles from WP-15
- Brett from WP-16
- Karsten or Tom from MDI