12th Meeting of DR/BDS/DUMP group

Date : 2021/03/31 (Wed)

Attendees : Karsten Buesser, Philip Burrows, Ibon Bustinduy, Marco Calviani, Angeles Faus-Golfe, Andy Lankford, Andrea Latina, Thomas Markiewicz, Shin Michizono, Toshiyuki Okugi, Ivan Podadera, Soren Prestemon, David L. Rubin, Peter Sievers, Nobuhiro Terunuma, Glen White, Andrzej Wolski, Kaoru Yokoya, Mikhail Zobov

Topics : The TPD revision for DR/BDS/DUMP

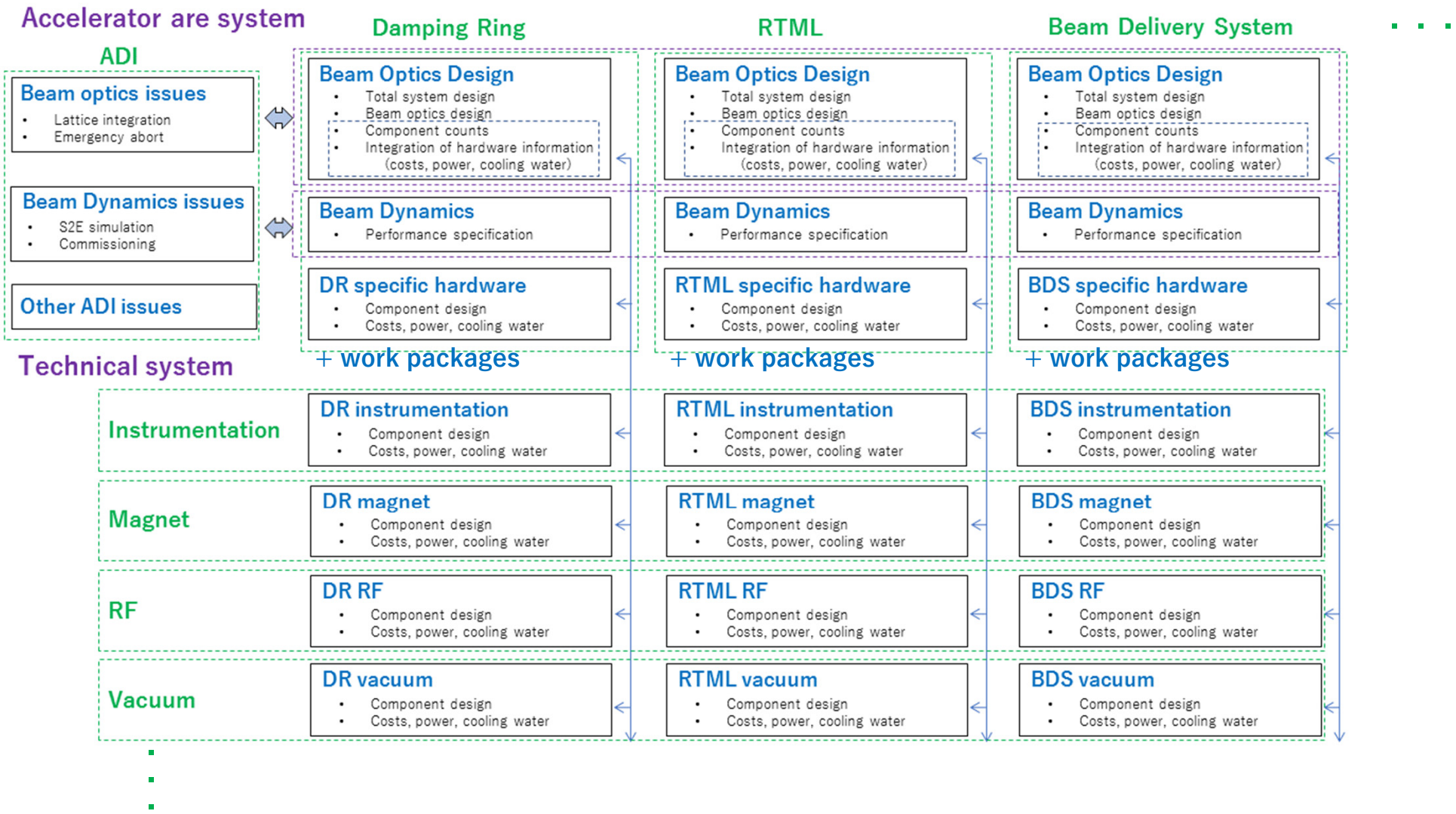
13th Meeting of DR/BDS/DUMP group

Date : 2021/04/14 (Wed)

Attendees were not recorded. (sorry)

Topics : WBS for DR/RTML/BDS area systems
(list up the to-do-lists for DR/RTML/BDS)

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



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

- 3WPs
- 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

Damping Rings

Work packages

WP-12

WP-13

WP-14

Items	Deliverables	Related area and technical systems
DR cell design, based on present ILC optics (WP-12)	Beam optics design	DR(WP-12)
DR cell design (further small emittance) (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 positrin 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)
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

Area system

Optics design and system integration

Beam dynamics and tuning

Fast kicker

Items	Deliverables	Related area and technical systems
DR cell design, based on present ILC optics (WP-12)	Beam optics design	DR(WP-12)
DR cell design (further small emittance) (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
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)
Spece charge effects	Performance specification	DR
Impedance driven instability	Performance specification	DR
Tune shift by quadrupole wake for E-driven PS	Performance specification	DR/Source
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

Technical system

Instrumentation

Magnet

RF

Vacuum

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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
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
Magnet support	System design; costing	Alignment/Magnet/DR
Vacuum chambers to reduce SEY for positrin 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
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
Cryogenics	System design; costing; power, cooling water estimation	Cryo/CFS/SCRF/SCmagnet/DR
System design of DR alignment system	System design	Alignment/CFS/DR
System design of emergency abort	System design	ADI/CFS/DR

Resource of technical preparation

Resource of EDR

RTML

- List up all items for EDR related to RTML

RTML area system

Technical system

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

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
ILC 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
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
S2E 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

Instrumentation

Magnet

RF

Vacuum

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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
Magnet support	System design; costing	Alignmet/Magnet/ADI/CFS/RTML
Chamber, vacuum pump etc.	Component counts; costing	Vacuum/RTML
Chamber support	System design; costing	Alignmet/ADI/CFS/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
Cryogenics	System design; costing; power, cooling water estimation	Cryo/CFS/Magnet/SCmagnet/RTML
System design of RTML alignment system	System design	Alignment/CFS/RTML
System design of emergency abort	System design	ADI/CFS/RTML
Tuning beam dump	Component design; costing; cooling water estimation	Beam dump/CFS/ADI/RTML

Resource of EDR

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

Items	Deliverables	Related area and technical systems
Optics design of final focus beam line (WP-15)	Beam optics design	BDS(WP-15)
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 desing 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
Collimators (WP-15)	System design; Performance specification; Costing	BDS(WP-15)/CFS
QD0 package with anti-solenoid (WP-16)	Component design; Costing; Power estimation	BDS(WP-16)/SCmagnet/MDI
QF1 package (WP-16)	Component design; Costing; Power estimation	BDS(WP-16/SCmagnet/MDI
QD0 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

Area system

Optics design and system integration

Beam dynamics and tuning

Items	Deliverables	Related area and technical systems
Optics design of final focus beam line (WP-15)	Beam optics design	BDS(WP-15)
Optics design for QD0 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 mail 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
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 (resisitive 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 desing 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
S2E simulation (BDS part)	Performance specification; System design	ADI/BDS
Contact part with ADI for the beam dynamics and tuning	Performance specification	ADI/BDS

Technical system

Instrumentation

Magnet

RF

Vacuum

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Items	Deliverables	Related area and technical systems
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, cryostat (WP-3)	Component design; Costing; Power estimation	SCRF(WP-3)/BDS
Crab cavity LLRF (WP-3)	System design; Costing;	SCRF(WP-3)/LLRF/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
QD0 package with anti-solenoid (WP-16)	Component design; Costing; Power estimation	BDS(WP-16)/SCmagnet/MDI
QF1 package (WP-16)	Component design; Costing; Power estimation	BDS(WP-16)/SCmagnet/MDI
QD0 vibration test (WP-16)	Performance specification	BDS(WP-16)/SCmagnet/MDI
Anti-DID (detector solenoid)	Component design	BDS(MDI)/Scmagnet/MDI
He transfer for QD0/QF1 package	System design; Costing	SCmagnet/BDS/MDI
Power supplies, and cabling for SC magnet	Costing; Power, cooling water estimation	SCmagnet/BDS
NC magnets	Costing; Power, cooling water estimation	Magnet/BDS
Beam sweeper for dump	Component design; Costing; Power, cooling water estimation	Magnet/BDS
Muon spoiler and muon wall	Component design; Costing; Cooling water estimation	Magnet/BDS/MDI
Power supplies, and cabling for NC magnet	Component counts; Costing; Power, cooling water estimation	Magnet/BDS
Magnet support	System design; Costing	Alignment/Magnet/BDS
Vacuum components (pipe, bellows, pump etc.)	Component counts; Costing	Vacuum/BDS
Wakefield minimization for vacuum components (WP-15)	System design; Performance specification; Costing	BDS(WP-15)/Vacuum
Chamber support	System design; Performance specification; Costing	BDS/Vacuum
Collimators (WP-15)	System design; Performance specification; Costing	BDS(WP-15)/CFS
MPS collimators	System design; Performance specification; Costing	BDS/CFS/MDI
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
Cryogenics	System design; Costing; Power, cooling water estimation	Cryo/CFS/SCRF/SCmagnet/BDS
System design of BDS alignment system	System design	Alignment/CFS/BDS
System design of emergency abort	System design	ADI/CFS/BDS
Tuning beam dump	Component design; Costing; Cooling water estimation	Beam dump/CFS/ADI/BDS
Main beam dump	Component design; Costing; Cooling water estimation	Beam dump(WP-3?)/CFS/ADI/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

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:

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

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

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

4th 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:

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

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