

Shin MICHIZONO (KEK/IDT-WG2)

(Jan.11, 2021)

Accelerator activities at ILC Pre-Lab phase



Technical preparations /performance & cost R&D [shared across regions]

- **SRF** performance R&D, quality testing of a large number of cavities (~100), fabrication and shipping of cryomodules (validating shipping)
- **Positron source** final design and verification
- **Nanobeams (ATF3 and related)**: Interaction region: beam focus, control; and Damping ring: fast kicker, feedback
- **Beam dump**: system design, beam window, cooling water circulation
- Other technical developments considered performance critical

Technical preparation (18 WPs)
(Technical_preparation_Ver2B.docx)

Final technical design and documentation [central project office in Japan and possibly regional project offices]

- **Engineering design** and documentation, WBS
- **Cost confirmation/estimates**, tender and purchase preparation, transport planning, mass-production planning and QA plans, schedule follow up and construction schedule preparation
- Site planning including environmental studies, CE, safety and infrastructure (see below for details)
- Review office
- Resource follow up and planning (including human resources)

Engineering Design Report (EDR)
(EDR_Ver2.docx)

Preparation and planning of deliverables [distributed across regions, liaising with the central project office and/or its satellites]

- Prototyping and qualification in local industries and laboratories, from SRF production lines to individual WBS items
- Local infrastructure development including preparation for the construction phase (including Hub.Lab)
- Financial follow up, planning and strategies for these activities

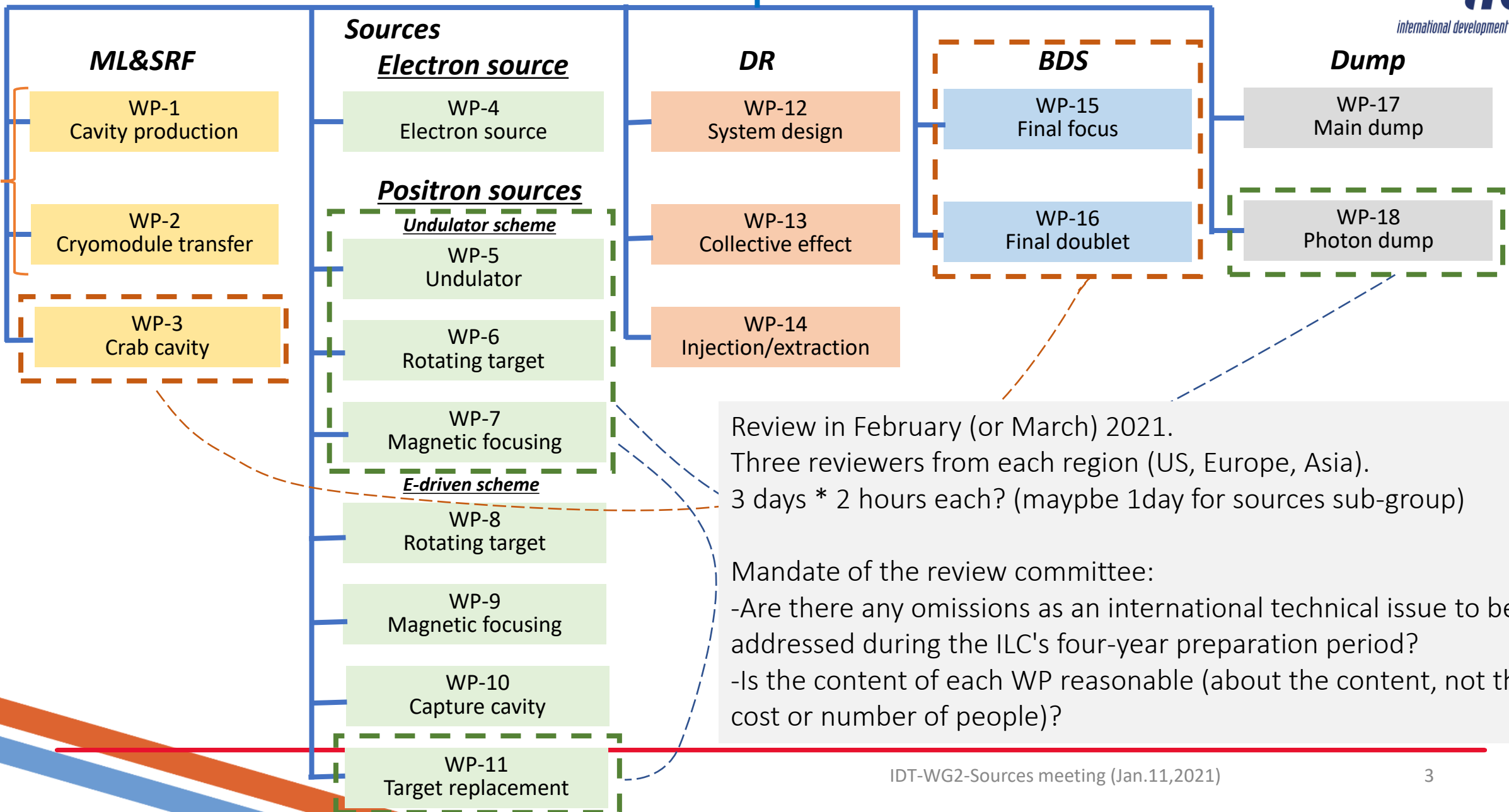
Planning and preparation of Hub lab.

Civil engineering, local infrastructure and site [host country assisted by selected partners]

- Engineering design including cost confirmation/estimate
- Environmental impact assessment and land access
- Specification update of the underground areas including the experimental hall
- Specification update for the surface building for technical scientific and administrative needs

Civil engineering

Real cavity and cryomodule production



Review in February (or March) 2021.
 Three reviewers from each region (US, Europe, Asia).
 3 days * 2 hours each? (maybe 1day for sources sub-group)

Mandate of the review committee:

- Are there any omissions as an international technical issue to be addressed during the ILC's four-year preparation period?
- Is the content of each WP reasonable (about the content, not the cost or number of people)?

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(Jan.08, 2021)

If all (IDT-EB/IDT-WG2/Sources subgroup) agree, I would like to change the timing of positron selection so that we can receive global support.

Assumed Pre-lab timeline (current version)

For Engineering design

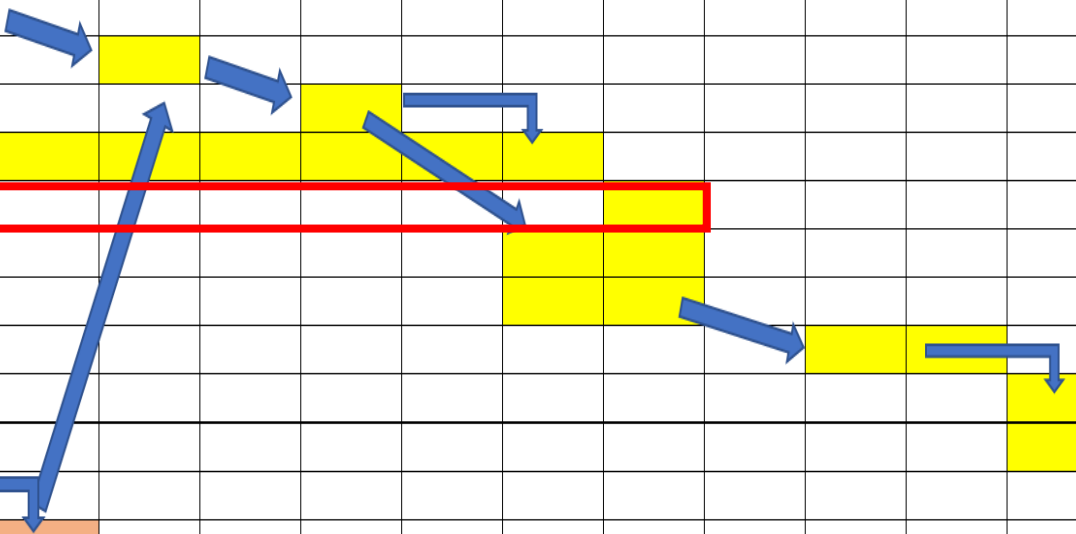
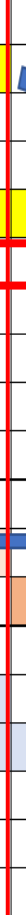
- 1st year:** Work on TDR-based **cost-estimate confirmation**, started by an international team centered on the Pre-lab.
- 2nd year:** Complete the cost-estimate confirmation, and an **internal review** in the latter half of the 2nd year.
The review also reports on the progress of technical issues during the preparation period.
- 3rd year:** Conduct an **external review** and completed scrutiny of costs and risks.
Complete the **draft of Engineering Design Report (EDR)**.
- 4th year:** Publish **EDR (in first half yr)**, report progress on technical issues, and prepare each large bid.

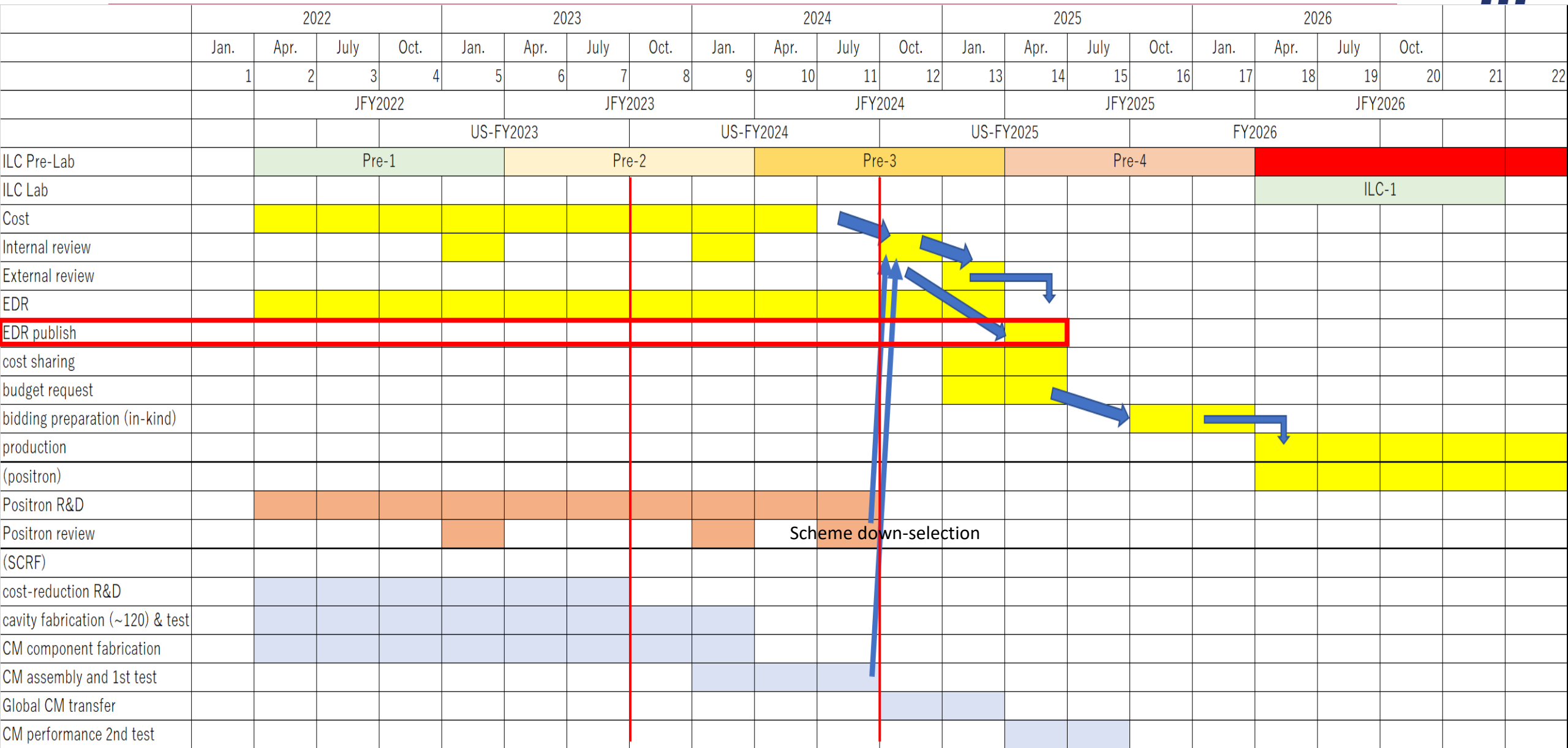
For technical preparation (example of SRF and positron)

- 1st year:** Extend SRF cost reduction R&D, Start a pre-series SRF cavities production preparing for industrialization
Continue positron survey
- 2nd year:** Complete SRF cost-reduction R&D, and extend the work to assemble the cavities with cryomodule (CM),
Select positron scheme
- 3rd year:** Demonstrate “Cryomodule Global transfer, aiming at HPG legal-process, shipment, and SRF QA test after transport
Mature Lab. planning and preparation
Prototyping of critical items (such as positron target)
- 4th year:** Evaluate CM performance after CM shipment, and prepare for Hub Lab. functioning
Progress prototyping of critical items (such as positron target)



	2022				2023				2024				2025				2026							
	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
	JFY2022				JFY2023				JFY2024				JFY2025				JFY2026							
					FY2023				FY2024				FY2025				FY2026							
ILC Pre-Lab		Pre-1			Pre-2				Pre-3				Pre-4											
ILC Lab																					ILC-1			
Cost		Yellow																						
Internal review																								
External review																								
EDR		Yellow																						
EDR publish																								
cost sharing																								
budget request																								
bidding preparation (in-kind)																								
production																								
(positron)																								
Positron R&D		Orange																						
Positron review																								
(SCRF)																								
cost-reduction R&D		Light Blue																						
cavity fabrication (~100)		Light Blue																						
CM assembly																								
Global CM transfer																								
CM performance test																								





Scheme down-selection

TDR experience/ advantages

- Nov., 2012 Internal Cost Review (FNAL)
- Dec., 2012 Program Advisory Committee (TDR review)
- Feb., 2013 External Cost Review (Windsor, UK)
- June, 2013 TDR publishing

- Moved positron decision from 2nd year to mid 3rd year
- Moved Cost's Internal Review from the end of the second year to the middle of the third year
- External Review 3 months late
- EDR publishing remains unchanged at the beginning of the fourth year

Consistent with TDR
schedule

Merit:

- Americas/Europe are interested in positrons, but the FY2023 budget will not be enough.
- It will be possible to make contributions on FY2024.
- It is also possible to include the results of the yield of superconducting cavities.

Demerit:

- Internal Review is delayed by 6 months. (Moved from the end of the second year to the middle of the third year)

Engineering design schedule

For Engineering design

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- 2nd year:** Complete the cost-estimate confirmation, and an **internal review** in the latter half of the 2nd year.
The review also reports on the progress of technical issues during the preparation period.
- 3rd year:** Conduct an **external review** and completed scrutiny of costs and risks.
Complete the **draft of Engineering Design Report (EDR)**.
- 4th year:** Publish **EDR (in first half yr)**, report progress on technical issues, and prepare each large bid.

(revised)

For Engineering design

- 1st year:** Work on TDR-based **cost-estimate confirmation**, started by an international team centered on the Pre-lab.
- 2nd year:** Conduct internal Program Advisory Panel on the progress in technical and cost-confirmation issues.
- 3rd year:** Complete the cost-estimate confirmation.
Conduct **internal and external Cost-confirmation Reviews** and completed scrutiny of costs and risks.
Complete the **draft of Engineering Design Report (EDR)**.
- 4th year:** Publish **EDR (in first half yr)**, report progress on technical issues, and prepare each large bid.

Technical preparation schedule

For technical preparation (example of SRF and positron)

- 1st year:** Extend SRF cost reduction R&D, Start a pre-series SRF cavities production preparing for industrialization
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(revised)

For technical preparation (example of SRF and positron)

- 1st year:** Extend SRF cost reduction R&D, Start a pre-series SRF cavities production preparing for industrialization
Continue positron survey, positron review
- 2nd year:** Complete SRF cost-reduction R&D, and extend the work to assemble the cavities with cryomodule (CM),
Positron review
- 3rd year:** Demonstrate “Cryomodule Global transfer, aiming at HPG legal-process, shipment, and SRF QA test after transport
Mature Lab. planning and preparation
Establish positron scheme down-select, prototyping of critical items (such as positron target)
- 4th year:** Evaluate CM performance after CM shipment, and prepare for Hub Lab. functioning
Progress prototyping of critical items (such as positron target)

Backup slides

Civil Engineering Design for Positron Source

Since civil engineering (CE) work will start immediately after the preparation period, a lot of detailed design work is expected during the preparation period, so the CFS Group will proceed with the basic design of the CE for the positron source in advance.

■ Have the CE design to **include the undulator scheme in any scenarios.**

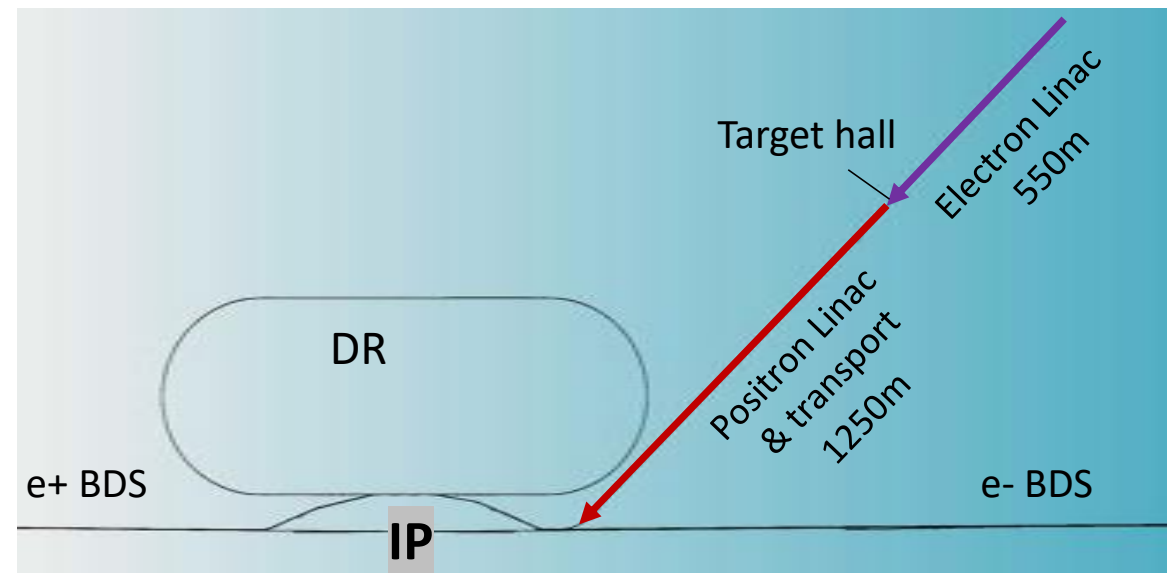
- TDR based layout
- and have **Photon dump line** in the BDS tunnel

■ **E-driven source** will be in **separated dedicated tunnel.**

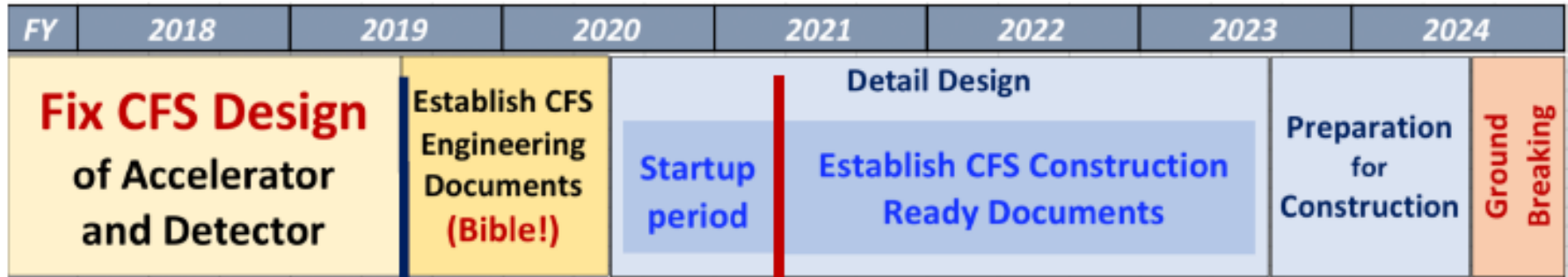
- **add on to the TDR based design**
- From the CE view, sharing of BDS tunnel is not realistic.
- e-driven study group is developing this design.
- Access tunnel should be considered.

Design study for e-driven positron source

- Figure shows the length of the linac, taking into account the size and placement of devices.
- Positron injection into the DR uses RTL.
- Joint angle to the BDS tunnel will be optimized for local conditions.



CFS timeline on "Pre- and Preparation Phase"



(A) Basic Design linked to CFS should be fixed.

- Accelerator layout
 - beamline
 - power supplies
- Requirement of Utilities
 - specification and route

(B) Selection of Positron Source Scheme

Note:
This timeline has been discussed and reached a consensus by the KEK LC-CFS members.

- M. Miyahara,
- H. Hayano,
- N. Terunuma,
- S. Michizono,
- K. Yokoya

Exception: Positron Source

- Prepare designs for all possible schemes by (A)
- Scheme choice should be done by (B)?