Positron Source Cost Update

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SCJ and Advisory Panel Report

- SCJ Report said
  - ✓In the main preparatory phase, it is planned that the prototype of the rotating target will be made and the magnetic focusing system immediately after the positron source will be developed. The technology selection is to be made by the second year of the main preparatory phase. The strategy should be clarified, taking into account the R&D cost.
- Advisory Panel said
  - ✓The helical undulator scheme is adopted as the positron source. It contains some technologies under development such as the cooling of the target irradiated by the gamma rays from the undulator and the replacement method of the activated target.
  - ✓The choice of technology should be based on development costs.

R&D Cost

- R&D Cost
  - ✓Undulator
    - 1.5MILCU + 10FTE-yr
  - ✓e-Driven
    - 4.35MILCU + 5FTE-yr
  - ✓These are presented in the Technical Preparation Document with the attachment table
- Explanation of imbalance of cost/FTE
  - ✓e-driven requires commercial products such as klystron, modulator, etc.

Construction Cost

- The construction cost itself is not mentioned in the reports
  - ✓ But we must be prepared as questions related to the technology choice
  - ✓ How to present the cost to the Advisory Panel has not yet been decided
- Undulator
  - ✓ Based on TDR
  - ✓ Some changes since TDR (e.g., undulator length)
- e-Driven
  - ✓ First cost estimation in Sep.2017
  - ✓ Conceptual design published in NIM in 2019
  - ✓ Recent cost estimation based on NIM paper with new CFS estimation
- Const comparison as of Oct.2017
  - ✓ Talk at LCWS Strasbourg
  - ✓ Uploaded in today's indico page
    - Following 2 pages are extracts from the slides

Comparison of the Basic Cost

	Undulator	e-Driven
Accelerator	274 OkuYen	272 OkuYen
CFS	74 OkuYen	44 OkuYen
Sum	348 OkuYen	316 OkuYen

Final Cost Comparison

	Undulator	e-Driven
Basic cost (1)	348	316 (2)
Empty space for timing (3) for 31.5 MV/m	26	
for 35 MV/m	46	
Sum for 31.5 MV/m	374	316
35 MV/m	394	316

- (1) components+CFS, including 3GeV compensation, dogleg
- (2) Assume the space for undulater+photon drift is eliminated. If reserved, the cost increases by ~23 OkuYen
- (3) CFS + RTML beam line + main beam line. Only the positron wing

Latest Cost Comparison

- There are 3 cases starting with e-driven sheme

A) e-Driven alone
  - ✓ Install e-driven system at electron linac downstream
  - ✓ No space prepared for future undulator system
  - ✓ Undulator scheme possible only at the time of energy upgrade

B) e-Driven with reserved space for undulator
  - ✓ e-driven at electron linac downstream

C) e-Driven in a separate tunnel
  - ✓ Installation of undulator scheme is possible at any time

- The following 3 tables compare the cost with the case of the undulator scheme. These tables have been prepared by Hayano san. There may be some changes later. For now, please consider them as confidential.
- These 3 pages were eliminated from the uploaded slides