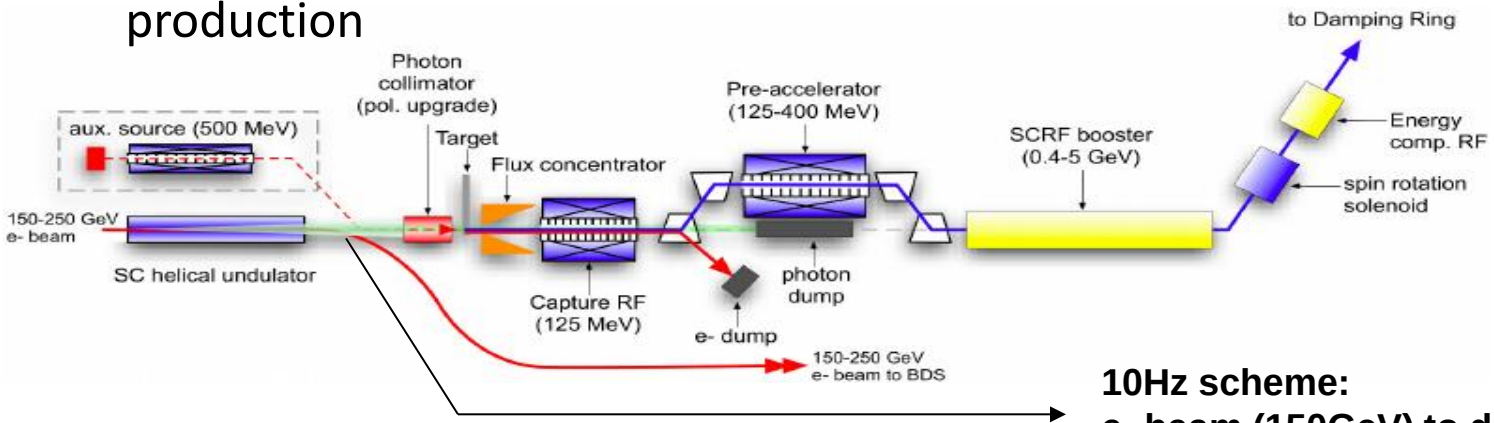
Questions to particle physics community: low E running and e+ source (T. Omori)

Low energy running:

- For E_e < 150 GeV e+ yield is below 1.5 e+/e-
- E_{cm} ≤ 250 GeV:

→ TDR: 10 Hz scheme

1. Alternating with e- beam for physics (E_e~120GeV) an e- beam with E_e=150GeV passes undulator to generate γ for e+ production



2. Alternative solution: use full length of undulator and optimize system, works for E_{cm} = 240 GeV (A. Ushakov, LC-REP-2013-019)

Consideration on
Low energy operation of undulator based e+ source

ILC-CLIC e+ studies
12-Dec-2013
T. Omori

Low energy operation of undulator based e+ source

Issues: Physics

(1) Do we need scan at Ecm = 208 – 240 GeV?

(2) Do we need Z-pole (Ecm = 91 GeV) running (Giga-Z)?

(3) Do we need running at W-pair production (Ecm = 161 GeV)?

Low energy operation of undulator based e+ source

Issues: Physics

(1) Do we need scan at Ecm = 208 – 240 GeV?

(2) Do we need Z-pole (Ecm = 91 GeV) running (Giga-Z)?

(3) Do we need running at W-pair production (Ecm = 161 GeV)?

Options: Accelerator

(1) Do not employ 10Hz operation. Employ 230m undulator. (Andriy)

We can make initial and operation cost reduction.

Low energy operation of undulator based e+ source

Issues: Physics

(1) Do we need scan at Ecm = 208 – 240 GeV?

(2) Do we need Z-pole (Ecm = 91 GeV) running (Giga-Z)?

(3) Do we need running at W-pair production (Ecm = 161 GeV)?

Options: Accelerator

(1) Do not employ 10Hz operation. Employ 230m undulator. (Andriy)

We can make initial and operation cost reduction.

(2) Employ 10Hz operation. Employ 147m undulator. (RDR solution)

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

Low energy operation of undulator based e+ source

Issues: Physics

(1) Do we need scan at Ecm = 208 – 240 GeV?

(2) Do we need Z-pole (Ecm = 91 GeV) running (Giga-Z)?

(3) Do we need running at W-pair production (Ecm = 161 GeV)?

Options: Accelerator

(1) Do not employ 10Hz operation. Employ 230m undulator. (Andriy)

We can make initial and operation cost reduction.

(2) Employ 10Hz operation. Employ 147m undulator. (RDR solution)

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

(3) Employ 10Hz operation. Employ 230m undulator.

We can make operation cost reduction, but slightly higher initial cost.

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

Low energy operation of undulator based e+ source

Issues: Physics

(1) Do we need scan at Ecm = 208 – 240 GeV?

(2) Do we need Z-pole (Ecm = 91 GeV) running (Giga-Z)?

(3) Do we need running at W-pair production (Ecm = 161 GeV)?

Options: Accelerator

(1) Do not employ 10Hz operation. Employ 230m undulator. (Andriy)

We can make initial and operation cost reduction.

Do we give up Giza-Z, W-pair, and 208 – 240 GeV? -> If No ->

(2) Employ 10Hz operation. Employ 147m undulator. (RDR solution)

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

(3) Employ 10Hz operation. Employ 230m undulator.

We can make operation cost reduction, but slightly higher initial cost.

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

Low energy operation of undulator based e+ source

Issues: Physics

(1) Do we need scan at Ecm = 208 – 240 GeV?

(2) Do we need Z-pole (Ecm = 91 GeV) running (Giga-Z)?

(3) Do we need running at W-pair production (Ecm = 161 GeV)?

Options: Accelerator

(1) Do not employ 10Hz operation. Employ 230m undulator. (Andriy)

We can make initial and operation cost reduction.

Do we give up Giza-Z, W-pair, and 208 – 240 GeV? -> If No ->

(a) Add 10Hz later.

-> Change all refrigerators and modulators (Klystron PSs).

Very expensive additional investment, not realistic.

(2) Employ 10Hz operation. Employ 147m undulator. (RDR solution)

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

(3) Employ 10Hz operation. Employ 230m undulator.

We can make operation cost reduction, but slightly higher initial cost.

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

Low energy operation of undulator based e+ source

Issues: Physics

(1) Do we need scan at Ecm = 208 – 240 GeV?

(2) Do we need Z-pole (Ecm = 91 GeV) running (Giga-Z)?

(3) Do we need running at W-pair production (Ecm = 161 GeV)?

Options: Accelerator

(1) Do not employ 10Hz operation. Employ 230m undulator. (Andriy)

We can make initial and operation cost reduction.

Do we give up Giza-Z, W-pair, and 208 – 240 GeV? -> If No ->

(a) Add 10Hz later.

-> Change all refrigerators and modulators (Klystron PSs).

Very expensive additional investment, not realistic.

(b) Apply 2.5+2.5 Hz operation.

-> We can go to any low energy with 1/2 luminosity.

(2) Employ 10Hz operation. Employ 147m undulator. (RDR solution)

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

(3) Employ 10Hz operation. Employ 230m undulator.

We can make operation cost reduction, but slightly higher initial cost.

We can make low energy running at Ecm = 91, 161, 208-240 GeV.

Questions to the particle physics community: low E running and e+ source (T. Omori)

Please, think about these options and the resulting implications for physics (asap).

The detailed design, construction ad costs of the positron source design depend on the answers.

- The design must be fixed asap to be ready in time