

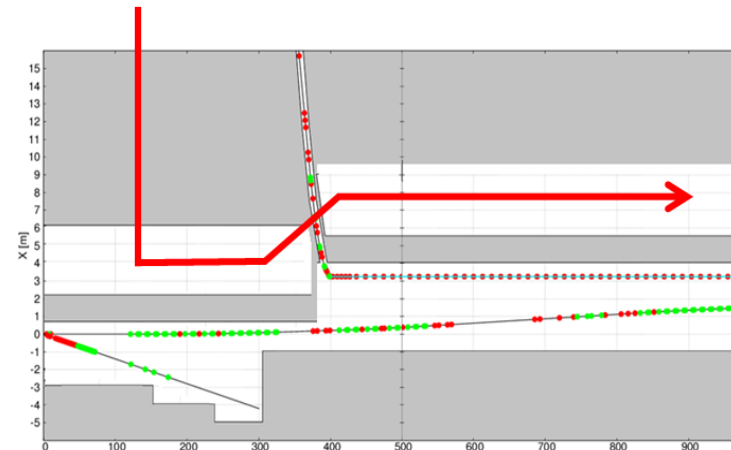
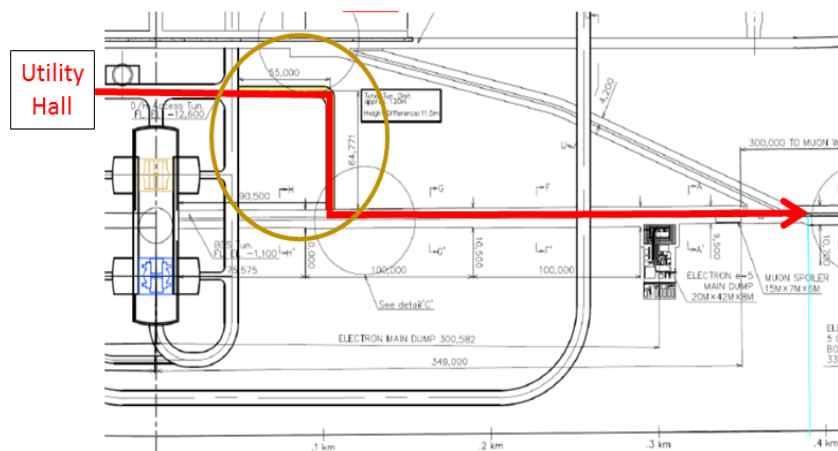
# CRWG+PositronWG Status

K. Yokoya

2017.3.22 TCMB

# CRWG : CR for Positron BDS (1)

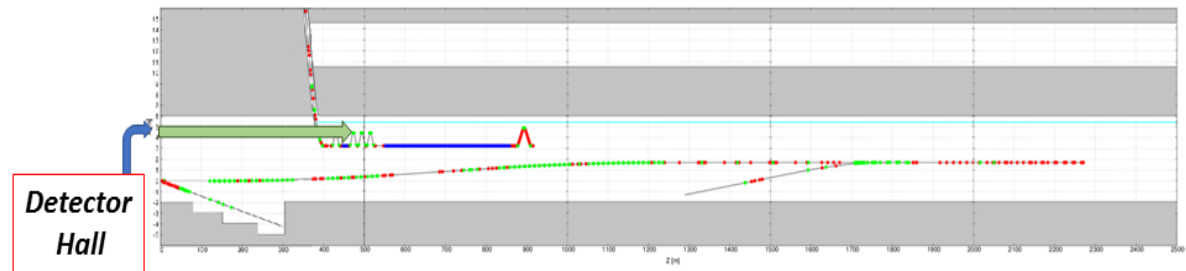
- Going to submit Change Request on positron BDS tunnel
  - drafted by Okugi & Miyahara
- Positron BDS tunnel :
  - TDR: twin tunnel (linac end → LTR entrance)
  - single tunnel (LTR entrance → Detector Hall)
  - CR: kamaboko tunnel (linac end → Detector Hall)
  - power line from utility hall near DH to BDS and electron linac



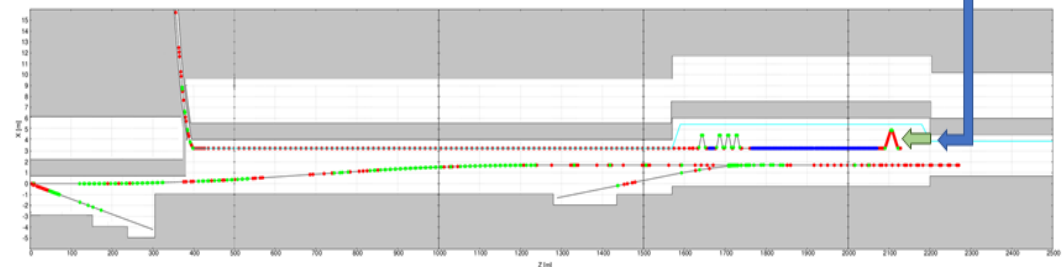
# CRWG : CR for Positron BDS (2)

- Move electron source upstream
  - Advantage:
    - shorter helium line
    - avoid radiation from collimator to shower on electron cryomodules
  - Disadvantage:
    - longer electron transport line

(a) TDR positron BDS tunnel



(b) proposed positron BDS tunnel



Schematic figure of the helium transfer paths

# CRWG : CR for Positron BDS (3)

- Cost of kamaboko tunnel is more expensive than TDR (2240m, ~50MILCU) by ~1.2MILCU
- But, if penetration cost were added to TDR, kamaboko tunnel would be less expensive by ~2.0 MILCU
  - (Above numbers are based on kamaboko tunnel model with 1.5m shield wall and 6.75m separation in TDR twin tunnel)
- Cost increase by longer electron line (+2.2km) is ~2.2MILCU, whereas cost decrease by shorter helium line (~500m) is 2.5MILCU
- In any case, the cost change is minor (only a few MILCU)

# CRWG Future

- Remaining items
  - Electron BDS tunnel
  - Commissioning
  - Review of safety issues
  - etc
- Interruption for several months
- Waiting for progress of positron source

# Positron Working Group

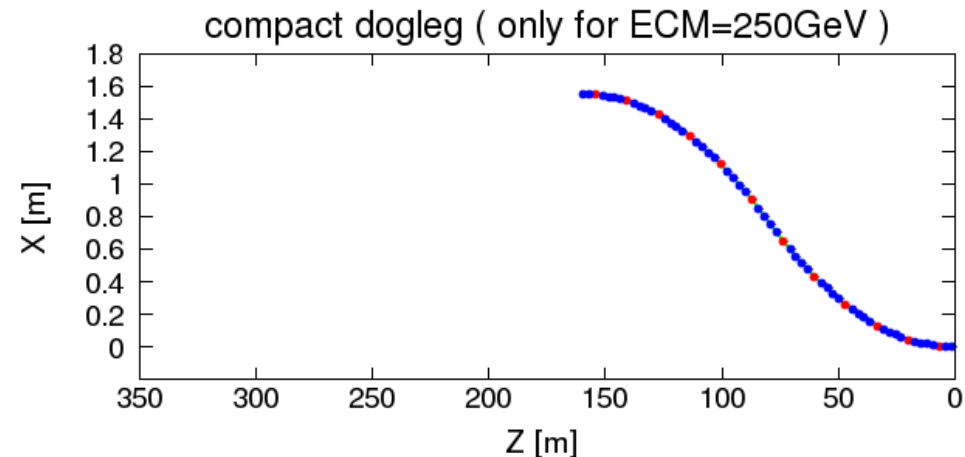
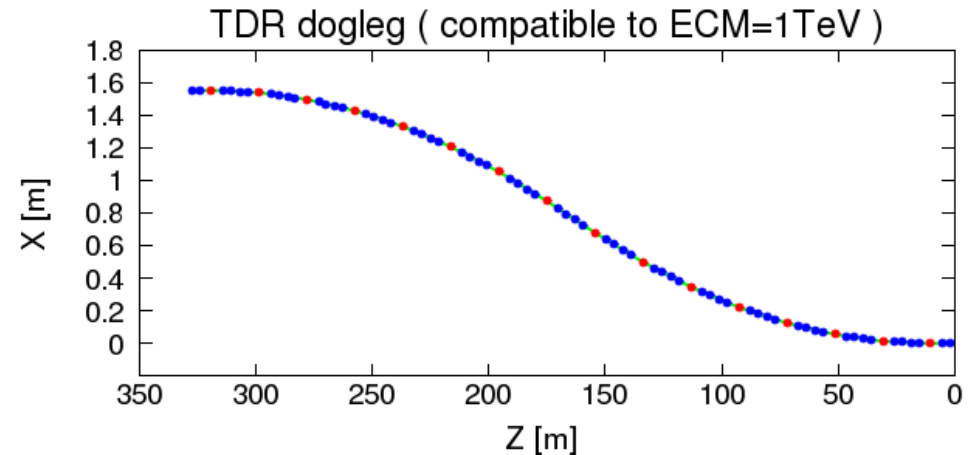
- Charges (from Shin)
  - Evaluate undulator? Conventional? At 250GeV CM
  - Evaluate technical difficulty, cost (based on TDR), commissioning
  - Submit final report by June 2017 including
    - essential R&D in 2018-19
    - proposal of positron scheme
- Members
  - Germany
    - Andriy Ushakov, Gudrid Moortgat, Sabine Riemann, Peter Sievers, Benno List
  - Japan
    - Tohru Takahashi , Tsunehiko Omori, Masao Kuriki
    - Kaoru Yokoya (chair), Toshiyuki Okugi, Akira Yamamoto
  - US
    - Wei Gai
- Plan of WG (discussed in the 1st meeting on Mar.2)
  - 1<sup>st</sup> priority: Make a plan of R&D for FY2017-2019
  - 2<sup>nd</sup> priority: Consistent design

# 2<sup>nd</sup> Meeting on Mar.15 (1)

- R&D Plan for e-Driven Scheme
  - Concentrate on 1312 bunches
    - Problem with 2625 bunches is the bunch interval 3ns because of high and quick transient beam-loading
  - Target
    - Prove feasibility within JFY2017
    - Assume we will get ~100k\$ in JFY2017
    - Target test
      - Evaporation of magnetic fluid?
      - 50cm diameter model (not tungsten)
  - Presumably, downstream part (FC, capture cavities) are OK if 1312 bunches. Simulation studies are still needed but don't need money
- But no much progress in the meeting
- Will discuss by email communication

# 2<sup>nd</sup> Meeting on Mar.15 (2)

- Planned to fix the undulator scheme parameters for 250GeV CM
- but we had only ~5 minutes
- Move undulator downstream (closer to the target)
  - Smaller photon spot size
- Okugi san
  - shorter dogleg possible for  $E_e=125\text{GeV}$
- Andriy
  - Calculated heating of target and FC
  - No essential improvement from long to short dogleg





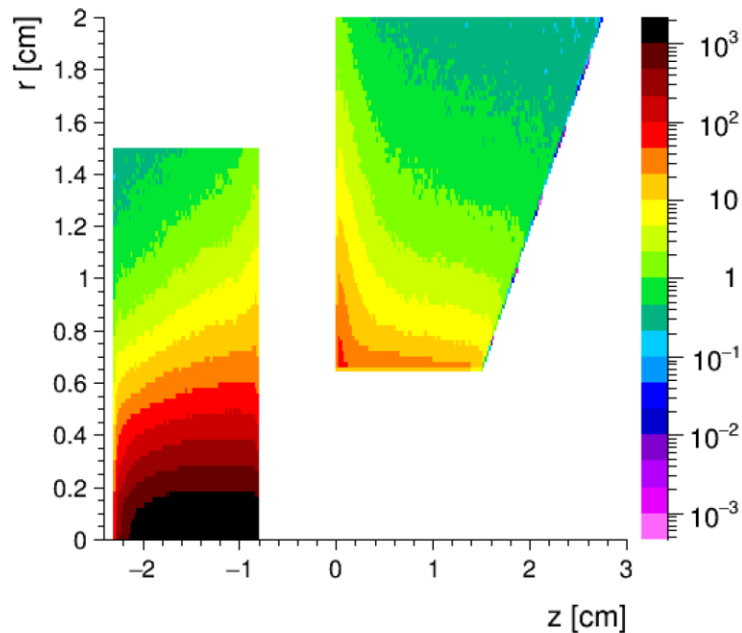
Andriy's simulation base on Okugi's geometry

- PEDD limit of Cu is 7-12 J/g

## PEDD in FC. Compact Dogleg

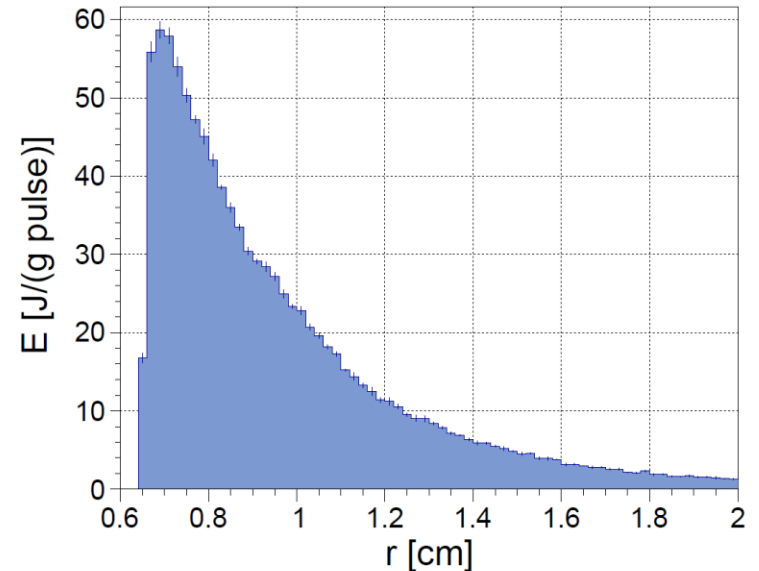
125 GeV  $e^-$ , 1312 bunches/pulse, 231 m undulator with  $K = 0.85$

Energy Deposition in Target\*  
and FC [J/(g pulse)]



\* Target without rotation

Energy Deposition Radial Profile  
at  $z = 0.3$  mm



$$\text{PEDD}_{\text{FC}} = 58.7 \text{ J/(g pulse)}$$
$$\Delta T_{\text{inst}} = 152.6 \text{ K}$$

# FC Heating Problem (undulator scheme)

- PEDD at the tip of FC is serious for 125GeV beam
  - Low energy photon → larger spot and wider shower development in the target material
  - Less serious for 250GeV beam
- Possible cures (to be discussed in coming meetings)
  - Shorter distance from undulator to target
    - Andriy's simulation showed only ~15% reduction of PEDD
  - Larger beam hole of FC
    - Compatible with 3Tesla field?
  - Lower K of undulator
    - smaller angle spread and higher photon energy ( $1/(1+K^2)$ )
    - But reduces photon number (propt.  $K^2$ )
  - Thinner target
    - Less development of shower angle
    - But reduces positron yield
  - Photon collimator (originally for higher polarization)
    - Scrape out low energy photons (useless for positron production and cause larger angle in target)
    - But reduces positron yield
- Minimum baseline
  - DC QWT: how much is the luminosity reduction?

## 3<sup>rd</sup> Meeting on Mar.30: R&D Plan for Undulator Scheme

- Sabine will give a draft on the R&D plan for JFY2017 and JFY2018-19
- Expect some budget
- Also an important topics in the “staging miniWS”

# Staging miniWS

- Apr.5 afternoon (2 hours)
  - Undulator scheme
  - R&D plan
  - Parameters for 250GeV CM
    - Problem of PEDD on FC
  - Photon dump
  - Manpower
- Apr.6 morning (2 hours)
  - e-Driven scheme
  - R&D plan