Brief summary of DR/BDS/DUMP group meeting (02/02)

Attendees : Karsten Buesser, Angeles Faus-Golfe, Kiyoshi Kubo, Andrea Latina, Miguel Magan, Thomas Markiewicz, Shin Michizono, Tatsuya Nakada, Toshiyuki Okugi, Brett Parker, David Rubin, Peter Sievers, Ben Shepherd, Nobuhiro Terunuma, Kaoru Yokoya, Mikhail Zobov

2022/02/08

Toshiyuki OKUGI, KEK

IDT WG2 meeting

- ✓ ***Possibility to save the operation power with pulse magnet at RTML***
- ✓ ***IDT-WG2 steering panel (DR/BDS/DUMP group)***

Sustainability Issues of ILC

International Development Team

Sustainability Issues
Benno List, DESY
25th IDT WG2 Meeting
19.10.2021

IDT Upcoming Conference: IAEA

- IAEA Conference on accelerators for research and sustainable development
- Vienna, May 23-27, 2022
- Submitted an abstract for ILC and CLIC: "Sustainability studies for linear colliders"
  - Authors: S. Stapnes, S. Michizono, BL
- Intent: Provide an overview over measures to increase sustainability of ILC and CLIC
  - Overall design
  - Energy saving components
  - Renewable energy sources
  - Waste heat usage
  - …
- If accepted, writeup is expected

https://conferences.iaea.org/event/264/

IDT Reduced Damping Ring Operation

- Damping Rings consume 14MW (13%) of total power
- At 2.5Hz operation, beams circulate for 400ms instead of 200ms
  -> longer damping time sufficient?
- Can wiggler fields be reduced and RF power saved?
- Damping rings consume
  - 7.4MW RF power
  - 1.5MW cryo power
  - How much could be saved at 2.5Hz operation?

	500 TDR	250-A	250-A' w/R&D	250-A Lx2
Rep-Rate / Hz	5	5	5	5
Bunches / Pulse	1312	1312	1312	2625
Lumi / 10^{34}	1.8	1.35	1.35	2.7
Gradient / MV/m	31.5	31.5	35	31.5
Q_0/1E10	1.0	1.0	1.6	1.0
ML E-gain / GeV	470	220	220	220
ML Power / MW	107.1	50.1	49.3	53.5
e- Src / MW	4.9	4.9	4.9	5.6
e+ Src / MW	9.3	9.3	9.3	10.2
DR / MW	14.2	14.2	14.2	22.2
RTML / MW	10.4	10.4	10.4	13.3
BDS / MW	12.4	9.3	9.3	9.3
Dumps / MW	1.2	1.2	1.2	1.2
IR / MW	5.8	5.8	5.8	5.8
Campus / MW	2.7	2.7	2.7	2.7
Gen. Margin/MW	5.1	3.3	3.2	4.0
Total	**173**	**111**	**110**	**138**

From ILC-CR-0018

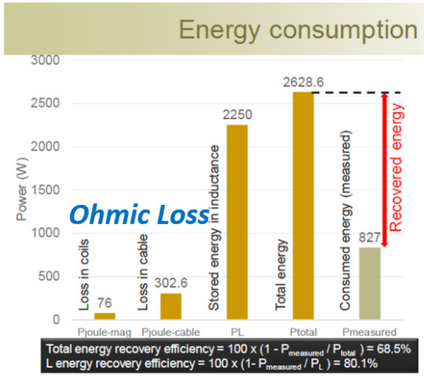
Can we reduce the operating power for RTML by using the pulsed magnet ?

The possibility of operating power reduction for the warm magnet of RTML is roughly evaluated with the pulse magnet used in SuperKEK linac.

Possibility to save the operation power with pulse magnet at RTML

Operating power of the pulse magnet

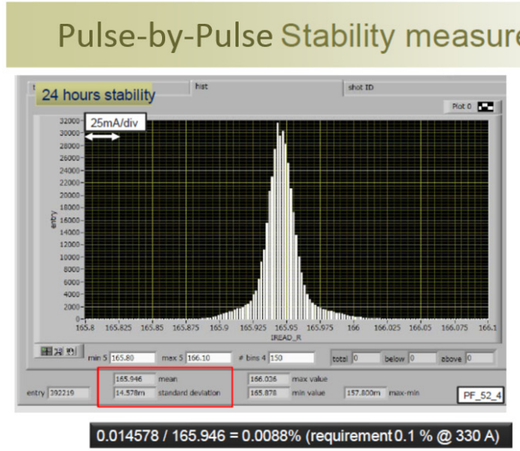
Y. Enomoto @LINAC2018



	Q (PM_32_4)
t_1 (s)	2.5 m
t_2 (s)	0.5 m
I_{max} (A)	300
L (H)	1 m
R_{mag} (Ω)	7.8 m
R_{total} (Ω) incl. cable	38.83 m
$P_{joule\text{-}mag}$ (W) @ 50 Hz	76
$P_{joule\text{-}cable}$ (W) @ 50 Hz	302.6
$P_{joule\text{-}total}$ (W) @ 50 Hz	378.6
P_L (W) @ 50 Hz	2250
P_{total} (W) @ 50 Hz	2628.6

	rep. rate	gradient	bore diameter	Current	Ohmic loss	Stored energy	recovery rate	Total Power	
								no recov.	with recov.
LINAC Pulse Magnet	50 Hz	55 T/m	20 mm	300 A	380	2250	0.800	2630	830
	5 Hz				38	225	0.107	263	239
ATF2 CW magnet		35 T/m	32 mm	75 A				**750**	

Stability of the pulse magnet



Y. Enomoto @LINAC2018

Stability of the pulse magnet of SUperKEKB Linac

Pulse-by-pulse stability (measurement)	0.0088%
Flat-top stability (design)	0.1%

The possibility of operating power reduction for the warm magnet of RTML is roughly evaluated with the pulse magnet used in SuperKEK linac.

It was found that the power consumption can be reduced to roughly 1/3 by comparing to that of similar size magnet in ATF.

However, the strength stability of the pulse magnet is about 1e-3 at flat top, and the pulse-by-pulse stability is just under 1e-4, which is larger than the 1e-5 used in the ILC RTML simulation.

The value of 1e-5 was assumed during the simulation, and is not the allowable value that is actually required for the magnet.

IDT-WG2 steering panel (DR/BDS/DUMP group)

IDT-WG2 with steering members

Shin Michizono (Chair)
Benno List (Deputy)

Steering panel

ML&SRF steering panel

Yasuchika Yamamoto	***KEK***
Sergey Belomestnykh	FNAL
Enrico Cenni	CEA
Peter McIntosh	STFC
Laura Monaco	INFN Milano
Akira Yamamoto	KEK

Sources steering panel

Kaoru Yokoya	***KEK***
Joe Grames	JLAB
Masao Kuriki	U. Hiroshima
Gudrid Moortgat-Pick	U. Hamburg

DR/BDS/Dump steering panel

Toshiyuki Okugi	***KEK***
Philip Burrows	U. Oxford
Angeles Faus-Golfe	LAL
David Rubin	Cornell
Glen White	SLAC
Nobuhiro Terunuma	KEK

- *Establish IDT-WG2 steering panel*

(group leader (SRF, Sources, DR/BDS/Dump)+ steering panel members will manage each group.)

2022/02/04 1st steering panel meeting of DR/BDS/Dump

Attendee: Angeles Faus-Golfe, David Rubin, Glen White, Nobuhiro Terunuma, Toshiyuki Okugi

2022/02/08 2nd steering panel meetingof DR/BDS/Dump

Attendee: Phillip Burrows, Angeles Faus-Golfe, David Rubin, Nobuhiro Terunuma, Toshiyuki Okugi

Next week 3rd steering panel meetingof DR/BDS/Dump

Next DR/BDS/DUMP group meeting
Joint meeting with crab cavity group (WP-3)

Date : 2/16 22:00-24:00 (JST)

Discussion items

- ***What is the actual length (flange to flange) that the crab cavity can be used?***
- ***What is the aperture of the crab cavity?***
- ***Up to what energy should we place a usable crab cavity at the start of ILC operation?***
- ***Contingency ?***