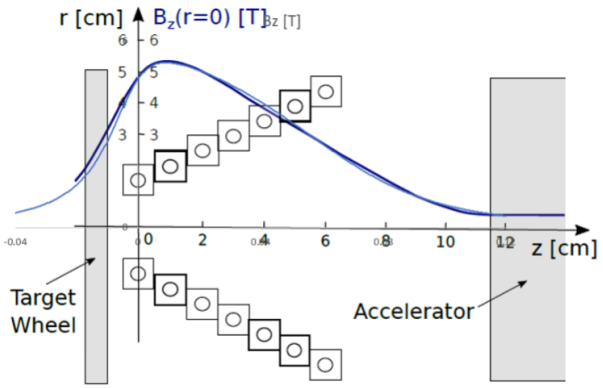
Sources Subgroup Summary, Jan.31. 2022

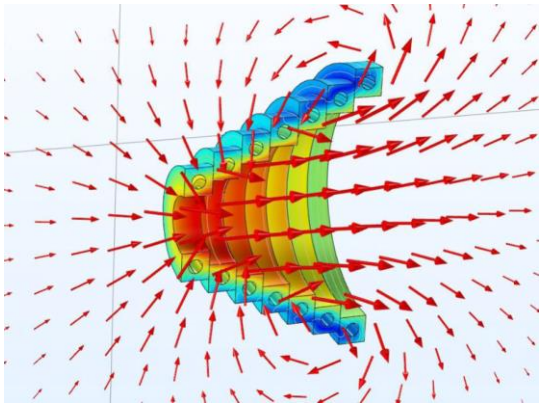
K. Yokoya, for IDT-WG2 Feb.08.2022

- Jan.31 24th Regular meeting
  - ✓ Masao Kuriki, Gudi Moortgat-Pick, Joe Grames, Kaoru Yokoya, Gregor Loisch, Carmen Tenholt, Sabine Riemann, Tsunehiko Omori, Tohru Takahashi, Peter Sievers, Steffen Doebert, Phil Burrows, Hitoshi Hayano, Jenny List, Andrea Latina, Andy Lankford, (Some may be missing)
  - ✓ Indico https://agenda.linearcollider.org/event/9556/
- Presentation on pulsed solenoid
  - ✓ Gregor Loisch, Carmen Tenholt
  - ✓ "A tapered pulsed solenoid as optical matching device for the undulator-based ILC positron source"
  - ✓ Uploaded in the above indico page 220128_ILC_Sources_Solenoid_Mk2.pdf
- Next meeting
  - ✓ Not decided yet
  - ✓ There was steering panel meeting yesterday (Feb.7). Discussed on WP prioritization
  - ✓ Will continue on next Monday

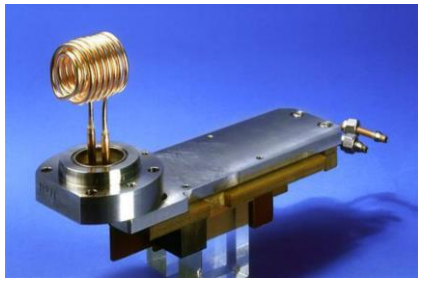
Pulsed Solenoid

- Pulsed solenoid being studied as the optical matching device for the undulator scheme
  - ✓ Flux concentrator: time-dependence problem of the field
  - ✓ QWT: positron yield is not sufficient

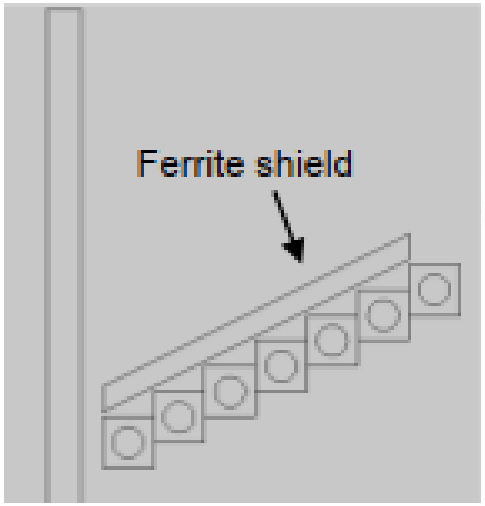


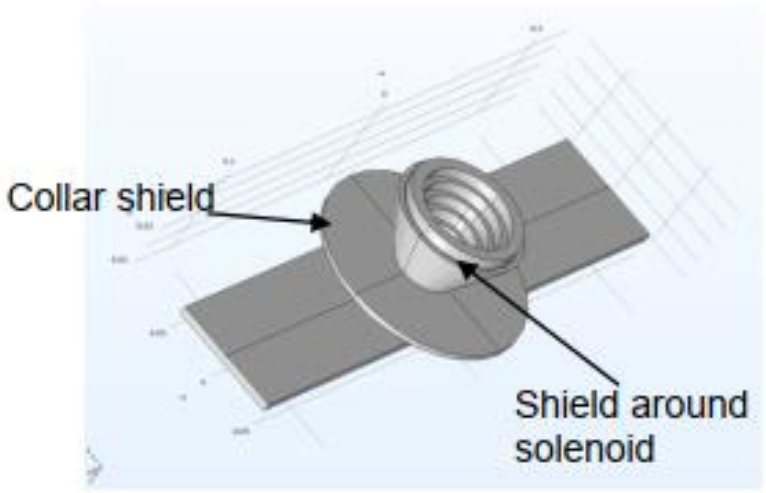


- Preliminary parameters
  - ✓ Peak current ~50kA
  - ✓ 4ms half sine plus 1ms flattop, 5Hz
  - ✓ Peak field ~5T
    (compare LEP positron source: 2.5kA, 20μs, 100Hz, 0.83T)
  - ✓ 7 turns, linear taper 20mm → 80mm
  - ✓ With ferrite shielding to reduce the field on target



- Skin depth effect
  - ✓Skin depth at 125Hz ~ 6mm
    - Larger than the coil diameter.
    - The current is effectively DC
  - ✓Field intensity variation less than 1%
- Effects of ferrite shielding
  - ✓Added to reduce the field and force on target
    - Distance target ←→ coil ~4mm right now (to be further optimized)
  - ✓Target heat load due to rotation 711W → 298W
  - ✓Target head load by time-dependent field 73W → 31W
  - ✓Peak force on target 612N → 263N





➢Yield Simulation

✓Done by Fukuda and Okugi (KEK)

	Beamloss Power				Positron Yield	
	@dogleg	@booster	@EC	@DR	@capture (|Z|<7mm)	@DR
QWT	0.677 kW	0.014 kW	4.01 kW - 5.56 kW	13.15 kW - 14.3 kW	1.07	**~1.1**
Pulse solenoid w/o shield	0.927 kW	0.055 kW	5.86 kW - 7.93 kW	17.39 kW - 16.01 kW	1.81	**1.91**
Pulse solenoid with shield	0.871 kW	0.064 kW	5.58 kW - 7.90 kW	17.73 kW - 16.24 kW	1.64	**1.74**

➢Coil stress

- ✓Max. peak von-Mises stress ~ 146 Mpa
- ✓Average power dissipation ~11.5kW
- ✓Manageable level

➢Mechanical design at start