

DR/BDS/DUMP group meeting (12/21)

Attendees : Philip Burrows, Angeles Faus-Golfe, Alexej Grudiev, Benno List, Thomas Markiewicz, Laura Monaco, Toshiyuki Okugi, Ben Shepherd, Nobuhiro Terunuma, Akira Yamamoto, Kaoru Yokoya, Mikhail Zobov

Presentation by Benno List
about “RF power estimate of the ILC DR”

2023/01/17
Toshiyuki OKUGI, KEK
IDT WG2 meeting

Current DR RF Power Estimate

DR RF power was evaluated to be **8.674MW** (5Hz + 10Hz scenario for low energy operation).

- Klystron output power is 4.80MW for the scenario.
- No details available how to get from 4.80MW to 8.674MW.
- Overall efficiency: $4.8/8.674 = 55.3\%$.
 - not unrealistic for 65% efficient klystron.
 - Would include WG losses, Klystron efficiency and solenoid power, PS efficiency etc. ?

Revisit lattice / beam dynamics: has the RF voltage changed (14MV for 5Hz baseline)?

Consider CR-0016 New 250GeV Luminosity:

included new DR lattice

-> does that need more RF?

Comment ;

DR RF voltage for the CR-0016 DR design for 5Hz operation is same as the old DR design (14MV).

In EDMS, the AC power of the DR RF for 5Hz operation was estimated to be **7.355MW**.

Revisit factor for AC Wall plug -> klystron output

- Factor 55% is not documented, unclear which klystron efficiency was assumed.
- Unclear which other losses were considered.

Klystron efficiency

Factors to be considered:

Klystron efficiency (use 80%?)

Klystron solenoid power

Waveguide losses

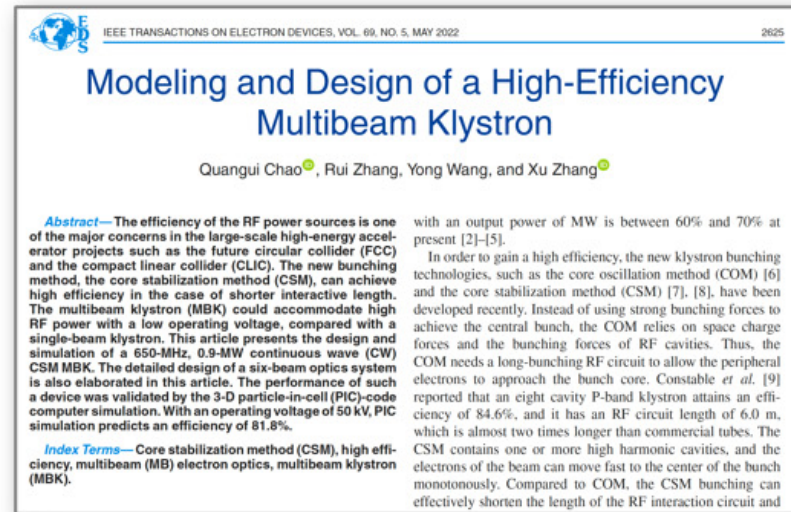
Klystron power supply efficiency

Revisit other factors:

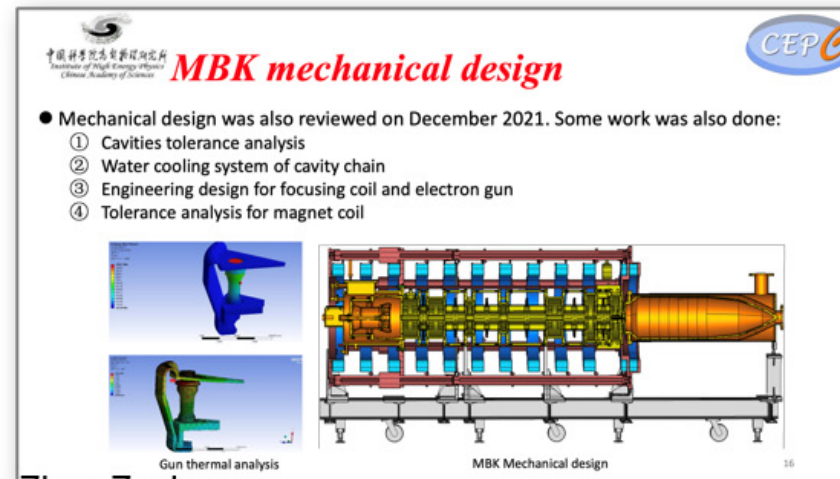
5% HOM losses

10% “power overhead” (what is this?)

650 MHz CW Klystron for CEPC



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Zhou Zusheng,

<https://indico.cern.ch/event/1138197/contributions/4821384/>

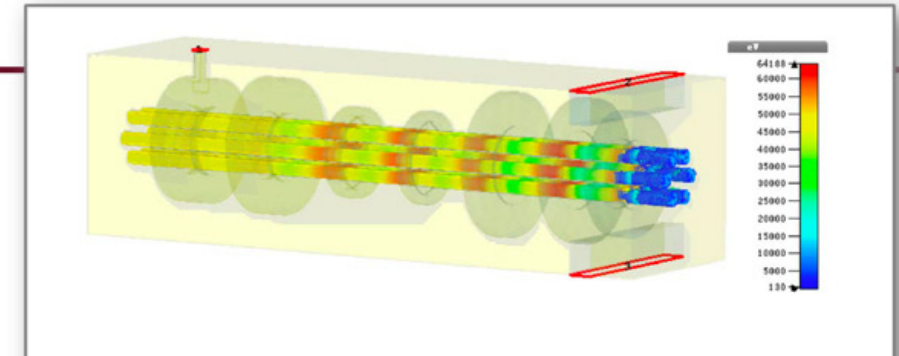


Fig. 7. Snapshot of the particle velocity modulation in the steady state simulated by CST (time 1000 ns).

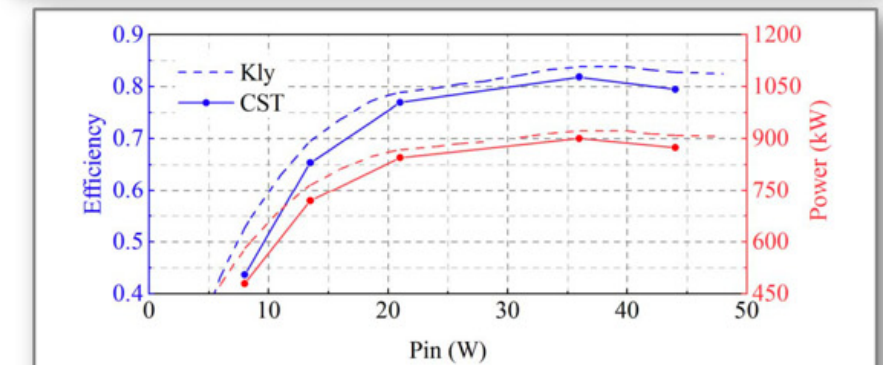


Fig. 10. Efficiency and power of the MBK versus the powers of the exciting signal in Kly/1-D and CST simulations.

Simulated efficiency: 80.5%

Journal publication

Prototype in fabrication

Proposed Change Request:

“Adoption of high efficiency klystrons”

CR would include

- New DR klystrons with 80% efficiency (estimate: save 2.7MW)
- New ML (L-Band) klystrons with 80% efficiency (separate presentation in SRF group)
-> saves 5MW
- Overall: Power 111MW -> 104MW

Comments;

The ILC evaluates power and other figures based on real hardware. Adding values from simulations to the design may cause doubts about the feasibility of the ILC.

Other future accelerators have added simulation-based high efficiency klystrons to their power estimates. It would be better to use the same standard for comparison with other accelerators.