

HOM Damping Requirements

Project: CEBAF 12 GeV Upgrade

Beam parameter

- Beam current: **100 μ A (400 μ A/2passes special beam physics)**
- Bunch charge: **67 pC**
- Bunch length: **300 fs (90 μ m)**
- Bunch rep. rate: **1497 MHz CW**

Cavity / Linac parameter

- Total number of cavities: **18 Injector + 320 OC cavities + 80 new cavities = 418**
- Cavity frequency: **1497 MHz**
- Number of cells per cavity: **7**
- Longitudinal loss factor at design bunch length: **70 V/pC per cavity at 90 μ m (worst case extrapolation from calculation with larger bunch size)**

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): **47mW at 1mA beam loading**
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: **20 W**
- 90% of HOM power below: **1130 GHz (estimate from integrated bunch spectrum)**
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes **$Q < 1.4e9$**
 - Dipole modes **$Q < 1.5 e6$**
 - Quadrupole modes **$Q < 6.e8$ (unsure)**

Your name: **F. Marhauser**

HOM Damping Requirements

Project: **Project X CW linac**

Beam parameter

- Beam current: **1 mA**
- Bunch charge: **14 pC**
- Bunch length: **1 mm**
- Bunch rep. rate: **70 MHz average (I/Qb)**

Cavity / Linac parameter

- Total number of cavities: **194**
- Cavity frequency: **650 MHz**
- Number of cells per cavity: **5**
- Longitudinal loss factor at design bunch length: **<4 V/pC/cavity**

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): **60 mW**
 - Worst case peak HOM power per cavity in case of resonant excitation of a mode: **26 kW (Q=2.e8)**
 - 90% of HOM power below: **2.5 GHz**
 - Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes **$Q < 2e7^*$**
 - Dipole modes **$Q < 1.e9$**
 - Quadrupole modes **$Q < 1.e10$**
- * HOM doesn't dilute emittance even in resonance.**

Your name: **V. Yakovlev, T. Khabibouline**

HOM Damping Requirements

Project: XFEL

Beam parameter

- Beam current: 4.5 mA
- Bunch charge: 1 nC
- Bunch length: 25 μm
- Bunch rep. rate: 4.5 Mhz
- 0.65 ms bunch trains @ 10Hz

Cavity / Linac parameter

- Total number of cavities: 648
- Cavity frequency: 1.3 GHz
- Number of cells per cavity: 9
- Longitudinal loss factor at design bunch length: 17.6 V/pC per cavity

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): 0.5 W
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: 2 kW
- 90% of HOM power below: 100 GHz
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < 1e5$
 - Dipole modes $Q < 1e5$
 - Quadrupole modes $Q <$

Your name: J. Sekutowicz

HOM Damping Requirements

Project: SPL study @ CERN

Beam parameter

- Beam current: 40 mA
- Bunch charge: 114 pC
- Bunch length: 1.2 mm
- Bunch rep. rate: 352 MHz

Cavity / Linac parameter

- Total number of cavities: 200
- Cavity frequency: 704 MHz
- Number of cells per cavity: 5
- Longitudinal loss factor at design bunch length: 4.8 V/pC

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): 22 W
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: $> 10^5$ W
- 90% of HOM power below: 17 GHz
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < 10^4$
 - Dipole modes $Q < 10^7$
 - Quadrupole modes $Q < ?$

Your name: W. Weingarten

HOM Damping Requirements

Project: APS Upgrade SPX

Beam parameter

- Beam current: 100 mA (200 mA)
- Bunch charge: ~ 30 nC
- Bunch length: ~ 40 ps RMS (2 mA)
- Bunch rep. rate:

Cavity / Linac parameter

- Total number of cavities: 16
- Cavity frequency: 2815 MHz
- Number of cells per cavity:
- Longitudinal loss factor at design bunch length: 0.523 V/pC

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): ~ 2 kW /cavity
- Worst case peak HOM power per cavity in case of resonant excitation of a mode:
- 90% of HOM power below: 3.5 GHz
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < 500$
 - Dipole modes $Q < 200$
 - Quadrupole modes $Q <$

Your name: Ali Nassiri

HOM Damping Requirements

Project: BERLinPro

Beam parameter

- Beam current: 100 mA
- Bunch charge: 77 pC
- Bunch length: 2 ps
- Bunch rep. rate: 1.3 GHz

Cavity / Linac parameter

- Total number of cavities: 6
- Cavity frequency: 1300 MHz
- Number of cells per cavity: 7?
- Longitudinal loss factor at design bunch length: ? 10 V/pC

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): 150 W
- Worst case peak HOM power per cavity in case of resonant excitation of a mode:
- 90% of HOM power below: 45 GHz
(muß geprüft werden, wird nachgeliefert)
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < ?$
 - Dipole modes $Q < 10^4$ ($R < 1 \text{ MOhm}$)
 - Quadrupole modes $Q < 10^6$ ($R < 100 \text{ MOhm}$)

Your name: Jens Knobloch, A. Matveenko

HOM Damping Requirements

Project: KEK-cERL

Beam parameter

- Beam current: **10mA (initial)**
100mA (final)
- Bunch charge: **7.7pC (initial)**
77pC (final)
- Bunch length: **3ps-2ps**
- Bunch rep. rate: **1.3GHz**

Cavity / Linac parameter

- Total number of cavities: **2**
- Cavity frequency: **1.3GHz**
- Number of cells per cavity: **9**
- Longitudinal loss factor at design bunch length: **10V/pC-12V/pC**

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): **1.54W-1.85W (initial)**
154W-185W (final)
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: **160W**
- 90% of HOM power below: **52 GHz**
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < 1.0E6$
 - Dipole modes $Q < 1.1E4$
 - Quadrupole modes $Q < 4.8E8$

Your name: **M. Sawamura**

HOM Damping Requirements

Project: Cornell ERL

Beam parameter

- Beam current: $2 \cdot 100$ mA
- Bunch charge: 77 pC
- Bunch length: 600 μm
- Bunch rep. rate: 1.3 GHz

Cavity / Linac parameter

- Total number of cavities: 364
- Cavity frequency: 1.3 GHz
- Number of cells per cavity: 7
- Longitudinal loss factor at design bunch length: 13.1 V/pC per cavity

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): 200 W
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: ~ 500 W (near beam harmonics)
- 90% of HOM power below: ~ 50 GHz
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < \text{few } 1,000$ near beam harmonics
 - Dipole modes $Q < 10,000$
 - Quadrupole modes $Q < \text{few } e9$

Your name: M. Liepe

HOM Damping Requirements

Project: eRHIC

Beam parameter

- Beam current: $6 \times 50 \text{ mA} = 0.3 \text{ A}$
- Bunch charge: 3.5 nC
- Bunch length: 2 mm rms
- Bunch rep. rate: 14 MHz

Cavity / Linac parameter

- Total # of cavities: $240 \times 18 \text{ MV}$
- Cavity frequency: ~ 704
- Number of cells per cavity: 5
- Longitudinal loss factor at design bunch length: 3.6 V/pC

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): 7.5 kW
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: 7 kW
- 90% of HOM power below: 25 GHz
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < ?$
 - Dipole modes $Q < 40,000$
 - Quadrupole modes $Q < ?$

Your name: **al. et H. Hahn**

HOM Damping Requirements

Project: 56MHz SRF Cavity for RHIC

Beam parameter

- Beam current: 0.3A
- Bunch charge: 32nC
- Bunch length: 0.2m
- Bunch rep. rate: 9MHz

Cavity / Linac parameter

- Total number of cavities: 1
- Cavity frequency: 56.3MHz
- Number of cells per cavity: 1
- Longitudinal loss factor at design bunch length: N/A for RHIC

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): 4W
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: 4.3W
- 90% of HOM power below: 0.5GHz
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < \sim 1E4$
 - Dipole modes $Q < N/A$
 - Quadrupole modes $Q < N/A$

Your name: Qiong Wu

Additional Information

- 56MHz SRF cavity is a quarter-wave resonator for increasing the luminosity of RHIC.
- This cavity will be installed in the common section of both rings.
- The HOM damping of this cavity is accomplished by magnetic coupling at the rear end of the cavity.

HOM Damping Requirements

Project: KEKB-CRAB cavity (deflecting RF)

Beam parameter

- Beam current: 1.7 A (e+) & 1.25 A (e-)
- Bunch charge: 11 nC & 8 nC
- Bunch length: 6 – 7 mm
- Bunch rep. rate: 127 – 170 MHz

Cavity / Linac parameter

- Total number of cavities: 1 & 1
- Cavity frequency: 509 MHz
- Number of cells per cavity: single
- Longitudinal loss factor at design bunch length: 1.4 V/pC @ 4 mm

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): $1.1 \text{ V/C} \times 11 \text{ nC} \times 1.7 \text{ A} = 21 \text{ kW}$
- Worst case peak HOM power per cavity in case of resonant excitation of a mode:
- 90% of HOM power below:
14 GHz @ 4mm, 9 GHz @ 6mm
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes $Q < 100$
 - Dipole modes $Q < 200$
 - Quadrupole modes $Q < ?$

Your name: Takaaki. Furuya



HOM Damping Requirements

Project: KEKB SC-RF (storage ring RF)

Beam parameter

- Beam current: **1.4 A**
- Bunch charge: **10 nC**
- Bunch length: **6 – 7 mm**
- Bunch rep. rate: **127 – 170 MHz**

Cavity / Linac parameter

- Total number of cavities: **8**
- Cavity frequency: **509 MHz**
- Number of cells per cavity: **single**
- Longitudinal loss factor at design bunch length: **1.82 V/pC @ 4 mm**

HOM parameter

- Average HOM power per cavity ($k \cdot Q_b \cdot I$): **$1.1 \text{ V/C} \times 10 \text{ nC} \times 1.4 \text{ A} = 15 \text{ kW}$**
- Worst case peak HOM power per cavity in case of resonant excitation of a mode: **4 kW**
- 90% of HOM power below:
14 GHz @ 4mm, 9 GHz @ 6mm
- Required HOM damping for strongest modes (typical Q-values only!)
 - Monopole modes **$Q < 100-120$**
 - Dipole modes **$Q < 100-150$**
 - Quadrupole modes **$Q < ?$**

Your name: Takaaki. Furuya

