

Vacuum Requirements etc. for ANKA

General Requirements for UHV Vacuum:

Pressure without beam:	$< 1 \cdot 10^{-10}$ mbar
Pressure with beam (200 mA):	$< 1 \cdot 10^{-9}$ mbar
Leak rate:	$< 1 \cdot 10^{-10}$ mbar l / s
Desorption rate:	$< 1 \cdot 10^{-12}$ mbar l / (cm ² s)
RMS (mass >2 without 28,44) / (mass 2):	< 0.01

General Requirements for HV Vacuum:

Pressure without beam:	$< 1 \cdot 10^{-7}$ mbar
Leak rate:	$< 1 \cdot 10^{-9}$ mbar l / s
Desorption rate:	$< 1 \cdot 10^{-12}$ mbar l / (cm ² s)
RMS (mass >28 without 44) / (mass <28):	< 0.01

Materials

Appropriate for UHV application (e-beam pipe)

Steel: 316 LN, 316L, 304L

Copper: OFHC, CLIDCOP

Aluminum: AlMg, AlCu, AlSi

Ceramic: AlO

Glas: Quartz, Sapphire, Pyrex

Pumping

UHV: Pumps: Diode Ion-Ion-Pumps (Varian)
Pump-Controller: (MIDIVAC, DUAL (Varian))
Connectors: (DESY)
NEG



HV: Turbo-Pumps (Pfeiffer)
(Ionpumps)



V: Diaphragm Pumps (Vacuubrand)
Scroll Pumps (Leybold)
oil free!!

Gauges / Valves

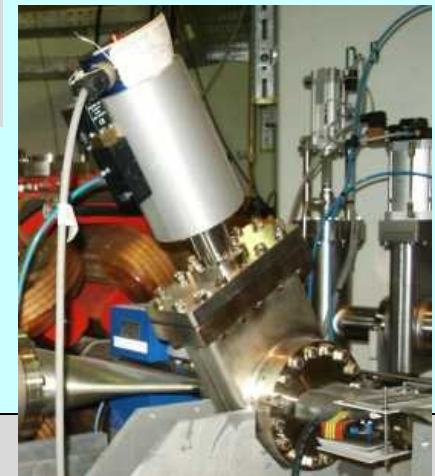
Cold Cathode: Pfeiffer (IKR070, PKR251(full range))

Monitor: TPG300/TPG265 analog output+RS422
Relay for interlock

RMS: Pfeiffer QMG220 Faraday cup



RF-All Metal. (Cetec) Gate, VAT
All-Metal Gate: VAT
All-Metal Right-Angle: (CETEC, VAT, Caburn)



Lifetime

Limits at ANKA:

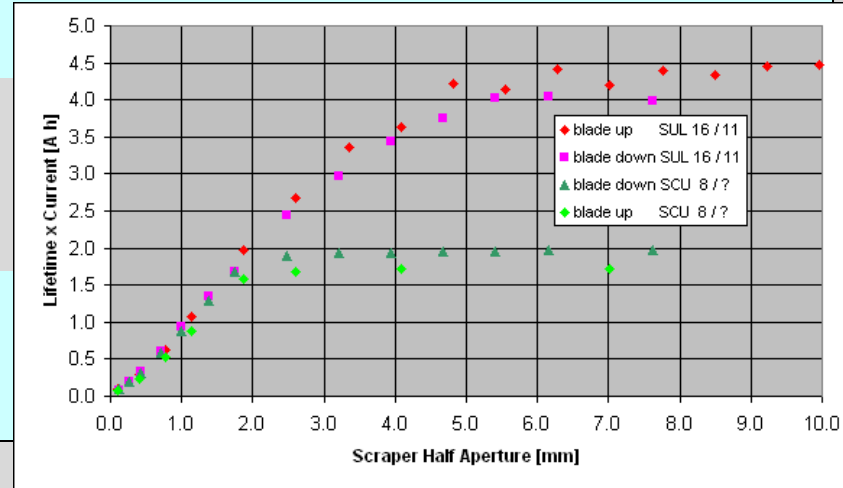
Low energy Injection (0.5 MeV)
No Low vertical beta at injection

Present bottle neck: SUL-Wiggler-Al-Vacuum chamber: 11 mm

Preference to increase the gap at cryo temperature: 13 mm

Lifetime (180 mA):	0.5 GeV, 11 mm gap:	2 h
	2.5 GeV, 11 mm gap:	18 h
	2.5 GeV, 8? Mm gap:	12 h

Inelastic scattering: $\sim E \epsilon_{\text{acc}}$
Elastic scattering $\sim \text{gap}^2 / (E^2 p \beta_v)$
Touschek



Special Issus SC

Liner: 316LN, Copper-plated
No Pumping
UHV test before final assembling

Isolation Vacuum: Pumping?

Mechanical strength:
Isolation Vacuum and e-beam-Vacuum to be vented independent

Safety: Quench Burst-disk

Corrector coils for 1st, 2nd field integral v (h?)

Limits (1st, 2d Harmonics)

Limit Orbit distortion < 50 μm in horizontal
 5 μm in Vertical

1. Field integral $v(h)$: $3 \cdot 10^{-5}$ ($3 \cdot 10^{-6}$) Tm
 2. Field integral $v(h)$: $4 \cdot 10^{-4}$ ($1 \cdot 10^{-5}$) Tm²

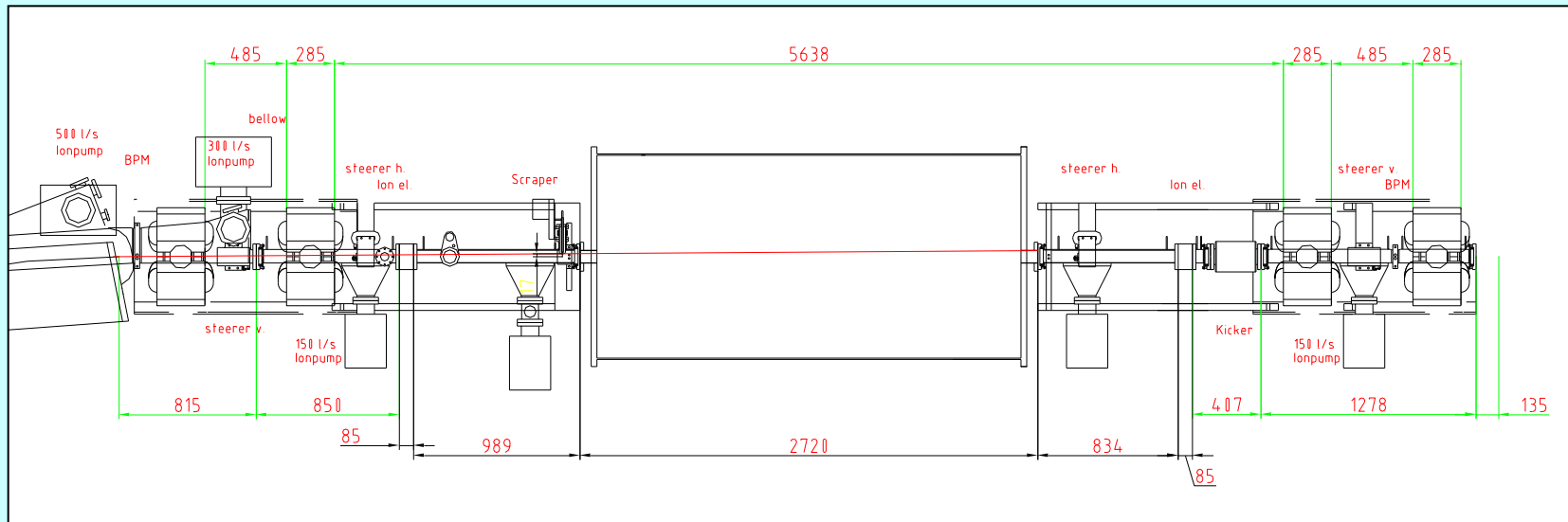
Maintain dynamic aperture

Higher Harmonics: int. quadrupole component:	0.005 T
int. sextupole component:	0.1 T/m
int. octupole component:	100 T/m ²
Roll off @ +/- 10 mm:	<0.5%

Maximum Field Variation? Suppress Undulator spectrum?

SR Protection

Radiated SR Power from bends (total): 120 kW
Power at wiggler (2.7-5.4 m from bend): 125 W
Entrance/Exit: 0.9 / 0.23 W/cm

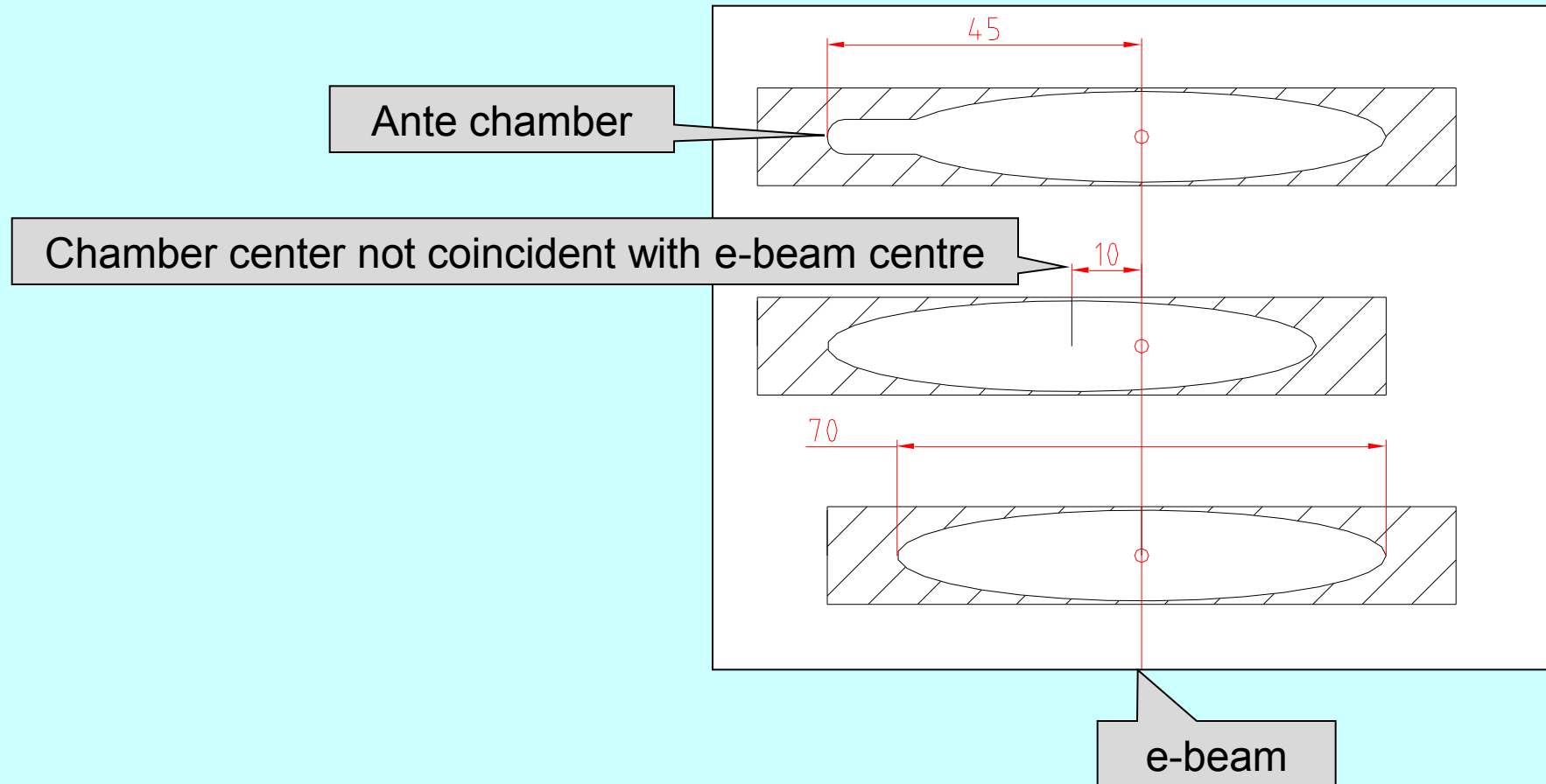


Protection by vertical scraper

SCU14: 0.5 GeV (Injection) / 2.5 GeV scraper 32/13 mm from beam centre

Further devices: 20 mm from beam centre

Liner-Cross section



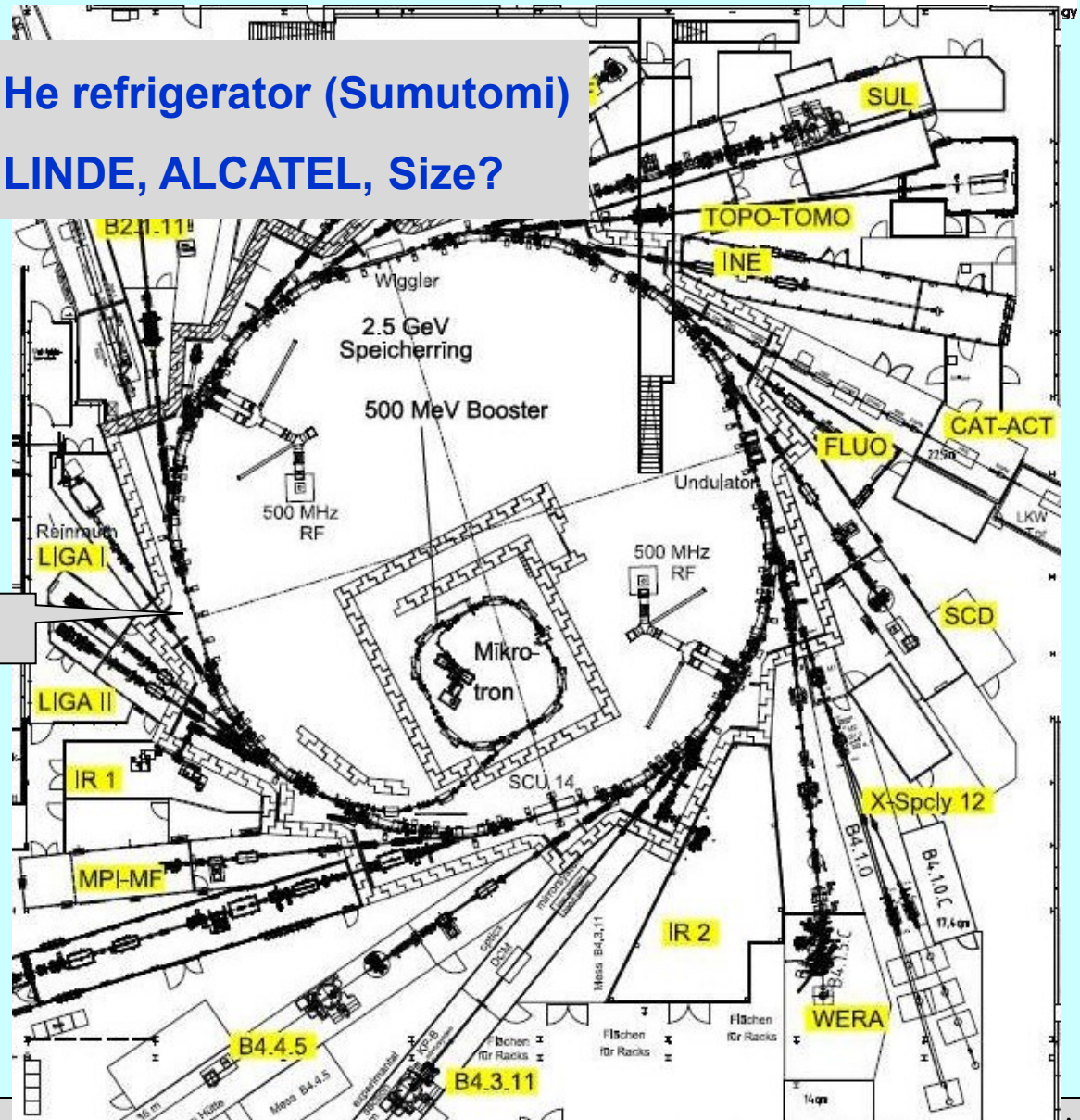
He-Refrigerator

ANKA: Zero-boil off:

He refrigerator (Sumutomi)

CLIC: He-plant:

LINDE, ALCATEL, Size?



Here we are

Control system

PLC: S7 controller (...)

Local visualization

Visualization: PVSS

Control parameter:

- Temperature**
- He level / pressure**
- Vacuum pressure**
- Compressor / Liquifier**