

EuroCirCol Kickoff Meeting, WP4 Task 4.6

Measurement on Cryogenic Beam Vacuum System Prototype

S.Casalbuoni,
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ANKA Beam Parameters

Energy:	2.5	GeV
Emittance:	50	nm rad
Circumference:	110.4	m
Current:	200	mA
Optics:	4x2	DBA
DP-field:	1.5	T

DP SR Power:	18	W / mrad
DP SR Photon flux:	$6 \cdot 10^{19}$	Ph / (s mrad)
E_{critic}	6.2	keV

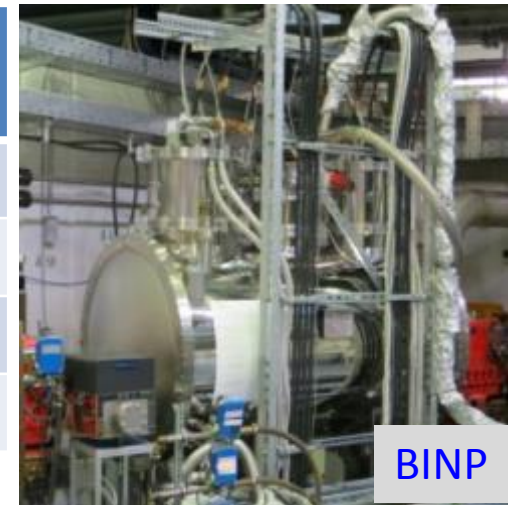
Incident angle: 7 mrad

DP SR Power:	57	W / m
DP SR Photon flux:	$1.8 \cdot 10^{17}$	Ph / (s m)

Specs EURO-CIRCOL:	DP SR Power:	42	W / m
	DP SR Photon flux:	$2.0 \cdot 10^{17}$	Ph / (s m)

SC Insertion Devices at ANKA

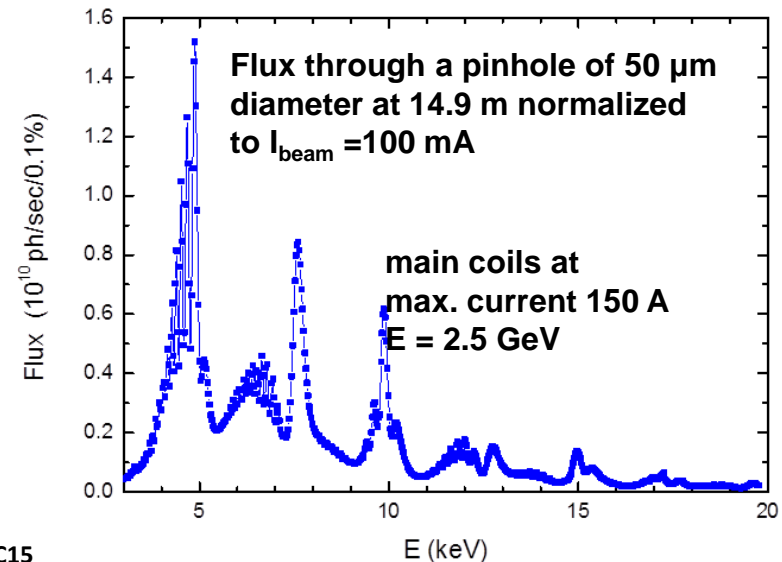
	Status	Period [mm]	Field [T]	Length [m]	L He [l]
CAT-ACT	installed	48	2.5	0.9	200 →
CLIC	delivered	51	3.0	2.0	50
SCU15	installed	15	0.7	1.5	Cryogen free
CASPER	Test bed for SC magnets				Cryogen free



2 cold heads (4 K / 1.5 W) + 2 cold heads (10 K / 6W)

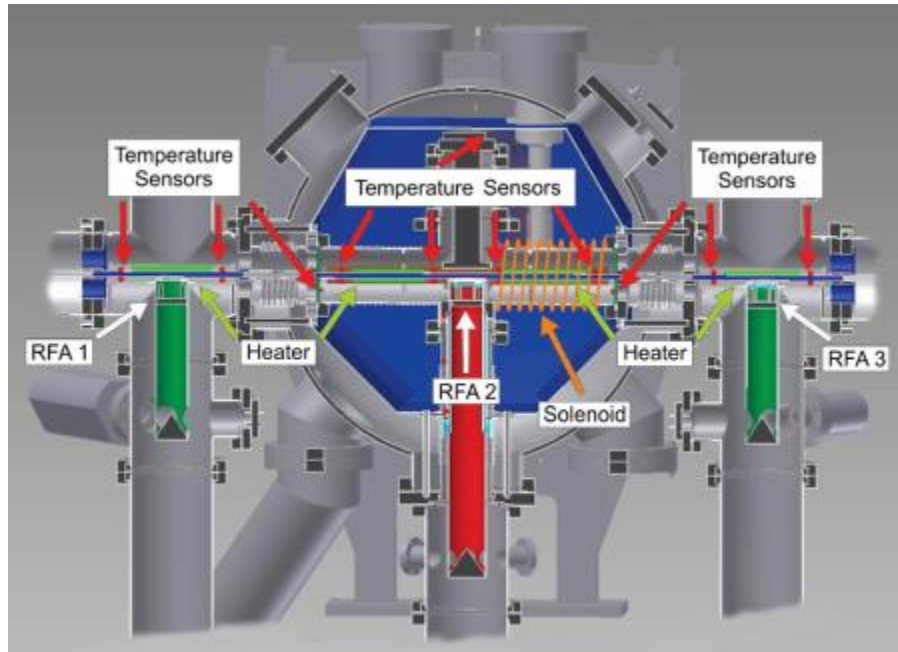


S. Casalbuoni et al., IPAC15



COLDDIAG

Investigate Heat load from beam to Cold Tube



S.Casalbuoni et al.,
IEEE Trans. on Appl. Supercond. Vol. 21-3 ,2300-2303 (2011)
S. Gerstl et al., Phys. Rev. ST Accel. Beams 17, 103201 (2014)

Cryogen free: cooling with Sumitomo RDK-415D cryocooler (1.5W@4.2K).

Cold vacuum chamber (0.5 m) located between two warm (0.27 m) sections to compare beam heat load with and without cryosorbed gas layer.

3 identically equipped diagnostic ports with room temperature connection to the beam vacuum.

Copper plated ($\sim 50 \mu\text{m}$) beam tube
60 m \times 10 mm elliptical cross section.

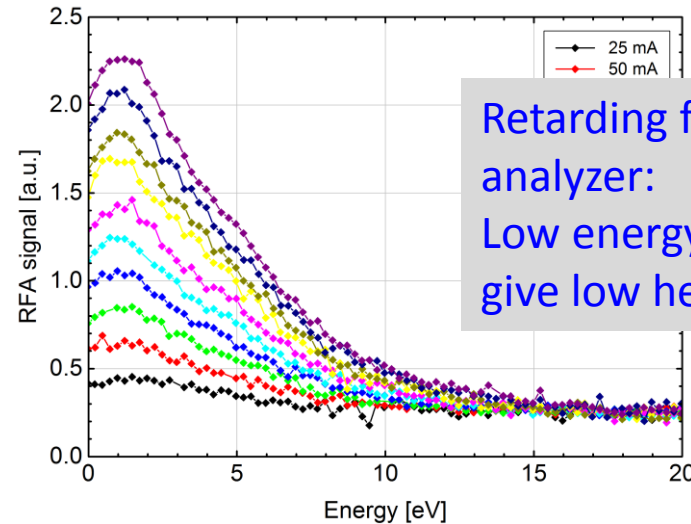
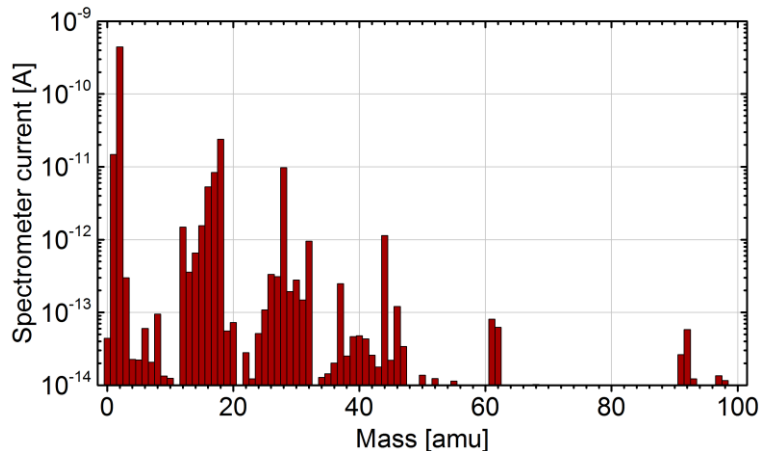
COLDDIAG measurements at the DLS

Heat load caused by:

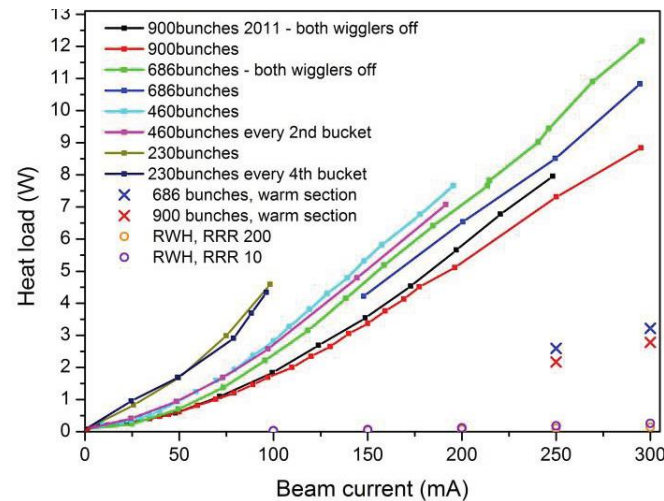
- Synchrotron Radiation ($\sim I$)
- Impedance ($\sim I^2$)
- e/ion bombardment

Not fully understood

Calculated Heat load from
Impedance from resistive wall
Magnitude below measurement



Retarding field analyzer:
Low energy electrons
give low heat load



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R. Voutta et al., IPAC15

Foreseen Activities at ANKA (TASK 4.6)

CERN provides COLDEX

ANKA provides the beam (SR)

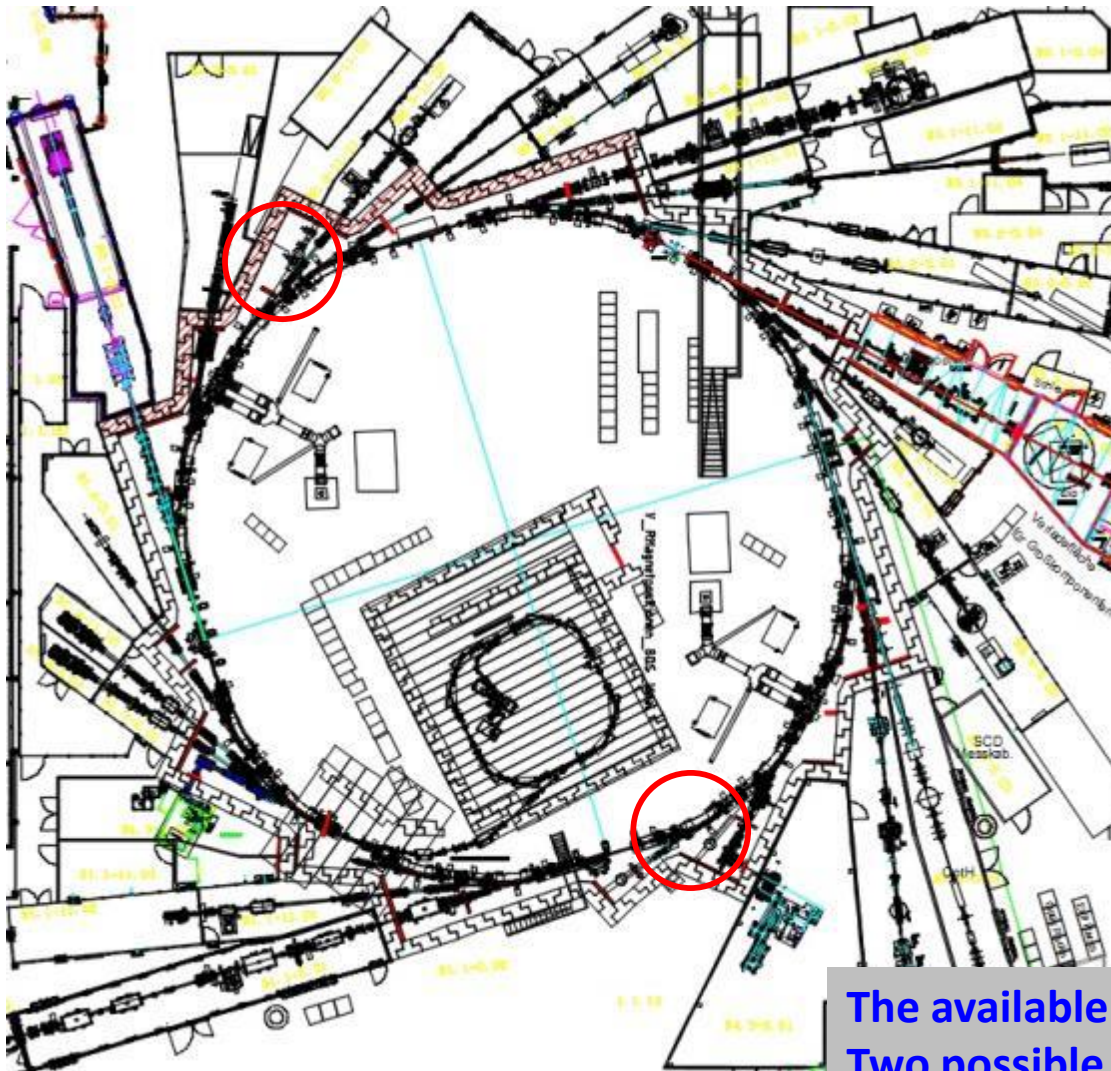
CERN / INFN install COLDEX; ANKA assist (15 PM)

INFN commission and perform measurements

Schedule:

Installation of COLDEX:	Month 06-15	01.2016-09.2016
Measurement.	Month 15-28	09.2016-10.2017

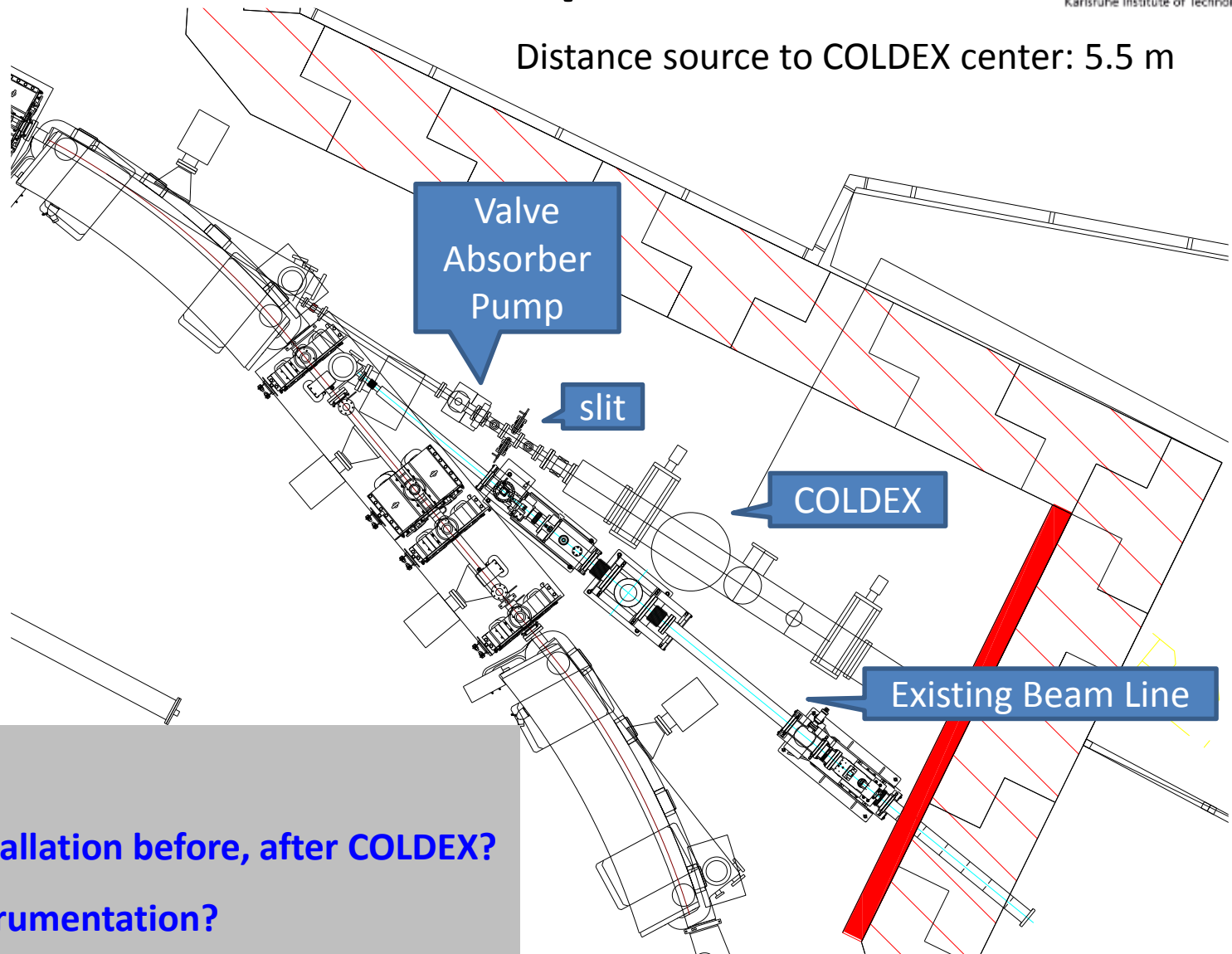
ANKA



**The available space is limited at ANKA
Two possible locations**

COLDEX Set Up at ANKA

Distance source to COLDEX center: 5.5 m



Does it fit?

Needed installation before, after COLDEX?

Pumps, instrumentation?

COLDEX Cooling

SULZER TCF20 (L-He capacity: 0.8 g/s)

L-He transfer lines to 15 l cryostat to cold bore	3.0-4.5 K
G-He (passing heater) to Beam screen	4.5-50 K



Interface:

Power?

Cooling?

Location at ANKA?

Transferline (length)?

Alternative cooling:

LHe by external dewar?

Coldheads?

To be clarified

Schedule: Installation beginning 2016?

COLDEX available? Activated?

Needed Equipment: Absorber, Valve, Pumps (available)

Slit ?

Instrumentation (Gauges, RGA) needed?

Installation before and after COLDEX?

COLDEX model to be provided for installation.

Cryogenic Equipment

Experimental Program

Exchange of Beam Screen foreseen?