

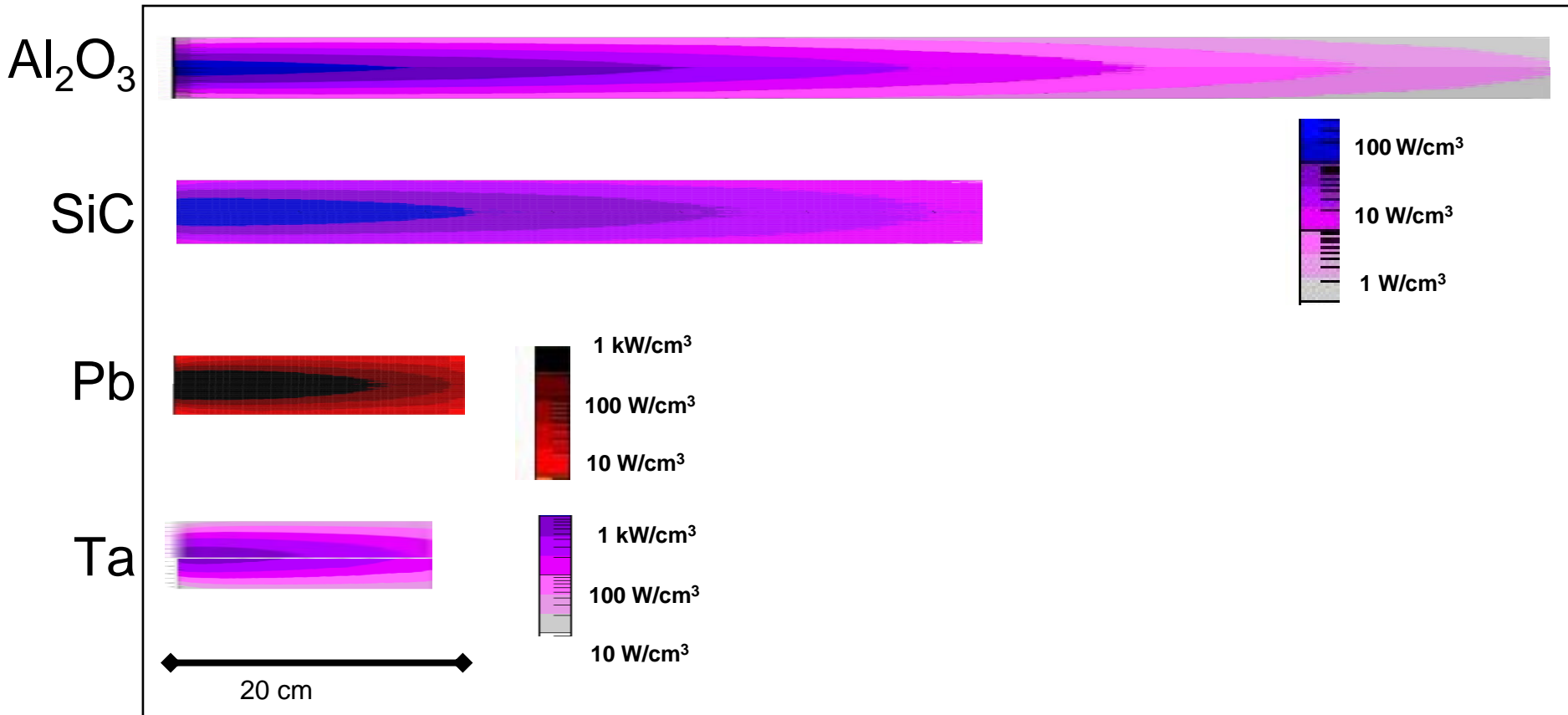
Task #3 :
100kW direct target stations



Multiple transfer lines
for ISOL target and ion source units

Thierry STORA for Task #3

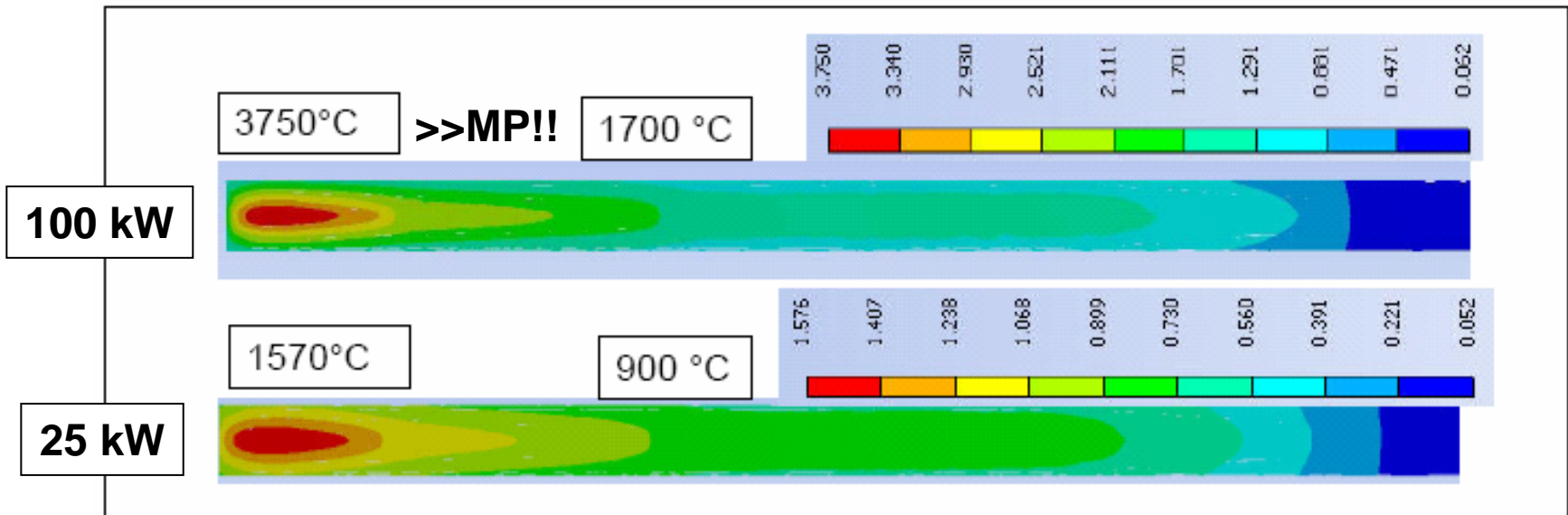
Why multiple transfer lines ?



Heat deposition, FLUKA,
 $\sigma=7\text{mm}$, $R=3\sigma$, $1\text{GeV } p$, 100kW , $X=200\text{g/cm}^2$

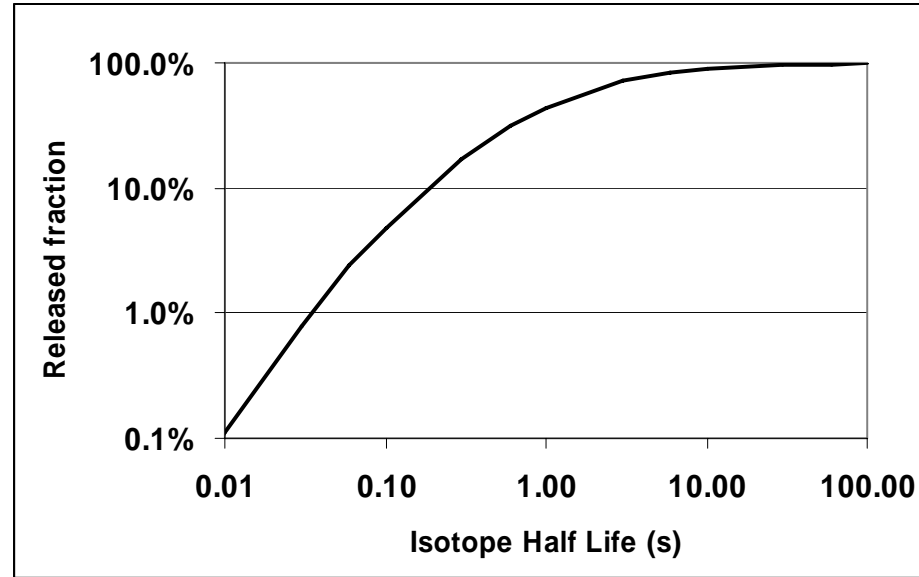
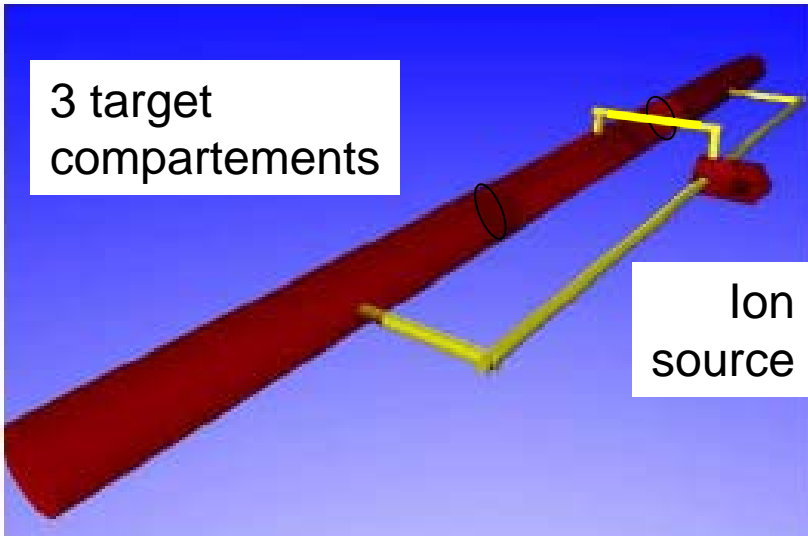
Thermal dissipation

- Simulations done with ANSYS wb
- Al_2O_3 , radiative cooling towards $T=25^\circ\text{C}$



$d=55\%$, $\varepsilon = 0.65$, $\lambda=5 \text{ W/mK}$ at 1300 K

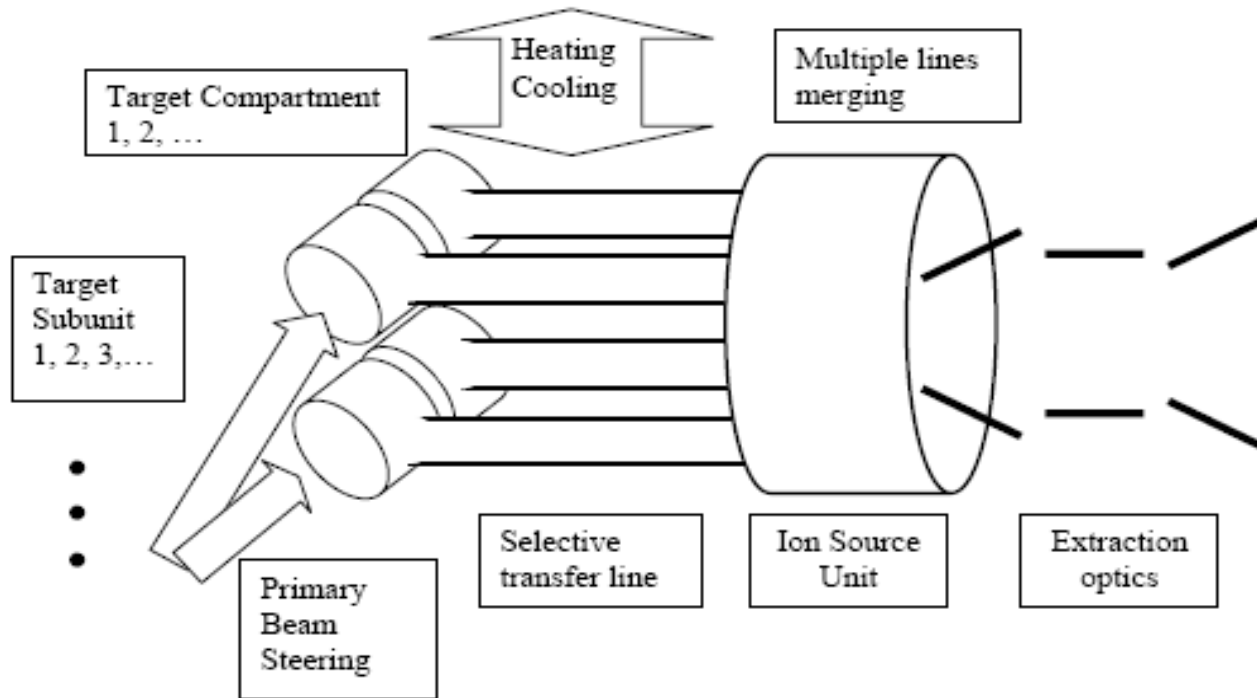
Effusion



Tar	L cm	Φ cm	# t.l.	# cont.	t_f ms	FP_p m	COL_{out}	FP_{tot} m
1	20	2.0	1	1	56	59	83	9650
3	100	4.2	1	1	1920	2700	135000	3000
4	100	4.2	3	3	820	1120	59500	1270
5	100	4.2	3	1	819	1140	55000	1270
6	100	4.4*	3	3	640	724	41000	780

Ne isotopes
(RIBO,
M. Santana-Leitner)

Solid target designs



Multiple vs Single line

Yes,
But what about the ion source ?

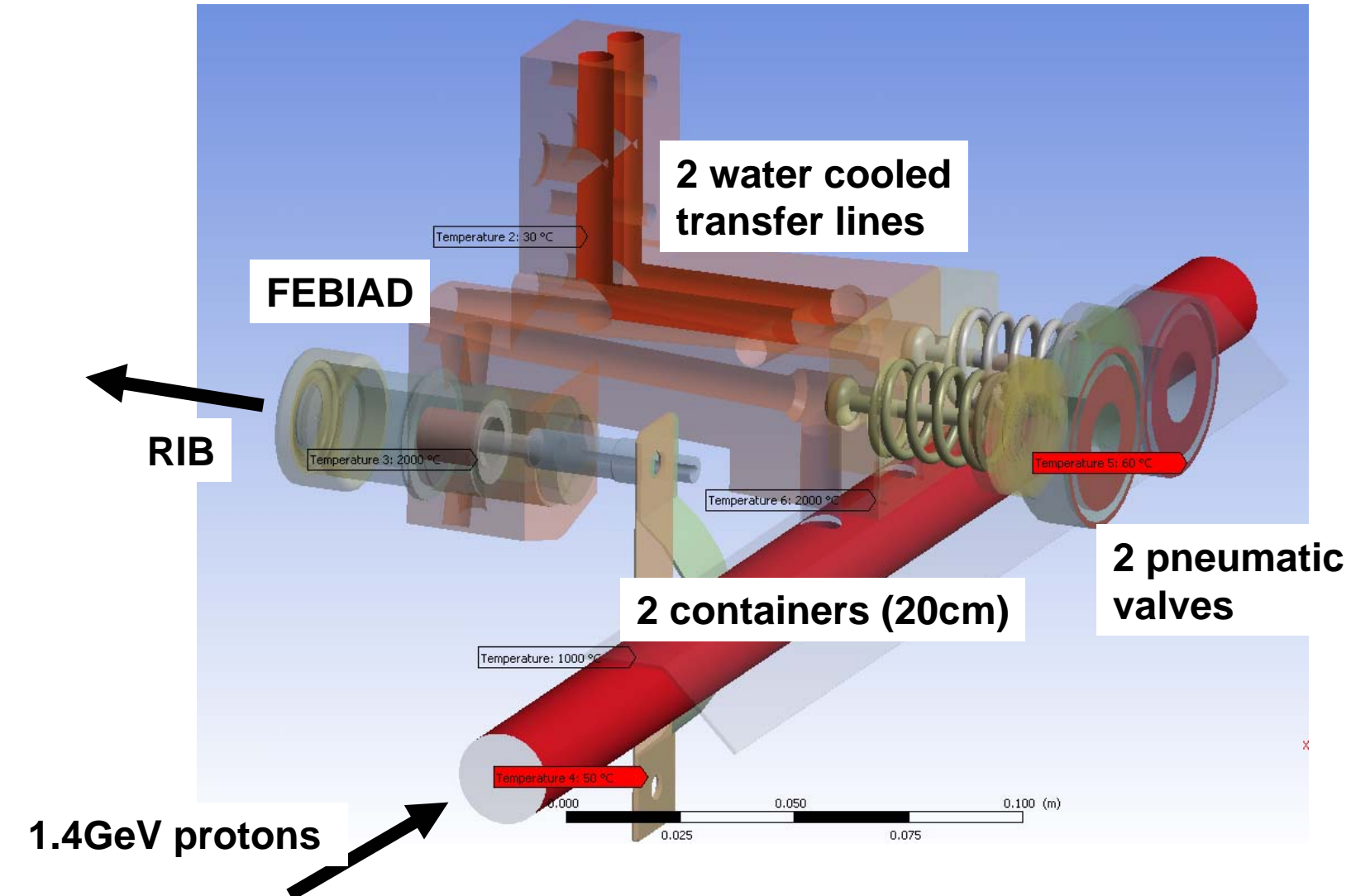
- Efficiency
- Effusion decay losses
- Decay losses in revisits of other transfer lines before ionisation/extraction

Prototype test is required

Multiple line prototype

- Forced Electron Beam Induced Arc Discharge (FEBIAD) with cold transfer lines - **MK7**
- **CaO** target material
- Two transfer lines equipped with remote controlled, pneumatic **valves**
- **Two** 20 cm long target **containers**

Dual-valve prototype

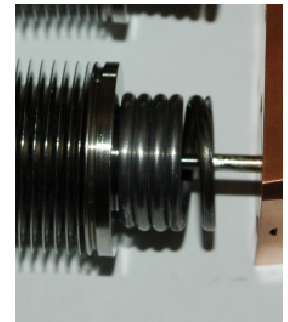
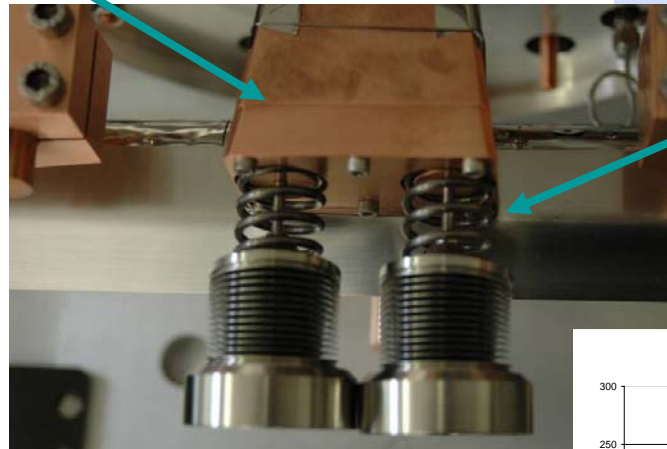
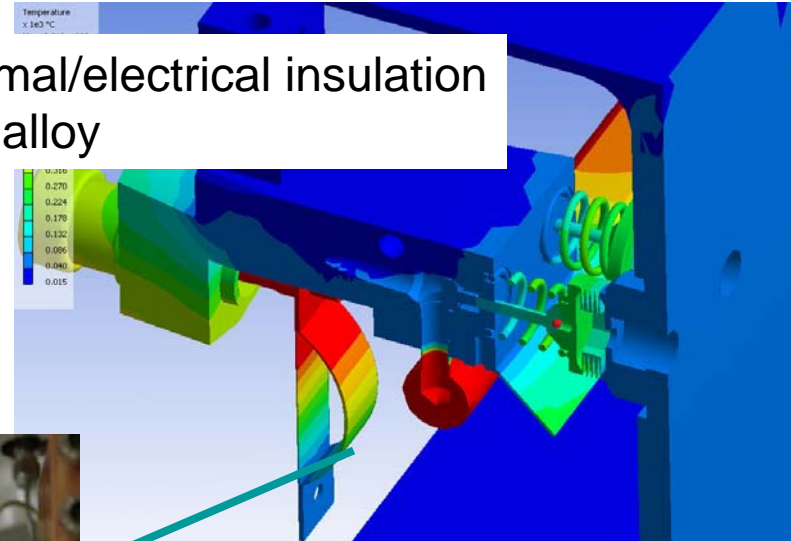


Development

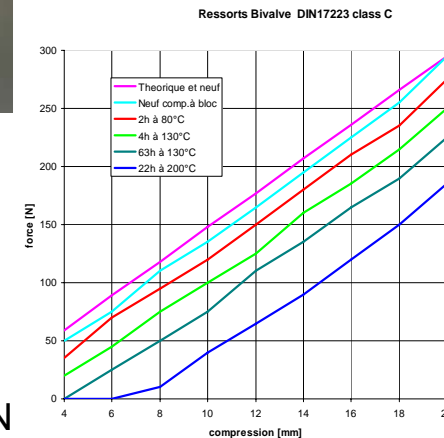
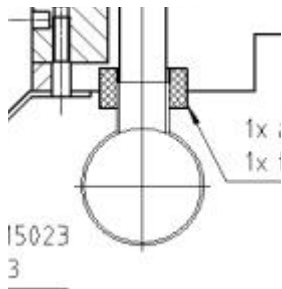
For better sealing
Metal-metal → O ring - metal



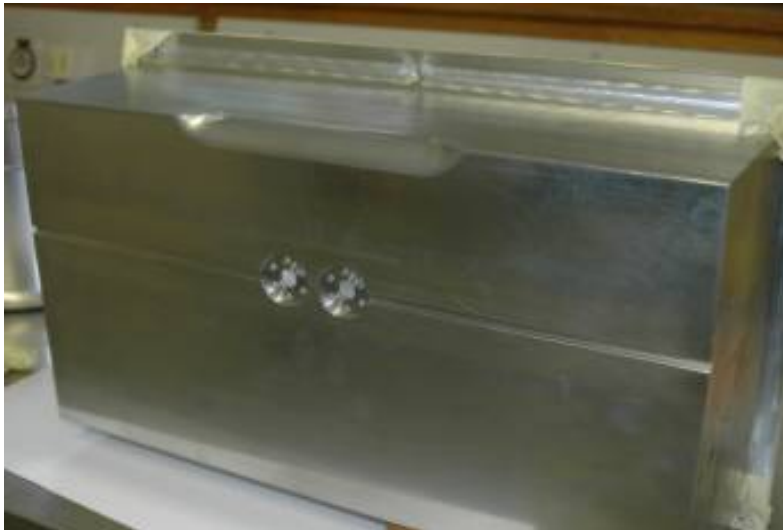
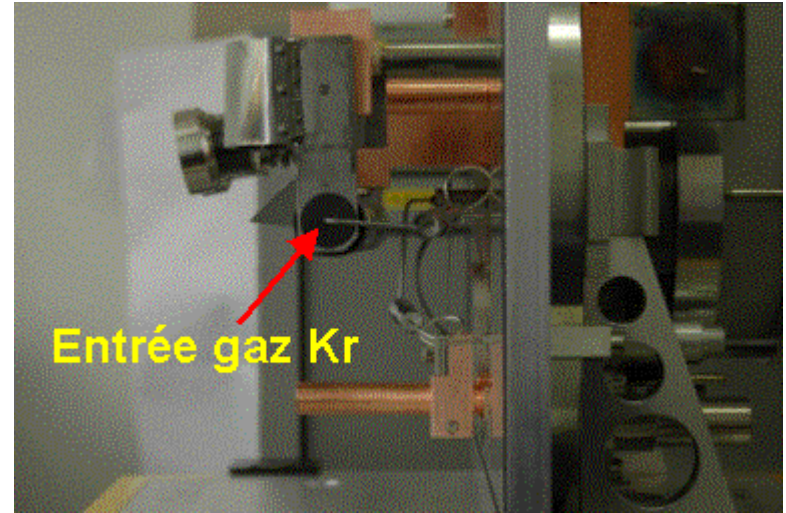
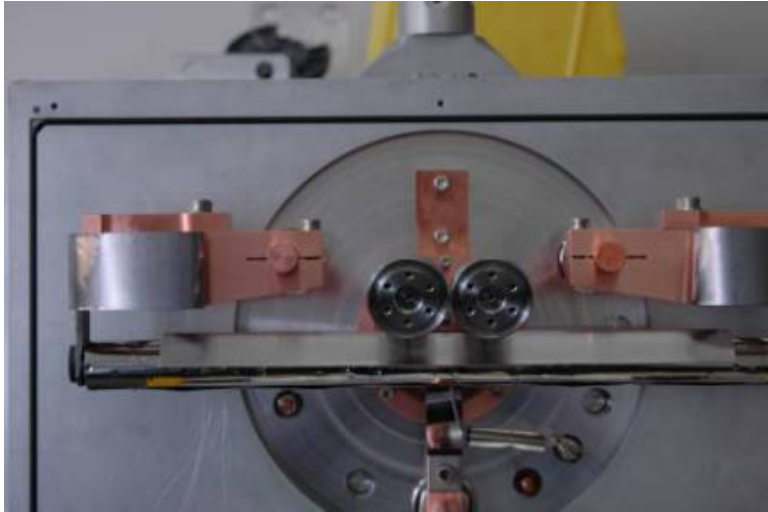
Thermal/electrical insulation
New alloy



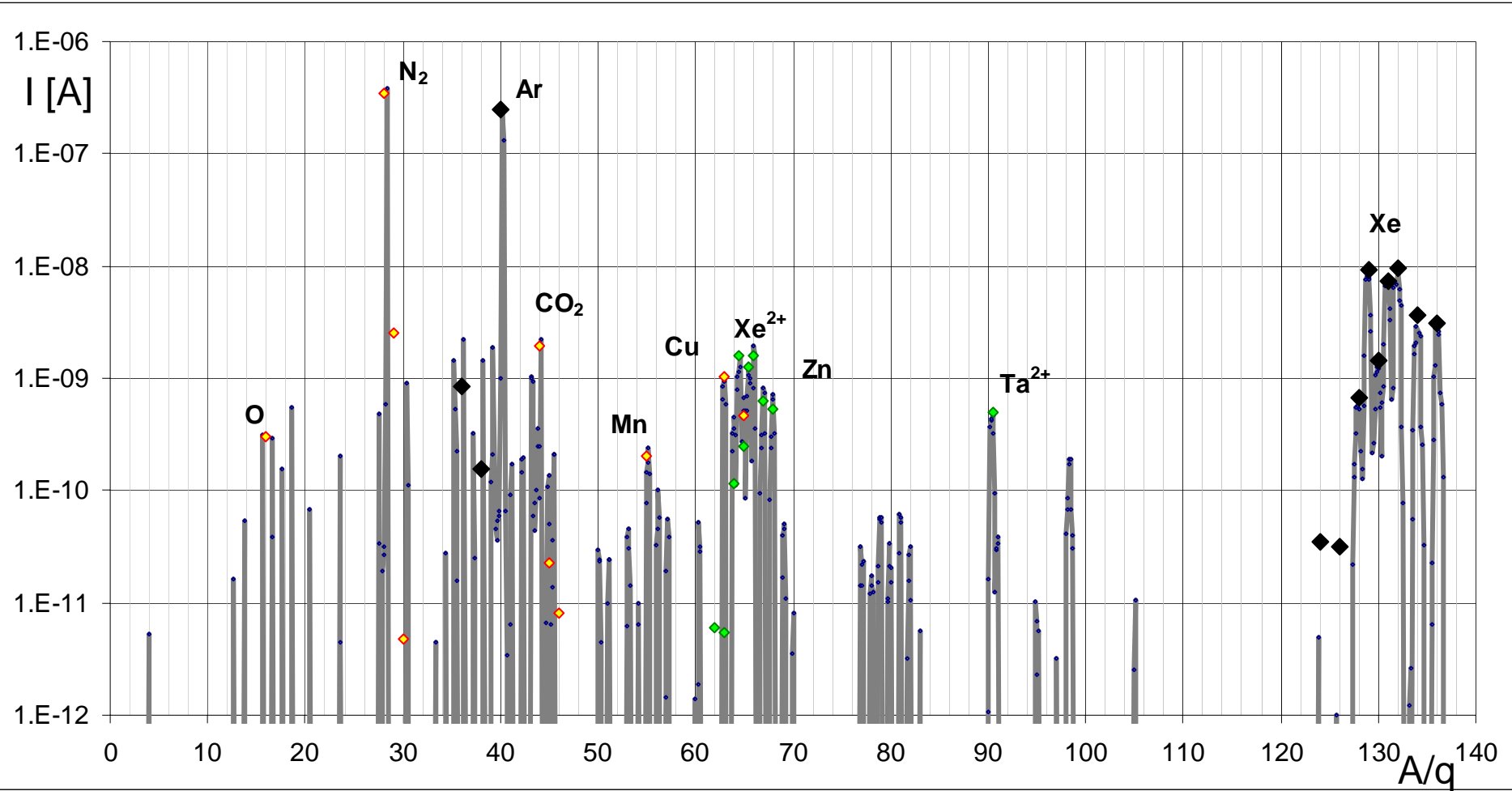
Ceramics:
BN → A_2O_3



Prototype assembly



Stable beam offline mass separator

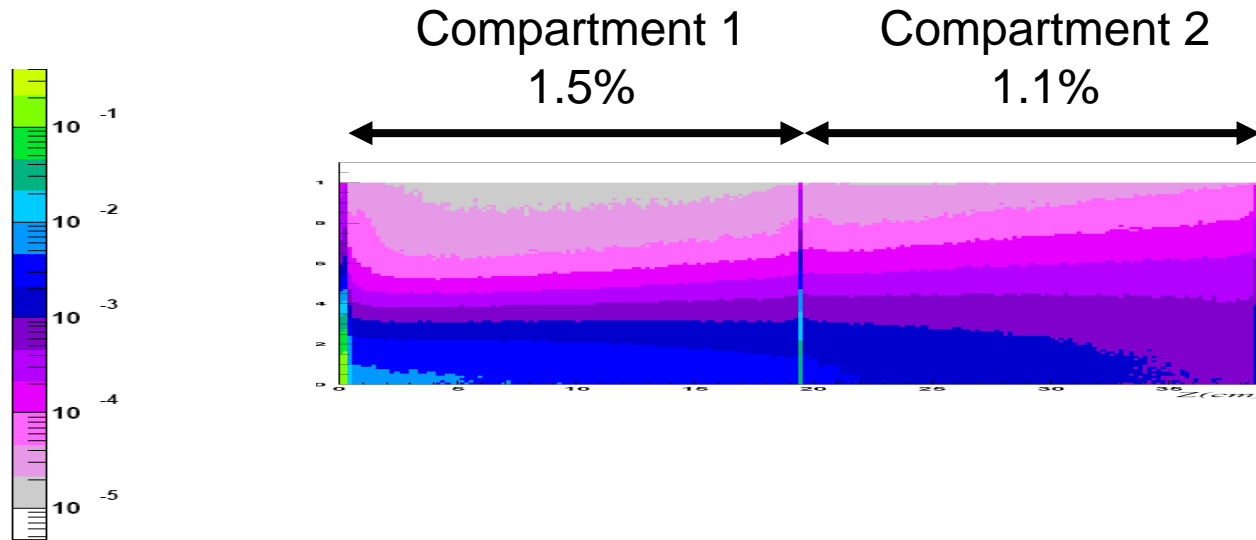


Isotopes for tests

Isotope	$T_{1/2}$ [ms]	1 st Ion. Pot. [eV]	$\sigma_{\text{ioniz e}^-}$ [cm ⁻²]	Target #
⁶ He	807	24.6	$2.0 \cdot 10^{-16}$	14
¹⁸ Ne	1670	21.6	$2.4 \cdot 10^{-16}$	54
¹⁹ Ne	17220			55
²⁴ Ne	202800			73
³³ Ar	174	15.8	$3.8 \cdot 10^{-16}$	105
³⁵ Ar	1780			106
¹⁴ N ¹⁶ N	7130	14.5	$4.3 \cdot 10^{-16}$	122
¹⁴ N ¹⁷ N	4170			236

Heat deposition

Computed with FLUKA
Total deposited : 3.9%



80 W beam induced heating
VS
>500 W external Joule heating

Revisit of second line

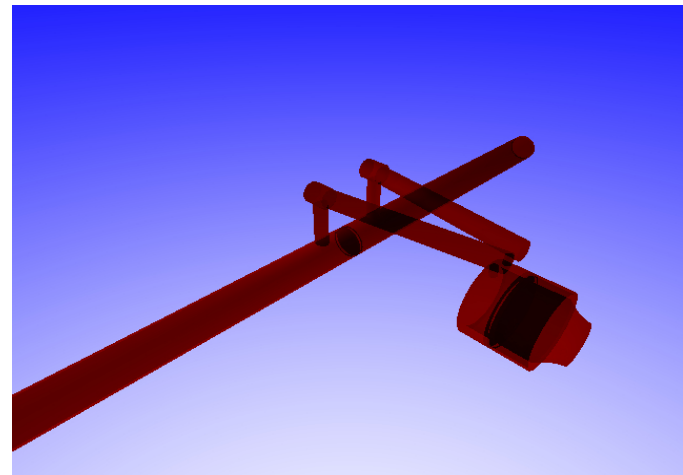


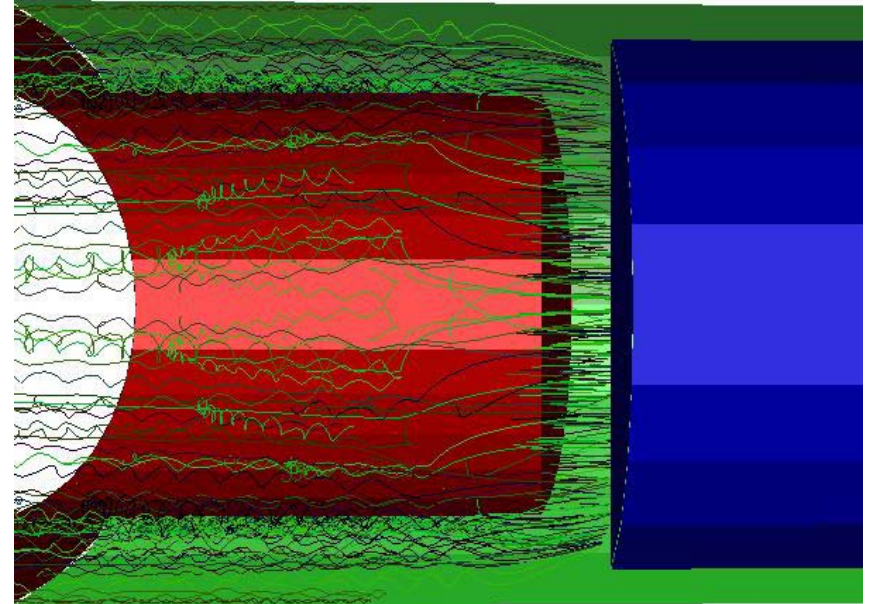
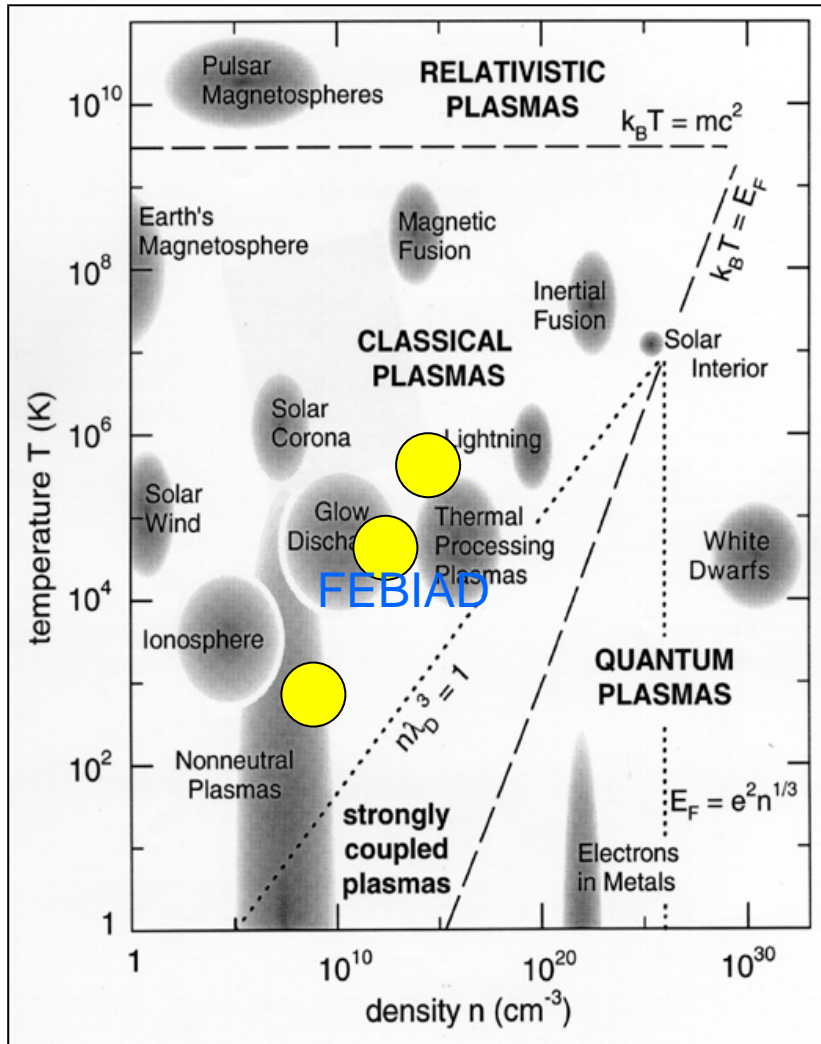
1st order estimate:

Ratio of surface areas
of inlet line
and
outlet extraction hole

Refined estimate:

RIBO, CPO, VORPAL





Liviu Penescu, Poster

- Offline tests ongoing
- Numerical simulations ongoing
- Online tests for early 2007 at ISOLDE
- Multiple transfer line impact on FEBIAD-MK7 operation parameters

- G. Arnau, E. Barbero, E. Bouquerel, D. Carminati, R. Catherall, J. Lettry, S. Marzari, E. Noah, L. Penescu, M. Santana-Leitner, R. Wilfinger