

Beam, Multi-Beam and Broad Beam production with COMIC devices

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0 - Recall of the COMIC principle

1 - Mono-beam / Mono-cavity devices

1.1 CO-MIMAC : a moveable beam line for detector tests

1.2 Q-COMIC : the Quartzed COMIC for on-line applications

2 - Mono-beam / Multi-cavity devices

2.1 T-COMIC : a plug & play device for implanter

*2.2 COMIC-Array : low energy broad beam for surface
traitement*

3 - Multi-beam / Multi-cavity device

3.1 COMIC-Array : medium energy multi beam for implantation

4 - Conclusion

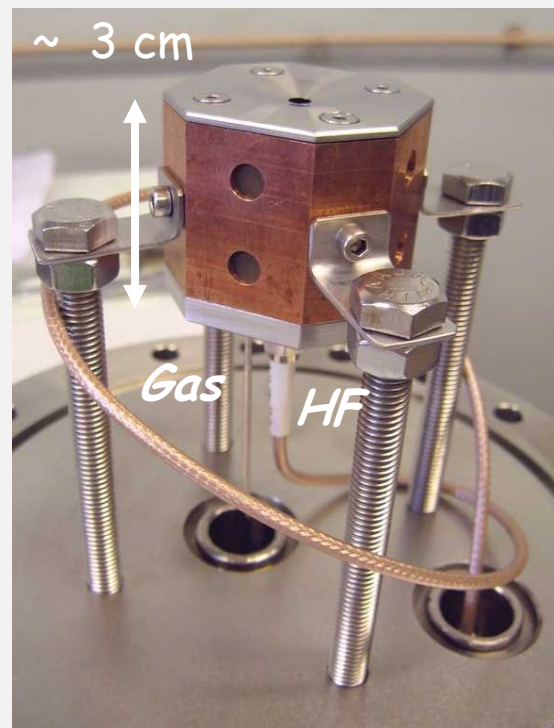
0 - The COMIC principle

The COMIC discharge : a drastic simplification and miniaturisation of a microwave discharge (plasma = matched load)

The source



The discharge



Patent request : N° 0857068

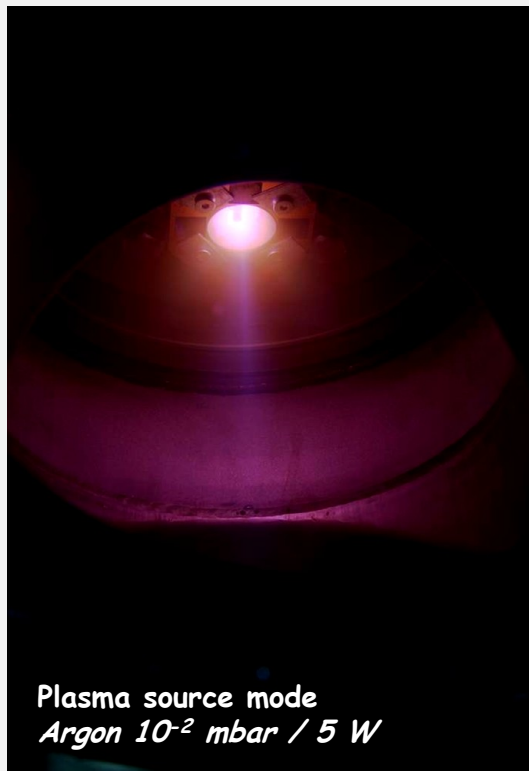
Beam, Multi-Beam and Broad Beam production with COMIC devices

0 - The COMIC principle

Very compact, low power ($< 10\text{ W}$)

- but -

*delivering a current comparable
to an filament ion source $\sim \text{mA}$*

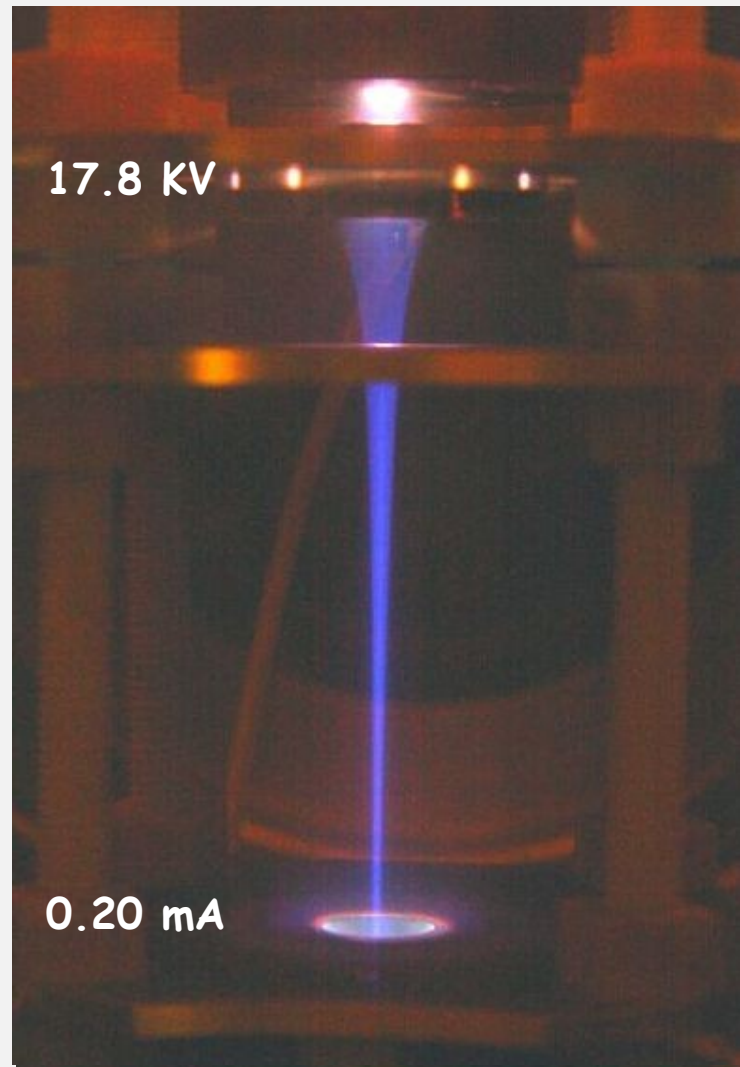


Source 18.5 KV

Extraction
electrode

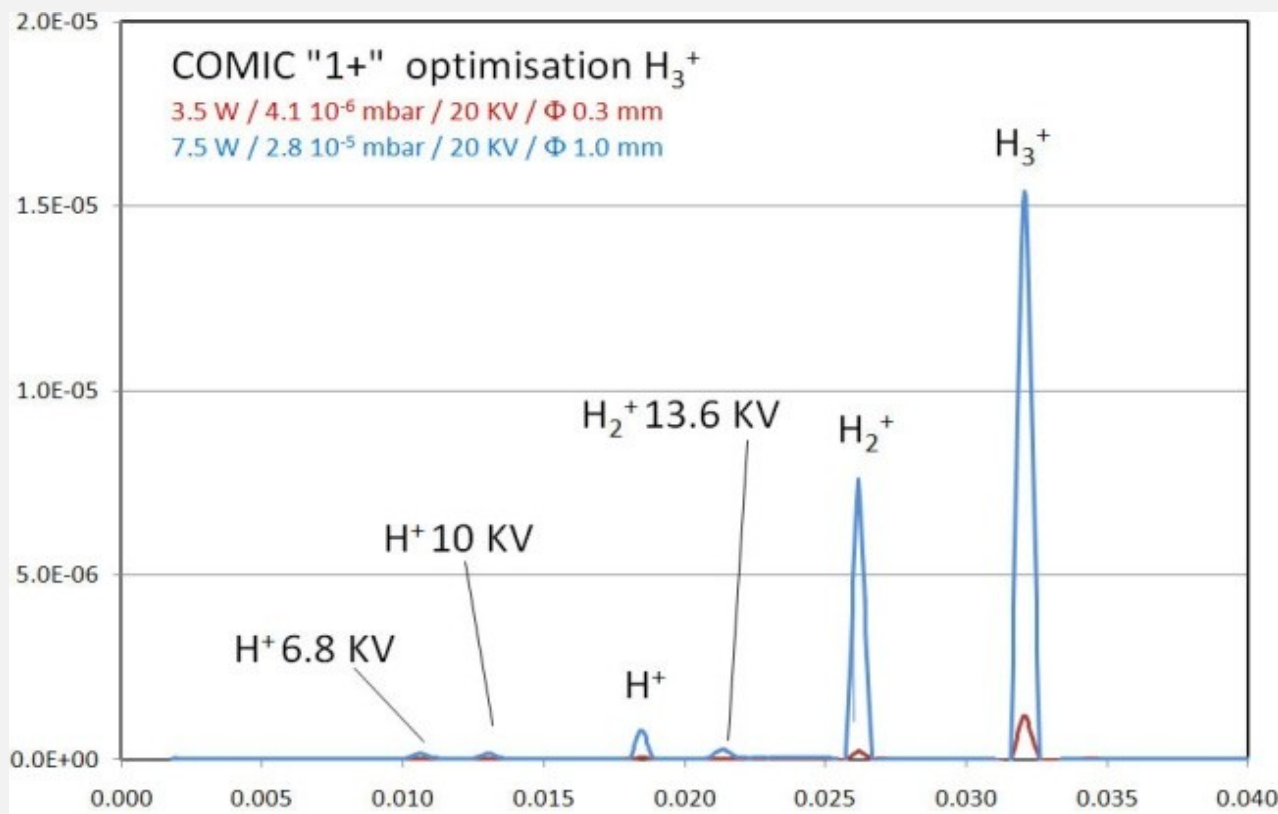
Grounded
electrode

FC



0 - The COMIC principle

*The COMIC discharge : the « soft » ionisation ,
 $Te \sim 5 \text{ eV}$, $n_e \sim 5 \cdot 10^{10} \text{ cm}^{-3}$ (measured at the exit of the cavity)
 $\tau_i \sim \text{very small}$, gas flux $\sim \text{can be relatively high}$*



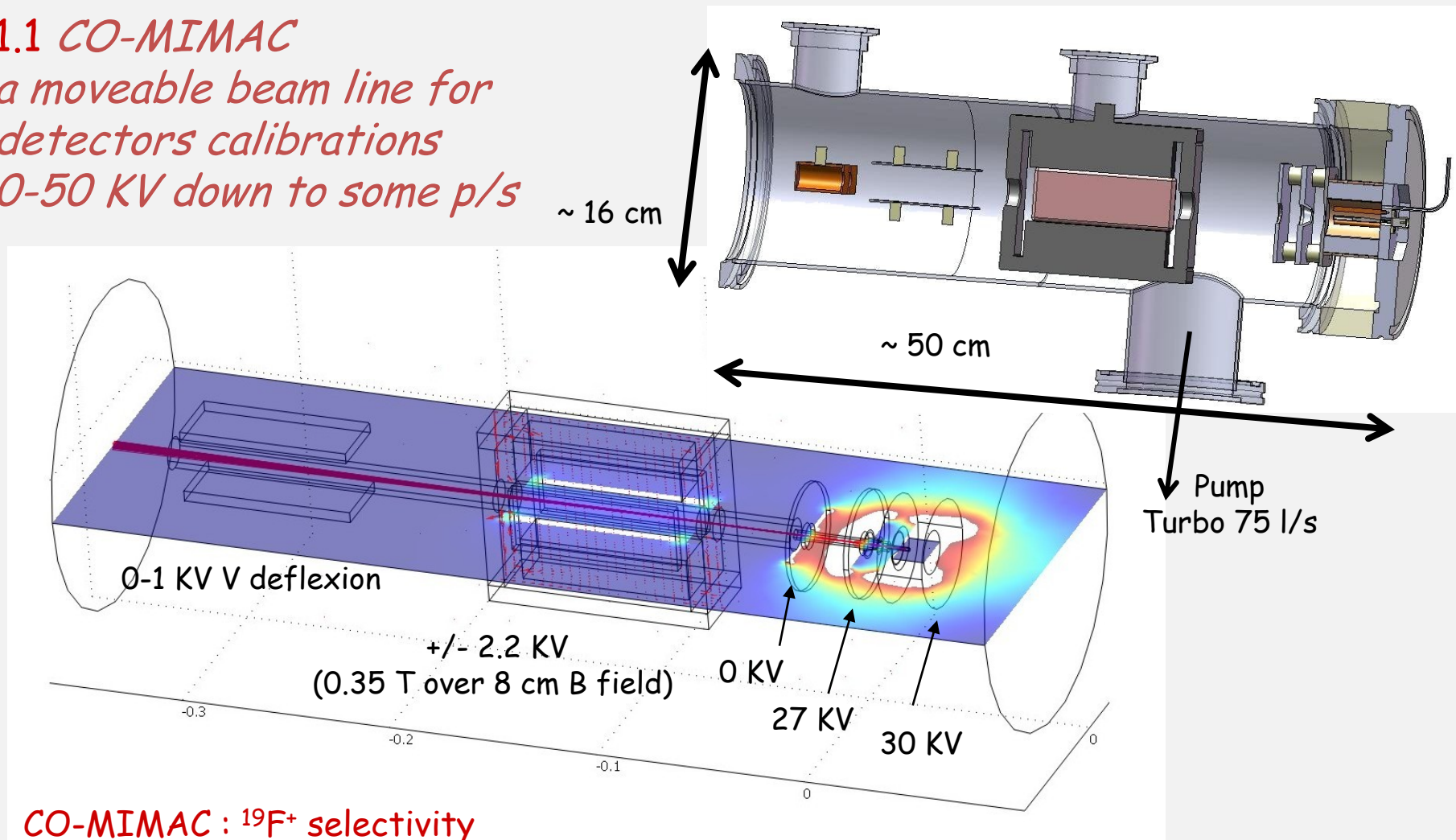
*Molecular
production :*

*H_3^+ optimization
(on the charge
breeding
beam line)*

1 - Mono beam Mono cavity devices

1.1 CO-MIMAC

a moveable beam line for
detectors calibrations
0-50 KV down to some p/s



CO-MIMAC : $^{19}\text{F}^+$ selectivity

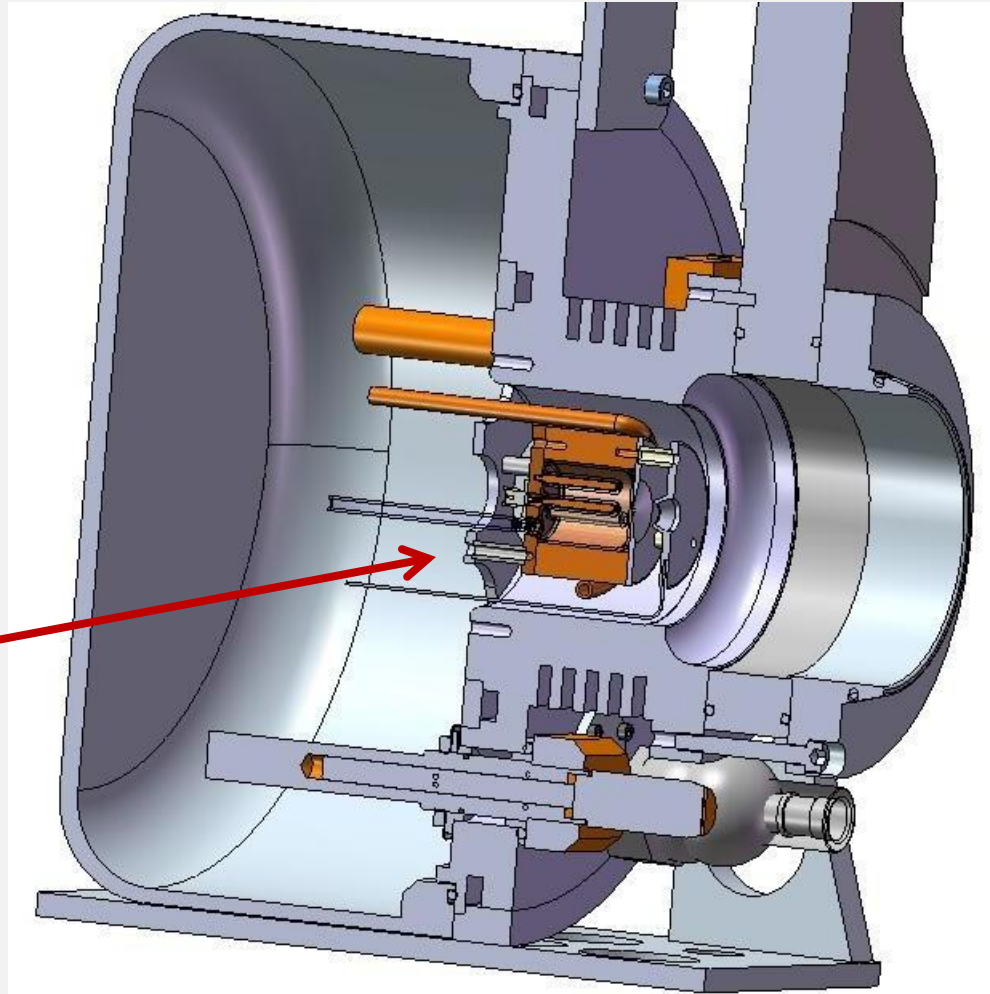
1 - Mono beam Mono cavity devices

1.2 Q-COMIC :

*the Quartzed
COMIC for
on-line applications*

*Retrofit of a source
inside an existing
system*

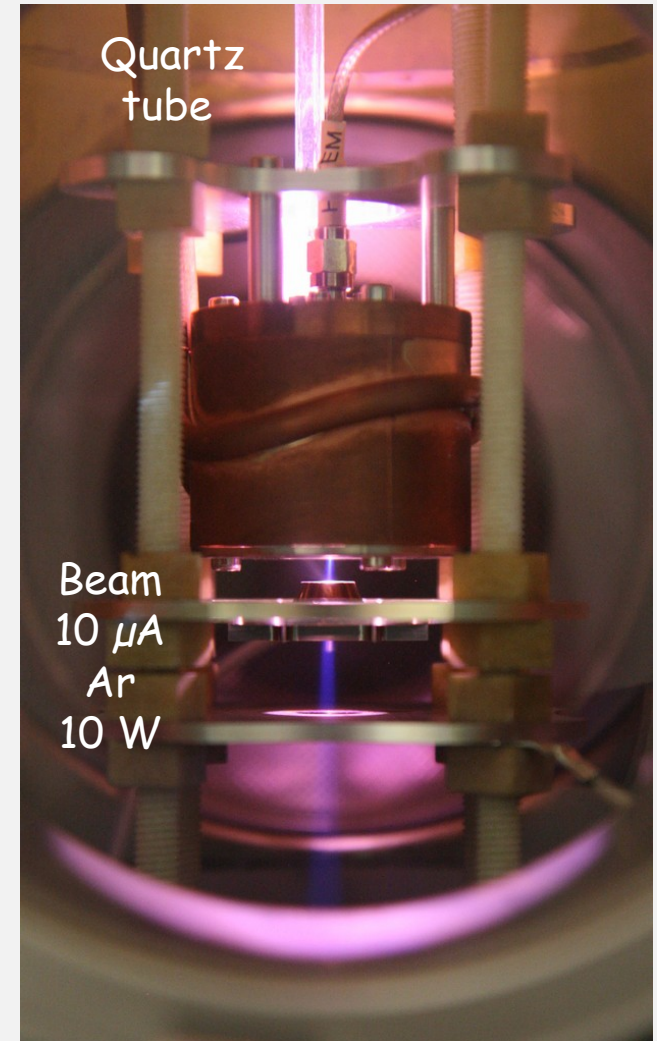
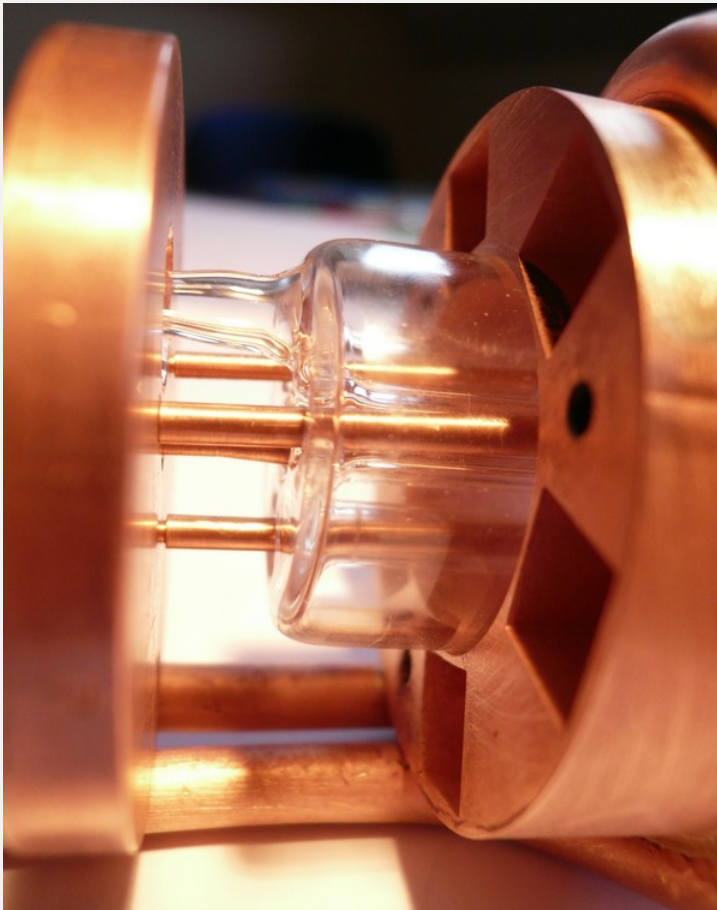
*Q-COMIC inside the
ISOLDE TISS*



Beam, Multi-Beam and Broad Beam production with COMIC devices

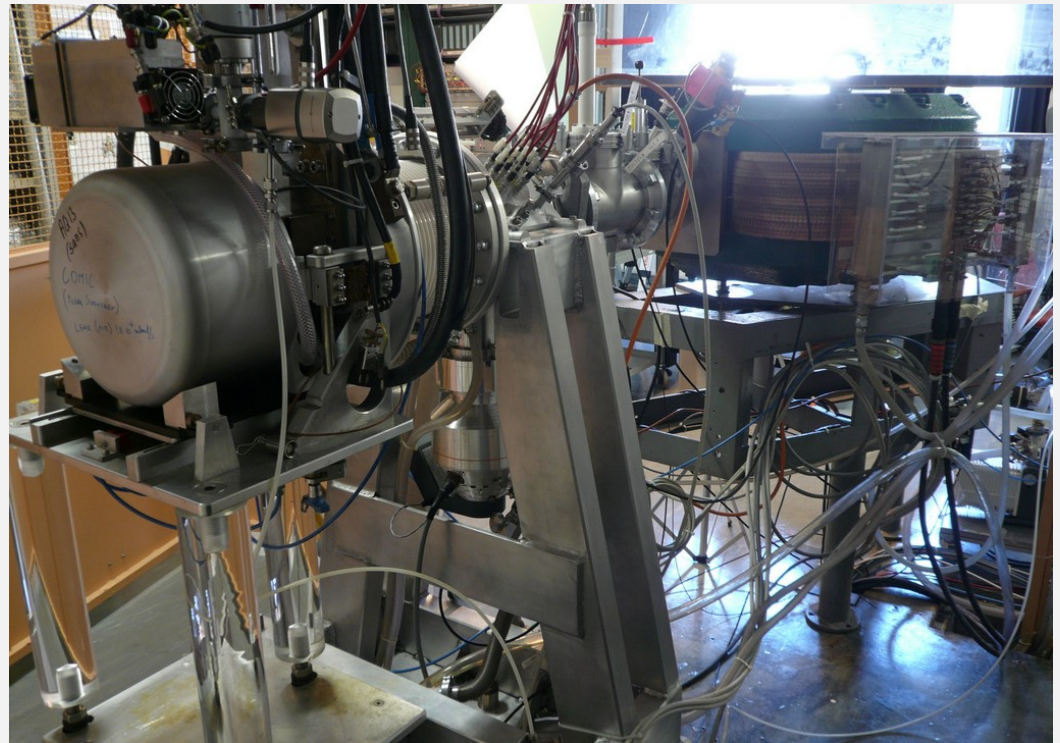
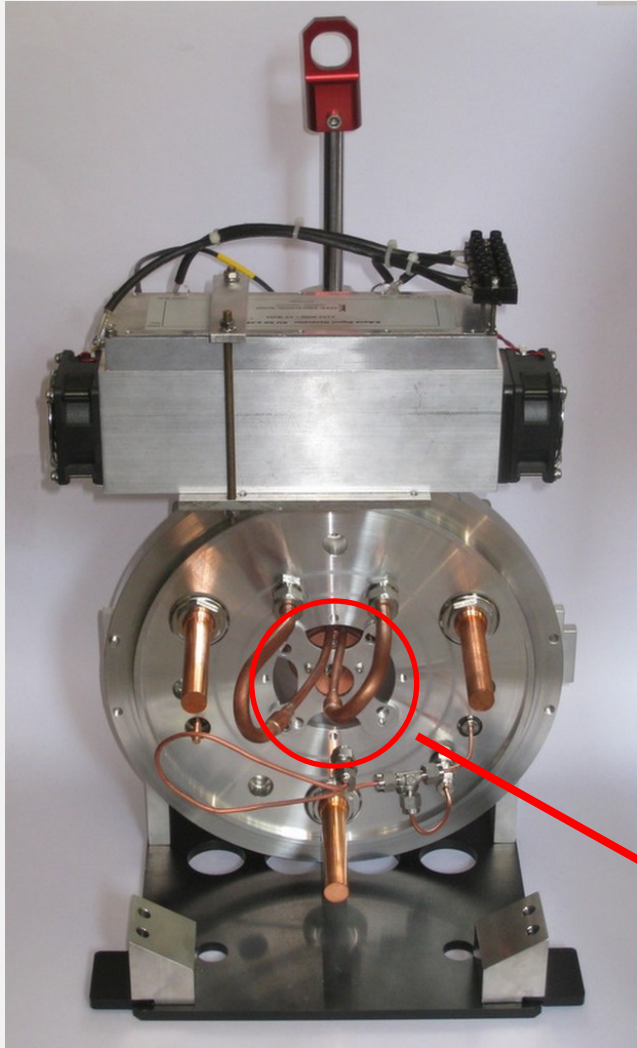
1 - Mono beam Mono cavity devices

1.2 Q-COMIC : the Quartzed COMIC for on-line applications



Beam, Multi-Beam and Broad Beam production with COMIC devices

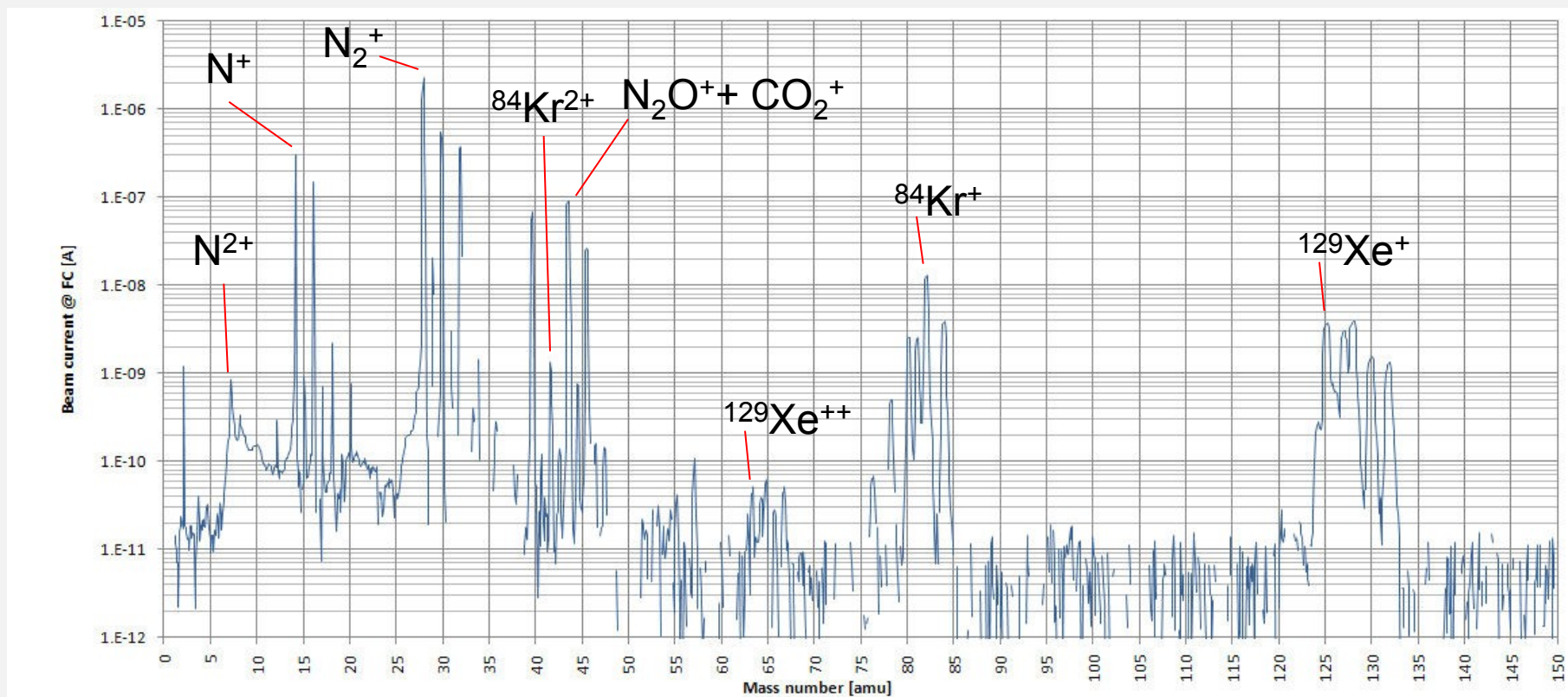
1 - Mono beam Mono cavity devices



Q-COMIC inside the Isolde TISS

1 - Mono beam Mono cavity devices

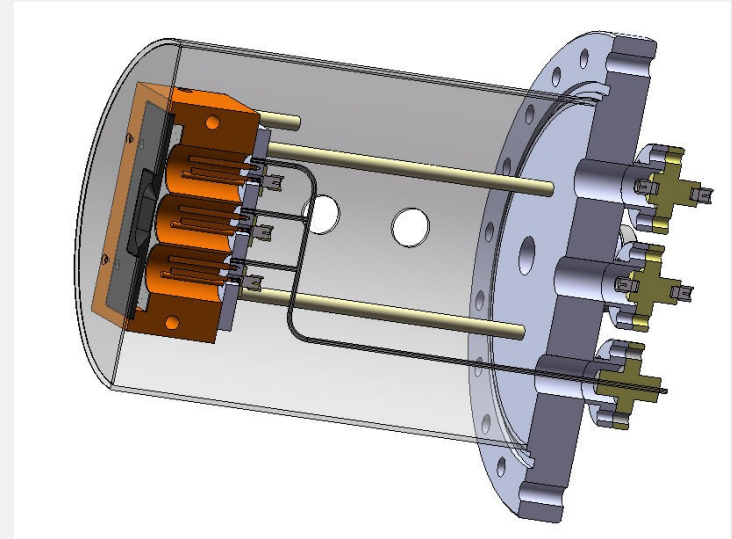
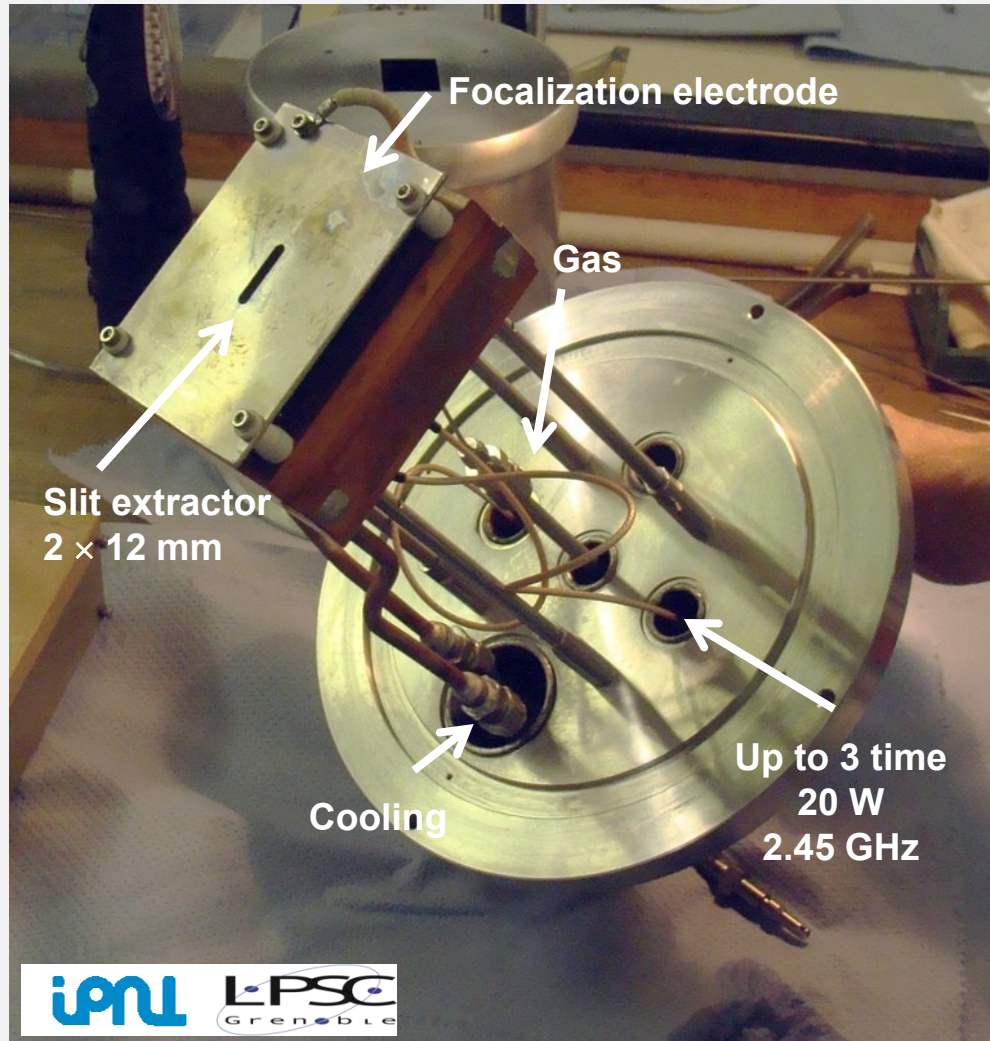
Multicharged ions identification with Q-COMIC :



Q-COMIC : Air + impurities of CO₂, Kr & Xe / 25 W / 4 10⁻⁶ mbar
For the efficiency measurements please refer to the Pekka Suominen poster

Beam, Multi-Beam and Broad Beam production with COMIC devices

2- Mono beam Multi cavity devices



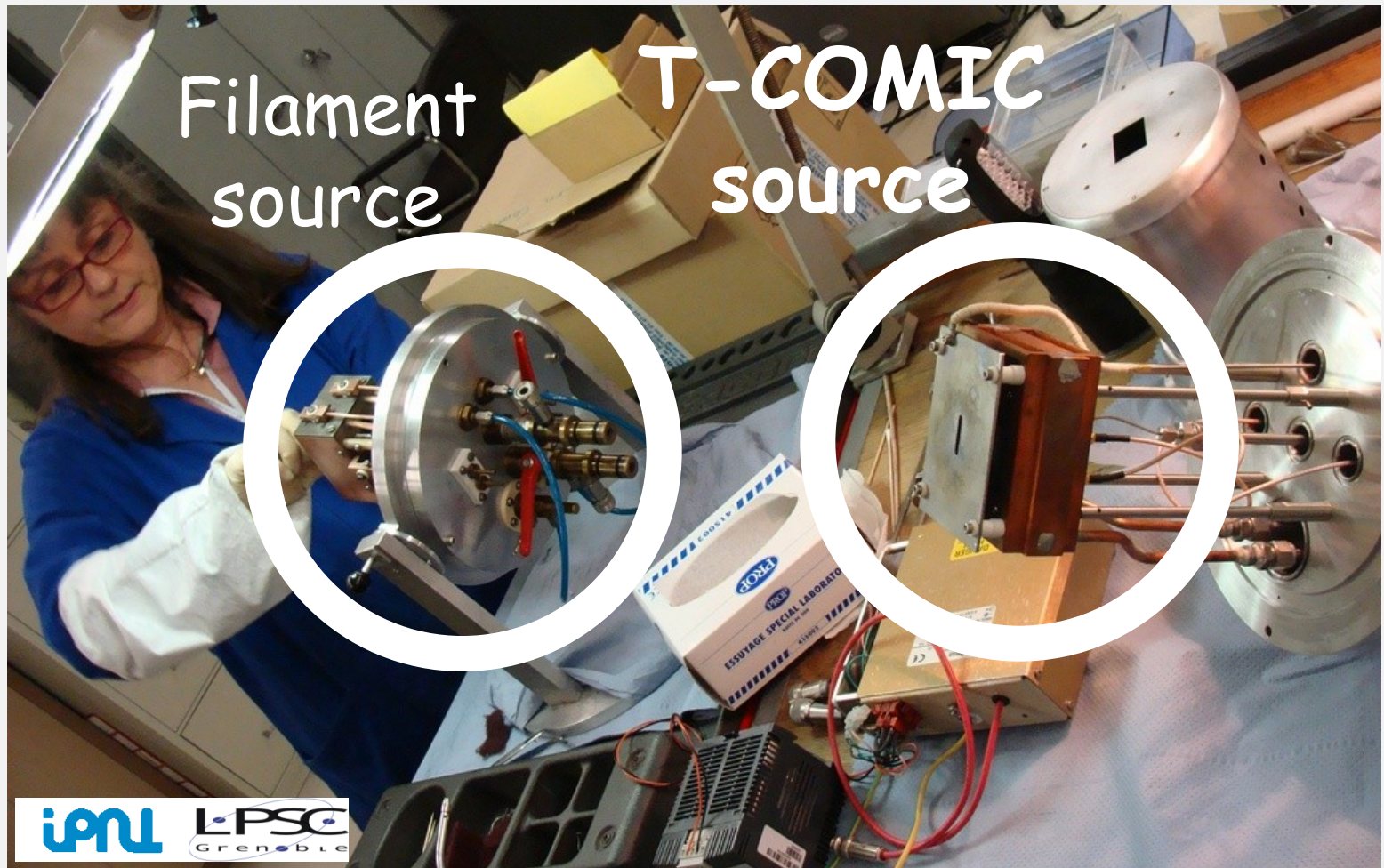
Triple-COMIC :
Three cavities,
one slit extractor

2.1 T-COMIC

Beam, Multi-Beam and Broad Beam production with COMIC devices

2- Mono beam Multi cavity devices

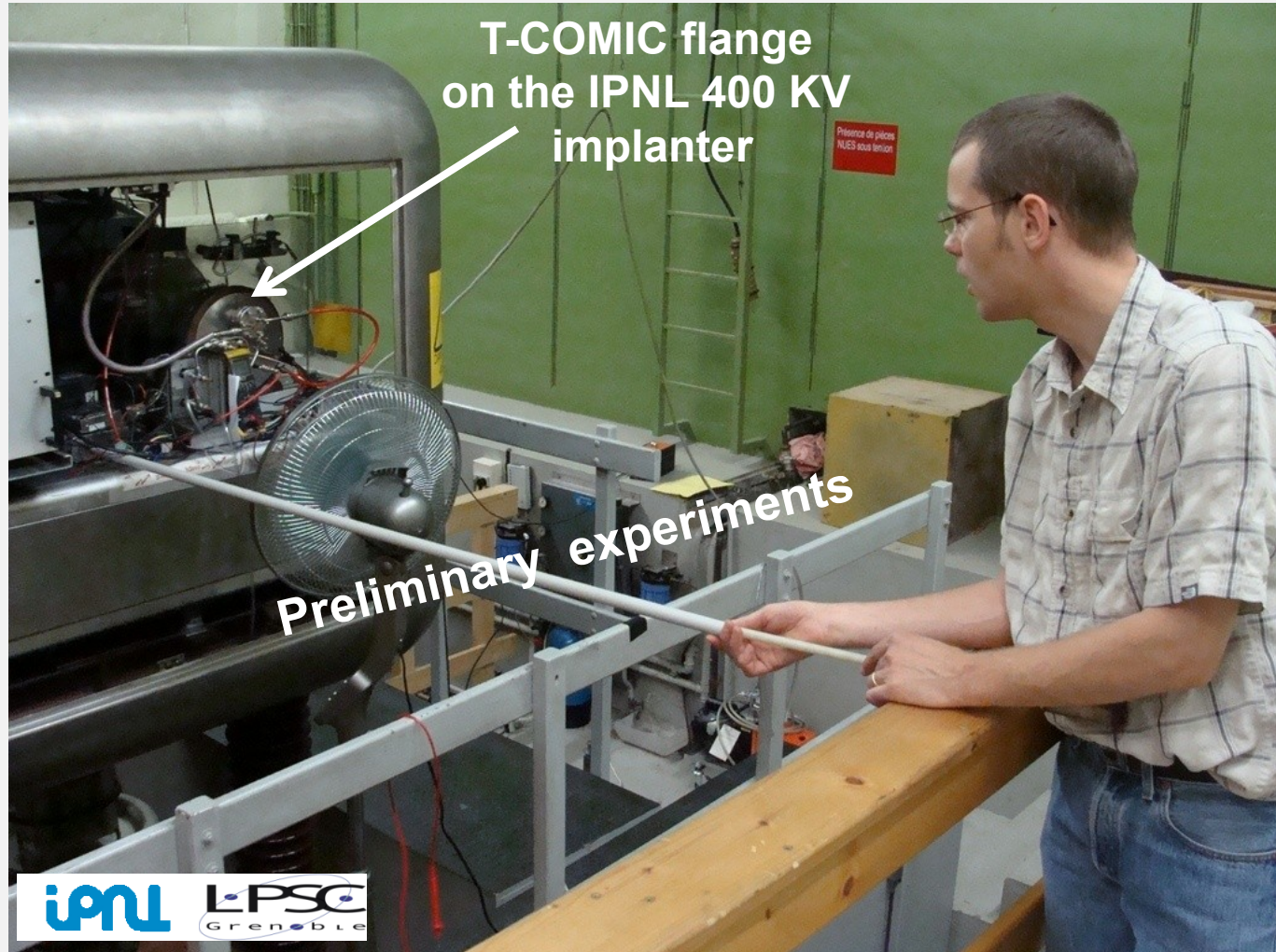
2.1 T-COMIC : a plug & play device for implanter



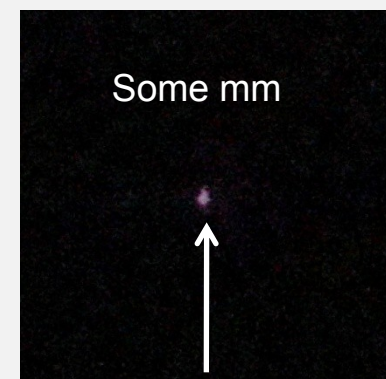
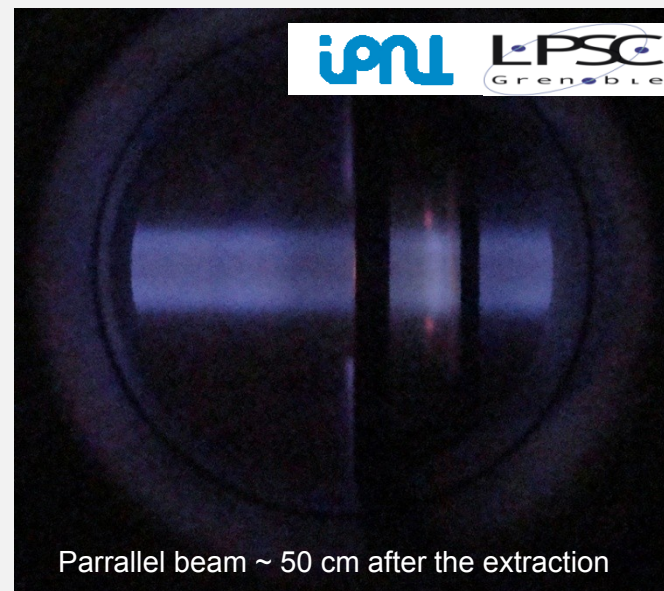
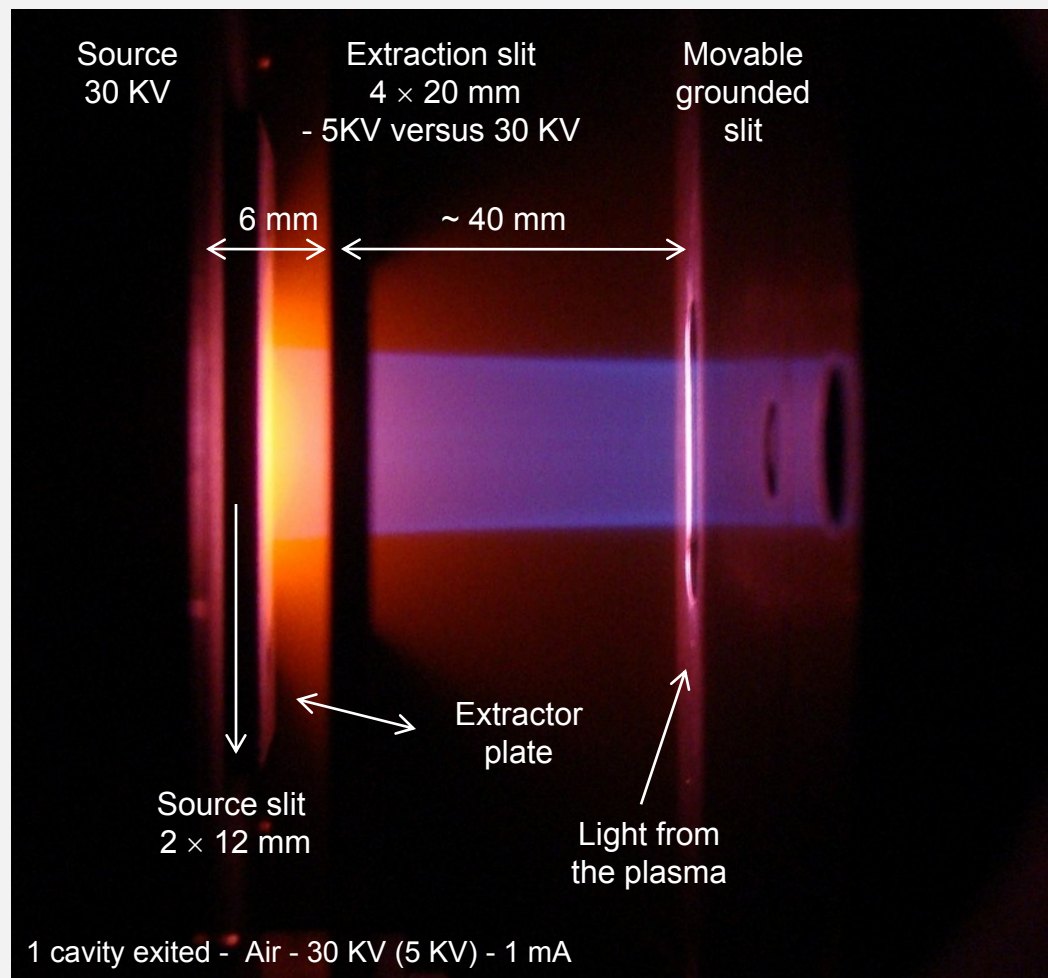
Beam, Multi-Beam and Broad Beam production with COMIC devices

2- Mono beam Multi cavity devices

2.1 T-COMIC



2- Mono beam Multi cavity devices



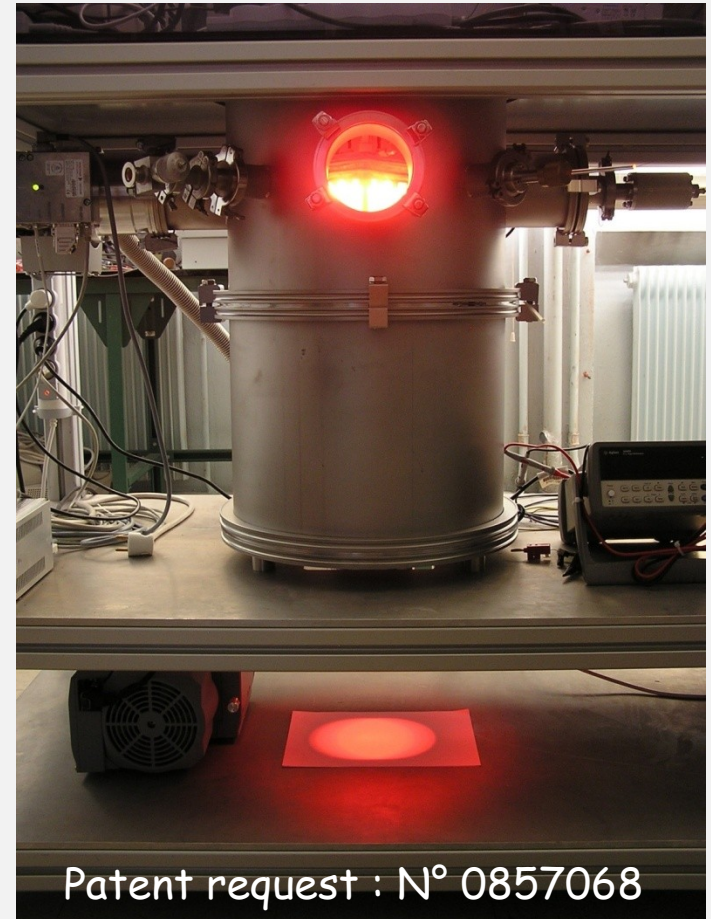
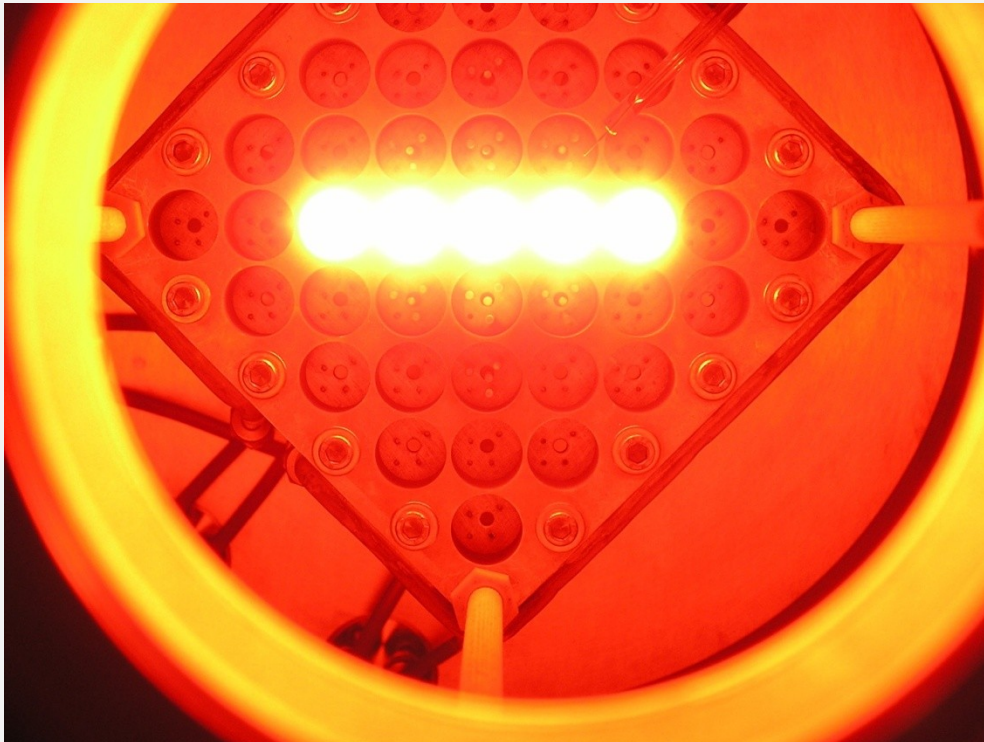
2.1 T-COMIC

Focused $30 \mu\text{Ae}$ ^{129}Xe beam at 100 KV after the THT column and matching line

Beam, Multi-Beam and Broad Beam production with COMIC devices
2- Mono beam Multi cavity devices

Plasma generation over an arbitrary size : COMIC -Array

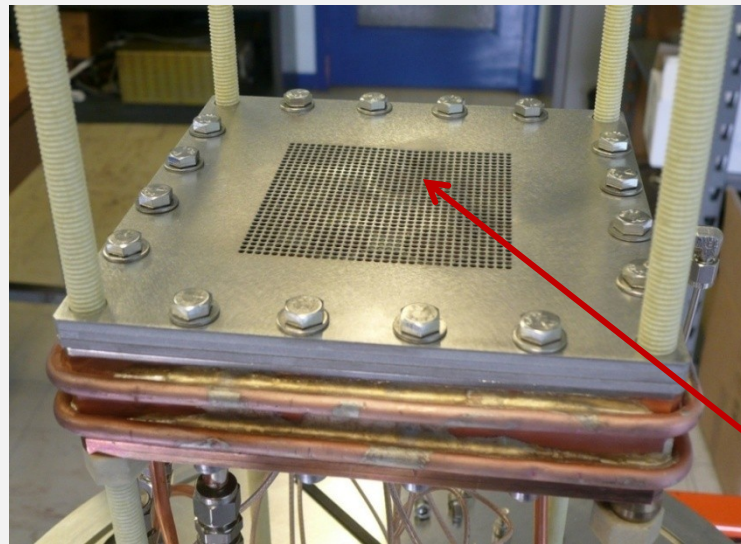
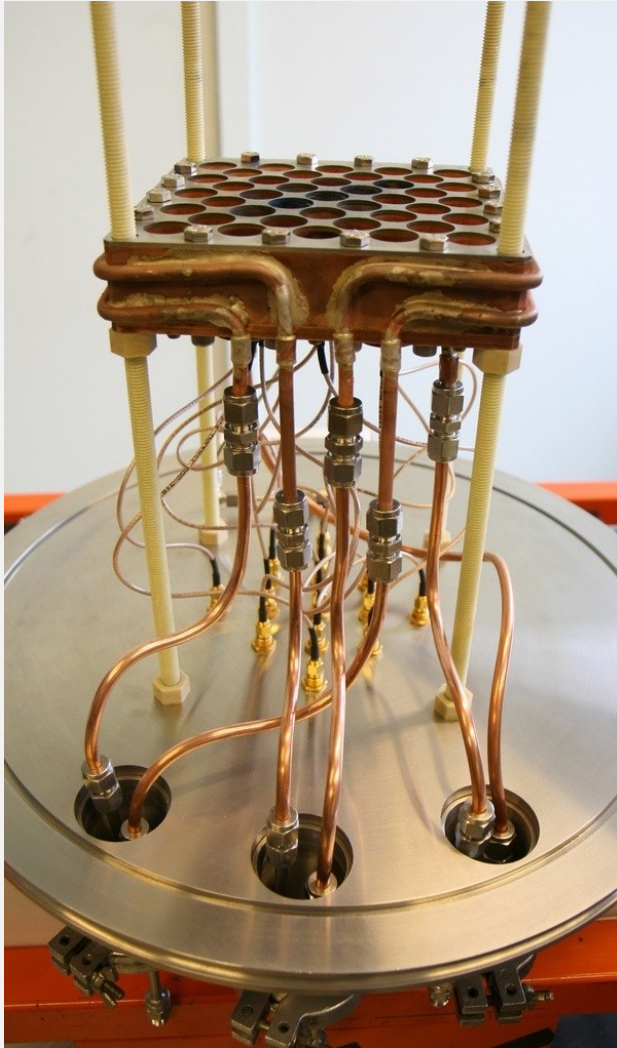
41 discharges (5 excited)
Neon about 5 W



Patent request : N° 0857068

Beam, Multi-Beam and Broad Beam production with COMIC devices

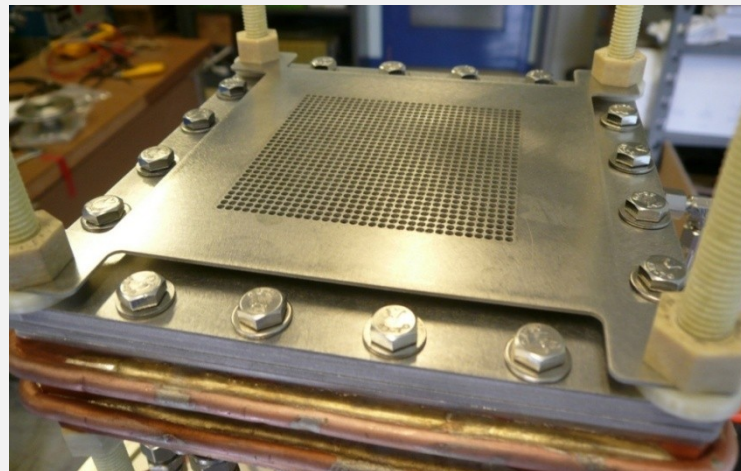
2- Mono beam Multi cavity devices



2.2 COMIC-Array :

*Introduction
of the grid
extractor*

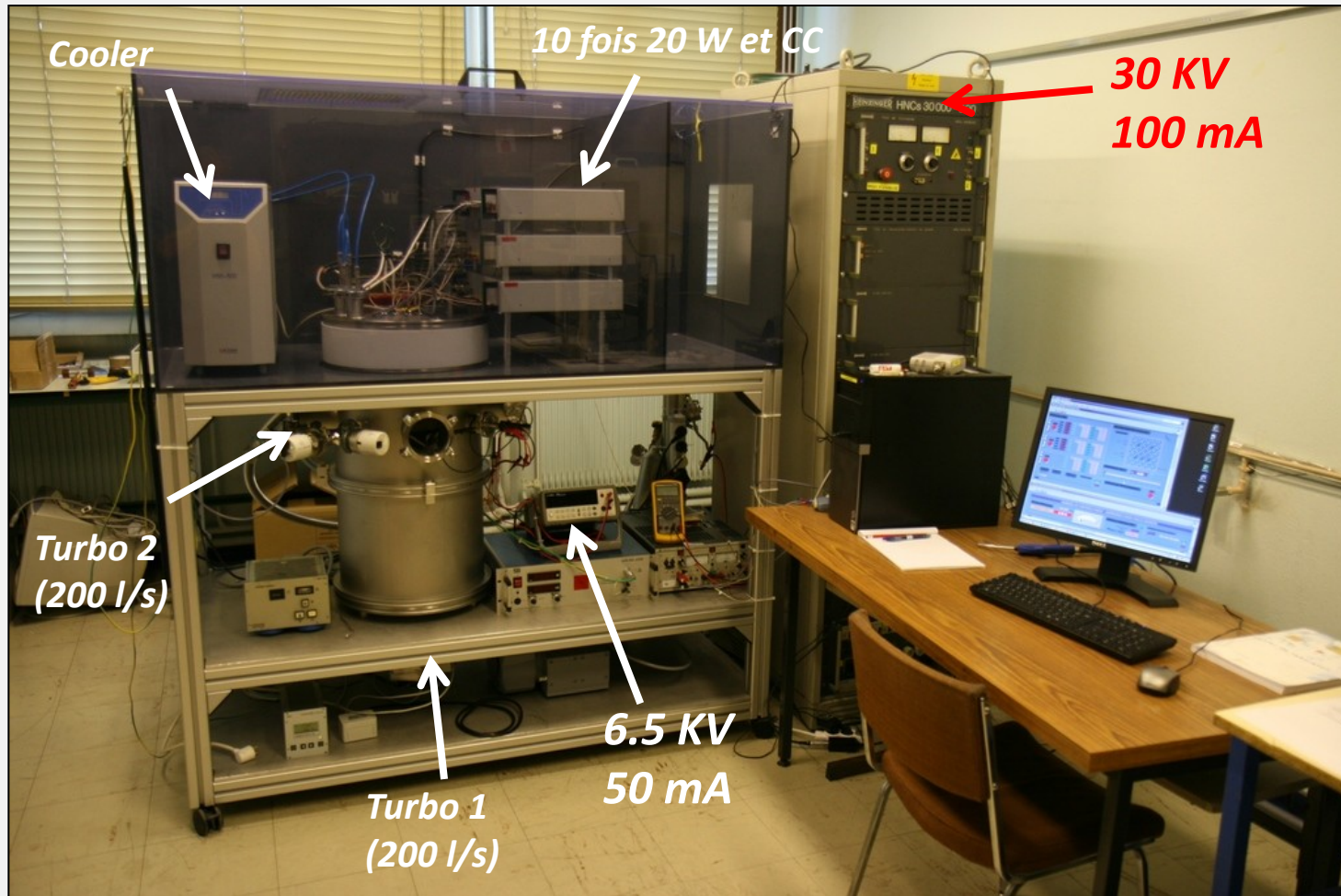
*Electrode distortion
around
cavities 7 & 8*



Beam, Multi-Beam and Broad Beam production with COMIC devices

2- Mono beam Multi cavity devices

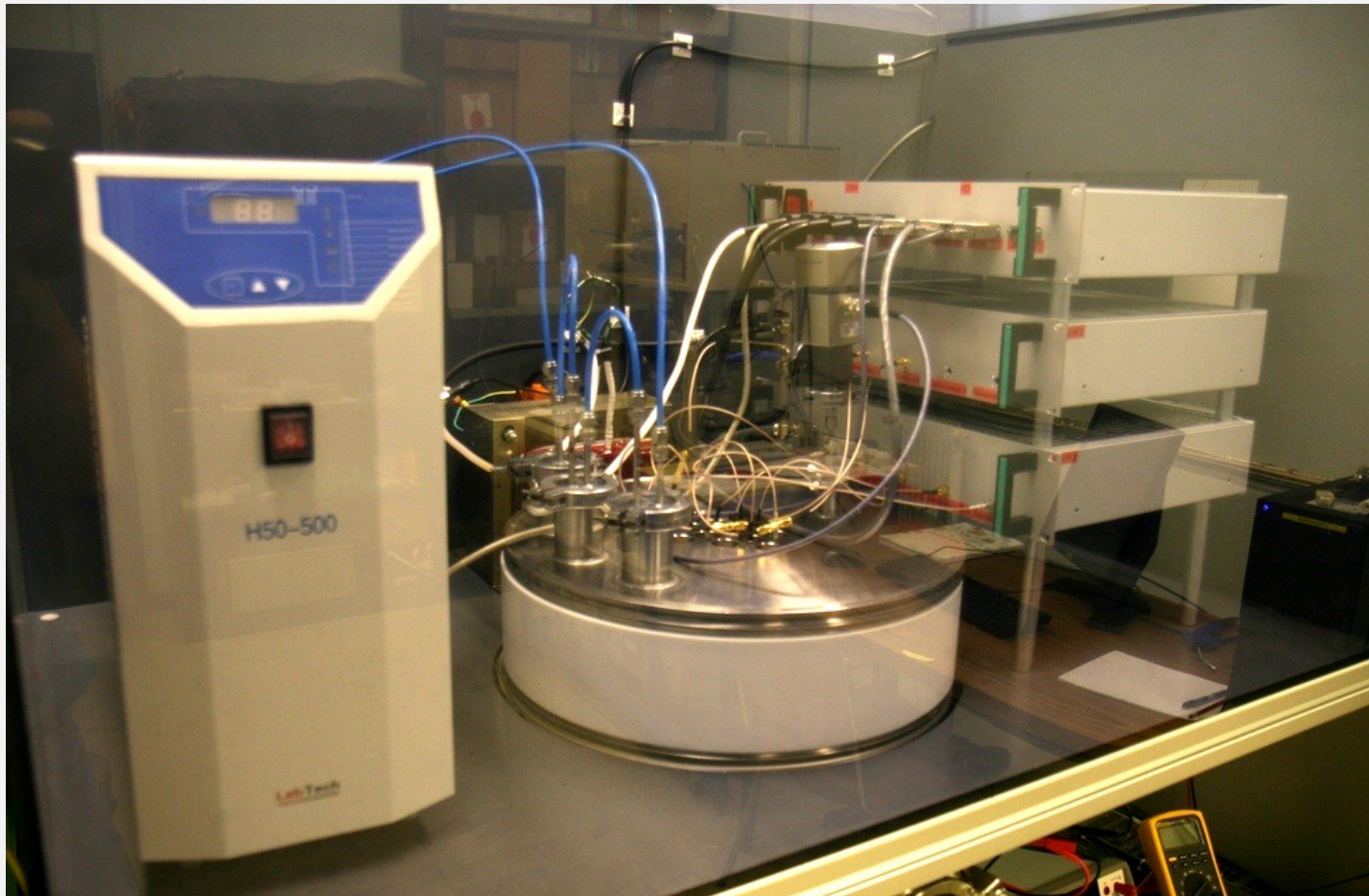
2.2 COMIC-Array : low energy broad beam for surface traitement



Beam, Multi-Beam and Broad Beam production with COMIC devices

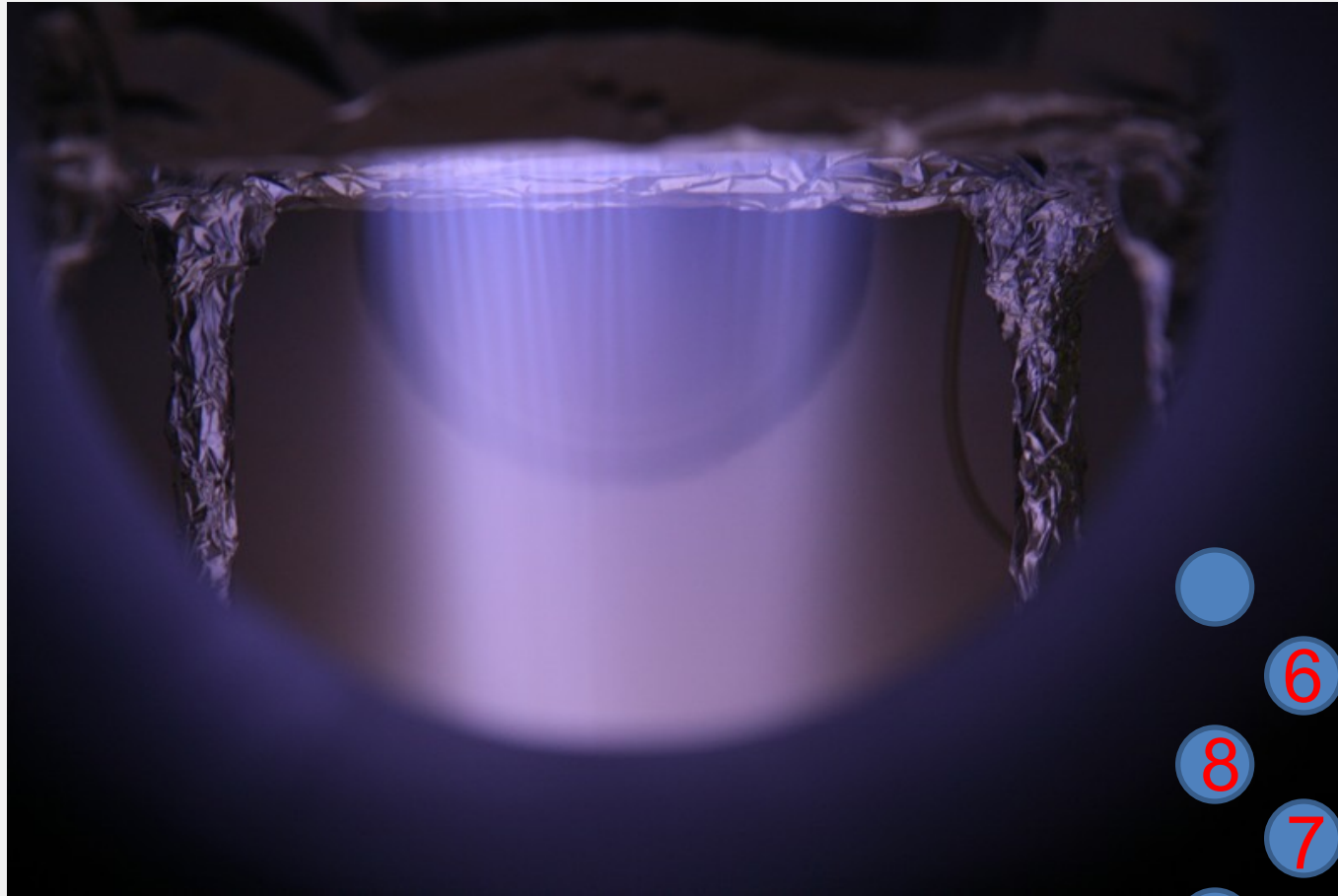
2- Mono beam Multi cavity devices

2.2 COMIC-Array: low energy broad beam for surface treatments



2- Mono beam Multi cavity devices

Distorsions around the cavities 7 & 8



Gas flux :

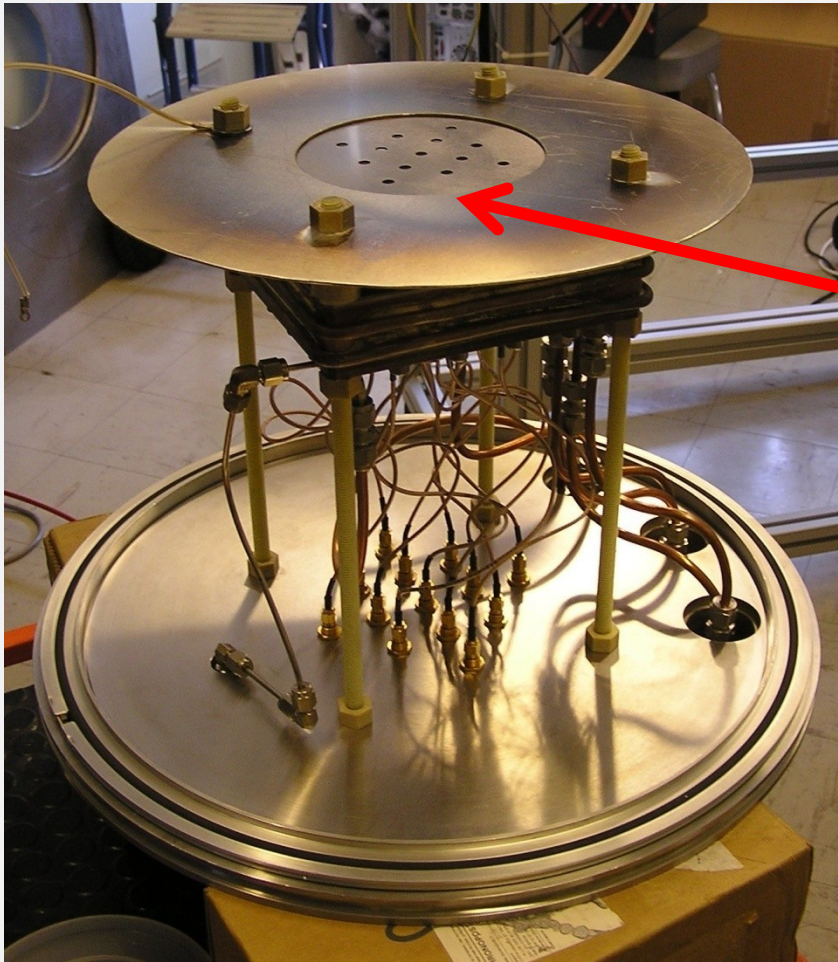
$\sim < 1 \text{ mbar l/s}$

$1.2 \cdot 10^{-3} \text{ mbar}$

2 KV / 22 mA - 10 W per cav. / monogap extraction 4 mm / net of holes 2 mm - 2.5 mm

Beam, Multi-Beam and Broad Beam production with COMIC devices

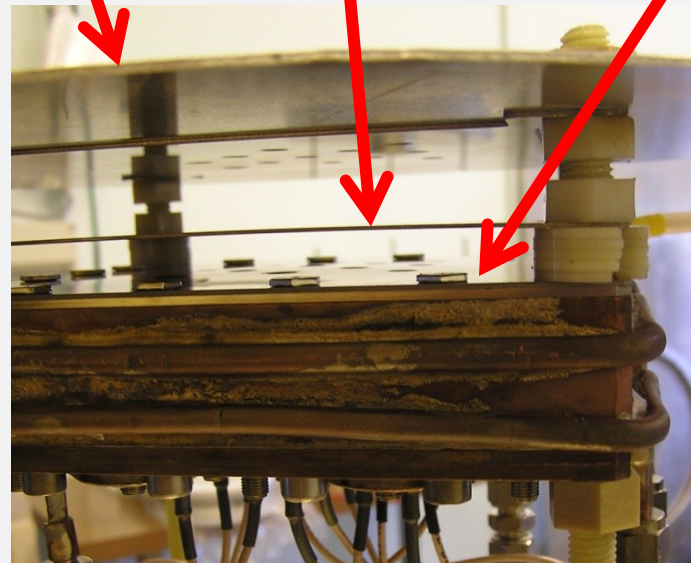
3- Multi beam Multi cavity device



Source configured for 13 beams up to 70 KV

13 times Φ 2 mm with 2 electrodes

Plasma electrode
Intermediate electrode (focalisation)
Grounded Electrode



3- Multi beam Multi cavity device

20 KV source

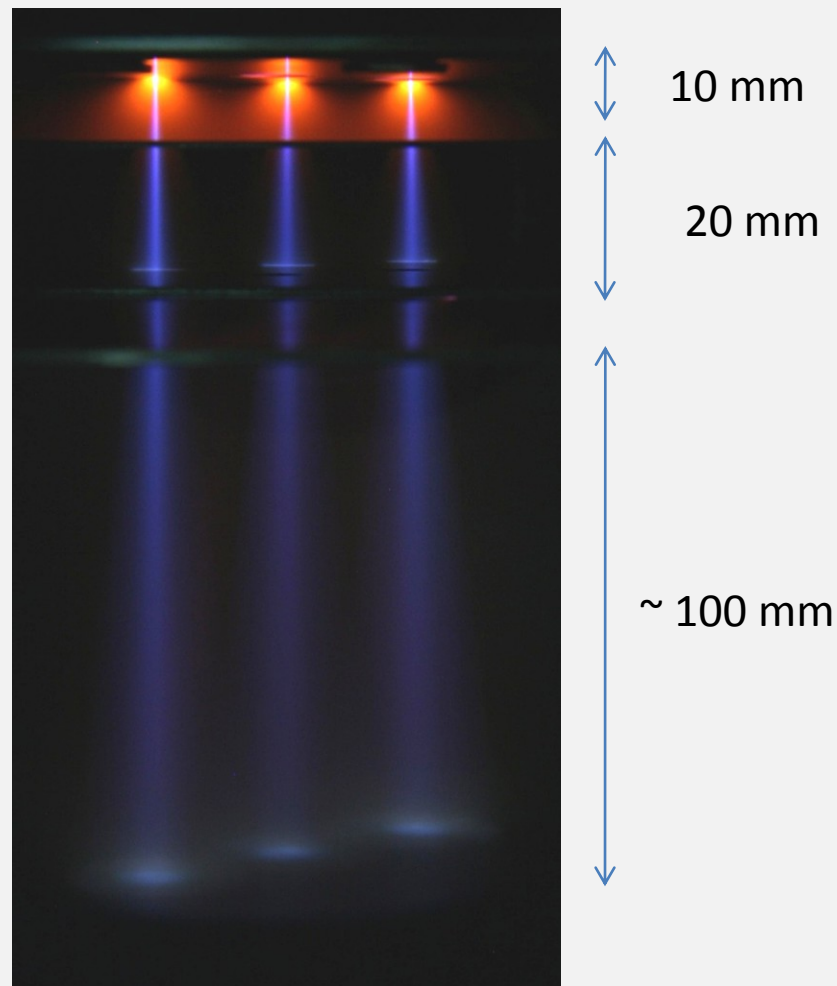
10 KV
in-between
electrode

Multi extraction and

- control of the focalization -

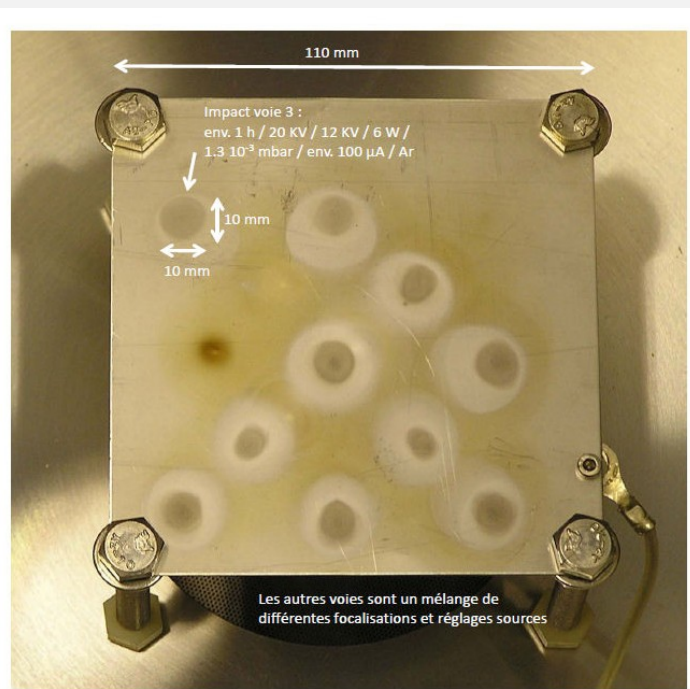
to assure homogeneity at an
arbitrary distance

Nitrogen (air) 20 KV
~ 20 W per discharge
Pressure : $8 \cdot 10^{-4}$ mbar
 Φ 2 mm extraction hole

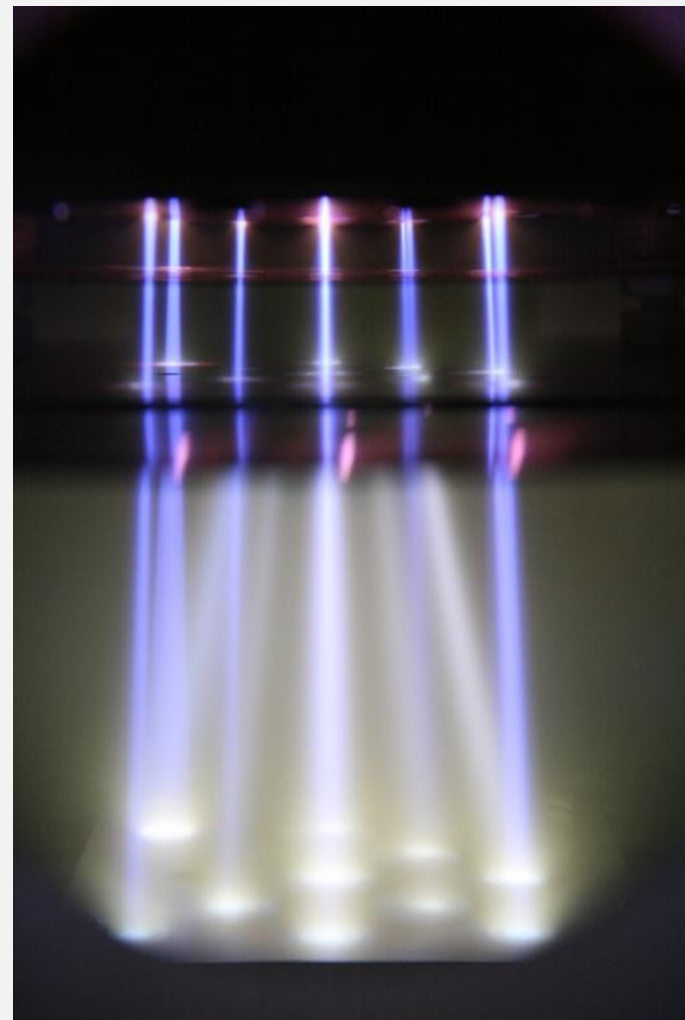


3- Multi beam Multi cavity device

Example of operation
10 times Φ 2 mm with Argon



(13 gas feedings)
With 2 electrodes :
Source : 25.0 KV
 $E_{\text{in-between}}$: 12.0 KV
 $\approx 150 \mu\text{A}$ per beam
 $1.2 \cdot 10^{-3}$ mbar



4- Conclusion

- 1 - *Very basic, but, very customizable*
- 2 - *High pressure source*
- 3 - *New industrial applications*
- 4 - *Lot of possible improvements :
brightness, frequency, magnetic fields
(up to reintroduction of a minimum B)*

4- Conclusion of the conclusion

Small is
beautiful