Electrolitic Plasma Cell

Decades of experiences of preliminary evidences

Domenico Cirillo

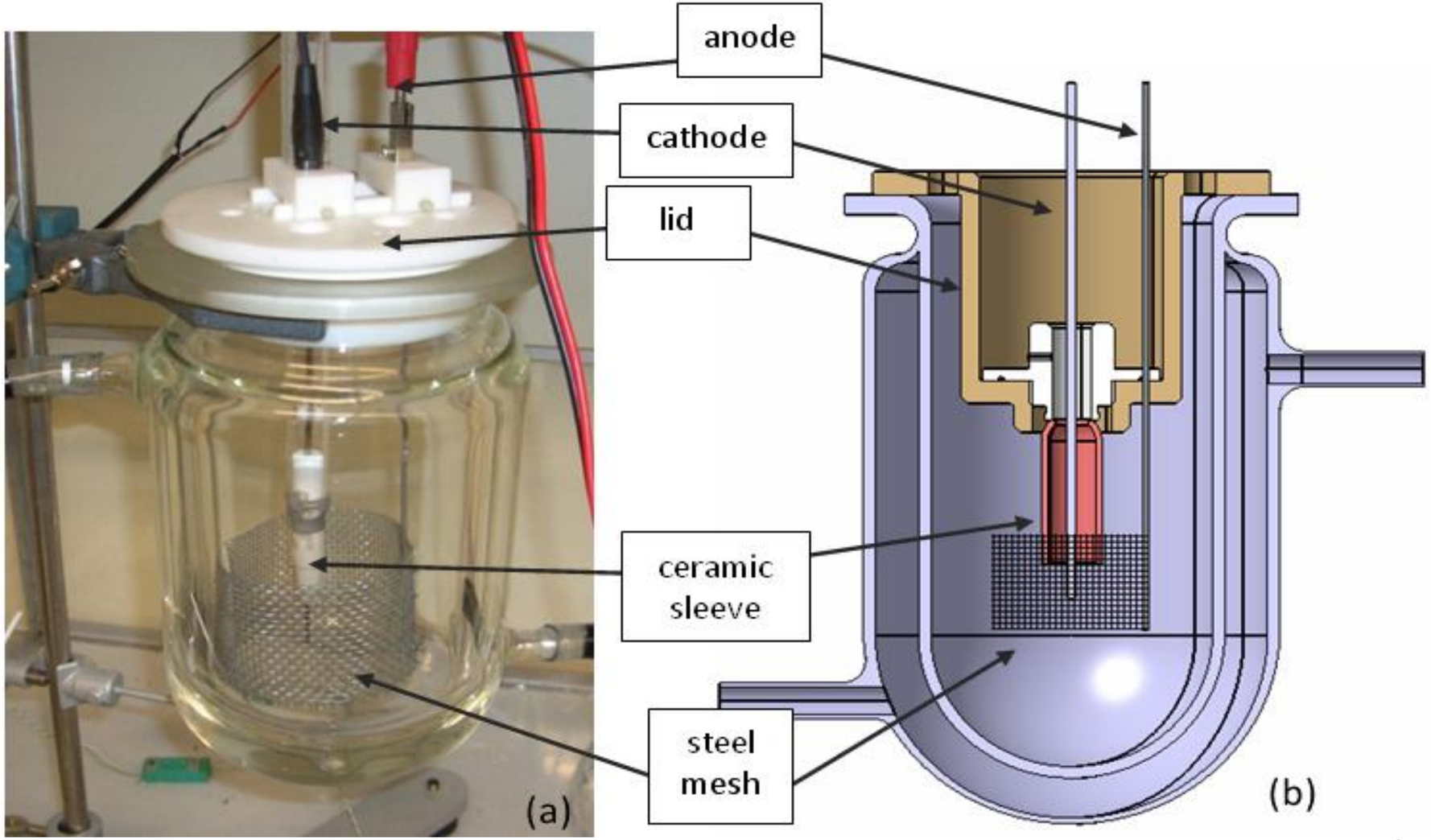
CONDITIONS

- **THIS PRESENTATION EXPLAINS EXPERIMENTAL EVIDENCES AND PRELIMINARY CONVERGENCES ON ANOMALIES EMERGING FROM TESTING ON ELECTROLYTIC PLASMA CELL**

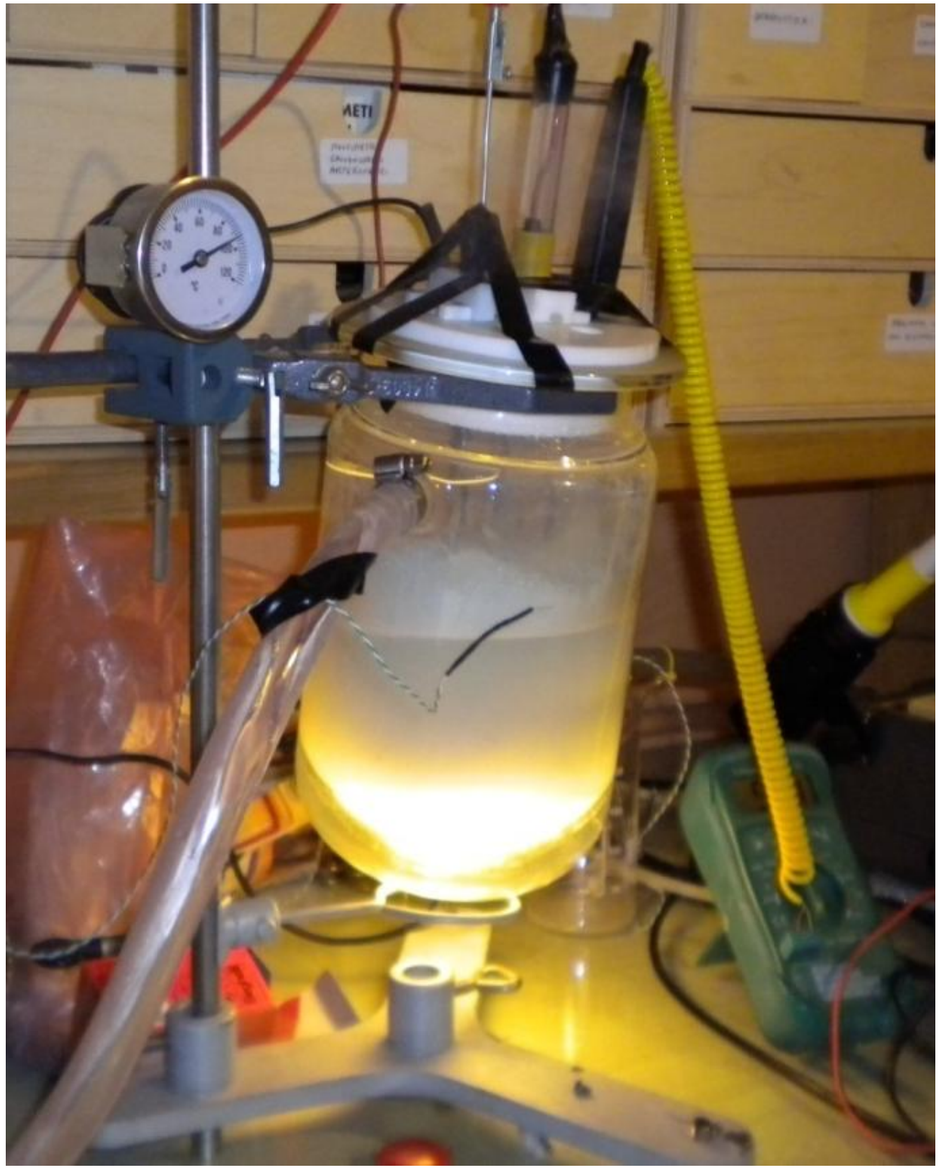
- **SUCH ANOMALIES ARE TWO TYPES: DETECTION OF NUCLEAR EVIDENCIES AND ENERGETIC ANOMALIES**

- **DESPITE THE EVIDENCES, WHAT WE HAVE OBTAINED IT IS STILL AT A STAGE (SADLY) PRELIMINARY**

Cell configuration (last configuration)



Plasma cell during a run



Typical aspect during which the breakthrough of electrochemical behaviour is passed and the cell works in plasma mode

Steps to reach Plasma mode

conditions depending by cell's parameters

< 100 V input

Hydrogen generation at cathode

$2H_2O + 2e^- \rightarrow H_2 + 2OH^-$

$2H_3O^+ + 2e^- \rightarrow H_2 + 2H_2O$

100 – 200 V input

Discharge (not Faradayan behaviour)

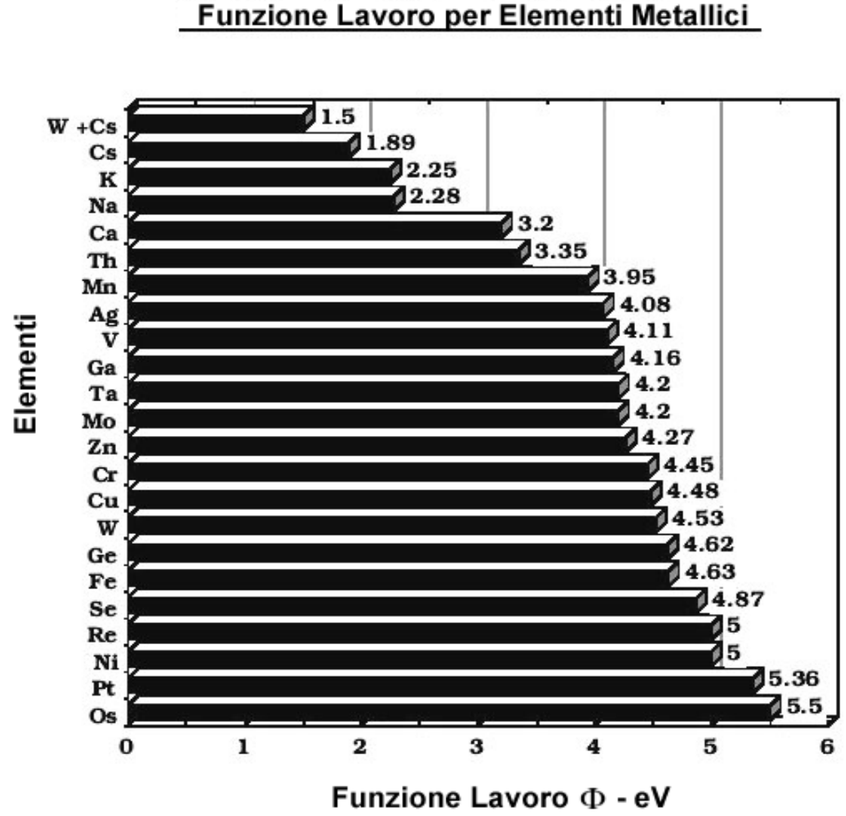
200 – 240 V input

stable plasma layer

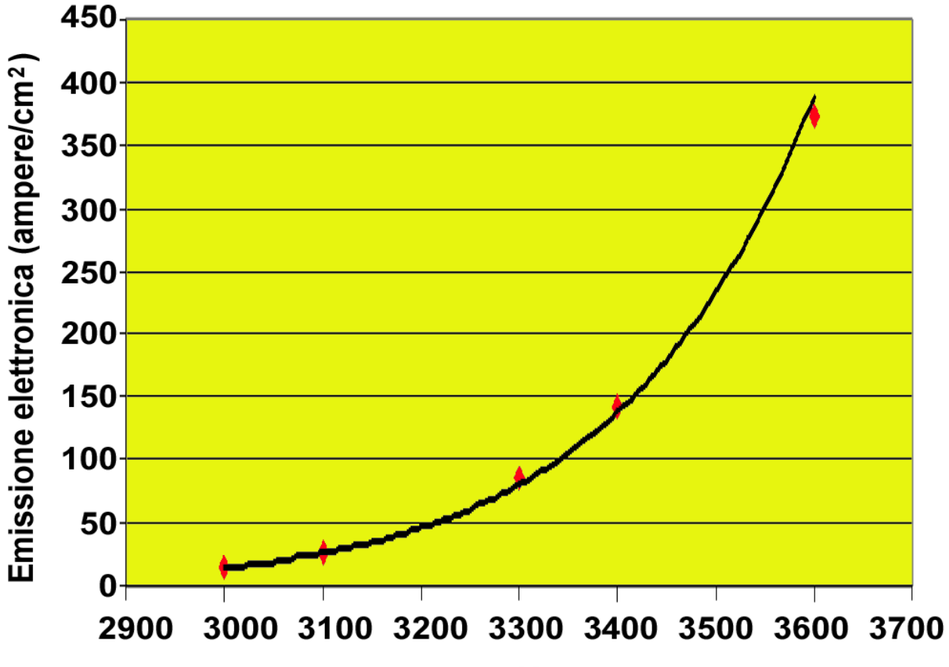
> 250 V input

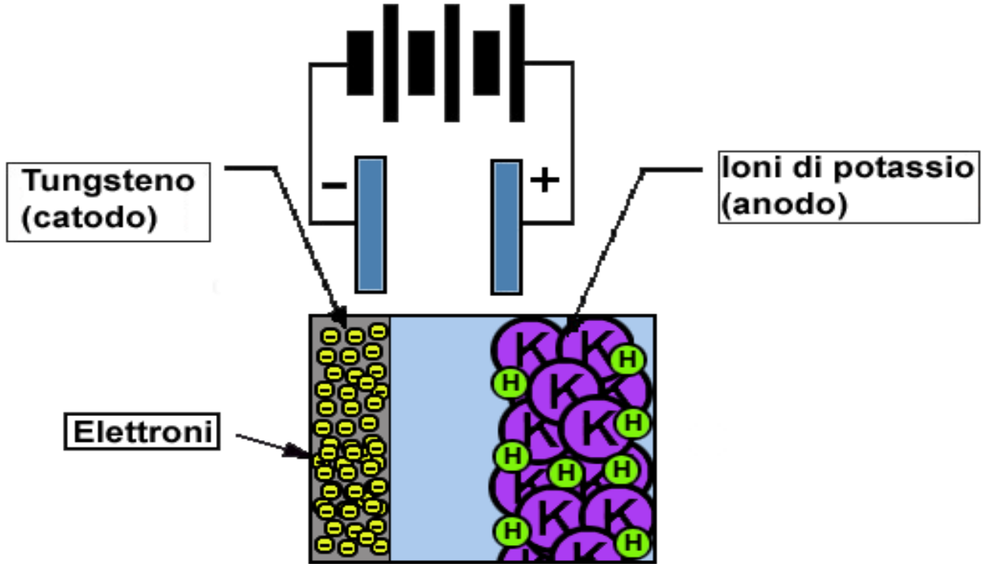
ambiente di plasma attivo

anomalies activity environment



cathodic conditions

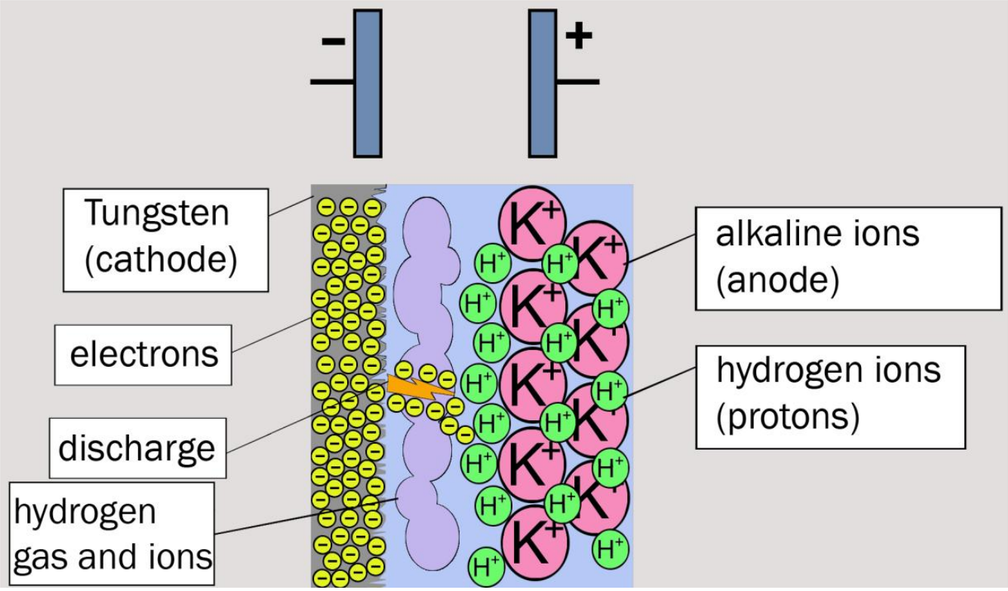




EMISSIONE TERMOELETTRONICA
(Dushman-Richardson)

$$I_e = A_0 \cdot S \cdot T^2 \cdot e^{-\frac{b_0}{T}}$$

plasma environment conditions (>200 V)



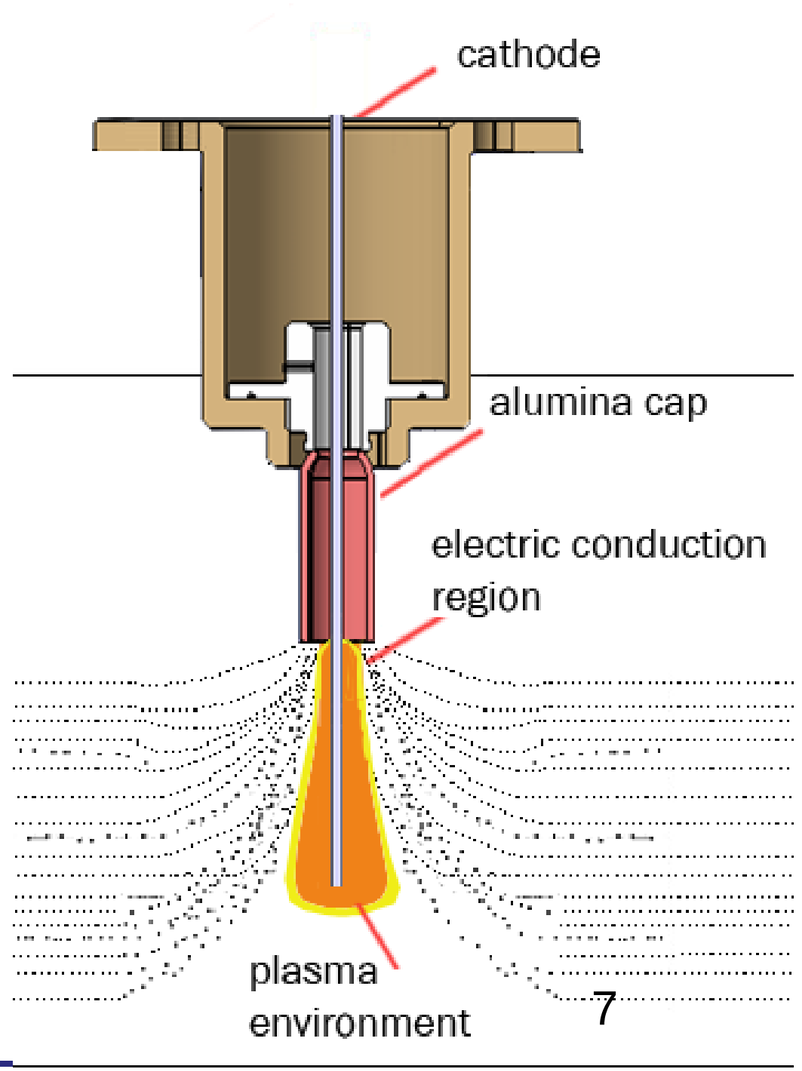
On cathodic superface:

- cracks on tungsteno bulk

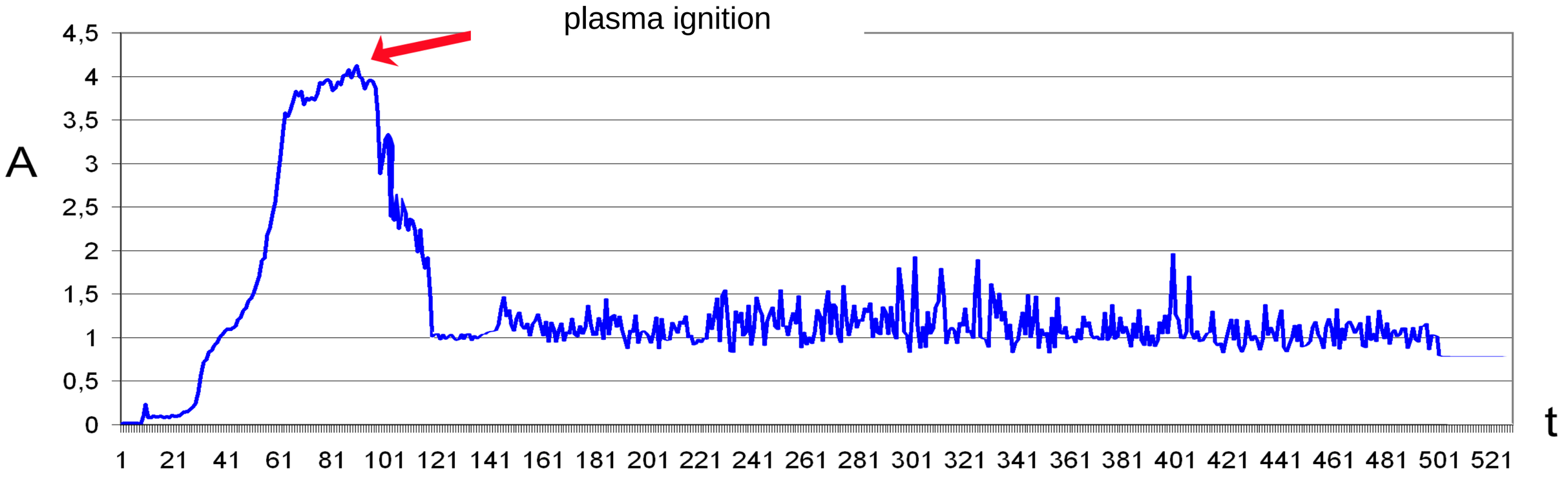
- monoatomic hydrogen ions locally

- electronic high density

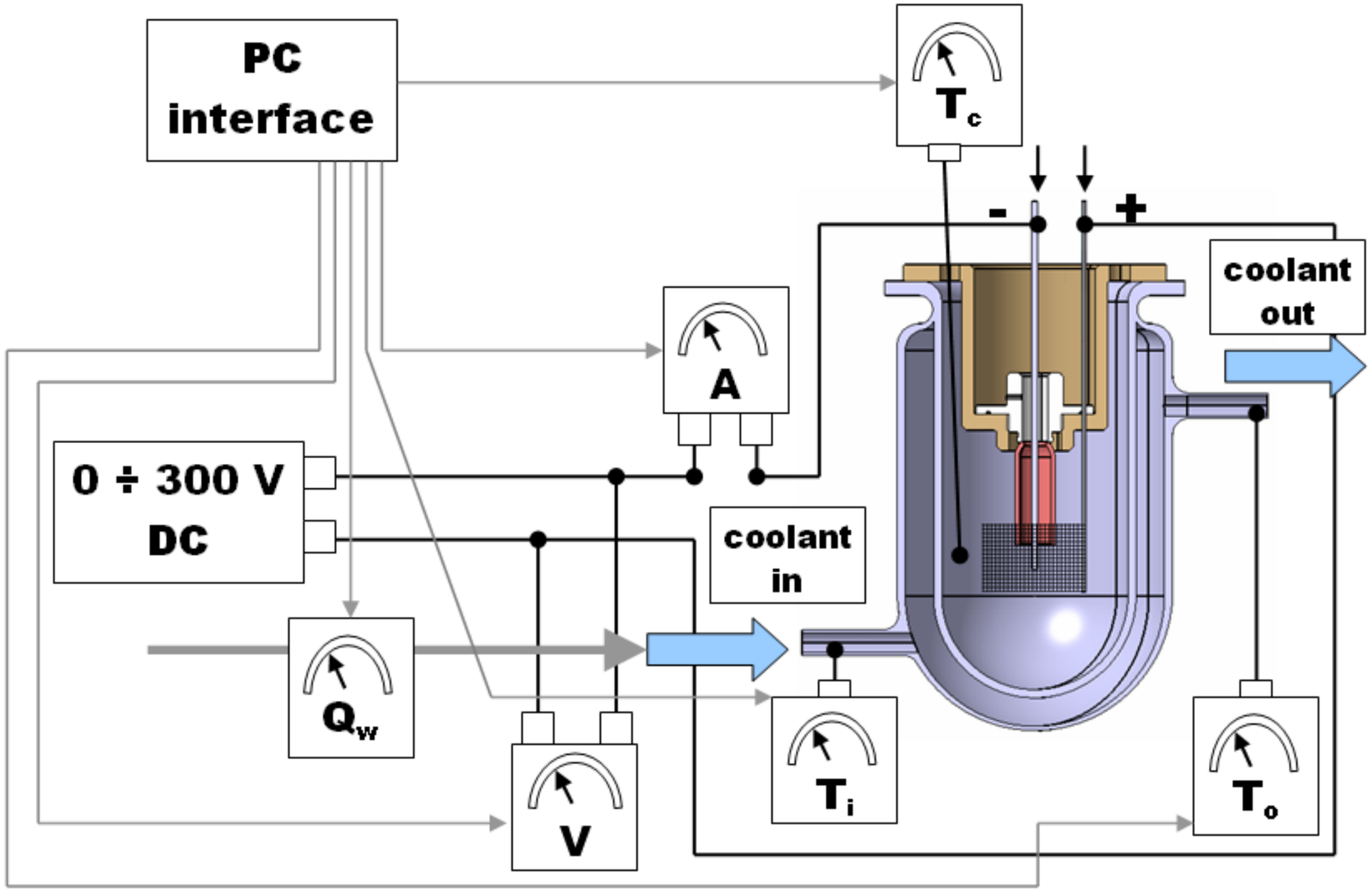
- electric field very high



ignition conditions



Data measurement system

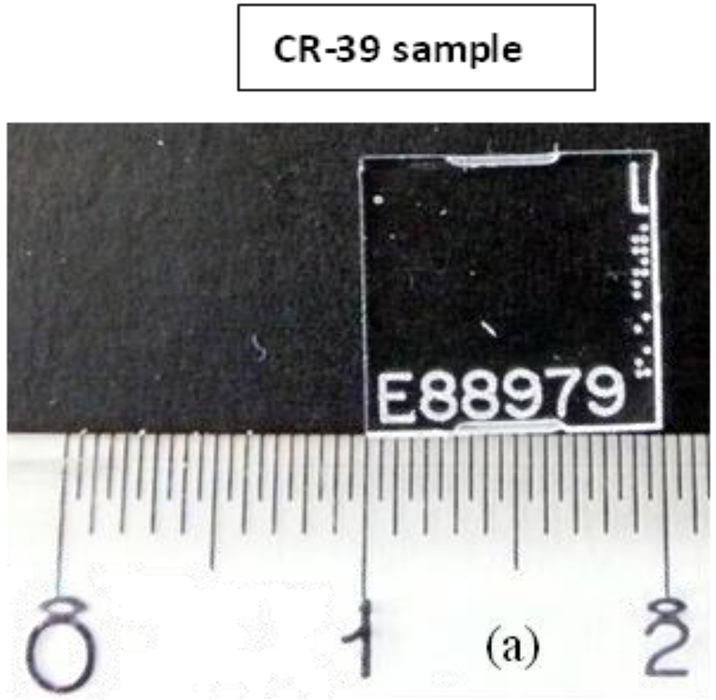


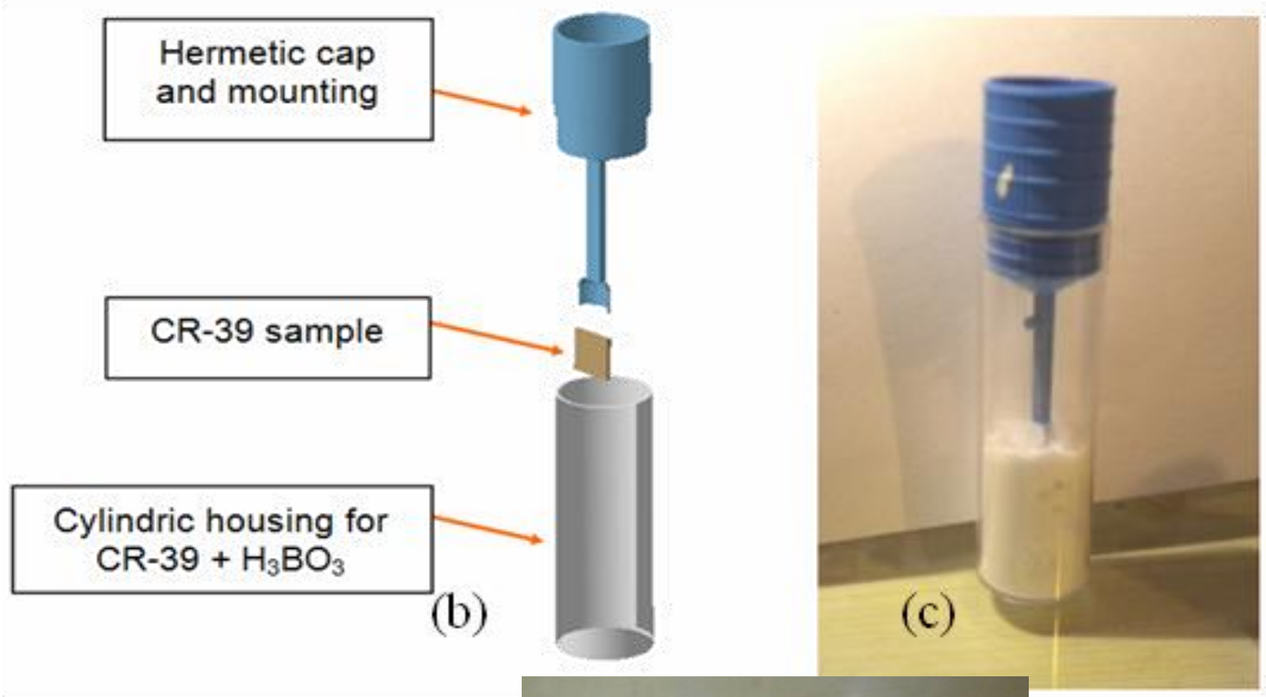
EXPERIMENTAL RESULTS

or

- **nuclear phenomena**
- **calorimetric anomalies**

Dosimeter features

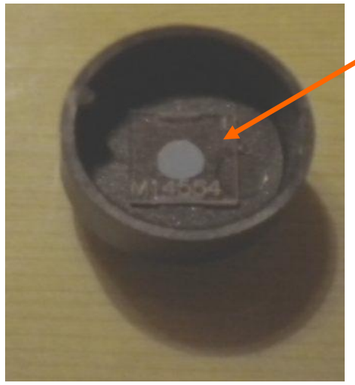




In proximity of the cathodic surface:

- **a) CR39 detector**
- **b) dosimeter's scheme assembling**
- **c) dosimeter**

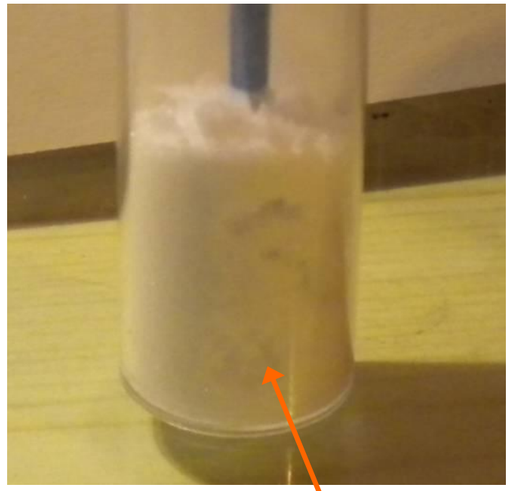
Misura dei neutroni



CR39 = $C_{12}H_{18}O_7$

(CH_2=CH-CH_2-O-CO-O-CH_2CH_2-O-CH_2CH_2-O-CO-O-CH_2-CH=CH_2)

polymer sensitive at α (alpha) emission



BORIC ACID = H_3BO_3

boron contained into the **H_3BO_3** has got an natural isotopic distribution :

- **20%** ⟶ **^{10}B** **sensitive at thermal neutrons (E @ 0,025 eV)**
- **80%** ⟶ **^{11}B**

$^{10}B + n \longrightarrow \alpha$ [1.47 MeV] + $^{7}Li + \gamma$ (93.6%)

$^{10}B + n \longrightarrow \alpha$ [2.79 MeV] + ^{7}Li (6.4%)

Energetic range for CR39 vs α (alpha) particle's energy

α ⟶ [0.04 MeV; 4 MeV]

Dosimeter’s calibration

A collection of 20 sample s containing CR39 + H_3BO_3 were delivered to the **“National Institute of Metrology in Ionizing Radiations” (Casaccia ENEA).**

Such samples were **exposed at a calibrated source of thermal neutrons, emitting a flux**

$1.2 \cdot 10^2$ N/mm^2·s (0,12 µS/s)

The source is composed by six sources based on Am-Be reaction, covered by graphite and polyethilene .

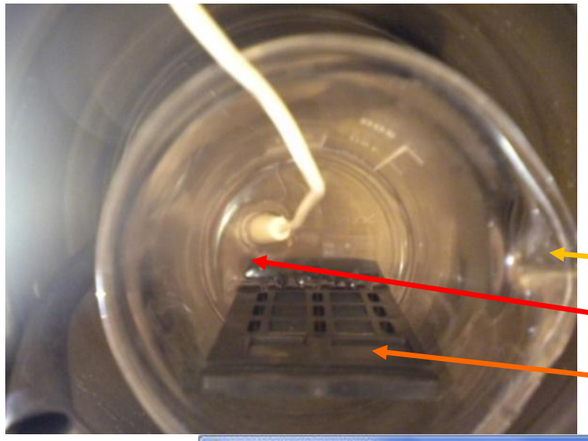
The exposition was done in ‘single blind’. We don’t know the sample exposed and the exposition time.

Dosimeter’s calibration

In order to obtain a calibration and a reference for compare the measurements done through this dosimetric system, the 20 samples were divided into six groups, exposed at thermal neutron flux according:

1. group - 1’ exposure time
2. group - 5’ exposure time
3. group - 20’ exposure time
4. group - 40’ exposure time
5. group - 60’ exposure time
6. group - NOT exposed (blank)

Dosimeter’s calibration



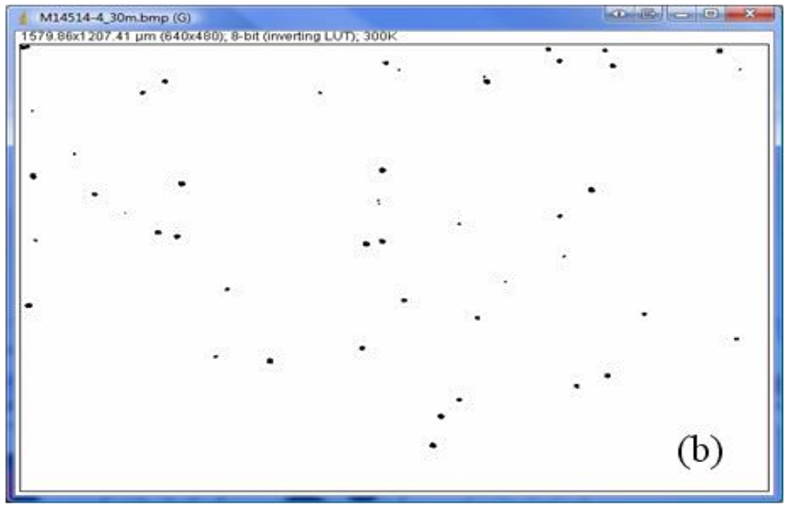
Etching sample conditions:

- **Solution 6,2 M NaOH**
- **Temperature process = 65°C**
- **Etching time > 4 h**

Thermostatic chamber for CR39 etching process

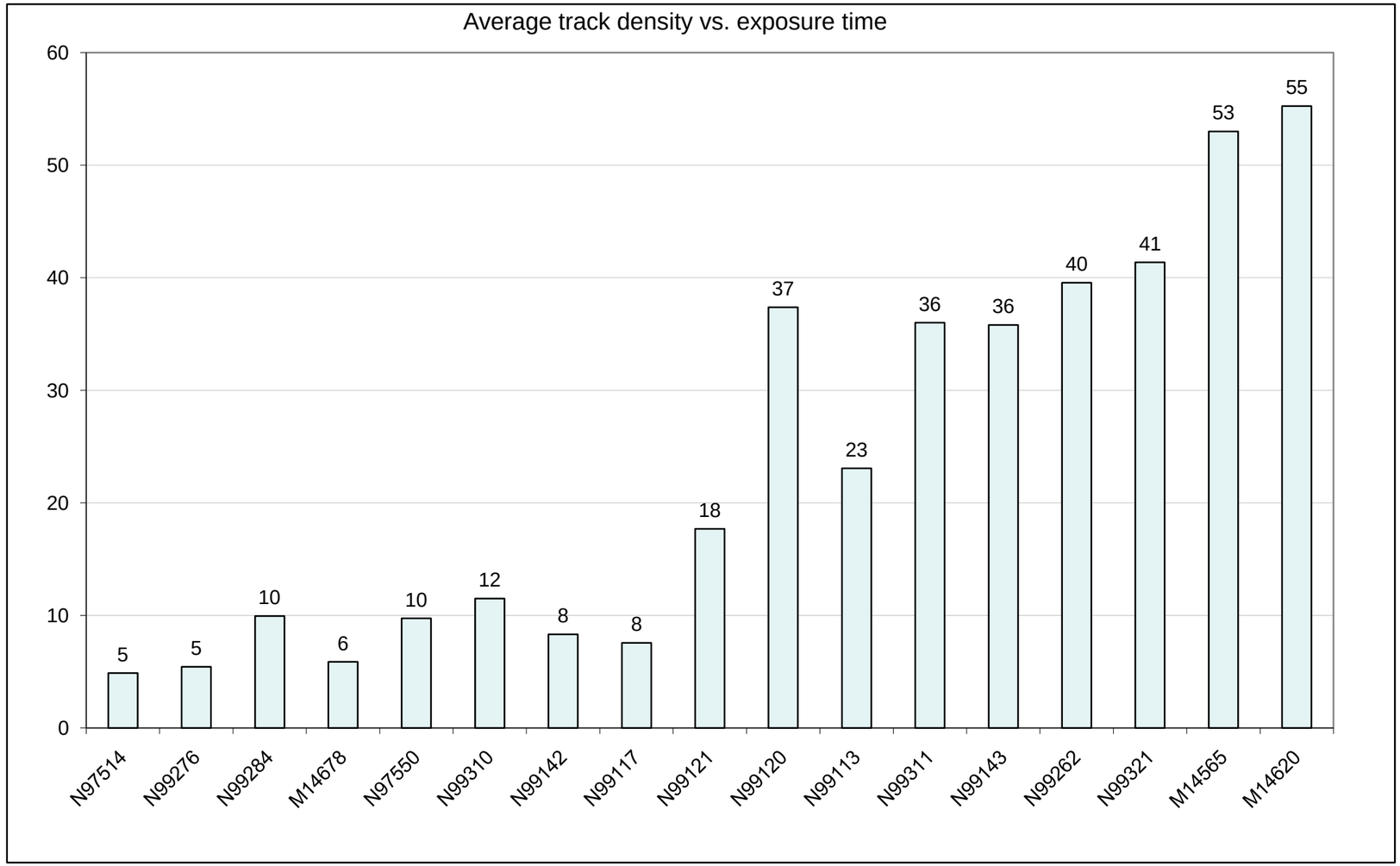
Thermal probe

CR39



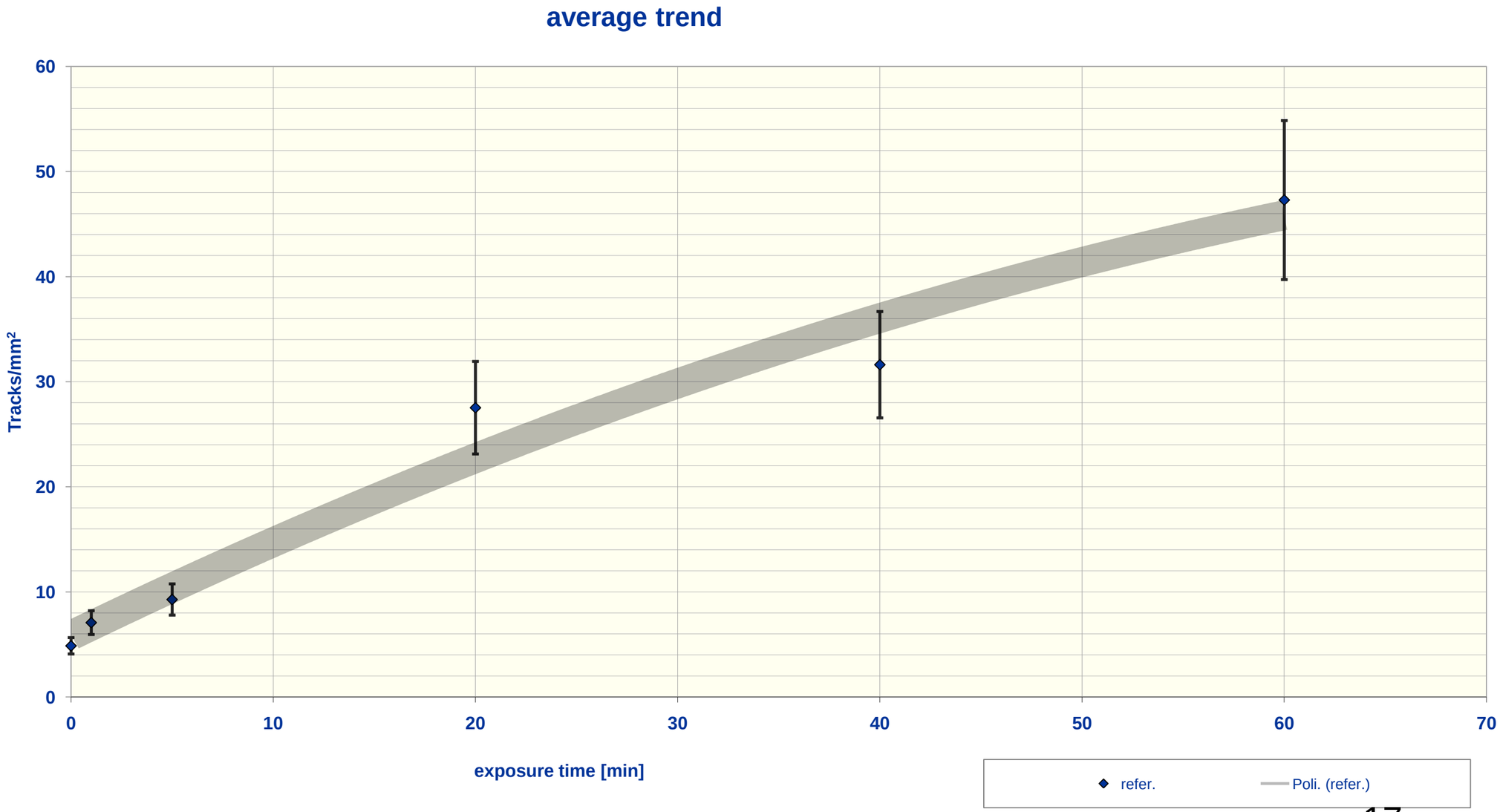
After etching, the sample is analized through electronic magnifier and a specific software to counts the tracks on CR39 plate after the etching process

Dosimeters’ calibration (the gauge)

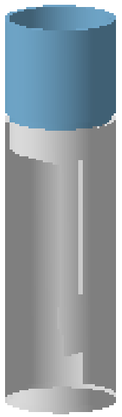


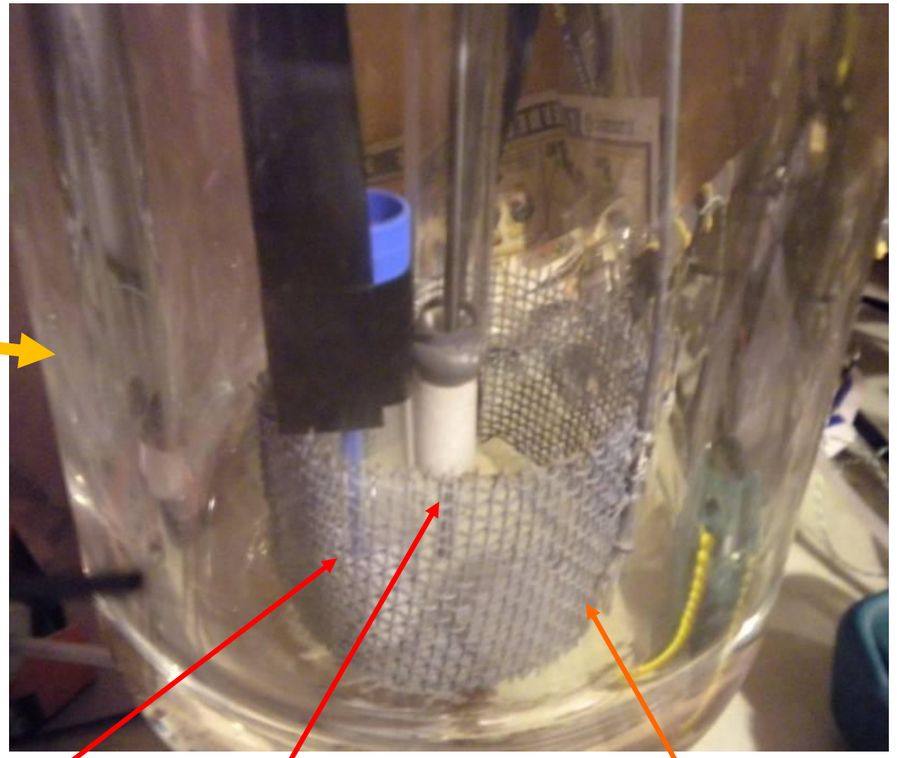
CR-39 sample code	Exposure time (min.)	Average track density (tracks/mm^2)	Group average track density (tracks/mm^2)
N97514	0	5	5
N99276	1	5	7
N99284	1	10	
M14678	1	6	
N97550	5	10	9
N99310	5	12	
N99142	5	8	
N99117	5	8	
N99121	20	18	28
N99120	20	37	
N99113	40	23	32
N99311	40	36	
N99143	40	36	
N99262	60	40	47
N99321	60	41	
M14565	60	53	
M14620	60	55	

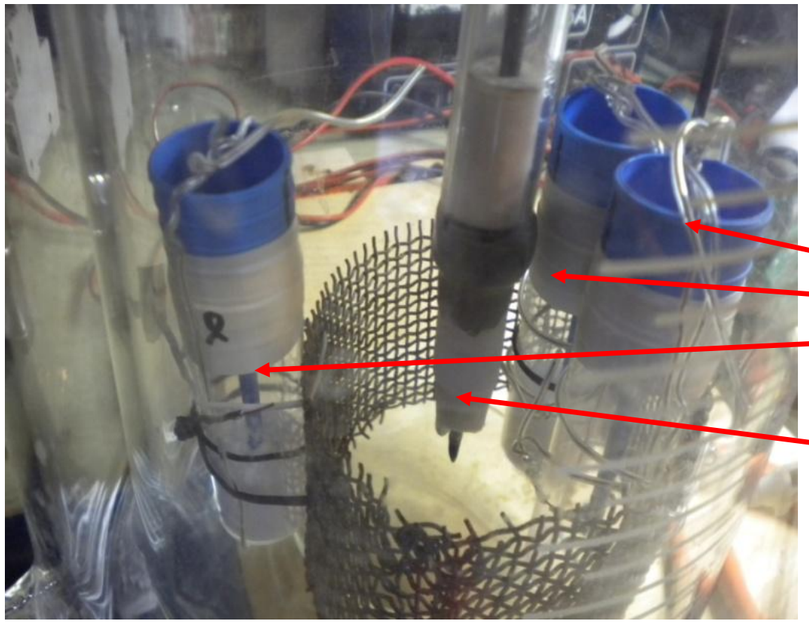
Dosimeters’ calibration (the gauge)



Plasma Cell’s exposition





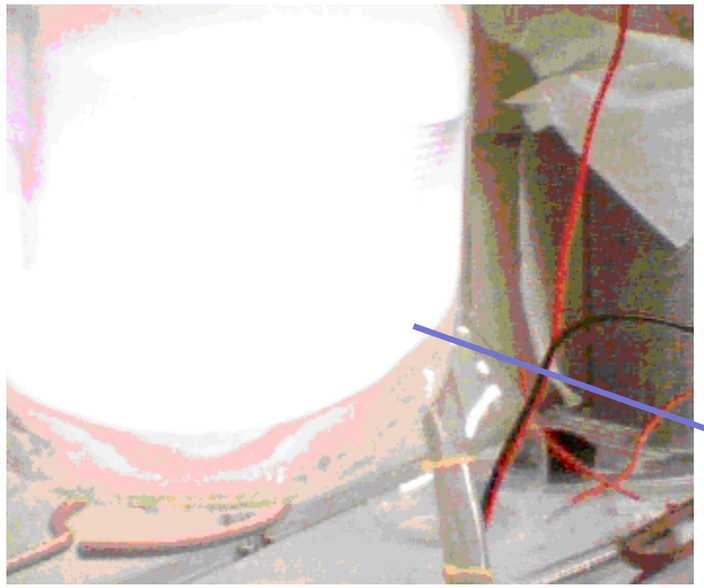


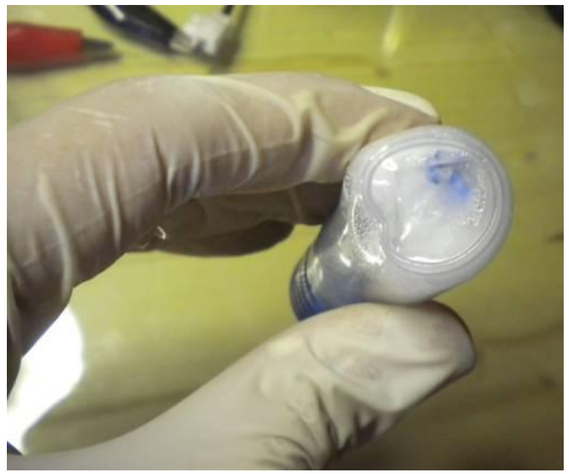
dosimeter

cathode

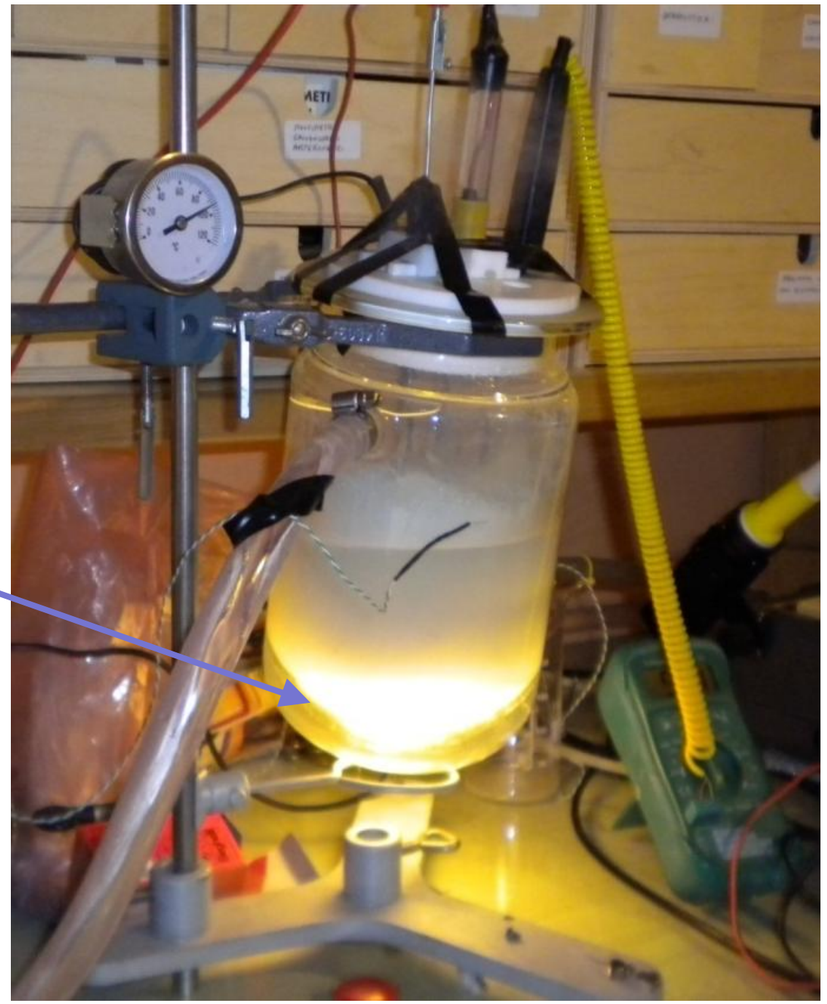
anode

operative conditions

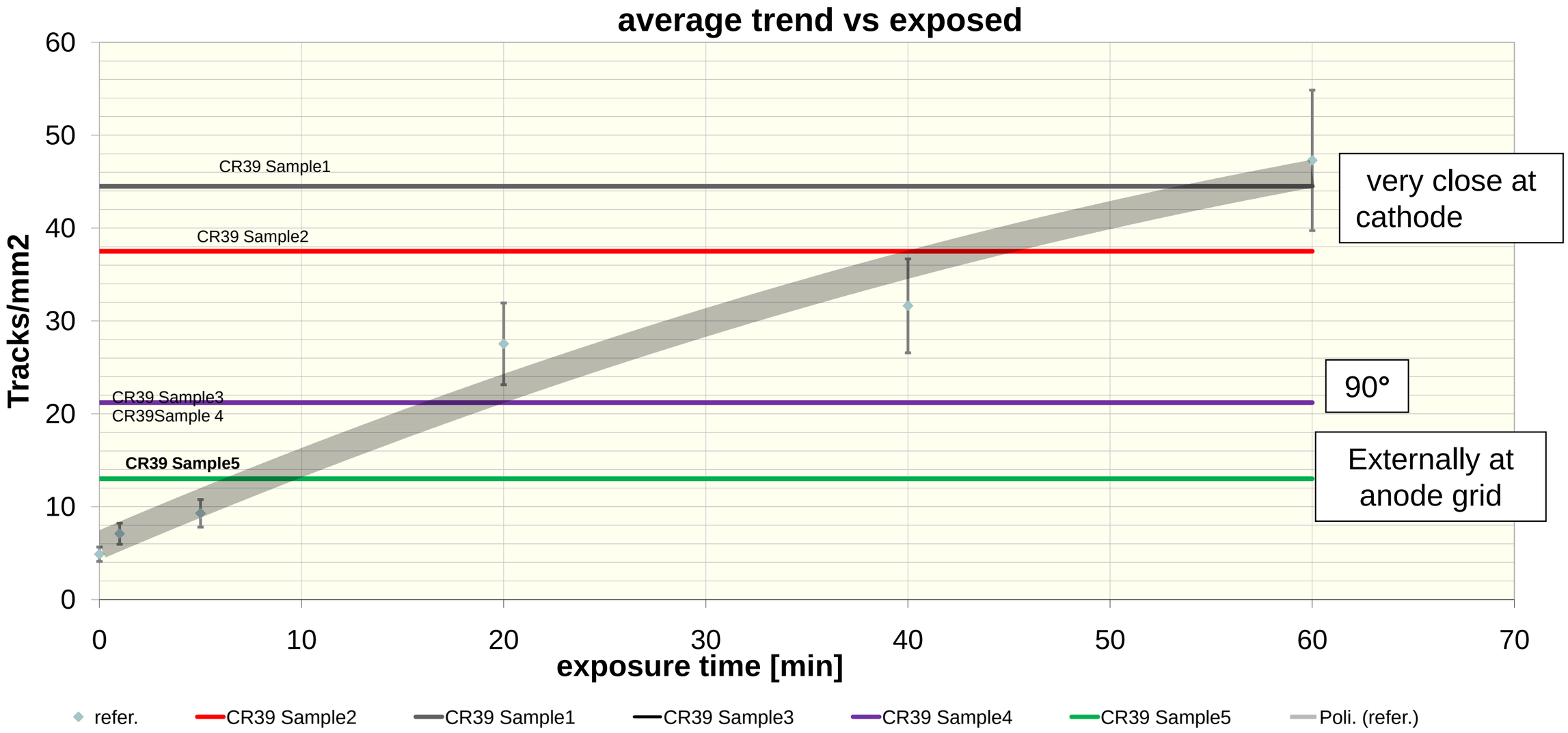




Dosimeter after a run very close at cathode



Tracks comparison (CR39)

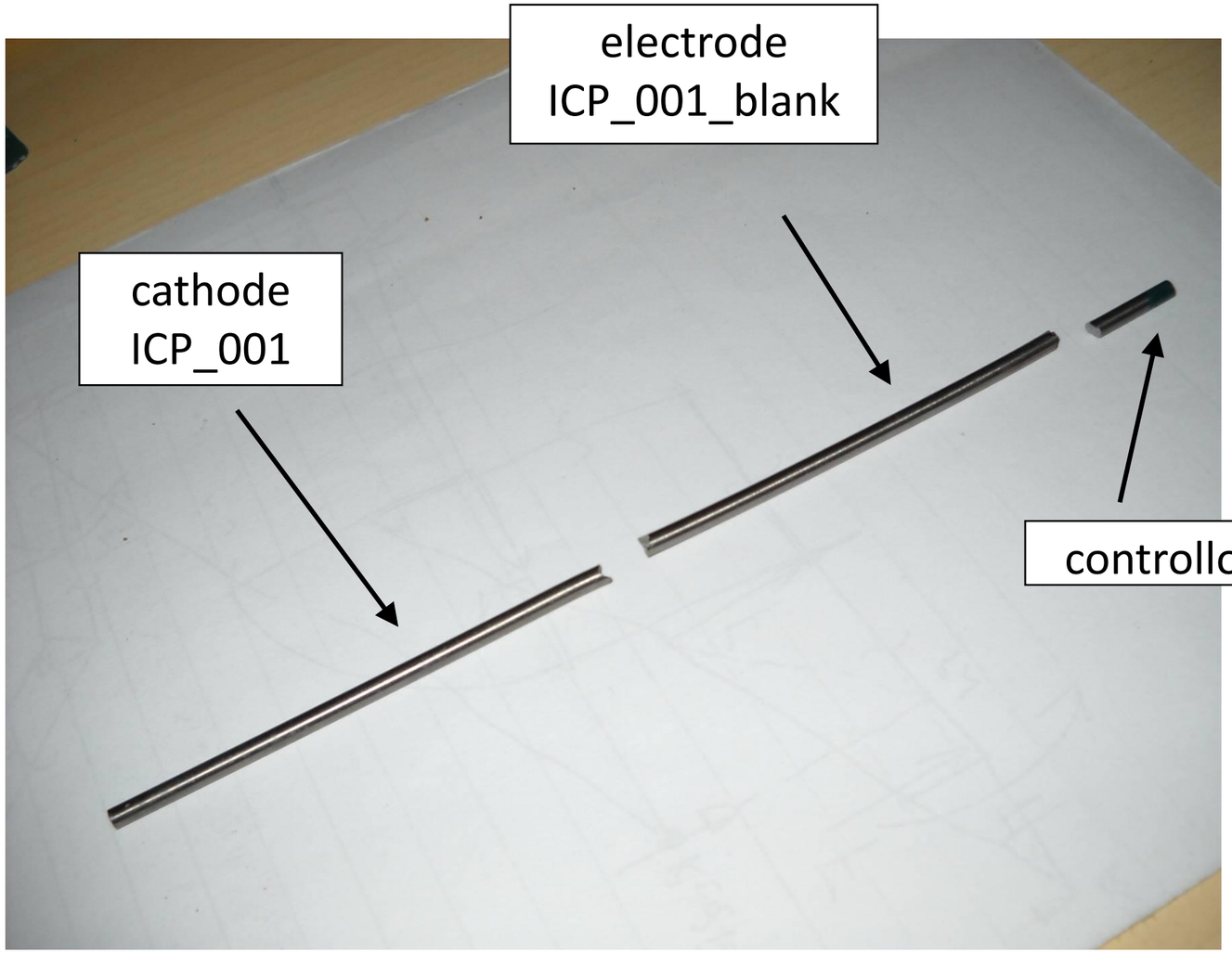


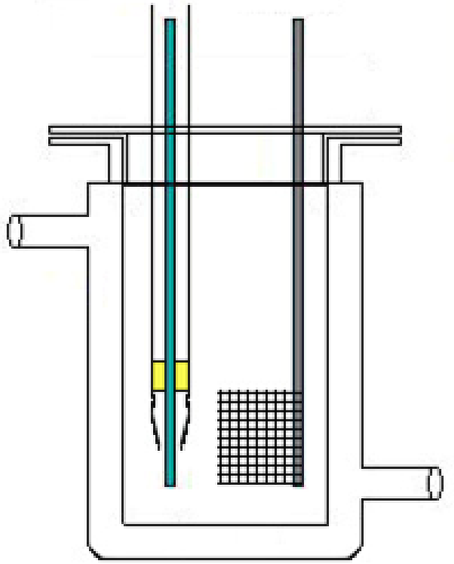
IMPORTANT NOTES

- **The neutron detection method based on CR-39 nuclear track detectors, coupled with a boron converter, has demonstrated neutron generation by plasma discharge in an electrolytic cell with alkaline solution.**
- **A significant number of tracks were revealed by the CR-39 detector samples positioned in close proximity to the plasma discharge, next to the tungsten cathode of the electrolytic cell.**
- **the blank detectors show no tracks, if positioned far from electrolytic cell.**

NUCLEAR TRANSMUTATIONS

ICP analysis of electrolithic solution – 07/2012





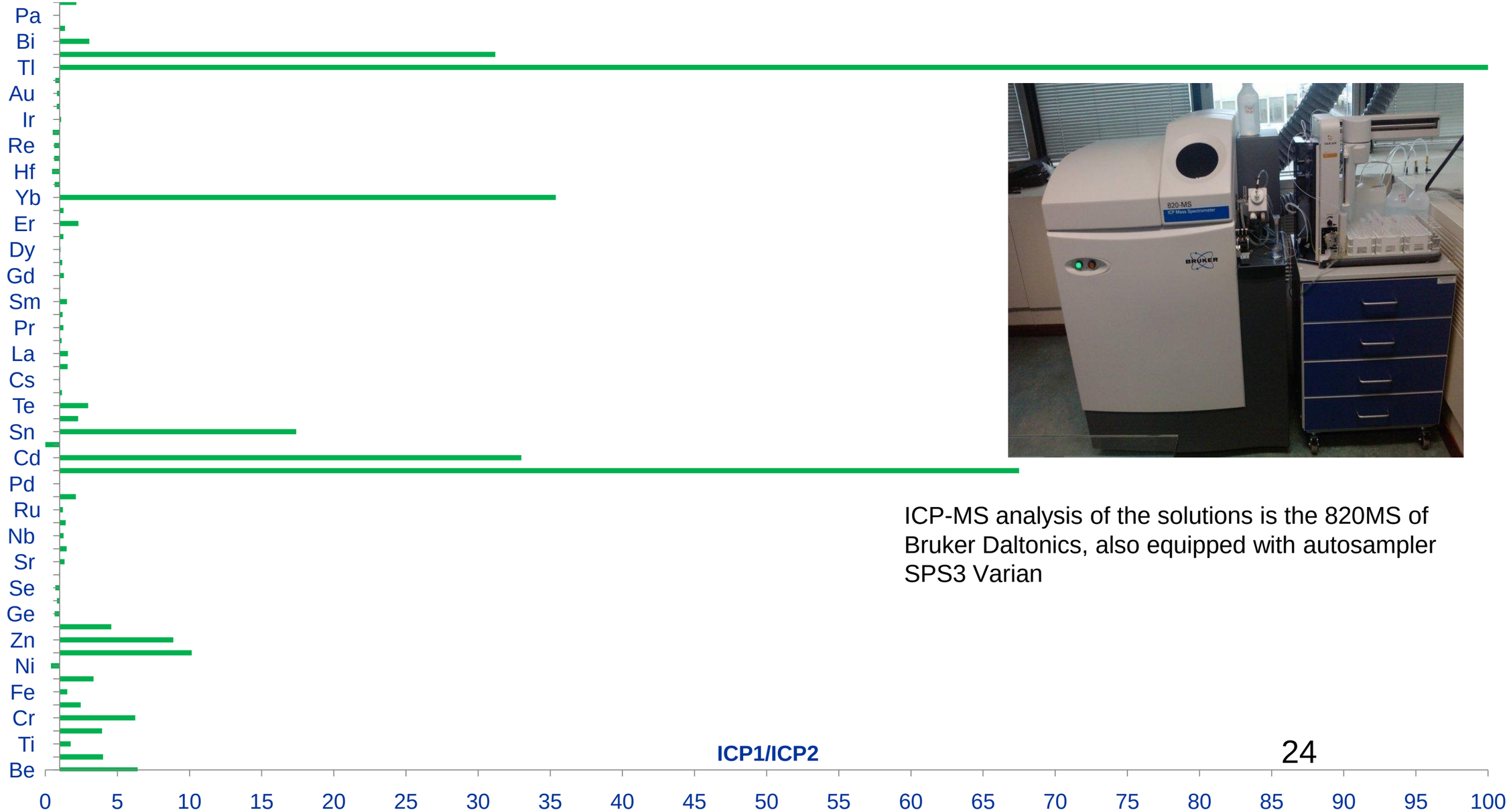
Test done using the same electrode (broken in 2 parts) on two tests,

The first one in a plasma test

The second one in a simple electrolysis test (same electric energy for both run).

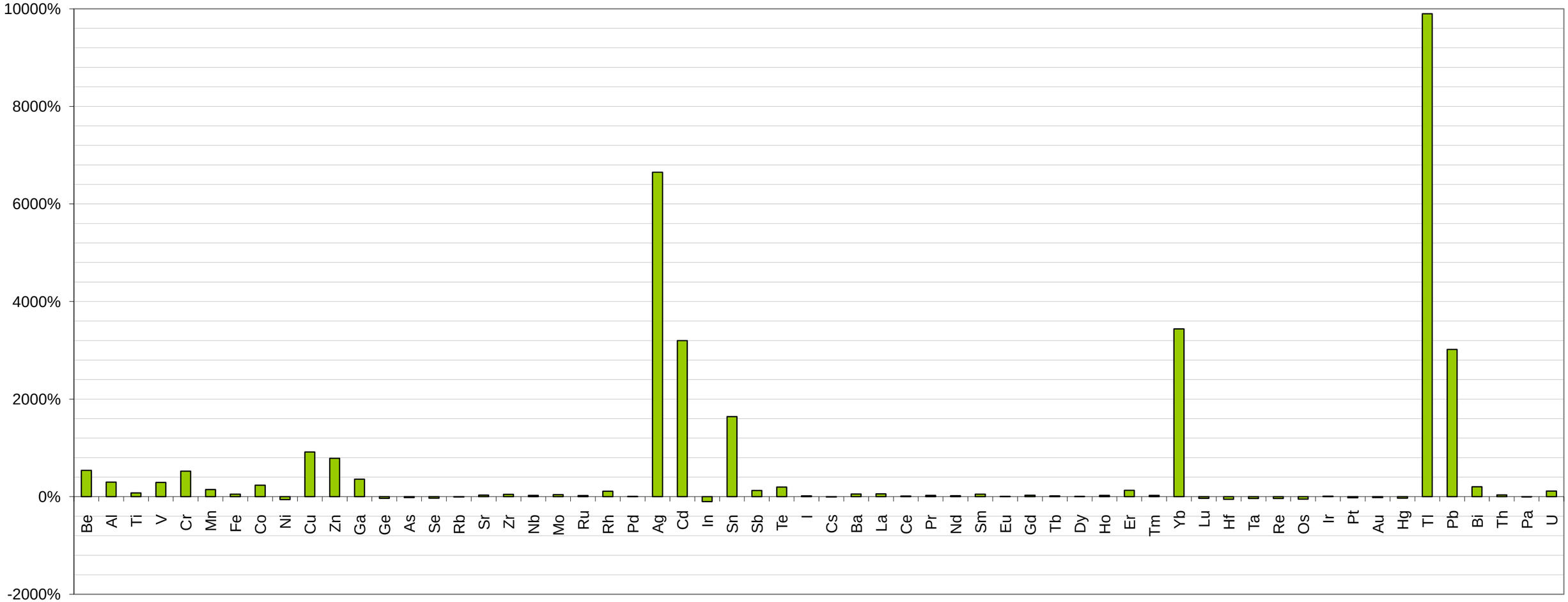
After each test, the cathode was dissolved in solution using electrolytic methods

ICP analysis of electrolithic solution (I)– 07/2012



ICP-MS analysis of the solutions is the 820MS of Bruker Daltonics, also equipped with autosampler SPS3 Varian

ICP analysis of electrolithic solution (I)– 07/2012



Several important increasements of composition, in terms of percentage and in terms of quantities, but also important decreasements, of chemical species (like indium, but also nikel, **rhenium, osmium, hafnium, platinum, gold,** mercure, germanium, arsenicum and selenium) not comparable to the increasing of new chemical elements after plasma action.

analisi ICP della soluzione elettrolitica (II) – 06/2012

I valori di concentrazione espressa in parti per milione degli elementi richiesti sono riportati nella tabella seguente.

	Re	Os	Au	Pt
A [ppm]	0.13	0.26	2.59	0.47
Std dev	*0.0145*	*0.0232*	*0.0215*	*0.00275*
B [ppm]	0.004 (tracce)	0.06	*Inf. limiti di detezione*	*Inf. limiti di detezione*
Std dev	*0.0023*	*0.0299*	--	--

Oro e platino nel campione "B" risultano inferiori al limite di rilevabilità dello strumento.

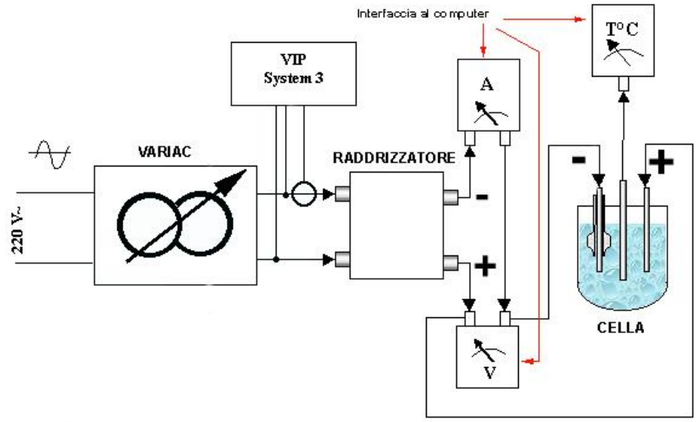
CONSIGLIO NAZIONALE DELLE RICERCHE
National Research Council of Italy
ISTITUTO DI GEOSCIENZE E GEORISORSE
Institute of Geosciences and Earth Resources
SEZIONE di TORINO

UNIVERSITÀ DEGLI STUDI DI TORINO
ALMA UNIVERSITAS TAURINENSIS
Università degli Studi di Torino
DIPARTIMENTO DI SCIENZE DELLA TERRA

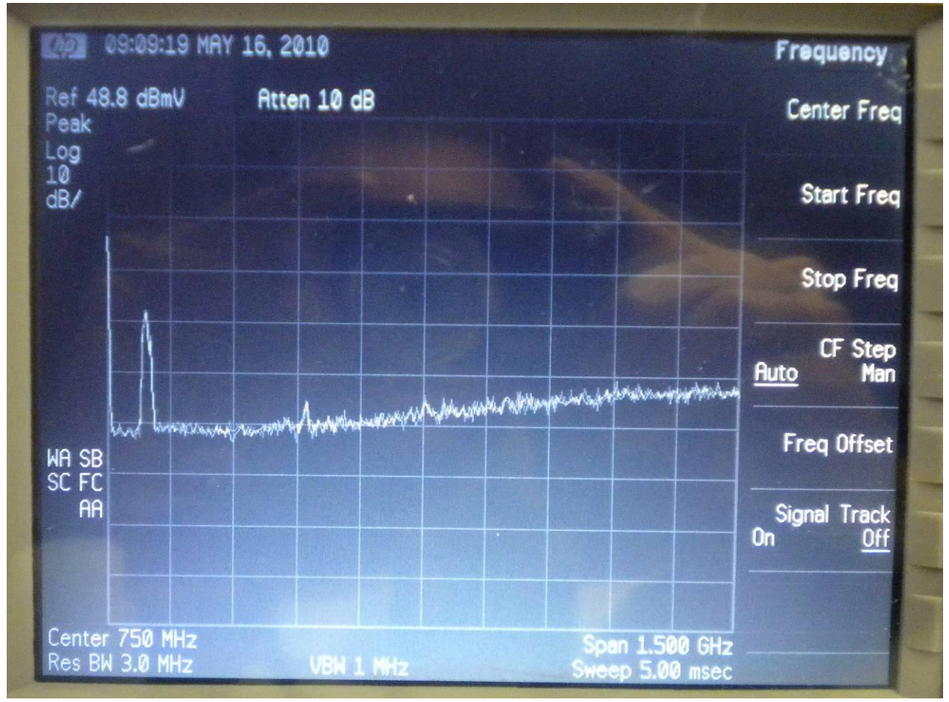
ICP analysis independent, performed by an important Italian research institution showed similar abnormalities in the composition of the solution that emerged after the step of plasma prolonged.

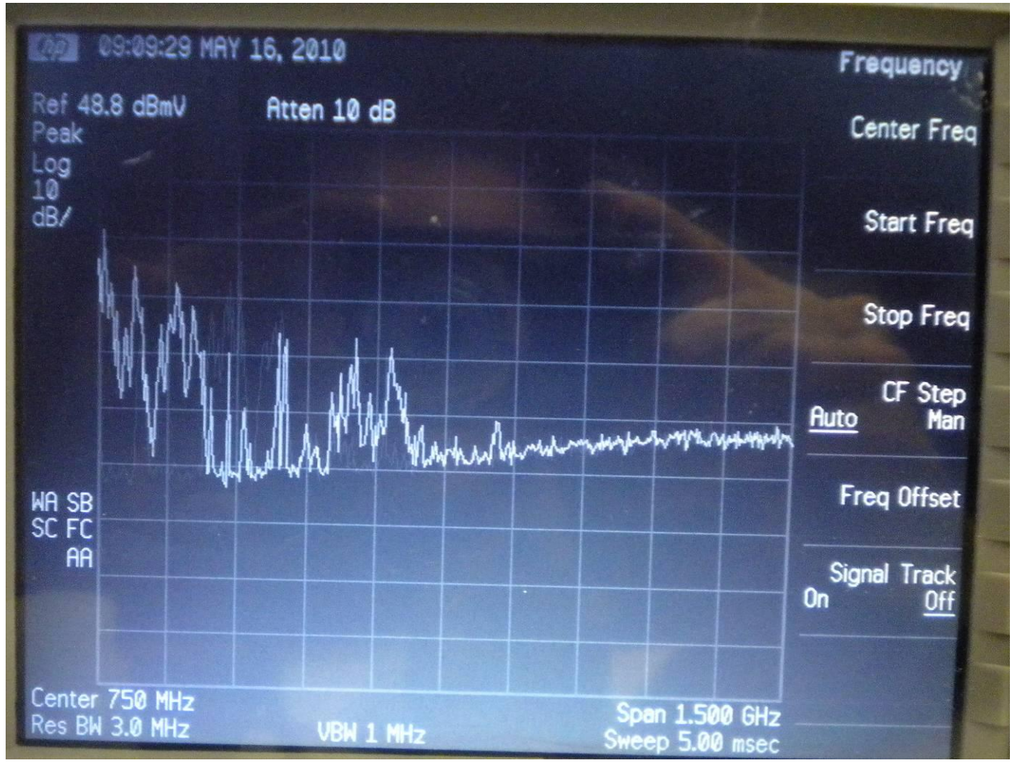
ENERGETIC ANOMALIES

Previous experimental campaign

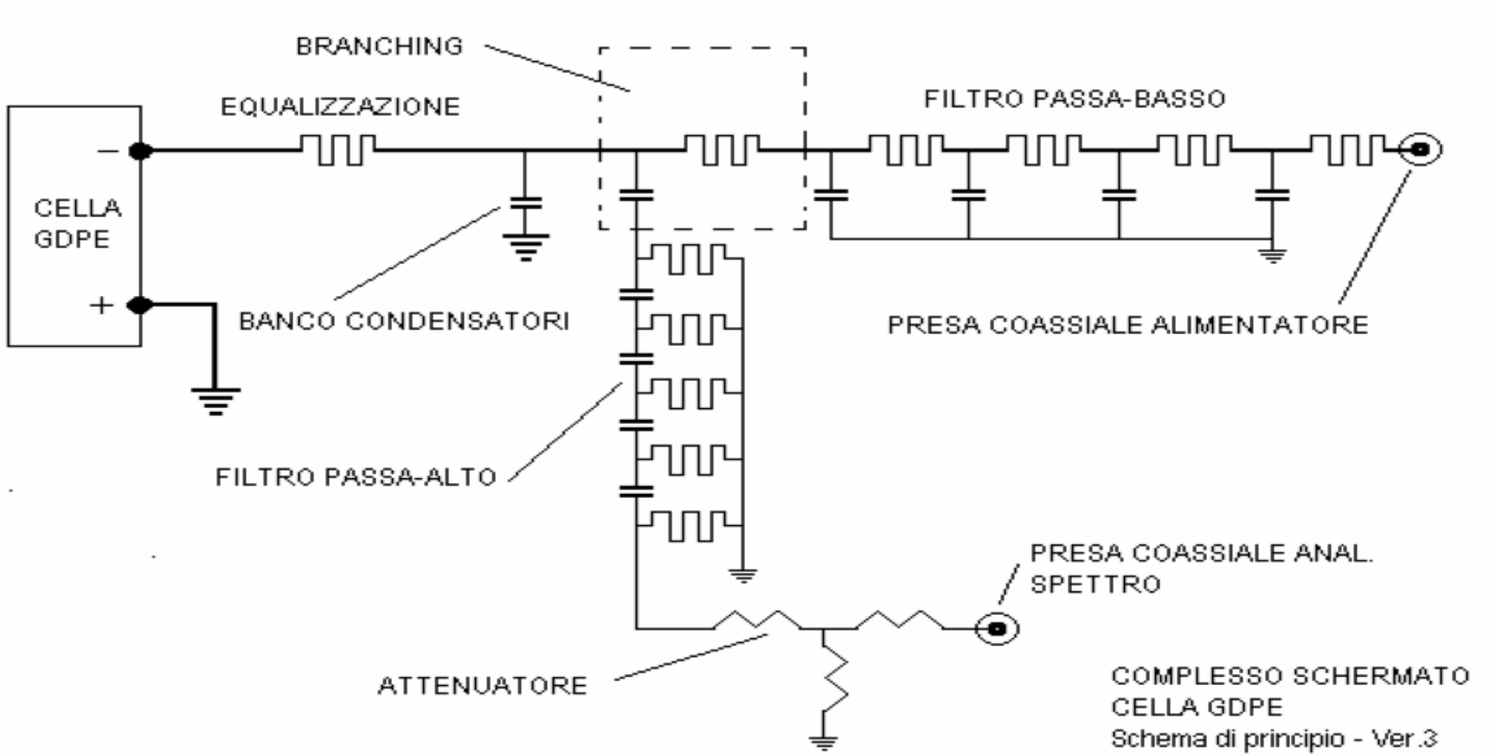


All previous measurements were affected by errors related to the underestimation of the input energy due to the inadequacy of the instruments in the detection of all components induced plasma, mainly in the high frequencies





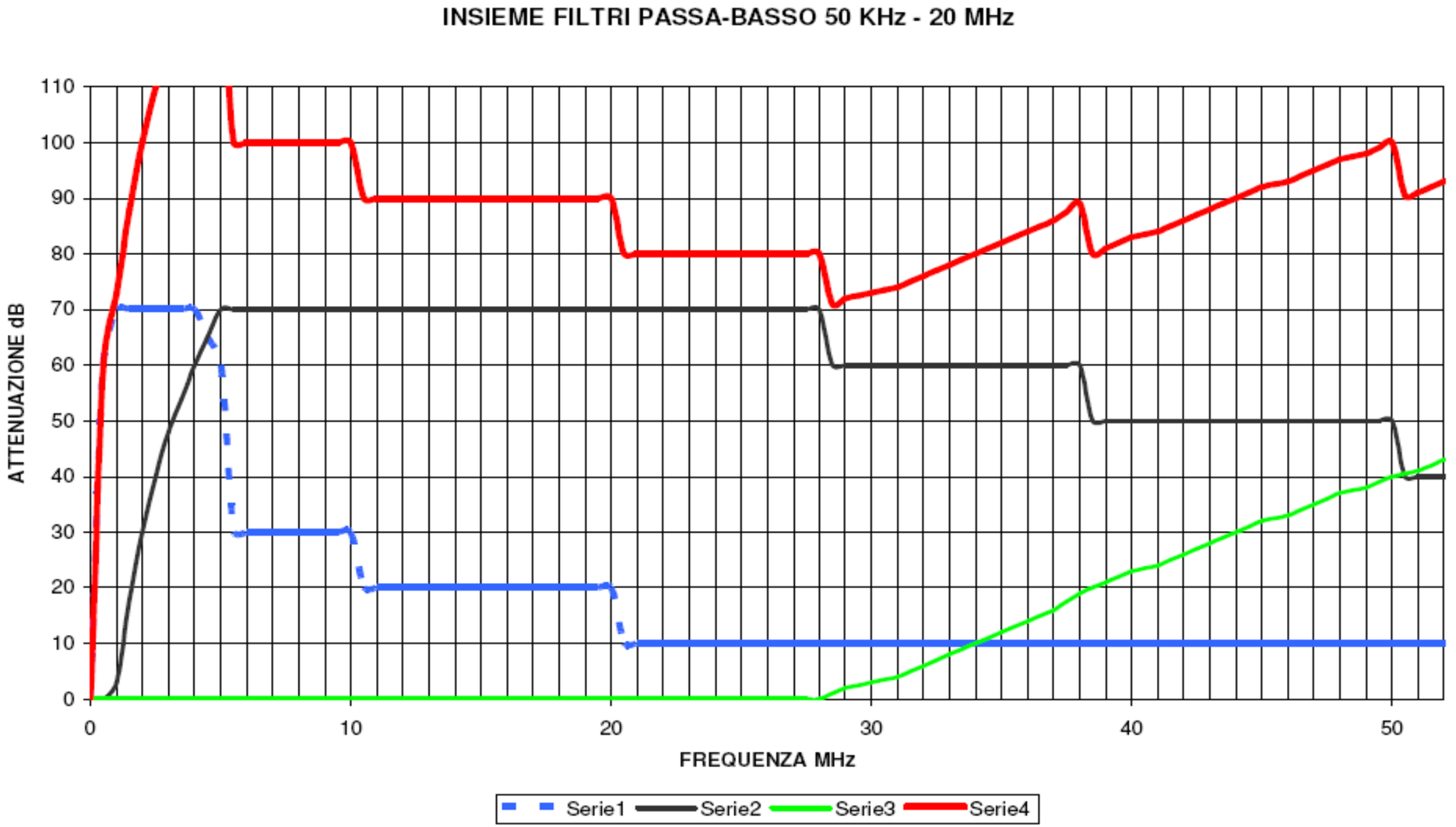
Measurements in progress



The cell was equipped with a stabilized power supply and noise filtration system.

The cell and its connections are enclosed in a Faraday cage.

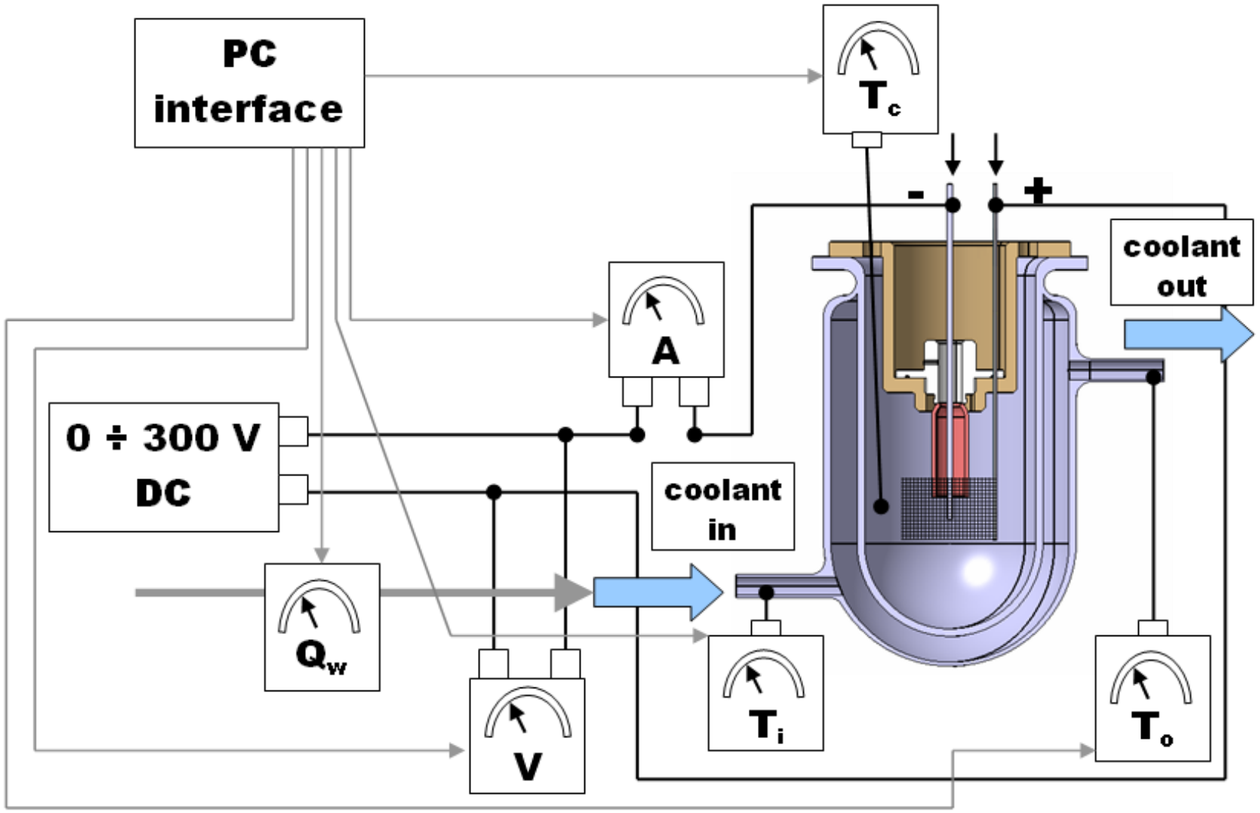
Measurements in progress



Calculating attenuation system low - pass filters

(blu = 50kHz, black = 500kHz, green = 20MHz, red = risultante)

Measurements in progress



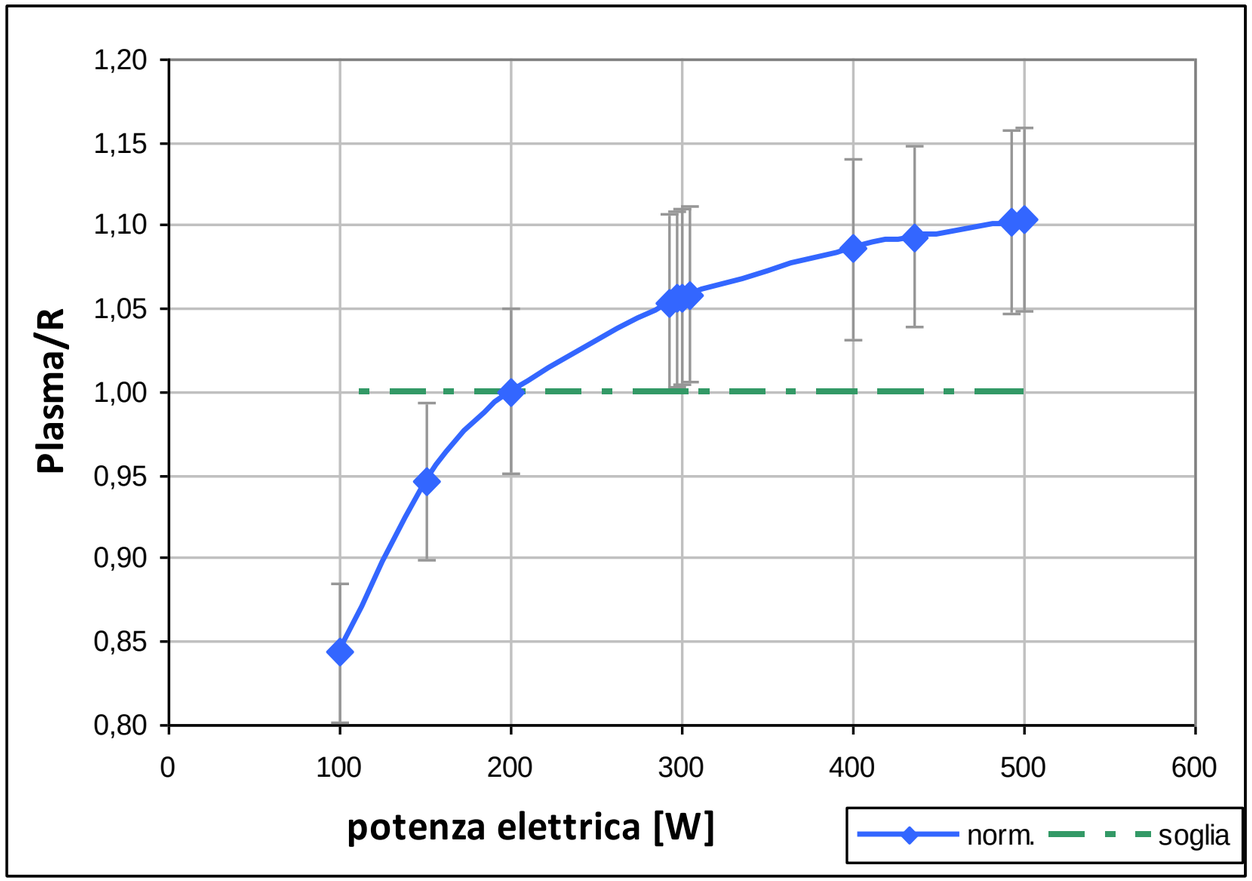
All the measurements performed so far with this system are constrained from having a flow rate of the cooling fluid set by the circulation pump and the thermal exchange between the fluids of measurement through the glass.
These two features represent two substantial limitations:

- impossibility of control of the T cell (thus the plasma)
- calorimetric measurement times with 'shift' with respect to an electrical stimulus due to the characteristics of the glass

The last correction to be made to the measuring system cell is the implementation of the measuring system calorimetric which represents a major limitation in the analysis of the cell to the low response speed

Measurements in progress

Despite the limitations imposed (obligation to long-term tests, no control on the T cell, no check on the flow rate) which determine the scatter of the calorimetric anomalies of short duration, they are measured anomalies that require the need for system analysis.



Future

- **The first preliminary measurements and the first results are NOT definitive. Its are just PRELIMINARY evidencies for a long and deep investigation.**
- **From the point of view calorimetric the way is already marked and characterization of the plasma will be performed through the steps already described relative to electrical measurements, and calorimetric.**

GRAZIE