thin film and

pvsolutions

gencoa

components for sputter
deposition, process control
and plasma treatment

Gencoa offer the following range of products & process technology for the thin film industry developed over the last 20 years

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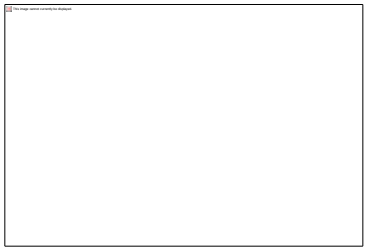


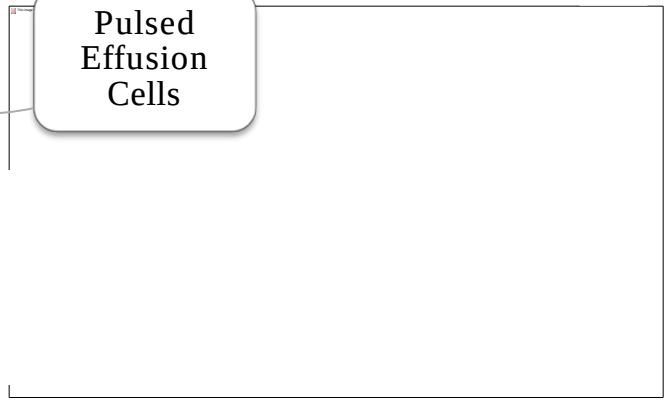
Planar Magnetrons

Plasma Pre-Treaters

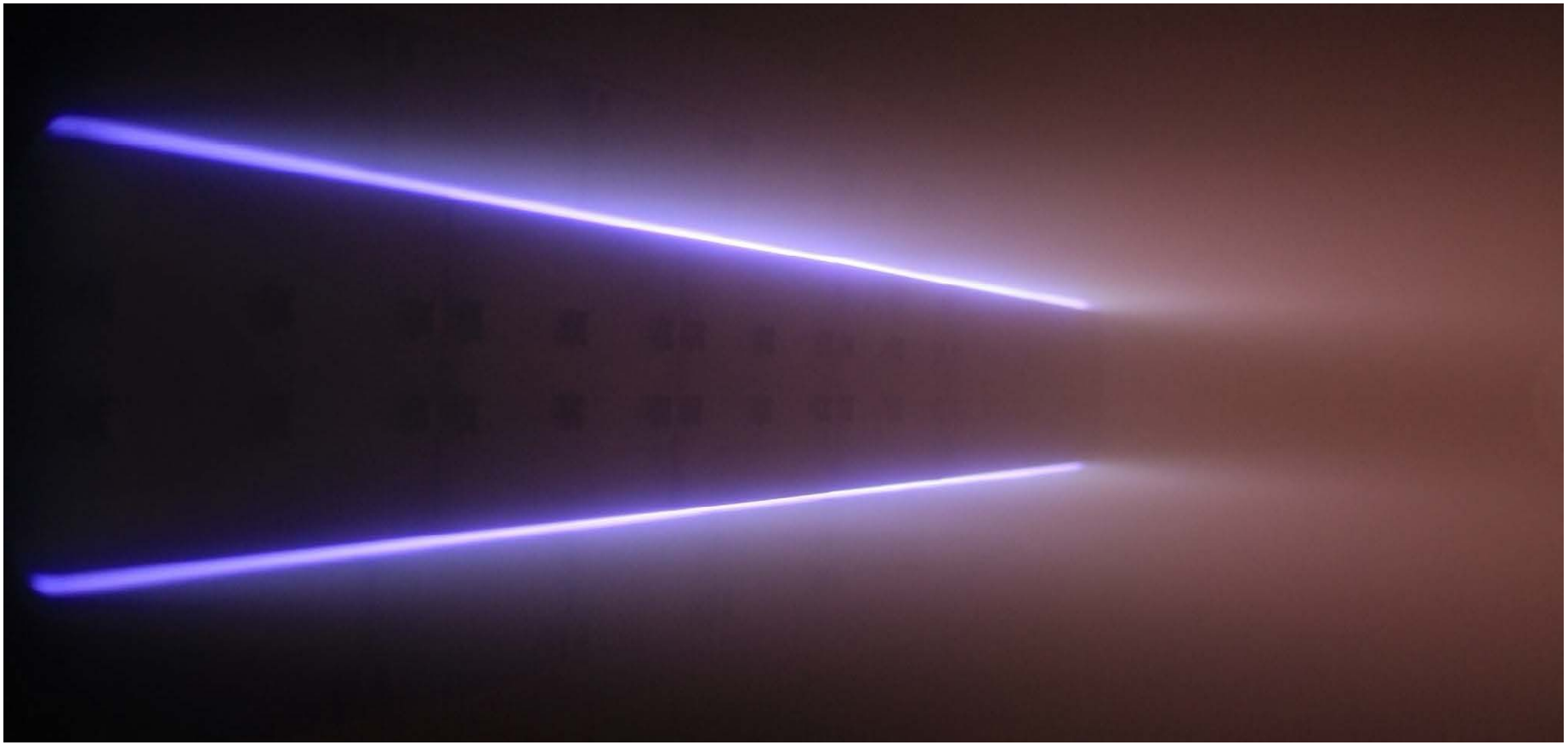
Rotatable Magnetrons

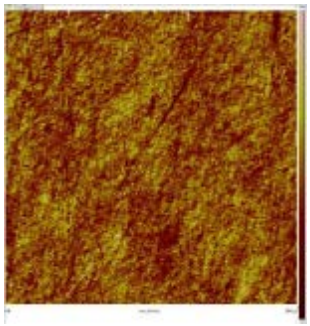
Reactive Gas Control

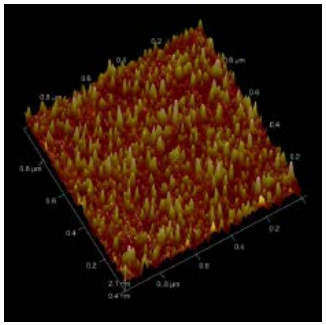
Pulsed Effusion Cells



Plasma Treatment Sources







Linear ion sources

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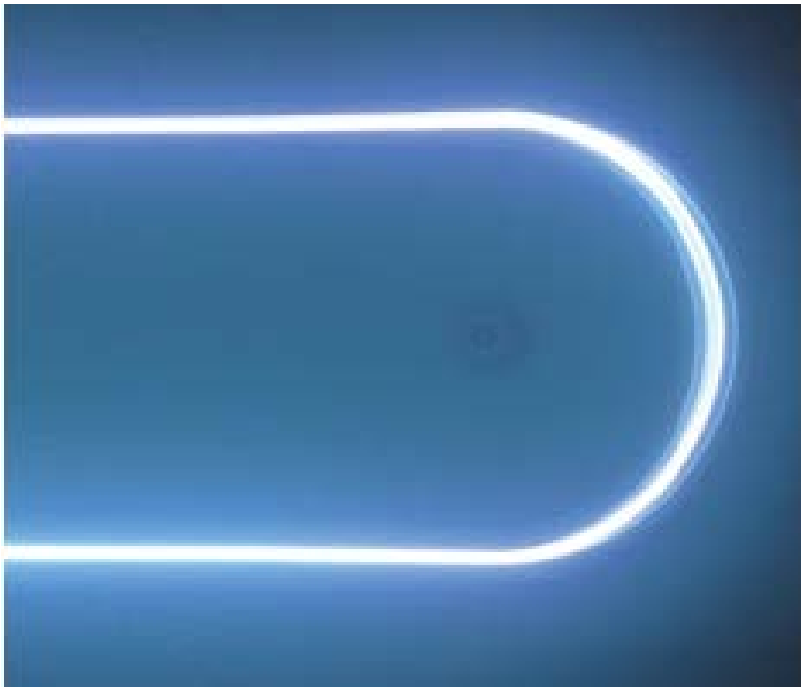

Linear ion sources

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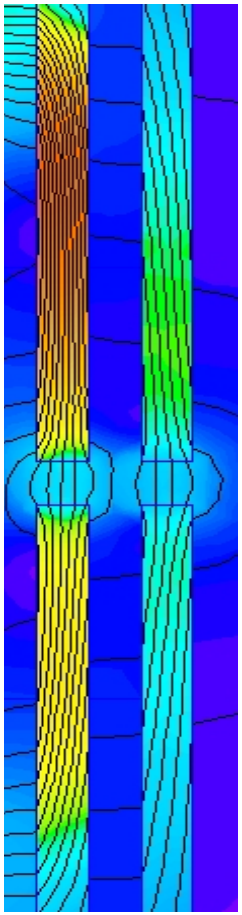
Key Advantages



• **GENCOA** have developed an inverted magnetron type linear ion source to provide the best process solution combined with highly robust components:

• Optimized magnetic fields to produce a collimated plasma beam at standard sputtering pressures.
• Graphite anode and cathode to protect the substrate from contamination and provide long-life components.
• RF standard electrical insulation on all ion sources.
• In-direct cooling of anode and cathode – quick switching of parts.
• Easy switching of cathode parts to provide multiple magnetic traps for lower voltage operation, or a focused beam.
• Voltage regulated power supply with gas adjustment feedback to maintain same current at all times.

Linear ion sources

Concept of operation based upon space plasma thruster devices

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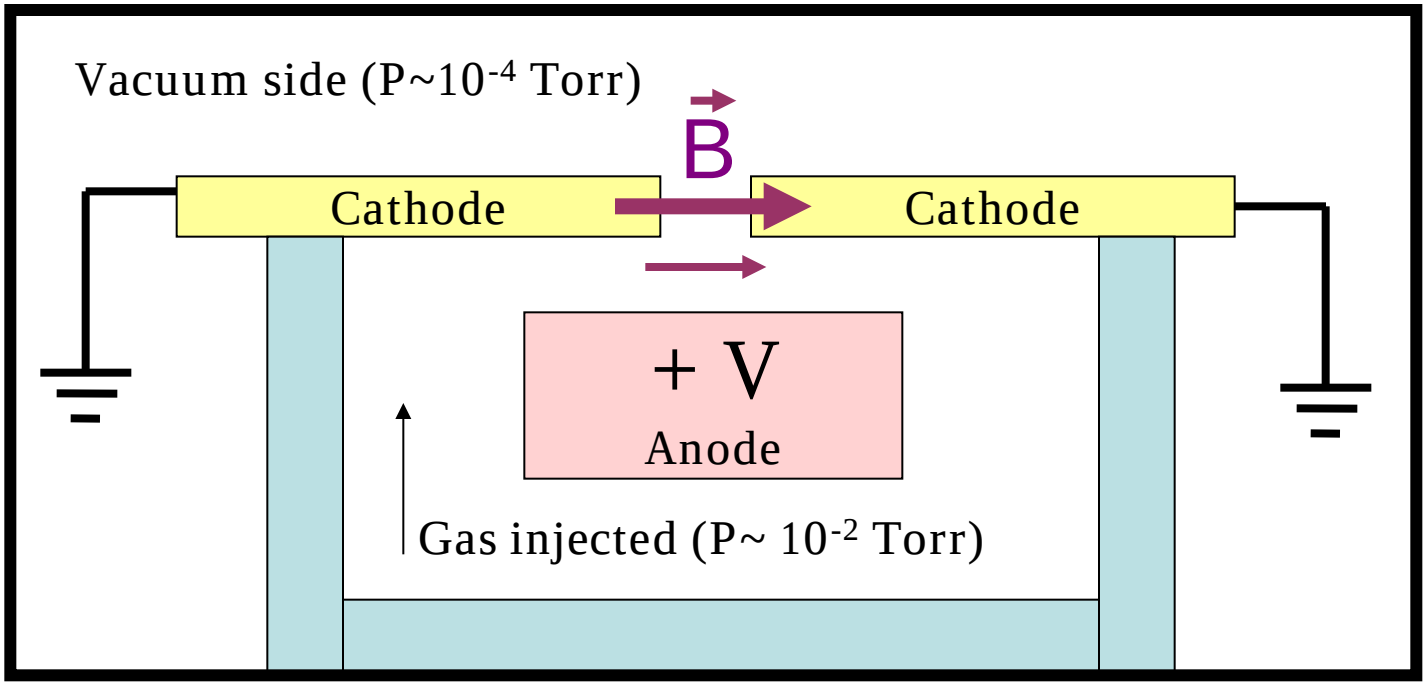
- **A plasma jet is generated by the combined closed magnetic trap, high voltage between anode and cathode, and correct pressure – gas flow through the magnetic trap.**



Energy of the ions are an average of the discharge voltage / 2

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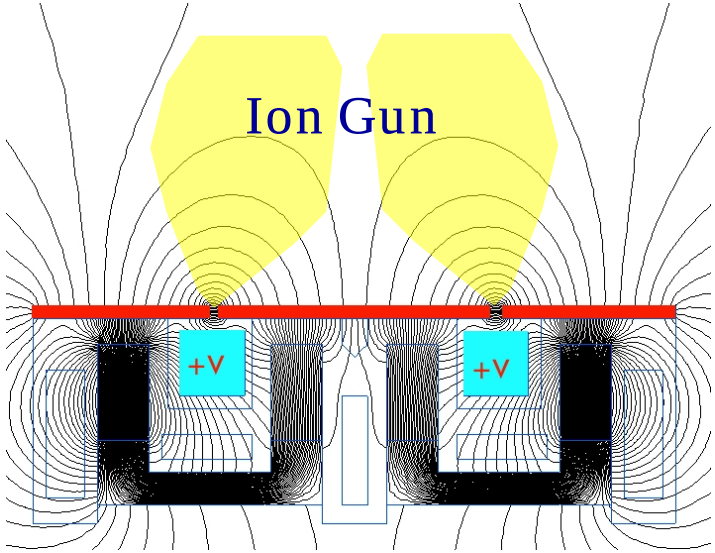
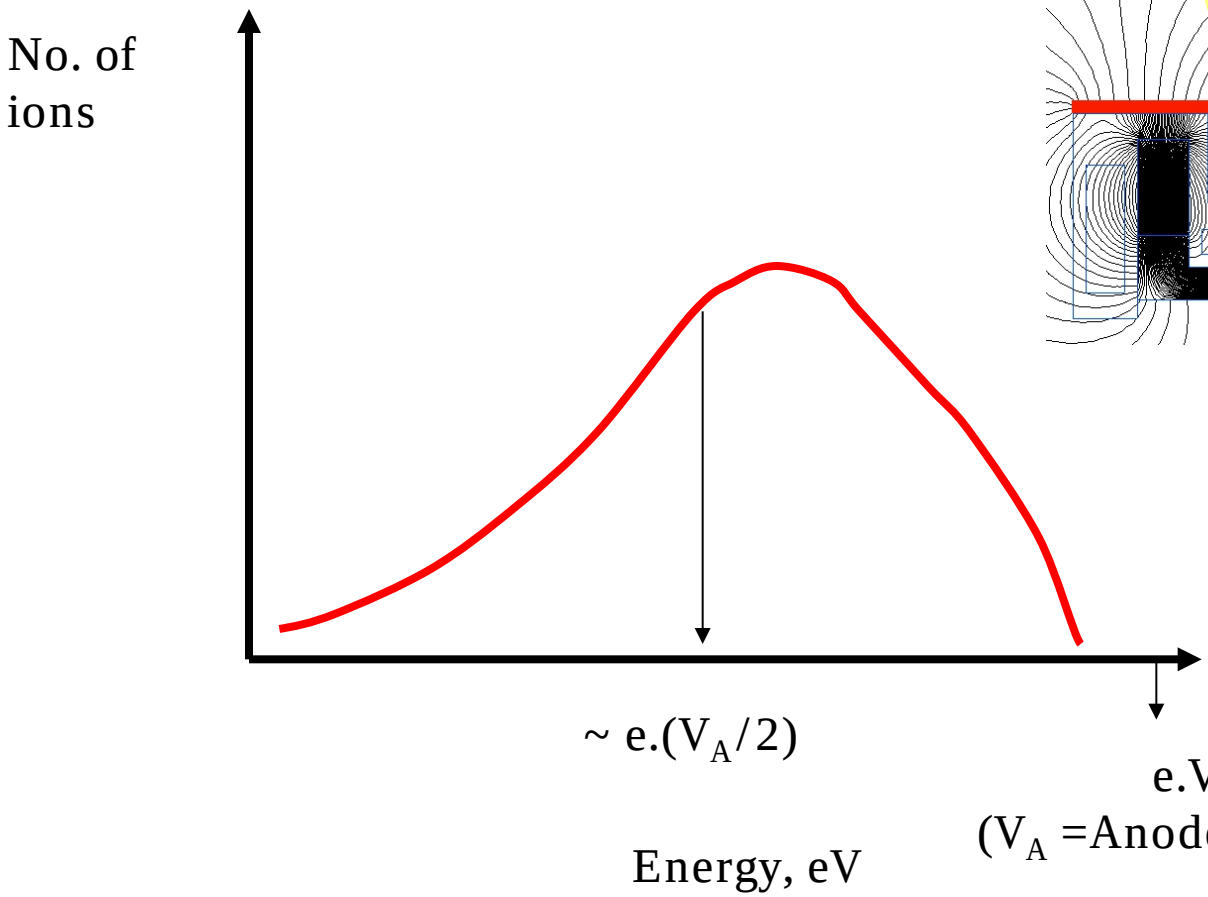
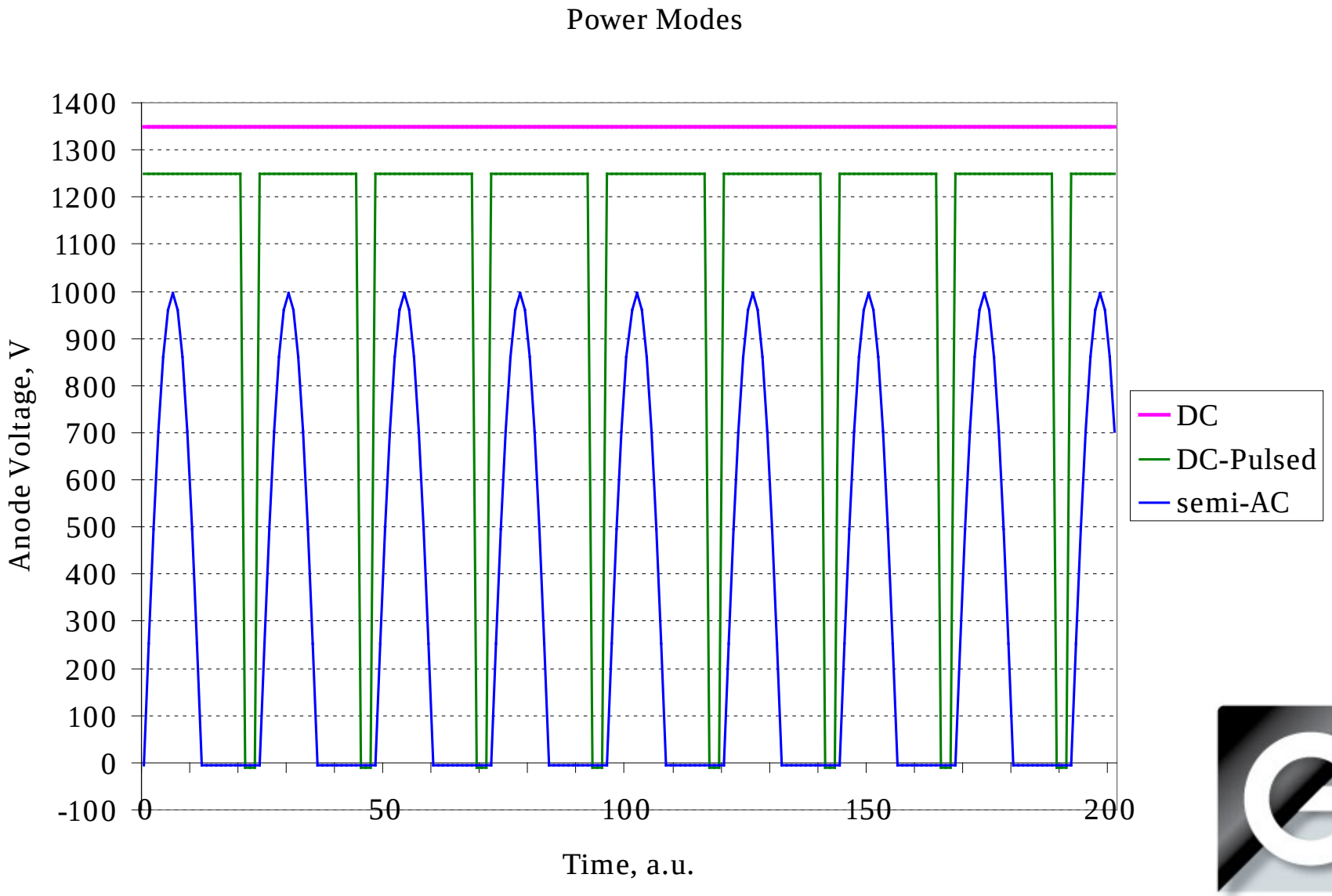
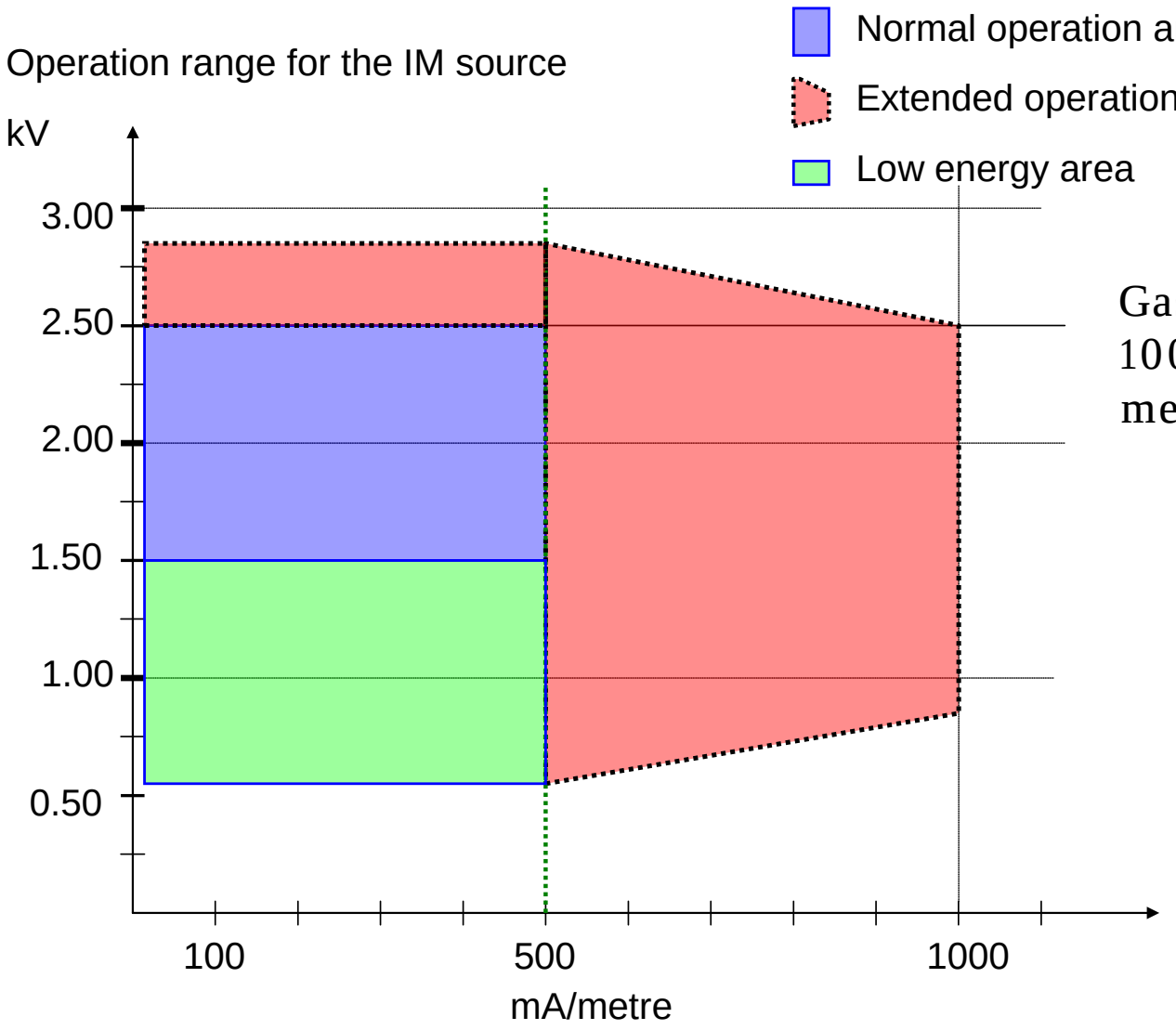




Various power modes are possible, but DC is standard



Typically the sources operate at upt0 1 Amp per meter length and at upto 100 sccm per meter length



Gas consumption: ~ 100 sccm argon per metre length

Lengths from 200 to 5000mm beams and internal / external mounting

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External mounting *im*300 with carbon cathode

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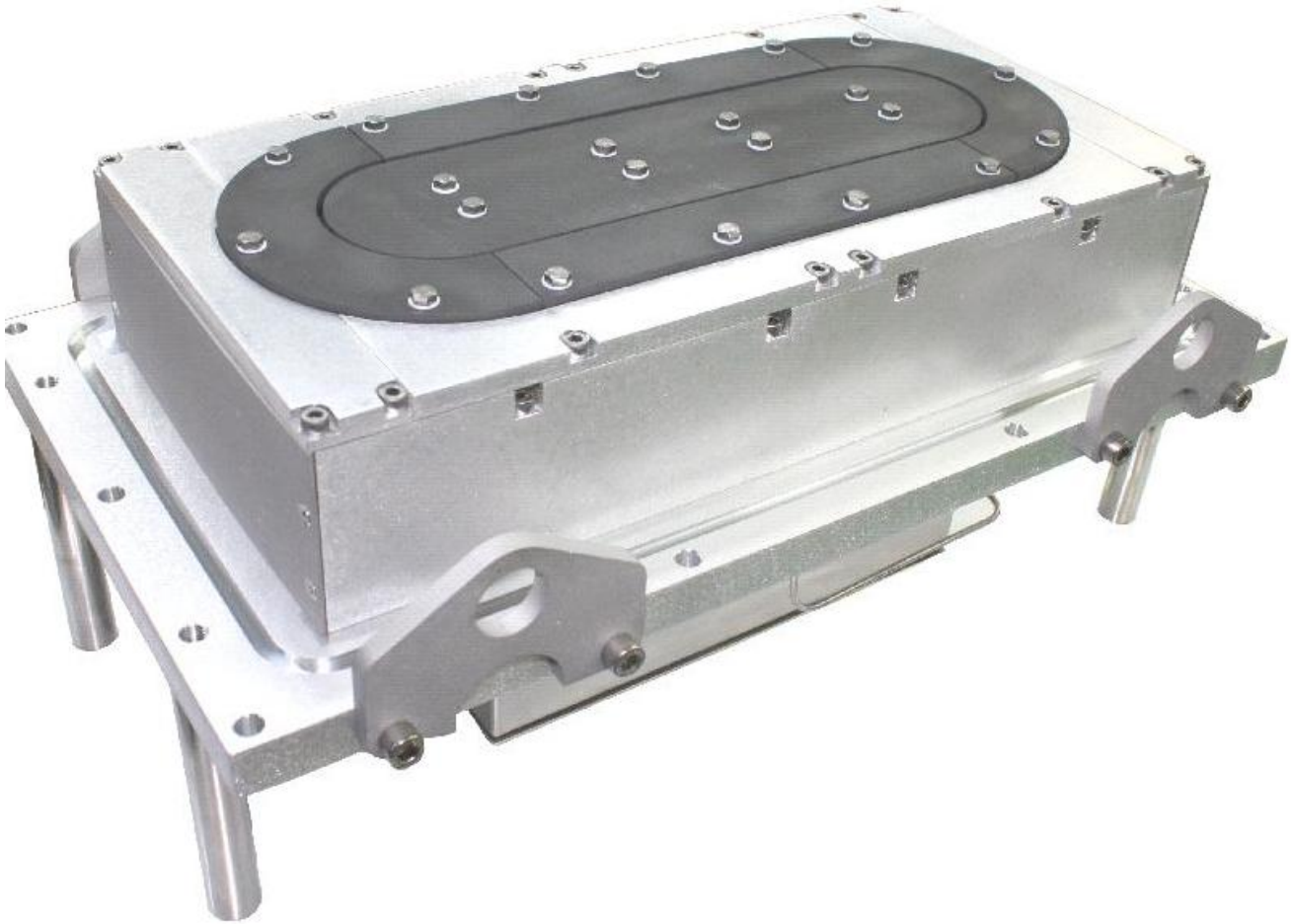

Internal mounting *im*400 with metal cathode and cantilever mounting

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Internal mounting *im*600 with carbon cathode and end support mounting

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Internal mounting *im*800 with metal cathode and end support mounting

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Internal mounting *im* 800 & 250 with carbon cathode and rear support mounting

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Internal mounting *im*1000 with carbon cathode and end support mounting

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External mounting *im*1500 with carbon cathode

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Internal mounting *im*2500

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Internal mounting *im* 4700 worlds longest linear ion source

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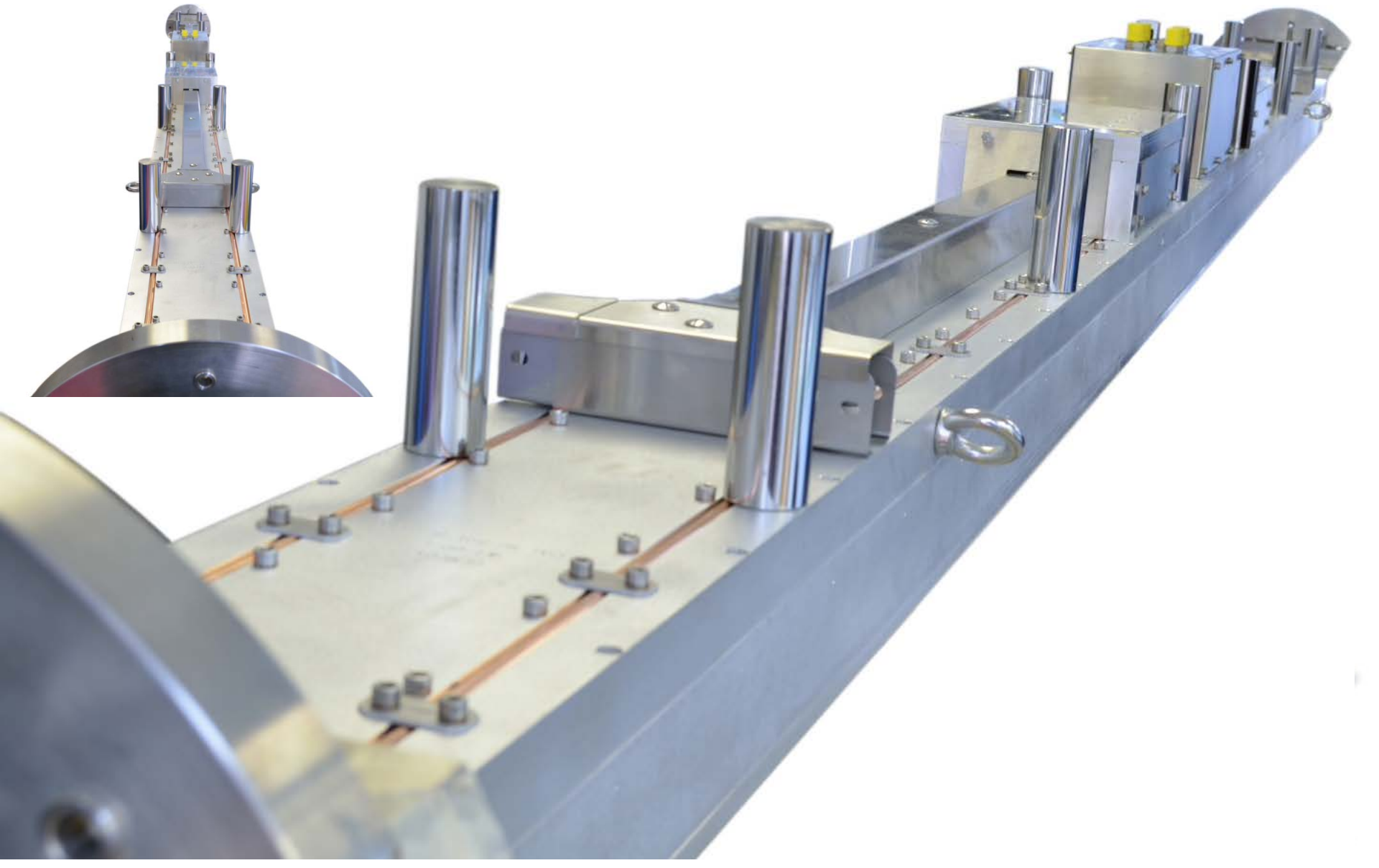

External mounting *im*1500 connection and utility details

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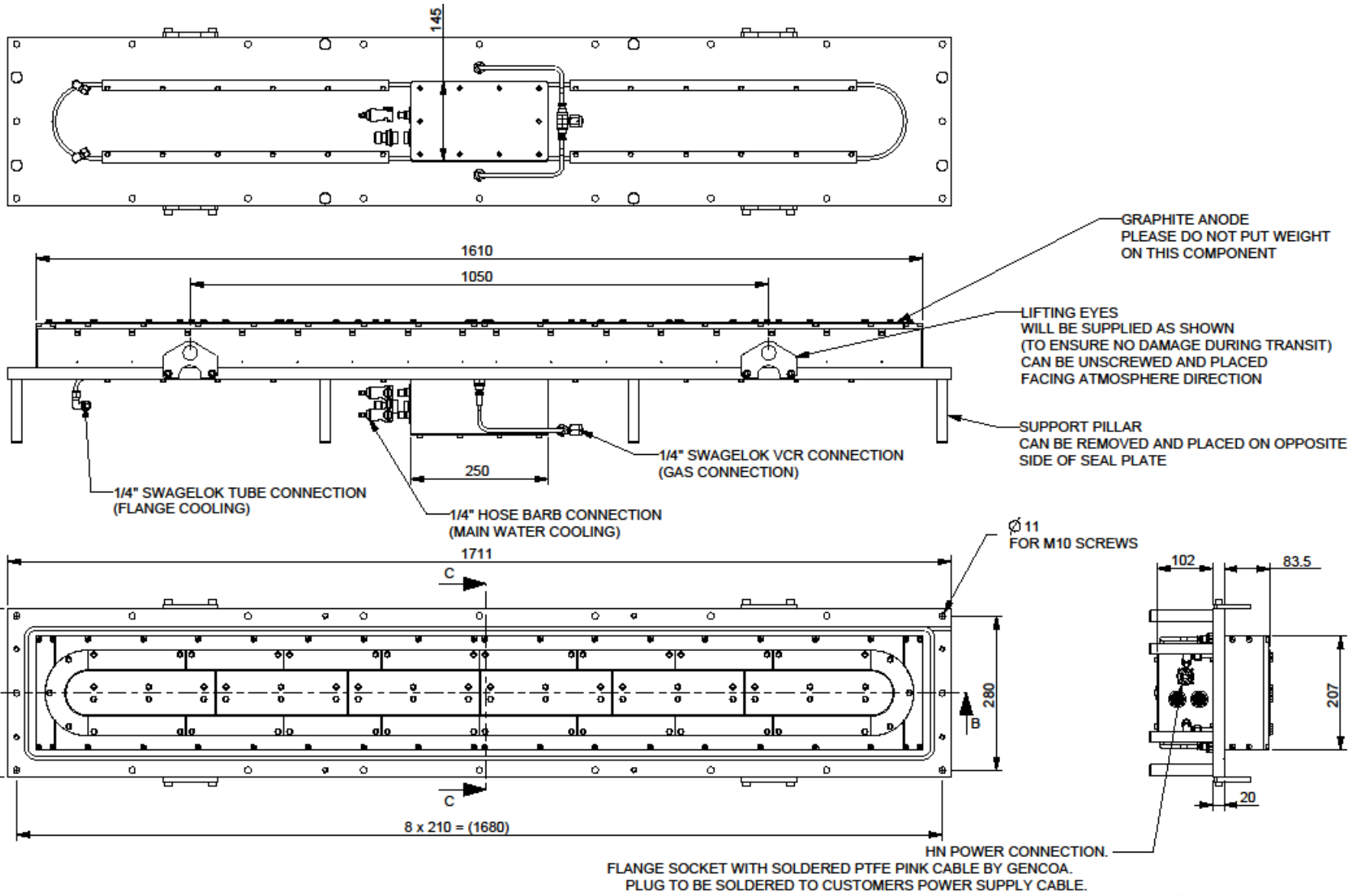
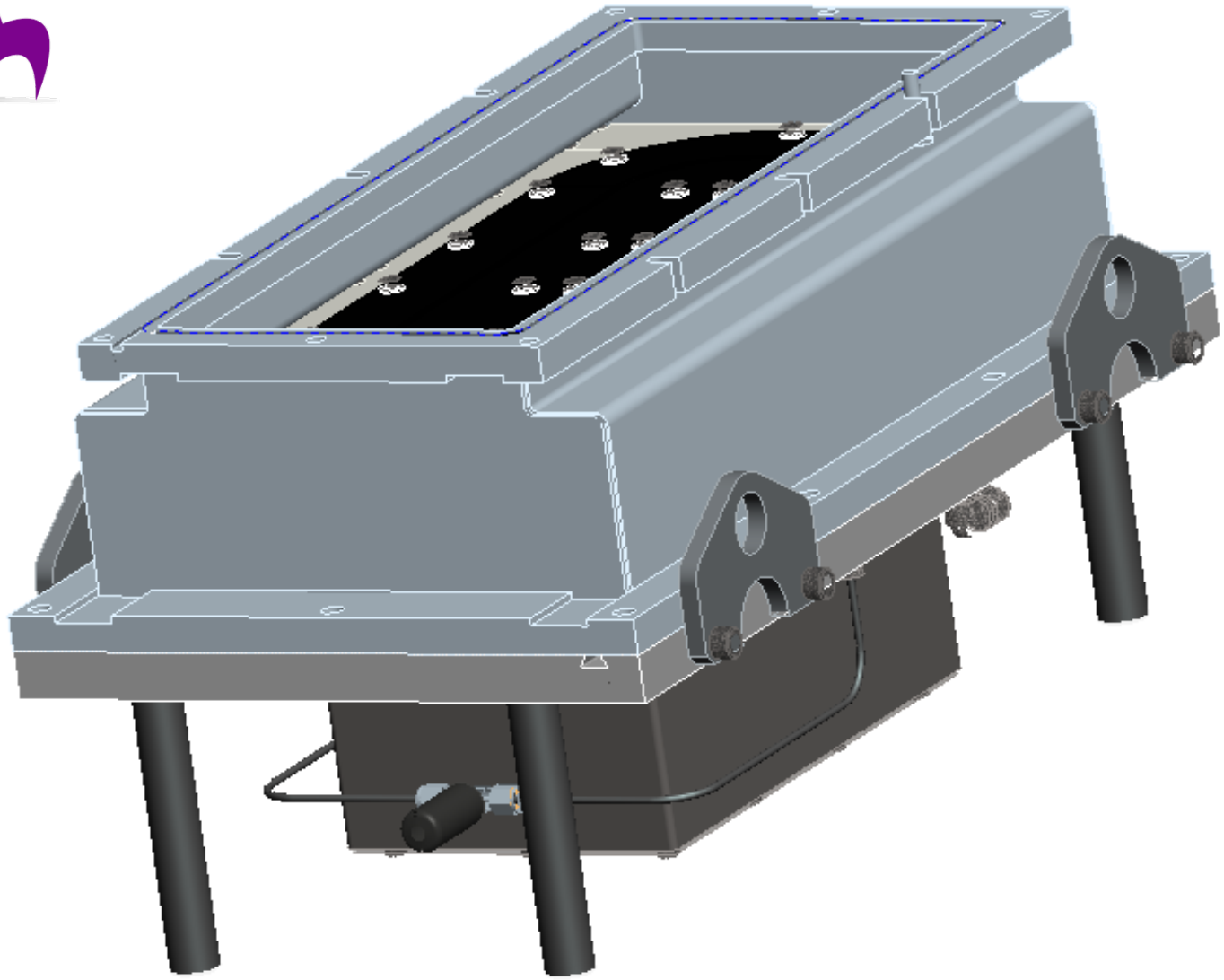
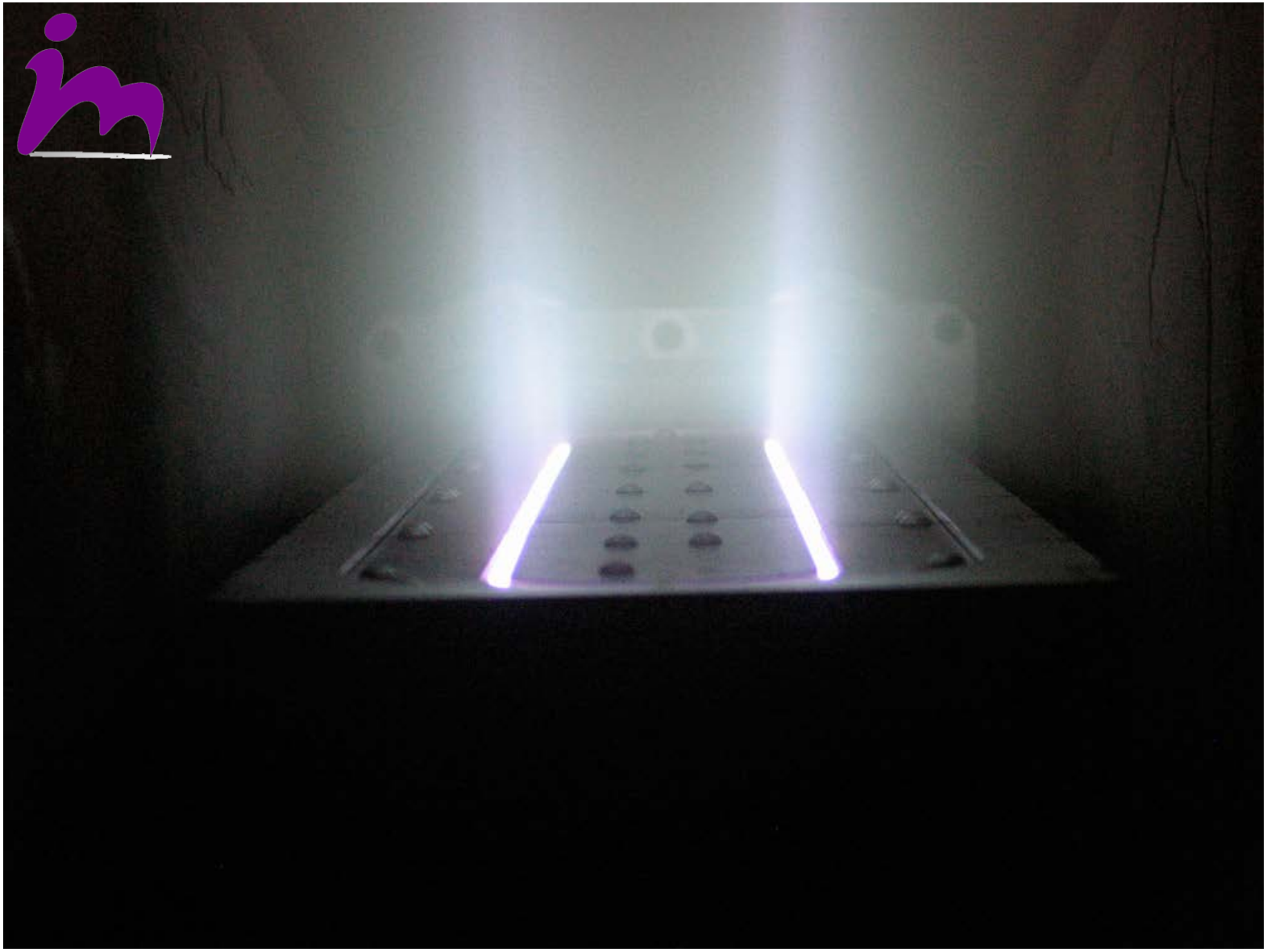


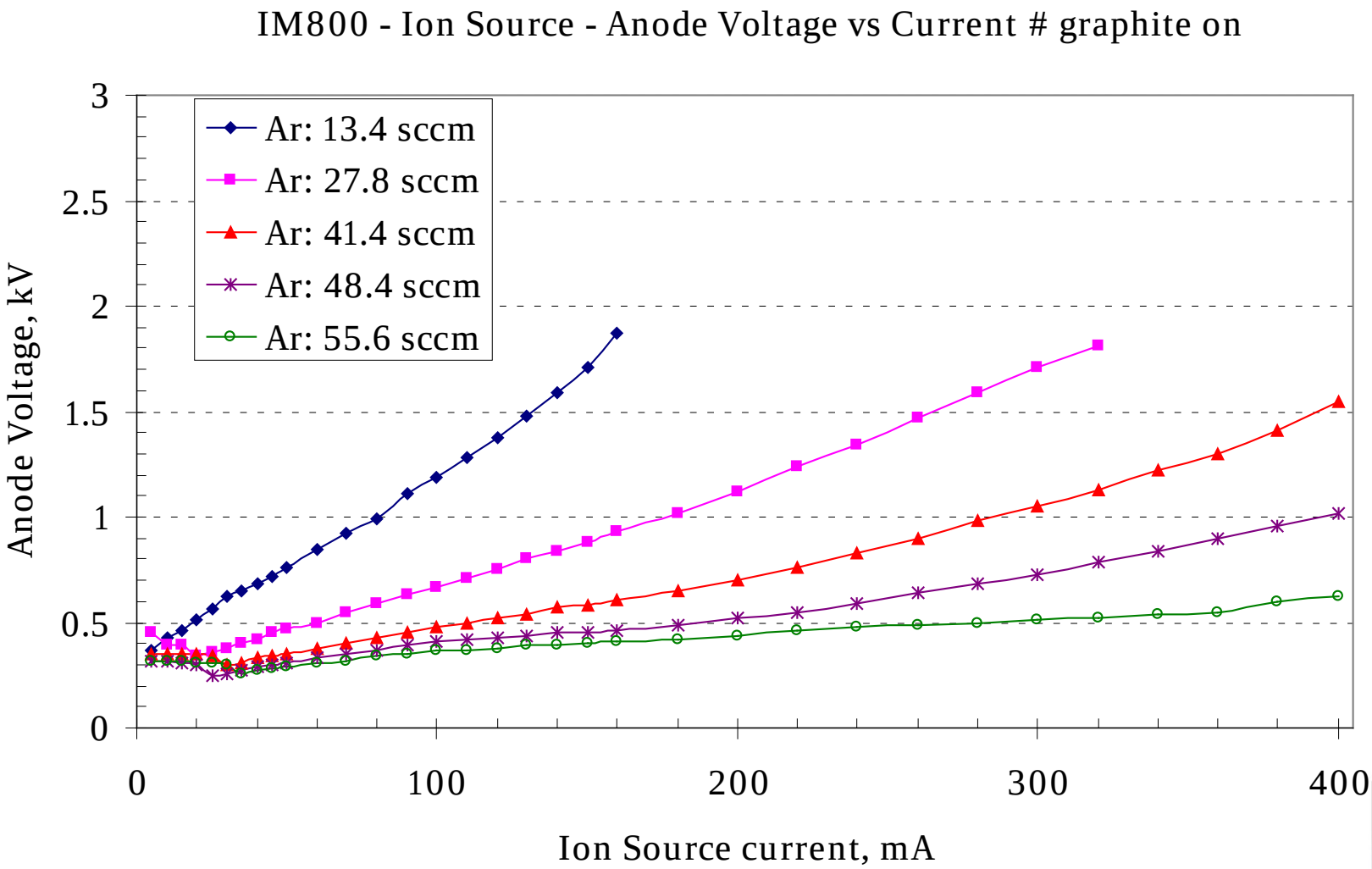
Adaptors available to convert to existing port designs – MRC type shown



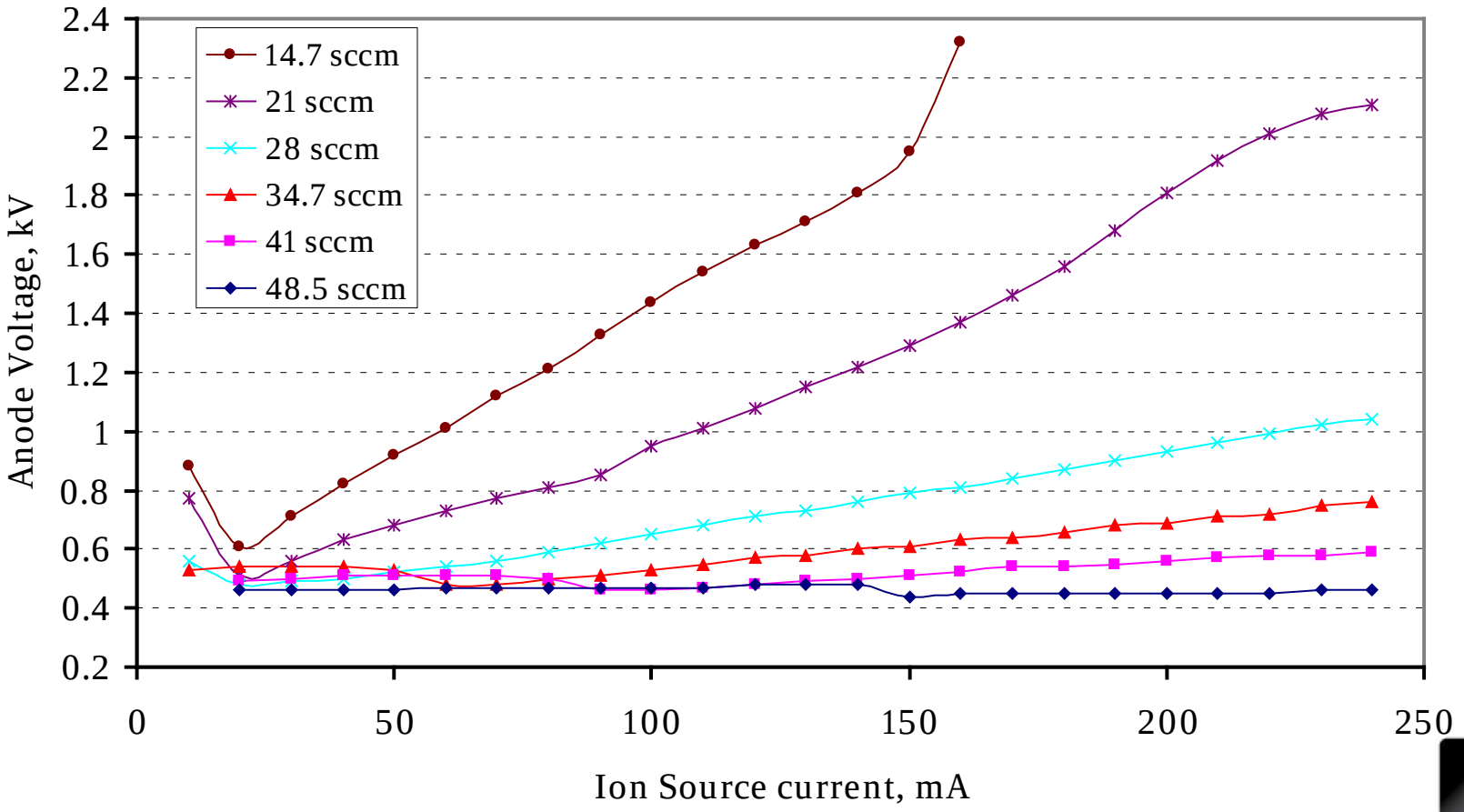
Standard straight beam arrangement



Standard straight and focused beam arrangement


IM800 - Ion Source - Anode Voltage vs Current # graphite on
Ar: 13.4 sccm
Ar: 27.8 sccm
Ar: 41.4 sccm
Ar: 48.4 sccm
Ar: 55.6 sccm
Anode Voltage, kV
3
2.5
2
1.5
1
0.5
0
0
100
200
300
400
Ion Source current, mA

IM400 V vs I plot for Ar flow rate (%)



Linear ion sources are typically used to pre-treat before sputter coating

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scalable robust devices based upon DC power

The Gencoa range of linear ion sources are a powerful means to liberate moisture and burn-off hydrocarbons before the sputter coating of the flexible web.

The linear ions sources work at sputtering pressures and with web speeds of <5m/min. For higher speed webs, magnetron based plasma treaters are recommended.

The 6, 3 or 0.3 kW ion source power supply has a unique automatic gas adjustment feature to make operation of the ion source very simple.

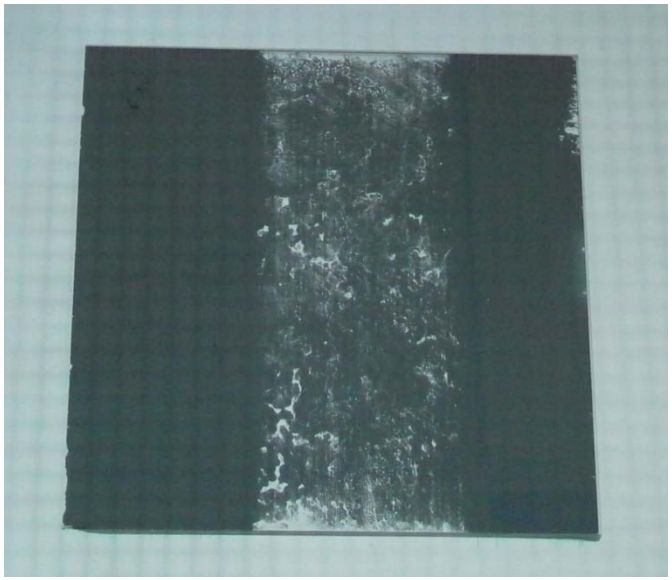
Ion pre-treatment is a powerful means to improve coating adhesion and device performance

Elcometer abrasion test (ISO 11998)

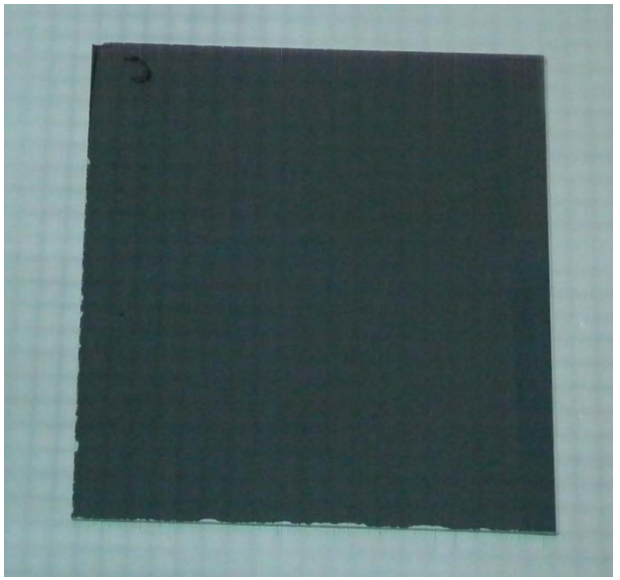
- Abrasion resistance of coatings
- Rubbing in wet conditions
- Load: 100 gr.
- No. Cycles: 500
- Comparative results of coating with and without ion beam pre-treatment

Results of single pass plasma pre-treat

Sample without ion-beam pretreatment



Sample treated by ion beam



Comparison of tempered glass with and without the use of a single pass plasma pre-treat with linear ion source

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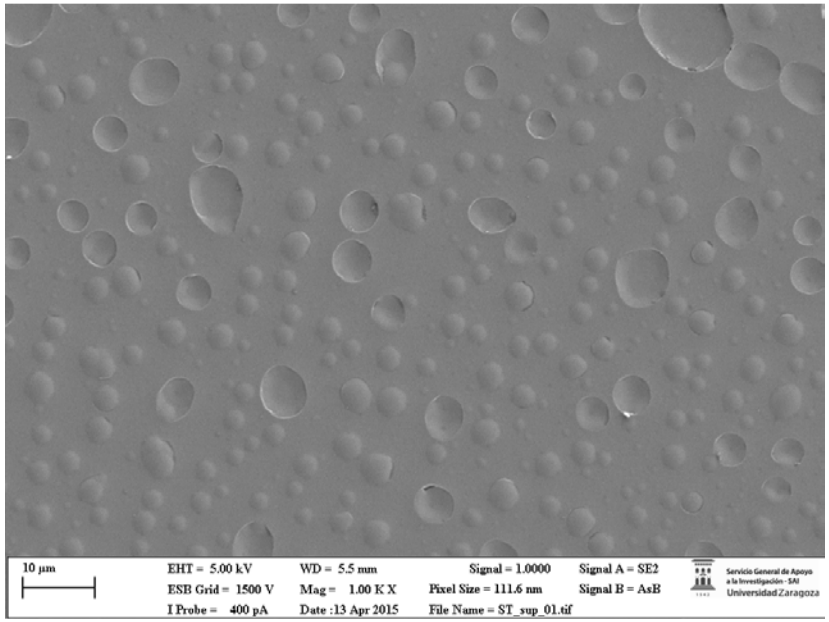
Parallel on-axis in-lens secondary electron detection

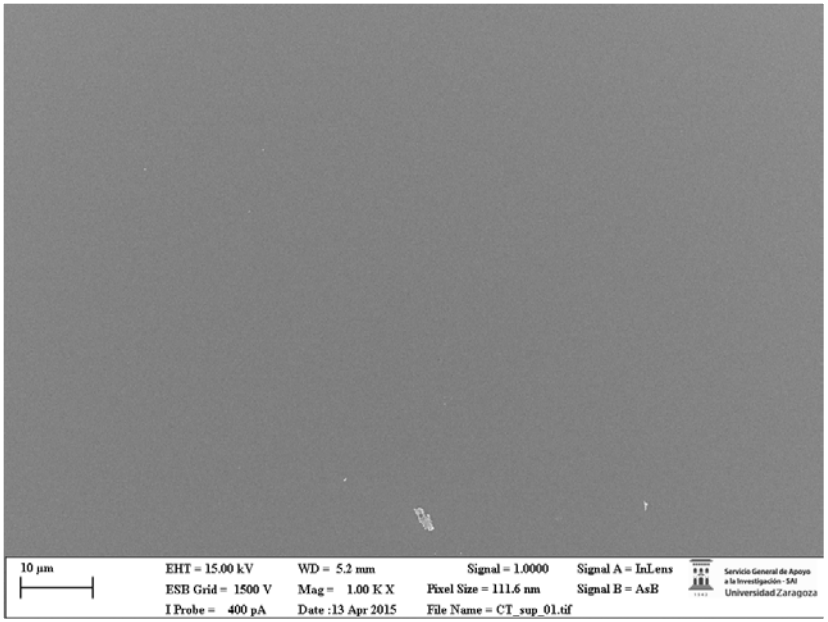
Sample not treated by ion beam



Samples without ion beam pretreatment show a hazy reflection.

Due to small bubbles (5 mm) in the coating.

Sample with ion-beam pre-treatment



After the tempering process no visible defects were detected on the coating.

SEM analysis confirm the good state of the coating.

Typical etch rates for different materials

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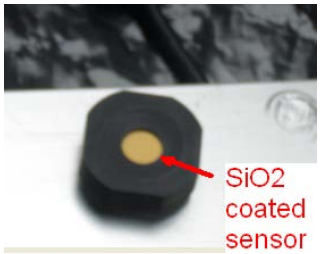
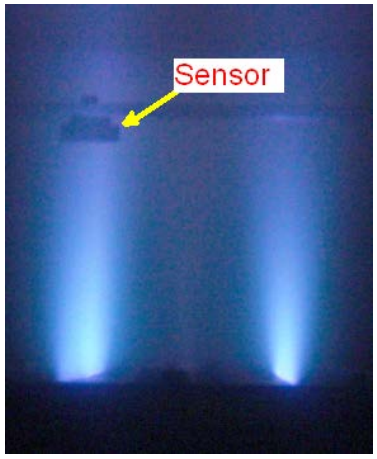
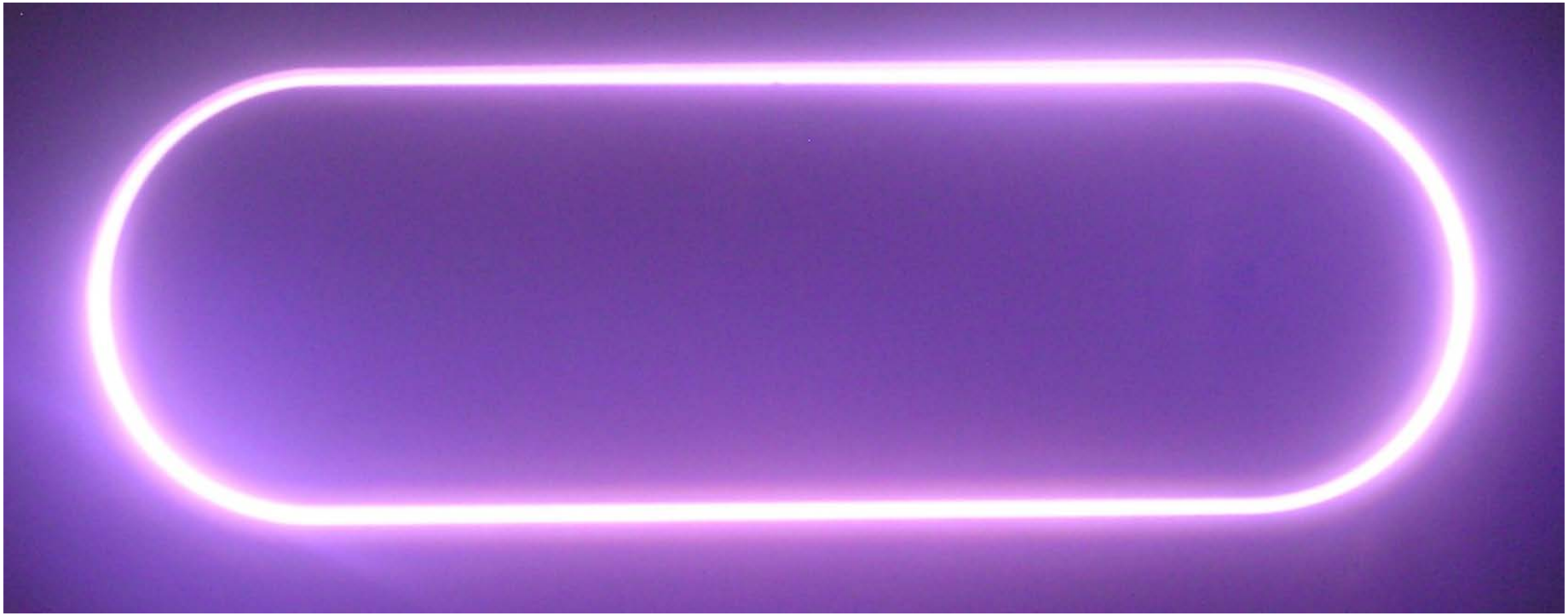


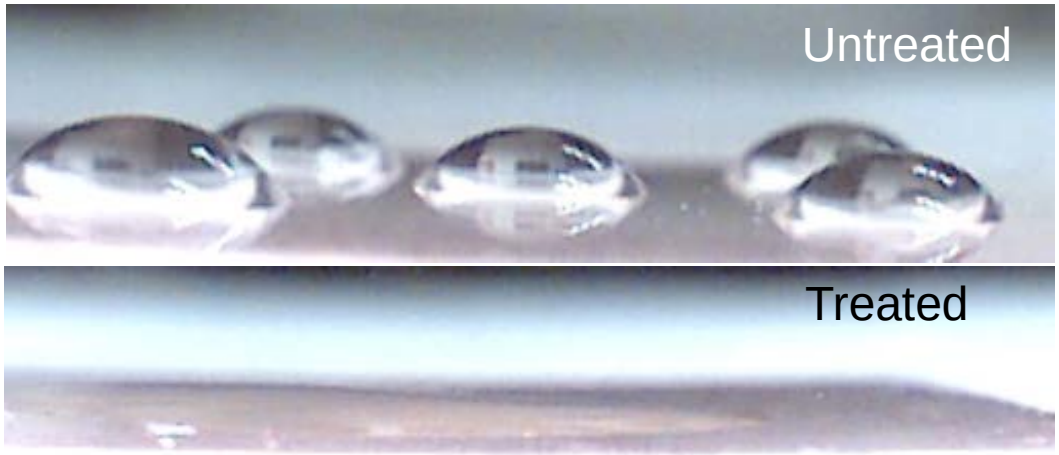


Polymer etch rates:
Gas: O2
IM400: 200 mA beam @ +1.5 kV
Substrate in rotation at equivalent 600mm/min linear speed (80 passes)
Example of polymer: silicone
Etching rate ~ 20 A/pass
Example of polymer: acrylic
Etching rate ~ 38 A/pass

Example of metal Ti:
Etching rates: 0.5-1 A/pass (170 mA @ +1.82 kV)

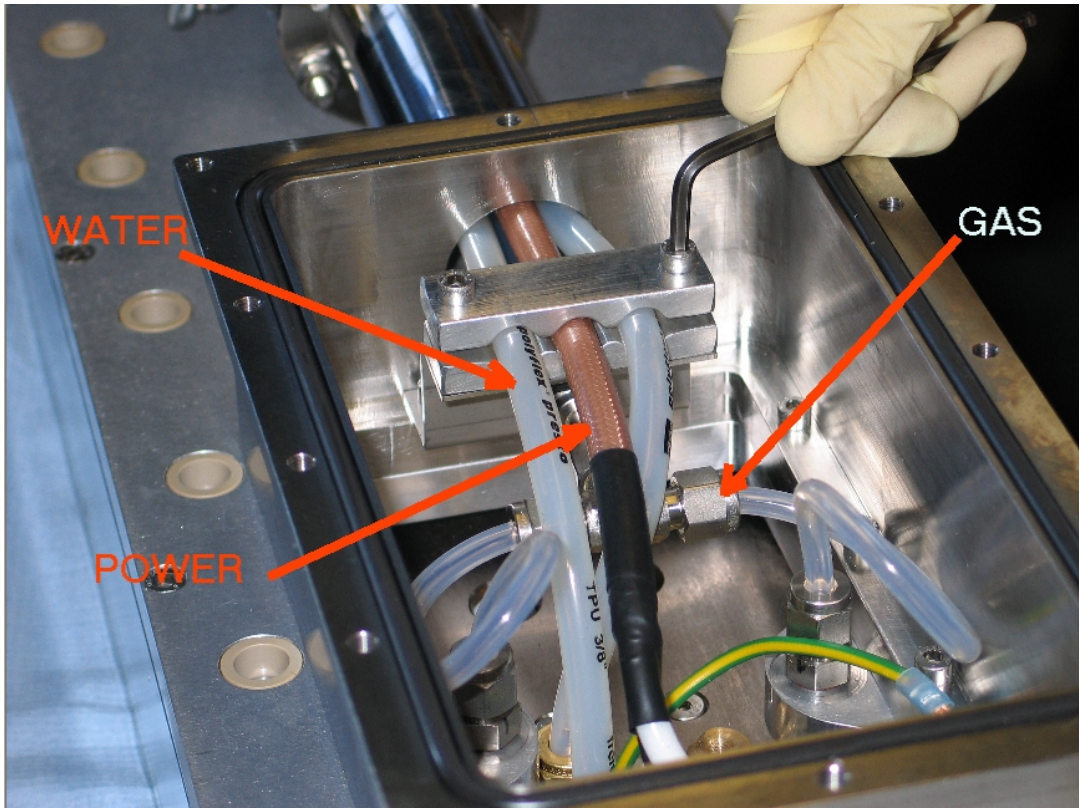
Oxide etch rates:
Gas Ar
IM600, 300 mA beam @ +1.6 kV
Example of oxide: SiOx
Etching rate: 5 nm/min static (over 8 mm diameter substrate, total time 23 mins)

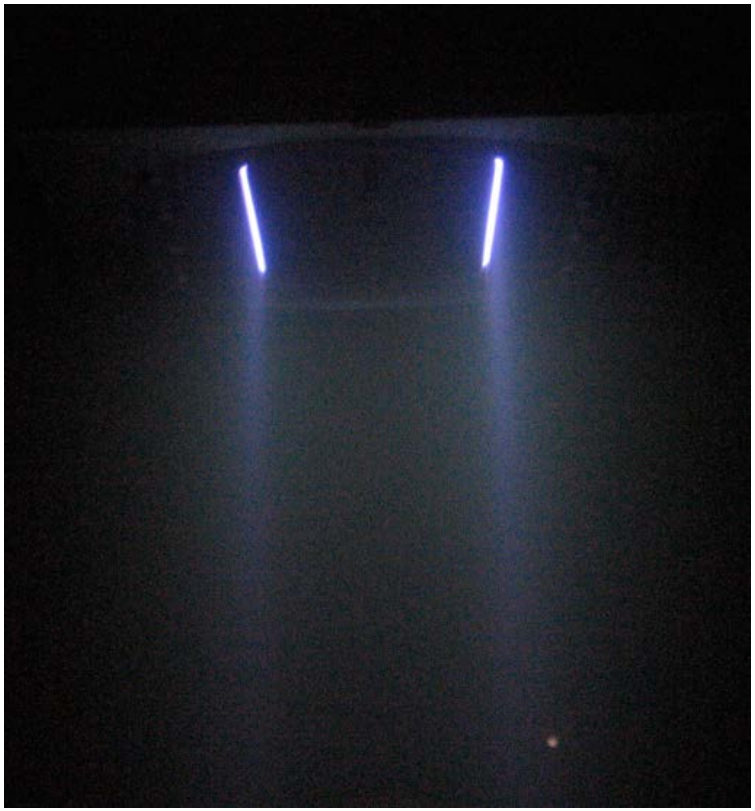




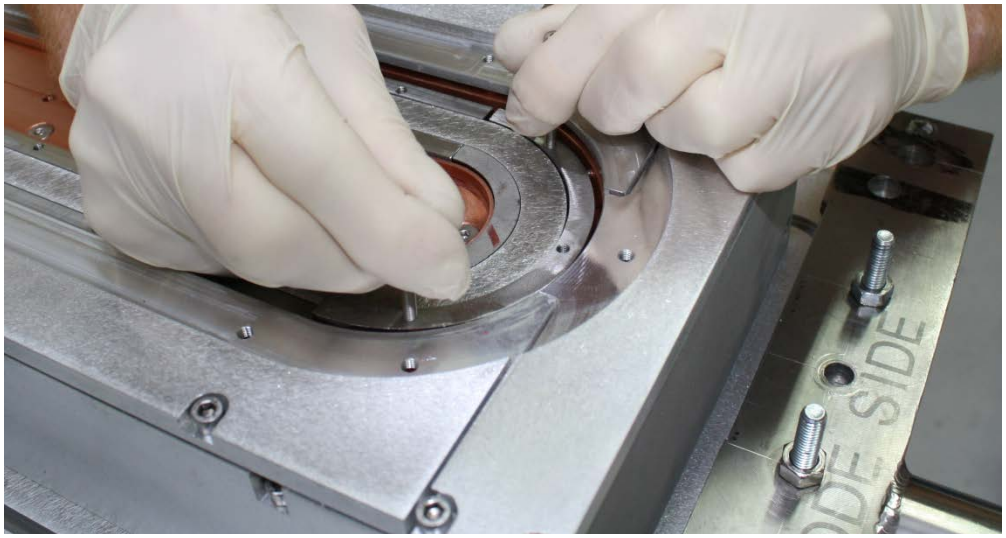
Comparison of wetability of un-treated and treated PET film – 1 pass.

Robust mechanical design, easy to access and connect





Long operating lifetime, very easy to service and maintain



No water or vacuum seal broken during anode / cathode change, typically 2 hours for full conversion from straight beam to focused beam mode.

Gencoa provide a unique customer built power supply that automatically regulates the gas flow for ease of operation (300, 3000 & 6000 w)

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Output voltage	Up to 2500V (3000V ignition voltage)
Output current	2 A @ 2000V, short circuit 2.5A
Output Power	4000W @ 2000V
Output polarity	Positive
Regulation Mode	Current 0-2.5A
Output connector	Fischer, type 105, 10kV rating for RG213 coax cable
Mains input	3x400Vac +/- 10% 50Hz (L1,L2,L3 PE)
Dimensions	Standard Rack 19” 4U=177mm High
Weight	12kg
Cooling	Forced air cooling
Working temperature	15-35°C

Schematic of the ion source with power supply and automatic gas regulation

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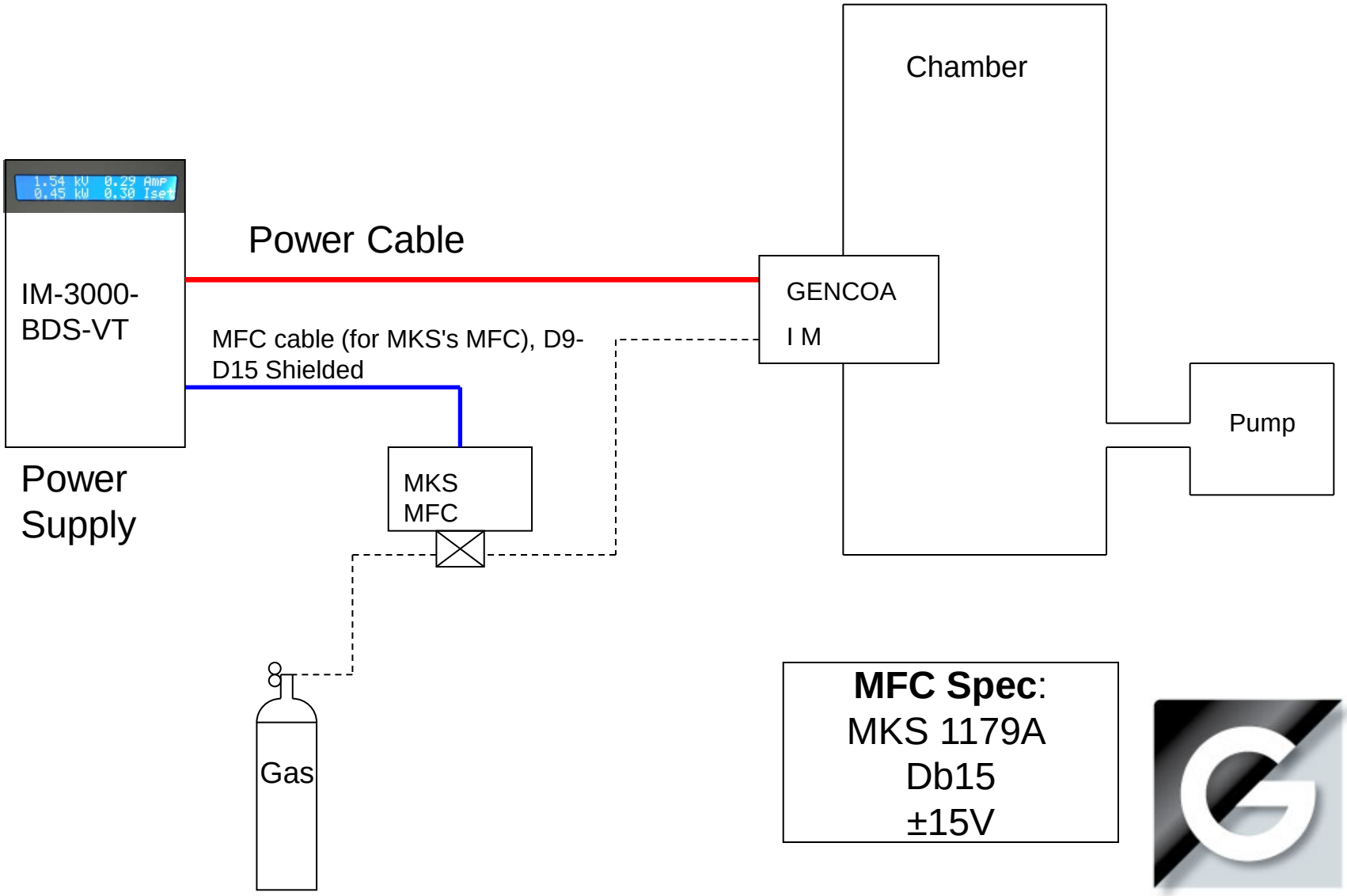
Removes beam variation – I & V regulated



Schematic of the ion source with power supply and automatic gas regulation

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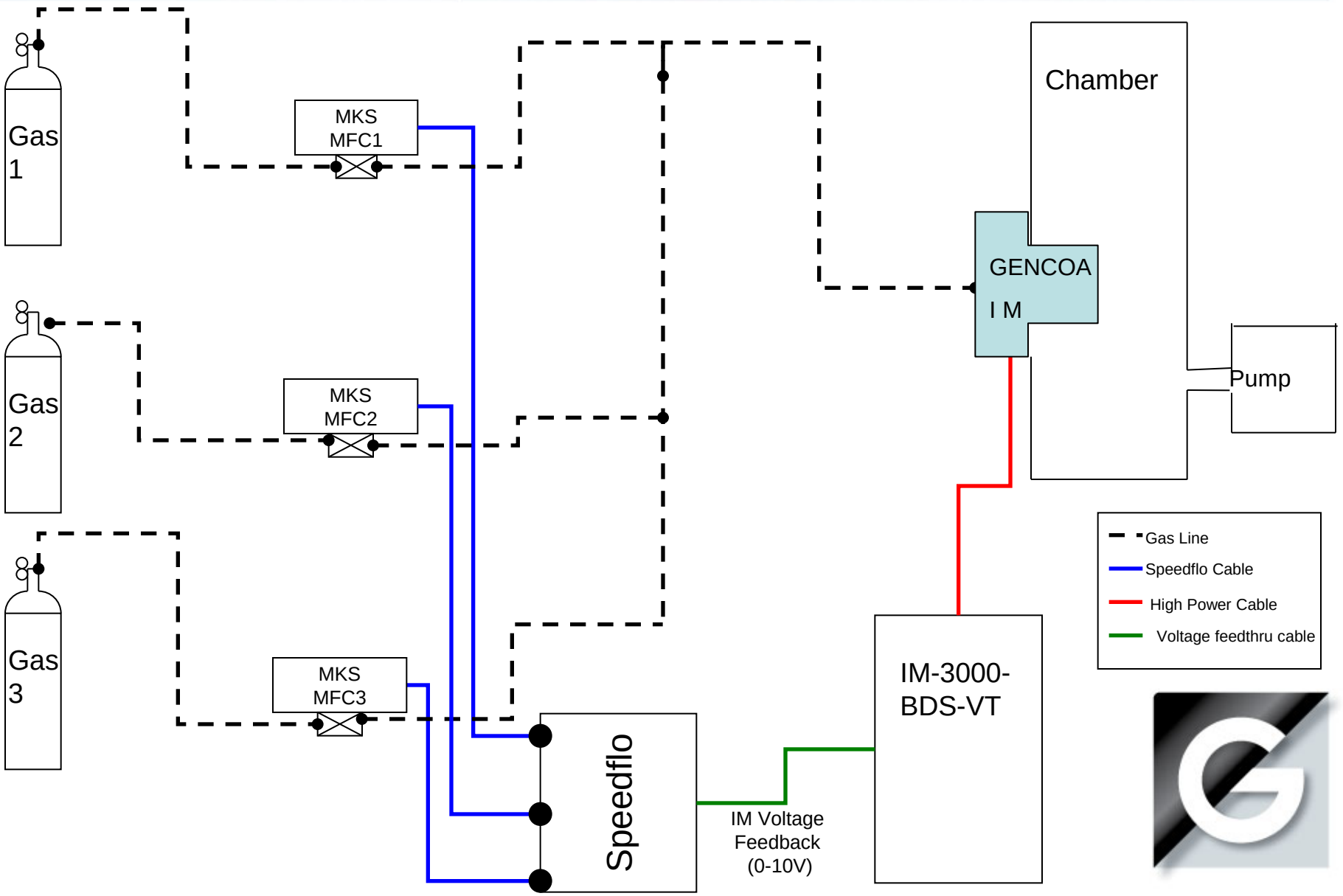
Of more than 1 gas type – needs speedflo mini



IM600 at 300mA - gas Ar - Example of voltage tracking feature via auto control of gas

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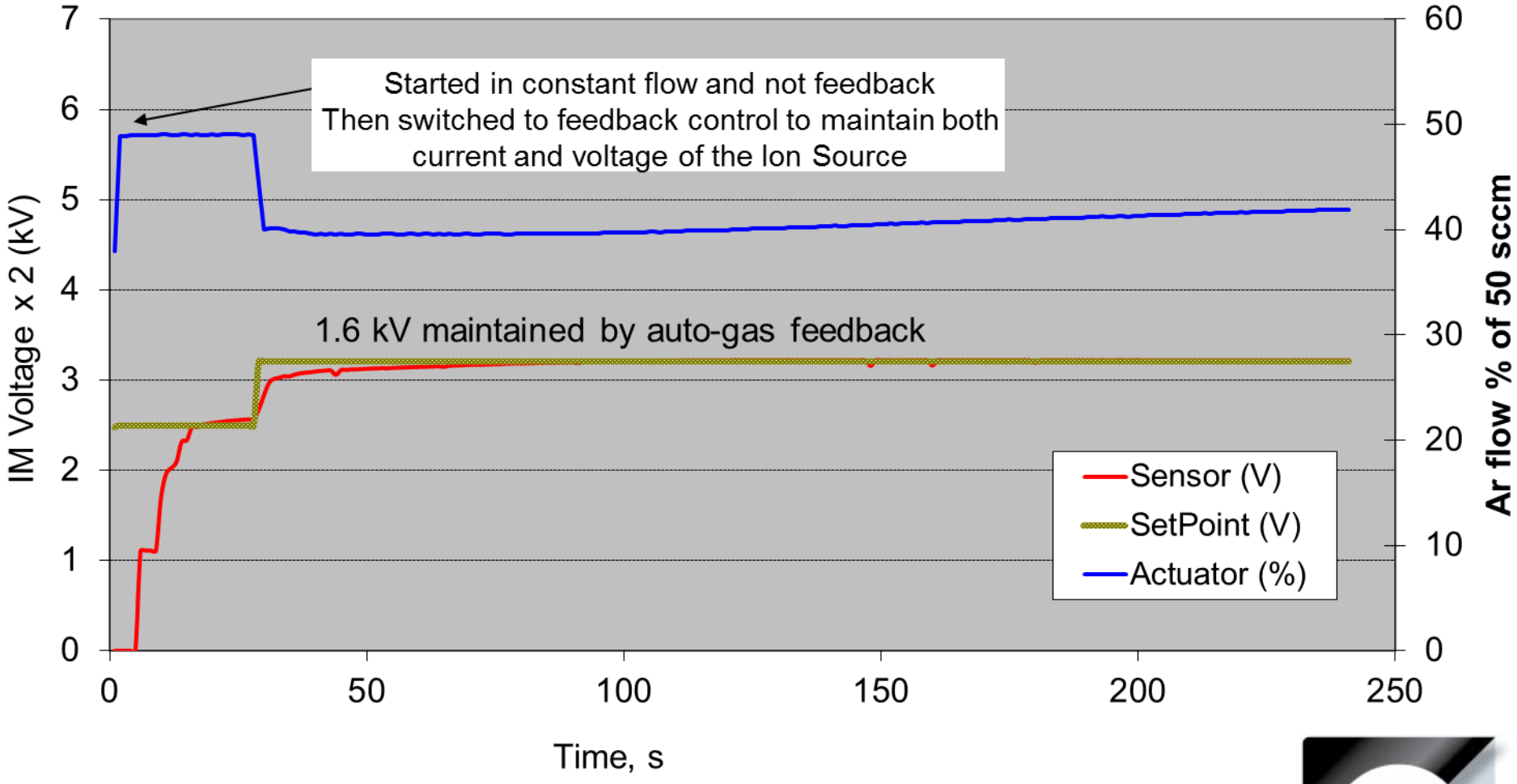
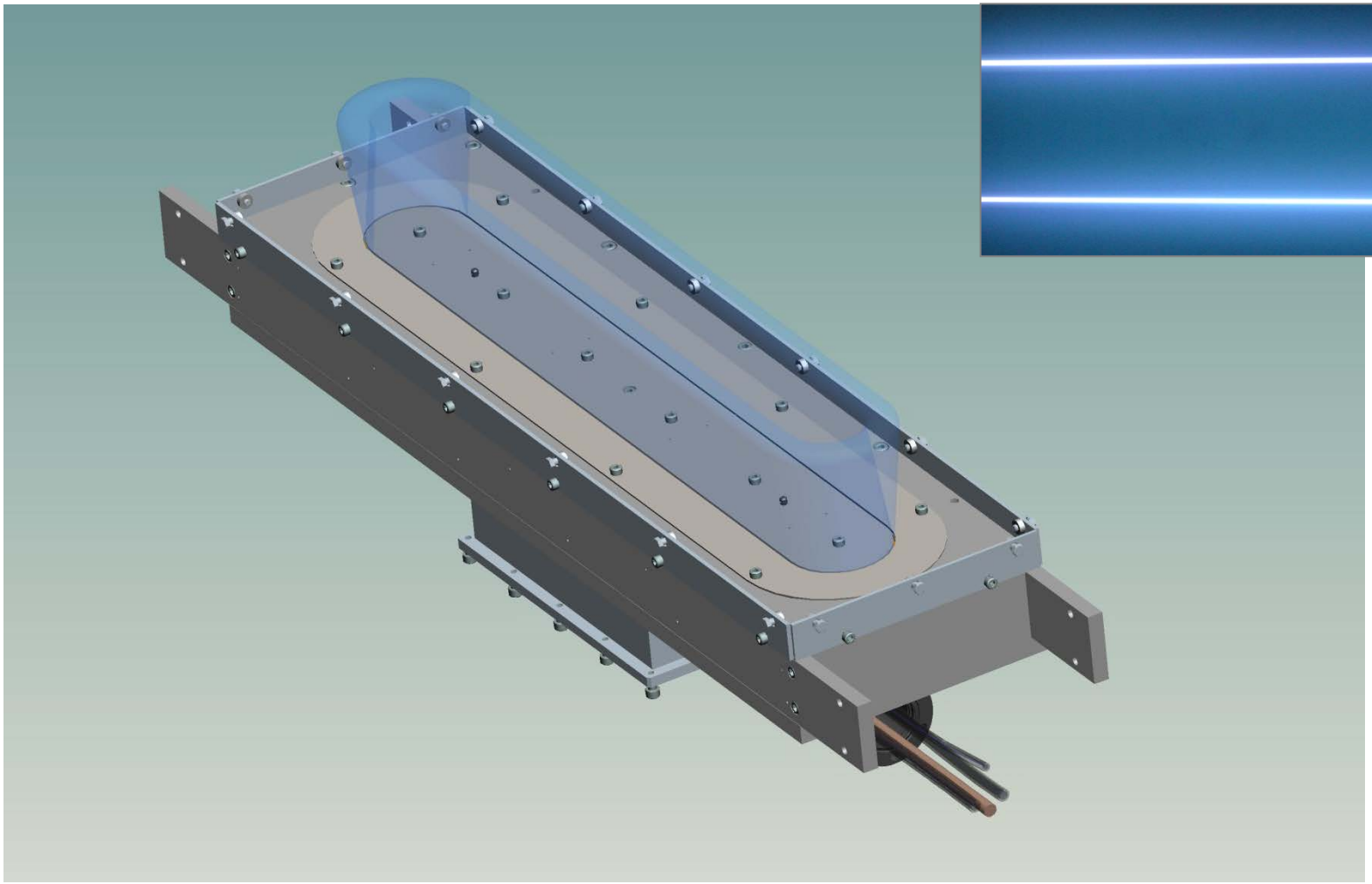


Any length of plasma beam is available and a variety of mounting options



Standard straight and focused beam arrangements

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Different kinds of plasma sources from Gencoa