



Gencoа 3G Circular Magnetrons

Presenting Gencoа's 3rd
generation range of circular
magnetrons

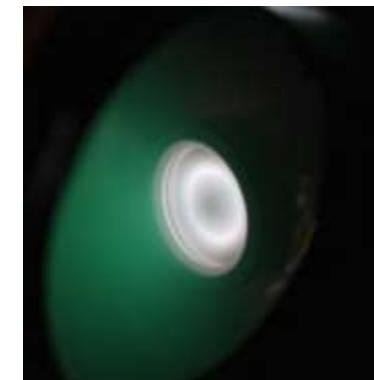


Contents

- Product Overview
- Introduction
- 3G Design Features
- 3G Mechanical Options
- High Yield Magnetics from 4" target
- High Strength Magnetics
- Low pressure operation
- Deposition Rate
- Performance curves
- Conclusion



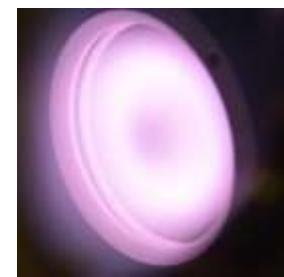
Copper target, DC
300W, 8.5 E-3 Torr



Copper target, RF
300W, 8.5 E-3 Torr

Product Overview

	BP φ	Standard 2 pole (SW/PP)	Magnetic Materials	High Yield HY	HU High Uniformity	MRS - Multi-ring static	VT variable	FFE
2"	50							
3"	75							
4"	100		3G					
5"	125							
6"	150							
8"	200							
10"	250							
12"	300							
14"	350							
16"	400							

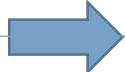


Gencoa 3G Circular Magnetrons – 3rd generation of circular magnetron design

Gencoa's small sized circular magnetrons for R&D have evolved in 3 stages to the current third generation with more performance in a smaller space



1996



2010

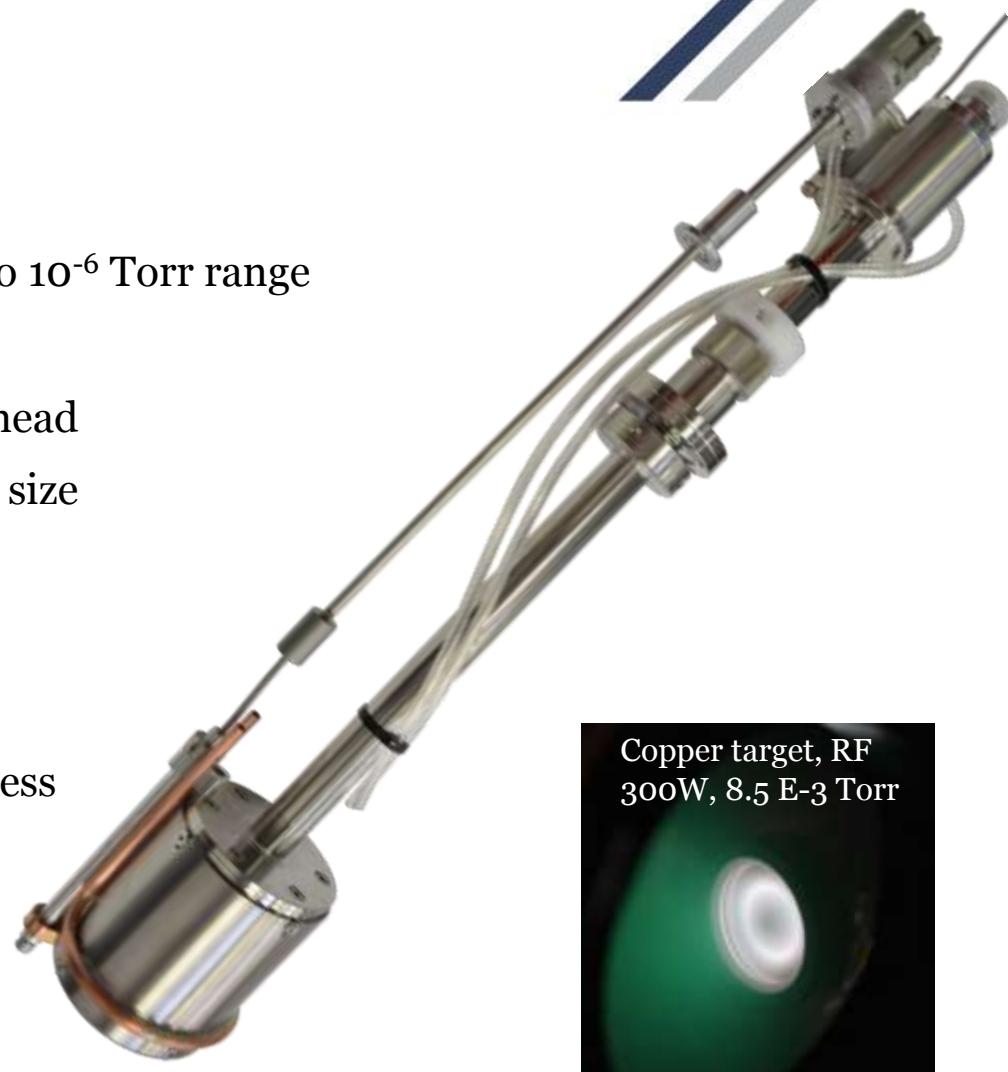


2017



3G cathode features

- Launched in 2017
- Works in wide range of pressure – into 10^{-6} Torr range
- Compact Size
- Unique non-bellow tilted magnetron head
- High Yield magnetics for the 4" target size
- Magnetic material sputtering
- Gas Injection as standard
- PEEK insulation to reduce outgassing
- Accommodates different target thickness
- DC, DC pulse, RF and HIPIMS ready



Copper target, RF
300W, 8.5 E-3 Torr

3G cathode variations

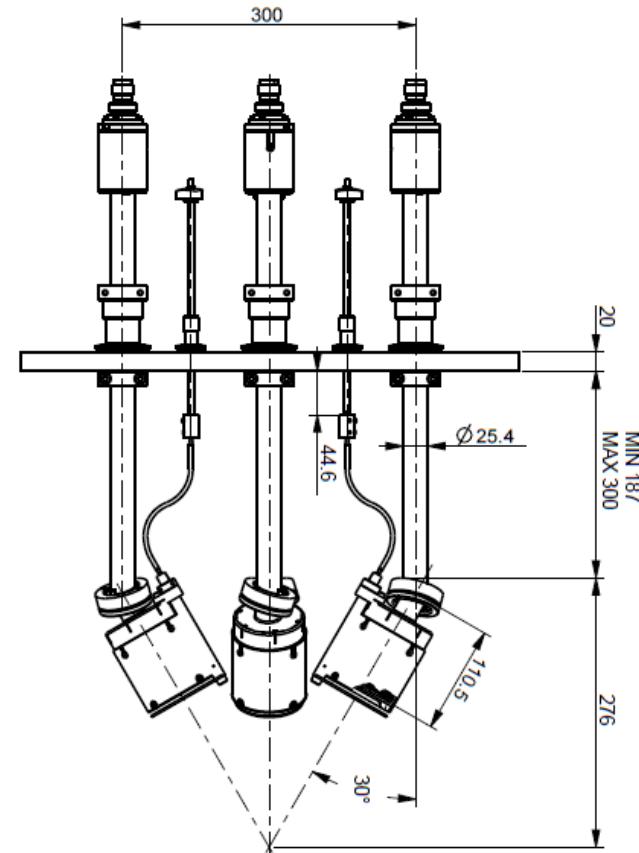
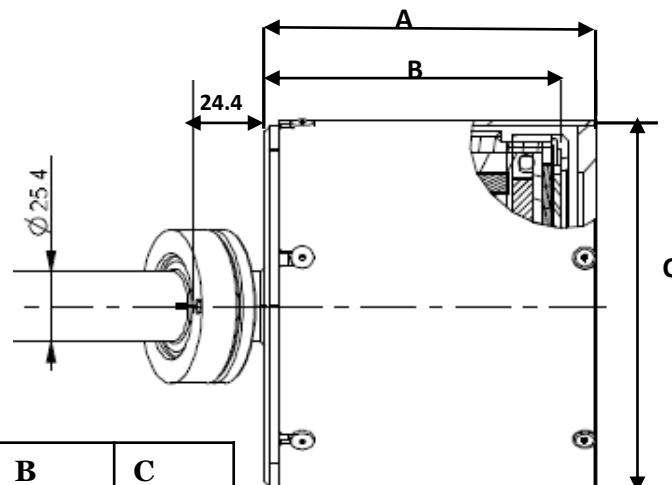
Available in 5 different assembly options

- SW (3G)- Full option with 45^0 tilt, RF /HIPIMS ready and gas injection
- SW (3GA)- The cathodes can be supplied with a simple straight & no gas injection.
- SW (3GB)- The basic design with only gas injection as option
- SW (3GC)- This model comes with tilt and gas injection but no power connection box.
- SW (3GE)- Externally mounted magnetron with gas injection and RF/HIPIMS ready



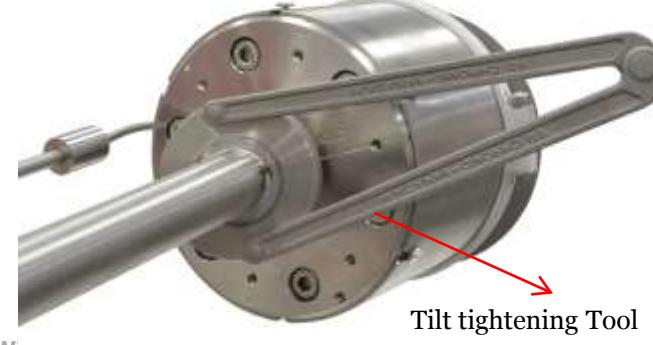
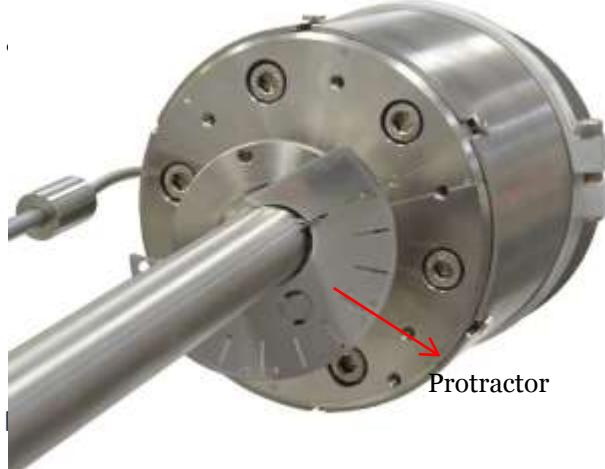
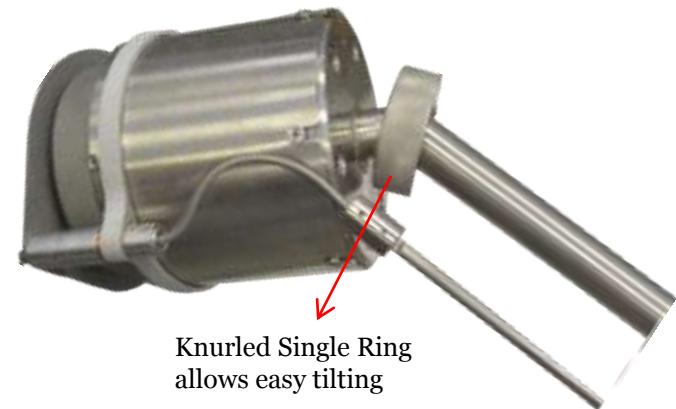
3G small head size and tilt means smaller chambers

- Small head size – approx. 1" larger than target size
- Tilt height most compact in industry - tilt pivot point is 1" from cathode rear allowing higher tilt angles
- 3G means smaller chambers can be used whilst having the same tilt and head positions



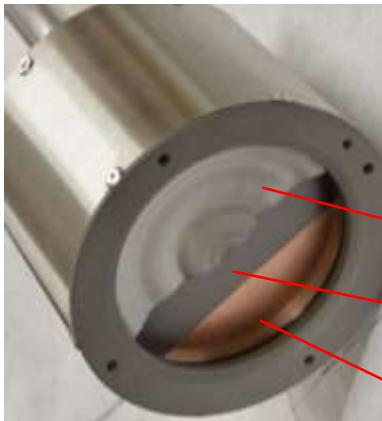
3G has innovative head angle adjustment

- $\pm 45^\circ$ tilt without bellows
- Angle can be viewed and adjusted from the front of the cathode
- The 2 position clamp pressure is released by means of a supplied tool or by hand, the head is rotated to the desired angle, then the clamp is re-fixed to the first 'notch' tight position
- To measure the angle, there is a milled slot on the clamp that is aligned with the protractor angle allowing the tilt angle to be fixed accurately to 5° .



Self Adjusting Target Clamps

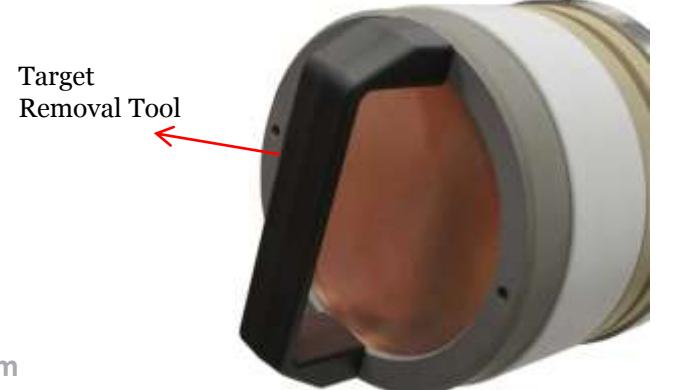
- Target clamp adjust to the target thickness. anti-sticking materials used for the threaded fixing
- Can use a thermal conduction gasket between target and cooled diaphragm
- High water flow (2l/min) and diaphragm cooling for high power capacity
- Directly cooled targets available – factory configured



4" HY target with graphite gasket and diaphragm



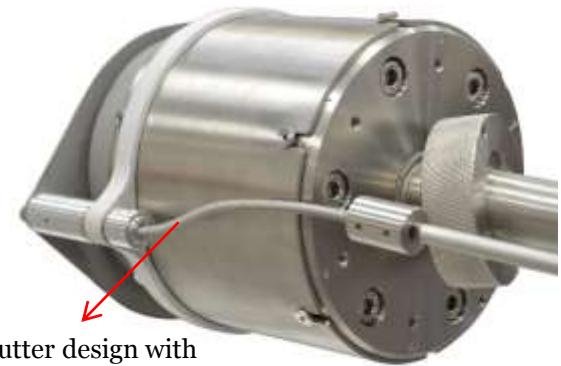
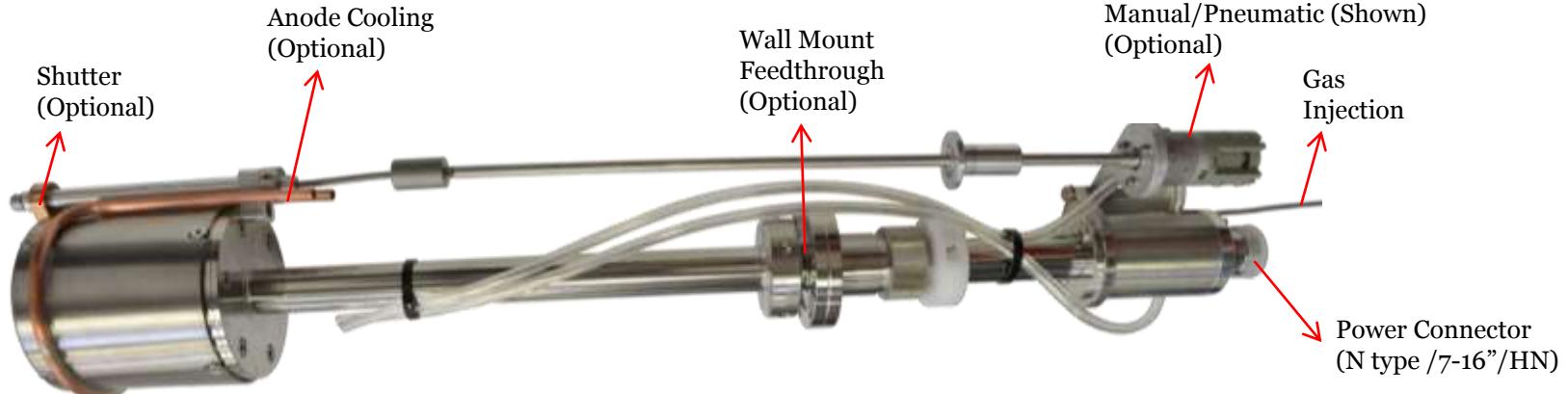
Threaded Target Clamp
PEEK Insulator (reduces Outgassing)



3G Extra Options

Various mechanical options available

- Design allows to fit manual and pneumatic shutter
- Anode cooling to provide extra source cooling for HOT chamber environments
- Gas injection
- Sputter Chimney
- Quick coupling feedthrough
- ISO or CF flange mounting option



New shutter design with longer flexible shaft

3G Mechanical Option Matrix

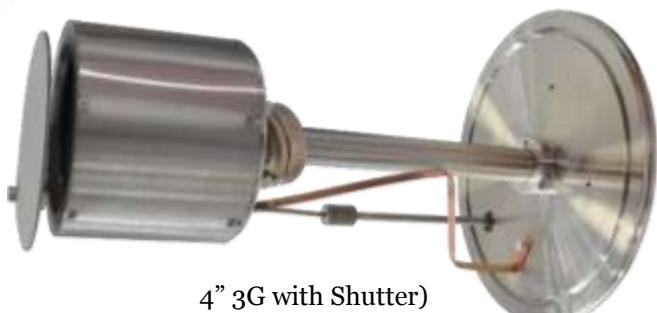
Model	Gas Injection	Tilt	RF/ HIPIMS	Shutter	Chimney	Wall Mount Feedthrough	Water Cooled Anode	Hidden Anode
3G	●	●	●	●	●	●	●	●
3G(A)	●	●	●	●	●	●	●	●
3G(B)	●	●	●	●	●	●	●	●
3G(C)	●	●	●	●	●	●	●	●
3G(E)	●	●	●	●	●	●	●	●

● Standard Feature

● Optional

● Not Applicable

Mechanical Options Examples



4" 3G with Shutter)



3G100 External



Anode Cooling



3G 45° Tilted

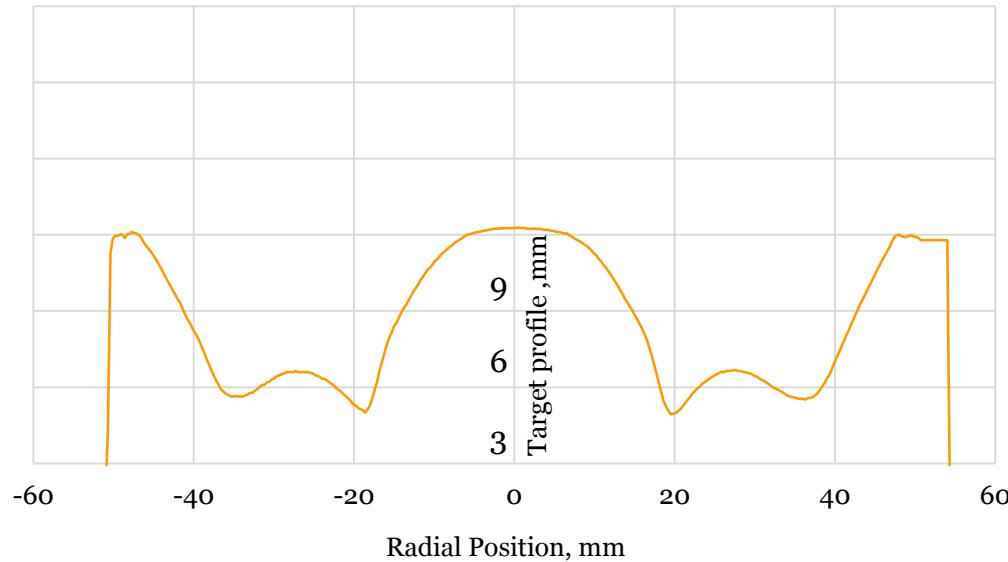


Sputter Chimney

3G100 High Yield type magnetics for high target use

- The 3G100 is available with a high yield HY type array
- >40% target utilization
- Gencoa solution for precious material sputtering

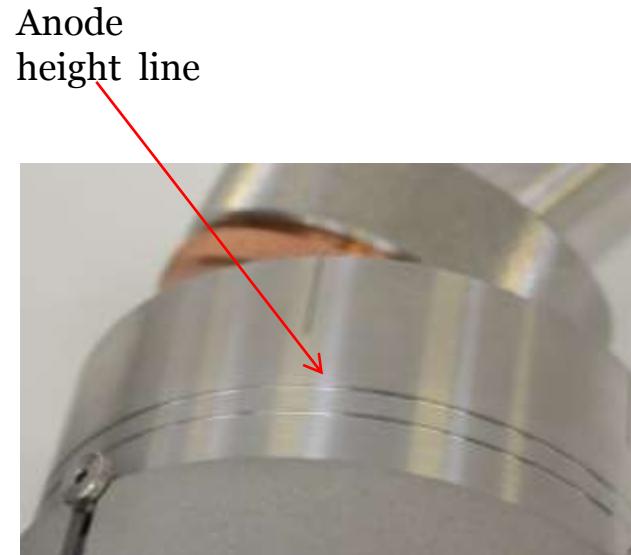
3G100-HY 10mm thick target erosion



Magnetic Material Sputtering (High Strength Array)

- The cathodes allow magnetic material sputtering as standard with diaphragm cooled target.
- Thicker target can be sputtered using directly cooled target.
(Pre-configured at factory)
- Anode height adjustable to accommodate different target thickness.

Size	Magnetic Strength on the target surface (G)	Fe Thickness (mm)	Ni Thickness (mm)
50mm (2")	780	1	3
75mm (3")	840	1.5	4
100mm (4")	620	0.5	2

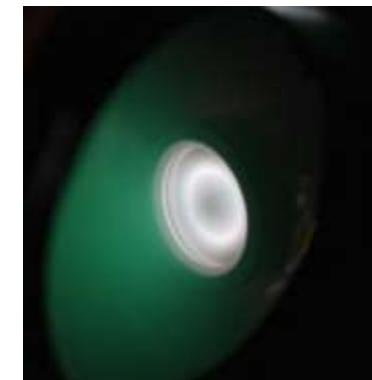


3G cathode testing

- Extensive testing performed on 3G prototypes for product reliability and plasma stability
- Achieved 2l/min water flow through the cathode at 1.5 bar pressure difference
- Works in wide range of pressure
- Coating uniformity & deposition rate measured for different target diameters
- Performance curves obtained at various pressure levels for various power modes

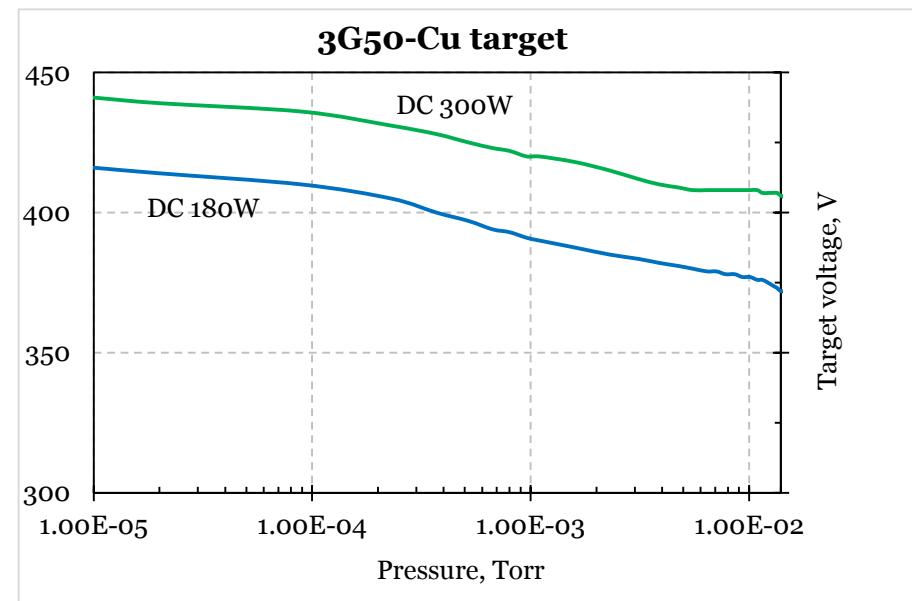
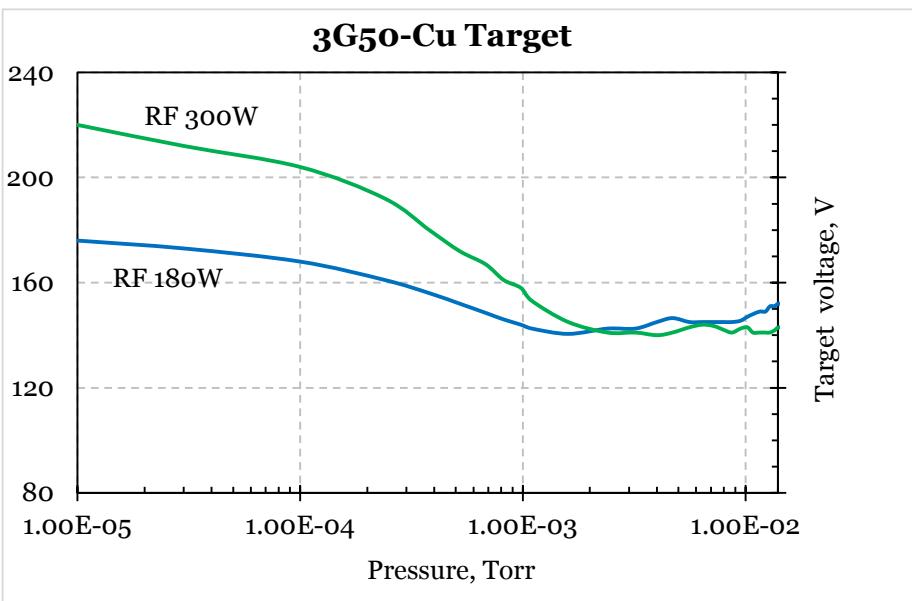


Copper target, DC
300W, 8.5 E-3 Torr

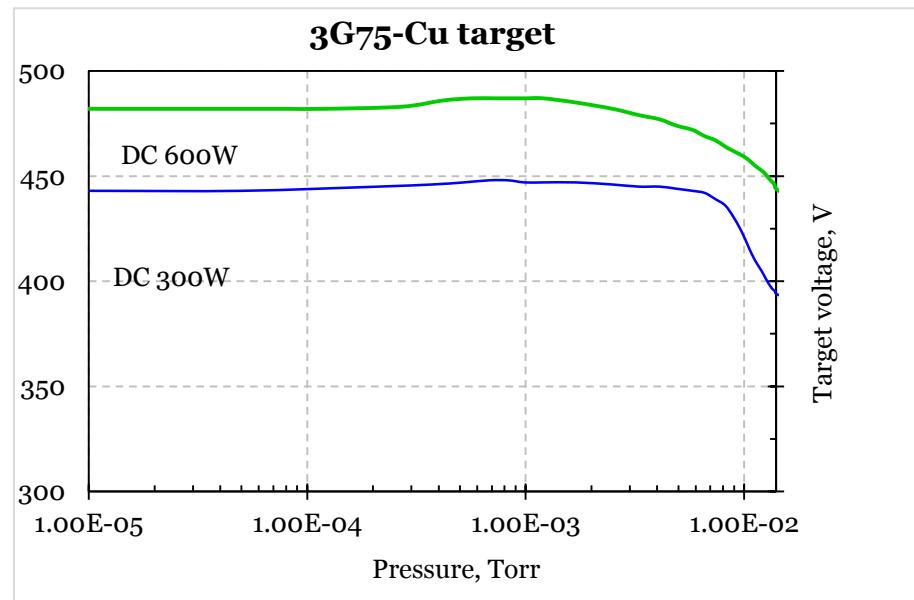
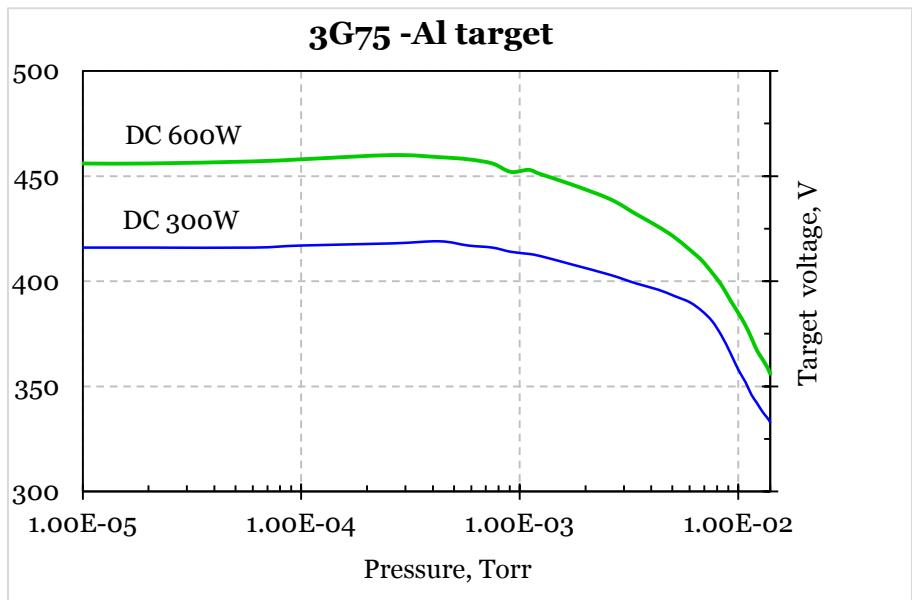


Copper target, RF
300W, 8.5 E-3 Torr

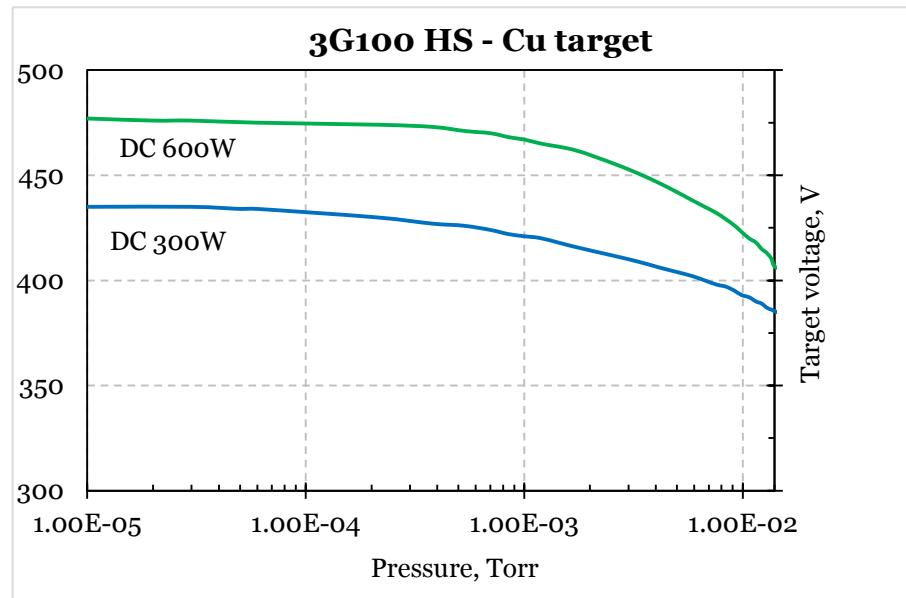
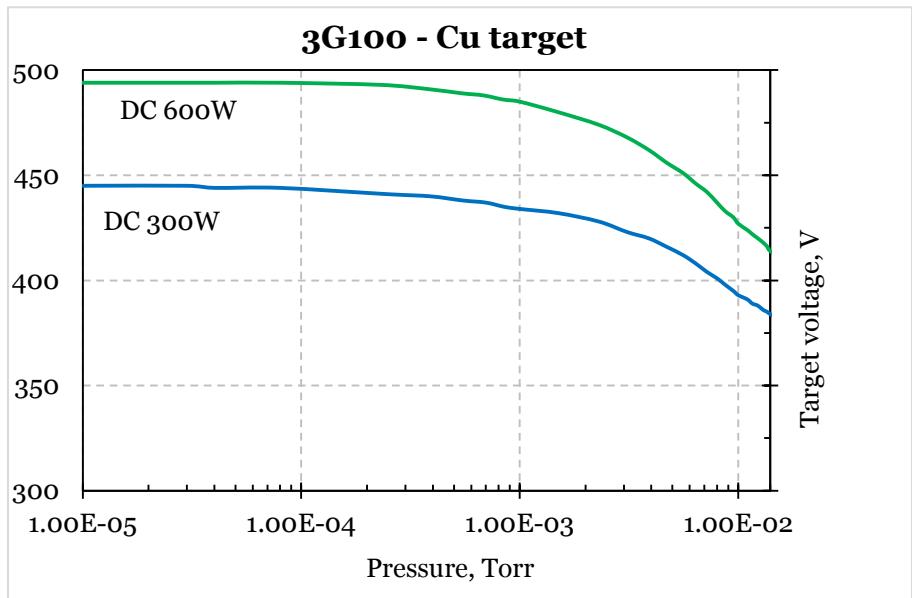
10^{-6} to 10^{-2} Operating Pressure Range – example of 3G50 (2")



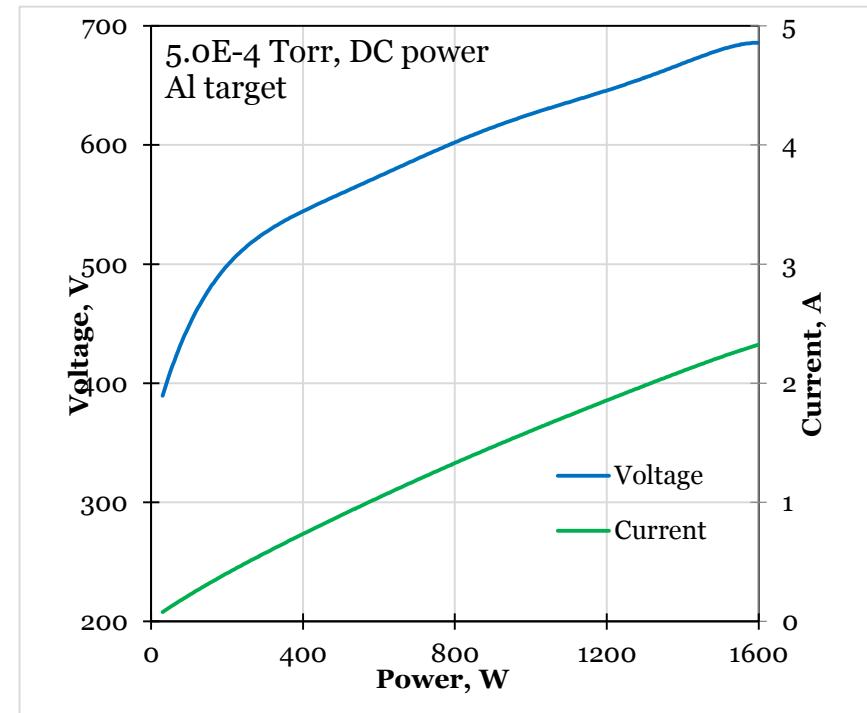
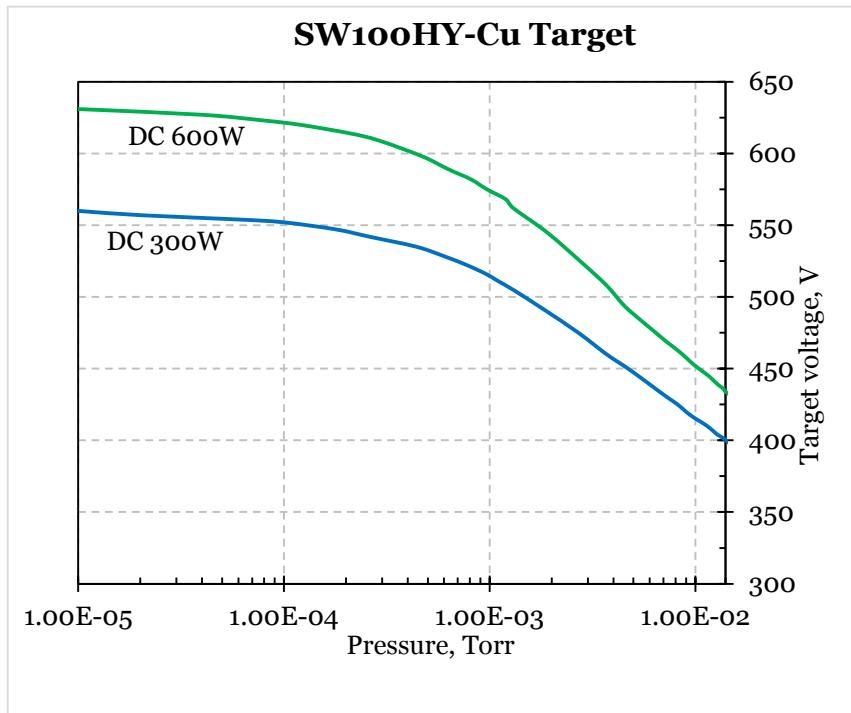
10^{-6} to 10^{-2} Operating Pressure Range – example of 3G75 (3")



10^{-6} to 10^{-2} Operating Pressure Range – example of 3G100 (4")

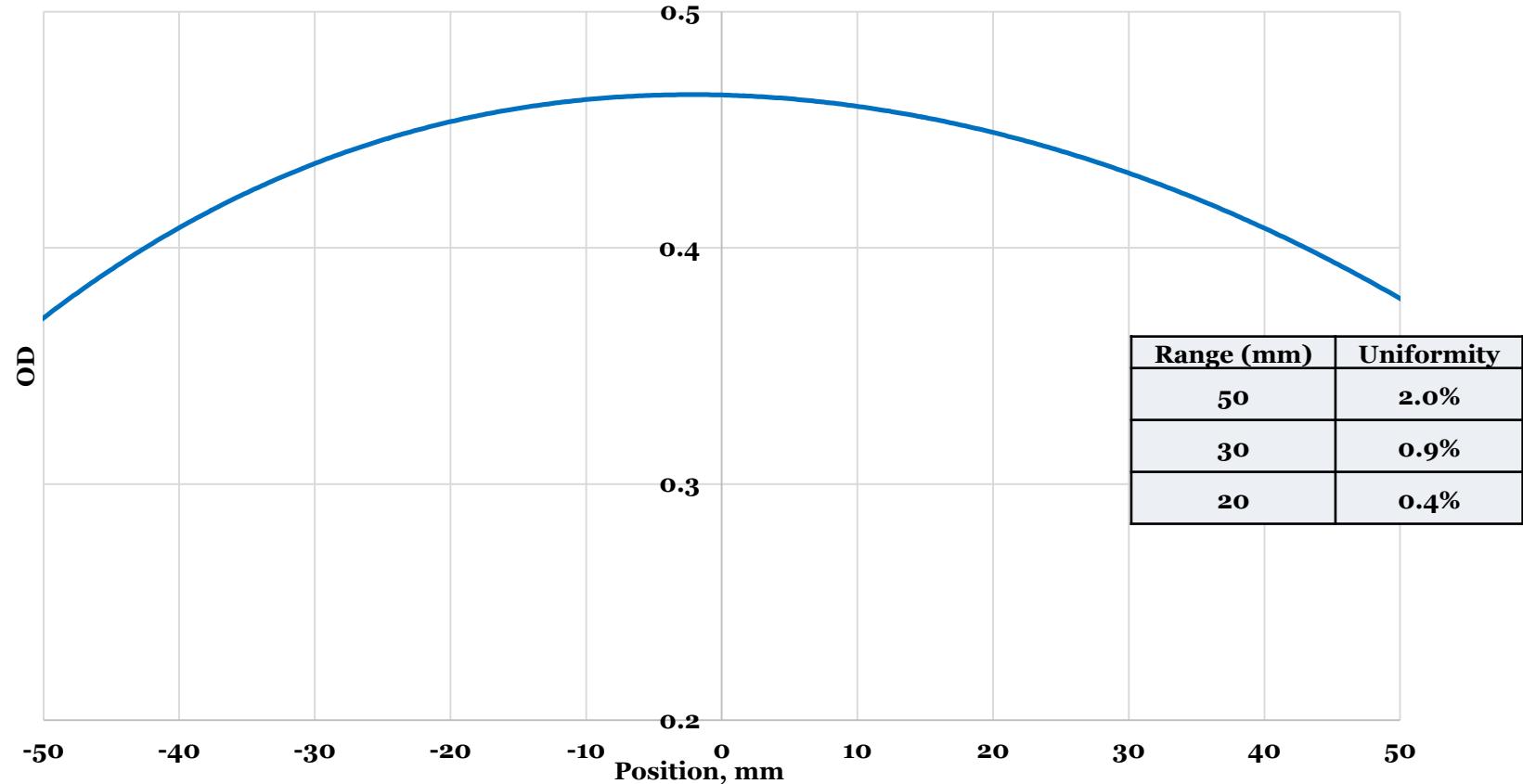


3G100HY operating parameter example

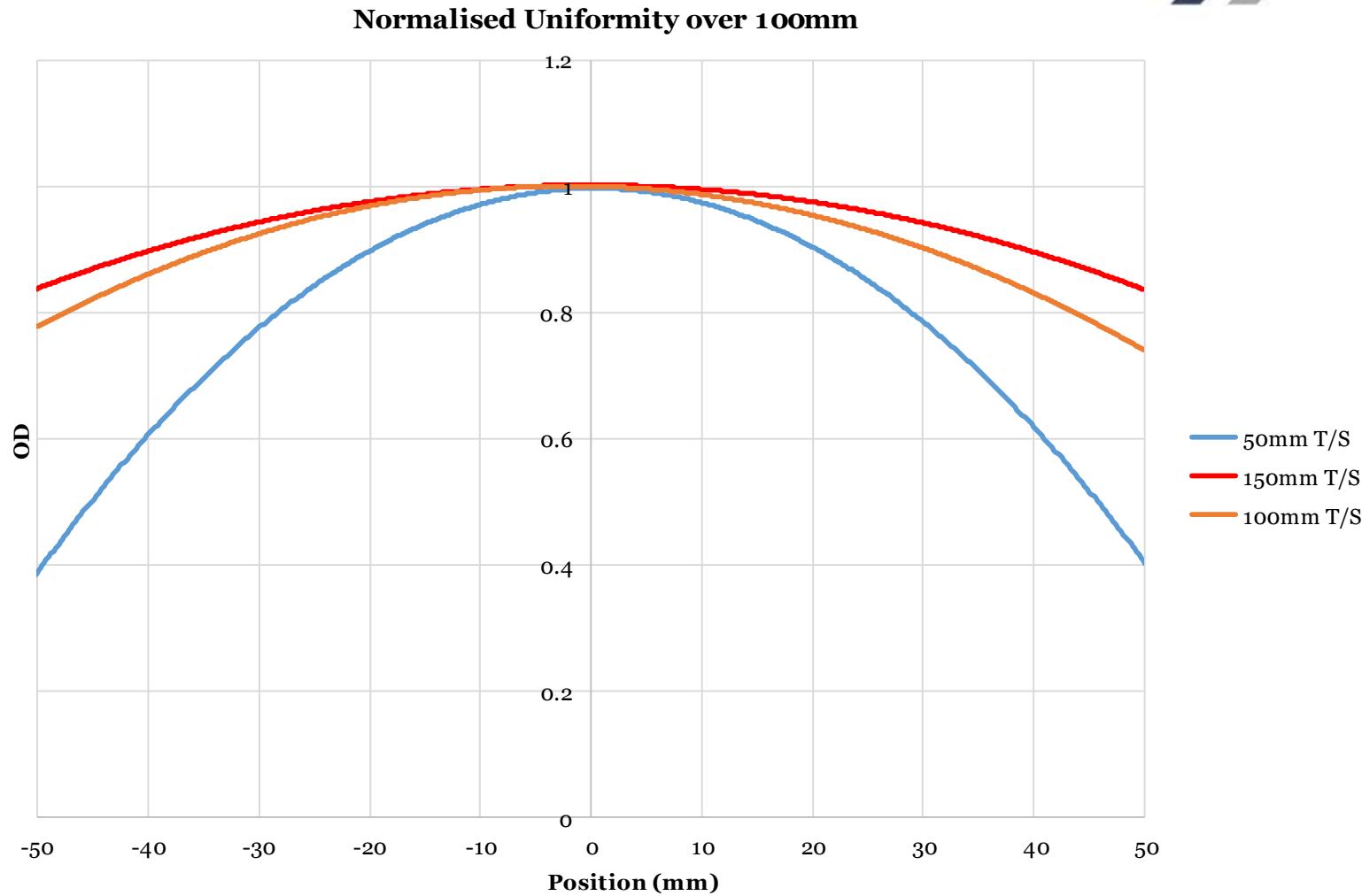


Coating Uniformity 3G50

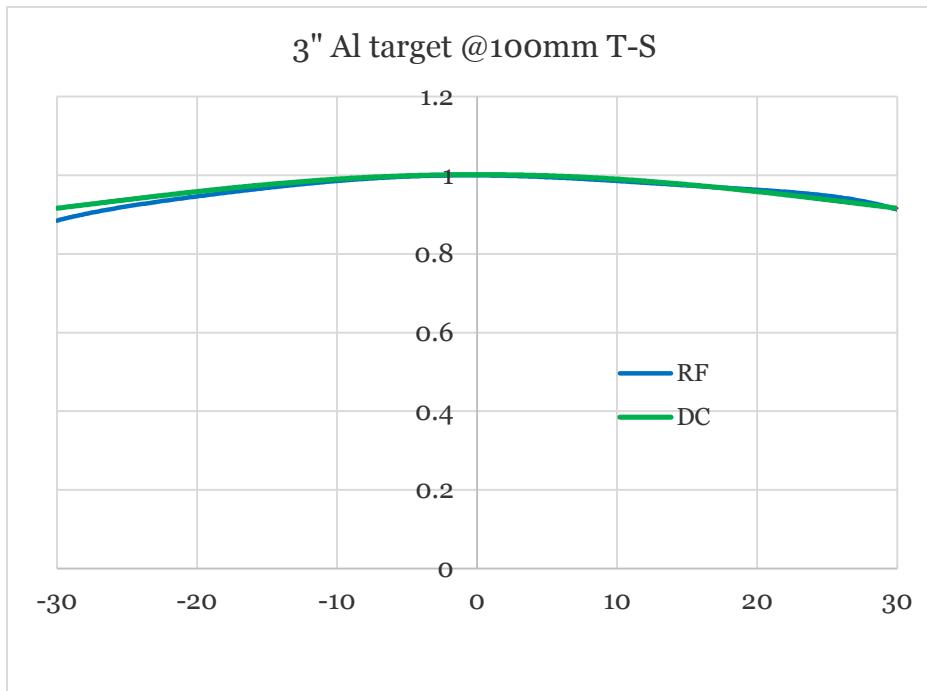
DC Power 150mm T/S, Copper target



Coating Uniformity 3G50



Coating uniformity 3G75 DC & RF comparison



Range, mm	DC Uniformity
50	±4.4%
60	±6.5%
70	±8.4%

Al target, DC 300W,
2.5 E-3 Torr

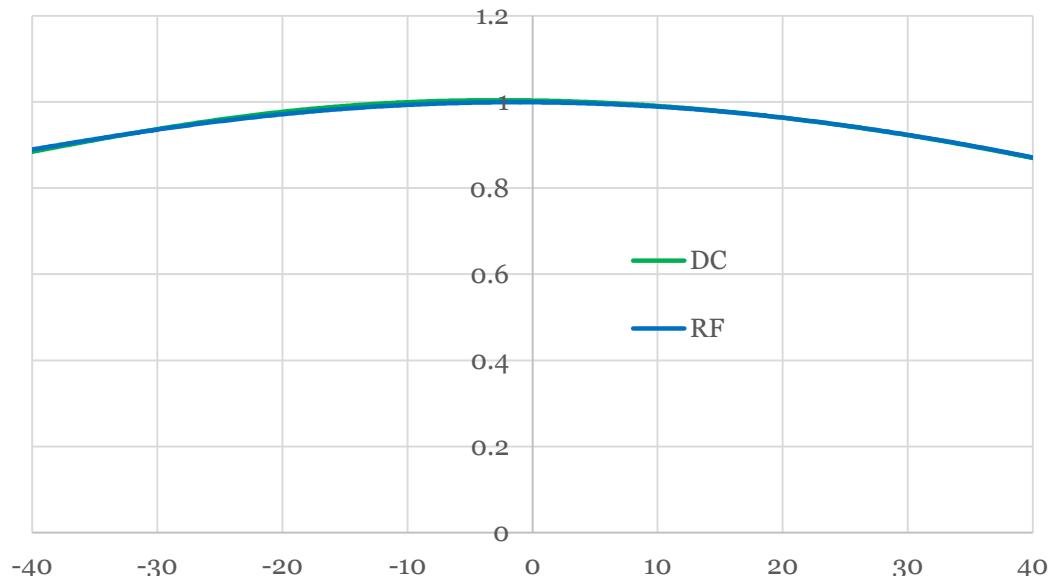


Range, mm	RF Uniformity
50	±3.5%
60	±5.7%
70	±7.9%

Al target, RF 300W,
2.5 E-3 Torr

Coating Uniformity 3G100 DC & RF Comparison

4" Cu Target @150mm T-S



Range, mm	DC Uniformity
50	±5.1%
60	±7.2%
70	±9.1%

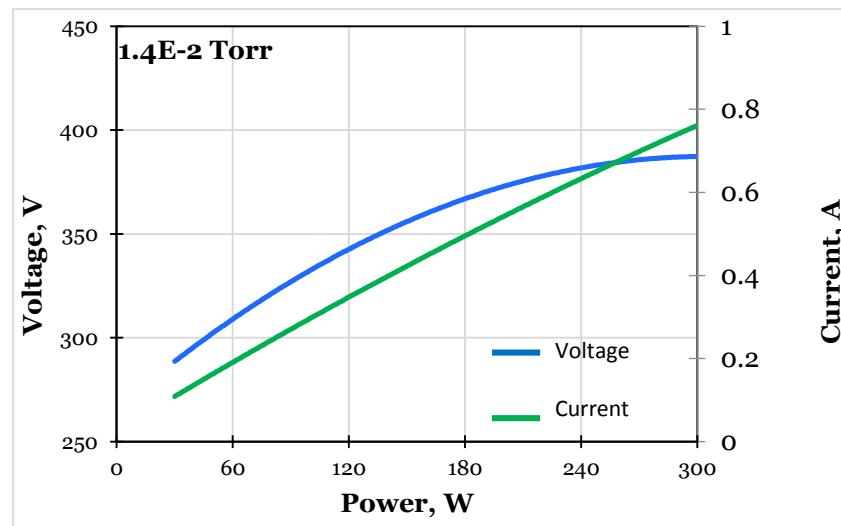
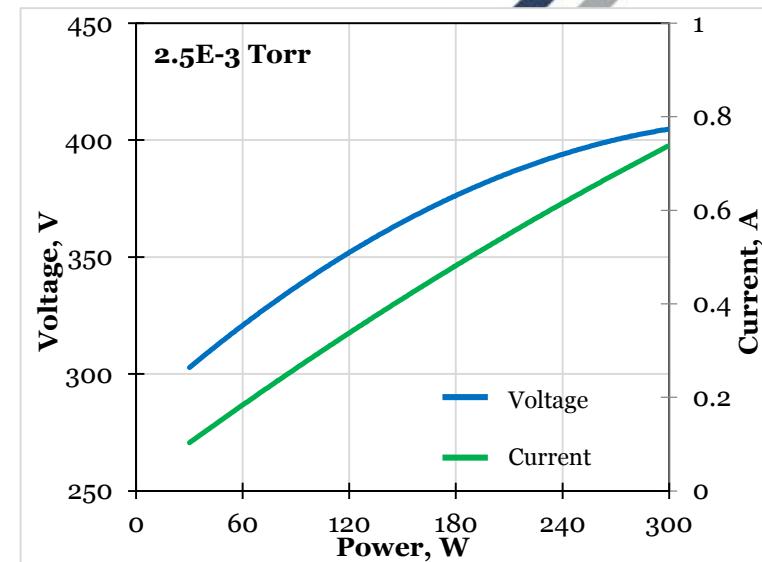
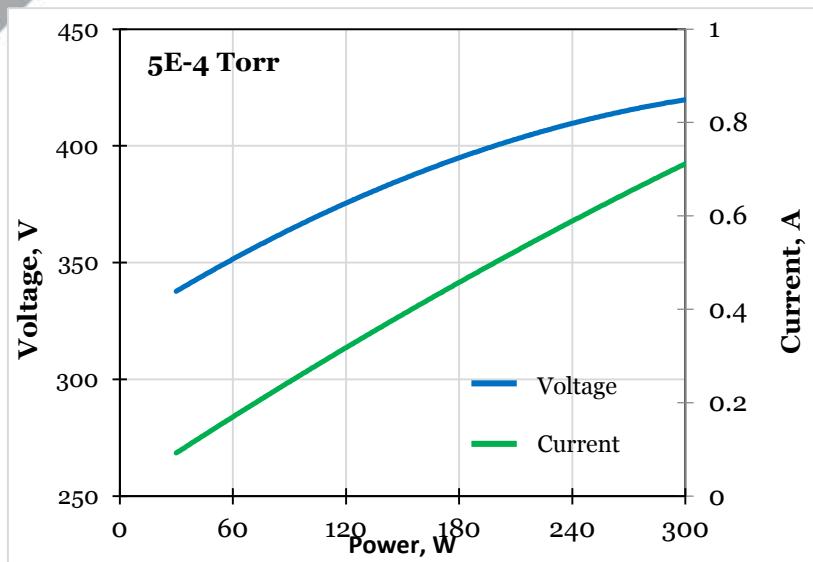
Cu target, DC 300W,
1.4 e-2Torr



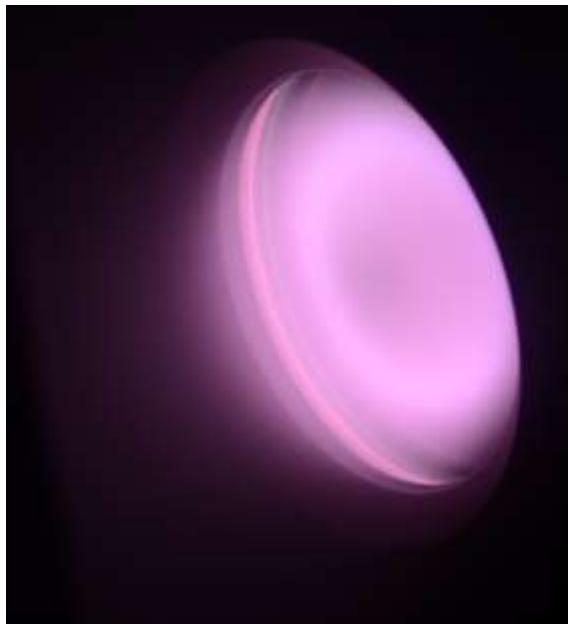
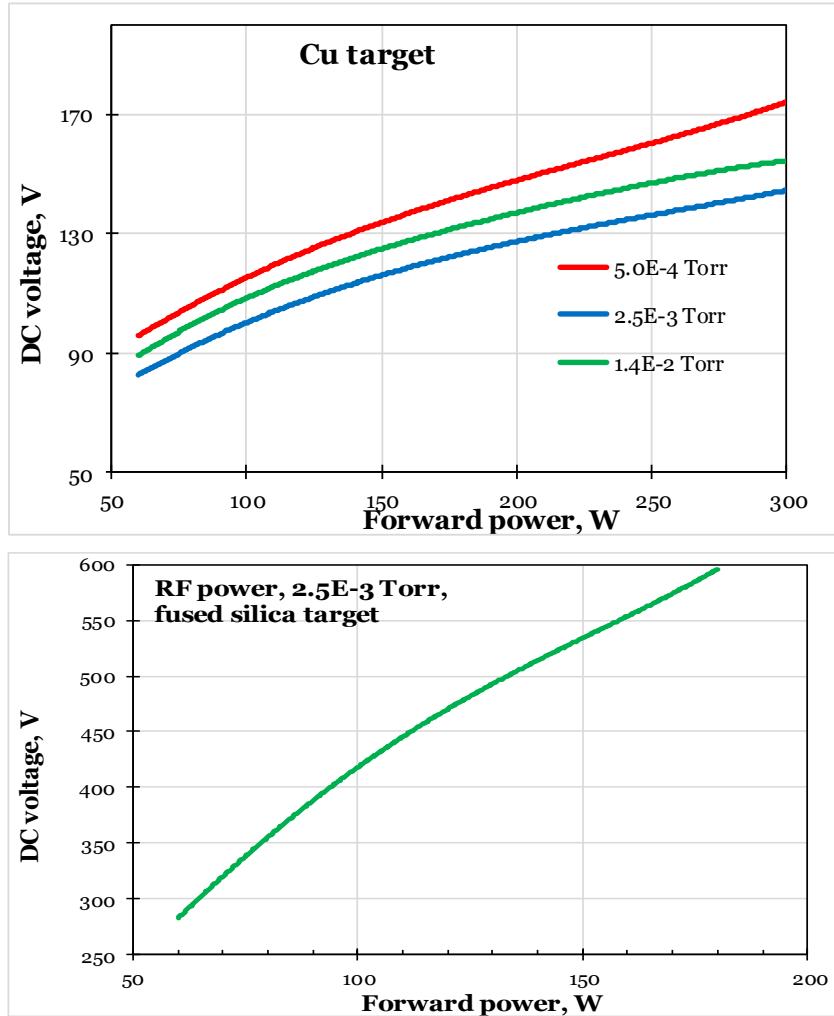
Range, mm	RF Uniformity
50	±5.2%
60	±6.9%
70	±9.1%

Cu target, RF 300W,
1.4 e-2Torr

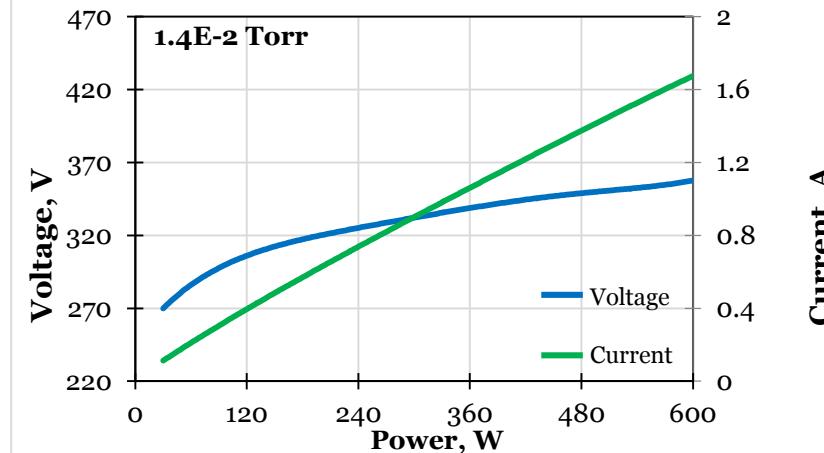
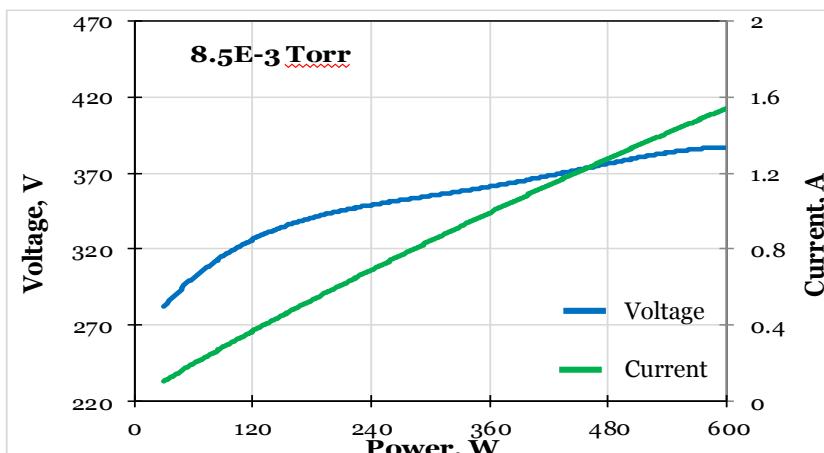
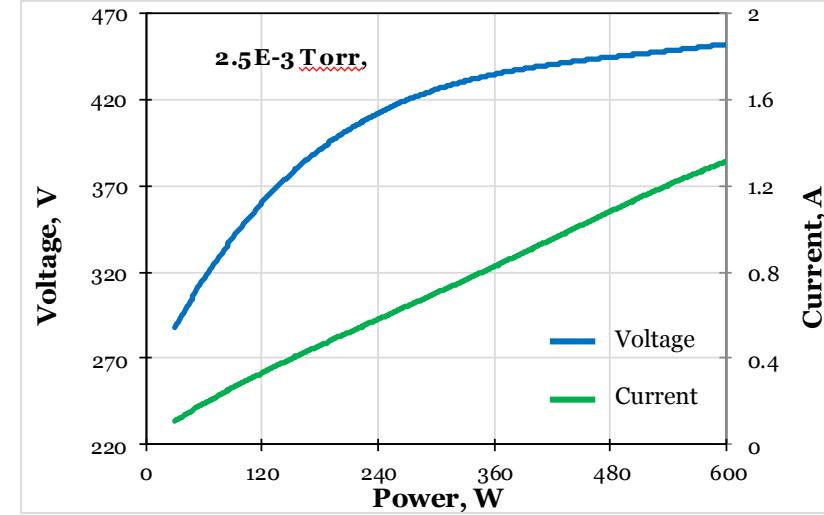
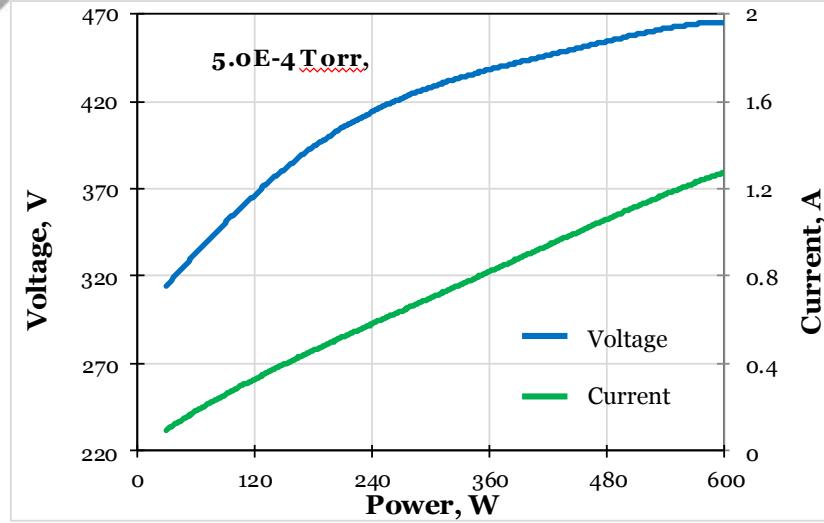
Power Vs Voltage Vs Current (3G50 Cu target, DC power)



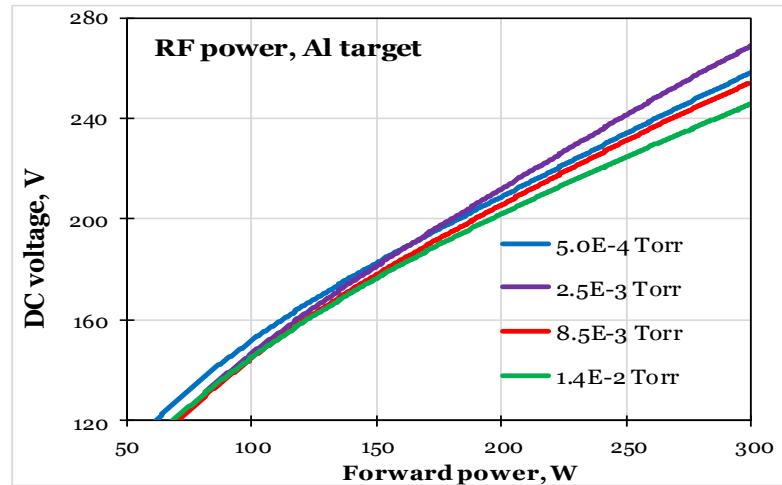
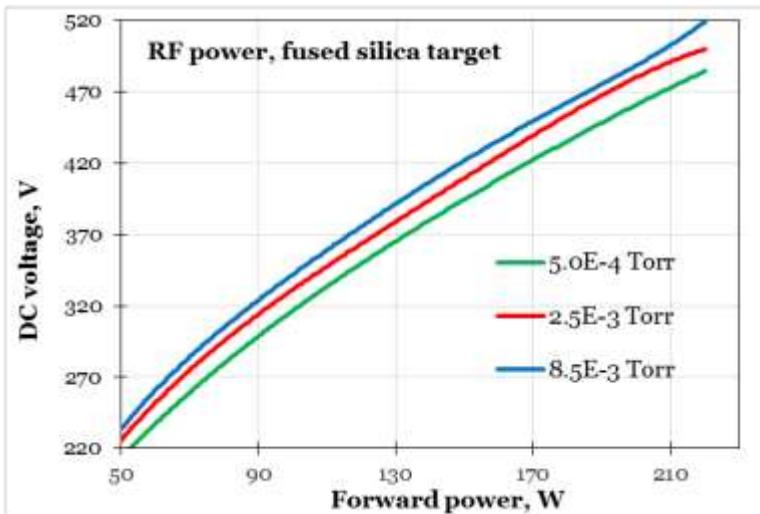
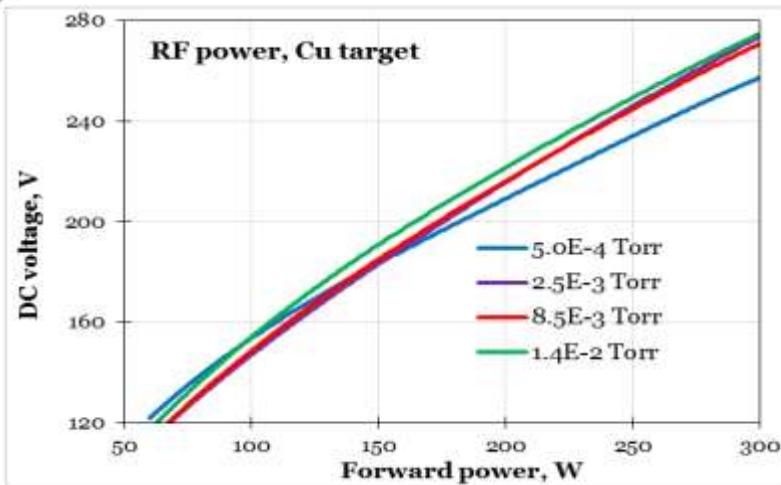
Power Vs Voltage (3G50 RF Power)



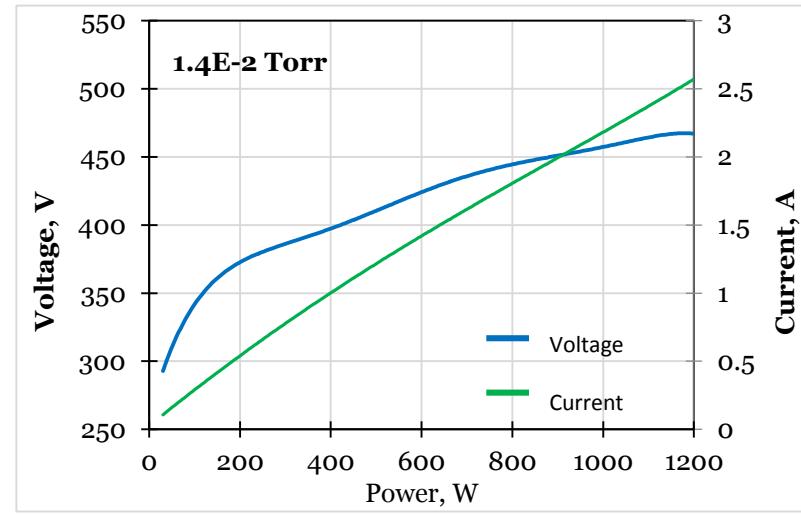
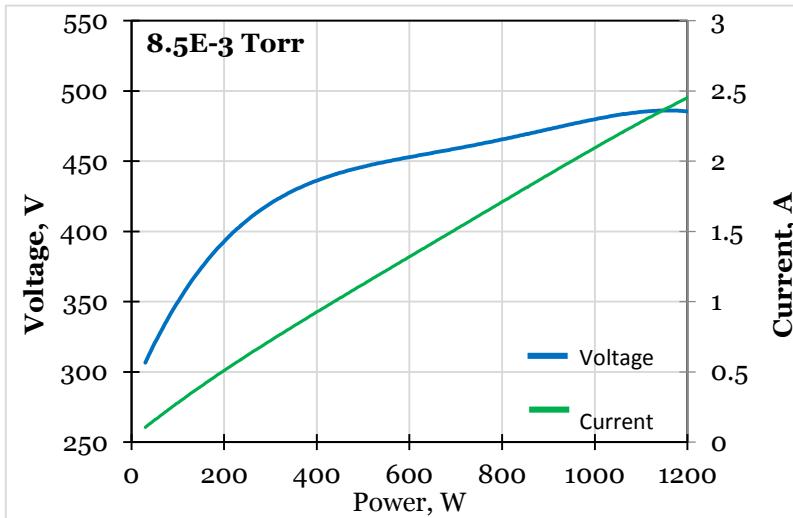
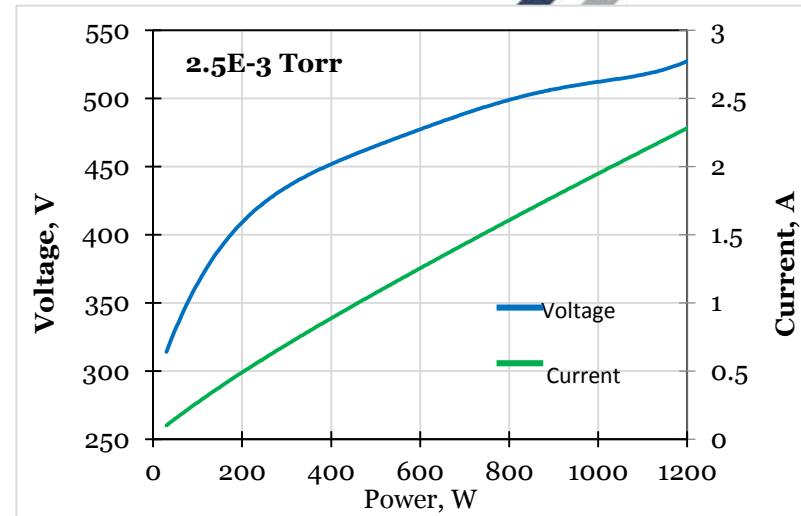
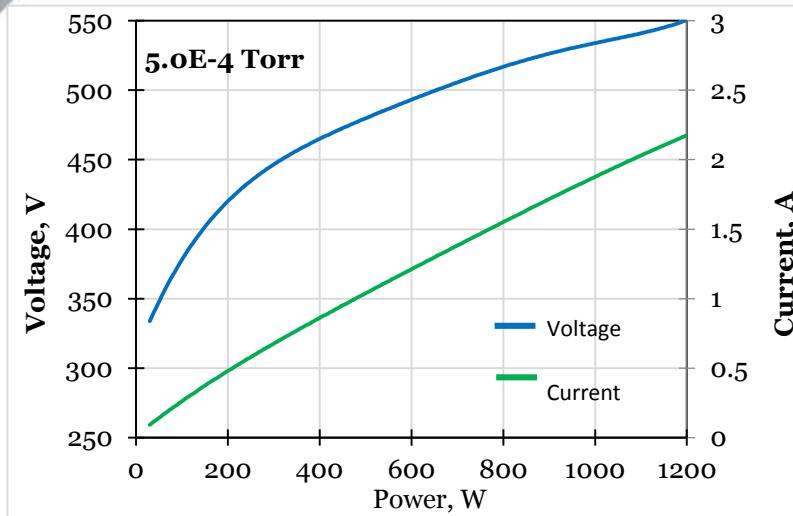
Power Vs Voltage Vs Current (3G75 Al target, DC power)



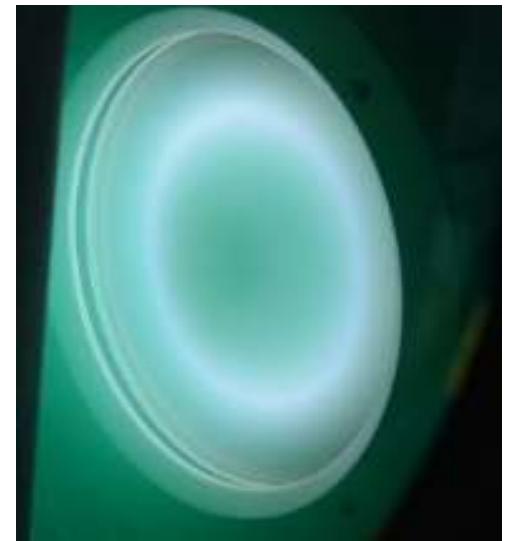
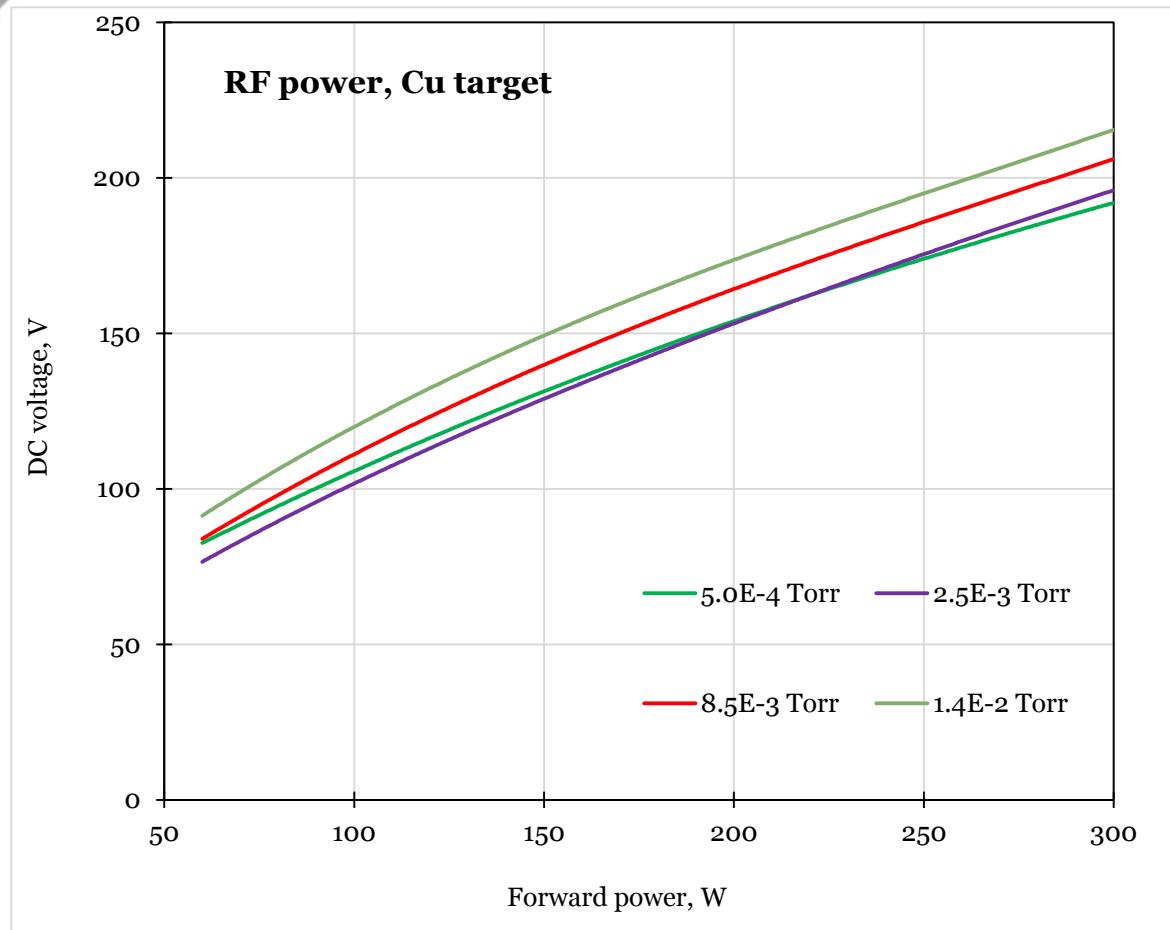
Power Vs Voltage (3G75, RF power)



Power Vs Voltage Vs Current (3G100 Cu target, DC power)



Power Vs Voltage (3G100, RF power)





Gencoа 3G – No.1 choice for R&D Thin Film Technology

Gencoа 3G Advantages	Competition
Lower Pressure Operation. 3G magnetrons can work down to e-6 Torr range	Most small size magnetrons work e-4 Torr range only
Small head size allows for smaller chambers or more sources within the same space	Larger heads require larger chambers
Magnetron head can be tilted 45 ° with ease. No welded bellows and compact tilt height allows sources closer together in a cluster. The angle can be fixed accurately to 1 °.	Magnetrons are tilted using welded bellows which requires more chamber space and less accurate.
High Yield magnetics for 4" offering >40 % target use and recommended for precious metal sputtering	Not Available
<i>Gas injection standard for all magnetrons</i>	Extra cost
<i>DC, RF & HIPIMS compatible as standard</i>	Ordered as an option
<i>Gencoа developed uniformity software to generate a coating uniformity direct from the magnetic field model and taking into account all system parameters</i>	Not available

3G Cu Example Deposition Rates (100mm T-S)

Target Size	Target Thickness (mm)	Power Mode	Power (W)	Deposition Rate (nm/min)
2"	3	DC	300	134
2"	3	RF	300	94.5
3"	6	DC	300	133
3"	6	RF	300	80
4"	6	DC	300	116
4"	6	RF	300	70



Gencoа cluster solution to R&D Market

IMC75

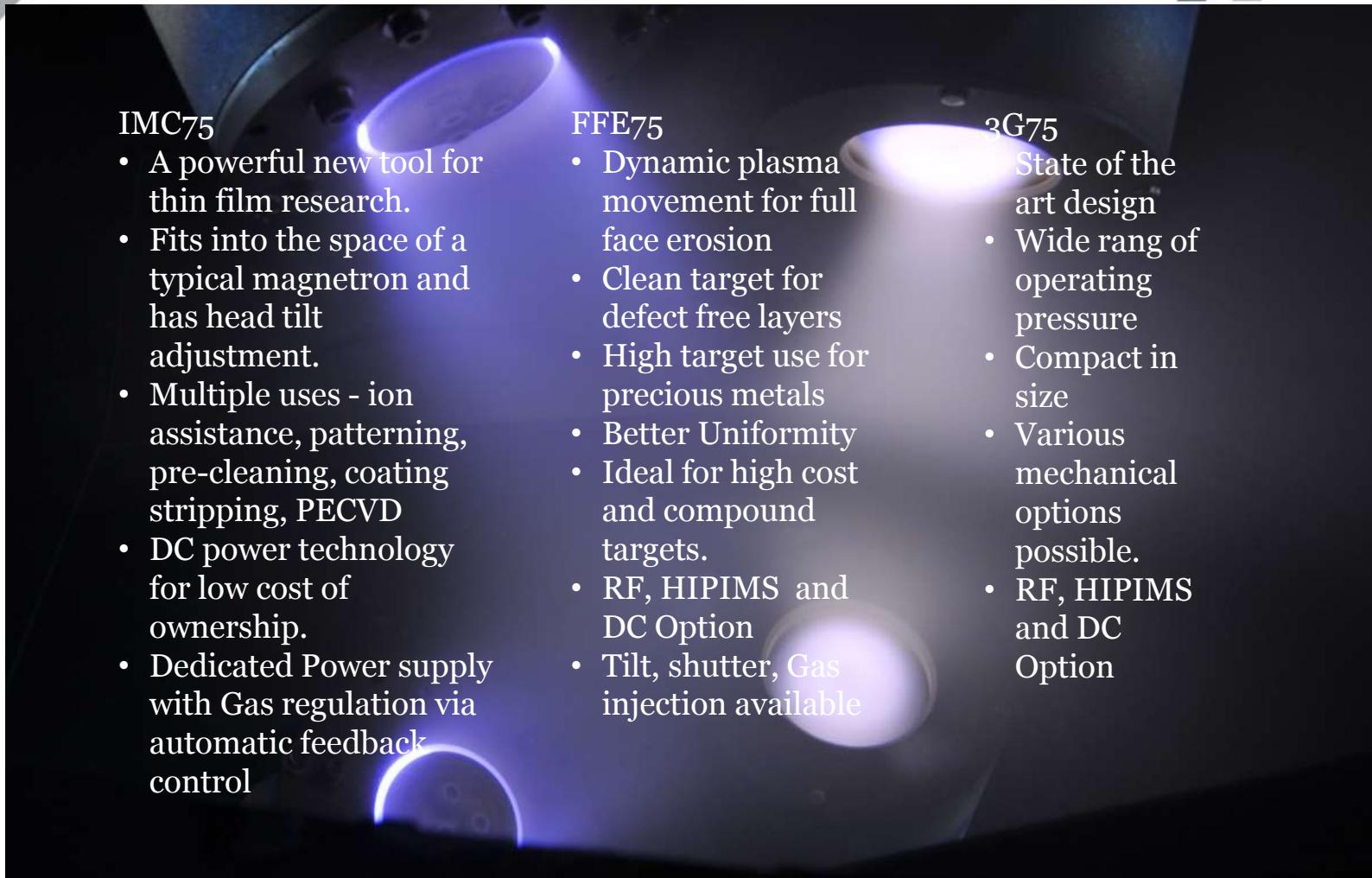
- A powerful new tool for thin film research.
- Fits into the space of a typical magnetron and has head tilt adjustment.
- Multiple uses - ion assistance, patterning, pre-cleaning, coating stripping, PECVD
- DC power technology for low cost of ownership.
- Dedicated Power supply with Gas regulation via automatic feedback control

FFE75

- Dynamic plasma movement for full face erosion
- Clean target for defect free layers
- High target use for precious metals
- Better Uniformity
- Ideal for high cost and compound targets.
- RF, HIPIMS and DC Option
- Tilt, shutter, Gas injection available

3G75

- State of the art design
- Wide rang of operating pressure
- Compact in size
- Various mechanical options possible.
- RF, HIPIMS and DC Option



Further information gencoacom/3g-circular



You might also be interested
in our small circular ffe
magnetron range and IMC75
circular ion source

IMC75 R&D Power in one source
– substrate pre-cleaning, etch
and patterning, ion assistance,
oxidation, Plasma ALD, Plasma
CVD, ion beam sputtering,
cluster encapsulation



Further information

For further information on the Gencoa range of 3G circular magnetrons, visit www.gencoa.com/3g-circular or email sales@gencoa.com to contact member of the sales team.

