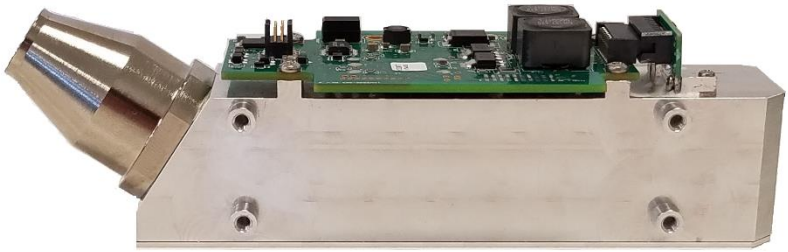
M502 and M502HC Ultra-mini X-ray Source



M502 Ultra-mini X-ray Source, 50kV, 05W: The M502 monoblack is a fully integrated miniature 50kV, 5W x-ray generator designed specifically to be used as a component of a handheld, portable or benchtop x-ray instrument. The source includes a miniature sealed x-ray tube with a transmission-type end window, a high voltage power supply and control electronics mounted on a compact grounded enclosure. The M502 is also available in a high current version, the M502HC.

Features

Compact design – The M502 measures 141mm in length - ideal for handheld, portable and benchtop instruments

Low power consumption - compatible with battery operation

Easy to operate - available with either I^2C digital interface or analog interface

Integrated design - no high voltage cables

Machined metal enclosure - precision mounting and alignment

Patented x-ray Omnishield™ - 360° light weight radiation shielding (except output window)

Wide cone angle - 110° full width x-ray cone angle

Applications

XRF Materials Analysis

- Alloy and metal sorting
- ROHS and ELV compliance
- Forensic science
- Mining and geology
- Art and archeology
- Coating thickness
- Lead detection
- Quality control
- NDT
- Precious metal verification

X-ray imaging

- Medical, dental, small animal
- Security, contraband

Operating Specifications:	**M502**	**M502HC**
Tube voltage:	8 kV - 50 kV	4kV - 50kV
Tube current:	5 - 200 µA	5 - 500 µA
Tube power:	5 Watts max	5 Watts max

Physical Specifications:	
Tube type:	Metal-ceramic
Cathode type:	Tungsten filament
X-ray window:	Be, 125 µm
Target type:	Transmission
Available targets:	Au, Ag, Rh, W
X-ray cone angle:	110°
Input voltage:	11-12 VDC nominal
HV polarity:	Grounded anode
HV stability:	< 0.1%
Electrical insulation:	Silicone potting
Radiation shielding:	Self-shielded
Operating temp (case):	-10°C - 60°C
Storage temp:	-25°C - 85°C
Cooling:	Air cooled
Ambient humidity:	90% max (non-condensing)
Weight:	Approx. 245 g.

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Analog Interface

PIN	NAME	TYPE	RANGE	SCALING/VALUE
Pin 1	V+	Input Power	10.5 - 12 VDC	
Pin 2	V+	Input Power	10.5 - 12 VDC	
Pin 3	GND	Ground	0V	
Pin 4	GND	Ground	0V	
Pin 5	TUBE I CNTL	Analog Input	0 - 4V	0 - 200 µA (M502) 0 - 500 µA (M502HC)
Pin 6	TUBE HV CNTL	Analog Input	0 - 4V	0 - 50 kV
Pin 7	N/A			
Pin 8	TUBE ENABLE	Digital Input	0-5V	LOW = OFF HIGH = ENABLE
Pin 9	TUBE HV MONITOR	Analog Output	0 - 4V	0 - 50 kV Tolerance=0.1%
Pin 10	TUBE I MONITOR	Analog Output	0 - 4V	0 - 200 µA (M502) 0 - 500 µA (M502HC)

I^2C Interface

PIN	NAME	TYPE	RANGE	
Pin 1	V+	Input Power	10.5 - 12 VDC	1.0 Amp Max
Pin 2	V+	Input Power	10.5 - 12 VDC	1.0 Amp Max
Pin 3	GND	Ground	0V	(POWER COMMON)
Pin 4	GND	Ground	0V	(POWER COMMON)
Pin 5	V_Io	I^2C Input Power	3.3-5.0v	(LOGIC POWER)
Pin 6	GND_Io	I^2C Ground	0 V	(LOGIC COMMON)
Pin 7	TUBE READY	Digital Output	0-5V CMOS	LOW = NOT READY HIGH = READY
Pin 8	TUBE ENABLE	Digital Input	0-5V CMOS	LOW = OFF HIGH = ENABLE
Pin 9	I^2C_SCL	Serial Clock Input	SCL/SDA voltage level = V_Io External pullup required as per I^2C specification. 100 or 400 kHz speeds allowed.	
Pin 10	I^2C_SDA	Serial Data Bidirectional		

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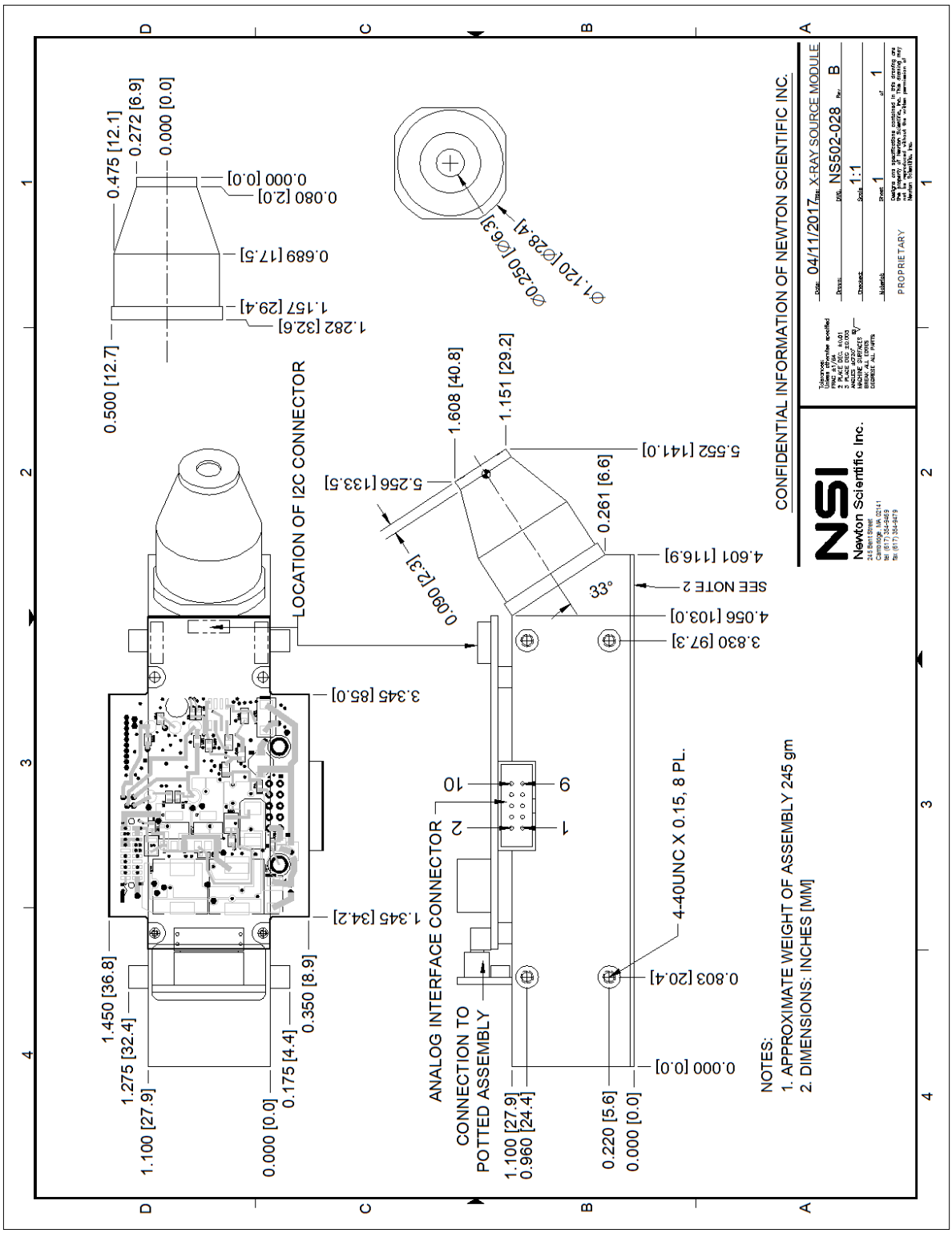

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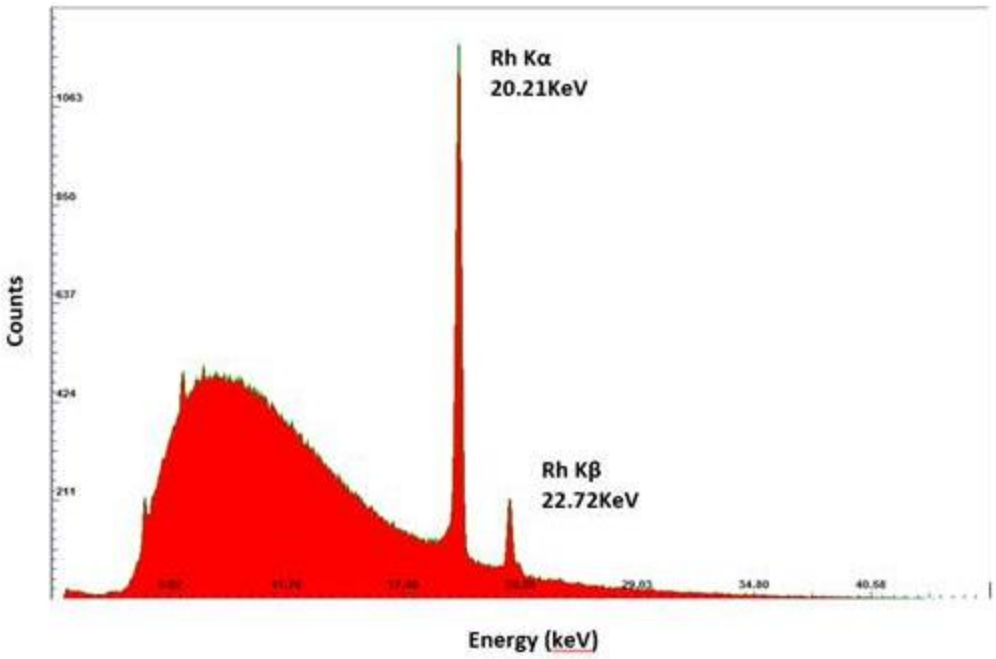
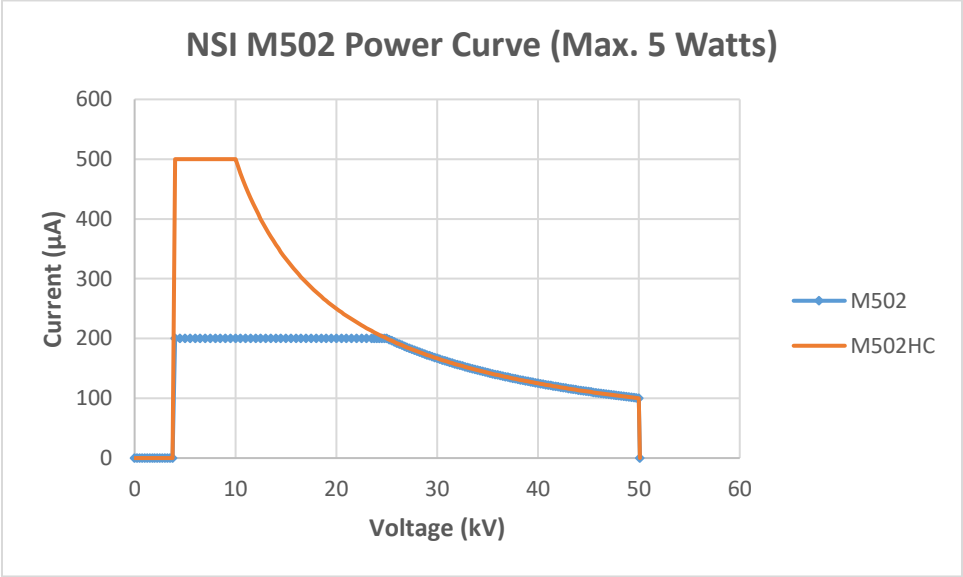
X-ray Output Spectrum for Rh Target at 45kV
(Measured using an Amptek PX4 Analyzer and a SiPIN detector)





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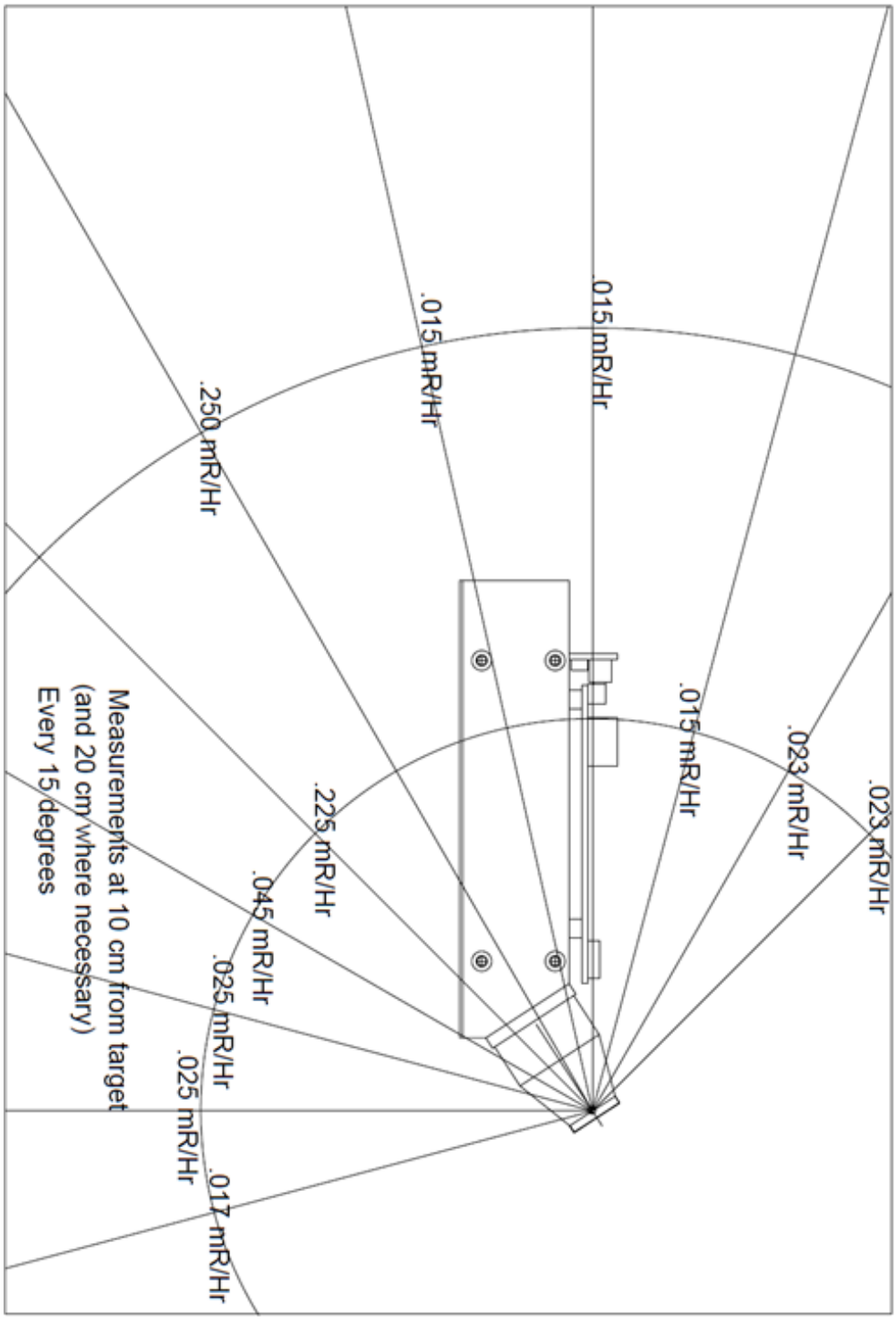
Measured at 50kV and 100µA



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