RESONANCE LTD
Optical Solutions & Technologies

High-Power, RF-Excited VUV Light Source KrLM-LHP, XeLM-LHP, ArCM-LHP, XeCM-LHP, KrCM-LHP

Operating Manual

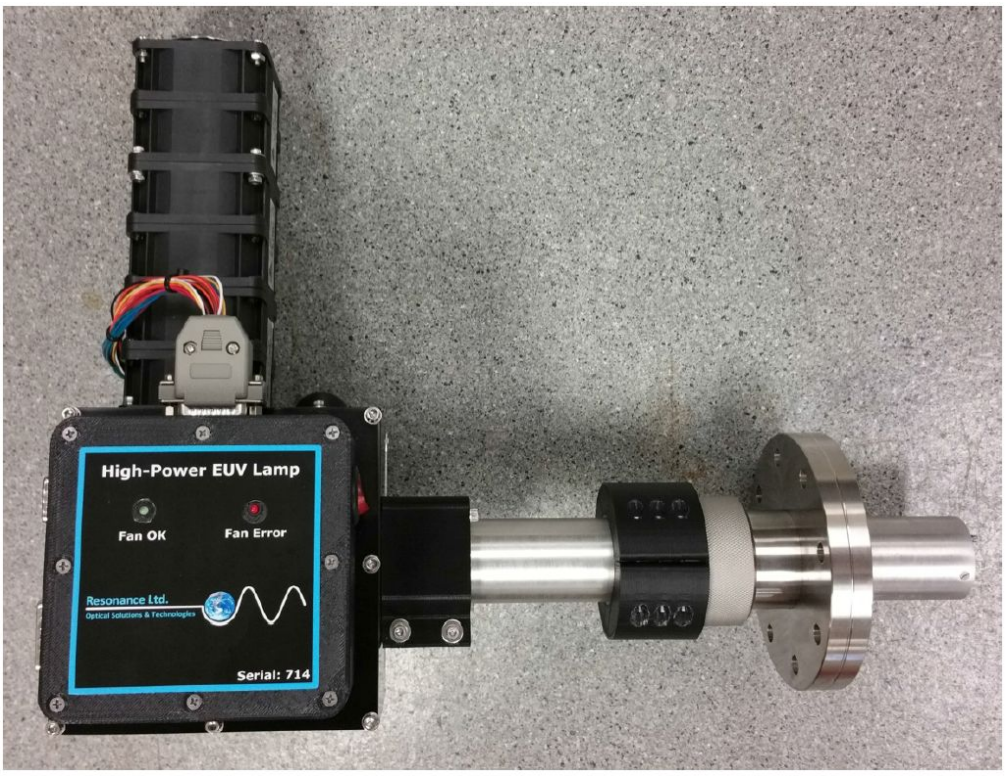


Table of Contents

Overview

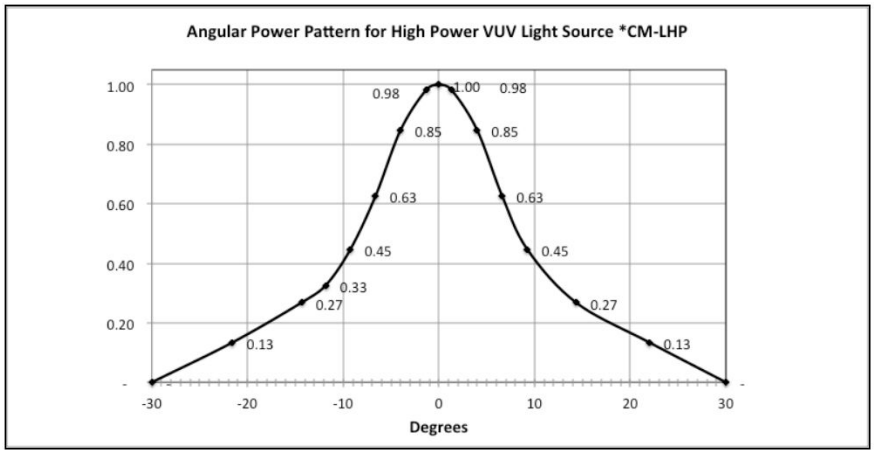
The Resonance Ltd. High Power VUV lamp can accept up to 300W of RF input power and can use a variety of bulbs containing Argon, Krypton and Xenon. While the lamps emit light up to 7,000 nm they are mainly used to produce VUV and UV radiation in the 100 to 200 nm range either in discrete lines (XxLM types or continuua XxCM types.

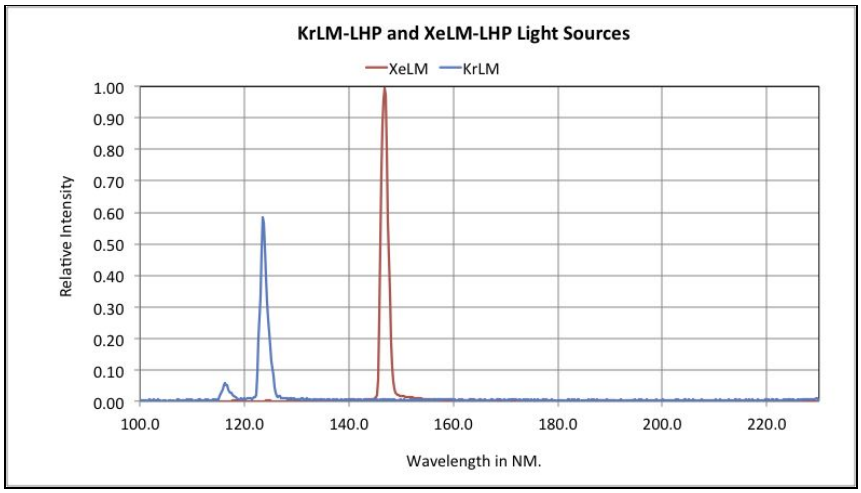
This source mounts to a 4.5 inch CF (other flanges on request) for convenient connection to a HV system. The re-entrant design facilitates control of the flux-coverage area and irradiance on the target. The 0-300 W power supply works at 13.5 MHz with a matching network to optimize coupling to the lamp. Versions with focusing mirrors and calibration detectors are available as custom systems.

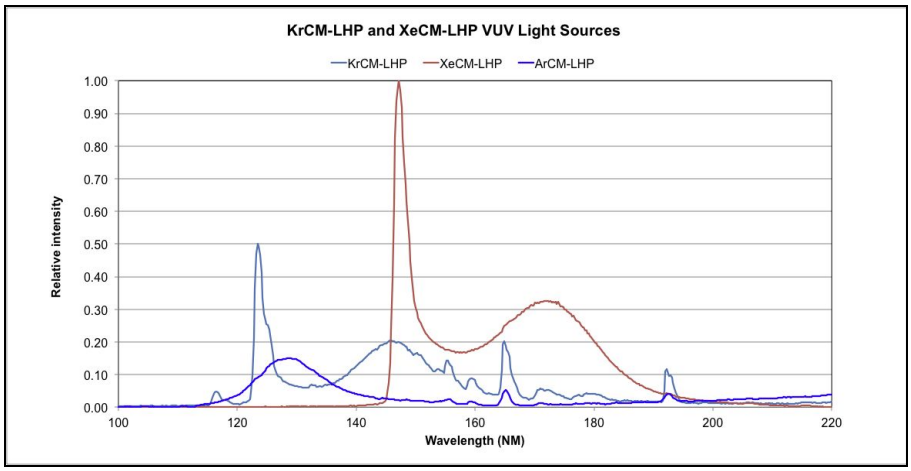
A key feature of the light source is its fully automatic variable cooling system with a stack of high-flow fans. This system prevents overheating with an internal heat sink that is integral with the lamp bulb that is cooled with a variable speed fan system. The RF power supply is interlocked into the cooling system such that the fans must be active and regulated at a suitable speed or else the RF cannot be turned on. The lamp also includes a high-voltage starting wire that can be used to impart a charge onto the bulb to aid in starting if the RF power does not light the bulb.

Electrical/Optical/General Specifications				
Specification	Minimum	Typical	Maximum	Units
Gas fills		Ar, Kr, Xe		
VUV Wavelengths	KrLM-LHP: 116.5 and 123.6 XeLM-LHP: 147 ArCM-LHP: 113 to 140 nm KrCM-LHP: 116 to 170 XeCM-LHP: 146 to 190			NM
Full Spectral Range	-	28 – 7000	-	NM
VUV Intensity	KrLM-LHP: 5E16 ph/sec/sr @70W XeLM-LHP: 1e17 ph/sec/sr @70W ArCM-LHP: 6E16 ph/sec/sr @70W KrCM-LHP: 1E17 ph/sec/sr @70W XeCM-LHP: 1.8E17 ph/sec/sr @70W			Photons/sec/steradian
Full Angle Output Cone	16	18	21	Degrees
Clear Aperture (Standard Tube)	0.85	0.9	0.95	CM.
Certification	Calibration of Irradiance in Vacuum			
Input Power	1	70	300	Watts
Input Voltage	70	115	260	VAC
Mounting Flange	4.5inch CF is standard, lamp can be sealed to HV system			
Cooling	Forced air cooling with 6-stage fan			

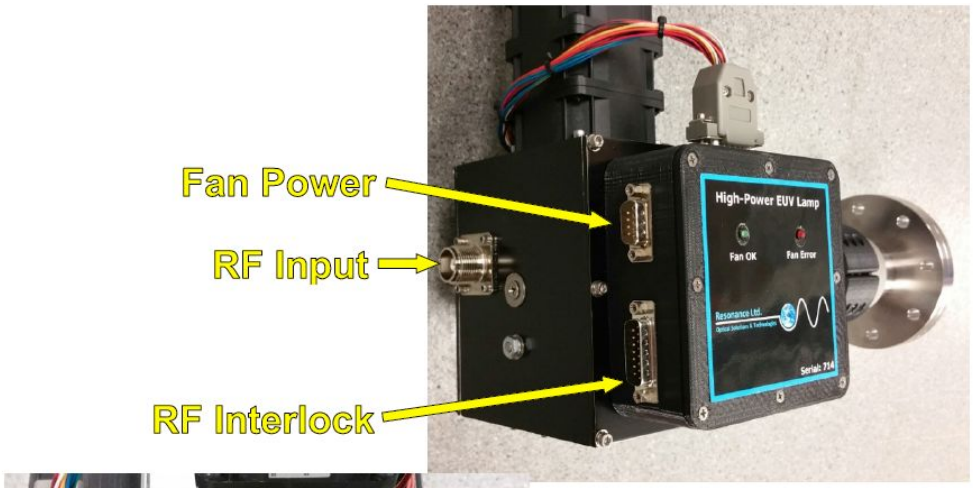
Optical Characteristics

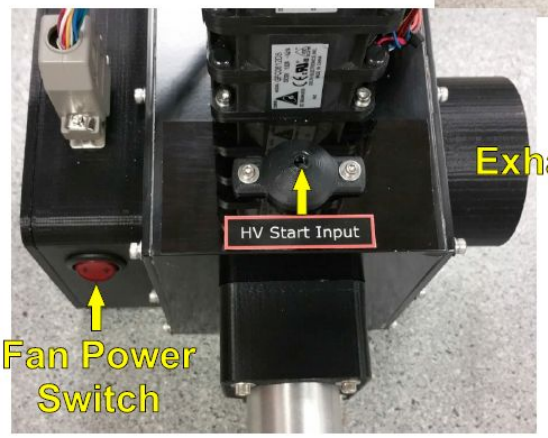






Configuration





Operating Warnings

Warning: Eye Hazard

Do not look directly at the light source plasma unless wearing glasses. Normal eyeglasses will block extreme UV of all light sources except mercury and deuterium. For these light sources use special UV-blocking glasses.

Warning: Avoid Damaging Window Seal

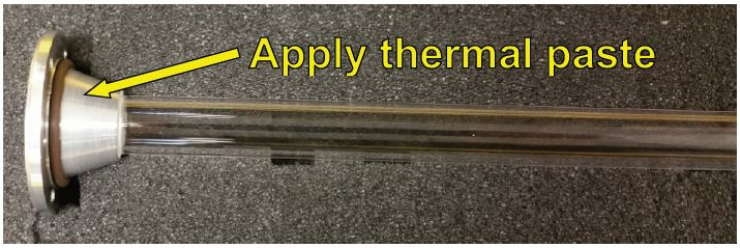
Do not use chloroform, acetone, xylene or vinegar to clean the light source window. Use of these (or similar based solvents) might dissolve the window or the window seal.

Operation

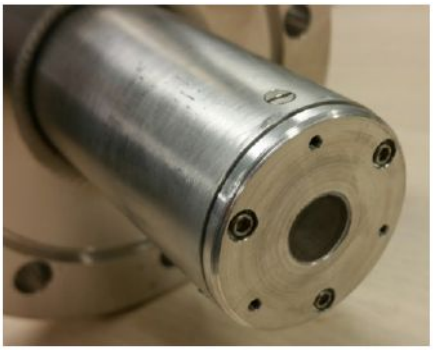
To start using your high-powered lamp please follow these instructions:

1. Select either the Xenon or Krypton bulb. Be very careful not to break the bulb while handling as they are very fragile. Inspect the bulb's window and clean if necessary following the instructions in the next section of this manual.

2. Apply some thermal paste onto the aluminum conical section of the bulb:



3. Carefully insert the bulb into the lamp and fasten tightly using the #2 screws:



4. Connect the RF power supply's output into the RF tuning box's input:

5. Connect the RF tuning box's RF output to the lamp's RF Input.

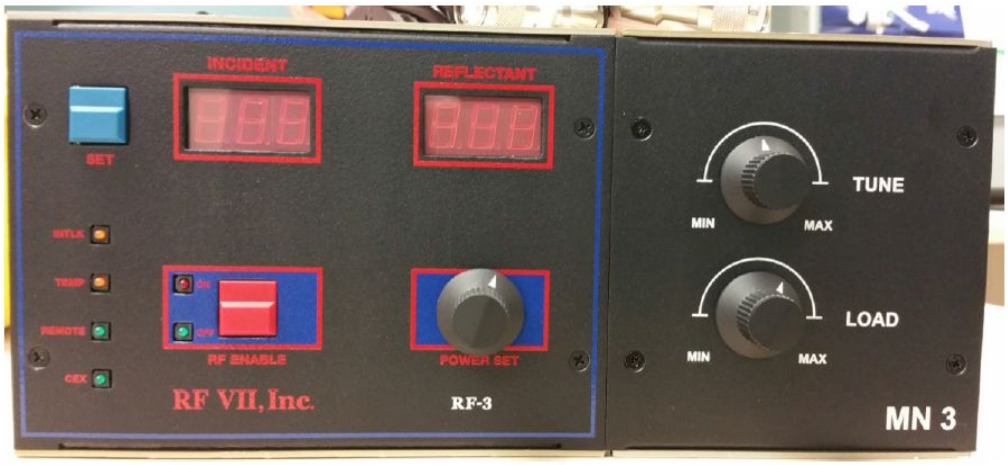
6. Connect the RF interlock on the lamp and the "Analog Interface" on the RF power supply together using the included 15-pin DSUB cable.

7. Connect the fan power supply to the lamp.

8. Connect the fan power supply and RF power supply to AC mains power.

9. Turn on the lamp's fan cooling. The Fans should momentarily pulse to a high speed and the green "Fan OK" LED should turn on.

10. Turn on the RF supply by using the main switch on its back panel. RF power will not be output until the "RF Enable" button on the front panel is pressed.



11. As long as the green "Fan OK" LED is lit, RF power can be enabled since its interlock should be satisfied. Press the "RF Enable" button to activate RF output. Adjust the amplitude (power) of the RF by turning the "Power Set" knob. We recommend using 25 Watts of RF power as an initial setting.

12. Take note of how much RF power is "Reflectant". This number should be as low as possible and can be tweaked by using the "Tune" and "Load" knobs on the MN-3 tuning box. Once this number has been reduced to < 3 Watts the lamp may be checked for light output.

13. If the lamp has not yet started keep increasing RF power up to 50 Watts. If the bulb still isn't lighting the high-voltage starting input may be used.

14. While RF power is enabled, bring a high-voltage source such as a Tesla coil near the top opening of the "HV Input". This is essentially a wire wrapped directly around the bulb and allows for imparting high-energy pulses to kick-start the ionization of the gas inside the bulb which in turn allows plasma to form. A few shocks should start the bulb.

Window Cleaning

The light source window is polished magnesium fluoride and its vacuum ultraviolet transmission will be degraded if it is touched or otherwise contaminated. In all but the best vacuum systems a slow loss of window transmission will result from photo-polymerization of organic materials on the outside window surface. These problems may be overcome by proper cleaning of the window. A small bottle of polishing powder (1 micron aluminum oxide powder) and cotton-tipped applicators along with polishing instructions are included with the light source unit.

Before using the light source, inspect the window for any signs of gross contamination, such as fingerprints. If there are or if, after operating the light source, you notice a drop in output then clean the window with polishing powder (aluminum oxide) following these instructions. All cleaning operations are carried out with cotton-tipped applicators or with lint-free tissues.

1. Apply the polishing powder to an applicator tip.

2. Polish the window by firmly pressing the applicator against the center of the window and, in a circular motion, work your way outwards to the edge of the window. You should notice a frictional resistance as you slide across the window.

3. Repeat, using a new applicator, until there is no evidence of a film on the window when it is viewed with reflected light and there has been a noticeable decrease in the frictional resistance.

4. Wipe away excess powder with a dry applicator. A few specks of powder on the window will have a negligible effect on the optical transmission.

5. Remove the final bits of powder by directing a stream of ultra-high purity helium, nitrogen or argon across the window. ***Never use a lab source of air for this process because it may contain compressor oil.***

   For quick cleaning, it is acceptable to wipe the window with isopropanol or methanol using a cotton-tipped applicator. This will only work for light cleaning (light finger prints, dust, light smudges) and not more serious window contaminants.

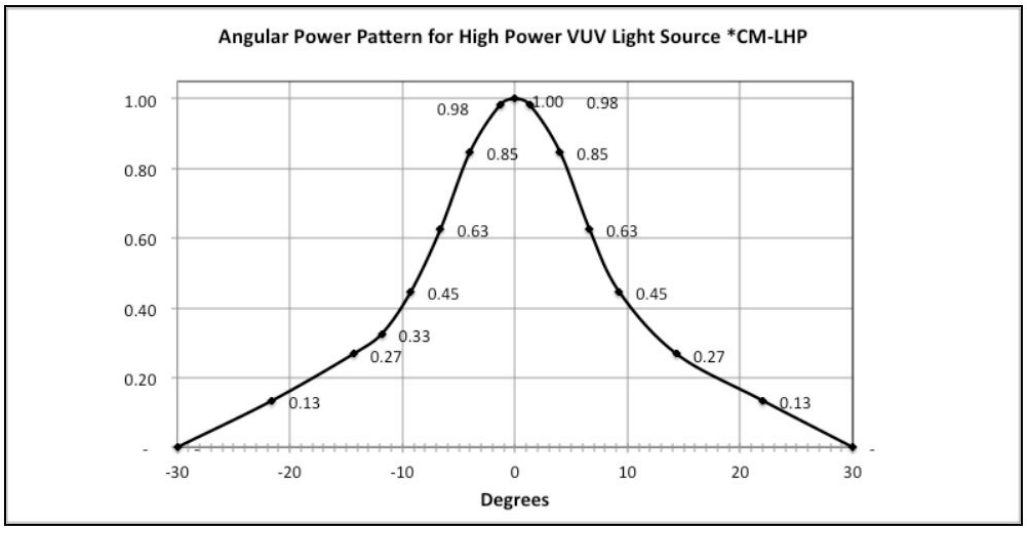
Calibration Data

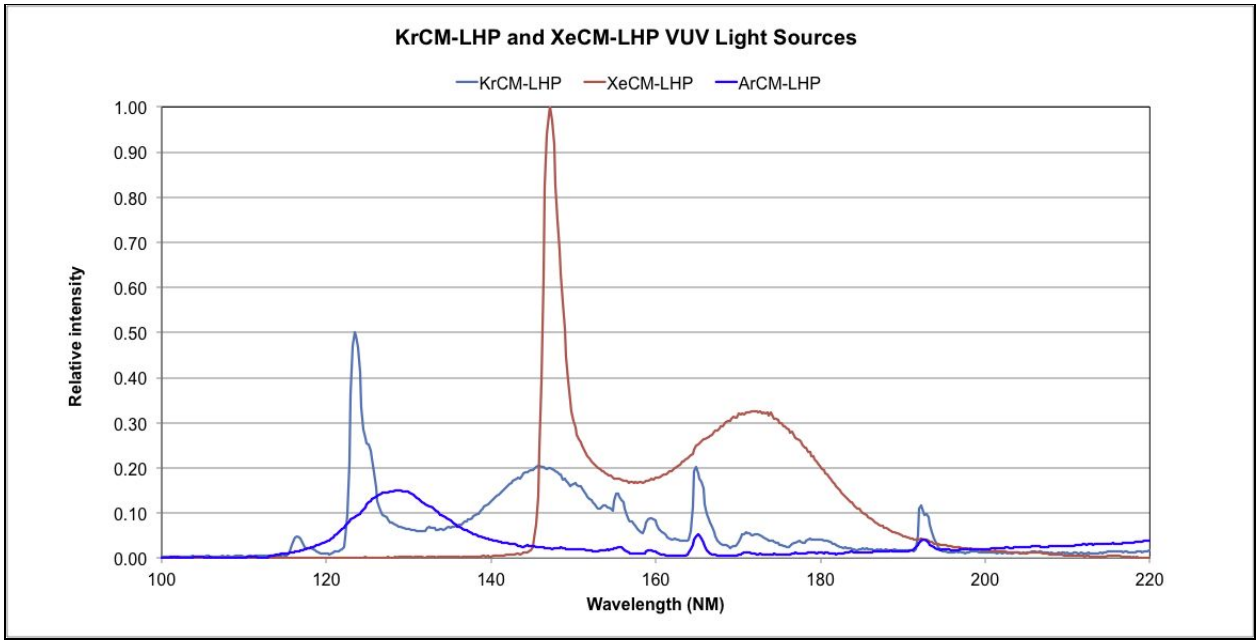
Calibration		
Calibration Standard	AXUV Diode NIST cal 02-126	
Parameter	Value	Units
Bulbs	LHP Ar, Kr, Xe	
Wavelength	Kr LIne 116.5, 123.6 Xe line 147 Ar continuum 128+-15 Kr continuum 116 to 170 Xe continuum 146 to 190	Nm
Forward Power	70	Watts
Reflected Power	0	Watts
Distance En. Slit to Lamp	4	Cm
Spectrometer Calibration	1.42E + 12c	Ph/sec/steradian per ct. per sec.
Measured Counts	11,200	Counts/second
Measured Intensity	See below	Ph/sec/steradian
Ultimate Vacuum	<2e – 7	Torr

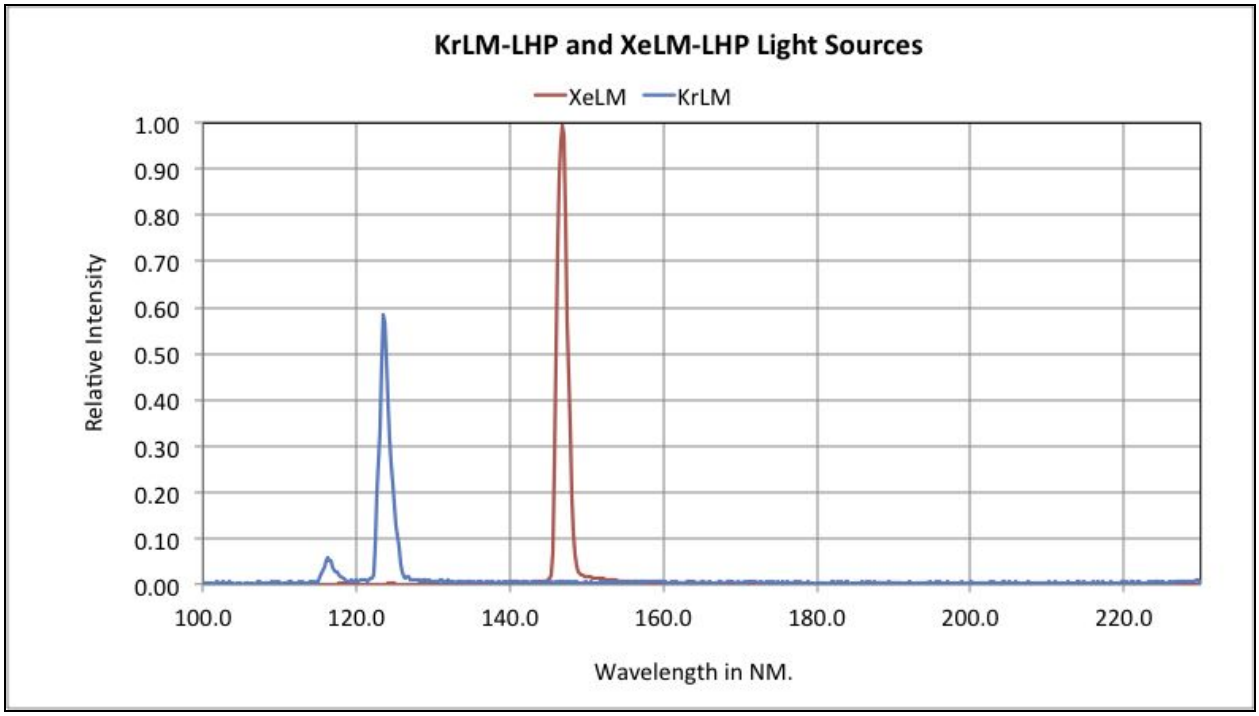
Lamp Flux (at peak of power pattern)

ArCM-LHP 4.9 E16 (ph/sec/sr)
KrCM-LHP 9.7E16 (ph/sec/sr)
XeCM-LHP 1.8 E17(ph/sec/sr)
(corresponding line sources are ~0.5 x continuum sources with the exception of Ar which is variable owing to window solarization)

Angular Power Pattern




KrCM-LHP and XeCM-LHP VUV Light Sources
KrCM-LHP
XeCM-LHP
ArCM-LHP
Relative intensity
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
100
120
140
160
180
200
220
Wavelength (NM)


KrLM-LHP and XeLM-LHP Light Sources
XeLM
KrLM
Relative Intensity
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
100.0
120.0
140.0
160.0
180.0
200.0
220.0
Wavelength in NM.

Contact

Resonance Ltd. stands behind every product we sell. We welcome feedback and encourage any of our customers to contact us with questions, or concerns. You may contact us through e-mail, our website, telephone, or fax!

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