Ultrahigh Brightness and Broadband Laser-Driven Light Sources

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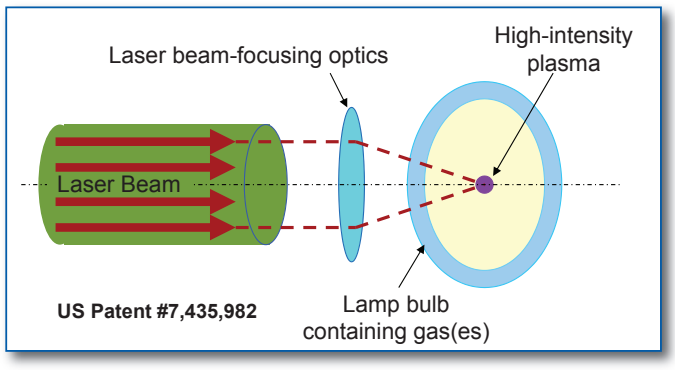
Abstract

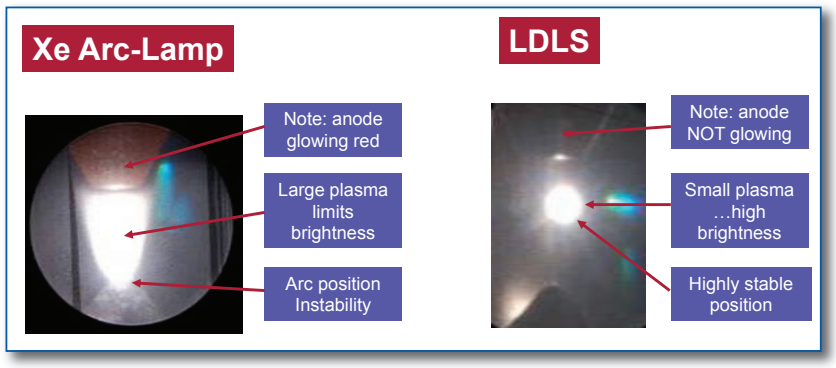
Today's cutting edge research and manufacturing applications in semiconductor, materials and life sciences require light sources capable of delivering highly bright and stable radiation over long lifetimes. Laser-Driven Light Sources (LDLSTM) were developed to use high power diode lasers to energize high intensity xenon (Xe) plasma. The light sources produce 170nm to 1700nm radiation with ultrahigh brightness and long source life.

LDLS Principle of Operation



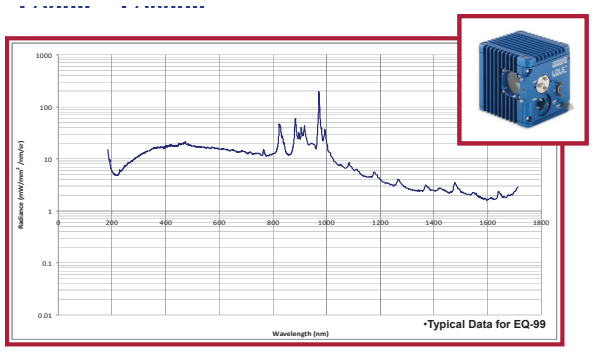
Near infrared diode laser beam is focused into a high pressure Xe bulb and a laser optical power sustained high temperature Xe plasma is generated. The plasma emits broad band radiation from 170nm to 1700nm with extremely high radiance (brightness).

Compare Plasmas in an Arc Lamp and in LDLS

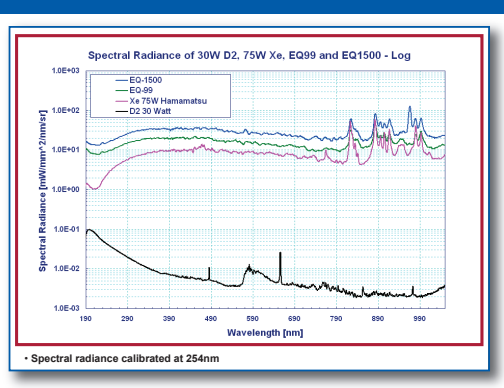


- LDLS has higher brightness with ~100 µm diameter Xenon plasma,
- LDLS can be efficiently coupled into small fibers or spectrometer slits
- LDLS is close to a point source enables better collimation
- LDLS plasma has higher temperatures for higher DUV emission

LDLS EQ-99: UV-Vis-NIR Radiance 170nm – 1700nm



Compare LDLS with Traditional Lamps



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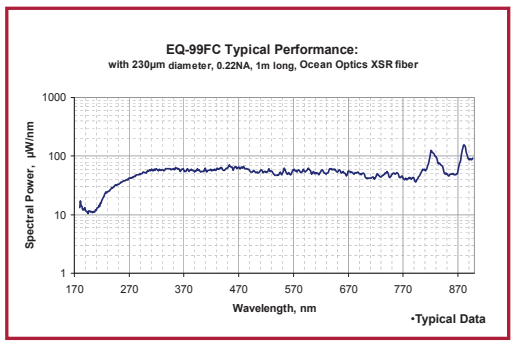
EQ-99FC (Fiber Coupled) Spectral Distribution



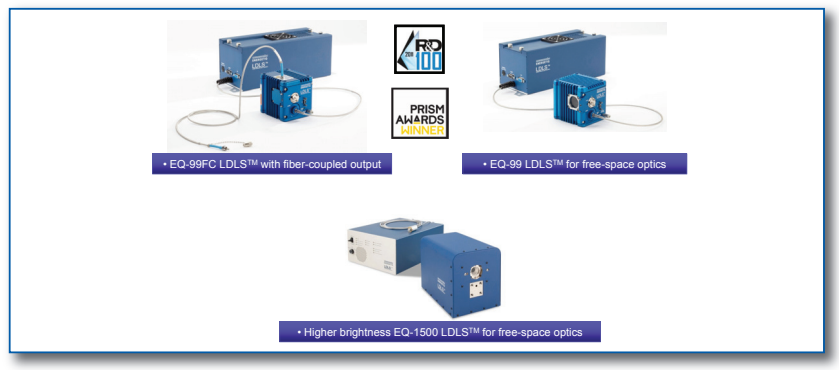
Power ratios	
Fiber (µm)	Multiplier
230	1
450	2.02
600	2.26

Benefits of LDLS Technology

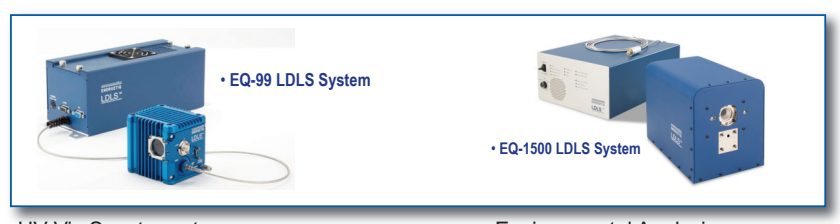
- Very high brightness across complete spectrum
  - 170nm through visible and out to 2100 nm
- Eliminates need for multiple lamps (replaces D2/Tungsten/Xenon Arc)
  - Simplified optical system
- Excellent Spatial stability
  - Repeatable measurements
- Superior short and long term power stability
  - Repeatable measurements
- Electrodeless operation for long life
  - Reduced consumable costs
  - Minimal recalibration of instrument

Broadband	√
Brightness	√
Stability	√
Lifetime	√

Energetiq LDLS Products on the Market



Field of Applications



- UV-Vis Spectrometry
- Monochromator Source
- PEEM
- Atomic Absorption Spectroscopy
- Materials Characterization
- Environmental Analysis
- Hyperspectral Imaging
- Gas Phase Measurements
- Advanced UV-Vis Microscopes
- Endoscopes/Borescopes

Summary

- Very high brightness across complete spectrum
  - 170nm through visible and out to 1700 nm
  - Easy coupling to small fibers and spectrometer slits
  - Ease of collimation
- Eliminates need for multiple lamps (replaces D2/Tungsten/Xenon Arc)
  - Simplified optical system
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