

**Naval Research Laboratory**  
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### Specification for UV Imaging Camera System

<b>Components described by this document</b>	
Imaging camera	Gated, intensified, UV imaging camera. Item must conform to specifications as listed in Tables A-C.
Imaging software	Data acquisition, image processing and development software. Item must conform to specifications as listed in Table D.
Acquisition hardware	Data acquisition hardware (i.e., frame grabber). Item must conform to specifications as listed in Table E.

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## Introduction

The Electra program at the Naval Research Laboratory is in need of a gated, intensified, UV sensitive camera for large-scale KrF excimer laser development. This camera will be used in various experiments and diagnostic studies to further the engineering and scientific understanding of KrF laser drivers for fusion energy. Various applications include temporal and spatial laser profile imaging, UV-VIS spectroscopy, beam angular multiplexing effects and plasma diagnostics. As a result, the camera must be robust, versatile and easy to use, and are, thus, subject to the specifications listed in the tables below. Please respond with "comply" or "noncompliance" in the column titled "Response." Finally, due to the nature of this research program, timely delivery of the requested products is essential. It is required that the lead time for this product be no greater than 12 weeks. If you cannot provide a camera system that meets or exceeds these specifications within this timeframe, please respond with "No Bid."

## Specifications

Parameter	Description	Requirement	Min/Max	Response
Delivery Time		12 weeks	Max	
Item Condition	New/used/refurbished	New		
Resolution	Total active pixels	1280x1024 pixels	Min	
Spatial resolution		30 lines/mm	Min	
Gray scale	A/D converter readout	12 bit	Min	
Intensifier gate time	Variable gating time	3ns to 25s		
Built-in delay generator	Variable delay time	0s to 25s		
Pixel size		13 $\mu$ m x 13 $\mu$ m	Max	
Full Frame readout	At full resolution	8 frames/s	Min	
Spectral range	Operating wavelength range	190nm to 700nm		
Sensitivity	Counts per photoelectron	80 counts/e <sup>-</sup>	Min	
Camera lens coupling	"Camera" mode	C-mount		
Spectrometer coupling	"Spectrograph" mode	Must have adapters available		

Parameter	Description	Requirement	Min/Max	Response
Sensor type		Progressive scan		
Active image area		1280x1024 pixels	Min	

Pixel size		13 $\mu$ m x 13 $\mu$ m	Max	
Full well capacity		25000 e <sup>-</sup>	Min	
Dynamic range		2000:1	Min	
Readout rate	At full resolution	6 MHz	Min	
Full Frame readout	At full resolution	8 frames/s	Min	
Readout noise	At full frame rate	8 e <sup>-</sup>	Max	
Horizontal binning	Variable binning range	1 –8 bins	Min	
Vertical binning	Variable binning range	1 –128 bins	Min	
Windowing	Region of interest (ROI)	Yes		
Dark current		0.1 e <sup>-</sup> /pixel/s	Max	
Cooling type	No liquid cooling allowed (air cooling is ok)	Thermo-electric		

**Table C: Intensifier Requirements**

Parameter	Description	Requirement	Min/Max	Response
Design		Single stage MCP		
Photocathode diameter		25 mm	Max	
Spectral range	Photocathode sensitivity wavelength range	190 nm to 700 nm		
Gate width	Variable gating time	3 ns to 25 s		
Delay range	Variable trigger time	0 to 25 s		
Delay Increment	For delay between 0-50 ns	1 ns step size	Min	
Intrinsic delay time		45 ns	Max	
Jitter		1 ns	Max	
Repetition rate		Up to 2MHz		
Phosphor decay time	To 10% of initial value	1 ms	Max	
Vignetting	Max from center to rim	30%	Max	

**Table D: Software Requirements**

Parameter	Requirement	Response
Operating system compatiblity	Windows 2000	
Camera system software suite	Software to use camera "out of box" without the need for user programming	

Data acquisition capabilities	Development package for complete camera operational programmability	
Data processing capabilities	Development package for image processing programmability	
Camera command language	Development package of Visual Basic and C compatible functions	

<b>Table E: Hardware Requirements</b>		
<b>Parameter</b>	<b>Requirement</b>	<b>Response</b>
Operating system compatibility	Windows 2000 (PC-based)	
A/D board interface	PCI board	
A/D resolution	12-bit	
A/D conversion frequency	12.5 MHz	
A/D conversion factor	5e <sup>-7</sup> /count	
TTL-I/O board interface	PCI board – for synchronization to external devices	
TTL-I/O input channels	At least 3 input channels (optically isolated)	
TTL-I/O output channels	At least 20 output channels	