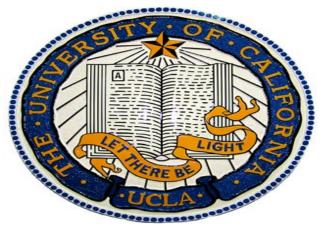
Progress on AE85 A Multiatmosphere CO₂ Amplifier Optically Pumped by a 4.3 µm Fe:ZnSe Laser

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<u>Jeremy Pigeon*</u>, SERGEI TOCHITSKY-PI, Dana Tovey, Chan Joshi

Department of Electrical Engineering, UCLA
*Department of Physics and Astronomy, Stony Brook
University

Igor Pogorelsky, Mikhail Polyanskiy
Brookhaven National Laboratory, USA
Sergei Mirov et al, University of Alabama at Birmingham



Electron Beam Requirements

Parameter	Units	Typical Values	Comments	Requested Values
Beam Energy	MeV	50-65	Full range is ~15-75 MeV with highest beam quality at nominal values	NA
Bunch Charge	nC	0.1-2.0	Bunch length & emittance vary with charge	
Compression	fs	Down to 100 fs (up to 1 kA peak current)	3	
Transverse size at IP (s)	mm	30 – 100 (dependent on IP position)	It is possible to achieve transverse sizes below 10 um with special permanent magnet optics.	
Normalized Emittance	mm	1 (at 0.3 nC)	Variable with bunch charge	
Rep. Rate (Hz)	Hz	1.5	3 Hz also available if needed	
Trains mode		Single bunch	Multi-bunch mode available. Trains of 24 or 48 ns spaced bunches.	

CO₂ Laser Requirements

Configuration	Parameter	Units	Typical Values	Comments	Requested Values
CO ₂ Regenerative Amplifier Beam	Wavelength	mm	9.2	Wavelength determined by mixed isotope gain media	NA
	Peak Power	GW	~3		
	Pulse Mode		Single		
	Pulse Length	ps	2		
	Pulse Energy	mJ	6		
	M ²		~1.5		
	Repetition Rate	Hz	1.5	3 Hz also available if needed	
	Polarization		Linear	Circular polarization available at slightly reduced power	
CO ₂ CPA Beam	Wavelength	mm	9.2	Wavelength determined by mixed isotope gain media	NA
Note that delivery of full power pulses to the Experimental Hall is presently limited to Beamline #1 only.	Peak Power	TW	2	~5 TW operation is planned for FY21 (requires further in-vacuum transport upgrade). A 3-year development effort to achieve >10 TW and deliver to users is in progress.	
	Pulse Mode		Single		
	Pulse Length	ps	2		
	Pulse Energy	J	~5	Maximum pulse energies of >10 J will become available in FY20	
	M^2		~2		
	Repetition Rate	Hz	0.05		
	Polarization		Linear	Adjustable linear polarization along with circular polarization will become available in FY20	

Other Experimental Laser Requirements

Ti:Sapphire Laser System	Units	Stage I Values	Stage II Values	Comments	Requested Values
Central Wavelength	nm	800	800	Stage I parameters should be achieved by mid-2020, while Stage II parameters are planned for late-2020.	NA
FWHM Bandwidth	nm	20	13		
Compressed FWHM Pulse Width	fs	<50	<75	Transport of compressed pulses will initially include a very limited number of experimental interaction points. Please consult with the ATF Team if you need this capability.	
Chirped FWHM Pulse Width	ps	? 50	?50		
Chirped Energy	mJ	10	200		
Compressed Energy	mJ	7	100		
Energy to Experiments	mJ	>4.9	>80		
Power to Experiments	GW	>98	>1067		

Nd:YAG Laser System	Units	Typical Values	Comments	Requested Values
Wavelength	nm	1064	Single pulse	NA
Energy	mJ	5		
Pulse Width	ps	14		
Wavelength	nm	532	Frequency doubled	
Energy	mJ	0.5		
Pulse Width	ps	10		

Special Equipment Requirements and Hazards

Electron Beam

• Please indicate any special equipment that you expect to need, including (but not limited to) the transverse deflecting cavity, shaped bunch using mask technique, plasma capillary discharge system, bolometer/interferometer setup etc.:

CO₂ Laser

- Please note any specialty laser configurations required here:
- Ti:Sapphire and Nd:YAG Lasers
 - Please note any specialty non-CO₂ laser configurations required here:
- Hazards & Special Installation Requirements
 - Large installation (chamber, insertion device, etc.):
 - Cryogens: Liquid nitrogen for Fe:ZnSe
 - Introducing new magnetic elements:
 - Introducing new materials into the beam path:
 - Any other foreseeable beam line modifications:

Experimental Time Request

CY2020 Time Request

Capability	Setup Hours	Running Hours
Electron Beam Only		
Laser* Only (in FEL Room)		
Laser* + Electron Beam		

Time Estimate for Remaining Years of Experiment (including CY2020)

Capability	Setup Hours	Running Hours
Electron Beam Only		
Laser* Only (in FEL Room)		
Laser* + Electron Beam		

^{*} Laser = Near-IR or LWIR (CO₂) Laser