

Laser developments under TRP funding

- PULSNIR – Pulsed Laser Source in NIR

 - Frequency converter for CO₂ DIAL

 - Optical parametric or Raman conversion scheme

 - Highly challenging spectral performance requirements

 - Closely related to parallel pump laser development

- HELPS – High Efficient Laser Pump Source

 - Versatile pulsed pump source for future Lidar systems

 - Focus on significant increase of wall-plug efficiency

Pulsed Laser Source in NIR (PULSNIR)

Parameter	Value	Comments
Laser wavelength λ	Only a single one of the indicated wavelengths will be selected by the Agency at kick-off for implementation.	Set of two distinct wavelengths $\lambda_1, \lambda_2 \in [1.57\mu\text{m}, 1.61\mu\text{m}]$ or $\lambda_1, \lambda_2 \in [2.04\mu\text{m}, 2.06\mu\text{m}]$
<i>Wavelength tunability</i>	± 3 GHz ± 0.6 GHz	for $\lambda \in [2.04\mu\text{m}, 2.06\mu\text{m}]$ for $\lambda \in [1.57\mu\text{m}, 1.61\mu\text{m}]$
Output energy per pulse	> 40 mJ	
<i>Pulse repetition frequency</i>	50 Hz	continuous single pulse mode
Optical-to-optical conversion efficiency	$> 35\%$	ratio of optical output power at selected wavelength λ to optical input pump power
<i>Pulse-to-pulse energy stability (rms)</i>	$< 3\%$ $< 10\%$	short term (over 10 sec.) long term (over 24 hours)
Spatial beam quality	$M^2 < 2.0$	
<i>Beam pointing stability</i>	$< 150 \mu\text{rad}$	short term (over 10 sec)
Pulse duration τ	TBD, $\tau \in [10\text{ns}, 120\text{ns}]$	FWHM
<i>Longitudinal mode</i>	single	
Pulse spectral linewidth	< 60 MHz	FWHM
<i>Pulse-to-pulse linewidth variation (rms)</i>	< 6 MHz	FWHM, short term (over 10 sec)
Spectral purity	99.98% of pulse energy within 1 GHz	
<i>Pulse-to-pulse centre frequency stability (rms)</i>	< 0.5 MHz	short term (over 10 sec)

High Efficient Laser Pump Source (HELPS)

Parameter	Value	Comments
Laser wavelength	TBD	$\lambda \in [1000\text{nm}, 1100\text{nm}]$
<i>Wavelength tunability</i>	TBD	the wavelength shall be tuneable over TBD nm
Output energy per pulse	> 500 mJ	
<i>Pulse repetition frequency</i>	50 Hz	continuous single pulse mode
Wall-plug efficiency	> 14%	time-averaged optical output power to overall received electrical power
<i>Pulse-to-pulse energy stability</i>	< 3 % <10%	short term (over 10 sec.) long term (over 24 hours)
Spatial beam quality	$M^2 < 2.5$	
<i>Beam pointing stability</i>	< 100 μrad	short term (over 10 sec)
Pulse duration	$\tau \in [5\text{ns}, 60\text{ns}]$	FWHM
<i>Longitudinal mode</i>	single	
Pulse spectral linewidth	< 100 MHz	FWHM
<i>Spectral purity</i>	99% of pulse energy within 300 MHz	
Centre frequency accuracy and stability	< 40 MHz	short term (over 10 sec)