VEGA PW facility: usage statistics and management tools

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VEGA system is a user Petawatt research facility belonging to the Spanish Pulsed Lasers Center (CLPU). The facility is open to experiments devoted to explore the physics of linear and non-linear interactions of intense lasers with matter. The Ti:Sapphire Chirped Pulse Amplification (CPA)-based laser chain installed by Amplitude [1], offers three common front-end outputs called VEGA 1,2,3 with characteristics shown in Table 1.

Table 1. VEGA system outputs characteristics

		VEGA 1	VEGA 2	VEGA 3
Energy		0.5 J	5 J	30 J
Pulse duration		30 fs	30 fs	30 fs
Peak power		16 TW	160 TW	1 PW
Repetition rate		10 Hz	10 Hz	1 Hz
Strehl ratio		0.7	0.7	0.8
Temporal intensity contrast	@ns (replica)	$\leq 10^{-9}$		
	@ <100 ps	$\leq 10^{-11}$		

All over 2017, commissioning experiments for VEGA 2 [2] were developed before the first users' competitive access (2018). These first experiments showed betatron radiation and TNSA protons generation [3]. VEGA 3 commissioning took place all over 2019 and users' experimental time has been routinely developed since mid-year 2020.
Besides the scientific production linked to the experiments, all over this user's time, the facility has also increased its knowledge and effort in order to test specific management procedures and developments so as to get closer to the desired goal of reliability needed to support external users' activities. These actions include: laser working procedures, lab-planning actions, predictive and corrective maintenance actions, key elements on line inventory catalog and integrated web-based lab full data management and statistical analysis to support strategic management decisions. In this work, we make a complete review of these management actions and tools, pointing out its strengthens and weaknesses in order to fulfill as much as possible a complete catalog of tools to offer integrated laboratory trustworthiness.
We also comment statistical reliability behaviour of the facility and near future actions for improvement and open data access.

References

[1] https://amplitude-laser.com/
[2] M. Huault, et al., "Commissioning experiments of VEGA-2 at Centro de Láseres Pulsados (CLPU)," Frontiers in Optics. OSA Technical Digest (online) (Optical Society of America, 2017), paper FM2B.4.
[3] J. Apiñaniz et al. "A quasi-monoenergetic short time duration compact proton source for probing high energy density states of matter ", Nature Scientific Reports 11,6881 (2021)