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New applications for high repetition rate high energy P-P lasers

Victor V Apollonov

Prokhorov General Physics Institute, Russia

At present, we consider as most energetic and promising for high repetition rate pulse – periodic (P-P) laser applications carbon dioxide laser, chemical laser and solid-state laser. In the future, high-power high-frequency P-P lasers will find applications in the field of ecology of space. Besides, they will be used to transmit power over long distances, to obtain high-power plasma radiation in the range of ten to hundreds of Angstroms, to realize arbitrary geometry of the breakdown in a three-dimensional space, to produce ultrasound, electromagnetic fields etc. A new class of rocket engines – a laser jet engine (LJE) – objectively belongs to the most promising rocket engines of the foreseeable future. The LJE is substantially more cost-effective than conventional chemical fuel engines. At the initial stage of the flight, the LJE employs atmospheric air as a working medium and in outer space use is made of a small space-borne gas supply or an easily sublimated substance. In this case, the specific costs of the cargo launching to outer space may be reduced down to 150–300 USD/kg. The LJE-based solution of a series of very interesting and important problems is predicted, in particular designing of a space interceptor that would destroy debris and other dangerous space objects, such as asteroids, meteors, etc.; launching of macro-objects with a very high acceleration that is orders of magnitude greater than it can be done by existing technology; realization of super-long orbital-scale conducting channels for addressing the global challenges of ecology and energy transfer; laser-plasma generator of multiply charged ions produces a large number of heavy ions in the regime of short P-P pulses, which is of interest for ion accelerators operating in the P-P regime and many other applications of high energy P-P lasers.

Biography

Victor V Apollonov is the leading specialist in the area of basic principles of creation and development of high energy laser systems and high energy laser radiation interaction with matter. He has made an outstanding input into creation and development of new branches of science - physical and technical fundamentals of high average power laser optics and adaptive optics, investigation of physical processes in a high volume self-controlled volume discharges, creation of high power continuous wave, pulsed and high repetition rate pulse-periodic laser systems, high energy laser radiation interaction with matter, and high energy laser application. He is the author of more than 1300 publications: 16 books, 368 presentations and 147 patents, 750 articles, (Research Gate). He is a full member of Russian Academy of Natural Science and Academy of Engineering Sciences, member of the Presidium RANS. He is the laureate of State Prize of USSR (1982) and of Russia (2002).

vapollo@kapella.gpi.ru

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