

c.1.b.2. An average or CW output power exceeding 20 W; *or*

c.1.c. An output wavelength exceeding 1,400 nm and having any of the following:

c.1.c.1. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; *or*

c.1.c.2. An average or CW output power exceeding 1 W;

c.2. Non-"tunable" "lasers", as follows:

Note: 6A005.c.2 includes atomic transition solid state "lasers".

c.2.a. Neodymium glass "lasers", as follows:

c.2.a.1. "Q-switched lasers" having any of the following:

c.2.a.1.a. An output energy exceeding 20 J but not exceeding 50 J per pulse and an average output power exceeding 10 W; *or*

c.2.a.1.b. An output energy exceeding 50 J per pulse;

c.2.a.2. Non-"Q-switched lasers" having any of the following:

c.2.a.2.a. An output energy exceeding 50 J but not exceeding 100 J per pulse and an average output power exceeding 20 W; *or*

c.2.a.2.b. An output energy exceeding 100 J per pulse;

c.2.b. Neodymium-doped (other than glass) "lasers", having an output wavelength exceeding 1,000 nm but not exceeding 1,100 nm, as follows:

N.B.: For neodymium-doped (other than glass) "lasers" having an output wavelength not exceeding 1,000 nm or exceeding 1,100 nm, see 6A005.c.2.

c.2.b.1. Pulse-excited, mode-locked, "Q-switched lasers" having a "pulse duration" of less than 1 ns and having any of the following:

c.2.b.1.a. A "peak power" exceeding 5 GW;

c.2.b.1.b. An average output power exceeding 10 W; *or*

c.2.b.1.c. A pulsed energy exceeding 0.1 J;

c.2.b.2. Pulse-excited, "Q-switched lasers" having a pulse duration equal to or more than 1 ns, and having any of the following:

c.2.b.2.a. A single-transverse mode output having:

c.2.b.2.a.1. A "peak power" exceeding 100 MW;

c.2.b.2.a.2. An average output power exceeding 20 W; *or*

c.2.b.2.a.3. A pulsed energy exceeding 2 J; *or*

c.2.b.2.b. A multiple-transverse mode output having:

c.2.b.2.b.1. A "peak power" exceeding 400 MW;

c.2.b.2.b.2. An average output power exceeding 2 kW; *or*

c.2.b.2.b.3. A pulsed energy exceeding 2 J;

c.2.b.3. Pulse-excited, non-"Q-switched lasers", having:

c.2.b.3.a. A single-transverse mode output having:

c.2.b.3.a.1. A "peak power" exceeding 500 kW; *or*

c.2.b.3.a.2. An average output power exceeding 150 W; *or*

c.2.b.3.b. A multiple-transverse mode output having:

c.2.b.3.b.1. A "peak power" exceeding 1 MW; *or*

c.2.b.3.b.2. An average power exceeding 2 kW;

c.2.b.4. Continuously excited "lasers" having:

c.2.b.4.a. A single-transverse mode output having:

c.2.b.4.a.1. A "peak power" exceeding 500 kW; *or*

c.2.b.4.a.2. An average or CW output power exceeding 150 W; *or*

c.2.b.4.b. A multiple-transverse mode output having:

c.2.b.4.b.1. A "peak power" exceeding 1 MW; *or*

c.2.b.4.b.2. An average or CW output power exceeding 2 kW;

c.2.c. Other non-"tunable" "lasers", having any of the following:

c.2.c.1. A wavelength less than 150 nm and having any of the following:

c.2.c.1.a. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; *or*

c.2.c.1.b. An average or CW output power exceeding 1 W;

c.2.c.2. A wavelength of 150 nm or more but not exceeding 800 nm and having any of the following:

c.2.c.2.a. An output energy exceeding 1.5 J per pulse and a pulsed "peak power" exceeding 30 W; *or*

c.2.c.2.b. An average or CW output power exceeding 30 W;

c.2.c.3. A wavelength exceeding 800 nm but not exceeding 1,400 nm, as follows:

c.2.c.3.a. "Q-switched lasers" having:

c.2.c.3.a.1. An output energy exceeding 0.5 J per pulse and a pulsed "peak power" exceeding 50 W; *or*

c.2.c.3.a.2. An average output power exceeding:

c.2.c.3.a.2.a. 10 W for single-mode "lasers";

c.2.c.3.a.2.b. 30 W for multimode "lasers";

c.2.c.3.b. Non-"Q-switched lasers" having:

c.2.c.3.b.1. An output energy exceeding 2 J per pulse and a pulsed "peak power" exceeding 50 W; *or*

c.2.c.3.b.2. An average or CW output power exceeding 50 W; *or*

c.2.c.4. A wavelength exceeding 1,400 nm and having any of the following:

c.2.c.4.a. An output energy exceeding 100 mJ per pulse and a pulsed "peak power" exceeding 1 W; *or*

c.2.c.4.b. An average or CW output power exceeding 1 W;

d. Dye and other liquid "lasers", having any of the following:

d.1. A wavelength less than 150 nm and:

d.1.a. An output energy exceeding 50 mJ per pulse and a pulsed "peak power" exceeding 1 W; *or*

d.1.b. An average or CW output power exceeding 1 W;

d.2. A wavelength of 150 nm or more but not exceeding 800 nm and having any of the following:

d.2.a. An output energy exceeding 1.5 J per pulse and a pulsed "peak power" exceeding 20 W;

d.2.b. An average or CW output power exceeding 20 W; *or*

d.2.c. A pulsed single longitudinal mode oscillator having an average output power exceeding 1 W and a repetition rate exceeding 1 kHz if the "pulse duration" is less than 100 ns;

d.3. A wavelength exceeding 800 nm but not exceeding 1,400 nm and having any of the following:

d.3.a. An output energy exceeding 0.5 J per pulse and a pulsed "peak power" exceeding 10 W; *or*

d.3.b. An average or CW output power exceeding 10 W; *or*

d.4. A wavelength exceeding 1,400 nm and having any of the following:

d.4.a. An output energy exceeding 100 mJ per pulse and a pulsed "peak power" exceeding 1 W; *or*

d.4.b. An average or CW output power exceeding 1 W;

e. Components, as follows:

e.1. Mirrors cooled either by active cooling or by heat pipe cooling;

Technical Note: Active cooling is a cooling technique for optical components using flowing fluids within the subsurface (nominally less than 1 mm below the optical surface) of the optical component to remove heat from the optic.

e.2. Optical mirrors or transmissive or partially transmissive optical or electro-optical components specially designed for use with controlled "lasers";

f. Optical equipment, as follows:

N.B. For shared aperture optical elements, capable of operating in "Super-High Power Laser" ("SHPL") applications, see the U.S. Munitions List (22 CFR part 121).

f.1. Dynamic wavefront (phase) measuring equipment capable of mapping at least 50 positions on a beam wavefront having any of the following:

f.1.a. Frame rates equal to or more than 100 Hz and phase discrimination of at least 5% of the beam's wavelength; *or*

f.1.b. Frame rates equal to or more than 1,000 Hz and phase discrimination of at least 20% of the beam's wavelength;

f.2. "Laser" diagnostic equipment capable of measuring "SHPL" system angular beam steering errors of equal to or less than 10 μ rad;

f.3. Optical equipment and components specially designed for a phased-array "SHPL" system for coherent beam combination to an accuracy of $\lambda/10$ at the designed wavelength, or 0.1 μ m, whichever is the smaller;

f.4. Projection telescopes specially designed for use with "SHPL" systems.

6A008 Radar systems, equipment and assemblies having any of the following characteristics (see List of Items Controlled), and specially designed components therefor.

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6C992 Optical sensing fibers not controlled by 6A002.d.3 which are modified structurally to have a 'beat length' of less than 500 mm (high birefringence) or optical sensor materials not described in 6C002.b and having a zinc content of equal to or more than 6% by 'mole fraction'.

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List of Items Controlled

Unit: * * *

Related Controls: * * *