

1061. cont'd.

1. a. 1. c. 2. A continuously radiated acoustic power density exceeding $0.001 \text{ mW/mm}^2/\text{Hz}$ for devices operating at frequencies below 10 kHz;

Technical Note:

Acoustic power density is obtained by dividing the output acoustic power by the product of the area of the radiating surface and the frequency of operation.

3. Designed to withstand pressure during normal operation at depths exceeding 1,000 m; **or**
4. Side-lobe suppression exceeding 22 dB;
- d. Acoustic systems, equipment and specially designed components for determining the position of surface vessels or underwater vehicles designed:

Note:

1061.1.a.1.d. includes equipment using coherent "signal processing" between two or more beacons and the hydrophone unit carried by the surface vessel or underwater vehicle, or capable of automatically correcting speed-of-sound propagation errors for calculation of a point.

1. To operate at a range exceeding 1,000 m with a positioning accuracy of less than 10 m rms (root mean square) when measured at a range of 1,000 m; **or**
2. To withstand pressure at depths exceeding 1,000 m;
2. Passive (receiving, whether or not related in normal application to separate active equipment) systems, equipment and specially designed components therefor, as follows:
 - a. Hydrophones (transducers) having any of the following characteristics:
 1. Incorporating continuous flexible sensors or assemblies of discrete sensor elements with either a diameter or length less than 20 mm and with a separation between elements of less than 20 mm;
 2. Having any of the following sensing elements:
 - a. Optical fibres;
 - b. Piezoelectric polymers; **or**
 - c. Flexible piezoelectric ceramic materials;
 3. A hydrophone sensitivity better than -180 dB at any depth with no acceleration compensation;
 4. When designed to operate at depths not exceeding 35 m, a hydrophone sensitivity better than -186 dB with acceleration compensation;
 5. When designed for normal operation at depths exceeding 35 m, a hydrophone sensitivity better than -192 dB with acceleration compensation;
 6. When designed for normal operation at depths exceeding 100 m, a hydrophone sensitivity better than -204 dB; **or**
 7. Designed for operation at depths exceeding 1,000 m;

Technical Note:

Hydrophone sensitivity is defined as twenty times the logarithm to the base 10 of the ratio of rms output voltage to a 1 V rms reference, when the hydrophone sensor, without a pre-amplifier, is placed in a plane wave acoustic field with an rms pressure of $1 \mu\text{Pa}$. For example, a hydrophone of -160 dB (reference 1 V per μPa) would yield an output voltage of 10^{-9} V in such a field, while one of -180 dB sensitivity would yield only 10^{-9} V output. Thus, -160 dB is better than -180 dB.

2. b. Towed acoustic hydrophone arrays with any of the following:
 1. Hydrophone group spacing of less than 12.5 m;
 2. Hydrophone group spacing of 12.5 m to less than 25 m and designed or able to be modified to operate at depths exceeding 35 m;

Technical Note:

'Able to be modified' in 1061.1.a.2.b.2. means having provisions to allow a change of the wiring or interconnections to alter hydrophone group spacing or operating depth limits. These provisions are: spare wiring exceeding 10% of the number of wires, hydrophone group spacing adjustment blocks or internal depth limiting devices that are adjustable or that control more than one hydrophone group.

3. Hydrophone group spacing of 25 m or more and designed to operate at depths exceeding 100 m;
4. Heading sensors embargoed by 1061.1.a.2.d.;
5. Non-metallic strength members or longitudinally reinforced array hoses;
6. An assembled array of less than 40 mm in diameter;
7. Multiplexed hydrophone group signals; **or**
8. Hydrophone characteristics specified in 1061.1.a.2.a.;
- c. Processing equipment, specially designed for towed acoustic hydrophone arrays, with either of the following:
 1. A Fast Fourier or other transform of 1,024 or more complex points in less than 20 ms with no "user-accessible programmability"; **or**
 2. Time or frequency domain processing and correlation, including spectral analysis, digital filtering and beamforming using Fast Fourier or other transforms or processes with "user accessible programmability";
- d. Heading sensors having an accuracy of better than $\pm 0.5^\circ$; **and**
 1. Designed to be incorporated within the array hosing and to operate at depths exceeding 35 m or having an adjustable or removable depth sensing device in order to operate at depths exceeding 35 m; **or**
 2. Designed to be mounted external to the array hosing and having a sensor unit capable of operating with 360° roll at depths exceeding 35 m;
- b. Terrestrial geophones capable of conversion for use in marine systems, equipment or specially designed components embargoed by 1061.1.a.2.a.;
- c. Correlation-velocity sonar log equipment designed to measure the horizontal speed of the equipment carrier relative to the sea bed at distances between the carrier and the sea bed exceeding 500 m;

2. Optical Sensors

- a. Optical detectors, as follows:

Note:

1061.2.a. does not embargo germanium or silicon photodevices.

1. "Space-qualified" solid-state detectors having any of the following:
 - a. 1. A peak response in the wavelength range exceeding 10 nm but not exceeding 300 nm; **and**
 2. A response of less than 0.1% relative to the peak response at a wavelength exceeding 400 nm;
 - b. 1. A peak response in the wavelength range exceeding 900 nm but not exceeding 1,200 nm; **and**
 2. A response "time constant" of 95 ns or less; **or**
 - c. A peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;
2. Image intensifier tubes and specially designed components therefor, as follows:
 - a. Image intensifier tubes having all of the following:
 1. A peak response in the wavelength range exceeding 400 nm but not exceeding 1,050 nm;
 2. A microchannel plate for electron image amplification with a hole pitch (centre-to-centre spacing) of less than $25 \mu\text{m}$; **and**
 3. a. An S-20, S-25 or multialkali photocathode; **or**
 - b. A GaAs or GaInAs photocathode;
 - b. Specially designed components, as follows:
 1. Fibre optic image inverters;
 2. Microchannel plates having both of the following:
 - a. 15,000 or more hollow tubes per plate; **and**
 - b. Hole pitch (centre-to-centre spacing) of less than $25 \mu\text{m}$;
 3. GaAs or GaInAs photocathodes;