

3. Hydrophone sensitivity better than -180 dB at any depth with no acceleration compensation;
4. When designed to operate at depths not exceeding 35 m, hydrophone sensitivity better than -186 dB with acceleration compensation;
5. When designed for normal operation at depths exceeding 35 m, hydrophone sensitivity better than -192 dB with acceleration compensation;
6. When designed for normal operation at depths exceeding 100 m, 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 micropascal. For example, a hydrophone of -160 dB (reference 1 V per micropascal) would yield an output voltage of  $10^{-8}$  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.

1061. 1. a. 2. b. Towed acoustic hydrophone arrays with:
  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; *or*  
**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:
    - a. Having an accuracy of better than  $\pm 0.5^\circ$ ;
    - b. Incorporated within the array hosing and designed or able to be modified to operate at depths exceeding 35 m; *or*  
**Technical Note:**  
'Able to be modified' in 1061.1.a.2.b.4.b. means having an adjustable or removable depth sensing device.
    - c. Mounted external to the array hosing and having a sensor unit capable of operating with  $36^\circ$  roll at depths exceeding 35 m;
  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.;

1061. 1. a. 2. c. Processing equipment, specially designed for towed acoustic hydrophone arrays, with either of the following:
  1. A Fast Fourier or other transform of 1024 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";

1061. 1. b. Terrestrial geophones capable of conversion for use in marine systems, equipment or specially designed components embargoed by 1061.1.a.2.a.;

1061. 1. 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;

1061. 2. Optical Sensors

- a. Optical detectors, as follows:

**NOTE:**

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

1. "Space-qualified" single-element or focal plane array (linear or two dimensional) elements having any of the following:
  - a. 1. A peak response at a wavelength shorter than 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;
1061. 2. a. 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 micrometres; *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 characteristics:
      - a. 15,000 or more hollow tubes per plate; *and*
      - b. Hole pitch (centre-to-centre spacing) of less than 25 micrometres;
    3. GaAs or GaInAs photocathodes;
1061. 2. a. 3. Non-"space-qualified" linear or two dimensional focal plane arrays, having any of the following:
 

**NOTES:**

  1. 1061.2.a.3. includes photoconductive arrays and photovoltaic arrays.
  2. 1061.2.a.3. does not embargo silicon focal plane arrays, multi-element (not to exceed 16 elements) encapsulated photoconductive cells or pyroelectric detectors using any of the following:
    - a. Lead sulphide;
    - b. Triglycine sulphate and variants;
    - c. Lead-lanthanum-zirconium titanate and variants;
    - d. Lithium tantalate;
    - e. Polyvinylidene fluoride and variants;
    - f. Strontium barium niobate and variants; *or*
    - g. Lead selenide.
1061. 2. a. 3. a. 1. Individual elements with a peak response within the wavelength range exceeding 900 nm but not exceeding 1,050 nm; *and*
2. A response "time constant" of less than 0.5 ns;
- b. 1. Individual elements with a peak response in the wavelength range exceeding 1,050 nm but not exceeding 1,200 nm; *and*
2. A response "time constant" of 95 ns or less; *or*
- c. Individual elements with a peak response in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm;
1061. 2. a. 4. Non-"space-qualified" single-element or non-focal-plane multi-element semiconductor photodiodes or phototransistors having both of the following:
  - a. A peak response at a wavelength exceeding 1,200 nm; *and*
  - b. A response "time constant" of 0.5 ns or less;