

1061. cont'd.

2. a. 3. Non-"space-qualified" "focal plane arrays", having any of the following:

**Technical Note:**

Linear or two-dimensional multi-element detector arrays are referred to as "focal plane arrays".

**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.
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;
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 in the wavelength range exceeding 1,200 nm but not exceeding 30,000 nm; **and**
  - b. A response "time constant" of 0.5 ns or less;
- b. "Multispectral imaging sensors" designed for remote sensing applications, having either of the following:
  1. An Instantaneous-Field-Of-View (IFOV) of less than 200 microradians; **or**
  2. Specified for operation in the wavelength range exceeding 400 nm but not exceeding 30,000 nm; **and**
    - a. Providing output imaging data in digital format; **and**
    - b. 1. "Space-qualified"; **or**
    2. Designed for airborne operation, using other than silicon detectors, and having an IFOV of less than 2.5 milliradians;
- c. Direct view imaging equipment operating in the visible or infrared spectrum, incorporating either of the following:
  1. Image intensifier tubes embargoed by 1061.2.a.2.a.; **or**
  2. "Focal plane arrays" embargoed by 1061.2.a.3.;

**Technical Note:**

'Direct view' refers to imaging equipment, operating in the visible or infrared spectrum, that presents a visual image to a human observer without converting the image into an electronic signal for television display, and that cannot record or store the image photographically, electronically or by any other means.

**Note:**

1061.2.c. does not embargo the following equipment incorporating other than GaAs or GaInAs photocathodes:

- a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;
  - b. Medical equipment;
  - c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;
  - d. Flame detectors for industrial furnaces;
  - e. Equipment specially designed for laboratory use.
2. d. Special support components for optical sensors, as follows:
1. "Space-qualified" cryocoolers;
  2. Non-"space-qualified" cryocoolers, with a cooling source temperature below 218 K (-55°C), as follows:

- a. Closed cycle type with a specified Mean-Time-To-Failure (MTTF), or Mean-Time-Between-Failures (MTBF), exceeding 2,500 hours;
  - b. Joule-Thomson (JT) self-regulating minicoolers with bore (outside) diameters of less than 8 mm;
3. Optical sensing fibres:
- a. Specially fabricated either compositionally or structurally, or modified by coating, to be acoustically, thermally, inertially, electromagnetically or nuclear radiation sensitive; **or**
  - b. Modified structurally to have a "beat length" of less than 50 mm (high birefringence);

**3. Cameras**

(For cameras specially designed or modified for underwater use, see 1081.2.d. and 1081.2.e.)

- a. Instrumentation cameras, as follows:
1. High-speed cinema recording cameras using any film format from 8 mm to 16 mm inclusive, in which the film is continuously advanced throughout the recording period, and that are capable of recording at framing rates exceeding 13,150 frames per second;
- Note:**
- 1061.3.a.1. does not embargo cinema recording cameras for normal civil purposes.
2. Mechanical high speed cameras, in which the film does not move, capable of recording at rates exceeding 1,000,000 frames per second for the full framing height of 35 mm film, or at proportionately higher rates for lesser frame heights, or at proportionately lower rates for greater frame heights;
  3. Mechanical or electronic streak cameras with writing speeds exceeding 10 mm/μs;
  4. Electronic framing cameras having a speed exceeding 1,000,000 frames per second;
  5. Electronic cameras having:
    - a. An electronic shutter speed (gating capability) of less than 1 μs per full frame; **and**
    - b. A read out time allowing a framing rate of more than 125 full frames per second;
- b. Imaging cameras, as follows:

**Note:**

1061.3.b. does not embargo television or video cameras specially designed for television broadcasting.

1. Video cameras incorporating solid state sensors, having any of the following:
  - a. More than  $4 \times 10^6$  "active pixels" per solid state array for monochrome (black and white) cameras;
  - b. More than  $4 \times 10^5$  "active pixels" per solid state array for colour cameras incorporating three solid state arrays; **or**
  - c. More than  $12 \times 10^5$  "active pixels" for solid state array colour cameras incorporating one solid state array;
2. Scanning cameras and scanning camera systems:
  - a. Incorporating linear detector arrays with more than 8,192 elements per array; **and**
  - b. Having mechanical scanning in one direction;
3. Incorporating image intensifiers embargoed by 1061.2.a.2.a.;
4. Incorporating "focal plane arrays" embargoed by 1061.2.a.3.;

**4. Optics**

- a. Optical mirrors (reflectors), as follows:
1. "Deformable mirrors" with either continuous or multi-element surfaces, and specially designed components therefor, capable of dynamically repositioning portions of the surface of the mirror at rates exceeding 100 Hz;
  2. Lightweight monolithic mirrors with an average "equivalent density" of less than 30 kg/m<sup>2</sup> and a total weight exceeding 10 kg;
  3. Lightweight "composite" or foam mirror structures with an average "equivalent density" of less than 30 kg/m<sup>2</sup> and a total weight exceeding 2 kg;
  4. Beam steering mirrors more than 100 mm in diameter or length of major axis which maintain a flatness of  $\lambda/2$  or better ( $\lambda$  is equal to 633 nm) with a control bandwidth exceeding 100 Hz;