

**1061.3.a. con't.**

2. Mechanical high speed cameras, in which the film does not move, capable of recording at rates exceeding 1,000,000 frames/s 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 having writing speeds exceeding 10 mm/ $\mu$ s;
4. Electronic framing cameras having a speed exceeding 1,000,000 frames/s;
5. Electronic cameras having all of the following:
  - a. An electronic shutter speed (gating capability) of less than 1  $\mu$ s per full frame; and
  - b. A read out time allowing a framing rate of more than 125 full frames per second.
6. Plug-ins, having all of the following characteristics:
  - a. Specially designed for instrumentation cameras which have modular structures and which are controlled by 6.A.3.a.; **and**
  - b. Enabling these cameras to meet the characteristics specified in 6.A.3.a.3., 6.A.3.a.4. or 6.A.3.a.5., according to the manufacturer's specifications.

## b. Imaging cameras, as follows:

**Note:**

1061.3.b. does not control 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  $4 \times 10^6$  "active pixels" per solid state array for colour cameras incorporating three solid state arrays; **or**
  - c. More than  $12 \times 10^6$  "active pixels" for solid state array colour cameras incorporating one solid state array;

**Technical Note**

For the purpose of this entry, digital video cameras should be evaluated by the maximum number of "active pixels" used for capturing moving images.

2. Scanning cameras and scanning camera systems, having all of the following:
  - a. Linear detector arrays with more than 8,192 elements per array; **and**
  - b. Mechanical scanning in one direction;
3. Imaging cameras incorporating image intensifier tubes having the characteristics listed in 1061.2.a.2.a.;
4. Imaging cameras incorporating "focal plane arrays" having the characteristics listed in 1061.2.a.3.

**Note:**

1061.3.b.4. does not control imaging cameras incorporating linear "focal plane arrays" with twelve elements or fewer, not employing time-delay-and-integration within the element, designed for any of the following:

- a. Industrial or civilian intrusion alarm, traffic or industrial movement control or counting systems;
- b. Industrial equipment used for inspection or monitoring of heat flows in buildings, equipment or industrial processes;
- c. Industrial equipment used for inspection, sorting or analysis of the properties of materials;
- d. Equipment specially designed for laboratory use; or
- e. Medical equipment.

**4. Optics**

- a. Optical mirrors (reflectors), as follows:
  1. "Deformable mirrors" having either continuous or multi-element surfaces, and specially designed components therefore, capable of dynamically repositioning portions of the surface of the mirror at rates exceeding 100 Hz;
  2. Lightweight monolithic mirrors having an average "equivalent density" of less than 30 kg/m<sup>2</sup> and a total mass exceeding 10 kg;
  3. Lightweight "composite" or foam mirror structures having an average "equivalent density" of less than 30 kg/m<sup>2</sup> and a total mass 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) having a control bandwidth exceeding 100 Hz.
- b. Optical components made from zinc selenide (ZnSe) or zinc sulphide (ZnS) with transmission in the wavelength range exceeding 3,000 nm but not exceeding 25,000 nm and having any of the following:
  1. Exceeding 100 cm<sup>3</sup> in volume; **or**
  2. Exceeding 80 mm in diameter or length of major axis and 20 mm in thickness (depth).
- c. "Space-qualified" components for optical systems, as follows:
  1. Lightweighted to less than 20% "equivalent density" compared with a solid blank of the same aperture and thickness;
  2. Raw substrates, processed substrates having surface coatings (single-layer or multi-layer, metallic or dielectric, conducting, semiconducting or insulating) or having protective films;
  3. Segments or assemblies of mirrors designed to be assembled in space into an optical system with a collecting aperture equivalent to or larger than a single optic 1 m in diameter;
  4. Manufactured from "composite" materials having a coefficient of linear thermal expansion equal to or less than  $5 \times 10^{-6}$  in any coordinate direction.
- d. Optical control equipment, as follows:
  1. Specially designed to maintain the surface figure or orientation of the "space-qualified" components controlled by 1061.4.c.1. or 1061.4.c.3.;
  2. Having steering, tracking, stabilization or resonator alignment bandwidths equal to or more than 100 Hz and an accuracy of 10  $\mu$ r (microradians) or less;
  3. Gimbals having all of the following:
    - a. a maximum slew exceeding 5°;
    - b. a bandwidth of 100 Hz or more;
    - c. Angular pointing errors of 200  $\mu$ r (microradians) or less; **and**
  - d. Having any of the following:
    1. Exceeding 0.15 m but not exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 2 r(radians)/s<sup>2</sup>; **or**
    2. Exceeding 1 m in diameter or major axis length and capable of angular accelerations exceeding 0.5 r(radians)/s<sup>2</sup>;
4. Specially designed to maintain the alignment of phased array or phased segment mirror systems consisting of mirrors with a segment diameter or major axis length of 1 m or more;