SCHEDULE Regulation 10

"SCHEDULE 2A Regulation 21

Critical-industry goods and critical-industry technology

PART 1

Interpretation

1.—(1) A thing is specified in this Schedule if it is specified in Parts 2 to 8, and a reference in any note in this Schedule to a thing being "controlled" or subject to "controls" is to be read as a reference to it being specified.

(2) In this Schedule, defined terms are printed in quotation marks.

(3) Terms printed in quotation marks and not defined in this Schedule have the meaning given to them in—

(a) Schedules 2 and 3 of the Export Control Order 2008, or

(b) Annex I of the Dual-Use Regulation,

as applicable.

2.—(1) In this Schedule—

"dynamic adaptive routing" means automatic rerouting of traffic based on sensing and analysis of current actual network conditions, but does not include cases of routing decisions taken on predefined information;

"fluoride fibres" means fibres manufactured from bulk fluoride compounds;

"hybrid computer" means equipment that can—

(a) accept data,

(b) process data, in both analogue and digital representation, and

(c) provide output of data;

"media access unit" means equipment that contains one or more communication interfaces ("network access controller", "communications channel controller", modem or computer bus) to connect terminal equipment to a network;

"stored program controlled" means a control using instructions stored in an electronic storage that a processor can execute in order to direct the performance of predetermined functions, and equipment may be "stored program controlled" whether the electronic storage is internal or external to the equipment;

"terminal interface equipment" means equipment at which information enters or leaves the telecommunication systems, for example a telephone, data device, computer, or facsimile device.

(2) For the purposes of this Schedule, the interpretative notes set out in Table 1 apply.

Table 1

Interpretative notes

"multi-data-stream processing" refers to the "microprogram" or equipment architecture technique that permits simultaneous processing of two or more data sequences under the control of one or more instruction sequences by means such as:

Single Instruction Multiple Data (SIMD) architectures such as vector or array processors;

Multiple Single Instruction Multiple Data (MSIMD) architectures;

Multiple Instruction Multiple Data (MIMD) architectures, including those that are tightly coupled, closely coupled or loosely coupled;

structured arrays of processing elements, including systolic arrays.

"data signalling rate" means the rate, as defined in International Telecommunications Union Recommendation 53-36, taking into account that, for non-binary modulation, baud and bit per second are not equal.

Bits for coding, checking and synchronization functions are to be included.

When determining the "data signalling rate", servicing and administrative channels shall be excluded.

It is the maximum one-way rate, i.e., the maximum rate in either transmission or reception.

"spectral efficiency" is a figure of merit parametrized to characterize the efficiency of transmission system that uses complex modulation schemes such as QAM (quadrature amplitude modulation), Trellis coding, QSPK (Q-phased shift key), etc.. It is defined as the Digital transfer rate (bits/second) divided by 6dB spectrum bandwidth (Hz).

PART 2

Electronics

3A991 Electronic devices and components

a. "Microprocessor microcircuits", "microcomputer microcircuits", and microcontroller microcircuits having any of the following:

a.1. A performance speed of 5 GFLOPS or more and an arithmetic logic unit with an access width of 32 bit or more;

a.2. A clock frequency rate exceeding 25 MHz; or

a.3. More than one data or instruction bus or serial communication port that provides a direct external interconnection between parallel "microprocessor microcircuits" with a transfer rate of 2.5 Mbyte/s;

b. Storage integrated circuits, as follows:

b.1. Electrical erasable programmable read-only memories (EEPROMs) with a storage capacity;

b.1.a. Exceeding 16 Mbits per package for flash memory types; or

b.1.b. Exceeding either of the following limits for all other EEPROM types:

b.1.b.1. Exceeding 1 Mbit per package; or

b.1.b.2. Exceeding 256 kbit per package and a maximum access time of less than 80 ns;

c. Analog-to-digital converters having any of the following:

c.1. A resolution of 8 bit or more, but less than 12 bit, with an output rate greater than 200 million words per second;

c.2. A resolution of 12 bit with an output rate greater than 105 million words per second;

c.3. A resolution of more than 12 bit but equal to or less than 14 bit with an output rate greater than 10 million words per second; or

c.4. A resolution of more than 14 bit with an output rate greater than 2.5 million words per second;

d. Field programmable logic devices having a maximum number of single-ended digital input/outputs between 200 and 700;

e. Fast Fourier Transform (FFT) processors having a rated execution time for a 1,024 point complex FFT of less than 1 ms;

f. Custom integrated circuits for which either the function is unknown, or the control status of the equipment in which the integrated circuits will be used is unknown to the manufacturer, having any of the following:

f.1. More than 144 terminals; or

f.2. A typical "basic gate propagation delay time" of less than 0.4 ns;

g. Traveling-wave "vacuum electronic devices," pulsed or continuous wave, as follows:

g.1. Coupled cavity devices, or derivatives thereof;

g.2. Devices based on helix, folded waveguide, or serpentine waveguide circuits, or derivatives thereof, having either of the following:

g.2.a. An "instantaneous bandwidth" of half an octave or more; and

g.2.b. The product of the rated average output power (expressed in kW) and the maximum operating frequency (expressed in GHz) of more than 0.2; or

g.2.c. An "instantaneous bandwidth" of less than half an octave; and

g.2.d. The product of the rated average output power (expressed in kW) and the maximum operating frequency (expressed in GHz) of more than 0.4;

h. Flexible waveguides designed for use at frequencies exceeding 40 GHz;

i. Surface acoustic wave and surface skimming (shallow bulk) acoustic wave devices (i.e., "signal processing" devices employing elastic waves in materials), having either of the following:

i.1. A carrier frequency exceeding 1 GHz; or

i.2. A carrier frequency of 1 GHz or less; and

i.2.a. A frequency side-lobe rejection exceeding 55 dB;

i.2.b. A product of the maximum delay time and bandwidth (time in μs and bandwidth in MHz) of more than 100; or

i.2.c. A dispersive delay of more than 10 μs;

j. Cells as follows:

j.1. Primary cells having an energy density of 550 Wh/kg or less at 293 K (20ºC);

j.2. Secondary cells having an energy density of 350 Wh/kg or less at 293 K (20ºC);

Note:3A991.j does not control batteries, including single cell batteries.

Technical Notes:

1. For the purposes of 3A991.j energy density (Wh/kg) is calculated from the nominal voltage multiplied by the nominal capacity in ampere-hours divided by the mass in kilograms. If the nominal capacity is not stated, energy density is calculated from the nominal voltage squared then multiplied by the discharge duration in hours divided by the discharge load in Ohms and the mass in kilograms.

2. For the purposes of 3A991.j, a 'cell' is defined as an electrochemical device, which has positive and negative electrodes, and electrolyte, and is a source of electrical energy. It is the basic building block of a battery.

3. For the purposes of 3A991.j.1, a 'primary cell' is a 'cell' that is not designed to be charged by any other source.

4. For the purposes of 3A991.j.2, a 'secondary cell' is a 'cell' that is designed to be charged by an external electrical source.

k. "Superconductive" electromagnets or solenoids, specially designed to be fully charged or discharged in less than one minute, having all of the following:

Note: *3A991.k does not control "superconductive" electromagnets or solenoids specially designed for Magnetic Resonance Imaging (MRI) medical equipment.*

k.1. Maximum energy delivered during the discharge divided by the duration of the discharge of more than 500 kJ per minute;

k.2. Inner diameter of the current carrying windings of more than 250 mm; and

k.3. Rated for a magnetic induction of more than 8T or "overall current density" in the winding of more than 300 A/mm^2;

l. Circuits or systems designed for electromagnetic energy storage, containing components manufactured from "superconductive" materials specially designed for operation at temperatures below the "critical temperature" of at least one of their "superconductive" constituents, having all of the following:

l.1. Resonant operating frequencies exceeding 1 MHz;

l.2. A stored energy density of 1 MJ/m^3 or more; and

l.3. A discharge time of less than 1 ms;

m. Hydrogen/hydrogen-isotope thyratrons of ceramic-metal construction and rated for a peak current of 500 A or more;

n. Digital integrated circuits based on any compound semiconductor having an equivalent gate count of more than 300 (2 input gates);

o. "Space qualified" solar cells, cell-interconnect-coverglass (CIC) assemblies, solar panels, and solar arrays.

3A992 General purpose electronic equipment, as follows:

a. Electronic test equipment;

b. Digital instrumentation magnetic tape data recorders having any of the following;

b.1. A maximum digital interface transfer rate exceeding 60 Mbit/s and employing helical scan techniques;

b.2. A maximum digital interface transfer rate exceeding 120 Mbit/s and employing fixed head techniques; or

b.3. “Space qualified”;

c. Equipment having a maximum digital interface transfer rate exceeding 60 Mbit/s and designed to convert digital video magnetic tape recorders for use as digital instrumentation data recorders;

d. Non-modular analogue oscilloscopes having a bandwidth of 1 GHz or greater;

e. Modular analogue oscilloscope systems having either of the following:

e.1. A mainframe with a bandwidth of 1 GHz or greater; or

e.2. Plug-in modules with an individual bandwidth of 4 GHz or greater;

f. Analogue sampling oscilloscopes for the analysis of recurring phenomena with an effective bandwidth greater than 4 GHz;

g. Digital oscilloscopes and transient recorders, using analogue-to-digital conversion techniques, capable of storing transients by sequentially sampling single-shot inputs at successive intervals of less than 1 ns (greater than 1 giga-sample per second), digitising to 8 bits or greater resolution and storing 256 or more samples.

Note: This entry controls the following components designed for analogue oscilloscopes:

1. Plug-in units;

2. External amplifiers;

3. Pre-amplifiers;

4. Sampling devices;

5. Cathode ray tubes.

3A999 Specific processing equipment as follows.

a. Frequency changers capable of operating in the frequency range from 300 up to 600 Hz;

b. Mass spectrometers;

c. All flash x-ray machines, and components of pulsed power systems designed therefor, including Marx generators, high power pulse shaping networks, high voltage capacitors, and triggers;

d. Pulse amplifiers;

e. Time delay generation or time interval measurement equipment, as follows:

e.1. Digital time delay generators having a resolution of 50 nanoseconds or less over time intervals of 1ms or greater; *or*

e.2. Multi-channel (three or more) or modular time interval meter and chronometry equipment having a resolution of 50 ns or less over time intervals of 1 ms or greater;

f. Chromatography and spectrometry analytical instruments

3B991 Equipment for the manufacture of electronic components and materials, and specially designed components therefor.

a. Equipment specially designed for the manufacture of electron tubes, optical elements and components controlled by entry 3A001 of Annex I of the Dual-Use Regulation, or entry 3A991;

b. Equipment for the manufacture of semiconductor devices, integrated circuits and "electronic assemblies", as follows, and systems incorporating or having the characteristics of such equipment:

Note*:3B991.b also controls equipment used or modified for use in the manufacture of other devices, such as imaging devices, electro-optical devices, acoustic-wave devices.*

b.1. Equipment for the processing of materials for the manufacture of devices and components, as specified in the heading of 3B991.b, as follows:

Note*:3B991 does not control quartz furnace tubes, furnace liners, paddles, boats (except specially designed caged boats), bubblers, cassettes or crucibles specially designed for the processing equipment*

b.1.a. Equipment specially designed for producing polycrystalline silicon and materials controlled by entry 3A001 of Annex I of the Dual-Use Regulation;

b.1.b. Equipment specially designed for purifying or processing III/V and II/VI semiconductor materials controlled by entries 3C001, 3C002, 3C003, 3C004, or 3C005 of Annex I of the Dual-Use Regulation except crystal pullers, for which see 3B991.b.1.c below;

b.1.c. Crystal pullers and furnaces, as follows:

Note*:3B991.b.1.c does not control diffusion and oxidation furnaces.*

b.1.c.1. Annealing or recrystallising equipment other than constant temperature furnaces employing high rates of energy transfer capable of processing wafers at a rate exceeding 0.005 m^2 per minute;

b.1.c.2. "Stored program controlled" crystal pullers having any of the following:

b.1.c.2.a. Rechargeable without replacing the crucible container;

b.1.c.2.b. Capable of operation at pressures above 2.5 x 10^5 Pa; *or*

b.1.c.2.c. Capable of pulling crystals of a diameter exceeding 100 mm;

b.1.d. "Stored program controlled" equipment for epitaxial growth having any of the following:

b.1.d.1. Capable of producing silicon layer with a thickness uniform to less than ± 2.5% across a distance of 200 mm or more;

b.1.d.2. Capable of producing a layer of any material other than silicon with a thickness uniformity across the wafer of equal to or better than ± 3.5%; or

b.1.d.3. Capable of rotating individual wafers during processing;

b.1.e. Molecular beam epitaxial growth equipment;

b.1.f. Magnetically enhanced 'sputtering' equipment with specially designed integral load locks capable of transferring wafers in an isolated vacuum environment;

Note: 'Sputtering' is an overlay coating process wherein positively charged ions are accelerated by an electric field towards the surface of a target (coating material). The kinetic energy of the impacting ions is sufficient to cause target surface atoms to be released and deposited on the substrate. (Note: Triode, magnetron or radio frequency sputtering to increase adhesion of coating and rate of deposition are ordinary modifications of the process.)

b.1.g. Equipment specially designed for ion implantation, ion-enhanced or photo-enhanced diffusion, having any of the following:

b.1.g.1. Patterning capability;

b.1.g.2. Beam energy (accelerating voltage) exceeding 200 keV;

b.1.g.3 Optimised to operate at a beam energy (accelerating voltage) of less than 10 keV; *or*

b.1.g.4. Capable of high energy oxygen implant into a heated "substrate";

b.1.h. "Stored program controlled" equipment for selective removal (etching) by means of anisotropic dry methods (e.g., plasma), as follows:

b.1.h.1. 'Batch types' having either of the following:

b.1.h.1.a. End-point detection, other than optical emission spectroscopy types; *or*

b.1.h.1.b. Reactor operational (etching) pressure of 26.66 Pa or less;

b.1.h.2. 'Single wafer types' having any of the following:

b.1.h.2.a. End-point detection, other than optical emission spectroscopy types;

b.1.h.2.b. Reactor operational (etching) pressure of 26.66 Pa or less; *or*

b.1.h.2.c. Cassette-to-cassette and load locks wafer handling;

Notes: *1. 'Batch types' refers to machines not specially designed for production processing of single wafers. Such machines can process two or more wafers simultaneously with common process parameters, e.g., RF power, temperature, etch gas species, flow rates.*

2. 'Single wafer types' refers to machines specially designed for production processing of single wafers. These machines may use automatic wafer handling techniques to load a single wafer into the equipment for processing. The definition includes equipment

that can load and process several wafers but where the etching parameters, e.g., RF power or end point, can be independently determined for each individual wafer.

b.1.i. "Chemical vapor deposition" (CVD) equipment, e.g., plasma-enhanced CVD (PECVD) or photo-enhanced CVD, for semiconductor device manufacturing, having either of the following capabilities, for deposition of oxides, nitrides, metals or polysilicon:

b.1.i.1. "Chemical vapor deposition" equipment operating below 10^5 Pa; or

b.1.i.2. PECVD equipment operating either below 60 Pa (450 millitorr) or having automatic cassette-to-cassette and load lock wafer handling;

Note: *3B991.b.1.i does not control low pressure "chemical vapor deposition" (LPCVD) systems or reactive 'sputtering' equipment.*

b.1.j. Electron beam systems specially designed or modified for mask making or semiconductor device processing having any of the following:

b.1.j.1. Electrostatic beam deflection;

b.1.j.2. Shaped, non-Gaussian beam profile;

b.1.j.3. Digital-to-analogue conversion rate exceeding 3 MHz;

b.1.j.4. Digital-to-analogue conversion accuracy exceeding 12 bit; *or*

b.1.j.5. Target-to-beam position feedback control precision of 1 μm or finer;

Note: *3B991.b.1.j does not control electron beam deposition systems or general purpose scanning electron microscopes.*

b.1.k. Surface finishing equipment for the processing of semiconductor wafers as follows:

b.1.k.1. Specially designed equipment for backside processing of wafers thinner than 100 μm and the subsequent separation thereof; *or*

b.1.k.2. Specially designed equipment for achieving a surface roughness of the active surface of a processed wafer with a two-sigma value of 2 μm or less, total indicator reading (TIR);

Note*:3B991.b.1.k does not control single-side lapping and polishing equipment for wafer surface finishing.*

b.1.l. Interconnection equipment which includes common single or multiple vacuum chambers specially designed to permit the integration of any equipment controlled by 3B991 into a complete system;

b.1.m. "Stored program controlled" equipment using "lasers" for the repair or trimming of "monolithic integrated circuits" with either of the following:

b.1.m.1. Positioning accuracy less than ± 1 μm; or

b.1.m.2. Spot size (kerf width) less than 3 μm.

b.2. ‘Masks’, ‘mask’ “substrates,” mask-making equipment and image transfer equipment for the manufacture of devices and components as specified in the heading of 3B991, as follows:

Note: *The term ’masks’ or ‘mask’ refers to those used in electron beam lithography, X-ray lithography, and ultraviolet lithography, as well as the usual ultraviolet and visible photo-lithography.*

b.2.a. Finished masks, reticles and designs therefor, except:

b.2.a.1. Finished masks or reticles for the production of integrated circuits not controlled by entry 3A001 of Annex I of the Dual-Use Regulation; *or*

b.2.a.2. Masks or reticles, having both of the following:

b.2.a.2.a. Their design is based on geometries of 2.5 μm or more; and

b.2.a.2.b. The design does not include special features to alter the intended use by means of production equipment or “software”;

b.2.b. Mask “substrates” as follows:

b.2.b.1. Hard surface (e.g., chromium, silicon, molybdenum) coated “substrates” (e.g., glass, quartz, sapphire) for the preparation of masks having dimensions exceeding 125 mm x 125 mm; *or*

b.2.b.2. “Substrates” specially designed for X-ray masks;

b.2.c. Equipment, other than general purpose computers, specially designed for computer aided design (CAD) of semiconductor devices or integrated circuits;

b.2.d. Equipment or machines, as follows, for mask or reticle fabrication:

***Note*:** *3B991.b.2.d.1 and b.2.d.2 do not control mask fabrication equipment using photo-optical methods which was either commercially available before the 1st January, 1980, or has a performance no better than such equipment.*

b.2.d.1. Photo-optical step and repeat cameras capable of producing arrays larger than 100 mm x 100 mm, or capable of producing a single exposure larger than 6 mm x 6 mm in the image (i.e., focal) plane, or capable of producing line widths of less than 2.5 μm in the photoresist on the “substrate”;

b.2.d.2. Mask or reticle fabrication equipment using ion or “laser” beam lithography capable of producing line widths of less than 2.5 μm; or

b.2.d.3. Equipment or holders for altering masks or reticles or adding pellicles to remove defects;

b.2.e. “Stored program controlled” equipment for the inspection of masks, reticles or pellicles with:

b.2.e.1. A resolution of 0.25 μm or finer; and

b.2.e.2. A precision of 0.75 μm or finer over a distance in one or two coordinates of 63.5 mm or more;

Note: *3B991.b.2.e does not control general purpose scanning electron microscopes except when specially designed and instrumented for automatic pattern inspection.*

b.2.f. Align and expose equipment for wafer production using photo-optical or X-ray methods, e.g., lithography equipment, including both projection image transfer equipment and step and repeat (direct step on wafer) or step and scan (scanner) equipment, capable of performing any of the following:

Note*:3B991.b.2.f does not control photo-optical contact and proximity mask align and expose equipment or contact image transfer equipment.*

b.2.f.1. Production of a pattern size of less than 2.5 μm;

b.2.f.2. Alignment with a precision finer than ± 0.25 μm (3 sigma);

b.2.f.3. Machine-to-machine overlay no better than ± 0.3 μm; or

b.2.f.4. A light source wavelength shorter than 400 nm;

b.2.g. Electron beam, ion beam or X-ray equipment for projection image transfer capable of producing patterns less than 2.5 μm;

Note*:For focused, deflected-beam systems (direct write systems), see 3B991.b.1.j or b.10.*

b.2.h. Equipment using "lasers" for direct write on wafers capable of producing patterns less than 2.5 μm.

b.3. Equipment for the assembly of integrated circuits, as follows:

b.3.a. "Stored program controlled" die bonders having all of the following:

b.3.a.1. Specially designed for "hybrid integrated circuits";

b.3.a.2. X-Y stage positioning travel exceeding 37.5 x 37.5 mm; *and*

b.3.a.3. Placement accuracy in the X-Y plane of finer than ± 10 μm;

b.3.b. "Stored program controlled" equipment for producing multiple bonds in a single operation (e.g., beam lead bonders, chip carrier bonders, tape bonders);

b.3.c. Semi-automatic or automatic hot cap sealers, in which the cap is heated locally to a higher temperature than the body of the package, specially designed for ceramic microcircuit packages controlled by entry 3A001 of Annex I of the Dual-Use Regulation and that have a throughput equal to or more than one package per minute.

b.4. Filters for clean rooms capable of providing an air environment of 10 or less particles of 0.3 μm or smaller per 0.02832 m^3 and filter materials therefor.

3B992 Equipment for the inspection or testing of electronic components and materials, and specially designed components therefor.

a. Equipment specially designed for the inspection or testing of electron tubes, optical elements and specially designed components therefor, controlled by entry 3A001 of Annex I of the Dual-Use Regulation or 3A991;

b. Equipment specially designed for the inspection or testing of semiconductor devices, integrated circuits and "electronic assemblies", as follows, and systems incorporating or having the characteristics of such equipment:

Note: *3B992.b also controls equipment used or modified for use in the inspection or testing of other devices, such as imaging devices, electro-optical devices, acoustic-wave devices.*

b.1. "Stored program controlled" inspection equipment for the automatic detection of defects, errors or contaminants of 0.6 μm or less in or on processed wafers, "substrates", other than printed circuit boards or integrated circuits, using optical image acquisition techniques for pattern comparison;

Note: *3B992.b.1 does not control general purpose scanning electron microscopes, except when specially designed and instrumented for automatic pattern inspection.*

b.2. Specially designed "stored program controlled" measuring and analysis equipment, as follows:

b.2.a. Specially designed for the measurement of oxygen or carbon content in semiconductor materials;

b.2.b. Equipment for line width measurement with a resolution of 1 μm or finer;

b.2.c. Specially designed flatness measurement instruments capable of measuring deviations from flatness of 10 μm or less with a resolution of 1 μm or finer.

b.3. "Stored program controlled" wafer probing equipment having any of the following:

b.3.a. Positioning accuracy finer than 3.5 μm;

b.3.b. Capable of testing devices having more than 68 terminals; *or*

b.3.c. Capable of testing at a frequency exceeding 1 GHz;

b.4. Test equipment as follows:

b.4.a. "Stored program controlled" equipment, specially designed for testing discrete semiconductor devices and unencapsulated dice, capable of testing at frequencies exceeding 18 GHz;

Technical Note: *Discrete semiconductor devices include photocells and solar cells.*

b.4.b. "Stored program controlled" equipment specially designed for testing integrated circuits and "electronic assemblies" thereof, capable of functional testing:

b.4.b.1. At a 'pattern rate' exceeding 20 MHz; *or*

b.4.b.2. At a 'pattern rate' exceeding 10 MHz but not exceeding 20 MHz and capable of testing packages of more than 68 terminals.

Notes: 3B992.b.4.b does not control test equipment specially designed for testing:

1. Memory;

2. "Electronic assemblies" for home and entertainment applications; and

3. Electronic components, and integrated circuits not controlled by entry 3A001 of Annex I of the Dual-Use Regulation or 3A991 provided such test equipment does not incorporate computing facilities with "user accessible programmability".

Technical Note: For purposes of 3B992.b.4.b, 'pattern rate' is defined as the maximum frequency of digital operation of a tester. It is therefore equivalent to the highest data rate that a tester can provide in non-multiplexed mode. It is also referred to as test speed, maximum digital frequency or maximum digital speed.

b.4.c. Equipment specially designed for determining the performance of focal-plane arrays at wavelengths of more than 1,200 nm, using "stored program controlled" measurements or computer aided evaluation and having any of the following:

b.4.c.1. Using scanning light spot diameters of less than 0.12 mm;

b.4.c.2. Designed for measuring photosensitive performance parameters and for evaluating frequency response, modulation transfer function, uniformity of responsivity or noise; *or*

b.4.c.3. Designed for evaluating arrays capable of creating images with more than 32 x 32 line elements;

b.5. Electron beam test systems designed for operation at 3 keV or below, or "laser" beam systems, for non-contact probing of powered-up semiconductor devices having any of the following:

b.5.a. Stroboscopic capability with either beam blanking or detector strobing;

b.5.b. An electron spectrometer for voltage measurements with a resolution of less than 0.5 V; *or*

b.5.c. Electrical tests fixtures for performance analysis of integrated circuits;

***Note*:** *3B992.b.5 does not control scanning electron microscopes, except when specially designed and instrumented for non-contact probing of a powered-up semiconductor device.*

b.6. "Stored program controlled" multifunctional focused ion beam systems specially designed for manufacturing, repairing, physical layout analysis and testing of masks or semiconductor devices and having either of the following:

b.6.a. Target-to-beam position feedback control precision of 1 μm or finer; *or*

b.6.b. Digital-to-analogue conversion accuracy exceeding 12 bit;

b.7. Particle measuring systems employing "lasers" designed for measuring particle size and concentration in air having both of the following:

b.7.a. Capable of measuring particle sizes of 0.2 μm or less at a flow rate of 0.02832 m^3 per minute or more; *and*

b.7.b. Capable of characterising Class 10 clean air or better.

3C992 Positive resists designed for semiconductor lithography specially adjusted (optimised) for use at wavelengths between 370 and 193 nm.

3D991 "Software" specially designed for the "development", "production", or "use" of electronic devices, or components controlled by entry 3A991 of Annex I of the Dual-Use Regulation, general purpose electronic equipment controlled by 3A992, or manufacturing and test equipment controlled by 3B991 and 3B992; or "software" specially designed for the "use" of equipment controlled by entry 3B001.g and h of Annex I of the Dual-Use Regulation.

3E991 "Technology" for the "development," "production" or "use" of electronic devices or components controlled by entry 3A991 of Annex I of the Dual-Use Regulation, general

purpose electronic equipment controlled by 3A992, or manufacturing and test equipment controlled by 3B991 or 3B992, or materials controlled by 3C992.

PART 3

Computers

4A994 Computers, "electronic assemblies" and related equipment, and specially designed components therefor.

Note 1: The control status of the "digital computers" and related equipment described in 4A994 is determined by the control status of other equipment or systems provided:

a. The "digital computers" or related equipment are essential for the operation of the other equipment or systems;

b. The "digital computers" or related equipment are not a "principal element" of the other equipment or systems; and

N.b. 1: The control status of "signal processing" or "image enhancement" equipment specially designed for other equipment with functions limited to those required for the other equipment is determined by the control status of the other equipment even if it exceeds the "principal element" criterion.

N.b. 2: For the control status of "digital computers" or related equipment for telecommunications equipment, see Category 5, Part 1 (Telecommunications) of Annex I of the Dual-Use Regulation.

c. The "technology" for the "digital computers" and related equipment is determined by Category 4E of Annex I of the Dual-Use Regulation.

a. Electronic computers and related equipment, and "electronic assemblies" and specially designed components therefor, rated for operation at an ambient temperature above 343 K (70°C);

b. "Digital computers", including "signal processing" or "image enhancement" equipment, having an "Adjusted Peak Performance" ("APP") equal to or greater than 0.0128 Weighted TeraFLOPS (WT);

c. "Electronic assemblies" that are specially designed or modified to enhance performance by aggregation of processors, as follows:

c.1. Designed to be capable of aggregation in configurations of 16 or more processors;

c.2. Not used.

Note 1: 4A994.c applies only to "electronic assemblies" and programmable interconnections with a "APP" not exceeding the limits in 4A994.b, when shipped as unintegrated "electronic assemblies". It does not apply to "electronic assemblies" inherently limited by nature of their design for use as related equipment controlled by 4A994.k.

Note 2: 4A994.c does not control any "electronic assembly" specially designed for a product or family of products whose maximum configuration does not exceed the limits of 4A994.b.

d. Not used;

e. Not used;

f. Equipment for "signal processing" or "image enhancement" having an "Adjusted Peak Performance" ("APP") equal to or greater than 0.0128 Weighted TeraFLOPS WT;

g. Not used;

h. Not used;

i. Equipment containing "terminal interface equipment" exceeding the limits in 5A991;

j. Equipment specially designed to provide external interconnection of "digital computers" or associated equipment that allows communications at data rates exceeding 80 Mbyte/s;

***Note*:** *4A994.j does not control internal interconnection equipment (e.g., backplanes, buses) passive interconnection equipment, "network access controllers" or "communication channel controllers".*

k. "Hybrid computers" and "electronic assemblies" and specially designed components therefor containing analogue-to-digital converters having all of the following:

k.1. 32 channels or more; and

k.2. A resolution of 14 bit (plus sign bit) or more with a conversion rate of 200,000 conversions/s or more.

4D993 "Program" proof and validation "software," "software" allowing the automatic generation of "source codes," and operating system "software" that are specially designed for "real-time processing" equipment.

a. "Program" proof and validation "software" using mathematical and analytical techniques and designed or modified for "programs" having more than 500,000 "source code" instructions;

b. "Software" allowing the automatic generation of "source codes" from data acquired on line from external sensors described in Annex I of the Dual-Use Regulation;

c. Operating system "software" specially designed for "real-time processing" equipment that guarantees a "global interrupt latency time" of less than 20 μs.

Note: "Global interrupt latency time" is the time taken by the computer system to recognise an interrupt due to the event, service the interrupt and perform a context switch to an alternate memory-resident task waiting on the interrupt.

4D994 Software" other than that controlled in entry 4D001 of Annex I of the Dual-Use Regulation specially designed or modified for the "development", "production", or "use" of equipment controlled by entry 4A101 of Annex I of the Dual-Use Regulation, or 4A994.

4E992 "Technology" for the "development," "production," or "use" of equipment controlled by 4A994, or "software" controlled by 4D993 or 4D994.

4E993 "Technology" for the "development" or "production" of equipment designed for "multi-data-stream processing."

PART 4

Telecommunications and information security

CHAPTER 1

Telecommunication equipment

5A991 Telecommunication equipment.

Note:

1. 'Asynchronous transfer mode' ('ATM') is a transfer mode in which the information is organised into cells; it is asynchronous in the sense that the recurrence of cells depends on the required or instantaneous bit rate.

2. 'Bandwidth of one voice channel' is data communication equipment designed to operate in one voice channel of 3,100 Hz, as defined in CCITT Recommendation G.151.

3. 'Communications channel controller' is the physical interface that controls the flow of synchronous or asynchronous digital information. It is an assembly that can be integrated into computer or telecommunications equipment to provide communications access.

4. 'Datagram' is a self-contained, independent entity of data carrying sufficient information to be routed from the source to the destination data terminal equipment without reliance on earlier exchanges between this source and destination data terminal equipment and the transporting network.

5. 'Gateway' is the function, realised by any combination of equipment and "software", to carry out the conversion of conventions for representing, processing or communicating information used on one system into the corresponding, but different conventions used in another system.

6. 'Packet' is a group of binary digits including data and call control signals that is switched as a composite whole. The data, call control signals, and possible error control information are arranged in a specified format.

a. Any type of telecommunications equipment, not controlled by 5A001.a, specially designed to operate outside the temperature range from 219 K (-54 °C) to 397 K (124 °C).

b. Telecommunication transmission equipment and systems, and specially designed components therefor, having any of the following characteristics, functions or features:

a. Categorised as follows, or combinations thereof:

1. Radio equipment (e.g., transmitters, receivers and transceivers);

2. Line terminating equipment;

3. Intermediate amplifier equipment;

4. Repeater equipment;

5. Regenerator equipment;

6. Translation encoders (transcoders);

7. Multiplex equipment (statistical mutiplex included);

8. Modulators/demodulators (modems);

9. Transmultiplex equipment (see CCITT Rec. G701);

10. "Stored program controlled" digital cross-connection equipment;

11. 'Gateways' and bridges;

12. "Media access units"; and

b. Designed for use in single or multi-channel communication via any of the following:

1. Wire (line);

2. Coaxial cable;

3. Optical fibre cable;

4. Electromagnetic radiation; or

5. Underwater acoustic wave propagation.

b.1. Employing digital techniques, including digital processing of analogue signals, and designed to operate at a "digital transfer rate" at the highest multiplex level exceeding 45 Mbit/s or a "total digital transfer rate" exceeding 90 Mbit/s;

Note: 5A991.b.1 does not control equipment specially designed to be integrated and operated in any satellite system for civil use.

b.2. Modems using the 'bandwidth of one voice channel' with a "data signalling rate" exceeding 9,600 bits per second;

b.3. Being "stored program controlled" digital cross-connect equipment with "digital transfer rate" exceeding 8.5 Mbit/s per port.

b.4. Being equipment containing any of the following:

b.4.a. 'Network access controllers' and their related common medium having a "digital transfer rate" exceeding 33 Mbit/s; *or*

b.4.b. "Communication channel controllers" with a digital output having a "data signalling rate" exceeding 64,000 bit/s per channel;

Note: If any uncontrolled equipment contains a "network access controller", it cannot have any type of telecommunications interface, except those described in, but not controlled by 5A991.b.4.

b.5. Employing a "laser" and having any of the following:

b.5.a. A transmission wavelength exceeding 1,000 nm; *or*

b.5.b. Employing analogue techniques and having a bandwidth exceeding 45 MHz;

Note: *5A991.b.5.b does not control commercial TV systems.*

b.5.c. Employing coherent optical transmission or coherent optical detection techniques (also called optical heterodyne or homodyne techniques);

b.5.d. Employing wavelength division multiplexing techniques; or

b.5.e. Performing optical amplification;

b.6. Radio equipment operating at input or output frequencies exceeding:

b.6.a. 31 GHz for satellite-earth station applications; or

b.6.b. 26.5 GHz for other applications;

Note: *5A991.b.6. does not control equipment for civil use when conforming with an International Telecommunications Union (ITU) allocated band between 26.5 GHz and 31 GHz.*

b.7. Being radio equipment employing any of the following:

b.7.a. Quadrature-amplitude-modulation (QAM) techniques above level 4 if the "total digital transfer rate" exceeds 8.5 Mbit/s;

b.7.b. QAM techniques above level 16 if the "total digital transfer rate" is equal to or less than 8.5 Mbit/s;

b.7.c. Other digital modulation techniques and having a "spectral efficiency" exceeding 3 bit/s/Hz; or

b.7.d. Operating in the 1.5 MHz to 87.5 MHz band and incorporating adaptive techniques providing more than 15 dB suppression of an interfering signal.

Notes:

1. 5A991.b.7 does not control equipment specially designed to be integrated and operated in any satellite system for civil use.

2. 5A991.b.7 does not control radio relay equipment for operation in an ITU allocated band:

a. Having any of the following:

a.1. Not exceeding 960 MHz; or

a.2. With a "total digital transfer rate" not exceeding 8.5 Mbit/s; and

b. Having a "spectral efficiency" not exceeding 4 bit/s/Hz.

c. "Stored program controlled" switching equipment and related signalling systems, having any of the following characteristics, functions or features, and specially designed components therefor:

Note: Statistical multiplexers with digital input and digital output which provide switching are treated as "stored program controlled" switches.

c.1. Data (message) switching equipment or systems designed for "packet-mode operation" and electronic assemblies and components therefor,

c.2. Not used;

c.3. Routing or switching of 'datagram' packets;

Note: The restrictions in 5A991.c.3 do not apply to networks restricted to using only 'network access controllers' or to 'network access controllers' themselves.

c.4. Not used.

c.5. Multi-level priority and pre-emption for circuit switching;

Note: 5A991.c.5 does not control single-level call pre-emption.

c.6. Designed for automatic hand-off of cellular radio calls to other cellular switches or automatic connection to a centralised subscriber data base common to more than one switch;

c.7. Containing "stored program controlled" digital cross connect equipment with "digital transfer rate" exceeding 8.5 Mbit/s per port.

c.8. "Common channel signalling" operating in either non-associated or quasi-associated mode of operation;

c.9. "Dynamic adaptive routing";

c.10. Being packet switches, circuit switches and routers with ports or lines exceeding any of the following:

c.10.a. A "data signalling rate" of 64,000 bit/s per channel for a 'communications channel controller'; or

Note: 5A991.c.10.a does not control multiplex composite links composed only of communication channels not individually controlled by 5A991.b.1.

c.10.b. A "digital transfer rate" of 33 Mbit/s for a 'network access controller' and related common media;

Note: 5A991.c.10 does not control packet switches or routers with ports or lines not exceeding the limits in 5A991.c.10.

c.11. "Optical switching";

c.12. Employing 'Asynchronous Transfer Mode' ('ATM') techniques;

d. Optical fibres and optical fibre cables of more than 50 m in length designed for single mode operation;

e. Centralised network control having all of the following:

e.1. Receives data from the nodes; and

e.2. Process these data in order to provide control of traffic not requiring operator decisions, and thereby performing "dynamic adaptive routing";

Note: 5A991.e does not preclude control of traffic as a function of predictable statistical traffic conditions.

f. Phased array antennas, operating above 10.5 GHz, containing active elements and distributed components, and designed to permit electronic control of beam shaping and pointing, except for landing systems with instruments meeting International Civil Aviation Organisation (ICAO) standards (microwave landing systems (MLS));

g. Mobile communications equipment and electronic assemblies and components therefor;

h. Radio relay communications equipment designed for use at frequencies equal to or exceeding 19.7 GHz and components therefor.

5B991 Telecommunications test equipment.

5C991 Preforms of glass or of any other material optimised for the manufacture of optical fibres controlled by 5A991.

5D991 "Software" specially designed or modified for the "development," "production" or "use" of equipment controlled by 5A991 and 5B991, and dynamic adaptive routing software, as follows:

a. "Software", other than in machine-executable form, specially designed for "dynamic adaptive routing";

b. Not used.

5E991 "Technology" for the "development", "production" or "use" of equipment controlled by 5A991 or 5B991, or "software" controlled by 5D991, and other "technologies" as follows:

Note:

1. 'Synchronous digital hierarchy' (SDH) is a digital hierarchy providing a means to manage, multiplex, and access various forms of digital traffic using a synchronous transmission format on different types of media. The format is based on the Synchronous Transport Module (STM) that is defined by CCITT Recommendation G.703, G.707, G.708, G.709 and others yet to be published. The first level rate of 'SDH' is 155.52 Mbits/s.

2. 'Synchronous optical network' (SONET) is a network providing a means to manage, multiplex and access various forms of digital traffic using a synchronous transmission format on fiber optics. The format is the North America version of 'SDH' and also uses the Synchronous Transport Module (STM). However, it uses the Synchronous Transport Signal (STS) as the basic transport module with a first level rate of 51.81 Mbits/s. The SONET standards are being integrated into those of 'SDH'.

a. Specific "technologies" as follows:

a.1. "Technology" for the processing and application of coatings to optical fibre specially designed to make it suitable for underwater use;

a.2. "Technology" for the "development" of equipment employing 'Synchronous Digital Hierarchy' ('SDH') or 'Synchronous Optical Network' ('SONET') techniques.

CHAPTER 2

Information security

5A992 "Information security" systems, equipment and components, described by entry 5A002 of Annex I of the Dual-Use Regulation and classified under Note 3 to Category 5, Part 2 of Annex I of the Dual-Use Regulation (Cryptography Note).

5D992 "Information Security" "software" described by entry 5D002 to Category 5, Part 2 in Annex I of the Dual-Use Regulation and classified under Note 3 to Category 5, Part 2 of Annex I of the Dual-Use Regulation (Cryptography Note).

Note: This entry does not control "software" designed or modified to protect against malicious computer damage, e.g., viruses, where the use of "cryptography" is limited to authentication, digital signature and/or the decryption of data or files.

5E992 "Information Security" "technology" as follows:

a. "Technology" for the "use" of items controlled by 5A992 or "software" controlled by 5D992.

PART 5

Sensors and lasers

6A991 Marine or terrestrial acoustic equipment capable of detecting or locating underwater objects or features or positioning surface vessels or underwater vehicles; and specially designed components therefor.

6A992 Optical Sensors as follows

a. Image intensifier tubes and specially designed components therefor, as follows:

a.1. Image intensifier tubes having all the following:

a.1.a. A peak response in wavelength range exceeding 400 nm, but not exceeding 1,050 nm;

a.1.b. A microchannel plate for electron image amplification with a hole pitch (centre-to-centre spacing) of less than 25 μm; *and*

a.1.c. Having any of the following:

a.1.c.1. An S-20, S-25 or multialkali photocathode; *or*

a.1.c.2. A GaAs or GaInAs photocathode;

a.2. Specially designed microchannel plates having both of the following:

a.2.a. 15,000 or more hollow tubes per plate; *and*

a.2.b. Hole pitch (centre-to-centre spacing) of less than 25 μm.

b. Direct view imaging equipment operating in the visible or infrared spectrum, incorporating image intensifier tubes having the characteristics listed in 6A992.a.1.

6A993 Cameras as follows:

a. Cameras that meet the criteria of Note 3 to entry 6A003.b.4. of Annex I of the Dual-Use Regulation.

6A994 Optics as follows:

a. Optical filters:

a.1. For wavelengths longer than 250 nm, comprised of multi-layer optical coatings and having either of the following:

a.1.a. Bandwidths equal to or less than 1 nm Full Width Half Intensity (FWHI) and peak transmission of 90% or more; or

a.1.b. Bandwidths equal to or less than 0.1 nm FWHI and peak transmission of 50% or more;

Note: *6A994 does not control optical filters with fixed air gaps or Lyot -type filters.*

a.2. For wavelengths longer than 250 nm, and having all of the following:

a.2.a. Tunable over a spectral range of 500 nm or more;

a.2.b. Instantaneous optical bandpass of 1.25 nm or less;

a.2.c. Wavelength resettable within 0.1 ms to an accuracy of 1 nm or better within the tunable spectral range; and

a.2.d. A single peak transmission of 91% or more;

a.3. Optical opacity switches (filters) with a field of view of 30 degrees or wider and a response time equal to or less than 1 ns;

b. "Fluoride fibre" cable, or optical fibres therefor, having an attenuation of less than 4 dB/km in the wavelength range exceeding 1,000 nm but not exceeding 3,000 nm.

6A995 "Lasers" as follows:

a. Carbon dioxide (CO_2) "lasers" having any of the following:

a.1. A CW output power exceeding 10 kW;

a.2. A pulsed output with a "pulse duration" exceeding 10 μs; and

a.2.a. An average output power exceeding 10 kW; or

a.2.b. A pulsed "peak power" exceeding 100 kW; or

a.3. A pulsed output with a "pulse duration" equal to or less than 10 μs; *and*

a.3.a. A pulse energy exceeding 5 J per pulse and "peak power" exceeding 2.5 kW; *or*

a.3.b. An average output power exceeding 2.5 kW;

b. Semiconductor lasers, as follows

b.1. Individual, single-transverse mode semiconductor "lasers" having:

b.1.a. An average output power exceeding 100 mW; *or*

b.1.b. A wavelength exceeding 1,050 nm;

b.2. Individual, multiple-transverse mode semiconductor "lasers", or arrays of individual semiconductor "lasers", having a wavelength exceeding 1,050 nm;

c. Ruby "lasers" having an output energy exceeding 20 J per pulse;

d. Non-"tunable" "pulsed lasers" having an output wavelength exceeding 975 nm but not exceeding 1,150 nm and having any of the following:

d.1. A "pulse duration" equal to or exceeding

1 ns but not exceeding 1 μs, and having any of the following:

d.1.a. A single transverse mode output and having any of the following:

d.1.a.1. A 'wall-plug efficiency' exceeding 12% and an "average output power" exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1kHz; *or*

d.1.a.2. An "average output power" exceeding 20 W; or

d.1.b. A multiple transverse mode output and having any of the following:

d.1.b.1. A 'wall-plug efficiency' exceeding 18% and an "average output power" exceeding 30W;

d.1.b.2. A "peak power" exceeding 200 MW; or

d.1.b.3. An "average output power" exceeding 50 W; or

d.2. A "pulse duration" exceeding 1 μs and having any of the following:

d.2.a. A single transverse mode output and having any of the following:

d.2.a.1. A 'wall-plug efficiency' exceeding 12% and an "average output power" exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1 kHz; or

d.2.a.2. An "average output power" exceeding 20 W; or

d.2.b. A multiple transverse mode output and having any of the following:

d.2.b.1. A 'wall-plug efficiency' exceeding 18% and an "average output power" exceeding 30 W; or

d.2.b.2. An "average output power" exceeding 500 W;

e. Non-"tunable" continuous wave "(CW) lasers", having an output wavelength exceeding 975 nm but not exceeding 1,150nm and having any of the following:

e.1. A single transverse mode output and having any of the following:

e.1.a. A 'wall-plug efficiency' exceeding 12% and an "average output power" exceeding 10 W and capable of operating at a pulse repetition frequency greater than 1 kHz; or

e.1.b. An "average output power" exceeding 50 W; or

e.2. A multiple transverse mode output and having any of the following:

e.2.a. A 'wall-plug efficiency' exceeding 18% and an "average output power" exceeding 30 W; or

e.2.b. An "average output power" exceeding 500 W;

Note: *6A995.e.2.b does not control multiple transverse mode, industrial "lasers" with output power less than or equal to 2kW with a total mass greater than 1,200kg. For the purpose of this note, total mass includes all components required to operate the "laser," e.g., "laser," power supply, heat exchanger, but excludes external optics for beam conditioning and/or delivery.*

f. Non-"tunable" "lasers", having a wavelength exceeding 1,400 nm, but not exceeding 1555 nm *and* having any of the following:

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

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

g. Free electron "lasers".

6A996 "Magnetometers", "Superconductive" electromagnetic sensors, and specially designed components therefor, as follows

a. "Magnetometers", having a 'sensitivity' lower (better) than 1.0 nT (rms) per square root Hz.

Technical Note: *For the purposes of 6A996, 'sensitivity' (noise level) is the root mean square of the device -limited noise floor which is the lowest signal that can be measured*.

b. "Superconductive" electromagnetic sensors and components manufactured from "superconductive" materials, having all of the following:

b.1. Designed for operation at temperatures below the "critical temperature" of at least one of their "superconductive" constituents (including Josephson effect devices or "superconductive" quantum interference devices (SQUIDS));

b.2. Designed for sensing electromagnetic field variations at frequencies of 1 KHz or less; *and*

b.3. Having any of the following:

b.3.a. Incorporating thin-film SQUIDS with a minimum feature size of less than 2 μm and with associated input and output coupling circuits;

b.3.b. Designed to operate with a magnetic field slew rate exceeding 1 x 10^6 magnetic flux quanta per second;

b.3.c. Designed to function without magnetic shielding in the earth's ambient magnetic field; *or*

b.3.d. Having a temperature coefficient less (smaller) than 0.1 magnetic flux quantum/K.

6A997 Gravity meters (gravimeters) for ground use as follows:

a. Having a static accuracy of less (better) than 100 microgal; *or*

b. Being of the quartz element (Worden) type.

6A998 Radar systems, equipment and specially designed components therefor, as follows:

a. Airborne radar equipment and specially designed components therefor.

b. "Space-qualified" "laser" radar or Light Detection and Ranging (LIDAR) equipment specially designed for surveying or for meteorological observation.

c. Millimetre wave enhanced vision radar imaging systems specially designed for rotary wing aircraft and having all of the following:

c.1. Operates at a frequency of 94 GHz;

c.2. An average output power of less than 20 mW;

c.3. Radar beam width of 1 degree; and

c.4. Operating range equal to or greater than 1500 m.

6A999 Specific processing equipment, as follows:

a. Seismic detection equipment not controlled in paragraph c.

b. Radiation hardened TV cameras,

c. Seismic intrusion detection systems that detect, classify and determine the bearing on the source of a detected signal.

6B995 Equipment, including tools, dies, fixtures or gauges, and other specially designed components therefor, specially designed or modified for any of the following:

a. For the manufacture or inspection of:

a.1. Free electron "laser" magnet wigglers;

a.2. Free electron "laser" photo injectors;

b. For the adjustment, to required tolerances, of the longitudinal magnetic field of free electron "lasers".

6C992 Optical sensing fibres that are modified structurally to have a 'beat length' of less than 500 mm (high birefringence) or optical sensor materials not described in entry 6C002.b. of Annex I of the Dual-Use Regulation and having a zinc content of equal to or more than 6% by 'mole fraction.'

Note: 'Mole fraction' is defined as the ratio of moles of ZnTe to the sum of the moles of CdTe and ZnTe present in the crystal. 2) 'Beat length' is the distance over which two orthogonally polarised signals, initially in phase, must pass in order to achieve a 2 Pi radian(s) phase difference.

6C994 Optical materials.

a. Low optical absorption materials, as follows:

a.1. Bulk fluoride compounds containing ingredients with a purity of 99.999% or better; *or*

Note: *6C994.a.1 controls fluorides of zirconium or aluminium and variants.*

a.2. Bulk fluoride glass made from compounds controlled by entry 6C004.e.1 of Annex I of the Dual-Use Regulation;

b. 'Optical fibre preforms' made from bulk fluoride compounds containing ingredients with a purity of 99.999% or better, specially designed for the manufacture of "fluoride fibres" controlled by 6A994.b.

6D991 "Software," specially designed for the "development", "production", or "use" of items controlled by entries 6A002 and 6A003 of Annex I of the Dual-Use Regulation, 6A991, 6A996, 6A997, or 6A998.

6D992 "Software" specially designed for the "development" or "production" of equipment controlled by 6A992, 6A994, or 6A995.

6D993 Other "software".

a. Air Traffic Control (ATC) "software" application "programs" hosted on general purpose computers located at Air Traffic Control centres, and capable of automatically handing over primary radar target data (if not correlated with secondary surveillance radar (SSR) data) from the host ATC centre to another ATC centre.

b. "Software" specially designed for seismic intrusion detection systems in 6A999.c.

c. "Source Code" specially designed for seismic intrusion detection systems in 6A999.c.

6E991 "Technology" for the "development", "production" or "use" of equipment controlled by 6A991, 6A996, 6A997, 6A998 or 6A99.c.

6E992 "Technology" for the "development" or "production" of equipment, materials or "software" controlled by 6A992, 6A994, or 6A995, 6B995, 6C992, 6C994, or 6D993.

6E993 Other "technology" as follows.

a. Optical fabrication technologies for serially producing optical components at a rate exceeding 10 m2 of surface area per year on any single spindle and having all of the following:

a.1. Area exceeding 1 m2, and

a.2. Surface figure exceeding λ/10 (rms) at the designed wavelength;

b. "Technology" for optical filters with a bandwidth equal to or less than 10 nm, a field of view (FOV) exceeding 40° and a resolution exceeding 0.75 line pairs per milliradian;

c. "Technology" for the "development" or "production" of cameras controlled by 6A993;

d. "Technology" "required" for the "development" or "production" of non-triaxial fluxgate "magnetometers" or non-triaxial fluxgate "magnetometer" systems, having any of the following:

d.1. 'Sensitivity' lower (better) than 0.05 nT (rms) per square root Hz at frequencies of less than 1 Hz; or

d.2. 'Sensitivity' lower (better) than 1 x 10-3 nT (rms) per square root Hz at frequencies of 1 Hz or more;

e. "Technology" "required" for the "development" or "production" of infrared up-conversion devices having all of the following:

e.1. A response in the wavelength range exceeding 700 nm but not exceeding 1500 nm; and

e.2. A combination of an infrared photodetector, light emitting diode (LED), and nanocrystal to convert infrared light into visible light.

Technical Note: For the purposes of entry 6E993, 'sensitivity' (or noise level) is the root mean square of the device-limited noise floor which is the lowest signal that can be measured.

PART 6

Navigation and avionics

7A994 Navigation direction finding equipment, airborne communication equipment, all aircraft inertial navigation systems, and other avionic equipment, including components,
7B994 Other equipment for the test, inspection, or "production" of navigation and avionics equipment.
7D994 "Software" for the "development", "production", or "use" of navigation, airborne communication and other avionics.
7E994 "Technology" for the "development," "production" or "use" of navigation, airborne communication, and other avionics equipment.

PART 7

Marine

8A992 Vessels, marine systems or equipment, and specially designed components therefor, and marine boilers and components therefor.

a. Underwater vision systems, as follows:

a.1. Television systems (comprising camera, lights, monitoring and signal transmission equipment) having a limiting resolution when measured in air of more than 500 lines and specially designed or modified for remote operation with a submersible vehicle; *or*

a.2. Underwater television cameras having a limiting resolution when measured in air of more than 700 lines;

Technical Note: Limiting resolution in television is a measure of horizontal resolution usually expressed in terms of the maximum number of lines per picture height discriminated on a test chart, using IEEE Standard 208/1960 or any equivalent standard.

b. Photographic still cameras specially designed or modified for underwater use, having a film format of 35 mm or larger, and having autofocusing or remote focusing specially designed for underwater use;

c. Stroboscopic light systems, specially designed or modified for underwater use, capable of a light output energy of more than 300 J per flash;

d. Other underwater camera equipment;

e. Other submersible systems;

f. Vessels, including inflatable boats, and specially designed components therefor, ;

g. Marine engines (both inboard and outboard), and specially designed components therefor, ;

h. Other self-contained underwater breathing apparatus (scuba gear) and related equipment, ;

i. Life jackets, inflation cartridges, compasses, wetsuits, masks, fins, weight belts, and dive computers;

j. Underwater lights and propulsion equipment;

k. Air compressors and filtration systems, specially designed for filling air cylinders.

l. Marine boilers designed to have any of the following:

l.1. Heat release rate (at maximum rating) equal to or in excess of 190,000 BTU per hour per cubic foot of furnace volume; *or*

l.2. Ratio of steam generated in kg per hour (at maximum rating) to the dry weight of the boiler in kg equal to or in excess of 0.83.

m. Components for marine boilers described in 8A992.l.

8D992 “Software” specially designed or modified for the “development”, “production” or “use” of equipment controlled by 8A992.

8D999 “Software” specially designed for the operation of unmanned submersible vehicles.

8E992 “Technology” for the “development”, “production” or “use” of equipment controlled by 8A992.

PART 8

Aerospace and Propulsion

9A990 Diesel engines and tractor units, and specially designed components therefor.

a. Diesel engines for trucks, tractor units, and automotive applications of continuous power output of 400 BHP (298 kW) or greater (performance based on Society of Automotive Engineers J1349 standard conditions of 100 kPa and 25°C);

b. Off-road semi-trailer wheeled tractor units of carriage capacity 9 t or more and specially designed components therefor;

c. On-road semi-trailer tractor units, with single or tandem rear axles rated for 9 t per axel or greater and specially designed components therefor.

9A991 “Aircraft” and gas turbine engines and components

a. Not used;

b. “Aircraft”;

c. Aero gas turbine engines and specially designed components therefor;

d. Components specially designed for "aircraft";

e. Pressurised aircraft breathing equipment and specially designed components therefor.

9A992 Parachutes, harnesses, platforms and electronic release mechanisms, specially designed for air cargo delivery systems.

9B990 Vibration test equipment and specially designed components therefor.

9B991 "Equipment," tooling or fixtures specially designed for manufacturing or measuring gas turbine blades, vanes or tip shroud castings, as follows:

a. Automated equipment using non-mechanical methods for measuring aerofoil wall thickness;

b. Tooling, fixtures or measuring equipment for the "laser", water jet or ECM/EDM hole drilling processes controlled by entry 9E003.c of Annex I of the Dual-Use Regulation;

c. Ceramic core leaching equipment;

d. Ceramic core manufacturing equipment or tools;

e. Ceramic shell wax pattern preparation equipment;

f. Ceramic shell burn out or firing equipment.

9D990 "Software", for the "development" or "production" of equipment controlled by 9A990 or 9B990.

9D991 "Software", for the "development" or "production" of equipment controlled by 9A991 or 9B991.

9E990 "Technology", for the "development" or "production" or "use" of equipment controlled by 9A990 or 9B990.

9E991 "Technology", for the "development", "production" or "use" of equipment controlled by 9A991 or 9B991.

9E993 Other "technology", not described by entry 9E003 of Annex I of the Dual-Use Regulation, as follows:

a. Rotor blade tip clearance control systems employing active compensating casing "technology" limited to a design and development data base;

b. Gas bearing for turbine engine rotor assemblies.

SCHEDULE 2B

Regulation 60B

Consumer communication devices

1. In regulation 60B, "consumer communication device" means any of the following, of a type which is generally available to the public—

(a) computers falling within entries 5A992 and 4A994.b of Schedule 2A ;

(b) disk drives and solid-state storage equipment falling within entry 5A992 of Schedule 2A;

(c) input/output control units (other than industrial controllers designed for chemical processing);

(d) graphics accelerators and graphics coprocessors;

(e) monitors falling within entry 5A992 of Schedule 2A;

(f) printers falling within entry 5A992 of Schedule 2A;

(g) modems falling within entries 5A991.b.2, 5A991.b.4 or 5A992 of Schedule 2A;

(h) network access controllers and communications channel controllers falling within entry 5A991.b.4 of Schedule 2A;

(i) keyboards, mice and similar devices specified in entry 5A992 of Schedule 2A;

(j) mobile phones, including cellular and satellite telephones, personal digital assistants, and subscriber information module (SIM) cards and similar devices falling within entries 5A992 or 5A991 of Schedule 2A;

(k) memory devices falling within entry 5A992 of Schedule 2A;

(l) information security equipment, software (except encryption source code) and peripherals falling within entries 5A992 or 5D992 of Schedule 2A;

(m) digital cameras and memory cards falling within entry 6A993 or 5A992 of Schedule 2A;

(n) television and radio receivers falling within entry 5A992 of Schedule 2A;

(o) recording devices falling within entry 5A992 of Schedule 2A;

(p) batteries, chargers, carrying cases and accessories for the goods falling within paragraphs (a) to (o) above;

(q) software (except encryption source code) falling within entries 4D994, 5D991 and 5D992 of Schedule 2A, which is for use with equipment described in paragraphs (a) to (p) above.

2. For the purposes of paragraph 1, goods and technology are generally available to the public if they are —

(a) sold from stock at retail selling points without restriction, by means of—

(i) over the counter transactions,

(ii) mail order transactions,

(iii) electronic transactions, or

(iv) telephone order transactions, and

(b) designed for installation by the user without further substantial support by the supplier."