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BIS 2022

UPDATE CONFERENCE ON EXPORT CONTROLS & POLICY

BUILDING A NETWORK OF GLOBAL COOPERATION

JUNE 29 - JULY 1

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BIS 2022 UPDATE CONFERENCE ON EXPORT CONTROLS & POLICY

New Wassenaar Arrangement Entries on Section 1758 Topics

John Varesi

National Security and Technology Transfer Controls

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New Wassenaar Arrangement (WA) Entries

- Gallium Oxide & Diamond Substrates
  - Addition of 3.C.1.e. & 3.C.1.f. sub-entries
  - Amending 3.C.5. & 3.C.6.
  - Addition of 3.E.3.h. sub-entry
- Electronic Computer-Aided Design (ECAD) Software
  - Addition of 3.D.6.
- Pressure Gain Combustion Technology
  - Addition of 9.E.3.a.2.e sub-entry

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Typical Sources of New WA Entries

- Technical Advisory Committees
  - Emerging Technology (ETTAC), Information Systems (ISTAC), Materials & Equipment (METAC), Regulations and Procedures (RPTAC), Sensors & Instrumentation (SITAC), TRANSportation (TRANSTAC)
- Government
  - agency technology evaluators, interagency working groups
- Wassenaar Arrangement proposals from partner countries

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The Wassenaar Arrangement (WA)

- Purpose
  - ➢To contribute to regional and international security and stability, by promoting transparency and greater responsibility in transfers of conventional arms and dual-use goods and technologies, thus preventing destabilizing accumulations.
- The Initial Elements were originally established in 1996 and set out the purposes and scope of the Arrangement.
- There are currently 42 participating states.
- The Experts Group is the technical body for the Arrangement.

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Wassenaar Arrangement Dual-Use List Categories

Category 1 –	Special Materials & Related Equipment	Category 2 –	Materials Processing
Category 3 –	Electronics	Category 4 –	Computers
Category 5P1 –	Telecommunications	Category 5P2 –	Information Security
Category 6 –	Sensors & Lasers	Category 7 –	Navigation & Avionics
Category 8 –	Marine	Category 9 –	Aerospace & Propulsion

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Wassenaar Arrangement Process Timeline

October
Proposals due to BIS

November
USG interagency proposal review process begins

February
USG submits WA proposals; Receives foreign proposals

March/April
Initial Experts Group meeting

June
Experts Group intersessional technical discussions

Sept/October
Final Experts Group meeting

December
WA Plenary considers Expert Group List change recommendations

April – Sept
BIS regulation implementation of WA changes

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Ultra-wide Bandgap Semiconductors

- Gallium Nitride (GaN) and Silicon Carbide (SiC) are the leading materials for microwave/millimeter wave devices (ECCN 3A001.b) or high-power semiconductor devices (ECCN 3A001.g & h).
- Gallium Oxide (Ga_2O_3) and diamond materials are being developed for use in fabricating more sophisticated devices than those produced.
- The devices made from Ga_2O_3 or diamond are expected to work under more severe conditions, such as higher voltage or higher temperature, and provide significant military potential.

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Ultra-wide Bandgap Semiconductors

3.C.1. Hetero-epitaxial materials consisting of a "substrate" having stacked epitaxially grown multiple layers of any of the following:

a. Silicon (Si)

…

e. Gallium Oxide (Ga_2O_3); <u>or</u>

f. Diamond

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Ultra-wide Bandgap Semiconductors

3.C 5. High resistivity materials as follows:

a. Silicon carbide (SiC), gallium nitride (GaN), aluminum nitride (AlN), aluminum gallium nitride (AlGaN), **gallium oxide (Ga_2O_3) or diamond** semiconductor "substrates", or ingots, boules, or other preforms of those materials, having resistivities greater than 10,000 ohm-cm at 20°C;

b. Polycrystalline "substrates" or polycrystalline ceramic "substrates", having resistivities greater than 10,000 ohm-cm at 20°C and having at least one nonepitaxial single-crystal layer of silicon (Si), silicon carbide (SiC), gallium nitride (GaN), aluminum nitride (AlN), aluminum gallium nitride (AlGaN), **gallium oxide (Ga_2O_3) or diamond** on the surface of the "substrate".

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Ultra-wide Bandgap Semiconductors

3.C.6. Materials, not specified by 3.C.1., consisting of a "substrate" specified by 3.C.5. with at least one epitaxial layer of silicon carbide, gallium nitride, aluminum nitride, or aluminum gallium nitride, **gallium oxide (Ga_2O_3) or diamond**.

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Ultra-wide Bandgap Semiconductors

3.E.3. Other "technology" for the "development" or "production" of the following:

a. Vacuum microelectronic devices;

…

h. Substrates of gallium oxide for electronic components.

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Circuit Design Software

- Electronic Computer-Aided Design (ECAD) is a software tool for designing, analyzing, optimizing or validating Integrated Circuits (IC) or Printed Circuit Boards (PCB).
- ECAD links various stages: Register Transfer Level (RTL) to logic design, then to physical design and Geometrical Database Standard II (GDSII). Application to Gate-All-Around Field-Effect Transistor (GAAFET) structures is a new development.
- GAAFET technology is key to scaling to 5 nanometer and below IC technology nodes.

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Circuit Design Software

3.D.6. 'Electronic Computer-Aided Design' ('ECAD') "software" specially designed for the "development" of integrated circuits having any "Gate-All-Around Field-Effect Transistor" ("GAAFET") structure, and having any of the following:

a. Specially designed for implementing 'Register Transfer Level' ('RTL') to 'Geometrical Database Standard II' ('GDSII') or equivalent standard; <u>or</u>

b. Specially designed for optimization of power or timing rules.

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Circuit Design Software

Technical Notes

1. ***'Electronic Computer-Aided Design' ('ECAD') is a category of "software" tools used for designing, analyzing, optimizing, and validating the performance of integrated circuit or printed circuit board.***
2. ***'Register Transfer Level' ('RTL') is a design abstraction which models a synchronous digital circuit in terms of the flow of digital signals between hardware registers, and the logical operations performed on those signals.***
3. ***'Geometrical Database Standard II' ('GDSII') is a database file format for data exchange of integrated circuit or integrated circuit layout artwork.***

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Gas Turbine Engine Technology

- Pressure Gain Combustion (PGC) is a new development for gas turbine engines that has the potential to increase gas turbine engine efficiency by more than 10%, with applications in rockets and hypersonic systems.
- PGC advantages are: (1) steadying the combustion cycle, which increases thermodynamic efficiency, and (2) reducing compressor stages by increasing combustion pressure, resulting in a more compact engine.

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Gas Turbine Engine Technology

9.E.3. Other "technology" as follows:

a. "Technology" "required" for the "development" or "production" of any of the following gas turbine engine components or systems:

2. Combustors having any of the following:

a. 'Thermally decoupled liners' …

…

e. Utilizing 'pressure gain combustion';

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Gas Turbine Engine Technology

Technical Note

In 'pressure gain combustion' the bulk average stagnation pressure at the combustor outlet is greater than the bulk average stagnation pressure at the combustor inlet due primarily to the combustion process, when the engine is running in a "steady state mode" of operation.

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Thank you for your attention.

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