

## Intangible Transfer of Technology (ITT): Open-source Information Analysis for the Implementation of Sanctions on North Korea

Hyuk Kim  
March 2023

### Appendix I. Examples of regulations that control ITT.

#### Academic collaboration between Jong Kwang Hyok and foreign scholars.

Article

Low energy optical excitations as an indicator of structural changes initiated at the termini of amyloid proteins

Jong, K.H., Azar, Y.T., Grisanti, L., ...Kaminski Schierle, G.S., Hassanali, A.

*Physical Chemistry Chemical Physics*, 2019, 21(43), pp. 23931–23942

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Related documents

(Source: SCOPUS)

#### Azar's affiliation with an Iranian entity related to nuclear technology.

T. Azar, Yavar

① Nuclear Science & Technology Research Institute, Tehran, Tehran, Iran

SC 56136350700 ①  <https://orcid.org/0000-0002-9838-5425>

(Source: SCOPUS)

**NSTRI sanctioned by the US Department of the Treasury.**

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(Source: [US Consolidated Screening List](#))

## Appendix 2. Examples of regulations that control ITT.

### Section 734.13 (a) of the United States [Export Administration Regulations \(EAR\)](#)

... Export means:

- (1) An actual shipment or transmission out of the United States, including the sending or taking of an item out of the United States, in any manner;
- (2) Releasing or otherwise transferring “technology” or source code (but not object code) to a foreign person in the United States (a “deemed export”);...

### Article 19 (1) of the [Foreign Trade Law of the Republic of Korea](#)

... Any person who intends to export...shall obtain permission...

1. Transfer from Korea to a foreign country;
2. Transfer from a national of the Republic of Korea (including a legal entity established pursuant to domestic laws) to a foreigner (including a legal entity established pursuant to foreign laws) in the Republic of Korea or a foreign country.

**Article 32-3 of the Enforcement Decree of the Foreign Trade Act of the Republic of Korea**

...transferred by any of the following methods:

1. Transfer through an information network, such as telephone, fax, and email;
2. Transfer through discourse or act, such as direction, education, training, and presentation;
3. Transfer through recording devices, such as paper, film, magnetic disc, optical disc, and semiconductor memory apparatus, or through a computer and other information processing devices.

**Article 2 (10) of Regulation (EU) 2021/821**

... 'exporter' means:

(a) any natural or legal person or any partnership that, at the time when the export declaration or the re-export declaration or an exit summary declaration is accepted, holds the contract with the consignee in the third country and has the power to determine the sending of the items out of the customs territory of the Union; where no export contract has been concluded or if the holder of the contract does not act on its own behalf, exporter means the person who has the power to determine the sending of the items out of the customs territory of the Union; or

(b) any natural or legal person or any partnership that decides to transmit software or technology by electronic media, including by fax, telephone, electronic mail or by any other electronic means to a destination outside the customs territory of the Union or to make available in an electronic form such software and technology to natural or legal persons or to partnerships outside the customs territory of the Union.

... 'provider of technical assistance' means:

(a) any natural or legal person or any partnership that provides technical assistance from the customs territory of the Union into the territory of a third country;

(b) any natural or legal person or any partnership resident or established in a Member State that provides technical assistance within the territory of a third country; or

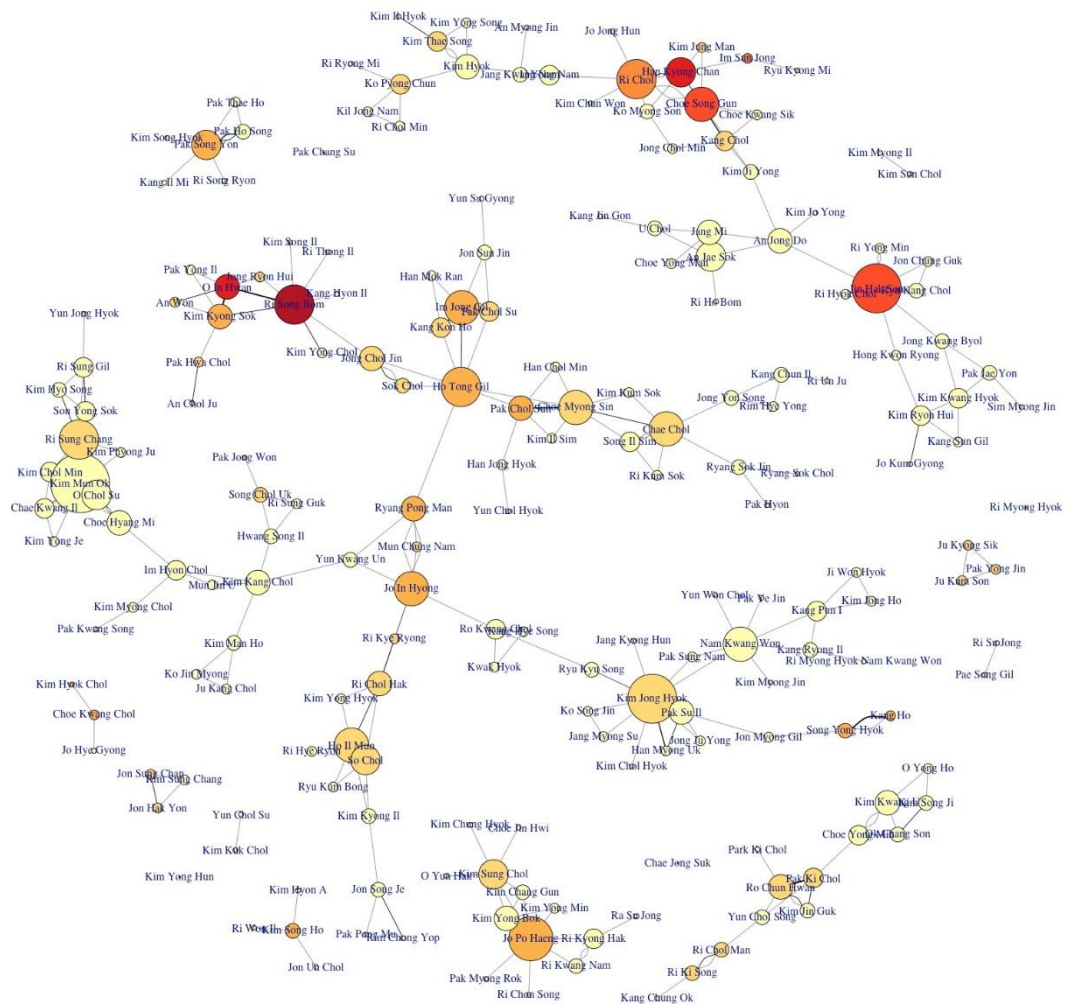
(c) any natural or legal person or any partnership resident or established in a Member State that provides technical assistance to a resident of a third country temporarily present in the customs territory of the Union.

## Appendix 3. Nuclear Fusion Research by North Korean Scholars.

TITLE	YEAR	AUTHOR 1	AUTHOR 2	AUTHOR 3
The Effect of Pressure Gradient and Bootstrap Current on Ballooning Instability in Spherical Tokamak	2017	Son Yong Sok	Ri Sung Chang	Kim Mun Ok
Distribution of Gas Flux Characteristics Quantities in Supersonic Speed Nozzle of Plasma Jet	2016	Kim Mun Ok	Chae Kwang Il	Kim Chol Min
Computation of Discharge Characteristic Quantities in AC-PDP Cell	2016	Choe Hyang Mi	O Chol Su	Kim Mun Ok
Temperature Determination in Hg Discharge Plasma by Doppler Broadening	2015	Kim Mun Ok	O Chol Su	Choe Hyang Mi
Cascade Theory for Separation of Lithium Isotope in Amalgam (Li)-Aqueous System without electrolysis: Steady State of Lithium Isotope Concentration in Complete Reflex	2014	Han Kyong Chan	Ri Chol	Choe Song Gun
Cascade Theory for Separation of Lithium Isotope in Amalgam(Li)-Aqueous System without Electrolysis: Transition State of Lithium Isotope Concentration in Complete Reflux	2013	Han Kyong Chan	Im Sun Jong	
Experiment on the Separation of Lithium Isotope by Countercurrent electromigration in Molten Nitrate System	2011	Choe Kwang Chol	Ri Yun Chol	
Cascade Theory for Separation of Lithium Isotope in Amalgam(Li)-Aqueous System without Electrolysis: Steady State of Chemical Concentrations in Complete Reflux	2011	Han Kyong Chan	Im Sun Jong	
Stabilization of the Main Magnet Current of Microtron	2011	Choe Kwang Chol	Ri Yun Chol	Kim Chol Hyok
On the Measurement of Spectral Linewidth in Plasma by Fringe Analysis	2010	Rim Wi Song	Kim Mun Ok	Kim Sung Chan
Manufacture and Parameter Determination of Fabry-Perot Interferometer for Plasma Diagnosis	2010	Rim Wi Song	Kim Mun Ok	Kim Sung Chan

Table: Hyuk Kim • Source: Journal of Kim Il Sung University • Created with Datawrapper

## Appendix 4. Domestic Network of North Korean Nuclear Scientists.



(Sources: Journal of Kim Il Sung University; figure by Hyuk Kim, more details available at [Kaggle](#))

## Appendix 5. Select Keywords Potentially Related to Nuclear Weapons.

All keywords and the titles of journal articles were converted into root forms of each word after removing duplicates when natural language processing (NLP) was conducted.

APPLICATION	KEYWORDS
Tamper	natural uranium, depleted uranium, tungsten
Initiators	beryllium, polonium, tritium, deuterium
Radiation shield (thermonuclear weapons)	uranium, tungsten, boron, radioactive, radiation, x-ray, γ-ray, ray, γ, high-Z
Hohlraum	uranium, lead, tungsten, Teller-Ulam
Radiation channel	polystyrene, acetonitrile, ACN, channel, low-Z
Fusion Pusher/Tamper	Depleted uranium, natural uranium, tungsten, lead
Fusion Fuel	lithium deuteride, tritium, deuterium, lithium, deuteride, helium, Li6, Li-6
Salted bombs	cobalt-60, cobalt, Co, gold, zinc, Zn, tantalum, Ta
Plutonium alloy	gallium, Ga, alpha phase, delta phase
Explosion/Implosion	barium nitrate, Baratol, boracitol, boric acid, viton, estane, HMX, octogen, nitroamine, hexogen, RDX, TATB, triaminotrinitrobenzene, triamino, trinitrobenzene, DATB, iaminotrinitrobenzene, Polymer-bonded, PBX, PEETN, Pentaerythritol tetranitrate, implosion, implode, insensitive high explosive, Lanthanum, La, boost
Detonator	lead, mercury fulminate, PENT, Pentaerythritol tetranitrate, tetryl, platinum, Pt, gold, Au
Reflector	Beryllium, Be, tungsten carbide
Uranium processing, uranium enrichment, and spent-fuel reprocessing	U, Pu, concentration, concentrate, enrich, reprocess, uranium, plutonium, isotope, cascade, calutron, porous, centrifuge, centrifugal, rotate, Lorenz, atomic vapor, laser, isotope separation, U(III), U(IV), U(V), U(VI), (IV), (V), (III), (VI), U (III), U (IV), U (V), U (VI), uranyl trioxide, UO3, uranyl chloride, UO2Cl2, tetrachloride, UCl4, uranium dioxide, UO2, uranyl, uraninite, uranium hexafluoride, hexafluoride, leaching, caustic soda, extraction, solvent, exchange, tributylphosphate, TPB, kerosene, TPB-kerosene, TBP-Cl2, TBP-chloride, phosphoric, tributyl phosphate, tributyl, phosphate, tetrachloride, hexafluoride, Teflon, sinter, nickel, sintered nickel, perchloric, hydrochloric, nitric, acid, MOX, mixed oxide, alkyl phosphoric acids, di(2-ethylhexyl) phosphoric acid, di (2-ethylhexyl) phosphoric acid, uranyl nitrate, solvent extraction, ion exchange, uraninite, uranyl, uranyl salts, uraninite, hydrochloric acid, UF6, AVLIS, Zippe centrifuge, PUREX, Laser, U3O8, UO2, Uranium metal, Triuranium octoxide, Uranium dioxide, spectrometer, mass spectrometer, mass spectrometry
Plutonium handling and plating	nickel carbonyl, oxidized tantalum, Yttrium, Y, Tantalum, Ta, zirconium, Zr
Weapons management	ICF, inertial confinement fusion, target, target capsule, fusion target, one-point safety, flash X-ray, streaking camera, streak, hydro testing
Heavy Water Reactor	heavy, water, heavy water, natural uranium graphite moderated, pressure tube reactor, DO2, tritium, TO2
Yield measurements	kilotons, megatons, alpha-t curve, diagnostics

Table: Hyuk Kim • Created with Datawrapper

## Appendix 6: North Korean contact information shared among multiple individuals and entities.

### Jong Kwang Hyok's contact information.

54. <b>JONG Kwang-Hyok</b>	DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA	<b>PARTICIPANT</b>
Research Field :		
Research Topic :		
Permanent Institute: Department of Physics Kim Il Sung University Ryongnamdong Taesong District Pyongyang DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA Permanent Institute e mail gfstcn@gmail.com	Present institute: Condensed Matter Theory Sector, International School of Advanced Studies SISSA Via Bonomea, 265 Trieste Italy Present Institute e mail kjong@ictp.it Until when: 31 December 2018	

(Source: [International Centre for Theoretical Physics](#))

### Flyer from the Chongshin Informatics Centre.



(Source: *Foreign Trade of the Democratic People's Republic of Korea*, no. 3 (2013): 32.)

### Korea Kumsan Trading Corporation information.



(Source: *Foreign Trade of the Democratic People's Republic of Korea*, no. 1 (2013): 30.)

## Appendix 7: Indications of North Korean scholars using possibly US-origin items in nuclear research.

(Disclaimer: The author of this article cannot guarantee the validity of the information found in **Appendix 7**. Any similarity to the names of any real products or entities is purely coincidental.)

### Titles of North Korean studies containing possible product codes of US items

Title	Year
A Design Method Of Current Sensitive Preamplifier Using Ad8004	2016
USB 2.0 Serial Data Communication Of A-T Multichannel Two-Dimensional Spectrometer Using Cy7c68013 Chip	2015
On The Control Equipment Of Radiation Ct Using Atmegat 128	2015
On The Measurement Equipment Of Integral Ions Flux By Pic16f877a	2014
The Potable Radiation Counting Device Using Microcontroller Pic16f877a	2014
Computer Connection Of Spectrophotometer Using Pic16f877	2014
Revision Method Of Dead Time By Using Timer Modules Of Microprocessor Pic18f4550	2010
A Method For Using The Microprocessor Pic18f4550'S Internal A/D Module As A/D Converter For Nuclear Spectroscopy	2010
Characteristic Of Linear Amplifier Using TI702	2008

Table: Hyuk Kim • Source: Journal of Kim Il Sung University • Created with Datawrapper

### Potential product codes, manufacturer, and export classification number

(Potential) Product Code	(Potential) Manufacturer	(Potential) Export Control Classification Number (ECCN)
AD8004	Analog Devices	EAR99
CY7C68013	Cypress Semiconductor	3A001
ATMEGAL 128	Microchip Technology	EAR99
PIC16F877A	Microchip Technology	EAR99
PIC18F4550	Microchip Technology	3A991
TL702	Texas Instruments	

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