
Korea Nuclear Data Center

Progress Report for 2019-2021



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KNDC - Progress Report

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01 Introduction

» KNDC

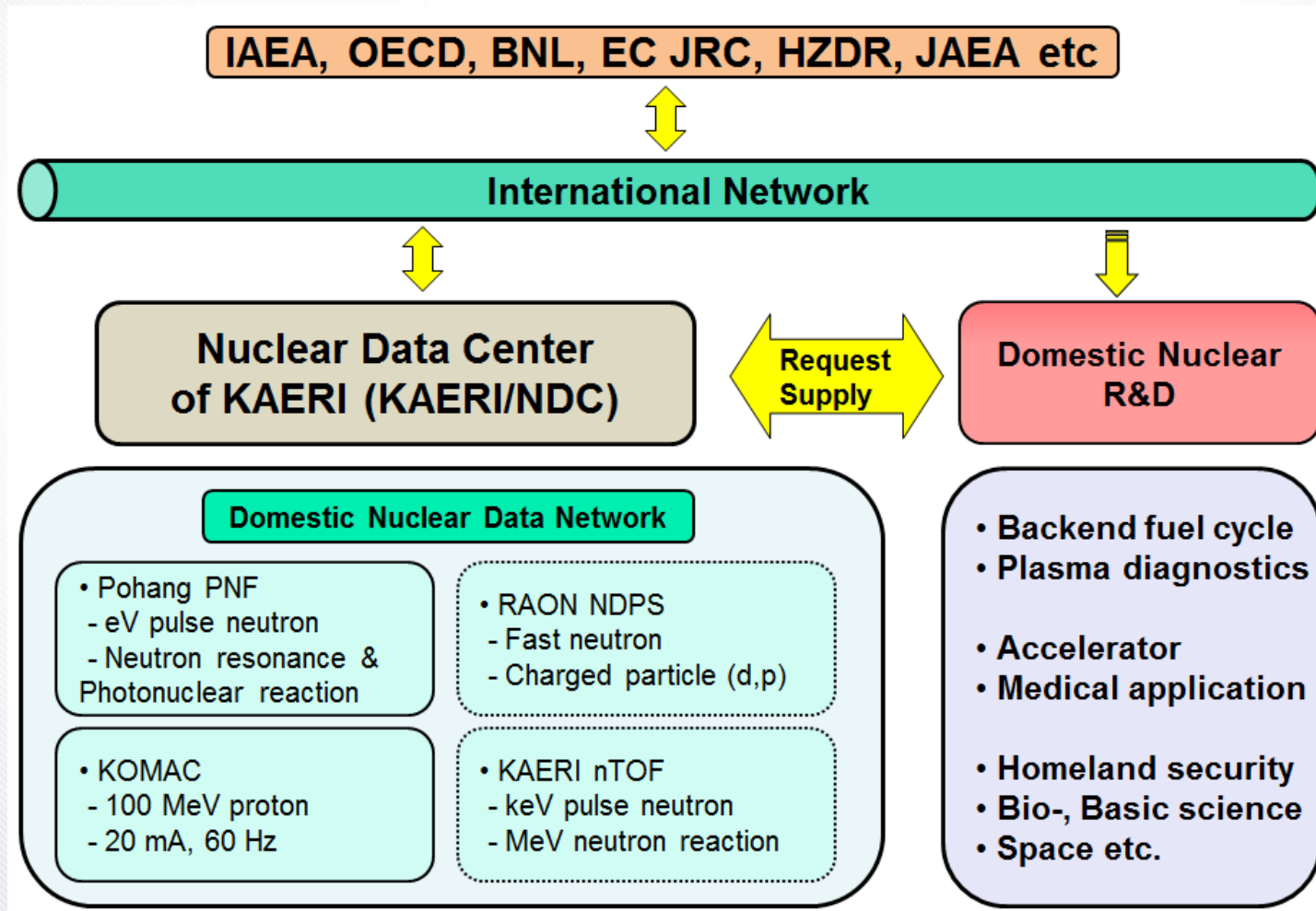
- Established in 1997 to start research on nuclear data in Korea (formerly, 'Nuclear Data Evaluation Lab.')
- Joined the International Network of NRDC in 2000

» Main tasks

- **Evaluation** and method development for nuclear reaction data
- Establishment of **processing and validation** system of nuclear reaction/covariance data
- **Measurement** of nuclear reaction data and establishment of measurement facility
- Production and validation of **atomic/molecular** collision data

01 Introduction

» Mission



01 Introduction

» Staff

- 12 staff members: 9 regular staffs, a post-doctor, an intern researcher, and a Ph.D. student

Korea Nuclear Data Center (Head: D.H. Kim)

Evaluation

Y.-S. Cho
H.I. Kim

Measurement

Y.-O. Lee
T.-Y. Song
S.C. Yang

Processing/ Validation

D.H. Kim
C.-S. Gil
J.H. Lee
H.L. Hyun

Atomic/ Molecular

D.-H. Kwon
K.-B. Chai
M.K. Lee

02 EXFOR Activity

» Responsibility

- Begin in 2009
- Compile nuclear reaction data in Korea under the guidance of IAEA/NDS
- Measurement data induced by neutron, charged particle, and photon

» Compilation status

- Number of entries in EXFOR: 12 (including 9 new entries)
- Incident particle: proton (5), neutron (3), gamma (4)
- Compiled and transmitted: neutron (2)
- Checking tool: www.jcprg.org/exfor/tool

03 Measurement Facility

» Existing facilities

Facility	Characteristics	Measurements
Electron Linear Accelerator (PAL)	<ul style="list-style-type: none"> • 100 MeV, 2.5 GeV linacs • Neutron production by 100 MeV linac • γ production by 100 MeV and 2.5 GeV linacs 	<ul style="list-style-type: none"> • Total cross section • (n, γ) by neutron activation method • Isomeric yield ratio • Photo fission
Cyclotron (KIRAMS)	<ul style="list-style-type: none"> • p : 20- 50 MeV / 40 μA • d : 10- 25 MeV / 20 μA • α : 20- 50 MeV / 1 μA 	<ul style="list-style-type: none"> • Activation cross section
Proton Linear Accelerator (KOMAC, KAERI)	<ul style="list-style-type: none"> • 20 & 100 MeV linac 	<ul style="list-style-type: none"> • Activation cross section

» Planned facilities

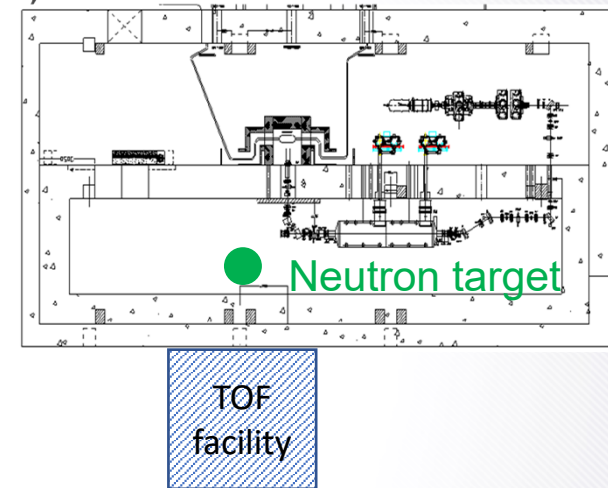
Facility	Characteristics	Status
Electron Linear Accelerator (KNDC, KAERI)	<ul style="list-style-type: none"> • 17 MeV SC linac • Liquid Pb target 	<ul style="list-style-type: none"> • nTOF building construction • Licensing
Heavy-Ion Accelerator (NDPS, IBS)	<ul style="list-style-type: none"> • Cyclotron (70 MeV proton) • SC linac (H ~ U, 200 MeV/u(U)) • SC linac (d (53 MeV), p (83 MeV)) 	<ul style="list-style-type: none"> • Scheduled to operate in 2022

03 Measurement Facility

» nTOF of KNDC

- Completed TOF building construction (2019.01)
- Completed neutron target system, collimator, DAQ, etc.
- Repairing/updating electron accelerator (stopped)
- Licensing work (stopped)
- TOF length: 5 – 10 m

Electron energy	17 MeV
RF power	Max. 100 kW
Pulse width	~20 ps
Pulse current	~20 A
Pulse frequency	Max. 2 MHz (200 kHz)
Beam power	Max. 14 kW (1.4 kW)
Ave. current	Max. 0.8 mA (0.08 mA)



03 Measurement Facility

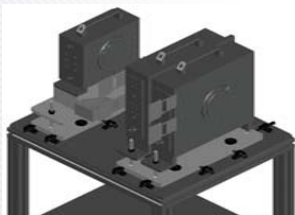
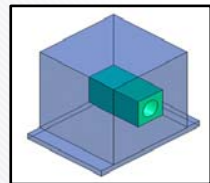
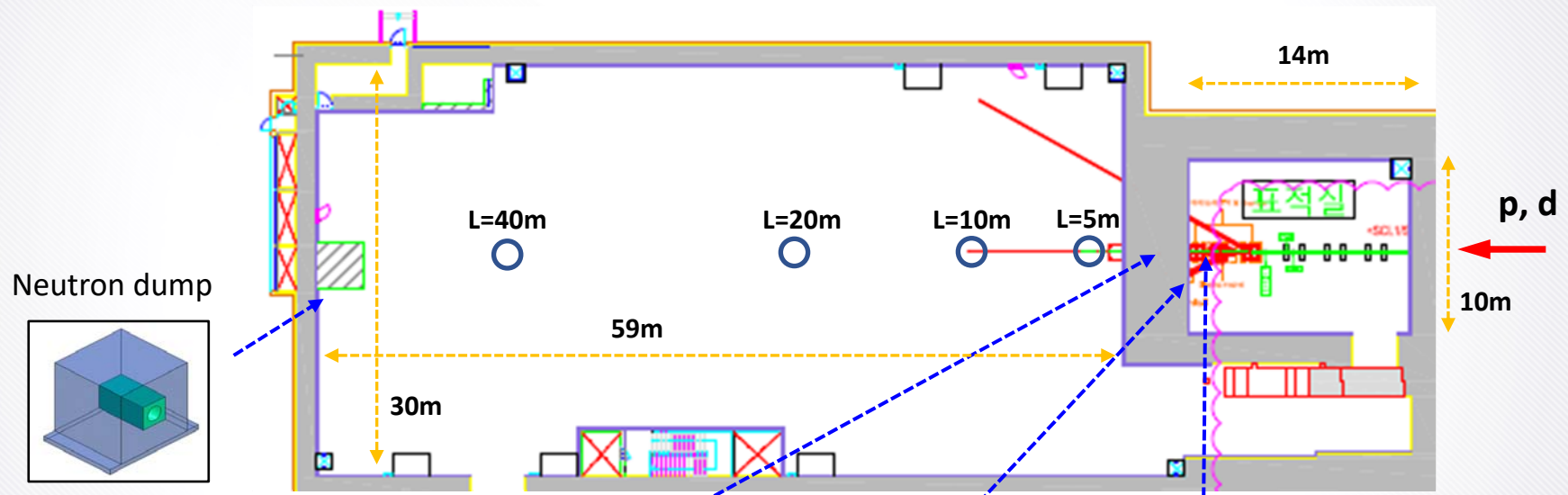
» NDPS of IBS

- Constructing Nuclear Data Production System (NDPS) facility in Institute for Basic Science (IBS)
- Cooperation with KNDC (KAERI), SKKU and UNIST in Korea
- To measure some nuclear reactions such as (n,f), (n, xn), etc. using TOF method in the range of 5 to 40 m
- Neutron target system, collimator, beam dump, beam line, single bunch selector, detection system, etc.

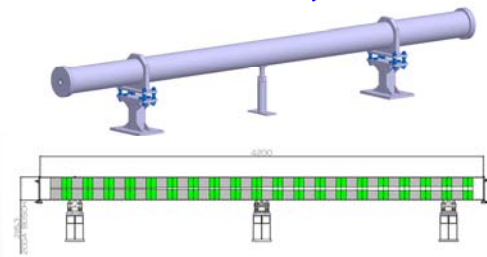
Primary beam	Beam energy [MeV]	Beam intensity [#/sec]	Beam power [kW]	Target			Neutrons [#/sec]
				Material	Density [g/cm ³]	Thickness [mm]	
d	97.8	7.68E+13	1.20	C	2.253	25	1.25E+13
p	82.7	9.74E+13	1.29	Li	0.534	2 ~ 7	9.21E+11

03 Measurement Facility

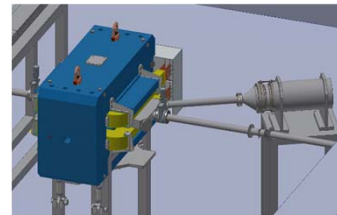
» NDPS of IBS



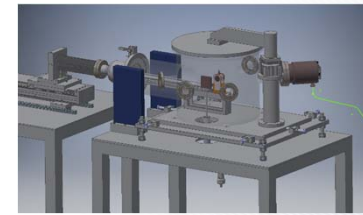
Detector (PPAC, MGAS)



Neutron collimator



Dipole, Proton dump



C target system

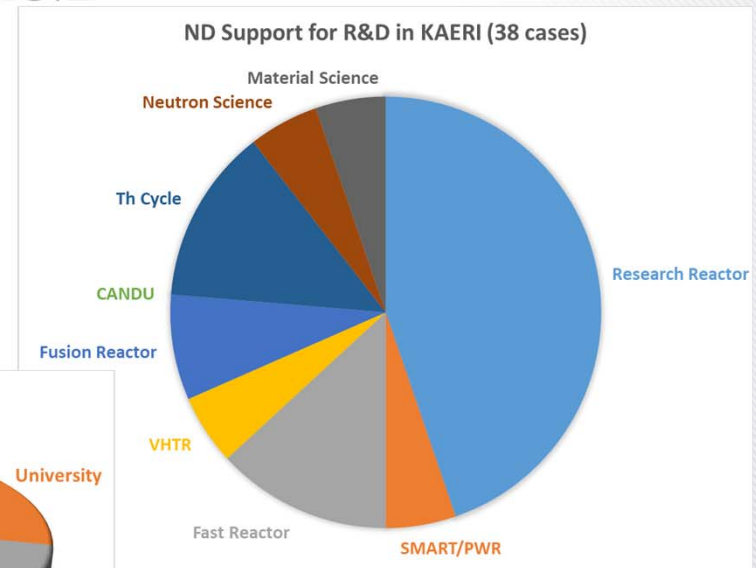
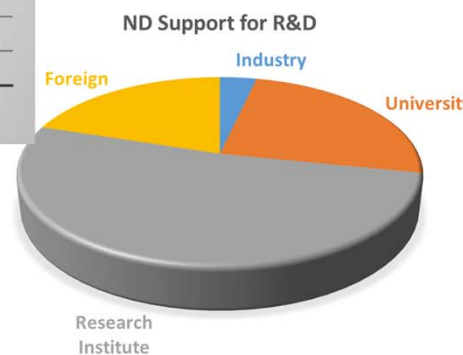
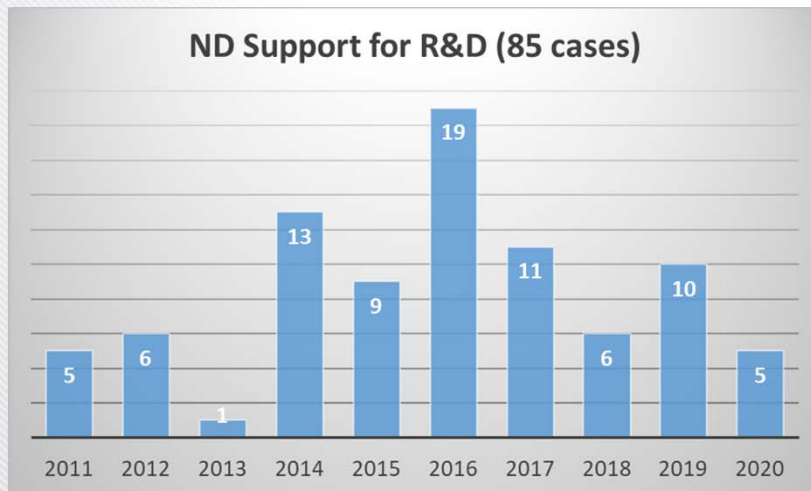
04 Nuclear Data Activity

» Workshop

- Workshop on Reactor Physics and Nuclear Data (Nov. 8~9, 2019)
- Organized by SKKU and supported by KNDC



» Support for Nuclear/Radiation R&D

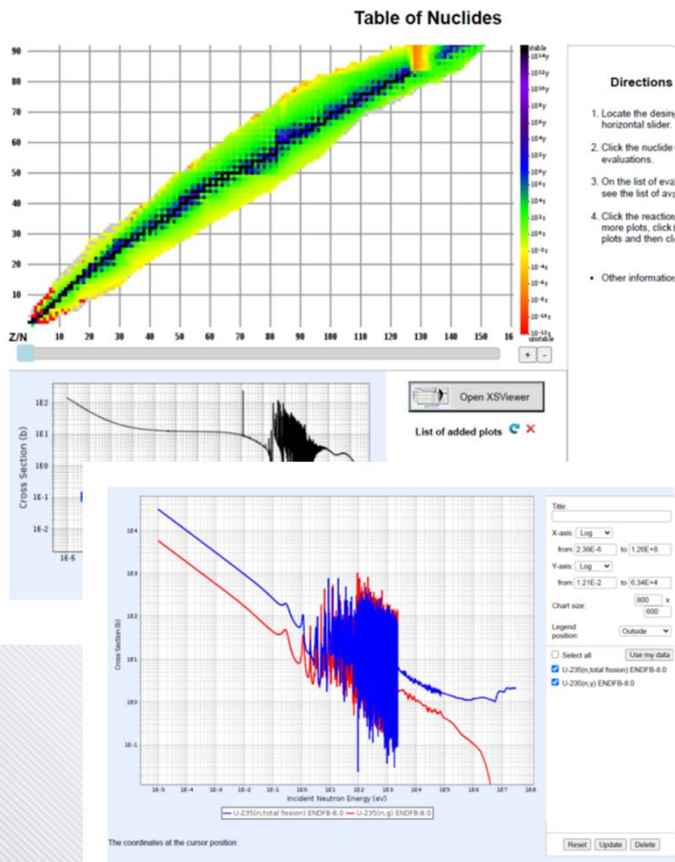


04 Nuclear Data Activity

» Web Service

Nuclear Data Chart

(<http://atom.kaeri.re.kr/nuchart/>)



Application Library

(<http://atom.kaeri.re.kr/NDVG/>)

Nuclear Data Validation Group

ACE-Format Nuclear Data Library

Description

- KNE71 (Revision 0 as of October 31, 2013) was generated at room temperature (293.6K) through NJOY99.396 code processing with the ENDF-B-VII.1 neutron sublibrary.
- CI-35, which uses the Reich-Moore Limited resonance format, has been processed with NJOY2012.
- ACE files and plots are available for each of the 423 nuclides (ACE_371.zip and subr1.171) and a merged MCNP library (lib71.zip and subr1.171) is also prepared.
- The nuclides are identified by their ZA identifiers (ZAID). ZZZ is the atomic number, AAA is the atomic mass number, and mmC is the user-supplied suffix. For a metastable nuclide, the atomic mass number is changed to (AAA+50) for distinction with its ground state one. The atomic mass number is set at '000' for a natural element.

List of Nuclides

No.	MAT	Nuclide	ZAID	ACE	Plot	Note
1	126	1-M-1	1001.800	0018_001_n11.nnn	0	0018_001_n11.pdf
2	128	1-M-2	1002.800	0018_002_n11.nnn	0	0018_002_n11.pdf
3	151	1-M-3	1005.800	0018_003_n11.nnn	0	0018_003_n11.pdf
4	226	2-M-3	2003.800	0028a003_n11.nnn	0	0028a003_n11.pdf
5	228	2-M-4	2004.800	0028a004_n11.nnn	0	0028a004_n11.pdf
6	326	3-L-3	3006.800	0032a006_n11.nnn	0	0032a006_n11.pdf
7	328	3-L-7	3007.800	0032a007_n11.nnn	0	0032a007_n11.pdf
8	419	4-B-7	4007.800	0048a007_n11.nnn	0	0048a007_n11.pdf
9	426	4-B-9	4008.800	0048a009_n11.nnn	0	0048a009_n11.pdf
10	626	6-B-10	6010.800	0068_010_n11.nnn	0	0068_010_n11.pdf
11	628	6-B-11	6011.800	0068_011_n11.nnn	0	0068_011_n11.pdf
12	800	8-C-0	8000.800	0080_000_n11.nnn	0	0080_000_n11.pdf

Validation Results

- D.H. Kim, C.-S. Gil, and Y.-O. Lee, "Current Status of ACE Format Libraries for MCNP at Nuclear Data Center of KAERI", BORD-8: 8th International Symposium on Radiation Safety and Detection Technology, Jeju, Korea, July 14-18, 2015.
- D.H. Kim, H.I. Kim, C.-S. Gil, Y.-O. Lee, and P. Schillebeeckx, "Validation Study on G-versions of U-238 Evaluations for JEFF", Working Party on International Nuclear Data Evaluation Co-operation Subgroup Meeting, Paris, France, May 18-22, 2015.
- D.H. Kim, H.I. Kim, C.-S. Gil, and Y.-O. Lee, "Validation of New KAERI Evaluations of Actinides for JEFF", JEFF-Measurement, Evaluation, Processing and Benchmarking Working Group, Paris, France, November 25-29, 2013.

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Atomic Data

(<http://pearl.kaeri.re.kr/pearl/>)

Photonic Electronic Atomic Reaction Laboratory

Atomic Data Center in KAERI

Access the Atomic Databases

Database on Photoionization/Electron Impact Ionization/Dielectronic Recombination Cross Sections and Rate Coefficient (periodic.jsp)

Go →

Database on CR-Model for Helium

Electron Impact Excitation Rate Coefficient (crmodel/atomicdata2.jsp)

Go →

Line Ratio

(crmodel/linratio2.jsp)

Go →

Nuclear Data Center at KAERI
(<http://atom.kaeri.re.kr/>)

Korea Atomic Energy Research Institute
(<http://www.kaeri.re.kr/>)



05 Summary

- Introduction to KNDC: Main Tasks, Mission, Staffs
- EXFOR Compilation Status
- Measurement Facilities in Korea
 - ✓ Existing: Electron Linac(PAL), Cyclotron(KIRAMS), KOMAC(KAERI)
 - ✓ Planned: nTOF(KAERI), NDPS(IBS)
- ND Activity: Workshop, Support for nuclear R&Ds, Web service
- Current Issues of KNDC
 - ✓ Manpower: Drs. Y.-O. Lee and C.-S. Gil to retire in 2022
 - ✓ Organization: NOT an independent organization in KAERI