Korea Nuclear Data Center
Progress Report for 2021-2022

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KNDC-Progress Report

CONTENTS

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

Staff

- 11 staff members: 9 regular staffs, a post-retirement researcher, and a Ph.D. student

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

Evaluation	Measurement	Processing/ Validation	Atomic/ Molecular
Y.-S. Cho	Y.-O. Lee	D.H. Kim	D.-H. Kwon
H.I. Kim	T.-Y. Song	C.-S. Gil	K.-B. Chai
	S.C. Yang	J.H. Lee	
		H.L. Hyun	

02 Measurement Facility

Existing facilities

Facility	Characteristics	Measurements
Cyclotron (KIRAMS)	• p : 20- 50 MeV / 40 μA • d : 10- 25 MeV / 20 μA • α : 20- 50 MeV / 1 μA	• Activation cross section
Proton Linear Accelerator (KOMAC, KAERI)	• p : 20 & 100 MeV (linac)	• Activation cross section
Cyclotron (Jeongeup, KAERI)	• p : 30 MeV / 100 μA	• Activation cross section

Planned facilities

Facility	Characteristics	Status
Heavy-Ion Accelerator (NDPS, IBS)	• Cyclotron (70 MeV proton) • SC linac (H ~ U, 200 MeV/u(U)) • SC linac (d (49 MeV/u), p (83 MeV))	• Installed all components in 2021 • Performance tests in 2022 • Scheduled to operate in 2023

02 Measurement Facility

NDPS of IBS

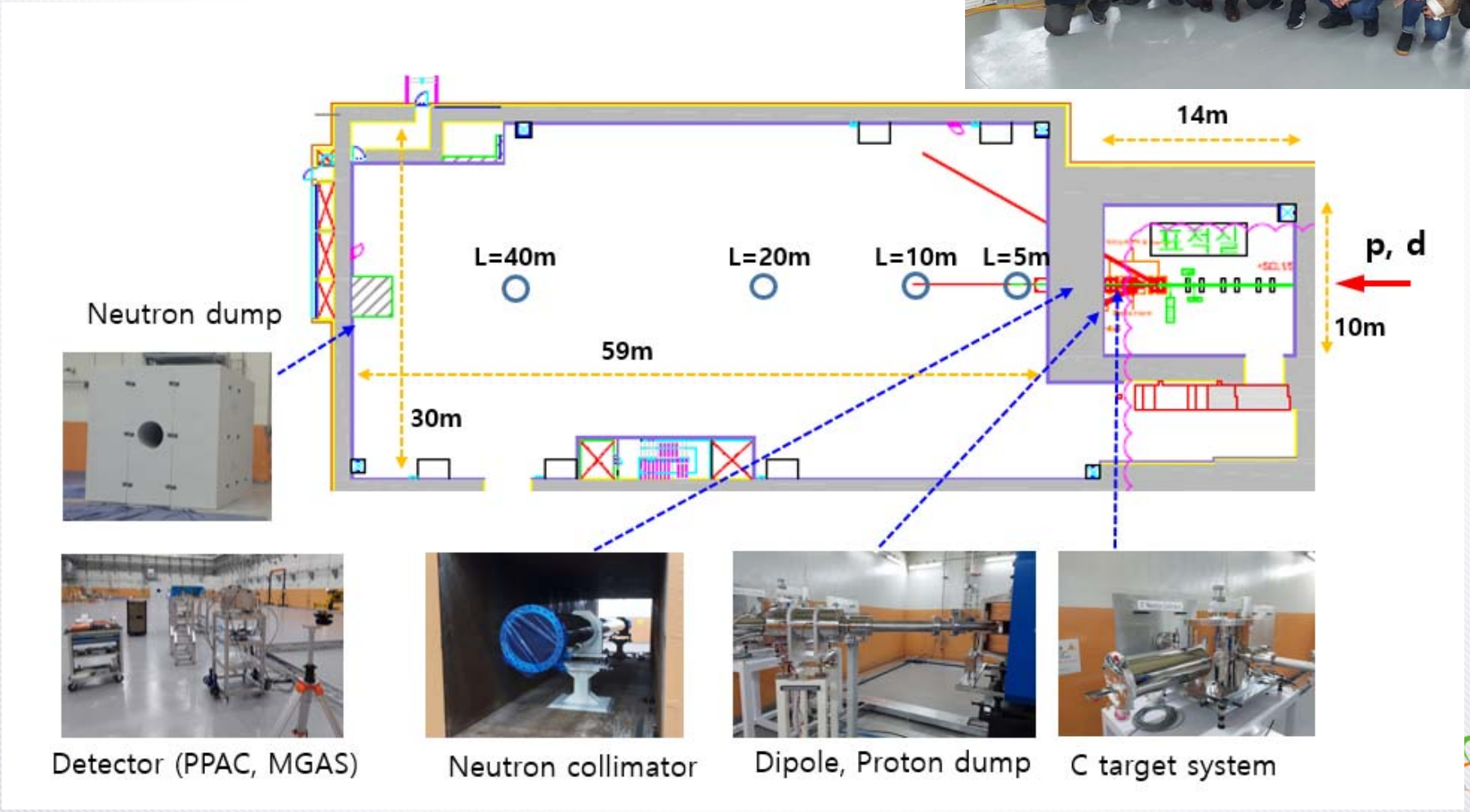
- Constructing Nuclear Data Production System (NDPS) as a part of Heavy-Ion Accelerator in Institute for Basic Science (IBS)
- Cooperation with KNDC (KAERI), SKKU and UNIST in Korea
- Installed all the components for NDPS: neutron target system, collimator, beam dump, beam line, single bunch selector, detection system, etc.
- Carrying out performance tests for some components
- To measure various nuclear reactions such as (n,f), (n, xn), etc. using TOF method in the range of 5 to 40 m

Primary beam	Beam energy [MeV/u]	Beam intensity [#/sec]	Beam power [kW]	Target			Neutrons [#/sec]
				Material	Density [g/cm^3]	Thickness [mm]	
d	48.9	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

02 Measurement Facility

NDPS of IBS

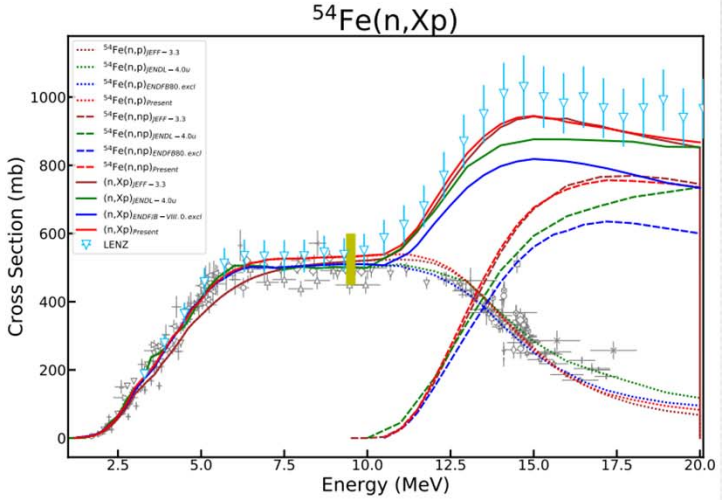
NDPS Installation Celebration (Jan. 18, 2022)

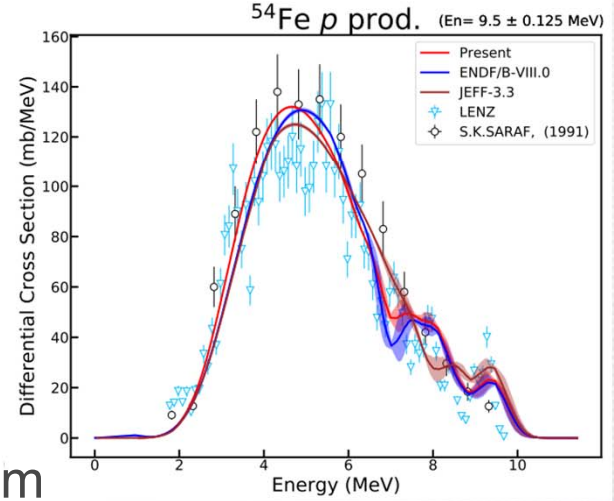


03 Nuclear Data Activity

Neutron-induced CP data update

- Under I-NERI project with LANL
- To analyze experimental data for angular distributions and spectra of (n,p) and (n,a) on several structural materials such as Fe, Ni, and Zn isotopes
- To evaluate/update the accompanying data





New Project on TSL data production

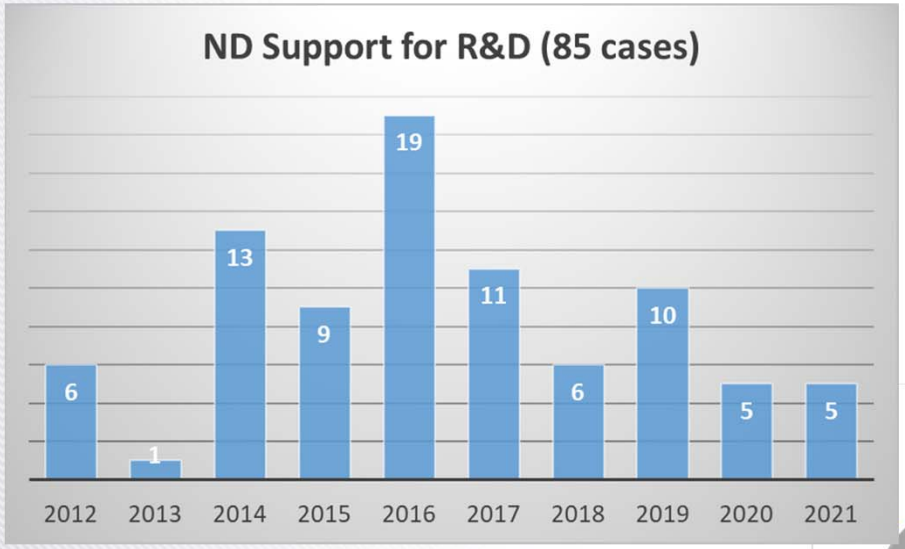
- Launched in April 2022
- To establish an MD-based TSL data production system
- To produce, validate and support TSL data of coolant/moderator materials for future advanced nuclear reactor development in Korea

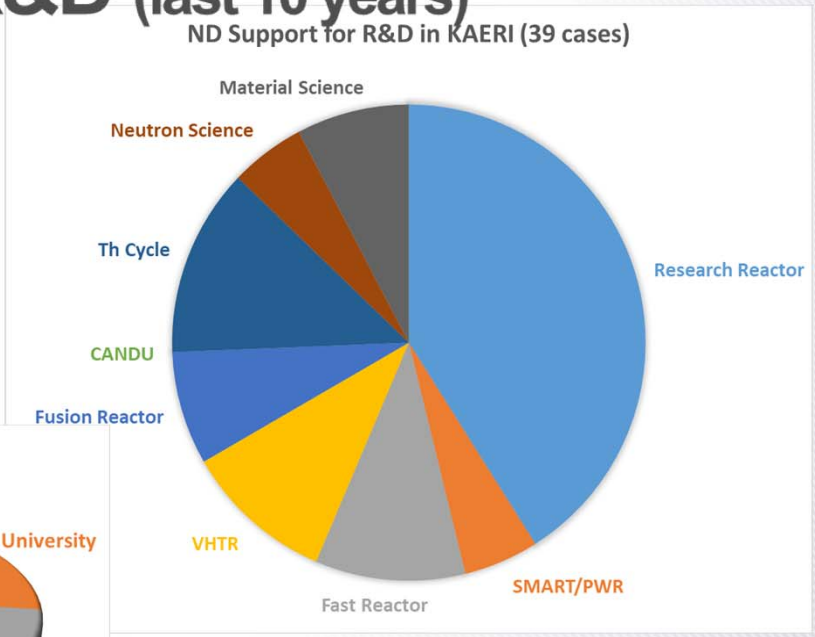
03 Nuclear Data Activity

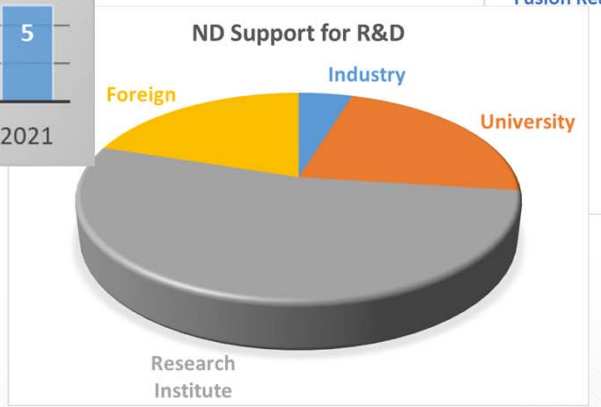
Event

- 11th Korea-Japan Joint Summer School on Accelerator and Beam Science, Nuclear Data, Radiation Engineering and Reactor Physics (Aug. 1~4, 2022)
- Organized by KOMAC/KAERI and supported by KNDC

Support for Nuclear/Radiation R&D (last 10 years)







04 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: 10
  - ✓ Incident particle: neutron (4), proton (1), gamma (3), alpha (2)
- Compiled and transmitted: proton (5)
- Checking tool: www.jcprg.org/exfor/tool

04 EXFOR Activity

Status

No.	TRANS	ENTRY	SUBENTRIES	ARTICLE	STATUS
1	3201	30847	8	JRN,313,47,2017	EXFOR
2	3200	30848	3	RCA,105,593,2017	EXFOR
3	G047	G3136	5	RCA,105,789,2017	EXFOR
4	G047	G3137	2	EPJ,CS,106,04008,2016	EXFOR
5	G048	G3138	2	JRN,311,1559,2017	EXFOR
6	3206	30849	4	NP/A,970,156,2018	EXFOR
7	3206	30850	3	NP/A,970,411,2018	EXFOR
8	D135	D7028	4	RCA,106,87,2018	EXFOR
9	D135	D7029	8	EPJ/A,54,12,2018	EXFOR
10	D135	D7030	11	JRN,317,1021,2018	EXFOR
11		D7031	10	JRN,318,1863,2018	Compiled
12		D7032	4	KPS,72,228,2018	Compiled
13		D7033	8	JRN,318,2049,2018	Compiled
14		D7034	3	NIM/B,449,35,2019	Compiled
15		D7035	11	NIM/B,464,74,2020	Compiled

KAERI

04 EXFOR Activity

D7031 Entry

- Article: Excitation functions of ^{nat}Ta(p,x) reactions up to 44.2 MeV
- Isomeric flagging: half-life (2.36 h) of ^{178}Ta

^{178m1}Ta	2.36 h	88.9	64.4	^{181}Ta(p,tn)	β^+(100)
		93.2	17.2	^{180}Ta(p,t)	
		213.4	81.4	^{181}Ta(p,d2n)	
		325.6	94.1	^{181}Ta(p,p3n)	
		331.6	31.19		
		426.4	97.0		

[Ref. NuDat-2.6 in paper]

- ✓ Nuclear wallet cards (2011): metastable state
- ✓ JAEA nuclear chart (2014): ground state
- ✓ NuDat 3.0: ground state

- Selection: 2.36 h half-life of Ta-178 as ground state

04 EXFOR Activity

D7035 Entry

- Article: Activation cross-sections of ^{nat}Dy(p,x) reactions up to 45 MeV
- Floating point number in data file

- Use of E: illegal floating point error (JCPRG exfor tool)
- Use of e: no problem (JCPRG, JANIS)

- Discussion with Dr. Otsuka and Prof. G.N. Kim
- Selection: floating point number as E

^{156}Tb
6.51 ± 0.47
5.99 ± 0.43
4.62 ± 0.33
3.93 ± 0.29
3.25 ± 0.24
3.14 ± 0.23
2.48 ± 0.18
1.69 ± 0.13
0.95 ± 0.07
0.54 ± 0.04
0.25 ± 0.02
0.16 ± 0.02
0.06 ± 0.01
0.03 ± 5E-3
1E-3 ± 1E-3

KAERI

04 EXFOR Activity

Summary

- Compilation: ~8 per year
- To be reserved entries: 30 (as of 2022-06-07)