

A stylized graphic of an atomic symbol is positioned in the upper right quadrant of the slide. It features two dark blue spheres representing protons and neutrons, connected by a network of light blue lines. Several curved, semi-transparent blue arcs sweep across the background, suggesting electron orbits or data paths.

# **KNDC Progress Report**

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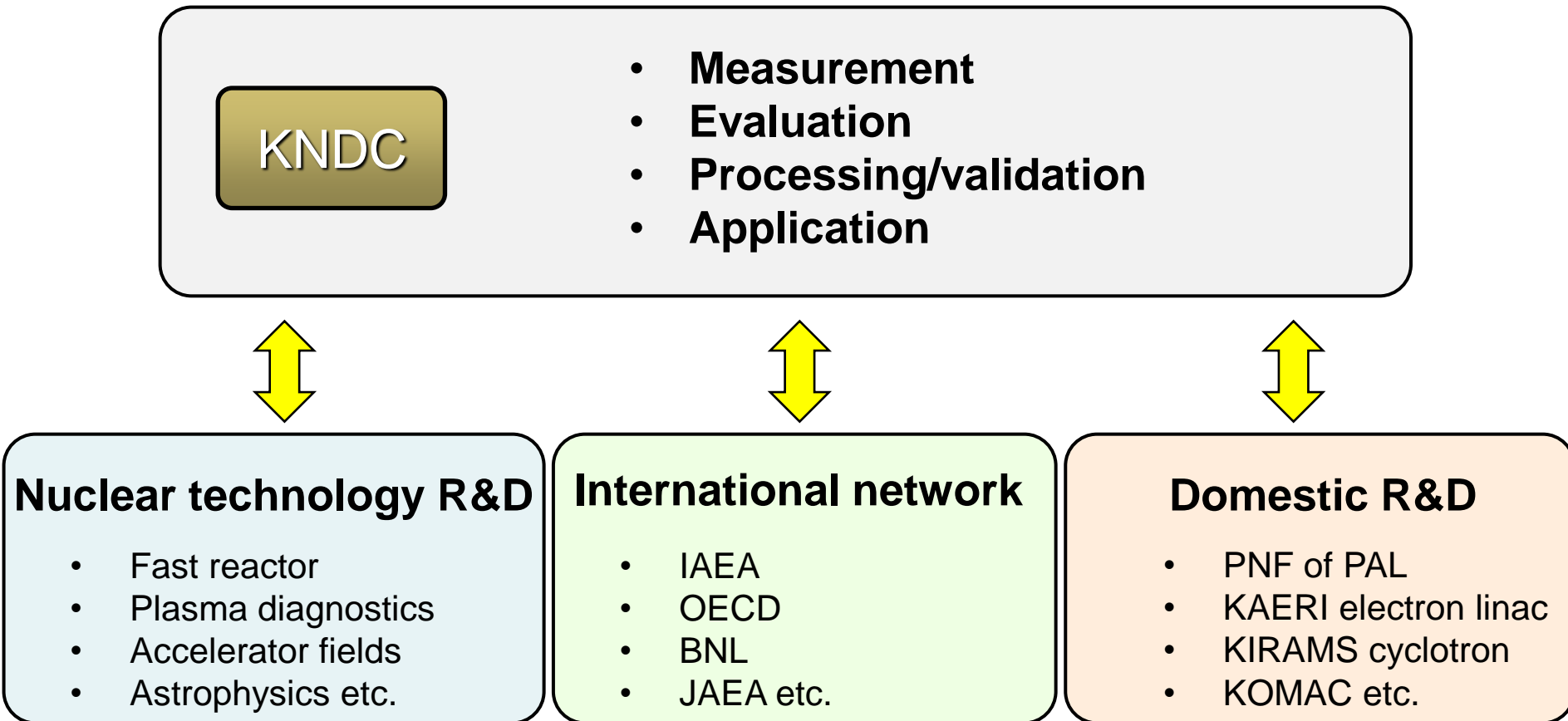


- **Introduction**
- **EXFOR activity**
- **Facilities of Korea**
- **Cooperation with domestic groups**
- **Website service**
- **Conclusion**

# Introduction



## ● Missions



# Introduction



## ● Staff members

- Head of center (Young-Ouk Lee)
  - 3 in evaluation
  - 2 in measurement
  - 2 in atomic and molecular data
  - 4 in processing and validation
  - 2 in applications
  - 4 in reactor physics
- 5 members joined in September 2016.  
- for the design and operation of the accelerator (KAERI n\_TOF)

# Introduction



## ● In 2016

<b>Evaluation and method development for nuclear reaction data</b>	<ul style="list-style-type: none"><li>- Production of nuclear data for nuclear fusion (Mn, Mo, Nb)</li><li>- Evaluation of actinide nuclide (U-238) in fast neutron energy region</li></ul>
<b>Production and validation of atomic/molecular collision XS</b>	<ul style="list-style-type: none"><li>- Calculation for electron-impact recombination XS (<math>W^{20+}</math>)</li><li>- Experimental setup for Capacitively Coupled Plasma (CCP)</li></ul>
<b>Establishment of validation system of nuclear reaction/covariance data</b>	<ul style="list-style-type: none"><li>- Production, validation of ACE-format library based on ENDF/B-VII.1</li><li>- Construction of service system of web-based MATXS library</li></ul>
<b>Measurement of nuclear data and development of facility</b>	<ul style="list-style-type: none"><li>- Licensing of KAERI TOF facility</li><li>- Design of electron beam line</li><li>- Measurement of activation XS of Zr</li><li>- Measurement of neutron production XS (DDX)</li></ul>

# Introduction



## ● International Cooperation

### • IAEA

- Participating in IAEA CRP on photonuclear data and photon strength functions
- EXFOR compilation of domestic experimental data: 7 entries

### • OECD/NEA

- Participation in CIELO project of WPEC
- Verification of nuclear criticality for JEFF-3.3T1 and JEFF-3.3T2

### • BNL

- Improvement of EMPIRE code in cooperation with BNL

### • JNDC (via Kyushu Univ.)

- Measurement of heavy-ion nuclear reaction with Kyushu Univ.

# EXFOR activity



- **Compilation responsibility**

- Neutron data and CPND from Korea (coordinated by NDS)

- **Status**

- EXFOR compilation progress (since NRDC2016 meeting)
- Number of new entries: 7
  - Residual cross section
  - Isomeric ratio
  - Neutron capture and total cross sections

- **Checking tool**

- JCPRG-exfor-tool

#	TRANS	ENTRY	SUBJECT	STATUS
1	G036	G3121	$\gamma$	EXFOR
2	G036	G3122	$\gamma$	EXFOR
3	3176	30837	n	EXFOR
4		30838	n	PRELIM
5	G037	G3123	$\gamma$	EXFOR
6		30839	n	PRELIM
7		G3124	$\gamma$	Compiled

# Facilities of Korea



## Existing facilities

Facility	Characteristics	Measurements
Electron linear accelerator (PAL)	<ul style="list-style-type: none"> <li>• 100 MeV, 2.5 GeV linacs</li> <li>• Neutron production by 100 MeV linac</li> <li>• <math>\gamma</math> production by 100 MeV and 2.5 GeV linacs</li> </ul>	<ul style="list-style-type: none"> <li>• Total cross section</li> <li>• <math>(n,\gamma)</math> by neutron activation method</li> <li>• Isomeric yield ratio</li> <li>• Photo fission</li> </ul>
Cyclotron (KIRAMS)	<ul style="list-style-type: none"> <li>• p : 20- 50 MeV / 40 <math>\mu</math>A</li> <li>• d : 10- 25 MeV / 20 <math>\mu</math>A</li> <li>• <math>\alpha</math> : 20- 50 MeV / 1 <math>\mu</math>A</li> </ul>	<ul style="list-style-type: none"> <li>• Activation cross section</li> </ul>
Proton linear accelerator (KOMAC)	<ul style="list-style-type: none"> <li>• 20 &amp; 100 MeV linac</li> </ul>	<ul style="list-style-type: none"> <li>• Activation cross section</li> </ul>

## Planned facilities

Facility	Characteristics	Status
Electron linear accelerator (KAERI)	<ul style="list-style-type: none"> <li>• 17 MeV SC linac</li> <li>• Neutron production</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual design is completed</li> <li>• Licensing</li> </ul>
Heavy-ion accelerator (IBS)	<ul style="list-style-type: none"> <li>• Cyclotron (70 MeV proton)</li> <li>• SC linac (H – U, 200 MeV/u(U) )</li> <li>• SC linac (d (53 MeV), p (70 MeV))</li> </ul>	<ul style="list-style-type: none"> <li>• Accelerator will be available in 2019</li> </ul>



# Cooperation with domestic groups

- **Workshop on nuclear data measurement and related subject**
  - December 2 in 2016, Kyungpook National Univ. (KNU)
  - Organized by Kyungpook National Univ. (KNU)
  - Supported by Dongnam Institute of Radiological & Medical Sciences (DIRAMS), Pohang University of Science and Technology (POSTECH) and KNDC
- **Topics**
  - Facility for nuclear data measurement
  - Nuclear data evaluation and theoretical method
  - Nuclear data measurement
  - Detector, data acquisition system and related topics

# Website service

- **KNDC website** (<http://atom.kaeri.re.kr>)

- The newly designed table of nuclide allows the used to easily navigate through the nuclides.
- **Continue to update** the plot of cross section for the evaluated and measured nuclear data

### Nuclear Data Center at KAERI

- **Table of Nuclides**  
Nuclear properties, evaluations, cross section plotting
- **Table of  $\gamma$ -rays**  
Decay diagram
- **Electron and Photon Attenuation**  
Electron stopping powers, photon attenuation coefficients
- **AMODS (Atomic Molecular and Optical Database Systems)**  
Atomic and molecular structures, transition lines and probabilities, etc.
- **PEARL (Photonic Electronic Atomic Reaction Laboratory)**  
Photoionization, electron impact reactions, etc.
- **TradiationI Table of Nuclide**  
Nuclear properties
- **Tradiational Cross Section Plotter**  
cross section plotting

### Table of Nuclides (under construction)

92-U-235

**Nuclear Property**

Atomic mass:  $235.043930131 \pm 0.00000192$  u  
Mass excess:  $40.920654 \pm 0.001789$  MeV  
Binding energy / A:  $7.590906 \pm 0.000008$  MeV  
Beta decay energy:  $-0.72422 \pm 0.000854$  MeV  
Abundance:  $0.7204 \pm 0.0006$  %

$E_{\alpha}$ (MeV)	$J_{\pi}$	Half-life	Decay Modes
0.0	7/2-	704 My (1)	IS=0.7204 6: $\alpha$ =100...
0.0765 (0.0004)	1/2+	-26 m	IT=100

Note: place mouse pointer here.

**Neutron-induced Cross Sections**

List of Evaluated Nuclear Data Libraries

- ENDF/B-VII.1 [Full text](#)  
+ Cross sections
- JENDL-4.0 [Full text](#)  
+ Cross sections
- JEFF-3.1 [Full text](#)  
+ Cross sections
- CENDL-3.1 [Full text](#)  
+ Cross sections

Open XSViewer

List of added plots

Get data Add to XSViewer

# Conclusions



- **The organization and mission of KNDC was introduced.**
- **EXFOR progress in KNDC was introduced.**
  - Compilation responsibility for domestic experiments
  - Since NRDC2016 meeting, EXFOR: 4, PRELIM: 3
- **Introduction for the specifications of Korea's facilities**
- **Cooperation with domestic group and website service**