KEK物質構造科学研究所
パルス中性子ミュオン発生40周年記念
オンラインシンポジウム
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Grand design of neutron instruments in J-PARC

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1. Focusing points for grand design for J-PARC instruments

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   - Science and industrial use
   - Current status and future direction in the world
   - Complementary use of pulse and steady neutron
   - Operation system (KEK, JAEA, Ibaraki, CROSS)
   - Human resource development
   - Collaboration quantum beams

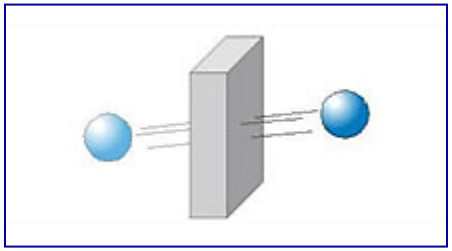
2. Discussion with community and grand design

3. Construction of instruments

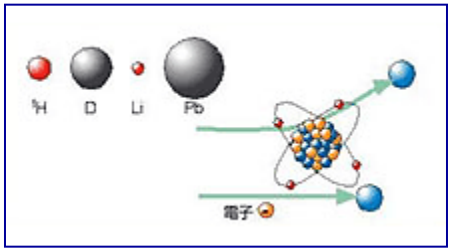
4. Evaluation of instruments and future problems

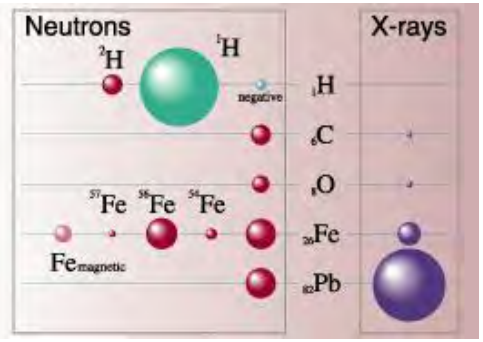
Characteristic features of neutron

1. **High penetration capability**

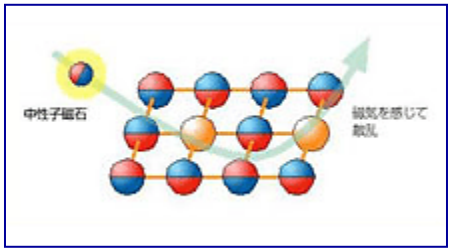


2. **Distinction of isotopes**

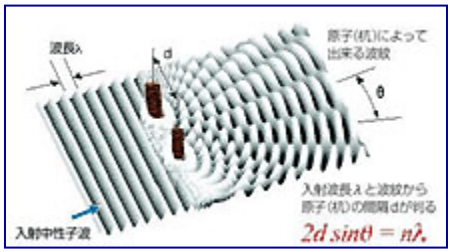




3. **Small magnet**

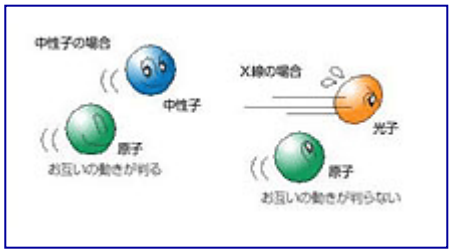


4. **Structure study**



Bragg7s law
2dsinΘ=nλ

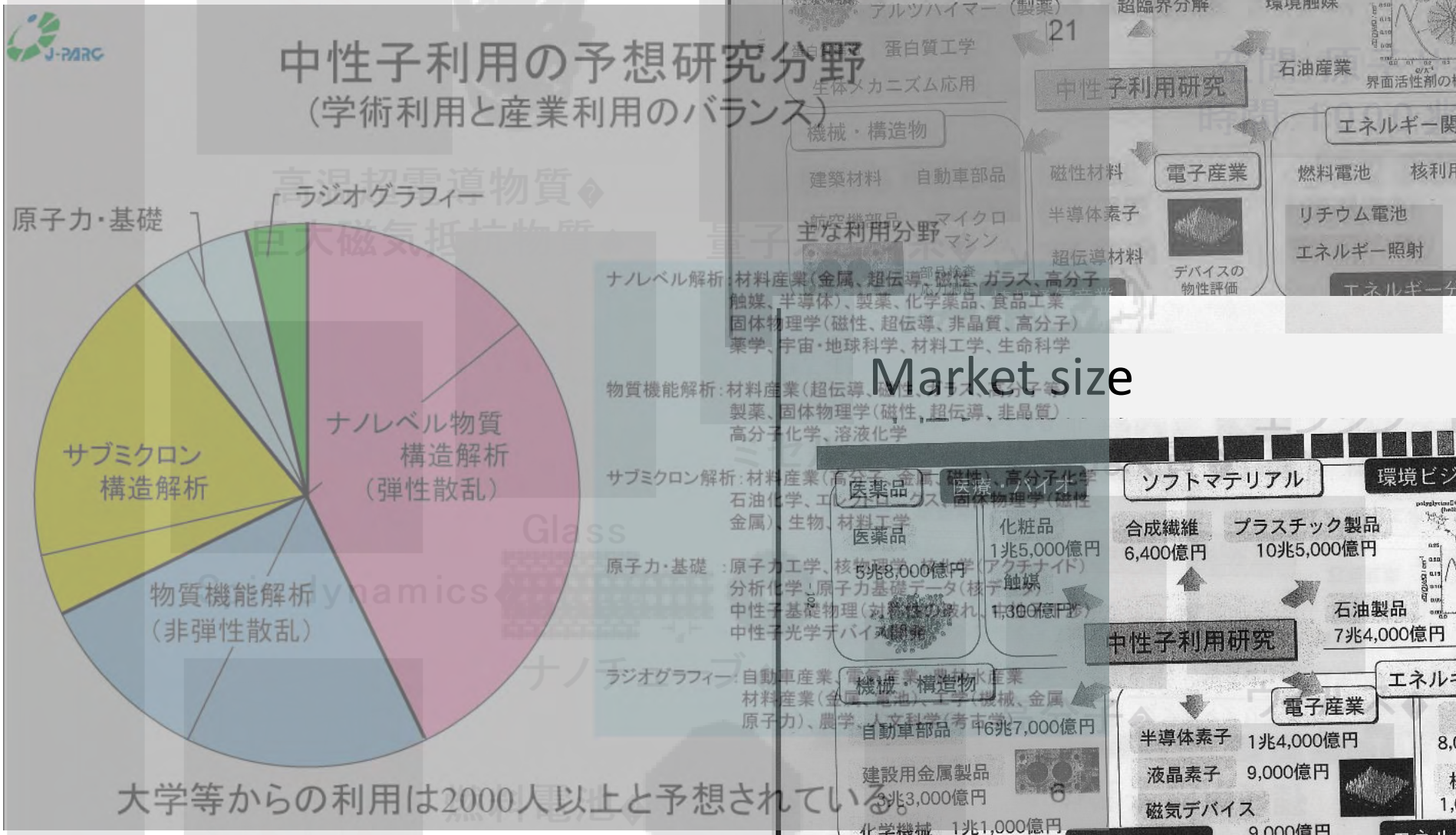
5. **Dynamic study**



300 K = 25.8 meV = 1.8 Å

Use of Neutron

Industrial use



Market size

Pulse neutron sources in the world : new era of neutron researches

ESS
欧州
2019~
5MW

ISIS, RAL
UK
TS2
2008~
0.16MW
0.3MW

CSNS
China
2019~
500kW

MLF, J-PARC
Japan
2008~
1MW

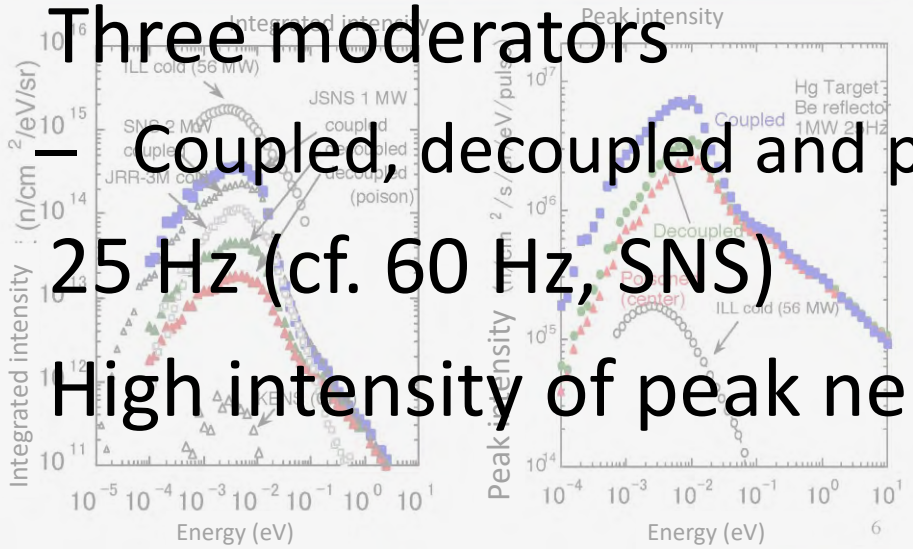
IPNS, ANL
@Illinois, USA
0.01MW

LANSCE, LANL
@Los Alamos, USA
0.06MW

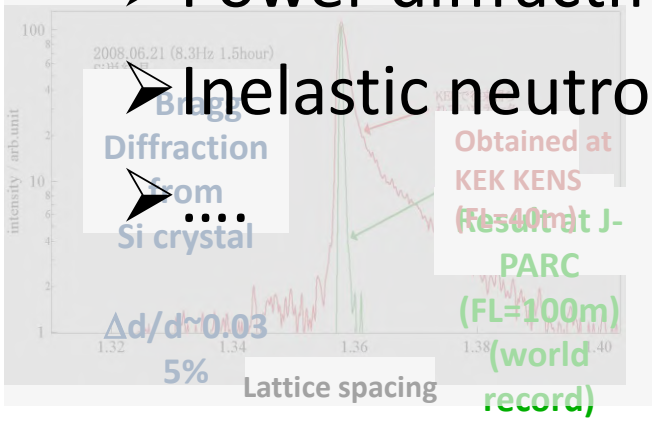
SNS, ORNL
USA
2006~
1.4MW

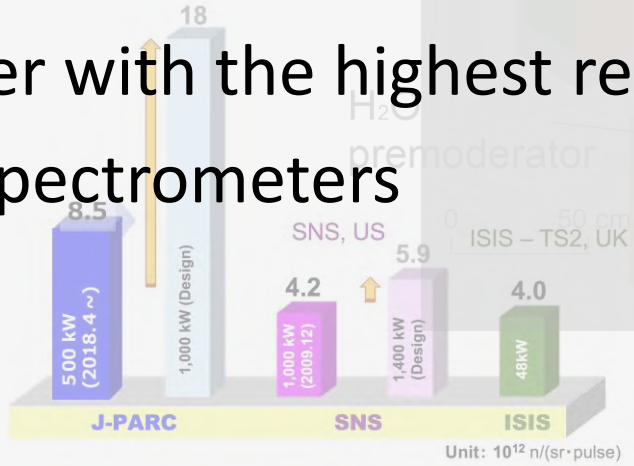
Characteristic features of J-PARC pulse neutron

- Three moderators
  - Coupled, decoupled and poisoned moderators
- 25 Hz (cf. 60 Hz, SNS)
- High intensity of peak neutron (1MW)



- Power diffractmeter with the highest resolution
- Inelastic neutron spectrometers
- ....





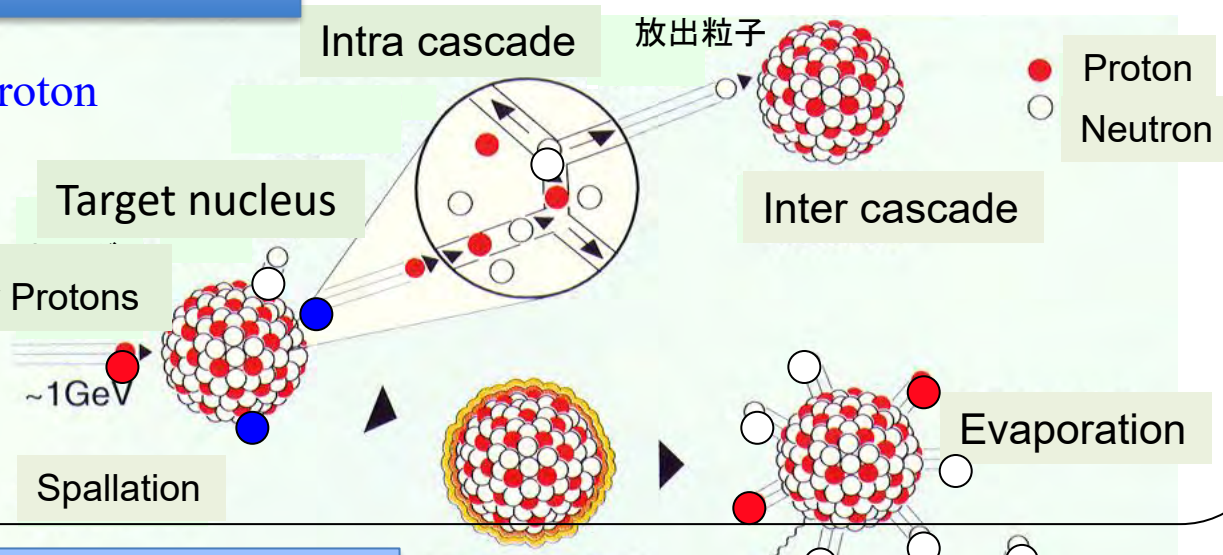
Neutron Production

J-PARC MLF

Spallation Neutron Source

Spallation (~60n/3Gev proton
~24n/1GeV proton)

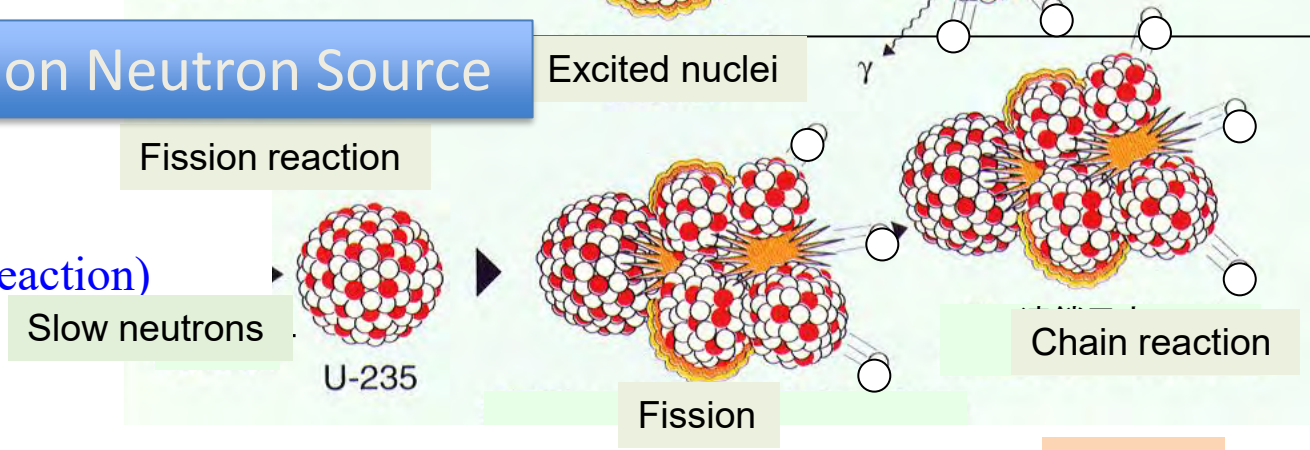
Accelerator Based Neutron



Fission Reaction Neutron Source

Fission Reaction(~2.5n/reaction)

Reactor Based Neutron



JRR-3

Complementary use of pulse neutron (J-PARC) and steady neutron (JRR-3)

J-PARC: high peak intensity

JRR-3: high integrated intensity

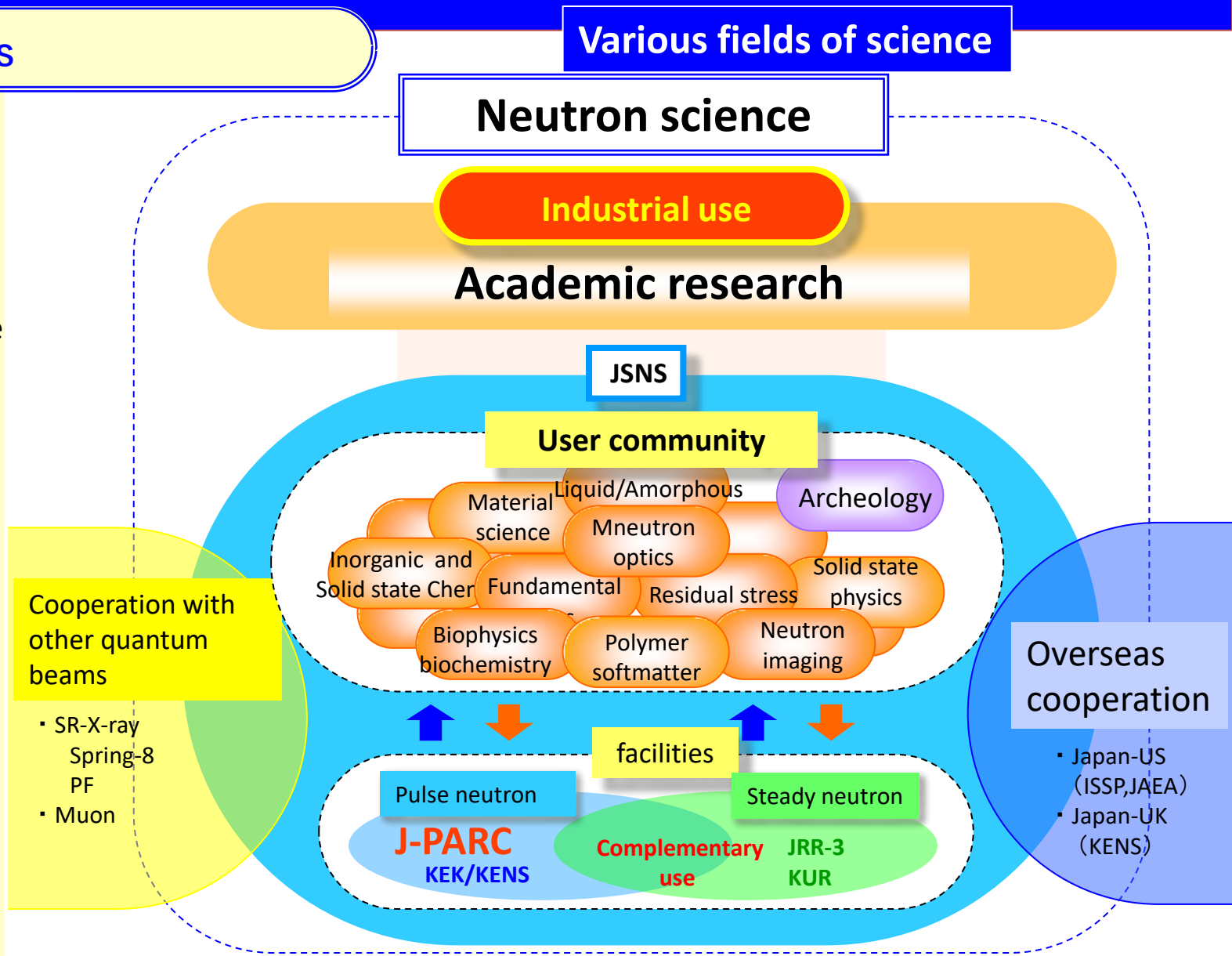
Discussion with community

Japanese Society of Neutron Science (JSNS)

Role of JSNS

- user community
- Enlightenment activities
- Human resource development
- Public relations
- Academic exchange
- Honoring
- Complementary use of pulse and steady neitrons
- Complementary use of quantum beams

etc



Ad hoc committee for public use of large facility

- **President of JSNS,** **Chair of the committee**

1. Y. Fujii, T. Fukunaga
   Report of phase 1 (2004-8)
2. Y. Endo, T. Kanaya
   Report of phase 2: On comprehensive use of large facility (2006-3)
3. Y. Endo, T. Kanaya
   Report of phase 3: Facility management for comprehensive use of large facility — Roadmap for construction of neutron platform — (2007-4)
4. K. Yamada, T. Kanaya
   Report of phase 4: Grand design of J-PARC (2008-10)
5. K. Yamada, T. Kanaya
   Report of phase 5: Instrument selection for the law for Promotion of Public Use* (2009-9)
   *Act on the Promotion of Public Utilization of the Specific Advanced Large Research Facilities)
6. T. Kanaya, Y. Kiyanagi
   Report of phase 6: Consideration for next research reactor (2012-12)
7. Y. Kiyanagi, M. Fujita
   Report of phase 7: Roadmap to next neutron science (2018-07)
8. K. Kakurai → Promotion committee for neutron science

Recommendations from ad hoc committee for public use of large facility

2006「The committee: Phase 2」
2007「The committee: Phase 3」
2008「The committee: Phase 4」

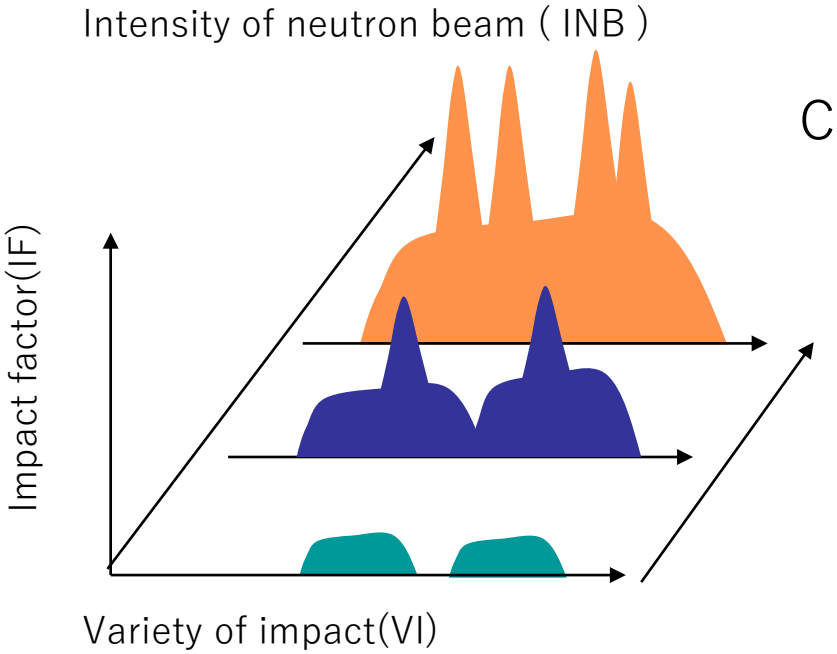
●**all-Japan system**（**cooperation of users (academia, industry), facility and government)**
●**construction of neutron platform**
(towards comprehensive use of neutron)

◆ **Academic and industrial use**
contribution to society
academic research for industrial use
◆ **Unified user office and unified operation**
user oriented operation system
◆ **Neutron platform**
complementary use of pulse and steady neutron sources
complementary use of quantum beams
cooperation with universities
facility projects
human resource development

Characteristic in neutron science

Report of phase 4: Grand design of J-PARC （2008-10）

○ wide range of science　　○top science



Compatibility of two aims

We need grand design

In the early stage, versatile machines with high performance are important.

（ Serendipity ）

Increasing the beam intensity and number of instruments, it is expected

1） spreading research fields
2） merging science fields
3） increasing high impact results

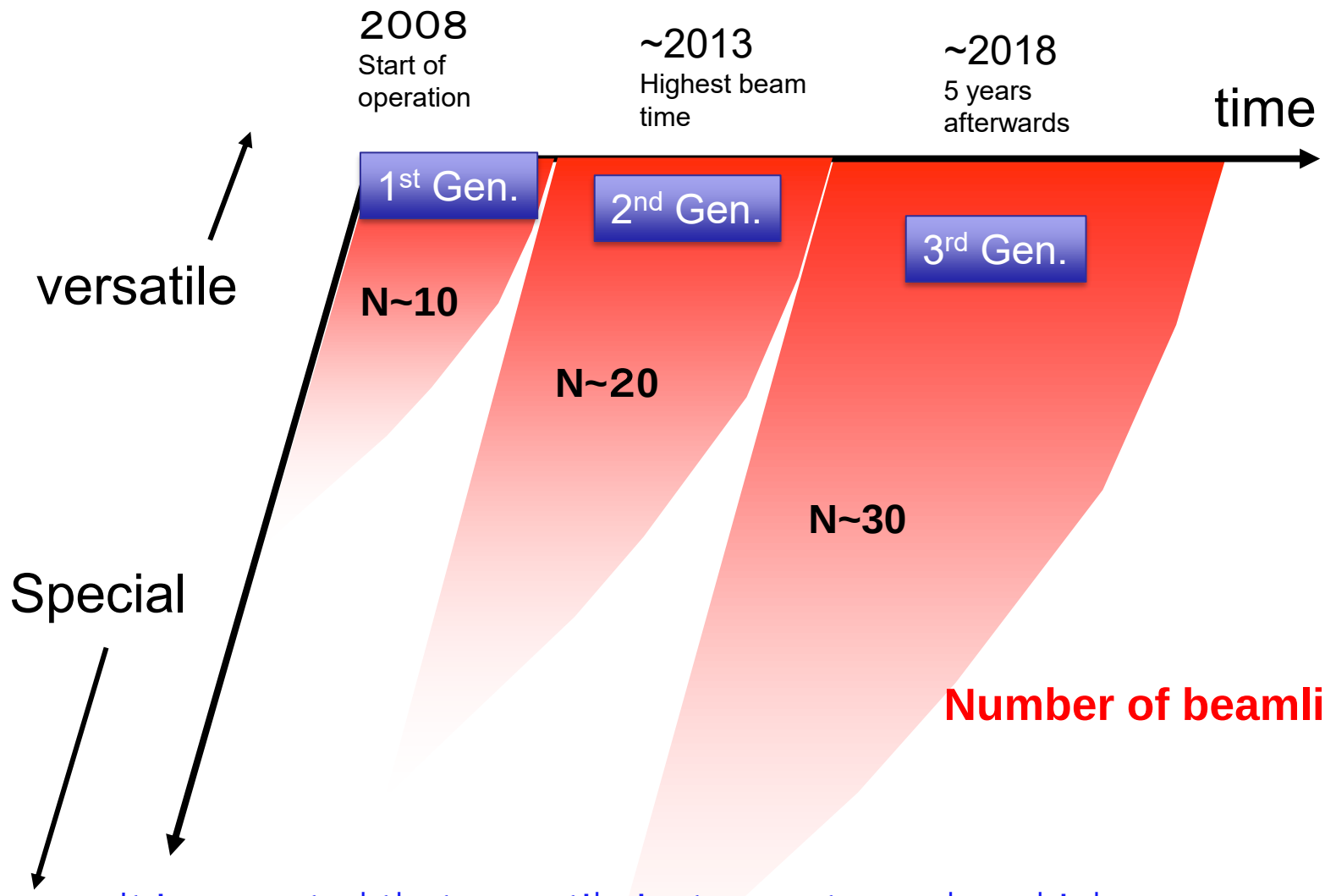
Idea for instrument selection

As neutron science covers various fields of science, it is not meaningless to discuss if the instruments in J-PARC cover all fields of science or not. We have to discuss how we can produce high quality and high impact results in academic researches and industrial use from J-PARC instruments

Two directions

○ High quality versatile instruments to promote material science in various science fields
（Serendipity）
○ Special instruments aiming at high science impact
（high science impact）

Timeline for instrument construction



It is expected that versatile instruments produce high impact results.

Summary of opinions on grand design from user community

- Satisfied with the grand design
- But, need of science peaks

The community requested:

- special sample and measurements environments（extreme conditions, deuteration lab., etc)
- future developments of instruments
- Industrial use
- Proper operation management（user support, review system of proposals, confidentiality, etc)
- New user promotion

proposal of grand design of J-PARC instruments

1st generation（instruments constructed before beam operation)

1. inel. Instr. (Chop.,Instr. for exploring 4D space（4SEASONS, BL01））
2. inel. Instr.（Chop.,（AMATERAS, BL14）, cold N, branched beamline）
3. el. Instr.（Ibaraki pref. biomol. struct.（iBIX, BL03））industrial use
4. el. Instr.（Ibaraki pref. mater. struct.（iMATERIA, BL20））
5. el. Instr.（high res. power（SHRPD, BL08）, branched beamline）
6. el. Instr.（res. stress for eng. Mater.（TAKUMI, BL19）, branched beamline）
7. el. Instr.（high int. total scat.（NOVA, BL21））
8. other instr.（test port for neutron source, (NOBORU, BL10)）
9. other instr.（instr. for neutron-nuclear reaction (BBRI, BL04)）
10. other instr.（neutron optics for fundamental physics, (NOP, BL05)）

1：It is necessary to unify the naming system
2：detailed description of each instrument can be found in the report from J-PARC

2nd generation（instruments constructed until the maximum beam intensity (~5 years)

11. reflectometer（horizontal、BL16, KEK）
12. small angle scattering（HI-SANS, wide-Q, BL15, JAEA）
    Complementary use with JRR-3 SANS machine
13. inel. Instr.（back scattering instr., BL02, DNA, JAEA)
    High energy resolution machine
14. inel. Instr.（Chop., versatile, wide-q and E range)
    Cooperation between KEK and ISSP
15. reflectometer（vertical, polarized Neutron, GI-SANS, BL17, JAEA）
    Development of polarized neutron science and technology
16. el. Instr.（versatile, extrem condition
    Complementary use with JRR-3
17. Imaging instr. (energy selective, JAEA)
    Complementary use with JRR-3
18. inel. Instr.（Spin echo, MEZEI type, slow dynamics)
    Complementary use with JRR-3
    has to clarify the relation between MIEZE type spin echo machine
    under support by JST

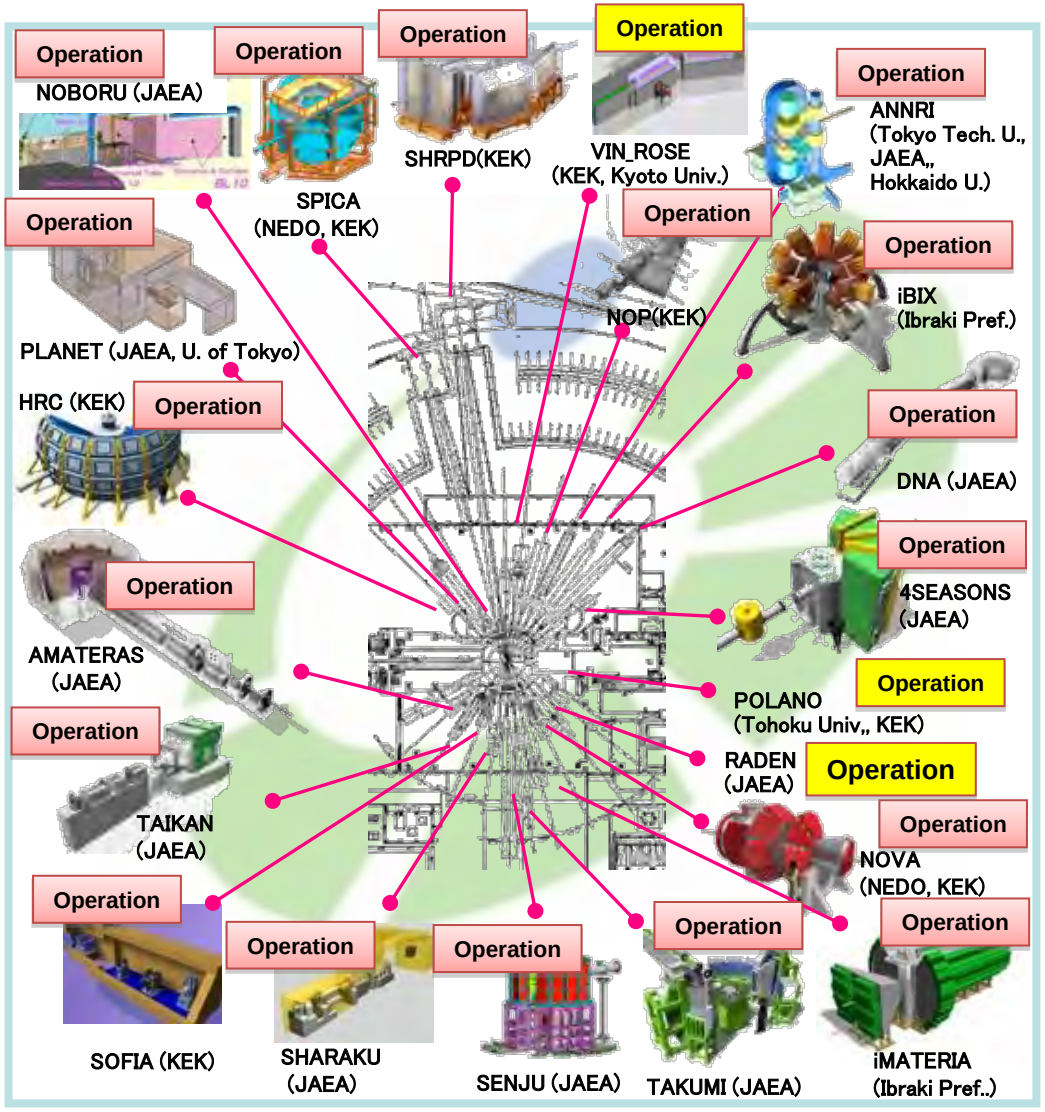
3rd generationn（instruments 10 years after the beam operation. possibility of replacement by new instruments)

19. el. intr.（high pressure measurement, branched beamline)
    Developing by Univ. of Tokyo
20. small angle machine（USANS by two crystals, branched beamline, cheap machine
21. inel. instr.（molecular spectroscopy）
    many users, construction team is necessary
22. inel. instr.（chop., polarized neutron, extream condition)
23. inel. instr.（backscattering machine with thermal neutron)
24. reflectometer（spin echo type, branched beamline)
25. el. instr.（high magnetic field）
    New machine for high magnetic field is under developing
26. reflectometer（horizontal, special environmental)
27. inel. instr.（spin echo, MIEZE type, resonance type)
    Has to clarify the relation between MEIZEI type spin echo machine [18]
28. Small angle machine（microfocus, cascade type）
    Under developing in JRR-3
29. inel. instr.（epithermal neutron）
30. el. instr.（3D material structure)

History of BL construction

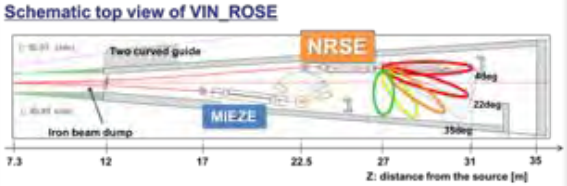
＊この他、現在、生体高分子専用高分解能中性子結晶回折計(生体高分子精密構造解析、反応過程解析)の提案がなされている。

Neutron Instruments in MLF at 2020

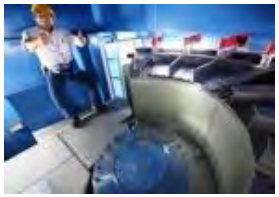


- 23 Neutron Beam Ports
- Operation: 21 (April, 2018)
  Commissioning:0

VIN-ROSE (NSE): opened to users @2017B

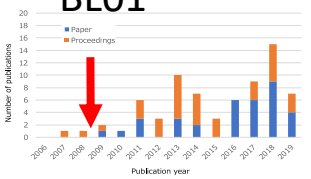


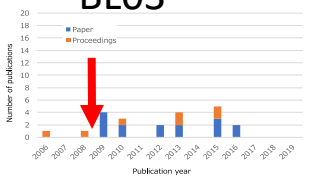
POLANO (Polarization Analysis Spect.)

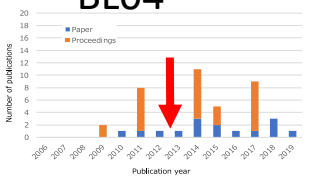


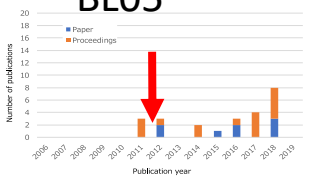
Opened to users @2019A

Number of publications from each BL (2006 - 2019(July))　　（paper&proc.）







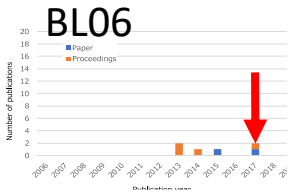


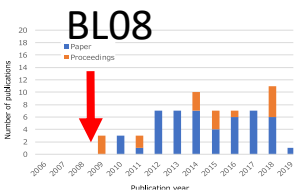
BL06 Num. pubs. (paper & proc.)

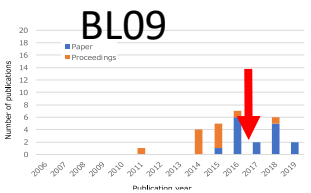
BL08 Num. pubs. (paper & proc.)

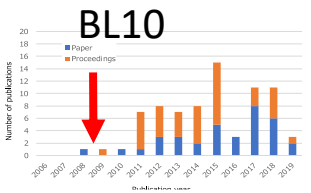
BL09 Num. pubs. (paper & proc.)

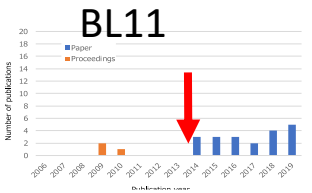
BL10 Num. pubs. (paper & proc.)











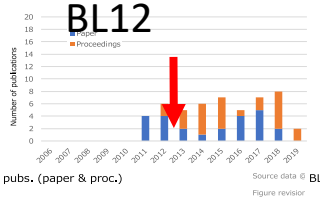
BL12 Num. pubs. (paper & proc.)

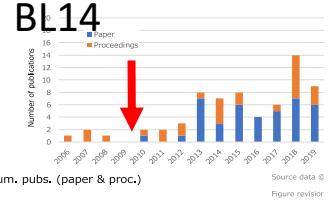
BL14 Num. pubs. (paper & proc.)

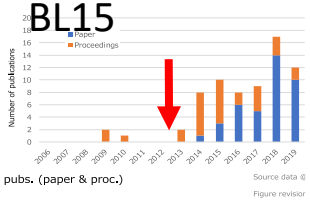
BL15 Num. pubs. (paper & proc.)

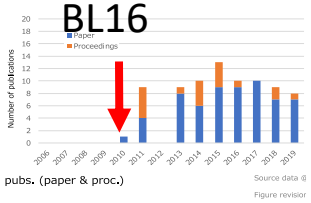
BL16 Num. pubs. (paper & proc.)

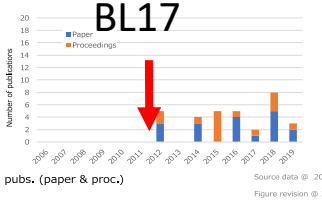
BL17 Num. pubs. (paper & proc.)











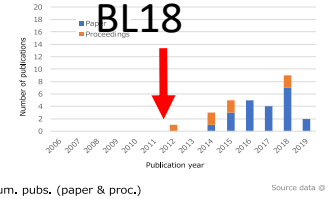
L18 Num. pubs. (paper & proc.)

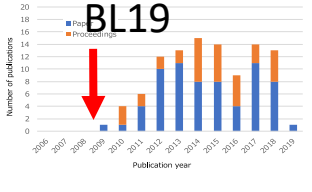
BL19 Num. pubs. (paper & proc.)

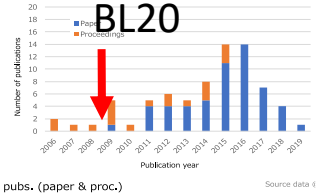
BL20 Num. pubs. (paper & proc.)

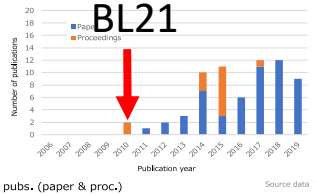
BL21 Num. pubs. (paper & proc.)

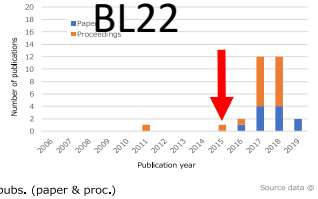
BL22 Num. pubs. (paper & proc.)









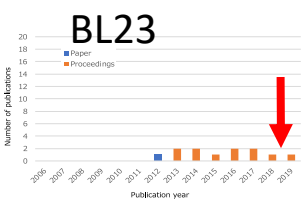


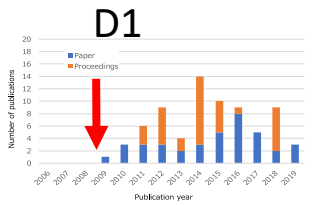
L23 Num. pubs. (paper & proc.)

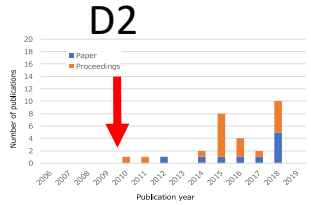
D1 Num. pubs. (paper & proc.)

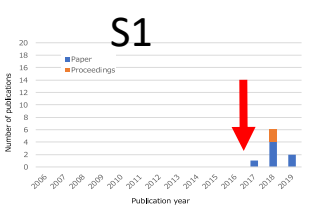
D2 Num. pubs. (paper & proc.)

S1 Num. pubs. (paper & proc.)









↓ Red arrows indicate the start of user operation

Number of publications within Top 25%, 2008-2017

BL01 11

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL01論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	59	7.90	0.95	Magnetic ground state of FeSe	NATURE COMMUNICATIONS	2016	PHYSICS
2	52	4.23	3.40	High-energy spin and charge excitations in electron-doped copper oxide superconductors	NATURE COMMUNICATIONS	2014	PHYSICS
3	61	4.33	3.42	Development status of software 'Utsusemi' for Chopper Spectrometers at MLF, J-PARC	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2013	PHYSICS
4	68	3.40	5.24	First Demonstration of Novel Method for Inelastic Neutron Scattering Measurement Utilizing Multiple Incident Energies	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2009	PHYSICS
5	20	2.68	7.95	Crystal-field parameters of the rare-earth pyrochlores R2Ti2O7 (R = Tb, Dy, and Ho)	PHYSICAL REVIEW B	2016	PHYSICS
6	46	2.40	9.04	First neutron production utilizing J-PARC pulsed spallation neutron source JSNS and neutronic performance demonstrated	NUCL INSTRUM METHODS PHYS RES A	2010	PHYSICS
7	12	2.34	9.48	Inelastic and quasi-elastic neutron scattering spectrometers in J-PARC	BIOCHIMICA ET BIOPHYSICA ACTA-GENERAL SUBJECTS	2017	BIOLOGY & BIOCHEMISTRY
8	40	2.32	9.80	The Fermi Chopper Spectrometer 4SEASONS at J-PARC	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2011	PHYSICS
9	14	1.87	13.89	First-principles calculation and experimental investigation of lattice dynamics in the rare-earth pyrochlores R2Ti2O7 (R = Tb, Dy, Ho)	PHYSICAL REVIEW B	2016	PHYSICS
10	24	1.39	19.36	s(+/-)-like spin resonance in the iron-based nodal superconductor BaFe2(As0.65P0.35)(2) observed using inelastic neutron scattering	PHYSICAL REVIEW B	2011	PHYSICS
11	18	1.28	21.95	Switching of intra-orbital spin excitations in electron-doped iron pnictide superconductors	PHYSICAL REVIEW B	2013	PHYSICS

BL02 3

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL02論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	24	4.12	3.35	Polar rotor scattering as atomic-level origin of low mobility and thermal conductivity of perovskite CH3NH3PbI3	NATURE COMMUNICATIONS	2017	CHEMISTRY
2	12	2.34	9.48	Inelastic and quasi-elastic neutron scattering spectrometers in J-PARC	BIOCHIMICA ET BIOPHYSICA ACTA-GENERAL SUBJECTS	2017	BIOLOGY & BIOCHEMISTRY
3	13	1.51	18.82	Dynamical Behavior of Human alpha-Synuclein Studied by Quasielastic Neutron Scattering	PLOS ONE	2016	BIOLOGY & BIOCHEMISTRY

BL03 5

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL03論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	144	8.20	0.78	A Functional [NiFe]Hydrogenase Mimic That Catalyzes Electron and Hydride Transfer from H-2	SCIENCE	2013	CHEMISTRY
2	27	1.58	15.66	"Newton's cradle" proton relay with amide-imidic acid tautomerization in inverting cellulase visualized by neutron crystallography	SCIENCE ADVANCES	2015	MOLECULAR BIOLOGY & GENETICS
3	28	1.40	19.06	Development of data processing software for a new TOF single crystal neutron diffractometer at J-PARC	NUCL INSTRUM METHODS PHYS RES A	2009	PHYSICS
4	18	1.28	21.95	Evaluation of performance for IBARAKI biological crystal diffractometer iBIX with new detectors	JOURNAL OF SYNCHROTRON RADIATION	2013	PHYSICS
5	27	1.17	23.84	Hydrogen-bond network and pH sensitivity in transthyretin: Neutron crystal structure of human transthyretin	JOURNAL OF STRUCTURAL BIOLOGY	2012	BIOLOGY & BIOCHEMISTRY

BL04 6

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL04論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	32	2.20	11.65	Neutron-capture cross-sections of Cm-244 and Cm-246 measured with an array of large germanium detectors in the ANNRI at J-PARC/MLF	JOURNAL OF NUCLEAR SCIENCE AND TECHNOLOGY	2012	ENGINEERING
2	28	1.62	16.03	Measurement of energy spectra and spatial distributions of neutron beams provided by the ANNRI beamline for capture cross-section measurements at the J-PARC/MLF	NUCL INSTRUM METHODS PHYS RES A	2011	PHYSICS
3	21	1.59	18.42	Cross-section measurement of Np-237 (n, gamma) from 10 meV to 1 keV at Japan Proton Accelerator Research Complex	JOURNAL OF NUCLEAR SCIENCE AND TECHNOLOGY	2013	ENGINEERING
4	27	1.35	19.85	Nuclear data study at J-PARC BL04	NUCL INSTRUM METHODS PHYS RES A	2009	PHYSICS
5	17	1.38	20.00	Capture Cross-section Measurement of Am-241(n,gamma) at J-PARC/MLF/ANNRI	NUCLEAR DATA SHEETS	2014	PHYSICS
6	15	1.22	23.34	Energy resolution of pulsed neutron beam provided by the ANNRI beamline at the J-PARC/MLF	NUCL INSTRUM METHODS PHYS RES A	2014	PHYSICS

BL05 0

BL06 1

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL06論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	12	2.34	9.48	Inelastic and quasi-elastic neutron scattering spectrometers in J-PARC	BIOCHIMICA ET BIOPHYSICA ACTA-GENERAL SUBJECTS	2017	BIOLOGY & BIOCHEMISTRY

BL08 16

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL08論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	1240	51.64	0.03	A lithium superionic conductor	NATURE MATERIALS	2011	MATERIALS SCIENCE
2	145	7.25	1.35	Rietveld analysis software for J-PARC	NUCL INSTRUM METHODS PHYS RES A	2009	PHYSICS
3	59	4.80	2.70	Bipartite magnetic parent phases in the iron oxypnictide superconductor	NATURE PHYSICS	2014	PHYSICS
4	64	3.17	5.50	Application of matrix decomposition algorithms for singular matrices to the Pawley method in Z-Rietveld	JOURNAL OF APPLIED CRYSTALLOGRAPHY	2012	CHEMISTRY
5	55	2.87	6.84	Structural and piezoelectric properties of high-density (Bi0.5K0.5)TiO3-BiFeO3 ceramics	JOURNAL OF APPLIED PHYSICS	2010	PHYSICS
6	16	2.75	7.64	A-Site and B-Site Charge Orderings in an s-d Level Controlled Perovskite Oxide PbCoO3	JOURNAL OF THE AMERICAN CHEMICAL SOCIETY	2017	CHEMISTRY
7	38	2.58	8.35	Synthesis, structure, and conduction mechanism of the lithium superionic conductor Li10+delta Ge1+delta P2-delta S12	JOURNAL OF MATERIALS CHEMISTRY A	2015	MATERIALS SCIENCE
8	46	2.40	9.04	First neutron production utilizing J-PARC pulsed spallation neutron source JSNS and neutronic performance demonstrated	NUCL INSTRUM METHODS PHYS RES A	2010	PHYSICS
9	44	2.29	9.65	Doping dependence of spin-lattice coupling and two-dimensional ordering in multiferroic hexagonal Y1-xLuxMnO3 (0 <= x <= 1)	PHYSICAL REVIEW B	2010	PHYSICS
10	14	1.87	13.89	Partial nitrogen loss in SrTaO2N and LaTiO2N oxynitride perovskites	SOLID STATE SCIENCES	2016	PHYSICS
11	36	1.62	15.37	Role of Ga3+ and Cu2+ in the High Interstitial Oxide-Ion Diffusivity of Pr2NiO4-Based Oxides: Design Concept of Interstitial Ion Conductors through the Higher-Valence d(10) Dopant and Jahn-Teller Effect	CHEMISTRY OF MATERIALS	2012	MATERIALS SCIENCE
12	20	1.57	17.56	Structural Origin of the Anisotropic and Isotropic Thermal Expansion of K2NiF4-Type LaSrAlO4 and Sr2TiO4	INORGANIC CHEMISTRY	2015	CHEMISTRY
13	22	1.28	21.48	Super High Resolution Powder Diffractometer at J-PARC	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2011	PHYSICS
14	17	1.21	23.47	Large in-plane deformation of RuO6 octahedron and ferromagnetism of bulk SrRuO3	JOURNAL OF PHYSICS-CONDENSED MATTER	2013	PHYSICS
15	6	1.31	24.30	Crystal structure, site selectivity, and electronic structure of layered chalcogenide LaOBiPbS3	EPL	2017	PHYSICS
16	22	1.12	24.52	Phase relationship of the TbO1.81-Mn3O4-Fe2O3 system synthesized at 1200 degrees C	JOURNAL OF ALLOYS AND COMPOUNDS	2013	MATERIALS SCIENCE

BL09 4

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL09論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	64	6.94	0.99	Origin of stabilization and destabilization in solid-state redox reaction of oxide ions for lithium-ion batteries	NATURE COMMUNICATIONS	2016	CHEMISTRY
2	37	4.01	3.26	Pure H- conduction in oxyhydrides	SCIENCE	2016	CHEMISTRY
3	24	2.60	7.84	Real-time observations of lithium battery reactions-operando neutron diffraction analysis during practical operation	SCIENTIFIC REPORTS	2016	CHEMISTRY
4	30	1.93	12.76	Synthesis, structure, and ionic conductivity of solid solution, Li10+delta M1+delta P2-delta S12 (M = Si, Sn)	FARADAY DISCUSSIONS	2014	CHEMISTRY

BL10 9

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL10論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	46	2.40	9.04	First neutron production utilizing J-PARC pulsed spallation neutron source JSNS and neutronic performance demonstrated	NUCL INSTRUM METHODS PHYS RES A	2010	PHYSICS
2	35	1.75	14.37	NOBORU: J-PARC BL10 for facility diagnostics and its possible extension to innovative instruments	NUCL INSTRUM METHODS PHYS RES A	2009	PHYSICS
3	33	1.54	16.30	Design and application of NOBORU - NeutrOn Beam line for Observation and Research Use at J-PARC	NUCL INSTRUM METHODS PHYS RES A	2008	PHYSICS
4	8	1.75	16.51	Multiple-wavelength neutron holography with pulsed neutrons	SCIENCE ADVANCES	2017	PHYSICS
5	24	1.48	17.79	A large-area two-dimensional scintillator detector with a wavelength-shifting fibre readout for a time-of-flight single-crystal neutron diffractometer	NUCL INSTRUM METHODS PHYS RES A	2012	PHYSICS
6	21	1.22	22.63	Quantitative magnetic field imaging by polarized pulsed neutrons at J-PARC	NUCL INSTRUM METHODS PHYS RES A	2011	PHYSICS
7	15	1.22	23.34	Neutron resonance transmission spectroscopy with high spatial and energy resolution at the J-PARC pulsed neutron source	NUCL INSTRUM METHODS PHYS RES A	2014	PHYSICS
8	17	1.21	23.47	Neutron imaging detector based on the mu PIC micro-pixel chamber	NUCL INSTRUM METHODS PHYS RES A	2013	PHYSICS
9	6	1.31	24.30	Non-Destructive Study of Bulk Crystallinity and Elemental Composition of Natural Gold Single Crystal Samples by Energy-Resolved Neutron Imaging	SCIENTIFIC REPORTS	2017	PHYSICS

BL11 4

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL11論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	21	2.07	11.79	Design and performance of high-pressure PLANET beamline at pulsed neutron source at J-PARC	NUCL INSTRUM METHODS PHYS RES A	2015	PHYSICS
2	9	2.08	13.03	Hydrogenation of iron in the early stage of Earth's evolution	NATURE COMMUNICATIONS	2017	GEOSCIENCES
3	19	1.55	17.30	Site occupancy of interstitial deuterium atoms in face-centred cubic iron	NATURE COMMUNICATIONS	2014	PHYSICS
4	6	1.31	24.30	Bulk moduli and equations of state of ice VII and ice VIII	PHYSICAL REVIEW B	2017	PHYSICS

BL12 5

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL12論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	41	2.38	9.42	High Resolution Chopper Spectrometer (HRC) at J-PARC	NUCL INSTRUM METHODS PHYS RES A	2011	PHYSICS
2	12	2.34	9.48	Inelastic and quasi-elastic neutron scattering spectrometers in J-PARC	BIOCHIMICA ET BIOPHYSICA ACTA-GENERAL SUBJECTS	2017	BIOLOGY & BIOCHEMISTRY
3	11	1.47	19.51	Crystal Field Excitations in the Breathing Pyrochlore Antiferromagnet Ba3Yb2Zn5O11	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2016	PHYSICS
3	11	1.47	19.51	Weyl fermions and spin dynamics of metallic ferromagnet SrRuO3	NATURE COMMUNICATIONS	2016	PHYSICS
5	12	1.18	24.81	Magnetic model in multiferroic NdFe3(BO3)(4) investigated by inelastic neutron scattering	PHYSICAL REVIEW B	2015	PHYSICS

BL14 11

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL14論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	24	4.12	3.35	Polar rotor scattering as atomic-level origin of low mobility and thermal conductivity of perovskite CH3NH3PbI3	NATURE COMMUNICATIONS	2017	CHEMISTRY
2	56	3.45	4.89	Spin Wave Measurements over the Full Brillouin Zone of Multiferroic BiFeO3	PHYSICAL REVIEW LETTERS	2012	PHYSICS
3	55	3.19	5.85	AMATERAS : A Cold-Neutron Disk Chopper Spectrometer	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2011	PHYSICS
4	41	2.91	6.75	Well-Defined Crystal Field Splitting Schemes and Non-Kramers Doublet Ground States of f Electrons in PrT2Zn20 (T = Ir, Rh, and Ru)	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2013	PHYSICS
5	12	2.34	9.48	Inelastic and quasi-elastic neutron scattering spectrometers in J-PARC	BIOCHIMICA ET BIOPHYSICA ACTA-GENERAL SUBJECTS	2017	BIOLOGY & BIOCHEMISTRY
6	10	2.19	11.74	Structure of the magnetic excitations in the spin-1/2 triangular-lattice Heisenberg antiferromagnet Ba3CoSb2O9	NATURE COMMUNICATIONS	2017	PHYSICS
7	13	1.74	15.50	Spontaneous decays of magneto-elastic excitations in non-collinear antiferromagnet (Y,Lu)MnO3	NATURE COMMUNICATIONS	2016	PHYSICS
8	20	1.63	16.16	Spin-Nematic Interaction in the Multiferroic Compound Ba2CoGe2O7	PHYSICAL REVIEW LETTERS	2014	PHYSICS
9	18	1.41	20.56	Relationship between Torsion and Anisotropic Exchange Coupling in a Tb-III-Radical-Based Single-Molecule Magnet	INORGANIC CHEMISTRY	2015	CHEMISTRY
10	19	1.35	20.61	Hyperfine structure of magnetic excitations in a Tb-based single-molecule magnet studied by high-resolution neutron spectroscopy	PHYSICAL REVIEW B	2013	PHYSICS
11	6	1.31	24.30	Crystal-electric-field excitations and spin dynamics in Ce3Co4Sn13 semimetallic chiral-lattice phase	PHYSICAL REVIEW B	2017	PHYSICS

BL15 4

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL15論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	56	5.53	2.03	Uniaxial stress control of skyrmion phase	NATURE COMMUNICATIONS	2015	PHYSICS
2	24	1.54	18.02	Direct Evidence of Confined Water in Room-Temperature Ionic Liquids by Complementary Use of Small-Angle X-ray and Neutron Scattering	JOURNAL OF PHYSICAL CHEMISTRY LETTERS	2014	CHEMISTRY
3	14	1.52	19.18	Cross-link inhomogeneity in phenolic resins at the initial stage of curing studied by H-1-pulse NMR spectroscopy and complementary SAXS/WAXS and SANS/WANS with a solvent-swelling technique	POLYMER	2016	CHEMISTRY
4	33	1.40	19.54	Symmetry, Structure, and Dynamics of Monoaxial Chiral Magnets	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2016	PHYSICS

BL16 13

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL16論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	72	3.65	4.50	Chain dimensions and surface characterization of superhydrophilic polymer brushes with zwitterion side groups	SOFT MATTER	2013	MATERIALS SCIENCE
2	55	3.19	5.85	Design and performance of horizontal-type neutron reflectometer SOFIA at J-PARC/MLF	EUROPEAN PHYSICAL JOURNAL PLUS	2011	PHYSICS
3	51	2.90	6.46	Novel neutron reflectometer SOFIA at J-PARC/MLF for in-situ soft-interface characterization	POLYMER JOURNAL	2013	CHEMISTRY
4	28	2.59	8.34	The Novel Additive 1-Naphthalenethiol Opens a New Processing Route to Efficiency-Enhanced Polymer Solar Cells	ADVANCED FUNCTIONAL MATERIALS	2016	MATERIALS SCIENCE
5	25	1.96	12.32	Effect of Local Chain Dynamics on a Bioinert Interface	LANGMUIR	2015	CHEMISTRY
6	12	2.06	12.71	Effect of Charged Group Spacer Length on Hydration State in Zwitterionic Poly(sulfobetaine) Brushes	LANGMUIR	2017	CHEMISTRY
7	34	1.94	12.83	Environmentally friendly repeatable adhesion using a sulfobetaine-type polyzwitterion brush	POLYMER CHEMISTRY	2013	CHEMISTRY
8	9	1.97	13.81	Influence of solution- and thermal-annealing processes on the sub-nanometer-ordered organic-organic interface structure of organic light-emitting devices	NANOSCALE	2017	PHYSICS
9	26	1.51	17.59	Interfacial properties of polystyrene thin films as revealed by neutron reflectivity	PHYSICAL REVIEW E	2011	PHYSICS
10	27	1.54	18.10	High Density Polymer Brush Spontaneously Formed by the Segregation of Amphiphilic Diblock Copolymers to the Polymer/Water Interface	ACS MACRO LETTERS	2013	CHEMISTRY
11	24	1.33	20.29	Neutron reflectivity study of the swollen structure of polyzwitterion and polyeletrolyte brushes in aqueous solutione	JOURNAL OF BIOMATERIALS SCIENCE-POLYMER EDITION	2014	MATERIALS SCIENCE
12	19	1.29	22.04	Molecular Interdiffusion between Stacked Layers by Solution and Thermal Annealing Processes in Organic Light Emitting Devices	ACS APPLIED MATERIALS & INTERFACES	2015	MATERIALS SCIENCE
13	17	1.33	22.20	Effect of interfacial structure on bioinert properties of poly(2-methoxyethyl acrylate)/poly(methyl methacrylate) blend films in water	PHYSICAL CHEMISTRY CHEMICAL PHYSICS	2015	CHEMISTRY

BL17 0

BL18 5

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL18論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	46	4.99	2.06	Encapsulating Mobile Proton Carriers into Structural Defects in Coordination Polymer Crystals: High Anhydrous Proton Conduction and Fuel Cell Application	JOURNAL OF THE AMERICAN CHEMICAL SOCIETY	2016	CHEMISTRY
2	33	4.42	3.13	Magnetoelectric coupling in the honeycomb antiferromagnet Co4Nb2O9	PHYSICAL REVIEW B	2016	PHYSICS
3	7	1.53	19.85	Time-of-Flight Three Dimensional Neutron Diffraction in Transmission Mode for Mapping Crystal Grain Structures	SCIENTIFIC REPORTS	2017	PHYSICS
4	13	1.41	21.34	Molecular Gyrotops with a Five-Membered Heteroaromatic Ring: Synthesis, Temperature-Dependent Orientation of Dipolar Rotors inside the Crystal, and its Birefringence Change	CRYSTAL GROWTH & DESIGN	2016	CHEMISTRY
5	12	1.30	23.79	SENJU: a new time-of-flight single-crystal neutron diffractometer at J-PARC	JOURNAL OF APPLIED CRYSTALLOGRAPHY	2016	CHEMISTRY

BL19 4

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL19論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	63	3.19	5.56	Effects of ausforming temperature on bainite transformation, microstructure and variant selection in nanobainite steel	ACTA MATERIALIA	2013	MATERIALS SCIENCE
2	43	2.92	6.83	Effect of prior martensite on bainite transformation in nanobainite steel	ACTA MATERIALIA	2015	MATERIALS SCIENCE
3	10	1.47	20.34	Evaluation of austenite volume fraction in TRIP steel sheets using neutron diffraction	MATERIALS CHARACTERIZATION	2017	MATERIALS SCIENCE
4	31	1.29	20.38	Tensile Behavior of a TRIP-aided Ultra-fine Grained Steel Studied by Neutron Diffraction	ISIJ INTERNATIONAL	2011	MATERIALS SCIENCE

BL20 12

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL20論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	434	62.80	0.00	High-power all-solid-state batteries using sulfide superionic conductors	NATURE ENERGY	2016	ENGINEERING
2	145	7.25	1.35	Rietveld analysis software for J-PARC	NUCL INSTRUM METHODS PHYS RES A	2009	PHYSICS
3	37	4.01	3.26	Pure H- conduction in oxyhydrides	SCIENCE	2016	CHEMISTRY
4	64	3.17	5.50	Application of matrix decomposition algorithms for singular matrices to the Pawley method in Z-Rietveld	JOURNAL OF APPLIED CRYSTALLOGRAPHY	2012	CHEMISTRY
5	56	2.80	7.25	IBARAKI materials design diffractometer (iMATERIA)-Versatile neutron diffractometer at J-PARC	NUCL INSTRUM METHODS PHYS RES A	2009	PHYSICS
6	38	2.58	8.35	Synthesis, structure, and conduction mechanism of the lithium superionic conductor Li10+delta Ge1+delta P2-delta S12	JOURNAL OF MATERIALS CHEMISTRY A	2015	MATERIALS SCIENCE
7	31	1.72	14.48	New Perovskite-Related Structure Family of Oxide-Ion Conducting Materials NdBaInO(4)	CHEMISTRY OF MATERIALS	2014	MATERIALS SCIENCE
8	18	1.67	16.51	Layered NaxCrxTi1-xO2 as Bifunctional Electrode Materials for Rechargeable Sodium Batteries	CHEMISTRY OF MATERIALS	2016	MATERIALS SCIENCE
9	20	1.57	17.56	Structural Origin of the Anisotropic and Isotropic Thermal Expansion of K2NiF4-Type LaSrAlO4 and Sr2TiO4	INORGANIC CHEMISTRY	2015	CHEMISTRY
10	15	1.39	21.08	Grain-orientation-dependent of gamma-epsilon-alpha ' transformation and twinning in a super-high-strength, high ductility austenitic Mn-steel	NUCL INSTRUM METHODS PHYS RES A	2016	MATERIALS SCIENCE
11	18	1.22	23.51	Improved oxide-ion conductivity of NdBaInO4 by Sr doping	JOURNAL OF MATERIALS CHEMISTRY A	2015	MATERIALS SCIENCE
12	22	1.12	24.52	Experimental Visualization of the Diffusional Pathway of Oxide Ions in a Layered Perovskite-type Cobaltite PrBaCo2O5+delta	CHEMISTRY OF MATERIALS	2013	MATERIALS SCIENCE

BL21 8

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL21論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	59	4.80	2.70	Bipartite magnetic parent phases in the iron oxypnictide superconductor	NATURE PHYSICS	2014	PHYSICS
2	37	2.38	8.95	Hydrogen Ordering and New Polymorph of Layered Perovskite Oxyhydrides: Sr2VO4-xHx	JOURNAL OF THE AMERICAN CHEMICAL SOCIETY	2014	CHEMISTRY
3	17	1.84	14.24	Li+ Local Structure in Li-Tetraglyme Solvate Ionic Liquid Revealed by Neutron Total Scattering Experiments with the Li-6/7 Isotopic Substitution Technique	JOURNAL OF PHYSICAL CHEMISTRY LETTERS	2016	CHEMISTRY
4	33	1.72	14.44	Development of a neutron detector with a GEM	NUCL INSTRUM METHODS PHYS RES A	2010	PHYSICS
5	22	1.56	17.08	From antiferromagnetic insulator to ferromagnetic metal: Effects of hydrogen substitution in LaMnAsO	PHYSICAL REVIEW B	2013	PHYSICS
6	7	1.53	19.85	Large-moment antiferromagnetic order in overdoped high-T-c superconductor (SmFeAsO1-xDx)-Sm-154	PROC. NATL. ACAD. SCI. U.S.A.	2017	PHYSICS
7	13	1.41	21.34	Nanometer-Size Effect on Hydrogen Sites in Palladium Lattice	JOURNAL OF THE AMERICAN CHEMICAL SOCIETY	2016	CHEMISTRY
8	16	1.26	24.07	True Boundary for the Formation of Homoleptic Transition-Metal Hydride Complexes	ANGEWANDTE CHEMIE-INTERNATIONAL EDITION	2015	CHEMISTRY

BL22 2

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL22論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	7	1.53	19.85	Far-field interference of a neutron white beam and the applications to noninvasive phase-contrast imaging	PHYSICAL REVIEW A	2017	PHYSICS
2	6	1.31	24.30	Development of Multi-colored Neutron Talbot-Lau Interferometer with Absorption Grating Fabricated by Imprinting Method of Metallic Glass	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2017	PHYSICS

BL23 1

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

BL23論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	12	2.34	9.48	Inelastic and quasi-elastic neutron scattering spectrometers in J-PARC	BIOCHIMICA ET BIOPHYSICA ACTA-GENERAL SUBJECTS	2017	BIOLOGY & BIOCHEMISTRY

D1 8

Source data @ 2019-07-08
Citation data @ 2019-07-19
Figure revision @ 2019-11-21

D1論文リスト（Top 25%以内、2008-2017、Percentileでソート）

Rank	被引用回数	CNCI	Percentile	タイトル	雑誌名	出版年	ESI22分野
1	59	4.80	2.70	Bipartite magnetic parent phases in the iron oxypnictide superconductor	NATURE PHYSICS	2014	PHYSICS
2	60	3.48	5.02	Ba2IrO4: A spin-orbit Mott insulating quasi-two-dimensional antiferromagnet	PHYSICAL REVIEW B	2011	PHYSICS
3	52	2.71	7.48	Evidence for Appearance of an Internal Field in the Ordered State of CeRu2Al10 by mu+SR	JOURNAL OF THE PHYSICAL SOCIETY OF JAPAN	2010	PHYSICS
4	34	1.97	12.33	Magnetic and diffusive nature of LiFePO4 investigated by muon spin rotation and relaxation	PHYSICAL REVIEW B	2011	PHYSICS
5	32	1.67	15.03	Low-temperature magnetic properties and high-temperature diffusive behavior of LiNiO2 investigated by muon-spin spectroscopy	PHYSICAL REVIEW B	2010	PHYSICS
6	25	1.54	16.85	Diffusive behavior in LiMPO4 with M = Fe, Co, Ni probed by muon-spin relaxation	PHYSICAL REVIEW B	2012	PHYSICS
7	30	1.50	17.46	Insular Superconductivity in a Co-Doped Iron Pnictide CaFe1-xCoxAsF	PHYSICAL REVIEW LETTERS	2009	PHYSICS
8	17	1.21	23.47	Muon-spin relaxation study on Li- and Na-diffusion in solids	PHYSICA SCRIPTA	2013	PHYSICS

D2 0

S1 0

Evaluation of beamlines
evaluation by many committees

- Instrument committee (MLF)
  - 5 year evaluation after operation (encouragement to BL)
  - 10 year evaluation after operation (evaluation of 10 years activity and future plan)
- Review in NAC, MAC and IAC
  - Evaluation on neutron and muon target
  - Evaluation of neutron and muon instruments (no evaluation on each instrument)
- Committee for KEKS S-type proposals
  - Evaluation on instrument and science activity in KEK BL
- Committee for JAEA Instrument group proposals
  - Evaluation on instrument and science activity in JAEA BL
- Many other committees

Suites of instruments received comprehensively high evaluation

Problems in beamline operation

1) Gap between ground design and actual construction of BL

We have prepared a ground design of beamline construction with the neutron community to decide the construction order, but due to the budget problem, versatile machines were not necessary public beamlines.

＊public beamlines are supported by Budget for Promotion of Public Use (*Act on the Promotion of Public Utilization of the Specific Advanced Large Research Facilities*) and the users are support by CROSS

2) Unbalance of budget and man-power between public beamlines and KEK/JAEA beamlines

Introducing a law of Promotion of Public Use, user support and financial condition have been well developed (5~6 persons/BL) for public beamlines, but not in KEK/JAEA beamlines.

Number of public beamlines is only 7, it is not considered by users that MLF is a public facility opened to users. → We need "Public Beam Time".

3) Budget for investment for facility development

To keep the facility in the world highest level, we need budget for investment

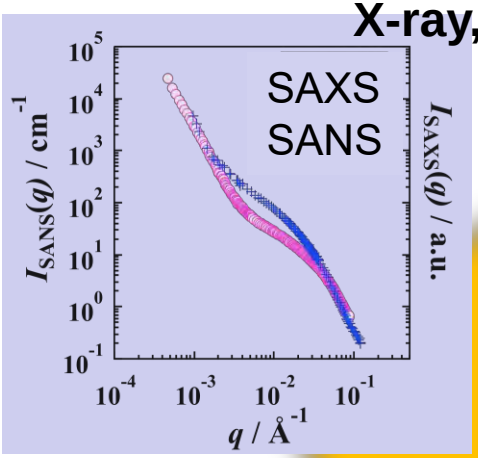
4) Aging problems are serious

An example of soft matter research

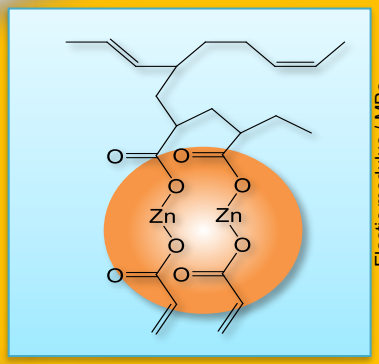
Cooperation with **industry,** Complementary use of **quantum beams**

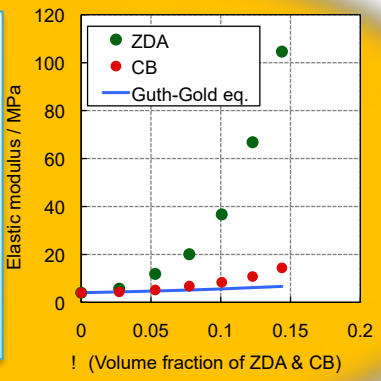
Structure
X-ray, neutron

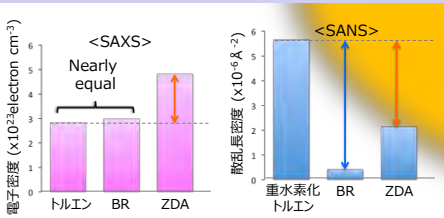
Dynamics
Neutron, muon



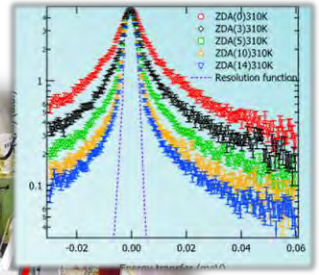
ZDA reinforced Rubber

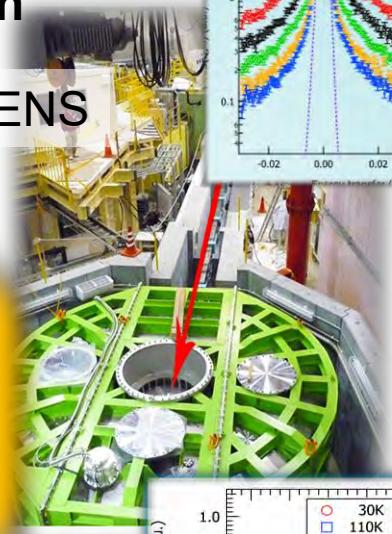


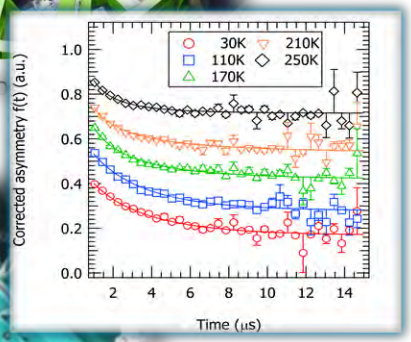




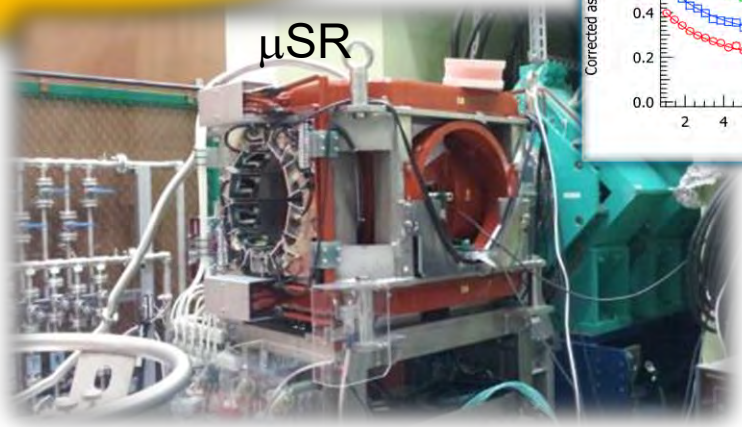
QENS



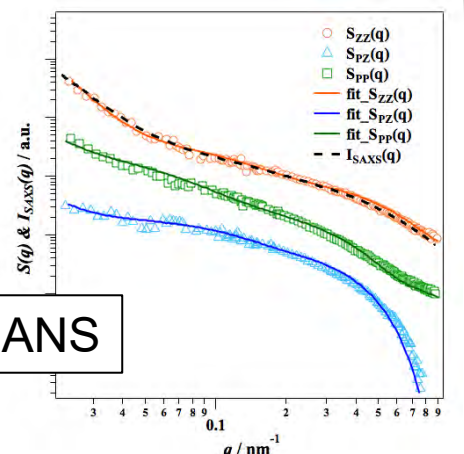




μSR



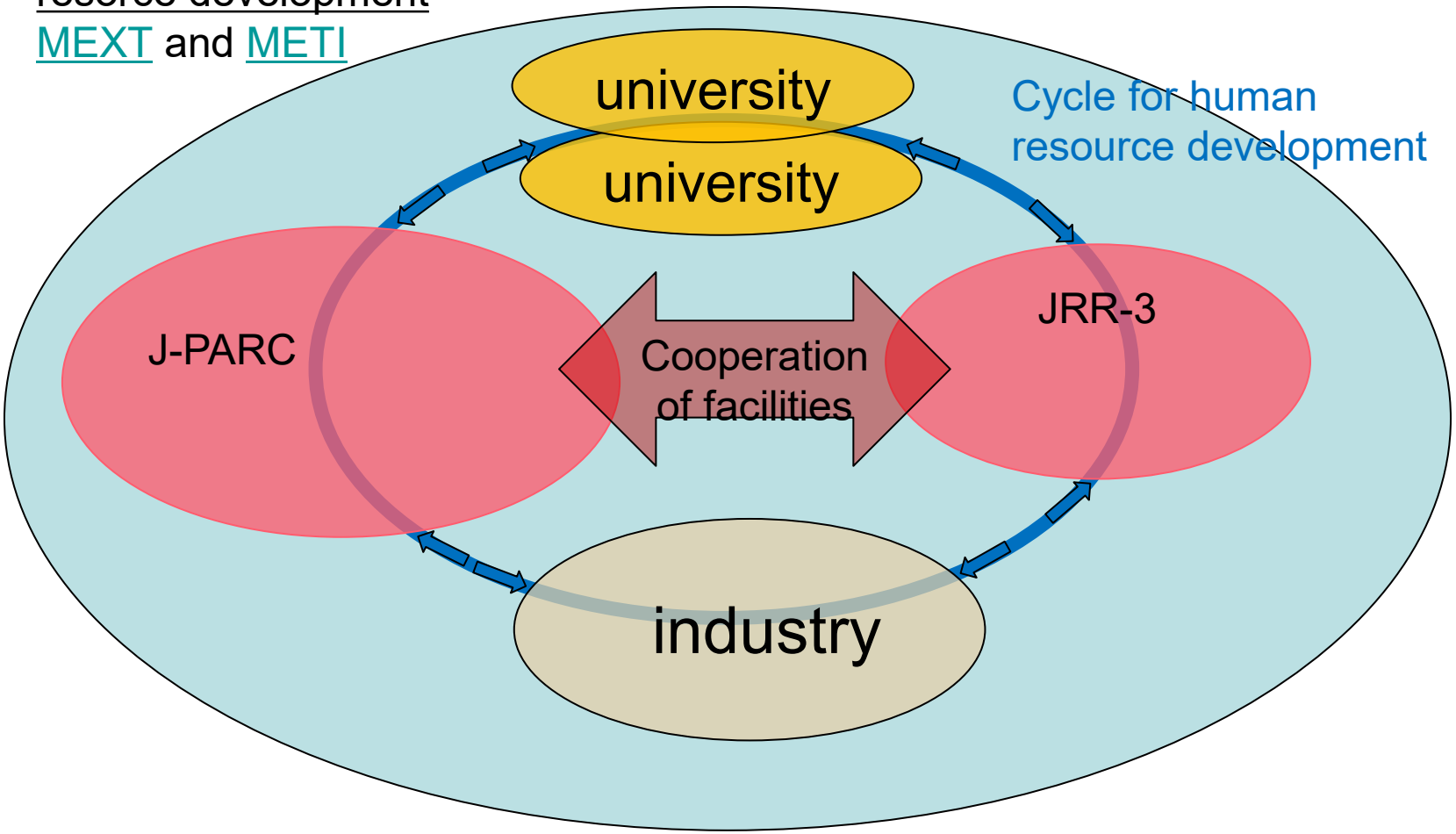
CV-SANS



Development of human resource: cooperation with university and industry

Positive growth cycle in iniversity and industry collaboration for human resorce development

MEXT and METI



summary

- **Balance between versatile instruments and specialized instruments**
- **Construction of all Japan system, including academic and industrial users, facilities and government**
- **Promotion of industrial use**
- **Complementary use of pulse and steady neutron sources**
- **Cooperation between universities, facilities and industries for human resource development**
- **Cooperation of quantum beams**
- **Neutron platform (quantum beam platform)**

Thank you for your kind attention