

# RIKEN Accelerator-driven compact neutron systems, RANS project

**Yoshie Otake<sup>1,2,3</sup>**

1. *Neutron Beam Technology Team, RIKEN, Center for Advanced Photonics, RIKEN, Saitama, Japan*
2. *Technology Research Association for Neutron Next Generation System, Saitama, Japan*
3. *Ransview, Saitama, Japan*

## **Abstract**

At RIKEN we have developed compact neutron systems for on-site quantitative evaluation for practical use. There are two major goals of our RANS (**RIKEN Accelerator-driven compact Neutron Systems**) Project's research and development [1]. One is to establish and realize CANS (Compact Accelerator-driven Neutron Source) system model that can be easily operated, non-destructively measured, and quantitatively evaluated, as a floor-standing type for industrial use as non-destructive analysis equipment. Another goal is to invent a novel transportable compact neutron system for outdoor use of the preventive maintenance of large-scale construction such as bridges and highways. Two accelerator-based compact neutron source systems, RANS (7 MeV proton, Be target) [1] and RANS-II (2.49 MeV proton, Li target), as well as RANS- $\mu$  (252Cf) which have started real bridge measurements, are in constant operation. The transmission imaging, neutron diffractometer towards stress measurement, small angle scattering instruments with thermal and cold moderators at RANS, fast neutron scattering time-of-flight imaging, neutron activation analysis at RANS and RANS-II are available, and neutron-induced prompt gamma-ray analysis with RANS- $\mu$ . In addition, RANS-III, a transportable compact neutron system for non-destructive inspection of bridge decks, and cable-stayed bridge anchorage deterioration detection [2] by fast neutron scattering time-of-flight imaging [3] is being developed for onboard use. Development of the transportable compact neutron system RANS-III is progressing. The accelerator, neutron source target, and shielding system have already been mounted on a trailer, and neutron generation tests are scheduled to be conducted shortly.



Fig.1: RANS-III trailer is entering for its experimental building

## **References**

- [1] Otake, Y., Wakabayashi, Y., Takamura, M., ..., "RIKEN Compact Neutron Source Systems RANS Project", Nucl. Phys. News, 33(2), 17–21 (2023)
- [2] Y.Otake, "A Compact Proton Linac Neutron Source at RIKEN", "Applications of Laser-Driven Particle Acceleration" eds. Paul Bolton, et al. (2018) Chapter 19 pp.291-314 CRC Press
- [3] T.Fukuchi, et.al. Proceedings of the concrete structure scenarios, Journal Society of Material Science, Japan 24 pp.565-570, (2024)
- [4] Y. Ikeda, et al. Plasma and Fusion Research Vol.13(2018) pp.2406005-1-5