RIKEN Accelerator-driven compact neutron systems, RANS, and their applications

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Keywords: Compact neutron system, non-destructive test, infrastructure, Quantum beams, Salt meter

We have been developing and upgrading Compact Neutron Systems and their applications at RIKEN since 2011[1]. There are two major goals of the RANS project. One of the objectives is to construct a floor-standing type of compact neutron system that enables non-destructive evaluation and analysis of materials and components using low-energy neutrons, which has not been possible until now on-site, and to demonstrate its achievements, thereby contributing to industrial applications and human resource development. Another major objective is to develop and demonstrate outdoors new, transportable, compact neutron systems for preventive maintenance of bridges and other large infrastructure structures, thereby contributing to extending the service life of social capital. Neutron scattering experiments such as imaging, neutron diffraction, and small-angle scattering have been performed on RANS and RANS-II, including for external user applications. As an urgent issue to prevent bridge accidents, we have developed an ultra-compact neutron salt meter, RANS-μ, for salt damage, which is one of the three most common causes of bridge accidents and have already conducted measurements on actual bridges [2]. In addition, we have succeeded in visualizing sedimentation by scattered neutron imaging, which visualizes the internal degradation of bridge suspension cable anchors. Efforts toward the practical application of the RANS project will also be presented.

Fig.1 RANS challenge, RANS, RANS-II, III, μ

Fig.2 RANS-μ at a bridge

References

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[2] Wakabayashi, et.al., J. Neutron Res. 24, no. 3-4, pp. 411-419, (2022).