

## Research Result Report

### ICRR Inter-University Research Program 2022

<p>Research Subject:</p> <p>Research and Development for XENONnT and future Dark Matter Searches</p>
<p>Principal Investigator:</p> <p>Kai Martens</p>
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<p>Summary of Research Result :</p> <p>Our 2020 PRL “Excess Electronic Recoil Events in XENON1T” stirred interest and focused the XENON collaboration to check on the main background (BG) hypothesis remaining after careful evaluation: that tritium (T) had entered the XENON1T liquid xenon target. To investigate this hypothesis Yamashita-san and Kobayashi-san developed and calibrated a method to collect moisture from the air in the relevant experimental halls at both LNGS and Kamioka so that its T content can be measured.</p> <p>At XENONnT we are commissioning the Kamioka technology based Gd-water purification system (GdWPS) for the neutron veto and started treating Gd-water after separating the GdWPS from the XENONnT water shield again and dissolving Kamioka Gd-sulfate in closed loop operation – the final step toward dissolving Gd-sulfate in the water shield after a final decision is reached by the collaboration about potentially accessing the liquid xenon target at its center again.</p> <p>Three papers were published by XENONnT in FY2022:</p> <p>“Material radiopurity control in the XENONnT experiment”, Eur. Phys. J. C (2022) 82:599,</p> <p>“Double-wak decays of <math>^{124}\text{Xe}</math> and <math>^{136}\text{Xe}</math> in the XENON1T and XENONnT experiments”, Phys. Rev. C 106, 024328, and</p>

“Search for New Physics in Electronic Recoil Data from XENONnT”,  
Phys. Rev. Lett. 129, 161805,(2022).

For DARWIN our members are actively working with Hamamatsu Photonics to develop new low BG liquid xenon capable scintillation light sensors.

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