The status of the Callio Lab Underground laboratory in the Pyhäsalmi Mine

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New science and R&D centre at Pyhäsalmi Mine

Callio Lab is one of the few Deep Underground Laboratories (DULs) in the world. It is located in the Pyhäsalmi Mine (owned by First Quantum Minerals Ltd.), Pyhäjärvi, Finland. Callio Lab hosts among other users the Centre for Underground Physics in Pyhäsalmi (CUPP) [1]. Kerttu Saalasti Institute is an academic partner of Callio Lab.



- **Fig. 1.** Callio Lab is located in the Pyhäsalmi Mine, in the town of Pyhäjärvi, in the middle of Finland
- **Fig. 2.** The Callio Lab is within 2 hours of drive from four airports, less than 4 hours from a harbor and it has its own railway access all the way into the mining area.

The mine is 1 441 meters deep and it can be accessed by an elevator (3 min from surface to bottom) or by a 11 km long truck-sized driveway (decline, 30 min.)

Excellent rock quality, seismically stable and dry granite bedrock (below 600 meters) makes Callio Lab an ideal location for hosting future scientific and commercial underground infrastructures. The wide number of existing boreholes, reaching down to 2.4 km, provide great possibilities for geophysical testing and measurements.

As an outcome of LAGUNA and LAGUNA – LBNO design studies the Pyhäsalmi Mine is an optimal site in terms of physics experiment requiring low cosmic background, rock mechanics, general infrastructure and accessibility among the DULs in Europe [2].





- <u>J. Joutsenvaara¹</u>, T. Enqvist¹, V. Isoherranen¹, P. Jalas¹, J. Kutuniva¹ and P. Kuusiniemi¹
 - 1. Kerttu Saalasti Institute, University of Oulu, Finland Email: jari.joutsenvaara@oulu.fi



Fig. 3. Cosmic ray experiment EMMA at the depth of 75 m. It is run by Univ. Oulu and Jyväskylä, Finland, together with INR from Russian Academy of sciences [3].



Fig. 5. Deepest exploration boreholes reach the depth of 2.4 km. These boreholes and the borehole samples collected enable the study of rock mechanics, geochemical composition and microbiome composition. E.g. VTT and GTK have conducted such analysis from the boreholes of Pyhäsalmi Mine. The studies were contacted at the vicinity of Lab 2. [5].



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Fig. 4. Lab 2 at the depth of 1 430 m currently hosts C14-experiment measuring the abundance of 14C in liquid scintillator samples. It is run by Univ. Oulu and Jyväskylä together with INR from Russian Academy of sciences [4].



Fig. 6. Radon blocking material tests at the level of 990 m. Tests conducted by the staff of CUPP. Site also hosts testbeds for mushroom farming.



Fig. 7. An existing caverns at the level 660 m will be transformed into test facility for steady temperature hydrofonic farming.

References

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