

# Construction of a Secure Clock Location for Alternative Realization of UTC(SP)

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Based on a request from the Swedish Post-and Telecommunications Authority, responsible for the availability and robustness of communications, a cavern was reconstructed to operate as a redundant NMI-level Time and Frequency laboratory and collocate with a fiber network node [1].

The paper intends to describe the construction with aims, and some specific solutions in detail. The laboratory is hosted within an EM-shielded building, resting on vibration absorbers, behind a shock-wave protecting door, more than 15 meters below street level. Redundancy was paramount in the construction of the facility.

Some specific solution to handle was the electrical power supplies that are assured with dual feed lines that are automatically switched on failure. Multiple external diesel generators, with a minimum of 7 days of operation, will power the whole facility. Local modular redundant AC UPS will sustain power supply to the laboratory >1 hour. Vital instrumentation is backed up by dual modular DC UPS with at least 1 hour operation time. The climate control system, consisting of double closed coolant loops and air coolers, is controlled by dual redundant control units. The system keeps the laboratory's climate within narrow tolerances. The produced heat is transferred to a central cooling system that dissipates it into several deep bore holes in the surrounding bed-rock. Internal, fresh water cooled, backup cooling machine engages in the case of absence of external coolant. As an environmental benefit, the heat that is generated in the cavern is used to heat the buildings on street level. All parts of the climate control system are alternatingly operated to secure the functionality. The system is remotely monitored and controllable.

As the cavern is in a collocation with a fiber network node, providing access to redundant communication paths, external communications is achieved through redundant dark fibers, connecting the location with the two central hubs of SUNET, the Swedish University Network, with 1 GbE. Furthermore, dark fibers are rented to connect external clients in the Stockholm area, requesting secure and reliable frequency or timing signals.

The paper also briefly describes the time and frequency equipment used for the alternative realization of UTC(SP) and its redundant dissemination.

- [1] P. O. Hedekvist, S.C. Ebenhag, C. Rieck G. Bideberg and K. Jaldehag, "Time and Frequency Activities at SP", The Institute of Navigation *Precise Time and Time Interval (PTTI) Systems and Applications Meeting*, 2013