This project is related to ultra-precise distribution of atomic timescale in fiber optic networks. It means that in locations distant by hundreds of kilometers the “time readings” will be synchronized with accuracy of picoseconds, i.e. the billionths fractions of second.
The first challenge in designing such synchronization networks is that the propagation delay of signals traveling down the fibers tends to change, mainly due to changes of ambient temperature. To avoid “speeding up” and “slowing down” the timescale at the fiber output, special means for the delay stabilization should be applied. This issue have been successfully overcome, among others by this proposal authors with frame of previous projects.
The second challenge, addressed in this project, is to determine, with picoseconds accuracy, the delay of the time signal outgoing the fiber in respect to original timescale. In next step this delay should be compensated in some way, to obtain the situation of full synchronization of time signals in all network nodes.
The networks for picosecond timing synchronization will support various new scientific experiments, mainly in physics, astronomy and geodesy, and in future in various additional disciplines.
They also will play crucial societal role, because they will form a core segment of future terrestrial positioning and navigation systems, which will guide the autonomously driven vehicles with centimeter accuracy.
Thus we need to know not only which hour it is, but also which pico(!)second is!