INVESTIGATION OF TEMPERATURE INFLUENCE ON SIGNAL DELAY OF COAXIAL CABLES

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Coaxial cables serve as critical infrastructure for high-speed data transmission and time synchronization in telecommunications, aerospace, and particle physics experiments. However, temperature fluctuations can degrade signal characteristics and timing accuracy through variable propagation delays in coaxial cables. The primary objective of this work is to investigate the influence of temperature on signal propagation delay for different cable types. The research aims at establishing how physical dimensions and manufacturing quality variances contribute to the temperature coefficient of delay. Although different methods can be used to estimate the delay of the cable, time interval counters disciplined by 10 MHz signal generated by cesium atomic clocks and two reference signals with the same repetition rate (one pulse per second) are used. The investigation uses temperature range from -6 ºC to 23 ºC, cable length from 5 m to 15 m and cable types RG174, H155. The results show that different cable types feature different temperature coefficients of delay. Thus, these results are important in evaluating measurement uncertainty for measurements carried out in the Time and Frequency Standard Laboratory.