



**Title:** Optical Phase Noise Cancellation through Differential Detection Using Analog Circuit Techniques

**Abstract:** In optical fiber communication systems, intensity modulation and direct detection (IM-DD) is widely used. In contrast, coherent detection based on optical phase modulation improves receiver sensitivity compared to IM-DD. This presentation introduces a method for canceling optical phase noise through differential detection. The method is particularly suitable for high-reliability optical fiber networks, such as intra-vehicle optical communication systems. First, the principle of noise cancellation is explained, and its effectiveness is verified through theoretical simulations using mathematical multiplication and addition. Then, post-layout simulation results of the designed analog circuits for differential detection, frequency mixers and a combiner, demonstrate effective noise-canceling performance at 25 Gb/s.