

# Wi-Fi Direct based WSN Node Deployment in Underground Mine Tunnels

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Fast data transmission is becoming a key parameter in mine planning, operation, and safety. Therefore WSNs (wireless sensor networks) is taking a leading role in underground mine environment communication. WSNs can measure mine environmental parameters by sensors to provide quick and detailed communication for comprehensive assessment of the situation, during both regular operations and emergency situations. Nowadays, WSNs are developing very fast, getting more compact, energy and cost-efficient. On the other hand, underground mines have very specific working conditions characterized by narrow spaces, dynamic environments, and high humidity. This demands WSN nodes to be specifically arranged to be functioning efficiently considering limited throughput and energy resources. Wi-Fi Direct is a wireless connection type used in WSN and supported by many manufacturers around the world. This research will consider using Wi-Fi Direct and ad hoc networks for WSN and will analyze the deployment of WSN nodes in underground mine environments. The physical experiment measuring the performance of deterministic Wi-Fi Direct mode node deployment in Osarizawa experimental underground mine was conducted. The experiment indicated that the data packets can be sent without loss to a distance up to a 140 m in a straight tunnel with 4 m<sup>2</sup> cross-section area. The obtained results were applied to planned WSN node deployment at Tishinskiy mine site in East Kazakhstan.

**Keywords** : WSN, Wi-Fi Direct, Node deployment