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Wireless data transmission for high energy physics applications

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Over the last years, wireless data transmission technologies have seen tremendous progress to cope with the ever increasing demand on bandwidth, for instance in the mobile sector. Developments on short distance communication are pushing towards frequencies in the mm-band which allow the use of an even higher bandwidth and smaller form factors.

In high energy physics the demand on bandwidth is increasing rapidly with the development of more and more granular detectors. Especially tracking detectors require readout systems with thousands of links that can transfer several Gbit/s each. At the same time, stringent space, material and power constraints are set on these readout systems.

The WADAPT project (Wireless Allowing Data and Power Transmission) has been started to study the feasibility of wireless data and power transmission for future tracking detectors. The current focus is set on communication in the 60 GHz band, which offers a high bandwidth, a small form factor and an already mature technology. Tracking detectors can benefit a lot from wireless data transmission. For instance, the material budget of tracking detectors can potentially be minimized and installation can be simplified as the amount of cables and connectors can be reduced. Data transmission topologies that are impossible with wired data links can be realized using wireless communication, allowing for even faster on-detector data processing.

This talk presents current developments of 60 GHz transceiver chips for HEP applications. Studies of antennas and data transmission will be shown. Studies on crosstalk between wireless links in a reflecting environment have been conducted. Silicon strip and pixel sensors have been operated while being exposed to a 60 GHz data transmission and results of these studies will be presented.

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