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WADAPT: Wireless Allowing Data and Power Transfer

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The WADAPT consortium (Wireless Allowing Data and Power Transfer) was created to study wireless (multi-gigabit) data transfer for high energy physics applications (LoI, CERN-LHCC-2017-002; LHCC-I- 028. - 2017). New millimeter frequency-band radio technologies allow fast signal transfer and efficient partitioning of detectors in topological regions of interest. Large bandwidths are available: 14 GHz to 60 GHz and 32 GHz to 140 GHz, respectively.
An example of use is the transfer of information from a vertex detector widely used in our experiments. We are currently developing a coherent program with stages and deliverables over 3 years with the aim of building a demonstrator as proof of principle for use in future HEP experiments. For vertex detectors at HL-LHC, for example, the bandwidth of 60 GHz is adequate and commercial products are available. They have been tested for signal confinement, crosstalk, electromagnetic immunity and resistance to radiation (up to 1014 Neq / cm2). A 60 GHz demonstrator is currently being built in Heidelberg, using 130 nm SiGe BI-CMOS technology, with on-off keying. Following this development, an optimized demonstrator is planned to assess the feasibility and performance, refine the estimate of the required data transfer, energy consumption, BER, latency, mass, radiation resistance, high directivity antennas, cost and establish a solid foundation for designing the final reading system.
Larger bandwidth is available at 140 GHz and higher data rates (20 to over 100 Gbps, depending on the architecture) are possible for future FCC applications, without degrading performance.
Once the proof of principle has been carried out, there would no longer be any obstacle to generalizing the use of wireless reading to other detectors, with the possibility of adding intelligence on the detector to perform a four-dimensional reconstruction of the traces and vertexes online, in order to attach the traces to their vertex with great efficiency even in difficult experimental conditions.
The WADAPT project includes a long-term step aimed at transmitting energy wirelessly. Leti works on the concepts of simultaneous RF data and energy transmission, and energy recovery. This would create a new paradigm for the transmission of data and power in particle physics detectors.

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