

The main subject of this lecture is how readout is implemented on pixel integrated circuits for particle physics. The presentation will include a brief overview of pixel devices used in particle physics and then focus on the challenges of higher data rate and smaller pixel size in future experiments. A key distinguishing factor between particle physics and other applications of pixel devices is low occupancy or sparse readout. The need to read mostly empty "image frames" at a very high rate and without pause has implications for on-chip data flow that do not arise in imaging applications. The question will be formulated as a data reduction and queuing problem, before discussing implementation options. In the second part of the lecture, the question of real time processing will be presented as a natural extension of the readout problem. This refers to digital processing of information as part of the data flow within the IC, carried out in a short enough time that it adds a negligible delay to the the time for moving data off-detector.