Customized turbulent flow fields generated by means of an active grid MICHAEL HOELLING, ForWind - Institute of Physics, University of Oldenburg, NICO REINKE, University of Oldenburg, ForWind, JOACHIM PEINKE, ForWind - Institute of Physics, University of Oldenburg — Wind tunnel experiments, which should clarify the interaction of wind energy converters and the ambient turbulent field, should be performed under realistic flow conditions. For the generation of realistic turbulent flow conditions we use an active grid. This grid allows for the generation of flows with high turbulence intensity and even to repeat those turbulent fields to a certain degree. Moreover, flow features are to a certain extent tuneable, e.g. velocity increments distributions or energy density spectrum, realized by individually controllable horizontal and vertical rotating axes, which are equipped with flaps. The rotation patterns of the axes over time are defined in an excitation protocol. The challenge is designing an excitation protocol, which generates a flow flied for a specific application. A general approach is still missing. Our approach allows estimating the flow features to given excitation protocols. The approach is based on the assumption that the flow field behind an active grid consists basically of different turbulent pulses, which belong to the excitation setting. Our approach gives a sequence of those pulses, which we call synthetic velocity time series, which is made on a computer.

Michael Hoelling
ForWind - Institute of Physics, University of Oldenburg