DOCTORAL CANDIDATE:	Yun Ai
DEGREE:	Philosophiae Doctor
FACULTY:	Faculty of Mathematics and Natural Sciences
DEPARTMENT:	Department of Informatics
AREA OF EXPERTISE:	Telecommunications
SUPERVISORS:	Michael Cheffena (NTNU), Josef Noll (UiO)
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The industry is experiencing an ongoing transformation of industry based on interconnected digital technologies, often called industry 4.0. There is no doubt that the Information and Communication Technologies (ICTs) and especially industrial Internet of Things (IIoTs) are going to play a vital role in this transformation. Industrial communications, particularly the wireless industrial communications, will enable a lot of new possibilities for highly flexible and efficient automation solutions. The advantages of wireless communication imply that it is an important part of the IIoTs. However, the industrial environments have some particular characteristics which makes it radio-harsh for reliable transmission required by many industrial systems. Therefore, it is important to have good knowledge on the industrial propagation channels as well as the performance limits of communication systems operating in these propagation environments.

This PhD project on enabling technologies for industrial communications was mainly carried out in three parts. For the first part, extensive channel measurements in industrial facilities were firstly conducted and a simple but accurate approach to analyze indoor channel was proposed. In the second part, the research is mainly on the performance of cooperative communications, which is motivated by that fact that for industrial scenarios as well as other environments, where wireless sensor network (WSNs) or IoT solutions are going to be deployed, the large dimension of the propagation environment and reliable transmission of information often require the transmission to be done collaboratively. In the third part, we will focus on the performance analysis of PLC systems. It is clear that wireless communication cannot fit all requirements of the industrial communications or IIoTs. Thus, we might conclude that the wired communication is still very likely going to be an essential enabling technology for future industrial communication solutions in addition to the wireless systems.