

## Spatial Correlation of Channel State Information in Real Long Range Measurement

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**Abstract :** The Internet of Things (IoT) is developed to ensure monitoring and connectivity within different applications. Thus, it is critical to study the channel propagation characteristics in Low Power Wide Area Network (LPWAN), especially Long Range Wide Area Network (LoRaWAN). In this paper, an in-depth investigation of the reciprocity between the uplink and downlink Channel State Information (CSI) is done by performing an outdoor measurement campaign in the area of Campus Beaulieu in Rennes. At each different location, the CSI reciprocity is quantified using the Pearson Correlation Coefficient (PCC) which shows a very high linear correlation between the uplink and downlink CSI. This reciprocity feature could be utilized for the physical layer security between the node and the gateway. On the other hand, most of the CSI shapes from different locations are highly uncorrelated from each other. Hence, it can be anticipated that this could achieve significant localization gain by utilizing the frequency hopping in the LoRa systems by getting access to a wider band.

**Keywords :** IoT, LPWAN, LoRa, effective signal power, onsite measurement

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