Outlook

Paper Decision Notification - ICSCST 2026 Paper ID: 1866

From Microsoft CMT <noreply@msr-cmt.org>
Date Thu 4/23/2026 9:34 PM
To Heerok Banerjee <Heerok.Banerjee@iem.edu.in>

Dear Heerok,

Greetings from the ICSCST 2026 Organizing Committee.

We are pleased to inform you that your paper titled "Experimental Evaluation of LoRa SF7 Signal Propagation in a Multi-Floor Urban Environment" (Submission ID: 1866) has been **Accepted** for presentation in the International Conference on Smart Communication and Sustainable Technologies to be held from 18/06/2026 to 20/06/2026. You are cordially invited to come to Saintgits College of Engineering (Autonomous) Kottayam, Keralam, India to present your paper.

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Experimental Evaluation of LoRa SF7 Signal Propagation in a Multi-Floor Urban Environment

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***Abstract*—The advent of Low-Power Wide Area Networking (LPWAN) technologies yields promising prospects in terms of long-range low-power radio communication. As such, beyond 1 km communication under heavily optimized path cost and energy efficiency has become the need of the hour. This paper presents an experimental evaluation of LoRa communication performance using spreading factor 7 (SF7) in a dense urban multi-floor environment with the intent to address long-range vertical communication. RSSI and SNR measurements were collected at multiple receiver locations ranging from ground level to the ninth floor of a neighboring building, while the transmitter remained fixed indoors. Box plot analysis was employed to study signal strength variability and link stability across different heights. The results show that lower and mid-height floors provide significantly better link quality compared to higher floors, despite similar horizontal separation. These findings highlight the impact of building penetration, Fresnel zone obstruction, and multipath fading on LoRa performance at SF7.**

***Index Terms*—IoT, LoRa, LPWANs, signal propagation, RSSI, SNR, Spreading Factor 7(SF7)**

I. Introduction

Low-Power Wide Area Network (LPWAN) technologies have become a key enabler for large-scale Internet of Things (IoT) [1], [2]. Among the leading technologies, LoRa (Long Range) has emerged as one of the most distinctive high-coverage communication technologies with low energy consumption. LoRa has gained significant attention for IoT applications such as smart buildings, environmental monitoring, and urban sensing. Due to LoRA's inherent long-distance propagation properties, several emperical studies have previously emphasized on high spreading factors (SF10-SF12) to ensure maximum reach from the transmitter to the receiver, covering a wide range of distances between them. In contrast, a lower spreading factor, such as SF7, offers higher data rates and reduced transmission time, making it ideal for applications that require low latency and high reliability.Most existing work either evaluates higher spreading factors for maximum range, or tests mixed SF configurations without examining any single spreading factor in depth. This paper addresses a critical gap by providing a dedicated experimental evaluation of SF7 performance between two adjacent buildings, where diagonal propagation paths penetrate multiple reinforced concrete slabs and brick walls across nine floors, giving rise to cumulative attenuation and multipath fading,understanding how signal quality varies with receiver elevation for reliable network planning [3]. By isolating SF7 varying only the receiver elevation, this study generates floor-level RSSI and SNR baselines that are directly applicable to the design of latency-sensitive, high-data-rate indoor IoT systems, a practical need that existing higher-SF studies do not serve. Additionally, a key challenge of Higher-SF deployments has been the tradeoff between energy footprint and latency/datarate. Higher-SF provides penetrability at the cost of energy consumption and huge delay due to increased Time-on-Air. On the other hand, Lower-SF bands like SF7 offer energy efficiency and lower latency. However, the reliability of SF7 bands in complexly dense, multi-floor indoor environments has been poorly explored till now.Our study aims to bridge this gap by measuring the Received Signal Strength Indicator (RSSI) and the Signal-to-Noise Ratio (SNR) across various floor levels. By analysing RSSI and SNR values collected at various receiver heights and distances, this work provides a baseline for designing LoRa-based building management systems using SF7.

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II. Background and Related Works

Research on the LoRa signal has evolved alongside the expansion of IoT applications from wide-area outdoor sensing to dense indoor and smart building deployments. Earlier, experiments were conducted by R. Muppala, Abhinav Navnit, Surya Poondla and Aftab M. Hussain [4] investigating long-range outdoor LoRa propagation models. As such, early experimental studies primarily focused on demonstrating the long-range communication capabilities of LoRa in open environments, where communication distances of several kilometres can be achieved under favourable conditions. Although these works established LoRa as a viable LPWAN technology, their assumptions are often insufficient for describing signal behaviour inside complex building structures. Comprehensive analyses of LoRaWAN performance have shown that indoor environments significantly affect RSSI and SNR due to structural attenuation and interference, often requiring higher spreading factors for reliable communication [5]. The work of Honghong Chen et al. [6] on indoor multi-floor positioning using LoRa provided useful insights into signal behaviour across building floors.

The advantages of LoRa over existing technologies in IoT were previously discussed by Shilpa Devalal and A.Karthikeyan [7]. IoT systems increasingly move indoors, provides practical insight into the challenges of deploying LoRa networks in smart buildings and urban indoor environments. The findings contribute experimental evidence that can support more informed design decisions for indoor IoT systems requiring energy efficiency and reliable connectivity under low-power conditions. Beyond the immediate findings, this study opens up a compelling direction for future work. One environment where reliable wireless communication is critically needed but yet remains largely unsolved, is underground mining. Workers operating deep underground often have no dependable communication link to the surface, which becomes a direct life-safety concern during emergencies such as gas leaks, tunnel collapses, or fires. Establishing robust underground communication has been identified as one of the grand challenges in IoT research, given the extreme physical constraints imposed by depth, material density, and the complete absence of conventional network infrastructure. A key observation that makes this extension particularly natural is that a multi-floor reinforced concrete building closely resembles a layered underground environment in its propagation characteristics; concrete floor slabs attenuate radio signals in a manner closely comparable to layered rock strata, while elevator shafts and stairwells bear strong resemblance to mine shafts in terms of how they guide or obstruct signal propagation. This parallel suggests that controlled indoor multi-floor experiments represent a valid and reproducible methodology for approximating underground propagation behaviour, without the significant logistical constraints of deploying equipment in an actual mine [18]. The results of this study lend direct weight to this argument. The demonstrated ability of LoRa SF7 to maintain a measurable communication link across nine floors of dense reinforced concrete with accumulating penetration losses through multiple structural slabs, brick walls, and internal obstructions certainly provides a quantifiable basis for claiming its potential applicability in underground environments. Nine floors of urban construction represent a substantial barrier, and sustaining SF7 connectivity through such a structure makes a strong case that comparable performance could be achieved at equivalent depths underground [19]. Future deployments could pair LoRa nodes with sensors monitoring gas concentrations [20], temperature anomalies, or ground vibration, forming the basis of a lightweight, infrastructure-independent safety network capable of delivering real-time hazard alerts to both underground workers and surface control teams.

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