





GOALS

Through EXpLoRa experiment, we analyzed the performance of LoRa products under realistic conditions, by employing three F4Fp testbeds:

- NITOS city-wide LoRa testbed
 - 13 LoRa devices scattered in a city scale environment
- NITOS isolated indoor testbed
 - 4 LoRa devices scattered under controlled interference
- NITOS office indoor testbed
 - 8 + 8 LoRa devices in typical energy metering conditions

CHALLENGES

LoRa performance under key configurations has not been investigated in detail:

- high obstruction density, such as cities with tall buildings and NLOS conditions
- congested and rich interference conditions
 - multiple collocated nodes
 - overlapping LoRa transmissions
- representative application scenarios
 - energy metering within buildings

DEMO SETUP





NITOS city-wide LoRa testbed

LoRa Experimental Settings

- 10 LoRa Transmission modes • BW, SF, Data Rate
- 8 channels (862.5 868 MHz)
- 3 TX Power levels • 0,7,14 dBm
- configurable attenuators
- varying payload (10-250B)



NITOS isolated indoor testbed

NITOS office indoor testbed

Performance Analysis >200K LoRa

packets • RSSI range -75 to -137dBm



Key parameters

- Duty Cycle (Monitor node)
- PDR per node and TX power
- PDR per TX Mode
 - PDR vs RSSI





NITOS LoRa link quality evaluation framework



PDR across SF and channel overlap

PDR under jamming across floors

PDR in typical energy metering setups





2 floors 3 floors 6 floors 1 floor



Activated mechanism

LoRa TX Mode

CONCLUSIONS

POST MORTEM

Key LoRa findings

• sufficient PDR even at low RSSI conditions(-137 dBm) and high interference (DC=1)

- SF isolation performs better than channel isolation for interference mitigation
- CSMA is a must extension for LoRa clients providing great performance improvement for simultaneously activated and collocated links
- LoRa is ideal both for city-scale and and intra-building energy metering applications

Further plans

- pilot the LoRa-based solution in customer setups
 - integrate LoRa with other domX solutions
- deploy own LoRa GWs to cover customer needs
- develop new business model and services on top of the prototype • exploit results in relevant H2020 research projects of the energy efficiency domain

