

LTE450 trial in Germany: Recent experiences and outlook on future use cases

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in cooperation with

X450connect

ERICSSON

VDE FNN Position Paper – February 2019

450 MHz Network for Critical Infrastructure in the Energy Sector





... to maintain the supervision and control of the energy grids in the event of a blackout

... to ensure mobile voice communication in the event of disruptions and crisis situations

... to allow the connection and network integration of decentralized energy generation, storage facilities and loads

... to improve the availability of network-related telecommunications services in rural areas and in buildings

..... to offer synergies and economies of scale for the optimal use of the frequency range for smart meter and charging

Forum Netztechnik/Netzbetrieb im VDI

LTE 450 Mhz PoC background and targets

Our major Use Cases for LTE 450MHz – Voice and Data



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innogy LTE 450 MHz PoC – Test Setup

E2E Test Setup for innogy Voice and Data Use Cases



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PoC Test Results

Network Coverage – Drive Tests Results

- Drive tests to measure and assess the coverage and quality of the LTE 450 radio network
- The car equipped with test devices recorded over 300 million RSRP values on a distance of approximately 400 kilometers
- Measured values have been averaged using grid areas of 25m x 25m resulting in about 14,000 values
- The greatest distance towards one of the two radio locations was around 27 km
- Measured RSRP values were on average 3 dB higher than the values predicted in the radio propagation model
- Pending: Further indoor measurements to prove impact of building materials on radio propagation for 450 MHz









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PoC Test Results

innogy Use Cases Voice – Test Results



- Result with Jabber client: 4.3
- Result with PTT client: 3.9
- Overall good to very good voice quality and high stability
- Traffic prioritization under high load successfully tested
- PTT devices require improvements in stability and usability

MOS	Quality	Effort required to understand
5	Excellent	Complete relaxation possible; no effort required
4	Good	Attention necessary; no appreciable effort required
3	Fair	Moderate effort required
2	Poor	Considerable effort required
1	Bad	No meaning understood with any feasible effort
Sprachqualität nach ITU-T Mean Opinion Score vs. Signalstärke in dBm		-T Mean Opinion Score RSRP (dBm) >-95 -96105 -106115 316 125
		eke in dBm Mean ● Opinion 4,7 3,6 1,75 Score
		Voice quality MOS



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innogy Use Cases Data – Test Results

- Secure file transfer e2e throughput in line with expectations using 1.4 MHz band up to 3.8 Mbit/s in download and 2.1 Mbit/s in upload
- Experienced high stability in data transfer both with stationary indoor and mobile use (including handover scenarios outdoor and in-car)
- Connectivity of smart grid device using IEC-104 protocol over LTE 450 successfully verified
 - E.g. 5 days connected, 46k messages, zero errors
- Connectivity of smart meter gateways over LTE 450 successfully verified
 - SMGW standard test cases applied (e.g. user profile setup, transfer of measurement data, operational logs)







Future Outlook

Future use cases enable smart infrastructures for electricity, gas, water and heat





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Summary

 LTE 450 MHz is well suited for dedicated mobile networks for critical infrastructures in the utility world

- Proof of Concept includes configuration / commissioning
- Several options for voice and data transfer have been tested successfully

- Our use cases for LTE 450 voice and data services have been demonstrated
- Tests are based on "real world" scenarios
- Waiting for regulatory decision on future frequency use in Germany
- Further scenarios under investigation (e.g. CAT-M1, use case UAV control)

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