



5G and beyond

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Ongoing Collaboration between US and Finland

www.wifi.us.org

Around 30 funded projects since 2012

The screenshot shows the website for 'Wi-Fi US: Wireless Innovation between Finland and US'. The navigation menu includes Home, Organization, Ongoing Projects (highlighted), Earlier Projects, Funding, Contact, Members' Area, PI Meeting 2018, and Summer School 2018. Logos for the University of Illinois, Tekes, and the Academy of Finland are displayed. A search bar is present with the text 'Type here to search'. The 'Projects 2017-2019' section lists ten projects, and the 'People' section lists ten names.

Projects 2017-2019

- [Ambient Re-Scatter Inspired Machine Type Communications for Heterogeneous IoT Systems](#)
- [Efficient and Robust Cognitive IoT Systems using Unreliable Sensors: Fundamental Limits and Practical Strategies](#)
- [Internet of Cognitive Things for Personalised Healthcare](#)
- [Low Overhead Wireless Access Solutions for Massive and Dynamic IoT Connectivity](#)
- [Millimeter Wave-based Wearable Networks in High-end IoT Applications](#)
- [Scalable Edge Architecture for Massive Location-Aware Heterogeneous IoT Systems](#)
- [Secure Inference in the Internet of Things](#)
- [Securing Lifecycle of Internet-of-Things](#)
- [Ultra-low Latency and High Reliability for Wireless IoT](#)

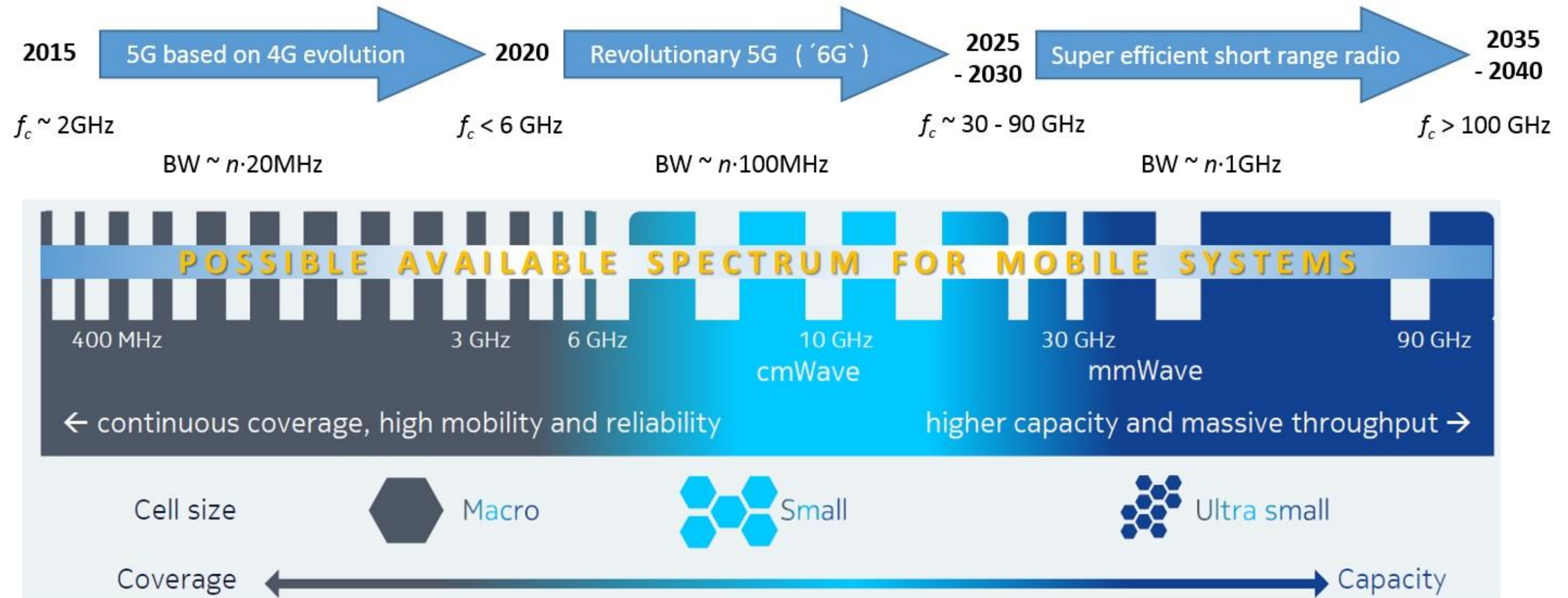
People

- [Asokan, N](#)
- [Ailisto, Heikki](#)
- [Berry, Randall](#)
- [Blum, Rick S.](#)
- [Ding, Zhi](#)
- [Dutt, Nikil D.](#)
- [Galinina, Olga](#)
- [Glisic, Savo](#)
- [Grover, Pulkit](#)
- [Heath, Robert W.](#)

In 2013-2017 CWC's researchers have produced in total 211 joint publications with colleagues from 45 universities and research institutes in US reaching a citation count of 2 037.

Challenge #1: Communications Towards THz Spectrum

Our guess made in 2015:



Challenge #2: Distributed Intelligence

Ericsson white paper
GFMC-18:000260
June 2018



Artificial intelligence and machine learning in next-generation systems

Due to highly dynamic nature of wireless systems, intelligence at the edge of network is essential to realize autonomous vertical applications.

Research challenges:

- Real-time intelligence
- Distributed and decentralized intelligence
- Machine learning & machine reasoning
- Human-machine interaction
- Safety, security and trust

5G, the next generation of mobile communication, will play a similar role in the evolution of digitalizing industries as cloud technologies have for the web industry. The ability to automate and leverage on data from distributed systems with real-time capabilities will be critical. Based on insights about future 5G systems and developments in manufacturing and ITS automation, this white paper reflects on the technical challenges the R&D community needs to address in order for ICT providers and other industry players to be able to fully capitalize on the potential of artificial intelligence (AI) and machine learning.



Genesis

6G Enabled Smart Society and Ecosystem
Finnish Flagship on Wireless Communications
for 2018-2026; volume 251M€



www.oulu.fi/

#6Genesis @LatvaMatti



www.6genesis.org

Wireless Connectivity

Ultra-reliable low-latency communications



Unmanned processes

Distributed Computing

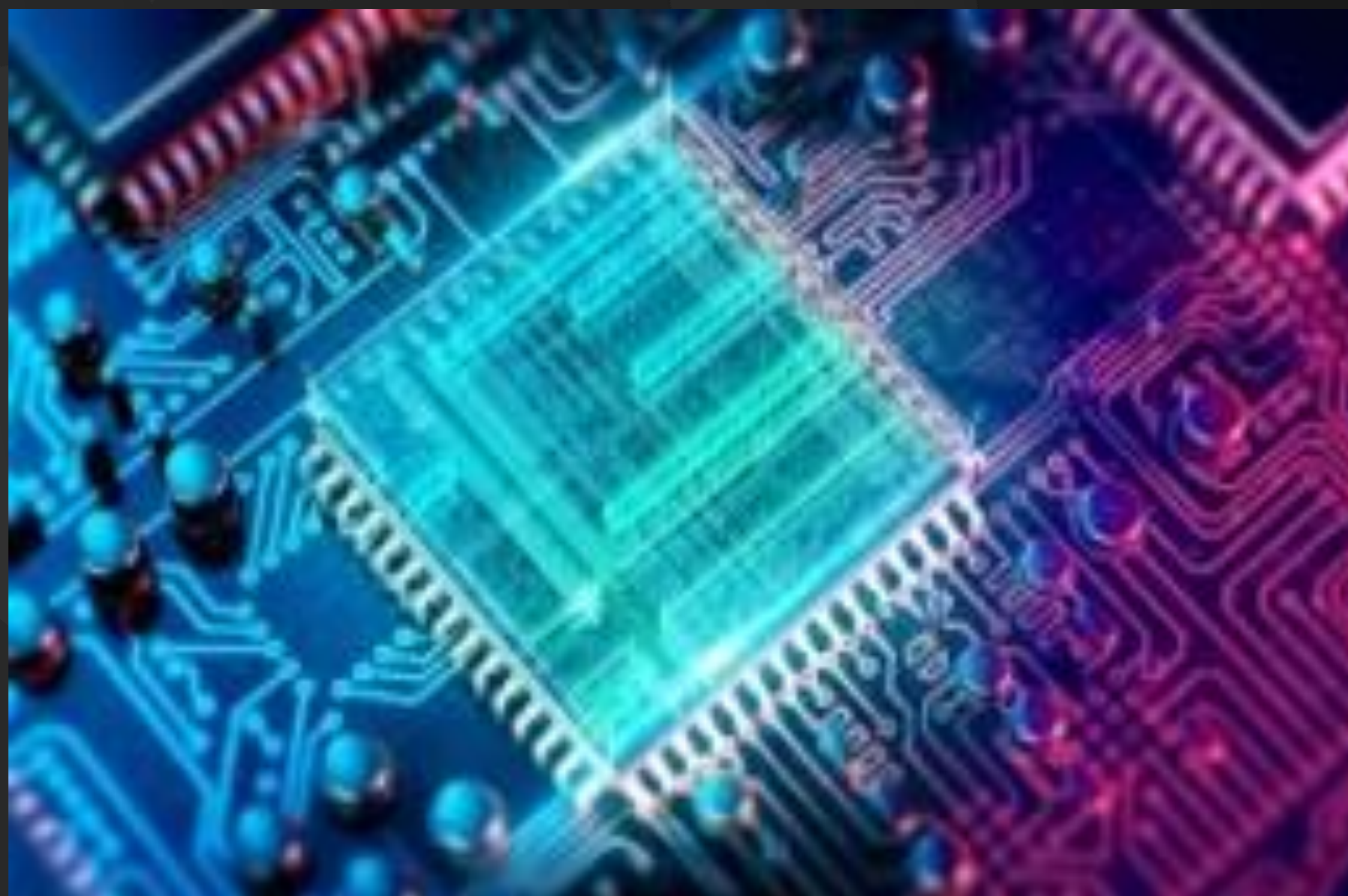
Mobile edge intelligence



Time critical & trusted applications

Devices & Circuit Technology

THz communications materials & circuits



Unlimited connectivity

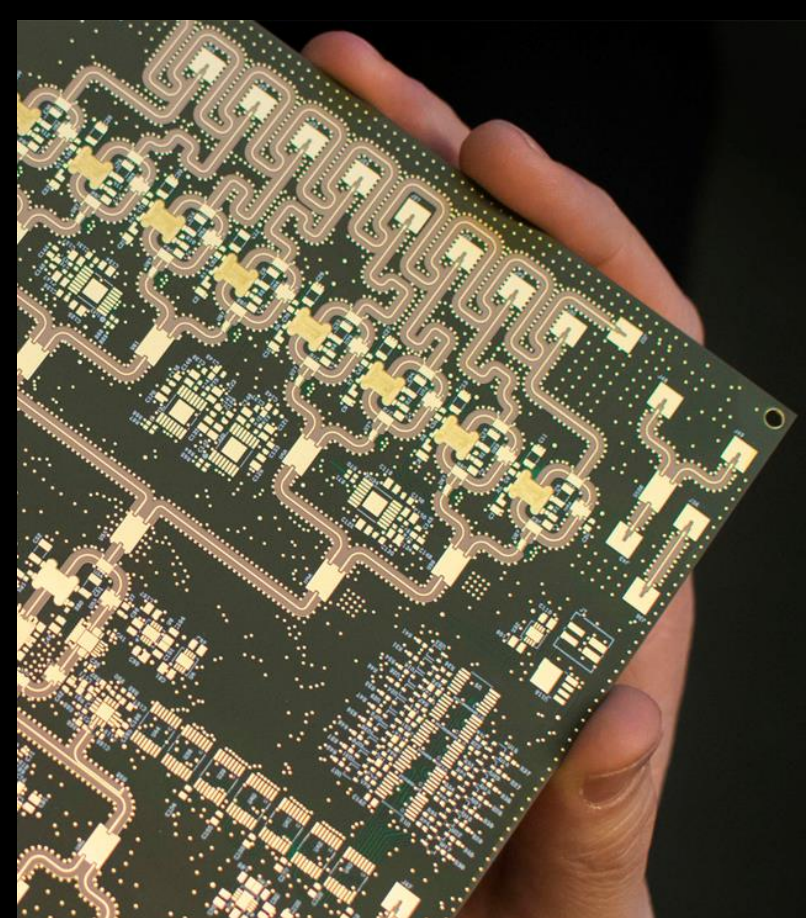
Services and Applications

Multidisciplinary research accross verticals



Disruptive value networks

- Open test network for co-creation (<https://5gtn.fi>).
- Main parts located in Oulu & Helsinki regions.
- Was used in EU-Korea demos at 2018 Winter Olympic Games (<http://www.oulu.fi/cwc/node/50700>).
- Operator grade live network with plugged in 5G prototype radios.
- Near future targets: become the first operational local micro-operator at University of Oulu Digital Campus.



800 MHz @26/28 GHz
10 Gbps
Hybrid beamformer



5G PoC



IoT sensors



LTE Macros
with NB IoT



LTE small cell
@3.5GHz



5G-TN SIM