



Genesis

6G Enabled Smart Society and Ecosystem

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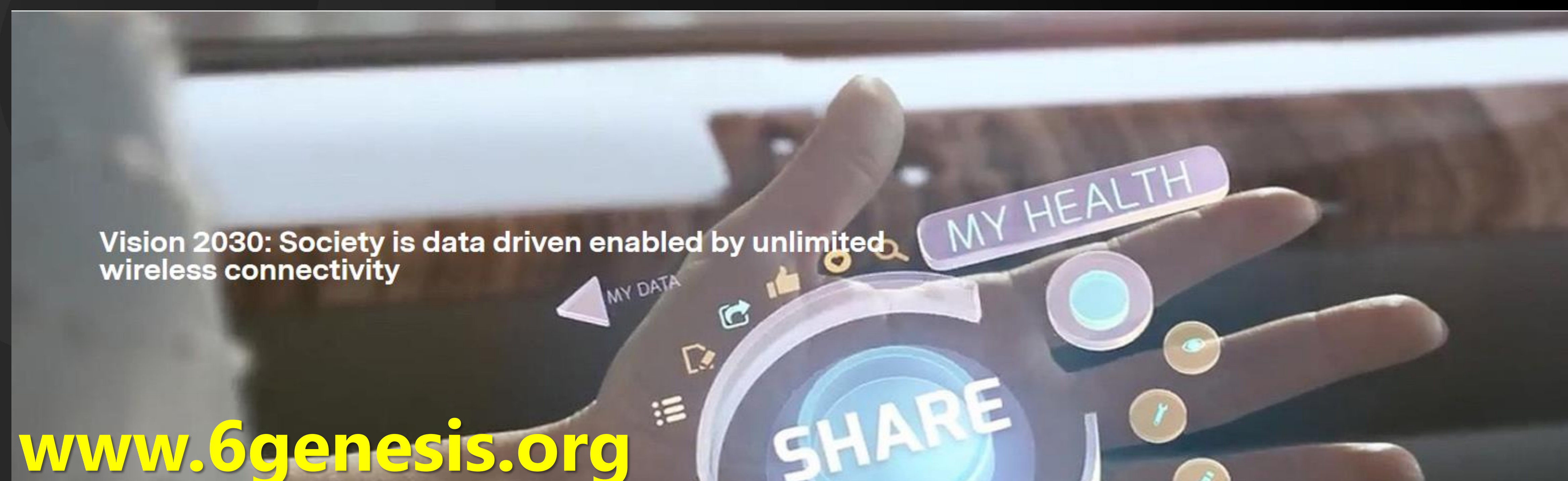


www.oulu.fi/



university/6gflagship

- National Flagship for 2018-2026
- 6G Enabled Wireless Smart Society & Ecosystem (6Genesis); est. volume 251M€.
- Operated by UOulu, in collaboration with: Nokia, VTT, Aalto University, BusinessOulu, Oulu University of Applied Sciences.
- Flagship Director: Prof. Matti Latva-aho (matti.latva-aho@oulu.fi)



RESEARCH AREAS:

Wireless Connectivity

6G Waveforms towards Tbps regime



Unmanned processes

Devices & Circuit Technology

THz communications materials & circuits



Unlimited connectivity

Distiributed Computing

Ubiquitous mobile edge intelligence



Time critical & trusted applications

Services and Applications

Multidisciplinary research accross verticals



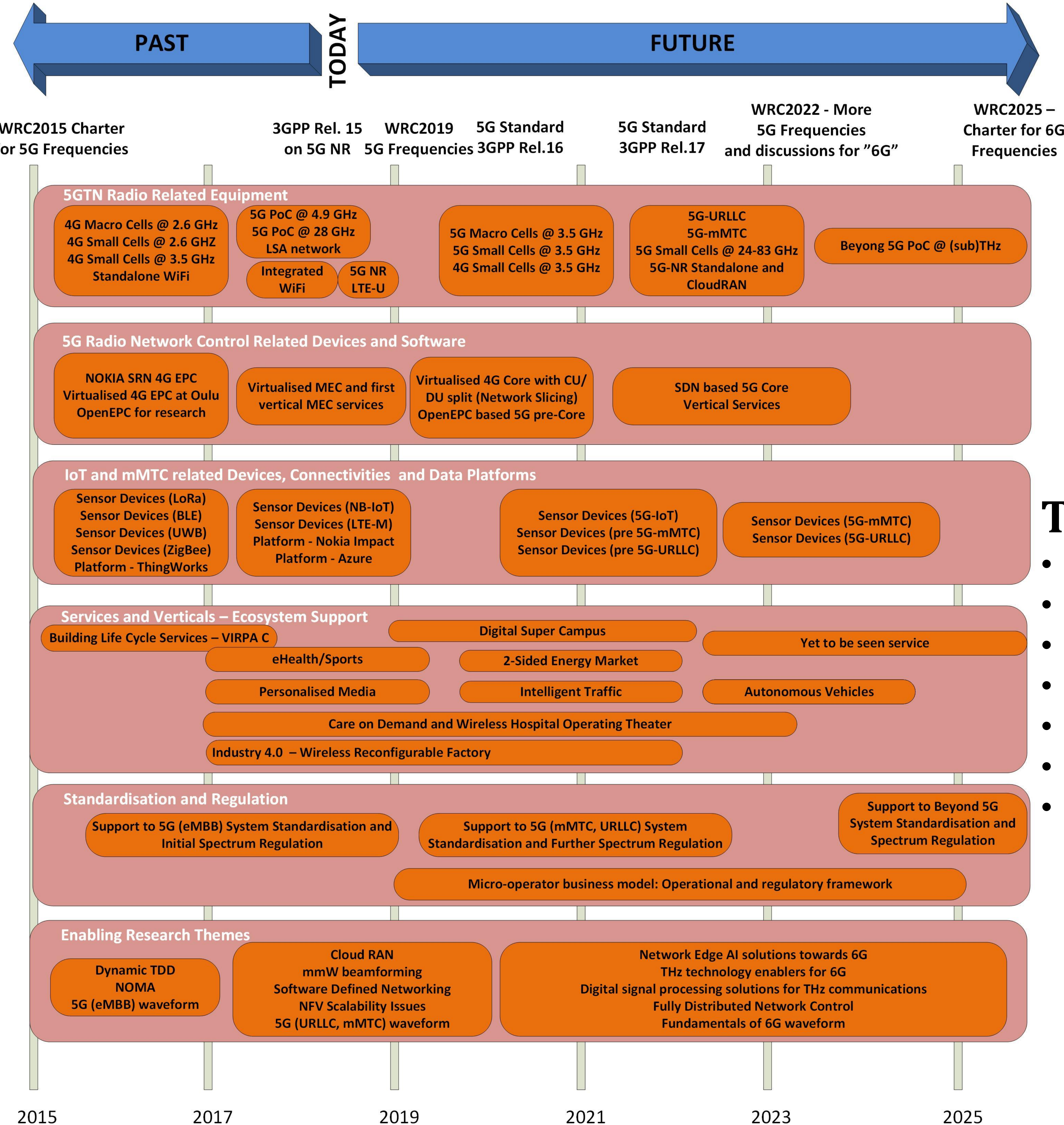
Disruptive value networks



5G Test Network

Next Steps - Roadmap

www.5gtn.fi



Roadmap 2018-2025

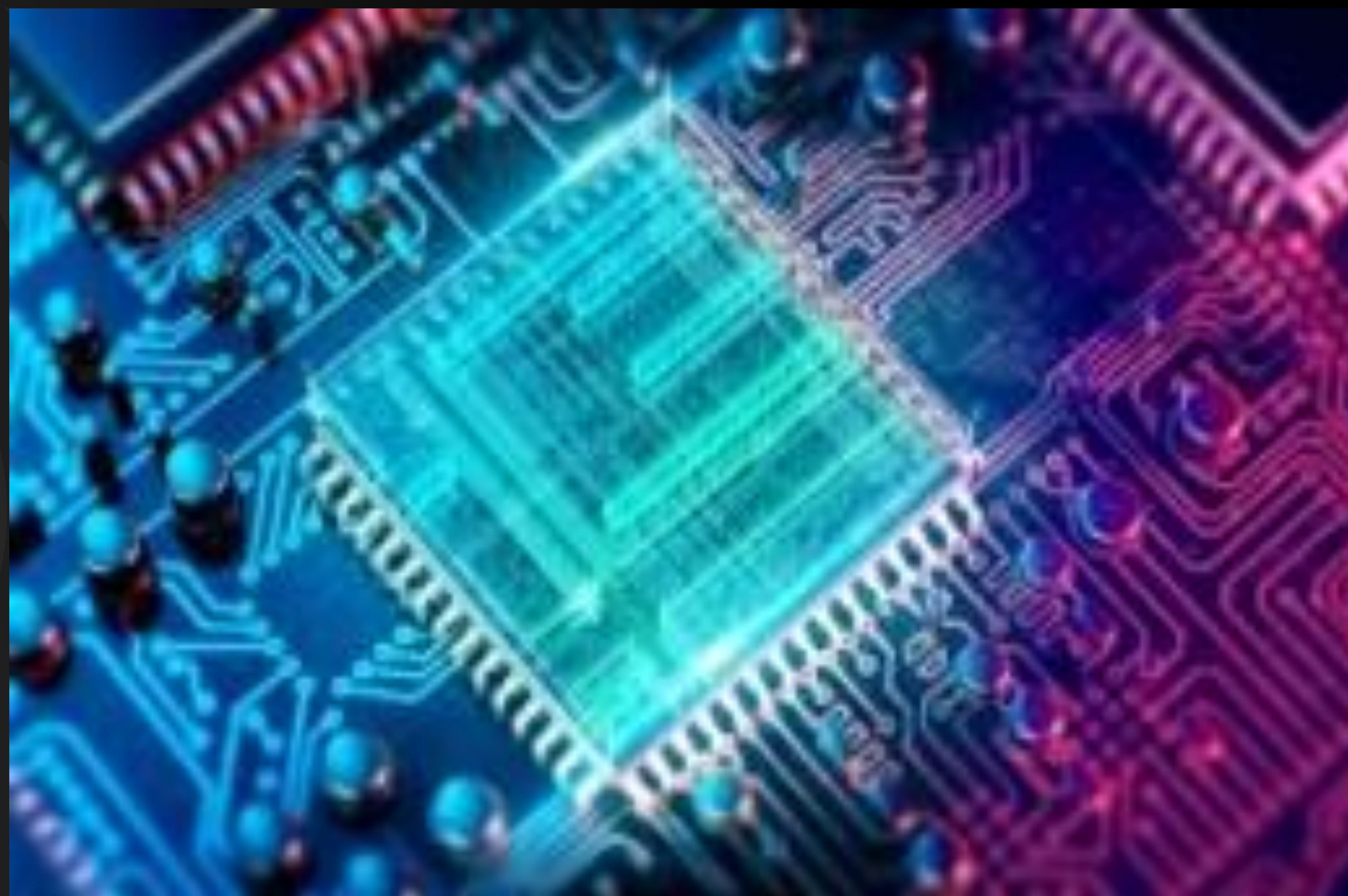
From 5GTN to 6GTN

Tools for Deployment

- 6Genesis
- BF 5th Gear Programme
- Allied ICT Finland
- H2020 5G-PPP
- Regional Development Funds
- Collaboration NSF/PAWR
- AoF FIRI / ESFRI

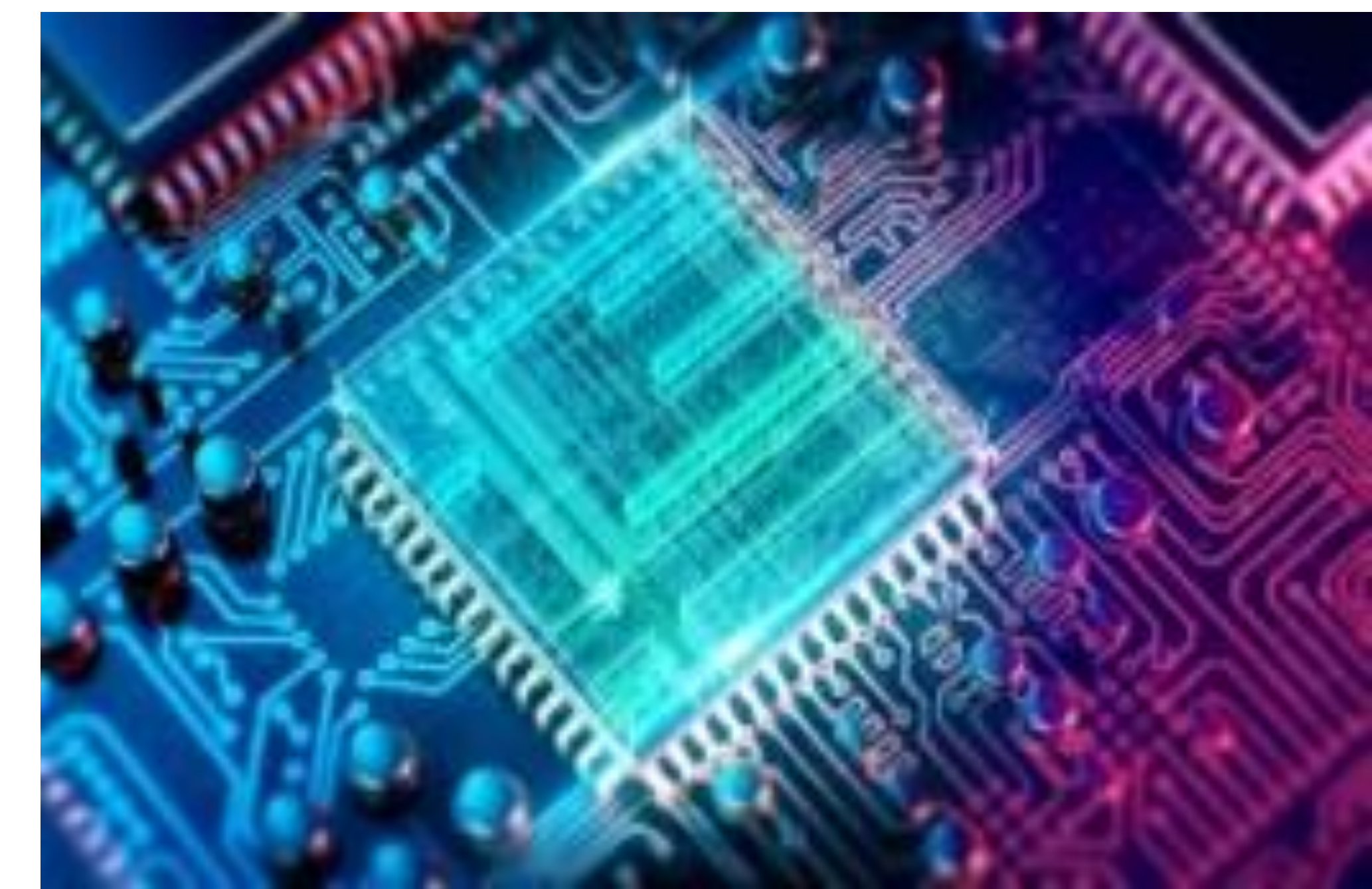
Devices & Circuit Technology

THz communications materials & circuits

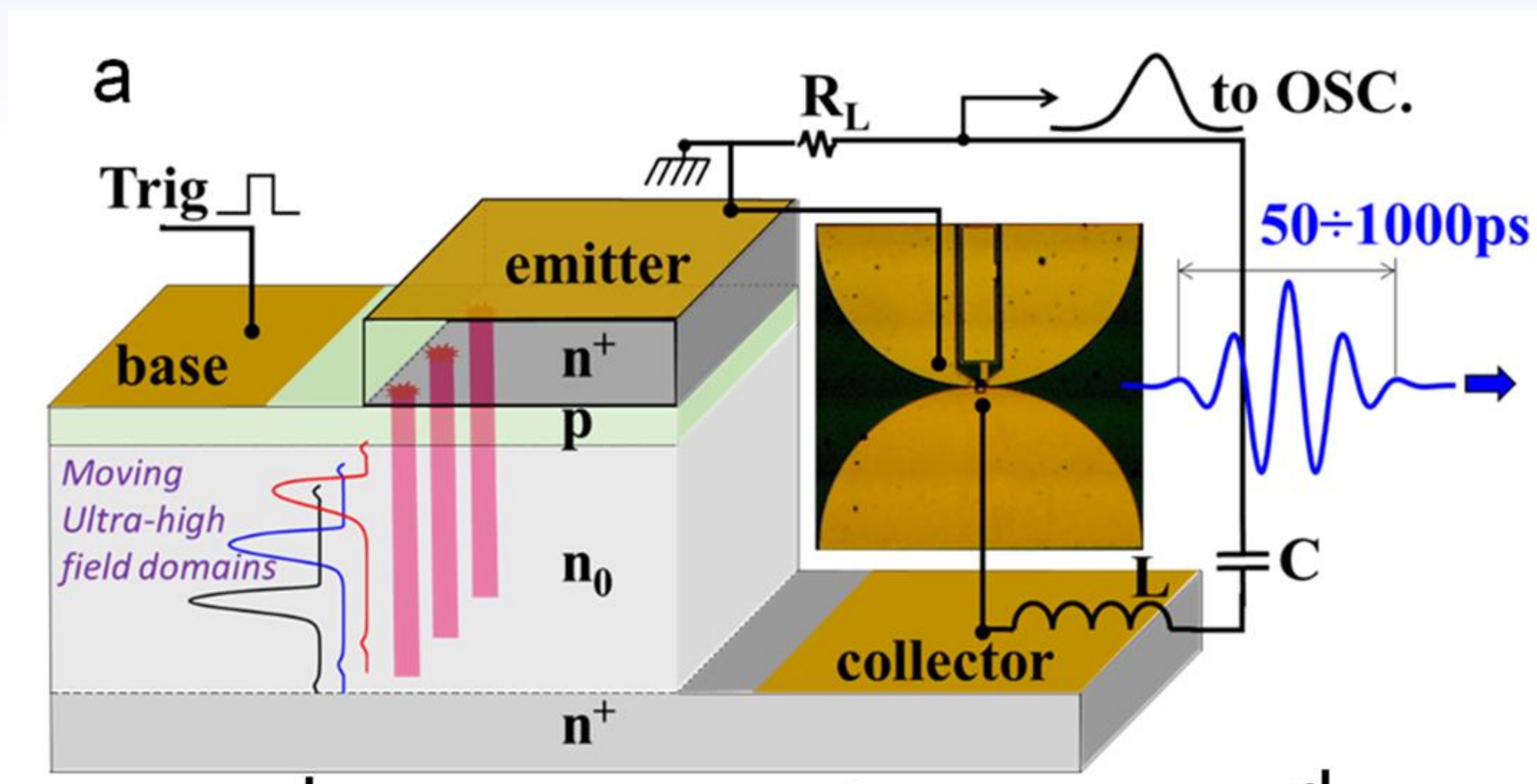


Unlimited
connectivity

- **Focus in HW technologies is on key enabling technologies for 6G from materials to transceivers and sensing at THz range (0.1THz onwards)**
- **Approach from systems to HW and back**
- **Key challenges:**
 - Affordable technology-power-performance trade-off
 - Silicon based transceiver design from blocks to systems
 - Integration, scalability and performance of arrays including challenge of wideband modulation
 - New enabling technologies beyond IC core
- **Build on the top of 5G experience, investing in THz lab**



- **Miniature ps-pulsed sub-THz source for all-electronic TDI with sub-ps precision**
 - Source: $\sim \mu\text{m}$ size combined with on-chip antenna of sub-mm size
 - Currently 110-200GHz/1mW; aiming at up to 500GHz multi-mW
 - Operating principle: recently discovered collapsing-field-domain (CFD) phenomenon using GaAs-based bipolar structures
 - Application examples: transmission imaging for industrial non-destructive tests, security, drug detection, biomedical (cancer detection), looking through the walls



Comparison of classical Gunn domain and CFD in low-voltage ($< 25\text{V}$, sub- μm) GaAs BJT

