

Chips for 6G:

What could we expect at least 5 years ahead?

Mohand Achouche

EF ECS 2022, Amsterdam
25-11-2022

What is 6G?

What the crowd-sourced crystal ball tells us ?

What will be the defining new application for the 6G Era?

Immersive experience/XR	27%
Digital-physical fusion	25%
Autonomous vehicles	25%
Co-bots & AI agents	23%

782 votes

New experiences...

Which of the below will be one of the defining new technologies for 6G?

AI-based networking	51%
Cloud-native architecture	24%
Satellite	13%
New spectrum radio	12%

3,119 votes

...over native-AI networks

What do you think will be the most important KPI for 6G networks?

Security and trust	34%
Latency & reliability	29%
Energy Efficiency	20%
Throughput & capacity	17%

3,126 votes

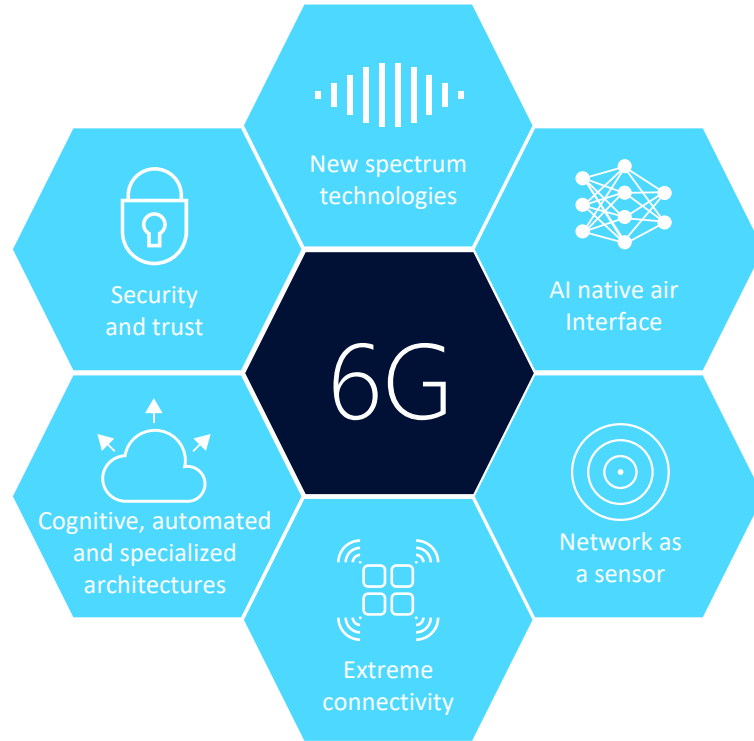
...which are safe and trustful

Nokia Bell Labs 6G vision, since 2019:

- Digital-physical fusion will liberate human potential in the 6G Era
- Powered by native-AI networks and applications
- In a (quantum) safe and trusted way

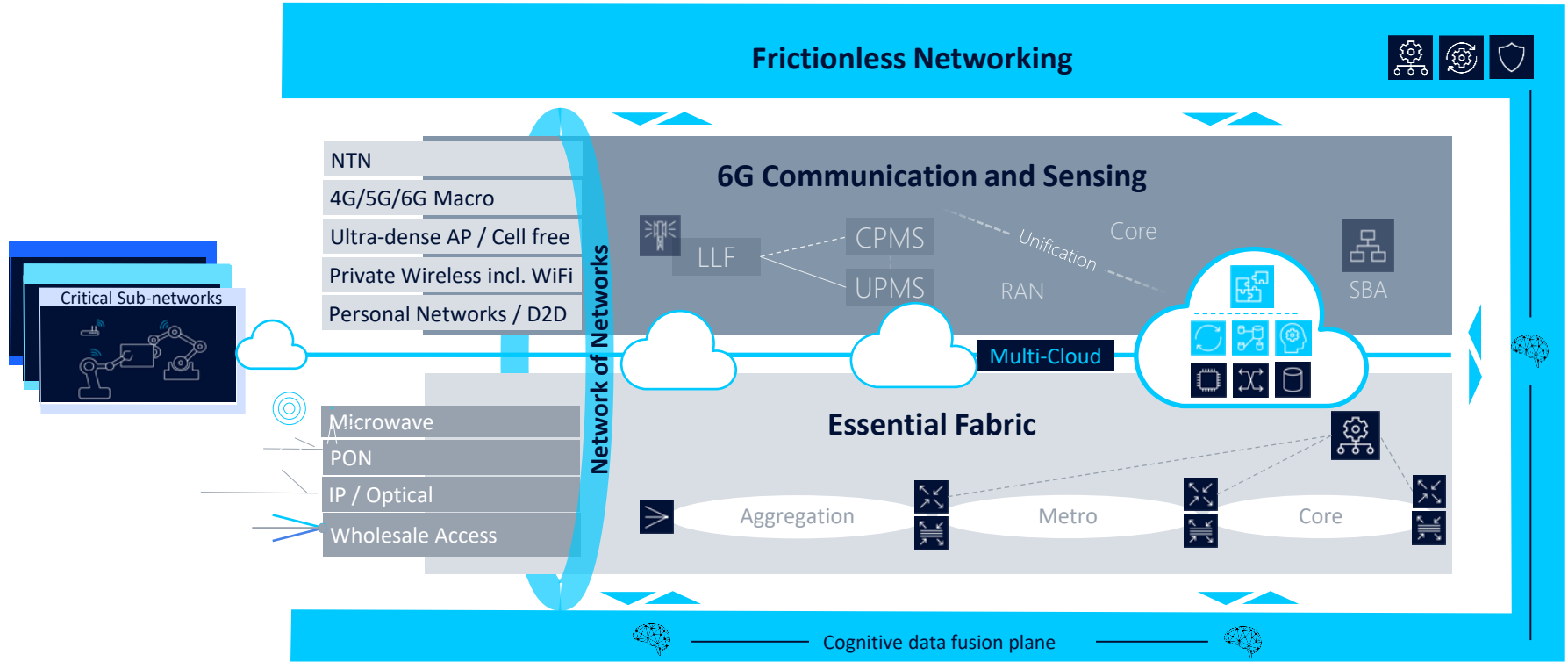
Bringing future to live

Six key technology areas for the 6G essential infrastructure



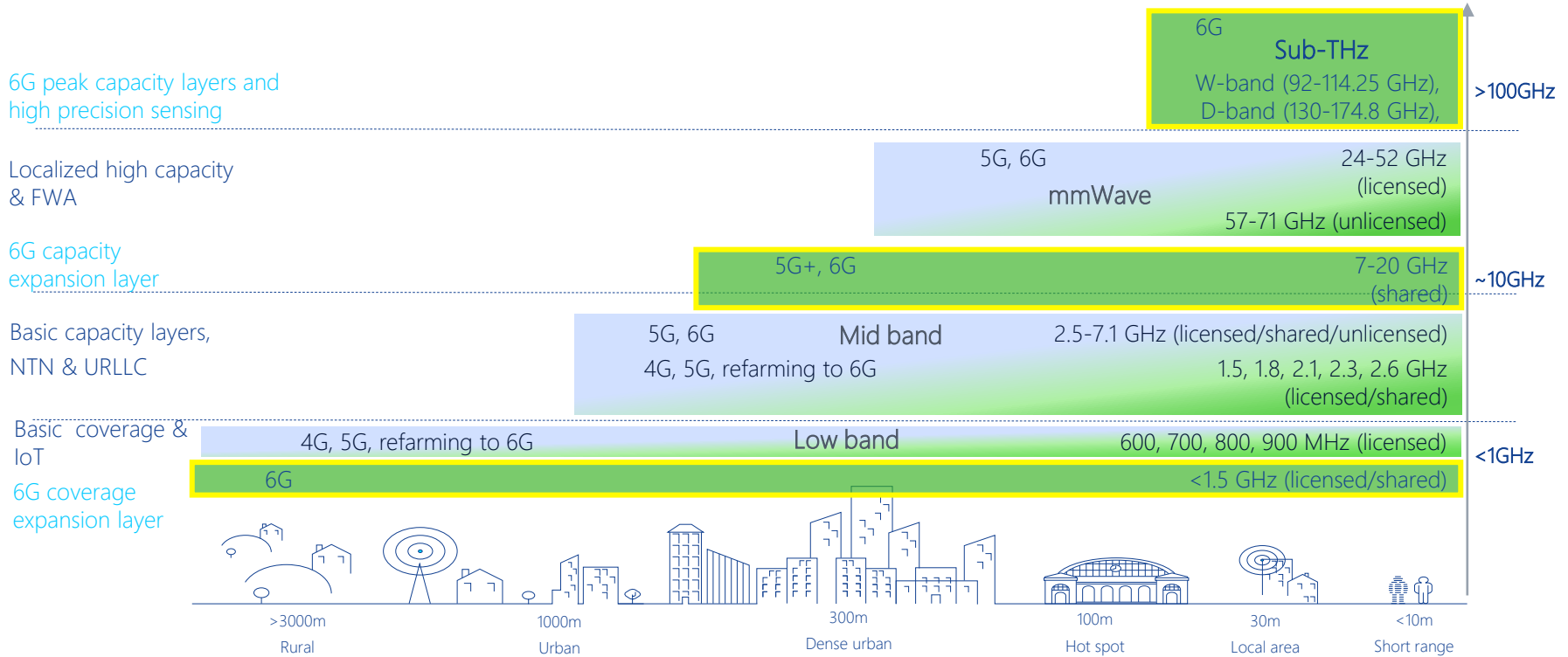
Wireless/Optical convergence in the context of 6G

The architectural view of future networks in 2030



6G new spectrum technologies

Band options for a new generation



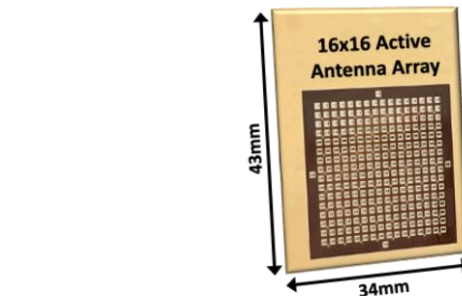
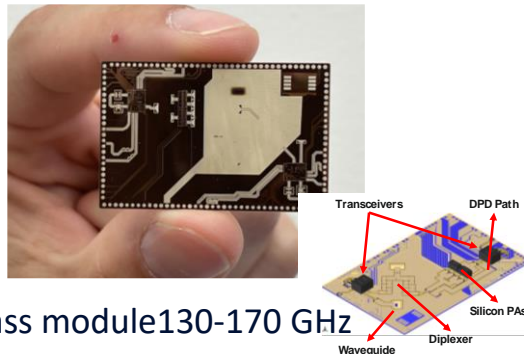
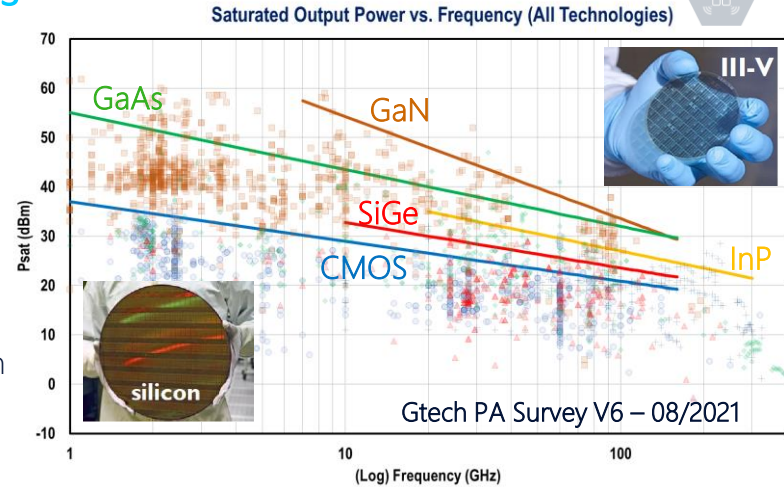
6G new spectrum technologies

... And there is still exciting research in wireless



Analog and Mixed Signal Circuits

- Analog circuits **do not follow Moore's scaling laws** for size, DC power or performance.
- The analog industry has seen **strong consolidation** and a trend towards **higher integration** of functions especially in consumer applications
- Use of **III-V technologies** (GaN, GaAs and InP) enables higher frequency operation, lower noise and higher output power and efficiency for PA's
- Future trend is monolithic or wafer-scale integration of III-V devices with scaled CMOS (**InP & GaN on Si**) enabling optimal analog-digital SoC's



Solving the Extreme Connectivity equation

Flexibility and Low Power

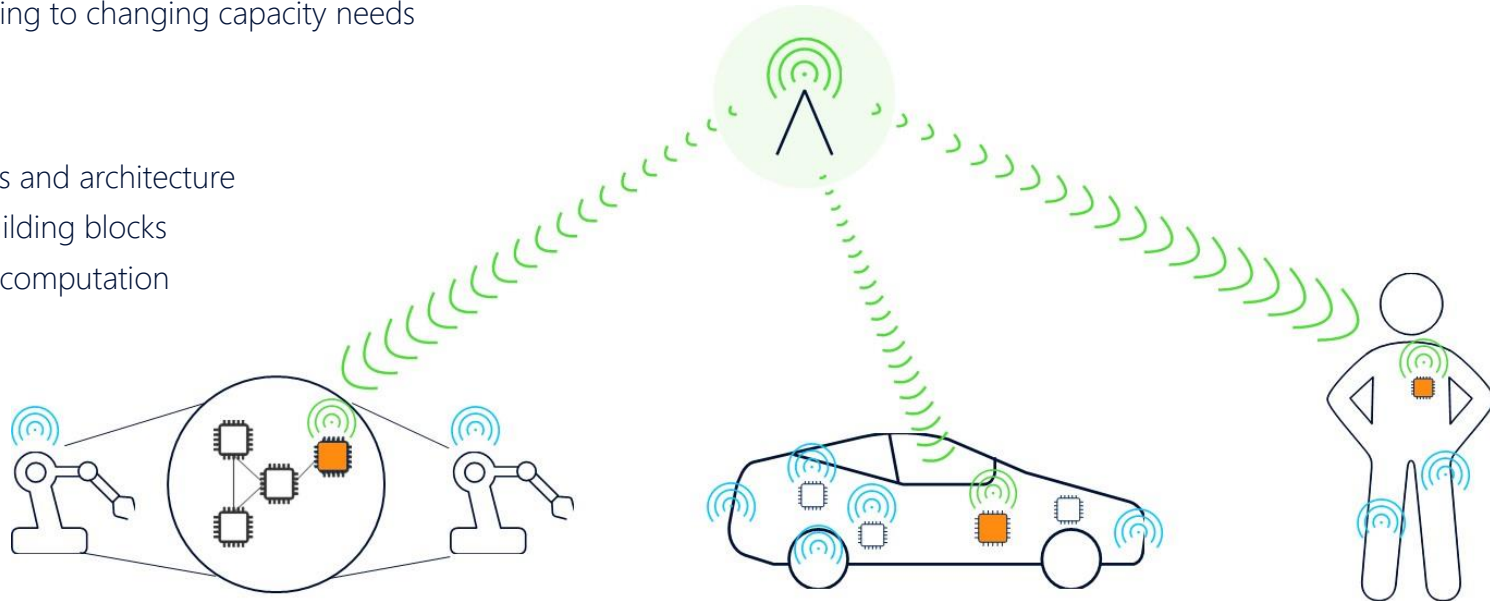


Processor-based approach - ASIPs

- Programmable accelerator IP – adapting to changing standards
- Baseband functions – adapting to changing algorithms
- Scalable SoC – adapting to changing capacity needs

Enabling technologies

- Memory technologies and architecture
- Low-power digital building blocks
- Analog-mixed signal computation



6G: Access, Sensing and Intelligence at Scale

Disruptive Chips to unleash all the potential



Consumers and home



Enterprises



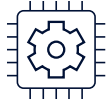
- Baseband and radio digital IP
- PON line termination
- Machine learning



- Switching and routing
- Optics DSP



Sovereignty and Supply chain



Chips shortage revealed a fragile supply chain

The long-term success of European digital industry will depend on how Europe can secure its presence in the overall value chain

- EU's capability to capture its strengths on digital infrastructure and industry verticals
- Catalyse research, and innovate in the microelectronics/Photonics domains
- Eventually build a full strategic value chain

However, European digital autonomy does not mean to control all elements of the entire value chain

- Focus on controlling essential parts by mastering advanced and competitive technologies including critical chips design capabilities to lower the cost and support growing the talent pipeline & skills
- Meanwhile ensuring mutual dependencies between different regions (trusted partners)

NOKIA