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TNO VIEW ON 6G

VISIONS FOR FUTURE COMMUNICATIONS SUMMIT

TOON NORP

TNO

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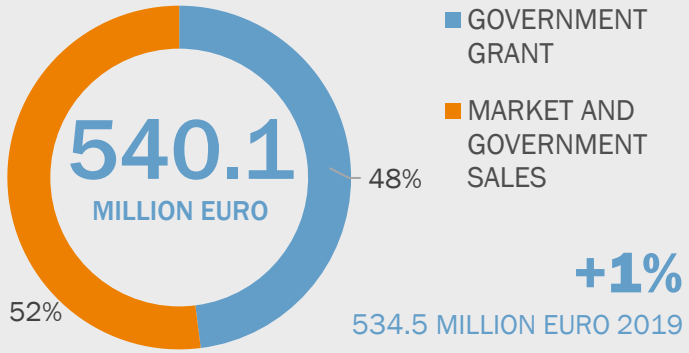
REVENUE ORGANISATION TNO (INCL. GOVERNMENT GRANT)



+1%

534.5 MILLION EURO 2019

NUMBER OF EMPLOYEES

3,562
TOTAL

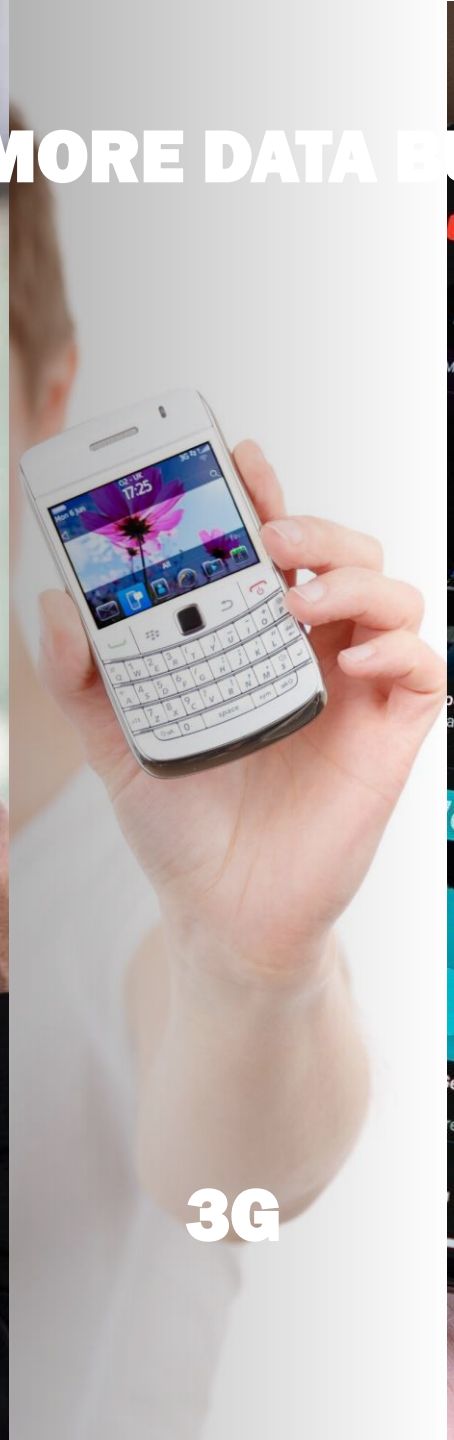
3,431 2019

- TNO is an independent research organisation in the Netherlands that focuses on applied science.

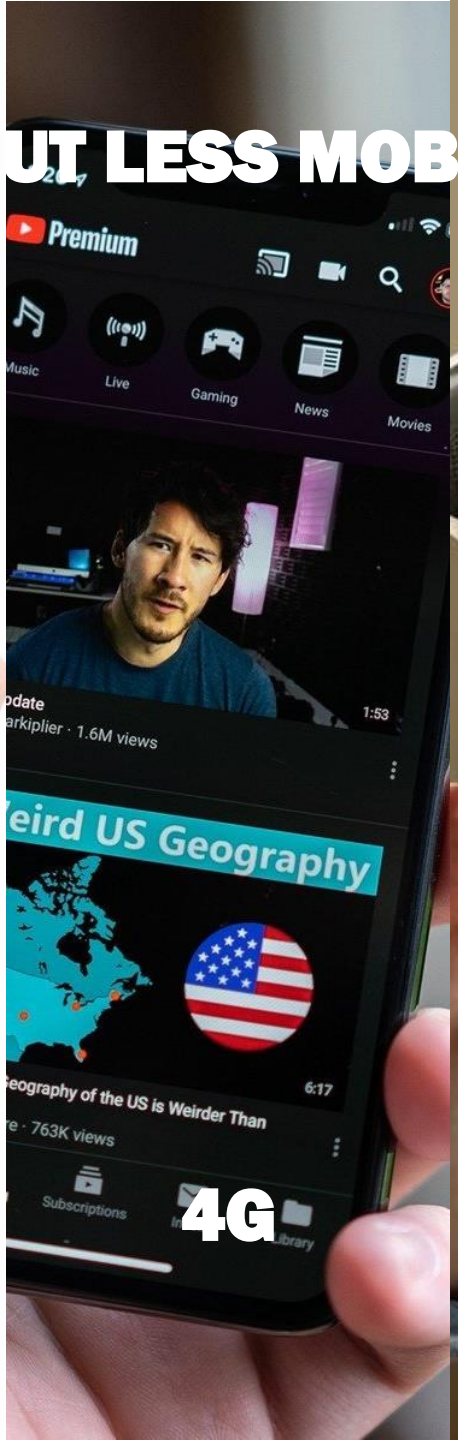
EACH GENERATION MORE DATA BUT LESS MOBILITY

1G

2G



3G



4G

5G

6G

THE INDOOR CHALLENGE

High data rate applications mostly indoors

- An important challenge is going to be the use of THz frequency bands in an environment that is not very radio friendly
- Ultra massive MIMO beamforming
- Cell free networking
- Ultra dense networks
- Highly dynamic environment
- AI/ML based resource management

High data rate and capacity at higher frequencies

↓

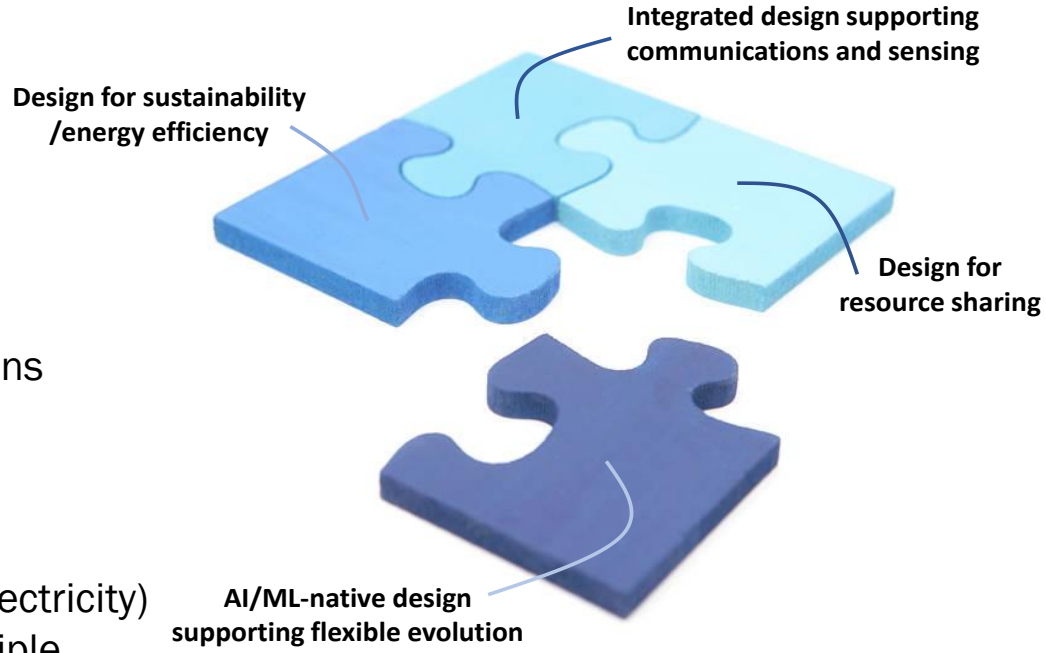
Propagation at high frequencies is a challenge

↓

Indoor basestations

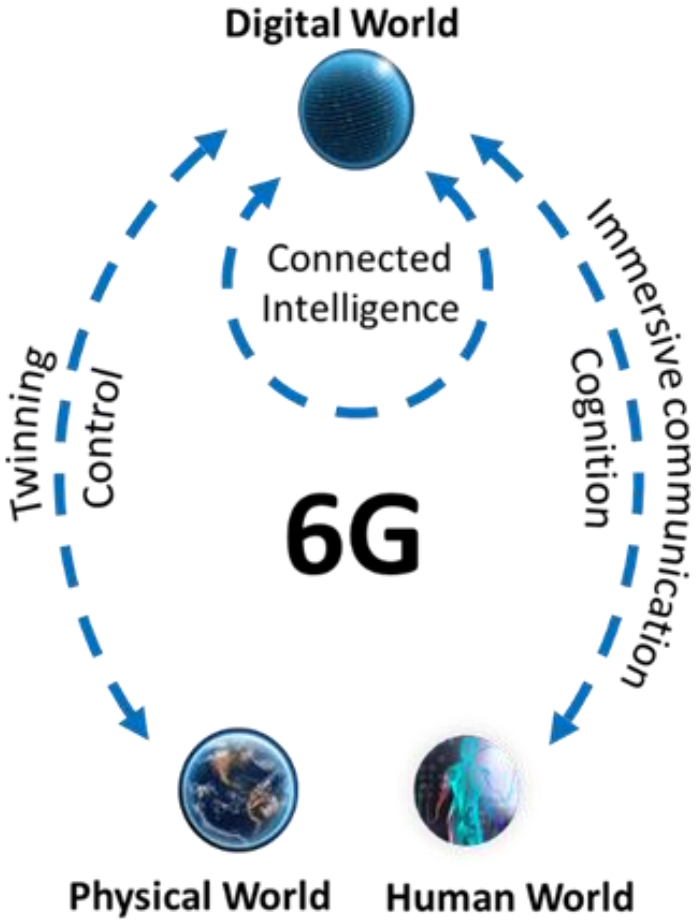
6G DESIGN CRITERIA

- Energy efficiency is crucial
  - Goal should at least be to keep energy consumption equal in light of growing data volumes, more devices and more base stations
- 6G needs to support resource sharing
  - Like with other infrastructures (road, train, electricity) it becomes increasingly difficult to have multiple infrastructures in parallel everywhere
- AI-native software in an open architecture
  - No separation of radio access network and core network
  - Flexible evolution by updating software components



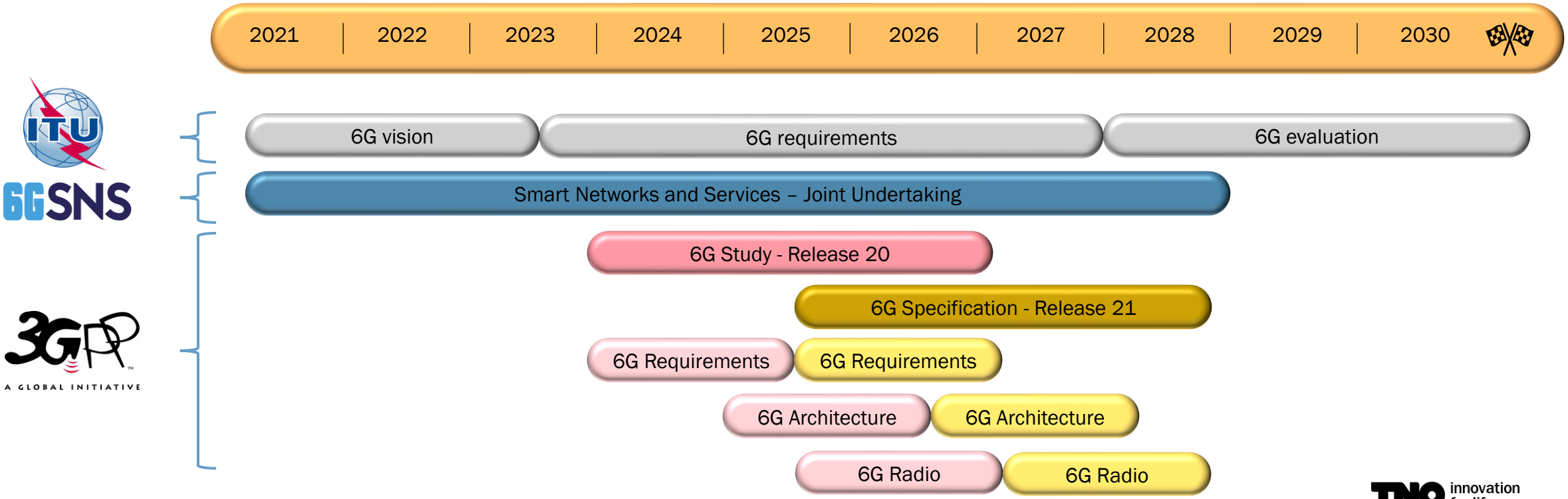
CONNECTED INTELLIGENCE

- Immersive communication, cognition and twinning, imply virtual representations in the digital world of entities in the physical and human world
- Connections between virtual representations in the digital world replace connections between mobile end-devices
- Fundamental impact on the mobile network
  - Scalability of virtual representations
  - Identification of virtual representations replaces identification of mobile devices



6G STANDARDISATION

- We expect 3GPP to start on 6G in around 2024
  - Release 20 will be 6G studies, Release 21 will be first normative 6G specification
  - Each release starts with requirements, followed by architecture and radio architectural aspects



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IN CONCLUSION

SOME BOLD STATEMENTS ☺

- There may not be room for both 6G and WiFi
- If we do it right 6G can be the final generation
- Smart agents replace the smart phone as the representation of persons in mobile communication

THANK YOU FOR YOUR TIME

Links:
https://5g-ppp.eu/wp-content/uploads/2021/06/WhitePaper-6G-Europe.pdf

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