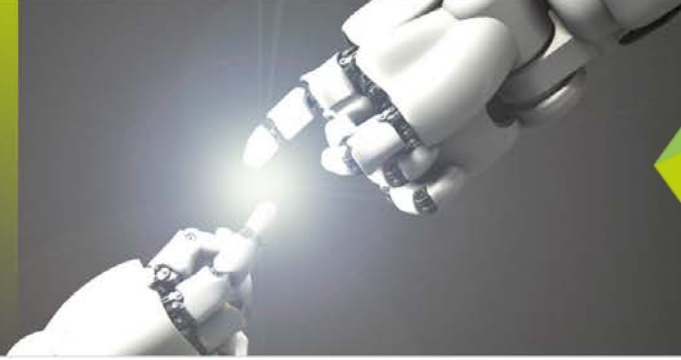




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## Application Areas



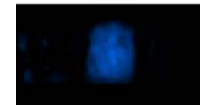
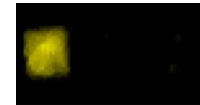
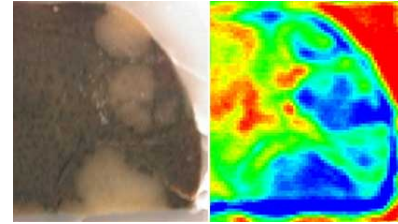
**Gerhard P. Fettweis** – Vodafone Chair Professor – TU Dresden

## THz value chain from

- Materials and process technology
- Devices and components technology
- Subsystem integration and system design

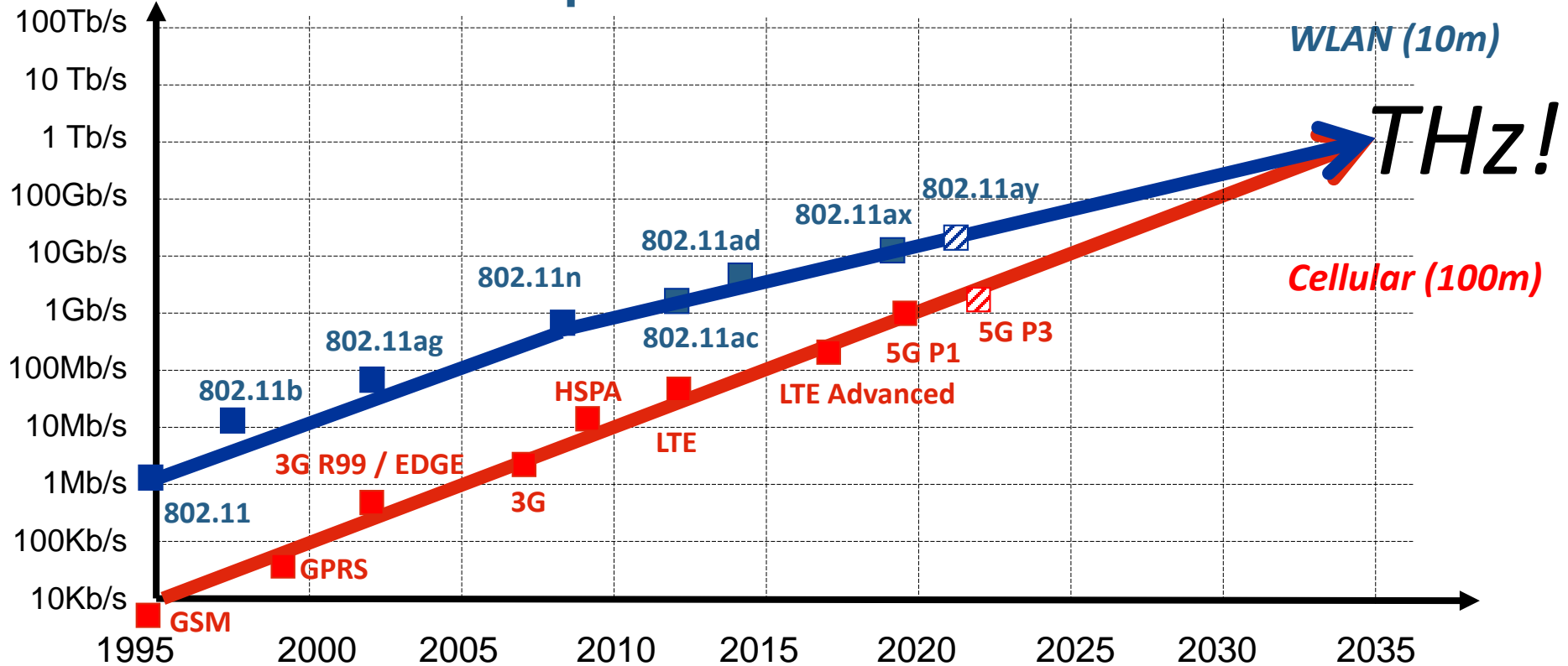
## 7 application areas:

- Future connectivity
- Radar and sensing for mobility
- Manufacturing and robotics
- Security
- Health
- Space exploration and climate change
- Food and agriculture
  - + open science track



# Future Connectivity

## The Wireless Roadmap >2020 Outlook



# Radar and Sensing



RADAR: E.g. indoor mobile robotics

- Require sub-mm ranging RADAR
- wavelength at 0.3THz is 1mm → 1THz allows for 10-100 $\mu$ m ranging (using phase estimation)
- Radar “sweep” via massive-MIMO antenna systems

Sensing/Imaging:

- Not only echograms of first reflection, but true 10 $\mu$ m-resolution imaging

# Manufacturing and Robotics



Radar: see previous

Imaging:

- Require sub-mm resolution and object recognition for precision manufacturing
- Fault analysis by THz scans

Communications:

- Super low-latency Tactile Internet
- Super low-latency communications for VR, AR, cameras

# Security



## Imaging:

- Unique object/person identification (contour)
- Unique material detection (spectroscopy)
- Details
- Small massive-MIMO “cameras”:
  - e.g. 1THz 3cm x 3cm antenna array has 40K “pixels”
  - e.g. 3THz 5cm x 5cm antenna array has 1M “pixels”

# Health



## Personal health scans / imaging

- Oral
- Skin,...

Micro surgery Radar imaging heads

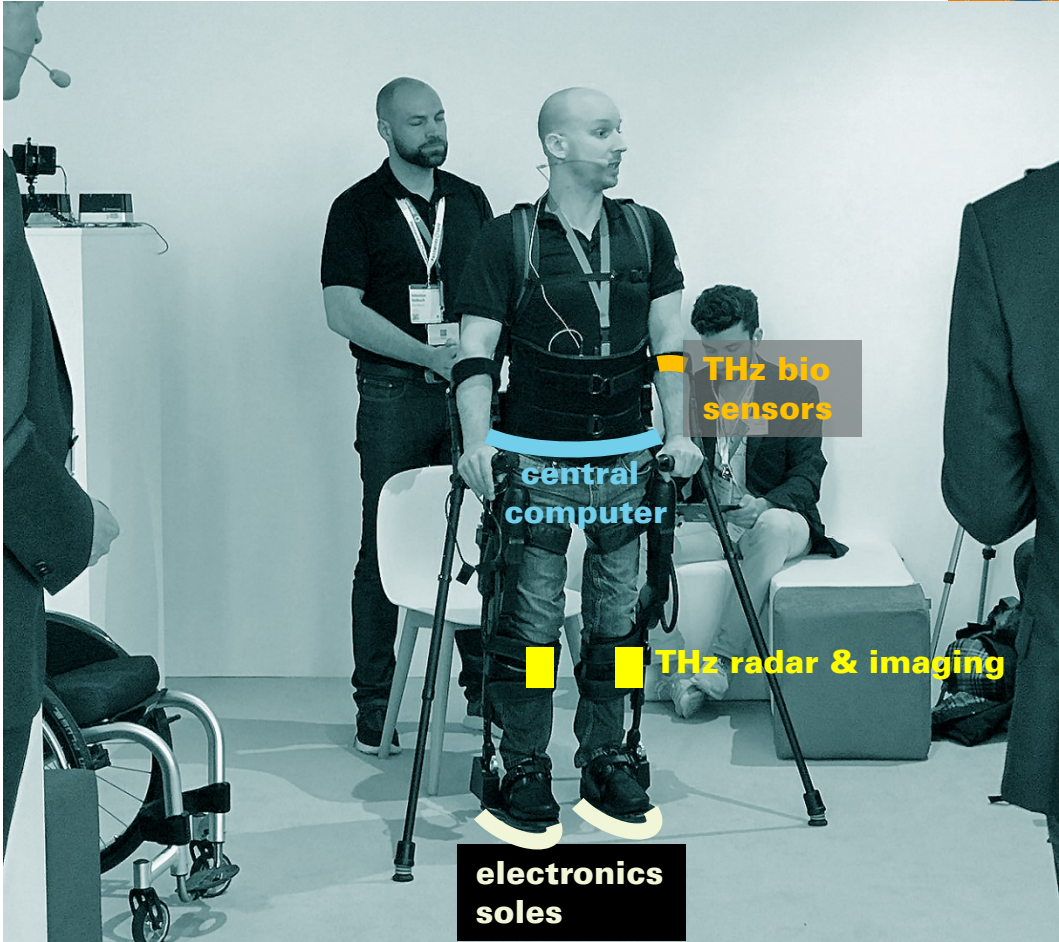
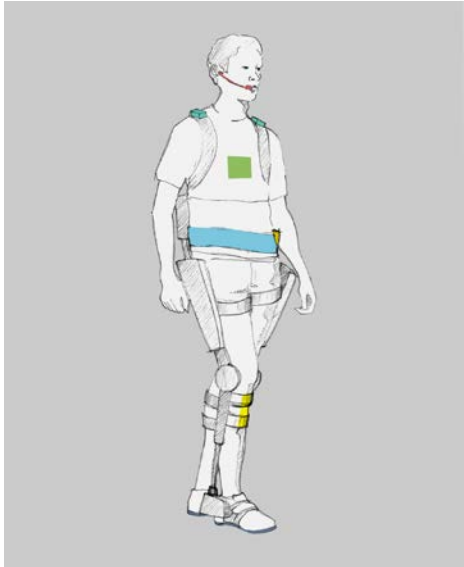


# Exoskeleton vs. Walker



# Exoskeleton vs. Walker

Enabled by: THz electronics



# Space Exploration and Climate Change



Broadband sat-sat and sat-ground communications (Tb/s)

Earth and atmosphere spectroscopy

Space trash detection with super-resolution Radar scans?

# Food and Agriculture



## Food inspection

- Spectroscopy (contamination)
- Imaging for searching defects

## Agriculture

- Spectroscopic scans (e.g. via drones)
- Detailed pest monitoring

# Open Science Track



Open applications, e.g.

- Super low-latency broadband, e.g. for AR, VR,...
- THz automotive

Open deep sciences, e.g.

- Examples?