Digitale
Kommunikationssysteme

RUB

Reconfigurable Intelligent Surfaces (RIS) for next generation wireless networks

Ruhr University Bochum

Prof. Dr.-Ing. Aydin Sezgin

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This is us….

- Research Focus:
  - 6G research
  - Sensing Security
  - Terahertz
  - Non-destructive testing

6GEM

- Research Projects:
  - Projects with industry (6GEM, 6G-ANNA)
  - Several DFG (German Research Foundation) projects (SFB/TRR196 – MARIE, CASA)
  - Terahertz.NRW

Digital Communication Systems

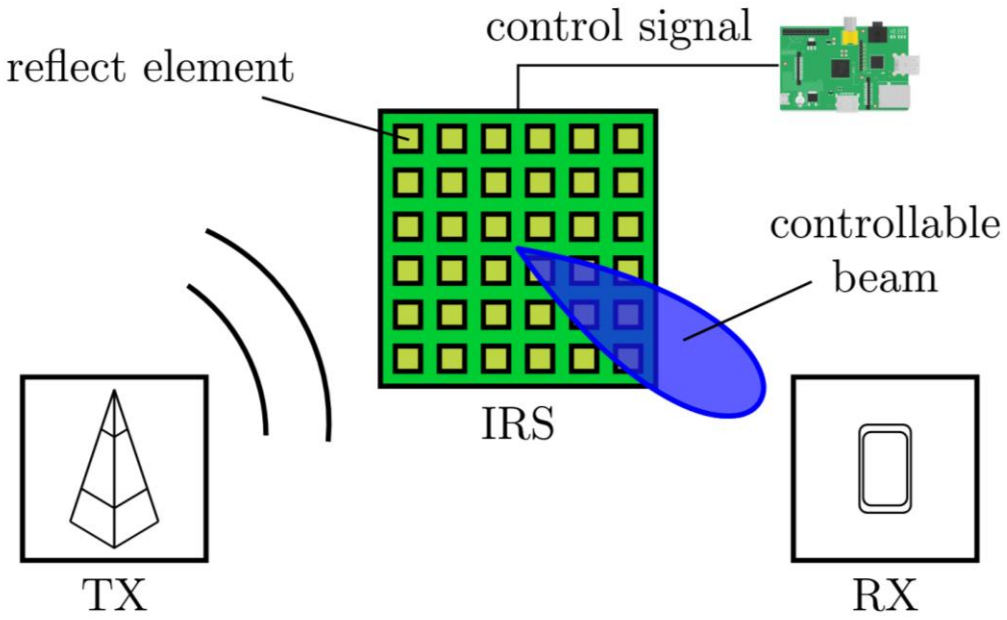
Challenges in 5G and beyond

- Blocking of signals
- Path loss
- Reliability of high data rate links in urban areas
- Coverage in rural areas

Assumed to be given is the wireless channel is assumed to be determined by nature (Shannon's perspective)

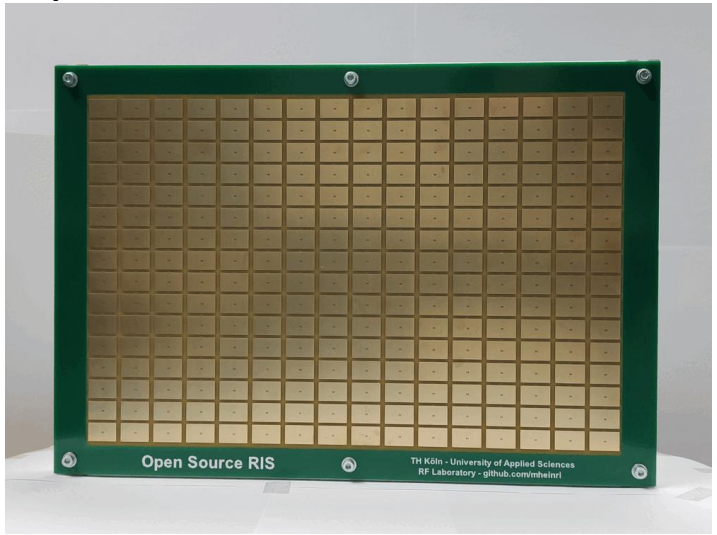
Beyond Shannon: Reconfigurable Intelligent Surfaces

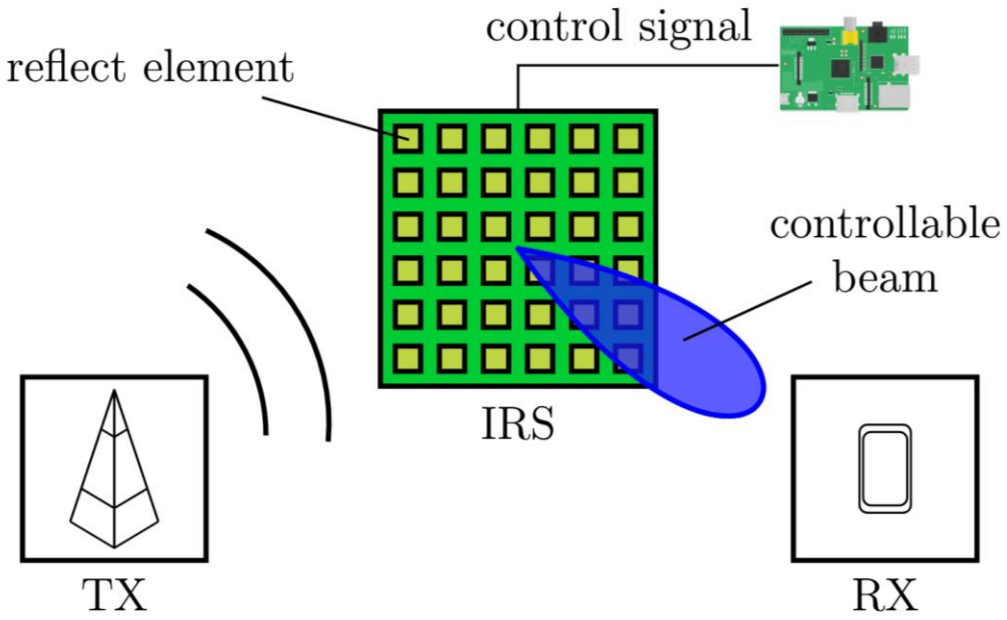
- A thin surface consisting of passive scattering elements that can be controlled by a low-cost electronic circuit
- Key idea: Reflect the incoming signal to the desired destination
- RIS-assisted systems can achieve high spectral and energy efficiency at low cost



Use cases for Reconfigurable Intelligent Surfaces

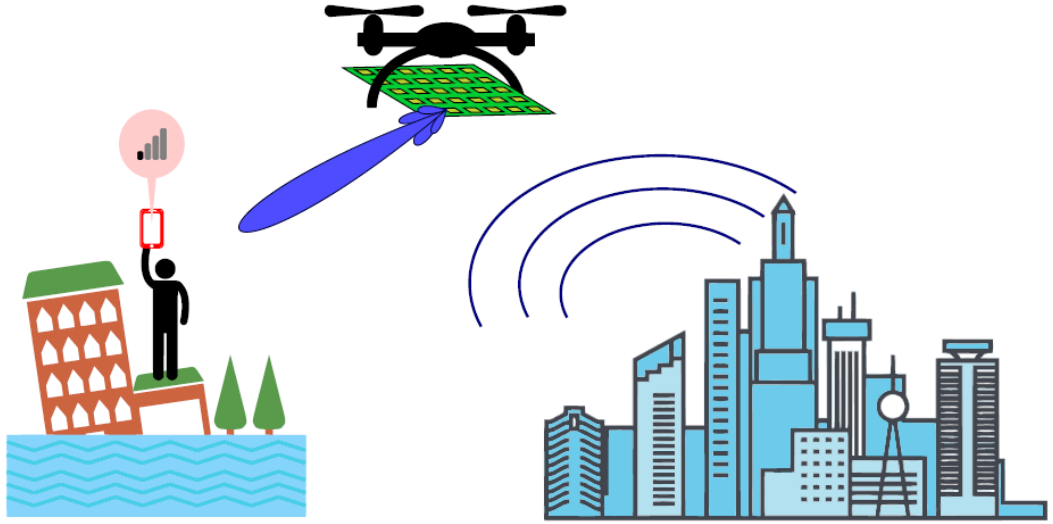
- Localization
- obfuscation from wireless sensing, security from jamming,
- coverage extension, fast recovery of communication networks with UAV-mounted RIS to bridge distances.
- And many more…

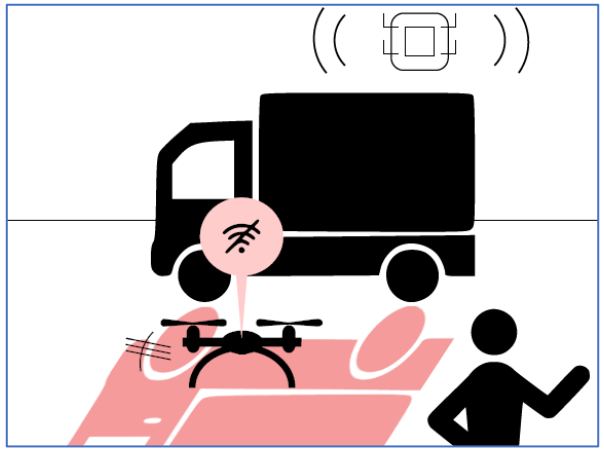


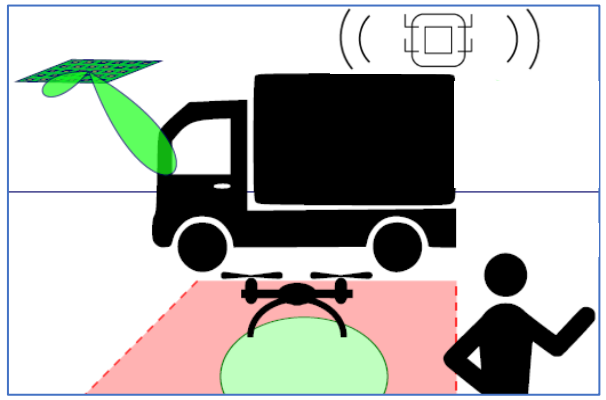


Facilitating demands of 5G and beyond

- connecting intelligent cities,
- Industrial automatization,
- resilient communication,
- Sustainable and low-cost communication
- And many more…

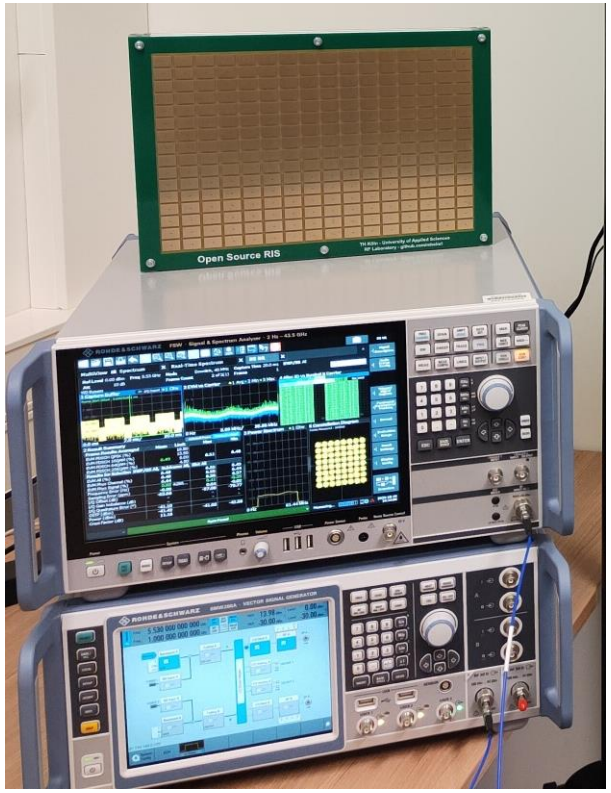






Next steps…

- Fabrication of RIS in large scale
- Adaptors /implementation in various uses cases
- Standardization
- Improved RF design
- Deep learning (RL) based approaches for RIS



Prof. Dr.-Ing. Aydin Sezgin

Ruhr-University Bochum
Faculty for Electrical Engineering and Information Technology
Digital Communication systems

- aydin.sezgin@rub.de
- (+49)(0)234 / 32 – 29849

https://www.dks.ruhr-uni-bochum.de/en