Aristotle University of Thessaloniki (AUTH)
(6G-IA full member)

ARISTOTLE UNIVERSITY OF THESSALONIKI

Agapi Mesodiakaki, PhD

Senior Researcher, WinPhoS, Aristotle University of Thessaloniki

Center for Interdisciplinary Research and Innovation

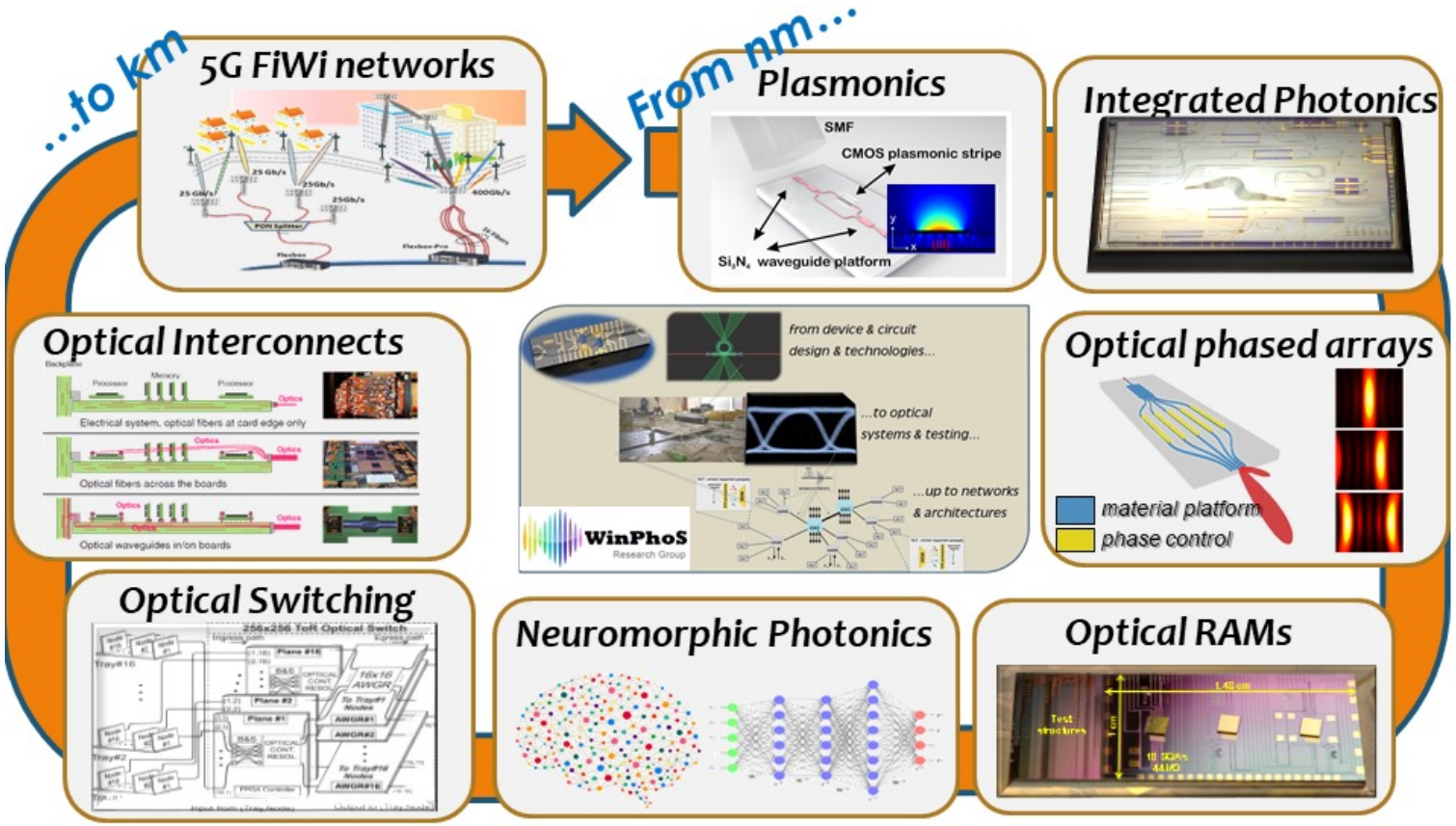
Aristotle University of Thessaloniki (AUTH)

- Greece's largest University, founded in 1925
- Main campus located in the center of Thessaloniki (second largest city in Greece)
- 11 Faculties
  - ***Physical Sciences***, ***Engineering***, Law, Economics and Political Sciences, Agriculture Forestry and Natural Environment, Health Sciences, Education, Theology, Philosophy, Physical Education and Sport Sciences, Fine Arts
- 40 Schools
- > 85,000 students (~77,000 undergraduate, ~6500 postgraduate, ~3900 PhD students)
- > 1600 faculty members

Aristotle University of Thessaloniki (AUTH)

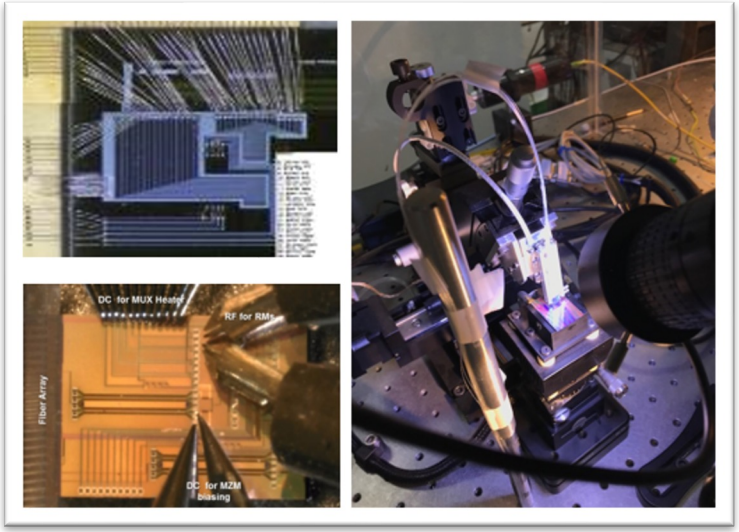
- Numerous off-campus facilities (partial list):
  - University Farm
  - Teloglion Foundation of Art
  - Mount Olympus Meteorological Station
  - Center for Interdisciplinary Research and Innovation (CIRI, ΚΕΔΕΚ)
    - 22 research groups in diverse inter-disciplinary domains
    - Our group: ***Wireless and Photonics Systems and Networks (WinPhoS)***
      - Collaboration between departments of Physics, Informatics and Electrical & Computer Engineering
      - 6 faculty members, 12 senior researchers, >15 PhD/MSc students
      - > 24 FP7 and H2020 projects (>6 as coordinator)

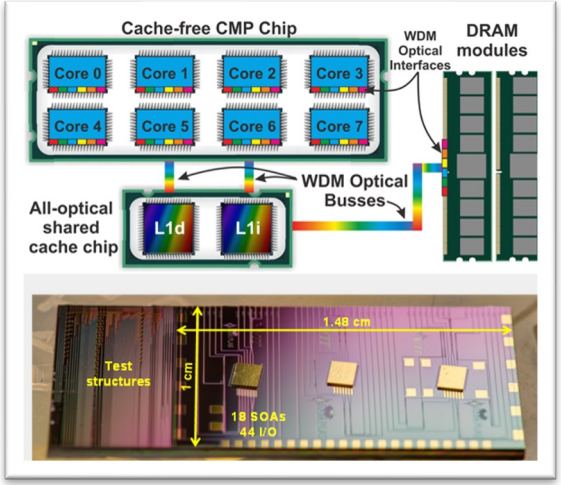
Summary of WinPhoS main research interests

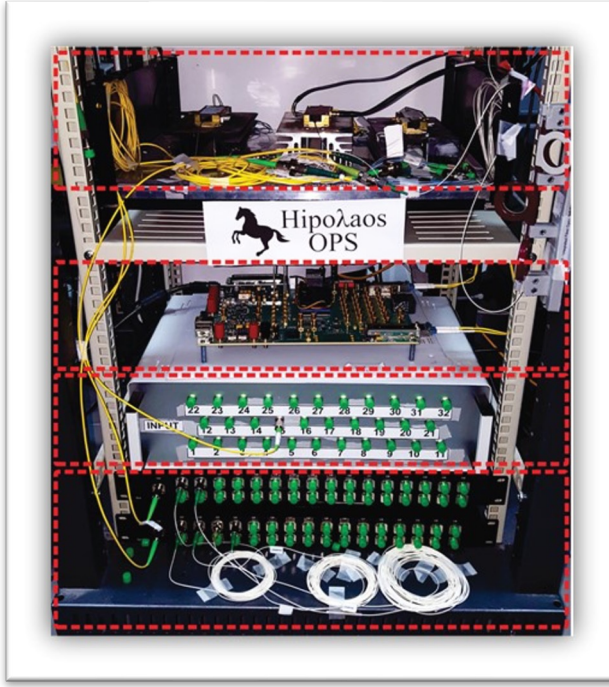


WinPhoS expertise (details) (1/2)

- Optical communications (switching, interconnects, PICs)
  - Optical computing (optical RAM, optical cache) & neuromorphic processing
  - Silicon integrated photonics and plasmonics
  - Laboratory evaluation of prototypes



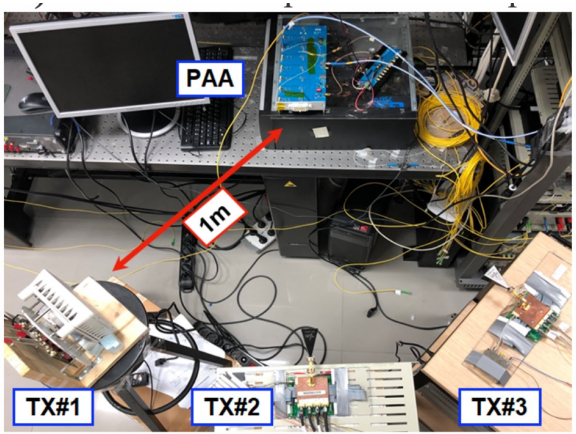




WinPhoS expertise (details) (2/2)

- Optical/wireless systems, Radio-over-Fiber, converged Fiber/Wireless architectures
  - System/component modelling and network simulations in 3D networks
  - FiWi MAC layer protocols and performance analysis

- 6G heterogeneous 3D network architectures and protocols
  - Multi-RAT (mmWave/THz) X-hauling architectures in integrated TN-NTNs
  - E2E joint resource allocation optimization models and algorithm development
  - Design of field trials and testbed evaluation



WinPhoS hardware infrastructure

Signal Generation

6-bit DAC @ 35GHz & 100Gsa/s

FPGA Board with 900Gb/s optical tranceivers

$LiNBO_3$ Mod @ 40GHz

RF Amplifier @ 65GHz

RF Signal Gen. up to 40GHz

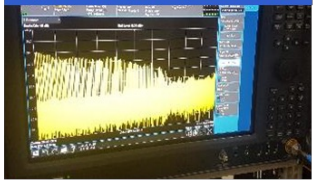
RF MUX up to 64Gb/s

Soon

- RF signal generation capabilities of **120Gsa/s!**
- InP modulators up to **56Gbaud/s!**

Signal Reception & Analysis

Signal analyzer up to 50GHz



BERT up to 64Gb/s

35GHz IR Photoreceiver

RTO @ 63GHz & 160Gsa/s

- InP Photoreceiver up to **70GHz**
- Balanced PD up to **43GHz**!
- BERT up to **64Gb/s**

Other capabilities

Photonic Network Analyzer

Up to 50GHz

Optical amplification

EDFA and PDFA optical amplifiers are available

Wire Bonder

Thank you!

Winphos website:
http://winphos.web.auth.gr/

AUTH faculty:

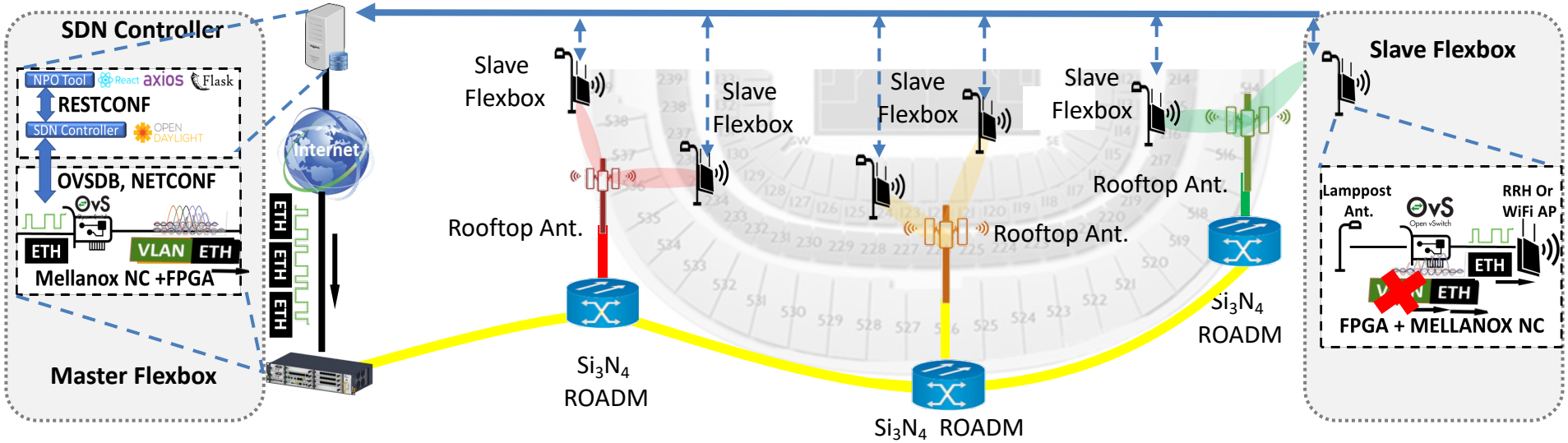
- *Prof. Nikos Pleros: npleros@csd.auth.gr*
- *Prof. Amalia Miliou: amiliou@csd.auth.gr*
- *Prof. Kostas Vyrsokinos: kv@auth.gr*
- *Prof. Kostas Siozios: ksiop@auth.gr*

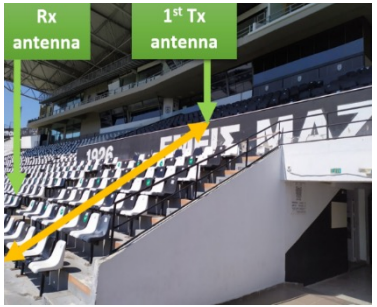
WinPhoS senior researchers:

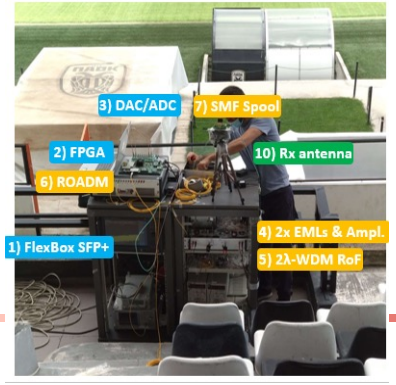
- *Dr. Agapi Mesodiakaki: amesodia@csd.auth.gr*
- *Dr. Marios Gatzianas: mgkatzia@csd.auth.gr*
- *Dr. Chris Vagionas: chvagion@csd.auth.gr*
- *Dr. George Kalfas : gkalfas@csd.auth.gr*

Annex

5G pilot testbed at PAOK FC Stadium (H2020 5G-PHOS)



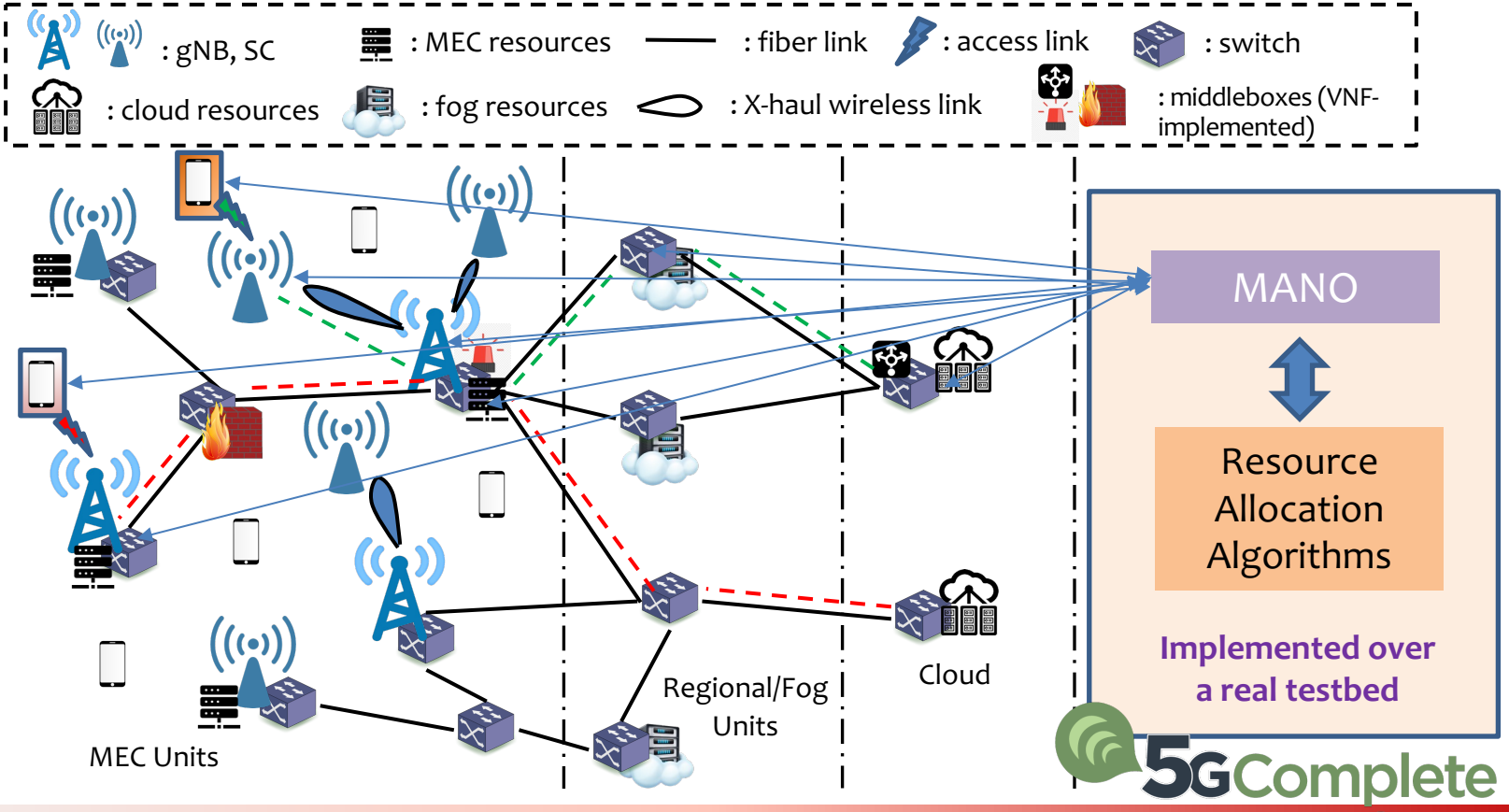




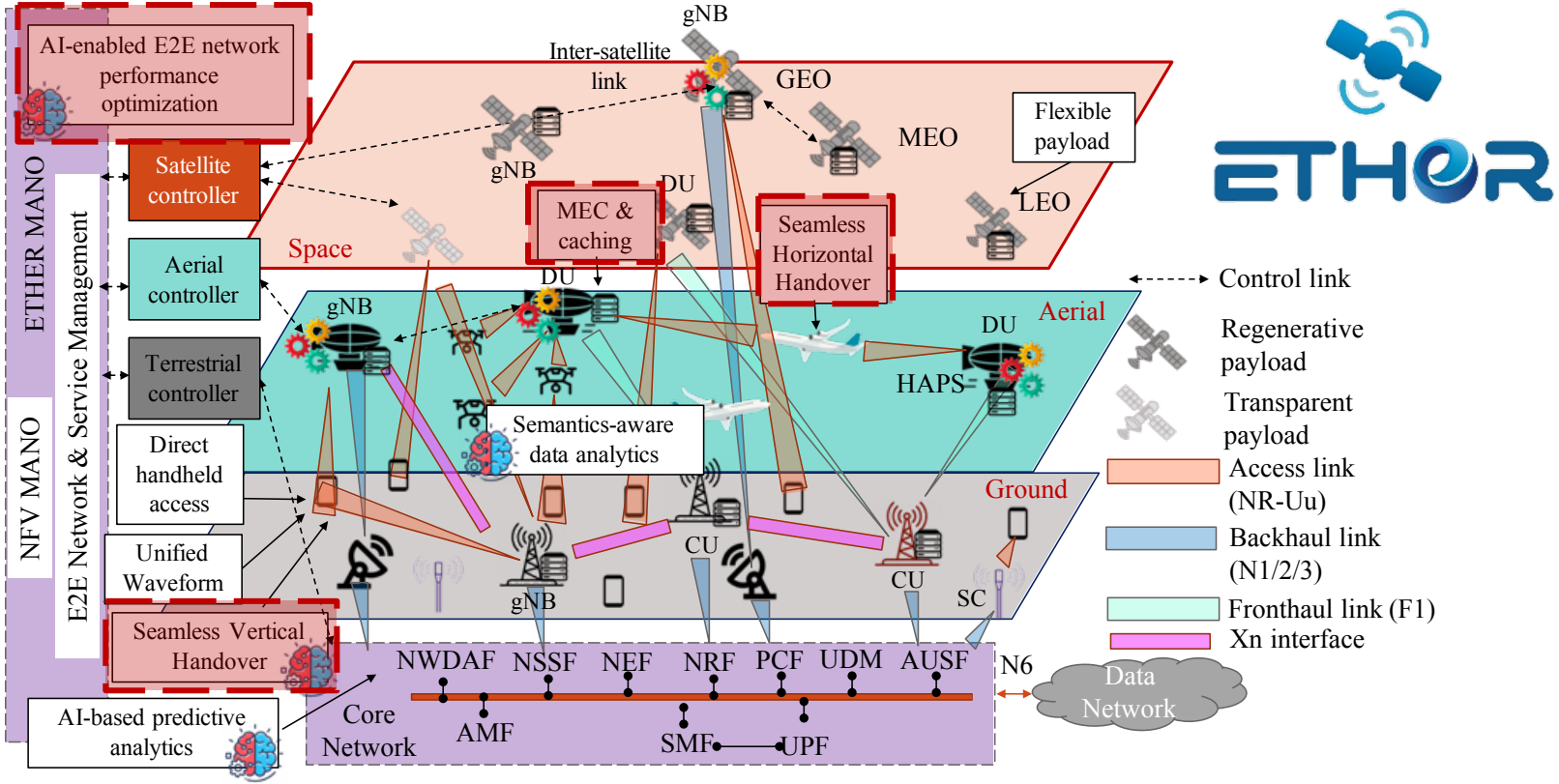
5G phos

5G pilot testbed (indoor demonstrator) (H2020 5G-PHOS)

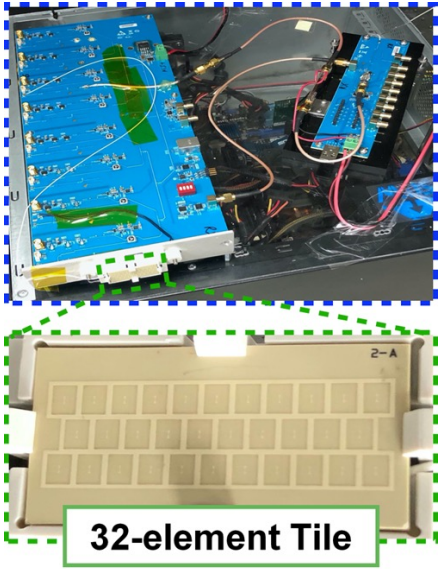
Online E2E resource allocation in 6G Hetnets (5G-COMPLETE)



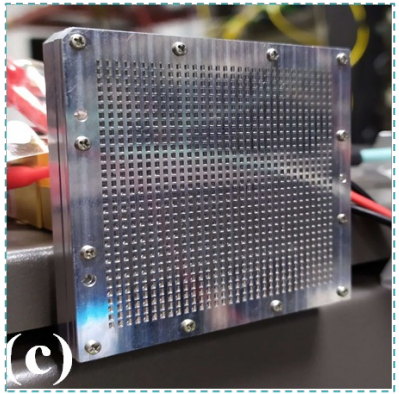
E2E network optimization in 3D 6G networks (ETHER)



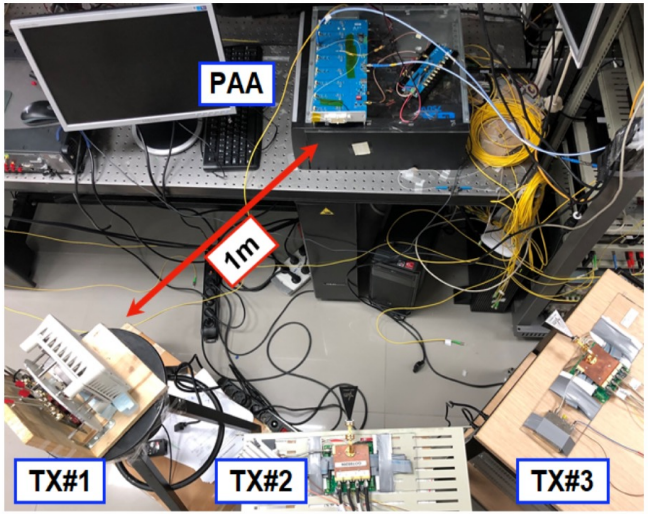
Additional WinPhoS infrastructure (1/3)



Massive MIMO antenna @ 60 GHz

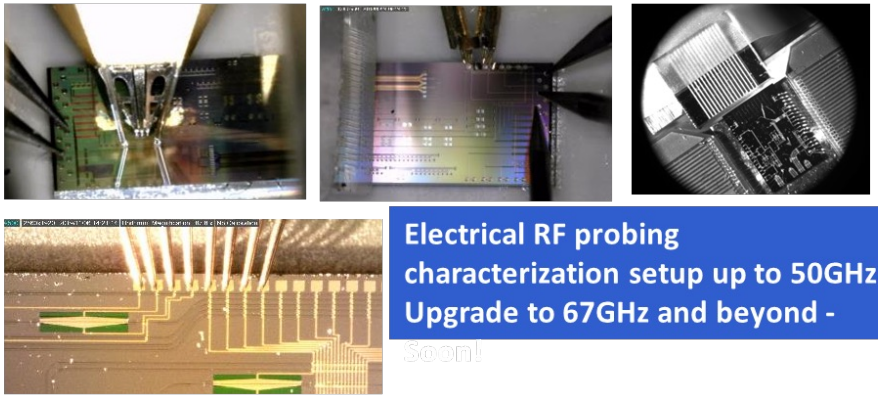


D-band antenna @ 160 GHz



Additional WinPhoS infrastructure (2/3)

Vertical and Edge Coupling



Electrical RF probing characterization setup up to 50GHz
Upgrade to 67GHz and beyond - Soon!

PICs characterization equipment

8-channel optical power meter

1260 – 1360 nm O band TLS

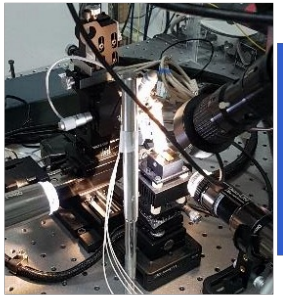
1500 – 1630 nm C band TLS

High Res. OSA

IR Camera

InGaAs Sensor
640 x 512 pixels
(400 nm - 1700nm)

Automation



Fully automate passive characterization measurements on a chip scale

Additional WinPhoS infrastructure (3/3)

Hardware

- **Mini HPC cluster** (8 workstations, 160 cores, 960 GB RAM)
- **NI-USRP** Software Defined Radios (wireless testing)

Software

- **Lumerical** for EM simulations
- **VPIphotonics Design Suite** for system level setups
- **Synopsys** and **Nazca** for GDSII Design
- **Matlab** for wireless system modeling and optimization algorithms