


# Review Open Call SME
# F4Fp-09-M08
# 5GFed experiment

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Remote Review

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# 5GFed

## Integration and testing of 5G NR OpenAirInterface in the Fed4FIRE+ federation

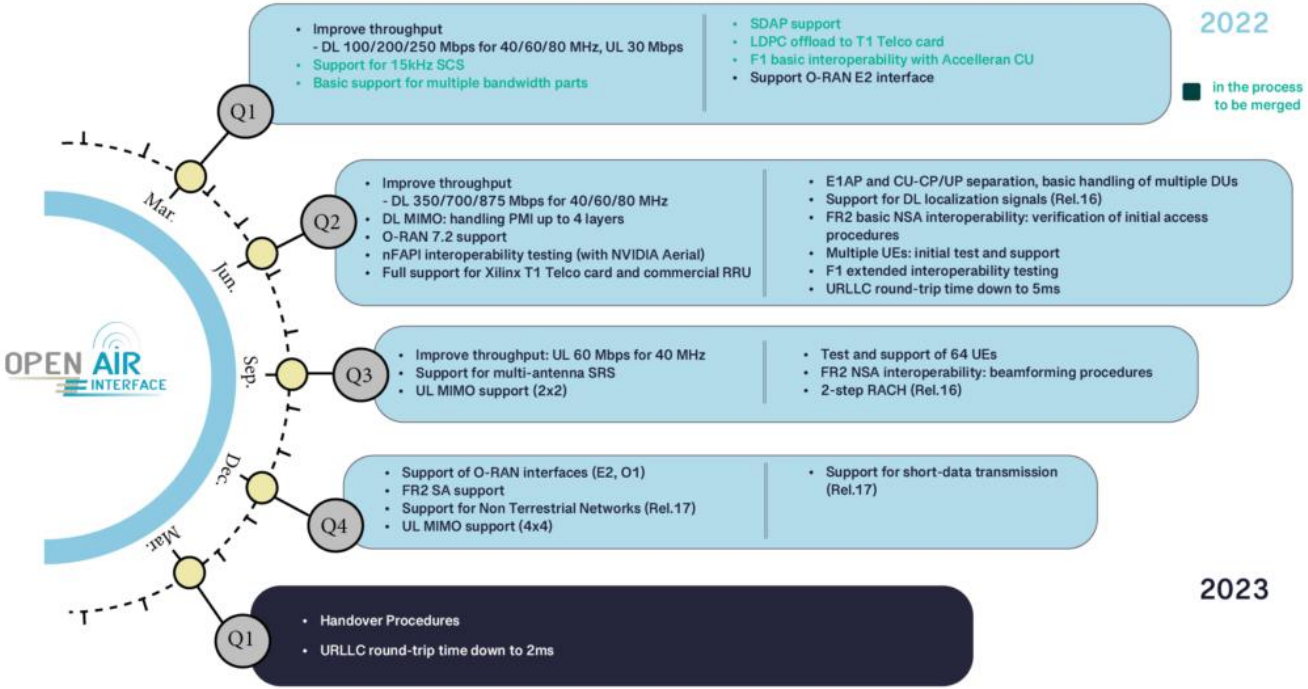
IRIS (TCD) and CityLab (imec) testbeds

# Concept and Objectives

- The practical experimentation with 3GPP networks has been historically reserved exclusively to network equipment vendors and telecommunication operators, primarily due to high equipment costs and licensing constraints.
- In recent years, the state of play has been changing with the advent of open source 3GPP stacks based on increasingly more affordable Software Defined Radio (SDR) systems.
- In this context, OpenAirInterface (OAI) emerges as an open-source initiative that provides a reference implementation of 5G gNB, User Equipment (UE), and 5G core network (5GC), standard compliant with 3GPP NR Release 15 and that runs on general purpose x86 computing platforms along with off-the-shelf SDR hardware platforms like USRPs.

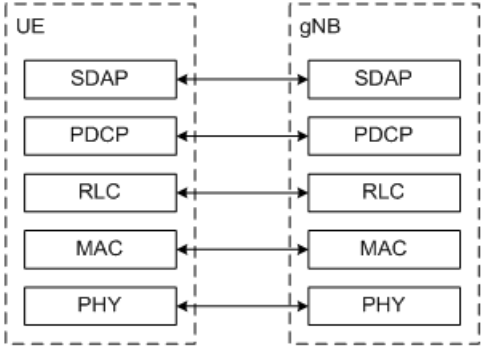
# Concept and Objectives

- OAI RAN roadmap.

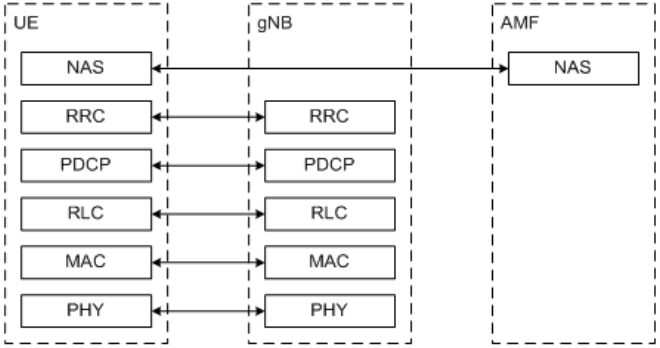


# Concept and Objectives

- The OAI code can be adapted to different use cases and deployment and new functionality can be implemented, making it an ideal platform for both industrial and academic research on 3GPP networks.
- **The main objective of the 5GFed experiment is to integrate and test the latest OAI 5G NR standard-compliant implementation within two Fed4FIRE+ testbeds: IRIS (TCD) and CityLab (imec).**

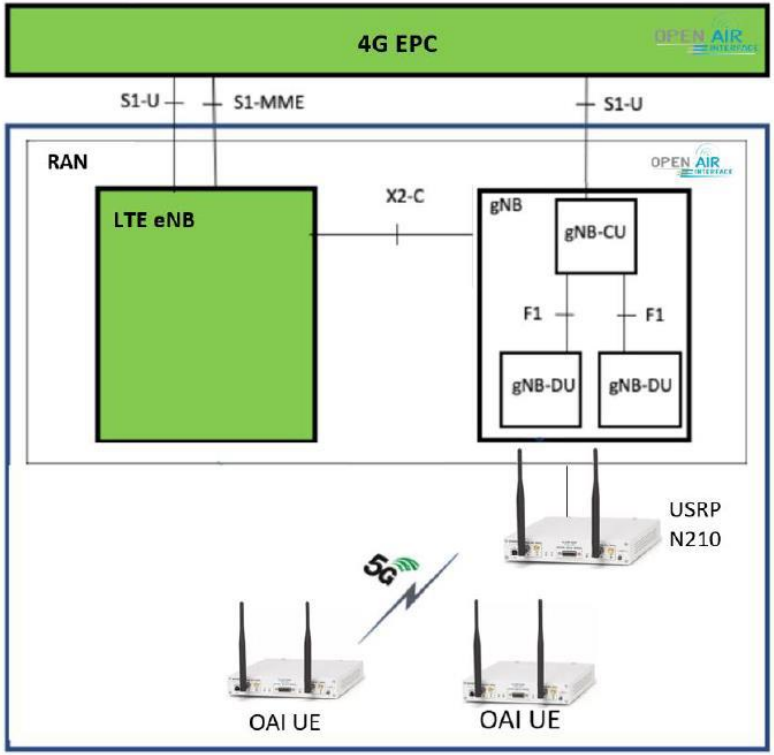



User Plan

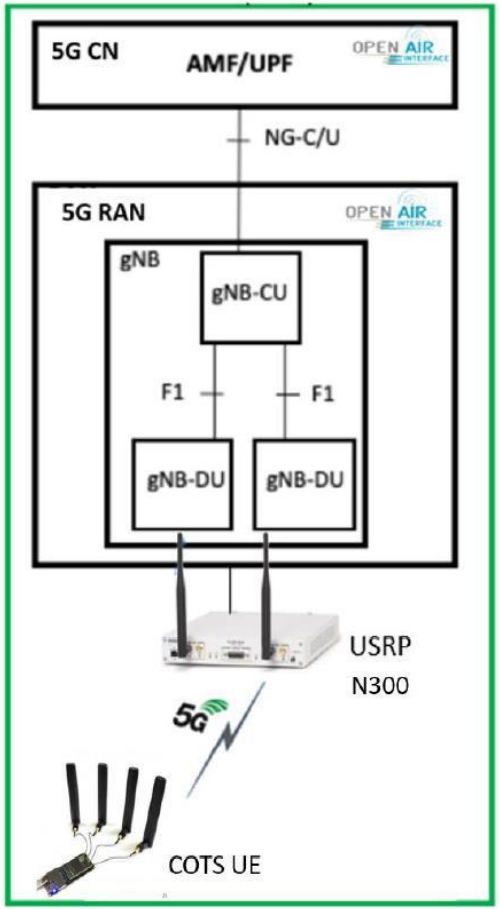



Control Plan

# Concept and Objectives



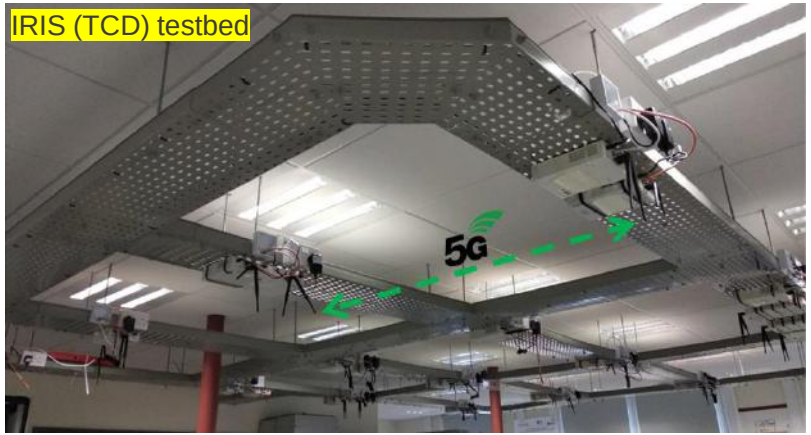

Setup1: 5G NSA with USRPs




Setup 2: 5G SA with COTS 5G UE

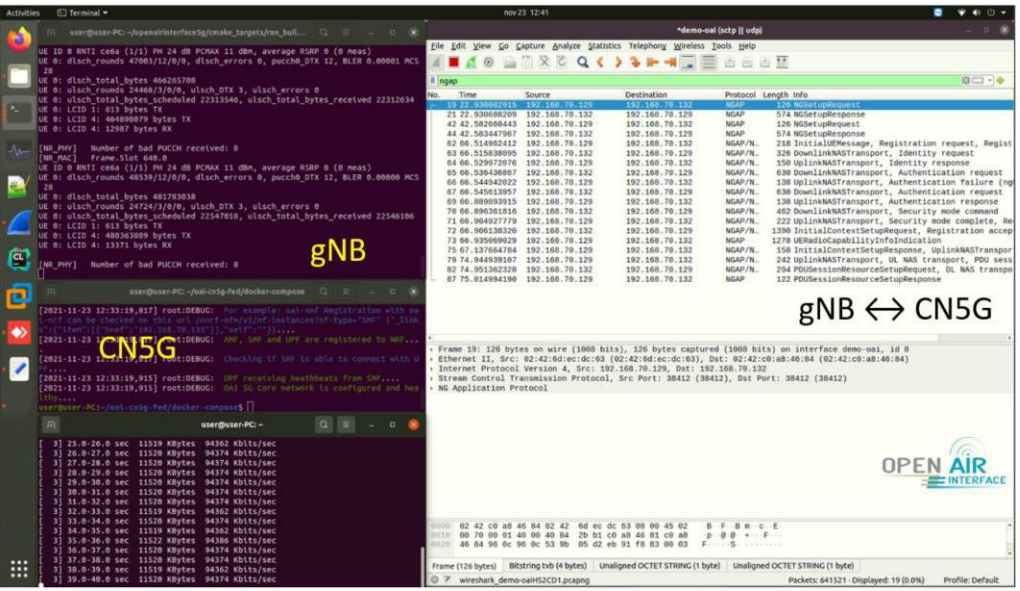
# Project results

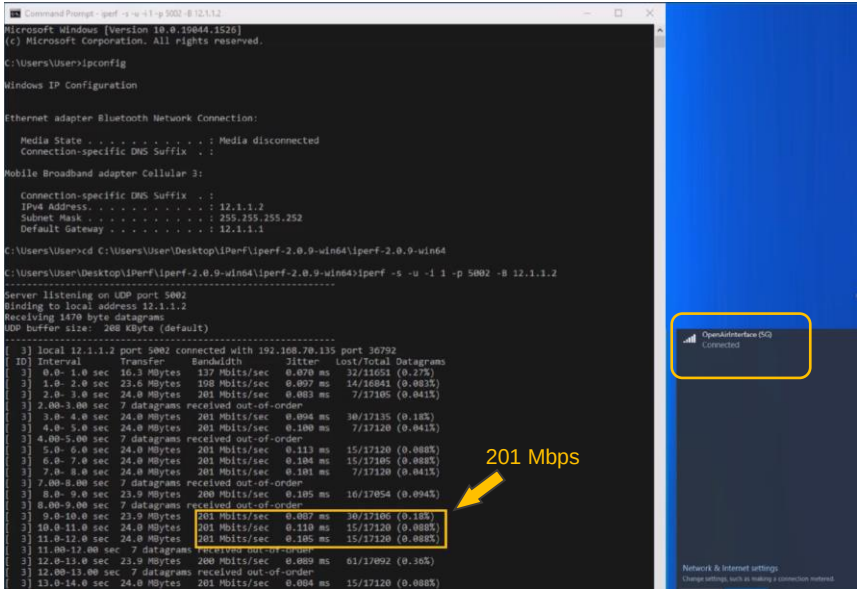
- End-to-end implementation of OAI 5GNR in the IRIS testbed
- Interoperability test between OAI gNB and COTS UE (Quectel RM500Q).
    - TDD configuration, 30kHz SCS (Subcarrier Spacing)
    - Downlink configurations: 256 QAM max, 60 MHz bandwidth (162 PRB), single layer
    - Uplink configurations: QPSK max, 60MHz bandwidth (162 PRB), single layer
    - iPerf UDP between OAI CN5G and QUECTEL RM500Q



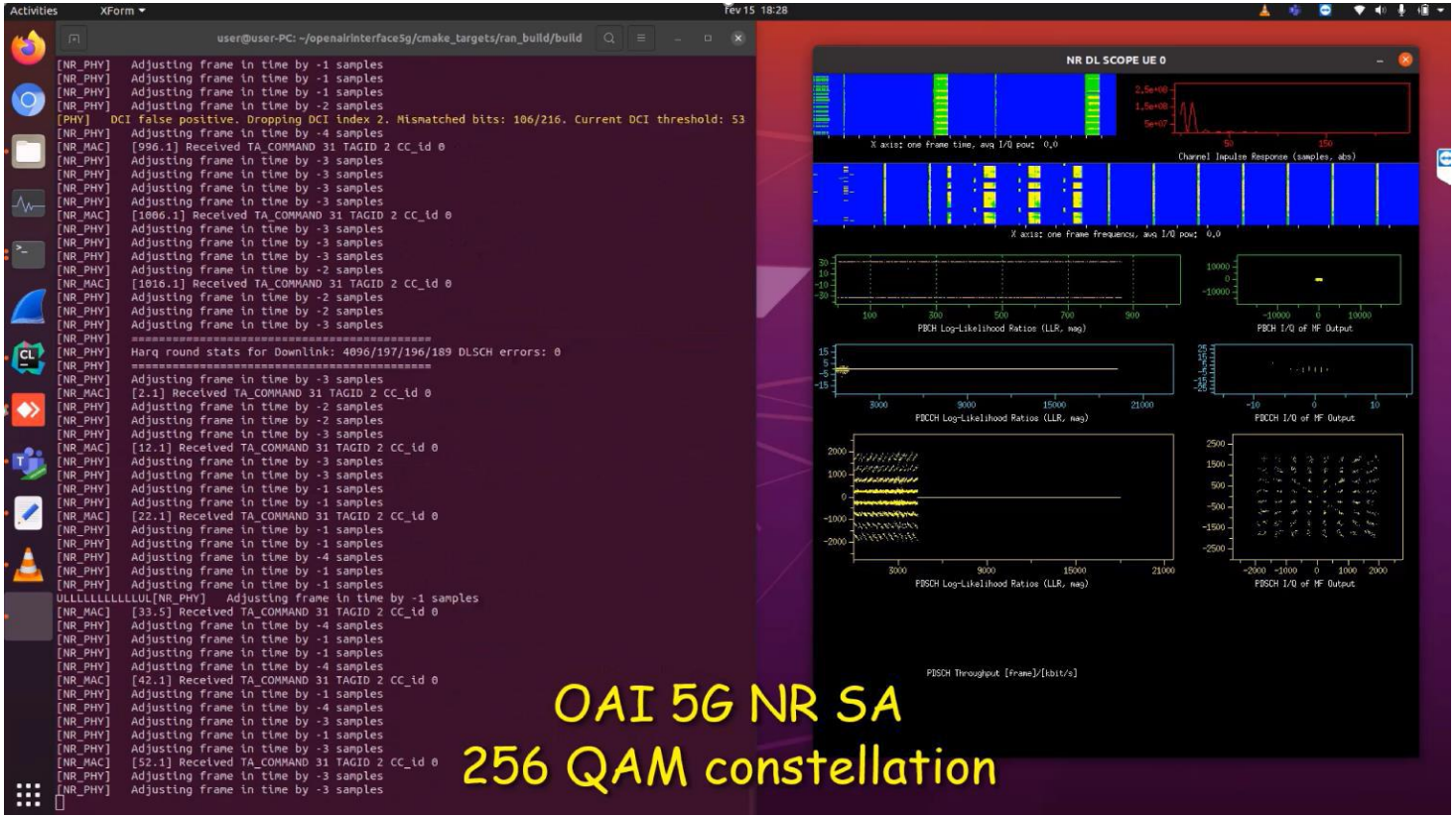
# Project results

- End-to-end implementation of OAI 5GNR in the IRIS testbed (TCD)



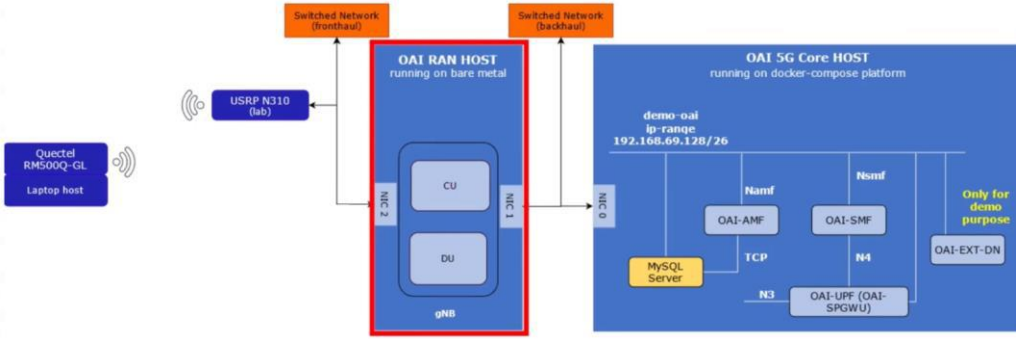



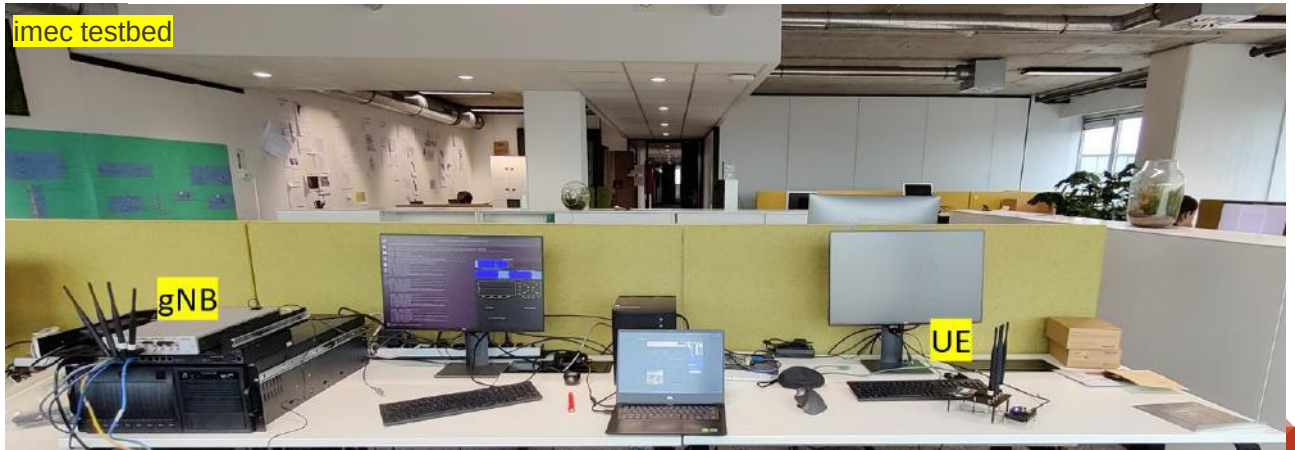
# Project results



# Project results

- End-to-end implementation of OAI 5GNR in the testbed CityLab (imec).



# Project results

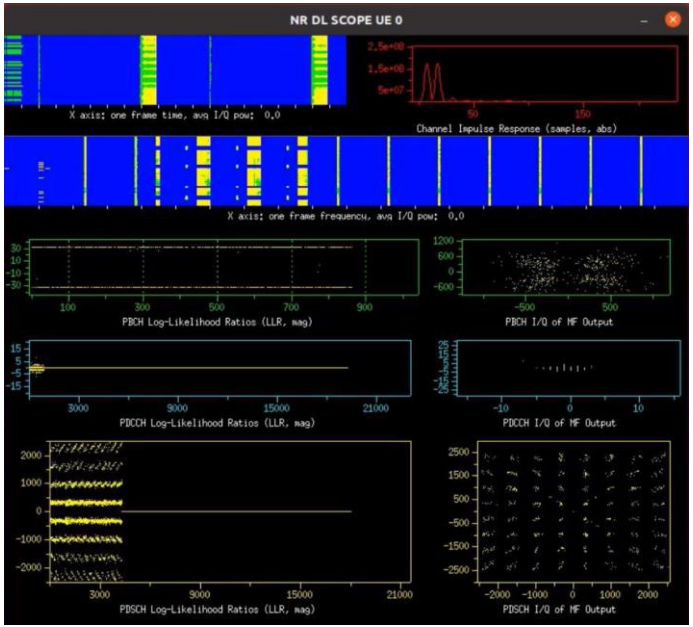
- Indoor testing @ imec

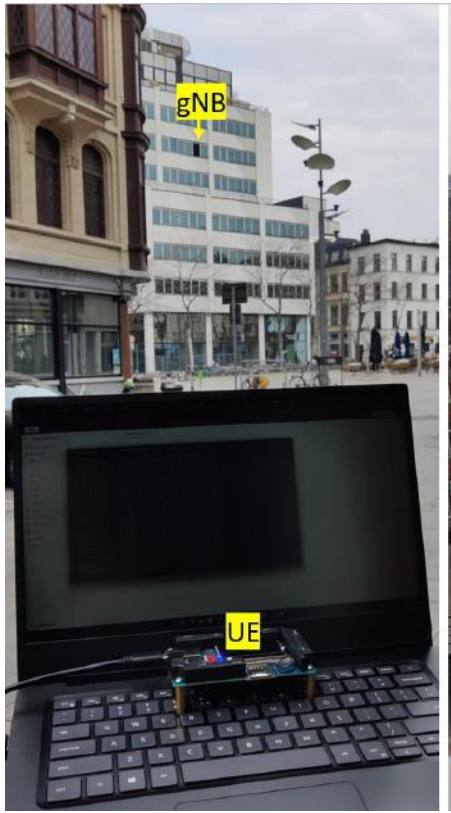
| Configuration | Bandwidth [MHz] | DL throughput [Mbit/s] |
|---|---|---|
| SISO | 40 | 123 |
| SISO | 60 | 188 |
| MIMO 2x2 | 40 | 184 |
| MIMO 2x2 | 60 | 240 |

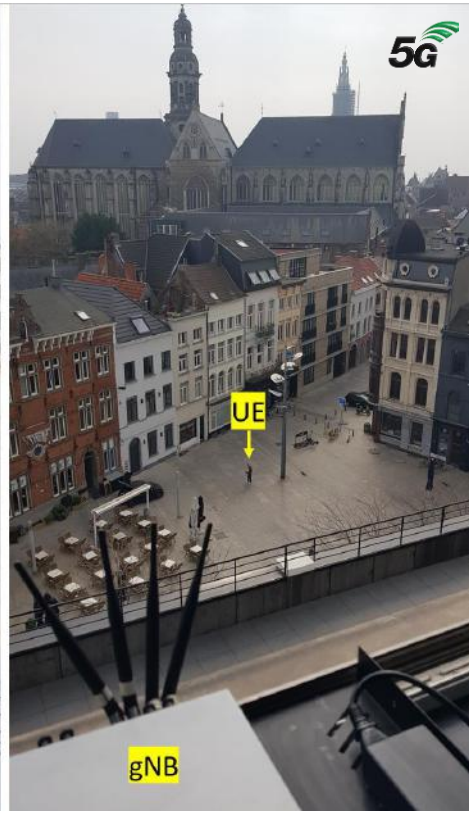

5G NR SA indoor testing using MIMO 2x2, 60 MHz bandwidth and reaching DL 240 Mbps.

# Project results

- Outdoor testing @imec



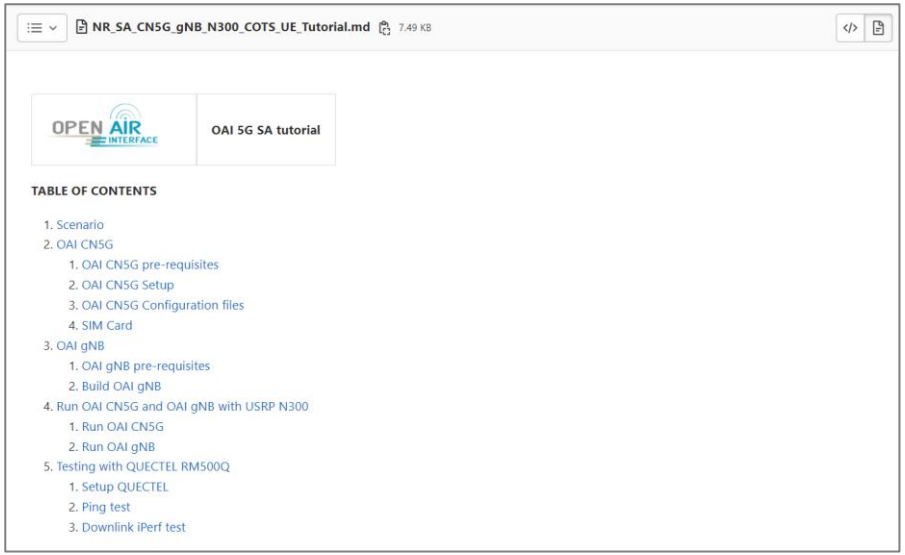




5G NR SA outdoor testing using MIMO 2x2, 60 MHz, 95 m LOS, reaching DL 58 Mbps and UL 4 Mbps.

# Project results

Allbesmart has published a tutorial to allow the OAI community to replicate the 5GFed experiment. The tutorial is available in the gitlab repository from EURECOM.


NR_SA_CN5G_gNB_N300_COTS_UE_Tutorial.md 7.49 KB

OPEN AIR INTERFACE | OAI 5G SA tutorial

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# Business impact

- Fed4FIRE+ has provided a unique opportunity for Allbesmart to have access to state-of-art Software Defined Radio (SDR) testbed infrastructure.
- This experiment helps us to speed up our developing and testing phase and position the company as a player in the emerging market of 5G open-source solutions.
- This experiment has allowed us to mature the technology sufficiently to offer it to our commercial partners and to approach potential new partners for proof-of-concept testing and trials.
- Allbesmart wants to leverage its OAI deep expertise to provide consultancy services on OAI implementations of 3GPP 5G NR protocol stack to accelerate 5G product development and innovations.

# Business impact

- Thanks to this experiment, IRIS and CityLab testbeds will be able to provide end-to-end 5G open-source implementation for protocol testing, contributing to the sustainability of the Fed4FIRE+ project.

# Feedback

- A very good point is that in OC projects the level of administrative burden for experimenters is very low compared with other H2020 projects.
- Excellent support from TCD and imec teams.
- The documentation available was sufficient to run the experiment.
- We aim to build on top of this experiment and strength the collaboration with TCD (Open Ireland testbed) and imec on open-source solutions for 5G and beyond.



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**MANY THANKS TO FED4FIRE+**
**AND TO**
**THE TCD AND IMEC TEAMS !**

**WWW.FED4FIRE.EU**