COSMOS³ COMMUNITY WORKSHOP · HALF DAY

# Next-Generation Testbed Capabilities

## FR3, the digital twin, and street-level sensing — what COSMOS³ does today, and what we still need to build

Upper mid-band radio, a channel-calibrated digital twin, and street-level sensing decide what the next generation of COSMOS experiments can be. A requirements workshop, not a showcase: the output is what each of the three has to become next.

| DATE | VENUE | ATTENDANCE |
|---|---|---|
| **Thursday, 17 September 2026**<br>12:00 – 5:00 PM · reception to 6:00, off-site dinner 6:30 | **WINLAB, Rutgers University**<br>671 Route 1 South, North Brunswick, NJ 08902 | **In person**<br>Free · Register: eventbrite.com/e/1998936074609 · Zoom link on request |

## PROGRAM

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| 11:30 – 12:00 | *Registration and light lunch* |
| 12:00 – 12:15 | **Welcome and the COSMOS³ roadmap**<br>Ivan Seskar, Rutgers/WINLAB — the four-year plan, and where the three threads meet |
| 12:15 – 12:45 | **FR3 and the next-generation node**<br>Ivan Seskar — the SB1 sandbox today: Pi-Radio front ends on USRP-2974, links at 10–10.5 and 12.2–12.7 GHz. Next: 10 MHz–20 GHz at 1 GHz instantaneous bandwidth |
| 12:45 – 1:10 | **Scalable Wireless Digital Twins and Machine Learning for High-fidelity RF Signal Mapping**<br>Tingjun Chen, Duke University |
| 1:10 – 1:50 | **Keynote — FR3: why now**<br>Sundeep Rangan — Director, NYU WIRELESS; Professor of Electrical and Computer Engineering, NYU Tandon School of Engineering; IEEE Fellow. What has changed in spectrum, silicon and standards to make this the moment to build in the band |
| 1:50 – 2:00 | **Break** |
| 2:00 – 2:25 | **Dynamic Spectrum Access research in the COSMOS PAWR**<br>Carlos Caicedo, Syracuse University |
| 2:25 – 2:50 | **Securing Smart Cities with COSMOS: From Real-Time Video Analytics to Trusted Navigation**<br>Jhonatan Tavori, Columbia University |
| 2:50 – 3:05 | **Networking in a Quantum COSMOS**<br>John Louis Drogo, Columbia University |
| 3:05 – 4:00 | **Demo break** |
| 4:00 – 5:00 | **What do you need next in COSMOS?**<br>One open session, everyone in the room — the experiment you cannot run yet, and what stops you. Across all three threads: **A.** Upper mid-band: front ends, antennas, calibration, 1 GHz end-to-end · **B.** Digital twin: scene fidelity, channel calibration, shared scenarios, reproducibility · **C.** Street-level sensing and ISAC: modalities, ground truth, coexistence and outdoor authorization |
| 5:00 – 6:00 | *Reception — joint with W4AI attendees arriving for Friday* |
| 6:30 onwards | *Dinner (off-site) — optional, separate free ticket* |

## WHERE COSMOS IS TODAY

**Upper mid-band.** A bookable FR3 sandbox: Pi-Radio heterodyne front ends in SB1, 2×2 TX/RX, IF interface to USRP-2974 SDRs, wideband Vivaldi antennas, up to **160 MHz** of signaling with precise gain and LO control. First measurements at **10–10.5** and **12.2–12.7 GHz**, bookable now via sb1.cosmos-lab.org, with four published tutorials.

**The digital twin.** A 3.5 GHz sounding campaign — 20 positions, 16 for training and 4 held out — feeds measured channel impulse responses into **NVIDIA AODT** and **Sionna RT**, so the twin is calibrated against the street rather than assumed. Duke's **Geo2SigMap** builds scenes from open map data and trains a cascaded U-Net purely on synthetic ray-traced data, predicting RSRP to **6.04 dB RMSE** — 3.59 dB better than statistical, ray-tracing and prior ML methods.

**Street-level sensing.** The next-generation medium node carries six modalities on one time-aligned data plane — lidar, thermal, 4 MP RGB, a 16-channel acoustic array, air quality and climate, and UWB anchors. ISAC runs on 28 GHz phased arrays, with every dataset published out to the Smart Streetscapes community.

### Call for participation

Bring the experiment you cannot run yet. On the table:

- **Antennas and arrays** across 7–24 GHz — what designs, and from whom?
- **1 GHz end-to-end** — full-bandwidth sounding implies at least 25 GbE (realistically 100 GbE) fronthaul, with storage and compute to match.
- **Twin fidelity** — what error, against what measurement, makes a simulated result publishable?
- **Sensing and ground truth** — which modalities, at what rate, labeled how?
- **Coexistence and incumbents** — what must a testbed demonstrate to earn outdoor FR3 authorization?

**Coming from out of town? Stay for Friday.** The **STAIRWAI to COSMOS Workshop on Wireless for AI (W4AI)** runs the next day, Friday 18 September 2026, at the same venue — a full day on making AI applications wireless-native. Register: eventbrite.com/e/1998936130777

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