

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

11:30 – 12:00	<i>Registration and light lunch</i>
12:00 – 12:15	Welcome and the COSMOS³ roadmap Ivan Seskar, Rutgers/WINLAB — the four-year plan, and where the three threads meet
12:15 – 12:45	FR3 and the next-generation node 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 Tingjun Chen, Duke University
1:10 – 1:50	Keynote — FR3: why now 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 Carlos Caicedo, Syracuse University
2:25 – 2:50	Securing Smart Cities with COSMOS: From Real-Time Video Analytics to Trusted Navigation Jhonatan Tavori, Columbia University
2:50 – 3:05	Networking in a Quantum COSMOS John Louis Drogo, Columbia University
3:05 – 4:00	Demo break
4:00 – 5:00	What do you need next in COSMOS? 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	<i>Reception — joint with W4AI attendees arriving for Friday</i>
6:30 onwards	<i>Dinner (off-site) — optional, separate free ticket</i>

WHERE COSMOS IS TODAY

Upper mid-band. A bookable FR3 sandbox: Pi-Radio heterodyne front ends in SB1, 2x2 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