

Panel Discussion: Driving Innovations in 5G

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Research-driven Innovation for next-gen Wireless Networks (5G and Beyond)

❑ Various US federal agencies, DoD/DoE Labs

- ❑ NSF, NIST, DARPA, ARL, AFRL, DSO, AFOSR, NASA, DoE/INL, NTIA/ITS
- ❑ Cumulative spending over \$300M per year
- ❑ Broad spectrum of wireless research

❑ Research areas

- ❑ Circuits, Devices, Signal Processing, Algorithms, Protocols, Systems

❑ Investment Technologies

- ❑ Dynamic Spectrum Sharing, Millimeter-Wave, Massive MIMO, Full Duplex, SDN/NFV, densification, multi-RAT integration, Backscatter, Internet Architecture
- ❑ Research investments across academia, federal research labs and industry

❑ Perspective on 5G

- ❑ Industry-brand term
- ❑ Convergence expected soon
- ❑ US Federal priorities are aligned at a high-level
- ❑ NSF Resource Page: <https://www.nsf.gov/cise/5G/>

Disruptive innovation

❑ Not just incremental research

- ❑ Focus on Game-Changer technologies
- ❑ Dynamic Spectrum Sharing, Massive-MIMO, Full-Duplex, Backscatter, Architectures, Millimeter wave/FSO, Network Architectures
- ❑ DARPA: 100G RF (backhaul), Mobile Hotspots (mobile mm-wave), Adaptive RF (radio)
- ❑ NSF: EARS (spectrum sharing), NeTS, CIF, CCSS, FIA

❑ One measure of success – startups and tech transfers

- ❑ Startups: SiBeam, Kumu Networks, FirstRF, Dynamic Spectrum LLC, netBlazr, S2 Corp, Ratrix, Shared Spectrum, ORB Analytics, MaXentric Technologies, Physical Devices LLC, Fidelity Comtech, Time Domain, Jeeva Wireless, Meraki Networks, BigSwitch, and many more
- ❑ Tech transfers (NSF: AIR, IUCRC, STTR programs) – 10 or more instances per year in this domain.

❑ Research beyond 5G

- ❑ A world without spectrum regulation – laissez faire spectrum ecosystem
- ❑ Testbeds for technology convergence that can last beyond 5 years