

Unlicensed @ 6 GHz

What's going on?

September 22, 2020

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Wi-Fi 6E brings Wi-Fi into 6GHz

Features



More, contiguous spectrum



Wider channels



Less interference

Benefits



Gigabit speeds



Extremely low latency



High capacity

What's the Big Deal with Unlicensed 6 GHz?

Use Case Examples



Carrier Aggregation that can be quickly deployed



FWA

- Possible combination of CBRS, 6 GHz and mmwave
- CBRS control and coverage, mmwave preferred downlink and 6 GHz for primary uplink when mmwave degrades



MDU Applications



Whole home gigabit coverage



Muni Wi-Fi

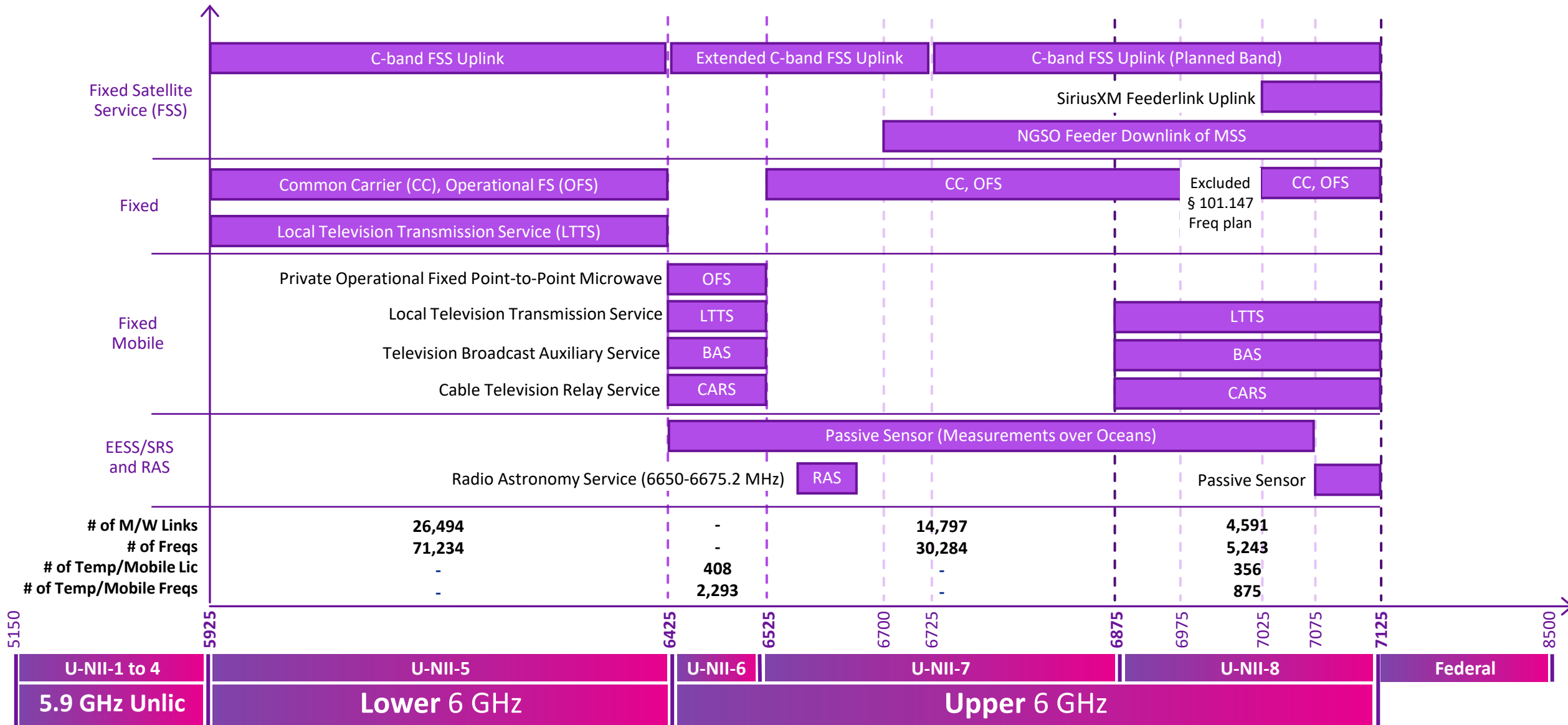


Factory and Warehouse IoT



Multi-gigabit Wi-Fi venue capacity

6 GHz Band: Incumbent Use & U-NII Designations





Summary of the Rulemaking

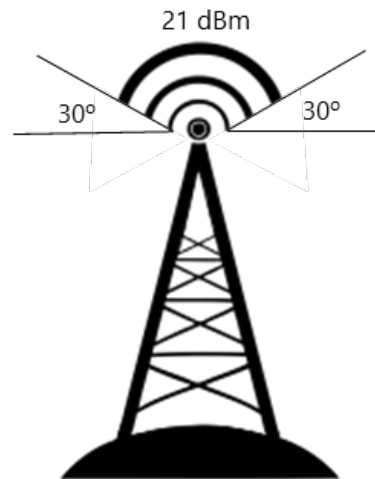
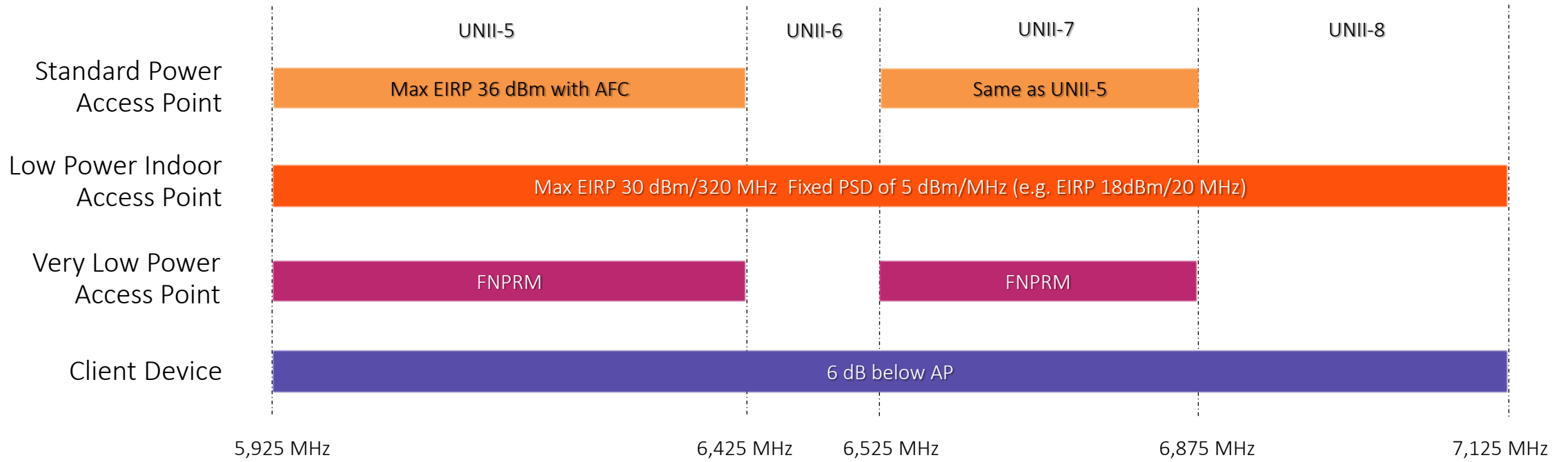
Report & Order (R&O)

- All 1200 MHz going to unlicensed
- Low Power Indoor (LPI) can operate without AFC
- Standard-power APs can operate indoors and outdoors and must use AFC
- No mobility permitted for Standard-power or LPI
 - But can operate in aircraft above 10,000 ft
 - Except can't operate in UAS (drones) at all
- Suggests formation of a new multi-stakeholder group (MSG) to study issues around:
 - AFC requirements
 - Interference detection/reporting/remediation
- Rules went into effect on July 27

Further Notice of Proposed Rule Making (FNPRM)

- Very Low Power can operate outdoor across the band without AFC: 14 dBm EIRP / -8 dBm PSD
- Can a contention-based protocol protect incumbents?
- Increase LPI power to 2W (33 dBm) / 8 dBm per MHz
 - To accommodate 320 MHz bandwidths
- Permit Standard-power APs to be mobile
- Permit Standard-power APs to operate at higher power
 - Using higher gain antennas
 - Require professional installation
 - Changes to AFC to support
- Comments: June 29 / Replies: July 27

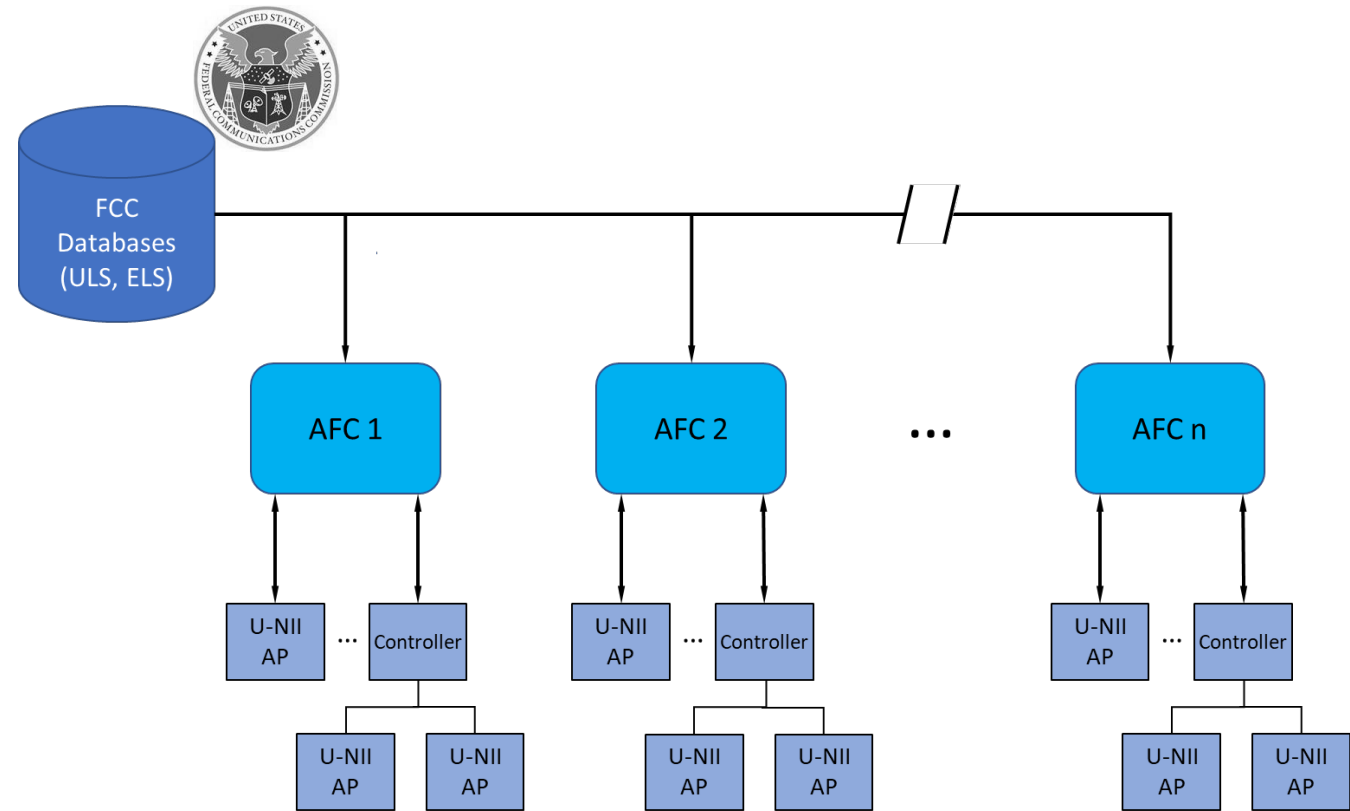
Power Specification



Outdoor Standard power device must maintain less than 21 dBm/MHz for >30° above horizon.

Basics of AFC

- FCC databases only (ULS & EAS)
- Interaction is read-only
- No AFC-AFC communication required
- Devices register on AFC & check daily
- AFC returns lists of available channels (and perhaps max powers)
- Device controllers can act as device proxies
- Location uncertainty (x, y, z) used to derive an Area of Location Uncertainty where device can be located



AFC Functional Architecture

WinnForum 6 GHz Committee

- Approved by WinnForum in August 2019
- The 6 GHz Committee is
 - An industry body,
 - Formed to study and specify sharing arrangements
 - In spectrum designated for unlicensed operation within all or part of the 6 GHz band (5925-7125 MHz)
- The Committee will
 - Provide technical input to inform the FCC's 6 GHz rulemaking
 - Facilitate the interpretation and implementation of the rulemaking that allows industry and regulators to collaborate on implementation of a common, efficient and well-functioning 6 GHz ecosystem

WinnForum 6 GHz Committee Members

- Airspan Networks
- Amdocs
- AT&T
- CableLabs
- Cambium Networks
- Charter Communications
- Cisco Systems
- Comcast
- CommScope / Comsearch
- Communications Research Centre (CRC)
- CTIA
- Ericsson
- Fairspectrum
- Federated Wireless
- Google
- Institute for Telecommunication Sciences
- iPosi
- Key Bridge Global LLC
- L3Harris
- Midco
- MITRE Corp
- Motorola Solutions
- NCTA The Internet & Television Association
- NIST
- Nokia Corp.
- Optimum Semiconductor Technologies, Inc.
- Pathfinder Wireless Corp.
- Qualcomm
- RED Technologies SAS
- Regulatory Advisory Committee Group
- Ruckus Wireless
- Samsung
- Sercomm
- SOLiD
- Sony
- Sporton International
- T-Mobile
- U.S. Cellular
- Verizon
- Wireless Internet Service Providers Association

WinnForum 6 GHz Committee Current Work

Up-to-date Incumbent Data

- Describe ULS function & operation
- Define data sets needed from ULS and EAS (and other databases)
- Addressing missing data elements
- Antenna patterns – microwave and AP
- Procedures for accessing (API?)
- Protecting incumbents throughout the licensing process
- Look at Canada & Mexico

Interference Analysis/Frequency Availability Methodology

- Granularity of I/N assessment
- Rx antenna near-field effects
- Link budget determinations
- Application of propagation models
- Application of location uncertainty
- Antenna patterns – microwave and AP
- Application of BEL for indoor APs

6 GHz Multi-stakeholder Group (MSG)

- Still in formation
- Open to all
- Next meeting, Oct 9
- Terms of Reference agreed upon
- Work Streams identified
- Open call for MSG co-chairs

6 GHz MSG Work Streams

Work Stream #1: Process for Harmful Interference Detection, Reporting & Resolution

- Process for detecting harmful interference to licensed incumbents
- Process to measure and identify sources of harmful interference
- Process for harmful interference reporting and for interference mitigation and resolution
- Characterization of U-NII device(s) signals to aid in processes above

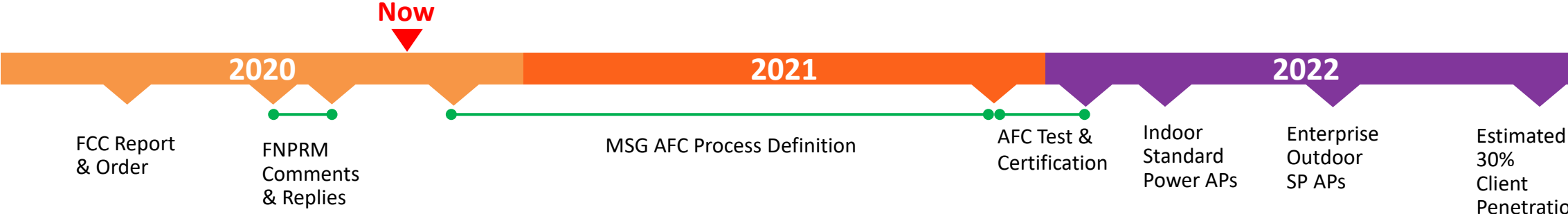
Work Stream #2: Up-to-date Incumbent Information

- Best practices around provision of (and periodic updates to) incumbent system data to ULS
- Processes for ensuring AFC systems contain complete and up-to-date incumbent data

Work Stream #3: AFC Development and Implementation

- Recommendations on application of AFC propagation models (e.g., parameters , I/N calculations)
- Reports from standards bodies undertaking AFC development
- Comment on SDO-developed test plans for AFC systems & AFC devices
- Contribute to development of test vectors
- AFC security best practices

Estimated Best Case Timeline



Thank you!