



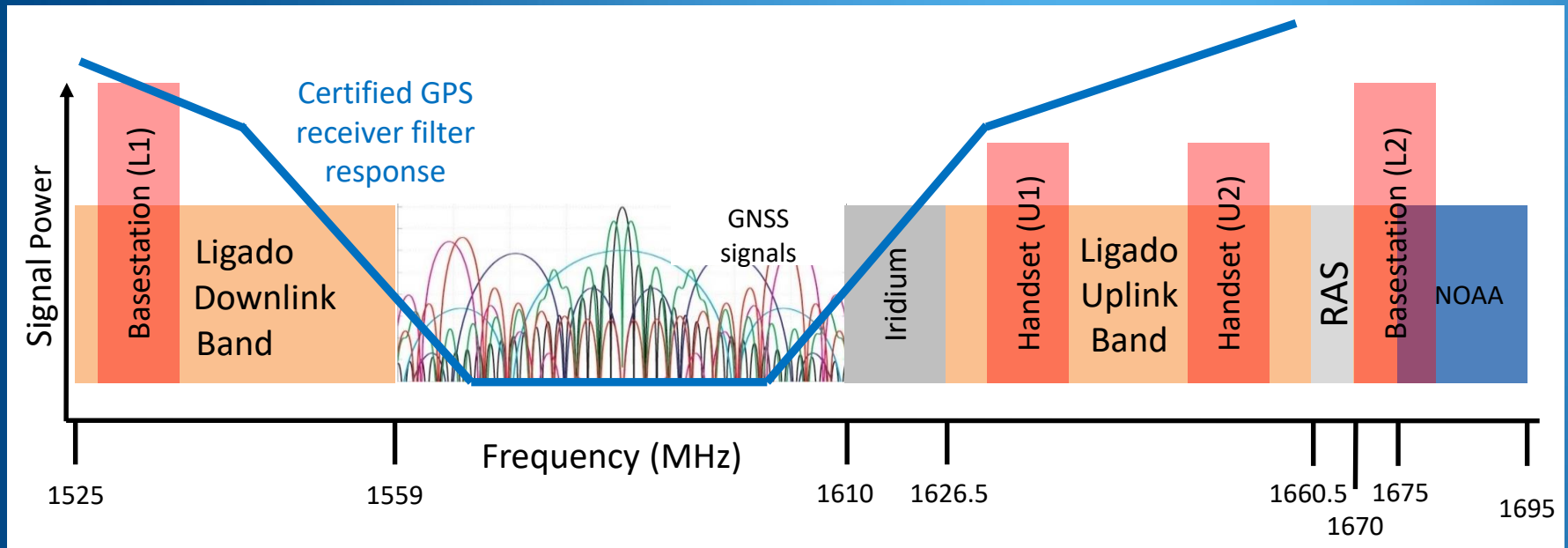
Ligado Update

AFC Fall 2016 Meeting – Austin, Tx

Scope

- Overview of spectrum problem
- Aviation work since last meeting
- Future work

The Spectrum Problem



- GPS (certified aviation)
- GPS (non-certified)
- SATCOM (Inmarsat and Iridium)
- NOAA satellite downlinks

Principle concerns

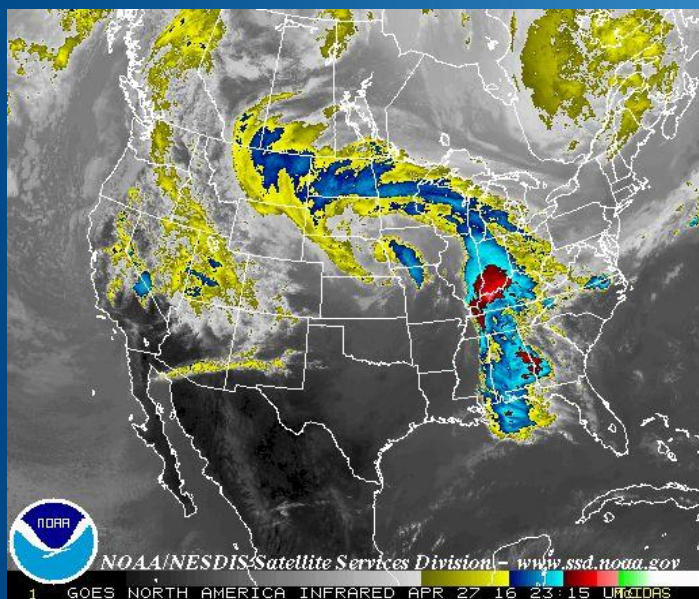


- Generic plan that does not address specifics
- GPS (certified aviation)
 - Separation limits, handsets, implementation process
- GPS (non-certified)
 - Testing of existing receivers, level of impact
- SATCOM (Inmarsat and Iridium)
 - Inmarsat – Unknown impact, indications from other studies
 - Iridium – Handset interference, no agreement possible
- NOAA satellite downlinks
 - Technical study issues, no protection for non-NOAA users, CDN details

NOAA Weather Satellites



- Ligado's spectrum move impacts the NOAA datalinks
 - Weather balloons reporting links
 - Geostationary Operational Environmental Satellites (GOES)
- GOES system imagery is the primary source of:
 - NWS Aviation Weather Center (AIRMET, SIGMET & PROG Charts)
 - NWS Volcanic ash advisories
 - NWS Hurricane Center advisories
 - NWS Storm Prediction Center advisories
 - Polar route radiation warning system
 - Flood and storm surge warnings advisories
 - Cloud-to-cloud and cloud-to-ground lightning data
- Only Ligado has conducted any technical analysis
 - Flaws in the analysis
- Internet replacement proposal has minimal details





- FCC issued two Public Notices on the 22 April 2016
 - Consideration of Ligado's GPS proposals for a waiver
 - Possible licensing of the NOAA weather band
- ASRI has been coordinating with AFC membership and other aviation organization to submit appropriate information
 - ASRI drafted filing with supporting signatories

Joint Aviation Filings



- ASRI and 11-14 other signatories have filed comments against the issues
 - 23 May, 11 & 21 Aug
 - Noted that proposals are premature
 - Too many outstanding issues
- Issue now unlikely to be resolved in current administration
 - NOAA filing had a large number of diverse comments

Aviation Meeting with Agencies



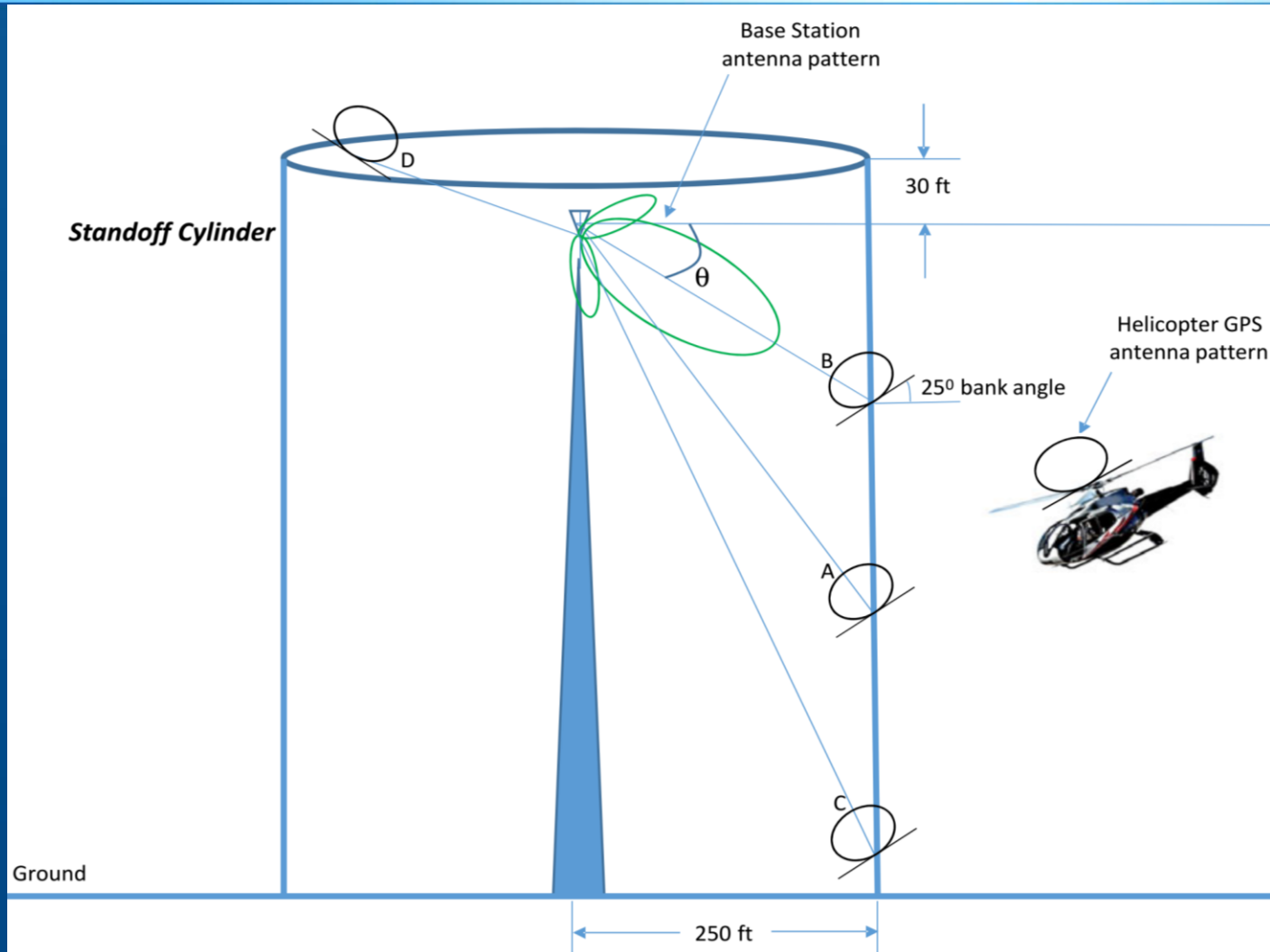
- 27 Jul – FCC Staff
- 15 Aug – FCC Chairman's Office
- 18 Aug – Ligado
- 29 Aug – DOT
- 30 Aug – NTIA
- 6 Oct – FCC Commissioners and Chairman's Office
 - NOAA focus

Ligado's New GPS Plan for Aviation



- In Sep 2016, Ligado finally released details of the plan to mitigate interference to certified aviation GPS receivers.
- Reduce power from previous levels to create a GPS standoff cylinder that does not guarantee certified aviation GPS will work within it
 - 250ft lateral and 30ft vertical separation
 - Would apply to approx. 10,000 – 20,000 basestation across US
- Use RTCA standards to determine the power limit required to ensure each base station's compliance
 - Individually assess each proposed base station prior to deployment
- RTCA seeking comments by 17 Nov 2016 on technical and operational proposals
 - RTCA TOC also involved

Ligado Plan



Looking Forward



- Public notice has finished
 - Comments and ex parte still being filed
- Unlikely for FCC decision before new administration
 - FAA/RTCA work will continue during that period
- Work has moved more into the operational environment for GPS concerns
 - ASRI requesting aviation operators provide direct comment to RTCA

Summary



- Aviation support for ASRI filings has been critical to opposition
 - Some concessions from Ligado
- More direct operator involvement now required for GPS
 - RTCA involvement critical, especially for helicopter operators
- ASRI looking to work with Iridium for SATCOM concerns
 - Awaiting Ligado response first
- Inmarsat a direct issue at this time until clarified



Questions?