HWG | HARRIS, WILTSHIRE & GRANNIS LLP

September 25, 2017

Ex Parte

Marlene H. Dortch
Secretary, Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service*; IB Docket No. 17-95

Dear Ms. Dortch:

On September 21, 2017, Maureen C. McLaughlin, Vice President of Public Policy for Iridium Communications, Inc. ("Iridium"), Brandon Hinton of Harris Corporation, and Shiva Goel and I of Harris, Wiltshire & Grannis LLP met with Jose Albuquerque, Chip Fleming, Joseph Hill, and Cindy Spiers of the International Bureau.

We expressed support for the Commission's proposal to expand the spectrum available for earth stations in motion ("ESIMs"), but questioned the wisdom of including the 29.25-29.3 GHz band among the new spectrum identified for ESIMs in the *NPRM*.[1]

Unlike other potential ESIM spectrum, the 29.25-29.3 GHz band is shared with non-geostationary satellite orbit ("NGSO") systems operating in the mobile satellite service ("MSS"). Iridium is in the midst of upgrading its NGSO system in the band with its new $3 billion Iridium NEXT constellation. While Iridium for many years has shared this spectrum successfully with *fixed* terminals of geostationary satellite orbit ("GSO") operators, primarily gateways, the addition of ESIMs would create an impractically complex sharing environment—and not just for Iridium, but for future NGSO MSS systems as well.

The problem is that after years of effort, the industry still has not developed a method for identifying the size, shape, and orientation of an exclusion zone beyond which ESIMs in sight of an Iridium earth station will not cause harmful interference. This is because the boundary of the exclusion zone depends on the number and location of GSO terminals, which, for ESIMs, will change over time and cannot be pre-determined as explained in the attached presentation. The problem is especially acute for earth stations aboard aircraft ("ESAAs"). The shape and orientation of interference zones vary by the altitude and flight path of each interfering GSO terminal, meaning that GSO operators would have to ensure that their constantly moving ESIMs comply with constantly changing exclusion zones.

[1] *Amendment of Parts 2 and 25 of the Commission's Rules to Facilitate the Use of Earth Stations in Motion Communicating with Geostationary Orbit Space Stations in Frequency Bands Allocated to the Fixed Satellite Service*, Notice of Proposed Rulemaking, 32 FCC Rcd. 4239 (2017) ("*NPRM*").

In response to questions from staff about whether the number of ESIM terminals in operation remains relevant to the definition of an exclusion zone even when ESIM terminals do not communicate simultaneously with a GSO satellite, Iridium explained that the non-simultaneous nature of ESIM interference is precisely the concern. When individual ESIM terminals communicate at different times, they multiply the number of short-term interference events that erode each GSO network's allotment of Iridium's short-term protection criterion, as also demonstrated on the attached presentation. More to the point, there is no means to determine whether individual ESIM terminals interfering at different times create, in the aggregate, excessive interference into the Iridium system, because the number and location of the ESIMs remain unknown.

We also discussed how ESIMs pose additional complexity relative to blanked-licensed fixed terminals with respect to both achieving coordination and enforcing compliance with coordination conditions. Here too, we explained that terminals on aircraft, whose location changes constantly in three dimensions, raise unique concerns. We also explained that coordination with blanket-licensed fixed terminals has hardly been common, has been challenging to the limited extent that it has occurred, becomes increasingly complex with each additional system, and would make sharing with ESIMs even more difficult.

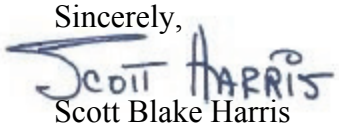
Finally, we discussed the practical implications of the complexities described above. Because of the coordination challenges that have confounded the industry for the better part of a decade, the Commission can only authorize ESIMs on the expectation that it will have to hear and mediate disputes over how best to define an exclusion zone—disputes that effectively would place the Commission in the position of trying to accomplish what the industry thus far has been unable to achieve itself. Moreover, the result of the Commission's effort would inevitably be very large, conservative exclusion zones covering enormous swaths of the United States, including key flight routes, based on the footprint of Iridium's existing ground infrastructure, and even larger areas as Iridium's network expands with the continued launch of Iridium NEXT. And even after such zones are defined, risk to Iridium would remain, given the practical difficulty of enforcing compliance for large numbers of terminals that are not installed at fixed locations, but instead placed aboard platforms that move extensively, quickly, and freely on earth and in the sky.

The result would be more regulatory intervention, less value per MHz, and more risk to Iridium and the commercial, military, and civilian government users that it serves—and an FCC stuck in the middle of an industry debate that has gone in circles for years.

Instead of tasking Commission staff to develop a formula for an equation that no one has been able to solve, the better approach would be to defer action on the 29.25-29.3 GHz band until the industry can arrive at a solution that works. That is especially true where, as here, there is no pressing need for the 50 MHz available in the 29.25-29.3 GHz band—which represents just a few percent of the total amount of new ESIM spectrum encompassed by the Commission's otherwise strong and reasonable proposal.

Please let me know if you have any questions.

Sincerely,



Scott Blake Harris
Counsel to Iridium Communications, Inc.

Attachment

ESIM INTERFERENCE TO IRIDIUM FEEDER LINKS

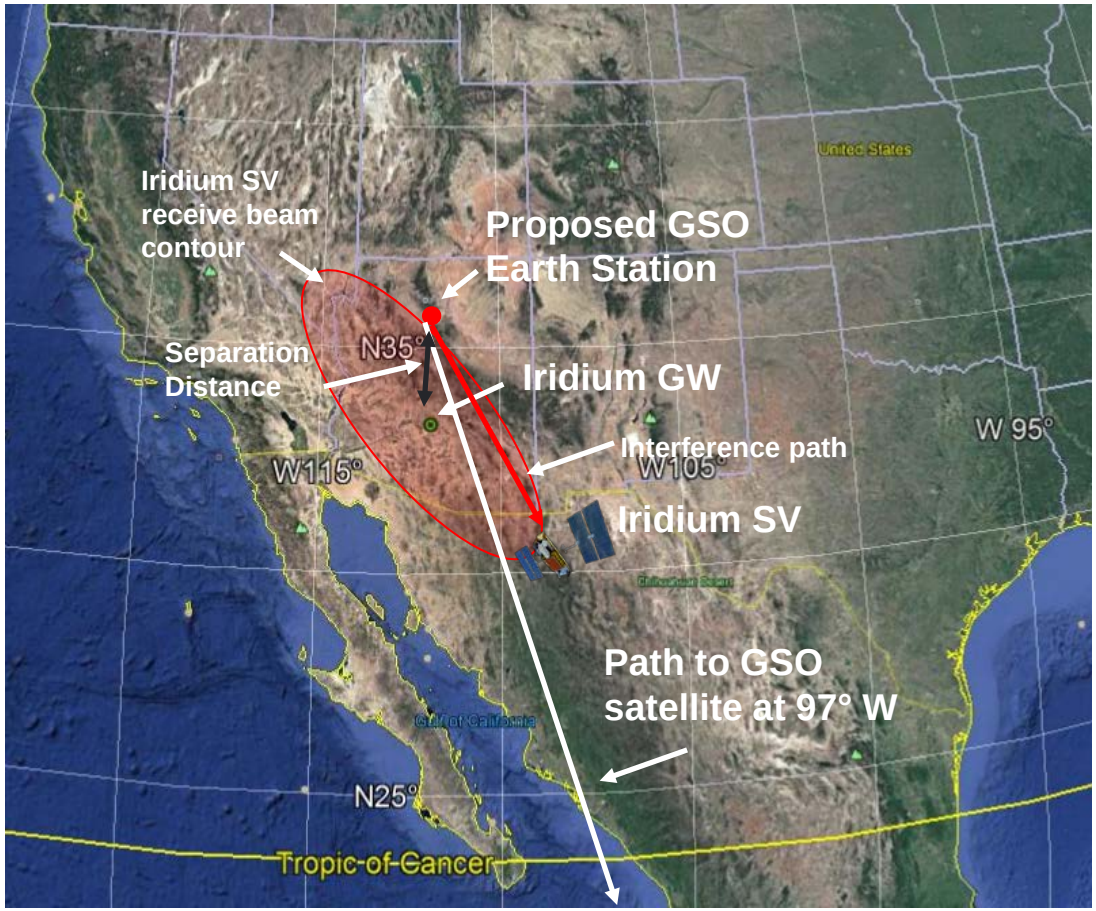
21 SEPTEMBER 2017

INTRODUCTION

- Compatibility between Iridium feeder links and GSO networks supporting ESIMs in the 29.25-29.3 GHz band raises significant concerns about ensuring protection of those feeder links
- Insufficient guidance currently exists on how to ensure time-varying sources of interference can meet short-term protection criteria requirements for Iridium's feeder links
- Without this technical methodology in place, one cannot assume that compatibility can be resolved through coordination – a well-defined technical basis for how to coordinate must be in place before Iridium can be assured of the protection it deserves

TYPICAL COORDINATION PROCESS WITH GSO NETWORK

- GSO operator proposes location(s) for GSO earth station(s)
- Simulation and/or analysis performed, based on following as input:
  - Locations of GSO earth stations
  - GSO earth station transmit characteristics
  - GSO satellite location and Iridium constellation ephemeris
  - Iridium SV receiver characteristics
  - Iridium single-entry long-term and short-term protection criteria
- Proposed GSO earth station either meets protection criteria (earth station location acceptable) or doesn't (earth station location not acceptable)
- If multiple GSO earth stations are proposed (communicating with one or more GSO satellites within the network), then aggregate interference from all earth stations is determined and compared to the single-entry protection criteria allotted to that GSO network



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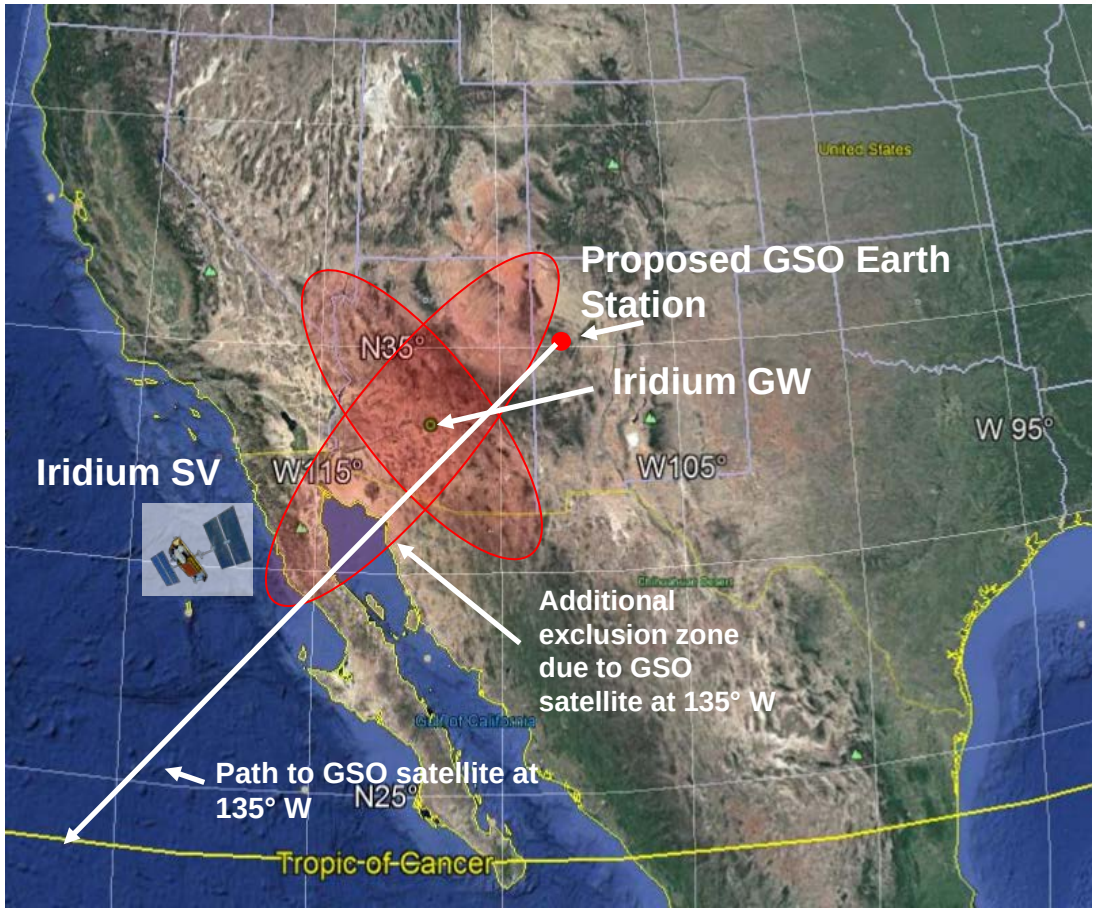
EACH GSO NETWORK REQUIRES NEW EXCLUSION ZONE

- Additional GSO networks add new exclusion zones
- Size, shape and orientation of these new exclusion zones will be a function of GSO satellite position, number and location of GSO earth stations



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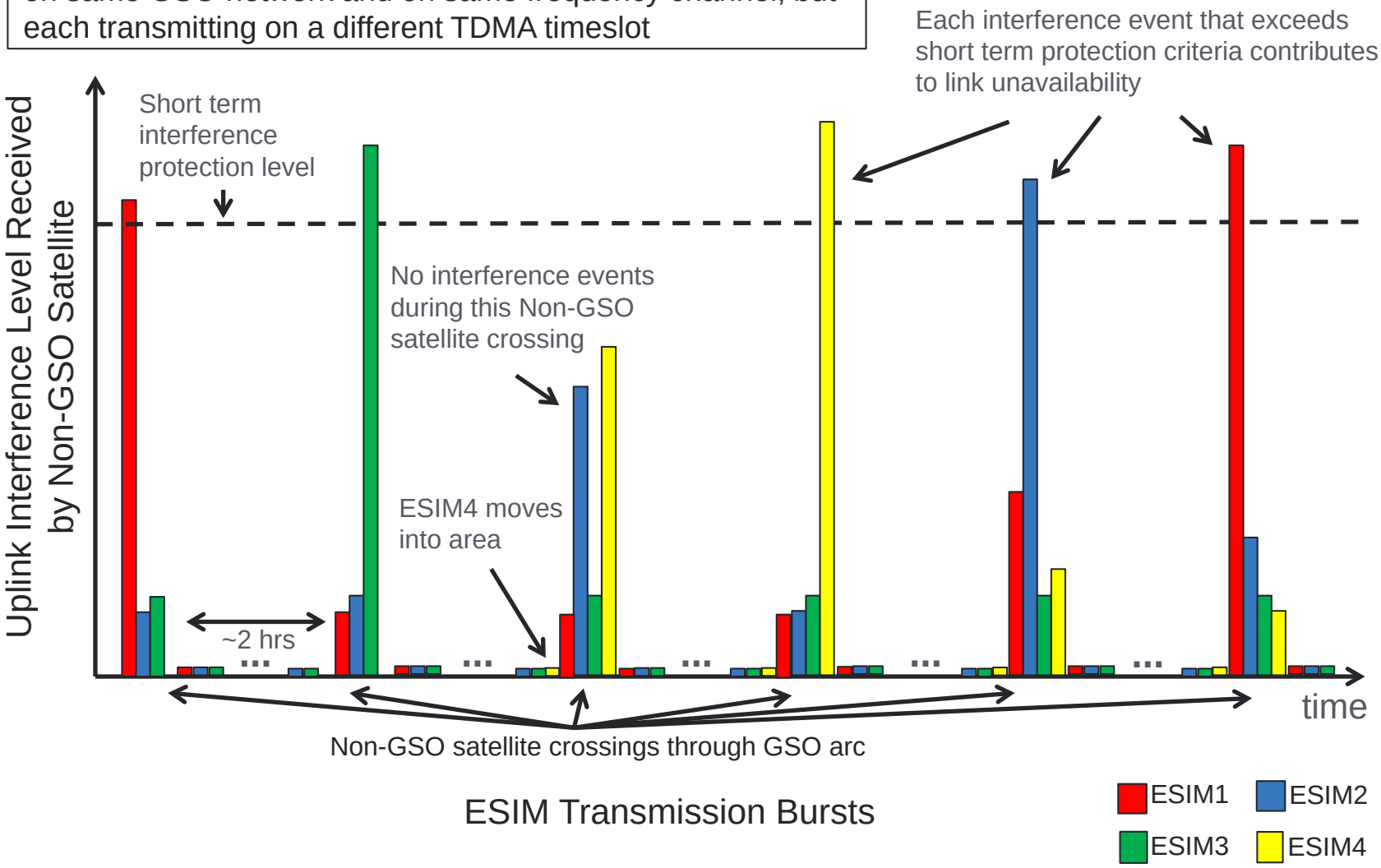
UNDEFINED COORDINATION PROCESS WITH GSO NETWORK PROPOSING TO SUPPORT ESIMS

- Simulation and/or analysis needs to be performed, based on following as input:
  - Locations of GSO earth stations (unknown)
  - Number of GSO earth stations (unknown)
  - GSO earth station transmit characteristics
  - GSO satellite location and Iridium constellation ephemeris
  - Iridium SV receiver characteristics
  - Iridium long-term and short-term protection criteria
- Insufficient information to perform analysis to determine whether interference from GSO network ESIMs meets protection criteria
- Therefore, Iridium must try and define an exclusion zone around its feeder link earth stations to ensure protection
- But, since the size, shape and orientation of this exclusion zone is a function of the number of interfering sources and their locations (which are both time-varying for ESIMs), defining this exclusion zone *a priori*, becomes very difficult

ESIM IMPACT ON SHORT TERM PROTECTION CRITERIA

Example scenario: 4 ESIM at different locations, operating on same GSO network and on same frequency channel, but each transmitting on a different TDMA timeslot



ADDITIONAL NOTES TO FIGURE

- Short term protection criteria defines: a) a given interference level that cannot be exceeded and b) a percentage of time for which that level cannot exceed.
- Interfering bursts from ESIM do not aggregate in power, since they each occur at different times
- However, each interfering burst contributes to link unavailability
- As can be seen – the number of interference events depends on the number of interfering ESIM in the area around an Iridium gateway station
- This number of interfering ESIM is continuously changing due to motion of interfering stations
- There is no methodology in place today to determine whether ESIMs are meeting a given GSO network's allotment of interference percentage of time

ADDITIONAL AERONAUTICAL ESIM COORDINATION PROBLEMS

- Aeronautical ESIMs pose an additional problem when addressing protection of Iridium feeder links
- The standard interference protection zone needed around an Iridium feeder link earth station is defined as a two-dimensional region on the Earth's surface in which an interfering GSO earth station is not allowed to operate co-frequency if it won't meet Iridium protection criteria
- Even if a protection zone could be determined for terrestrial ESIMs, it's obvious that aeronautical ESIMs at altitude force the need for a three-dimensional protection zone that extends up into the national air space
- The required protection zone does not merely extend vertically from the Earth's surface – it extends along the (continually changing) slant path towards the victim Iridium satellite (see figure), making the definition and enforcement of this protection zone challenging