USA

Proposal to initiate work under Resolution 731

**Background**

Resolution 731 (Rev.WRC-19) resolves to invite ITU-R:

1 to continue its studies to determine if and under what conditions sharing is possible between active and passive services in the frequency bands above 71 GHz, such as, but not limited to, 100‑102 GHz, 116‑122.25 GHz, 148.5‑151.5 GHz, 174.8‑191.8 GHz, 226‑231.5 GHz and 235‑238 GHz;

**Discussion**

This work will address the sharing issues above 71 GHz requested in Resolution 731. The most difficult sharing issues involve protecting EESS use in bands listed in RR5.340. While RAS use must also be protected, RAS receiver sites at frequencies above 71 GHz tend to be in high altitude arid sites in order to avoid high atmospheric absorption at these frequencies. Thus there are very few RAS sites that need protection for communications uses in this spectrum and they can be protected by a combination terrain-based protection zones and limits on path azimuths within such protection zones. Due to the locations of these RAS sites this will have little practical impact on telecommunications uses of this spectrum.

EESS protection is much more complex because these passive satellites cover the whole earth regularly performing critical meteorological and environmental measurements, usually from low altitude orbits. The FIXED service is the prime communications use for consideration at this time as its fixed geometry greatly simplifies protection issues compared to any MOBILE service. While in general optical fiber communications is the lowest cost medium to connect sites with broadband communications either for mobile backhaul or for direct communications, optical fiber installation is a major factor in both system cost and ability to build capacity quickly. FIXED systems above 71 GHz have the potential promise of quick installation for paths with a distance of a few km as well as lower costs in places with terrain between the endpoints that does not permit low cost installation. The quick installation could be of value for both special events that occur without much lead time, one teem events that do not justify optical fiber installation, and emergency restoration of capacity in networks where optical fibers have been damaged and can not be quickly repaired as in the case of a disaster that damages a wide area.

While the 5.340 bands individually have bandwidth of a few GHz, the numerous such bands above 71 GHz limit the ability to create large contiguous bands. For example, in 71-200 GHz the largest block that does not include spectrum restricted by 5.340 is the 22.5 GHz between 116 and 148.5-1 GHz. But if any acceptable procedure could be found for interference-free sharing of the 148.5-151.5 GHz band now protected by 5.340, then 116-164 GHz might be available for FIXED use – a contiguous band of 48 GHz.

The general approach to be taken is based on the observation that protection of the primary allocations in 5.340 bands has to be a key issue in the design of any system using such spectrum. It is not possible to discuss communications requirements in the abstract sense for such spectrum and then see if sharing is possible. Interference-free sharing must be a fundamental design criteria.

Fortunately, sharing above 71 GHz raises different technical issues than in the lower bands also contained at 5.340. Atmospheric absorption is a key propagation issue above 71 GHz for paths greater than a few km. As a result, low elevation angle ground-to-satellite paths have paths losses generally above 1000 dB making the atmospheric basically opaque. However this path loss decreases with path elevation angle increase and zenith propagation is comparable to much lower bands. The basic approach in this is to develop EIRP limits for emissions at various elevation angles for FIXED transmitters in selected 5.340 bands.

FIXED systems generally have low elevation angles, so main beam illumination of EESS receivers by such can be eliminated. But sidelobe illumination is a possible interference source. While all finite size antennas must have sidelobes for theoretical reasons, it is theoretically possible to decrease sidelobes at high elevation angles below the typical values generally encountered in today’s FIXED systems which were designed in a terrestrial-to-terrestrial sharing environment where such sidelobes were not of concern. But antenna designers need a sidelobe suppression goal in order to develop such designs. Such goals are the focus of this work.

**Proposal**

Building on the P.676-11 and P.525 propagation methods, the United States proposes developing methods for computing the incidental illumination of EESS systems by sidelobes of terrestrial Fixed Service systems with low elevation angle paths. This method could then be used to develop EIRP limits for high elevation angle emissions as a possible method to meet interference-free sharing objectives of Res. 731. Both individual and cumulative signal strengths from such uses are considered in the context of meeting RS.2017 protection limits.

The US proposes to start this work with the Fixed Service, recognizing that it could be expanded to include the mobile service, as appropriate. Initial focus is proposed on the 100-102 GHz and 148.5-151.5 GHz bands. Again, the scope could be expanded, as appropriate.

In order to initiate this work, the US proposes requesting characteristics and propagation information from the relevant working parties. Draft liaison statements are provided for the consideration of WP1A.

Attachments: Draft liaison statements