July 15, 2015

VIA ELECTRONIC DELIVERY

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W., Room TW-B204
Washington, D.C. 20554

Re: Comprehensive Review of Licensing and Operating Rules for Satellite Services; IB Docket No. 12 - 267

Dear Ms. Dortch:

The Satellite Industry Association ("SIA") herein further discusses several matters addressed during the May 12, 2015 meeting between SIA and Federal Communications Commission ("FCC") International Bureau staff regarding the above-captioned proceeding.[1] The matters addressed in this *ex parte* are (1) Kymeta's proposal to flatten the off-axis effective isotropically radiated ("EIRP") power spectral density mask; (2) the minimum earth station antenna size requirements for routine earth station processing; (3) the allowed exceedances to the off-axis gain in 47 CFR 25.209; and (4) the definition of N in the (-10log(N)) formula.

Eliminating the Wings in the Off-Axis EIRP Density Mask

Both in its Reply Comments[2] and during the aforementioned May 12th meeting, SIA recommended that the FCC eliminate the wings, thereby flattening the equivalent EIRP density mask in the off-axis range of 19.1° - 48° for conventional geostationary orbit ("GSO") Ka-band and Ku-band antennas.

FCC staff has inquired whether the worst-case analyses of potential interference in Kymeta's Comments[3] and SIA's Reply Comments took into account the permitted exceedances proposed by SIA. As explained below, Kymeta's Comments took into account the permitted exceedance while SIA's Comments were informed using Recommendation ITU-R S.732 and the work done in its development.

Kymeta's analysis compared the potential interference using the FCC's existing mask[4] to the potential interference using the Kymeta-proposed mask, which flattened the wings between 19.1° and 48°.[5] Kymeta's analysis assumed a 3 dB exceedance between 19.1° - 36.9° off-axis for both the FCC's existing mask and Kymeta's proposed mask. The rules proposed by SIA, as clarified below, would permit a specified exceedance within specific angular limits. The total angular range for the exceedances

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[1] *See* Satellite Industry Association, Notice of Oral Ex Parte, Comprehensive Review of Licensing and Operating Rules for Satellite Services, IB Docket No. 12-267 (May 14, 2015).
[2] Reply Comments of the Satellite Industry Association, Comprehensive Review of Licensing and Operating Rules for Satellite Services, IB Docket No. 12-267 (filed Mar. 2, 2015)("SIA Reply Comments").
[3] *See* Comments of Kymeta Corporation, Comprehensive Review of Licensing and Operating Rules for Satellite Services, IB Docket No. 12-267 (filed Jan. 29, 2015)("Kymeta Comments").
[4] *See* 47 CFR 25.138.
[5] Kymeta Comments at Exhibit 1.

cannot be greater than 10% of the entire angular range of $\psi < \theta \leq 180°$.[6] For Ka-band, the angular range is 178° (2° – 180°), 10% of which is 17.8°. The Kymeta proposal would not make any changes to the mask outside 48°, and thus, any proposed exceedances beyond 48° are not relevant to the analysis.[7]

SIA's analysis also compared the potential interference using the FCC's existing mask with the potential interference using the Kymeta-proposed mask.[8] SIA's initial analysis did not assume an exceedance for either the existing mask or Kymeta's proposed mask. SIA has undertaken a revised analysis adding a 3 dB exceedance to both masks. The revised analysis shows that adding the 3 dB exceedance to both masks would not result in a material difference in the results. *See* Exhibit A, Revised Technical Showing.

Minimum Antenna Size

SIA re-affirms its position that there should be no minimum earth station antenna diameter requirements for the routine processing of earth stations.[9] Minimum earth station antenna diameter requirements are not technology neutral and are not necessary to address antenna mis-pointing issues. All earth station antennas that meet the FCC's technical requirements should be processed expeditiously.

However, should the FCC retain the minimum earth station antenna diameter requirements – and impose such requirements in the case of Ka-band – then the rule should include a streamlined process for earth station antennas that automatically track the target satellite and have appropriate pointing error control and shut-off mechanisms.

SIA Recommendation Regarding Allowed Exceedances to the Off-Axis Gain in § 25.209

SIA provides a revision to its original proposals for §§ 25.209(a)(3) and 25.209(a)(4) in its Comments and Reply Comments.[10] Specifically, SIA supports allowing the off-axis gain to exceed the mask in a total angular range that is no greater than 10% of the *entire* angular range $\psi < \theta \leq 180°$ where ψ is equal to: (i) 1.5° for C-bands; (ii) 1.5° for Ku-band; and (iii) 2° for Ka-band in § 25.209(a)(3) and $3° < \theta < 180°$ for § 25.209(a)(4).

SIA re-affirms its support of an allowed excess of 10 dB within the angular range of $48° < \theta \leq 180°$ for antenna data measurement compliance as proposed in the SIA Comments for § 25.209(a)(3) and the new proposed § 25.209(a)(4).[11] This proposal allows for more flexibility with new terminals, whether mobile or fixed, including steerable phased arrays.

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[6] Comments of the Satellite Industry Association, IB Docket No. 12-267 (filed Jan. 29, 2015)("SIA Comments") at 9. The rules proposed by the FCC would permit an exceedance by up to 3 dB in 10% of the angular range from 7° - 180°. Comprehensive Review of Licensing and Operating Rules for Satellite Services, Further Notice of Proposed Rulemaking, IB Docket No. 12-267, FCC 14-142 (rel. Sept. 30, 2014) at Appendix A, Proposed Rule Changes, Sections 25.209(a) and (b).
[7] The same analysis would apply to the Ku-band.
[8] *See* SIA Reply Comments at Exhibit 1.
[9] Id. at 5 – 6.
[10] *See* Comments of the Satellite Industry Association, at 9-10, Annex B 90-91, IB Docket No. 12-267 (filed Jan. 29, 2015), *and* Reply Comments of the Satellite Industry Association, at Exhibit 3, 59-60, IB Docket No. 12-267 (filed Mar. 2, 2015).

[11] *Id.*

Exhibit B contains SIA's revised proposal for §§ 25.209(a)(3) and 25.209(a)(4) with changes red-lined against the original SIA Comments and Reply Comments.

Minus 10log(n) Formula and the Definition of N

SIA re-affirms its position that no change is necessary to the definition of N for TDMA and FDMA in the case of spot beam satellites. This applies to both the § 25.138 and § 25.218 rules. However, SIA does recognize that the Ka-band rules were generally established with spot beam satellites in mind. SIA understands that the introduction of new Ku-band spot beam satellites is of particular concern to the Commission. As a result, SIA agreed to perform an analysis using two representative Ku-band area and spot beam satellites. SIA will submit the results of that analysis soon.

Please contact the undersigned with any questions related to this filing.

Respectfully submitted,
/s/

SATELLITE INDUSTRY ASSOCIATION

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EXHIBIT A: REVISED TECHNICAL SHOWING

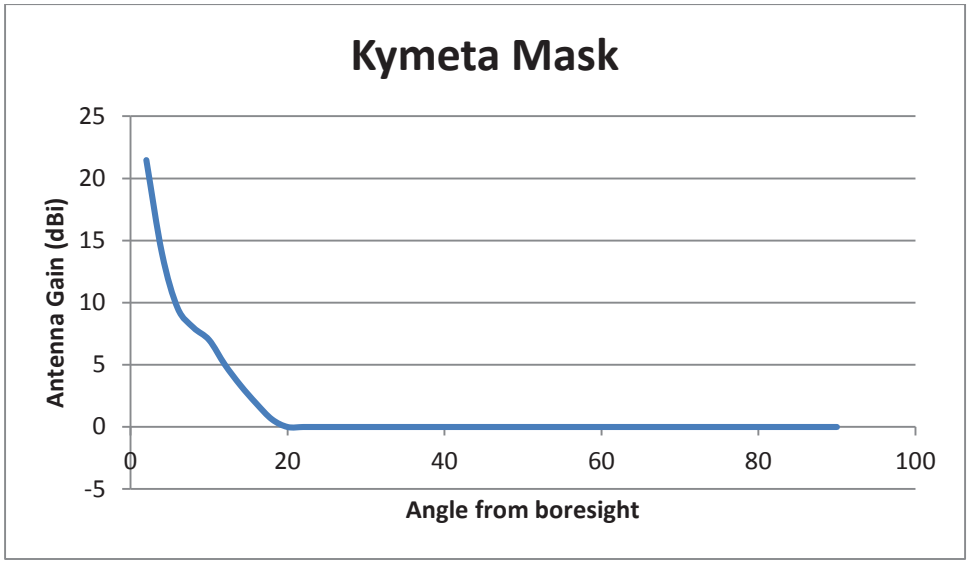
Impact of the Kymeta Proposed Changes to Section 25.138

The following analysis considers the impact of the proposal made by Kymeta in regards to the GSO FSS off-axis EIRP density mask in Ka-band.

Assumptions:

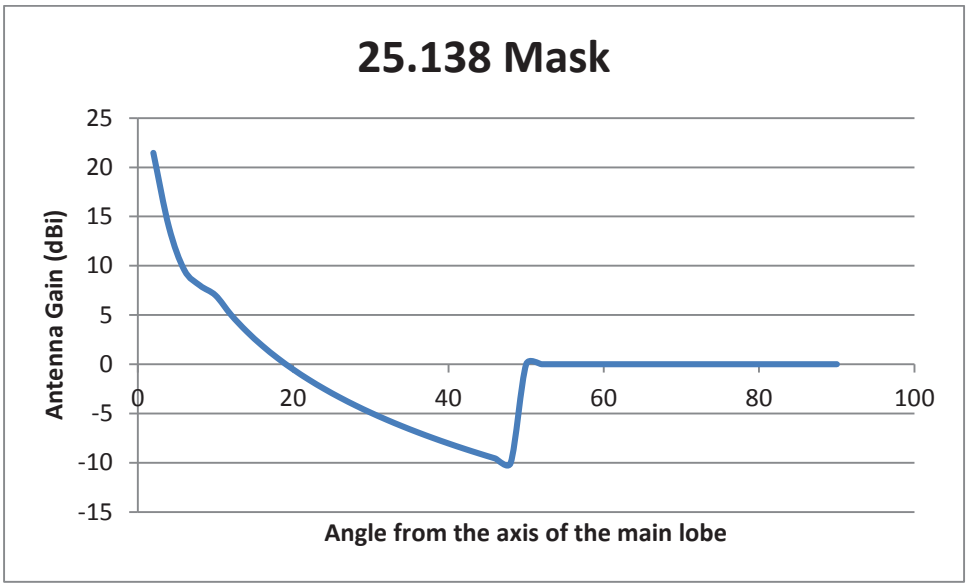
a. It is assumed that the GSO FSS off axis earth station antenna gain mask underpinning the proposal by Kymeta is as follows:

Angle from the axis of the earth station antenna mainlobe	Antenna gain (dBi)
$2° \leq \theta \leq 7°$	$29 - 25 \log \theta$
$7° < \theta \leq 9.23°$	8
$9.23° < \theta \leq 19.1°$	$32 - 25 \log \theta$
$19.1° < \theta \leq 180°$	0 dBi



b. It is assumed that the current off axis earth station antenna gain mask underpinning the GSO FSS off axis EIRP density mask in 25.138(a)(1) of the Commission's Rules is provided in the table below:

Angle from the axis of the earth station antenna mainlobe	Antenna gain (dBi)
$2° \leq \theta \leq 7°$	$29 - 25 \log \theta$
$7° < \theta \leq 9.23°$	8
$9.23° < \theta \leq 48°$	$32 - 25 \log \theta$
$48° < \theta \leq 180°$	0 dBi



c. It is assumed that the victim is a GSO FSS satellite.

d. It is assumed that interferers are a collection of co-located GSO FSS earth stations. Each interfering earth station transmits with the same flange power density. Each of the interfering earth station points to a different GSO FSS satellite. The target GSO FSS satellites are located at two degree increments around the GSO arc. (*i.e.* 2, 4, 6, 8, ….).

e. The wanted carrier comes from an earth station co-located with the interfering earth stations.

Analysis

a. Calculating the aggregate C/I can be found using the following equation:

$$\frac{C}{I}(dB) = C(dB) - 10 * \log\left[2 * \sum_{i=1}^{90}[P_i * G_i]\right]$$

Where **i** is an index relating to the *ith* interfering earth station, transmitting with a flange power P_i and an antenna gain towards the victim satellite of G_i.

b. Calculating the difference in C/I between the two antennas can be found as follows:

$$Difference = \frac{C/I_{Kymeta}}{C/I_{25.138}}$$

Since the wanted carrier power "C" is the same in both cases:

$$= \frac{I_{Kymeta}}{I_{25.138}}$$

or:

$$= I_{Kymeta} - I_{25.138} \quad (dB)$$

substituting from (a) above:

$$= \left[10 * \log\left[2 * \sum_{i=1}^{90}[P_i * G_i]\right]\right]_{Kymeta} - \left[10 * \log\left[2 * \sum_{i=1}^{90}[P_i * G_i]\right]\right]_{25.138}$$

Removing the constants:

$$= \left[10 * \log\left[\sum_{i=1}^{90}[Gain_i]\right]\right]_{Kymeta} - \left[10 * \log\left[\sum_{i=1}^{90}[Gain_i]\right]\right]_{25.138}$$

From the two attached spread sheet:

$$= [24.2232\ dB]_{Kymeta} - [24.3871\ dB]_{25.138}$$

$$= 0.16\ dB$$

For a GSO FSS earth station transmitting with the more permissive mask of the Kymeta proposal, the C/I could increase by up to 0.16 dB under the assumptions stated above.

Considering further 25.138(a)(3) in which the above masks may be exceeded by 3 dB, for values $\theta > 10°$, provided that the total angular range over which this occurs does not exceed 20° when measured along both sides of the GSO arc, the above analysis is easily modified to adjust the gain by +3 dB in the range of 19° to 29° on each side of the arc.

In this case the resulting values are:

$$= [24.4652\ dB]_{Kymeta} - [24.2718\ dB]_{25.138}$$

$$= 0.19\ dB$$

The increase as a result of including the allowed exceedance in 25.138(a)(3) is an additional 0.03 dB over the baseline Kymeta proposal as examined in the first version of this text.

Exhibit B

Proposed Revision to Sections 25.209(a)(3) and 25.209(a)(4) with Changes Shown Against the Original SIA Comments and Reply Comments

25.209(a)(3). While assessing antenna measurement data for compliance, the off-axis gain may exceed the mask in the main plane by the "allowed excess" value within the angular limits listed below. The total angular range of exceedance cannot be greater than ~~over~~ 10% of the angular range ~~±~~ $\psi < \theta \leq$ ~~<–~~180°~~given in the table for each of the "angular limits" ranges specified~~

Angular limits (°)	~~Angular range (°)~~	Allowed excess (dBi)
$\psi < \theta \leq 7$	~~5.5 (C, Ku bands)~~ ~~5 (Ka bands)~~	1
$7 < \theta \leq 9.2$	~~2.2~~	3
$9.2 < \theta \leq 48$	~~9.9~~	3
$48 < \theta \leq 180$	~~132~~	10

where ψ, θ and dBi are defined in (a)(1) of this section.

25.209(a)(4). While assessing antenna measurement data for compliance, the off-axis gain may exceed the mask in the plane orthogonal to the main plane by the "allowed excess" value within the angular limits listed below. The total angular range cannot be greater than ~~over~~ 10% of the ~~"~~angular range~~"~~ ~~±~~$3 < \varphi \leq$ ~~<–~~180°~~given in the table for each of the "angular limits" ranges specified~~

Angular limits (°)	~~Angular range (°)~~	Allowed excess (dBi)
$3 < \varphi \leq 48$	~~45~~	6
$48 < \varphi \leq 180$	~~132~~	10

where φ and dBi are defined in (a)(2) of this section.