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VIA ELECTRONIC FILING

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

Re: *Notice of Ex Parte Meeting*, GN Docket No. 18-122

Dear Ms. Dortch:

Per FCC Rule 1.1206, this letter provides notice that on May 9, 2019, Bill Tolpegin, Chief Executive Officer of the C-Band Alliance (“CBA”); Susan Crandall, Associate General Counsel, Intelsat; Steve Corda, Vice President Media Platforms, SES; Petra Vorwig, Senior Legal & Regulatory Counsel, SES; and Kathryn Dickerson of Wiley Rein LLP met with Julius Knapp, Chief, Office of Engineering and Technology, along with staff members Aspasia Paroutsas, Michael Ha, Nicholas Oros, and Paul Murray.

At the meeting, Ms. Crandall discussed the technical, operational, and logistical issues related to clearing 200 MHz (inclusive of a 20 MHz guard band) of C-band spectrum for terrestrial operations in an 18-36 month timeframe. Ms. Crandall emphasized that the CBA’s proposed approach will facilitate rapid repurposing of the C-band for 5G deployment while protecting incumbent operators providing video programming and audio content to more than 100 million American households.

Mr. Corda then gave a presentation, attached hereto, that described the design principles underlying the technical rules the CBA proposed in the Technical Annex to its Reply Comments; measures to protect Fixed Satellite Service earth stations from interference from 5G, including a 5G aggregate power density limit and band pass filters; and a tool developed by the CBA to assist terrestrial mobile operators in calculating aggregate power density levels.

Please contact the undersigned with any questions regarding this letter.

Respectfully submitted,

 /s/
Jennifer D. Hindin
Counsel for the C-Band Alliance

Attachment

C-Band Alliance

Overview of CBA-Proposed Rules

C-band Alliance Membership



1 Design Principles

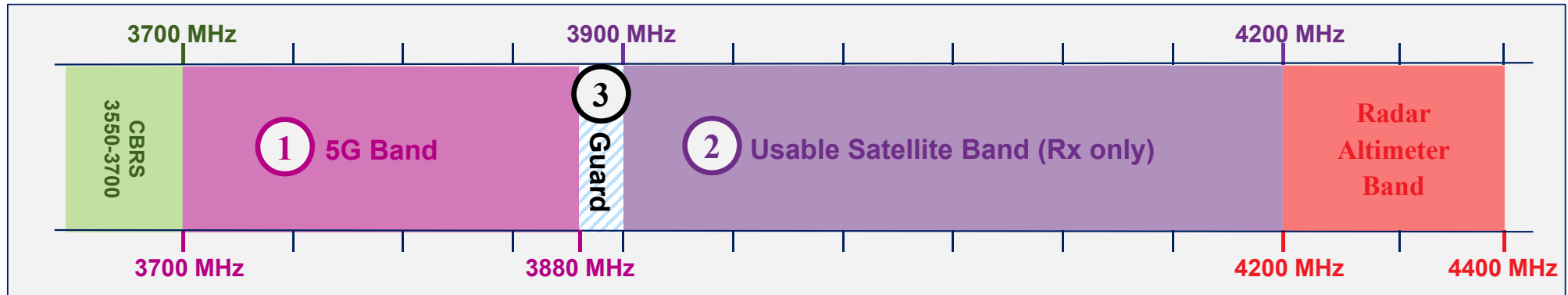
2 FSS Protection and 5G Parameters

3 Reference Earth Station and Tool

1 Design Principles

- In the technical annex to its reply comments, the CBA proposes **rules to be adopted by the FCC** that will
 - (i) **Protect FSS operations** in the remaining 3900-4200MHz and the few Earth Stations (“ES”) that will continue operating in the lower band
 - (ii) **Maximize 5G in-band power levels and deployment flexibility**
- The proposed rules are based upon **extensive analysis** of key technical issues raised in the opening round of comments, **discussions** with customers, mobile operators and 5G manufacturers, **and extensive testing**

1 180 MHz 5G Band



1 5G Band

- 180 MHz to be vacated for high power 5G at the lower end of the C-Band
- Some [teleports](#) to be grand-fathered and non-interference rules

2 Usable Satellite Band

- 300 MHz of [spectrum](#) to provide current C-Band users with certainty and operational integrity
- [Receive-only band](#)

3 Guard Band

- [5G / Satellite C-Band power difference](#) requires a guard band

1 Design Principles

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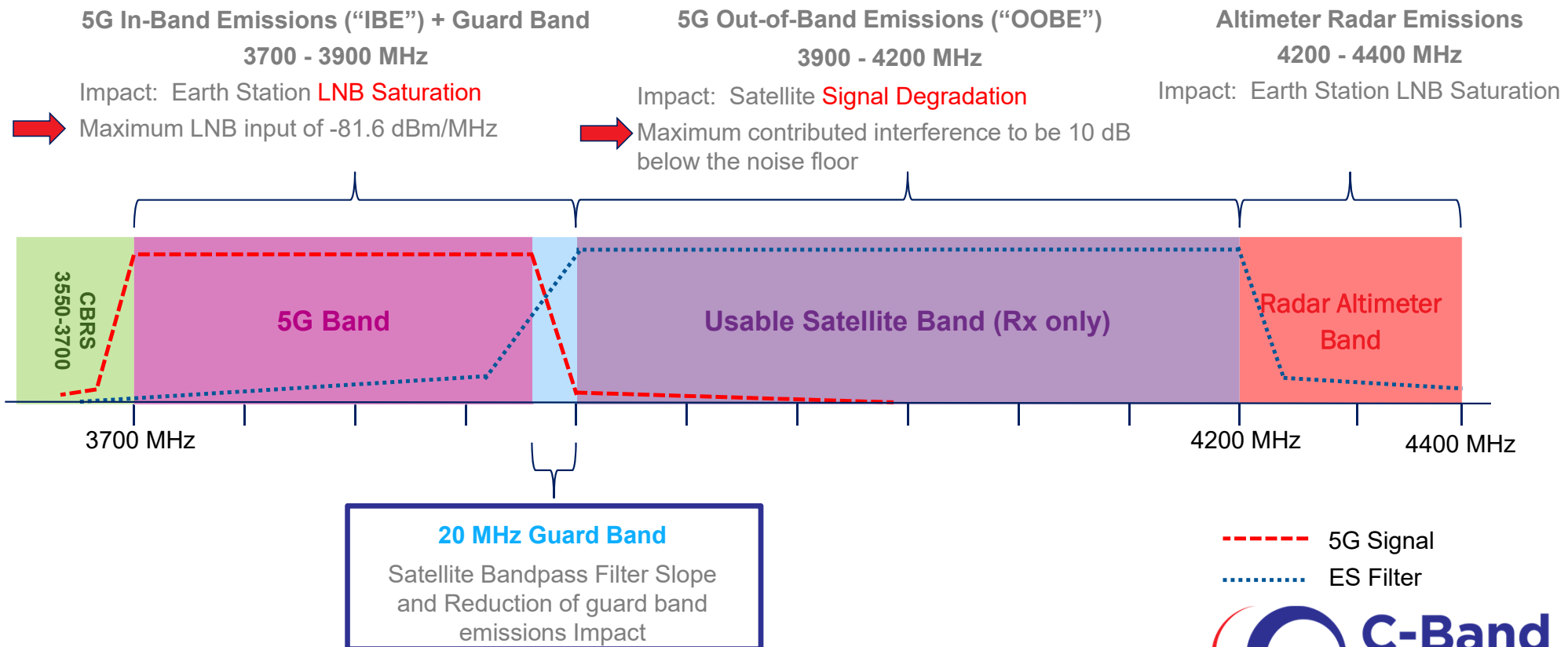
2 Incumbent C-Band Earth Stations to be Protected

- Protection is based on the location of the FSS Earth Stations
 - All FSS Earth Stations registered with the FCC before the freeze
 - CBA proposes an additional registration window for FSS Earth Stations during a period of 30 days following publication of the FCC report and order in the Federal Register
 - Protection for Earth Stations registered after the 30-day window closes will be pursuant to agreement with the local Flexible-Use Provider and a waiver from the FCC
- Antennas within an area of 150 meter radius of the registered location with a diameter between 3 meters and 13 meters and with an elevation angle of 5 degrees or more are protected in the entire 3900-4200 MHz band and across the accessible geostationary arc (full band / full arc)
- A very limited number of Earth Stations will be grand-fathered in the 3700-3900 MHz band, requiring larger exclusion zones

2 Measures to Protect FSS Operations

- A 20 MHz Guard Band 3880-3900 MHz to isolate satellite signal from 5G signal
- B 5G Aggregate Power Density limit at the input of a satellite receiver Low Noise Block-converter (“LNB”)
 - In the band 3700-3900 MHz, to prevent Earth Station LNB saturation
 - In the band 3900-4200 MHz, to contain interference into FSS signals
- C 5G Base Station and User Equipment in-band Emission Levels and out-of-band Emission Masks
 - No 5G Base Station total power level limitation required (i.e. supporting levels beyond NPRM’s 75 dBm proposed limits)
- D FSS Earth Station Rx 3900-4200 MHz band pass filters to prevent 5G signals from over-driving Earth Station LNB front ends

2 5G Impact on the Satellite Spectrum Environment



2 Preventing LNB Saturation and Excessive FSS Signal Degradation

LNB saturation



FSS threshold: maximum LNB input of -81.6 dBm/MHz

- Each 5G licensee will have to comply with an aggregate power density limit of -81.6 dBm/MHz to be met in the band 3700-3900 MHz at the input of a LNB for all 5G Base Stations within 40 km of an Earth Station
- The 5G licensee will calculate the LNB input level by taking into account a [reference antenna](#) pattern and a [reference filter](#) attenuation

FSS signal interference

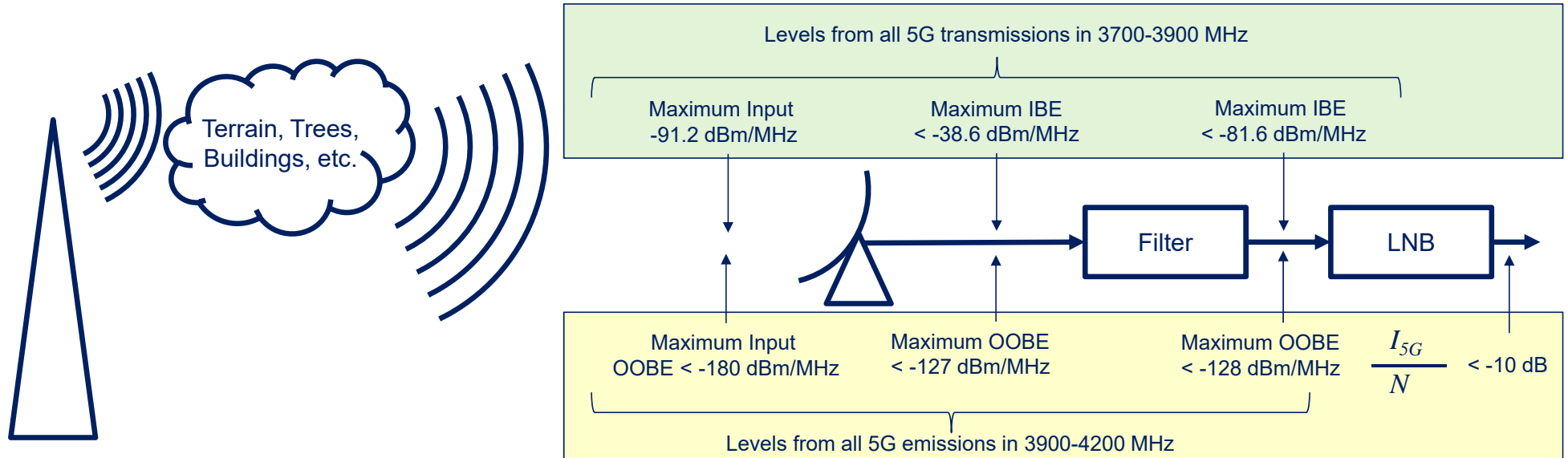


FSS threshold: contributed interference to C-Band signals <10 dB below the noise floor

- Each 5G licensee will have to comply with an aggregate power density limit of -128 dBm/MHz to be met in the band 3900-4200 MHz at the input of an LNB for all 5G Base Stations within 40 km of an Earth Station
- The 5G licensee will calculate the LNB input level by taking into account a [reference antenna](#) pattern and a [reference filter](#) insertion loss

2 5G In-Band and Out-of-Band Power Levels at Earth Stations

- 5G BS power level + 5G deployment = ES received power level
 - Impact of receive power level depends upon ES antenna and filter performance



Notes

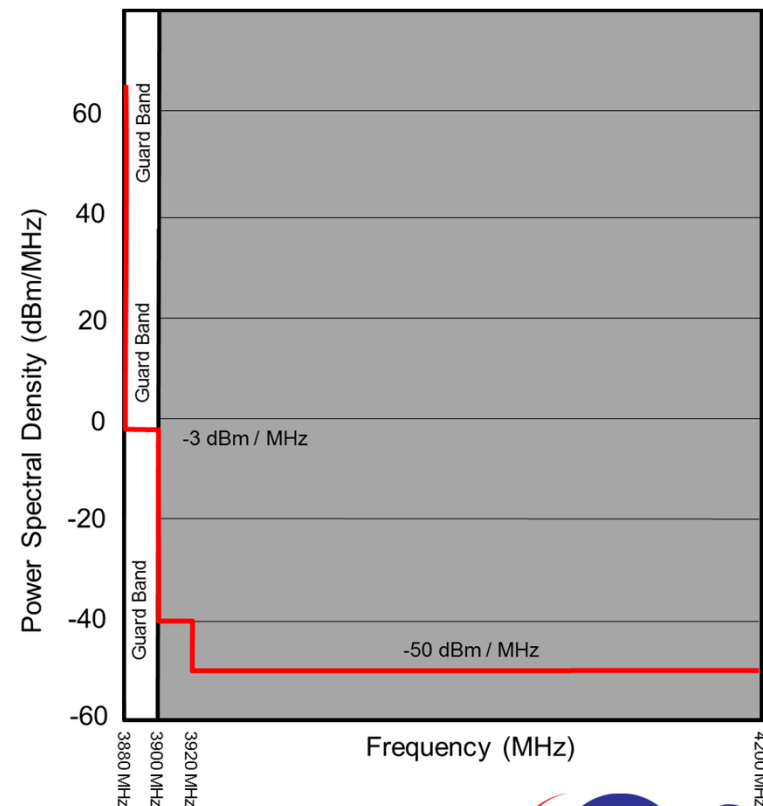
- 1) Required levels for < 0.5 dB satellite link degradation
- 2) Assumes noise floor post LNB of -118 dBm/MHz
- 3) Filter rejection in 3700-3900 MHz = 43 dB; Filter insertion loss in 3900-4100 MHz = 1 dB
- 4) Earth Station receive gain = 52.6 dBi

2 5G Base Station EIRP and PSD Levels

- The CBA supports the 5G Base Station Effective Isotropic Radiated Power (“EIRP”) and Power Spectral Density (“PSD”) levels proposed by the FCC in the NPRM
 - Urban: 1640 watts/MHz (62 dBm/MHz)
 - Rural: 3280 watts/MHz (65 dBm/MHz)
- The total EIRP limit of 75 dBm (regardless of 5G transmission bandwidth) is not needed from the perspective of FSS, **provided** that the FCC adopts the CBA’s proposed limits at FSS Earth Stations in the Rules

2 5G Base Station Out-of-Band Emission Levels (conductive)

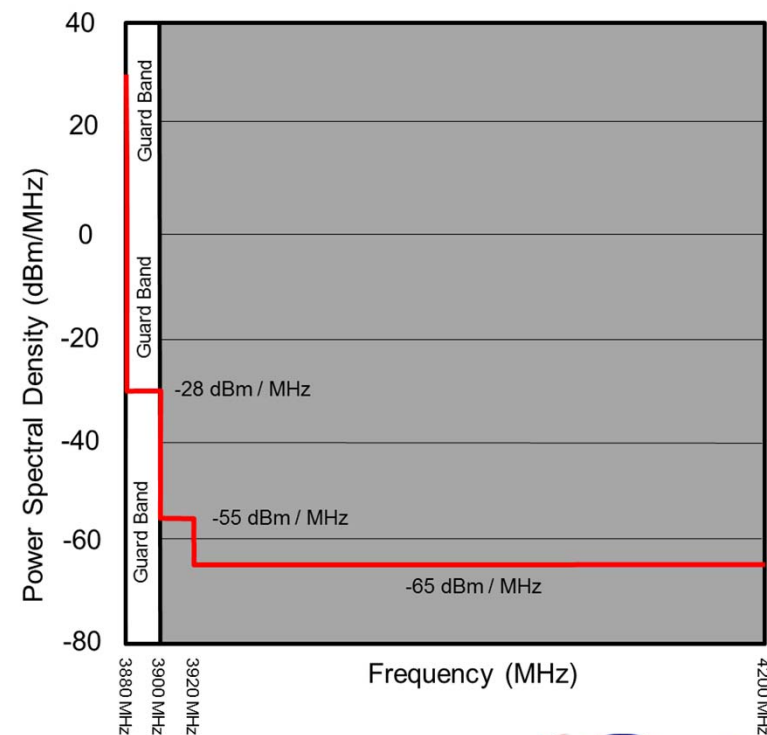
- The CBA supports Nokia's suggested maximum Base Station OOB emission levels of
 - -3 dBm/MHz from 0 to 20 MHz offset from the 5G spectrum block
 - -40 dBm/MHz from 20 MHz to 40MHz offset from the 5G spectrum block
 - -50 dBm/MHz for frequency offset greater than 40MHz
- The CBA has determined that the -3 dBm/MHz level does not result in any appreciable increase in interference over the previously proposed -13 dBm/MHz level as it pertains to potential Earth Station LNB saturation



2 5G User Equipment Out-of-Band Emission Levels (conductive)

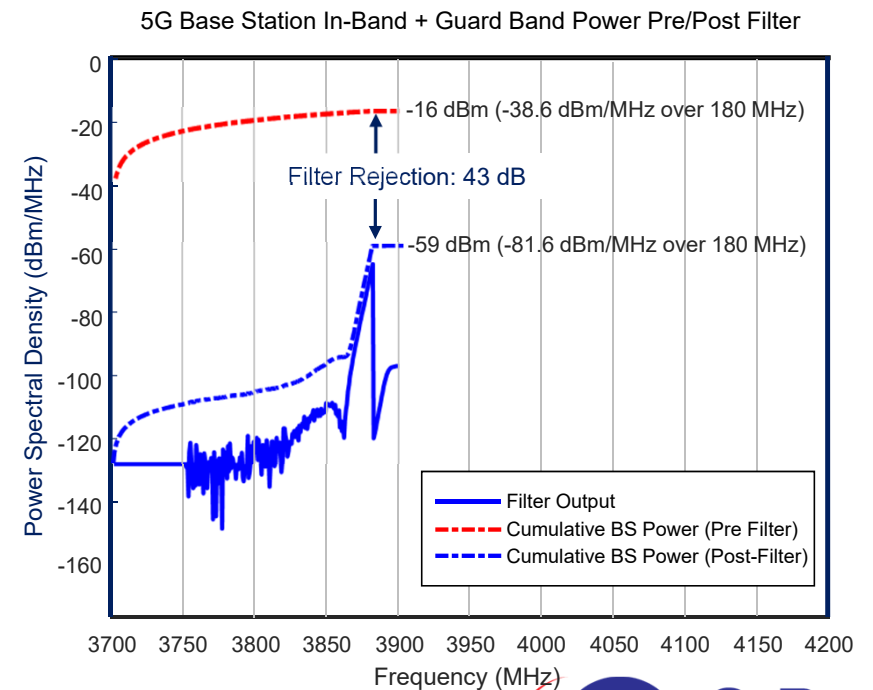
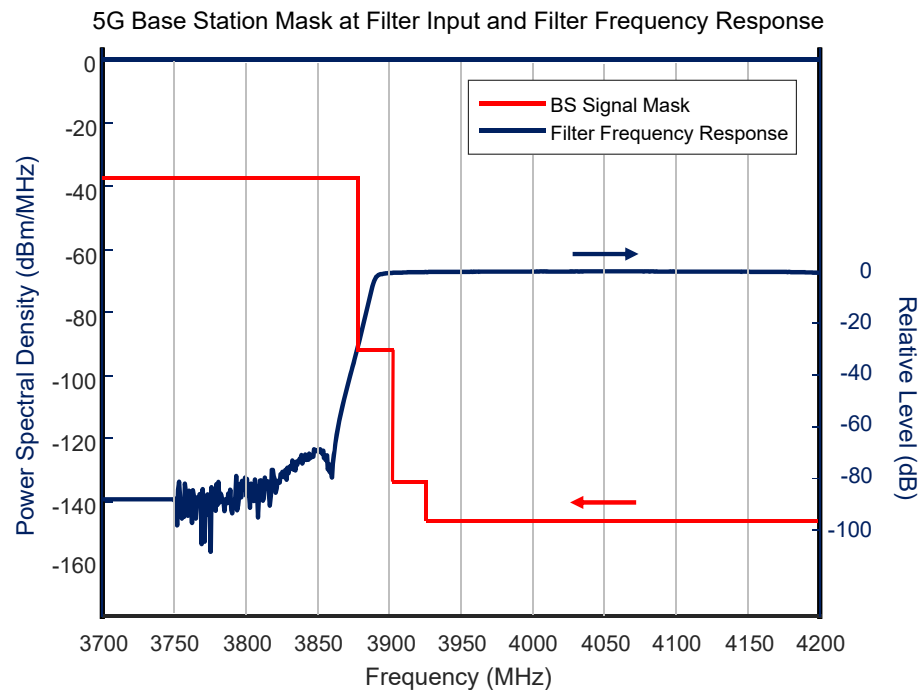
- The CBA proposes maximum user equipment OOB levels of
 - -28 dBm/MHz from 0 to 20MHz offset from the 5G spectrum block
 - -55 dBm/MHz from 20MHz to 40MHz offset from the 5G spectrum block
 - -65 dBm/MHz for frequency offset greater than 40MHz

These levels are currently being discussed between CBA and various 5G stakeholders



2 FSS Earth Station Filter Performance

- All Incumbent Earth Stations will be equipped with 3900-4200 MHz band-pass filters



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- 1 Design Principles
 - 2 FSS Protection and 5G Parameters
 - 3 Reference Earth Station and Tool

3 FSS Earth Station Reference Antenna and Filter Mask

- Flexible-Use Providers will apply reference antenna and filter masks in the operation of their Base Stations to ensure emissions do not exceed maximum levels
 - Antenna mask: 47 CFR 25.209 with addition of constraint at angles $< 1.5^\circ$ from antenna boresight
 - Filter mask: -43 dB from 3700-3900 MHz and -1 dB from 3900 to 4200 MHz
- FSS Earth Station LNB input levels, maximum:
 - 3700-3900 MHz < -81.6 dBm/MHz
 - 3900-4200 MHz < -128 dBm/MHz
- The maximum levels are aggregated from all Base Stations from each Flexible-Use Provider within a 40 km radius of a registered Earth Station coordinates of lat/long

ES Reference Antenna Mask	
$G = 52.6$ dBi	for $0^\circ \leq \varphi < 1.5^\circ$
$G = 29 - 25 \log \varphi$ dBi	for $1.5^\circ \leq \varphi < 7^\circ$
$G = 8$ dBi	for $7^\circ \leq \varphi < 9.2^\circ$
$G = 32 - 25 \log \varphi$ dBi	for $9.2^\circ \leq \varphi < 48^\circ$
$G = -10$ dBi	for $48^\circ \leq \varphi \leq 180^\circ$

The CBA has developed a tool to assist terrestrial mobile operators in calculating Aggregate Power Density ("APD") for a given 5G Base Station deployment scenario

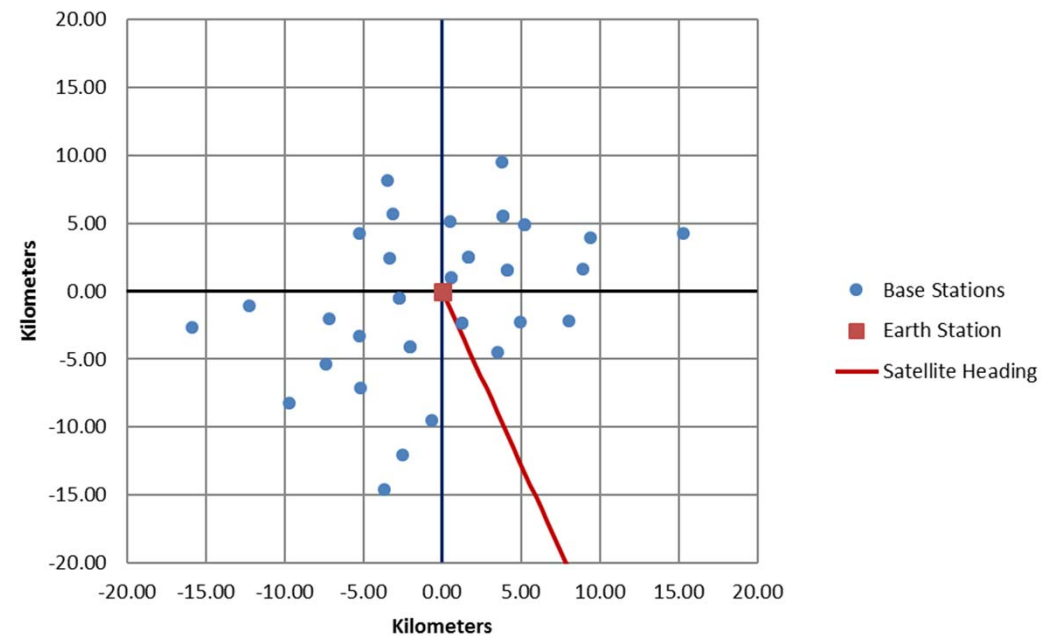
3 APD Modeling Tool

Inputs

- Earth Station coordinates of lat/long, altitude, antenna height
- Base Station coordinates of lat/long, altitude, antenna height, path loss to Earth Station, power spectral density of emissions within 3700-4200 MHz in direction of ES

Outputs

- Margin to APD limits
- Impact per Base Station on APD



C-band Alliance Membership

