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VIA ELECTRONIC FILING

Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20228

Re: IB Docket No. 13-213

Attachment #1: Analysis titled "Even If Approved, Globalstar's TLPS Will Underperform Free Wi-Fi On (Tens Of) Millions Of Existing Devices", submitted to SeekingAlpha.com 12/21/2014

Attachment #2: Analysis titled "Globalstar's TLPS Will Not Work On iPhone 6/6 Plus; Globalstar Doesn't Know Whether Other Cellular Devices Will Work Either", submitted to SeekingAlpha.com 2/12/2015

Attachment #3: Article titled "Gerst Capital Challenges Globalstar: Prove TLPS Will Work On iPhone 6 (Apple Filings Say No)", contains an open letter to Globalstar CEO regarding his comments on the content of Attachment #2, submitted to SeekingAlpha.com 2/19/2015

Attachment #4: Article titled "Is Globalstar Telling The Full Story?" contains questions regarding alleged comments made by Globalstar on a conference call held 2/12/2015 (hours after Attachment #2 was published), submitted to SeekingAlpha.com on 2/26/2015 (updated 3/10/15)

Dear Ms. Dortch,

I would first like to express my appreciation for the level of professionalism shown by every FCC staff member I've dealt with so far. Members of your legal and technical staff always reply promptly to messages, and provide helpful information regarding rules and regulations for someone who has only recently become "part of the process".

According to the FCC's website describing "[What We Do](#)", one section seems particularly relevant to contention around Globalstar's TLPS Proposal:

Organization

The commission is organized into [bureaus and offices](#), based on function (see also [Organizational Charts of the FCC](#)). [Bureau and office staff members](#) regularly share expertise to cooperatively [fulfill responsibilities such as](#):

- Developing and implementing regulatory programs
- Processing applications for licenses and other filings
- Encouraging the development of innovative services
- [Conducting investigations and analyzing complaints](#)
- Public safety and homeland security
- Consumer information and education

With this in mind, I have the following questions for your legal and technical staff:

1. Has any 802.11n (or g) device operating on Wi-Fi Channel 14 ever been subject to Part 15.247 testing (modified to measure emissions limits at 2495MHz instead of 2483.5MHz)?

A device configured for 802.11n on Channel 14 is not legally allowed anywhere in the world. While 802.11b on Channel 14 is allowed under certain circumstances in Japan, deploying an inferior, legacy standard is not a viable option for TLPS.

As detailed by other interested parties, TLPS deployment presents technical risks to the operation of "Free Wi-Fi", Bluetooth, and other wireless communications system in and around the 2.4GHz ISM band.

While the set of recently proposed (executed?) tests ([Bluetooth Special Interest Group](#), [Cablelabs/Wi-Fi Alliance/WISPA](#), [Globalstar](#)) address "user-level" technical issues, none address "RF-level" issues that Part 15.247 tests would expose.

In addition, during my analysis of Apple's iPhone 6 test reports, emissions limits currently set at 2483.5MHz have implications for the maximum power level achievable for an 802.11n Wi-Fi device operating on Channel 14. The iPhone 6's "Output Power" tables (pages 50 and 52 of the "Certification Test Report for Cellular Phone with Bluetooth and WLAN Radios", FCC ID: BCG-E2816A) shows a reduction Channel 13's 802.11n power level by ~13dB (vs Channel 6). This power reduction is driven by the emissions limits specified in parts 15.205 and 15.209. It is not clear whether these limits will apply at 2495MHz for TLPS in addition to currently specified ATC limits (specifically, paragraph 32 in [FCC-08-98A1.pdf](#)). Ironically, LTE-enabled devices with coexistence filters should have no problem falling within emissions limits at 2495MHz. The devices of concern (those without coexistence filters) are the only type being used by Globalstar in current demonstrations.

Whatever the FCC ultimately decides on out-of-band emissions limits for TLPS, clearly they must be tested for any device configured to use 802.11n on Channel 14. Approving TLPS without conducting at least a modified subset of Part 15.247 testing across a representative sample of existing Wi-Fi devices seems incredibly risky.

2. If an interested party makes a series of claims contradicted by available technical evidence, does the FCC have a responsibility to manage the investigation to a sufficient level where said claims can be validated?

As noted by myself and others, Globalstar has made a series of claims that are not supported by available data. The following are just three examples:

Example #1:

"802.11 compliant hardware is already capable of utilizing Channel 14 with a device firmware modification."

- TECHNICAL EXHIBIT FOR EXPERIMENTAL LICENSE APPLICATION " for Globalstar's San Carlos, CA trial ([application submitted October 20, 2014](#), [trial approved on December 21, 2014](#))

"In fact every Wi-Fi device out there has the ability to see the spectrum as long as it is enabled through a software or firmware push. So the whole ecosystem is there. It can take-off immediately and I think that's why people are having conversations with us."

- Jay Monroe, 2013 Q1 Earnings Call

Data from publicly filed FCC test reports and coexistence filter specifications contradict Globalstar's claim that all devices can successfully operate on Channel 14 using 802.11n with only a firmware/software modification. Most, if not all, LTE+Wi-Fi devices produced in the past few years have coexistence filters. As the attached analyses show, these coexistence filters are likely to have a material negative effect on TLPS operation.

Available data seems to indicate Globalstar's claim that "every Wi-Fi device out there" should be restated as "every non-LTE-capable Wi-Fi device out there". **Globalstar's alleged "ecosystem" might exclude the vast majority of LTE-enabled smartphones, LTE-enabled tablets, and any other LTE-enabled device. Neither they nor anyone else will really know until these devices are subject to a modified subset of Part 15.247 tests.**

Example #2:

"So these filters were not designed with the idea of ch 14 or TLPS in mind, but they don't really preclude its operation and it hasn't been something in any of our testing has been of impact to the actual usability of the service with the existing ecosystem"

- Alleged quote attributed to John Dooley on Globalstar's 2/12/15 conference call hosted by Odeon Capital Group, LLC. Mr. Dooley is the person named on the Globalstar trial (Call Sign: WH2XBC) that used Ruckus Wireless Access Points.

As detailed in the second and fourth attachments, FCC Test reports for the Ruckus 7372 (FCC ID: S9GZF7372) and 7982 (FCC ID: S9G-MPE2N33A) Access Points indicate the presence of a coexistence filter. For instance, a close review of spectrum analyzer data on pages 92-94 of the Ruckus 7372 Part 15.247 test report implies this filter would have a material impact on an 802.11n signal transmitted on Channel 14.

The presence of a coexistence filter in an Access Point is not important in and of itself. The important point is that the same filter technology (with the same bandwidth requirements for the transition from "passband" to "stopband") is used by both Access Points and LTE-enabled client devices. For instance, the Avago ACPF-7124 filter marketed for client devices is actually the same part as the ACFF-1024 filter marketed for access points (the only difference being guaranteed specifications in production test and -40°C characterization).

Any coexistence filter issues identified during the WH2XBC trial (including the necessity of removing the filter) would call into question Globalstar's repeated assertion that ALL existing devices (including all LTE-enabled devices!) only require a software/firmware upgrade.

I believe answers to questions in the last attachment are important. They are:

1. Does the Ruckus 7372 AP have a coexistence filter designed in? (FCC Test Report Implies "Yes")
2. Was the Ruckus 7372 AP used in the TLPS trial with the call sign WH2XBC? (Mr. Dooley's FCC Filing regarding trial WH2XBC indicates "Yes")
3. Was the coexistence filter removed from the Ruckus 7372 AP used in the TLPS trial?
4. If the answer to Question #3 is "Yes", then why did John Dooley claim this filter had no impact on any tests? Having to remove the filter is a material impact.
5. If the answer to Question #3 is "No", then the claim of "no impact" on TLPS operations is obviously in question. Data should be provided to all interested parties to back-up this claim, because Ruckus 7372 FCC test data implies this is not true.

Example #3:

“There will be no “loss” of unlicensed spectrum for Bluetooth and other existing and future unlicensed technologies, or the related harms that apparently created concern for some commenters.”

- [Consolidated Reply of Globalstar, Inc., Filed 1/29/13](#)

One of the key issues for Bluetooth is the availability of channels that are least likely to be impaired by other popular communications methods in the 2.4GHz ISM band, with Wi-Fi being the most likely “culprit”. In almost any area where Wi-Fi is heavily used (retail, hotel, enterprise, high-density dwellings, hospitals, etc.), the three non-overlapping 2.4GHz Wi-Fi channels (1, 6, and 11) are quite saturated. Globalstar’s own presentations highlight this fact.

Fortunately for Wi-Fi users, almost all devices manufactured in the past few years have the option to use the 5GHz unlicensed band. With the increasing availability of 802.11ac devices, “Free Wi-Fi” at 5GHz has the added benefit of much higher data rates than any current or future device operating in the 2.4GHz band.

However, Bluetooth has no such option for additional spectrum. In the US, the frequency range from ~2403MHz (the low edge for 802.11n on channel 1) to ~2471MHz (the upper edge 802.11n on channel 11) is shared with “Free Wi-Fi”. As I understand things, in a “Wi-Fi saturated” RF environment, Bluetooth relies heavily on the channels above 2471MHz (Bluetooth Basic Rate channels 70-78, and Low-Energy data channels 33-36 plus the only LE advertising channel outside the range of “Free Wi-Fi”).

The following table provides a simple illustration of Bluetooth channels that will not be impaired by Channels 1, 6, or 11 (green), and the impact if Channel 14/TLPS is added (red).

Impact on Bluetooth Basic Rate/Enhanced Data Rate (BR/EDR) Channels	
Bluetooth BR/EDR Ch's Outside Wi-Fi Channels 1/6/11:	22
Bluetooth BR/EDR Ch's Outside Wi-Fi Channels 1/6/11/14:	16
Channel 14/TLPS Impact on BR/EDR Ch's "Outside Wi-Fi":	-27%

Impact on Bluetooth Low-Energy (LE):		Data Ch.	Adv. Ch.
Bluetooth LE Ch's Outside Wi-Fi Channels 1/6/11:		9	3
Bluetooth LE Ch's Outside Wi-Fi Channels 1/6/11/14:		7	2
Channel 14/TLPS Impact on BT LE Ch's "Outside Wi-Fi":		-22%	-33%

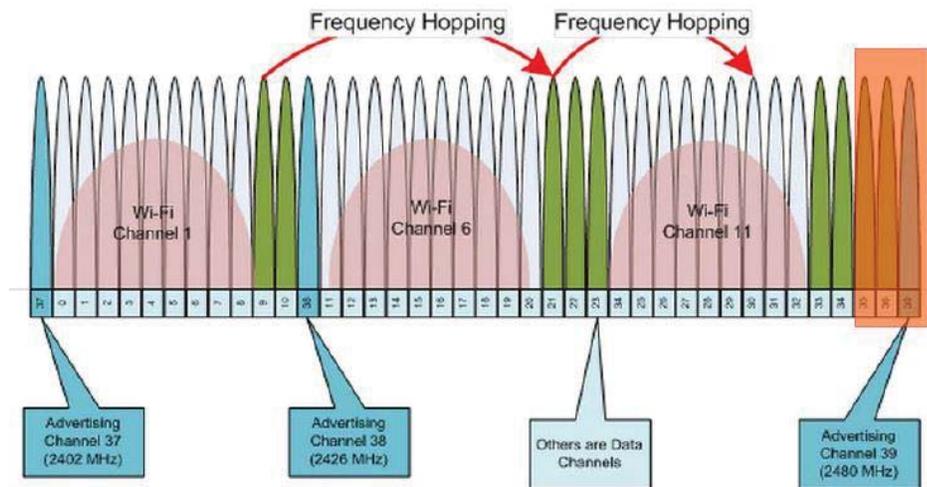
BT Channel (BR/EDR)	BT Channel Frequency (BR/EDR)	BT Channel (BR/EDR)	BT Channel Frequency (BR/EDR)	BT Channel (LE)	BT Channel Frequency (LE)	Advertising Channels (LE)
0	2402	40	2442	37	2402	LE Adv
1	2403	41	2443	0	2404	
2	2404	42	2444	1	2406	
3	2405	43	2445	2	2408	
4	2406	44	2446	3	2410	
5	2407	45	2447	4	2412	
6	2408	46	2448	5	2414	
7	2409	47	2449	6	2416	
8	2410	48	2450	7	2418	
9	2411	49	2451	8	2420	
10	2412	50	2452	9	2422	
11	2413	51	2453	10	2424	
12	2414	52	2454	38	2426	LE Adv
13	2415	53	2455	11	2428	
14	2416	54	2456	12	2430	
15	2417	55	2457	13	2432	
16	2418	56	2458	14	2434	
17	2419	57	2459	15	2436	
18	2420	58	2460	16	2438	
19	2421	59	2461	17	2440	
20	2422	60	2462	18	2442	
21	2423	61	2463	19	2444	
22	2424	62	2464	20	2446	
23	2425	63	2465	21	2448	
24	2426	64	2466	22	2450	
25	2427	65	2467	23	2452	
26	2428	66	2468	24	2454	
27	2429	67	2469	25	2456	
28	2430	68	2470	26	2458	
29	2431	69	2471	27	2460	
30	2432	70	2472	28	2462	
31	2433	71	2473	29	2464	
32	2434	72	2474	30	2466	
33	2435	73	2475	31	2468	
34	2436	74	2476	32	2470	
35	2437	75	2477	33	2472	
36	2438	76	2478	34	2474	
37	2439	77	2479	35	2476	
38	2440	78	2480	36	2478	
39	2441			39	2480	LE Adv

WiFi Channel Frequency Range				
Channel	1	6	11	14
Center	2412	2437	2462	2484
Low	2403	2428	2453	2475
High	2421	2446	2471	2493

* Bluetooth Channels "Occupied by Wi-Fi 1/6/11/14" is computed as: Range = Center +/- 9MHz (round 17.5/2)

Channel 14/TLPS Impact on "Free" Bluetooth Channels (Bluetooth channels not overlapping Wi-Fi channels 1/6/11):
Basic Rate/Enhanced Data Rate Impact: 27% Channel Reduction
Low-Energy Impact: 22%/33% Data/Advertising Channel Reduction

The following figure comes from a [Bluetooth Low-Energy primer](#). It also illustrates the number of “Free” LE data channels” (Green) and the three BT LE advertising channels (Blue). I added the section highlighted in red to illustrate the impact Channel 14/TLPS would have.



A simple analysis of the overlap between Bluetooth channel specifications and available Wi-Fi channels clearly calls into question Globalstar’s contention that Bluetooth will not be impacted by the utilization of Wi-Fi channel 14.

3. Does the FCC have a “technical validation” plan for coming to a conclusion on whether to approve TLPS?

In order to complete a reasonable level of technical due diligence on Globalstar’s TLPS proposal, it seems the FCC could largely follow the certification process used for all existing Wi-Fi capable devices sold in the US.

If Globalstar continues to insist ALL existing devices can support TLPS through a software/firmware upgrade, then require them to subject a representative set of devices to (appropriately modified) Part 15.247 tests at an FCC-accredited lab. To confirm Globalstar’s claims, it seems sufficient to test the following categories of devices:

- Category #1: The two most popular Wi-Fi Only Devices
- Category #2: The two most popular LTE-enabled smartphones
- Category #3: The two most popular LTE-enabled tablets
- Category #4: The two most popular LTE-enabled laptops

If testing eight representative devices is too time consuming, an alternative would be testing a smaller set (one of each category) in combination with an 802.11n system simulation using Matlab. Matlab has a freely available 802.11n “[PHY Layer Model](#)”. Any number of signal processing experts could modify such a model to incorporate the impact of a variety of coexistence filters. The benefit of using industry-proven simulation methods is the ability to characterize a wide variety of existing and proposed hardware implementations in a short period of time, for relatively little cost.

In fact, I am almost certain manufacturers such as Ruckus, Cisco, and others have working 802.11n Matlab models that could easily be modified to quantitatively assess TLPS under almost any possible scenario (including the impact of commercially available coexistence filters).

In combination with testing already in progress, I believe the suggestions above represent the minimum technically comprehensive path for completing diligence on Globalstar's TLPS proposal.

Upon request by FCC technical staff, I would be happy to provide files used in my analyses over the past few months. These include:

- Excel Spreadsheets
- Matlab "m-files" and "MAT-files" (the "MAT-files" contain the s2p filter specifications imported into Matlab)
- The "s2p" specification files for the following Avago filter part numbers: ACPF-7025, ACPF-7124, ACFF-1024, ACPF-7025 and ACPF-7424. I was given permission by Avago to share s2p files only upon request.

Respectfully Submitted,

Greg Gerst
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