

L. Barbee Ponder IV General Counsel & Vice President Regulatory Affairs

November 18, 2015

Via Electronic Filing

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

#### Re: *Ex Parte* Notice: *Terrestrial Use of the 2473-2495 MHz Band for Low-Power Mobile Broadband Networks* – IB Docket No. 13-213

Dear Ms. Dortch:

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Globalstar, Inc. ("Globalstar") writes to inform the Commission that it has deployed Terrestrial Low Power Service ("TLPS") at the Washington School for Girls ("WSG"), pursuant to an experimental license granted by the Commission.<sup>1</sup> On November 16, 2015, Julius Knapp, Chief of the Office of Engineering and Technology; Troy Tanner, Deputy Chief of the International Bureau; and Jose Albuquerque, Chief of the International Bureau's Satellite Division visited WSG and observed students utilizing TLPS along with Channels 1, 6 and 11.<sup>2</sup> As shown during this visit and as described below, the WSG deployment has been a success and further confirms the significant public interest benefits of the Commission's proposed TLPS rules. With Globalstar's TLPS deployment, WSG's students are the first in the nation to gain access to TLPS and now have more 2.4 GHz spectrum available to meet their educational needs than any other students in the country.

The Washington School for Girls, whose motto is "In the Spirit of Courageous Women," is the only full-scholarship private school for girls in Anacostia. The school, established in 1997, has grown to include grades three through eight. Rather than

See Globalstar Experimental License, Call Sign WH2XNQ.

<sup>&</sup>lt;sup>2</sup> I visited WSG on November 16<sup>th</sup> at the same time as Commission staff, along with other Globalstar representatives that included Regina Keeney and Steve Berman of Lawler, Metzger, Keeney & Logan, LLC, Bryan Mikesh and Avinash Koduri of AT4 wireless, and Ken Zdunek of Roberson and Associates, LLC.

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recruiting students based on academic prowess,<sup>3</sup> WSG intentionally recruits girls whose socioeconomic and personal circumstances present barriers to their academic and social development.<sup>4</sup> Despite these barriers, 98% of WSG's graduates go on to complete high school and 80% continue their educations further, the majority of those matriculating to college. By contrast, less than half of the students in the surrounding community graduate from high school.

One of the major challenges facing the girls who attend WSG has been a "lack of access to technological resources."<sup>5</sup> Globalstar is pleased to have worked closely with the school to help address this challenge. This fall, Globalstar's technical consultant, AT4 wireless ("AT4"), deployed TLPS-enabled access points at the school and seamlessly integrated TLPS into WSG's wireless network. AT4 installed TLPS during two lunch hours on consecutive school days, ensuring minimal disruption to the school's daily activities while boosting the school's network from three to four channels in the 2.4 GHz band.

Prior to the TLPS deployment, WSG shared IEEE 802.11 non-overlapping Channels 1, 6 and 11 with numerous other wireless networks in the multi-tenant building where WSG is located.<sup>6</sup> During peak usage periods, congestion on these channels limits data throughput at the school, which is particularly problematic during on-line standardized testing. With the deployment of TLPS, WSG has an additional clear channel for its use regardless of the traffic occurring on the three existing Wi-Fi channels. WSG's 8<sup>th</sup> grade students now use TLPS Channel 14 on TLPS-enabled Chromebooks daily, while the 6<sup>th</sup> and 7<sup>th</sup> grade students continue to use Channels 1, 6 and 11, with full compatibility and increased throughput.<sup>7</sup>

<sup>7</sup> Globalstar and AT4 completed the TLPS installation at WSG by providing the school with twenty-five Acer CB5311P-T9AB Chromebooks configured to operate on Channel 14 as well as on Channels 1, 6 and 11. *See Acer Chromebook*, ACER, http://us.acer.com/ac/en/US/content/model/NX.MRDAA.003 (last visited Nov. 18, 2015).

<sup>&</sup>lt;sup>3</sup> Rachel Wold, *A Commitment to Opportunity for Girls in Anacostia*, THE NEBO COMPANY BLOG (Mar. 21, 2014), http://nebocompany.com/blog/girls-in-anacostia-216.

<sup>&</sup>lt;sup>4</sup> In the 2014-2015 academic year, 82% of WSG's students qualified for the Federal Meals Program and 83% lived in single parent/guardian households. *See Impact Report 2014-2015 School Year*, THE WASHINGTON SCHOOL FOR GIRLS, at 1, 6 (July 21, 2015), http://media.wix.com/ugd/057e9e\_59e77336a28e4571b15c6f54d56266bc.pdf.

<sup>&</sup>lt;sup>5</sup> *Id.* at 3.

<sup>&</sup>lt;sup>6</sup> WSG is located in the Town Hall Education Arts Recreation Campus (THEARC) at 1901 Mississippi Ave., SE, in Washington, D.C. Other tenants in the building include Children's Medical Center, Covenant House, The Washington Ballet and Levine Music.

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Following its installation of the new TLPS-enabled access points, AT4 conducted initial measurements to ensure proper operations and assess the performance of the enhanced network at WSG. As described in the attached report (which was provided to Commission staff during their visit to WSG), these measurements confirm the substantial benefits of adding TLPS capability to the school's wireless network. Downlink throughput increased 45% and uplink throughput increased 34% when the school's access points were tuned to a fourth channel, Channel 14, in addition to Channels 1, 6 and 11.

During the November 16<sup>th</sup> visit to WSG, we observed 8<sup>th</sup> grade girls in the school's Science Lab discussing and modifying presentation slides that they had created on-line to explain the science topics that they were discussing - compression and expansion of gases. During prior visits, Globalstar representatives and other guests have observed 8<sup>th</sup> grade girls in the school's Science Lab individually downloading, streaming, pausing and replaying a science video over TLPS Channel 14, while other students in the school were simultaneously using Channels 1, 6 and 11. The 8<sup>th</sup> grade science class utilized the TLPS access point (AP6) located in the Mathematics room on the other side of the building, while  $6^{th}$  grade students in the Mathematics room simultaneously used Channel 6 via an Aruba access point (AP3) located in the hallway between the Science Lab and Mathematics room.<sup>8</sup> More generally, the 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade classes (with two sections for each grade) move around the school from class to class during the school day, with the 8<sup>th</sup> grade students always using TLPS and all other students using Channels 1. 6 and 11. As indicated by AT4's initial measurements, the availability of a fourth clear channel at 2.4 GHz will yield substantial benefits for these students throughout the school day.

With each deployment, Globalstar has demonstrated the compatibility and public interest benefits of TLPS. In Chicago, Globalstar demonstrated that integrating TLPS Channel 14 into an existing Wi-Fi network on a university campus improved the experience of all the network's users, without disruption. When the devices were set to maximize the use of Channel 14, the throughput on the client devices operating on all four non-overlapping 802.11 channels increased by over 90%. Each of the scenarios in the Chicago deployment demonstrated the ability of TLPS to relieve existing Wi-Fi congestion immediately.<sup>9</sup>

<sup>&</sup>lt;sup>8</sup> The physical lay-out of WSG and the access point locations on this campus are shown on page 12 of the attached AT4 report.

<sup>&</sup>lt;sup>9</sup> In its October letter in this proceeding, Google recognized the "extreme congestion of currently available 2.4 GHz spectrum" – congestion that has only grown worse since Globalstar proposed TLPS as a solution almost three years ago, and which TLPS will help ameliorate. Letter from Austin C. Schlick, Google Inc., to Marlene H. Dortch, FCC Secretary, IB Docket No. 13-213, at 2 (dated Oct. 10, 2015, filed Oct. 13, 2015).

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In its November 2012 petition for rulemaking, Globalstar committed to provide 20,000 TLPS access points to schools and other institutions. Globalstar recognized that as the public's demand for mobile broadband spectrum grows, students in particular will benefit from the additional broadband capacity of TLPS. Globalstar is proud that the students at WSG are among the first to benefit from this innovative use of spectrum and hopes to bring similar benefits to thousands of other students across the United States within the near future.

Globalstar urges the Commission to adopt the rules it proposed two years ago. The proposed rules will enable students and other consumers across the country to enjoy the public interest benefits of additional broadband spectrum.

Pursuant to section 1.1206(b)(2) of the Commission's rules, 47 C.F.R. § 1.1206(b)(2), this *ex parte* notification and the attached presentation are being filed electronically for inclusion in the public record of the above-referenced proceeding.

Respectfully submitted,

<u>/s/ L. Barbee Ponder IV</u> L. Barbee Ponder IV General Counsel & Vice President Regulatory Affairs

cc: Julius Knapp Troy Tanner Jose Albuquerque

## **School Wireless Network – TLPS Installation**



• Three TLPS-enabled Ruckus 7982 APs were installed and integrated into WSG's wireless network.



## **School Wireless Network – Ethernet Connections**



- Internet access was provided via a centralized switch.
- TLPS was integrated into WSG's wireless network without interrupting service to network users.



## **Scenario #1: Baseline Measurement**



- Purpose: Demonstrate baseline performance on Channels 1, 6 and 11 with high channel utilization
- Environment:
  - 4 laptops, each connected to one AP
    - RSSI levels were consistent for all Wi-Fi clients: approx. -45dBm
  - 4 APs operating on 3 channels (Channels 1+6+11+ 1<sup>2nd AP</sup>)
    - Set-up depicted on next slide
  - Tests were performed during regular class hours
    - Generic full buffer TCP data was used
- Steps:
  - Channels 1+6+11+ 1<sup>2nd AP</sup> simultaneously
  - Executed 3 times, 3 minutes each
  - Averaged DL and UL throughput per channel

# Scenario #1: Baseline Measurement (cont'd)



- AP1, AP2 and AP3 were set to Auto Channel configuration. These APs were operating on the channels indicated above.
- Ruckus AP4 continued to operate on Channel 1 during this testing for baseline measurement.
- AP5 and AP6 had no test devices connected for purposes of this scenario.



# Scenario #1: Baseline Measurement (cont'd)





### Scenario 1: Baseline Measurement Results

- Aggregated DL network capacity was approx. 100Mbps; UL was approx. 90 Mbps.
- Two APs set to Channel 1 to establish a baseline with same number of active APs before introducing TLPS in next scenario.

# Scenario #2: Network with TLPS Enabled



- Purpose: Demonstrate what, if any, increase in throughput is achieved by adding Channel 14 operations and measure any impact on the performance of Channels 1, 6 and 11.
- Environment:
  - 4 laptops, each connected to one AP
    - RSSI levels were consistent for all Wi-Fi clients: approx. -45dBm
  - 4 APs operating on 4 channels (Channels 1+6+11+14)
    - Set-up depicted on next slide
  - Tests were performed during regular class hours
    - Generic full buffer TCP data was used
    - Similar environmental conditions as previous test's scenario
- Steps:
  - Channels 1+6+11+14 simultaneously
  - Executed 3 times, 3 minutes each
  - Averaged DL and UL throughput per channel



# Scenario #2: Network with TLPS Enabled (cont'd)



- AP1, AP2 and AP3 were set to Auto Channel configuration. These APs were operating on the channels indicated above.
- AP4 was configured to operate on Channel 14. ۲
- AP5 and AP6 had no test devices connected in order to maintain one AP per channel.





### Scenario 2: Network with TLPS

- Aggregated DL network capacity was approx. 150Mbps; UL was 120 Mbps.
- Channel 14 increased DL capacity by 45% and UL capacity by 34%.
- Channel 14 operations had no impact on other channels.

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# **Comparison of Scenarios: WLAN Capacity**





**Comparison of Scenarios** 

■ Baseline ■ With TLPS



# **RF Environment**





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