

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

<b>In the Matter of</b>	)	
	)	
<b>Unlicensed Operation in the TV Broadcast Bands</b>	)	<b>ET Docket No. 04-186</b>
	)	
<b>Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band</b>	)	<b>ET Docket No. 02-380</b>
	)	

**OPPOSITION OF  
THE COALITION OF WIRELESS MICROPHONE USERS  
TO PETITIONS FOR RECONSIDERATION**

Antoinette C. Bush  
David H. Pawlik  
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP  
1440 New York Avenue, N.W.  
Washington, D.C. 20005  
(202) 371-7000

May 8, 2009

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## **Summary**

"Wireless Microphones," including cue and control systems, IFBs, intercoms, and similar equipment (collectively, "Wireless Microphones"), serve an important and essential role in the operations of theatres, sports events, educational institutions, religious services, and other live entertainment and informational presentations. The Coalition of Wireless Microphone Users ("CWMU") represents the theatres, educators, sports leagues, venues, and other professionals that enrich the quality of American life through their performances and presentations. TV Band Devices ("TVBDs") operating on the same spectrum as Wireless Microphones could disrupt Broadway productions and performances in regional theatres across the nation, could interfere with the broadcast and coaching of sports events, and could obstruct countless curricular offerings, religious services, and public presentations. These disruptions would have a deleterious effect on the nation's economy in addition to the harm they would cause to the performances and productions that audiences have come to expect and enjoy.

Many Wireless Microphone users have been operating without licenses because the Commission's current Part 74 rules limit licensing to an extremely narrow set of media professionals. The Commission should expand its eligibility criteria and additionally should confirm that its rules require protection of Wireless Microphones as they are currently used.

Because spectrum sensing technology has never successfully demonstrated an ability to protect Wireless Microphones, it is vital that the database proposed by the Commission's rules provide adequate protection. To ensure this, there must be only a single national database provider, supervised by the Commission with input from representatives of all concerned industries. The database must allow real-time registration of Wireless Microphone uses and must permit timely access by TVBDs seeking available channels. TVBDs must not

operate within a radius of sufficient distance from registered Wireless Microphones to provide actual protection from interference. To the extent that spectrum sensing is used at all, the threshold should be tightened beyond the limits specified in the Commission's rules.

The density of Wireless Microphone use in certain specific locations, such as Times Square in New York City or the immediate vicinity of professional sporting events, would preclude relying on a few set-aside "safe harbor" channels to protect Wireless Microphones. There should be, however, one channel set aside in every market for ENG operations and other uses that cannot be advance-registered in the database.

CWMU provides additional details regarding these proposals in the following text of its "Opposition" and respectfully urges the Commission to modify its rules in conformance with the requests made herein.

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The Coalition of Wireless Microphone Users ("CWMU"), pursuant to Section 1.429 of the Commission's rules, 47 C.F.R. § 1.429, presents its opposition to several arguments made by various parties in their Petitions for Reconsideration of the Commission's "Second Report and Order and Memorandum Opinion and Order" in the above cited dockets.<sup>1</sup> Although CWMU supports many of the positions taken by petitioners, as discussed below, CWMU is especially concerned with: (i) the expansion of eligibility for licenses, (ii) the criteria to be used for the development and operation of the proposed database, (iii) the spectrum sensing threshold, and (iv) the number of television channels available for wireless microphone use. If the Commission grants all of the protections that CWMU seeks for wireless microphones, the effect on TV Band Devices ("TVBDs") would be limited to discrete geographic areas. In return, the Commission would preserve the countless benefits to the public that are derived from the use of wireless microphones.

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<sup>1</sup> FCC 08-260, 23 FCC Rcd. 16807 (2008) (the "White Spaces Order").

## **1. Introduction**

CWMU is an informal organization of entities that use wireless microphones, interruptible fold-back ("IFB") systems, intercoms, and other wireless cue and control systems operating on frequencies assigned to Low Power Auxiliary Stations under Part 74, Subpart H of the Commission's rules (collectively herein, "Wireless Microphones"). In addition to amplifying the voices and music of performers, intercoms are used for life-safety purposes to prevent accidents in darkened backstage settings and other production locations. Producers of sports programming rely on Wireless Microphones for sideline reporting, trophy presentations, ambient sound effects, and point-of-view sound (where players, coaches, and game officials wear Wireless Microphones). Additionally, wireless cue and control systems are used to control events, coach the team, and manage the production.

CWMU members include professional and amateur theatres, educational institutions, venues, and support organizations; professional sports leagues; and producers of sports programming for broadcast and cable distribution.<sup>2</sup> CWMU members use Wireless Microphones to entertain and enlighten millions of Americans annually. Interference with their operations would cause a serious artistic and cultural loss and, considering the importance of live entertainment and sports to the American economy, significant financial damage.

Live theatre enriches the fabric of American cultural life. Broadway theatre is the pinnacle of live entertainment, defining and reflecting our culture, heritage, and aspirations.

Broadway is arguably the number one tourist attraction in New York City, contributing over \$5.1

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<sup>2</sup> Members of CWMU include The Broadway League; The Shubert Organization; Theatre Communications Group, Inc.; The Alliance of Resident Theatres/New York, Inc.; The Educational Theatre Association; League of Off-Broadway Theaters and Producers, Inc.; League of Resident Theatres; Sports Video Group, LLC; National Basketball Association; National Football League, National Hockey League, Major League Baseball; ESPN, Inc.; and News Corporation.

billion annually to the city's economy and supporting an estimated 44,000 full-time equivalent jobs in the 2006-2007 season. Touring Broadway companies bring the excitement and incomparable Broadway experience to cities across the nation. In the 2004-2005 season, nearly 100 shows of varying sizes were presented in the "Broadway Series" of more than 250 theatres across the United States, contributing more than \$3.2 billion to the economy. Not-for-profit theatres improve the quality of life of Americans by contributing to lifelong learning, preserving our cultural heritage, and fostering the creative expression that tells the story of our personal and collective histories. Not-for-profit arts organizations engage the public in a diverse array of cultural and artistic experiences. In 2007, 1,910 not-for-profit theatres offered approximately 197,000 performances, employed more than 109,000 workers (actors, directors, playwrights, designers, administrators, and technicians), and constituted a \$1.7 billion industry. These theatre professionals received training in secondary schools, colleges, and universities, which regularly use Wireless Microphones in their curricular offerings and public performances.

Professional sports are a cornerstone of the American experience. From Monday Night Football to the World Series; from elementary school playgrounds to retirement villages; fans of professional sports teams debate the big plays and extol the heroes of the moment. Lifelong bonds and rivalries are created on courts and fields. League standings create and embellish community identity and pride. Major League Baseball's annual revenues surpassed \$6 billion in 2007. The teams of the National Football League had combined revenues of over \$6 billion in the same year as well. In their 2007/2008 seasons, the NBA and NHL had revenues of \$3.57 billion and \$2.44 billion, respectively. So, in addition to the role that professional sports play in enhancing the quality of American life, they make major contributions to the national economy.

Theatres and sports leagues, in addition to educational institutions, churches, amusement parks, hotels, and conference centers, all have come to rely on Wireless Microphones in their standard operations. The Commission must not endanger the quality or viability of these enterprises through the introduction of new technology without carefully designed and tested safeguards. CWMU is concerned that the White Spaces Order does not adequately protect the interests of Wireless Microphone users and their audiences<sup>3</sup> and is further concerned that many of the suggestions made to the Commission in petitions for reconsideration would create even greater problems for its members and the public.

**2. The Commission Should Expand Eligibility for Wireless Microphone Licenses.**

The Commission's current Part 74 rules limit licenses for Wireless Microphones to a specifically defined set of television, cable, and motion picture professionals,<sup>4</sup> which has prevented many of CWMU's members from obtaining licenses for their Wireless Microphone equipment. In a closely related proceeding, CWMU has requested that the Commission change its Part 74 rules so that CWMU members and similarly situated entities would qualify for licenses.<sup>5</sup> CWMU has proposed that eligibility be expanded to include producers of live

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<sup>3</sup> Members of CWMU filed a Petition for Review with the United States Court of Appeals for the Second Circuit, which has been consolidated with another Petition for Review of the White Spaces Order. *See, Alliance of Resident Theatres/New York, Inc. et al. v. Federal Communications Commission and the United States of America*, No. 09-0787; now consolidated as Case No. 09-1118 in the U.S. Court of Appeals for the District of Columbia Circuit with *The Association of Maximum Service Television v. FCC and USA*, No. 09-1080.

<sup>4</sup> 47 C.F.R. § 74.832.

<sup>5</sup> *See Ex Parte* filings by CWMU in WT Dockets Nos. 08-166 and 08-167, In the Matter of Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band; Public Interest Spectrum Coalition, Petition for Rulemaking Regarding Low Power Auxiliary Stations, Including Wireless Microphones, and the Digital Television Transition (the "PISC Rulemaking"). That proceeding also involves the relocation of Wireless Microphones out of the 700 MHz Band. CWMU understands the need to vacate spectrum for the use of public safety organizations and has notified the Commission that its members have already moved a major portion of their equipment from the 700 MHz Band and will comply with whatever deadline the Commission establishes for complete removal.

performing arts, cultural presentations (including religious presentations), professional or amateur sporting events, conventions or trade shows, the owners or operators of venues where such events take place; and government or educational entities.

CWMU members, when so qualified, intend to apply for Part 74 licenses.

CWMU strongly objects to petitions in this proceeding that oppose licensing for its members.<sup>6</sup>

Although CWMU believes that the public interest supports the need for its members to become Part 74 Wireless Microphone licensees, regardless of the outcome in the PISC Rulemaking, it is vital that the Commission's rules in the instant proceeding provide adequate protection for Wireless Microphones. The Commission expressed this intent in the White Spaces Order:

"While we are aware that many wireless microphones are now operated without the required license, we nonetheless understand the important function that wireless microphones serve and find that it is in the public interest to preserve spectrum in the TV bands that is available for their use."<sup>7</sup> On reconsideration the Commission should underscore that determination and reject the suggestions of those who would not provide adequate protection for Wireless Microphones.

### **3. The Commission Should Require a Single, Secure, Reliable, and Efficient Database.**

The White Spaces Order proposes to protect Wireless Microphones from new, unlicensed TVBDs through spectrum sensing, which has never tested successfully, and through an unproven database. Spectrum-sensing technology offers only a vague promise of viability in

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<sup>6</sup> Adaptrum, Inc. ("Adaptrum") Petition at 2; Public Interest Spectrum Coalition ("PISC") Petition at 8; *see also ex-parte* presentation of Google Inc. in ET Docket No. 04-186 and WT Dockets Nos. 08-166 and 08-167, dated April 24, 2009.

<sup>7</sup> White Spaces Order at ¶ 151.

the real world.<sup>8</sup> Thus, it is especially vital that any database developed for use with TVBDs be secure, reliable, operationally sound, and accurate. The database must permit Wireless Microphone users to register their locations, frequencies, and times of use. There is some ambiguity in the White Spaces Order as to whether unlicensed Wireless Microphone users would be permitted to register their uses in the TVBD database. This issue would become moot if the Commission accepts CWMU's proposal in the PISC Rulemaking, but in the event it has not done so prior to its action on the Petitions for Reconsideration in this proceeding, the Commission should clarify that all Wireless Microphone users may register their uses in the TVBD database.

CWMU urges the Commission to authorize a single national TVBD database to avoid error and confusion.<sup>9</sup> If the Commission were to permit multiple competing databases, it would only invite coordination problems and potentially provide a perverse incentive for some databases to compete for business by permitting unacceptable interference to Wireless Microphones. Requiring simultaneous registration in multiple databases would add unnecessary costs and operational uncertainty to Wireless Microphone operations. Even if users only have to register in one of several databases, the necessary coordination among such multiple databases would result in confusion and would add a time-lag to the database operations. Furthermore, TVBD operators would naturally gravitate toward a database that provided more opportunities for use by the unlicensed devices; thus, because database operators may charge TVBD operators a fee for access, a database operator would have a financial incentive to operate with incomplete

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<sup>8</sup> CWMU supports the conclusions set forth in the Petition of the Society of Broadcast Engineers ("SBE") at 15 and 17: "The test results clearly show that spectrum sensing will not be able to protect wireless microphones." CWMU also agrees with the analysis made in the Petition of Richard A. Rudman and Dane E. Ericksen ("Rudman and Ericksen") at 5 (noting that TVBDs did not reliably detect microphone signals and determining that opposite conclusions are "contrary to common sense, engineering good practices, and any reasonable and unbiased technical reading of the [Commission's OET] report").

<sup>9</sup> See SBE Petition at 20: "A single database operator would facilitate device design and database security."

data to gain a competitive edge, which would inevitably lead to unacceptable interference to Wireless Microphones.

The single database must be secure, reliable, and transparent. It must employ strong cryptography to protect the security of data from the deliberate false entry or removal of data, which could result in devastating interference to Wireless Microphone users registered in the database.<sup>10</sup> The database must follow strict operational rules that provide for easy, but secure entry of user information and access to accurate information by TVBDs. It must allow Wireless Microphone users to check the accuracy of information stored in it and correct any errors, but at the same time not permit unauthorized parties to manipulate that information. The Commission may wish to encourage local (*e.g.*, DMA-wide) or industry-based (*e.g.*, theatres, sports leagues) coordinators who would accept database information from Wireless Microphone users, enter it into the database, and double-check the entries. Such coordinators could alleviate problems that might result from data entry by inexperienced and infrequent users. The database should use only open-source software (*e.g.*, Linux, MySQL) to avoid unnecessarily steep royalty payments.

The database operator, whether an individual firm or a consortium, must function under the close supervision of the Commission with an advisory panel consisting of representatives of all stakeholders, including the theatre and sports industries. The database design must reflect the Commission's goals of increasing service to the public without disrupting incumbent services such as Wireless Microphones and television broadcasting, must be designed by impartial professionals, and must not become captive to factional interests or profiteering motives. The costs of developing and operating the database should be borne by the new TVBD

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<sup>10</sup> Key Bridge Global LLC has some suggestions in its petition, at 3, but the Commission needs to ensure that the TVBD database uses the most secure, tamper-resistant data processing techniques available.

users and there should not be a charge to broadcasters or Wireless Microphone users, who will already be assuming the operational costs of registering their operations with the database and ensuring that the data is complete and accurate. Database registrations by Wireless Microphone users should not expire without clear notice and ample opportunity to renew.

The database must be dynamic, operationally sound, and efficient. It should be available 24 hours a day, 7 days a week, and should make information about registered Wireless Microphone users available to queries from TVBDs on a real-time basis, so that when the new devices access the database – which they should be required to do no less frequently than once per hour – recently entered information will be available.<sup>11</sup> Fixed or Mode II personal/portable TVBDs must be capable of determining the availability of a TV channel without actually transmitting on any such channel. Once an available channel has been established, if a TVBD fails to successfully contact the database for an hourly check, it should be required to immediately retry and, if again unsuccessful, must stop transmissions. Personal/portable devices should be required to send their locations to the database on an hourly basis to aid Wireless Microphone users and broadcasters in tracing any interference that is not curtailed by the database. A personal/portable device that moves more than 50 meters should be required to rescan the database within 60 seconds.

The database must contain the most accurate information possible. The Commission's requirement that geographic coordinates be determined to an accuracy of +/- 50 meters is needlessly lax. Locations of both Wireless Microphone venues and TVBDs should be accurate to +/- 5 meters, which is easily within the capabilities of modern consumer GPS

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<sup>11</sup> See Petition of IEEE 802 at 6, noting that the 48-hour grace period allowed by the Commission's rules would lead to "an extended duration of uncontrollable interference." IEEE 802 also recommends that master-mode TVBDs maintain hourly contact with the database or cease operations.

technology. With this accurate geolocation data, the database should restrict on-channel TVBD operations within a specified distance from registered Wireless Microphone uses. The Commission's rules specify a 1 km separation for both personal/portable and fixed TVBDs, even though one will operate at 100 mW or less and the other at 4 W. The effective radius at which TVBDs will be capable of producing interference depends upon the type of antenna used by a device and its height above average terrain. For example, a personal/portable device operated in a high-rise building just over 1 km from a football stadium could disrupt the use of Wireless Microphones during a game. If it is impossible to use a table for the protection area specified in Section 15.712(f)(1), then the protection zone for personal/portable TVBDs should be expanded to 2 km and the operation of fixed TVBDs should be restricted within 4 km from all registered Wireless Microphone uses.

Even with this expanded protection radius, there would be adequate available channels for use by TVBDs in all but the rare areas and times of intense Wireless Microphone use, such as Times Square, New York City, on a Saturday evening or near the football stadium on Super Bowl Sunday.

#### **4. If Spectrum Sensing is Required, the Threshold Should be Tightened.**

Although spectrum sensing has never been demonstrated to work, and may never be workable, if the Commission requires TVBDs to use sensing as a back-up protection method, CWMU supports those petitioners who believe that the -114 dBm detection threshold in Section 15.711(c)(1)(C) is inadequate,<sup>12</sup> and opposes those petitioners who believe the Commission's

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<sup>12</sup> SBE Petition at 17 (noting that it originally recommended a level of -116 dBm, but based on the DTV planning factors, a level of -122 dBm would be more appropriate); Rudman and Ericksen Petition at 9-10 (finding a cumulative error of 20 dB).

threshold is too sensitive.<sup>13</sup> There is no sound engineering rationale for the -114 dBm sensing level specification. Any detection level is arbitrary and meaningless without a corresponding specification for the type of antenna and the antenna height that will be used for the sensing.<sup>14</sup> If the Commission requires spectrum sensing of any type for the protection of Wireless Microphones, the threshold should be that formulated for use in the United Kingdom: -126 dBm.<sup>15</sup>

##### **5. Proposals for Set-Aside, "Safe Harbor" Channels are Insufficient.**

A number of petitioners believe that Wireless Microphones can be protected by reserving a couple of TV broadcast channels for their use.<sup>16</sup> Advocates of such suggestions are seriously uninformed about the demands for Wireless Microphone facilities in modern stage and sports presentations. Wireless Microphones generally require about 400 kHz of bandwidth to operate within close proximity of each other. That would theoretically permit 15 devices per TV channel under optimum conditions, but not every channel is available in every location because of operating television stations and the need to coordinate with nearby users.

A large musical production on a Broadway stage will use more than 60 Wireless Microphones, all requiring separate frequencies. An average musical uses about 50 frequencies. The current production of "HAIR," for example, uses 49 individual Wireless Microphone frequencies operating over 15 TV channels. Within a one-block area of Broadway, between 45<sup>th</sup>

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<sup>13</sup> IEEE 802; The WiFi Alliance; Dell, Inc. and Microsoft Corp.; Motorola, Inc. ("Motorola"); and PISC.

<sup>14</sup> See SBE Petition at 17-18.

<sup>15</sup> Office of Communications of the United Kingdom ("Ofcom"), "Digital dividend: cognitive access" (Consultation, 16 February 2009), § 5.34; see also SBE Petition at 23-24.

<sup>16</sup> See Adaptrum Petition at 2; Motorola Petition at 10.

and 46<sup>th</sup> Streets, there are currently three "average" and two "large" musicals all in operation at the same time, collectively using more than 300 Wireless Microphones.

The "Monday Night Football" telecast has used 155 Wireless Microphone frequencies spread over 31 TV channels. Additionally, the National Football League itself will use a minimum of 40 units per game played. Extraordinary games, such as the Super Bowl, exceed even these requirements. In the two-week period around the 2009 Super Bowl in Tampa, the NFL Super Bowl Game Day Coordinators coordinated the shared use of over 1,000 Part 74 Wireless Microphone frequencies. A political convention, major awards show, or major sporting event can easily use from 250 to over 800 Wireless Microphones sharing coordinated frequencies within the venue while other producers use additional Wireless Microphones in close proximity for "tailgate" or "red carpet" segments.

Sports productions require careful coordination among users to prevent interference. For example, the 2008 U.S. Open Tennis Tournament, a typical medium-sized event, involved over 150 media organizations and frequency coordination of Wireless Microphones, satellite uplinks, and walkie-talkies. In addition to media, the coordination extended to the National Tennis Center's security team, IT group, maintenance staff, and even restaurant workers. Protection against interference to Wireless Microphones may be complex, but it will be extremely important to the success of such events in the future. If elements of sports production that are made possible through the use of Wireless Microphones were to disappear, it's possible that the programming will become less attractive to viewers and advertisers. If advertising dollars are lost, jobs will follow.

Because of the exceptional need for Wireless Microphones in a few discrete locations for limited times, it is impossible to provide U.S. audiences, either in theatres or at

home, the quality productions they currently enjoy on a few "safe harbor" channels. The Commission should note, however, that outside the limited areas surrounding theatrical and sports events, the vast number of uses of Wireless Microphones by schools, churches, and business presentations would result in only a *de minimis* reduction in the number of channels available for TVBDs.

There is one use for a safe harbor channel, however. In addition to the two TV channels set aside in 13 metropolitan areas pursuant to Section 15.712(f)(2), the Commission should set aside one 6 MHz television channel in each metropolitan area for use by roving microphones, such as those used by television news crews for electronic news gathering ("ENG") operations, in situations when it would be impractical or impossible to register in advance locations where Wireless Microphones will be used.

**6. Conclusion**

CWMU members are eager to continue serving the public with live presentations, sporting events, and curricular offerings, but are concerned that the Commission's rules as developed in the White Spaces Order will not provide sufficient protection against interference from new unlicensed TVBDs. Accordingly, for all the reasons set forth above, CWMU respectfully urges the Commission to modify its rules in conformance with the requests made herein.

Respectfully submitted,

THE COALITION OF WIRELESS MICROPHONE USERS

/s/

By: \_\_\_\_\_

Antoinette C. Bush  
David H. Pawlik  
SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP  
1440 New York Avenue, N.W.  
Washington, D.C. 20005  
(202) 371-7000

Its Attorneys

Dated: May 8, 2009

## Certificate of Service

I, Valerie Covarrubias, certify that I have caused a copy of the "Opposition of The Coalition of Wireless Microphone Users to Petitions for Reconsideration" to be sent by First Class Mail to the following:

- Michael Lynch, on behalf of IEEE Local and Metropolitan Area Networks Standards Committee,
- Rich Kennedy, on behalf of The Wi-Fi Alliance,
- Donald G. Everist, on behalf of Cohen Dippell and Everist PC,
- Christopher D. Imlay, for Booth Freret Imlay & Tepper PC, on behalf of The Society of Broadcast Engineers, Inc.,
- Richard A. Rudman & Dane E. Ericksen,
- Richard Harnish, for Rini Coran PC, on behalf of The Wireless Internet Service Providers Association,
- Susan Eid, on behalf of DIRECTV, Inc., & Linda Kinney, on behalf of DISH Network LLC,
- Peter Tannenwald, for Fletcher Heald & Hildreth PLC., on behalf of The Community Broadcasters Association,
- R. Paul Margie, for Harris Wiltshire & Grannis LP, on behalf of Dell, Inc., & Microsoft Corp.,
- Michele C. Farquhar, for Hogan & Hartson LLP, on behalf of FiberTower, Sprint Nextel, COMPTTEL, and RTG,
- Steve B. Sharkey & Robert D. Kubik, on behalf of Motorola, Inc.,
- Neal M. Goldberg, on behalf of National Cable & Telecommunications Association,
- Harold Feld, on behalf of Public Interest Spectrum Coalition
- Catherine Wang & Timothy Bransford, for Bingham McCutchen LLP, on behalf of Shure Incorporated,
- Jesse M. Caulfield, on behalf of Key Bridge Global LLC,
- Haiyun Tang, on behalf of Adaptrum, Inc.

/s/  
Valerie Covarrubias