Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Promoting More Efficient Use of Spectrum	)	
Through Dynamic Spectrum Use Technologies	)	ET Docket No. 10-237
	)	
	)	
To: The Commission	)	

COMMENTS OF THE SATELLITE INDUSTRY ASSOCIATION

SATELLITE INDUSTRY ASSOCIATION

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SUMMARY

SIA supports the Commission's goal of promoting more efficient use of spectrum by exploring whether dynamic spectrum access radios can share with incumbent licensees. Satellite bands, however, are not viable candidates for sharing with dynamic radios. Satellite spectrum is used intensively today to provide many important communications services, including video programming, broadband service and critical public safety and government communications. In addition, satellite networks play important research and scientific roles. Satellite service providers already have strong incentives to maximize the efficiency of their spectrum use, and there is a vibrant secondary market for satellite transponder capacity in most bands.

For the reasons raised by the Commission in the NOI and as discussed herein, the terrestrial deployment of dynamic radios in satellite bands is not technically feasible and would pose a serious threat of harmful interference to satellite networks. Neither real-time databases nor spectrum sensing technologies would protect satellite services from harmful interference caused by ubiquitously deployed dynamic spectrum access radios in satellite spectrum.

Use of a real-time database by dynamic radios would not protect satellite downlinks or uplinks from harmful interference. In satellite downlink spectrum, a real-time database could protect only those satellite ground terminals for which it had accurate location information. Therefore, it would be of no value in protecting blanket-licensed earth stations, unregistered receive-only dishes or mobile satellite transceivers. In satellite uplink spectrum, a real-time database would have no mitigating impact on the aggregate effect of dynamic spectrum access radio transmissions. Every dynamic radio within the satellite's coverage area would contribute to an aggregate increase in the noise floor regardless of its proximity to satellite earth stations identified in the real-time database. The overall increase in the noise floor would result in more frequent and longer satellite service outages.

Likewise, spectrum sensing technologies would not protect satellite downlinks or uplinks. Spectrum sensing would serve no purpose whatsoever in satellite downlink bands. Dynamic radios located near earth station receivers in the satellite's coverage area would not be able to sense the receiver and would transmit, causing harmful interference to the satellite downlink signal. Spectrum sensing would also be of no value in protecting satellite uplinks because the dynamic radio's proximity to an earth station has no impact on the aggregate noise that the receiver on the space station "hears" over its entire coverage area. Again, the aggregate effect of thousands of dynamic spectrum access radio transmissions would be to increase the noise floor, causing loss of the link between satellite and earth station.

Enforcing non-interference requirements would be impossible, particularly if the Commission authorized dynamic spectrum access radios to be deployed ubiquitously and used for mobile or unlicensed operations. The satellite industry and the Commission learned this lesson ten years ago with unlicensed radar detectors that caused harmful interference to Very Small Aperture Terminals ("VSATs"). In that case, the Commission recognized that satellite operators could not identify the individual sources of interference due to the mobile nature and intermittent transmissions of radar detectors.

Finally, by raising the noise floor on uplinks into satellites operating in view of the United States, including foreign-licensed satellites serving Canada and Mexico, dynamic spectrum access radios could increase the number of outages for foreign-licensed satellites in violation of United States treaty obligations and the International Telecommunication Union's Radio Regulations.

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The Satellite Industry Association ("SIA"), pursuant to Section 1.415 of the Commission's rules, hereby submits its comments on the Notice of Inquiry ("NOI") in the above-captioned proceeding.[1] SIA supports the Commission's goal of promoting more efficient use of spectrum by exploring the capabilities of terrestrial "dynamic spectrum access" or "cognitive" radios. There may be multiple spectrum bands where such radios could operate without causing harmful interference to incumbent services and thus increase spectrum efficiency. This is not the case, however, for satellite bands.

Instead, for the reasons raised by the Commission in the NOI and as discussed herein, sharing of satellite bands with dynamic spectrum access radios is not feasible and would result in harmful interference to satellite services. As a result, allowing terrestrial deployment of dynamic spectrum access radios in satellite bands would not lead to any spectrum efficiencies, but would instead impair many important services delivered via satellite.

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[1] *See Promoting More Efficient Use of Spectrum Through Dynamic Spectrum Use Technologies*, ET Docket No. 10-237, Notice of Inquiry, 25 FCC Rcd 16632, FCC 10-198 (rel. Nov. 30, 2010) ("NOI").

SIA is a U.S.-based trade association providing worldwide representation of the leading satellite operators, service providers, manufacturers, launch services providers, remote sensing operators, and ground equipment suppliers.[2] SIA is the unified voice of the U.S. satellite industry on policy, regulatory, and legislative issues affecting the satellite business. As the primary representative for the U.S.-based satellite industry, SIA has a direct interest in this proceeding, which has specifically inquired about the use of satellite bands as a potential home for dynamic spectrum access radios.[3]

I. SATELLITE SERVICES USE SPECTRUM EFFICIENTLY TO PROVIDE CRITICAL COMMUNICATIONS

SIA endorses the Commission's goal of increasing spectrum efficiency by, for example, accommodating dynamic spectrum access radios in certain spectrum bands. In pursuing this goal, however, the Commission must carefully consider the nature and extent of existing services that are entitled to protection. As the discussion below will demonstrate, the terrestrial deployment of dynamic spectrum access radios in satellite frequency bands is not technically feasible and

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[2] SIA Executive Members include: Artel, Inc.; The Boeing Company; CapRock Communications, Inc.; The DIRECTV Group; Hughes Network Systems, LLC; DBSD North America, Inc.; Echostar Satellite Services, LLC; Integral Systems, Inc.; Intelsat, Ltd.; Iridium Communications Inc.; LightSquared; Lockheed Martin Corporation.; Loral Space & Communications, Inc.; Northrop Grumman Corporation; Rockwell Collins Government Systems; SES WORLD SKIES; and TerreStar Networks, Inc. SIA Associate Members include: Arqiva Satellite and Media; ATK Inc.; Cisco; Cobham SATCOM Land Systems; Comtech EF Data Corp.; DRS Technologies, Inc.; Eutelsat, Inc.; GE Satellite; Globecomm Systems, Inc.; Glowlink Communications Technology, Inc.; iDirect Government Technologies; Inmarsat, Inc.; Marshall Communications Corporation.; Panasonic Avionics Corporation; Spacecom, Ltd.; Spacenet Inc.; Stratos Global Corporation; TeleCommunication Systems, Inc.; Telesat Canada; Trace Systems, Inc.; and ViaSat, Inc. Additional information about SIA can be found at http://www.sia.org.

[3] *See* NOI, 25 FCC Rcd at 16649, ¶ 49.

would pose a serious threat of harmful interference to satellite networks in use today that provide many important services.

For example, nearly 30 million households receive their video programming directly from Direct Broadcast Satellite ("DBS") networks.[4] Every day, C-band and Ku-band satellites are used to deliver hundreds of channels of video programming to thousands of cable systems throughout the country, which serve another 60 million households.[5] Satellites are used to deliver network or syndicated programming to thousands of television and radio stations nationwide, and 20 million customers receive programming directly from Satellite Digital Audio Radio System ("SDARS") networks. Increasingly, satellites are being used to deliver broadband Internet access to consumers, especially in remote communities or other areas not well served by terrestrial infrastructure. As the Commission recognized recently, "[s]atellite service is ideally suited for serving housing units that are the most expensive to reach via terrestrial technologies, because there is little marginal cost to add a subscriber, assuming capacity is available."[6] Today, satellite broadband serves nearly 1 million households nationwide.[7]

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[4] *See Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, MB Docket No. 06-189, Thirteenth Annual Report, 24 FCC Rcd 542, 580, FCC 07-206, ¶ 75 (2009) ("Video Competition Thirteenth Annual Report").

[5] *See id.* at 554, ¶ 30.

[6] *See Connect America Fund*, WC Docket No. 10-90, Notice of Proposed Rulemaking and Further Notice of Proposed Rulemaking, FCC 11-13, ¶ 133 (rel. Feb. 2, 2011).

[7] The latest quarterly reports show approximately 558,200 satellite broadband customers for Hughesnet and approximately 415,000 subscribers for ViaSat's Wildblue service. *See* Hughes Communications, Inc., Quarterly Report (Form 10-Q) (filed Nov. 4, 2010), *available at* http://www.sec.gov/Archives/edgar/data/1345840/000119312510246415/d10q.htm and ViaSat, Inc. Quarterly Report (Form 10-Q) (filed Feb. 8, 2011), *available at* http://www.sec.gov/Archives/edgar/data/797721/000095012311010892/a58053e10vq.htm.

Satellites also play a critical role in disaster recovery, navigation, weather forecasting, remote sensing, network redundancy, critical infrastructure and national security services. Satellites provide backhaul connectivity for wireless communications and network redundancy to back up global maritime cable communications. First responders also rely heavily on satellite services in the initial hours and days following a disaster when terrestrial communications are often disrupted.[8] The Commission must not endanger these critical satellite services by allowing terrestrial deployment of dynamic spectrum access radios in satellite bands.

Introducing new terrestrial operations is not needed to ensure that satellite spectrum is used efficiently. To the contrary, the economics of satellite operation require operators to maximize their spectrum efficiency,[9] and these incentives are buttressed by Commission frequency reuse obligations for the Fixed Satellite Service ("FSS").[10] Satellite spectrum is also reused multiple times by multiple satellite providers across the geostationary arc.[11] Finally, there

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[8] *See* Comments of the Satellite Industry Association, ET Docket No. 02-135, at 16 (filed July 8, 2002).

[9] The long lead times and extremely high up-front costs of purchasing, launching, insuring and operating a satellite (which must all be incurred before any revenue can be earned) provide powerful incentives for satellite operators to design satellites that maximize spectrum efficiency in order to ensure a return on investment. Moreover, the satellite operator has no means of recouping these costs gradually as the network is deployed, as is the case with terrestrial systems, but must wait until the satellite is manufactured, launched and tested before commercial service can begin producing revenues.

[10] *See* 47 C.F.R. § 25.210(f) (requiring FSS operators to achieve full frequency reuse through either dual polarizations or multiple spot beams). More recent technical innovations allow satellite spot beams to be reconfigured dynamically through the use of ground-based beam forming technology or on-board processing.

[11] For example, the Commission's two-degree spacing rules ensure that the same FSS frequencies are reused by numerous geostationary satellites operating in different orbital locations. Satellite service providers negotiate and execute detailed and extensive coordination agreements with other satellite network operators based on careful situation-specific engineering in order to more efficiently use spectrum without causing harmful interference to each other.

is a vibrant secondary market for satellite transponder capacity in most bands, with significant capacity sold on the spot market or on-demand from vendors to meet the often sporadic needs of newsgathering, disaster recovery and military operations.[12] Given satellite networks' intensive use of satellite spectrum to provide critical services, the satellite bands should not be used to as a test bed for dynamic spectrum access technology.

II. INTRODUCING DYNAMIC SPECTRUM ACCESS RADIOS IN SATELLITE SPECTRUM WOULD CAUSE HARMFUL INTERFERENCE TO SATELLITE SERVICES

Due to the nature and physics of satellite communications, it is not technically feasible for satellite services to co-exist with dynamic spectrum access radios in the same frequency band.[13] The Commission recognized as much when it observed that "certain bands, such as

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[12] *See* Comments of the Satellite Industry Association, ET Docket No. 02-135, at 3 (filed Jan. 27, 2003) ("SIA 2003 Spectrum Policy Task Force Comments"). In fact, the Commission determined in the secondary markets proceeding that the spectrum leasing policies it adopted for terrestrial services were not necessary for satellite services because "there already exists a robust secondary market for parties seeking to gain access to spectrum in our satellite services." *Promoting Efficient Use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, WT Docket 00-230, Second Report and Order, Order on Reconsideration, and Second Further Notice of Proposed Rulemaking, 19 FCC Rcd 17503, 17536, ¶ 66, n.166 (2004).

[13] The obstacles to sharing described herein apply both to spectrum in active use for satellite services today and to spectrum identified for new satellite operations. For example, FSS use of the V-band between 37.5-42.5 GHz is just over the horizon and represents the "next frontier" for cost-effective wideband satellite services. *See* Comments of the Satellite Industry Association, IB Docket No. 97-95 (filed Jan. 6, 2011). Introduction of dynamic spectrum access radios in V-band satellite spectrum would upset the delicate balance embodied in the "soft segmentation" approach the Commission adopted to allow the V-band to be shared by ubiquitously deployed FSS and terrestrial fixed service terminals. *See id.* at 11-12; *see also Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations*, IB Docket No. 97-95, Second Report and Order, 18 FCC Rcd 25428, 25432, FCC 03-296, ¶¶ 6-9 (2003). Therefore, V-band satellite spectrum should be excluded

those accommodating satellite uses, are more difficult to protect [from dynamic spectrum access radios] than other bands."[14] Of the approaches discussed by the Commission, neither real-time databases nor spectrum sensing technologies could protect satellite services from harmful interference caused by the aggregate operation of ubiquitously deployed dynamic spectrum access radios in satellite spectrum.

A. A Real-Time Database Would Not Protect Satellite Services

The database approach, whether based on the Spectrum Dashboard or another real-time database, relies on the premise that if the locations of all receivers in a particular band that might experience interference were known, a dynamic radio would not transmit in that band when in the vicinity of an existing receiver. In the TV White Spaces proceeding, for example, the Commission found that employing a real-time database would enable the use of new devices in spectrum not in active use within a particular geographic area.[15]

The NOI, however, explicitly recognized that this approach may not be effective in other spectrum bands.[16] In particular, the Commission cautioned that "extending the Television Band

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from any further consideration of bands above 38.6 GHz in which introduction of dynamic spectrum access radios may otherwise be feasible. *See* NOI, 25 FCC Rcd at 16648, ¶ 46.

[14] NOI, 25 FCC Rcd at 16638, ¶ 14.

[15] *See Unlicensed Operation in the TV Broadcast Bands*, ET Docket No. 04-186, Second Memorandum Opinion and Order, FCC 10-174 (2010).

[16] The Commission explained in the NOI that "in September 2010 we permitted devices operating in the TV bands to rely only on geo-location and a real-time database to determine if a channel is available. However, it remains to be seen whether such an approach would be sufficient for providing access to other spectrum bands that may present a more variable spectrum environment as compared to the relatively steady-state operation of TV stations." NOI, 25 FCC Rcd at 16640-1, ¶ 24.

Device concept to [satellite bands] could be *extremely challenging*."[17] The Commission observed that:

> The governing database would need to either know the location and target area of all satellites and, possibly – for NGSO systems – the location of the satellites as they move relative to the surface of the earth, as well as all mobile or fixed earth stations, both transmitting and receive-only, at any given time; or be able to predict with a high degree of accuracy and confidence the location of mobile stations.[18]

In satellite downlink spectrum, a real-time database can protect only those satellite ground terminals for which it has accurate location information.[19] That means it would be of no value in protecting significant categories of satellite ground terminals, including blanket-licensed earth stations and unregistered receive-only dishes. As noted above, there are nearly 30 million DBS receivers and 20 million SDARS receivers deployed nationwide, and tens of thousands more terminals are licensed under blanket authorizations. There is no practical way for a database to contain accurate location information for all of these antennas. Further, the database could not capture the real-time location of mobile satellite transceivers such as vehicle-mounted earth stations ("VMESs"), earth stations onboard vessels ("ESVs") and aeronautical mobile-satellite service ("AMSS") terminals, which are increasingly used to provide mobile broadband access to underserved customer groups.[20] Many critical users also rely on handheld or low data

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[17] *Id.* at 16649, ¶ 49 (emphasis added).

[18] *Id.*

[19] *See id.* at 16648, ¶ 48 ("Commenters should keep in mind that this approach was pursued in the TV bands under the premise that most facilities needing protection (*e.g.*, TV stations, cable headends, wireless microphones) are generally fixed.").

[20] Although ESVs installed on ships at sea often may not be in proximity to dynamic spectrum access radios, the ESVs could receive interference when docked, sailing in internal waterways or while otherwise in close proximity to land. Likewise, AMSS terminals could receive interference if a dynamic radio were onboard or while the aircraft is on the ground.

rate devices to provide essential communications from remote locations or mobile platforms, including smart grid and homeland security applications.

In satellite uplink spectrum, a real-time database would have no mitigating impact on the aggregate effect of dynamic spectrum access radios. Space station receivers are highly sensitive because they receive transmissions from tens of thousands of miles away, and they "hear" noise emanating from their entire coverage area or footprint. The dynamic radio's proximity to a transmitting earth station is the only information that could potentially be gleaned from consulting the real-time database and does not significantly impact whether the radio's transmission would cause harmful interference to the satellite receiver in space. Instead, every dynamic radio transmitting in a particular uplink frequency band within the satellite's footprint would contribute to the noise floor in the satellite uplink band. The aggregate effect of thousands of such devices transmitting in the satellite uplink band would be to raise the overall noise floor, which could cause the satellite link to be degraded. The increased noise would be particularly harmful to the extent it results from dynamic spectrum access radios transmitting in a southerly direction toward the equator and the geostationary arc.

Over time, changes in space station design in order to increase spectrum efficiency have resulted in the use of higher gain receive antennas on satellites that are significantly more susceptible to increases in noise and interference.[21] Satellite service uplinks operate with limited link margin and can be affected by weather patterns and solar activity, which can result in

[21] *See* SIA 2003 Spectrum Policy Task Force Comments at 11. As the Commission recognized in the NOI, this is a concern not only for co-frequency transmissions, but also for out-of-band emissions into the satellite bands. *See* NOI, 25 FCC Rcd at 16642, ¶ 28 ("an appropriate out-of-band emissions standard might be much more stringent when operating in a band that is adjacent to a service that relies on reception of extremely weak signals"). Satellite service providers operate highly sensitive receivers designed to receive signals in orbit from tens of thousands of miles away.

occasional outages. Ubiquitously deployed dynamic spectrum access radios would raise the overall noise floor, resulting in more frequent and longer outages, especially during adverse weather conditions when satellite networks used for emergency services are most needed.[22] Given the potential ubiquitous deployment of dynamic spectrum access radios, it would be extremely difficult to engineer a link and have reasonable certainty that its margin would be sufficient to always overcome the noise. The increase in the noise floor would necessitate more powerful earth station transmitters, increasing operational costs, and might preclude the use of smaller "transportable" earth station transmitters that are a critical component of emergency response efforts. As a result, the introduction of dynamic spectrum access radios would decrease – not increase – spectrum efficiency and would compromise the significant public interest benefits of satellite services.[23]

B. Spectrum Sensing by Dynamic Spectrum Access Radios Would Not Protect Satellite Services

The Commission also requests comment on whether spectrum sensing technology could be used to protect incumbent services.[24] Radios using spectrum sensing technology must be able to sense, or "hear" the transmissions of incumbent services in the band in order to know not to transmit in a certain location at a certain time. The Commission recognized in the TV White Spaces proceeding that spectrum sensing technology was not "sufficiently mature" for use in

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[22] Allowing unlicensed dynamic spectrum access radios to raise the overall noise floor essentially establishes a right of unlicensed devices to cause harmful interference to licensed services. *See* SIA 2003 Spectrum Policy Task Force Comments at 13-16.

[23] The adverse impact on satellite services is not limited to communications. There are also highly sensitive antennas in the Space Research, Space Operations, Intersatellite, Earth Exploration, Meteorological, and Radiodetermination Satellite bands, and the location of these antennas may be unknown or difficult to ascertain at any given time.

[24] *See* NOI, 25 FCC Rcd at 16639-42, ¶¶ 20-24.

consumer devices to protect broadcast services.[25] Even if the technology improved, however, it would not be effective in preventing interference to satellite communications services from dynamic spectrum access radios.

Spectrum sensing would serve no purpose at all in satellite downlink bands. Satellite coverage areas are extremely large and, as discussed above, FSS spectrum is reused by satellites located at two degree spacing across the geostationary arc. Thus, in almost any given location in the United States, signals from multiple satellites in virtually every satellite downlink band are capable of being received. A spectrum sensing technology-equipped radio may not be able to "hear" these satellite signals, since the signal strength is low by the time it arrives on earth. But the presence of a signal can be assumed without the need for sensing technology.

Whether a dynamic spectrum access radio's transmission would interfere with reception of a satellite downlink signal depends on whether there is a nearby ground terminal attempting to receive the signal. Of course, spectrum sensing technology can't answer that question because there is no way to "sense" a nearby receiver. Instead, information about receivers would require access to a comprehensive database, which is not feasible for the reasons discussed above. These obstacles to the use of spectrum sensing technology to protect satellite receivers have been highlighted in International Telecommunication Union ("ITU") proceedings. ITU Working Party 4A observed that sensing satellite downlink signals is difficult "[g]iven the low power flux-densities of FSS/BSS involved in satellite communications," and that "due to regional or global

[25] *See id.* at 16634, ¶ 4.

coverage of satellites, even detecting the satellite downlink signal would not provide any usable information about the actual deployment of receiving earth stations."[26]

Spectrum sensing technology would be similarly ineffective in satellite uplink spectrum. A space station's antenna receives interference generated throughout the satellite's footprint. Thus, the distance between a dynamic radio and a transmitting uplink earth station – whether it is close enough for the radio to "sense" the transmission – has no impact on the likelihood that the satellite would be subjected to a sufficient increase in the overall noise floor to cause signal loss. For these reasons, spectrum sensing would not protect important satellite communications in either the uplink or downlink direction.

III. NON-INTERFERENCE REQUIREMENTS ON UNLICENSED, UBIQUITOUS DYNAMIC SPECTRUM ACCESS RADIOS WOULD NOT BE ENFORCEABLE

As discussed above, there is no database, spectrum sensing technology or other reliable means to protect satellite services from the harmful interference that would result from the operation of dynamic spectrum access radios in satellite bands. Further, once such interference does occur, it would be extremely difficult for satellite service providers and the Commission to locate and shut down the offending radios because their transmissions in any given band would be sporadic. The problem would be compounded if the radios were mobile or unlicensed.[27]

The experience of the satellite industry and the Commission with respect to harmful interference caused by certain radar detectors to Very Small Aperture Terminals ("VSATs") is instructive. In 2002, the Commission revised its Part 15 rules to impose emissions limits and

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[26] ITU Working Party 4A, Liaison Statement to Working Party 1B for Action (and to Working Party 5A for Information) on WRC-11 Agenda Item 1.19, Document 1B/97-E, 28 May 2009 at 2.

[27] The Commission's NOI considers both licensed and unlicensed uses. *See* NOI, 25 FCC Rcd at 16647, ¶ 42.

certification requirements on radar detectors that were causing harmful interference to VSATs operating in the 11.7-12.2 GHz downlink band.[28] In that case, the Commission recognized that "identifying each individual source of interference from radar detectors is not practical for a satellite operator because these devices are mobile and therefore interfere intermittently."[29] The Commission further acknowledged that the "interference sources are not under the control of the satellite operator, so in most cases it is not possible for the satellite operator to remedy the interference even if the source could be identified."[30] The Commission required that new radar detectors be certified to comply with the revised emissions requirements, but that remedy did not affect the devices that were already on the street causing interference for several years thereafter.

Similarly, if the Commission were to permit dynamic spectrum access radios to share satellite bands, there is no adequate means to enforce a non-interference requirement against potentially mobile, intermittently-transmitting, and possibly unlicensed, devices. Dynamic radios would cause harmful interference not just to VSATs, but potentially to all satellite services, including those used for media distribution to millions of households, critical infrastructure and national security communications. Such an outcome would clearly be contrary to the public interest.

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[28] *See Review of Part 15 and Other Parts of the Commission's Rules*, ET Docket No. 01-278, First Report and Order, 17 FCC Rcd 14063, FCC 02-211 (2002).

[29] *Id*. at 14067, ¶ 11.

[30] *Id*.

IV. DYNAMIC SPECTRUM ACCESS RADIOS COULD CREATE INTERFERENCE AND COORDINATION PROBLEMS IN VIOLATION OF THE INTERNATIONAL RADIO REGULATIONS

The NOI asks whether international coordination problems could arise by permitting dynamic radios to operate in satellite bands.[31] By raising the noise floor on uplinks into satellites operating in view of the United States, dynamic spectrum access radios could cause harmful interference to foreign-licensed satellites in violation of United States treaty obligations and the ITU's Radio Regulations. To be an authorized spectrum user, a dynamic radio would have to be licensed by the Commission to operate as an application within a radio service. As most of the principal satellite bands available for commercial use in the United States do not include terrestrial mobile allocations, dynamic radios using these bands in mobile systems would have to do so under No. 4.4 of the ITU Radio Regulations. As the Commission has recognized, "ITU Radio Regulation 4.4 (ITU RR 4.4) permits licensing of services that do not otherwise conform to the Radio Regulations so long as those services do not cause interference to, or claim protection from interference by, other services licensed in compliance with the Radio Regulations."[32] By being unable to comply with this condition, dynamic radios would have to operate outside of satellite frequency bands.

Many foreign-licensed satellites serving Canada and Mexico are in geostationary orbit positions that are in view of the United States. Therefore, receive antennas on those satellites would "hear" noise emanating from radios in the United States. As discussed above, the aggregate transmissions of dynamic spectrum access radios would raise the noise floor, thereby

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[31] *See* NOI, 25 FCC Rcd at 16649, ¶ 49.

[32] *See Procedures to Govern the Use of Satellite Earth Stations on Board Vessels in the 5925-6425 MHz/3700-4200 MHz Bands and 14.0-14.5 GHz/11.7-12.2 GHz Bands*, IB Docket No. 02-10, Report and Order, 20 FCC Rcd 674, 726, ¶ 127 (2004).

causing harmful interference to satellite uplinks and increasing the frequency and length of outages. Under the Radio Regulations, U.S. dynamic spectrum access radios that caused harmful interference to foreign-licensed satellites would be in violation of No. 4.4 and would have to be shut down. As discussed previously, however, pinpointing those sporadically-transmitting and potentially mobile radios and terminating their transmissions would be difficult, if not impossible.

In some satellite bands, the specific frequencies that satellites use are designated through an international coordination process, which can change the frequency bands used by a particular system over time. If the United States were to implement policies affecting dynamic spectrum use that differed from the approaches used in other countries, it would not be possible to predict which bands might be affected if those policies affected spectrum bands that are coordinated internationally.

Moreover, many satellite systems are deployed in spectrum that is harmonized internationally for satellite use, enabling satellites to provide regional or global service. If the United States were to deploy dynamic spectrum policies affecting these satellite bands, the potential for other countries to copy this approach and adopt similar policies could have significant negative effects on international spectrum coordination and the use of satellite spectrum internationally.

V. CONCLUSION

SIA supports the Commission's goal of identifying suitable spectrum for the introduction of dynamic spectrum access radios. For the reasons discussed herein, satellite spectrum is not an acceptable test bed for these radios. Due to the physics of satellite communications, operation of dynamic spectrum access radios in satellite bands would cause harmful interference to satellite downlinks and uplinks, including to foreign licensed satellites in violation of United States treaty obligations and the international Radio Regulations. Any harmful interference would be difficult to remedy due to the likely intermittent and mobile nature of dynamic radio transmissions. The Commission should therefore eliminate satellite spectrum from the bands being considered for the operation of dynamic spectrum access radios.

Respectfully submitted,

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