In the Matter of	)	
	)	
Redesignation of the 17.7-19.7 GHz Frequency	)	
Band, Blanket Licensing of Satellite	)	IB Docket No. 98-172
Earth Stations in the 17.7-20.2 GHz and	)	RM-9005
27.5-30.0 GHz Frequency Bands,	)	RM-9818
and the Allocation of Additional Spectrum	)	
in the 17.3-17.8 GHz and 24.75-25.25 GHz	)	
Frequency Bands for Broadcast	)	
Satellite-Service Use	)	

COMMENTS OF THE FIXED POINT-TO-POINT COMMUNICATIONS SECTION, WIRELESS COMMUNICATIONS DIVISION OF THE TELECOMMUNUNICATIONS INDUSTRY ASSOCIATION

Respectfully submitted,

FIXED POINT-TO-POINT COMMUNICATIONS SECTION, WIRELESS COMMUNICATIONS DIVISION OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

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Summary

The Fixed Point-to-Point Communications Section, Wireless Communications Division of the Telecommunications Industry Association has studied carefully the Commission's band segmentation and sharing proposals in this proceeding and, while it appreciates the Commission's desire to provide specific allocations to the satellite services in the 18 GHz band, the Section believes that the specific segmentation and sharing proposals in the Notice raise serious concerns about the potential for mutually unacceptable interference between services, and about immediate injuries to FS services, if these proposals are implemented.

Briefly, the Fixed Section believes that adoption of the Commission's proposals would result in widespread intolerable interference to terrestrial fixed services and to satellite earth stations and cause costly dislocations of thousands of existing systems, and would seriously restrict the ability of the fixed services to continue to serve the many communications requirements of existing and emerging communications providers and users.

It is clearly desirable that all categories of services be able to meet their respective spectrum requirements. However, as we have learned from past experience, sharing the same spectrum by incompatible services becomes increasingly difficult, and in many cases this ultimately results in one of the sharing services having to vacate the shared bands. This generally has resulted in the relocated services having to move to a less desirable frequency allocation. As we are now approaching frequency gridlock, there are no new suitable alternative frequency allocations, other than those that would require sharing with other services. The Fixed Section,

therefore, believes that, as a matter of policy where a new service is proposed, the new service should share with similar services in the same category. In this reallocation proceeding, the new satellite fixed services (FSS) should be required to share spectrum with other FSS services.

The Fixed Section agrees that band segmentation will solve difficult sharing problems. Therefore, the Section proposes a modified version of the Commission's proposed band segmentation plan which would minimally accommodate Fixed Services (FS) needs and, at the same time, provide significant specific allocations for GSO/FSS, NGSO/FSS and MSS/FL proposed systems.

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COMMENTS OF THE FIXED POINT-TO-POINT COMMUNICATIONS SECTION, WIRELESS COMMUNICATIONS DIVISION OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

The Fixed Point-to-Point Communications Section, Wireless Communications Division of the Telecommunications Industry Association ("Fixed Section" or "Section")[1] files its comments in response to the Commission's Notice of Proposed Rulemaking ("NPRM" or "Notice") in the above-referenced proceeding.[2] The Section's responses to

[1]The Telecommunications Industry Association is the principal industry association representing telecommunications equipment manufacturers, including manufacturers of terrestrial fixed point-to-point microwave radio service equipment. Fixed Section members serve, among others, companies – including telephone carriers, emerging communications carriers, PCS carriers, cellular carriers, public safety operations, utilities, railroads, and governments – which are licensed by the Commission to use private and common carrier bands for provision of important and essential telecommunications services. These comments reflect only the views of the Fixed Point-to-Point Section and does not necessarily reflect the views of any other member of the Association.

[2]In the Matter of Redesignation of the 17.7-19.7 GHz Frequency Band, Notice of Proposed Rulemaking, released September 18, 1998, FCC 98-235; 63 Fed. Reg.

to provide specific spectrum allocations for the fixed satellite and for the terrestrial fixed services. However, the Section disagrees with the Commission's specific proposals and offers a number of changes which would make the Commission's final decision more technically sound and would better serve the interests of all of the services now sharing the 18 GHz band.

I. The Commission's proposed band segmentation plan for the 18 GHz band raises serious concerns

54100, October 8, 1998 ("Notice" or "NPRM").

The Fixed Section is concerned about the Commission's unrealistic expectations in this proceeding. If its proposals are adopted without change, the Fixed Section believes that the terrestrial fixed services ("FS") will not have access to spectrum they require for their continued viability. In its Notice, the Commission proposes to reduce the spectrum available to the FS by 53.3%. Further, in the 46.7% of the spectrum remaining, FS point-to-point services would be required to share with FS point-to-multi-point one way VIDEO distribution services, something that is not done today. This effectively reduces the FS point-to-point and point-to multi-point available frequencies because sharing is virtually impossible due to the coordination difficulties between these services in the metropolitan areas where these services both reside. This point is clearly acknowledged by the Commission.[3] Finally, whereas the VIDEO distribution services only require one-way frequencies, the frequencies paired with the one-way frequencies would be lost to the point-to-point FS services. The total impact of this could be a loss of an additional 560 MHz of FS point-to-point spectrum in areas where video distribution services operate. The ultimate impact of this action would be either the loss of 84% of FS point-to-point frequencies where full video distribution services are deployed, or the loss of 53% of FS point-to-point frequencies and the loss of 100% of the VIDEO distribution services. This is clearly unacceptable to both of these services.

[3]See Notice, Par. 27, where the Commission states: "Due to the difficulties of coordination these point-to-multipoint operations with typical point-to-point terrestrial fixed service operations, these services have generally been licensed in separate portions of the 17.7-19.7 GHz band."

II. The Fixed Section proposes a reasonable alternative segmentation plan for the 18 GHz Band

As an alternative to the Commission's proposed segmentation plan,[4] and as more fully discussed in Section VII below, the Fixed Section proposes a modified plan which would:

1. Preserve the existing 17.7-18.14 and 19.26-19.76 GHz paired FS primary allocations.

2. Preserve the existing 18.14-18.58 GHz primary private cable allocation.[5]

3. Grandfather incumbent licensees as primary in the paired 18.58-18.82 and 18.92-19.16 GHz FS allocation.

4. Allocate the 18.58-18.8 GHz band as primary for GSO/FSS gateways and ubiquitous blanket licensed satellite receivers.

5. Allocate the 18.8-19.26 GHz band as primary for NGSO/FSS ubiquitous blanket licensed receivers.

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[4]The Commission's proposed band segmentation plan is summarized in Par. 29 of the NPRM.

[5] Although this band is available to both private cable operators and traditional franchised cable operators, it is used primarily by the former. Also, this band is the only one available to private cable operator (PCO) industry, which is an effective and growing source of competition to franchised cable operators. The 12.7-13.2 GHz band is not available to private cable operators.

6. Rechannelize the 17.7-18.14 and 19.26-19.76 GHz paired FS primary allocation to (a) accommodate growth from the narrow band grandfathered systems in the paired 18.58 18.82 and 18.92-19.16 GHz FS band and (b) accommodate the demand for new systems in this band.

7. Lift de facto freeze.

As discussed in Section VII below, the Fixed Section believes this plan, which represents a loss of 35% of FS spectrum in this band, will provide the minimum necessary spectrum for continued viability of 18 GHz band FS and CARS services while providing significant allocations to the proposed satellite services. In summary, the modified band segmentation plan provides 880 MHz for FS needs, 440 MHz for CARS/PCO licensees and 1120 MHz for proposed satellite systems.

III. The proposals in this proceeding would reduce SIGNIFICANTLY the spectrum available to the FS, continuing the trend of erosion of FS spectrum by the Commission over the last several years.

The FS currently has 440 MHz paired go/return (880 MHz total) spectrum (17.7- 18.14 GHz, 19.26-19.7 GHz), and 240 MHz paired go/return (480 MHz total) spectrum (18.58-18.82 GHz, 18.92-19.16 GHz) for a total of 680 MHz paired (1360 MHz total) spectrum for two-way communications. Additionally, there is 440 MHz of spectrum (18.14-18.58 GHz) available for one-way video distribution.

The proposals in the proceeding would make FS access to the 18.92-19.16 GHz band secondary since the Commission has correctly determined that FS sharing with ubiquitous satellite earth stations is impossible, a lesson well learned by the FS community through its inability to

coordinate new FS links in the 3.7-4.2 GHz band. While the Commission would leave the FS co-primary in the 18.55-18.8 GHz band, this would be of no use to the FS since this is half of a go/return frequency band and reallocation of the upper part to secondary status results in the elimination of pairing capability and consequent loss of the lower part as well. Additionally, co-primary status in the 18.55-18.8 GHz spectrum for the FS will lead to the elimination of the FS for future growth as experienced by the FS at 4 GHz due to the ubiquitous nature of the GSO/FSS gateway locations. This one proposed action would result in an immediate loss of 35% of the available FS go/return frequencies in the 18 GHz band.

The proposed plan would place the FS into a secondary status in the 19.26-19.3 GHz frequency range. This effectively eliminates use of the 17.7-17.74 GHz band since this is also a PAIRED band. This is another 5% loss of frequencies to the FS.

The proposed plan would also eliminate 280 MHz, or 64% of the one-way video distribution band. But as a practical matter, this step would render the band unuseable to private cable operators. This service cannot operate competitively with a reduced bandwidth since it needs the full 72 channel complement for video distribution in metropolitan areas. Sharing between point-to-point and full band point-to-multi-point services is virtually impossible. Therefore, adoption of this one element of the reallocation proposal would eliminate one of these services in any given geographical area. This represents another 16% loss of the currently available FS frequencies at 18 GHz.

Finally, the Commission proposes to allocate 17.7-17.8 GHz to the Broadcast Satellite Service (BSS) in the year 2007 on a co-primary basis with the FS. Ubiquitously deployed BSS earth receiving stations CANNOT share with the FS, as the Commission acknowledges in

Paragraph 19 of the NPRM. Therefore, the allocation of 17.7-17.8 GHz would require FS stations to be relocated, and would also freeze future FS growth in this band. Additionally, allocation of this frequency range would also effectively eliminate use of the PAIRED frequencies from 19.3-19.36 GHz. This would represent another 7% loss of FS 18 GHz frequencies.

IV. Proposed "grandfathered" digital and analog FS systems would suffer interference and serious performance degradation

The Commission proposes to grandfather FS systems now operating on frequencies in the band segments to be re-designated for primary satellite use. However, as shown below, both analog and digital grandfathered FS systems will be harmfully interfered with by the proposed satellite systems. GSO/FSS systems will cause continuous interference for certain antenna alignments, and the NGSO/FSS systems will unacceptably degrade FS performance periodically. Thus, even under the current pfd limits, grandfathered digital and analog FS systems will suffer serious performance degradation in the presence of the proposed satellite systems.

The proposed pfd allowed to illuminate the earth by the satellites is - 118 dBW/m^2/MHz. This level of interference causes a significant degradation of the threshold of a digital receiver, and makes an AM video distribution receiver unworkable. This is illustrated by the following example:

> FS digital receiver example: A 12-DS1 receiver with a 10 MHz bandwidth is assumed. This receiver has a thermal Noise floor of -100 dBm, and a corresponding threshold of -89 dB. A 4-foot diameter antenna is used in these calculations.
>
> First, convert -118 dbw/m^2/MHz to an interference noise floor of the digital receiver.
>
> -118 dBw/m2/MHz = -118 + 10 dB(BW) + 30 dB (dBw-to-dBm) -2 dB (4-ft antenna) =

-80 dBm

The new receiver threshold is -80 dBm + 13 dB C/N = -67 dBm. The FS digital receiver has lost 22 dB of threshold due to the interference. It is interesting to note that this level exceeds the 20 dB I/N short-term interference criteria proposed by the satellite industry. And while the satellite industry claims that this short-term interference occurs rarely, computer simulations have shown that interference levels 20 dB above the thermal noise floor will occur approximately every 40 minutes.[6] It should be noted that the antennas used in this simulation are 6-foot antennas; whereas antennas commonly used by the digital FS service in the U.S. are normally a 2-and 4-foot antennas, which will make the interference worse due to the larger look angles of these smaller antennas. Further, the bulk of the existing digital radios currently in service are older technology 4 FSK radios which have minimal or no error correction. Therefore, at the very least, the interference levels will cause degradation of the background error rate of these radios.

Finally, high interference levels lasting more than two seconds cause the channel bank and switch Carrier Group Alarms (CGA) which terminates system traffic for a minimum of 20 seconds. However, it is not unusual for a cell-site switch to take from 10-30 minutes to recover from a 2-second CGA!

Thus, high interference levels from satellite systems into grandfathered digital systems can

[6]See, ITU-R Document 4-9S/44-E, submitted to the September international meetings of ITU-R WP4-9S.

cause not only per-hop outages, but also total system outages.

Next consider the analog AM video receiver example: A per-channel (6 MHz) video distribution receiver has a 4 MHz noise bandwidth resulting in a typical thermal noise floor of -108 dBm. With a noise floor of -108 dBm, the video receiver is operating at approximately a 52 dB CtN. This is 6 dB above where visible picture "graininess" is observed in the picture, and 17 dB above a complete system outage (35 dB C/N). Currently, the FCC Rules require a subscriber terminal C/N of no worse than 43 dB.[7] As of January 1999, this is to change to 46 dB C/N).

Assuming that the video distribution service providers are willing to accept a l-dB degradation of C/N (putting them only 6 dB from "graininess"), the maximum permissible interference power into the receiver would be -114 dBm.

The interference noise floor of -114 dBm will determine the effective aperture of the antenna as follows:

-118 dBw/m^2/MHz + 6 dB (BW) + Effective aperture (dB) + 30 dB

(dBw-to-dBm) -3 dB (circular polarization).= -114 dBm

Rearranging, the Effective Aperture (dB) required = -31 dB.

Therefore, any antenna look angles that give an effective aperture loss of less than 31 dB will cause unacceptable interference to the video distribution providers.

Simulations by satellite interests purporting to show minimal interference into FS receivers have not taken into account terrain scatter. In particular, metallized glass buildings have been shown to be efficient reflectors of RF energy. Energy from satellites at any elevation can be

[7]See 47 CFR § 76.605(a)(7).

reflected directly into the boresite of an FS antenna due to terrain scatter.[8]

Simulations by satellite interests purporting to show minimal interference into FS receivers also have not taken into account the frequent 6 dB upfades that occur due to multipath conditions for in-phase reflections. This is a high occurrence phenomenon well known by the FS community. The phenomenon has also been noted by the FSS interests in Document ITU-R 4-9S/38, liaison statement from Working Party 3Mof ITU-R Study Group 3, submitted to the September 1998 meetings of ITU-R WP4-9S as information to be taken into consideration in the development of the PFD limits.

It is very important to note that any type of interference, and especially intermittent interference, is EXTREMELY difficult to identify, locate, and resolve. An interfering signal 14-30 dB (depending on modulation complexity and error-correct coding employed) BELOW a digital radio spectrum can cause complete loss of synchronization of the radio. This interference is not visible with a spectrum analyzer since it is completely obscured up by the desired digital radio received spectrum. Most of the many thousands of 18 GHz FS users would be unaware of the satellite interference. This is known primarily by the frequency coordination houses. In

[8]This effect is discussed by Dr. Joseph Shapira in his paper, Interference from Mobile Satellite Systems Through Terrain Scattering, published in International Journal of Wireless Information Networks, Vol. 3, No. 3. In that paper, Dr. Shapira concludes: "This type of interference has the potential to exceed the directly coupled interference by far, not to be strongly angle dependant, and only mildly dependant on small uptilt of the antenna."

general, cases of intermittent interference usually result in users spending many weeks or months changing out suspected defective radio modules. Finally, in frustration, the user calls the equipment manufacturer who dedicates field service engineers for extended periods of time to the problem. These field service engineers first must check out the radio (again) before looking for interference. Finding interference normally entails taking the hop off the air for an extended period of time thereby disrupting the customer's traffic. Therefore, the Commission's proposal that new satellite users would have to protect FS operations from interference is illusory and cannot be relied on to be effective in the real world.

V. The proposed ubiquitous satellite receivers in the 18.3-18.55 GHz, and 18.92-19.16 GHz bands will be unable to co-exist with the "grandfathered" FS systems

FS transmitters operate with relatively high effective EIRPs (up to +55 dBw), whereas satellite receivers are very sensitive and operate very close to threshold. The band segmentation proposal of this proceeding is based on the fact that sensitive satellite receivers cannot co-exist with the high EIRP FS transmitters. This incompatibility between the FS transmitters and satellite receivers is well known to the FS and has been demonstrated time and again by the inability of FS applicants to coordinate new FS transmitters in the 3.7-4.2 GHz FS/Satellite "shared" band, due to the ubiquitous nature of licensed satellite receivers in that band. At 18 GHz, there is a large number of high EIRP point-to-point FS transmitters as well as a large number of high EIRP point-to-multipoint video distribution transmitters. The effect of these high power FS transmitters will cause large "exclusion zones" in which the satellite receivers will be unable to operate. This is exactly the problem experienced at 3.7-4.2 GHz; however, since the satellite receivers were already in place at 4 GHz, new FS systems have been kept out of that band. Obviously, this is not

acceptable either to the FS or satellite interests.

VI. While new wireless services should of course be accommodated in the radio spectrum, they must be required to use the spectrum efficiently

The Fixed Section supports fully the Commission's policy to provide frequencies for new emerging technologies, but points out that new technologies must compete for access to finite radio spectrum. No new spectrum is being created and, therefore, more efficient use of the spectrum is required. The FS has been a technology leader in the efficient use of the diminishing spectrum available to it. FS radio manufacturers have implemented modulation technologies which permit up to 9 bits/sec/Hz of spectrum efficiency in the bands below 12 GHz. The technology to implement spectral efficiency greater than 1 b/s/Hz, currently required by the Commission for Part 101 digital radios above 12 GHz, is becoming available at reasonable cost for radios operating above 12 GHz. Additionally, through the Telecommunications Industry Association (TIA) and the National Spectrum Managers Association (NSMA), the FS has developed comprehensive and effective coordination methodologies for coordination of FS routes with maximum frequency re-use. The Fixed Section believes that the satellite systems must be held to reasonable spectral efficiency standards and to efficient coordination methods as well, although this step will not by itself avoid destructive interference.

VII. The Commission's band segmentation proposals should be modified

The Fixed Section applauds the Commission in its efforts to provide frequencies for emerging new services. In recognition of the necessity for substantial compromises so as to accommodate new and emerging satellite services, Fixed Section proposes a modification of the

Commission's proposal that will provide for future growth of the FS and will also allow the different satellite services to be accommodated at 18 GHz. Towards that end, the Fixed Section proposes the following:

FS should be given primary status from 17.7-18.58 GHz, and co-primary status with MSS/FL from 19.26-19.7 GHz. This would permit paired (go/return) FS operation with 17.7-18.14 GHz paired with 19.26-19.7 GHz. These bands will accommodate (1) the growth of existing wideband systems, (2) new wideband systems, (3) growth of the grandfathered narrowband systems, (4) new narrowband systems, and (5) dispaced grandfathered FS systems. The Fixed Section believes that the satellite services will find that interference into their systems from grandfathered narrow band FS transmitters is unacceptable, and will opt to sponsor relocation of grandfathered narrowband FS systems.

Video distribution services would retain their primary status from 18.14 - 18.58 GHz. Since point-to-point bi-directional FS cannot share with point-to-multi-point one-way video distribution services, these two types of FS services must have their own separate frequency allocations. FS spectrum loss from 19.26-19.3 GHz is NOT AN OPTION because this would also cause the paired loss of FS spectrum from 17.7-17.74 (80 MHz total additional FS loss). Similarly, the loss of FS spectrum below 17.8 GHz in 2007 would cause a loss of spectrum in the paired band below 19.36 GHz resulting in loss of an additional 120 MHz to the FS.

FS would give up 18.58-18.82 GHz, and 18.92-19.16 GHz. The Fixed Section agrees with the Commission that sharing between FS and the NGSO/FSS ubiquitous terminals from 18.92 - 19.16 GHz is not possible. Accordingly, since the 18.92-19.16 GHz band is paired with the 18.58-18.82 GHz band, the 18.58-18.82 GHz band is of no future use to the FS once the

18.92-19.16 GHz band becomes unavailable. Additionally, due to the expected effective ubiquitous nature of the licensed GSO/FSS gateways between 18.55-18.8 GHz, the Section believes that this frequency range will become unavailable for future growth of the FS due to the same exclusion zone problem experienced by FS at 4 GHz. Existing FS systems between 18.58-18.82 GHz and 18.92-19.16 GHz must be grandfathered on a co-primary basis. Relocation of these existing links should be at the expense of the satellite services as the Commission indicates in the NPRM.

The 18.3-18.55 GHz allocation proposed in the NPRM for GSO/FSS ubiquitous satellite terminals should be moved to the 18.58-18.8 GHz range. This would place GSO/FSS ubiquitous terminals in a "sharing" scenario with the GSO/FSS coordinated gateways. This should be possible if the coordinated gateways can be remotely located, and the bulk of the ubiquitous terminals would more likely be located in high population areas. For remote areas, where ubiquitous terminals are required, some frequencies could be set aside specifically for these ubiquitous terminals. Even with simple QPSK modulation, the 220 MHz from 18.58 - 18.8 GHz would provide a data capacity of over 400 Mb/s. Surely this entire capacity is not needed by each licensed earth station terminal. More effective modulation technologies such as those being introduced by the FS today at 18 GHz in new FS products, would permit up to three times this data capacity (over 1.2 Gb/s). There would no longer be co-primary usage by the FS in this band, other than the grandfathered existing FS links. This should further facilitate sharing between the GSO/FSS ubiquitous and gateway terminals since they would not also have to share with co-primary FS systems.

VIII. The FS segments of the 18 GHz band should be re-channelized for more efficient use

The Fixed Section proposes that the 17.7-18.14 GHz and 19.26-19.7 GHz frequency ranges be re-channelized in 2.5, 5, 10, 20, and 40 MHz channels, and permit concatenation. With the current spectral efficiency rules in Part 101, radio capacities of less than 8-DSls would be spectrally inefficient in the existing 10 MHz channel bandwidths. These low capacity radios have been used effectively in the 18.58-18.82 GHz and 18.92-19.16 GHz range where 5 MHz channels have been available.

Additionally, the Fixed Section believes that higher spectral efficiency radios will be required as demands for spectrum continue to increase and, therefore, a 2.5 MHz channeling plan is also recommended.

IX. Sharing by FS and MSS/FL systems must be well managed

In order for the FS to ensure reasonably reliable operation and growth in the significantly reduced spectrum at 18 GHz, the MSS/FL co-primary users in the 19.26-19.7 GHz band must be required to use the available spectrum efficiently, and so as to not hinder growth of the co-primary Fixed Service. Therefore, the FCC should requires that:

(1) MSS/FL sites be located in remote areas. This will minimize the "exclusion zone"problem experienced by the FS at 4 GHz, which effectively eliminated the FS from the 4 GHz band;

(2) MSS/FL sites must include 360 degree integral shielding of at least 25 dB for protection from FS transmitters; and

(3) MSS/FL sites must only coordinate the frequencies and arcs necessary.

Full-band, full-arc coordination is nothing short of spectrum warehousing and cannot be tolerated when spectrum is at such a premium. While the satellite interests may argue that they need full band coordination for growth, terrestrial fixed licensees may only coordinate frequencies they can justify. And yet, the FS has been able to successfully grow in bands where they do not share with satellite services.

X. CONCLUSION

Notwithstanding the desirability to provide spectrum for emerging satellite services and to harmonize domestic US spectrum allocations for these different services, in so doing, the Commission must consider the impact of its proposal on all services to be affected. The FS community is proposing significant concessions in the interests of spectrum efficiency and in order to accommodate future services. Under the modifications proposed by the Fixed Section 1/3 of the currently available FS frequencies at 18 GHz would be reallocated.

As an overall policy matter, the Commission should require the proponents of new services that propose to use spectrum currently fully utilized by existing services, to develop and use technologies which will permit the new services to operate in an interference environment by the use of interference cancellation techniques.

Finally, the Commission must grant the terrestrial services immediate relief by lifting the de facto freeze and resume authorizing terrestrial fixed systems on a regular basis, while it considers the comments on its proposals and adopt its decision in this proceeding.

The Fixed Section respectfully submits the foregoing Comments and requests that the Commission act in a manner consistent with the views expressed herein.

Respectfully submitted,

FIXED POINT-TO-POINT COMMUNICATIONS SECTION, WIRELESS COMMUNICATIONS DIVISION OF THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

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