

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)	
)	
Request for Declaratory Ruling by)	WT Docket No. 07-121
Wireless Strategies, Inc. Regarding)	DA 07-2684
Coordination of Microwave Links)	
Under Part 101 of the Commission's Rules)	
)	

To: The Commission

Comments of the Society of Broadcast Engineers, Inc.

The Society of Broadcast Engineers, Incorporated (SBE), the national association of broadcast engineers and technical communications professionals, with more than 5,000 members world wide, hereby respectfully submits its comments in the above-captioned Request by Wireless Strategies, Inc. (WSI) for a Declaratory Ruling relating to the use of transmitting antennas for fixed point-to-point microwave links having distributed radiating elements.

I. The WSI Proposal

1. WSI proposes that the Commission issue a Declaratory Ruling allowing fixed, point-to-point microwave links subject to Part 101 frequency coordination to use, in addition to a conventional parabolic transmitting antenna, one or more separate and additional transmitting antennas comprised of scores or hundreds of active elements, which WSI calls a distributed radiating elements, or DRE, antenna; in effect, a phased-array antenna. Because 950 MHz and 18 GHz Aural Broadcast Auxiliary Services (BAS) links, plus 2.5, 7, 13 and 18 GHz TV BAS links, are now subject to the Part 101 prior coordination notice (PCN) process, any decision concerning the Part 101.103(d) FCC Rules could also impact BAS stations. SBE is therefore submitting its comments to this rulemaking.

II. SBE Opposes the WSI Proposal for Multiple Reasons

2. SBE opposes the WSI proposal, for several technical and practical reasons, as follows:

2A. The proposal assumes that there is always some headroom between the actual side lobe amplitudes of a parabolic dish and the manufacturer's published radiation pattern envelope (RPE). SBE does not believe that this is the case. Rather, for each step level of the RPE, there is

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likely at least one side lobe that has the same, or nearly the same, amplitude as the RPE limit. See the attached Figure 1.

2B. The proposal ignores that the reason manufacturers of parabolic microwave antennas publish an RPE instead of the actual pattern of the side lobes is to allow for manufacturing tolerances. Some dishes may have the just-touching side lobe at one off-axis direction for a particular serial number antenna, whereas another serial number dish, of the same size and model number, could have the maximum side lobe at a somewhat different direction (but still not exceeding that step portion of the RPE).

2C. The additional phased-array transmitting antennas would apparently be dynamically programmable, and could be mounted at different heights, and aimed in different directions, than the main parabolic transmitting dish (which WSI refers to as a "dumb" antenna). SBE prefers to call it a "dumb and honest" antenna. When a conventional parabolic transmitting antenna is installed, others can see its size (diameter), polarization, whether or not it's a shrouded antenna, the direction of the feed horn, and whether the dish has mechanical beam tilt. Whereas for one or more dynamic phased-array transmitting antennas, this information would be difficult, and perhaps impossible, to verify. Also, it would be difficult or perhaps impossible to verify how much of the microwave transmitter power output (TPO) is being diverted to one or more phased-array transmitting antennas.

2D. The proposal ignores that if one or more supplemental phased-array transmitting antennas are added, one would have to do a power domain summation of the total equivalent isotropic radiated power (EIRP) in a particular direction, to ensure that the EIRP does not exceed, at any azimuth or elevation angle, the EIRP based on the RPE of the main beam antenna. This would require knowing the exact off-axis angles and exact side lobe amplitudes for the main parabolic dish, versus the generalized RPE for that antenna. That is, the actual side lobe performance of each parabolic dish would have to be individually measured, with a serial-number specific radiation pattern being generated. This would be in stark contrast to the current practice of measuring the side lobe amplitudes and directions of a representative number of dishes, and then drawing an RPE that reflects the worse-case manufacturing tolerances for the side lobes. SBE submits that forcing the manufacturers of large-diameter microwave parabolic dishes to have to measure and document the actual side lobes of each and every serial number antenna would be impractical.

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2E. The proposal claims that the use of one or more phased-array transmitting antennas would conform to "all applicable Commission rules."¹ SBE questions this claim. All transmitting antennas used by fixed-link Private Operational Fixed Service (POFS) stations, and all microwave fixed-link BAS stations, except 950 MHz Aural BAS stations, must use an antenna that meets at least Category B criteria. Further, if the path is in a "frequency-congested area," then the transmitting antenna must meet Category A criteria. SBE doubts whether a physically small phased-array transmitting antenna as proposed by WSI would meet the minimum gain, minimum side lobe suppression, or maximum half power beam width (HPBW) that Category A and Category B antennas must achieve. SBE notes that the WSI Request for Declaratory Ruling provides no technical data regarding the gain, HPBW, and side lobe suppression of its proposed physically small phased-array antenna.

2F. And even if WSI could demonstrate that its phased-array transmitting antenna meets Category B or Category A criteria, such compliance would need to be demonstrated over all possible modes of operation of the phased-array antenna. Otherwise reprogramming the individual elements of the phased-array could cause the array pattern to change from an antenna with a compliant RPE to an antenna that fails one or more of the minimum antenna performance criteria.

2G. Another issue is what happens to the pattern of a phased-array antenna when one or more active elements fail. Large-diameter parabolic dishes are inherently robust and reliable devices; arrays of one or more dynamically alterable phased-array antennas would be an unknown application, requiring, at a minimum, a program of experimentation by an independent and unbiased testing laboratory as to the reliability and worse-case failure modes of active-element phased-array transmitting antennas.

III. Proposal Would Change the Nature of POFS Stations

3. SBE notes that POFS stations, and fixed-link microwave BAS stations, are point-to-point links.² They are not point-to-multipoint stations, such as Broadband Radio Service (BRS) stations (formerly Multichannel Multipoint Distribution Service, or MMDS, stations). Yet the

¹ WSI Request for Declaratory Ruling, at page 7.

² Although many Part 78 Cable Television Relay Service (CARS) stations have more than one path, each path has its own transmitting dish meeting the appropriate Category A or Category B criteria, each path is subject to a detailed frequency coordination study, and a CARS license explicitly documents the dish makes and models, orientations, polarization, and elevation or depression angles. Thus, CARS microwave stations are not remotely similar to what is being proposed here.

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WSI proposal for multiple phased-array transmitting antennas to be added to the main parabolic dish of a POFS point-to-point link appears to be an end-run attempt to create a new point-to-multipoint use. SBE believes that the interference potential to existing point-to-point links would be far too great to allow such a change. And, in any event, the appropriate regulatory approach would be a Petition for Rulemaking, and not a Request for Declaratory Ruling disguised as a Petition for Rulemaking.

4. And there is another problem with the WSI proposal: Under WSI's "concurrent coordination" approach, WSI wants to be able to place another link in a direction off of the main beam, as long as the "concurrent" link has less EIRP than calculated from the main antenna RPE /EIRP. While this could work for the frequency of the DRE antenna feeding the off-axis site (albeit with the significant drawbacks discussed in the next section of these SBE comments), it falls apart if the off-axis site wants to communicate *back* to the main dish, it will have to transmit on the transmit frequency of the other dish on the main beam (that is, the return path main dish). But the location of the off-axis return path transmitter is unknown in the original coordination, and therefore not coordinated. Thus, the WSI proposal has the additional limitation of being inherently simplex. But, if the purpose is to create a new one-way point-to-multipoint service (similar to the Qualcomm MediaFLO architecture, where FLO stands for forward link only, perhaps WSI doesn't care about this limitation.

IV. Corollary WSI Microwave Applications

5. WSI has filed for three new fixed-link microwave stations in New Jersey, as follows:

ULS application ³ number	Path	Path Length	Frequency (MHz)/ Polarization	EIRP
0002925444	Lima to BA tower	22.4 km	6,197.24/V	84.2 dBm
0002925448	Mt. Laurel to BA tower	23.3	6,197.24/V	84.2
0002925450	BA tower to Mt. Laurel	23.3	5,945.2/V	84.2
	BA tower to Lima	22.4	5,945.2/V	84.2

³ Even though Petitions to Deny were filed against each of these applications by Verizon, SBE notes that the WSI applications have now been granted: WQDH215 (Lima-to-BA tower); WQHD217 (Mt. Laurel-to-BA tower); and WQHD218 (BA tower-to-Mt. Laurel/BA tower-to-Lima). While SBE notes that the alternative relief requested by Verizon, the placement of a special condition on each grant, explicitly prohibiting the use of DRE antennas, did occur, the grant of these applications means that the other issue raised in the Verizon Petitions to Deny, namely the use of grossly excessive power, is apparently not of concern to the Commission. SBE finds this appalling.

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However, the requested EIRPs are unusually high for a 6 GHz path of just 23 km: namely, 84.2 dBm. For example, even if the EIRP is reduced by 20 dB from the excessive EIRP of 84.2 dBm requested by WSI, for a 23.3-km path at 6.2 GHz, using the specified AAS-106P receiving antenna with a gain of 38.2 dBi, and assuming 2 dB of waveguide loss to the receiver, the unfaded receive carrier level would be -35.5 dBm. If we assume a typical threshold of -86 dBm for the receiver, this gives a fade margin of 50.5 dB. Applying the Bell & Vigants multipath model for this fade margin gives a predicted path availability of better than 99.9999%.⁴ Thus, the requested EIRP is clearly excessive by two orders of magnitude (*i.e.*, 20 dB).

6. It would therefore appear that the WSI approach is to artificially and unnecessarily raise the main beam EIRP based on use of a conventional parabolic transmitting antenna, and thus create "headroom" under the RPE for that conventional antenna, into which they would then add one or more distributed radiating elements (DRE), or phased-array, transmitting antennas, arguing that the added EIRP from these additional antennas is supposedly not an added interference threat. However, this approach would have two problems: One, it would first require the main transmitting antenna's EIRP to be lower than the applied for main beam EIRP, otherwise the additional radiation from one or more DRE antennas would still cause the RPE EIRP to be increased at some angles.⁵ Two, this scheme could only be accomplished at the expense of specifying an unnecessarily high and excessive authorized main beam EIRP, which SBE submits would constitute a violation of Section 101.113(a) of the FCC Rules, which requires that only the power necessary to carry out the desired communication be used. As shown above, an EIRP of 82.4 dBm for a 6.2-GHz, 23-km path is at least 20 dB more power than necessary.

7. Indeed, one could argue that the WSI approach, if allowed, would constitute "spectrum warehousing," in support of a point-to-multipoint, "area licensing" scheme. But spectrum warehousing is explicitly prohibited by Section 309(j)(4)(B) of the Communications Act, and area licensing is not permitted for point-to-point, fixed-link, POFS stations.

⁴ Using terrain factor $a = 1$ ("average") and climate factor $b = 0.25$ ("normal").

⁵ Indeed, in a July 5, 2007, telephone call from Mr. Michael Mulcay of WSI to the Chairman of the SBE FCC Liaison Committee, in response to an e-mail query sent to WSI, Mr. Mulcay freely admitted that the plan was to operate with much less main beam power than requested in the WSI microwave applications. This would thus create RPE EIRP "headroom," but at the expense of an unnecessarily preclusive PCN. So much for the claim made at page 1 of the April 27, 2007, WSI Reply Comments to Verizon's Petition to Deny, or, Alternatively, To Impose Conditions, Dated April 6, 2007, where WSI states:
"Wireless Strategies Inc. (WSI) will, of course, operate the facilities strictly in accordance with the technical parameters specified in the Application and will adhere to all FCC regulations in the present and future."

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8. And these are not the only problems with the WSI applications: Those applications are based on the supposed use of an antenna meeting FCC Category A criteria, a WSI Model AAS-016P antenna. The claimed performance specifications for this antenna are as shown in the attached Figure 2, provided by WSI. As shown by this figure, "AAS" stands for "adaptive antenna system." When WSI was contacted by SBE, the proponent, Mr. Michael Mulcay, explained that the AAS-106P was *not* a conventional parabolic dish antenna but rather a "multi array antenna." When asked, Mr. Mulcay further admitted that this antenna was not a commercially available product, but rather was constructed by a "partner corporation" which Mr. Mulcay refused to identify. When asked for more documentation, such as who conducted the RPE measurements, and when and where were the measurements done, Mr. Mulcay again refused to provide any additional information or documentation.

9. In its April 27, 2007, reply comments to the Verizon Petitions to Deny its microwave applications, WSI stated:

Verizon arrived at its erroneous conclusions and assumptions because it skipped the fact-gathering stage and went straight to accusations and assumptions. Unlike others, they never contacted WSI to ask for further explanation of the proposed equipment and operations. WSI has always welcomed dialog and peer review, direct and at industry conferences.

Yet when SBE tried to do just that, WSI refused to provide any documentation for the mystery AAS-106P antenna other than the one-page document shown in Figure 2; such a document could have been created by anyone with access to word processing software.

10. Further, SBE has learned that the WSI-provided Figure 2 was the basis for the commercial microwave frequency coordinator (CMFC) that WSI used to coordinate the paths; that is, the CMFC had no independent information about the WSI Model AAS-106P antenna; indeed, in an e-mail to SBE, that CMFC stated

We only have the same information that you have and would be most interested to see measured patterns as well.

Accordingly, SBE urges the Commission to instruct WSI to submit the pattern measurements for its Model AAS-106P to the Commission, to prove that they exist.

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V. Parallels To The Rejected "Interference Temperature" Rulemaking

11. In SBE's view, the WSI proposal is similar to the rejected ET Docket 03-237 "interference temperature" rulemaking.⁶ In that rulemaking, some parties hypothesized that unlicensed stations could be allowed to transmit because their emissions would be below the sensitivity, or noise temperature, of the receivers used by licensed stations, and thus not cause interference to those licensed stations. This is, of course, not the case in reality, because once unlicensed transmitters are made available to the public one loses all control over their location. And if there is no controlling the location of an unlicensed transmitter, then there can be no guarantee that such transmitter(s) won't get used in close proximity to the receiving antenna of a licensed station. The Commission accordingly wisely declined to open up the interference-temperature "Pandora's Box." The Commission should similarly not invite widespread interference to carefully-engineered and frequency coordinated microwave links by allowing the use of unverifiable-in-practice phased-array transmitting antennas to "supplement" the emissions from a licensed point-to-point link employing a highly-directional and verifiable Category A or Category B transmitting antenna.

VI. Summary

12. SBE believes that the WSI Request for Declaratory Ruling is ill-advised and should be denied. It is, in effect, a proposal to change POFS stations from point-to-point links to a point-to-multipoint microwave distribution service. There are other bands, such as the 2.6 GHz BRS band, that are already available for such applications. And, in any event, WSI has provided no documentation showing that a physically small phased-array, or DRE, antenna could, by itself, meet the FCC minimum antenna standards; indeed, there is substantial question whether even the WSI Model AAS-106P multi-element array transmitting antenna proposed in the pending WSI microwave applications in fact meets FCC Category A or even Category B antenna performance requirements..

⁶ Closed without action (but without prejudice) on May 4, 2007 (FCC 07-78).

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List of Figures

13. The following figures or exhibits have been prepared as a part of these WT Docket 07-121 comments:

1. Example of actual parabolic antenna side lobes versus RPE
2. Document provided by WSI regarding the claimed performance of its Model AAS-106P 6 GHz microwave antenna.

Respectfully submitted,

Society of Broadcast Engineers, Inc.

/s/ Chriss Scherer, CPBE, CBNT
SBE President

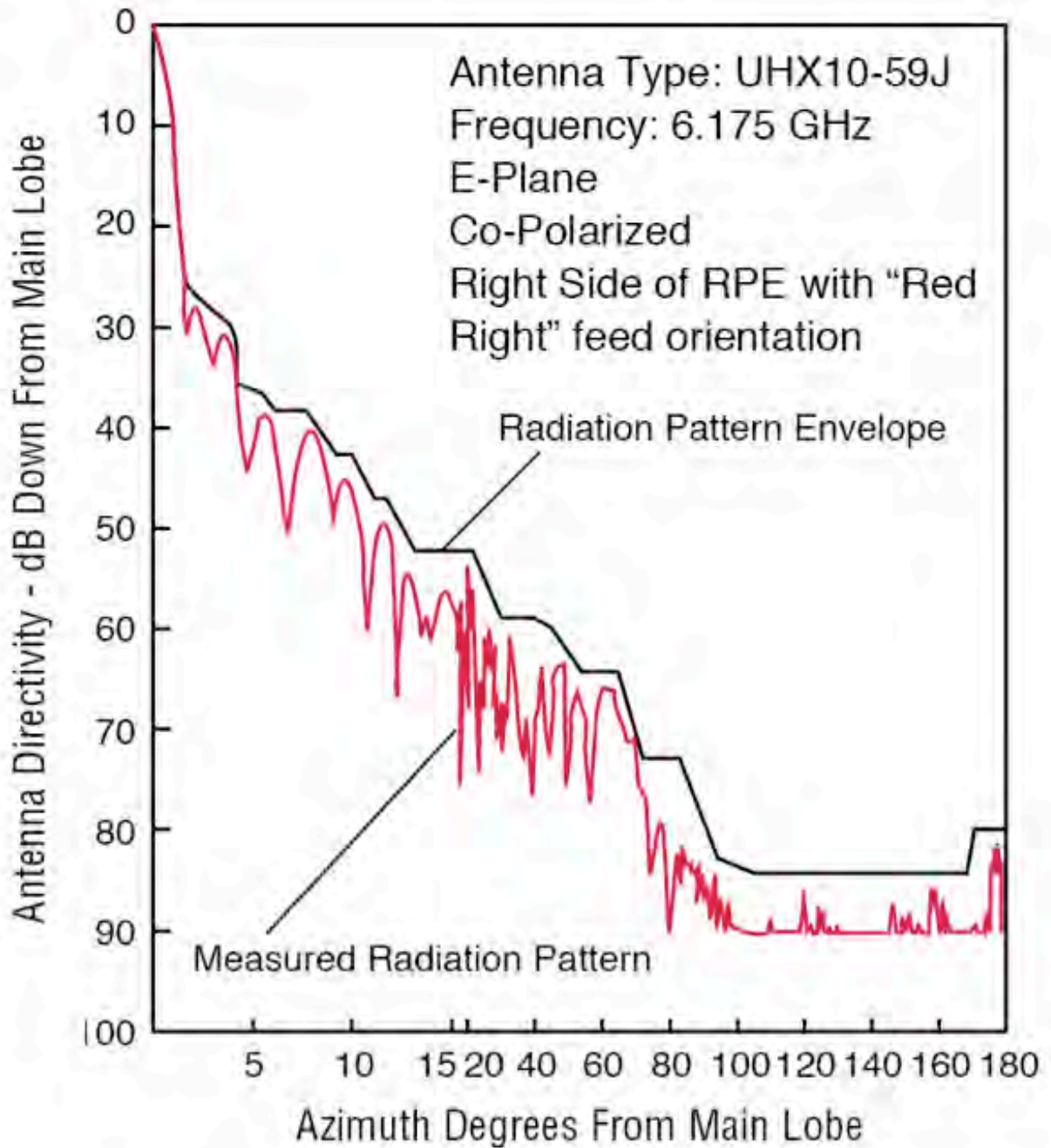
/s/ Dane E. Ericksen, P.E., CSRTE, 8-VSB, CBNT
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General Counsel

July 19, 2007

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Derivation of a Radiation Pattern Envelope



Source: Andrew Corporation



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Claimed Performance Specifications

Wireless Strategies Inc.

Adaptive Antenna System Model AAS - 106

Primary Element

Frequency	5925 - 6425MHz
Regulatory Compliance	FCC Part 101.115(b), Category A
Polarization	Vertical
Feed Input	CPR137G/Type N (Female)
Return Loss	20dB
Main Lobe Beamwidth, deg.	2.20
Gain-dBi	

5925MHz	38.00
6174MHz	38.20
6425MHz	38.40

Radiation Pattern Envelope	Angle Degrees	V/V dB	V/H dB
	0.00	0.00	-30.00
	0.50	-0.40	-30.00
	1.10	-3.00	-30.00
	2.00	-8.08	-30.00
	3.00	-13.72	-30.00
	4.00	-19.36	-45.00
	5.00	-25.00	-45.00
	10.00	-25.00	-45.00
	10.00	-29.00	-45.00
	15.00	-29.00	-50.00
	15.00	-33.00	-50.00
	20.00	-33.00	-54.00
	20.00	-36.00	-54.00
	30.00	-36.00	-55.00
	30.00	-42.00	-55.00
	100.00	-42.00	-55.00
	100.00	-55.00	-55.00
	180.00	-55.00	-55.00

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220606

Source: WSI

