

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Multispectral Solutions, Inc. Request for Waiver)	
of Section 15.250 of the Commission's Rules)	ET Docket No. 06-103
)	

ORDER

Adopted: May 21, 2007**Released: May 24, 2007**

By the Commission:

I. INTRODUCTION

1. By this action, we grant a waiver of the peak power limit contained in Section 15.250(d)(3) of the rules¹ to allow Multispectral Solutions, Inc. (MSSI) to obtain FCC certification and market a higher power model of its existing wideband radio frequency Sapphire DART Precision Asset Location System (Sapphire DART system).² Specifically, we are allowing a 12.75 dB increase in peak power for Sapphire DART system transmitters that are used in high risk industrial sites such as petroleum and chemical production and storage facilities, power plants, and mines, in order to enable this system to better track and identify critical assets and personnel. We find that granting this waiver, subject to certain conditions set forth below, is in the public interest in that it will permit Sapphire DART systems to operate more effectively and reliably in protecting human life in these high-risk industrial settings, without increasing the risk of interference to authorized services.

II. BACKGROUND

2. Part 15 of the Commission's rules permits the operation of low power radio frequency (RF) devices without an individual license from the Commission or the need for frequency coordination. The technical standards contained in Part 15 are designed to ensure that there is a low probability that these unlicensed devices will cause harmful interference to authorized users of the radio spectrum. Section 15.250(d)(3) provides that for transmitters operating as part of a wideband system within the 5925-7250 MHz band, the peak equivalent isotropically radiated power (EIRP) limit is 0 dBm/50 MHz. However, a resolution bandwidth of less than 50 MHz, but not less than 1 MHz, also may be used to measure the peak power, provided the peak power does not exceed a limit of $20 \log (RBW/50)$ dBm where RBW is the resolution bandwidth in megahertz that is employed by the measurement instrument.

3. The Sapphire DART system operates in the spectrum region from 5937 MHz to 7124 MHz and consists of unlicensed mobile transmitters embedded in tags placed on assets or worn by personnel and fixed passive receivers that provide real-time identification and tracking. MSSI states that the current Sapphire Dart system meets the requirements of the rules and has been deployed in over 100 facilities worldwide. MSSI further states that certain applications require higher power transmitter tags because of

¹ 47 C.F.R. § 15.250(d)(3).

² Letter from MSSI (MSSI Request for Waiver) to Julius Knapp, Office of Engineering and Technology, ET Docket 06-103 (filed April 12, 2006).

either range limitations or deteriorated signal penetration that occurs in dense metallic environments such as petrochemical facilities.³ MSSSI states that from extensive data it collected during operation of a higher power transmitter tag under an experimental license in an oil refinery,⁴ it has determined that an additional 12.75 dB in peak power is needed to enable effective and reliable operation in industrial settings. Therefore, in its waiver request, MSSSI seeks an increase of 12.75 dB in the peak power limit⁵ in Section 15.250(d)(3) for the transmitter tags used in the Sapphire DART system.⁶ In subsequent amendments to its original petition, MSSSI requests expanded use of the higher power transmitter tags with other applications including other high risk industrial sites such as nuclear, hydraulic and electric power plants; mines; steel, power and pulp mills; and other similar potentially hazardous industrial sites where real time personnel tracking is required for safety purposes. MSSSI also lists certain conditions that would create an “extra margin of interference protection” that it will accept on operation of the Sapphire DART system at the higher power level it requests: automatic (*i.e.*, without human intervention) deactivation of all Sapphire DART transmitter tags when an employee leaves the site; restricting use of the tags to track personnel and safety equipment only; operating the devices with a duty cycle not exceeding 0.1% for every second of operation, and without synchronization; and marketing of products under the waiver for safety applications only.⁷

4. The Commission issued a Public Notice soliciting comments on MSSSI’s request on May 12, 2006.⁸ Comments in general support of the waiver were filed by BP West Coast Products, LLC, Cherry Point Refinery (BP) and IBM Corporation (IBM).⁹ The Fixed Wireless Communications Coalition (FWCC) expresses concerns about interference but supports the waiver with specific conditions.¹⁰ Oppositions were filed by Time Domain Corporation (Time Domain), the National Radio Astronomy Observatory (NRAO), the National Spectrum Managers Association (NSMA), the National Science Foundation, Verizon Wireless (Verizon), and J. Whedbee.¹¹

³ MSSSI Request for Waiver at 1. In its original request, MSSSI identifies high risk industrial facilities generically as petrochemical facilities. In its amended request, MSSSI identifies these facilities as petroleum and chemical production and storage facilities. *See* MSSSI Request for Waiver and MSSSI Amended Request at 1 and 2, respectively.

⁴ *See* Experimental License Call Sign WD2XSW granted on 7/20/2005 to BP Cherry Point Refinery in the state of Washington.

⁵ MSSSI does not request change to the average power limit in Section 15.250(d)(1)-(2).

⁶ MSSSI initially sought the increased peak power level for two specific applications: (a) the tracking of assets and personnel in high-risk industrial facilities, such as petrochemical plants; and (b) the tracking of cattle for infectious disease control and monitoring. On September 14, 2006, MSSSI amended its request to eliminate the cattle tracking application.

⁷ MSSSI Modification of Waiver Request (MSSSI amended request) filed September 14, 2006 and *ex parte* filed October 24, 2006.

⁸ *See* Public Notice, DA 06-1025.

⁹ Comments of BP and reply comments of IBM.

¹⁰ Comments of FWCC.

¹¹ J. Whedbee withdrew his opposition if MSSSI’s waiver grant is restricted to the conditions MSSSI put forward in its filing of October 24, 2006, in which MSSSI extended its proposed operational conditions to include the supplemental conditions from FWCC. These conditions are specified in ¶3, *supra*. *See* Whedbee *ex parte* letter (filed on Oct. 30, 2006). Comments from the agricultural and cattle industry (Cattle Traq, Clement, J., Coston, D.C., Kentucky Department of Agriculture, National Institute for Agricultural Security (NIAS), North Dakota Department of Agriculture, State Board of Animal Health, North Dakota State University, Ohio Department of Agriculture,

(continued....)

III. DISCUSSION

5. It is a well-established principle that the Commission will waive its rules in specific cases only if it determines, after careful consideration of all pertinent factors, that such a grant would serve the public interest without undermining the policy which the rule in question is intended to serve.¹² As discussed below, we find that a waiver of the peak power limit provision of Section 15.250(d)(3) will serve the public interest because it will help improve safety of life for personnel working in high-risk industrial facilities. These activities will enhance the protection afforded to employees of high risk industrial installations that are vital to the public well-being, facilitating homeland security efforts. The second criteria is whether the waiver undermines the policy which the rule in question is intended to serve, *i.e.*, to protect authorized users of the spectrum from harmful interference. We conclude that, with appropriate operational and technical restrictions, a waiver of the peak power limit requirement in Section 15.520(d)(3) can be granted without increasing the potential for harmful interference and is therefore in the public interest.

6. BP, which operates a higher power Sapphire DART system at its refinery facility in Washington State under a Part 5 experimental license, states that the Sapphire DART system improves safety for personnel at its refinery facilities in two ways: 1) the Sapphire DART system provides accurate and fully automated personnel accounting within the refinery's dense metallic environment, allowing BP to know where its staff are in real-time, thus significantly reducing the risks to emergency responders in an evacuation;¹³ and 2) the Sapphire DART system can be used to monitor access into restricted areas, thus enhancing BP's mandatory compliance with the requirements of the Occupational Safety and Health Administration (OSHA).¹⁴

7. FWCC is concerned that the Sapphire DART system operates in frequency bands that are heavily used by the Fixed Service (FS) for critical services such as public safety communications (including police and fire vehicle dispatch); for coordinating the movement of trains; for controlling natural gas and oil pipelines, and for regulating the electric grid and backhauling wireless telephone traffic.¹⁵ FWCC argues that the aggregate signals from multiple higher power Sapphire DART transmitter tags could cause the noise floor to increase and affect the reliability of such fixed services in the 6 GHz band.¹⁶ Verizon, which operates a large number of microwave links in the 6 GHz bands for backhaul communications of its wireless networks, generally concurs with FWCC.¹⁷ To minimize impact on FS service, FWCC recommends certain conditions on any grant of the MSSSI's request, including limiting the duty cycle and prohibiting synchronization of the transmitter tags.¹⁸ Although Verizon agrees

(...continued from previous page)

University of Missouri, Weaber, R. and Woods, T.) were not considered due to MSSSI Amended Request, filed September 14, 2006, to withdraw the application for cattle tracking under the waiver.

¹² See *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969). *Northeast Cellular Telephone Co. v FCC*, 897 F.2d 1164 (D.C. Cir. 1990).

¹³ Comments of BP. BP has been operating the MSSSI Sapphire DART with the 12.75 dB higher power under a Part 5 experimental license since 2005. See Experimental License Call Sign WD2XSW granted on 7/20/2005 to BP Cherry Point Refinery in the state of Washington.

¹⁴ See OSHA Emergency Planning and Response Regulation, 29 C.F.R. §§ 1910.38(c)(4) & 1910.146(f)(4).

¹⁵ Comments of FWCC at 2-3.

¹⁶ Comments of FWCC at 3.

¹⁷ Reply comments of Verizon at 3.

¹⁸ Comments of FWCC at 4.

that the above restrictions might reduce the potential interference from the Sapphire DART system, it states that they would not reduce interference to levels that would be considered not harmful.¹⁹

8. In subsequent *ex parte* comments, FWCC requests additional restrictions to limit the proliferation of the Sapphire DART higher power transmitter tags which would allow that system to coexist successfully with FS systems. The additional restrictions would limit the use of the higher power transmitter tags to the expanded deployments sought by MSSSI, including: petroleum, gas, nuclear, steel and chemical production and processing facilities; manufacturing and storage facilities for energy materials, radioactive substances and explosive components; prisons; heavy industry and heavy constructions sites; mining, ore processing and excavation operations; emergency and disaster locations; shipyard/dock works; and lumber/paper processing mills. Further, FWCC requests that the higher power transmitter tags be restricted to track only personnel and not physical assets, except for safety equipment located at the above qualified locations that would need to be located promptly in the event of an emergency (*e.g.*, respirators, fire extinguishers, decontamination equipment, etc.), and that use of the Sapphire DART system be limited to marketing for safety related applications only. Finally, FWCC reiterated its earlier requests that the time interval during which transmission occurs, as based on duty cycle or some other transmission feature, should not exceed 1 millisecond for every second of operation (*i.e.*, it submits that the duty cycle should not exceed 0.1% for every second of operation) and that operation of these tags should not be synchronized.²⁰ MSSSI states in its amended request and subsequent *ex parte* comments that it would comply with the recommendations from FWCC.²¹

9. NRAO, NSMA and NSF oppose the waiver request out of concerns for the operations of the Radio Astronomy Service (RAS) in the band 6650-6675.2 MHz. These parties expressed particular concern about RAS facilities, such as the Very Large Array (VLA) facility in New Mexico and the Robert C. Byrd Green Bank Telescope, which operate in close proximity to livestock herds on open acreage grazing land.²² These parties state that RAS operations are extremely sensitive to broadband emissions from wideband systems such as the Sapphire DART system.²³ NSMA raises an additional concern, namely that space borne receivers in the Fixed Satellite service operating in the 6525–7025 MHz would also be subject to interference from aggregate signals produced by the MSSSI transmitter tags.²⁴ As noted above, MSSSI withdrew its request that higher power Sapphire DART transmitter tags be allowed to be used for livestock tracking in its September 14, 2006 amended request.

10. Time Domain also opposes the waiver request. It claims that the MSSSI receiver is based on a low-cost, simplistic threshold detector where each individual pulse must exceed the noise floor to enable reception. Time Domain argues that this low receive sensitivity requires higher transmitter power, which is an inappropriate basis for requesting a waiver of the rules because the receiver could be re-designed to meet existing regulations.²⁵

¹⁹ Reply comments of Verizon at 3.

²⁰ *Ex parte* of FWCC filed October 19, 2006 at 4.

²¹ See also, MSSSI Amended request filed September 14, 2006 and *ex parte* communication of MSSSI filed October 24, 2006. Verizon did not file any additional comments subsequent to these filings by FWCC and MSSSI.

²² Comments of NRAO at 2 and NSF at 1. The Methanol Line at 6668.5188 MHz is an important tracer of star formation activity.

²³ Radio Astronomy operates in the 6650-6675.2 MHz band in accordance with US footnote 342. See 47 C.F.R. § 1.206.

²⁴ Comments of NSMA at 2.

²⁵ Comments of Time Domain at 3-4.

11. We conclude that, in the case of MSSSI's Sapphire DART system, the potential for interference resulting from the requested increase in peak power can be balanced by operational and technical conditions and are granting MSSSI's waiver request subject to the conditions set forth below. As the Commission has noted previously, the interference potential of unlicensed wideband devices to authorized services can be controlled by several factors.²⁶ Limits on the average and peak emission levels produced by the devices are one method of controlling potential interference. The potential for interference also can be reduced by limiting the applications for which the devices may be employed and the manner in which the devices may be operated. We observe that MSSSI has operated the Sapphire DART system at the requested higher power at the BP refinery in Washington State for over a year under experimental licensing and there have been no complaints of interference.²⁷ We are therefore limiting the use of higher power Sapphire DART systems to the requested increase in peak power of 12.75 dBm and to high-risk industrial sites, as recommended by the FWCC and agreed to by MSSSI.²⁸ We find that allowing controlled deployments of the higher power Sapphire DART system in high-risk industrial sites will serve a significant public interest by providing a reliable and innovative means of protecting the life of employees that work in the areas critical to the country's infrastructure. This will enhance the security procedures of these areas, thereby facilitating homeland security efforts. As noted above, the portable, active transmitter tags are located on the items to be tracked, *e.g.*, personnel or safety assets and would generally operate within dense metallic structures, or within defined physical boundaries in and around the qualified facilities.²⁹ In addition, we will require that the transmitter tags be automatically deactivated when the tracked item leaves the bounded facility or location.³⁰ This will minimize the risk of the transmitter tags traveling to another geographic area. We find that the limitation of use of the higher power Sapphire DART transmitter tags to personnel and safety equipment in bounded facilities or locations would constrain the operation of these transmitter tags to specific high-risk industrial areas. We therefore conclude that the above operational restrictions constitute good controlling factors on the scope and scale of use of the higher power transmitter tags, thus minimizing their impact on authorized radio users in the band. Further, to ensure that these devices are restricted to the intended installations, we are also limiting their marketing only to such installations.

12. FWCC recommends limiting the duty cycle of the Sapphire DART system to 0.1% and prohibiting synchronization. Verizon disagrees with FWCC that imposing duty cycle and synchronization conditions, in addition to the restrictions on applications, are sufficient to prevent harmful interference to FS operations. MSSSI has agreed to FWCC's conditions.³¹ The specified low duty cycle will limit the potential and duration of a pulse being present in a victim receiver's bandwidth, further reducing interference potential. We thus are limiting the duty cycle of the Sapphire DART to 0.1%, and are prohibiting synchronization. Verizon's concerns about interference are further mitigated by

²⁶ See *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems Second Report and Order and Second Memorandum Opinion and Order* (2nd R&O and 2nd MO&O), ET Docket 98-153, 19 FCC Rcd 24558 (2004) at ¶ 13.

²⁷ MSSSI Request for Waiver at 2.

²⁸ *Ex parte* comments from FWCC and MSSSI filed October 19, 2006 and October 24, 2006, respectively.

²⁹ These "bounded" facilities or locations where high-risk industrial activities take place would generally be established by barriers such as buildings, fencing or security check points. In no case would the boundaries extend beyond the real property under control by the operator. In the case of an emergency or disaster event, the perimeter boundary would be established by the responsible public safety entity.

³⁰ We note that some commenters state that rule section 15.250(c), 47 C.F.R. § 15.250 (c), prohibits the operation of wideband transmitters outdoors. See, *e.g.*, NRAO Comments at 1-2. This is incorrect. The rule merely limits the outdoor use of fixed infrastructure, *i.e.*, fixed transmitters.

³¹ *Ex parte* of FWCC filed October 19, 2006, and MSSSI filed October 24, 2006.

the additional requirement, discussed above, that the higher power transmitter tags be automatically deactivated when the tracked item leaves the authorized site. This additional condition will further reduce the likelihood that the higher power tags will operate in close proximity to FS operations. Further, we do not agree with Verizon and FWCC that emissions from the Sapphire DART transmitter tags will result in an aggregate impact to FS operations. Verizon and FWCC provide no analysis or other evidence here to demonstrate that harmful interference would result from Sapphire DART transmitter tags operated in accordance with the requirements set forth herein.³² We thus conclude that the operational, marketing and technical conditions that we are imposing are sufficient to allow the higher power Sapphire DART system to operate without causing harmful interference to FS operations.³³

13. We also disagree with NSMA that a proliferation of the higher power Sapphire DART transmitter tags will result in interference to satellite-based receivers.³⁴ The restrictions on higher power tags' operating locations and duty cycle, combined with the other conditions we are adopting herein, will minimize the incidence of their use, minimize emissions in the direction of the satellites, and effectively preclude aggregation of the emissions. Thus, there should be no impact to satellite operations.

14. Finally, we note that MSSI's withdrawal of the cattle livestock tracking application in its amended request alleviates concerns of potential interference to RAS receivers expressed by the commenters, which were based on the possible proximity of livestock to the typical rural locations of RAS facilities.³⁵ With regard to Time Domain's contention that a different receiver design would permit MSSI to operate its system in the subject environments under existing rules, we note that these systems and their equipment are relatively new, and we do not have a basis upon which to evaluate whether a different receiver design would actually improve reception to the extent needed for the Sapphire Dart system to perform effectively and reliably in the difficult service environments for which MSSI requests an increase in the allowable power. MSSI has sought a waiver of the peak power limits for the current Sapphire DART system only for very limited, specified applications, where a higher limit appears warranted, and we are able to conclude that the system can operate with a higher peak power in these limited circumstances, subject to certain conditions, without causing harmful interference to authorized services.

15. We conclude that the restrictions we are placing on the operation of the higher power Sapphire DART transmitter tags will ensure that harmful interference is not caused to the authorized radio services, and that a waiver of the rules is in the public interest.

³² See comments of FWCC at 3 and reply comments of Verizon at 2-3.

³³ Verizon based its claim of harmful interference on a supposed increase in the noise floor, as calculated by FWCC, which determined that the Sapphire emissions are 9dB higher than the emissions from the Fixed Service (FS). However, FWCC's calculations compared average conducted emission levels, prior to gain from the antenna from an FS transmitter, to peak radiated emission levels from the Sapphire DART transmitter tags. The radiated peak emissions from the higher powered Sapphire DART transmitter tags under this waiver may not exceed -34 dBm/MHz, whereas the radiated average spurious emissions from FS transmitters could be greater than +25 dBm/MHz, depending on the specific antenna gain at the radiated frequency. Accordingly, the emissions from the Sapphire DART are 59 dB below the limits for FS. The difference would be greater if we compared average emissions levels. Even if the FWCC analysis, upon which Verizon relies, were correct, we note that FWCC itself concludes that FS operations could coexist successfully with a higher power Sapphire DART system if the operational and technical conditions we are adopting were applied.

³⁴ See comments of NSMA at 2.

³⁵ We note that although NRAO states in its September 29, 2006 *ex parte* filing that it remains highly interested in the proceeding, it also states that it does not have any further remarks on the MSSI amended waiver. *Ex parte* of NRAO filed September 29, 2006.

16. Accordingly, we are waiving the peak power limit of Section 15.250(d)(3) to allow MSSSI to obtain a new FCC certification for the transmitter portion of the higher power Sapphire DART system with a radiated peak power level of 12.75 dB above that permitted under the rule in the band 5925-7250 MHz. We are not altering the average power limit specified in Section 15.250(d)(1)-(2) of the rules.³⁶ The Sapphire DART systems operating under this waiver shall comply with the following provisions:

- 1). The requirement of Section 15.250(d)(3) is relaxed to allow a radiated peak power level up to 12.75 dB above the maximum permitted peak EIRP as specified in this section.
- 2). All installations of Sapphire DART transmitter tags operated under this waiver shall be restricted to the high-risk operations at the following types of facilities or locations: petroleum, gas, nuclear, steel and chemical production and processing facilities; manufacturing and storage facilities for energy materials, radioactive substances and explosive components; prisons; heavy industry and heavy constructions sites; mining, ore processing and excavation operations; emergency and disaster locations; shipyard/dock works; and lumber/paper processing mills. The higher power Sapphire DART system shall be marketed for use only within bounded facilities and locations involving these high-risk activities as described herein.
- 3). The Sapphire DART transmitter tags operated under this waiver shall be used to track only personnel and safety equipment at the facilities and locations identified in (2), above. Safety equipment shall include only that needed to be located promptly in the event of an emergency (*e.g.*, respirators, fire extinguishers, decontamination equipment, etc.)
- 4). The Sapphire DART transmitter tags operated under this waiver shall be automatically deactivated when a tagged item (*e.g.*, an employee or safety equipment) leaves the site where it normally operates.
- 5). Each Sapphire DART tag operated under this waiver shall have a duty cycle not exceeding 0.1% for every second of operation. Along with the application for certification, MSSSI shall include a technical description of how the system will meet the duty cycle requirement imposed in this waiver. There shall be no synchronization (*e.g.*, common clocking) among transmitter tags.
- 6). This waiver shall apply to all models of the Sapphire DART produced by MSSSI as described herein provided no major changes are made to the transmitter circuitry that would increase the device's duty cycle, radiated power, or bandwidth.

IV. CONCLUSION AND ORDERING CLAUSE

17. Accordingly, pursuant to authority in Section 1.3 of the Commission's rules, 47 C.F.R. section 1.3, and Sections 4(i), 302, 303(e), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 302, 303(e), and 303(r), IT IS ORDERED that the Request for Waiver filed by Multispectral Solutions, Inc. IS GRANTED consistent with the terms of this Order. This action is effective upon release of this Order.

³⁶ 47 C.F.R. § 15.250(d)(1)-(2).

18. The Commission will not send a copy of this Order pursuant to the Congressional Review Act, see 5 U.S.C. 801(a)(1)(A), because the Order does not adopt any rules it grants a “Request for Waiver.”

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary