

Atlanta, February 26, 2007

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Mr. James R. Burtle
Experimental Licensing Branch Chief
Federal Communication Commission
445 12th Street SW
Washington, DC 20554
Copy to: Douglas Young, Phone 202-418-2440, douglas.young@fcc.gov

RE: Application 0090-EX-PL-2007

Dear Mr. Burtle,

I need your assistance in making a major advance in construction safety. Please expedite approval for indoor and outdoor use of Multispectral Solutions' (MSSI) one-watt Ultra-wideband tags.

The School of Civil and Environmental Engineering at the Georgia Institute of Technology is striving to improve safety in construction operations to enhance compliance with federal safety regulations (Occupational Safety and Health Administration, e.g. OSHA rule 1926.550(a)). One key issue is how to locate people during construction operations and in particular locating people surrounding the travel path or swing radius of heavy equipment. Currently, most construction sites manually install various improvised safety tools (see example in Figure 1 below), however, if installed at all, they do not guarantee any safety. Construction companies and equipment vendors have long been asked by regulators to use innovative technologies or best practices to find a better solution. Using Ultra-wideband tags allows the accurate tacking of the location of heavy equipment and the relative position of workers surrounding it. This might help reduce the many accidents and fatalities in construction.



Figure 1. Currently installed best practices in safety using passive tape devices

Safety Statistics

Operation of heavy equipment in hazardous work environments like on construction or at night times is one of the primary issues of construction related to the transportation industry. According to OSHA (Occupational Safety and Health Administration), the construction industry continues to report the largest number of fatal work injuries of any industry. A significant number of equipment-human or equipment-objects accidents resulted from missing safety features installed on currently operated heavy equipment. In 2002, the Bureau of Labor Statistics publicized a statistic that the category “contact with objects or equipment” accounts for 18% of 1,125 fatal injuries in U.S. construction. But the portion of injuries actually involving construction vehicles and equipment is probably greater. Falls were responsible for 33% of fatalities in the construction industry, 24% in transportation incidents, exposure to harmful substances or environments killed 18% workers (of which 74% were related to contact to electrical current and overhead power lines), 18% had contact with objects and equipment (about half each were “struck by” or “caught in”), fires accidents and assaults each were attributable to about 3%. Three categories combined (“struck-by”, “caught-in”, electronic shock incidents) accounted for over 58% of total fatalities and were largely due to accidents stemming from false operations of heavy equipment (Statistics from Bureau of Labor Statistics and OSHA, 2006).

Our past research efforts in safety indicate that actively sensing the environment (e.g. use of Ultra-wideband) can prevent or reduce accidents and fatalities by a significant number.

Research Plan

We have found that ultra-wideband RFID holds the answer. Combined with other technologies it will drastically reduce the chance of human error and provide real-time locations of all personnel including machinery. The only procedure required of the staff will be “wear your badges at all times” (see Figure 2). Safety inspectors will have full accounting of the workers who are within the safety perimeter of heavy equipment, and of those who are, an automated signal, visually through a blinking light, or an acoustic alarm can go off.

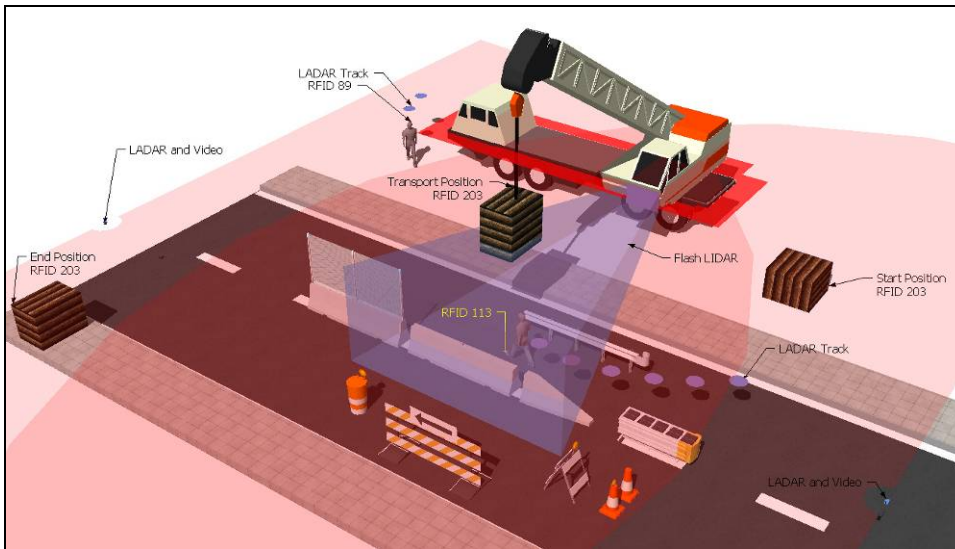


Figure 2. Tracking the location of workers on a construction Site to prevent accidents

Our research staff in the Real-time Acquisition and Processing for Information Decision Systems (RAPIDS) has evaluated different RFID tags and also different Ultra-wideband systems. None of the investigated products was achieving nearly the performance (accurate location in densely cluttered environments consisting of reinforced concrete wall environments) that the one-watt ultra-wideband tags, provided by Multispectral Solutions Inc. (MSSI) can provide.

Furthermore we have based our selection of ultra-wideband tags on the fact that the **Federal Communications Commission (FCC) has awarded Multispectral Solutions Inc. (MSSI) / British Petrol (BP) / IBM an experimental license at a much larger scale of 5,000 tags.**

Application File Number: 0038-EX-ML-2006
Callsign: WD2XSW

Our research intends to be at a much smaller scale of maximum 100 tags. We will try to locate the proximity of workers to heavy equipment machinery such as cranes, derricks, excavators, etc on a nearby construction site. In addition, we are cooperation with the National Institute of Standards and Technology (NIST) in this research domain. Two research groups at NIST are using the same equipment from MSSI and the same 1W tags.

Experimental license

We are awaiting FCC approval to implement the system inside our research laboratories, and on a construction site that is on the Georgia Institute of Technology campus. We have learned from the experimental results of above described research project at a BP refinery and would like to implement, experiment, and test these tags on a medium sized construction project with adequate number of tags that can cover the personnel involved in the daily construction operation. We believe that once these tests are performed successfully, manufacturers of safety equipment related to the construction industry will follow suite to comply with federal and state regulations, and improve safety actively using these tags. Please enable the major improvement in construction safety as quickly as possible by approaching our petition to allow indoor and outdoor use of 1W ultra-wideband tags.

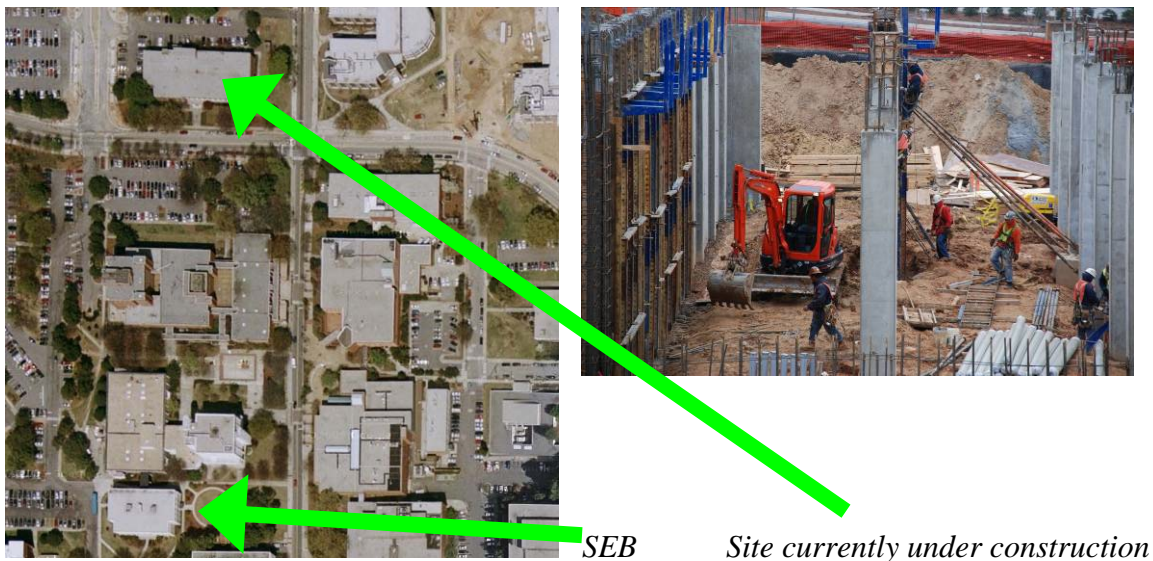


Figure 3: Location on Georgia Tech's campus (RAPIDS laboratory in the Sustainable Education Building (SEB), Structural Laboratory, and nearby construction site for Nanotechnology building), reinforced structures require 1W tags

We ask you to issue an experimental license to us to use

- **Multispectral Solutions Ultra-wideband equipment**
- **Maximum one hundred 1W tags**
- **License duration of 48 months (needed to validate safety approach in a long term study to prove that accidents/fatalities are prevented using UWB-tags)**
- **Location: Indoor and outdoor use on the campus of the Georgia Institute of Technology, Radius 0.6km**

According to a note from Multispectral (MSSI) to the FCC on September 19, 2006 "the higher power tags (1W) are designed to be hermetically sealed. Furthermore, the electronic design and enclosures were required to pass stringent UL certifications for use

in hazardous environments (UL 1604). As such, these tags were not designed with a mechanism for deactivation. [...] MSSSI has also applied for a waiver relating to the use of higher power tags for safety applications. It is our understanding that deactivation will be required for tags designed to operate under this waiver. It is our intent to redesign the tags used in the experimental license (1. above) to incorporate a deactivation switch for use under the broader waiver.”

Educational Merit

Secondly, our mission and vision at Georgia Tech is to teach our students on emerging technologies to strive for better education and innovation through research that hopefully will benefit the entire society. Granting an experimental license will educate students involved in the research project to strive for new goals in their careers.

Request for experimental license

I do ask you to give Georgia Tech an experimental license that allows us proceeding in our research efforts to prevent accidents and save lives in the construction industry. We believe our experimental research efforts will have significant impact in other industries.

Thank you very much for your assistance in this urgent matter.

Sincerely,



Jochen Teizer

Director of the Real-time Acquisition and Processing for Information Decision Systems (RAPIDS), Research for the Future Construction and Transportation Industry

Attachments that were previously submitted to FCC that may clarify some of the technical components and intentions in safety:

- Details on the FCC experimental license issued to BP
- Support Letter from IBM for BP’s experimental license
- Needs Letter from BP’s refinery to issue experimental license

Please be aware that our experiments will be on a much smaller scale.

Multispectral Solutions, Inc.
Answer
Call Sign WD2XSW
File Number 0038-EX-ML-2006
Reference number: 4428

On June 23, 2006 MSSSI was asked via email by Mr. John Kennedy of the FCC, “How is the request for 5000 units considered an experiment?”

Introduction

Multispectral Solutions, Inc. (MSSSI), in cooperation with BP (formerly British Petroleum), conducted a series of successful experiments with MSSSI’s Sapphire DART RFID location awareness system during the period of August 2005 until January 2006. The trials were conducted under the current FCC Experimental License (0175-EX-PL-2005) at BP’s Cherry Point Refinery in Blaine, Washington. The primary purpose of the experiments was to test the feasibility of MSSSI’s Sapphire DART system to improve safety and to meet Occupational Safety and Health Act (OSHA) and Washington Industrial Safety and Health Act (WISHA) regulations. These regulations mandate “control over entrance to a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.”¹

Specifically, BP requirements include:

- Location of staff that do not show up at assigned mustering points
- Improve rescue team response time and their safety
 - Limiting time in hazardous atmosphere, especially when using Self-Contained Breathing Apparatus
- Comply with OSHA/WISHA safety regulations
- Ensure personnel have proper certifications to enter hazardous areas
- Provide safety/maintenance information to personnel based upon location
- Track assets for more efficient operations

The experiments clearly demonstrated the value of MSSSI’s system in improving the safety of operations within the refinery and are highlighted in the attached letter from Mr. Rick Porter (BP Cherry Point Business Unit Leader). The trials also demonstrated the need for using tags with a higher power output (e.g. +12.75 dB above Part 15.250 unlicensed limits for wideband transmissions). Higher power tags are necessary due to the need to locate personnel in an around the extremely high multipath environment of the refinery. The presence of metal tanks, pipes, grates, etc. makes localization extremely difficult without adequate tag transmitter power.

¹ OSHA CFR 1910.119(f)(4) and WISHA WAC 296-67-021 Operating procedures.



Figure 1. Challenging Refinery Environment

The other benefit of higher powered tags is the reduction in infrastructure complexity and cost. The trials showed that the infrastructure required to cover the refinery was reduced by a factor of 10-20 because the greater communications range of the tags significantly reduced the number of receivers. The Cherry Point Refinery (shown below) covers an area of approximately 4 million square feet making personnel localization very difficult and costly if excessive infrastructure is required. MSI has estimated that approximately 80 receivers will be required to cover the primary processing area of 1.5 million square feet. This discovery was made during the initial trial and is considered a major breakthrough in enabling a cost effective RFID solution.



Figure 2. Overhead view of BP's Cherry Point Refinery

Next Steps

At the conclusion of the trials, BP safety personnel stated to their management, “[b]ased on the test results, the Location Aware Safety System (based upon MSI’s UWB

technology) is the clear direction Cherry Point should pursue. This solution will place us in 100% compliance with PSM regulatory requirements while having minimal impact on the general refinery population. It also opens the door to unlimited possibilities in safety, security and asset management.”

Based upon the success of the experiments, MSSSI and BP would like to expand upon the experimental license to increase the number of RFID tags from 50 to 5000. 3500 tags will cover the maximum number of personnel that would have access to the refinery at any given time and 1500 will be used for the localization of assets such as motor vehicles and other ground equipment. In order to evaluate the system for BP safety and OSHA/WISHA compliance, all personnel will need to have badges. In addition, the operational area for locating tags will increase to cover a greater portion of the refinery.

As stated on the FCC website, *“There are many instances in which experimental licenses are appropriate. Experimental licenses permit experimentation in scientific or technical operations directly related to the use of radio waves. The experimental radio service provides the opportunity to experiment with new techniques or new services prior to submitting proposals to the FCC to change its rules.”*

The initial experiments were focused on the localization of personnel within the severe multipath areas of the refinery. For the limited localization experiments within this small area, 50 tags were adequate. The next level of experimentation is focused on achieving accurate personnel counts in order to meet OSHA/WISHA regulations. Here, all contractors and employees will require RFID badges to enable counts throughout the various areas within the processing area of the refinery. This area within the refinery is estimated to encompass approximately 1.5 million square feet.

Areas for additional experimentation include:

- Sapphire system capability to accurately process and report a larger number of tags to meet OSHA/WISHA regulations
- Improve antenna designs to enhance coverage and location accuracy
- Middleware software capability to accurately process and report a larger number of tags to meet OSHA/WISHA regulations
- Investigate tag performance under real world conditions (e.g. reading tags mounted in various locations on moving personnel)
- Investigate receiver performance under real world conditions (e.g. exposure to various weather (rain, heat, humidity) and refinery conditions (vibration, shock, multipath))
- Examine compatibility with existing wireless services such as 802.11a/b/g
- Examine aggregate effects – 50 tags is too small of a sample for this purpose

MSSI does not believe that the aggregate effects of 5000 tags are an issue. In MSSI's Sapphire DART UWB-based Real Time Location System, the UWB tags transmit, on the average, approximately 100 UWB pulses (each roughly 2 ns in duration) each second. The pulses are transmitted in a single packet burst at a 1 Mpps intersymbol rate, resulting in a transmission duty cycle (i.e., ratio of RF "ON" time to "OFF" time) of

$$\text{Transmission duty cycle} = 2 \text{ ns} \times (100 \text{ pulses})/\text{sec} = 0.00002\%.^2$$

Thus, even with 5,000 tags, each continuously transmitting from the exact same location so as to obtain a worst case field strength, the measured effective transmission duty cycle is less than 0.1%. The tag transmissions have exceedingly small duty cycles for the purposes of maximizing battery life and minimizing channel occupancy to prevent packet collisions. These same attributes are precisely what makes this system non-interfering to other co-located systems.

The FCC website also states that the rules also provide for limited market studies to assist the licensee in evaluating the market potential for new equipment or services, and for demonstrating equipment prior to obtaining an equipment authorization. The successful results of MSSI initial experiment as evidenced by the strong endorsement by BP demonstrates a significant market opportunity for this U.S. born technology. Many other petrochemical companies seeking to improve the safety of their operations, within the U.S. and abroad, are eager to move forward with installations.

Finally, the FCC will benefit from the information provided by MSSI in aiding the FCC in identifying what new services and technologies are being developed and in what part of the spectrum. This experiment clearly meets the intent of Section 7 of the Communications Act of 1934 as shown in the following paragraph as written by the FCC in the UWB NPRM in 2000.

We believe that UWB technology holds promise for a vast array of new or improved devices that could have enormous benefits for public safety, consumers and businesses. Further, we anticipate the UWB technology could create new business opportunities for manufacturers, distributors and vendors that will enhance competition and the economy. UWB technology may also enable increased use of scarce spectrum resources by sharing frequencies with other services without causing interference. It is important that we find ways to encourage the development and deployment of technologies that may allow more efficient use of the spectrum. We note that Section 7 of the Communications Act of 1934, as amended, requires the Commission "to encourage the provision of new technologies and services to the public."³ Accordingly, we conclude that the

² The true transmission duty cycle is actually a fraction of this value since the pulses are transmitted with an ON-OFF keying technique, the absence of a transmission representing a logic "zero".

³ See 47 U.S.C. § 157(a) (1998).

Commission should develop reasonable regulations that will foster the development of UWB technology while continuing to protect radio services against interference.

The safe operation and security of our petrochemical facilities is in the nation's interest as it benefits public safety, consumers and businesses. MSSSI's UWB technology is also meeting the FCC's mandate to increase the use of scarce spectrum resources without causing interference. Thus, MSSSI respectfully requests that the FCC immediately approve the use of 5000 tags.



Office of the Director of Public Affairs

1301 K Street, Northwest, Suite 1200
Washington, DC 20005 3307

June 27, 2006

RECEIVED

JUN 27 2006

Federal Communications Commission
Office of Secretary

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, S.W.
Washington, DC 20554

RE: ET Docket No. 06-103

Dear Ms. Dortch:

I am writing in support of the Multispectral Solutions, Inc. (MSSI) request for a waiver of Part 15.250 of the Commission's rules to allow for the use of higher power ultra wideband (UWB) RFID tags for personnel accounting and safety in the refinery environment.

In 2005, MSSI requested and was granted an Experimental License from the FCC to utilize higher power UWB RFID tags at a petrochemical facility operated by BP. Working in collaboration with engineers from MSSI and BP's Cherry Point Refinery in Blaine, Washington, IBM has witnessed the success of higher power UWB RFID tags in providing accurate, real-time personnel location capability within the dense metallic environment of a refinery. This new system should help BP increase worker safety, and reduce risk to emergency responders in an evacuation.

Data collected during operation of the higher power tags indicate infrastructure costs could be reduced while maintaining reliable tracking coverage. In addition, in the experiment, the higher power UWB tags, operating in the 6 GHz band, did not cause any interference to existing wireless infrastructure (e.g., on-site 802.11 networks) or other systems.

Therefore, I urge the Commission to permit the use of higher power tags as requested by MSSI in their request for waiver in the above referenced docket.

Sincerely,

Steven W. Stewart

SWS:cb

cc: Mr. Julius Knapp, Deputy Chief, FCC OET
Mr. John Feed, Sr. Engineer, FCC OET



BP West Coast Products LLC
 Cherry Point Refinery
 4519 Grandview Road
 Blaine, WA 98230

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RECEIVED & INSPECTED
 JUN 12 2006
 FCC - MAILROOM

Rick E. Porter
 Business Unit Leader

May 22, 2006

The Honorable Kevin J. Martin, Chairman
 Federal Communications Commission
 Office of Engineering Technology
 445 12th Street SW
 Washington, DC 20554

Re: ET Docket 06-103

Dear Chairman Martin:

At BP Cherry Point Refinery, personnel and process safety have always been at the core of how we operate our business. When we realized that we could potentially improve procedures for personnel accounting during emergencies by using RFID, we decided to work closely with RFID manufacturers to adapt the technology to the refinery environment and hosted the technology development on our site. After 15 months of collaboration, we believe we have developed a system that can fully automate personnel accounting and dramatically improve safety by using MSSSI's new ultra wideband (UWB) technology.

The application improves safety and enhances compliance primarily in two ways. First and foremost, it provides fully automated personnel accounting during an evacuation and allows us to know where our staff are in real-time. The new system is a step-change compared to the manual, roster-based procedure the industry currently employs and enhances compliance with the Occupational Safety and Health Administration (OSHA) Emergency Planning and Response Regulation (29 CFR 1910.38(c)(4)) that requires facilities to have procedures in place to account for all staff. Knowing where people are also eliminates unnecessary sweeps and significantly reduces the risk to emergency responders in an evacuation. Second, the system can also be used for monitoring access to areas that can only be entered by authorized personnel. Indeed, locating of personnel to protect them from the hazards of entry into permit-required confined spaces is also mandated by the OSHA (29 CFR 1910.146(f)(4)).

Until recently, it has not been possible to accurately locate people in a refinery environment. After extensive testing and evaluation by BP, MSSSI's ultra wideband (UWB) based tracking solution was found to be capable of providing accurate, real-time personnel location within the dense metallic environment of a refinery. Over the course of the past year, BP and MSSSI have worked closely together to instrument a real-time tracking capability at BP's Cherry Point Refinery in the state of Washington. Cherry Point Refinery is designed to process Alaska North Slope crude, and is the largest in Washington state with over 230 thousand barrels processed every day. The refinery is laid out on about one square mile, with the total property owned at 3.75 square miles (2400 acres).

In order to adequately cover an area the size of Cherry Point, BP requested and was granted an Experimental License from the FCC to utilize a higher power UWB tag manufactured by MSSSI. These experiments clearly demonstrated that, with the higher power tags, infrastructure costs could be minimized while maintaining reliable tracking coverage. Furthermore, our experiments verified that

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The Honorable Kevin J. Martin, Chairman
Page Two

these higher power UWB tags, operating in the 6 GHz band, did not cause any interference to existing wireless infrastructure (e.g., on-site 802.11 networks) or other systems.

BP has reviewed the Request for Waiver submitted by MSSSI in the above referenced docket, and strongly recommends that the FCC permit the use of higher power tags as requested. As indicated above, the extensive experience obtained with MSSSI's higher power UWB tags has demonstrated that such devices can be operated without any adverse effects to co-located electronics or other systems. Furthermore, the higher power devices have been shown to permit the reliable operation of real-time, and highly accurate, personnel tracking even in the dense metallic environments of a refinery. Finally, MSSSI's UWB tags (both FCC Part 15 and higher power versions) are the only active tags available which meet UL1604 requirements for use in hazardous environments.

Please do not hesitate to contact me if you should need any further information.

Sincerely,

A handwritten signature in black ink, appearing to read "Rick E. Porter", written over a horizontal line.

Rick E. Porter

cc: Mr. Julius Knapp, Deputy Chief, FCC OET
Mr. John Reed, Sr. Engineer, FCC OET