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November 6, 2006

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street SW, Room TW-B204
Washington DC 20554

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Federal Communications Commission
Office of the Secretary

RE: Siemens Milltronics Process Instruments Inc.
REQUEST for WAIVER and PETITION for RULEMAKING
to establish regulations for TLPR under Part 15 of the FCC
Rules

Dear Ms. Dortch,

Pursuant to Section 1.3 of the Commission's Rules, Siemens Milltronics Process Instruments Inc. is hereby requesting a waiver of the spurious emissions only requirement of Section 15.205(a) of the FCC Rules to permit certification of tank level probing radar (TLPR) in the band 78 – 79 GHz for use in closed metal and reinforced concrete material storage tanks under the provisions of Section 15.209 of the FCC Part 15 Rules.

Concurrently with this request Siemens is filing a Petition for Rulemaking pursuant to Section 1.49 of the Commission's rules to establish permanent regulatory requirements in Part 15 of the Commissions rules to permit certification of TLPR in the band 77 – 81 GHz.

Sincerely,

Phillip Inglis

cc: (via email) Julius P. Knapp, Acting Chief, OET
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OET 06-27

Before the

Federal Communications Commission

Washington, DC 20554

In the Matter of REQUEST for WAIVER of Section 15.205(a) of the Commission's Rules to permit certification of Tank level Probing Radar (TLPR) operating in the band 78 – 79 GHz and AMENDMENT of Part 15 to establish regulations for TLPR in the band 77 – 81 GHz	RM No. _____

WAIVER REQUEST
AND
PETITION FOR RULEMAKING

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November 3, 2006

SUMMARY

Siemens Milltronics Process Instruments Inc. ("Siemens") is requesting a waiver of Section 15.205(a) which limits emissions in the 78 – 79 GHz band to spurious emissions only. Waiver of this requirement would permit certification of frequency modulated continuous wave RF carrier (FMCW) tank level probing radar (TLPR) in the band 78-79 GHz for use in closed metal and reinforced concrete material storage tanks under the provisions of Section 15.209(a) of the FCC Part 15 Rules. Bench testing and in situ measurements of emissions outside the tank would be required in order to determine compliance with the limits in Section 15.209(a).

Concurrently with this request Siemens is filing a Petition for Rulemaking to establish regulations in Part 15 for wideband TLPR that would occupy the band from 77 to 81 GHz. Wide band TLPR will permit increased accuracy of material level measurements.

The approach to the certification process would require bench testing as well as in situ testing as proposed with the Waiver request. In addition to an increased bandwidth, Siemens request that installation in any type tank construction be permitted provided that in situ radiated emission levels of the fundamental as measured at 3 meters from the tank enclosure be permitted if the measured level is below -41.3 dBm/MHz. Installation of these systems in multiple types of tank structures using the proposed measurement process at 3 installations of the equivalent tank type and location will insure the fundamental and spurious emissions from these devices will not be a source of interference to other users of the spectrum as discussed later.

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In the Matter of REQUEST for WAIVER of Section 15.205(a) of the Commission's Rules to permit certification of Tank level Probing Radar (TLPR) operating in the band 78 – 79 GHz and AMENDMENT of Part 15 to establish regulations for TLPR in the band 77 – 81 GHz	RM No. _____

WAIVER REQUEST AND PETITION FOR RULEMAKING

B y this request Siemens Milltronics Process Instruments Inc. ("Siemens") is asking the Commission to permit Tank Level Probing Radar (TLPR) to be certified Pursuant to a Grant of the requested Waiver in order to allow the advantages of this technology to be brought to industry segments that heretofore have not had it available to them. Many industrial applications require higher levels of accuracy than currently available from TLPR and many additional industrial installation limitations, due to physical construction of the tank, prevent the use of existing TLPR technology. A grant of Siemens request for a Waiver will permit timely deployment of this technology to industry providing improved accuracy and physical deployment characteristics. Further, permitting TLPR technology in the

requested band, will further the Commissions goal to "encourage the commercial development and use of a portion of the "millimeter wave" frequencies above 40 GHz.[1]

Siemens is proposing that technical specifications and measurement requirements, as discussed in the text for the Waiver request and the Petition for Rulemaking, should be adopted that will preclude any interference from these devices to existing services in the proposed band(s) of operation. It is further noted these systems are not mobile and thus in the highly unlikely event that any interference did occur, the offending device could easily be located and corrective action taken.

TLPR equipments within the scope of the present document are professional systems strictly for commercial usage that must be installed and regularly maintained by professionally trained individuals. Their use is typically associated with new, industrial construction as well as in retrofitting existing industrial facilities to provide greater control of manufacturing processes.

I. Request for Waiver

Pursuant to Section 1.3 of the Commission's Rules, Siemens Milltronics Process Instruments Inc. ("Siemens") is requesting a waiver of the Section 15.205(a) requirement that only spurious emissions may appear in the band above 40 GHz. Waiver of this requirement would permit certification of frequency modulated continuous wave RF carrier (FMCW) tank level probing radar (TLPR) in the band 78-79 GHz for use in closed metal and reinforced concrete material storage tanks under the provisions of Section 15.209(a) of the FCC Part 15 Rules that limits emissions above 1000 MHz to a level of 500 uV/m measured at 3 meters which is equivalent to -41.3 dBm/MHz EIRP from intentional radiators. Bench testing of the

[1] See Third Report and Order, ET Docket No. 94-124, para 1.

TLPR to determine compliance with the proposed maximum EIRP, out of band and spurious emissions coupled with in situ measurements of emissions outside the tank in order to determine compliance with the limit in Section 15.209(a) would be required. Bench test data as well as in situ data taken at 3 installation sites would be required to be submitted with the application for certification of the equipment.

A. Background

In 1989 the Commission established a blanket restriction on fundamental emissions in the spectrum above 38.6 GHz to protect certain satellite downlinks below 40 GHz and to provide initial protection for various services above 40 GHz. In so doing they incorporated the spectrum above 38.6 GHz in Section 15.205 as a restricted band and specified that the spurious emissions in the band were subject to the limits in 47 C.F.R. Section 15.209. At the time the rule was adopted, there was no known demand for non-licensed devices above 40 GHz, thus the policy did not disadvantage anyone and it avoided the necessity to identify numerous allocations and services above 40 GHz that might require protection from Part 15 devices such as radio astronomy and satellite downlinks[2].

The logic in the initial decision to designate the entire spectrum above 40 GHz as a restricted band is no longer applicable. The Commission has since exempted several devices from either the restriction that only spurious emissions are permitted and/or that all spurious emissions must be no higher than 500 uV/m measured at 3 meters which is equivalent to -41.3 dBm EIRP measured in a 1 MHz bandwidth.[3]

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[2] *See Report and Order* in GEN Docket 87-389, 4 FCC Rcd 3493 (1989), Appendix C
[3] See 47CFR Part 15, Section 15.205(d)(4, 8, 9) and Section 15.205(e)

Further, at the time the Commission placed the entire spectrum above 38.6 GHz in the restricted band classification, measurements above 40 GHz were not routinely required and the procedures for making such measurements were not standardized. This is not the case now as measurements up to 231 GHz are required for collision avoidance radar pursuant to Section 15.253(c)(4).

B. The Commission Should Permit TLPR at 78 – 79 GHz

TLPR plays an important role in the economics of major mass material storage infrastructure projects. It is currently used in many industries to measure the amount of various materials stored in closed (not open) metallic tanks and/or reinforced concrete tanks or similar enclosure structures made of comparable attenuating material. When operating in a tank, the TLPR will receive several different reflections or echoes. The surface, which is the main objective to identify and follow is one echo, while other echoes may come from various structures in the tank such as agitators, baffles, inlets, other instruments, heating coils, or even the tank bottom (in case of a low dielectric liquid), etc. In actual operational modes, the surface level of material whose level is measured may not be the strongest echo in the tank. In order to distinguish between the different echoes, and to be able to identify and track the surface, a number of different optimization parameters exist for a user. They include frequency, antenna type and diameter, installation point on the tank, configuration of signal processing parameters, etc. The key performance drivers, in terms of accuracy and ability to resolve (distinguish between) two echoes that are close together, for any TLPR are bandwidth and power.

TLPRs are used in facilities such as refineries, chemical plants, pharmaceutical plants, pulp and paper mills, food and beverage plants, power plants, etc. Regardless of the material in the tank, its temperature or pressure, TLPR allows precise control of the manufacturing processes and storage facilities.

C. TLPR Can Co-exist With Services In The 78 – 79 GHz Band

Services allocated in the 78 – 79 GHz band do require protection from fundamental emissions from TLPR operation in the band. The spectrum above 38.6 GHz was initially classified as a restricted band primarily as a convenience to the Commission. Subsequent to that classification, the Commissions has removed various portions of that spectrum from the requirements attendant to classification as a restricted band.

In the Matter of Amendment of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications [4] adopted in July 1998, the FCC determined that automotive radar systems posed no threat to the existing services in the 76 – 77 GHz band and now permits fundamental emissions from automotive collision avoidance systems in that band with an EIRP of 42.3 dBm. In making that decision, the FCC determined appropriate limits for the fundamental and other emissions from automotive radar systems based on their expected operational configuration to preclude interference to the primary users of the band as well as users of the adjacent bands. At that time they also adopted spurious emission limits appropriate to preclude interference to satellite services in the bands near 153 and 229 GHz.

[4] *See Third Report and Order* ET Docket 94-124,

As shown in comparing Table 1 and Table 2, the band from 78 – 79 GHz, requested for TLPR, has essentially the same primary and secondary users that are in the 76 – 77 GHz band (currently used by automotive collision avoidance radar). Thus, it is reasonable to conclude that TLPR (with considerably lower emission levels than automotive collision avoidance radar) can share the band on a non-interfering basis with the users of the band just as automotive collision avoidance equipment can share the band with the users of the band. The same holds true for the second and third harmonics of TLPR equipment operating in the 78 – 79 GHz band.

The commonality of the existing regulations for automotive radar and the Siemens proposal for TLPR attest to the fact that there should be no concern for interference to services in the 78 – 79 GHz band from TLPR which clearly supports the Waiver request. Siemens has not requested use of any portion of the 76 – 78 GHz spectrum out of an abundance of caution related to use of a portion of that band (76 – 77 GHz) for what many consider a "safety-of-life" service allocated under Part 15 of the FCC Rules.

U.S. allocations for the 78 – 79 GHz band.

Frequency Band	US Gov't	Non-Gov't
78 – 79 GHz	RADIOLOCATION	RADIOLOCATION Amateur, Amateur – satellite

TABLE 1

U.S. allocations for the 78 – 79 GHz band.

Frequency Band	US Gov't	Non-Gov't
76 – 77 GHz	RADIOLOCATION	RADIOLOCATION Amateur

TABLE 2

As previously noted, the Commission has previously determined that automotive radar at power levels commensurate with the power levels proposed for TLPR can coexist on a non-interfering basis with Radiolocation and Amateur service in the band. These services are essentially the same services that TLPR in the 78 – 79 GHz band would be sharing the band with. Siemens has proposed in situ data be required showing compliance with a limit of -41.3 dBm/MHz EIRP in 3 installations. Further, operation of TLPR in the band for determining material measurement levels would require mounting its antenna assembly vertically with the antenna aperture pointing downward inside the specified tank thus radiated emissions will be directed downward.

Any concerns that TLPR operation in the requested band could cause interference to the above services are addressed by the conditions of operation and technical specifications listed in the following section as proposed by Siemens.

D. Proposed Technical and Operational Requirements For The Band 78 – 79 GHz.

Part 15 devices must operate on a no protection, no interference basis. Based on this requirement it is proposed that FMCW TLPR operating under this request for waiver meet the following technical and operational conditions for operation to ensure they are not a source of interference. The requested operational and technical requirements will preclude interference to other spectrum users.

Frequency band	Max. radiated bandwidth	Max. antenna input power conducted	Peak fundamental EIRP from bench test	Peak spurious EIRP from bench test	Installation Requirements	Maximum in situ radiated emission level outside tank 40 – 250 GHz @3m
78 GHz to 79 GHz	-10 dBc at band edge	+10 dBm	+43 dBm	-20 dBc	Metal or reinforced concrete tank	-41.3 dBm/MHz

TABLE 3

The TLPR emission levels proposed for in situ radiated power levels in the 40 – 250 GHz range outside the tank are the same as the levels currently specified in Part 15.209 (a) for spurious emissions from any source in the band, -41.3 dBm/MHz. Much higher levels[5] have been accepted by the FCC as appropriate for vehicle radar systems to emit in the fundamental band (76 – 77 GHz)[6] as well as outside the fundamental band of operation. It should be noted that Siemens is proposing that radiated emissions outside the TLPR tank enclosure at any frequency in the range 40 to 250 GHz be limited to a level of -41.3 dBm/MHz. With the requirement for fundamental emissions outside the tank, measured in situ, be attenuated to a level of -41.3 dBm/MHz, emissions at the band edge to be attenuated 10 dBc based on bench measurements and spurious emissions to be attenuated by 20 dBc based on bench measurements, protection of co-channel users as well as other spectrum users in the harmonically related bands is assured.

From the above table it is apparent that the above specification requires bench testing of the TLPR to determine if the basic parameters of maximum power level, out-of-band emissions, spurious emissions and bandwidth are met. Further in situ testing would be required to show that fundamental levels outside the tank are below -41.3 dBm/MHz. Since

[5] See 47CFR Section 15.253(c)
[6] See 47CFR Section 15.253

out-of-band and spurious emissions must be bench measured to emission levels -10 dBc and -20 dBc respectively and in band levels must be measured in situ to meet a -41.3 dBm/MHz level, compliance over the range of 40 to 250 GHz is assured without the need for specific in situ measurements of such low levels at the harmonic frequencies. Logically, harmonic leakage levels would not be greater than the fundamental leakage level. To confirm compliance with the installation requirement, it is proposed that a minimum of 3 actual installations be measured and the data provided as part of the test report with the FCC filing. Initial installation of 3 units would be permitted to allow the in situ measurements to be performed for submittal with the test report.

E. Prompt entry into the market place is in the public interest

The functionality of TLPR is to provide quick continuous highly reliable monitoring of "in tank" material depth readings. By permitting the prompt introduction of FMCW TLPR, the advantages of higher precision; higher repeatability; robust measuring performance; higher reliability; minimum maintenance requirements; level measurements independent of RF transport medium permitting a wide range of applications; ease of installation; non-contacting measuring principle; high long-term stability; improvement in environmental protection and human safety due to reduced spillage; and efficient alarm handling will be made available to industry. Currently TLPR finds its main applications in the following industries: refinery; chemical; petrochemical; pharmaceutical; power engineering; custody transfer; food and beverage; cement, powder, wood chips and other solid material applications; aviation fuel depots; water and sewage treatment etc. TLPR equipment within the scope of the present document is essentially a professional system strictly for commercial usage that

is installed and maintained by professionally trained individuals. Their use is associated with new industrial construction and in retrofitting existing industrial facilities. In so doing they will help to reduce waste, lower manufacturing cost, improve environmental conditions attendant to manufacturing processes and ultimately provide a significant measure of cost reduction to the public.

F. Conclusion

Prompt grant of this waiver request will bring to market a technology that gives industry a means to improve manufacturing processes and lower costs. In view of the extremely low potential of TLPR, operating under the proposed technical and operational requirements, to cause any interference to services operating in any spectrum above 40 GHz, grant of this waiver request to permit rapid deployment of FMCW TLPR is clearly in the public interest.

II. **Petition for Rulemaking**

Siemens hereby files this Petition for Rulemaking pursuant to Section 1.401 of the FCC's Rules[7] asking the Commission to initiate a rulemaking proceeding to establish permanent rules to permit Tank Level Probing Radar to operate (TLPR) in the band 77 – 81 GHz under Part 15 of the FCC Rules. The requested band will provide sufficient bandwidth to permit level measurement resolution of the order of 1 mm. Four GHz of bandwidth will permit TLPR to achieve an accuracy of 1 mm.

The applications where TLPRs operate, e.g. tanks containing internal structures, etc. demand a relatively high bandwidth and/or power to provide sufficient accuracy and distance

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[7] *See* 47 C.F.R. § 1.401.

resolution between the surface echo and other disturbing echoes. In either case the shielding provided by the tank, any surrounding material such as the ground, the absorption of RF energy by the substance in the tank, and the orientation of the antenna to point in a downward direction will act to contain the RF energy radiated from the TLPR to levels that are within the proposed limits.

A. The FCC Should Adopt Provisions for TLPR in the 77 – 81 GHz Band

TLPR technology has experienced a fast growth and acceptance in recent years. This growth has occurred despite the higher price over existing techniques because it has proved to be the most accurate and the most reliable solution to the severe environmental conditions in tanks that are used to hold almost any industrial product. TLPR technology is now maturing and becoming cost effective primarily due to the development of lower cost microwave semiconductors. With the advancement in microwave semiconductor technology, the capability of using frequencies in the millimeter wave band requested is cost effective and will provide improved accuracy and retrofit capability for these systems. Although today, the majority of new tanks are equipped with TLPRs there is a huge market in installed tanks that heretofore could not make use of the TLPR. Typically these tanks could not be retrofitted with TLPR due to physical restrictions such as horn antenna size for given power and accuracy requirements, etc.

Two issues that require a higher frequency of operation for TLPR to address are increased accuracy and higher gain horn antenna which provides the ability to avoid false measurements due to internal tank structures, mounting flange size restrictions, and material in the tank. These factors must be considered when selecting a TLPR instrument for each

application. Finally, by adopting regulations to permit TLPR in the requested band, the Commission will be encouraging the continued commercial development of products and services in the frequencies above 40 GHz as noted in the rulemaking proceeding establishing a regulatory environment for automotive collision avoidance systems.[8]

B. Proposed Measurement Requirements and Specifications

It is clear that TLPR cannot be a source of interference to any services in the band in which it operates and it must accept any interference which it receives. To insure that these systems can fulfill this mandate, a two-tiered system of measurement criteria is being proposed similar to the proposal in our waiver request.

1. Measurement Requirements and Band Sharing

Radiation from tank level probing radar systems must be measured outside of the enclosure in which the radar is installed and must meet the technical specifications for power output, out of band emissions, and spurious emissions specified in the rules as bench tested. This essentially would provide a regulatory structure that ensures these systems have limited operational parameters which when combined with the in situ measurements can be analyzed to show that no interference will occur as a result of TLPR operation. As a precaution against any potential interference, the TLPR must be installed in a typical tank as specified in the owner's manual and measurements made of the fundamental emission performed after installation in the tank to show any measurable leakage complies with the proposed limit of -41.3 dBm/MHz. In this way, the Commission and users of the band can be assured that radiation from TLPR that will cause any interference to existing primary or secondary

[8] See Third Report and Order in ET Docket No. 94-124, p 1.

services in the requested band has an extremely low probability of occurrence. It should also be noted that these systems are fixed in location. Thus, if any interference did occur from the operation of a TLPR, its location is easily determined and immediate measures can be taken to eliminate the interference.

The following table shows the current allocations in the requested band as well as the allocations in harmonically related bands.

Frequency Band	US Gov't	Non-Gov't
77 – 81 GHz	RADIOLOCATION	RADIOLOCATION Amateur, Amateur - Satellite
154 – 162 GHz	FIXED FIXED - SATELLITE	
231 – 235 GHz	FIXED, FIXED-SATELLITE MOBILE, Radiolocation	
235 – 238 GHz	FIXED, FIXED-SATELLITE MOBILE, EARTH EXPLORATION-SATELLITE SPACE EXPLORATION	
238 – 241 GHz	FIXED, FIXED-SATELLITE MOBILE, Radiolocation	
241 – 243 GHz* * ISM Equipment	RADIO LOCATION	RADIOLOCATION Amateur, Amateur-Satellite

TABLE 4

Each of the above bands for Gov't and Non-Gov't users provide for Satellite Services on a primary or secondary basis. Satellite services and radio astronomy are considered most susceptible to interference due to the extremely low signal levels that are received by them. However, given that radio astronomy equipment discriminates against off- beam signals and that TLPRs will be used in industrial environments coupled with in situ spurious emission level requirements below the stringent levels recommended by the Committee on Radio Frequencies (CORF)[9], we believe there is an extremely low probability of interference to Radio Astronomy or Satellite Services from these devices.

[9] See Third Report and Order, ET Docket No 94-124, para 13.

2. Specifications for operation

The parameters specified in the following provide a maximum limit on power, out of band emissions, spurious emissions and bandwidth and are measured in free space using appropriate measurement techniques. Typically, emission level parameters can be bench measured using a variety of techniques such as calibrated power meters or hi-gain preamplifiers covering the fundamental and harmonics with calibrated standard gain horn antennas at a measurement distance of 1 meter.

The parameters specified in the table below provide a maximum limit on power, unwanted emissions outside the band of operation and bandwidth and are measured in free space. As a further precaution against any potential interference, the equipment must be installed in a typical tank as specified in the owner's manual to comply with the essential requirements and additional in situ data of the fundamental emission.

Frequency band	Max. radiated bandwidth	Max. antenna input power conducted	Peak fundamental EIRP from bench test	Peak spurious EIRP from bench test	Installation Requirements	Maximum radiated emission level outside tank 40 – 250 GHz @3m
77 GHz to 81 GHz	-10 dBc at band edge	+10 dBm	+43 dBm	-20 dBc	Tank and surrounding structure providing minimum of 85 dB attenuation	-41.3 dBm/MHz

TABLE 4

Siemens is not specifying that TLPR installation must be in a metal or reinforced concrete tank in order to permit TLPR to be installed in additional vessels where the required attenuation characteristics is exhibited. To specify metal or reinforced concrete tanks only would limit applicability to many installations where TLPR could be used in accordance with the proposed limits. Under any circumstances, the required -41.3 dBm/MHz requirement for

fundamental level outside the tank must be met. To address the use in a broader range of tank structures, it is proposed that in situ measurements would be required at 3 installations of each type of tank, excluding metal and reinforced concrete, having similar physical material type and location circumstances, etc., (ground, partial ground, above ground, etc.) in which TLPR operating under the provisions of the rules was installed. As an example, each of the following tank types and locations would require the following number of sites to be evaluated with the data submitted with the application for certification.

- Metal tank in any physical location – 3
- Reinforced Concrete tank in any physical location – 3
- Plastic or Fiberglass tank below ground – 3
- Plastic or Fiberglass tank above ground – 3
- Carbon fiber above ground – 3
- Carbon fiber below ground – 3

Initially three installations of one type would be required to be measured and submitted with the application for certification along with the bench data. Subsequent to certification of the initial installation, each additional installation in another tank type would be required to be submitted as a Class II change to update the Grant of Certification for the equipment.

C. SUMMARY

Siemens is proposing that the Commission adopt rules to permit TLPR to provide enhanced accuracy and integratability into existing and future industrial manufacturing processes. Siemens has also proposed a regulatory framework that will ensure that these

systems will not be a source of interference to any radio services in the band or in the harmonically related bands. Further, this framework will permit operation of TLPR in multiple types of enclosures provided the required attenuation of all emissions to the-41.3 dBm/MHz level at 3 meters is met. The two tiered approach to certification provides a methodology for determining compliance by measuring the emission characteristics of the device with a bench test and then determines that the installation provides the required degree of attenuation to preclude any potential to cause interference.

Respectfully submitted,

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