Raytheon TI Systems
Smart Antenna Business Unit

PCS 1900 Active antenna
FCC Type Acceptance
FCC ID NMFAAGSM191250M

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The following list of exhibit files have been submitted as supplements to this report:

Section I Introduction

This Type Acceptance application describes an Active Antenna with 1250 Watts EIRP output and integrated low noise preamplification on receive for use in mobile wireless communications infrastructure. It operates in the 1900 MHz spectrum allocated to Broadband PCS (Personal Communication Systems). The Active Antenna applies Active Phased Array Antenna technology to the problem of improving the coverage and useful communications range of fixed infrastructure radio equipment.

It is designed to work as an option with the Ericsson 2302 Radio Base Station (RBS) and Power Battery Cabinet (PBC). The Radio Base Station provides the signals for amplification while the Power Battery Cabinet provides the DC power and alarming interface for the Active Antenna. Figure 1 illustrates the Active Antenna and the related equipment.

This product is similar to a previous Raytheon TI Systems Active Antenna product (reference FCC ID NMFAAGS1912501C1B) but it receives its power and control signals directly from the Ericsson PBC, whereas the previous product provided these functions with an additional, external interface control unit (ICU) to provide a universal system.

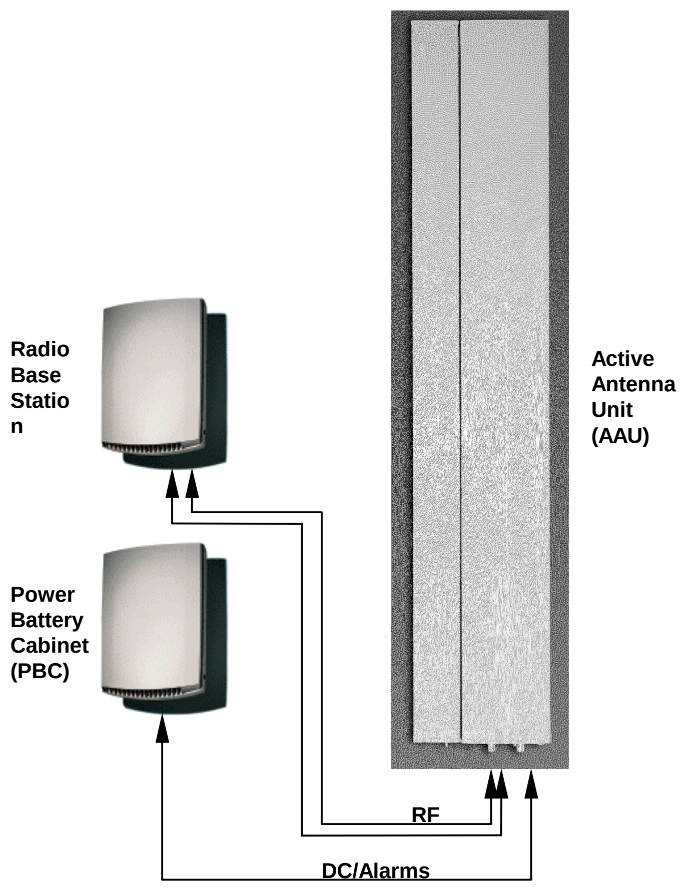

Figure 1 Active Antenna and Related Equipment

Section II Summary of Application

This application is specific to the Active Antenna Unit and is organized around paragraphs drawn from CFR 47 Part 24 and Part 2 as applied to an intentional radiator. Applicable Part 24 and Part 2 paragraphs are used as headings in this document to simplify traceability to the originating requirement.

The Active Antenna described in this document includes three dash numbers of the same physical assembly with each dash number differentiated only by the dash number of passive bandpass filters installed during Active Antenna assembly.

Test data on a single dash number Active Antenna assembly is presented in the exhibits along with supporting data on all three of the passive bandpass filters used to determine the dash number of the Active Antenna.
Technical information such as construction, layout, photographs, circuit schematics and test data required for Type Acceptance is also provided in the Exhibits.

Section III Data

2.981 Type Acceptance

The following data is submitted for Type Acceptance of a PCS-1900 Active Antenna for Raytheon TI Systems Incorporated in accordance with 47 CFR Part 24 subpart C (Technical Standards) and subpart E (Broadband PCS) , and Part 2, subpart J (Type Acceptance).

Definitions:

Active Antenna EIRP
The product of: a.) the vector sum of the powers supplied by the antenna's internal amplifiers and; b.) the antenna gain in the service area relative to an isotropic antenna.

Directive (Pattern) Gain of the Antenna (G_t)
The ratio of the power required at the input to a loss free, isotropic antenna to the vector sum of the powers generated by the active antenna's internal amplifiers to produce, in a given direction, the same field strength at the same distance .

Service Area of the Antenna
The region of the earth illuminated by the antenna within its half-power azimuth beamwidth when the antenna's peak radiation is directed toward the horizon.

Active Antenna Combined Amplifier Power Reference Point
The output point of a five way test combiner used to sum the individual output of each of the five power amplifiers in the Active Antenna transmit path for the purpose of measurement.

2.983 Application for Type Acceptance - Form 731

A complete FCC 731 form is included with this type acceptance application report

2.983 (a) Name of Applicant

Applicant (Corporate Location):	Raytheon TI Systems Inc. 2501 South Highway 121 Lewisville, Texas USA 75067
Applicant (Corporate Mailing):	Raytheon TI Systems Inc. PO Box 405 Mail Station 3425 Lewisville, Texas USA 75067
Manufacturer / Location:	Raytheon TI Systems Inc. 17217 Waterview Parkway Mail Station 333 Dallas, Texas USA 75252

2.983 (b) Identification of the Equipment

Name of applicant:	Raytheon TI Systems
Equipment Model Numbers:	KRE-101-1769/1 KRE-101-1769/2 KRE-101-1769/3 KRE-101-1769/11 KRE-101-1769/12 KRE-101-1769/13
Trade Name:	GSM 1900, Active Antenna Unit
FCC ID Number:	NMFAAGSM191250M

2.983 (c) Production is Planned

Production of the equipment model numbers described in this submittal is planned at the location noted in paragraph 2.983 (a)

2.983 (d) Technical Description

Introduction:
The Raytheon TI System (RTIS) Active Antenna is a mast mounted package which integrates power amplifiers and low noise amplifiers with a phased array antenna to provide RF amplification of signals to and from a ground based Radio Base Station (RBS). The Active Antenna can provide either one or two transmit paths, each capable of supporting one RF carrier, and two orthogonal polarization receive paths for diversity. The transmit paths provide linear RF power amplification for a single RF carrier over a 32 dB dynamic range, and include RF isolation, bandpass filtering, and aperture gain, while the receive paths provide aperture gain, bandpass filtering, and low noise amplification. The Active Antenna does not contain any RF exciters or modulators. A functional block diagram of the Active Antenna is shown in Figure 2.

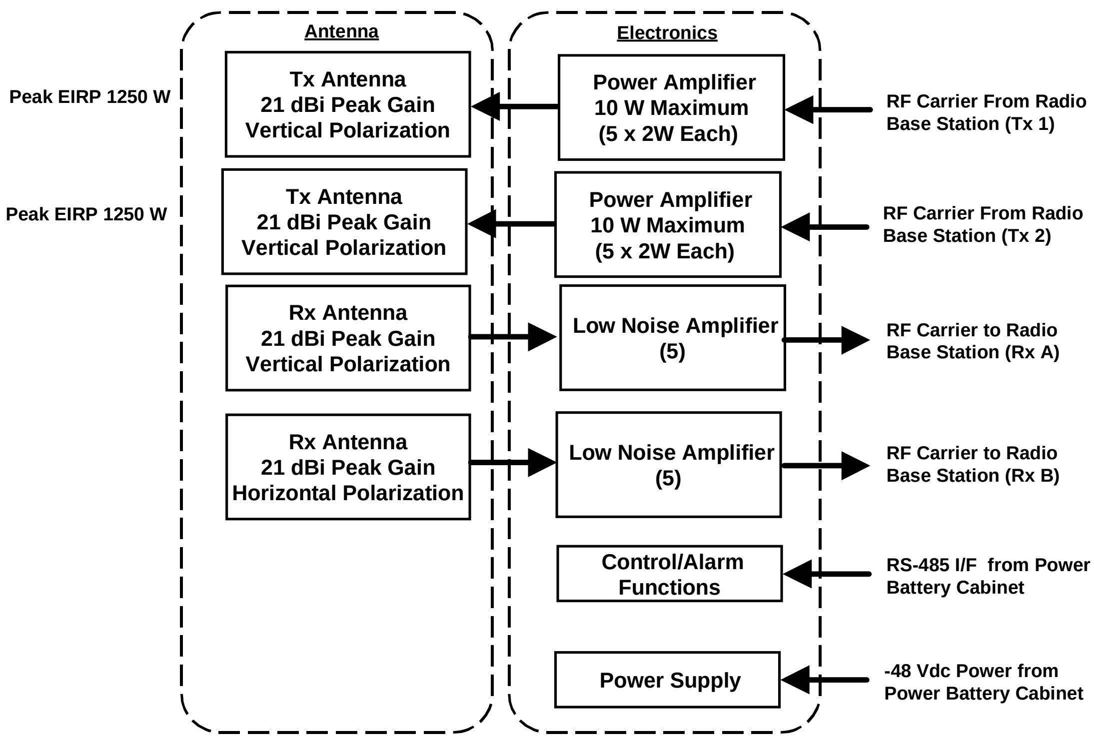

Figure 2 Active Antenna Functional Block Diagram

The Active Antenna's amplifier channels are implemented using multiple, distributed amplifiers to maximize the receive sensitivity of the Active Antenna / RBS combination and to generate high EIRP using low power RF amplifiers. A more detailed signal flow diagram is shown in Figure 3.

Layout and Construction
Solid state active circuits within the Active Antenna include Low Noise Amplifiers (LNA's) and Power Amplifiers (PA's) with appropriate bias and control support circuitry, a calibration circuit card assembly, for attenuating transmitter input drive levels, and a DC/fault circuit card assembly, consisting of DC-DC power converters with appropriate filtering, control circuitry and distribution circuitry, and, a single microcontroller / RS-485 transceiver for the collection, formatting, and transmission of alarm information and for self-calibration.

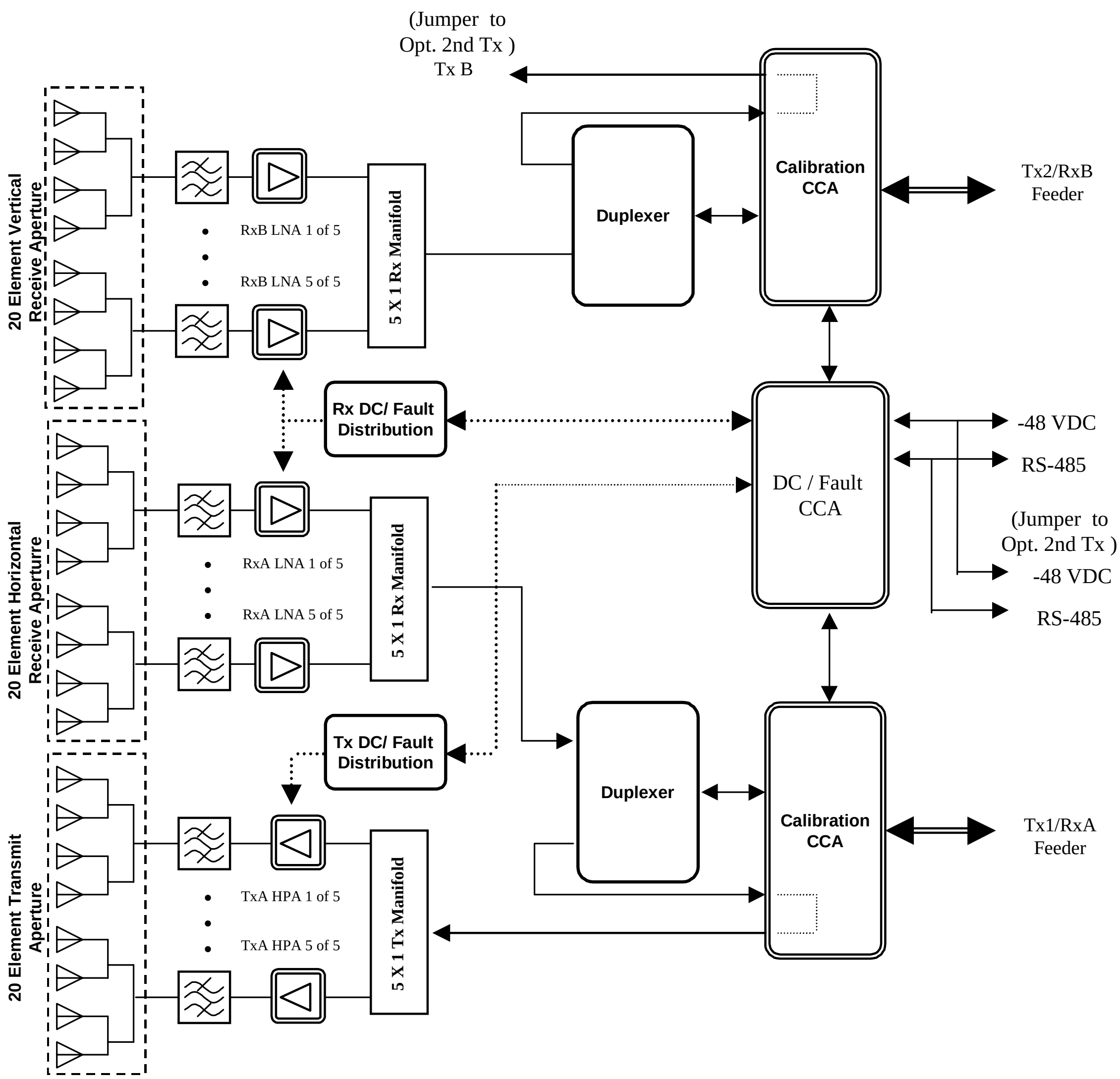

Figure 3 Signal Flow Diagram

Passive RF circuits include lightning surge suppression, RF distribution and summation, bandpass filtering, and the antenna aperture.

The first transmit channel and the two diversity receive channels are packaged in one larger housing, while the optional, second transmit channel is enclosed in a separate, smaller housing. The optional transmit module derives its drive signals and power from the main unit and cannot be operated independently.

External interfaces consist of RF connectors for two, duplexed paths, and a single connectorized cable containing both heavy gauge wire for supply of prime power (-48 VDC) and light gauge, sheilded twisted pair wiring for the RS-485 communication port. All interfaces to the Active Antenna are surge protected.

The Active Antenna requires RF input, DC power, and RS-485 control commands to operate as designed with the Ericsson RBS 2302 PCS Radio Base Station.

Signal Flow
The two, duplexed feeder lines enter the active antenna through the calibration circuit cards. This circuit contains a shared, variable RF attenuator that both controls the maximum RF drive level delivered to the transmit amplifiers and maintains a fixed gain into the radio base station on receive. This provides a fixed RF drive level to the power amplifiers independent of feeder cable losses. The attenuator is capable of adjusting for feeder losses up 12 dB. The attenuation value is automatically selected during the initial, on-site calibration process and is stored into non-volatile memory.

After the signal passes through the variable attenuator, it leaves the calibration circuit card and passes through a broadband duplexer to separate transmit and receive signals. The transmit signal from the radio base station returns to the calibration circuit where a small portion of the energy is coupled off to a power detector. The detector's output is compared to a fixed voltage level to generate a feedback signal for the internal microprocessor. This signal is used to adjust the variable attenuator during the calibration process discussed in Section 2.983 (d)-9.

The majority of the transmit energy proceeds on to the transmit manifold. This is a stripline power divider that provides equal level signals to each of the five, high power amplifier (HPA) circuits.

Each HPA is a three stage, linear, GaAs FET amplifier producing 2 W of power. The output of the HPA is passed through a double junction circulator to control reverse intermodulation products and waveguide filter to control the out-of-band emissions.

The filtered signal is fed into an antenna sub-array consisting of 4 patch elements. The HPA, filter, and element panel stages are replicated five times for each of the two transmit channels.

Received signals arrive through a set of five, similar patch element sub-arrays. The signal is passed through a waveguide filter to bandlimit the noise and to control leakage of the transmitted signal into the receiver system. After filtering, the signal enters a low noise amplifier (LNA).

This combination of element subarrays, filters, and LNA's is replicated five times for each of the two polarization diversity channels. The output of the LNA's for each channel is then summed with a five way stripline power combiner.

The combined output signal is returned, through the duplexer, to the calibration circuit, where it passes through the variable attenuator. The radio station's drive level and sensitivity have been balanced so that when the antenna system has been calibrated for the proper maximum input drive level, the receive gain will also be correct to maximize the system noise figure without saturating the base station's receiver.

The DC/fault circuit provides drive voltages for each of the power amplifier and low noise amplifier functions in addition to collecting fault information on the individual amplifier circuits for transmission to the Power Battery Cabinet. Prime DC power from the Power Battery Cabinet is -48 VDC. This circuit card also hosts the control microprocessor.

The microprocessor exchanges control commands and responses with the PBC via an RS-485 interface. Commands include: report software version, report alarm status of amplifiers and power supply, turn HPA's off (during calibration), turn HPA's on , set internal attenuators to maximum, calibrate attenuators to proper drive level, and output history log of commands and alarms. Responses include the corresponding acknowledgements and/or data messages as well as successful completion or failure of the calibration process.

Exhibit 2 provides block diagrams with additional detail on each of the circuit card assemblies. Exhibit 3 includes assembly drawings showing the placement of each of the component parts, and parts lists for each active circuit. Exhibit 9 contains photographs showing each of the major components and their placement in the assembled unit.

2.983 (d) - 1 Types of Emission

The Active Antenna's power amplifier channels are designed for linear RF amplification of a single GMSK modulated carrier in accordance with PCS-1900 requirements. An independent set of amplifiers is used for each frequency channel. The Active Antenna does not contain any RF exciters or modulators. Exhibit 3 shows test data taken on the power amplifiers with a standard GMSK waveform as the driving signal to demonstrate that the Active Antenna does not contribute spectral content to the waveform.

2.983 (d) - 2 Frequency Range

The Active Antenna described in this document will operate in three specific 20 MHz frequency passbands that cover the PCS-1900 spectrum blocks A - F. The passband of operation for any specific Active Antenna is determined by the passive filters installed during the assembly process. Passband characteristics for each set of filters are shown in Exhibit 2.

These filters are purchased pre-tuned from a filter supplier as dash numbers of the same physical part. After tuning, the parts are permanently sealed to prevent mis-adjustment either on the assembly line or in the field. The dash number of the filters installed determines the dash number of the Active Antenna assembly. All other components used in each of the Active Antenna dash numbers are identical.

The frequency plan for each Active Antenna operating band relative to the spectrum blocks is shown in Figure 3.

Block	Transmit MHz	Receive MHz	Active Antenna	Transmit MHz	Receive MHz
A D	1930 - 1945 1945 - 1950	1850 - 1865 1865 - 1870	Band 1	1930 - 1950	1850 - 1870
B E	1950 - 1965 1965 - 1970	1870 - 1885 1885 - 1890	Band 2	1950 - 1970	1870 - 1890
F C	1970 - 1975 1975 - 1990	1890 - 1895 1895 - 1910	Band 3	1970 - 1990	1890 - 1910

Figure 4 Operating Frequency Bands

2.983 (d) - 3 Range of Operating Power

The Active Antenna spatially combines the output of 5 linear power amplifiers for each frequency channel. At the maximum input RF drive level, the maximum RMS power delivered to the antenna elements is +40 dBm (10 W). The power amplifiers are linear over a 32 dB range from the +40 dBm maximum. The minimum RMS power delivered to the antenna elements is +8 dBm. Exhibit 4 provides the transfer function of the Active Antenna power amplifiers measured at the Active Antenna Combined Amplifier Power Reference Point.

2.983 (d) - 4 Maximum Transmit Power Level (24.232 (d) 1640 W peak EIRP)

The service area of the active antenna covers 65 degrees in azimuth. The antenna gain in the service area is computed by integrating the Directive Gain, G_t. This is given by:

$$G_t = \int_{\substack{\theta=-32.5 \\ azimuth}}^{32.5} G(\theta, \phi_0)\, d\theta \quad = \quad 19.8\, dB$$

$\theta = azimuth$

$\phi_0 = elevation\ angle\ at\ horizon$

Antenna gain is controlled in the manufacturing process to within +/- 0.5 dB.

The antenna's amplifiers are adjusted during the assembly process to produce a maximum combined power Pt, of 40 dBm ±0.5 dB over temperature with a nominal input drive level of 20.5 dBm.

The actual drive level seen in the field is determined by the resolution of the calibration circuit and will vary by +/- 0.3 dB. This circuit is also subject to temperature and VSWR induced variations of +/- 0.5 dB over the operational temperature range of the antenna.

This gives a maximum transmit EIRP of 59.8 + 0.5 + 0.5 + 0.3 + 0.5 = 61.6 dBm (1445 W). This does not exceed the maximum specified EIRP of 62.15 dBm (1640 W).

2.983 (d) - 5 DC Voltages and Current

The prime power requirement for the Active Antenna is -48 VDC @ 5.8 amperes maximum. The Active Antenna will operate with a prime power input of -38 VDC to -60 VDC. Switching DC-DC converters with appropriate regulation and filtering are used internally to generate the required voltages to operate the active circuits. Voltages generated internal to the Active Antenna include; -6 VDC, +8 VDC, +5 VDC and +9 VDC.

2.983 (d) - 6 Function of Each Active Circuit

The Active Antenna contains four unique active circuits fabricated on Circuit Card Assemblies (CCA's) with the following nomenclature: HPA CCA, LNA CCA, DC / Fault CCA and Calibration CCA. The Active Antenna contains ten each HPA CCA's, ten each LNA CCA's, two each DC / Fault CCA's, and two Calibration CCA's. Exhibits 2 and 3 contains block diagrams, circuit schematics, and pertinent measurement data for each of the four active circuits

The function of the HPA CCA is to provide linear power amplification of a single carrier over a 32 dB dynamic range and to provide a fault bit should any of the three amplifier stages fail.

The function of the LNA CCA is to provide Low Noise Amplification of all carriers within the Active Antenna Field of View and to provide a fault bit should either of the two amplifier stages fail.

The function of the DC / Fault CCA is to provide regulated, filtered DC operating voltages for the circuit functions and to collect, format, and transmit amplifier fault information via the RS-485 serial data port.

The function of the Calibration CCA is to detect and attenuate the input signal to provide the proper drive level to the RF amplifiers. This portion of the circuit is only active during the calibration procedure that is used at installation.

2.983 (d) - 7 Circuit Diagrams

Exhibit 2 provides circuit block diagrams for each of the active circuits noted above. Schematic drawings are shown in Exhibit 3.

2.983 (d) - 8 Users / Instruction Book

Exhibit 7 (Operating Instruction) describes the calibration sequence of the Active Antenna at the service providers cell site.

2.983 (d) - 9 Tune - up Procedure

The Active Antenna power amplifier output is calibrated at two different times during the Active Antenna manufacturing process and once during the initial installation with the Radio Base Station in the field.

Manufacturing:

1. Each HPA CCA is adjusted on the production test bench for nominal power out of 34 ± 0.3 dBm.

2. Following installation of the HPA CCAs and filters into the antenna assembly, the summed output of the HPA CCAs / filters are measured for both channels. The power level is measured at the Active Antenna Combined Amplifier Power Reference Point on the production test bench and both channels are adjusted for an output power of 40 ± 0.5 dBm with the maximum RF drive level into the Active Antenna.

Equipment Set Up with Radio Base Station

1. The installer commands the the Active Antenna Unit, via the PBC control panel, to reset it's internal attenuator values to maximum and disable the power amplifiers.
2. The switch operator configures the RBS for two carriers, tuned to the antenna's center frequency, with full output power on both carriers.
3. The installer issues a calibration command through the PBC. The AAU is commanded by the PBC to step the internal attenuator value down until the pre-determined drive level is reached, corresponding to the maximum allowable EIRP.
4. The attenuator settings are stored in non-volatile memory and the AAU notifies the PBC that calibration is complete.
5. The switch operator turns the RBS output power off.
6. The Active Antenna Unit is commanded to re-enable the power amplifiers.

2.983 (d) - 10 Frequency Stability

The Active Antenna contains no exciters or modulators. This paragraph is therefore not applicable.

2.983 (d) - 11 Circuits for Suppression of Spurs, Limiting Modulation, or Power Limits

The Active Antenna power amplifiers include RLC feedback circuits to minimize out of band gain to prevent generation of spurs. In addition the power amplifier chain includes a double junction isolator and a bandpass filter at the output of each power amplifier to reduce reverse intermodulation, suppress out of band spurs, and to attenuate transmit noise in the receive band.

2.983 (d) - 12 Digital Modulation

The Active Antenna contains no exciters or modulators. This paragraph is therefore not applicable.

2.983 (e) Data

Test data required by paragraphs 2.985 to 2.997 in accordance with paragraph 2.999 are shown in Exhibits 4 and 5.

2.983 (f) ID Plate

Exhibit 1 provides a drawing of the Active Antenna label

2.983 (g) Equipment Construction & Layout

Exhibits 3, 8 and 9 provides photographs, assembly drawings, and details views of the equipment layout and construction.

2.983 (h) Encoder Device

The Active Antenna contains no encoder devices. This paragraph is therefore not applicable.

2.983 (I) External RF Amplifier, Part 97 - Amateur Radio Service

The Active Antenna is not used for Amateur Radio Service, this paragraph is therefore not applicable..

2.983 (j) AM Broadcast - Stereo

The Active Antenna is not used for AM broadcast, this paragraph is therefore not applicable..

2.985 - 2.997 Measurements Required

Introduction:
The measurements specified in this section were performed on a Band 1 unit. Band 1 (A-block) represents a worst case since these units have transmit filters that have been slightly modfied to minimize reverse intermodulation products generated in the neighboring C-Block receive band, at the expense of overall rejection performance. Band 2 and 3 units use a more idealized version of the same filter, and should exhibit equal or better spurious radiation performance. Data for all three filters is provided in Exhibit 2. The test for emissions due to control circuits, power leads, and non RF circuit elements (2.993) will be the same for all bands since all of the electronics capable of producing these emissions are common between both units.

Measurement data, block diagrams, and test equipment information is included in the exhibits.

2.985 (a) Measurements Required: RF Power Output

Maximum EIRP is specified by 24.232(a) as 1640 W

RF power output was measured on both transmit channels in two environments.

First, laboratory measurements were made in a temperature chamber. For this test, the antenna panels were removed to allow direct access to the RF output connectors at the filter ports, and a test combiner was installed to sum the power output of each of the amplifiers.

Second, field measurements were made with the fully assembled unit installed on a tower.

Test methodology and data are shown in Exhibit 4

2.987 Measurements Required : RF Modulation Characteristics

The Active Antenna contains no exciters or modulators. This paragraph is therefore not applicable.

2.989 Measurements Required: RF Occupied Bandwidth

The Active Antenna contains no exciters or modulators. Exhibit 5 shows test data taken on the power amplifiers with a standard GMSK waveform as the driving signal to demonstrate that the Active Antenna does not contribute spectral content to the waveform

2.991 Measurements Required: Spurious Emissions at Antenna Terminals (24.238)

Emission limits are specified in 47 CFR 24.238 by the relationship 43 + 10logP where P is the combined power output of the amplifiers. For the Active Antenna, the total power out P is 10 W. The emission limit is therefore = 43 + 10log(10) = 53 dB below the carrier. A further requirement is to record any emissions less than 20 dB below the -53 dBc emission limit. i.e., any emissions above -73 dBc

The transmit filters have been designed to limit out-of-band emissions by a minimum of 30 dB to ensure compliance with the –53 dBc (-13 dBm) limits specified in paragraph 24.238 and the -36 dBm limits specified in paragraph 5.3.5.2 of the JTC standard for GSM equipment providers, J-STD-007A - PCS Air Interface Specification. In addition, these filters attenuate reverse intermodulation products in the receive band so that, in conjunction with the HPA's double junction circulator, the reverse intermodulation products generated are less than –100 dBm/100 kHz under the test conditions specified in J-STD-007A, paragraph 5.3.9.2. This ensures that the RBS/AAU system will comply with the –98 dBm reverse IM level specified for GSM equipment providers to prevent receiver blocking.

Passband characteristics for the filters are shown in Exhibit 2.

Emissions were measured in two environments. Field measurements were made with the fully assembled unit installed on a tower, and laboratory measurements were conducted with the antenna panels removed to allow direct access to the filters' RF output ports.

Field measurements of emissions with the Active Antenna operating at full rated power and 30 dB below full rated power were taken using a modulated signal source and a minimum 75 dB dynamic range spectrum analyzer. In all test cases, emissions are below the limit specified in 24.238 and no reportable emissions were detected. Test methodology and data are shown in Exhibit 5.

Laboratory measurements of emissions at the antenna terminals of the Active Antenna were performed using a test combiner to sum the power output of each of the amplifiers. In all test cases, emissions are below the limit specified in 24.238 and no reportable emissions were detected. Test methodology and data are shown in Exhibit 5.

2.993 Measurements Required: Field Strength of Spurious Radiation

2.993 (a) Spurious Emissions Radiated Directly from the Cabinet

Emission limits for energy radiated directly from the cabinet, power leads, and related circuit elements are specified in 47 CFR 24.238. The microprocessor and digital control devices, as defined by 47 CFR, Part 15, paragragh k are used only for the control of an intentional radiator, and as such are also compliant with the limits set in 24.238.

The emission limit is computed by the relationship 43 + 10log(P) where P is the combined output power of the amplifiers. For the Active Antenna the total power out P is 10 W. The emission limit is therefore = 43 + 10log(40) = 53 dB below the carrier. The preferred units for the emission limit, dBμV, were derived as follows;

Expressed in power, the 53 dBc limit P_L= (P-53) or (40-53) = -13 dBm = 50.12 x 10^{-6} W

To convert to field strength, the power flux density in Watts / m^2 is computed at a distance of 3 meters, and converted to volts / meter using free space impedance, and finally converted to dBμV. Conversion equations follow;

Power flux density $P_d = P_L / 4\pi R^2 = (50.12 \times 10^{-6}) / 4\pi 3^2 = 443 \times 10^{-9}$ Watts / m^2

Volts = $(P_d \times \eta)^{-1/2} = (443 \times 10^{-9} \times 376.7)^{-1/2} = 12.9 \times 10^{-3}$ V / m where η = free space impedance
Emission limit = 20Log (Volts) = 82.2 dBμV at a distance of 3 meters for an isotropic source, or 84.4 dBuV assuming radiation from the specified half wavelength dipole.

All emissions recorded were a minimum of 15 dB below the specified limit. The full report for this measurement is shown in Exhibit 6.

2.995 Measurements Required: Frequency Stability

The Active Antenna contains no exciters or modulators. This paragraph is therefore not applicable.

2.997 Frequency Spectrum to be Investigated

The frequency spectrum investigated for both 2.991 and 2.993(a) was 10 KHz to 20 GHz.

2.999 Measurement Procedures

Measurement procedures are documented in Exhibits 2 and 3

2.948 Description of Measurement Facilities

Measurements for this application were accomplished using Raytheon TI System's laboratory facilities in Dallas, Texas and McKinney, Texas and using the test facilities KTL Dallas, Inc. in Lewisville, Texas.

Measurements done at the Raytheon TI Systems facilities were accomplished using calibrated, commercially available test equipment. Specific equipment model numbers are included in the Exhibits detailing the measurements. An outdoor antenna range existing at the McKinney, Texas RTIS facility was used to measure the antenna pattern and EIRP.

All testing was accomplished using calibrated test instrumentation. Raytheon TI Systems requires that inspection, measuring, and test equipment be calibrated against certified equipment having a known relationship to national or international standards. A dated calibration label which indicates the calibration and re-calibration date is affixed to the equipment or its container.

Information on KTL facilities is included in Exhibit 6.

24.51 (d) RF Radiation Hazard

CFR 47 section 1.1307 paragraph "b" states that Broadband PCS non-rooftop devices mounted greater than 10 meters above the ground are not subject to routine environmental evaluation if the total power at the installation is less than 3280 W EIRP. Further, roof top antennas where the total EIRP is less than 3280 W EIRP are also excluded from routine evaluation.

The Active Antenna equipment described in this application will be located in limited/controlled access facilities and does not exceed 3280 W total EIRP. It is a range extension product designed for use on tall towers or buildings at an average height above terrain of 30 to 80 meters. Therefore, the Active Antenna Unit covered by this application is not subject to environmental evaluation.

To determine the radiofrequency exposure hazard of the Active Antenna, a calculation following the methods described in the FCC's OET Bulletin 65 as suggested in section 1.1310 of Title 47, chapter 1 was performed. The result of these computations indicate that the near field approximation developed by W.A. Tell should be used and the occupational safety limit will not be exceeded at any distance greater than 7 cm (2.76 inches) from the face of the Active Antenna. These calculations are on file if required.

Section IV Exhibits

Request for Confidentiality

Exhibit 1 ID Label & Location: 2.983 (f)

Exhibit 1 includes drawings showing the format and location of the ID labels.

Included Items
1. Drawing of the Manufacturers Name Plate
2. Drawing of the Type ID Number Plate
3. Location of the Type ID Number Plate

Exhibit 2 Block Diagrams- 2.983 (d) – 9,11

Exhibit 2 provides technical information on the function and design of each of the active circuits used in the Active Antenna. Specific items included in Exhibit 2 are listed following.

Included Items
1. HPA Circuit Card Assembly (CCA)
2. LNA Circuit Card Assembly (CCA)
3. DC / Fault Circuit Card Assembly (CCA)
4. Tx limit Circuit Card Assembly (CCA)
5. Bandpass filter characteristics (2.983 (d) -11)

Exhibit 3 Schematics: 2.983 (d)-7

Exhibit 3 includes Active Antenna design details including exploded views of the construction, assembly drawings, schematics, and parts list for the circuit cards. Specific items included in Exhibit 2 are listed following.

Included Items
1. Assembly Drawings for the Active Antenna Unit.
2. Circuit Diagrams
3. Parts Lists for Circuit Card Assemblies

Exhibit 4 RF Power Output: 2.983 (d)-3, 2.983 (d) -4, 2.985 (a)

Exhibit 4 provides Active Antenna data on measurement of RF power output both in the laboratory and in field measurements. Each set of data includes a block diagram of the test set up, list of test equipment, description of the test sequence, and test data. Specific items included in Exhibit 2 are listed following.

Included Items
1. Active Antenna RF power Output at the Combined Amplifier Power Reference Point - 2.983(d)-3
2. Range measurement of Antenna element pattern in polar coordinates
3. Active Antenna RF power output - field measurements

Exhibit 5 Spurious Emissions: 2.991 (a), 2.993(a)

Exhibit 5 provides Active Antenna data on measurement of spurious emissions both in the laboratory and in field measurements. Each set of data includes a block diagram of the test set up, list of test equipment, description of the test sequence, and test data. Specific items included in Exhibit 5 are listed following.

Included Items

1. Spurious Emissions at the Antenna terminals
2. Spurious Emissions Radiated Directly from the Cabinet
3. Spurious Emissions - Open Field Measurements

Exhibit 6 Field Test of Spurious Emissions – KTL Report: 2.993 (a)

Exhibit 7 Operation Instructions: 2.983 (d)-8

Exhibits 8,9 Photographs: 2.983 (g)