Transmitter Technical Characteristics

RF Output Power of Transceiver	0 dBm
Tunable Channels	123 (ARFCN 128 to ARFCN 251)
Frequency Range	869.2 MHz to 895.8 MHz
Frequency Stability	0.008 ppm
Emission Designator(s)	250KGXW 250KG7W
Spurious Emissions	< -70 dBC
Final Amplifier Stage Information	Watkins-Johnson Model AH102A amplifier (two used for balanced configuration) Supply voltage = 9 Vdc, Current = 200 mA x2, Gain = 13 dB

Antenna Information

Antenna Information	
Maximum Gain	16.6 dBi

General Description

The AirNet Broadband Transceiver System (AirNet BTS) is the primary equipment realizing the functionality of a GSM 850 MHz Base Transceiver System (BTS). The AirNet BTS uses AirNet's patented broadband technology to achieve its compact size and high capacity. The AirNet BTS is designed around the philosophy of the software-defined radio. AirNet's broadband technology comprises AirNet's software defined radio implemented with its Digital Signal Processors (DSPs) and Broadband Digital Transceiver (BDX). These components can be software-configurable and are programmed with modulation type, RF channel bandwidth, channel spacing, and frequency, and the parameters of cellular radio signals.

AirNet's broadband technology eliminates the need for a bank of cavity filters and RF combiners that are traditionally required with narrowband systems. Transmitted signals are combined digitally into a single broadband signal that is upconverted to the appropriate RF band by the BDX and amplified by an external highly linear, multi-carrier amplifier. The AirNet BTS-4000RM can combine up to 12 TRXs. Likewise individually received RF carriers are digitally filtered, which provides significantly more flexibility and

control for out-of-band signal rejection than analog filtering used in traditional BTS transceivers.

All software components (source, libraries and executables) of the AirNet software defined radio are tightly controlled using mature industry-standard software configuration management practices. All versions of code released for customer use are archived in an unwritable state and retained for the duration of product life, and can be readily compared to any other version. These archive versions are also backed up and stored off-site for disaster recovery. Subsequent changes to the baseline version of AirNet software delivered for initial testing by the FCC will be managed according to the FCC rules and regulations for permissive changes.

Per past direction from the OET office at the FCC (see FCC ID: MZKBPU2000-1900), this application covers the RF transceiver portion of the BTS; it does not include the high power amplifiers (HPA) that are sold with the product. This is a result of AirNet's ability to use different amplifiers from different vendors with the same base BDX and digital BTS hardware. Each amplifier type has it's own Part 22 certification. Therefore, this application is written for the RF output of the BDX - the HPA and the post HPA RF duplexer/filter have been bypassed for all conducted transmit tests shown herein.

This application refers to the complete BTS product with an HPA when discussing means for limiting output power and when referring to power limitations for channels at the band edge. As in the previous application, ARFCNs adjacent to the band edge are limited in the AirNet BTS to a power of 2 Watts or less. It has been shown previously that a 2 Watt GMSK or 8PSK modulated carrier centered 200 kHz from a band edge meets the FCC requirements for out of band spurious emissions. Total power out of the BTS with an HPA will be governed by the equipment authorization granted for the HPA and other applicable FCC regulations as described in Part 22.

Tune-up Procedure

The parameters for programming the transceiver synthesizes are stored in a file contained in flash memory on the BTS. This file is configured at the factory and the system user cannot change it. These parameters determine the receiver and transmit frequencies and their separation. The transceiver has a 5 MHz receiver and a 5 MHz transmit bandwidth at this base frequency. The parameters are downloaded to the flash non-volatile memory during BTS installation based on the frequency plan for that particular licensee. The BTS transceiver will automatically tune to these frequencies at power-up. This data, or list of tuning frequencies, is required in order for the base station to transmit; if lost or corrupted the system will not transmit. There is no user accessible way of retuning the BTS.

Means for Frequency Stabilization

The frequency reference for the BTS is an extremely stable 13 MHz signal supplied by the Rubidium Oscillator module. The 13 MHz signal is then used to phase lock a 91

MHz Voltage Controlled Crystal Oscillator or VCXO. The 91 MHz signal is then used by the transmit IF and RF synthesizes to produce the local oscillators required for the upconversion.

Means for Harmonic Suppression

Conducted Harmonic Suppression- The upconverter stage contains a SAW band-pass filter centered at 836.5 MHz with a 25 MHz bandwidth. This SAW filter significantly reduces the level of out of band spurious emissions and transmitter harmonics. In addition, there is a duplexer filter connected in the transmit path after the output of the high power amplifier. This is to ensure that any certified amplifier can be connected between the transceiver output and the duplexer filter input and continue to meet the requirements.

The duplexer is a cavity based 8-pole filter tuned to the GSM 850 MHz transmit band (824 to 849 MHz). This filter provides additional attenuation of spurious emissions generated or passing through an amplifier (80 dB out-of-band suppression). Note that the spurious emissions of the transceiver are attenuated well below FCC defined limits and the duplexer is not required to meet the FCC requirements. It was not used to make any of the transmitter measurements that are part of this report.

Means for Limiting Power

The dynamic range of the wideband digital signal coming to the transceiver from the DSP board is set in an initialization file that is automatically downloaded at system power-up. This value is chosen to give the maximum power out of the transceiver for the desired maximum number of carriers, while preventing the digital output from overflowing and thus clipping the signals. The base station controller has the capability, through software download, of changing the combiner gain value to yield a lower maximum power level out of the transceiver. The level can only be decreased, not increased. The granularity of the control is in 1 dB steps. There are no other methods for a system user to vary the power level.

Per the PCS-1900/850 Air Interface Specification, the system provides 15 levels of dynamic power control in steps of 2 dB each. This variable attenuation is used by the power control algorithm running on the digital signal processor boards to optimize the power level of the signal from the base station to the mobile handset. (Only use as much power as necessary to achieve an acceptable signal to noise ratio (SNR).) When a traffic channel is first turned on, it is at maximum attenuation, i.e., 30 dB below maximum power. The power control algorithm will then continually optimize this level based on the strength of the received mobile signal. This power adjustment mechanism is automatic and implemented in DSP software.

All high power amplifiers that will be used will shutdown if their input signal level is too high, if the VSWR at the output port is too high, if the output power is too high, or if a number of other error conditions occur. This ensures that the BTS will not transmit at power levels higher than authorized should a system equipment failure occur.

Active Devices Info

-see BDX block diagram file

Frequency Stability

Temperature Deg. C	Frequency Error (ppm)	
	+20 VDC	+31 VDC
+50	0.007	0.006
+40	0.006	0.007
+30	0.008	0.007
+20	0.006	0.008
+10	0.008	0.006
0	0.008	0.007
-10	0.006	0.006
-20	0.002	0.006
-30	0.007	0.008

(ARFCN 189, Frequency = 881.4 MHz)