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3rd Generation Partnership Project 2
"3GPP2"

Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations

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NOTES

1. "Base station" refers to the functions performed on the land side, which are typically distributed among a cell, a sector of a cell, and a mobile switching center.
2. This standard uses the following verbal forms: "Shall" and "shall not" identify requirements to be followed strictly to conform to the standard and from which no deviation is permitted. "Should" and "should not" indicate that one of several possibilities is recommended as particularly suitable, without mentioning or excluding others; that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is discouraged but not prohibited. "May" and "need not" indicate a course of action permissible within the limits of the standard. "Can" and "cannot" are used for statements of possibility and capability, whether material, physical, or causal.
3. Unless indicated otherwise, this document presents numbers in decimal form. Binary numbers are distinguished in the text by the use of single quotation marks.
4. Those wishing to deploy systems compliant with this standard should also be compliant with Title 47, Parts 15, 22, and 24 of the Code of Federal Regulations.
5. The following operators define mathematical operations:

   × indicates multiplication.

   / indicates division.

   + indicates addition.

   - indicates subtraction.

   * indicates complex conjugation.

   $\lfloor x \rfloor$ indicates the largest integer less than or equal to x: $\lfloor 1.1 \rfloor = 1$, $\lfloor 1.0 \rfloor = 1$.

   $|x|$ indicates the absolute value of x: $|-17|=17$, $|17|=17$.
6. All E_b/N_0 requirements in this document are based on simulated data.
7. This Standard supports testing of base stations compliant with TIA/EIA-95-B and subsequent revisions.
8. Tests in this revision reference the *General Neighbor List Message* and the *General Handoff Direction Message* to maintain consistency with new tests which require the extended capability of these messages. Where possible, the *Neighbor List Message*, *Extended Neighbor List Message*, and the *Extended Handoff Direction Message* may be used.

NORMATIVE REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. ANSI and TIA maintain registers of currently valid national standards published by them.

ANSI C63.4-1992, *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*, July 1992.

CFR Title 47, *Code of Federal Regulations*, October 1998.

TIA/EIA-95-B, *Mobile Station-Base Station Compatibility Standard for Dual-Mode Spread Spectrum Systems,* 1998.

TIA/EIA-98-C, *Recommended Minimum Performance Standards for Dual-Mode Spread Spectrum Mobile Stations.*

TIA/EIA-126-B, *Mobile Station Loopback Service Options Standard.*

1 INTRODUCTION

1.1 Scope

This Standard details definitions, methods of measurement, and minimum performance requirements for Code Division Multiple Access (CDMA) base station supporting operation in the 800 MHz cellular band or the 1.8 to 2.0 GHz Personal Communications Services (PCS) band. This Standard shares the purpose of TIA/EIA-95-B (and subsequent revisions thereof) by ensuring that a mobile station can obtain service in any system that meets the compatibility requirements of TIA/EIA-95-B.

Compatibility, as used in connection with this Standard and TIA/EIA-95-B, is understood to mean that any mobile station is able to place and receive calls in any system. Conversely, all systems are able to place and receive calls with any mobile station.

To ensure compatibility, it is essential that both radio-system parameters and call-processing parameters be specified. The speech-processing, modulation, and RF-emission parameters reflect the unique radio plan upon which cellular and PCS systems are based. The sequence of call-processing steps that the mobile station and base station execute to establish calls has been specified in TIA/EIA-95-B along with the control messages that are exchanged between the two stations.

Although the most prevalent use of the cellular and PCS systems has been voice communications, services such as data may allow the omission of some of the features specified herein, provided that the system compatibility is not compromised.

This Standard concentrates specifically on the base station radio transmitting and receiving equipment; it covers the operation of the base station and the mobile switching center only to the extent that compatibility with TIA/EIA-95-B is ensured.

Test methods are recommended in this document; however, methods other that those recommended may suffice for the same purpose.

1.2 Terms and Definitions

Access Attempt. A sequence of one or more access probe sequences on the Access Channel containing the same message. See also Access Probe and Access Probe Sequence.

Access Channel. A Reverse CDMA Channel used by mobile stations for communicating to the base station. The Access Channel is used for short signaling message exchanges, such as call originations, responses to pages, and registrations. The Access Channel is a slotted random access channel.

Access Probe. One Access Channel transmission consisting of a preamble and a message. The transmission is an integer number of frames in length, and transmits one Access Channel message. See also Access Probe Sequence and Access Attempt.

Access Probe Sequence. A sequence of one or more access probes on the Access Channel. The same Access Channel message is transmitted in every access probe of an access attempt. See also Access Probe and Access Attempt.

AWGN. Additive White Gaussian Noise.

Band Class. A set of frequency channels and a numbering scheme for these channels.

Base Station. A fixed station used for communicating with mobile stations. Depending upon the context, the term base station may refer to a cell, a sector within a cell, an MSC, or other part of the cellular or PCS system. See also MSC.

CDMA. See Code Division Multiple Access.

CDMA Cellular System. The entire system supporting Domestic Public Cellular Service operation as embraced by this Standard.

CDMA Channel. The set of channels transmitted from the base station and the mobile stations on a given frequency.

CDMA Channel Number. An 11-bit number corresponding to the center of the CDMA frequency assignment.

CDMA Frequency Assignment. A 1.23 MHz segment of spectrum. For CDMA cellular systems, the channel is centered on one of the 30 kHz channels of the existing analog cellular system. For CDMA PCS systems, the channel is centered on one of the 50 kHz channels.

CDMA PCS System. The entire system supporting Personal Communications Services as embraced by this Standard.

Code Division Multiple Access (CDMA). A technique for spread-spectrum multiple-access digital communications that creates channels through the use of unique code sequences.

Code Channel. A subchannel of a Forward CDMA Channel. A Forward CDMA Channel contains 64 code channels. Code channel zero is assigned to the Pilot Channel. Code channels 1 through 7 may be assigned either to the Paging Channels or to the Traffic Channels. Code channel 32 may be assigned either to a Sync Channel or to a Traffic Channel. The remaining code channels may be assigned to Traffic Channels.

dBm. A measure of power expressed in terms of its ratio (in dB) to one milliwatt.

dBm/Hz. A measure of power spectral density. The ratio, dBm/Hz, is the power in one hertz of bandwidth, where power is expressed in units of dBm.

E_b. Energy per information bit for the Access Channel or Traffic Channel at the base station RF input port.

Effective Isotropic Radiated Power (EIRP). The product of the power supplied to the antenna and the antenna gain in a direction relative to an isotropic antenna.

Effective Radiated Power (ERP). The product of the power supplied to the antenna and the antenna gain in a direction relative to a half-wave dipole.

EIRP. See Effective Isotropic Radiated Power.

ERP. See Effective Radiated Power.

FER. Frame Error Rate of Forward Traffic Channel. The value of FER may be estimated by using Service Option 2 or 9 (see TIA/EIA-126-B).

Forward CDMA Channel. A CDMA Channel from a base station to mobile stations. The Forward CDMA Channel contains one or more code channels that are transmitted on a CDMA frequency assignment using a particular pilot PN offset. The code channels are associated with the Pilot Channel, Sync Channel, Paging Channels, and Traffic Channels. The Forward CDMA Channel always carries a Pilot Channel and can carry one Sync Channel, up to seven Paging Channels, and up to 63 Traffic Channels, as long as the total number of channels, including the Pilot Channel, is no greater than 64.

Forward Fundamental Code Channel. A Fundamental Code Channel which is transmitted on the Forward CDMA Channel.

Forward Supplemental Code Channel. A Supplemental Code Channel which is transmitted on the Forward CDMA Channel.

Forward Traffic Channel. One or more code channels used to transport user and signaling traffic from the base station to the mobile station. See Forward Fundamental Code Channel and Forward Supplemental Code Channel.

Frame. A basic timing interval in the system. For the Access Channel, Paging Channel, and Traffic Channel, a frame is 20 ms long. For the Sync Channel, a frame is 26.666... ms long.

Good Frame. A received frame is declared a good frame if it is received with the correct rate with no bit errors.

Line Impedance Stabilization Network (LISN). A network inserted in the supply mains lead of apparatus to be tested that provides, in a given frequency range, a specified load impedance for the measurement of disturbance voltages and that may isolate the apparatus from the supply mains in that frequency range.

LISN. See Line Impedance Stabilization Network.

Mobile Station. A station intended to be used while in motion or during halts at unspecified points. Mobile stations include portable units (e.g., hand-held personal units) and units installed in vehicles.

Mobile Switching Center (MSC). A configuration of equipment that provides cellular or PCS service.

N_0. The effective inband noise or interference power spectral density.

PCS. See Personal Communications Services.

PCS System. See Personal Communications Services System.

Personal Communication Services System. A configuration of equipment that provides PCS radiotelephone services.

Personal Communications Services (PCS). A family of mobile and portable radio communications services for individuals and businesses that may be integrated with a variety of competing networks. Broadcasting is prohibited and fixed operations are to be ancillary to mobile operations.

Pilot Channel. An unmodulated, direct-sequence spread spectrum signal transmitted continuously by each CDMA base station. The Pilot Channel allows a mobile station to acquire the timing of the Forward CDMA Channel, provides a phase reference for coherent demodulation, and provides a means for signal strength comparisons between base stations for determining when to perform a handoff.

Power Control Bit. A bit, sent in every 1.25 ms interval on the Forward Traffic Channel, to signal the mobile station to increase or decrease its transmit power.

Power Control Group. A 1.25 ms interval on the Forward Traffic Channel and the Reverse Traffic Channel. See also Power Control Bit.

ppm. Parts per million.

Rate Set. A set of Traffic Channel transmission formats that are characterized by physical layer parameters such as transmission rates, modulation characteristics, and error correcting coding schemes.

Received Signal Quality Indicator (RSQI). A Reverse Traffic Channel measure of signal quality related to the received E_b/N_0.

Reverse CDMA Channel. The CDMA Channel from the mobile station to the base station. From the base station’s perspective, the Reverse CDMA Channel is the sum of all mobile station transmissions on a CDMA frequency assignment.

Reverse Fundamental Code Channel. A Fundamental Code Channel which is transmitted on the Reverse CDMA Channel.

Reverse Supplemental Code Channel. A Supplemental Code Channel which is transmitted on the Reverse CDMA Channel.

Reverse Traffic Channel. A Traffic Channel on which data and signaling are transmitted from a mobile station to a base station. The Reverse Traffic Channel is composed of one Reverse Fundamental Code Channel and zero to seven Reverse Supplemental Code Channels.

RMS. Root of Mean Square.

RSQI. See Received Signal Quality Indicator.

Service Option 2. Mobile station data loopback test mode for Multiplex Option 1 as specified in TIA/EIA-126-B.

Service Option 9. Mobile station data loopback test mode for Multiplex Option 2 as specified in TIA/EIA-126-B.

Sync Channel. Code channel 32 in the Forward CDMA Channel, which transports the synchronization message to the mobile station.

System Time. The time reference used by the system. System Time is synchronous to UTC time (except for leap seconds) and uses the same time origin as Global Positioning System (GPS) time. All base stations use the same System Time (within a small error). Mobile stations use the same System Time, offset by the propagation delay from the base station to the mobile station. See also Universal Coordinated Time.

Traffic Channel. A communication path between a mobile station and a base station used for user and signaling traffic. The term Traffic Channel implies a Forward Traffic Channel and Reverse Traffic Channel pair. See also Forward Traffic Channel and Reverse Traffic Channel.

Universal Coordinated Time (UTC). An internationally agreed-upon time scale maintained by the Bureau International de l'Heure (BIH) used as the time reference by nearly all commonly available time and frequency distribution systems, e.g., WWV, WWVH, LORAN-C, Transit, Omega, and GPS.

UTC. Universal Temps Coordiné. See Universal Coordinated Time.

Valid Power Control Bit. A valid power control bit is sent on the Forward Traffic Channel in the second power control group following the corresponding Reverse Traffic Channel power control group which was not gated off and in which the signal was estimated. See 7.1.3.1.8 of TIA/EIA-95-B.

No text.

2 STANDARD EMISSIONS MEASUREMENT PROCEDURES

The measurement and calibration procedures described are intended to provide an overview of radiated and conducted signal measurements. A detailed description of the required measurement procedures is given in ANSI C63.4.

2.1 Radiated Emissions Measurement

2.1.1 Standard Radiation Test Site

The test site shall be on level ground that is of uniform electrical characteristics. The site shall be clear of metallic objects, overhead wires, etc., and shall be as free as possible from undesired signals, such as ignition noise and other carriers. Reflecting objects, such as rain gutters and power cables, shall lie outside an ellipse measuring 60 meters on the major axis by 52 meters on the minor axis for a 30-meter site, or an ellipse measuring 6 meters on the major axis by 5.2 meters on the minor axis for a 3-meter site. The equipment under test shall be located at one focus of the ellipse and the measuring antenna at the other focus. If desired, shelters may be provided at the test site to protect the equipment and personnel. All such construction shall be of wood, plastic, or other non-metallic material. All power, telephone, and control circuits to the site shall be buried at least 0.3 meter under ground.

A turntable, essentially flush with the ground, shall be provided that can be remotely controlled. A platform 1.2 meters high shall be provided on this turntable to hold the equipment under test. Any power and control cables that are used for this equipment should extend down to the turntable, and any excess cabling should be coiled on the turntable.

If the equipment to be tested is mounted in racks and is not easily removed for testing on the above platform, then the manufacturer may elect to test the equipment when it is mounted in its rack (or racks). In this case, the rack (or racks) may be placed directly on the turntable.

If a transmitter with an external antenna is being tested, then the RF output of this transmitter shall be terminated in a non-radiating load that is placed on the turntable. A non-radiating load is used in lieu of an antenna to avoid interference with other radio users. The RF cable to this load should be of minimum length. The transmitter shall be tuned and adjusted to its rated output value before starting the tests.

In order to conduct unintentional radiator tests as specified in the Code of Federal Regulations (CFR) Title 47, Part 15, subpart B, the radiation site must comply with ANSI C63.4 (5.4.6 through 5.5) as required by CFR Title 47, Part 2.948.

2.1.2 Search Antenna

For narrow-band dipole adjustable search antennas, the dipole length shall be adjusted for each measurement frequency. This length may be determined from a calibration ruler that is normally supplied with the equipment.

The search antenna shall be mounted on a movable non-metallic horizontal boom that can be raised or lowered on a wooden or other non-metallic pole. The cable connected to the search antenna shall be at a right angle to the antenna. The cable shall be dressed at least 3 meters, either through or along the horizontal boom, in a direction away from the equipment being measured. The search antenna cable may then be dropped from the end of the horizontal boom to ground level for connection to the field-strength measuring equipment.

The search antenna shall be capable of being rotated 90 degrees on the end of the horizontal boom to allow measurement of both vertically and horizontally polarized signals. When the antenna length of a vertically mounted antenna does not permit the horizontal boom to be lowered to its minimum specified search range, adjust the minimum height of the boom for 0.3 meter clearance between the end of the antenna and the ground.

2.1.3 Field-Strength Measurement

A field-strength meter shall be connected to a search antenna. The field-strength meter shall have sufficient sensitivity and selectivity to measure signals over the required frequency ranges at levels at least 10 dB below the levels specified in any document, standard, or specification that references this measurement procedure. The calibration of the measurement instruments (field-strength meter, antennas, etc.) shall be checked frequently to ensure that their accuracy is in accordance with the current standards. Such calibration checks shall be performed at least once per year.

2.1.4 Frequency Range of Measurements

When measuring radiated signals from transmitting equipment, the measurements shall be made from the lowest radio frequency (but no lower than 25 MHz) generated in the equipment to the tenth harmonic of the carrier, except for that region close to the carrier equal to ±250% of the authorized bandwidth.

When measuring radiated signals from receiving equipment, the measurements shall be made from 25 MHz to at least 6 GHz.

2.1.5 Test Ranges

2.1.5.1 30-Meter Test Range

Measurement of radiated signals shall be made at a point 30 meters from the center of the turntable. The search antenna is to be raised and lowered from 1 to 4 meters in both horizontally and vertically polarized orientations.

The field-strength measuring meter may be placed on a suitable table or tripod at the foot of the mast.

When measuring radiated emissions from receivers, equipment that contains its own receive antenna shall be tested with the antenna in place. Equipment that is connected to an external receive antenna via a cable shall be tested without the antenna, and the receive ports on the equipment under test shall be terminated in a 50Ω non-radiating resistive load.

2.1.5.2 3-Meter Test Range

Measurement of radiated signals may be made at a point 3 meters from the center of the turntable, provided the following three conditions can be met:

1. A ground screen that covers an elliptical area at least 6 meters on the major axis by 5.2 meters on the minor axis is used, with the measuring antenna and turntable mounted 3 meters apart. The measuring antenna and turntable shall lie on the major axis and shall be equidistant from the minor axis of the elliptical area.
2. The maximum dimension of the equipment shall be 3 meters or less. When measuring radiated signals from receivers, the maximum dimension shall include the antenna if it is an integral part of the device.
3. The field-strength measuring equipment is either mounted below the ground level at the test site or is located a sufficient distance away from the equipment being tested and from the search antenna to prevent corruption of the measured data.

The search antenna is to be raised and lowered over a range from 1 to 4 meters in both horizontally and vertically polarized orientations. When the search antenna is vertically oriented, the minimum height of the center of the search antenna shall be defined by the length of the lower half of the search antenna.

When measuring radiated emissions from receivers, equipment that contains its own receive antenna shall be tested with the antenna in place. Equipment that is connected to an external receive antenna via a cable shall be tested without the antenna, and the receive ports on the equipment under test shall be terminated in a 50Ω non-radiating resistive load. The 3-meter test range may be used for determining compliance with limits specified at 30 meters (or other distances), provided that:

1. The ground reflection variations between the two distances have been calibrated for the frequencies of interest at the test range, or
2. A 5 dB correction factor is added to the specified radiation limit(s) to allow for average ground reflections.

Radiated field strength (volt/meter) varies inversely with distance, so that a measurement made on the 3-meter test range divided by 10 gives the equivalent value that would be measured on a 30-meter test range for the same EIRP (effective isotropic radiated power). The 30-meter field strength in volt/meter can be calculated from the EIRP by using the following formula:

$$\mu V/m \text{ @ } 30 \text{ meters} = 5773.5 \times 10^{EIRP(dBm)/20}$$

2.1.6 Radiated Signal Measurement Procedures

Radiated signals having significant levels shall be measured on the 30-meter or 3-meter test range by using the following procedure:

1. For each observed radiated signal, raise and lower the search antenna to obtain a maximum reading on the field-strength meter with the antenna horizontally polarized. Then rotate the turntable to maximize the reading. Repeat this procedure

of raising and lowering the antenna and rotating the turntable until the highest possible signal has been obtained. Record this maximum reading.

2. Repeat step 1 for each observed radiated signal with the antenna vertically polarized.
3. Remove the equipment being tested and replace it with a half-wave antenna. The center of the half-wave antenna should be at the same approximate location as the center of the equipment being tested.
4. Feed the half-wave antenna replacing the equipment under test with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to the observed radiated signal, raise and lower the search antenna to obtain a maximum reading on the field-strength measuring meter. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. Record the signal generator power output.
5. Repeat step 4 above with both antennas vertically polarized.
6. Calculate the power into a reference ideal isotropic antenna by:
   a. First reducing the readings obtained in steps 4 and 5 above by the power loss in the cable between the generator and the source antenna, and
   b. Then correcting for the gain of the source antenna used relative to an ideal isotropic antenna. The reading thus obtained is the equivalent effective isotropic radiated power (EIRP) level for the spurious signal being measured.
7. Repeat steps 1 through 6 above for all observed signals from the equipment being tested.

2.2 AC Powerline Conducted Emissions Measurement

2.2.1 Standard AC Powerline Conducted Emissions Test Site

The test site shall be on level ground that is covered with an earth-grounded, conductive surface that is at least 2 meters by 2 meters in size. The ground plane shall extend at least 0.5 meter beyond the foot print of the equipment under test.

A vertical conducting plane is optional for a standard (open area) test site and is only required for measurements made on table-top devices. If a vertical conducting plane is used, it shall be at least 2 meters by 2 meters in size and shall be electrically attached to the conductive ground plane at maximum intervals of one meter along its entire length.

2.2.2 Line Impedance Stabilization Network (LISN) Unit

A Line Impedance Stabilization Network (LISN) shall be used for equipment that is tested on a standard test site and connects directly to the public utility powerline, or receives power from a device that connects to the public utility powerline. The LISN shall be placed on top of or directly underneath the conductive ground plane and shall be electrically grounded to it. Powerline filters between the power source and LISN may be used to reduce the ambient noise level on the public utility line.

2.2.3 Standard Test Site Measurements

2.2.3.1 Floor Standing Equipment

Floor standing equipment shall be placed directly on the conductive ground plane. If a vertical conducting plane is used, the equipment under test shall be located 40 cm from the vertical conducting surface. All other conductive objects (including the LISN) shall be located at least 80 cm from any surface on the equipment under test.

2.2.3.2 Table Top Mounted Equipment

Table top equipment shall be placed on top of a non-conductive platform, with nominal long dimension of 1.5 meters, and located 80 cm above the horizontal conducting ground plane. The equipment under test shall be placed 40 cm from the vertical conductive surface, with all other conductive objects located at least 80 cm from any surface on the equipment under test.

2.2.3.3 Measurement Procedure

A radio noise meter employing a quasi-peak detector shall be used to test for radio noise between each current carrying conductor and the ground conductor. Each current carrying conductor shall be tested individually with all unused connections on the LISN terminated in a 50Ω resistive load. The ground (safety) conductor on the equipment under test shall be individually connected to the power source through the LISN. Any adapters used between the LISN power socket and the equipment under test shall be no more than 20 cm long and shall contain only one input and only one output.

The equipment under test shall be tested in various modes of operation with numerous cable orientations. The emissions level shall be recorded for the mode of operation and cable orientation that maximizes the radio noise level. This maximizing technique shall be repeated for measurements on each current carrying conductor.

2.2.3.4 Frequency Range of Measurements

When measuring AC powerline conducted emissions, the measurements shall be made at frequencies between 450 kHz and 30 MHz.

2.2.4 End User or Manufacturing Plant Test Sites

For equipment that cannot be tested at a standard (open area) test site, an AC powerline conducted emissions test may be performed at the end user’s location or at the manufacturing plant. Refer to ANSI C63.4, Section 5.6 for specifications and requirements of such tests.

No text.

3 CDMA RECEIVER MINIMUM STANDARDS

The CDMA base station receiving equipment shall include two diversity RF input ports. Receiver tests employ both inputs, unless otherwise specified. The equipment setups referenced in this section are functional. Other configurations may be necessary for actual testing due to equipment limitations and tolerances.

All tests in the section shall be performed for each band class supported by the base station.

3.1 Frequency Requirements

3.1.1 Frequency Coverage

The RF channel numbers and frequencies are given for dual-mode base stations and mobile stations in 3.1.1.1 and 3.1.1.2. The base station receive CDMA frequency assignments are associated on a one-to-one basis with the transmit CDMA frequency assignments. Each CDMA frequency assignment shall be centered at one of the indicated frequencies. The base station receiver may be fixed tuned to a specific CDMA frequency assignment or may be designed to cover a subset of the available frequency assignments. The base station shall support at least one of the preferred CDMA channels for each band class supported.

3.1.1.1 Cellular Band

The channel spacings, CDMA channel designations, and transmit center frequencies for Band Class 0 shall be as specified in Table 3.1.1.1-1. The Band Class 0 channel numbers are shown in Table 3.1.1.1-2. The preferred set of CDMA frequency assignments for Band Class 0 is given in Table 3.1.1.1-3.

Table 3.1.1.1-1. CDMA Channel Number to CDMA Frequency Assignment Correspondence for Band Class 0

Transmitter	CDMA Channel Number	CDMA Frequency Assignment (MHz)
Mobile Station	$1 \le N \le 777$	0.030 N + 825.000
	$1013 \le N \le 1023$	0.030 (N-1023) + 825.000
Base Station	$1 \le N \le 777$	0.030 N + 870.000
	$1013 \le N \le 1023$	0.030 (N-1023) + 870.000

Table 3.1.1.1-2. CDMA Channel Numbers and Corresponding Frequencies for Band Class 0

Block Designator	CDMA Channel Validity	CDMA Channel Number	Transmit Frequency Band (MHz)	
			Mobile Station	Base Station
A" (1 MHz)	Not Valid Valid	991-1012 1013-1023	824.040–824.670 824.700-825.000	869.040-869.670 869.700-870.000
A (10 MHz)	Valid Not Valid	1-311 312-333	825.030-834.330 834.360-834.990	870.030-879.330 879.360-879.990
B (10 MHz)	Not Valid Valid Not Valid	334-355 356-644 645-666	835.020-835.650 835.680-844.320 844.350-844.980	880.020-880.650 880.680-889.320 889.350-889.980
A' (1.5 MHz)	Not Valid Valid Not Valid	667-688 689-694 695-716	845.010-845.640 845.670-845.820 845.850-846.480	890.010-890.640 890.670-890.820 890.850-891.480
B' (2.5 MHz)	Not Valid Valid Not Valid	717-738 739-777 778-799	846.510-847.140 847.170-848.310 848.340-848.970	891.510-892.140 892.170-893.310 893.340-893.970

Table 3.1.1.1-3. CDMA Preferred Set of Frequency Assignments for Band Class 0

System Designator	Preferred Set Channel Numbers
A	283 (Primary) and 691 (Secondary)
B	384 (Primary) and 777 (Secondary)

3.1.1.2 PCS Band

The channel spacings, CDMA channel designations, and transmit center frequencies for Band Class 1 shall be as specified in Table 3.1.1.2-1. The Band Class 1 channel numbers are shown in Table 3.1.1.2-2. The preferred set of CDMA frequency assignments for Band Class 1 is given in Table 3.1.1.2-3.

Table 3.1.1.2-1. CDMA Channel Number to CDMA Frequency Assignment Correspondence for Band Class 1

Transmitter	CDMA Channel Number	Center Frequency of CDMA Channel (MHz)
Mobile Station	0 ≤ N ≤ 1199	1850.000 + 0.050 N
Base Station	0 ≤ N ≤ 1199	1930.000 + 0.050 N

Table 3.1.1.2-2. CDMA Channel Numbers and Corresponding Frequencies for Band Class 1

Block Designator	CDMA Channel Validity	CDMA Channel Number	Transmit Frequency Band (MHz)	
			Mobile Station	Base Station
A (15 MHz)	Not Valid	0–24	1850.000–1851.200	1930.000–1931.200
	Valid	25–275	1851.250–1863.750	1931.250–1943.750
	Cond. Valid	276–299	1863.800–1864.950	1943.800–1944.950
D (5 MHz)	Cond. Valid	300–324	1865.000–1866.200	1945.000–1946.200
	Valid	325–375	1866.250–1868.750	1946.250–1948.750
	Cond. Valid	376–399	1868.800–1869.950	1948.800–1949.950
B (15 MHz)	Cond. Valid	400–424	1870.000–1871.200	1950.000–1951.200
	Valid	425–675	1871.250–1883.750	1951.250–1963.750
	Cond. Valid	676–699	1883.800–1884.950	1963.800–1964.950
E (5 MHz)	Cond. Valid	700–724	1885.000–1886.200	1965.000–1966.200
	Valid	725–775	1886.250–1888.750	1966.250–1968.750
	Cond. Valid	776–799	1888.800–1889.950	1968.800–1969.950
F (5 MHz)	Cond. Valid	800–824	1890.000–1891.200	1970.000–1971.200
	Valid	825–875	1891.250–1893.750	1971.250–1973.750
	Cond. Valid	876–899	1893.800–1894.950	1973.800–1974.950
C (15 MHz)	Cond. Valid	900–924	1895.000–1896.200	1975.000–1976.200
	Valid	925–1175	1896.250–1908.750	1976.250–1988.750
	Not Valid	1176–1199	1908.800–1909.950	1988.800–1989.950

Table 3.1.1.2-3. CDMA Preferred Set of Frequency Assignments for Band Class 1

Block Designator	Preferred Set Channel Numbers
A	25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 275
D	325, 350, 375
B	425, 450, 475, 500, 525, 550, 575, 600, 625, 650, 675
E	725, 750, 775
F	825, 850, 875
C	925, 950, 975, 1000, 1025, 1050, 1075, 1100, 1125, 1150, 1175

3.1.2 Reserved

3.2 Mobile Station Access Probe Acquisition

3.2.1 Definition

Access probe acquisition performance is measured by the probability of successful access per probe at specified values of received E_b/N_0.

3.2.2 Method of Measurement

Refer to Figure 6.5.1-1 for a functional block diagram of the test setup.

1. Configure the base station under test and a mobile station simulator as shown in Figure 6.5.1-1.
2. Adjust the Additive White Gaussian Noise (AWGN) generators so that the noise power at each base station RF input port is at least -90 dBm/1.23 MHz.
3. Set the fields of the *Access Parameters Message* as follows:

ACC_CHAN	0
NOM_PWR	0
INIT_PWR	0
PWR_STEP	0
NUM_STEP	6
MAX_REQ_SEQ	1
MAX_RSP_SEQ	1
Remaining Parameters	As specified by manufacturer

4. Disable all forms of registration.
5. Retrieve the initial number of access attempts from the mobile station simulator. This may be done by using the *Retrieve Parameters Message.*
6. Adjust the equipment so that the access probe E_b/N_0 at each RF input port is no more than the desired value shown in Table 3.2.3-1.
7. Page the mobile station simulator. The E_b/N_0 of the forward link at the mobile station simulator should be sufficiently high so that the message error rate is negligible.
8. Retrieve the total number of access attempts from the mobile station simulator.
9. Compute the probe failure rate from the number of attempts and the number of successes recorded by the base station.
10. Repeat steps 7-9 until a pass or fail condition has been achieved in accordance with the confidence calculation described in 6.8.

3.2.3 Minimum Standard

The access probe failure rate shall be less than the maximum values shown in Table 3.2.3-1 with 90% confidence (see 6.8).

Table 3.2.3-1. Maximum Access Probe Failure Rates

E_b/N_0 per RF Input Port (dB)	Maximum Failure Rate
5.5	0.5
6.5	0.1

3.3 Demodulation Requirements

The tests in this section verify the demodulation performance of the Reverse Traffic Channel under AWGN and fading conditions.

3.3.1 Performance in Additive White Gaussian Noise (Reverse Traffic Channel)

3.3.1.1 Definition

The demodulation performance of the Reverse Traffic Channel in an AWGN (no fading or multipath) environment is determined by the frame error rate (FER) at specified values of E_b/N_0. The FER is calculated for each of the four possible data rates. Refer to 6.7 for the definition of FER.

3.3.1.2 Method of Measurement

Refer to Figure 6.5.1-1 for a functional block diagram of the test setup.

1. Configure the base station under test and a mobile station simulator as shown in Figure 6.5.1-1.
2. Adjust the AWGN generators to yield a noise power spectral density of -84 dBm/1.23 MHz ±5 dB at each base station receiver input.
3. Adjust the equipment so that the Reverse Traffic Channel E_b/N_0 at each RF input port is within the range specified below:

Rate Set	E_b/N_0 Limits (dB)	
	Lower	**Upper**
1	4.1	4.7
2	3.2	3.8

   Reverse Traffic Channel closed loop power control in the mobile station simulator shall be disabled (see 6.4.3).

4. Set up a call using Rate Set 1 loopback mode (Service Option 2).
5. Transmit random data to the mobile station simulator at each of the four data rates. This may be done either as separate single rate tests or as one mixed rate test.
6. For each of the four data rates, measure the frame error rate as described in 6.7.
7. If Rate Set 2 is supported, repeat steps 3 through 6 using Rate Set 2 loopback mode (Service Option 9).

3.3.1.3 Minimum Standard

With 95% confidence (see 6.8), the FER for each data rate shall not exceed that given by linear interpolation on a $\log_{10}$ scale between the two values given in Tables 3.3.1.3-1 and 3.3.1.3-2 at the larger of the E_b/N_0 values at the two RF input ports. The interpolated value, FER_{lim}, is given by

$$\log_{10}(FER_{lim}) = \log_{10}(FER_{upper}) + \left(\frac{(E_b/N_0)_{upper} - (E_b/N_0)_{meas}}{(E_b/N_0)_{upper} - (E_b/N_0)_{lower}}\right) \times [\log_{10}(FER_{lower}) - \log_{10}(FER_{upper})]$$

where the subscripts 'upper' and 'lower' refer to E_b/N_0 limits described in 3.3.1.2 and FER entries in Tables 3.3.1.3-1 and 3.3.1.3-2. $(E_b/N_0)_{meas}$ is the measured value in dB.

Table 3.3.1.3-1. Maximum FER for Rate Set 1 Receiver Demodulation Performance Tests in Additive White Gaussian Noise

Data Rate (bps)	FER Limits (%)	
	At Lower E_b/N_0	At Upper E_b/N_0
9600	2.5 (for Band Class 0) 3.0 (for Band Class 1)	0.2
4800	6.6 (for Band Class 0) 8.0 (for Band Class 1)	0.9 (for Band Class 0) 1.0 (for Band Class 1)
2400	23.0 (for Band Class 0) 12.0 (for Band Class 1)	5.0 (for Band Class 0) 4.0 (for Band Class 1)
1200	9.4 (for Band Class 0) 22.0 (for Band Class 1)	3.2 (for Band Class 0) 6.0 (for Band Class 1)

Table 3.3.1.3-2. Maximum FER for Rate Set 2 Receiver Demodulation Performance Tests in Additive White Gaussian Noise

Data Rate (bps)	FER Limits (%)	
	At Lower E_b/N_0	At Upper E_b/N_0
14400	4.7 (for Band Class 0) 5.0 (for Band Class 1)	0.2
7200	6.3 (for Band Class 0) 6.0 (for Band Class 1)	0.7
3600	5.6 (for Band Class 0) 5.8 (for Band Class 1)	1.0
1800	3.4 (for Band Class 0) 3.5 (for Band Class 1)	1.0

3.3.2 Performance in Multipath Fading (Reverse Traffic Channel) without Closed Loop Power Control

3.3.2.1 Definition

The performance of the demodulation of the Reverse Traffic Channel in a multipath fading environment is determined by the frame error rate (FER) at specified values of

E_b/N_0. The FER is calculated for each of the four possible data rates. Refer to 6.7 for the definition of FER.

3.3.2.2 Method of Measurement

Refer to Figure 6.5.1-2 for a functional block diagram of the test setup.

1. Configure both the base station under test and a mobile station simulator as shown in Figure 6.5.1-2.
2. Adjust the AWGN generators to yield a noise power spectral density of -84 dBm/1.23 MHz ±5 dB at each base station receiver input.
3. Adjust the equipment so that the mean Reverse Traffic Channel E_b/N_0 at each RF input port is within the range specified for case A below:

Rate Set	Case	Channel Simulator Configuration Number	E_b/N_0 Limits (dB) Lower	Upper
1	A	1 (8 km/h, 2 paths)	11.1 (for Band Class 0) 10.4 (for Band Class 1)	11.7 (for Band Class 0) 11.0 (for Band Class 1)
	B	2 (30 km/h, 1 path)	11.2 (for Band Class 0) 9.0 (for Band Class 1)	11.8 (for Band Class 0) 9.6 (for Band Class 1)
	C	3 (100 km/h, 3 paths)	8.8 (for Band Class 0) 8.0 (for Band Class 1)	9.4 (for Band Class 0) 8.6 (for Band Class 1)
	D	3 (100 km/h, 3 paths)	9.2 (for Band Class 0) 8.4 (for Band Class 1)	9.8 (for Band Class 0) 9.0 (for Band Class 1)
2	A	1 (8 km/h, 2 paths)	10.7 (for Band Class 0) 9.9 (for Band Class 1)	11.3 (for Band Class 0) 10.5 (for Band Class 1)
	B	2 (30 km/h, 1 path)	Not required	
	C	3 (100 km/h, 3 paths)	8.5 (for Band Class 0) 7.7 (for Band Class 1)	9.1 (for Band Class 0) 8.3 (for Band Class 1)
	D	3 (100 km/h, 3 paths)	8.9 (for Band Class 0) 8.1 (for Band Class 1)	9.5 (for Band Class 0) 8.7 (for Band Class 1)

Reverse Traffic Channel closed loop power control in the mobile station simulator shall be disabled (see 6.4.3). Refer to 6.4.1 for the standard channel simulator configurations.

4. Set up a call in Rate Set 1 loopback mode (Service Option 2).

5. Transmit random data to the mobile station simulator at each of the four data rates. This may be done either as separate single rate tests or as one mixed rate test.
6. For each of the four data rates, measure the frame error rate as described in 6.7.
7. Repeat steps 3-6 for cases B and C.
8. If case C results in an FER of greater than 0.5%, repeat steps 3 through 7 for case D.
9. If Rate Set 2 is supported, repeat steps 3 through 8 for cases A, C, and D using Rate Set 2 loopback mode (Service Option 9).

3.3.2.3 Minimum Standard

With 95% confidence (see 6.8), the FER for each data rate shall not exceed that given by linear interpolation on a $\log_{10}$ scale between the two values given in Tables 3.3.2.3-1 and 3.3.2.3-2 at the average of the two E_b/N_0 values measured in dB at the two RF input ports. The interpolated value, FER_{lim}, is given by

$$\log_{10}(FER_{lim}) = \log_{10}(FER_{upper}) + \left(\frac{(E_b/N_0)_{upper} - (E_b/N_0)_{meas}}{(E_b/N_0)_{upper} - (E_b/N_0)_{lower}}\right) \times [\log_{10}(FER_{lower}) - \log_{10}(FER_{upper})]$$

where the subscripts ‘upper’ and ‘lower’ refer to E_b/N_0 limits described in 3.3.1.2 and FER entries in Tables 3.3.2.3-1 and 3.3.2.3-2. $(E_b/N_0)_{meas}$ is the measured value in dB.

Table 3.3.2.3-1. Maximum FER for Rate Set 1 Receiver Demodulation Performance Tests in Multipath Fading

Case	Data Rate (bps)	FER Limits (%)	
		At Lower E_b/N_0	At Upper E_b/N_0
A	9600	1.3	0.8 (for Band Class 0) 0.7 (for Band Class 1)
	4800	1.4 (for Band Class 0) 1.3 (for Band Class 1)	0.9 (for Band Class 0) 0.8 (for Band Class 1)
	2400	1.6 (for Band Class 0) 2.0 (for Band Class 1)	1.2
	1200	1.3	0.9 (for Band Class 0) 0.7 (for Band Class 1)
B	9600	1.2 (for Band Class 0) 1.6 (for Band Class 1)	0.7
	4800	1.4 (for Band Class 0) 3.0 (for Band Class 1)	0.9 (for Band Class 0) 2.0 (for Band Class 1)
	2400	2.5 (for Band Class 0) 6.0 (for Band Class 1)	1.7 (for Band Class 0) 3.8 (for Band Class 1)
	1200	2.0 (for Band Class 0) 6.0 (for Band Class 1)	1.4 (for Band Class 0) 4.0 (for Band Class 1)
C	9600	1.6 (for Band Class 0) 2.5 (for Band Class 1)	0.6 (for Band Class 0) 0.5 (for Band Class 1)
	4800	2.6 (for Band Class 0) 4.2 (for Band Class 1)	1.2 (for Band Class 0) 1.3 (for Band Class 1)
	2400	6.4 (for Band Class 0) 12.0 (for Band Class 1)	3.4 (for Band Class 0) 6.0 (for Band Class 1)
	1200	5.6 (for Band Class 0) 9.0 (for Band Class 1)	3.5 (for Band Class 0) 5.5 (for Band Class 1)
D	9600	0.9 (for Band Class 0) 0.8 (for Band Class 1)	0.3 (for Band Class 0) 0.2 (for Band Class 1)
	4800	1.6 (for Band Class 0) 2.0 (for Band Class 1)	0.7
	2400	4.2 (for Band Class 0) 8.0 (for Band Class 1)	2.3 (for Band Class 0) 3.8 (for Band Class 1)
	1200	4.1 (for Band Class 0) 6.5 (for Band Class 1)	2.6 (for Band Class 0) 4.0 (for Band Class 1)

Table 3.3.2.3-2. Maximum FER for Rate Set 2 Receiver Demodulation Performance Tests in Multipath Fading

Case	Data Rate (bps)	FER Limits (%)	
		At Lower E_b/N_0	At Upper E_b/N_0
A	14400	1.3 (for Band Class 0) 1.5 (for Band Class 1)	0.8
	7200	1.0	0.5 (for Band Class 0) 0.6 (for Band Class 1)
	3600	0.7 (for Band Class 0) 0.8 (for Band Class 1)	0.4 (for Band Class 0) 0.5 (for Band Class 1)
	1800	0.6 (for Band Class 0) 0.5 (for Band Class 1)	0.5 (for Band Class 0) 0.2 (for Band Class 1)
C	14400	1.7 (for Band Class 0) 2.0 (for Band Class 1)	0.6 (for Band Class 0) 0.6 (for Band Class 1)
	7200	1.6 (for Band Class 0) 2.0 (for Band Class 1)	0.6 (for Band Class 0) 0.7 (for Band Class 1)
	3600	1.5 (for Band Class 0) 2.7 (for Band Class 1)	0.9 (for Band Class 0) 1.2 (for Band Class 1)
	1800	2.2 (for Band Class 0) 3.3 (for Band Class 1)	1.2 (for Band Class 0) 1.8 (for Band Class 1)
D	14400	0.9	0.3
	7200	0.9 (for Band Class 0) 1.0 (for Band Class 1)	0.4
	3600	1.1 (for Band Class 0) 1.6 (for Band Class 1)	0.6 (for Band Class 0) 0.7 (for Band Class 1)
	1800	1.5 (for Band Class 0) 2.2 (for Band Class 1)	0.9 (for Band Class 0) 1.1 (for Band Class 1)

3.3.3 Performance in Multipath Fading (Reverse Traffic Channel) with Closed Loop Power Control

3.3.3.1 Definition

The performance of the demodulation of Reverse Traffic Channel with closed loop power control in a multipath fading environment is determined by the frame error rate

(FER) at specified values of E_b/N_0. The FER is calculated for each of the four possible data rates. Refer to 6.7 for the definition of FER.

3.3.3.2 Method of Measurement

Refer to Figure 6.5.1-2 for a functional block diagram of the test setup.

1. Configure both the base station under test and a mobile station simulator as shown in Figure 6.5.1-2.
2. Adjust the AWGN generators to yield a noise power spectral density of -84 dBm/1.23 MHz ± 5 dB at each base station receiver input.
3. Adjust the equipment so that the mean Reverse Traffic Channel E_b/N_0 at each RF input port is within the range specified for case A below:

Rate Set	Case	Channel Simulator Configuration Number	E_b/N_0 Limits (dB) Lower	Upper
1	A	1 (8 km/h, 2 paths)	5.9 (for Band Class 0) 6.3 (for Band Class 1)	6.5 (for Band Class 0) 6.9 (for Band Class 1)
	B	2 (30 km/h, 1 path)	7.1 (for Band Class 0) 7.6 (for Band Class 1)	7.7 (for Band Class 0) 8.2 (for Band Class 1)
2	A	1 (8 km/h, 2 paths)	5.2 (for Band Class 0) 5.8 (for Band Class 1)	5.8 (for Band Class 0) 6.4 (for Band Class 1)
	B	2 (30 km/h, 1 path)	7.7 (for Band Class 0) 8.3 (for Band Class 1)	8.3 (for Band Class 0) 8.9 (for Band Class 1)

Reverse Traffic Channel closed loop power control in the mobile station simulator shall be enabled. Refer to 6.4.1 for the standard channel simulator configurations.

4. Set up a call using Rate Set 1 loopback mode (Service Option 2).
5. Transmit random data to the mobile station simulator at each of the four data rates. This may be done either as separate single rate tests or as one mixed rate test.
6. For each of the four data rates, measure the FER as described in 6.7.
7. Repeat steps 3 through 6 for case B.
8. If Rate Set 2 is supported, repeat steps 3 through 7 using Rate Set 2 loopback mode (Service Option 9).

3.3.3.3 Minimum Standard

With 95% confidence (see 6.8), the FER for each data rate shall not exceed that given by linear interpolation on a $\log_{10}$ scale between the two values given in 3.3.3.3-1 and 3.3.3.3-2 at the average of the two E_b/N_0 values measured in dB at the two RF input ports. The interpolated value, FER_{lim}, is given by

$$\log_{10}(FER_{lim}) = \log_{10}(FER_{upper}) + \left(\frac{(E_b/N_0)_{upper} - (E_b/N_0)_{meas}}{(E_b/N_0)_{upper} - (E_b/N_0)_{lower}}\right) \times [\log_{10}(FER_{lower}) - \log_{10}(FER_{upper})]$$

where the subscripts “upper” and “lower” refer to entries in Tables 3.3.3.3-1 and 3.3.3.3-2. $(E_b/N_0)_{meas}$ is the measured value in dB.

Table 3.3.3.3-1. Maximum FER for Rate Set 1 Demodulation Performance Tests in Multipath Fading

Case	Data Rate (bps)	FER Limits (%)	
		At Lower E_b/N_0	At Upper E_b/N_0
A	9600	2.8 (for Band Class 0) 2.4 (for Band Class 1)	0.3 (for Band Class 0) 0.4 (for Band Class 1)
	4800	7.6 (for Band Class 0) 10.0 (for Band Class 1)	2.2 (for Band Class 0) 4.5 (for Band Class 1)
	2400	23.0 (for Band Class 0) 20.0 (for Band Class 1)	12.0 (for Band Class 0) 15.0 (for Band Class 1)
	1200	22.0 (for Band Class 0) 25.0 (for Band Class 1)	14.0 (for Band Class 0) 16.0 (for Band Class 1)
B	9600	1.5 (for Band Class 0) 1.7 (for Band Class 1)	0.7
	4800	8.0 (for Band Class 0) 6.0 (for Band Class 1)	4.8 (for Band Class 0) 3.0 (for Band Class 1)
	2400	18.0 (for Band Class 0) 13.0 (for Band Class 1)	13.0 (for Band Class 0) 9.0 (for Band Class 1)
	1200	16.0 (for Band Class 0) 13.0 (for Band Class 1)	12.0 (for Band Class 0) 9.0 (for Band Class 1)

Table 3.3.3.3-2. Maximum FER for Rate Set 2 Demodulation Performance Tests in Multipath Fading

Case	Data Rate (bps)	FER Limits (%)	
		At Lower E_b/N_0	At Upper E_b/N_0
A	14400	2.8 (for Band Class 0) 1.8 (for Band Class 1)	0.4 (for Band Class 0) 0.5 (for Band Class 1)
	7200	4.7 (for Band Class 0) 6.0 (for Band Class 1)	1.3 (for Band Class 0) 3.0 (for Band Class 1)
	3600	8.7 (for Band Class 0) 13.0 (for Band Class 1)	4.6 (for Band Class 0) 8.0 (for Band Class 1)
	1800	15.0 (for Band Class 0) 12.0 (for Band Class 1)	9.8 (for Band Class 0) 7.0 (for Band Class 1)
B	14400	1.3	0.7
	7200	3.2 (for Band Class 0) 1.6 (for Band Class 1)	1.8 (for Band Class 0) 1.0 (for Band Class 1)
	3600	4.7 (for Band Class 0) 2.3 (for Band Class 1)	3.5 (for Band Class 0) 1.5 (for Band Class 1)
	1800	5.2 (for Band Class 0) 3.6 (for Band Class 1)	3.9 (for Band Class 0) 2.6 (for Band Class 1)

3.4 Receiver Performance

3.4.1 Receiver Sensitivity

3.4.1.1 Definition

The receiver sensitivity of the base station receiver is defined as the minimum received power, measured at the base station RF input ports, at which the Reverse Traffic Channel FER is maintained at 1%.

3.4.1.2 Method of Measurement

Refer to Figure 6.5.1-1 for a functional block diagram of the test setup.

1. Configure the base station under test and a mobile station simulator as shown in Figure 6.5.1-1.
2. Adjust the equipment to ensure that a signal power of -117 dBm (for Band Class 0) or -119 dBm (for Band Class 1) per RF input port is not exceeded.

Reverse Traffic Channel closed loop power control in the mobile station simulator should be disabled (see 6.4.3).

3. Disable the AWGN generators (set their output powers to zero).
4. Set up a call using Rate Set 1 loopback mode (Service Option 2).
5. Transmit random data to the mobile station simulator at full data rate.
6. Measure the frame error rate as described in 6.7.

3.4.1.3 Minimum Standard

The FER shall be 1.0% or less with 95% confidence (see 6.8).

3.4.2 Receiver Dynamic Range

3.4.2.1 Definition

The receiver dynamic range is the input power range at the base station RF input ports over which the FER does not exceed a specific value. Its lower limit is the sensitivity as measured by the test in 3.4.1. Its upper limit is the maximum total power per RF input port at which an FER of 1% is maintained.

3.4.2.2 Method of Measurement

Refer to Figure 6.5.1-1 for a functional block diagram of the test setup.

1. Configure the base station under test and a mobile station simulator as shown in Figure 6.5.1-1.
2. Adjust the equipment for a noise power spectral density at each RF input port of not less than -65 dBm/1.23 MHz and a signal power corresponding to an E_b/N_0 of 10 dB ±1 dB. Reverse Traffic Channel closed loop power control in the mobile station simulator may be disabled (see 6.4.3).
3. Set up a call using Rate Set 1 loopback mode (Service Option 2).
4. Transmit random data to the mobile station simulator at full data rate.
5. Measure the frame error rate as described in 6.7.

3.4.2.3 Minimum Standard

The FER shall be 1.0% or less with 95% confidence (see 6.8).

3.4.3 Single Tone Desensitization

3.4.3.1 Definition

Single tone desensitization is a measure of the ability to receive a CDMA signal on the assigned channel frequency in the presence of a single tone that is offset from the center frequency of the assigned channel.

3.4.3.2 Method of Measurement

Refer to Figure 6.5.1-3 for a functional block diagram of the test setup.

1. Configure the base station under test and a mobile station simulator as shown in Figure 6.5.1-3.
2. Adjust the equipment to ensure path losses of at least 100 dB. All power control mechanisms shall be enabled and set at nominal values.
3. Set up a call using Rate Set 1 loopback mode (Service Option 2).
4. Transmit random data to the mobile station simulator at full data rate.
5. Measure the mobile station simulator output power.
6. If the base station is operating in Band Class 0, adjust the CW generator to the desired frequency offset (±750 kHz or ±900 kHz) from the CDMA frequency assignment. If the base station is operating in Band Class 1, adjust the CW generator to the desired frequency offset (±1.25 MHz) from the CDMA frequency assignment.
7. If the base station is operating in Band Class 0, adjust the CW generator power to be 50 dB at ±750 kHz or 87 dB at ±900 kHz above the mobile station simulator output power at the RF input ports as measured in step 5. If the base station is operating in Band Class 1, adjust the CW generator power to be 80 dB at ±1.25 MHz above the mobile station simulator output power at the RF input ports as measured in step 5.
8. Measure the mobile station simulator output power and FER of the base station receiver.
9. Repeat steps 5-8 at the remaining frequency offsets.

3.4.3.3 Minimum Standard

3.4.3.3.1 Cellular Band

At the ±900 kHz offset, the output power of the mobile station simulator shall increase by no more than 3 dB and the FER shall be less than 1.5% with 95% confidence (see 6.8). At the ±750 kHz offset, the output power of the mobile station simulator should increase by no more than 3 dB and the FER shall be less than 1.5% with 95% confidence (see 6.8). The ±750 kHz requirement is intended to apply to channels that have potential AMPS frequency assignments as close as ±750 kHz. An example is CDMA frequency assignment to channel 691 (the A-band secondary CDMA Channel).

3.4.3.3.2 PCS Band

At the ±1.25 MHz offset, the output power of the mobile station simulator shall increase by no more than 3 dB and the FER shall be less than 1.5% with 95% confidence (see 6.8).

3.4.4 Intermodulation Spurious Response Attenuation

3.4.4.1 Definition

The intermodulation spurious response attenuation is a measure of a receiver's ability to receive a CDMA signal on its assigned channel frequency in the presence of two interfering CW tones. These tones are separated from the assigned channel frequency and from each other such that the third order mixing of the two interfering CW tones can occur in the non-linear elements of the receiver, producing an interfering signal in the band of the desired CDMA signal.

3.4.4.2 Method of Measurement

Refer to Figure 6.5.1-4 for a functional block diagram of the test setup.

1. Configure the base station under test and a mobile station simulator as shown in Figure 6.5.1-4.
2. Adjust the equipment to ensure path losses of at least 100 dB. All power control mechanisms shall be enabled and set at nominal values.
3. Set up a call using Rate Set 1 loopback mode (Service Option 2).
4. Transmit random data to the mobile station simulator at full data rate.
5. Measure the mobile station simulator output power.
6. If the base station is operating in Band Class 0, adjust the CW generators to frequency offsets of +900 kHz and +1700 kHz from the CDMA frequency assignment. If the base station is operating in Band Class 1, adjust the CW generators to frequency offsets of +1.25 MHz and +2.05 MHz from the CDMA frequency assignment.
7. Adjust the CW generator powers to be 72 dB for Band Class 0 or 70 dB for Band Class 1 above the mobile station simulator output power at the RF input ports as measured in step 5.
8. Measure the mobile station simulator output power and the FER of the base station receiver.
9. Repeat steps 5-8 at frequency offsets of -900 kHz and -1700 kHz for Band Class 0 or -1.25 MHz and -2.05 MHz for Band Class 1.

3.4.4.3 Minimum Standard

The output power of the mobile station simulator shall increase by no more than 3 dB and the FER shall be less than 1.5% with 95% confidence (see 6.8).

3.4.5 Reverse Link Power Control

Reverse link power control requirements are given in 4.3.3.

3.5 Limitations on Emissions

3.5.1 Conducted Spurious Emissions

3.5.1.1 Definition

Conducted spurious emissions are spurious emissions generated or amplified in the base station equipment and appearing at the receiver RF input ports.

3.5.1.2 Method of Measurement

1. Connect a spectrum analyzer (or other suitable test equipment) to a receiver RF input port.
2. Disable the transmitter RF output.
3. Sweep the spectrum analyzer over a frequency range from the lowest intermediate frequency or lowest oscillator frequency used in the receiver or 1 MHz, whichever is lower, to at least 2600 MHz for Band Class 0 or 6 GHz for Band Class 1.
4. Repeat steps 1-3 for all other receiver input ports.

3.5.1.3 Minimum Standard

3.5.1.3.1 Cellular Band

The conducted spurious emissions shall be

1. Less than -80 dBm, measured in a 30 kHz resolution bandwidth at the base station RF input ports, for frequencies within the base station receiver band between 824 and 849 MHz;
2. Less than -60 dBm, measured in a 30 kHz resolution bandwidth at the base station RF input ports, for frequencies within the base station transmit band between 869 and 894 MHz;
3. Less than -47 dBm, measured in a 30 kHz resolution bandwidth at the base station RF input ports, for all other frequencies.

3.5.1.3.2 PCS Band

The conducted spurious emissions shall be

1. Less than -80 dBm, measured in a 30 kHz resolution bandwidth at the base station RF input ports, for frequencies within the base station receiver band between 1850 and 1910 MHz;
2. Less than -60 dBm, measured in a 30 kHz resolution bandwidth at the base station RF input ports, for frequencies within the base station transmit band between 1930 and 1990 MHz;
3. Less than -47 dBm, measured in a 30 kHz resolution bandwidth at the base station RF input ports, for all other frequencies.

3.5.2 Radiated Spurious Emissions

Radiated spurious emission requirements are given for the entire system, including both transmitter and receiver, in 4.5.2.

3.6 Received Signal Quality Indicator (RSQI)

3.6.1 Definition

Received signal quality indicator (RSQI) refers to a measurement of signal quality performed by base stations. RSQI measurement results are used for comparisons of signal strength between different base stations.

Signal quality is defined as the signal to noise ratio E_b/N_0, where E_b is the energy per bit and N_0 is the total received noise-plus-interference power in the CDMA bandwidth divided by 1.23 MHz. Signal quality shall be computed by adding together the individual E_b/N_0 values from multipath components. RSQI shall be reported as a 6-bit unsigned integer, calculated as follows:

$$E_b / N_0 = \frac{\text{Energy per Bit}}{\text{Noise} + \text{Interference Power}} \times 1.23 \text{ MHz}$$

$$\text{RSQI} = \begin{cases} 0, & E_b / N_0 \le 1 \\ 63, & E_b / N_0 \ge 10^{3.15} \\ \lfloor 20 \log_{10}(E_b / N_0) \rfloor & \text{otherwise} \end{cases}$$

where the signal energy and noise power are measured within the CDMA bandwidth.

3.6.2 Method of Measurement

Refer to Figure 6.5.1-1 for a functional block diagram of the test setup.

1. Configure the base station under test and a mobile station simulator as shown in Figure 6.5.1-1.
2. Disable reverse link closed loop power control in the mobile station simulator.
3. Adjust the AWGN generators for a noise power spectral density of -84 dBm/1.23 MHz ±5 dB and adjust the other equipment for an E_b/N_0 of 8 dB at each RF input terminal.
4. Set up a call using Rate Set 1 loopback mode (Service Option 2).
5. Transmit random data to the mobile station simulator at full data rate.
6. Record the RSQI reported by the base station.
7. Reduce the mobile station simulator output power by 4 dB.
8. Record the RSQI reported by the base station.
9. Increase the mobile station simulator output power by 1 dB.

10. Repeat steps 8 and 9 until the E_b/N_0 per antenna reaches 14 dB.

11. If Rate Set 2 is supported, repeat steps 3 through 10 using Rate Set 2 loopback mode (Service Option 9).

3.6.3 Minimum Standard

The reported RSQI shall be within the bounds shown in Table 3.6.3-1. For E_b/N_0 greater than 14 dB the RSQI reports should be monotonically increasing or unchanging.

Table 3.6.3-1. Bounds on RSQI Reports

E_b/N_0 (dB) per Input Port	Minimum Acceptable Report Value	Maximum Acceptable Report Value
4	10	18
5	12	20
6	14	22
7	16	24
8	18	26
9	20	28
10	22	30
11	24	32
12	26	34
13	28	36
14	30	38

4 CDMA TRANSMITTER MINIMUM STANDARDS

All tests in the section shall be performed for each band class supported by the base station.

4.1 Frequency Requirements

4.1.1 Frequency Coverage

Channel frequencies and designations are given for dual-mode base stations and mobile stations in 3.1.1.1 and 3.1.1.2. The base station receiver CDMA frequency assignments are associated on a one-to-one basis with the transmitter CDMA frequency assignments. Each CDMA frequency assignment shall be centered at one of the indicated frequencies. Note that the base station transmitter may be fixed tuned to a specific CDMA frequency assignment or may be designed to cover a subset of the available frequency assignments. The base station shall support either the primary or the secondary CDMA Channel, or both.

4.1.2 Frequency Tolerance

4.1.2.1 Definition

Frequency tolerance is defined as the maximum allowed difference between the actual CDMA transmit carrier frequency and the specified CDMA transmit frequency assignment.

4.1.2.2 Method of Measurement

Frequency shall be measured using appropriate test equipment of sufficient accuracy to ensure compliance with the minimum standard. Frequency should be measured as part of the waveform quality test of 4.3.

4.1.2.3 Minimum Standard

For all operating temperatures specified by the manufacturer, the average frequency difference between the actual CDMA transmit carrier frequency and specified CDMA transmit frequency assignment shall be less than $\pm 5 \times 10^{-8}$ of the frequency assignment (±0.05 ppm).

4.2 Reserved

4.3 Modulation Requirements

Waveform specifications are tested by measuring the waveform quality ρ, as defined in 6.4.2.1, and code domain power as defined in 6.4.2.2. The range of values for the transmit waveform quality is from 1.0 for a perfect CDMA waveform to 0.0 for a non-CDMA signal. As an example, a base station with a 0.5 dB degradation in its transmit waveform would have a quality, ρ, of $10^{-(0.5/10)} = 0.89$.

4.3.1 Synchronization and Timing

4.3.1.1 Pilot Time Tolerance

Each base station shall use a time base reference from which all time critical CDMA transmissions, including pilot PN sequences, frames, and Walsh functions, shall be derived. The time base reference shall be time-aligned to CDMA System Time, as described in 1.2 of TIA/EIA-95-B. Reliable external means should be provided at each base station to synchronize each base station time base reference to CDMA System Time. Each base station should use a frequency reference of sufficient accuracy to maintain time alignment to CDMA System Time. With the external source of CDMA System Time disconnected, the base station shall maintain transmit timing within ±10 μs of CDMA System Time for a period of not less than 8 hours.

The base station shall make available an even second time reference signal for the purpose of synchronization testing.

4.3.1.1.1 Definition

Pilot time is defined as the estimate of CDMA System Time derived from observation of the pilot signal at the base station RF output port. Pilot time alignment error is the difference between the measured pilot time and the expected time, taking into account CDMA System Time and pilot offset.

4.3.1.1.2 Method of Measurement

Refer to Figure 6.5.1-5 for a functional block diagram of the test setup.

1. Connect the waveform quality test equipment to a base station RF output port.
2. Set the attenuator at an appropriate level for the test equipment.
3. Configure the base station to transmit the Pilot Channel(s) only. The PN offset(s) of the base station may be any value in accordance with 7.1.3.2.1 of TIA/EIA-95-B.
4. Trigger the test equipment from the base station even second time reference signal.
5. Measure the pilot time alignment error using the test equipment described in 6.4.2.1.
6. Repeat steps 1-5 for each available CDMA Channel (sectors or alternate frequencies).

4.3.1.1.3 Minimum Standard

The pilot time alignment error should be less than 3 μs and shall be less than 10 μs.

For base stations supporting multiple simultaneous CDMA Channels, all CDMA Channels radiated by a base station shall be within ±1 μs of each other.

4.3.1.2 Pilot Channel to Code Channel Time Tolerance

4.3.1.2.1 Definition

Pilot Channel to code channel time tolerance is the permissible error in timing between the radiated Pilot Channel and the other code channels within one Forward CDMA Channel.

4.3.1.2.2 Method of Measurement

Refer to Figure 6.5.1-6 for a functional block diagram of the test setup.

1. Configure the base station according to the test model described in 6.5.2.
2. Monitor the transmitter output with the code domain power test equipment as described in 6.4.2.2 and measure the relative timing of the active channels.

4.3.1.2.3 Minimum Standard

The time error between the Pilot Channel and all other code channels sharing the same Forward CDMA Channel shall be less than ±50 ns.

4.3.1.3 Pilot Channel to Code Channel Phase Tolerance

4.3.1.3.1 Definition

Pilot Channel to code channel phase tolerance is the permissible error in RF phase between the radiated Pilot Channel and the other channels within one Forward CDMA Channel.

4.3.1.3.2 Method of Measurement

Refer to Figure 6.5.1-6 for a functional block diagram of the test setup.

1. Configure the base station according to the test model described in 6.5.2.
2. Monitor the transmitter output with the code domain power test equipment as described in 6.4.2.2 and measure the relative phase of the active channels.

4.3.1.3.3 Minimum Standard

The phase differences between the Pilot Channel and all other code channels sharing the same Forward CDMA Channel should not exceed 0.05 radians and shall not exceed 0.15 radians.

4.3.2 Waveform Quality

4.3.2.1 Definition

Waveform quality is measured by determining the normalized correlated power between the actual waveform and the ideal waveform.

4.3.2.2 Method of Measurement

Refer to Figure 6.5.1-5 for a functional block diagram of the test setup.

1. Connect the base station RF output port to the test equipment described in 6.4.2.1.
2. Configure the base station to transmit the Pilot Channel only. The PN offset of the base station may be any value in accordance with 7.1.3.2.1 of TIA/EIA-95-B.
3. Trigger the test equipment from the system time reference signal from the base station.
4. Measure the waveform quality factor.

4.3.2.3 Minimum Standard

The normalized cross correlation coefficient, ρ, shall be greater than 0.912 (excess power < 0.4 dB).

4.3.3 Power Control Subchannel

4.3.3.1 Definition

The power control subchannel test ensures that the power control bits described in 7.1.3.1.8 of TIA/EIA-95-B have the correct sense, position, delay, and amplitude.

4.3.3.2 Method of Measurement

Standard Procedure:

Refer to Figure 6.5.1-1 for a functional block diagram of the test setup.

1. Configure the base station according to the test model described in 6.5.2.
2. Disable closed loop power control in the mobile station simulator. If the base station under test has a mechanism for the adjustment of the reverse link E_b/N_0 setpoint, it shall be disabled for this test.
3. Set the AWGN generators to yield a noise power spectral density of -84 dBm/1.23 MHz ±5 dB at each base station RF input port.
4. Set up a call using Rate Set 1 loopback mode (Service Option 2).
5. Transmit random data to the mobile station simulator at full data rate.
6. Adjust the mobile station simulator output power until the base station measures approximately 10% FER.
7. Start the power control test program in the mobile station simulator as described in 6.4.3. The mobile station simulator output power shall cycle between the level set in Step 6 and 10 dB higher as shown in Figure 4.3.3.2-1.
8. Count the occurrences of power up and power down control bits relative to mobile station simulator time reference pulses.
9. If Rate Set 2 is supported, repeat steps 4 through 8 using Rate Set 2 loopback mode (Service Option 9).

Alternative Procedure:

1. Configure the base station according to the test model described in 6.5.2 with only one traffic channel activated.
2. Enable closed loop power control in the mobile station simulator. If the base station under test has a mechanism for adjusting the reverse link E_b/N_0 setpoint, it shall be disabled for this test.
3. Set the AWGN generators to yield a noise power spectral density of -84 dBm/1.23MHz ±5 dB at each base station RF input port.
4. Set up a call using Rate Set 1 loopback mode (Service Option 2).
5. Transmit random data to the mobile station simulator at full data rate.
6. Adjust the mobile station simulator output power until the base station measures approximately 1% FER.
7. Decrease the reverse link path loss between the mobile station simulator and the base station RF input ports by 10 dB for 5 ms. Increase the path loss by 20 dB to a level 10 dB greater than the original path loss for 5 ms. Decrease the path loss by 20 dB to a level 10 dB less than the original path loss. Changes in path loss shall occur on power control group boundaries.
8. Measure and record the output power of the mobile station simulator at each test point. The timing of the test points relative to the reverse link path loss is shown in Figure 4.3.3.2-2. The timing of the test points may be delayed up to 200 µs, as indicated by the interval Z-A in Figure 4.3.3.2-2, to compensate for the response time of the mobile station to power control bits.
9. Repeat steps 4 through 8 until sufficient confidence is assured.
10. If Rate Set 2 is supported, repeat steps 4 through 9 using Rate Set 2 loopback mode (Service Option 9).

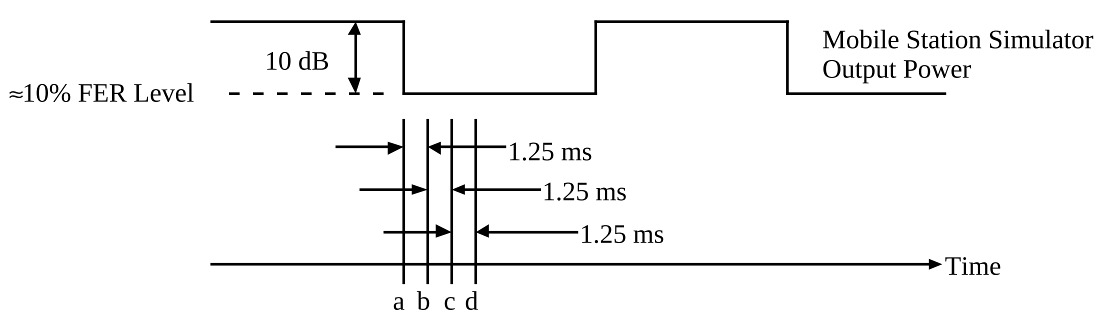

Figure 4.3.3.2-1(a). Power Up Command Measurement Interval

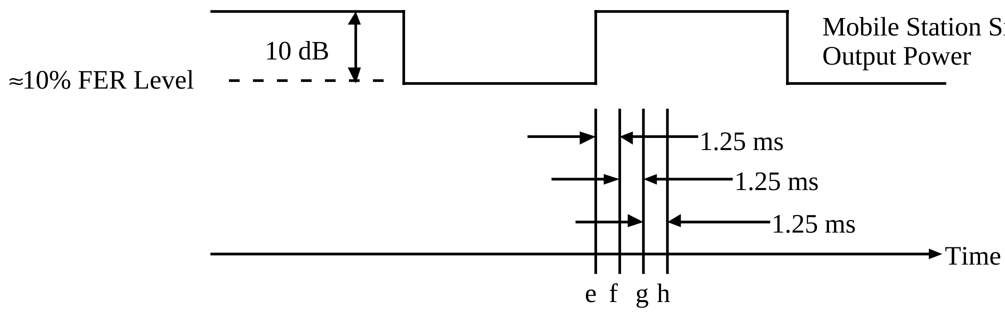

Figure 4.3.3.2-1(b). Power Down Command Measurement Interval

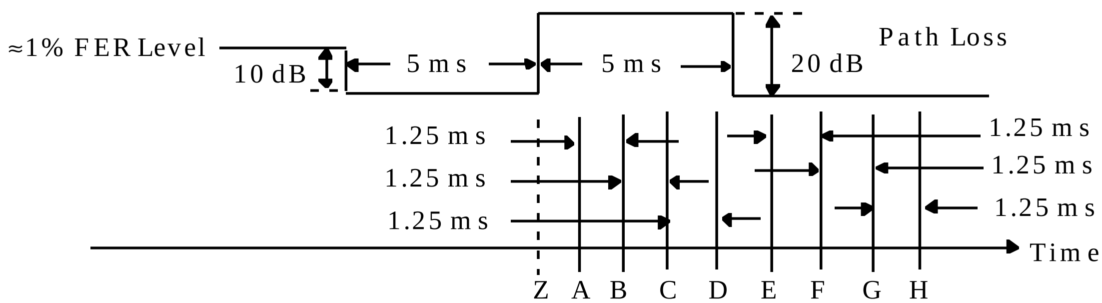

Figure 4.3.3.2-2. Path Loss Increase and Decrease Responses and the Test Points for the Alternative Test Procedure

4.3.3.3 Minimum Standard

Standard Procedure:

In Figure 4.3.3.2-1, interval b-c is the second and interval c-d is the third power control group following the drop in mobile station simulator output power. Interval f–g is the second and interval g-h is the third power control group following the rise in mobile station simulator output power. Within each power control group there will be one power control subchannel bit transmitted by the base station.

Of all the power control bits transmitted by the base station in intervals c-d and f-g, 70% or more shall be power up commands. Of all the power control bits transmitted by the base station in intervals b-c and g-h, 90% or more shall be power down commands.

The amplitude of the power control symbols shall be at least as large as the full rate data symbols independent of the data rate being transmitted on the Forward Traffic Channel.

Alternative Procedure:

The interval of test points A-B, B-C, C-D, D-E, E-F, F-G, and G-H in Figure 4.3.3.2-2 is 1.25 ms. Calculate the average output power of test points B, C, D, F, G, and H, and denote the results as P_B, P_C, P_D, P_F, P_G, and P_H, respectively. The values of P_D - P_C, P_G - P_F, P_B - P_C, and P_G - P_H shall be within the range of 1.0 ± 0.3 dB.

4.4 RF Output Power Requirements

4.4.1 Total Power

4.4.1.1 Definition

Total power is the mean power delivered to a load with resistance equal to the nominal load impedance of the transmitter.

4.4.1.2 Method of Measurement

1. Connect the power measuring equipment to the base station RF output port.
2. Set the base station to transmit a signal modulated with a combination of Pilot, Sync, Paging, and Traffic Channels as stated in 6.5.2.
3. Measure the mean power at the RF output port.

4.4.1.3 Minimum Standard

The total power shall remain within +2 dB and -4 dB of the manufacturer's rated power for the equipment over the environmental conditions described in Section 5.

4.4.2 Reserved

4.4.3 Pilot Power

4.4.3.1 Definition

The Pilot Channel power to total power ratio is the power attributed to the Pilot Channel divided by the total power, and is expressed in dB. The Code Domain Power Analyzer is used to determine the ratio of the Pilot Channel power to the total power. This equipment is described in 6.4.2.2.

4.4.3.2 Method of Measurement

1. Connect the base station RF output port to the Code Domain Power Analyzer using an attenuator or directional coupler if necessary.
2. Configure the base station to transmit a signal modulated with a combination of Pilot, Sync, Paging, and Traffic Channels as described in 6.5.2.
3. Measure the Pilot Channel power to total power ratio.

4.4.3.3 Minimum Standard

The Pilot Channel power to total power ratio shall be within ±0.5 dB of the configured value.

4.4.4 Code Domain Power

4.4.4.1 Definition

Code domain power is the power in each code channel of a CDMA Channel. The CDMA time reference used in the code domain power test is derived from the Pilot Channel and is used as the reference for demodulation of all other code channels.

4.4.4.2 Method of Measurement

Refer to Figure 6.5.1-6 for a functional block diagram of the test setup.

1. Configure the base station according to the test model described in 6.5.2.
2. Set the base station to transmit at the manufacturer's maximum rated power.
3. Measure the base station transmitter output at the RF output port with a Code Domain Power Analyzer described in 6.4.2.2.

4.4.4.3 Minimum Standard

The code domain power in each inactive channel shall be 27 dB or more below the total output power.

4.5 Limitations on Emissions

4.5.1 Conducted Spurious Emissions

4.5.1.1 Definition

Conducted spurious emissions are emissions at frequencies that are outside the assigned CDMA Channel, measured at the base station RF output port.

4.5.1.2 Method of Measurement

1. Connect a spectrum analyzer (or other suitable test equipment) to the base station RF output port, using an attenuator or directional coupler if necessary.
2. Set the base station to transmit a signal modulated with a combination of Pilot, Sync, Paging, and Traffic Channels as stated in 6.5.2. Total power at the RF output port shall be the maximum power as specified by the manufacturer.
3. Measure the power level at the carrier frequency.
4. Measure the spurious emission level in the base station transmit band between 864 MHz and 899 MHz for Band Class 0, or between 1925 MHz and 1995 MHz for Band Class 1.

4.5.1.3 Minimum Standard

4.5.1.3.1 Cellular Band

When transmitting in Band Class 0, the spurious emissions between 864 and 899 MHz shall be less than the limits specified in Table 4.5.1.3.1-1.

Table 4.5.1.3.1-1. Band Class 0 Transmitter Spurious Emission Limits

For |Δf| Greater than	Emission Limit
750 kHz	-45 dBc / 30 kHz
1.98 MHz	-60 dBc / 30 kHz; Pout ≥ 33 dBm -27 dBm / 30 kHz; 28 dBm ≤ Pout < 33 dBm -55 dBc / 30 kHz; Pout < 28 dBm
3.125 MHz	-13 dBm / 100 kHz

Note: All frequencies in the measurement bandwidth shall satisfy the restrictions on |Δf|, where Δf = center frequency - closer measurement edge frequency and Pout is the average transmitter power. The -13 dBm / 100 kHz emission limit is based on ITU Category A emission limits.

Current FCC rules shall also apply.

4.5.1.3.2 PCS Band

When transmitting in Band Class 1, the spurious emissions between 1925 and 1995 MHz shall be less than the limits specified in Table 4.5.1.3.2-1.

Table 4.5.1.3.2-1. Band Class 1 Transmitter Spurious Emission Limits

For |Δf| Greater Than	Emission Limit
885 kHz	-45 dBc / 30 kHz
1.98 MHz	-55 dBc / 30 kHz; Pout ≥ 33 dBm -22 dBm / 30 kHz; 28 dBm ≤ Pout < 33 dBm -50 dBc / 30 kHz; Pout < 28 dBm
2.25 MHz	-13 dBm / 1 MHz

Note: All frequencies in the measurement bandwidth shall satisfy the restrictions on |Δf|, where Δf = center frequency - closer measurement edge frequency, and Pout is the average transmitter power. The -13 dBm / 1 MHz emission limit is based on FCC rules which are more stringent than ITU Category A emission limits.

Current FCC rules shall also apply.

4.5.2 Radiated Spurious Emissions

Current FCC rules shall apply.

No text.

5 CDMA GENERAL REQUIREMENTS

5.1 Temperature and Power Supply Voltage

5.1.1 Definition

The temperature and voltage ranges denote the ranges of ambient temperature and power supply input voltages over which the base station will operate and meet the requirements of this Standard. The ambient temperature is the average temperature of the air surrounding the base station equipment. The power supply voltage is the voltage applied at the input terminals of the base station equipment. The manufacturer is to specify the temperature range and the power supply voltage over which the equipment is to operate.

5.1.2 Method of Measurement

The base station equipment shall be installed in its normal configuration (i.e., in its normal cabinet or rack mounting arrangement with all normally supplied covers installed) and placed in a temperature chamber. Optionally, the equipment containing the frequency determining element(s) may be placed in the temperature chamber if the frequency stability is to be maintained over a different temperature from that specified for the rest of the base-station equipment.

The temperature chamber shall be stabilized at the manufacturer's highest specified operating temperature and then shall be operated in accordance with the standard duty cycle test conditions specified in Section 6, and over the power supply input voltage range specified by the manufacturer. With the base station equipment operating, the temperature is to be maintained at the specified test temperature without forced circulation of air from the temperature chamber being directly applied to the base station equipment.

During the entire duty cycle, the transmitter frequency accuracy, timing reference, output power, and waveform quality shall be measured as specified in Section 4.

Turn the base station equipment off, stabilize the equipment in the chamber at room temperature, and repeat the above measurements after a 15-minute standby warmup period.

Turn the base station equipment off, stabilize the equipment in the chamber at the coldest operating temperature specified by the manufacturer, and repeat the above measurements above after a 15-minute standby warmup period.

For transmitter frequency stability measurements, the above procedure shall be repeated every 10°C over the operating temperature range specified by the manufacturer. The equipment shall be allowed to stabilize at each step before a frequency measurement is made.

5.1.3 Minimum Standard

Over the ambient temperature and power supply ranges specified by the manufacturer, the operation of the base station equipment shall conform to the limits shown in Table 5.1.3-1.

Table 5.1.3-1. Environmental Test Limits

Parameter	Limit	Reference
Frequency Tolerance	±0.05 ppm	4.1.2
Time Reference	±10 μs	4.3.1.1
Pilot Waveform Quality	ρ > 0.912	4.3.2
RF Power Output Variation	+2 dB, -4 dB	4.4.1

5.2 High Humidity

5.2.1 Definition

The term "high humidity" denotes the relative humidity at which the base station will operate with no more than a specified amount of degradation in performance.

5.2.2 Method of Measurement

The base station equipment, after having been adjusted for normal operation under standard test conditions, shall be placed, inoperative, in a humidity chamber with the humidity maintained at 0.024 gm H_20/gm Dry Air at 50°C (40% relative humidity) for a period of not less than eight hours. While in the chamber and at the end of this period, the base station transmitting equipment shall be tested for frequency accuracy, timing reference, output power, and waveform quality. No readjustment of the base station equipment shall be allowed during this test.

5.2.3 Minimum Standard

Under the above humidity conditions, the operation of the base station equipment shall conform to the limits specified in Table 5.1.3-1.

5.3 AC Powerline Conducted Emissions

5.3.1 Definition

AC powerline conducted emissions tests shall be performed on all equipment that directly connects to the public utility powerline. For equipment that receives power from a device that is directly connected to the public utility powerline (such as a DC power supply), the conducted emissions tests shall be performed on the power supply device, with the equipment under test connected, to insure that the supply continues to meet the current emissions standards. AC powerline conducted emissions tests are not required for equipment that contains an internal power source or battery supply with no means for connection to the public utility powerline.

5.3.2 Method of Measurement

The conducted measurement procedures described in 4.5.1 shall be used for measuring conducted spurious emissions.

5.3.3 Minimum Standard

The radio frequency voltage, as measured in 5.3.2, shall not exceed 1 mV for frequencies between 450 and 1705 kHz and shall not exceed 3 mV for frequencies between 1.705 and 30 MHz.

No text.

6 CDMA STANDARD TEST CONDITIONS

6.1 Standard Equipment

6.1.1 Basic Equipment

The equipment shall be assembled and any necessary adjustments shall be made in accordance with the manufacturer's instructions for the mode of operation required. When alternative modes are available, the equipment shall be assembled and adjusted in accordance with the relevant instructions. A complete series of measurements shall be made for each mode of operation.

6.1.2 Associated Equipment

The base station equipment may include associated equipment during tests if the associated equipment is normally used in the operation of the equipment under test. This would include power supplies, cabinets, antenna couplers, and receiver multicouplers.

6.2 Standard Environmental Test Conditions

Measurements under standard atmospheric conditions shall be carried out under any combination of the following conditions:

Temperature:	+15 °C to +35 °C
Relative Humidity:	45% to 75%
Air Pressure:	86,000 to 106,000 Pa (860 to 1060 mbar)

If desired, the results of the measurements can be corrected by calculation to the standard reference temperature of 25°C and the standard reference air pressure of 101,300 Pa (1013 mbar). Procedures for making such corrections can be found in EIA documents covering test procedures for standard two-way land-mobile equipment.

6.3 Standard Conditions for the Primary Power Supply

6.3.1 General

The standard test voltages shall be those specified by the manufacturer as minimum, normal, and maximum operating values. The voltage shall not deviate from the stated values by more than ±2% during a series of measurements carried out as part of one test on the same equipment.

6.3.2 Standard DC Test Voltage from Accumulator Batteries

The standard (or nominal) DC test voltage battery specified by the manufacturer shall be equal to the standard test voltage of the type of accumulator to be used multiplied by the number of cells minus an average DC power cable loss value that the manufacturer determines as being typical (or applicable) for a given installation. Since accumulator batteries may or may not be under charge and, in fact, may be in a state of discharge when the equipment is being operated, the manufacturer shall also test the equipment at anticipated voltage extremes above and below the standard voltage. The test voltages shall not deviate from the stated values by more than ±2% (nominal float voltage) during a series of measurements carried out as part of one test on the same equipment.

6.3.3 Standard AC Voltage and Frequency

For equipment that operates from the AC mains, the standard AC test voltage shall be equal to the nominal voltage specified by the manufacturer. If the equipment is provided with different input taps, the one designated "nominal" shall be used. The standard test frequency and the test voltage shall not deviate from their nominal values by more than ±2%.

The equipment shall operate without degradation with input voltage variations of up to ±10% and shall maintain its specified transmitter frequency stability for input voltage variations of up to ±15%. The frequency range over which the equipment is to operate shall be specified by the manufacturer.

6.4 Standard Test Equipment

6.4.1 Channel Simulator

The channel simulator shall support the following channel model parameters:

- All paths are independently faded.
- The fading is Rayleigh. The probability distribution function of power, F(P), is

$$F(P) = \begin{cases} 1 - e^{-P/P_{ave}}, P > 0 \\ 0, P \le 0 \end{cases}$$

  where P is the signal power level and P_{ave} is the mean power level.

- The level crossing rate, L(P) is

$$L(P) = \begin{cases} \sqrt{2\pi P / P_{ave}} \cdot f_d \cdot e^{-P/P_{ave}}, P > 0 \\ 0, P \le 0 \end{cases}$$

  where f_d is the Doppler frequency offset associated with the simulated vehicle speed given by

$$f_d = \left(\frac{v}{c}\right) f_c$$

  f_c is the carrier frequency, v is the vehicle speed, and c is the speed of light in a vacuum.

- The power spectral density, S(f), is

$$S(f) = \begin{cases} \dfrac{1}{\sqrt{1-\left(\dfrac{f-f_c}{f_d}\right)^2}}, & f_c - f_d \le f \le f_c + f_d \\ 0, & \text{otherwise} \end{cases}$$

- The autocorrelation coefficient of the unwrapped phase[1], $\rho(t)$, is

$$\rho(t) = \frac{3}{2\pi}\sin^{-1}[J_0(2\pi f_d t)] + 6\left\{\frac{1}{2\pi}\sin^{-1}[J_0(2\pi f_d t)]\right\}^2 - \frac{3}{4\pi^2}\sum_{n=1}^{\infty}\frac{[J_0(2\pi f_d t)]^{2n}}{n^2}$$

  where $J_0(\ )$ is a zero-order Bessel function of the first kind.

This autocorrelation coefficient is shown in Figure 6.4.1-1.

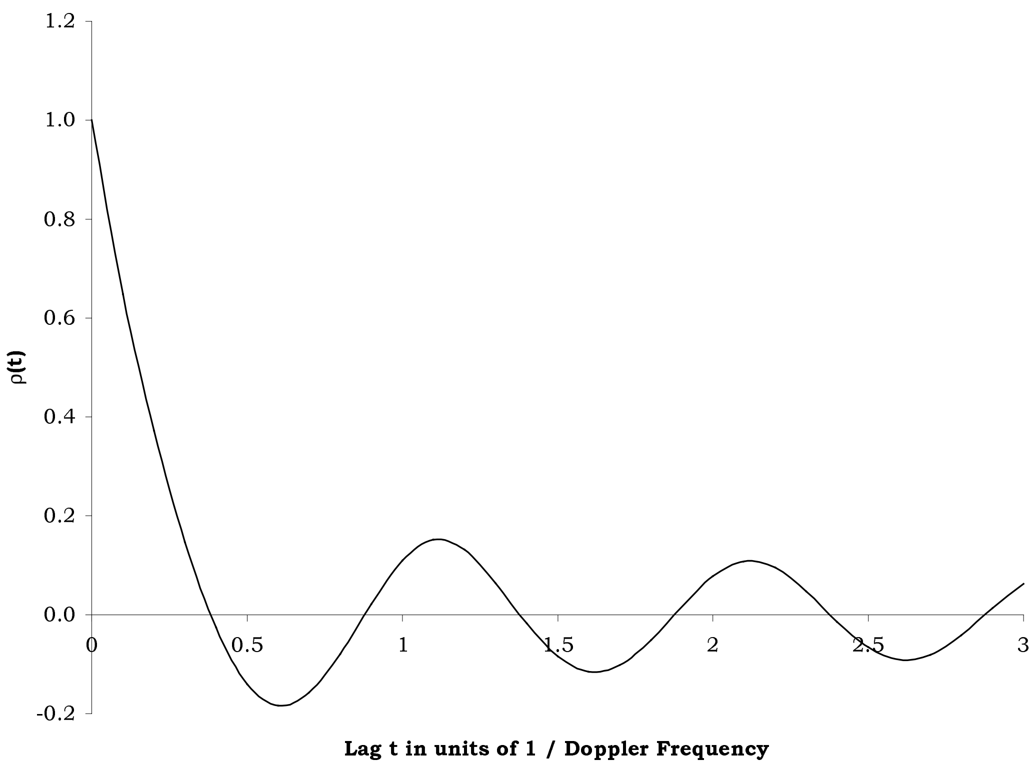

Figure 6.4.1-1. Autocorrelation Coefficient of the Phase

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[1]The term “unwrapped” refers to the continuous nature of the phase, that is, with no discontinuities of 2π.

The following standard conditions and tolerances on the channel model parameters shall be supported by the channel simulator:

- Vehicle Speed, v, as shown in Table 6.4.1-1

  The tolerance on Doppler shall be ±5%.

- Power distribution function, F(P)

  1. The tolerance shall be within ±1 dB of calculated, for power levels from 10 dB above to 20 dB below the mean power level.
  2. The tolerance shall be within ±5 dB of calculated, for power levels from 20 dB below to 30 dB below the mean power level.

- Level crossing rate, L(P)

  The tolerance shall be within ±10% of calculated, for power levels from 3 dB above to 30 dB below the mean power level.

- Measured power spectral density, S(f), around the carrier, f_c

  1. At frequency offsets $|f-f_c|=f_d$, the maximum power spectral density S(f) shall exceed $S(f_c)$ by at least 6 dB.
  2. For frequency offsets $|f-f_c|>2f_d$, the maximum power spectral density S(f) shall be less than $S(f_c)$ by at least 30 dB.

- Simulated Doppler frequency, f_d, shall be computed from the measured S(f) as

$$f_d = \left[\frac{2\int (f - f_c)^2 S(f) df}{\int S(f) df} \right]^{1/2}$$

- Measured autocorrelation coefficient of the unwrapped phase, ρ(t)

  1. At a lag of $0.05/f_d$ shall be 0.8 ±0.1.
  2. At a lag of $0.15/f_d$ shall be 0.5 ±0.1.

Table 6.4.1-1. Standard Channel Simulator Configurations

Channel Simulator Configuration Number	Vehicle Speed	Number of Paths	Path 2 Power (relative to path 1)	Path 3 Power (relative to path 1)	Delay Path 1 to Input	Delay Path 2 to Input	Delay Path 3 to Input
1	8 km/h	2	0 dB	N/A	0 µs	2.0 µs	N/A
2	30 km/h	1	N/A	N/A	0 µs	N/A	N/A
3	100 km/h	3	0 dB	-3 dB	0 µs	2.0 µs	14.5 µs

6.4.2 Waveform Quality Measurement Equipment

6.4.2.1 Rho Meter

Equipment capable of performing waveform cross-correlation shall be used for the measurement of forward link frequency tolerance, pilot time tolerance, and waveform compatibility.

Various equipment implementations are possible. The equipment used shall provide results equivalent to those produced by equipment that use the following algorithms:

The ideal transmitter signal is given as

$$s(t) = \sum_{i} R_i(t)\, e^{-j\omega_c t}$$

where

ω_c is the nominal carrier frequency of the signal,

$R_i(t)$ is the complex envelope of the ideal i^{th} code channel, given as

$$R_i(t) = a_i\left[\sum_{k} g(t - kT_c)\cos(\phi_{i,k}) + j\sum_{k} g(t - kT_c)\sin(\phi_{i,k})\right]$$

where

a_i is the amplitude of the i^{th} code channel,

$g(t)$ is the unit impulse response of the cascaded transmit filter and phase equalizer described in 7.1.3.1.11 of TIA/EIA-95-B,

$\phi_{i,k}$ is the phase of the k^{th} chip for the i^{th} code channel, occurring at discrete time $t_k = kT_c$, as specified in Figure 6.1.3.1.9-1 of TIA/EIA-95-B, and

T_c is the chip duration.

Modulation accuracy is the ability of the transmitter to generate the ideal signal s(t).

The actual transmitter signal is given by

$$x(t) = \sum_{i} b_i\left[R_i(t + \tau_i) + E_i(t)\right]e^{-j\left[(\omega_c + \Delta\omega)(t + \tau_i) + \theta_i\right]}$$

where

b_i is the amplitude of the actual signal relative to the ideal signal for the i^{th} code channel,

τ_i is the time offset of the actual signal relative to the ideal signal for the i^{th} code channel,

$\Delta\omega$ is the radian frequency error of the signal,

θ_i is the phase offset of the actual signal relative to the ideal signal for the i^{th} code channel, and

$E_i(t)$ is the complex envelope of the error (deviation from ideal) of the actual transmit signal for the i^{th} code channel.

Estimates of the radian frequency error $\Delta\omega$, the time offset τ_0, and the phase offset θ_0, of the pilot shall be obtained to the accuracy specified below. These estimates $\Delta\hat{\omega}$, $\hat{\tau}_0$, and $\hat{\theta}_0$, shall be used to compensate x(t) by introducing a time correction and a complex multiplicative factor to produce

$$y(t) = x(t - \hat{\tau}_0)\, e^{j\left[(\omega_c + \Delta\hat{\omega})t + \hat{\theta}_0\right]}$$

The radian frequency error $\Delta\hat{\omega}$ is converted to hertz frequency error by $\Delta\hat{f} = \frac{\Delta\hat{\omega}}{2\pi}$. The compensated signal, y(t), shall be passed through a complementary filter to remove the intersymbol interference (ISI) introduced by the transmit filter and the transmit phase equalizer to yield z(t). The impulse response of the filter resulting from cascading the complementary filter with the ideal transmit filter and equalizer shall approximately satisfy Nyquist's criterion for zero ISI. The null levels at the sample times shall be at least 50 dB below the on-time response. The noise bandwidth of the complementary low pass filter shall be less than 625 kHz.

The ideal output of the complementary filter is

$$r(t) = \sum_i \tilde{R}_i(t)$$

where

$$\tilde{R}_i(t_k) = a_i\left[\cos(\phi_{i,k}) + j\sin(\phi_{i,k})\right]$$

Modulation accuracy is measured by determining the fraction of power in the actual filter output z(t) that correlates with $\tilde{R}_0(t_k)$ sampled at the ideal decision points when the transmitter is modulated only by the Pilot Channel (the 0^{th} code channel). The waveform quality factor (ρ_0) is defined as

$$\rho_0 = \frac{\sum_{j=1}^{N}\left|\sum_{k=1}^{64} Z_{j,k}\, R_{0,j,k}^{*}\right|^2}{\left\{\sum_{j=1}^{N}\sum_{k=1}^{64}\left|\tilde{R}_{0,k}\right|^2\right\}\left\{\sum_{j=1}^{N}\sum_{k=1}^{64}\left|Z_{j,k}\right|^2\right\}}$$

where $Z_{j,k}$ = z[64(j-1)+k] is the k^{th} sample in the j^{th} Walsh Function period of the measurement interval and $\tilde{R}_{0,j,k} = \tilde{R}_0[64(j-1)+k]$ is the corresponding sample of the ideal output of the complementary filter for the Pilot Channel.

Modulation accuracy shall be measured by using the 64N complex-valued samples, $z(t_k)$, over a time interval of N Walsh Function periods. The first sample, $z(t_1)$, occurs at the first chip of a Walsh Function and the final sample, $z(t_{64N})$, occurs at the last chip of a Walsh Function. The summation over full Walsh Function periods is necessary to achieve the orthogonality property of the Walsh Functions.

The measurement interval shall be a multiple of the Walsh Function period, or 64N chips. N shall be at least 20.

The accuracy of the waveform quality measurement equipment shall be as shown in Table 6.4.2.1-1.

Table 6.4.2.1-1. Accuracy of Waveform Quality Measurement Equipment

Parameter	Symbol	Accuracy Requirement
Waveform Quality	ρ_0	$\pm 5\times 10^{-4}$ from 0.90 to 1.0
Frequency Error (exclusive of test equipment time base errors)	Δf	±10 Hz
Pilot Time Alignment Error	τ_0	±135 ns

6.4.2.2 Code Domain Measurement Equipment

See 6.4.2.1 for definition of signal parameters. Code domain measurement equipment measures:

1. Walsh code domain power coefficients ρ_0, ρ_1, ρ_2, … ρ_{63} (see below for definition).
2. Walsh code domain time offsets relative to pilot $\Delta\tau_i$, where

$$\Delta\tau_i = \tau_i - \tau_0 .$$

3. Walsh code domain phase offsets relative to pilot $\Delta\theta_i$, where

$$\Delta\theta_i = \theta_i - \theta_0 .$$

Code domain power is defined as the fraction of power in $z(t_k)$ that correlates with each $R_i(t_k)$ when the transmitter is modulated according to a known code symbol sequence. The actual signal is compensated in frequency error $\Delta\omega$, pilot time alignment error τ_0, and pilot phase θ_0.

Code domain power coefficients ρ_i are defined as

$$\rho_i = \frac{\sum_{j=1}^{N}\left|\sum_{k=1}^{64} Z_{j,k}\, R_{i,j,k}^{*}\right|^2}{\left\{\sum_{j=1}^{N}\sum_{k=1}^{64}\left|\tilde{R}_{i,k}\right|^2\right\}\left\{\sum_{j=1}^{N}\sum_{k=1}^{64}\left|Z_{j,k}\right|^2\right\}}, i = 0, 1, 2, \cdots 63$$

$Z_{j,k}$ is defined in 6.4.2.1 and $R_{i,j,k} = R_i[64(j-1)+k]$ is the k^{th} sample in the j^{th} Walsh period of the ideal output of the complementary filter for the i^{th} code channel.

The code domain time offsets τ_i and phase offsets θ_i shall be determined by creating the reference signal

$$\hat{R}_k = \sum R_i(t_k + \hat{\tau}_i)\, e^{-j\left[\Delta\hat{\omega}(t_k+\hat{\tau}_i) + \hat{\theta}_i\right]}$$

and finding the estimates $\Delta\hat{\omega}$, $\hat{\tau}_i$, $\hat{a}_i$, and $\hat{\theta}_i$ to minimize the sum-square-error

$$\varepsilon^2 = \sum_{k=1}^{64N} \left| Z_k - \hat{R}_k \right|^2$$

where $Z_k = z(t_k)$.

The measurement interval shall be a multiple of the Walsh period, or 64N chips. N shall be at least 20.

The accuracy of the code domain measurement equipment shall be as shown in Table 6.4.2.2-1 for the nominal Base Station Test Model (refer to 6.5.2).

Table 6.4.2.2-1. Accuracy of Code Domain Measurement Equipment

Parameter	Symbol	Accuracy Requirement
Code domain power coefficients	ρ_i	$\pm 5\times10^{-4}$ from 5×10^{-4} to 1.0
Frequency Error (exclusive of test equipment time base errors)	Δf	±10 Hz
Code domain time offset relative to pilot	$\Delta\tau_i$	±10 ns
Code domain phase offset relative to pilot	$\Delta\theta_i$	±0.01 radians

6.4.3 Mobile Station Simulator

The mobile station simulator shall be compliant with TIA/EIA-95-B and TIA/EIA-98-C. The mobile station simulator shall support TIA/EIA-126-B.

It shall be possible to disable reverse link closed loop power control in the mobile station simulator. When closed loop power control is disabled, it shall be possible to set the transmit power to any fixed level with a resolution of ±0.1 dB over the full dynamic range.

The mobile station simulator shall include a power control test program. The program function is to cycle the transmit power as shown in Figure 4.3.3.2-1. The transitions of output power shall be aligned with the power control group boundaries as defined in 6.1 of TIA/EIA-95-B. It shall also provide a timing reference signal aligned to the power cycles and it may provide the value of the power control bits received on the forward link. The durations of the high and low power period shall be at least 5 ms (4 power control groups).

6.4.4 AWGN Generator

The AWGN generator shall meet the following minimum performance requirements:

- Minimum Bandwidth: 1.8 MHz
- Frequency Range: 824 MHz to 894 MHz for Band Class 0 or 1850 MHz to 1990 MHz for Band Class 1
- Frequency Resolution: 1 kHz
- Output Accuracy: ±2 dB for outputs ≥ -80 dBm/1.23 MHz
- Output Settability: 0.1 dB
- Output Range: -20 to -95 dBm/1.23 MHz
- The AWGN generators shall be uncorrelated to the ideal transmitter signal and to each other.

6.4.5 CW Generator

- Output Frequency Range: Tunable over applicable range of radio frequencies for band class under test.
- Frequency Accuracy: ± 10 ppm.
- Frequency Resolution: 1 kHz.
- Output Range: -50 dBm to -10 dBm, and off.
- Output Accuracy: ± 1.0 dB.
- Output Resolution: 0.1 dB.
- Output Phase Noise: As required.

6.4.6 Spectrum Analyzer

The spectrum analyzer shall provide the following functionality:

- General purpose frequency domain measurements.
- Integrated channel power measurements (power spectral density in 1.23 MHz)

The spectrum analyzer shall meet the following minimum performance requirements:

- Frequency Range: Tunable over applicable range of radio frequencies.
- Frequency Settability: 1 kHz.
- Frequency Accuracy: ± 0.2 ppm.
- Displayed Dynamic Range: 70 dB.
- Display Log Scale Fidelity: ±1 dB over the above displayed dynamic range.
- Amplitude Measurement Range for signals from 10 MHz to either 2.6 GHz for Band Class 0 or 6 GHz for Band Class 1:

    Power measured in 30 kHz Resolution Bandwidth: -90 to +20 dBm.

Integrated 1.23 MHz Channel Power: -70 to +47 dBm.

Note: The Standard RF Output Load described in 6.4.8 may be used to meet the high power end of these measurements.

- Absolute Amplitude Accuracy in the CDMA transmit and receive bands for integrated 1.23 MHz channel power measurements:

  ±1 dB over the range of -40 dBm to +20 dBm

  ±1.3 dB over the range of -70 dBm to +20 dBm.

- Relative Flatness: ±1.5 dB over frequency range 10 MHz to either 2.6 GHz for Band Class 0 or 6 GHz for Band Class 1.
- Resolution Bandwidth Filter: Synchronously tuned or Gaussian (at least 3 poles) with 3 dB bandwidth selections of 1 MHz, 300 kHz, 100 kHz, and 30 kHz.
- Post Detection Video Filters: Selectable in decade steps from 100 Hz to at least 1 MHz.
- Detection Modes: Selectable to be either Peak or Sample.
- RF Input Impedance: Nominal 50 ohm

6.4.7 Average Power Meter

The power meter shall provide the following functionality:

- Average power measurements.
- True RMS detection for both sinusoidal and non-sinusoidal signals
- Absolute power in linear (watt) and logarithmic (dBm) units.
- Relative (offset) power in dB and % units.
- Automatic calibration and zeroing.
- Averaging of multiple readings.

The power meter shall meet the following minimum performance requirements:

- Frequency Range: 10 MHz to either 1 GHz for Band Class 0 or 2 GHz for Band Class 1
- Power Range: -70 dBm (100 pW) to +47 dBm (50 W)

  Different sensors may be required to optimally provide this power range. The RF output load described in 6.4.8 may be used to meet the high power end of these measurements.

- Absolute and Relative Power Accuracy: ±0.2 dB (5%)

  Excludes sensor and source mismatch (VSWR) errors, zeroing errors (significant at bottom end of sensor range), and power linearity errors (significant at top end of sensor range).

- Power Measurement Resolution: Selectable 0.1 and 0.01 dB.

- Sensor VSWR: 1.15:1

6.4.8 RF Output Load

The base station transmitter output shall be connected through suitable means to the measurement equipment or mobile station simulator. The means shall be non-radiating and capable of continuously dissipating the full transmitter output power. The VSWR seen by the transmitter over the 1.23 MHz band centered at the nominal transmit frequency under test shall be less than 1.1:1.

The base station transmitter signal may be terminated and sampled using a dummy load, attenuator, directional coupler, or combination thereof.

6.5 Test Setups

6.5.1 Functional System Setups

Figures 6.5.1-1 through 6.5.1-6 show the test setups used for base station testing. These are functional diagrams only. Actual test setups may differ provided the functionality remains the same.

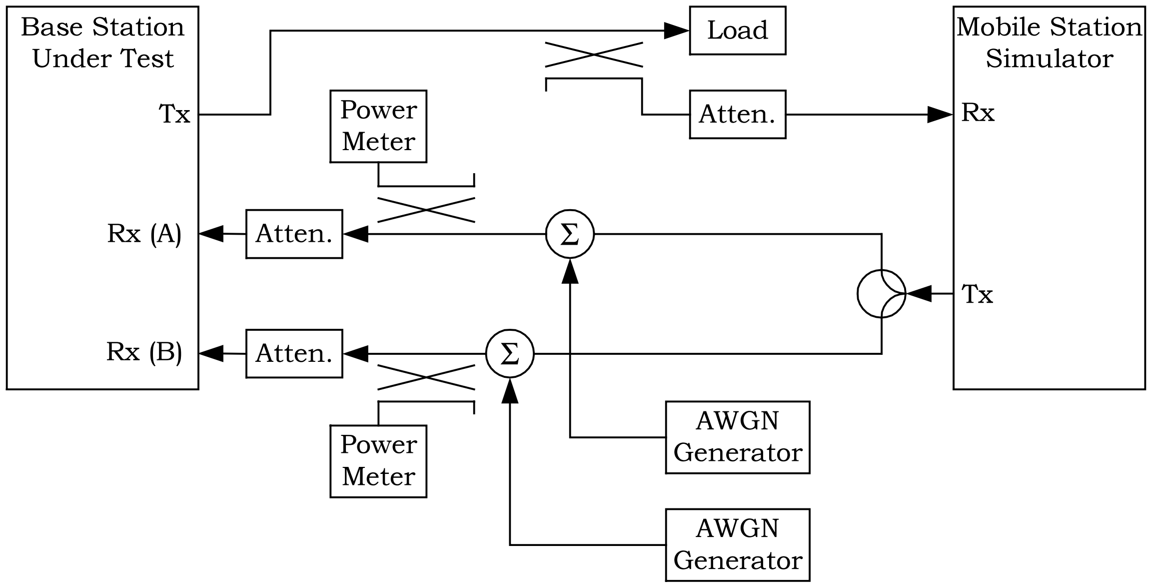

Figure 6.5.1-1. Functional Setup for Base Station Additive White Gaussian Noise Demodulation Tests and Sensitivity Tests

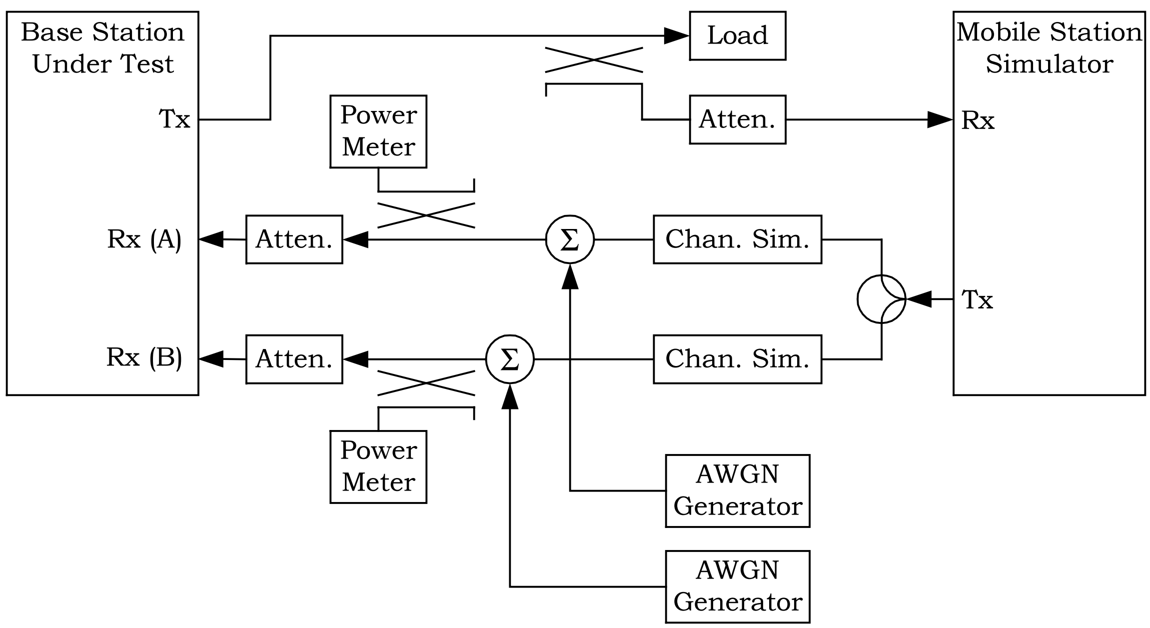

Figure 6.5.1-2. Functional Setup for Base Station Multipath Fading Tests

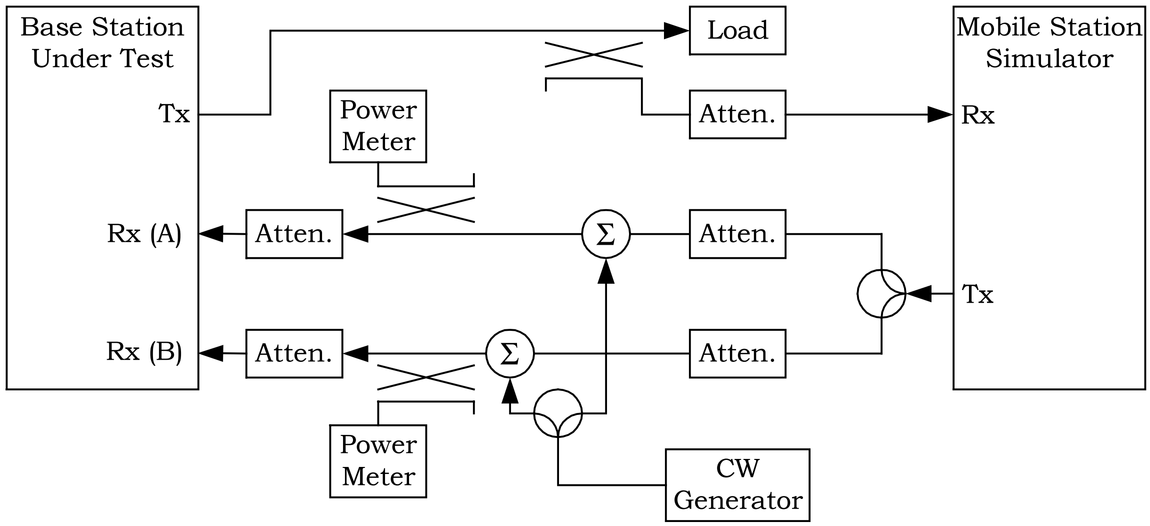

Figure 6.5.1-3. Functional Setup for Base Station Desensitization Tests

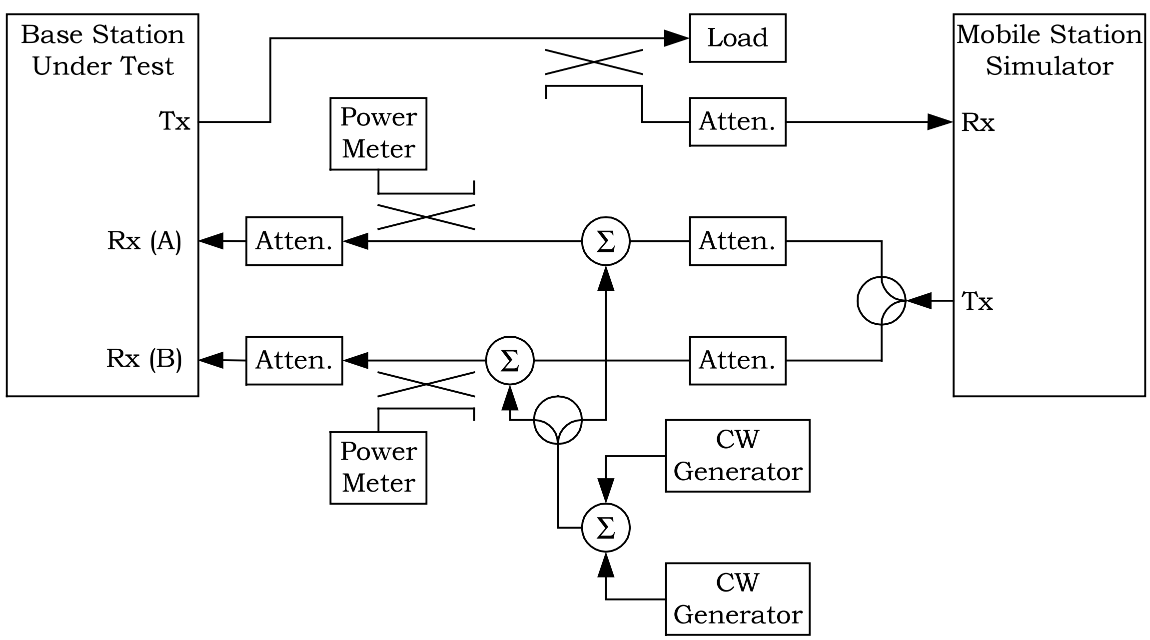

Figure 6.5.1-4. Functional Setup for Base Station Intermodulation Spurious Response Tests

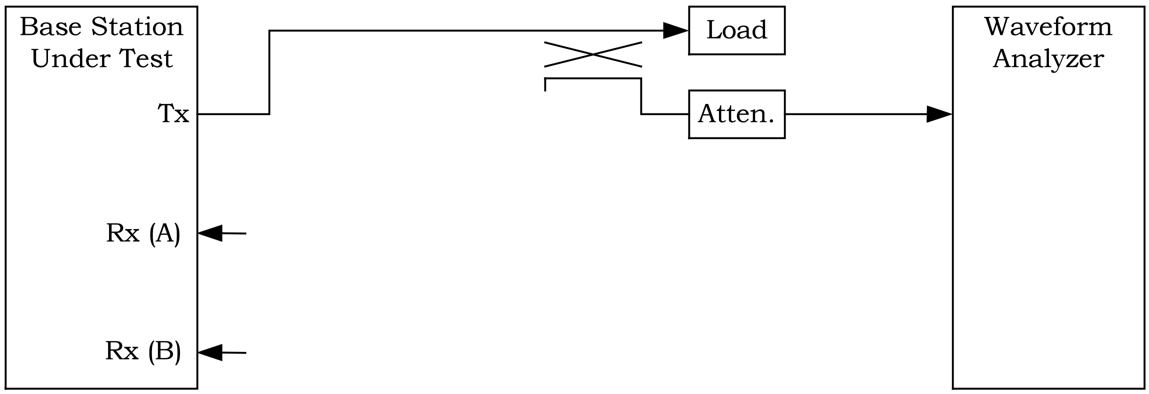

Figure 6.5.1-5. Functional Setup for Waveform Quality Test

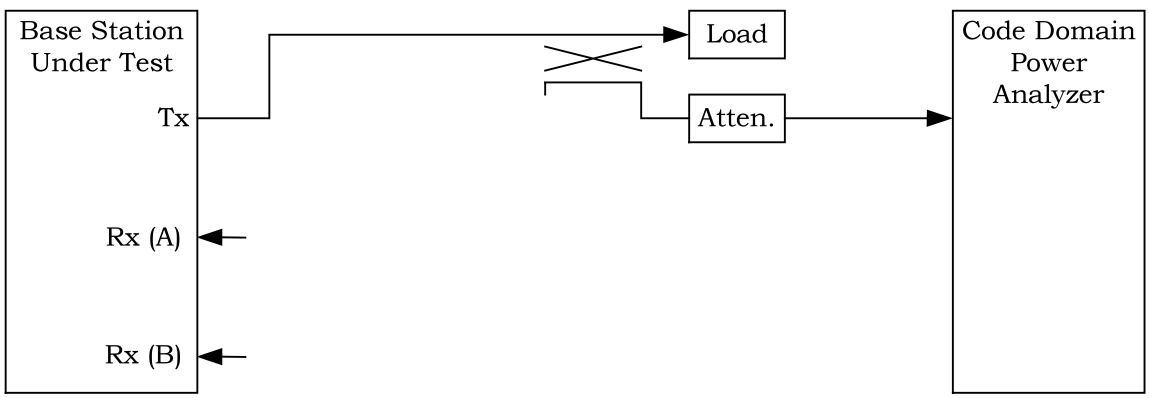

Figure 6.5.1-6. Functional Setup for Code Domain Power Test

6.5.2 Test Model for Base Station

For those base station equipment tests that require multiple code channels be active simultaneously, the configuration shown in Table 6.5.2-1 should be used.

If a different number of Traffic Channels is used, unless otherwise specified, the partitioning of power shall be as shown in Table 6.5.2-2.

For Tables 6.5.2-1 and 6.5.2-2, the fraction of power noted for each traffic channel shall be inclusive of power control bits.

Table 6.5.2-1. Base Station Test Model, Nominal

Type	Number of Channels	Fraction of Power (linear)	Fraction of Power (dB)	Comments
Pilot	1	0.2000	-7.0	Code channel 0
Sync	1	0.0471	-13.3	Code channel 32; always 1/8 rate
Paging	1	0.1882	-7.3	Code channel 1; full rate only
Traffic	6	0.09412	-10.3	Variable code channel assignments; full rate only

Table 6.5.2-2. Base Station Test Model, General

Type	Relative Power
Pilot	0.2 of total power (linear)
Sync+Paging+Traffic	Remainder (0.8) of total power (linear)
Sync	3 dB less than one Traffic Channel; always 1/8 rate
Paging	3 dB greater than one Traffic Channel; full rate only
Traffic	Equal power in each Traffic Channel; full rate only

6.6 Standard Duty Cycle

The transmitter shall be capable of operating continuously at full rated power for a period of twenty-four (24) hours. The equipment shall operate with all specified transmitter and receiver performance parameters being met during and after the 24-hour period.

6.7 Frame Error Rate Measurement

The physical layer of TIA/EIA-95-B provides Traffic Channel frames at a multiplicity of rates. Receivers must determine both the transmitted rate of each frame, and its contents. For purposes of this specification, a frame error is defined as either a rate determination or content error. Frame error rate is defined for each rate:

$$FER_x = 1 - \frac{\text{Number of frames received correctly at rate x}}{\text{Number of frames transmitted at rate x}}$$

Service Option 2 provides a convenient means for measuring the packet error rate of one link, provided the other link is operating at high E_b/N_0. During the base station demodulation performance tests signaling may be disabled, in which case the packet error rate is identical to the Reverse Traffic Channel frame error rate. Refer to 2.6 of TIA/EIA-126-B.

6.8 Confidence Limits

Some tests in this Standard include confidence limits. The requirement is stated in terms of the confidence level with which the error rate of the equipment under test is known to be below some specified maximum.

Error rate confidence testing typically requires E_b/N_0 values above expected values. Specific E_b/N_0 values have been chosen to allow manufacturers to conduct tests in a timely manner for the specified confidence levels.

Any reliable statistical procedure may be used to establish the confidence level. The tests may be either single-sided or two-sided. They also may be either fixed length or variable length. The procedure shall satisfy the following requirements:

- An established procedure shall be employed. It shall include:
    - Specification of minimum and maximum test length
    - Criteria for early termination
- Objective pass-fail criteria shall be established.
- Steps to be taken to rerun the test in case of a failure shall be specified.

Trial-to-trial correlations of errors, as may occur in frame error measurements in slow fading scenarios, should be taken into account. In addition to statistical variations in measurements, systematic errors due to test equipment tolerances and calibration should be considered in interpretation of results.

An acceptable procedure is as follows. Assume independent Bernoulli trials, where the outcome of each trial is classified as either 'error' or 'no error'. The specification error rate limit is λ_{lim} and the required confidence level is C.

1. Choose a suitable test length in terms of a maximum number of errors, K_{max}. The exact value is not critical, but must be large enough to ensure that compliant units pass with very high probability. This probability depends on the design rate ratio λ/λ_{lim} between the design error rate and the specification error rate limit. Values of K_{max} in the range of 30-100 should be suitable based on the margins in this Standard.

2. Carry out N_{max} or more trials under specified test conditions, where

$$N_{max} = \frac{\chi^2(1 - C,\ \ 2\,K_{max}\ )}{2\,\lambda_{lim}}$$

   and $\chi^2(P, n)$ is the inverse χ^2-distribution corresponding to probability P and n degrees-of-freedom. Table 6.8-1 gives N_{max} versus the actual number of errors (K) for C = 95% and representative λ_{lim}. Table 6.8-2 gives N_{max} versus the actual number of errors(K) for C = 90% and representative λ_{lim}.

3. Compute the empirical error rate

$$\lambda_N = K_N / N$$

   and the empirical rate ratio λ_N/λ_{lim}, where K_N is the number of errors in the N trials actually performed.

4. If the rate ratio is less than the confidence limit

$$\lambda_N / \lambda_{lim} < \frac{2\,K_N}{\chi^2(1 - C,\ \ 2K_N + 2)}$$

   or equivalently

$$N > \frac{\chi^2(1 - C,\ \ 2\,K_N + 2)}{2\lambda_{lim}}$$

   then the unit under test has passed; otherwise the unit has failed.

5. If the unit fails, repeat steps 2-4 twice more. If the unit passes both individual tests then it passes overall; otherwise the unit has failed.

This procedure may be modified to permit early termination. A test may be performed at every trial, or after a block of trials. Steps 3 and 4 are modified as follows:

3´. After each trial or block of trials compute the empirical error rate as

$$\lambda_N = K_N / N$$

where K_N is the number of errors up to and including the current (N^{th}) trial, and the rate ratio λ_N/λ_{lim}.

4´. If after the N^{th} trial the rate ratio is less than the confidence limit

$$\lambda_N / \lambda_{lim} < \frac{2K_N}{\chi^2(1-C,\ 2K_N+2)}$$

or equivalently

$$N > \frac{\chi^2(1-C,\ 2K_N+2)}{2\lambda_{lim}}$$

then the unit under test has passed and the testing stops. If the number of trials reaches N_{max} then the unit has failed and the testing stops.

Table 6.8-1. Trial Count (N) Thresholds for 95% Confidence

	λ_{lim}			
K	**0.5%**	**1.0%**	**5.0%**	**General**
0	599	300	60	$3.00/\lambda_{lim}$
1	599	300	60	$3.00/\lambda_{lim}$
2	949	474	95	$4.74/\lambda_{lim}$
3	1259	630	126	$6.30/\lambda_{lim}$
4	1551	775	155	$7.75/\lambda_{lim}$
5	1831	915	183	$9.15/\lambda_{lim}$
6	2103	1051	210	$10.51/\lambda_{lim}$
7	2368	1184	237	$11.84/\lambda_{lim}$
8	2630	1315	263	$13.15/\lambda_{lim}$
9	2887	1443	289	$14.43/\lambda_{lim}$
10	3141	1571	314	$15.71/\lambda_{lim}$
32	8368	4184	837	$41.84/\lambda_{lim}$
64	15540	7770	1554	$77.70/\lambda_{lim}$
128	29432	14716	2943	$147.16/\lambda_{lim}$
256	56575	28287	5657	$282.87/\lambda_{lim}$

Table 6.8-2. Trial Count (N) Thresholds for 90% Confidence

	λ_{lim}		
K	**10.0%**	**50.0%**	**General**
0	24	5	N/A
1	24	5	$2.30/\lambda_{lim}$
2	39	8	$3.89/\lambda_{lim}$
3	54	11	$5.32/\lambda_{lim}$
4	67	14	$6.63/\lambda_{lim}$
5	80	16	$8.00/\lambda_{lim}$
6	93	19	$9.28/\lambda_{lim}$
7	106	22	$10.53/\lambda_{lim}$
8	118	24	$11.77/\lambda_{lim}$
9	130	26	$13.00/\lambda_{lim}$
10	143	29	$14.21/\lambda_{lim}$
32	395	79	$39.43/\lambda_{lim}$
64	745	149	$74.44/\lambda_{lim}$
128	1427	286	$142.70/\lambda_{lim}$
256	2768	554	$276.71/\lambda_{lim}$

In general, the rate ratio form of the test may be used with the curves of Figure 6.8-1 and 6.8-2. This curve is applicable to any specification error rate.

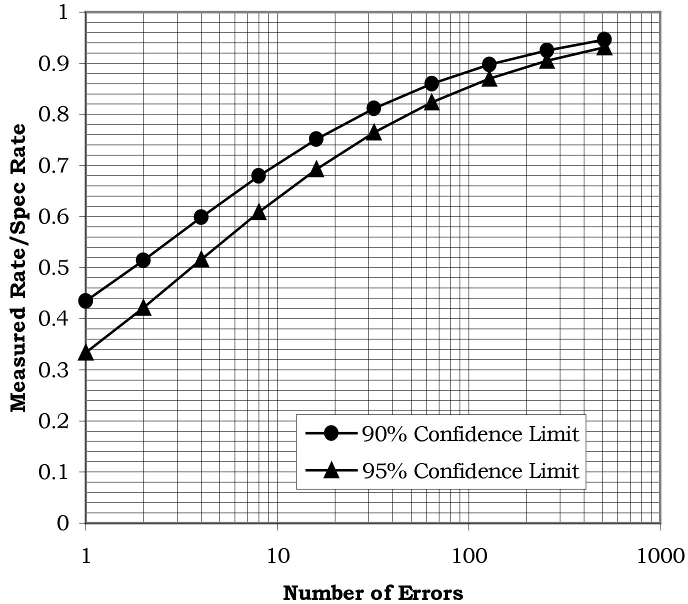

Figure 6.8-1. Rate Ratio (λ_N/λ_{lim}) Bound as a Function of Number of Errors (K) for 90 and 95% Confidence