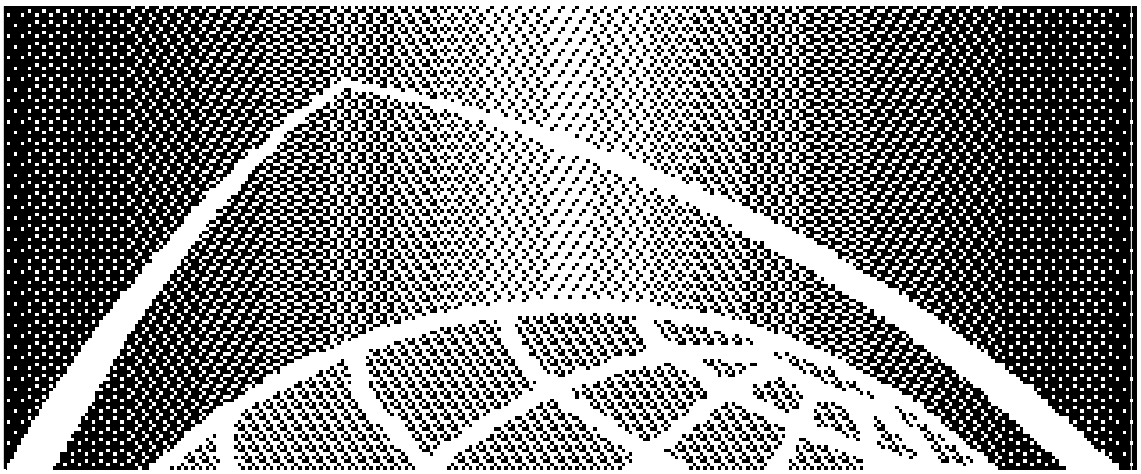
Globalstar™



Globalstar Analog Fixed User Terminal FCC Part 25 Certification Report FCC ID: J9CGSAF1

80-98831-1 X1

QUALCOMM®

QUALCOMM Incorporated
6455 Lusk Blvd.
San Diego, CA, 92121-2779
U.S.A.

Globalstar Analog Fixed User Terminal FCC Part 25 Certification Report
FCC ID: J9CGSAF1

80-98831-1 X1

July 12, 1999

MANUFACTURER

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Document Amendment Record

DATE	DETAILS OF CHANGE (affected pages, etc.)	ISSUE STATUS	MANUFACTURER APPROVAL
7/11/99	Initial Document Release	1	William Moyer

July 7, 1999

Federal Communications Commission
Office of engineering and Technology

Re: Application for Certification of Globalstar Analog Fixed User Terminal,

FCC ID No. J9CGSAF1

Gentlepeople:

Enclosed please find the following documentation for your review:

1. FCC Form 731, including the fee processing form, for the Globalstar Gateway RF Subsystem.
2. A letter for Request for confidentiality.
3. Notification of separate fee payment submittal in the form of a check ($610.00) #19xxxx and accompanying executed Form 159.
4. All test data and support documentation as required for certification under Part 2 and Part 25 of Title 47 of the Code of Federal Regulations Ch. 1 (10-1-98 Edition).

If any further information is required please contact myself or Paul Guckian. You may contact me directly by phone at 619-658-3542, by fax at 619-651-1982, or by e-mail at wmoyer@qualcomm.com. You may contact Paul Guckian directly by phone at 619-651-1547, by fax at 619-651-1988, or by e-mail at pguckian@qualcomm.com.

Please inform us when the Request for Confidentiality has been accepted and also when certification has been granted.

Very truly yours,

William E. Moyer

Sr. Engineer, EMC & Regulatory

FCC Form 731 for Analog Fixed User Terminal

FCC Form 731 for Analog Fixed User Terminal (p. 2)

FCC Form 731 for Analog Fixed User Terminal (p. 3)

Federal Communications Commission

Reference: FCC ID: J9CGSAF1

Request for Confidentiality

Pursuant to Sections 0.457 0.459 of the Commission's rules, Qualcomm Incorporated hereby requests confidentiality for certain aspects of the information accompanying this Application for Certification as specifically identified below:

1 Exhibit 3, Globalstar Compliance Lab Reverse Link Test Procedure (File: E.3 80-98735-1_x1.pdf)

2. Exhibit 4, Globalstar Compliance Lab Out-of-Band and In-Band Noise and Spurious Emissions Test Data (Files: E.4a AFUT obn&s data.pdf and E.4b AFUT ibn&s data.pdf)

3. Exhibit 5, Globalstar AFUT EMC Test Plan (File: E.5 GS AFUT EMC TP.pdf)

4. Exhibit 6, Globalstar AFUT EMC Test Report (Files: E.6 EMC Lab c photo-001.pdf, E.6 EMC Lab c photo-002.pdf, … E.6 EMC Lab c photo-013.pdf and E.6. TUV EMC TR.pdf)

5. Exhibit 7, AFUT Maximum Permissible Exposure Analysis (File: E.7 Fixed UT MPE Analysis.pdf)

6. Exhibit 8, Frequency Stability Data (File: E.8 AFUT Freq. Stab.pdf)

7. Exhibit 10, Description of the Globalstar System (File: E.10 Description of GS.pdf)

8. Exhibit 12, AFUT Installation Guide (File: E.12 80-98052-1X1.pdf)

9. Exhibit 13, Antenna Assembly Drawings (Files: E.13a CV90-70842_X7.PDF and E.13b 80-98735-1_x1.PDF)

10. Exhibit 14, RAU RF Board Drawings (Files: E.14a 20-81540_X2.PDF, E.14b LD20-81540_X1.PDF, E.14c PL20-81540-1X4.pdf), and E.14d AFUT RF Block Diag.pdf)

11. Exhibit 15, RAU Digital board Drawings (Files: E.15a 20-81220_X1.PDF, E.15b LD20-81220_X1.PDF, E.15c PL20-81220-1-.pdf, E.15d DC20-81220_X1.PDF, and E.15e 25-81220_X2.PDF)

12. Exhibit 16, RAU Interface Board Drawings (Files: E.16a 20-81385_X3.PDF, E.16b LD20-81385_X3.PDF, E.16c PL20-81385-1X3.pdf, E.16d DC20-81385_X3.PDF, and E.16e 25-81385_X3.PDF)

13. Exhibit 17, REN Card Drawings
(Files: E.16a 20-23545_X1.PDF, E.16b LD20-23545_X1.PDF, and E.16c PL20-23545-2-.pdf)

14. Exhibit 18, Junction Box Drawings (Files: E.18a CV90-81424_X1.PDF)

15. Exhibit 19, Analog Deskset Drawings
(File: E.19a GPX Deskset Dwg.PDF)

All items contain trade secrets and other proprietary information not customarily released to the general public. Public disclosure of this information would be harmful to Qualcomm Incorporated at this time, and would provide unjustified benefits to our competitors. These materials contain proprietary intellectual property, and Qualcomm is in the process of filing for patent protection on many of these items. Qualcomm understands that, pursuant to Rule 0.457, disclosure of any information contained in this application will not be made before the date of grant.

Very truly yours,

William E. Moyer

Sr. EMC & Regulatory Engineer

List of Exhibits

Exhibit	Description	FCC Reference
1	General Information	2.1033 (c)
2	Certification of Test Data	2.911
3	Globalstar Compliance Lab Reverse Link Test Procedures	2.947, 2.1051
4	Globalstar Compliance Lab Out-of-Band and In-Band Noise and Spurious Emissions Test Data	2.1051, 2.1049
5	Globalstar AFUT EMC Test Plan	2.947, 2.1053
6	Globalstar AFUT EMC Test Report & EMC Test Lab Color Photos	2.1053
7	Fixed UT Maximum Permissible Exposure Analysis	1.1310, 2.1091
8	AFUT Frequency Stability Data	2.1055
9	AFUT Identification Label	2.1033 (c) (11)
10	Description of the Globalstar System	2.1033 (c) (6), (13)
11	AFUT Deskset User Guide	2.1033 (c) (3)
12	AFUT Installation Guide	2.1033 (c) (3)
13	Antenna Assembly Drawings	2.1033 (c) (12)
14	AFUT RF Board Drawings	2.1033 (c) (10), (12)
15	AFUT Digital Board Drawings	2.1033 (c) (12)
16	AFUT Interface Board Drawings	2.1033 (c) (12)
17	AFUT REN Card Drawings	2.1033 (c) (12)
18	AFUT Junction Box Drawings	2.1033 (c) (12)
19	Analog Deskset Drawings	2.1033 (c) (12)

EXHIBIT 1 GENERAL INFORMATION

1.0 Introduction

This document comprises the Type Approval Support Documentation for Certification of Qualcomm's Globalstar Analog Fixed User Terminal (UT).

It provides the data required by the FCC for certification (formerly type acceptance) of intentional transmitters, to the requirements defined in 47 CFR Chapter 1 (10-1-98 Edition), Part 2, Sections 2.1033, 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, and 2.1055 and Part 25, Sections 25.202 (f), 25.204, and 25.213 (b), and (per Report and Order FCC 98-338, adopted 12-17-98) Section 25.200 (c).

Measured data provided was taken using measurement procedures in accordance with Part 2 Sections 2.1041 and 2.1057. The governing regulations are those applicable in the United States of America. Much of the content of the technical description called for in the Section 2.1033 (c) rules resides in the existing, separately published, internal Qualcomm or Globalstar documents furnished in Exhibits to this application. Please note that the information provided in all Exhibits, except Exhibits 1, 2, 9, and 11, is considered proprietary, as discussed in the aforeseen Request for Confidentiality, and is not to be freely distributed.

2.0 Equipment Description

As described in Exhibit 10, the Analog Fixed UT (AFUT) is one of three types of user terminals or phones which Qualcomm is bringing to market for use by Globalstar subscribers. The AFUT operates in Globalstar mode only, communicating directly with overhead Globalstar satellites and via those satellites to the nearest Globalstar Gateway and through the Gateway the rest of the network. The service supports voice and data communications and provides user position location information.

Physically the AFUT is comprised of an externally-mounted Remote Antenna Unit (RAU) containing the radio and digital control circuitry, a Junction Box which provides surge protection at the entry point to the dwelling or facility where the AFUT is installed, a Deskset (phone) which provides the telephone user interface, and the interconnecting cables and ground wires which tie the AFUT elements together, as depicted and described in detail in Exhibit 12 and in the test setup drawings in Exhibits 3 and 5 . Any standard analog telephone deskset may be used with the AFUT, although the audio quality may be less than that provided by the Qualcomm-furnished deskset.

3.0 Summary Technical Description

The following table provides a quick summary of the technical information included in the executed FCC form 731 and discussed further in the following Sections of this Exhibit, and provides a roadmap to the more

detailed descriptions of the Analog Fixed UT and the specific test data which are discussed or presented in this and subsequent Exhibits.

3.1 Operational Frequencies

Each Globalstar UT is capable of transmitting on any one of the frequency channels defined between 1610 and 1626.5 MHz, as described in Section 3 of Exhibit 10. In the US and other countries where one or more TDMA mobile satellite service (MSS) low earth orbit (LEO) systems are authorized to operate, Globalstar UT's transmit (and are authorized to transmit) in only the lower 9 of the 13 channels listed in Exhibit 10, operating in the frequency range from 1610 to 1621.35 MHz. Depending on local Globalstar traffic conditions, a given UT may be assigned to operate on any of the authorized channels for a given call. Multiple access and efficient frequency re-use is provided by means of code division multiple access (CDMA) technology.

3.2 CDMA Modulation Technology

The Globalstar Air Interface uses a modified form of IS-95 to support Code Division Multiple Access. CDMA was selected for Globalstar because it represents a proven technology that can provide efficient modulation scheme for satellite communications. It is relatively interference tolerant, both from a standpoint of generation of interference to other services and tolerating outside interference. As a bonus, there is a level of security inherent in the modulation scheme. It is difficult to listen into conversations or to pirate services from the system. CDMA is able to provide good voice quality while operating at relatively low RF power levels. The Globalstar CDMA is based on the existing QUALCOMM CDMA product line used for terrestrial cellular communications.

For a detailed description of the CDMA technology, see Section 4 of Exhibit 10, Description Of The Globalstar System.

3.3 Operating Power Levels

Active power control is employed in the Globalstar system to minimize collateral interference between proximate Globalstar subscribers, since as is true of any multiple access spread spectrum system, other users signals represent noise to a given users signal. Thus all signals are automatically reduced to minimum power levels by the system, transparently to the user. As defined in the Globalstar Air Interface (GAI) Specification (80-25118-1), the effective isotropic radiated power (EIRP) of a fixed UT operating at maximum power output ranges from 1 to 4 Watts, with 3 Watts being typical.

Table 1. General Information Required for Type Acceptance

In Accordance with FCC Rules and Regulations, 47 CFR Ch. 1 (10-01-98 Edition)
Part2, Sections 2.1046 - 2.1055, Test measurements per Sections 2.1041 and 2.1057

Section	Information Category					
2.1033 (c) (1)	Name and Address of Applicant: Qualcomm Incorporated 6455 Lusk Boulevard San Diego, CA 92064					
2.1033 (c) (2)	FCC Identification Number: J9CGSAF1 GLobalstar Analog Fixed User Terminal					
	Planned Production Quantity Multiple					
	Technical Description					
2.1033 (c) (4), (5), (6), and (7)	Emission Type	Frequency Range and Polarization	Maximum / Nominal Power ERP (dBW)	Maximum EIRP Density (dBW/4kHz)	Description of Modulation	Referenced Exhibits
	1M25G1W	Tx: 1610-1621.35 MHz LHCP	4 / 1	-18.9	- See Waveform -	Exhibits 1 and 10
	1M25G1W	Rx: 2483.5-2500 MHz LHCP			- See Waveform -	
25.xxx	Maximum EIRP toward Horizon:	-29 dBW/4 kHz				Exhibits 1 and 13
2.1033 (c) (13)	Waveform:					Exhibit 10, Section 4
	Waveform consists of multiple direct-sequence spread-spectrum channels whose carriers are uniformly spaced. Each CDMA channel is 1.23 MHz. Each CDMA RF waveform is QPSK.					
2.1033 (c) (8)	DC Voltages and Currents into Final RF Amplifier					Exhibits 1, 15, and 16
	12 VDC nominal, 0.3-30 A into RAU, PA isolated by multiple regulator stages from power input fluctuations					
2.1033 (c) (3) and (9)	Instruction Books and Tune Up Procedure					Exhibits 1, 11, and 12
	System is self regulating, no user tune up procedures are necessary or possible.					
2.1033 (c) (10)	Description of all Circuitry and Devices which Determine and Stabilize Frequency					Exhibits 1, 10, 14, and 15
	All RF circuit clocks and oscillators are phase lock loop locked to voltage controlled temperature compensated crystal oscillator (TCXO), the master system oscillator which provides frequency accuracy stability to 10 ppm.					
2.1033 (c) (10)	Description of Circuits/Devices used to Suppress Spurious Radiation, Limit Modulation, or Limit Power					Exhibits 10, 13, and 14
	System utilizes extensive filtering and open and closed loop power control.					
2.1033 (c) (11)	Drawing of Equipment Identification Label					Exhibit 9
	Located on Back of RAU Chassis					
2.1033 (c) (12)	Photographs of Equipment showing Equipment Construction and Layout					Exhibit 6
	Included in EMC Test Report, Exhibit 6					

3.4 Occupied Bandwidth and Out-of-Band Emissions (OOBE)

Conducted antenna port ccupied bandwidth and out of band emissions measurements for low, mid, and high frequency transmit channels are presented in Exhibit 4, which consists of the Compliance Lab Out-of-Band Noise and Spurious Emissions Test Data, the Compliance Lab In-Band Noise and Spurious Emissions Test Data, and also the Maximum antenna gain data. The latter provides the means to estimate an upper bound on antenna radiated emissions levels using the conducted antenna port data. Direct radiated out-of-band and spurious emissions test results are presented in Exhibit 6, where the emissions were compared against and show compliance with the more stringent Part 15 radiated emissions limits, which apply to the digital control and receiver functions of the AFUT.

3.5 DC Supply Voltage and Current

The AFUT is powered by an external DC power supply, which provides a nominal 12 VDC (10-18 VDC range) at 0.3 to 3 Amperes current draw, 30 Watts maximum load . Power to the transmitter power amplifier (PA) located on the RAU RF board is routed from the Digital board, passing through multiple switching and analog power regulator stages, and the PA never “sees” any changes in the RAU supply voltage. It is thus virtually immune to any effects of voltage fluctuation within the defined DC power voltage input range of the RAU. Outside that range the RAU simply shuts down.

3.6 Transmitter Adjustment and Tune-Up Procedure.

All frequency adjustments are made at the factory and no frequency adjustments are made by the user.

3.7 Frequency Stability

All RF oscillators are phase-lock loop locked to the output signal of a voltage controlled temperature compensated crystal oscillator (TCXO), the master oscillator of the system. It is specified to provide frequency accuracy to better than 10 parts per million over the UT’s 5 year design life, with 5 ppm allocated to TCXO aging. Exhibit 8 summarizes the temperature variation frequency stability test results which have been obtained. Due to the relatively large Doppler error inherent to an LEO communications system, transmit frequencies are locked to the TCXO signal and are not adjusted based on frequency differences with respect to Gateway transmitted signals.

3.8 Circuitry for Suppression of Spurious Radiation

Multiple stages of filtering are employed in the transmit chain from baseband through intermediate frequency (IF) to the RF transmitter output to

the antenna, as can be seen in the RF Board schematic and parts list in Exhibit 16. Multiple SAW filters are employed in the transmitter (TX) IF and Upconverter stages. A discrete ceramic filter and pi LC filter are applied to the output of the transmitter HPA.

3.9 Maximum Permissible Electromagnetic Field Exposure

Since the Analog Fixed UT transmitting antenna is used at distances greater than 20 cm (8 inches) from the user's body (generally at much greater distances) specific absorption rate (SAR) testing is not required. An analysis of RAU antenna EM emissions levels, to conservatively determine the minimum safe approach distance with respect to the FCC uncontrolled environment exposure limits specified in 47 CFR Ch.1 (10-01-98 Edition) Section 1.1310, is presented in Exhibit 7.

Exhibit 2 Certification of Test Data

The data, data evaluation, and equipment configuration presented herein are a true and accurate representation of the measurements of the sample's radio frequency interference emissions characteristics as of the dates and at the times of the tests under the test conditions specified herein. This applies to all tests that were performed that did not require an Open Area Test /Site (OATS). Tests that required an OATS were performed by TUV Product Services, a Competent Body Laboratory located in the United Kingdom, as indicated in Exhibit 6.

Equipment Tested: AFUT RAU model GSP2400P, S/N: N1065T4DR

Dates of Test: May 27, 1999

Test Performed by:

Lab. Tech. Donald Gosnell
Engineer: Vince Butsumyo

_____

Exhibit 3 Analog Fixed UT Globalstar Compliance Lab Reverse Link Test Procedures

Exhibit 4 Globalstar Compliance Lab Out-of-Band and In-Band Noise and Spurious Emissions Test Data

Exhibit 5 Globalstar AFUT EMC Test Plan

Exhibit 6 Globalstar AFUT EMC Test Report and EMC Lab Color Photos (Internal and External)

Exhibit 7 AFUT Maximum Permissible Exposure Analysis

Exhibit 8 Frequency Stability Data

Exhibit 9 FCC Identification Label

Exhibit 10 Description of the Globalstar System

Exhibit 11 AFUT Deskset User Guide

Exhibit 12 AFUT Installation Guide

Exhibit 13 Antenna Assembly Drawings

Exhibit 14 RAU RF Board Drawings

Exhibit 15 RAU Digital Board Drawings

Exhibit 16 RAU Interface Board Drawings

Exhibit 17 REN Card Drawings

Exhibit 18 Junction Box Drawings

Exhibit 19 Analog Deskset Drawings