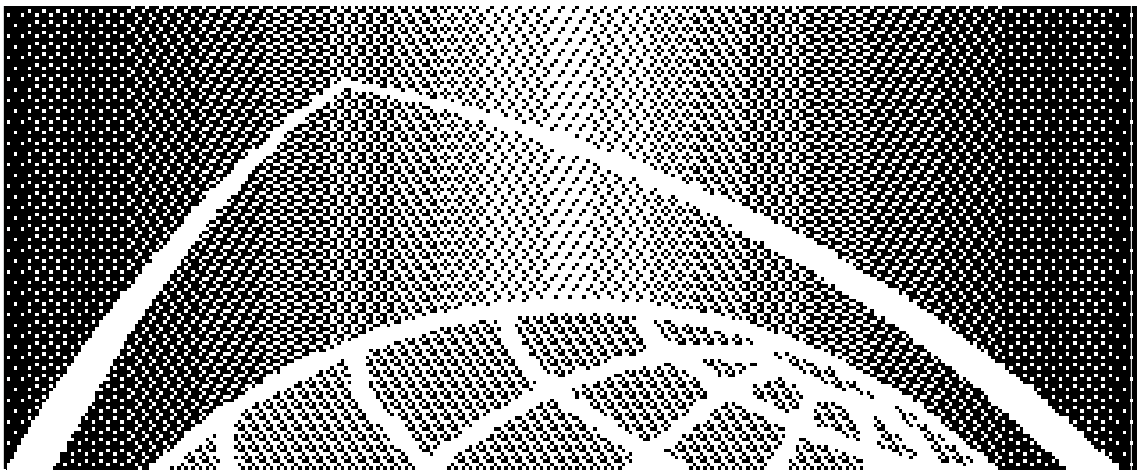
Globalstar™



Globalstar GCK-1410 Hands-Free Car Kit FCC Part 25 Certification Report FCC ID: J9CGSCK1A

80-98832-2 X1

QUALCOMM®

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U.S.A.

Globalstar Portable User Terminal Car Kit FCC Part 25 Certification Report
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April 26, 2000

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Document Amendment Record

DATE	DETAILS OF CHANGE (affected pages, etc.)	ISSUE STATUS	MANUFACTURER APPROVAL
07/15/99	GCK 1400 Initial Release	1	William Moyer
04/20/00	GCK-1410 Revision Released	1	William moyer

Cover Letter

See Exhibit 1. a.

FCC Form 731 for Globalstar GCK-1410 Hands-Free Car Kit

See Exhibit 1. b for copy of electronically-executed FCC Form 731

Confidentiality Request Letter

See Exhibit 1. c.

List of Exhibits

Exhibit	Description	FCC Reference
1	General Information	2.1033 (c)
2	Certification of Test Data	2.911
3a	Globalstar Compliance Lab Reverse Link Test Procedures	2.947, 2.1051
3b	Globalstar Car Kit Narrowband OOBE Test Plan	2.947, 2.1051
4a	Globalstar Car Kit ETSI Out-of-Band and In-Band Noise and Spurious Emissions Test Report	2.1051, 2.1049
4b	Conducted CK ETSI Test Data	2.1051, 2.1049
4c	Narrowband OOBE Test Report	2.1051, 2.1049
5a	Globalstar CK Spurious Radiated Emissions Test Plan	2.1051, 2.1049
5b	Globalstar CK Spurious Radiated Emissions Test Report	2.1051, 2.1049
6	Globalstar CK Color Photographs	2.1033 (c) (12)
7	GCK-1410 Maximum Permissible Exposure Analysis	1.1310, 2.1091
8	CK Frequency Stability Data	2.1055
9	CK Identification Labels	2.1033 (c) (11)
10	Excepts from the Description of the Globalstar System	2.1033 (c) (6), (13)
11a	GS Hands-Free Car Kit Installation/User Guide	2.1033 (c) (3)
11b	GCK-1410 Installation Sheet	2.1033 (c) (3)
12	Car Kit Outdoor Unit (ODU) Drawings	2.1033 (c) (12)
13	GS Car Kit Electronic Module (GEM) Drawings	2.1033 (c) (10), (12)
14	GS Car Kit Cradle Drawings	2.1033 (c) (12)
15	CK Accessories Drawings	2.1033 (c) (12)

EXHIBIT 1 GENERAL INFORMATION

1.0 Introduction

This document comprises the Certification Support Documentation for Certification of Qualcomm's Globalstar (GS) GCK-1410 Hands-Free Car Kit (CK).

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).

The GCK-1410 Car Kit, like the earlier and previously certified GCK-1400 Car Kit (FCC ID: J9CGSCK1) that it replaces, is classified as an amplifier of the modulated Globalstar-mode RF signals to and from any Portable User Terminal (UT) inserted in the Car Kit's cradle (as discussed in Section 2.0 of this exhibit and in Exhibits 10 and 11).

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 Exhibits 12 through 15, is considered proprietary, as discussed in the Exhibit 2 Request for Confidentiality, and is not to be freely distributed.

2.0 Equipment Description

As described in Exhibits 10 and 11, the Car Kit provides the ability for a portable UT to operate within a closed vehicle, operating in a hands-free mode when installed in the dashboard-mounted Car Kit Cradle, and utilizing external antennas mounted on the vehicle exterior. In Globalstar mode, the RF signal from the UT is amplified in the Car Kit Outdoor Unit (ODU) and transmitted to overhead Globalstar satellites by the ODU's antenna. The UT communicates with overhead Globalstar satellites through the ODU and via those satellites to the nearest Globalstar Gateway and through the Gateway to the rest of the network. For terrestrial cellular mode communications using a Tri-Mode UT in a Car Kit, the Car Kit provides a passive coaxial cable interconnect to a 3rd party vehicle mounted cellular phone antenna.

Physically the Car kit is comprised of an externally-mounted Outdoor Unit (ODU), a Globalstar CK Electronic Module (GEM), the CK Cradle, and the Car kit I/O interconnect cables which tie the system together. The ODU contains an RF power amplifier (PA), a DC power regulator, digital control

circuitry. The GEM provides the primary power interface and regulated power for the Car kit and UT, the optional hands-free microphone and loudspeaker interfaces, the optional privacy handset interface, and the main digital control circuitry for the Car kit. The Cradle physically holds the UT in place and provides the electrical power, signal, and control interfaces to the UT. (See Exhibits 12-15 and the Car Kit Installation Sheet in Exhibit 11b).

Functionally the GCK-1410 is inearly identical to the earlier bulkier GCK-1400 Hands-Free Car Kit. The GEM is nearly unchanged, except for some resistor values which determine the output DC voltage provided by the GEM to the ODU and the Car Kit's audio gain (which has been increased by 3 dB). The RF paths through the cradle and ODU are considerably different, with the ODU combiner eliminated from the design and two independent coaxial cables interconnecting the Cradle and ODU, for UT Rx and Tx signals. Digital control/monitor signals and DC power are multiplexed onto the Tx coaxial cable. The cradle board has thus been substantially modified. The ODU design, which incorporates dielectric resonator antennas, in place of the quadra-filar helical antennas used in the earlier Car Kit, and a substantially different shielding topology, is new.

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.

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:** J9CGSCK1 GLobalstar Portable User Terminal Car Kit					
	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	3.55 / 1	-21.3	- 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 12
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 and 12
	7.3 VDC nominal, 1.5 A into ODU, stepped down from 12 VDC vehicle battery voltage. PA is isolated by multiple regulator stages from power input fluctuations					
2.1033 (c) (3) and (9)	**Instruction Books and Tune Up Procedure**					Exhibits 1 and 11
	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, 8, and 12
	Frequency stability of 10 ppm is completely determined by characteristics of portable UT. Cark kit contains no synthesizer or LO's and provides only amplification of modulated RF signal from UT.					
2.1033 (c) (10)	**Description of Circuits/Devices used to Suppress Spurious Radiation, Limit Modulation, or Limit Power**					Exhibits 1 and 12
	System utilizes extensive filtering and open and closed loop power control.					
2.1033 (c) (11)	**Drawing of Equipment Identification Labels**					Exhibit 9
	3 Labels: Located on Bottom of ODU Chassis, Back of GEM box, and Back of Cradle					
2.1033 (c) (12)	**Photographs of Equipment showing Equipment Construction and Layout**					Exhibit 6
	Included in EMC Test Report, Exhibit 6					

3.2 CDMA Modulation Technology

The Globalstar Air Interface uses a modified form of IS-95 to provide Code Division Multiple Access. CDMA was selected for Globalstar because it represents a proven technology that can provide an 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 mobile UT's operating at maximum power output ranges from 1 to 4 Watts, with 3.55 Watts EIRP being the maximum rated radiated output power of the GCK-1410 Car Kit (radiated in the direction of the zenith), and 28 dBm being the maximum spatial average or typical radiated output power of the Car Kit. The radiated power is left hand circular polarized (LHCP), yielding a 3 dB reduction in coupling to other systems with linearly-polarized antennas.

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

Conducted antenna port occupied bandwidth and out of band emissions measurements for low, mid, and high frequency transmit channels are presented in Exhibits 4a, b, and c, which consist respectively of the Compliance Lab ETSI Out-of-Band Noise and Spurious Emissions Test Report, the ETSI Conducted Test Data , and the GCK-1410 Narrowband OOBE Test Report.. Radiated spurious emissions test results are presented in Exhibit 5.

3.5 DC Supply Voltage and Current

The Car Kit is powered by the vehicle's DC (battery) power distribution, which provides a nominal 12 VDC (10-18 VDC range) at 0.3 to 3 Amperes current draw, 30 Watts maximum load . The Vehicle DC power is stepped down by the GEM power supply to a nominal 7.7 VDC and that DC voltage is routed to the Cradle and UT, and over the special interconnecting coaxial cable to the ODU, which draws up to 1.5 Amperes when transmitting at full power. The power to the ODU power amplifier (PA) passes through multiple switching and analog power regulator stages, and the PA never "sees" any changes in the Car Kit supply voltage. It is thus virtually immune to any effects of voltage fluctuation within the defined DC power voltage input range of the Car kit. Outside that range the Car Kit 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

The Car Kit contains no synthesizer or local oscillators and cannot directly affect the frequency stability of the transmitted RF signal; it only provides amplification of the modulated RF signal from the UT. The frequency stability of the ODU transmit signal is thus determined by the frequency stability of the UT to which it is connected.

All UT 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.

The UT's frequency stability could in-principle be adversely affected by variations in the supply voltage provided to the UT by the Car Kit. But as discussed in Exhibit 8, the voltage variation of the Car Kit power supply output with temperature and input Car Kit voltage variations is within the range required by the UT to maintain its inherent frequency stability.

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 ODU RF Board schematic, block diagram, and parts list in Exhibit 12. Multiple SAW filters are employed in the transmitter (TX) IF and Upconverter stages.

3.9 Maximum Permissible Electromagnetic Field Exposure

Since the Car Kit 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 ODU 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.

The Car Kit also provides a coaxial interface cable to connect a Tri-Mode Portable UT to a 3rd party coax cable and externally-mounted cellular antenna. The resultant radiated terrestrial-mode transmit power is not known, but will be less than 1.5 W ERP at a distance greater than 20 cm from the body, meeting the MPE low-power categorical exclusion criterion of §2.1091 (c).

That conclusion is based on the calculated worst-case maximum ERP output of the phone with its built-in 4.1 dBi whip antenna (30 dBm, including 2 dB error tolerance), the maximum credible additional gain which could be provided by a 3rd party cellular antenna, 1.1 dB (5.2 dB - 4.1 dB) for a quarter-wave monopole with a large ground plane, and the probable cable loss for the greater length of coaxial cable between the phone PA and the antenna (0.5 to 1.0 dB). Together that yields a worst-case maximum predicted transmit power of 30.1 to 30.6 dBm ERP, 1.02 to 1.15 W ERP.

Exhibit 2 Certification of Test Data

Exhibit 3 Globalstar Compliance Lab Reverse Link Test Procedures and Narrowband OOBE Test Plan

Exhibit 4 Globalstar ETSI Out-of-Band and In-Band Noise and Spurious Emissions Test Report and Data, and Narrowband OOBE Test Rport

Exhibit 5 Globalstar GCK-1410 Car Kit Radiated Spurious Emissions Test Plan and Report

Exhibit 6 Globalstar Car Kit Color Photographs

Exhibit 7 Car Kit Maximum Permissible Exposure Analysis

Exhibit 8 Car Kit Frequency Stability Data

Exhibit 9 Car Kit Identification Labels

Exhibit 10 Description of the Globalstar System

Exhibit 11 Hands-Free Car Kit Installation/User Guide

Exhibit 12 Car Kit Outdoor Unit (ODU) Drawings

Exhibit 13 GS Car Kit Electronic Module (GEM) Drawings

Exhibit 14 Car Kit Cradle Drawings

Exhibit 15 Car Kit Accessories Drawings