

Uppgjord (även faktaansvarig om annan) - Prepared (also subject responsible if other)		Nr - No.	
BA/EML/AH/B Subhash Chander +44 1256 864224		BA/EML/AH/B 00_0234_A1	
Dokansv/Godk - Doc respons/Approved	Kontr - Checked	Datum - Date	Rev
BA/EML/AH/BC (Paul Kidson)		2000-01-10	A1
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INFORMATION FOR FCC SUBMISSIONTYPE : 1180101-BVMODEL: R290 SATELLITEFCC ID: OHL R290 SAT

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1 NAME AND FULL ADDRESS OF THE APPLICANT

Ericsson Mobile Communications (UK) Limited
The Keytech Centre
Ashwood Way,
Basingstoke,
Hants. RG23 8BG,
United Kingdom.

1.1 NAME AND FULL ADDRESS OF THE MANUFACTURER

Ericsson Mobile Communications (UK) Limited
Lawn Road
Carlton-in-Lindrick
Worksop
Nottingham S81 9LB
United Kingdom.

2 EQUIPMENT IDENTITY

Model No. R290 SAT
Type No. 1180101-BV
FCC identifier OHL R290 SAT

3 EQUIPMENT CLASS

3.1 SATELLITE MODE

User Terminal Class I I (Portable)

3.2 GSM MODE

User Terminal class 4 (Handheld).

4 BUILD STANDARD

4.1 HARDWARE REVISION(S)

Refer to Build Standard supplied separately.

4.2 SOFTWARE REVISION(S)

Refer to Build Standard supplied separately.

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4.3 MES IDENTIFICATION CODE (MIC)

IMEI as stated on equipment label.

5 S-PCN SYSTEM

Globalstar LP

5.1 MODES OF OPERATION

The R290 SAT is a **dual mode** device and will operate on the Globalstar Satellite network and on the GSM 900 Networks.

5.2 VOLTAGE REQUIREMENTS

Nominal:- +7.4 Vdc

Higher Extreme:- +8.2 Vdc

Lower Extreme:- +6.4 Vdc

6 CFR47 REFERENCE INFORMATION

6.1 CFR47 SECTION 2.1033(C) 4 / 5 (TYPE OF EMISSIONS / FREQUENCY RANGE)

6.1.1 Satellite mode

The User terminal uses the transmitter frequencies 1610 to 1626.5MHz, i.e. a 16.5 MHz bandwidth allocation.

509 channels are contained within this bandwidth which uses OQPSK as the modulation scheme.

Each channel is spectrally spread using a unique code to create a CDMA system where each channel has a 1.23MHz bandwidth.

QPSK CDMA signals are received at 2483.5 to 2500MHz.

6.1.2 GSM mode

The User terminal uses the transmitter frequencies 890 to 915MHz, i.e. a 25.5 MHz bandwidth allocation.

124 RF channels are available within these allocation bandwidth and the uses GMSK modulation scheme transmission with BT=0.3.

Eight traffic channels are slotted in each of the RF channels using TDMA system.

6.2 CFR47 SECTION 2.1033(C) 6 (POWER LEVELS)

6.2.1 Means Provided for Variation of Operating Power

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6.2.1.1 Satellite Mode

Power control is instigated at the Intermediate Frequency (I.F) using an AGC (automatic gain control) amplifier. When the User Terminal is under closed loop control to the Gateway, via the satellite, it is the Gateway that controls the transmitter output power level of the U.T.

To stop the transmitter PA (power amplifier) saturating when the satellite is constantly requesting more power, there is an additional power detector at the output of the PA. This is fed back to the CDMA Baseband Analogue ASIC (IC 22 Part Ref: CD90-21884-5), via the BB2's auxiliary analogue to digital converter.

6.2.1.2 GSM Mode

A power control voltage held in the register in the CSP1089 determines the transmit power level. Coupling and detecting a small portion of the output power and comparing the detected voltage with a reference voltage determined during transmission calibration provides power control. The output of this comparator is the PA control voltage. This provides closed loop control that continuously corrects the output power throughout the Tx burst.

6.2.2 Range of Operating Power Levels

6.2.2.1 Satellite Mode

Under closed loop power control conditions the User Terminal supports an output power control range of 18dB, from the maximum EIRP as defined in section 3.1 (CFR47 Section 2.1033(c) (7)).

6.2.2.2 GSM Mode

Under closed loop power control conditions the User Terminal supports an output power control range of 28dB (33dBm to 5dBm) for class 4 handheld mobile phones as defined in GSM 5.05.

6.3 CFR47 SECTION 2.1033(C) 7(MAXIMUM POWER RATING)

6.3.1 Satellite mode

G/T (dB/K)		EIRP (dBm)			
<u>Spatial Average</u>	<u>Minimum</u>	<u>Lower limit</u>	<u>Spatial Average</u>	<u>Upper limit</u>	<u>Control range (down from max.) (dB)</u>
>-28	-30	+22.5	≤+33	+28.5	18

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The transmit chain includes a power detector at the PA output and a temperature sensor. The power indication by the power detected is provided as a numerical value which is used to calibrate both the temperature and frequency of operation by the Baseband Sub-System.

6.4 CFR47 SECTION 2.1033(C) 8 (DC POWER SUPPLY TO TX STAGES)

Power supply to the various RF transmitter stages are indicated in the table below.

Power Rail	Function
+4V Supply	Used in GSM/BB and GS_RF boards.
+3.3V Supply	Used in GSM/BB and GS_RF boards.
+6.5V Supply	Further regulated in to: +5V_RF, +5V_LNA, +5V_RF_TX and +5V_RF_VCO.
+3.0V Supply	GS_RF board and derived from +3.3V supply
+5.0V Supply	GS_RF board and derived from +6.5V supply

6.5 CFR47 SECTION 2.1033(C) 9 (TX POWER TUNING)

6.5.1 Satellite mode

The transmitter power tuning is controlled by the network. The information for the transmit power is sent by the Gateway and local AGC is used to maintain the power. The AGC is also used to limit the maximum transmit power under abnormal request sent by the gateway. The following tuning range is used:

0.5dB +/-0.5dB for a nominal 0.5dB change requested by gateway, over whole operating frequency range.

10dB +/-2dB for a nominal 10dB change requested by gateway, over whole operating frequency range.

6.5.2 GSM Mode

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A power control voltage held in the register in the CSP1089 determines the transmit power level. Coupling and detecting a small portion of the output power and comparing the detected voltage with a reference voltage determined during transmission calibration provides power control. The output of this comparator is the PA control voltage. This provides closed loop control that continuously corrects the output power throughout the Tx burst.

2.0dB +/-0.5dB for a nominal 2 dB change requested by the GSM network for class 4 handheld mobile phone. The power level 5 corresponds to +33dBm and power level 19-31 corresponds to +5dBm.

6.6 CFR47 SECTION 2.1033(C) 10 (METHOD OF FREQUENCY STABILISATION)

6.6.1 Satellite mode

Both receive and transmit RF and IF local oscillator (frequency synthesizer) designs reference a temperature controlled crystal oscillator, TCXO.

Frequency lock detection circuitry is embedded into these local oscillator designs. Should any one

of these fault detection monitors flag a fail condition, the GUM IC will be notified and correspondingly

Inhibit RF transmit capability.

Circuitry & Device description:

Item	Part Identity	Part Reference	Description
1	IC29	Temperature controlled crystal oscillator (TCXO) 19.68MHz	Frequency may be adjusted manually via a tuning pot (this is factory pre-set to a given tolerance) and also adjusted via a control voltage. This voltage is fixed via a potential divider resistor network
2	IC2	LM2330A	Dual Frequency Synthesizer (PLL) IC Chip Contains dual modulus prescalers (32/33 or 64/65 prescaler in the 2.5GHz band) for both RF and IF loops and digital loop detector.
3	X1	QVC801488RT-2	Globalstar Transmit voltage controlled oscillator (VCO)
4	X2	QVC802267RT-2	Globalstar Receive VCO
5	IC22	CD90-21884-5	Baseband Analogue IC (BB2). Onboard Receive IF VCO and divide by 2 counter

6.6.2 GSM Mode

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The actual GSM frequency (both Tx and Rx) is synthesised using an UHF synthesiser controlled by a PLL. The 13MHz TCXO is used as a reference frequency. A 200kHz signal is derived from the 13MHz clock to use as a reference for the tuneable UHF synthesiser, 200kHz also provides the channel spacing required for GSM. In order to meet the frequency error specification on transmit of $\pm 0.1\text{ppm}$, a frequency offset is calculated from the error between the handset and base station time bases. An offset parameter is then loaded in to a register on the IC22 that then introduces a phase offset on to the transmit I & Q signals to compensate for any time base error.

6.7 CFR47 SECTION 2.1033(C) 10 (OPERATIONAL DESCRIPTION OF TRANSMITTER COMPONENTS)

6.7.1 CDMA In band Channel Filtering

6.7.1.1 Baseband

Digital Baseband I and Q data enters into the BB2 IC (part identity IC22 part CD90_21884-5). After digital to analogue conversion this signal is low pass filtered. Baseband signals between 1KHz and 630KHz are passed, while frequency components above 750KHz (i.e. out of band CDMA operation) are filtered.

This signal is modulated to an IF frequency of 130.38MHz.

6.7.1.2 Intermediate Frequency (IF) Filtering

A surface acoustic wave filter (part ref: F1), or SAW, is used in the IF section to further define the in band spectral response of the CDMA signal.

6.7.2 Power Control

Intermediate Frequency (IF) Gain control

Final transmitter output power is controlled by varying the gain of part IC27, an automatic gain control integrated circuit.

All other amplifiers at IF and RF stages have fixed gain.

6.7.3 Suppression of Spurious Radiation

6.7.3.1 Radio Frequency (RF) Filtering

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Bandpass filters, part references F6 and XR2 serve to filter out local oscillator breakthrough from the IF to RF mixer and also spectrally define the transmit out of band emissions mask.

A Lumped element 5 pole low pass filter at the end of the transmitter section provides additional rejection to harmonics of the operational CDMA channel.

6.8 CFR47 SECTION 2.1033(C) 13 (DESCRIPTION OF MODULATION TECHNIQUE USED)

6.8.1 Transmitter Architecture

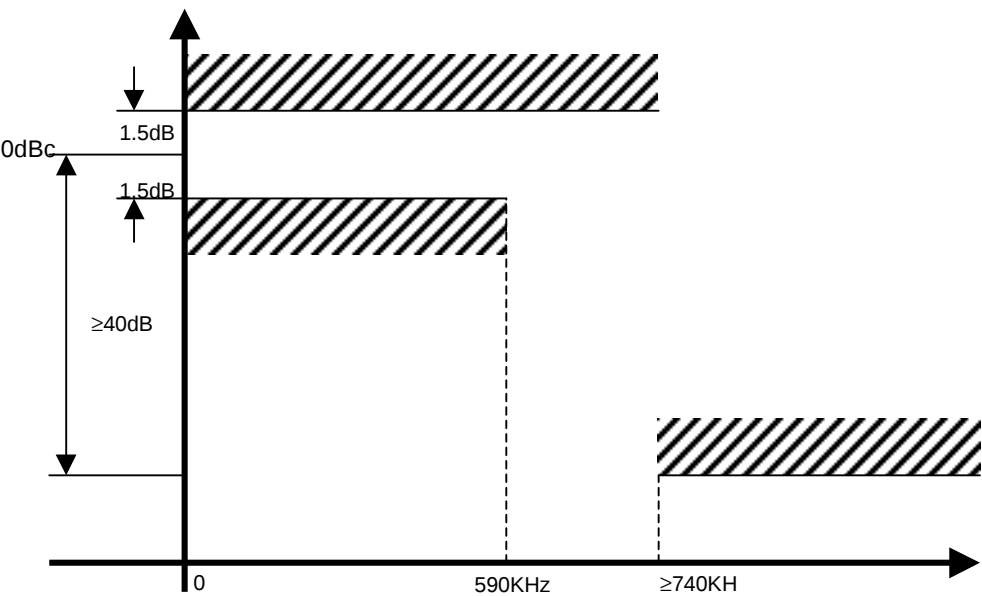
The transmitter uses the frequencies within 1610 to 1626.5MHz. A total of 509 channels are contained within this bandwidth, which uses OQPSK as the modulation scheme. Each channel is spectrally spread using a unique code to create a CDMA system. This PN Chip Rate is 1.2288Mcps. Each RF channel has a 1.23MHz bandwidth.

6.8.2 Receiver Architecture

The R290 Sat receives QPSK CDMA signals over the frequency band 2483.5 to 2500MHz. Each channel is spectrally spread, by the Gateway via the satellite, using a unique code to create a CDMA system. Again this PN Chip Rate is 1.2288Mcps.

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6.8.3 Response Characteristics of Baseband Low Pass Filters



7 SAR RESULTS

7.1 REQUIREMENT LIMITS

World Health Organisation SAR limit = 2 W/Kg max

7.2 MEASUREMENT RESULT SUMMARY

See a separate test report

7.3 CONCLUSION:

The SAR limit is within the recommended specifications of CFR47 section 1.1310 in accordance with provisions of CFR47 section 2.1093