FCC APPLICATION INQUIRY RESPONSE
L82-228870: SIEMENS GIGASET 2400 DESK STATION
Correspondence Number: 3392
September 17, 1998

1.0 Overview

This package was compiled to reply to inquiries made by Mr. Joe Dichoso of the FCC regarding the Type Certification Application for the Siemens Gigaset 2400 Desk Station. Each Inquiry item is listed below followed by the response.

2.0 Inquiry Responses

(1) The confidential letter requests only the technical description and the schematic to be held confidential. No technical description was submitted. Two block diagrams were submitted but one was marked confidential and the other was not. Please verify & correct this situation.

Answer:

A copy of the technical description of the Gigaset 2400 Desk Station is was submitted to the Commission via the 'add attachments' option on the electronic filing site on September 17, 1998. The technical description has been revised such that it is no longer Siemens-Confidential. The only portion of this application that should be confidential are the schematics. The correct block diagram was forwarded to the Commission via the 'add attachments' option of the electronic filing site on September 17, 1998.

(2) The photo of the main board was dark & unfocused. Please submit a clear photo.

Answer:

Photos of the front & back of the main board were retaken & resubmitted to the Commission via the 'add attachments' option on the electronic filing site on September 16, 1998. The main board without the shield was not re-photographed but can be if need.

(3) Please show compliance with the 20 dB down requirement at the band edges, when the device is in the highest and lowest channels. Also show compliance with the restricted band requirements (15.205) for the 2483.5 to 2500 MHz restricted band.

Answer:

Plots of emission bandwidth were taken of the device at the highest and lowest channels and are included in Appendix A of this attachment. A data sheet indicating radiated emission measurements at the low end of the 2483.5 MHz Restricted band are also contained in this Appendix. Based on the measurement procedures contained in Section 15.205 for signals above 1 GHz, the Siemens 2400 Desk Station is compliant with this specification.

(4) The 20 dB bandwidth was 903 kHz while the channel separation was only 864 kHz. The channels must be separated by atleast the 20 dB bandwidth. Try using a smaller but appropriate RBW for the 20 dB bandwidth measurement.

Answer:

The occupied bandwidth was remeasured at bottom, top and middle of the transmit band using a 30 kHz RBW and 100 kHz VBW. Lowering the RBW provides better resolution of the spectrum for a ~700 kHz bandwidth signal.

(5) Section 15.247(a)(1) indicates that the system receivers shall have input bandwidths thatn match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies with the transmitted signals. Please explain how the device complies withthis rule when a packet is repeated or when multiple packets are sent. What is the receiver input bandwidth? How does the receiver shift frequencies and determine which frequencies to shift to in order to synchronize with this transmitter.

Answer:

The IF bandwidth determines the receiver bandwidth. The IF bandwidth at 3 dB down is 700 kHz. This is equal to the bandwidth of the transmitter. Each base has its own pseudo random hopping sequence. When the mobile is registered with a base, it is given the same hopping sequence and is thus synchronized with that base. Any blocked frequencies are told to the mobile by the base. The phone does not repeat packets, and it does not use multiple packets. Bad packets are dropped.

(6) Please provide the calculation method used for RF Output Power.

Answer:

Calculation of the output power in watts is based on the following formula found in Industry Canada NIR-E document:

Power (ERP) = (E * r) / $(30)^{1/2}$

Where:

E = radiated electric field level in V/m
r = distance from the EUT to the measurement antenna

The method used in this application to calculate ERP goes through the following steps:

(a) Determine the peak level in dBμV/m
(b) Translate this level to μV/m using the following formula

μV/m = 10^((dbμV/m)/20)

(c) Translate this level to V/m by dividing by $1X10^6$
(d) Calculate ERP based on the formula at the beginning of this section for a test distance of X meters.

(7) How does this device comply with the RF Safety Requirements?

Answer:

Based on a conversation with Kwok Chan of the Commission on September 16, 1998, the following RF Safety analysis is provided:

The power used for evaluation to the RF Safety Hazard Specification can be derated based on the percentage that the transmit signal is actually present over time. For the Gigaset 2400 Desk Station, the duty cycle of the transmit signal over time is 1/8. The Power level used for comparison to the OET-65C limit can be calculated as follows:

Ref. Power = (Peak Power) * (Duty Cycle) = (0.469 watts) * (1/8) = 0.0586 watts

This figure is below the threshold (<0.2 watts at 2450 MHz for cordless phone handsets and most other trasnmitters using monopole or dipole type antennas as an integral part of the device) for this device. The Gigaset 2400 Desk Station uses an integral monopole antenna. Based on this criteria, special warnings or instructions are not required to show compliance for this device.

(8) Indicate the manufacturer of the Spread Spectrum Chip.

Answer:

The manufacturer of the spread spectrum chip is Siemens Semiconductors, Munich, Germanuy. The parts used are a PMB 4729 for the Gigaset 2400 Desk Station and a PMB 4724 for the Gigaset 2400 Handset.

(9) The transmitter cannot coordinate its hopping sequence with the hopping sequence of other transmitters, or vice versa, for the purpose of avoiding simultaneous occupancy of individual hopping frequencies by multiple transmitters. Provide a description on how the device complies with this rule.

Answer:

The hopping frequency sequence is determined by the unique identity of each base and nothing else.

(10) The system shall hop to channel frequencies that are selected at the system hopping rate froma pseudo random list of hopping frequencies. Indicate how the pseudo random hopping sequence is derived. Provide a lsit of channel frequencies and a sample of a few frequencies.

Answer:

The Pseudo Random Hopping Sequence is derived from the Base station unique identity. It is done by taking the Base ID number and modulo it with 16. The result "B_ID" is a number from 0 to 15.

2 variables are implemented which are Subset_Counter and Index_Counter.

- Subset_Counter repeats a sequence of 0,2,4,6,8,10,12,11,9,7,5,3,1,0,..
- Index_Counter repeats a sequence of 0,1,2,3,4,5,6,7,0,…

Depending on B_ID and Subset_Counter a Sequence_Number (a number from 1 to 12) is derived:

		1	2	3	4	5	6	7	8	9	10	11	12
0		1	2	3	4	5	6	7	8	9	10	11	12
1		2	3	4	5	6	7	8	9	10	11	12	1
2		3	4	5	6	7	8	9	10	11	12	1	2
3		4	5	6	7	8	9	10	11	12	1	2	3
4		5	6	7	8	9	10	11	12	1	2	3	4
5		6	7	8	9	10	11	12	1	2	3	4	5
6		7	8	9	10	11	12	1	2	3	4	5	6
7		8	9	10	11	12	1	2	3	4	5	6	7
8		9	10	11	12	1	2	3	4	5	6	7	8
9		10	11	12	1	2	3	4	5	6	7	8	9
10		11	12	1	2	3	4	5	6	7	8	9	10
11		12	1	2	3	4	5	6	7	8	9	8	11
12		12	11	10	9	8	7	6	5	4	3	2	1
13		11	10	9	8	7	6	5	4	3	2	1	12
14		10	9	8	7	6	5	4	3	2	1	12	11
15		9	8	7	6	5	4	3	2	1	12	11	10

Subset Counter

Sequence Number

B_ID

Given a sequence number and Index_Counter an offset is derived.

		1	2	3	4	5	6	7	8	9	10	11	12
0		1	3	5	3	1	5	4	8	6	4	6	8
1		2	4	6	4	2	6	3	7	5	3	5	7
2		3	1	1	7	5	3	6	4	2	8	8	6
3		4	2	2	8	6	4	5	3	1	7	7	5
4		5	7	3	1	7	7	2	2	8	6	2	4
5		6	8	4	2	8	8	1	1	7	5	1	3
6		7	5	7	5	3	1	8	6	4	2	4	2
7		8	6	8	6	4	2	7	5	3	1	3	1

Sequence Number

Offset

Index Counter

Then : Channel = (Subset_Counter) x 8 + Offset

So the following are samples of sequences

Base ID 1:

10 20 26 32 44 51 63 69 75 85 95 94 84 74 68 62 50 45 33 27 21 11 1 2 8 16 30 36 42 53 59 65 79 87 93 92 86 78 64

58 52 43 37 31 17 9 3 4 14 18 24 38 46 49 57 71 77 81 91 90 80 76 70 56 48 47 39 25 19 15 5 6 12 22 28 34 …

Base ID 2:

12 18 24 36 43 55 61 67 77 87 88 89 86 76 66 60 54 42 37 25 19 13 3 0 8 22 28 34 45 51 57 71 79 85 90 91 84 78 70

56 50 44 35 29 23 9 1 6 10 16 30 38 41 49 63 69 73 83 92 93 82 72 68 62 48 40 39 31 17 11 7 4 14 20 26 32 …

Base ID 3:

10 16 28 35 47 53 59 69 79 80 90 91 81 78 68 58 52 46 34 29 17 11 5 0 14 20 26 37 43 49 63 71 77 82 88 89 83 76 70

62 48 42 36 27 21 15 1 2 8 22 30 33 41 55 61 65 75 84 94 95 85 74 64 60 54 40 32 31 23 9 3 6 12 18 24 39 …

(11) Each frequency must be used equally on the avergae by each transmitter. Each new transmission must start on a different frequency and must use all frequencies before repeating a new sequence. Therefore, describe where the next transmission starts when all frequencies are nost used for a previous message. This is required because some transmissions may need only a few frequency hops to be completed. I.e. If the transmission started on the same frequency each time, this frequency would be used more than others if many short transmissions were sent.

Answer:

The phone hops after each 10 ms frame, not during a frame. The base transmitter is on continuously, with or without voice data, thus the phone transmits frequencies as the pseudo random sequence dictates. Sequential transmissions do not start on the same hopping channel except when that channel comes around in the pseudo random sequence.

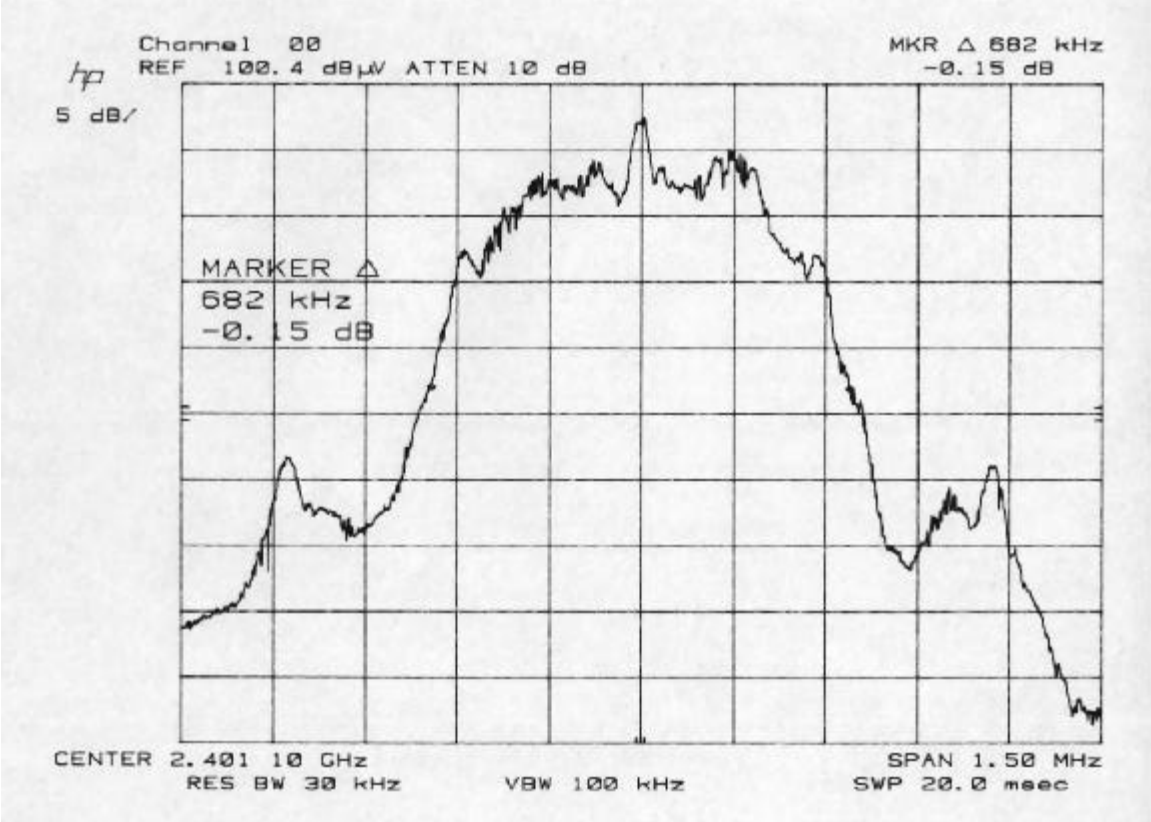
APPENDIX

OCCUPIED BANDWIDTH AND RESTICTED BAND DATA

Occupied Bandwidth Data Sheet

Siemens Business Communication Systems
Gigaset 2420HS Desk Station

SERIAL #: 505 PROJECT #: 99-016
DATE: September 16, 1998



COMMENT #1: Channel Setting = 00

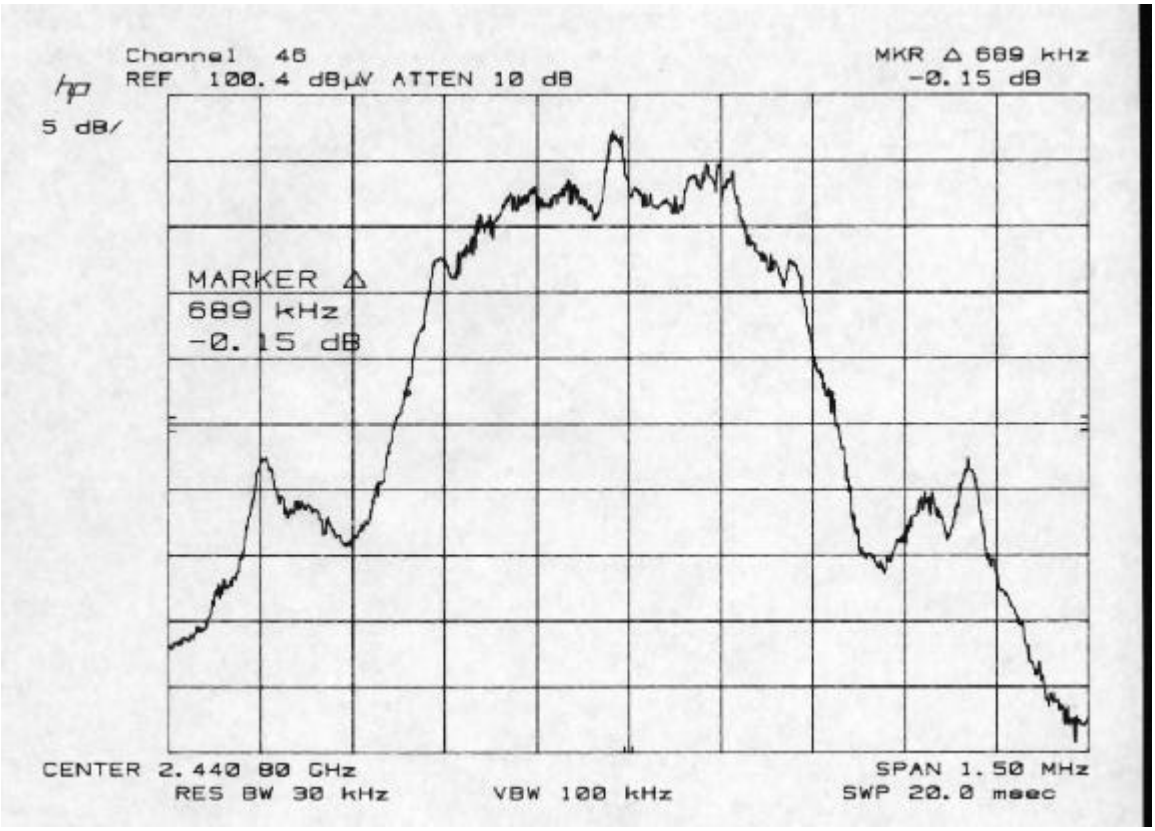
COMMENT #2: 20dB Bandwidth = 682 kHz

TEST ENGINEER:_____ **APPROVED BY**: _____
Michael FIndley John O'Brien

Occupied Bandwidth Data Sheet

Siemens Business Communication Systems
Gigaset 2420HS Desk Station

SERIAL #: 505 PROJECT #: 99-016
DATE: September 16, 1998



COMMENT #1: Channel Setting = 46

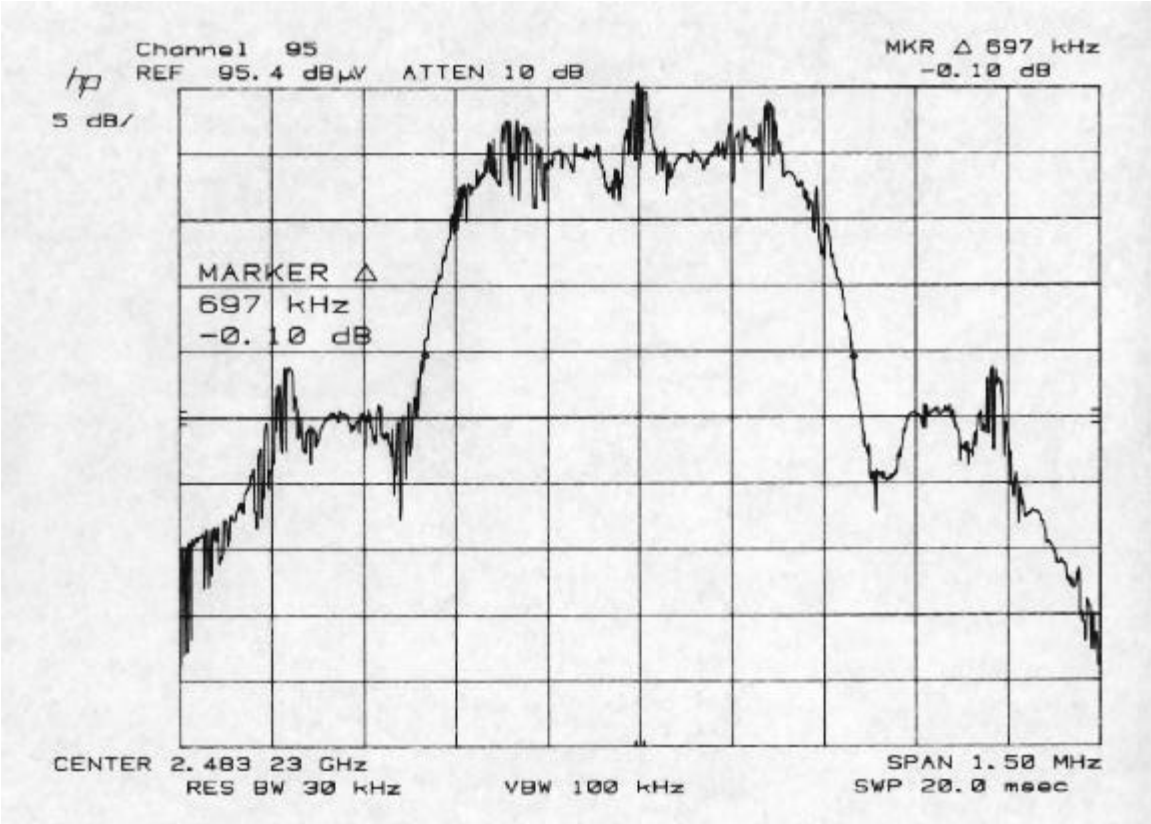
COMMENT #2: 20dB Bandwidth = 689 kHz

TEST ENGINEER:_____ **APPROVED BY**: _____
Michael FIndley John O'Brien

Occupied Bandwidth Data Sheet

Siemens Business Communication Systems
Gigaset 2420HS Desk Station

SERIAL #: 505 PROJECT #: 99-016
DATE: September 16, 1998



COMMENT #1: Channel Setting = 95

COMMENT #2: 20dB Bandwidth = 697 kHz

TEST ENGINEER:_____ **APPROVED BY**: _____
Michael FIndley John O'Brien

Radiated Data Sheet

Siemens Business Communication Systems
Gigaset 2420HS Desk Station

SERIAL #: 505
DATE: Septmber 16, 1998
PROJECT #: 99-016

MEASUREMENT DISTANCE (m): 1
MEASUREMENT HEIGHT: 1 meter
EUT Orientation: 180

RESTRICTED BAND TEST

Freq. (MHz)	Notes and Polarization	Recorded Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.5	(1) Vertical	32.2	26.8	1.6	60.6	63.5	-2.9
2483.5	(1) Horizontal	32.4	26.8	1.6	60.8	63.5	-2.7

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

COMMENT #1: Average Measurements

COMMENT #2: Peak Measurements

TEST ENGINEER:_____ **APPROVED BY**: _____
John O'Brien Jeffery Lenk

Radiated Data Sheet

Siemens Business Communication Systems
Gigaset 2420HS Desk Station

SERIAL #: 505
DATE: September 17, 1998
PROJECT #: 99-016

MEASUREMENT DISTANCE (m): 1
MEASUREMENT HEIGHT: 1 meter
EUT Orientation: 180

20 dB BAND EDGE TEST: LOWER END (TX = CHANNEL 00) (1)

Freq. (MHz)	Notes and Polarization	Recorded Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2401.00	(2) Vertical	97.9	29.0	1.4	128.3	Ref	Ref
2409.90	(2) Vertical	72.5	29.0	1.4	102.9	108.3	-5.4
2409.90	(2) Horizontal	65.2	29.0	1.4	95.6	108.3	-12.7

20 dB BAND EDGE TEST: UPPER END (TX = CHANNEL 95) (3)

Freq. (MHz)	Notes and Polarization	Recorded Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.13	(2) Vertical	96.6	26.8	1.6	125.0	Ref	Ref
2483.53	(2) Vertical	74.3	26.8	1.6	102.7	105.0	-2.3
2483.53	(2) Horizontal	69.5	26.8	1.6	97.9	105.0	-7.1

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

COMMENT #1:
Low Band Edge Measurement Point = Bottom Channel - ½ OBW - ½ RBW
= 2401.00 - 1/2 (682k) - ½ (100k) = 2401.00 - 0.391 = 2400.6 MHz

COMMENT #2: Peak Measurements; 100k/100k BW Settings.

COMMENT #3:
High Band Edge Measurement Point = Bottom Channel - ½ OBW - ½ RBW
= 2483.13 + 1/2 (697k) + ½ (100k) = 2483.13 - 0.399 = 2483.53 MHz

TEST ENGINEER:_____ **APPROVED BY**: _____
John O'Brien Jeffery Lenk