MEASUREMENT / TECHNICAL REPORT

Fujitsu Siemens Computers

Model: Keyboard KBPC M2 (K278)

FCC ID: HSS01TASTK278

Oct. 28, 1999

This report concerns:	Original grant	☐ Class II change
Equipment type:	Keyboard	

Request issue of grant:

- Immediately upon completion of review
- ☐ Defer grant per 47 CFR 0.457(d)(1)(ii) until _____ date _____. Company Name agrees to notify the Commission by _____ date _____ of the intended date of announcement of the product so that the grant can be issued on that date.

Measurement procedure used:

- ANSI C63.4-1992
- ☐ FCC/OET MP-4(1987)
- ☐ other _____

Limits on compliance with: CISPR 22 resp. FCC class B

Application for Certification
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Applicant for this device:

Siemens PC Systeme GmbH & Co. KG
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Germany
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Table of Contents

1 GENERAL INFORMATION

1.1 Product Description

The Siemens Keyboard KBPC M2 with the product number S26381-K278 is a MF-II-compatible multi media keyboard for personal computers. The connection between the keyboard and the personal computer is done by a cable which has:

- one PS/2 connector (mouse)
- two jack connectors (speaker and microphone)
- one AT03 connector (keyboard)

Description of the keyboard K278: *S26381-K278-V****

Dimensions and weight:

Dimensions (H x W x D)	59 x 227 x 459 mm
Tilt adjustment	6° and 12°
Weight	1.5 kg
Keyboard cable	1.5 m

Electrical:

Power consumption	< 600 mA at 5 V
Loudspeaker input	> 10 kΩ
Loudspeaker output	2 x 1 W
Capacitor microphone	1.6 kΩ at 1 kHz

Interfaces:

Keyboard	AT03
Mouse	PS/2
Microphone	3.5 mm jack
Stereo headphones	3.5 mm jack

Environmental conditions:

Ambient temperature	15° C to 32° C

Standards:

Industry standard	MF-II-compatible 104/105 key arrangement
System compatibility	AT-, XT and PS/2 systems, AT/XT automatic changeover

The keyboard is assembled by Siemens PC Systeme GmbH & Co. KG, Bürgermeister-Ulrich-Str. 100, 86199 Augsburg.

1.2 Related Submittal Grant

N/A

1.3 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

Pos	Model Number (Serial Number)	FCC ID	Description	Cable Description (length in [cm])
1	Siemens KBPC M2 S26381-K278-V***	HSS01TASTK278	Keyboard **EUT**	shielded keyboard cable [200]
2	Fujitsu Siemens Computers Scenic Pro M7 YBJF000509	HSSSCENICM701	Personal Computer (PII 350 MHz)	unshielded power cord [292]
3	Fujitsu Siemens Computers MCM 1705 NTD XC559743	A3LCGH760	Monitor	unshielded power cord [175] shielded video cable [168]
4	Cherry MY3000USB4A 000468	DOC	USB-Keyboard	shielded keyboard cable [143]
5	Microsoft MS 2.1A 6221424-40000	C3KKMP3	Mouse	shielded mouse cable [183]

Pos	Model Number (Serial Number)	FCC ID	Description	Cable Description (length in [cm])
6	Microsoft Intelli Mouse 1.1A 0015096-00000	DOC: m/n:IM1	USB-Mouse	shielded mouse cable [183]
7	Hewlett Packard HP 2225C+ (3012S70819)	DSI6XU2225	Printer, parallel I/F	unshielded AC cable [180], shielded centronics cable [190]
8	Hewlett Packard HP 2225D+ (2952S61229)	DSI6XU2225	Printer, serial I/F	unshielded power cord [185], shielded serial cable [190]
9	Boeder LT-100	N/A	Headphone	shielded cable [65]
10	Siemens	N/A	Handset	with cable (spiral) [100] unshielded
11	T261399-Y2561-V1		System cable	shielded cable [186]
	Pos 1 contains:			
a	S26381-D297		Main board	
b	S26381-D286-V1		Keyboard foil with controller	
c	SO905X1210		Two speakers	

Remark:

1.4 Test Methodology

Both, conducted and radiated tests were performed according to the procedures in ANSI C63.4-1992. Radiated testing was performed at an antenna to EUT distance of 10 meters. All radiated emission measurements were done in an anechoic chamber. Limits for radiated and conducted emission are in compliance with CISPR 22 resp. FCC class B.

1.5 Test Facility

The anechoic chamber and conducted measurement facility used to collect the emission data is located at Siemens PC Systeme GmbH & Co. KG, Bürgermeister Ulrich Str. 100, 86199 Augsburg, Germany. This site has been fully described in a report dated January 24, 1997 sub-mitted to your office, and accepted in a letter dated March 03, 1997 (31040/SIT).

1.6 Referenced Rules Sections

N/A

2 PRODUCT LABELING

2.1 FCC ID Label: see attached file

2.2 Location of Label on EUT: see attached file

3 SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a maximum fashion (as a customer can use it). Each type of external ports was connected with a peripheral unit. The EUT was connected to the system unit with a cable of 1.86 m length.

3.2 Video mode Justification

The system was tested in video graphic mode 1024 x 768, 85 Hz, because this is the most commonly used resolution and reflects the worst case.

3.3 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

The used sequence is:

- scrolling ”H” with applicable video mode (see 3.2)
- internal Floppy drive writes to the HD and reads back
- internal CD-ROM writes to the HD
- ”H`s” are sent to the printer ports
- data is sent to USB ports (continuous “ “ keyboard character pressed)

3.4 Special Accessories

As shown in Figure 3.1, all interface cables used for compliance testing are shielded like normally supplied by the manufacturer. All cable connectors feature integral metal hoods for shielding.

3.5 Equipment Modifications

To achieve compliance to Class B levels, the following modifications were made during compliance testing:

no modifications

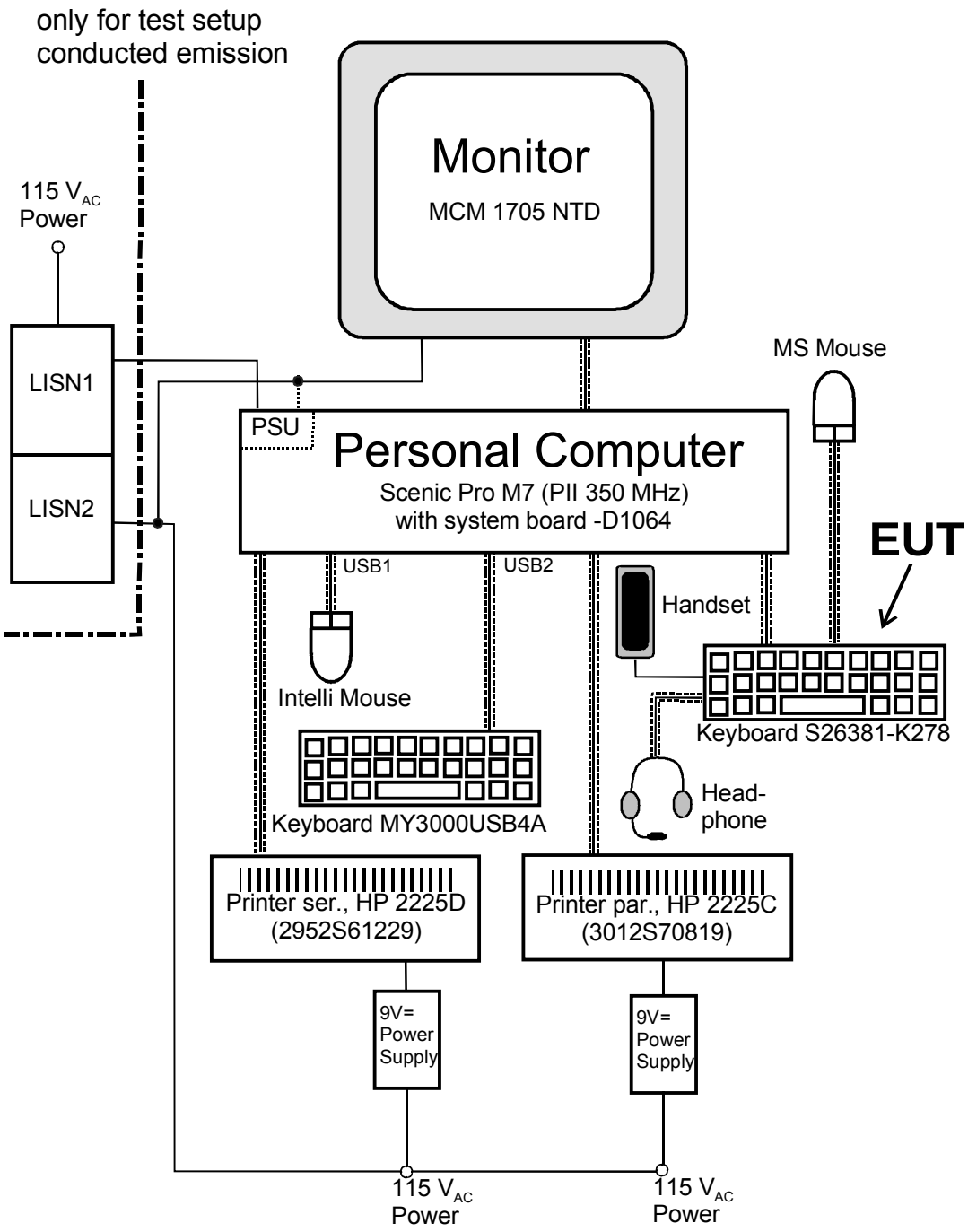
Applicant Signature _____ Date _____

Typed/Printed Name _____ Position _____

3.6 Configuration of Tested System

All necessary tests were carried out like figure 3.1. The system was used according to paragraph 1.1. During test for conducted emission the EUT was connected to a LISN. All peripherals were supplied by a second LISN. The equipment was configured according to ANSI C63.4-1992 Fig 11.

Figure 3.1 Configuration of Tested System



4 BLOCK DIAGRAM OF EUT

see fig 4.1 page 16

4.1 Block Diagram Description (see fig. 4.1)

The major parts of the system are (fig 4.1).

- Keyboard controller
- Key matrix
- Audio controller
- Connector pannel

The keyboard works exactly like a traditional keyboard.

4.2 Clockfrequencies of EUT

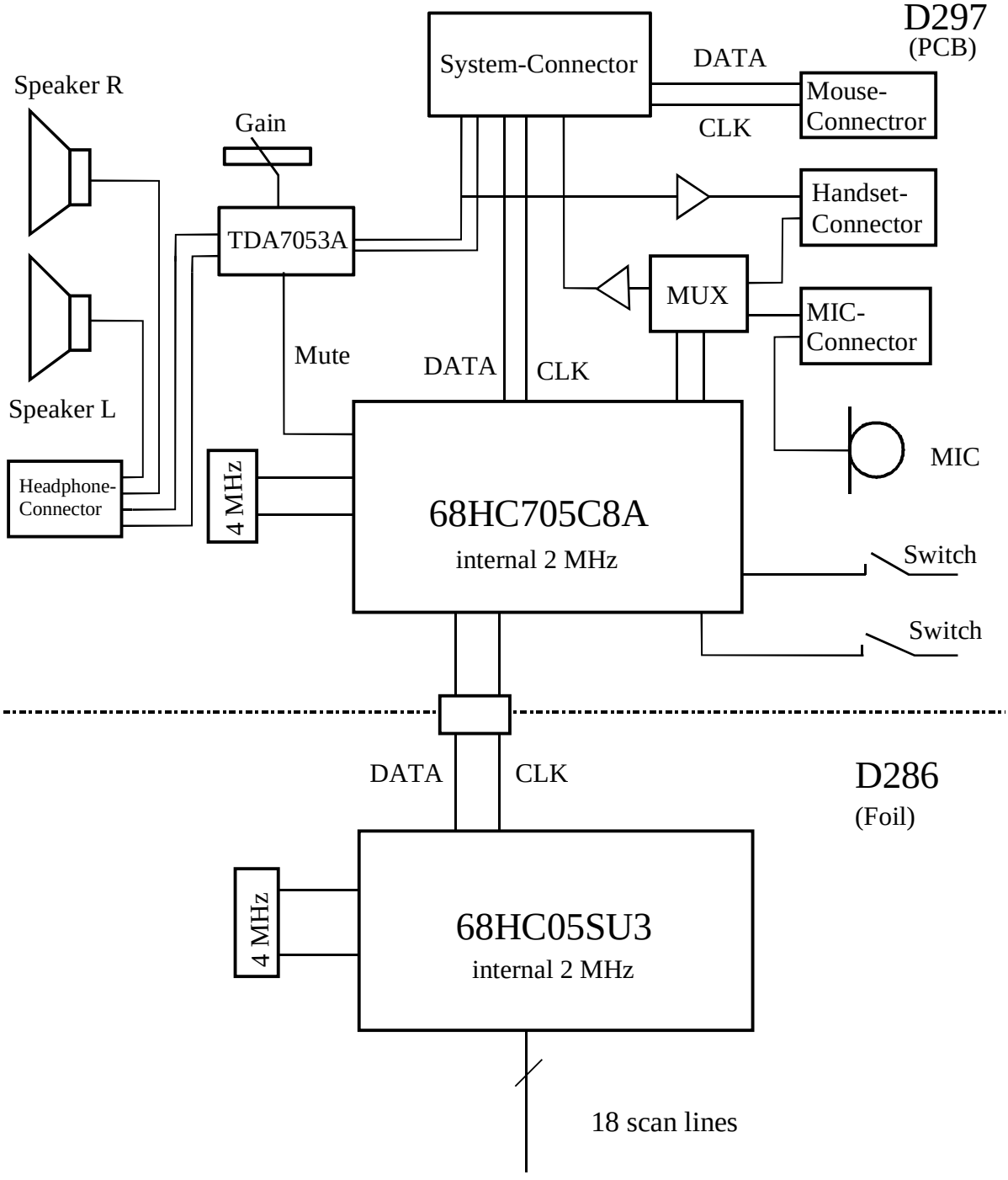
Quarz frequency for keyboard controller 4 MHz
Quarz frequency for audio controller 4 MHz

4.3 Theory of Operation

The keyboard part of the product works like a traditional keyboard.

The control of all keyboard functions is done by the controller 68HC05SU3. The controller scans a matrix all time and checks, if a key is pressed or released.
The audio communication is performed by the controller 68HC705C8A. The controller communicates also with the keyboard controller and the system via the system controller.

4.1 Block Diagram of the EUT



5 CONDUCTED EMISSION DATA

5.1 Test Procedure

The initial step in collecting conducted emission data is a Rohde & Schwarz Test Receiver (ESHS10). During first scan all data in peak mode is measured, then all significant peaks are explored either in quasi-peak mode or in average mode. In case of low noise (no peak value reaches the quasi peak limit), only average checks are done.

5.2 Measured Data

The conducted emission was measured the following way:

1. Peak noise on L
2. Peak noise on N

During the emission measurement the printers are supplied with power via a second LISN.
The worst case results of the measurement is given next:

Configuration a: monitor power from PC
b: monitor power external

Judgement: Passed by

	Frequency [MHz]	Measured [dB(µV)]	Kind of value	Limit [dB(µV)]	Configura-tion
phase	0,150	40,7	QP	66,0	a
phase	0,510	38,2	QP	56,0	a
neutral	0,804	31,5	QP	56,0	a
neutral	1,602	31,2	QP	56,0	a
neutral	1,908	30,9	QP	56,0	a

Judgement: Passed by

	Frequency [MHz]	Measured [dB(µV)]	Kind of value	Limit [dB(µV)]	Configura-tion
neutral	0,150	32,2	AV	56,0	a
neutral	0,438	29,5	AV	47,0	a
neutral	0,516	28,7	AV	46,0	a
neutral	0,732	24,3	AV	46,0	a
neutral	0,804	26,4	AV	46,0	a
neutral	0,522	32,7	QP	56,0	b
neutral	0,582	34,4	QP	56,0	b
neutral	0,804	31,8	QP	56,0	b
neutral	1,608	31,6	QP	56,0	b
neutral	1,968	31,0	QP	56,0	b
neutral	0,438	29,0	AV	47,0	b
neutral	0,510	30,4	AV	46,0	b
neutral	0,582	27,0	AV	46,0	b
neutral	0,732	24,6	AV	46,0	b
neutral	0,804	27,2	AV	46,0	b

AV: average
QP: quasi peak

Test Personnel:

Tester Signature: _____ Date: _____

Printed Name: R. Schaufler

Measurement Protocols: see attached files

Configuration a:
EUT with Personal Computer Scenic Pro M7
PII 350 MHz
monitor power from PC
video resolution 1024 x 768/85 Hz

Configuration b:
EUT with Personal Computer Scenic Pro M7
PII 350 MHz
monitor power external
video resolution 1024 x 768/85 Hz

5.3 Referenced Rules Sections

N/A

5.4 Test Instrumentation Used, Conducted Measurement

Type	Manufacturer/ Model No.	Serial No.	Last Cal.	Cal. Interval
Receiver	ESHS10 Rohde&Schwarz	842884/011	May 99	12 months
Receiver	ESH3 Rohde&Schwarz	879599/019	May 99	12 months
LISN	ESH2-Z5 Rohde&Schwarz	871884/004	May 99	12 months
LISN	ESH3-Z5 Rohde&Schwarz	883650/027	May 99	12 months
Pulse limiter	ESH3-Z2 Rohde&Schwarz	---	May 99	12 months

6 RADIATED EMISSION DATA

6.1 Test Procedure

The radiated emission was measured between 30 MHz to 1000 MHz. The bandwidth of the EMI-receiver was set to 120 kHz and the detector was set to peak. During prescan all data in peak mode are accumulated automatically. At final measurement the detector was set to CISPR quasi peak and values above the acceptance line were verified automatically.

The test was performed in a semi anechoic chamber, in a distance of 10 meters between antenna and EUT. During tests the EUT was turned 360° the receiving antenna was moved from 1 to 4 meters and the antenna polarisation was changed from horizontal to vertical for finding the maximum levels of emission.

For the whole range one antenna was used:

30 MHz to 1000 MHz: Bilog antenna

After automatic tests during manual verification the cables and the equipment were placed and moved within the range of position in order to find the maximum of emission.

For further data see enclosed test results.

6.2 Measured Data

The EUT was measured with the Personal Computer Scenic Pro M7 (PII 350 MHz) in video mode 1024 x 768, 85 Hz. The test results below reflect the worst case with:

Frequency range 30 MHz - 1000 MHz:

Judgement: Passed by

Frequency [MHz]	Level* [dB(µV/m)]	10 Meter Limit [dB(µV/m)]	Exceeding [dB]	Ant Pol	Height in [m]	Angle in deg
75.36000	23.50	30.000	-6.4	ver	1.60	150.000
122.43000	23.20	30.000	-6.7	ver	1.60	29.000
141.27000	25.20	30.000	-4.7	hor	3.40	59.000
300.12000	28.10	37.000	-8.9	hor	2.20	150.000
309.57000	31.70	37.000	-5.2	hor	2.20	59.000
315.00000	27.20	37.000	-9.7	hor	1.60	239.000

all levels are quasi-peak levels

*****The correction factor is considered automatically by the test receiver. A table of correction factors is listed in paragraph 7.4.

Test Personnel:

Tester Signature: _____ Date: _____

Printed Name: R. Schaufler

Measurement Protocols: see attached files

EUT with Personal Computer Scenic Pro M7
PII 350 MHz
video resolution 1024 x 768/85 Hz

6.3 Referenced Rules Sections

N/A

6.4 Test Instrumentation Used, Radiated Measurement

Type	Manufacturer/ Model No.	Serial No.	Last Cal.	Cal. Interval
Receiver	ESMI Rohde&Schwarz	840607/006	May 99	15 months
Antenna	CBL 6111 Chase	1345	May 99	12 months
Antenna	CBL 6112 Chase	2041	Aug. 99	15 months

6.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor automatically to the measured value. The display of the Receiver shows the corrected value. The complete table of correction factors is given on next page. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

where FS = Field Strength

AF = Antenna Factor (incl. Preamplifier factor)

CF = Cable Attenuation Factor

Assume a receiver reading of 28,5 dBµV is obtained. The Antenna Factor of 10,5 and a Cable Factor of 1,3 is added, giving a field strength of 40,3 dBµV/m.

FS = 28,5 + 10,5 + 1.3 = 40,3 dBµV/m

The 40,3 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

Level in µV/m =
Common Antilogarithm [(40,3 dBµV/m)/20] =

103,5 µV/m

6.6 Table of Correction Factors

Frequency range: 30 MHz to 1000 MHz

Frequency [MHz]	Correction Bilog Antenna [dB]	Correction Cable [dB]	Correction Antenna + Cable [dB]
30,0	17,80	0,65	18,45
35,0	15,10	0,67	15,77
40,0	12,40	0,68	13,08
45,0	9,80	0,73	10,53
50,0	7,70	0,74	8,44
55,0	6,20	0,82	7,02
60,0	5,10	0,84	5,94
70,0	5,00	0,90	5,90
80,0	6,60	0,95	7,55
90,0	8,50	0,99	9,49
100,0	10,30	1,10	11,40
120,0	11,40	1,14	12,54
140,0	10,40	1,27	11,67
160,0	9,40	1,35	10,75
180,0	8,50	1,45	9,95
200,0	9,10	1,51	10,61
250,0	11,80	1,71	13,51
300,0	13,00	1,84	14,84
350,0	14,10	2,00	16,10
400,0	16,00	2,18	18,18
450,0	16,30	2,35	18,65
500,0	17,10	2,43	19,53

Frequency [MHz]	Correction Bilog Antenna [dB]	Correction Cable [dB]	Correction Antenna + Cable [dB]
550,0	18,80	2,62	21,41
600,0	18,60	2,73	21,33
650,0	19,00	2,88	21,88
700,0	19,10	2,91	22,01
750,0	19,80	3,01	22,81
800,0	19,80	3,21	23,01
850,0	20,40	3,32	23,72
900,0	20,50	3,40	23,90
950,0	20,80	3,49	24,29
1000,0	21,10	3,69	24,79

7 Conducted And Radiated Emission Measurement Photos: see attached files

7.1 Test setup, conducted emission, front side view

7.2 Test setup, conducted emission, rear side view

7.3 Test setup, radiated emission, front side view

7.4 Test setup, radiated emission, rear side view

8 External Photos of EUT: see attached files

8.1 Front side view of EUT with headphone, handset and cable

8.2 Rear side view of EUT

9 Internal Photos of EUT: see attached files

9.1 Inside view of EUT
9.2 Inside view of EUT with foil
9.2 Main board, front side view
9.3 Main board, rear side view

10 User Manual: see attached files

For FCC statement please refer to user manual (English part) page 6.