ELECTRONIC TECHNOLOGY SYSTEMS
DR. GENZ GMBH

TEST - REPORT

FCC RULES PART 15 / SUBPART C

Test report no.:

G0M20206-6677-T-47

FCC

ELECTRONIC TECHNOLOGY SYSTEMS
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TABLE OF CONTENTS

1 General Information
1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.
The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.
Futhermore, there is no guarantee that a test sample which has Passed all the relevant tests conforms to a specification.
Neither is there any guarantee that such a test sample will interwork with other genuinely open systems.
The existence of the tests nevertheless provides the confidence that the test sample posseses the qualities as maintained and that is performance generally conforms to representative cases of communications equipment.

The test results of this test report relate exclusively to the item tested as specified in 1.5.
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Tester:

25.06.2002		N. Kaspar	
Date	ETS-Lab.	Name	Signature

Technical responsibility for area of testing:

25.06.2002		Dr. Genz	
Date	ETS	Name	Signature

1.2 Testing laboratory

1.2.1 Location

ELECTRONIC TECHNOLOGY SYSTEM DR. GENZ GMBH (ETS)
Storkower Straße 38c
D-15526 Reichenwalde b. Berlin
Germany
Telefon : +49 33631 888 00
Telefax : +49 33631 888 66

1.2.2 Details of accreditation status

ACCREDITED TESTING LABORATORY
DAR-REGISTRATION NUMBER: TTI-P-G 126/96-30

ACCREDITED COMPETENT BODY
DAR-REGISTRATION NUMBER: BPT-ZE-026/96-00

FCC FILED TEST LABORATORY REG. NO. 96970

BLUETOOTH QUALIFICATION TEST FACILITY (BQTF)
ACCREDITED BY BLUETOOTH QUALIFICATION REVIEW BOARD

INDUSTRY CANADA FILED TEST LABORATORY REG. NO. IC 3470

A2LA ACCREDITED Certificate Number 1983-01

1.3 Details of approval holder

Name	: ALPS Electric Co., Ltd.
Street	: 1-2-1, Okinouchi, Soma-City,
Town	: Fukushima
Country	: Japan
Telephone	: +81 244 35 1207
Fax	: +81 244 35 0602
Contact	: Masaaki Ueki
Telephone	: +81 244 35 1207

1.4 Application details

Date of receipt of application : 03.06.2002
Date of receipt of test item : 03.06.2002
Date of test : 13.06.2002-18.06.02

1.5 Test item

Description of test item : Bluetooth Module

Type identification : UGPZ2

Serial number : without

Photos : See Appendix A

Technical data

Frequency band : 2.4GHz – 2.4835GHz

Frequency (ch A) : 2.402 GHz

Frequency (ch B) : 2.441 GHz

Frequency (ch C) : 2480 GHz

Transmitter	**Unom**
Power (ch A)	: Conducted: 0,03 dBm
Power (ch B)	: Conducted: -0,04 dBm
Power (ch C)	: Conducted: -0,29 dBm

	Vnom Antenna 1	**Vnom –15 % Antenna 1**	**Vnom +15 % Antenna 1**
Power (chA)	: Radiated: 3,36 dBm	Radiated: 3,30 dBm	Radiated: 3,06 dBm
Power (ch B)	: Radiated: 0,88 dBm	Radiated: 1,14 dBm	Radiated: 0,82 dBm
Power (ch C)	: Radiated: 3,92 dBm	Radiated: 4,05 dBm	Radiated: 3,73 dBm

	Vnom Antenna 2	**Vnom –15 % Antenna 2**	**Vnom +15 % Antenna 2**
Power (chA)	: Radiated: 4,01 dBm	Radiated: 4,08 dBm	Radiated: 4,13 dBm
Power (ch B)	: Radiated: 4,93 dBm	Radiated: 4,73 dBm	Radiated: 4,47 dBm
Power (ch C)	: Radiated: 2,26 dBm	Radiated: 2,25 dBm	Radiated: 2,19 dBm

Antenna 1 = external Antenna
Antenna 2 = internal Antenna

Power supply	: 3,3 V DC battery		
Operating mode	: duplex		
Type of modulation	: FHSS		
Antenna gain	: Antenna 1:	-3,884 dBi (Average)	
		1,63 dBi(Max)	
	Antenna 2:	-5,08 dBi (Average)	
		1,62 dBi (Max)	

Manufacturer:
(if applicable)

Name	:
Street	:
Town	:
Country	:

Additional information:	The test sample is designed as Bluetooth device. Its pseudorandom hopping scheme, authentication, receiver parameters, synchronisation procedure and other parameters are determined by Bluetooth Core Specification.

1.6 Test standards

Technical standard : FCC RULES PART 15 / SUBPART C § 15.247

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed. ☒

or

The deviations as specified in 2.5 were ascertained in the course of the tests performed. ☐

2.2 Test environment

Temperature	: 23°C			
Relative humidity content	: 20 ... 75 %			
Air pressure	: 86 ... 103 kPa			
Details of power supply	: 3,3 V battery			
Extrem conditions parameters:	: test voltage - extreme	min.:	3,1 V	(Vnom - 15 %)battery
		max:	3,5 V	(Vnom + 15 %)battery

2.3 Test equipment utilized

No.	Measurement device:	Type:	Manufacturer:
ETS 0001	Test receiver	ESHS 10	Rohde&Schwarz
ETS 0002	Test receiver	ESVP	Rohde&Schwarz
ETS 0003	Test receiver	ESVS 10	Rohde&Schwarz
ETS 0004	Spektrum- and Network-Analyzer	FSMS 26	Rohde&Schwarz
ETS 0005	Test receiver	SMV 11	MEB
ETS 0006	Test receiver system	SME 12	MEB
ETS 0007	Spectrum analyzer	PSA-65A	Avcom
ETS 0008	Antenna	Loop antenna	Siemens
ETS 0009	Antenna	Loop antenna	MEB
ETS 0010	Antenna	Loop antenna	MEB
ETS 0011	Antenna	van Veen/ Frame	ETS
ETS 0012	Antenna	HK 116	Rohde&Schwarz
ETS 0013	Antenna	HL 223	Rohde&Schwarz
ETS 0014	Antenna	HL 025	Rohde&Schwarz
ETS 0015	Antenna	HL 025	Rohde&Schwarz
ETS 0016	Antenna	VHAP	Schwarzbeck
ETS 0017	Antenna	VHAP	Schwarzbeck
ETS 0018	Antenna	UHAP	Schwarzbeck
ETS 0019	Antenna	UHAP	Schwarzbeck
ETS 0020	Antenna	DP 21	MEB
ETS 0021	Antenna	DP 3	MEB
ETS 0022	Antenna	SAS-200/ 521	A.H. Systeme / USA
ETS 0023	Antenna	DP 1	MEB
ETS 0024	Antenna mast	AF 2	MEB
ETS 0025	Antenna mast	AF 2	MEB
ETS 0026	Tripod		Heinrich Deisel
ETS 0027	Tripod		Heinrich Deisel
ETS 0028	Tripod	STA 2	C. Lorenz AG
ETS 0029	Tripod		Berlebach
ETS 0030	Turn table	TT 1	ETS
ETS 0031	Turn table	DS 412	Heinrich Deisel
ETS 0032	Controller	HD 050	Heinrich Deisel
ETS 0033	RF generator	SMG	Rohde&Schwarz
ETS 0034	RF generator/ Amplifier	SMLR	Rohde&Schwarz
ETS 0035	RF generator/ Amplifier	SMLM	Rohde&Schwarz
ETS 0036	RF amplifier	10W 1000AM2	Amplifier Research
ETS 0037	RF amplifier	50W 1000	Amplifier Research
ETS 0038	RF amplifier	150L	Amplifier Research
ETS 0039	Absorbing clamp	MDS 21	Rohde&Schwarz
ETS 0040	Artifical mains	ESH3-Z5	Rohde&Schwarz
ETS 0041	Artifical mains	ESH3-Z4	Rohde&Schwarz
ETS 0042	Artifical mains	ESH3-Z6	Rohde&Schwarz
ETS 0043	Artifical mains	NNB 11	MEB
ETS 0044	Artifical mains	NNB 111	MEB
ETS 0045	Stripe line	IEC 801-3	ETS
ETS 0046	Power supply	LTS 006	RFT

No.	Measurement device:	Type:	Manufacturer:
ETS 0047	Power supply	TG 20/ 1	Statron
ETS 0048	Power supply	TG 20/ 1	Statron
ETS 0049	Power supply	T 102	TPW
ETS 0050	Power supply	T 101b	TPW
ETS 0051	Oscilloscope	TDS 640A	Tektronic
ETS 0052	Audio analyzer	UPA 4	Rohde&Schwarz
ETS 0053	ECAT Controlcentre		Keytek/ EMV
ETS 0054	EFT simulator		Keytek/ EMV
ETS 0055	Modul network coupler		Keytek/ EMV
ETS 0056	Blank plug-in		Keytek/ EMV
ETS 0057	Module SURGE with DC coupler		Keytek/ EMV
ETS 0058	Capacitive coupling clamp		Keytek/ EMV
ETS 0059	Kikusui amplfier	PCR 2000L	Keytek/ EMV
ETS 0060	Xitron power analyzer		Keytek/ EMV
ETS 0061	Power/ Arb (Harm., Ramp)		Keytek/ EMV
ETS 0062	Reference impedance		Keytek/ EMV
ETS 0063	Blank plug-in		Keytek/ EMV
ETS 0064	Filter system IEC 1000-4-6		Keytek/ EMV
ETS 0065	ESD-generator minizap		Keytek/ EMV
ETS 0066	EM Injection Clamp		FCC/ EMV
ETS 0067	Calibration Fixture	IEC 801-2031 CF	FCC/ EMV
ETS 0068	Filter system IEC 1000-4-6	CDN	FCC/ EMV
ETS 0069	EM Radiation Monitor	EMR-20	Wandel&Goltermann
ETS 0070	PC Transfer set EMR-20	EMR-20	Wandel&Goltermann
ETS 0071	Videocamera system	KMB012	Kocom
ETS 0072	Interphone system	JS-1400	Jiuh Sheng
ETS 0073	Audio noise meter	GSM 2	MKD/ RFT
ETS 0074	RF milivoltmeter	QRV 2	MKD/ RFT
ETS 0075	NF generator	GF 22	Präcitronic
ETS 0076	Feeding bridge A	SBA 1000	ESP
ETS 0077	Audio/ Video Filter	AV 55020	ETS
ETS 0078	LCR meter	SR 720	SRS
ETS 0079	Functional generator	MX-2020	Maxcom
ETS 0080	EMI Software	ES-K1	Rohde&Schwarz
ETS 0081	EMI Software	ES-K10	Rohde&Schwarz
ETS 0082	PC Novell network system	Novell	Esotronic
ETS 0083	Apple computer sstem	Performa 630	Macintosh
ETS 0084	Processcontroler	PSA 15	Rohde&Schwarz
ETS 0085	Shielded room	SR 1	Frankonia
ETS 0086	Anechoic chamber	AC 1	Frankonia
ETS 0087	Climatic cell	HC 4033	Heraeus
ETS 0088	Colour TV pattern generator	PM 5518-TX VPS	Philips
ETS 0089	Radiocommunication tester	CMS 54	Rohde&Schwarz
ETS 0090	DECT type approval CTR06	TS 8930	Rohde&Schwarz
ETS 0091	RF signal generator	SME 03	Rohde&Schwarz
ETS 0092	DM-Coder	SME-B11	Rohde&Schwarz
ETS 0093	Pulse Modulator	SM-B8	Rohde&Schwarz
ETS 0094	Rearpanel connectors	SME-B19	Rohde&Schwarz
ETS 0095	DECT system controller	PSMD	Rohde&Schwarz

No.	Measurement device:	Type:	Manufacturer:
ETS 0096	DECT Signalling unit	PSMD-B11	Rohde&Schwarz
ETS 0097	Rack, 19", 36 HU	TS 89RA	Rohde&Schwarz
ETS 0098	System engineering and software	CS 893BE	Rohde&Schwarz
ETS 0099	Extension unit for basic version	TS 8930B	Rohde&Schwarz
ETS 0100	RF signal generator	SME-06	Rohde&Schwarz
ETS 0101	DM-Coder	SME-B11	Rohde&Schwarz
ETS 0102	Pulse modulator	SM-B8	Rohde&Schwarz
ETS 0103	Pulse generator	SM-B4	Rohde&Schwarz
ETS 0104	Rearpanel connectors	SME-B19	Rohde&Schwarz
ETS 0105	High power synthesizer/ sweeper	SMP 22	Rohde&Schwarz
ETS 0106	Frequency extension	SMP-B11	Rohde&Schwarz
ETS 0107	RF attenuator for SMP 22	SMP-B15	Rohde&Schwarz
ETS 0108	DECT protocol tester TBR 22	TS 1220	Rohde&Schwarz
ETS 0109	Process controller	PSM 2	Rohde&Schwarz
ETS 0110	Real time signalling unit	PSMD-B2	Rohde&Schwarz
ETS 0111	PCM Realtime audio interface for	PSMD-B3	Rohde&Schwarz
ETS 0112	Synthesizer Module	PSMD-B4	Rohde&Schwarz
ETS 0113	Keyboard	PSA-Z2	Rohde&Schwarz
ETS 0114	RF step attenuator	RSG	Rohde&Schwarz
ETS 0115	Glide path		ETS
ETS 0116	RF Millivoltmeter	URV 55	Rohde&Schwarz
ETS 0117	Insertion unit	URV-Z2	Rohde&Schwarz
ETS 0118	Mixer	MFC 1000	Avcom
ETS 0119	Mixer	MFC 2000	Avcom
ETS 0120	RF step attenuator	TRI-50-20	INCO
ETS 0121	Oscilloscope	EO 147A	Serute
ETS 0122	Oscilloscope	5201	Dagatron
ETS 0123	RF step attenuator	RBU	Rohde&Schwarz
ETS 0124	Tripod	STA 2	Rohde&Schwarz
ETS 0125	Small components		
ETS 0126	Uninterruptable power supply	UPS - 1500	Sendon
ETS 0127	Uninterruptable power supply	UPS - 1000 LC	Sendon
ETS 0128	Uninterruptable power supply	UPS - 1000	Sendon
ETS 0129	Uninterruptable power supply	UPS - 500	Sendon
ETS 0130	Uninterruptable power supply	Power saver	Sendon
ETS 0131	Telephone connection box		Systel
ETS 0132	Frequency doubler	TR-0616	EMG
ETS 0133	Probe body	P6015	Tektronix
ETS 0134	Mains filter	MSF	Erika Fiedler
ETS 0135	Measureing switching point	AK 11	RFT
ETS 0136	Attenuator	33-6-34	Weinschel
ETS 0137	Multimeter	YX-360TRA	Mastech
ETS 0138	Multimeter	DT-9410	Diditec
ETS 0139	Multimeter	ST-9202	Standard
ETS 0140	High voltage generator	IP 6Wa	TPW
ETS 0141	Sliding bridge	J 573	RFT
ETS 0142	Impedanz converter	TK 11	RFT
ETS 0143	Impedanz converter	TK 12	RFT
ETS 0144			

No.	Measurement device:	Type:	Manufacturer:
ETS 0145			
ETS 0146	Probe	TK 103	MEB
ETS 0147	Active probe	ESH2-Z2	Rohde&Schwarz
ETS 0148	Test TV	21PT4301/00	Philips
ETS 0149	Power divider	ZAPD-21	MCL
ETS 0150	Switcher	HR07-720	Wisi
ETS 0151	Interference pulse generator	NSG 500C	Schaffner
ETS 0152	Simulator for Load-Dump-Impulse	NSG 506C (I)	Schaffner
ETS 0153	Simulator for Load-Dump-Impulse	NSG 506C (II)	Schaffner
ETS 0154	Signalgenerator	SMG	Rohde&Schwarz
ETS 0155	Signalgenerator	SMG	Rohde&Schwarz
ETS 0156	Adjacent channel power meter	NKS	Rohde&Schwarz
ETS 0157	TV and Sat-Signalgenerator	VTG 700	Grundig
ETS 0158	TV and Sat Signalgenerator	VTG 700	Grundig
ETS 0159	Programmable power supply	TOE 8815	Toellner
ETS 0160	Protective wire and isolation tester	PI 6001 D	SPS electronic
ETS 0161	Filter system / consumer electronic		Fiedler
ETS 0162	Acoustic chamber	403-A	IAC
ETS 0163	Test head	BK 4602	Brüel & Kjær
ETS 0164	Simulator ear	BK 4185	Brüel & Kjær
ETS 0165	Simulator mouth	BK 4227	Brüel & Kjær
ETS 0166	Acoustic calibrator	BK 4231	Brüel & Kjær
ETS 0167	Communication Analysis System	CAS TE I	HEAD acoustics
ETS 0168	Acoustical test for DECT	CTR 10	HEAD acoustics
ETS 0169	Measurement - Frontend (analog)	MFE III	HEAD acoustics
ETS 0170	Measurement - Frontend (digital)	MFE IV	HEAD acoustics
ETS 0171	Electronic test cradle	TEH	HEAD acoustics
ETS 0172	Noise generator	HNG III.1	HEAD acoustics
ETS 0173	Speaker	Canton S Pluss	HEAD acoustics
ETS 0174	Measurement - Frontend line interface	MFE V	HEAD acoustics
ETS 0175	Software Line interface (analog)	COPTZV5	HEAD acoustics
ETS 0176	Acoustic volt meter	COP 4	HEAD acoustics
ETS 0177	Feeding bridge B	SBA 1000	ESP
ETS 0178	Open area test side	30m	ETS
ETS 0179	Open area test side	30m	ETS
ETS 0180	Artifical mains	NNB01/RFZ	ETS
ETS 0181	Test pin for protective wire	PE 156-i	SPS electronic
ETS 0182	Power supply	MX-9300	Maxcom
ETS 0183	Frequency counter	MX-9300	Maxcom
ETS 0184	Function generator	MX-9300	Maxcom
ETS 0185	Digital multimeter	MX-9300	Maxcom
ETS 0186	Power supply	DF 1730	WJG
ETS 0187	Power suppy		TPW/RFT
ETS 0188	High voltage generator		
ETS 0189	Spectrum Analyzer	FSEB	Rohde&Schwarz
ETS 0190	Function generator	MX 2020	Maxcom
ETS 0191	Sweep function generator	7202	Dagatron
ETS 0192	Audio generator	7101	Dagatron
ETS 0193	Vibration table	N1-201-M	Sandox

No.	Measurement device:	Type:	Manufacturer:
ETS 0194	Digital multimeter	PMM 208	Dagatron
ETS 0195	Thermo hygro recorder		Amarell
ETS 0196	Digital thermometer	AK-688	KD
ETS 0197	Digital thermometer		Prima
ETS 0198	Digital thermometer	ad 170th	ama-digit
ETS 0199	Digital thermometer	ad 31th	ama-digit
ETS 0200	Digital thermometer / hygro meter	ad 90h	ama-digit
ETS 0201	Digital thermometer / hygro meter	37950-10	Cole Parmer
ETS 0202	Digital thermometer	ad 15th	ama-digit
ETS 0203	Digital thermometer	Type K	Amarell
ETS 0204	Digital thermometer	ad 20th	ama-digit
ETS 0205	High voltage test generator	HA 3300 D	SPS electronic
ETS 0206	High voltage test accessoires	HVGZ 312	SPS electronic
ETS 0207	Socket-Outlet torque balance	F 37.13	PTL
ETS 0208	Unjointed Finger probe	P 10.05	PTL
ETS 0209	Flixible Finger probe	P 10.01	PTL
ETS 0210	Spring operated impact hammer	P 22.50	PTL
ETS 0211	Metallic ball	F 53.32	PTL
ETS 0212	Hazardous live probe	P 10.06	PTL
ETS 0213	Hazardous live probe	P 10.11	PTL
ETS 0214	Ball pressure test apparatus	T 10.02	PTL
ETS 0215	Glow Wire tester	T 03.14	PTL
ETS 0216	Force indicator 50N	P 10.31	PTL
ETS 0217	Millivolt meter	URV 55	Rohde&Schwarz
ETS 0218	RF probe	URV5-Z7	Rohde&Schwarz
ETS 0219	Power sensor	NRV-Z2	Rohde&Schwarz
ETS 0220	Insertion unit	URV5-Z4	Rohde&Schwarz
ETS 0221	ISDN-S0-Analyzer	K1403	Siemens
ETS 0222	ISDN Protocol Analyser	TE965	Tekelec Teleco.
ETS 0223	GSM/ PCN/ PCS-Simul.	TS8915B	Rohde & Schwarz
ETS 0224	GSM System Simulator	FTA	Rohde & Schwarz
ETS 0225	SIM Simulator		Orga
ETS 0226	SIM Editor		Orga
ETS 0227	Vibration table	TIRA vib	GenRad
ETS 0228	Climatic chamber	VT 4010	Vötsch
ETS 0229	Radio Commun. Tester	CMT 54	Rohde & Schwarz
ETS 0230	Radio Commun. Tester	CMD 65	Rohde & Schwarz
ETS 0231	Testreceiver	ESVS 30	Rohde & Schwarz
ETS 0232	Radiation test source	VSQ 1	MEB
ETS 0233	Direction coupler	RK 100	MEB
ETS 0234	Power meter	NRVD	Rohde & Schwarz
ETS 0235	RF-network-analyser	8752 C	Hewlett Packard
ETS 0236	RF-amplifier	100A100	Amplifier Research
ETS 0237	RF-amplifier	100W1000M1	Amplifier Research
ETS 0238	Field strong meter	FM 2000	Amplifier Research
ETS 0239	Isotr. field probe 40 GHz	FP 2080 Kit	Amplifier Research
ETS 0240	Isotr. field probe 1 GHz	FP 2000 Kit	Amplifier Research
ETS 0241	Pulse Generator	4050	PicoSecond PL
ETS 0242	Harmonics analyser	F 41B	Fluke

No.	Measurement device:	Type:	Manufacturer:
ETS 0243	AC-clamp 1000 A	80i 1000s	Fluke
ETS 0244	Burst generator	EFT 200	EM-Test
ETS 0245	Load dump generator	LD 200	EM-Test
ETS 0246	Voltage drop simulator	VDS 200	EM-Test
ETS 0247	Microsecond generator	MPG 200	EM-Test
ETS 0248	Switch unit	AN 200	EM-Test
ETS 0249	Coupling network	CNA 200	EM-Test
ETS 0250	Coupling clamp	ACC	EM-Test
ETS 0252	System controller	PSM 12	Rohde & Schwarz
ETS 0253	Spectrum analyser	FSIQ	Rohde & Schwarz
ETS 0254	RF generator	SMIQ 03	Rohde & Schwarz
ETS 0255	RF generator	SMIQ 03	Rohde & Schwarz
ETS 0256	RF generator	SMP 03	Rohde & Schwarz
ETS 0257	Step attenuator	RSP	Rohde & Schwarz
ETS 0258	Rubidium standard	RSTU	DATUM GmbH
ETS 0259	Power meter	NRVD	Rohde & Schwarz
ETS 0260	Power sensor	NRVD-Z1	Rohde & Schwarz
ETS 0261	Power sensor	NRVD-Z1	Rohde & Schwarz
ETS 0262	Switching unit	SSCU	Rohde & Schwarz
ETS 0263	Signaling unit		Wird
ETS 0264	Spectrum analyser	F 1048	HAMEG
ETS 0265	Loop antenna	HFRA 9150	Schwarzbeck
ETS 0267	RF signal generator	SMT 03	Rohde & Schwarz
ETS 0268	RF signal generator	SMP 02	Rohde & Schwarz
ETS 0270	RF signal generator	SMP 04	Rohde & Schwarz
ETS 0271	Test receiver	ESI 40	Rohde & Schwarz
ETS 0272	RF signal generator	SME 03	Rohde & Schwarz
ETS 0273	RF signal generator	SME 03	Rohde & Schwarz
ETS 0274	RF signal generator	SMY 01	Rohde & Schwarz
ETS 0275	Power sensor	NRV-Z51	Rohde & Schwarz
ETS 0276	Audio analyser	UPL	Rohde & Schwarz
ETS 0277	Power sensor	NRV-Z1	Rohde & Schwarz
ETS 0278	Power sensor	NRV-Z31	Rohde & Schwarz
ETS 0279	Step attenuator	RSP	Rohde & Schwarz
ETS 0280	Power meter	NRVD	Rohde & Schwarz
ETS 0281	Spectrum analyser	FSM	Rohde & Schwarz
ETS 0282	RF bridge	86207 A	Hewlett Packard
ETS 0283	RF bridge	86205 A	Hewlett Packard
ETS 0284	Field probe	11940 A	Hewlett Packard
ETS 0285	Field probe	11941 A	Hewlett Packard
ETS 0286	Limiter	11867 A	Hewlett Packard
ETS 0287	Test receiver	ESHS 10	Rohde & Schwarz
ETS 0288	Artifical mains	ESH2-Z5	Rohde & Schwarz
ETS 0289	Audio generator	TAG 101	Troneer
ETS 0290	Audio generator	TAG 101	Troneer
ETS 0291	Loop antenna	HFH2-Z2	Rohde & Schwarz
ETS 0292	RF generator	SMHU	Rohde & Schwarz
ETS 0293	Artifical mains	NNBM 8125	Schwarzbeck
ETS 0294	Biconical antenna	HK 116	Rohde & Schwarz

No.	Measurement device:	Type:	Manufacturer:
ETS 0295	LPD antenna	HL 223	Rohde & Schwarz
ETS 0296	Oscilloscope	TDS 520 A	Tektronix
ETS 0297	Power pulse generator	IGUF 2910	Schwarzbeck
ETS 0298	ICO tester	TS 1232	Rohde & Schwarz
ETS 0299	DECT protocol tester	TS 1220	Rohde & Schwarz
ETS 0300	RF amplifier	75 A 250	Amplifier Research
ETS 0301	Relay switch unit	RSU	Rohde & Schwarz
ETS 0302	Data line CDN	CM-I/O CD	Keytek
ETS 0303	Telecom line CDN	CM-TEL CD	Keytek
ETS 0304	Test receiver	ESHS 10	Rohde & Schwarz
ETS 0305	Test receiver	ESVS 10	Rohde & Schwarz
ETS 0306	Function generator	HP 33120A	Hewlett Packard
ETS 0307	Commu. Sign. Analyzer	CSA 803 A	Tektronix
ETS 0308	Spectrum analyzer	R 3361A	Advantest
ETS 0309	Anechoic chamber	AC 2	Frankonia
ETS 0310	Anechoic chamber	AC 3	Frankonia
ETS 0311	Anechoic chamber	AC 4	Frankonia
ETS 0312	Climatic chamber	VC 0033	Vötsch
ETS 0313	Power sensor	NRV-Z51	Rohde & Schwarz
ETS 0314	LPD antenna	HL 223	Rohde & Schwarz
ETS 0315	Biconical antenna	HK 116	Rohde & Schwarz
ETS 0316	Switcher	Hr 07-720	WISI
ETS 0317	Switcher	Hr 07-720	WISI
ETS 0318	Dial pulse/ DTMF tester	210	HE
ETS 0319	Opto link	GPIB 140	NI
ETS 0320	Opto link	GPIB 140	NI
ETS 0321	RF Millivoltmeter	URV 55	Rohde & Schwarz
ETS 0322	Insertion unit	URV5-Z4	Rohde & Schwarz
ETS 0323	DECT portable part	Gigaset 1000	SIEMENS
ETS 0324	DECT fix part	Gigaset 1000	SIEMENS
ETS 0325	DECT portable part		Philipps
ETS 0326	DECT fix part		Philipps
ETS 0327	Blue Unit	V 2.0	Nokia
ETS 0328	BT Protocol tester	PTW 60	Rohde & Schwarz
ETS 0330	Spectrum analyser	FSM	Rohde & Schwarz
ETS 0333	turn table	DE 350	Heinrich Deisel
ETS 0334	Controller	HD 100	Heinrich Deisel
ETS 0335	BT Development kit	CASIRA	CSR
ETS 0336	LPD Antenna	HL 223	Rohde & Schwarz
ETS 0337	Professional Power Amplifier	SE-1200	Wharfedale Pro
ETS 0338	Coupling network	KN002	ETS
ETS 0339	Isolating Transformer	KN003	ETS
ETS 0340	Bluetooth test set	TS8960	Rohde & Schwarz
ETS 0341	EN 61000-4-8 Test System	F-1000-4-8/9/10-L	Fisher Custom
ETS 0431	AC Mains Adaptor	BS5733	Travel Emporium

2.4 Test Procedure

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-1992 using a 50µH LISN (if necessary). Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a spectrum analyzer. The bandwidth of the spectrum analyzer was 100 kHz with an appropriate sweep speed. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was the 100 kHz and the video bandwidth was 300 kHz. The ambient temperature of the UUT was 23°C with a humidity of 40 %.

FORMULA OF CONVERSION FACTORS: The Field Strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBµV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB.

Example:

Freq (MHz)	METER READING + ACF + CABLE LOSS (to the receiver) = FS
33	20 dBµV + 10.36 dB + 6 dB = 36.36 dBµV/m @3m

ANSI STANDARD C63.4-1992 10.1.7 MEASUREMENT PROCEDURES: The UUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m (non metallic table). The UUT was placed in the center of the table. The table used for radiated measurements is capable of continuous rotation. The spectrum was scanned from 30 MHz to 10th harmonic of the fundamental.

Peak readings were taken in three (3) orthogonal planes and the highest readings.
Measurements were made by ETS Dr. Genz GmbH at the registered open field test site located at Storkower Str. 38c, 15526 Reichenwalde, Germany.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

ANTENNA & GROUND:
This unit uses internal antenna. There is no provision for an external antenna (see photo).

3 Test results (enclosure)

TEST CASE	Required	Test passed	Test failed
Peak Output Power	☒	☒	☐
Equivalent radiated power	☒	☒	☐
Spurious Emissions radiated - Transmitter operating	☒	☒	☐
Spurious Emissions conducted - Transmitter operating	☐	☐	☐
Carrier Frequency Separation	☒	☒	☐
Number of Hopping Frequencies	☒	☒	☐
Time of Occupancy (Dwell Time)	☒	☒	☐
20dB Bandwidth	☒	☒	☐
Band-edge Compliance of RF Emissions	☒	☒	☐
Conducted Measurement at (AC) Power Line	☐	☐	☐
Peak Power Spectral Density (Master Inquiry Mode)	☒	☒	☐

3.1 Peak Output Power (transmitter)

This measurement applies to equipment with an integral antenna and to equipment with an antenna connector and equipped with an antenna as declared by the applicant.

The power was measured with modulation (declared by the applicant).

Test conditions		Conducted Power		
		Channel A [dBm]	**Channel B** [dBm]	**Channel C** [dBm]
T_{nom}= 23°C	V_{nom} = 3,3 V	0,03	-0,04	-0,29
Measurement uncertainty		< 3 dB		

Test conditions		Radited Power Antenna 1		
		Channel A [dBm]	**Channel B** [dBm]	**Channel C** [dBm]
T_{nom}= 23°C	V_{nom} = 3,3 V	3,36	0,88	3,92
Measurement uncertainty		< 3 dB		

Test conditions		Radiated Power Antenna 1		
		Channel A [dBm]	**Channel B** [dBm]	**Channel C** [dBm]
T_{nom}= 23°C	V_{min} = 3,1 V	3,30	1,14	4,05
Measurement uncertainty		< 3 dB		

Test conditions		Radiated Power Antenna 1		
		Channel A [dBm]	**Channel B** [dBm]	**Channel B** [dBm]
T_{nom}= 23°C	V_{max} = 3,5 V	3,06	0,82	3,73
Measurement uncertainty		< 3 dB		

Test conditions		Radited Power Antenna 2		
		Channel A [dBm]	**Channel B** [dBm]	**Channel C** [dBm]
T_{nom}= 23°C	V_{nom} = 3,3 V	4,01	4,93	2,26
Measurement uncertainty		< 3 dB		

Test conditions		Radiated Power Antenna 2		
		Channel A [dBm]	**Channel B** [dBm]	**Channel C** [dBm]
T_{nom}= 23°C	V_{min} = 3,1 V	4,08	4,73	4,05
Measurement uncertainty		< 3 dB		

Test conditions		Radiated Power Antenna 2		
		Channel A [dBm]	**Channel B** [dBm]	**Channel B** [dBm]
T_{nom}= 23°C	V_{max} = 3,5 V	4,13	4,47	3,73
Measurement uncertainty		< 3 dB		

Maximum Peak Output Power

Limits:

Frequency MHz	Number of hopping channels			
	≥75	≥50	≥25	≥15
902 –928	-	30 dBm	24 dBm	
2400-2483.5 MHz	30 dBm	-		21 dbm
5725-5850 MHz	30 dBm	-		

In case of employying transmitter antennas having antenna gain >dBi or using fixed poin-to point operation consider §15.247 (b)(4).

Test equipment used: ETS 0125, ETS 0340

3.2 De facto Equivalent isotropic radiated power

Because using an internal antenna there are no deviations from the radiated test results according 3.1.

3.2.1 Transmitter

Integral Antenna:
At the transmitter the measurement was transacted with the modulation declared by the manufacturer and the maximum available output power of the EUT.
In this arrangement the EUT fulfils the requirements of the FCC ruels § 15.247, subpart c, section b.
This unit uses internal antenna. There is no provision for an external antenna (see photo).

3.3 RF Exposure Compliance Requirements

According to Supplement C, Edition 01-01 to OET Bulletin 65, Edition 97-01 this spread spectrum transmitter is categorically excluded from routine environmental evaluation because of the low power level, where there is a high likelihood of compliance with RF exposure standards.
The antenna used for this Bluetooth transceiver module must not be co-located or operating in conjunction with any other antenna or transmitter.

3.4 Spurious emissions (tx)

Spurious emission was measured with modulation (declared by manufacturer).

In any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

SAMPLE CALCULATION OF LIMIT. All results will be updated by an automatic measuring system in accordance with point 2.3.

TEST RESULT (Transmitter): The unit DOES meet the FCC requirements.

Comment: see attached diagrams

Test equipment used: ETS 0125, ETS 0340, ETS 0271

3.5 Carrier Frequency Separation

Carrier Frequency Separation was measured with modulation (declared by manufacturer)**.**

According to FCC rules part 15 subpart C §15.247 frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or 20 dB bandwidth of the hopping channel, wichever is greater.

Test conditions		Channel Separation	
		Channel B	Channel B+1
T_{nom}= 23°C	V_{nom} = 3,3 V	1.027 MHz	
Measurement uncertainty		< 10 Hz	

Limits:

Frequency Range MHz	Limits	
	20 dB bandwidth < 25 kHz	20 dB bandwidth > 25 kHz
902 - 928	25 kHz	20 dB bandwidth
2400 – 2483,5 5725 – 5850		

Test equipment used: ETS 0125, ETS 0271

Comment: see attached diagram

3.6 Number of Hopping Frequencies

According to FCC rules part 15 subpart C §15.247 frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping frequencies. Frequency hopping systems in 5725-5850 MHz band shall use least 75 hopping frequencies.

For frequency hopping systems operating in the 902-928 MHz band: if the 20dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20dB bandwidth of the hopping channel 250 kHz or greater, the system shall use at least 25 hopping frequencies.

Test conditions		Operating Mode	Number of Channels
T_{nom}= 23°C	V_{nom} = 3,3 V	normal transmitting	79
T_{nom}= 23°C	V_{nom} = 3,3 V	inquiry mode	31

Limits:

Frequency Range MHz	Limit			
	20dB Bandwidth		20dB Bandwidth < 250 kHz	20dB Bandwidth ≥ 250 kHz
	≤ 1 MHz			
902 - 928 MHz			50	≥ 25
2400 – 2483,5	15	15	-	-
5725 - 5850 MHz	75	-		

Test equipment used: ETS 0125, ETS 0340

Comment: see attached diagrams

3.6.1 Pseudorandom Frequency Hopping Sequence

The generation of the hopping sequence is determined by the Bluetooth core specification and complies with the FCC requirements.

3.6.2 Coordination of hopping sequences to other transmitters

According to the Bluetooth core specification such a coordination is not possible. During scatternet function only one of the two hopping sequences will be used at a definite moment.

3.6.3 System Receiver Hopping Capability

According to the Bluetooth core specification.the system receivers shift frequencies in synchronization with the transmitted signals.

3.7 Time of Occupancy (Dwell Time)

According to FCC rules part 15 subpart C §15.247 frequency hopping systems operating in the 2400-2483.5 MHz and 5725-5850 MHz bands shall use an average time of occupancy on any frequency not greater than 0.4 seconds within a 30 second period.

For frequency hopping systems operating in the 902-928 MHz band: if the 20dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not greater than 0.4 seconds within a 20 second period; if the 20dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

Test conditions	**Operating mode**	**Measurement periode**	**Time of Occupancy**
T_{nom}= 23°C V_{nom} = 3,3 V Channel B	normal transmitting	31,6 ms	177,88 ms
	inquiry mode	0,117 ms	11,9 ms
Measurement uncertainty	< 1 µs		

Limits and measurement periodes:

Frequency MHz	Number of channels	Measurement Periode	Limit
902 -	≥50	20 s	0,4 s
	49 ≥ 25	10 s	0,4 s
2400 -	≥ 15	0,4 s * number of used channels	0,4 s
5725	≥ 75	30 s	0,4s

Test equipment used: ETS 0125, ETS 0271

Comment: see attached diagram

3.8 20dB Bandwidth

According to FCC rules part 15 subpart C §15.247 frequency hopping systems operating in the 5725-5850 MHz bands shall use a maximum 20dB bandwidth of 1 MHz.
The 20dB bandwidth was measured on the lowest,middle and highest hopping channel.

For frequency hopping systems operating in the 902-928 MHz band the maximum 20dB bandwidth of the hopping channel is 500 kHz.

Test conditions		20 dB Bandwidth		
		Channel A	Channel B	Channel C
T_{nom}= 23°C	V_{nom} = 3,3 V	0.872 MHz	0.824 MHz	0.824 MHz
Measurement uncertainty		< 10 Hz		

Limits:

Frequency Range / MHz	Number of channels	Limit
902 -	< 50	< 250 kHz
	49 ≥ 25	500 kHz ≥ 250 kHz
2400 -	-	not determined
5725 - 5850	75	≤ 1MHz

Test equipment used: ETS 0125, ETS 0271

Comment: see attached diagram

3.8.1 System Receiver Input Bandwidth

It is determined in the Bluetooth core specification. The value matches to the bandwidth of transmitter signal.

3.9 Band-edge Compliance of RF Emissions

According to FCC rules part 15 subpart C §15.247(c) in any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required.

Test conditions		Frequency at band-edges -20 dB	
		Channel A	Channel C
T_{nom}= 23°C	V_{nom} = 3,3 V	2,4015 GHz	2,4805 GHz
Measurement uncertainty		< 100 Hz	

Limits:

Frequency Range / MHz	Limit
902 –928 2400 – 2483.5 5725 - 5850	- 20 dB

Test equipment used: ETS 0125, ETS 0271

Comment: see attached diagrams

4 Conducted Measurement at (AC) Power Line

For an intentional radiator wich is designed to be connected to the puplic utility (AC) power line, the radio frequency voltage that is conducted back onto the AC line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.
If the level of the emission measured using the quasi-peak instrumentation is 6dB, or more higher than the level of the same emission measured with instrumentation having an average detector and a 9 kHz minimum bandwidth, that emission is considered broadband and the level obtained with the quasi-peak detector may be reduced by 13dB for comparison to the limits.
This measurement was transact first with instrumentation using an average and peak detector and a 10 kHz bandwidth. If the peak detector achieves a calculated level, the measurement is repeated by an instrumentation using a quasi-peak detector. The level of the quasi-peak measurement will decreased by 13dB if the difference between average and quasi-peak is 6dB or greater.

Frequency	Level		
	quasi-peak	average	quasi-peak –13dB
450 kHz	-- dBµV	-- dBµV	-- dBµV

Limits:

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi Peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

Test is not required the sample is battery used

Test equipment used: ETS 0003, ETS 0040, ETS 0109, ETS 0125

Comment: see attached diagram

Appendix

A Pictures
B Peak Output Power
C Spurious Emissions radiated - Transmitter operating
D Spurious Emissions conducted - Transmitter operating
E Carrier Frequency Separation
F Number of Hopping Frequencies
G Time of Occupancy (Dwell Time)
H 20dB Bandwidth
I Band-edge Compliance of RF Conducted Emissions
J Conducted Measurement at (AC) Power Line
K Peak Power Spectral Density (Master Inquiry Mode)

Appendix A

Pictures

Appendix B

Peak Output Power

Appendix C

Spurious Emissions radiated - Transmitter operating

Appendix D

Spurious Emissions conducted - Transmitter operating

Appendix E

Carrier Frequency Separation

Appendix F

Number of Hopping Frequencies

Appendix G

Time of Occupancy (Dwell Time)

Appendix H

20dB Bandwidth

Appendix I

Band-edge Compliance of RF Emissions

Appendix J

Conducted Measurement at (AC) Power Line

Appendix K

Peak Power Spectral Density (Master Inquiry Mode)