

**ELECTRONIC TECHNOLOGY SYSTEMS
DR. GENZ GMBH**

TEST - REPORT

FCC RULES PART 90

FCC ID: ONKATS-100

Test report no.:

G5M203080149-C-1

FCC

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3 Test Results

- 3.1 RF Power Output (conducted) FCC 2.1046(a), FCC 90.205
- 3.2 Radiated Power FCC 2.1046
- 3.3 Spurious Emission radiated, FCC 2.1053, FCC 90.210
- 3.4 Spurious emissions at antenna terminal FCC 2.1051, FCC 90.210(b) (d)
- 3.5 Audio frequency response FCC 2.1047(a)
- 3.6 Audio low pass filter frequency response FCC 2.1047(a), FCC 90.210
- 3.7 Modulation Limiting FCC 2.1047(b), FCC 22.915(b), FCC 90.242(b)(8)
- 3.8 Occupied Bandwidth FCC 2.1049, FCC 90.210
- 3.9 Frequency Stability vs. Temperature, FCC 90.213, FCC 2.1055, FCC 22.915(b)
- 3.10 Transient frequency behaviour of the transmitter FCC 90.214
- 3.11 Spurious emissions related to AC power line

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.

Furthermore, 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 possesses the qualities as maintained and that its 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:

23.10.2003

D. Hoppe



Date

ETS-Lab.

Name

Signature

Technical responsibility for area of testing:

23.10.2003

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

ACCREDITED COMPETENT BODY

DAR-REGISTRATION NUMBER: BPT-ZE-026/96

FCC FILED TEST LABORATORY REG. NO. 96970

BLUETOOTH QUALIFICATION TEST FACILITY (BQTF)

ACCREDITED BY: BLUETOOTH QUALIFICATION REVIEW BOARD (BQRF)

INDUSTRY CANADA FILED TEST LABORATORY REG. NO. IC 3470

A2LA ACCREDITED Certificate Number: 1983-01

1.3 Details of approval holder

Name	: Airtech I & C Co., Ltd.
Street	: zip 421-809, #101-807, Techno ParkComplex, 364, Samjung-dong
Town	: Ojung-Gu, Bucheon-si, Kyeonggi-Do
Country	: Korea
Telephone	: +82-32-234-2345
Fax	: +82-32-234-2350
Contact	: Mr. John Kim
Telephone	: +82-32-234-2345
E-mail	: sales1@airtech21.com

1.4 Application details

Date of receipt of application : 18.08.2003
Date of receipt of test item : 18.08.2003
Date of test : 03.09.2003-05.09.2003

1.5 Test item

Description of test item : VHF Transceiver
Type identification : ATS-100
Serial number : Test model without serial number.
Photos : See annex

Technical data

Frequency band : 136 MHz-174 MHz
Frequency (ch A) : 136.025 MHz
Frequency (ch B) : 155.025 MHz
Frequency (ch C) : 173.975 MHz
Channel spacing : 12.5 kHz and 25 kHz
Antenna : external Helical Antenna
Antenna gain : unity
Power supply : 7,5V
Operating mode : duplex
Type of modulation : FM
Emission : 8K5F3E / 16K0F3E

Manufacturer: (if applicable)

Name :
Street :
Town :
Country :

1.6 Test standards

Technical standard : FCC RULES PART 90, Part 2

Additional information : none

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 : 7,5 V DC

Extrem conditions parameters: : test voltage - extreme min : -- V, AC
max: -- V, AC

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	Spectrum- 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	Artificial mains	ESH3-Z5	Rohde&Schwarz
ETS 0041	Artificial mains	ESH3-Z4	Rohde&Schwarz
ETS 0042	Artificial mains	ESH3-Z6	Rohde&Schwarz
ETS 0043	Artificial mains	NNB 11	MEB
ETS 0044	Artificial 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 Control center		Keytek/ EMV
ETS 0054	EFT simulator		Keytek/ EMV
ETS 0055	Module 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 amplifier	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	Video camera 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 system	Performa 630	Macintosh
ETS 0084	Process controller	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	Color TV pattern generator	PM 5518-TX VPS	Philips
ETS 0089	Radio communication 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	Rear-panel connectors	SME-B19	Rohde&Schwarz
ETS 0095	DECT system controller	PSMD	Rohde&Schwarz

No.	Measurement device:	Type:	Manufacturer:
ETS 0096	DECT Signaling 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	Rear-panel 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 signaling 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	Uninterruptible power supply	UPS - 1500	Sendon
ETS 0127	Uninterruptible power supply	UPS - 1000 LC	Sendon
ETS 0128	Uninterruptible power supply	UPS - 1000	Sendon
ETS 0129	Uninterruptible power supply	UPS - 500	Sendon
ETS 0130	Uninterruptible 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	Measuring 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	Impedance converter	TK 11	RFT
ETS 0143	Impedance 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	Signal generator	SMG	Rohde&Schwarz
ETS 0155	Signal generator	SMG	Rohde&Schwarz
ETS 0156	Adjacent channel power meter	NKS	Rohde&Schwarz
ETS 0157	TV and Sat-Signal generator	VTG 700	Grundig
ETS 0158	TV and Sat Signal generator	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	Artificial 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 supply		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 accessories	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	Flexible 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	VSO 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 strength 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	FSIO	Rohde & Schwarz
ETS 0254	RF generator	SMIO 03	Rohde & Schwarz
ETS 0255	RF generator	SMIO 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	Artificial 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	Artificial 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	Kevtek
ETS 0303	Telecom line CDN	CM-TEL CD	Kevtek
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	GPIO 140	NI
ETS 0320	Opto link	GPIO 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		Philips
ETS 0326	DECT fix part		Philips
ETS 0327	Blue Unit	V 2.0	Nokia
ETS 0328	BT Protocol tester	PTW 60	Rohde & Schwarz
ETS 0330	Spectrum analyzer	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

The test procedure are performed following the test stands ANSI STANDARD C63.4 and ANSI /TIA/EIA-603, if applicable.

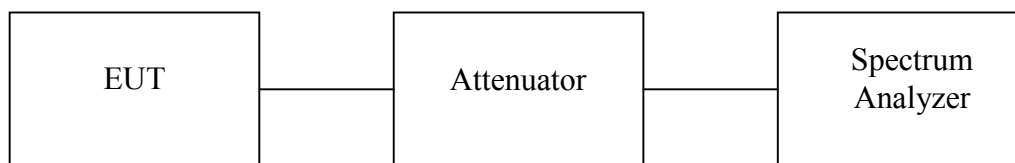
2.4.1 RF Power Output (conducted) FCC 2.1046(a), FCC 90.205

The conducted RF output power is the available power at the output terminals of the transmitter when the output terminals are corrected to the standard transmitter load.

The test sample is feeding a 50 ohm coaxial attenuator which is connected to a spectrum analyzer.

The power output at the transmitter antenna port is determined by adding the value of the attenuator to the spectrum analyzer reading.

The test are performed at the frequencies (low, middle, high channels of the EUT operating band) and full rated power levels of the transmitter.



2.4.2 Output power radiated FCC 2.1046

The radiated emission at the fundamental frequency is measured at 3m distance with a test antenna and spectrum analyzer.

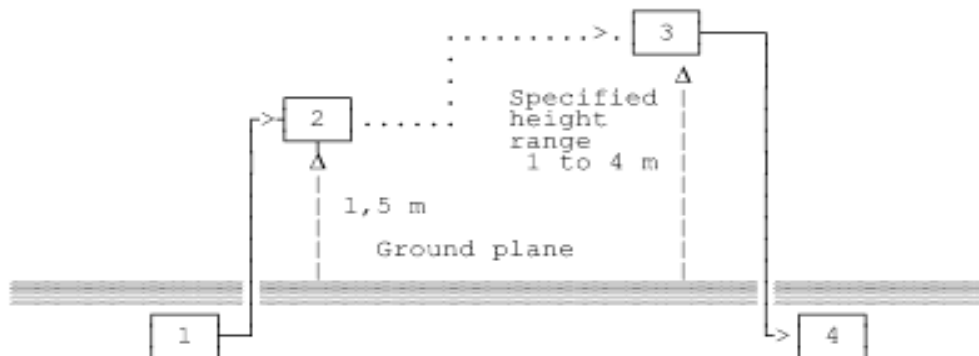
ERP measurement in the determined frequency band is using the substitution method which will be applied to RF output power measurements as well as spurious emission power measurements.

Substitution RF power measurements:

General:

The applied substitution method follows ANSI/TIA/EIA-603, ANSI/TIA/EIA-102.CAAA or the appropriate ETSI rules respectively.

The actual signal generated by the EUT can be determined by means of a substitution measurement in which a known signal source replaces the device to be measured.



- 1) Signal generator;
- 2) Substitution antenna;
- 3) Test antenna;
- 4) Spectrum analyzer or selective voltmeter.

The substitution antenna replaces the transmitter antenna at the same position and in vertical polarization. The frequency of the signal generator shall be adjusted to the measurement frequency. The test antenna shall be raised or lowered, if necessary, to ensure that the maximum signal is still received. The input signal to the substitution antenna shall be adjusted in level until an equal or a known related level to that detected from the transmitter is obtained in the measurement receiver. If a fully anechoic chamber is used as test site in order to provide free space conditions there is no need to change the height of the antenna. The measurement will be repeated in horizontal position.

Calibration:

In order to make this kind of measurement more effective and to avoid subjective measurement faults ETS has installed automatic computer controlled measurement procedures. With the above described substitution method a test site is calibrated over the full frequency range which is used in suitable frequency steps. For a certain power level on the substitution antenna the received power over the whole frequency range is documented. All necessary antenna gains, cable losses, filter losses and amplifications of preamplifiers are taken in consideration. The summary of this calibration measurement performs a transducer factor that is related to the considered test site and a certain measurement distance. Differences of the radiated power levels of different test samples are determined by internal attenuation of the measurement receiver. The proper function of such test site will be maintained by short term plausibility checks and periodical re-calibration.

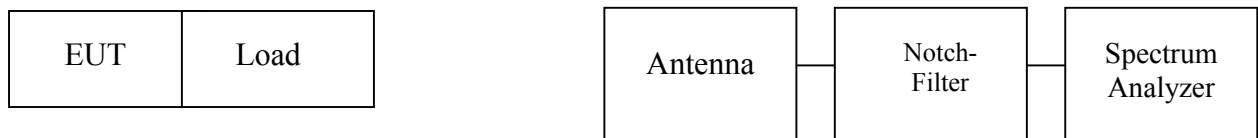
Testing:

Now the test sample will be putted on the table at the defined position and the radiated power will be received and documented by the measurement receiver. On test sites with ground plane the measurement antenna will be lowered and raised to maximum values at significant frequencies. For peak power measurements the sample is turned by the turntable over 360 degree in order to find the direction with the maximum radiation or to document the max reading with the MAXHOLD function during the rotation.

2.4.3 Spurious emissions radiated FCC 2.1053, FCC 90.210

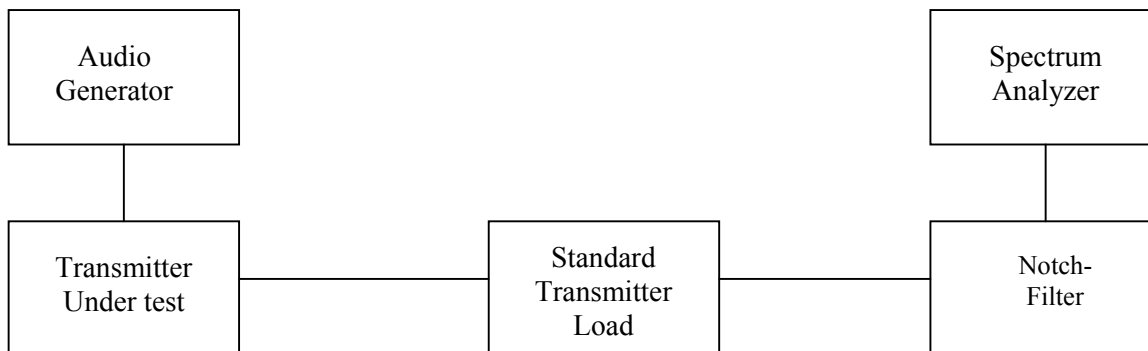
Radiated spurious emissions are emissions from the EUT when transmitting in nonradiating load on frequencies outside the operating band.

ERP measurement of spurious emission using the general substitution method as described at 2.4.2. In order to suppress intermodulation products in the spectrum analyzer a notch filter is used, if applicable.



2.4.4 Spurious Emissions at antenna terminal FCC 2.1051

Conducted spurious emissions are emissions at the antenna terminals on frequencies outside the operating band. The test is performed according the principle below using a computer controlled test set-up.



The transmitter is modulated with 2500 Hz sinewave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation.

2.4.5 Audio frequency response FCC 2.1047(a)

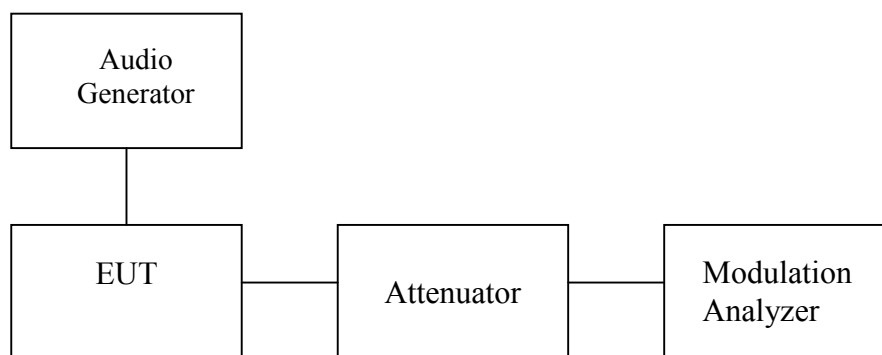
The audio frequency response is the degree of closeness to which the frequency deviation of the transmitter follows a prescribed characteristic.

The frequency response of the audio modulation part is measured over a frequency range of 100 Hz to 5000 Hz.

For a 1000 Hz tone reference signal the audio generator level is adjusted to get 20% of the rated system deviation.

The deviations obtained over the frequency range from 100 Hz to 5000 Hz are recorded and compared with the reference deviation as follows:

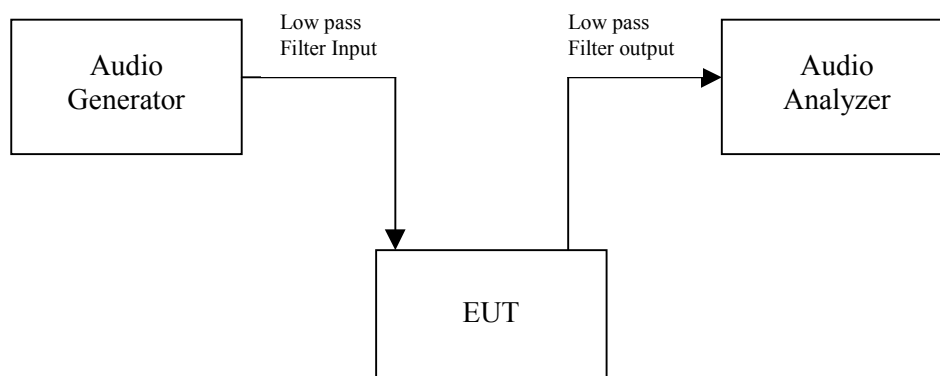
$$\text{Audio Frequency Response} = 20 \log [\text{DEV}_{\text{Freq}} / \text{DEV}_{\text{ref}}].$$



2.4.6 Audio low pass filter frequency response FCC 2.1047(a), FCC 90.242(b)(8)

The audio low pass filter response is the frequency response of the post limits low pass filter circuit above 3000 Hz.

It is measured from 1kHz (reference point) to 50 kHz with the test set-up below.



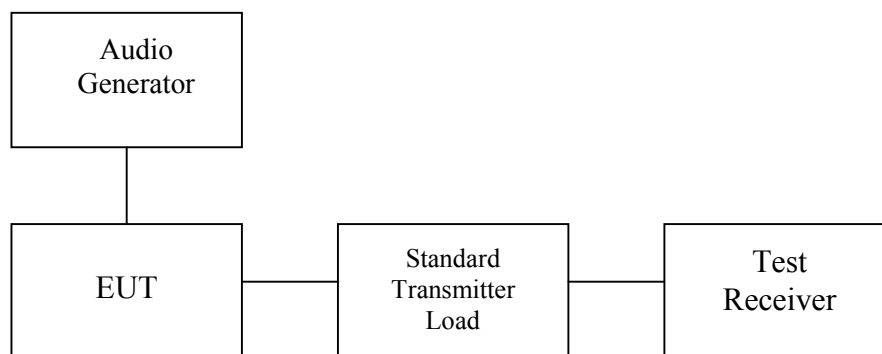
2.4.7 Modulation limiting FCC 2.1047(b), 22.915(b), 90.210

Modulation limiting is the transmitter circuit's ability to limit the transmitter from producing deviations in excess of rated system deviation.

The audio signal generator is connected to the audio input of the EUT with its full rating.

The modulation response is measured at certain modulation frequencies, related to 1000Hz reference signal. The basic setting is 60% of full rated system deviation which will be increased the audio generator level from -20 dB to 20 dB in nine steps..

Test are perform for positive and negative modulation.



2.4.8 Occupied Bandwidth FCC 2.1049, 90.210

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0,5 percent of the total mean power radiated by a given emission.

The transmitter is modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation.

The input level shall be established at the frequency of maximum response of the audio modulating circuit.

Different emission masks are required.

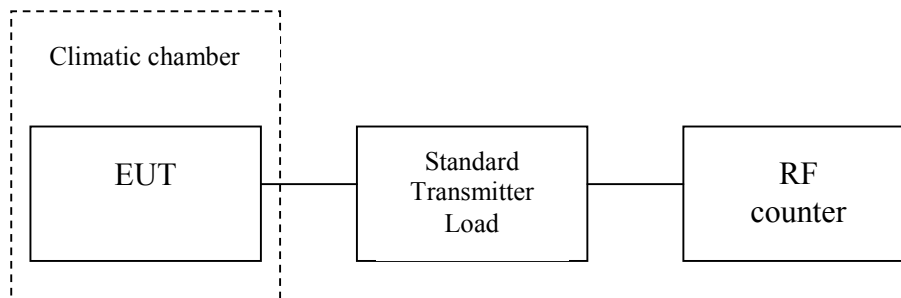
Emission Mask B for transmitters that are equipped with an audio low pass filter.

Emission Mask D for transmitters designed to operate with a 12.5 kHz bandwidth.

2.4.9 Frequency stability FCC 2.1055, FCC 90.213

The carrier frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

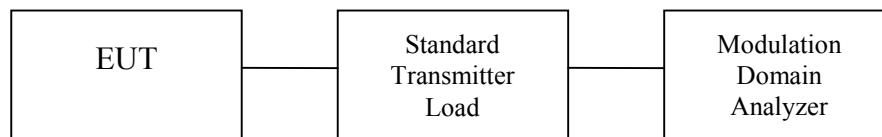
The frequency stability is measured with variation of ambient temperature from -30°C to $+50^{\circ}\text{C}$.



2.4.10 Transient frequency behaviour FCC 90.214

Transient frequency behaviour is a measure of the difference, as a function in time, of the actual transmitter frequency to the assigned transmitter frequency when the transmitted RF output power is switched on or of.

The modulation Domain Analyzer will capture the transient frequency behaviour for a 30 dB step during the switch on and switch off time.



2.4.11 Spurious emissions related to AC power lines FCC 15.107, FCC 15.109

This subclause is for ancillary equipment with direct connection to AC mains like chargers, AC/DC –adaptor etc.

Conducted:

The power line conducted interference measurement follows ANSI STANDARD C63.4- using a 50 μH LISN. The bandwidth of the measurement receiver is 10 kHz. Both lines are observed in the frequency range 150 kHz to 30 MHz.

Radiated:

Field strength spurious emission measurements are done at a 3m open air test site (OATS). The EUT is placed on a wooden table of 80 cm high with dimensions of 1m by 1,5m. The EUT is measured in horizontal and vertical position with searching of max. radiation by rotation of turn table and changing of the antenna high 1m to 4m over a frequency range from the lowest EUT generated frequency until the 5th harmonic of it.

3 Test results (enclosure)

TEST CASE	Required	Test passed	Test failed
Output power conducted	☒	☒	☐
Output Power radiated	☒	☒	☐
Spurious Emissions radiated	☒	☒	☐
Spurious Emissions at antenna terminal	☒	☒	☐
Audio frequency response	☒	☒	☐
Audio low pass filter frequency response	☒	☒	☐
Modulation limited	☒	☒	☐
Occupied bandwidth	☒	☒	☐
Frequency stability	☒	☒	☐
Transient frequency behaviour of the transmitter	☒	☒	☐
Spurious Emissions related to AC power line	☒	☒	☐

3 RF Output Power (conducted) FCC 2.1046(a), FCC90.205

3.1 Output Power conducted

Frequency Channel	Peak Output Power
lowest	35,46 dBm
middle	35,72 dBm
highest	35,51 dBm

Test equipment used: ETS 0125, ETS 0271

Comments: See attached diagrams.

3.2 Output Power radiated

Frequency Channel	Radiated Power
lowest	16,04 dBm
middle	20,84 dBm
highest	14,41 dBm

Test equipment used: ETS 0125, ETS 0271, ETS 0012, ETS 0013, ETS 0014

Comments: See attached diagrams.

3.3 Spurious Emission radiated FCC 2.1053, FCC 90.210

The radiated spurious emissions were measured at the middle channel of the EUT operating band and using.

Summary table with radiated data of the test plots

Freq.	Used Ch.	Frequency Marker [GHz]	Polarization	Δ corrections dB	Max. power Value dBm	Compliance Limit dBm	Detector	BW [MHz]	<u>Margin</u> [dB]

Comment: no relevant emissions found
see attached diagrams

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

Test equipment used: ETS 0271, ETS 0125, ETS 0012, ETS 0013, ETS 0014

3.4 Spurious emissions at antenna terminal FCC 2.1051, FCC 90.210(b) (d)

Summary table with conducted data of test plots

Freq.	Used Ch.	Frequency Marker [GHz]	Max. power Value dBm	Compliance Limit dBm	BW [MHz]	<u>Margin</u> [dB]

Comment: no relevant emissions found
see attached diagrams

3.5 Audio frequency response FCC 2.1047(a)

Operating Frequency: 155.025 MHz
 Channel: Middle
 Reference Voltage: 7,5 V DC

Audio frequency (Hz)	Channel spacing 12.5 kHz		Channel spacing 25 kHz	
	measured deviation (kHz)	calculated response (dB)	measured deviation (kHz)	calculated response (dB)
100	0,098	-14,2	0,152	-16,4
200	0,103	-13,7	0,162	-15,8
300	0,147	-10,6	0,275	-11,2
400	0,354	-3,0	0,675	-3,4
500	0,338	-3,4	0,619	-4,2
600	0,313	-4,1	0,616	-4,2
700	0,347	-3,2	0,705	-3,0
800	0,389	-2,2	0,783	-2,1
900	0,446	-1,0	0,908	-0,8
1000	0,500	0	1,000	0
2000	1,292	8,2	2,779	8,9
2500	1,472	9,4	3,319	10,4
3000	1,224	7,8	2,704	8,6
4000	0,426	-1,4	0,266	-11,5
5000	0,181	-8,8	0,339	-9,4

Test equipment used: ETS 0192, ETS 0089, ETS 0125

3.6 Audio low pass filter frequency response FCC 2.1047(a), FCC 90.210

Operating Frequency: 155.025 MHz

Channel: Middle

Reference Voltage: 7,5 V DC

Audio frequency (Hz)	Channel spacing 12.5 kHz	Channel spacing 25 kHz
	response (dB)	response (dB)
1	0	0
2	+1,8	+1,5
3	-1	-0,6
4	-13,5	-14
5	-22	-27
6	-29	-30
7	-33,5	-36
8	-37	-38
9	-42	-43
10	-51,5	-52
20	-57	-56
30	-60	-60
50	-61	-60

Test equipment used: ETS 0192, ETS 0089, ETS 0125

3.7 Modulation Limiting FCC 2.1047(b), FCC 22.915(b), FCC 90.242(b)(8)

Operating Frequency: 155.025 MHz

Channel: Middle

Reference Voltage: 7,5 V DC

12.5 kHz channel spacing

Audio input level relative (dB)	Positive peak deviation (kHz)			Negative peak deviation (kHz)		
	300 Hz	1000 Hz	3000 Hz	300 Hz	1000 Hz	3000 Hz
-20	0,098	0,213	0,448	0,104	0,203	0,465
-15	0,117	0,344	0,823	0,125	0,342	0,852
-10	0,141	0,513	1,230	0,147	0,509	1,297
-5	0,182	0,843	1,260	0,197	0,838	1,338
0	0,309	1,449	1,265	0,297	1,418	1,353
5	0,479	1,431	1,263	0,516	1,482	1,341
10	1,145	1,386	1,268	1,156	1,490	1,345
15	1,495	1,363	1,283	1,505	1,473	1,348
20	1,430	1,361	1,264	1,447	1,437	1,339

25 kHz channel spacing

Audio input level relative (dB)	Positive peak deviation (kHz)			Negative peak deviation (kHz)		
	300 Hz	1000 Hz	3000 Hz	300 Hz	1000 Hz	3000 Hz
-20	0,134	0,384	0,924	0,153	0,360	0,933
-15	0,195	0,612	1,565	0,177	0,607	1,572
-10	0,243	1,015	2,673	0,235	1,036	2,702
-5	0,383	1,783	2,781	0,341	1,739	2,836
0	0,613	3,179	2,760	0,617	30,62	2,802
5	1,032	3,122	2,797	1,051	3,186	2,845
10	2,339	3,066	2,798	2,207	3,154	2,853
15	3,177	3,012	2,792	3,007	3,127	2,861
20	3,044	2,982	2,776	2,868	3,061	2,837

Limits:

Channel spacing (kHz)	Rated frequency deviation (kHz)
12,5	2,5
25	5

Test equipment used: ETS 0089, ETS 0192, ETS 0125

3.8 Occupied Bandwidth FCC 2.1049, FCC 90.210,

Frequency Channel	Occupied Bandwidth Mask D Channel spacing 12.5 kHz	Occupied Bandwidth Mask B Channel spacing 25 kHz
Lowest	Pass	Pass
Middle	Pass	Pass
highest	Pass	Pass

Limits: Are determined by used emission mask.

Test equipment used: ETS 0271, ETS 0125

Comment: see attached diagrams

3.9 Frequency Stability vs. Temperature, FCC 90.213, FCC 2.1055, FCC 22.915(b)

Voltage (%)	Voltage (V)	ϑ / °C	Measured frequency (MHz)	Frequency Error (ppm)
100 %	7.5	-30	155.025 398	+2,567
100 %		-20	155.025 392	+2,529
100 %		-10	155.025 328	+2,116
100 %		0	155.025 287	+1,851
100 %		+10	155.025 225	+1,451
100 %		+20	155.025 086	+0,555
100 %		+30	155.025 077	+0,497
100 %		+40	155.025 063	+0,406
100 %		+50	155.025 060	0,387
85 %		+20		
115 %		+20		
Battery endpoint	6.0	+20	155.025 047	0,303

Limits:

Channel spacing (kHz)	Frequency error (ppm)
12,5	2,5
25	5

Test equipment used: ETS 0089, ETS 0192, ETS 0125

3.10 Transient frequency behaviour of the transmitter FCC 90.214

Limits:

Time intervals ^{1,2}	Maximum frequency Difference ³	All equipment	
		150 to 174 MHz	421 to 512 MHz
Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels			
t ₁ ⁴	±25,0 kHz	5,0 ms	10,0 ms
t ₂	±12,5 kHz	20,0 ms	25,0 ms
t ₃ ⁴	±25,0 kHz	5,0 ms	10,0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 12,5 kHz Channels			
t ₁ ⁴	±25,0 kHz	5,0 ms	10,0 ms
t ₂	±12,5 kHz	20,0 ms	25,0 ms
t ₃ ⁴	±25,0 kHz	5,0 ms	10,0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 6,25 kHz Channels			
t ₁ ⁴	±25,0 kHz	5,0 ms	10,0 ms
t ₂	±12,5 kHz	20,0 ms	25,0 ms
t ₃ ⁴	±25,0 kHz	5,0 ms	10,0 ms

¹ t_{on} is the instant when a 1 kHz test signal is completely suppressed, including any capture time due to phasing.

t_1 is the time period immediately following t_{on} .

t_2 is the time period immediately following t_1 .

t_3 is the time period from the instant when the transmitter is turned off until t_{off} .

t_{off} is the instant when the 1 kHz test signal starts to rise.

² During the time from the end of t_2 to the beginning of t_3 , the frequency difference must not exceed the limits specified in § 90.213.

³ Difference between the actual transmitter frequency and the assigned transmitter frequency.

⁴ If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

Test equipment used: ETS 0271, ETS 0125

Comment: see attached diagrams

3.11 Spurious emissions related to AC power line

Conducted:

Frequency	Level	
	quasi-peak	average
150 kHz	lower limit line	lower limit line

Limits:

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

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

Comment: see attached diagram

Appendix

- A Pictures
- B Output Power conducted
- C Output Power radiated
- D Spurious Emissions radiated - Transmitter operating
- E Spurious Emissions at antenna terminal
- F Audio frequency response
- G Audio low pass filter frequency response
- H Modulation limiting
- I Occupied Bandwidth
- J Frequency stability
- K Transient frequency behaviour of the transmitter
- L Spurious emissions related to AC power line