



**ETS PRODUCT SERVICE AG**

# **RADIO TEST - REPORT**

**EUROPEAN STANDARD EN 301 839  
FCC RULES PARTS 95I  
IC RADIO STANDARDS RSS-243**

**FCC ID:QRICM08V-1**

**TEST REPORT NUMBER : G0M20712-0342-T-48**



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**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 possesses the qualities as maintained and that its performance generally conforms to representative cases of communications equipment.


This report covers both, test results according to EN 301 839-1 (ULP-AMI) and FCC 95.628 ff (MICS) which are similar or the same related to test procedure and limits.

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


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**Tester:**

03.01.2008		W. Treffke	
<hr/>			
Date	ETS-Lab.	Name	Signature

**Technical responsibility for area of testing:**

03.01.2008		K. Damm	
<hr/>			
Date	ETS	Name	Signature

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**1.2 Testing laboratory**

ETS Produkt Service AG  
 Storkower Strasse 38c  
 D-15526 Reichenwalde b. Berlin  
 Germany

Telefon : +49 33631 888 00  
 Telefax : +49 33631 888 66

**ACCREDITED TESTING LABORATORY**  
 DAR-REGISTRATION NUMBER: DAT-P-201/96

**ACCREDITED NOTIFIED BODY EMC**  
 BNetzA-Registration No.: BNetzA-BS EMV-7/61

**ACCREDITED NOTIFIED BODY R&TTE**  
 BNetzA-Registration number: BNetzA-BS-02/51-53

**FCC filed test laboratory** Reg. No. 96970

**A2LA Accredited Certification** #1983.01

**Bluetooth Qualification Test Facility (BQTF)**  
 Accredited by Bluetooth Qualification Review Board

**Industry Canada filed test laboratory** Reg. No. IC 3470A

Test location, where different from ETS:

Name: ./.  
 Street: ./.  
 Town: ./.  
 Country: ./.  
 Telephone: ./.  
 Fax: ./.

### 1.3 Details of approval holder

Name: Biotronik GmbH & Co.  
Street: Woermannkehre 1  
Town: 12359 Berlin  
Country: Germany  
Telephone: +49 30 68905 1213  
Fax: 030 6890 5409

Contact: Herr Gunnar Börsch  
Telephone: +49 30 68905 1213

### 1.4 Application details

Date of receipt of application: 12.12.2007  
Date of receipt of test item: 12.12.2007  
Date of test: 12.12.2007 – 17.12.2007

### 1.5 Test item

Description of test item: Telex IV

Type identification: Cardiomessenger II - STLine / Cardiomessenger II - S

Frequency range: 402 MHz – 405 MHz

Antenna: internal antenna

Antenna gain: 0 dBi

Software: 1.xx

Hardware: W1/W2 with MT2456 or MT5656 (Cardiomessenger II-STLine)  
W1/W2 with G24 or G24L (Cardiomessenger II-S)  
optional shielding over ULPAMI transceiver (see Appendix A)

Power supply: 5.0 V DC  
100 - 240V / 50-60 Hz AC  
(AC/DC adaptor PA 1010-050 IB\* or FW 75555O/05)  
(\*valid only for Cardimessenger II-S)

Serial number: 4800000x and 4810000x and 4820000x and 4830000x

Photos: see Annex

**Manufacturer:**

Name: Biotronik GmbH & Co.  
Street: Woermannkehre 1  
Town: 12359 Berlin  
Country: Germany

**1.6 Test standards**

Technical standard : EN 301 839-1; (ULP-AMI)  
EN 301 839-2, (ULP-AMI)  
FCC Part 95 Subpart I - Medical Implant Communications (MICS)  
RSS-243 Iss2 (Active Medical Implants)  
FCC Part 15

## 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 2.4 were ascertained in the course of the tests performed.

### 2.2 Test environment

Temperature: 18 ... 25 °C

Relative humidity content 20 ... 75 %

Air pressure: 860 ... 1030 hPa

Details of power supply: **5.0 V DC**  
 100 - 240V / 50-60 Hz AC  
 (AC/DC adaptor PA 1010-050 IB\* or FW 75555O/05)  
 \*valid only for Cardimessenger II-S

Extrem conditions parameters:

Voltage	$V_{nom}$	: 5.0 V, DC
	$V_{min}$	: 4.5 V, DC
	$V_{max}$	: 5.5 V, DC

Temperature	$T_{nom}$	: 25 °C
	$T_{min}$	: -10 °C
	$T_{max}$	: +55 °C

Other parameters: --

## 2.3 Test information

Test monitoring test's are performed using out-of-operation region disturbances. These Out-of-operation –region disturbances are generated by:

a.) RF disturbing signals or fields	<input type="checkbox"/>
b.) Simulation by frequency administration commands	<input checked="" type="checkbox"/>

All the tests are done at an operating frequency near 403,5 MHz (app. middle of band) exempt the band edge test according to FCC 95.635(d)(5).



## 2.4 Test equipment utilized

No.	Test equipment	Type	Manufacturer
ETS 0001	ESD Gun	SESD 30000	Schlöder
ETS 0002	Test receiver	ESVP	Rohde & Schwarz
ETS 0003	Diode power sensor	NRV-Z2	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	Horn antenna	AT 4004	ar
ETS 0008	Antenna	Loop antenna	Siemens
ETS 0009	Antenna	ARA 2	MEB
ETS 0010	Antenna	Loop antenna	MEB
ETS 0011	Antenna	van Veen/ Frame	Rohde & Schwarz
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	Precision antenna kit	VHAP	Schwarzbeck
ETS 0017	Precision antenna kit	UHAP	Schwarzbeck
ETS 0018	Horn antenna	BBHA 9120 D	Schwarzbeck
ETS 0019	Horn antenna	BBHA 9120 D	Schwarzbeck
ETS 0020	Antenna	DP 21	MEB
ETS 0021	Antenna	DP 3	MEB
ETS 0022	Antenna	SAS-200/ 521	A.H. Systeme+D65
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	Antenna	HK 116	Rohde & Schwarz
ETS 0031	Turn table	DS 412	Heinrich Deisel
ETS 0032	Controller	HD 050	Heinrich Deisel
ETS 0033	Calibration Set CDN	3xAdapter 50-150 Ohm	ETS
ETS 0034	RF generator/ Amplifier	SMLR	Rohde & Schwarz
ETS 0035	RF generator/ Amplifier	SMLM	Rohde & Schwarz

No.	Test equipment	Type	Manufacturer
ETS 0036	Zirc. Antenna	3102	EMCO
ETS 0037	Zirc. Antenna	3102L	EMCO
ETS 0038	RF amplifier	150L	Amplifier Research
ETS 0039	Absorbing clamp	MDS 21	Rohde & Schwarz
ETS 0040	Artificial mains Network	ESH3-Z5	Rohde & Schwarz
ETS 0041	Artificial mains	ESH3-Z4	Rohde & Schwarz
ETS 0042	Artificial mains	ESH3-Z6	Rohde & Schwarz
ETS 0043	Directional coupler	1850	KRYTAR
ETS 0044	Artificial mains	NNB 111	MEB
ETS 0045	Stripe line	IEC 801-3	ETS
ETS 0046	Power supply	LTS 006	RFT
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	Tektronix
ETS 0052	Attenuator	776B-10	Narda
ETS 0053	ECAT Control center	CE 40	Keytek/ EMV
ETS 0054	EFT simulator	E 412	Keytek/ EMV
ETS 0055	Module network coupler	E 4551	Keytek/ EMV
ETS 0056	Blank plug-in		Keytek/ EMV
ETS 0057	Module SURGE with DC coupler	E 501	Keytek/ EMV
ETS 0058	Capacitive coupling clamp	E 502 B	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	CDN 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	CDN 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

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No.	Test equipment	Type	Manufacturer
ETS 0073	Audio noise meter	GSM 2	MKD/ RFT
ETS 0074	RF Millivoltmeter	QRV 2	MKD/ RFT
ETS 0075	NF generator	GF 22	Präcitronic
ETS 0076	Feeding bridge A	SBA 1000	ESP
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 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	Power amplifier	150W1000	AR Amplifier Research
ETS 0093	Attenuator	57-20-33	Weinschel
ETS 0094	Power sensor	NRV-Z55	Rohde & Schwarz
ETS 0095	DECT system controller	PSMD	Rohde & Schwarz
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	Power amplifier	50W1000B	AR Amplifier Research
ETS 0102	CDN	M3-801/6	MEB
ETS 0103	Magnetic field test set	MF1000	EMC Partner
ETS 0105	High power synthesizer/ sweeper	SMP 22 / 02	Rohde & Schwarz
ETS 0106	Antenna	VAMP 9443	Schwarzbeck Meßelektronik
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 Real-time audio interface for PSM	PSMD-B3	Rohde & Schwarz

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No.	Test equipment	Type	Manufacturer
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		Rohde & Schwarz
ETS 0116	Protocol Tester	PTW 70	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		System
ETS 0132	Frequency doubler	TR-0616	EMG
ETS 0133	Probe body	P6015	Tektronix
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 0146	Active RF probe	ESH2-Z2	Rohde & Schwarz
ETS 0147	Probe	TK 103	MEB
ETS 0148	RF Current Probe	F-65	FCC
ETS 0149	Power divider	ZAPD-21	MCL
ETS 0150	Switcher	HR07-720	Wisi
ETS 0151	Interference pulse generator	NSG 500C	Schaffner

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No.	Test equipment	Type	Manufacturer
ETS 0152	Simulator for load-dump Impulse	NSG 506C (I)	Schaffner
ETS 0153	Simulator for load-dump Impulse	NSG 506C (I)	Schaffner
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	Harmonic / Flicker Analyzer	HFA 3000	Schlöder
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 - Front-end (analogue)	MFE III	HEAD acoustics
ETS 0170	Measurement - Front-end (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 - Front-end line interface	MFE V	HEAD acoustics
ETS 0175	Software line interface (analogue)	COPTZV5	HEAD acoustics
ETS 0176	Acoustic volt meter	COP 4	HEAD acoustics
ETS 0177	Feeding bridge B	SBB 1000	ESP
ETS 0178	Open area test side	10m	ETS
ETS 0179	Open area test side	3m	ETS
ETS 0180	Artificial mains	NNB01/RFZ	RFZ
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		

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No.	Test equipment	Type	Manufacturer
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	Sandbox
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 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 0218	RF probe	URV5-Z7	Rohde & Schwarz
ETS 0219	Power sensor	NRV-Z2	Rohde & Schwarz
ETS 0221	ISDN-S0-Analyzer	K1403	Siemens
ETS 0222	ISDN Protocol Analyzer	TE965	Tekelec Teleco.
ETS 0223	GSM/ PCN/ PCS-Simul.	TS8915B	Rohde & Schwarz
ETS0224A	Millivoltmeter	URV5	Rohde & Schwarz
ETS0224B	Diode Power Sensor	NRV-Z1	Rohde & Schwarz
ETS0224C	Programmable high resolution time counter	PM6654G	Philips
ETS0224D	RF Step Attenuator	RSP	Rohde & Schwarz
ETS 0225	SIM Simulator		Orga

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No.	Test equipment	Type	Manufacturer
ETS 0226	SIM Editor		Orga
ETS 0227	Vibration table	TIRA vib	GenRad
ETS 0228	Climatic chamber	VT 4010	Vötsch
ETS 0229	Radio communication tester	CMT 54	Rohde & Schwarz
ETS 0230	Radio communication tester	CMD 65	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-analyzer	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	Isotropic field probe 40 GHz	FP 2080 Kit	Amplifier Research
ETS 0240	Isotropic field probe 1 GHz	FP 2000 Kit	Amplifier Research
ETS 0241	Pulse Generator	4050	PicoSecond PL
ETS 0242	Harmonics analyzer	F 41B	Fluke
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 0251	Climatic chamber	VT 4004	Vötsch
ETS 0252	System controller	PSM 12	Rohde & Schwarz
ETS 0253	Spectrum analyzer	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	PTW60	Rohde & Schwarz

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No.	Test equipment	Type	Manufacturer
ETS 0264	Spectrum analyzer	F 1048	HAMEG
ETS 0265	Loop antenna	HFRA 9150	Schwarzbeck
ETS 0266	Measurement adapter 1:100	50 Ohm	
ETS 0267	RF signal generator	SMT 03	Rohde & Schwarz
ETS 0268	RF signal generator	SMP 02	Rohde & Schwarz
ETS 0269	RF bridge 50 Ohm	86205 A	Aglient
ETS 0270	RF signal generator	SMP 04	Rohde & Schwarz
ETS 0271	Spectrum analyzer	FSEK30	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 analyzer	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 analyzer	FSM	Rohde & Schwarz
ETS 0282	RF bridge 75 Ohm	86207 A	Hewlett Packard
ETS 0283	RF bridge 50 Ohm	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
ETS 0295	LPD antenna	HL 223	Rohde & Schwarz
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

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No.	Test equipment	Type	Manufacturer
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 0318	Dial pulse/ DTMF tester	210	HE
ETS 0319	Opto link	GPIB 140	NI
ETS 0320	Opto link	GPIB 140	NI
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	ELF Field Strength System	HI-3604	Holaday Industries, INC.
ETS 0329	VDT/VLF Radiation System	HI-3603	Holaday Industries, INC.
ETS 0330	Fiber Optic Remote Control	HI.3616	Holaday Industries, INC.
ETS 0331	TS 1220		
ETS 0332	PSM		
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	Thermometer		Proficell

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No.	Test equipment	Type	Manufacturer
ETS 0341	Thermometer		Proficell
ETS 0342	Thermometer		Proficell
ETS 0343	Thermometer		Proficell
ETS 0344	Thermometer		Proficell
ETS 0345	Thermometer		Proficell
ETS 0346	Thermometer		Proficell
ETS 0347	Current Probe	EZ-17	Rohde & Schwarz
ETS 0348	RF Millivoltmeter	URV 55	Rohde & Schwarz
ETS 0349	Temperature / humidity logger	OPUS10 THI	LUFFT
ETS 0350	Horn Antenna	BBHA 9120-C	Schwarzbeck
ETS 0351	RF amplifier	DWT-1857	Microwave
ETS 0354	RF amplifier	DBS-0408N423	Microwave
ETS 0355	high pass	H03G12G3	Microwave
ETS 0356	high pass	H03G12G3	Microwave
ETS 0357	high pass	H08G18G3	Microwave
ETS 0358	RF amplifier	AFD3-010040-15-ln	MITEQ
ETS 0359	RF amplifier	M/N AM-1331	MITEQ
ETS 0360	RF amplifier	DBS-0408N423	Microwave
ETS 0361	RF amplifier	DBS 1826N515	Microwave
ETS 0362	high pass	H03G12G3	Microwave
ETS 0363	high pass	H08G18G3	Microwave
ETS 0364	high pass	H08G18G3	Microwave
ETS 0365	Notch filter 2.4 GHz	WRCT2.40/248	Wain Wright
ETS 0366	high pass	H08G18G3	Microwave
ETS 0367	high pass	H03G12G3	Microwave
ETS 0368	Notch filter 0.5-1 GHz	BN86883	Schomandl
ETS 0369	Notch filter 210-500 MHz	BN86882	Schomandl
ETS 0370	Notch filter 15-90 MHz	BN86880	Schomandl
ETS 0371	Notch filter 85-250 MHz	BN86881	Schomandl
ETS 0372	Direction coupler	RK 100	MEB
ETS 0373	Direction coupler	DC3001	EMV
ETS 0374	Power Supply	NGSM32	Rohde & Schwarz
ETS 0375	Vector Signal Generator	SMIQ03B	Rohde & Schwarz
ETS 0376	Signal Generator	SMP22	Rohde & Schwarz
ETS 0377	Advanced Signal Condi. Unit	ASCU850	Rohde & Schwarz
ETS 0378	Advanced Signal Condi. Unit	ASCU190	Rohde & Schwarz
ETS 0379	Advanced Signal Condi. Unit	ASCU180	Rohde & Schwarz

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No.	Test equipment	Type	Manufacturer
ETS 0380	Advanced Signal Condi. Unit	ASCU900	Rohde & Schwarz
ETS 0381	Ethernet HUB	CS-HUB	Rohde & Schwarz
ETS 0382	Vector Signal Generator	SMIQ03B	Rohde & Schwarz
ETS 0383	Spectrum Analyzer	FSU26	Rohde & Schwarz
ETS 0384	Main Frame Signal and Con. Unit	SSCU-GW	Rohde & Schwarz
ETS 0385	Universal Protocol Tester	CRTU-RU	Rohde & Schwarz
ETS 0386	Power meter	NRVD	Rohde & Schwarz
ETS 0387	Power sensor	NRV-Z1	Rohde & Schwarz
ETS 0388	Power sensor	NRV-Z1	Rohde & Schwarz
ETS 0389	Fading Simulator	ABFS	Rohde & Schwarz
ETS 0390	System PC PC3600	TS-PC36	Rohde & Schwarz
ETS 0391	Rubidium Frequency Standard	DATUM 8040	DATUM GmbH
ETS 0392	RF Distribution	DATUM 6502	DATUM GmbH
ETS 0393	Insertion unit	URV5-Z4	Rohde & Schwarz
ETS 0394	Advanced Signal Cond. Unit	ASCUFDD-WCDMA	Rohde & Schwarz
ETS 0395	Universal Protocol Tester	CRTU-RU	Rohde & Schwarz
ETS 0396	Universal Protocol Tester	CRTU-RU	Rohde & Schwarz
ETS 0397	Universal Protocol Tester	CRTU-RU	Rohde & Schwarz
ETS 0398	Fading Simulator	ABFS	Rohde & Schwarz
ETS 0399	System Protocol Unit	CRTU-PU	Rohde & Schwarz
ETS 0400	Universal Protocol Tester	CRTU-W	Rohde & Schwarz
ETS 0401	MPEG2 Generator	DVG	Rohde & Schwarz
ETS 0402	TV Messsender	SFQ	Rohde & Schwarz
ETS 0403	RF Current Probe	F-140	Rohde & Schwarz
ETS 0404	Exposure Level Tester	ELT-400	NARDA
ETS 0405	Magnetic Field Probe 100cm <sup>2</sup>	2300/90.10	NARDA
ETS 0406	Signal Generator	SML02	Rohde & Schwarz
ETS 0407	EMC Emission tester	Harmonics 1000	EMC Partner
ETS 0408	Transient 2000	TRA1Z191N	EMC Partner
ETS 0409	Stripline	DC220	Schwarzbeck
ETS 0410	BAN	1	ETS
ETS 0412	Spectrum Analyzer	FSU 3	Rohde & Schwarz
ETS 0418	High pass filter 4-8GHz		Microwave
ETS 0419	High pass filter 8-18 GHz		Microwave
ETS 0420	Amplifier 0.1-1 GHz	M/N AM-1331	MITEC
ETS 0421	Amplifier 1-4 GHz	AFD3-010040-15-LN	MITEC
ETS 0422	Amplifier 4-8 GHz	DBS-0408N423	Narda

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No.	Test equipment	Type	Manufacturer
ETS 0423	Amplifier 8-18 GHz	DWT-18057	Narda
ETS 0424	Amplifier 18-26.5 GHz	DBS-1826N515	Narda
ETS 0425	T-network	ESH 3-Z4	Rohde & Schwarz
ETS 0426	CDN	T4 HF	MEB
ETS 0427	Power sensor	NRV-Z6	Rohde & Schwarz
ETS 0428	4-WIRE ISN with B1	ENY41	Rohde & Schwarz
ETS 0429	Current probe test Jig	SW14 7LY	Chase
ETS 0430	RF signal generator	SML02	R&S
ETS 0431	AC mains adapter	BS5733	Travel Emporium
ETS 0432	RF amplifier matrix	RSU-ETS-BT	ETS
ETS 0433	RF amplifier matrix	RSU-ETS-CTR6	ETS
ETS 0434	Reserved Tre	RSU-ETS-GSM	
ETS 0435	HP-Filter	H1G04G01	Microwave
ETS 0436	HP-Filter	H1G04G01	Microwave
ETS 0437	HP-Filter	H0G408G1	Microwave
ETS 0438	HP-Filter	H0G408G1	Microwave
ETS 0439	Amplifier	DBS-1826N515	Narda-DBS-Microwave
ETS 0440	Amplifier	AM-1331	MITEQ
ETS 0441	Bluetooth Protocol Tester	PTW 60	Rohde & Schwarz
ETS 0442	Nokia Tester for Bluetooth 1.1	DTL - 1	Nokia
ETS 0443	IBM BT PC Card	BTPCN101	IBM / Motorola
ETS 0444	Sony BT DUN Modem	BTA- NW 1	Sony
ETS 0445	RF attenuator 6dB	50FH-006-300	JFK
ETS 0446	RF attenuator 30dB	50FH-030-300	JFK
ETS 0447	Motor vehicle artificial network	LN-KFZ/200	R. Heine Hochfrequenztechn.
ETS 0448	RF power amplifier	AR 60S1G3	AR Amplifier Research
ETS 0449	Stäubli robot	RX90B L	Stäubli
ETS 0450	Stäubli robot controller	CS/MBs&p	Stäubli
ETS 0451	DASY 4 measurement server		Schmid & Partner
ETS 0452	Control pendant		Stäubli
ETS 0453	Compaq computer	Pentium IV 2 GHz	Schmid & Partner
ETS 0454	Data acquisition electronics	DAE3V1	Schmid & Partner
ETS 0455	Dummy probe		Schmid & Partner
ETS 0456	Dosimetric E-field probe	ET3DV6	Schmid & Partner
ETS 0457	Dosimetric E-field probe	ET3DV6	Schmid & Partner
ETS 0458	Dosimetric H-field probe	H3DV6	Schmid & Partner
ETS 0459	System validation kit	D900V2	Schmid & Partner

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No.	Test equipment	Type	Manufacturer
ETS 0460	System validation kit	D1800V2	Schmid & Partner
ETS 0461	System validation kit	D1900V2	Schmid & Partner
ETS 0462	System validation kit	D2450V2	Schmid & Partner
ETS 0463	Probe alignment unit	LBV2	Schmid & Partner
ETS 0464	SAM twin phantom	V4.0	
ETS 0465	Mounting device	V 3.1	
ETS 0466	Directional coupler	HP 87300B	
ETS 0468	Isotropic E-Field Probe	ER3DV6	Schmid & Partner
ETS 0469	Dielectric probe kit	85070D	Agilent
ETS 0470	Amplifier	AM-1300-1103	MITEQ
ETS 0472	Antenna	BTA-H	Frankonia
ETS 0473	GSM / UMTS system simulator	TS 8950	Rohde & Schwarz
ETS 0474	EMI test receiver	ESCS30	Rohde & Schwarz
ETS 0475	Amplifier	AFS4-00101800-U	MITEQ
ETS 0476	Test receiver	ESCS 30	Rohde & Schwarz
ETS 0477	GPS system (active GPS antenna)	4490	HOPF
ETS 0478	Crystal filter	MQF 127.50-2400/F	Vectron International
ETS 0480	Validation dipole	DB 3	EMCO
ETS 0481	40GHz standard gain horn with amplifier	22240-25 CBL26402075	Flann Microwave
ETS 0482	40GHz high gain antenna	AT4560	Amplifier research
ETS 0483	Amplifier	AFD3010040-15-LN	MITEQ
ETS 0485	Radio Communication Tester	CMU 200	Rohde & Schwarz
ETS 0490	Rubidium Frequency Standard	8040	DATUM
ETS 0491	RF Distribution	6502	DATUM
ETS 0492	Industrial Controller	PSM12	R & S
ETS 0493	Protokoll Tester	PTW60	R & S
ETS 0494	Switching unit	SSCU	R & S
ETS 0495	RF Step Attenuator	RSP	R & S
ETS 0496	Spectrum Analyzer	FSP	R & S
ETS 0497	Power Meter	NRVD	R & S
ETS 0498	Diode Power Sensor	NRV-Z1	R & S
ETS 0499	Diode Power Sensor	NRV-Z1	R & S
ETS 0500	Signal Generator	SMIQ03	R & S
ETS 0501	Signal Generator	SMIQ03	R & S
ETS 0502	Power Splitter	DS-808-4	Macom

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## 2.5 Test results (enclosure)

1st test

test after modification

production test

Test case	Sub-clause EN	Sub-clause FCC	Test re- quested	Testresults		Remarks
				passed	failed	
<i>TRANSMITTER PARAMETERS</i>						
Frequency error	8.1	95.628 (e)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Emission bandwidth	8.2	95.633 (e)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Effective radiated power	8.3	95.639(f)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Spurious emissions	8.4		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Frequency stability under low voltage conditions	8.5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Unwanted radiation		95.635 (d)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Conducted emission (AC_power_line)		15.207	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<i>RECEIVER PARAMETERS</i>						
Spurious radiation	9.1		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Monitoring system threshold power level	10.1	95.628 (a)(3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Monitoring system bandwidth	10.2	95.628 (a)(1)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Scan cycle time	10.3.1.1 10.3.3.1	95.628 (a)(2)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Minimum channel monitoring period	10.3.1.2 10.3.3.2	95.628 (a)(2)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Channel access	10.4	95.628 (a)(4)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Discontinuation of MICS session	10.5	95.628 (a)(4)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Use of pre-scanned alternate channel	10.6	95.628 (a)(5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

### 3 Transmitter Parameters

#### 3.1 Frequency error EN 301 839- 8.1; FCC 95.628(e)

The frequency error is the difference between the frequency of the device under normal and extrem test conditions.

The measurements were performed as described in subclause 8.1.1 for the middle frequency within the band 402 MHz to 405 MHz, using a spectrum analyser and a climatic chamber.

Test conditions		Frequency 402.450	Center frequency 403,65MHz	Frequency 404.85
T <sub>nom</sub> = 25 °C	V <sub>nom</sub> = 5.0 V	402,450523 <i>1,29 ppm</i>	403,650516 <i>1,27 ppm</i>	404,850506 <i>1,24 ppm</i>
	V <sub>min</sub> = 4.5 V	--	403,652479 <i>6,14 ppm</i>	--
T <sub>min</sub> = -10 °C	V <sub>max</sub> = 5.5 V	--	403,648282 <i>-4,25 ppm</i>	--
	V <sub>min</sub> = 4.5 V	--	403,652401 <i>5.94 ppm</i>	--
T <sub>max</sub> = +55 °C	V <sub>max</sub> = 5.5 V	--	403,648283 <i>-4,25 ppm</i>	--
	V <sub>min</sub> = 4.5 V	--	403,652401 <i>5.94 ppm</i>	--
Maximum frequency drift (ppm)		6,14 ppm		
Measurement uncertainty		< 10 <sup>-7</sup> Hz		

Comment: See attached measurement diagrams, “Frequency Error”.

<b>Limits acc. subclause 8.1.2</b>	<b>Frequency error shall not exceed ± 100ppm (± 40,36 kHz)</b>
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Test equipment used: ETS 0235, ETS 0311

**3.2 Emission bandwidth EN 301 839- 8.2; FCC 95.633(e)**

The emission bandwidth of the device under test is measured as the width of the signal between the points on either side of carrier centre frequency that are 20 dB down relate to the maximum level of the modulated carrier

The measurements were performed as described in subclause 8.2.1.1 for the middle frequency within the band 402 MHz to 405 MHz.

Test conditions		Inside the assigned frequency band		
		402 MHz to 405 MHz		
		Measured bandwidth kHz	f <sub>LOW</sub> MHz	f <sub>HIGH</sub> MHz
T <sub>nom</sub> = 25 °C	V <sub>nom</sub> = 5.0 V	178,557	403,56252505	403,74108216
Measurement uncertainty		± 1 x 10 <sup>-7</sup>		

Comment: See attached measurement diagram, „ 20dB Emission bandwidth“.

<b>Limits acc. subclause 8.2.2</b>	<b>Maximum permitted emission bandwidth shall be 300 kHz</b>
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Test equipment used: ETS 0235



**3.3 Effective radiated power EN 301 839-8.3; FCC 95.639(f)**

The effective radiated power is the power radiated within the emission bandwidth of the EUT In the direction of the maximum level under specified conditions of measurements in the Presence of modulation or without modulation as appropriate.

The measurements were performed as described in subclause 8.3 for the middle frequency within the band 402 MHz to 405 MHz.

These tests are performed in a fully anechoic chamber equipped with suitable antennas, turn table, spectrum analyzer and control computer. All antenna gains, cable loss and applicable correction factors are calculated for final results.

Test instruction:

The EUT was adjusted so, that it transmits continuous unmodulated.

Test conditions			Effective radiated power	
			Antenna 1	Antenna 2
			dBm	dBm
T <sub>nom</sub> = 25 °C	V <sub>nom</sub> = 5.0 V	G24	-16,58	-16,79
T <sub>nom</sub> = 25 °C	V <sub>nom</sub> = 5.0 V	G24L	-16,58	-16,79
T <sub>nom</sub> = 25 °C	V <sub>nom</sub> = 5.0 V	MT2456	-21,59	-23,71
T <sub>nom</sub> = 25 °C	V <sub>nom</sub> = 5.0 V	MT5656	-21,59	-23,71
Measurement uncertainty			± 3 dB	

Comment: See attached measurement diagrams, „Radiated Power under normal conditions“.

<b>Limits acc. subclause 8.3.2</b>	<p><b>The effective radiated power shall not exceed 25µW</b></p> <p><b>ETSI: Radiated Power ≤ 25µW ERP (-16dBm)</b></p> <p><b>FCC: Radiated Power ≤ 25µW EIRP (-16dBm)</b></p>
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Test equipment used: ETS 0271, ETS 0311

**3.4 Spurious emissions**

**EN 301 839- 8.4**

Spurious emissions are emissions at frequencies other than those of the carrier and sidebands associated with normal test modulation.

Active medical implants shall have the effective radiated power (ERP) of their spurious emissions using the specified test fixture (simulated man).

These tests are performed in a fully anechoic chamber equipped with suitable antennas, turn table, spectrum analyzer and control computer. All antenna gains, cable loss and applicable correction factors are calculated for final results.

Test instruction:

The EUT was adjusted so, that it transmits continuous modulated.

**G24 / G24L**

TX mode	Frequency range	Limit	Spurious emissions	
			Antenna 1	Antenna 2
operating	25 MHz - 47 MHz	250 nW	-67 dBm 199,5 pW	-68 dBm 158,5 pW
	47 MHz - 74 MHz	4 nW	-69 dBm 125,9 pW	-69 dBm 125,9 pW
	74 MHz - 87,5 MHz	250 nW	-68 dBm 158,5 pW	-69 dBm 125,9 pW
	87,5 MHz - 118 MHz	4 nW	-69 dBm 125,9 pW	-69 dBm 125,9 pW
	118 MHz - 174 MHz	250 nW	-68 dBm 158,5 pW	-67 dBm 199,5 pW
	174 MHz - 230 MHz	4 nW	-67 dBm 199,5 pW	-67 dBm 199,5 pW
	230 MHz - 470 MHz	250 nW	-72 dBm 63,1 pW	-81 dBm 7,9 pW
	470 MHz - 862 MHz	4 nW	-63 dBm 501,2 pW	-61 dBm 794,3 pW
	862 MHz - 1 GHz	250 nW	-70 dBm 100,0 pW	-73 dBm 50,1 pW
	1 GHz - 4 GHz	1 µW	-45 dBm 31,6 nW	-48 dBm 15,8 nW
standby	< 1GHz	2 nW	--	--
	> 1 GHz	20 nW	--	--
Measurement uncertainty		±6dB		

**MT2456**

TX mode	Frequency range	Limit	Spurious emissions	
			Antenna 1	Antenna 2
operating	25 MHz - 47 MHz	250 nW	-67 dBm 199,5 pW	-59 dBm 1,25 nW
	47 MHz - 74 MHz	4 nW	-69 dBm 125,9 pW	-69 dBm 125,9 pW
	74 MHz - 87,5 MHz	250 nW	-67 dBm 199,5 pW	-69 dBm 125,9 pW
	87,5 MHz - 118 MHz	4 nW	-68 dBm 158,5 pW	-67 dBm 199,5 pW
	118 MHz - 174 MHz	250 nW	-69 dBm 125,9 pW	-68 dBm 158,5 pW
	174 MHz - 230 MHz	4 nW	-67 dBm 199,5 pW	-67 dBm 199,5 pW
	230 MHz - 470 MHz	250 nW	-73 dBm 50,1 pW	-81 dBm 7,9 pW
	470 MHz - 862 MHz	4 nW	-62 dBm 630,9 pW	-61 dBm 794,3 pW
	862 MHz - 1 GHz	250 nW	-72 dBm 63,0 pW	-73 dBm 50,1 pW
	1 GHz - 4 GHz	1 µW	-49 dBm 12,6 nW	-51 dBm 15,2 nW
standby	< 1GHz	2 nW	--	--
	> 1 GHz	20 nW	--	--
Measurement uncertainty		±6dB		

**MT5656**

TX mode	Frequency range	Limit	Spurious emissions	
			Antenna 1	Antenna 2
operating	25 MHz - 47 MHz	250 nW	-68 dBm 158,5 pW	-59 dBm 1,25 nW
	47 MHz - 74 MHz	4 nW	-69 dBm 125,9 pW	-69 dBm 125,9 pW
	74 MHz - 87,5 MHz	250 nW	-68 dBm 158,5 pW	-68 dBm 158,5 pW
	87,5 MHz - 118 MHz	4 nW	-68 dBm 158,5 pW	-68 dBm 158,5 pW
	118 MHz - 174 MHz	250 nW	-68 dBm 158,5 pW	-68 dBm 158,5 pW
	174 MHz - 230 MHz	4 nW	-67 dBm 199,5 pW	-67 dBm 199,5 pW
	230 MHz - 470 MHz	250 nW	-81 dBm 7,9 pW	-81 dBm 7,9 pW
	470 MHz - 862 MHz	4 nW	-62 dBm 630,9 pW	-61 dBm 794,3 pW
	862 MHz - 1 GHz	250 nW	-73 dBm 50,1 pW	-73 dBm 50,1 pW
	1 GHz - 4 GHz	1 µW	-49 dBm 12,6 nW	-51 dBm 15,2 nW
standby	< 1GHz	2 nW	--	--
	> 1 GHz	20 nW	--	--
Measurement uncertainty		±6dB		

Limits acc. subclause 8.4.2

State	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies below 1GHz	Frequencies above 1 GHz
operating	4 nW (-54dBm)	250 nW (-36dBm)	1 µW (-30dBm)
standby	2 nW (-57dBm)	2 nW (-57dBm) (-	20 nW (-47dBm)

Comment: See attached diagrams.

Test equipment used: ETS 0013, ETS 0018, ETS 0030, ETS 0271, ETS 0311

### 3.5 Frequency stability under low voltage conditions EN 301 839 - 8.5

**Applicable for battery operating equipment only**

The frequency stability under low voltage conditions is the ability of the equipment to remain within its permitted frequency limits when the battery voltage falls below the lower extrem voltage level.

Test instruction:

The EUT must be adjusted so, that it transmits continuous unmodulated.

Test conditions		Center frequency 403,65MHz
$T_{nom} = 25\text{ °C}$	$V_{nom} = 5.0\text{ V}$	--
Frequency drift (ppm)		--
Measurement uncertainty		$< 10^{-7}\text{Hz}$

Comment: not required

The EUT remain on the nominal operating frequency, within the limits stated in clause 8.1.2 whilst the radiated power is greater than the spurious emission limits (-36 dBm).

<b>Limits acc. subclause 8.5.2</b>	<p><b>Transmit with a carrier frequency within the limits of <math>\pm 100\text{ ppm}</math> whilst the radiated or conducted power is below the spurious emission limits; or</b></p> <p><b>Automatically cease to function below the provider's declared operating voltage</b></p>
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### 3.6 Unwanted radiation

### FCC 95.635 (d)

The intention of these tests is to prove whether the sample meets the requirements to save the spectrum against unwanted radiations.

The radiated test under this sub-clause are performed according to ANSI 63.4 in a semianechoic chamber

Such factors like antenna correction, cable loss, external attenuation etc. are already included in the provided measurement results. This is done by using validated test software and calibrated test system according the accreditation requirements.

### Out-of-band emissions

### FCC 95.635(d)(1)

The sample complies with the requirements

Comment: See attached diagrams, all other noted test plots do not contain significant test results in

relation to the limits, no spurious was found after the limit. The EUT does meet the FCC requirements.

Limits acc. FCC 95.635 (d)(1)

Frequency (MHz)	Field strength ( $\mu\text{V/m}$ )	Measurement distance (m)
30 - 88	100	3
88 -216	150	3
216 - 960	200	3
960 and above	500	3

Test equipment used: ETS 0013, ETS 0018, ETS 0030, ETS 0271, ETS 0432

The unwanted radiation measurements shall be performed with usual test modulation.

**In-band emissions****FCC 95.635(d)(4)**

Emissions within the MICS band (402 – 405 MHz) more than 150 kHz away from the center frequency of the spectrum the transmission is intended to occupy, will be attenuated below the transmitter output power by at least 20 dB.

The sample complies with the requirements

*Measured with antenna (1)*

*G24* max. measured power = 78,20 dB $\mu$ V/m  
78,20dB $\mu$ V/m – 20dB = **58,20  $\mu$ V/m**  $\triangle$ limit line

*G24L* max. measured power = 79,11 dB $\mu$ V/m  
79,11 dB $\mu$ V/m – 20dB = **59,11  $\mu$ V/m**  $\triangle$ limit line

*MT2456* max. measured power = 79,11 dB $\mu$ V/m  
79,11 dB $\mu$ V/m – 20dB = **59,11  $\mu$ V/m**  $\triangle$ limit line

*MT5656* max. measured power = 79,11 dB $\mu$ V/m  
79,11 dB $\mu$ V/m – 20dB = **59,11  $\mu$ V/m**  $\triangle$ limit line

*Measured with antenna (2)*

*G24* max. measured power = 78,17 dB $\mu$ V/m  
78,17 dB $\mu$ V/m – 20dB = **58,17  $\mu$ V/m**  $\triangle$ limit line

*G24L* max. measured power = 77,00 dB $\mu$ V/m  
77,00 dB $\mu$ V/m – 20dB = **57,00  $\mu$ V/m**  $\triangle$ limit line

*MT2456* max. measured power = 77,00 dB $\mu$ V/m  
77,00 dB $\mu$ V/m – 20dB = **57,00  $\mu$ V/m**  $\triangle$ limit line

*MT5656* max. measured power = 77,00 dB $\mu$ V/m  
77,00 dB $\mu$ V/m – 20dB = **57,00  $\mu$ V/m**  $\triangle$ limit line

Comment: See attached diagrams, all other noted test plots do not contain significant test results in relation to the limits. The EUT does meet the FCC requirements.

Test equipment used: ETS 0013, ETS 0018, ETS 0030, ETS 0271, ETS 0432

The unwanted radiation measurements shall be performed with usual test modulation.

**Band-edge emissions****FCC 95.635(d)(5)**

Emissions 250 kHz or less that are above and below the MICS band (402 – 405 MHz) will be attenuated below the maximum permitted output power by at least 20 dB (-16 dBm e.i.r.p.).

The sample complies with the requirements

***Band edge: 20dB under allowed radiated power 25μW***

$$25\mu\text{W} \triangleq 9100\mu\text{V/m} \triangleq 78,17 \text{ dB}\mu\text{V/m}$$

$$78,17 \text{ dB}\mu\text{V/m} - 20\text{dB} = 58,17 \mu\text{V/m}$$

Comment: See attached diagrams, all other noted test plots do not contain significant test results in relation to the limits. The EUT does meet the FCC requirements.

Test equipment used: ETS 0013, ETS 0018, ETS 0030, ETS 0271, ETS 0432

The unwanted radiation measurements shall be performed with usual test modulation.



**3.7 Conducted measurement at AC power line      FCC Part15**

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the table below. 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.

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.

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

Comment: See attached measurement diagrams in the Annex.

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

**4 Receiver Parameter**

**4.1 Spurious radiation**

**EN 301 839-9.1**

Spurious radiations from the receiver are components at any frequency, generated and radiated by active receiver circuitry and antenna.

Test instruction:

The EUT is adjusted to receive but does not transmit.

Frequency range	Maximum spurious radiation	
	G24 / G24L	MT2456 / MT5656
25 MHz - 200 MHz	-65,27 dBm	-65,70 dBm
200 MHz - 1 GHz	-73,11 dBm	-58,84 dBm
1 GHz - 4 GHz	-56,87 dBm	-57,32 dBm
Measurement uncertainty	±6dB	

<b>Limits acc. subclause 9.1.2</b>	<p><b>The spurious emission shall not exceed</b></p> <p><b>2nW (-57 dBm) below 1GHz</b></p> <p><b>20nW (-47 dBm) above 1GHz</b></p>
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Comment: See attached diagrams (worst case of antenna assignation)

Test equipment used: ETS 0013, ETS 0018, ETS 0030, ETS 0271, ETS 0311

## 4.2 Monitoring system threshold power level      EN 301 893-10.1 FCC 95.628 (a) (3)

The monitoring system threshold power level,  $Th_p$ , shall not be greater than the calculated level given by the equation:

$$10\log B(\text{Hz}) - 150 (\text{dBm/Hz}) + G (\text{dB}_i)$$

Measured emission bandwidth :  $B = 178.5 \text{ kHz}$       Gain:  $G = 0\text{dB}_i$

$$\begin{aligned} Th_p &= 10\log 178500 \text{ Hz} - 150\text{dBm/Hz} \\ Th_p &= -97,4 \text{ dBm} \end{aligned}$$

It is not necessary to measure the actual threshold power level of a MICS system, however, it shall be determined that the system uses the LIC selection process if no channel is available with an ambient power level at or below the calculated threshold power level.

Comment: Not required, the EUT transmits always on the channel disturbed least (LIC procedure).

**4.3 Monitoring system bandwidth EN 301 839-10.2 FCC 95.628 (a)(1)**

The intent of this requirement is to insure that the EUT measures the power in a bandwidth that is equal to or greater than the emission bandwidth of the transmitter with the widest emission that it will participate with in a MICS communications session.

Measure of bandwidth where a channel is occupied, the bandwidth should be at least so big as the emission bandwidth.

$f_{center} : (\pm 0\text{kHz})$	Interferer = -87 dBm	
$f_{low} : (-89.3 \text{ kHz})$	Interferer = -80 dBm (+7dB)	<i>passed</i>
$f_{low} : (+89.3 \text{ kHz})$	Interferer = -85 dBm (+2dB)	<i>passed</i>

<b>Limit acc. subclause 10.2.3</b>	The monitoring system bandwidth measured at its <b>20dB</b> down points shall be $\leq$ than the emission bandwidth of the intended transmission.
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Test equipment used: ETS 0253, ETS 0254

**4.4 Scan cycle time EN 301 839-10.3.1.1 FCC 95.628(a)(2)**

The intent of this requirement is to ensure that the monitoring system updates the detected power levels by scanning the ULP-AMI band at a rate less 5s. Within 5s prior to initiating a communication session, circuitry associated with medical implant programmer/control transmitter shall monitor the channels.

Measure the time up to find a free channel.

**System scan cycle time:**

Measure the time between dropping the disturbance signal on the dedicated channel and the start of transmission of EUT.

Test conditions		Center frequency 403,64MHz Measured scan cycle time
$T_{nom} = 25\text{ °C}$	$V_{nom} = 5.0\text{ V}$	2,16 s
Measurement uncertainty		<1μs

Comment: See attached measurement diagram “Monitoring scan cycle time “.

<b>Limit acc. subclause 10.3.3.1</b>	The scan cycle time shall be $\leq 5s$
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Test equipment used: ETS 0253, ETS 0254

**4.5 Minimum channel monitoring period      EN 301 839-10.3.1.2**

**FCC 95.628 (a)(2)**

The intend of this requirement is to ensure that the monitoring period on each channel is 10ms or longer to detect transmissions that may have silent periods between data that are less than 10ms in duration.

**Minimum channel monitoring period:**

all channels occupied, except Channel 0 → Level shall be > 3dB than Threshold Power Level  
 Channel 0 with pulsed Interferer → Pulse 100µs on, 9,9ms off

**Result: no Tx on Ch0 →      EUT passed the test**

<p><b>Limit acc. subclause 10.3.3.2</b></p>	<p>Each MICS channel shall be monitored for a minimum of 10ms during each scan cycle of 5s or less duration.</p>
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Test equipment used: ETS 0253, ETS 0254, ETS 0306

**4.6 Channel access    EN 301 839-10.4    FCC 95.628 (a)(4)**

MICS programmer/control transmitters are permitted to initiate a connection to an implant transmitter if the ambient signal level is below the maximum permitted threshold. If no channel is available with an ambient power level at or below the maximum permitted threshold, spectrum access is permitted based on the channel with the lowest ambient power level referred to as the LIC or “Least interfered channel”.

Check, whether the channel disturbed least is selected if all channels are occupied.

All channels are occupied except channel 0. Channel 5 shall be 3dB above the Threshold Power Level and all other channels shall be 10dB above the Threshold Power Level.  
 Level of continuous Interferer adjust on channel 0, 3dB below the Threshold Power Level;  
 Level of continuous Interferer increases at 9dB;  
 Communication must be installed at channel 5

Interferer level: -97,4 dBm      → connection on channel 0

Interferer level -87,4 dBm → channel 0 has changed to channel 5

Comment: See attached measurement diagrams, “Channel access based on ambient levels relative to the calculated access threshold level”

<p>Limit acc. subclause 10.4.3</p>	<p>The EUT shall access and transmit on the Least Interfered Channel (LIC) after the CW signal at frequency, <math>f_c</math>, has been increased by 9 dB from its initial level of 3dB below the calculated access threshold.</p>
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Test equipment used: ETS 0253, ETS 0254

**4.7 Discontinuation of MICS session EN 301 839-10.5 FCC 95.628 (a)(4)**

MICS system shall cease transmission in the event that the communication session is interrupted for a period of 5s or more.

Check, whether communication switching off, after 5s break

All channels are occupied, except channel 0.  
 Measure time up to communication switching off.

Test conditions		Center frequency 403,64MHz Measured time up to communication switching off
$T_{nom} = 25\text{ °C}$	$V_{nom} = 5.0\text{ V}$	<5s
Measurement uncertainty		<1μs

Comment: See attached measurement diagrams, “Discontinuation of MICS session if a silent period greater then or equal 5s occurs”

<b>Limit acc. subclause 10.5.2</b>	Time up to communication switching off must be $\leq 5s$ .
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Test equipment used: ETS 0253



#### **4.8 Use of pre-scanned alternate channel      EN 301 839-10.6**

##### **FCC 95.628 (a)(5)**

At the time a channel for operation is initially selected and accessed, it is permissible for the monitoring system to select one additional channel for alternate operation for use if the initially selected channel becomes unavailable due to blockage of the channel from unknown disturbing ambient signals. The procedures in this clause determine if the system use this feature and, if so, if it complies with the requirements for alternate channel selection. MICS programmer/controllers that do not use the alternate channel provision are required to meet the other provisions of the access protocol.

Comment: Test not required. This feature is not supported.

## 4.9 Radiated emissions

### Reference

FCC	Part 95.628
IC	RSS-Gen

### Method of measurement

The compliance of the EUT Receiver with the Limits of spurious emissions was performed according to the radiated measurement method.

The spectrum analyzer RBW was set to 100 kHz for measurements below 100 kHz and 1.0 MHz above 1.0 GHz. The measurement results are evaluated according to the procedure described in section 2.4 of this test report.

### Limits

	Spurious frequency	Field strength
	MHz	microvolt/m at 3 meter
FCC & IC	30 - 88	100
	88 - 216	150
	216 - 960	200
	above 960	500

### Test Results

#### G24 / G24L

Device Frequency	Frequency marker indication [MHz]	Antenna polarization	Worst case emission level [ $\mu\text{V}/\text{m}$ ]	Compliance limit [ $\mu\text{V}/\text{m}$ ]	Results [ $\mu\text{V}/\text{m}$ ]
403,65 MHz	195,571	V	41,35	150	<u>-108,65</u>
	192,505	H	45,81	150	<u>-104,19</u>
	807,615	V	84,63	200	<u>-115,37</u>
	807,615	H	40,18	200	<u>-159,82</u>
	3892,000	V	322,48	500	<u>-177,52</u>
	3958,000	H	347,94	500	<u>-152,06</u>

**MT2456 / MT5656**

Device Frequency	Frequency marker indication [MHz]	Antenna polarization	Worst case emission level [ $\mu\text{V/m}$ ]	Compliance limit [ $\mu\text{V/m}$ ]	Results [ $\mu\text{V/m}$ ]
<b>403,65 MHz</b>	192,505	V	44,51	150	<u>-105,49</u>
	192,164	H	45,39	150	<u>-104,61</u>
	807,615	V	93,65	200	<u>-106,35</u>
	807,615	H	60,39	200	<u>-139,61</u>
	3934,000	V	324,34	500	<u>-175,66</u>
	3874,000	H	330,37	500	<u>-169,63</u>

Comment: See attached measurement diagrams.

**Test equipment:** ETS 0014, ETS 0294, ETS 0295, ETS 0310, ETS 0416, ETS 0484

## Appendix

- A Pictures
- B Measurement diagrams “Frequency Error”
- C Measurement diagrams “20dB Emission bandwidth”
- D Measurement diagrams “Radiated Power under normal conditions”
- E Measurement diagrams “Spurious Radiation mode: TX”
- F Measurement diagrams “Unwanted radiations FCC RULES Part 95”
- G Measurement diagrams FCC RULES §95.635 (d) (5) “Band Edge Emissions”
- H AC power line conducted emissions
- I Measurement diagrams “Spurious Radiation mode: RX”
- J Measurement diagrams “Monitoring System bandwidth”
- K Measurement diagrams “Monitoring system scan cycle time and minimum channel monitoring period”
- L Measurement diagrams “Channel access based on ambient levels relative to the calculated access threshold level”
- M Measurement diagrams “Discontinuation of MICS session if a silent period greater than or equal
- N Measurement diagrams “Spurious emissions for Canada” RSS-GEN

## Appendix B

Measurement diagrams “Frequency Error”

## Appendix C

Measurement diagrams “20dB Emission bandwidth”

## Appendix D

Measurement diagrams “Radiated Power under normal conditions”

## Appendix E

Measurement diagrams “Spurious Radiation mode: TX”



## Appendix F

Measurement diagrams “ Unwanted radiations FCC RULES Part 95”

## Appendix G

Measurement diagrams FCC RULES §95.635 (d) (5) “Band Edge Emissions”

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## Appendix H

AC power line conducted emissions

## Appendix I

Measurement diagrams “Spurious Radiation mode: RX”

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Registration number: G0M20712-0342-T-48

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## Appendix J

Measurement diagrams “Monitoring System bandwidth”

## Appendix K

Measurement diagrams “Monitoring system scan cycle time and minimum channel monitoring period”

## Appendix L

Measurement diagrams “Channel access based on ambient levels relative to the calculated access threshold level”

## Appendix M

Measurement diagrams “Discontinuation of MICS session if a silent period greater than or equal 5s occurs”



## Appendix N

Measurement diagrams “Spurious emissions for Canada” RSS-GEN