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COMLAB
Accredited Testing and Certification
EMC, Radio and Telecommunications

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Pages	:	32
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Total no. of sheets	:	34

Test report : 01 / 05883 / 5

Item tested : TRON TR20

Equipment type : Survival craft portable VHF

Client : Jotron Electronics

Tested according to :

ETS 300 225– Survival Craft Portable VHF (January 1998)

Date of issue : 2001.10.05

Authorised by :

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CONTENTS

1 GENERAL INFORMATION

1.1 Test Laboratory

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1.2 Client Information

Name :	Jotron Electronics AS
Address :	Box 54
	N-3280 Tjodalyng
Telephone :	+47 33139700
Fax :	+47 33126780
Contact:	
Name :	Bjørn Allum

1.3 Manufacturer (if other than client)

Name :	Same as client

2 TEST INFORMATION

2.1 Test Item

Name/Type : Tron TR20

Model/version :

Serial number :

Software identity and version :

Remarks

The tested item is made for electrical test only.

2.2 Test Environment

2.2.1 Normal Test Conditions

Temperature : 20.9 - 21.8?C

Relative humidity : 33.5 - 53.7 %

Normal test voltage : 7.2 V DC

The values for temperature and relative humidity are the limits registered during the test period.

2.2.2 Extreme Test Conditions

Temperature

T_{min} : -20 °C

T_{max} : +55 °C

Voltage

Power Source : Power supply

V_{min} : 5.5 V

V_{max} : 9.5 V

2.3 Test Period

Test item received date : 06 September 2001

Test period : from 07 September to 03 October 2001

2.4 Standards and Regulations

ETS 300 225 (January 1998)

Technical characteristics and methods of measurement for survival craft portable VHF radiotelephone apparatues.

2.5 Test Engineer/s

Egil J Bredholt

2.6 Additional information

2.6.1 Test Methods

Described in standard ETS 300 225 (January 1998)

2.6.2 Selection Criteria

On the clients representative (Det norske Veritas) request only clause 8, 9 and 10 in ETS 300 225 have been measured.

2.6.3 Remarks

2.6.4 Test Equipment

List of used test equipment, see page no. 32

3 TEST REPORT SUMMARY

3.1 Abbreviations

P Passed, the equipment fulfils the requirement

F Failed, the equipment does not fulfil the requirement

NA Not applicable, the requirement is not applicable

NT Not tested, the test is not performed even though the requirement is relevant

3.2 Test Summary

Field measurement

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3.3 FIELD MEASUREMENTS

I-ETS 300 225 Clause 8.1

3.3.1 Transmitter Effective Radiated Power (ERP)

Rated output power level (maximum) 2 W

Test Conditions		**Transmitter Power (W)**	
		Channel 17 **F_n ; 156.850 MHz**	
		Vertical	**Horizontal**
T_{nom}(21 ºC)	V_{nom}(7.2 V)	0.575	
Measurement uncertainty		Frequency ? **1 GHz: + 3.1/- 4.1 dB**	

Limits Clause 8.1.3: Between 0.25 W and 25 W

Test Equipment used: No.: 1079, 1237. 1260 and 1331.

I-ETS 300 225 Clause 8.2

3.3.2 Spurious Emissions from the Transmitter

Spurious emissions power level		
Channel 17 **F_n ; 156.850 MHz**		
Spurious freq. **MHz**	**Bandwidth** **(kHz)**	**Power level** **(nW)**
78.425	15	0.1
313.70	15	4.8
470.55	15	5.5
784.25	15	30.5
Measurement uncertainty	Frequency ? **1 GHz: + 3.1/- 4.1 dB** Frequency **> 1 GHz: + 2.4/- 2.9 dB**	
Limits	? 0.25 ?W in the range 30 MHz to 1 GHz ? 1.0 ?W in the range 1 GHz to 2 GHz	

Bandwidth (kHz) refers to the bandwidth of the measuring receiver.

Test Equipment used: No.: 1079, 1221, 1237. 1260, 1331 and 1333.

I-ETS 300 225 Clause 8.3

3.3.3 Spurious Emissions from the Receiver

Spurious emissions power level		
Channel 17 **F_n ; 156.850 MHz**		
Spurious freq. **MHz**	**Bandwidth** **(kHz)**	**Power level** **(nW)**
178.25	15	0.1
356.50	15	0.4
534.75	15	<0.5
713.00	15	0.6
891.25	15	<0.5
Measurement uncertainty	Frequency ? **1 GHz: + 3.1/- 4.1 dB** Frequency **> 1 GHz: + 2.4/- 2.9 dB**	
Limits	? 2 nW in the range 30 MHz to 1 GHz ? 20 nW in the range 1 GHz to 2 GHz	

Bandwidth (kHz) refers to the bandwidth of the measuring receiver.

Test Equipment used: No.: 1079, 1221, 1237. 1260, 1331 and 1333.

3.4 TRANSMITTER MEASUREMENTS

I-ETS 300 225 Clause 9.1

3.4.1 Frequency Error

Test conditions		Frequency error (Hz)			
		Channel 16		Channel 17	
Temperature	Voltage	Hz	W	Hz	W
T_{nom} 24 ?C	7.2 V_{nom} >V	+808	2.0	+786	2.0
T_{min}	5.5 V_{min} >V	+812	1.6	NA	NA
55 V	9.5 V_{max} >V	+700	1.5	NA	NA
T_{max}	5.5 V_{min} >V	+679	1.6	NA	NA
-20 ?C	9.5 V_{max} >V	+469	2.2	NA	NA
Measurement uncertainty		? 10Hz			
Limits		Frequency error ? 1500 Hz			

Test Equipment used: No.: 12, 208. 1006, 1047 and 1083.

I-ETS 300 225 Clause 9.2

3.4.2 Carrier Power referenced to ERP

Test conditions		Carrier power ERP (W)			
		Channel 16		Channel 17	
Temperature	Voltage	H.P.	L.P.	H.P.	L.P.
T_{nom} 24 ?C	V_{nom} 7.2 V	NA	NA	0.57	-
T_{min}	V_{min} 5.5 V	0.43		NA	NA
55 ?C	V_{max} 9.5 V	0.46		NA	NA
T_{max}	V_{min} 5.5 V	0.46		NA	NA
-20 ?C	V_{max} 9.5 V	0.63		NA	NA
Measurement uncertainty		See clause 8.1			
Limits		The ERP shall be between 0.25 W and 25 W with power switch at maximum			

H.P. = Output power switch set at its maximum
L.P. = Output power switch set at its minimum

Test Equipment used: No.: 12, 208. 1006, 1047 and 1083.

I-ETS 300 225 Clause 9.3

3.4.3 Frequency Deviation

I-ETS 300 225 Clause 9.3.2

3.4.4 Maximum Permissible Frequency Deviation

Channel	f_{mod} (Hz)	Frequency deviation ? f	
		? f (kHz)	
		+	-
16	100	0.6	0.7
	300	4.2	4.2
	500	4.2	4.2
	1000	4.1	4.1
	2000	4.5	4.0
	3000	4.3	4.2
Measurement uncertainty		? 100 Hz	
Limits		? f = < 5 kHz	

Test Equipment used: No.: 12, 208. 1006 and 1047.

I-ETS 300 225 Clause 9.3.3

3.4.5 Reduction of Frequency Deviation at Modulation Frequencies above 3 kHz

Channel	f_{mod} (kHz)	Relative deviation (dB)
16	1	0
	1.5	2.0
	2	1.8
	3	0.9
	4	-1.5
	5	-5.0
	6	-8.7
	8	-15.6
	10	-21.6
	15	-32.3
	20	-39.5
	25	-43.4
Measurement uncertainty		? 0.7 dB
Limits		see fig. 1 in I-ETS 300 225

Test Equipment used: No.: 12, 208. 1006 and 1047.

I-ETS 300 225 Clause 9.4

3.4.6 Limitation Characteristics of the Modulator

Measured on Channel 16

Test conditions		**Frequency deviation (? f)**	
Temp.	Voltage	? f (kHz)	
		+	-
T_{nom}	V_{nom} (7.2 V)	3.9	3.9
T_{min} (+55 ?C)	V_{min} (5.5 V)	3.7	3.7
	V_{max} (9.5 V)	3.7	3.7
T_{max} (-20 ?C)	V_{min} (5.5 V)	4.0	4.0
	V_{max} (9.5 V)	4.2	4.2
Measurement uncertainty		? 200 Hz	
Limits		? f between ? 3.5 kHz and ? 5 kHz	

Test Equipment used: No.: 12, 208. 1006, 1047 and 1083.

I-ETS 300 225 Clause 9.5

3.4.7 Sensitivity of the Modulator, including Microphone

Channel	Frequency deviation (kHz)
16	2.9
Measurement uncertainty	? 3 dB
Limits	Freq. dev. between ? 1.5 kHz and ? 3 kHz

Test Equipment used: No.: 12, 208. 263, 264, 1006 and 1047.

I-ETS 300 225 Clause 9.6

3.4.8 Audio Frequency Response

f_{mod}	Modulation index m (dB)
(Hz)	Channel 16
300	-0.7
500	-0.4
800	-0.4
1000	0
1500	-0.1
2000	0
2400	-0
3000	-0.1
Measurement uncertainty	? 0.4 dB
Limits	-3 ? m ? 1dB

$m = 20 \log ? f / f_{mod}$ dB

$m = 0$ dB at $f_{mod} = 1000$ Hz

Test Equipment used: No.: 12, 208. 1006 and 1047.

I-ETS 300 225 Clause 9.7

3.4.9 Audio Frequency Harmonic Distortion of the Emission

Measured on Channel 16

Test Conditions		**f_{mod}**	**Audio frequency harmonic distortion (%)**
Temp.	Voltage	(Hz)	
T_{nom} (> ?C)	V_{nom} (7.2 V)	300	1.8
		1000	1.2
T_{min}(55 ?C)	V_{min} (5.5 V)	1000	4.0
	V_{max} (9.5 V)	1000	4.0
T_{max} (-20 ?C)	V_{min} (5.5 V)	1000	3.6
	V_{max} (9.5 V)	1000	3.9
Measurement uncertainty			? 1 %
Limits			? 10 %

Test Equipment used: No.: 12, 208. 1006, 1047 and 1083.

I-ETS 300 225 Clause 9.8

3.4.10 Adjacent Channel Power

	Adjacent channel power (? W and dBc)			
	Upper channel		Lower channel	
Channel	dBc	?W	dBc	?W
16	-79.7		-80.1	
Measurement uncertainty	? 3 dB			
Limits	? -70 dBc or ? 0.2 ?W			

Test Equipment used: No.: 12, 208. 1006 and 1047.

I-ETS 300 225 Clause 9.9

3.4.11 Residual Modulation of the Transmitter

Channel	Level of residual modulation (dB)
16	
	-49.7
Measurement uncertainty	? 2 dB
Limits	? -40 dB

Test Equipment used: No.: 12, 208. 1006 and 1047.

I-ETS 300 225 Clause 9.10

3.4.12 Transient Frequency Behaviour of the Transmitter

Channel	Maximum frequency difference (kHz)		
	during t_1 (= 5 msec)	during t_2 (= 20 msec)	during t_3 (= 5 msec)
16			
	*	*	*
Measurement uncertainty			
Limits	? 25 kHz	? 12,5 kHz	? 25 kHz

* See annex:1: Page 1 : Tx on. Page 2 : Tx off

Test Equipment used: No.: 12, 85, 208. 1006, 1010, 1047, 1125 and 1207.

3.5 RECEIVER MEASUREMENTS

I-ETS 300 225 Clause 10.1

3.5.1 Harmonic Distortion and Rated Audio Frequency Output Power

Requirement ; > 200 mW in a loadspeaker
> 1 mW in the headset earphone if provided

Channel 16 Fn = 156.000 MHz		Test signal level	f_{mod}	AF output power P (mW) and harmonic distortion D (%)					
Test conditions			(Hz)	Fn		Fn-1.5 kHz		Fn+1.5kHz	
Temp.	Voltage	(dB?V)		P	D	P	D	P	D
T_{nom}	V_{nom}	100	300	267	3.5	NA	NA	NA	NA
24 ?C	7.2 V		1000	237	4.0	NA	NA	NA	NA
T_{min}	V_{min} 5.5 V			214	2.0	225	3.3	203	3.6
55 ?C	V_{max} 9.5 V	100	1000	212	4.4	225	3.6	201	3.2
T_{max}	V_{min} 5.5 V			210	2.9	215	2.7	201	2.4
-20 ?C	V_{max} 9.5V	100	1000	206	3.7	212	1.8	200	2.7
Measurement uncertainty : -on P -on D				? 0.3 dB ? 1 %					
Limits				AF output power = rated AF output power D ? 10 %					

Test Equipment used: No.: 12, 208. 1006, 1047 and 1083.

I-ETS 300 225 Clause 10.2

3.5.2 Audio Frequency Response

Channel Fn	(Hz)	Norm dB	AF output power					
			Fn		Fn -1.5 kHz		Fn + 1.5 kHz	
			mW	dB (*)	mW	dB (*)	mW	dB (*)
Channel 16 156.000 MHz	300	10.4	57	6.6	60	6.8	51	6.2
	500	6.0	37	4.7	38	4.9	33	4.3
	600	4.4	29	3.6	30	3.8	27	3.4
	1000	0	13	0	13	0	12	0
	1200	-1.6	9	-1.4	9	-1.5	9	-1.3
	2400	-7.6	1	-9.4	1	-9.6	2	-7.7
	3000	-9.5	1	-12.3	1	-12.4	1	-10.7
Measurement uncertainty			? 0.4 dB					
Limits			Between +1 dB and -3 dB in the frequency range 500 Hz to 3 kHz and not more than -3 dB to -6 dB at 300 Hz, from a 6 dB/oct decreasing curve passing through the measured point at 1000 Hz					

(*) : 10log (Pout/Pout at 1000 Hz)
0 dB = AF output power at 1000 Hz

Test Equipment used: No.: 12, 208. 1006 and 1047.

I-ETS 300 225 Clause 10.3

3.5.3 Maximum Usable Sensitivity

Rated AF output power : 0.2 W
Requirement ; 100 mW in a loadspeaker
> 1 mW in the headset earphone if provided

Test Conditions		Sensitivity level and AF output power	
		Channel 16 Fn: 156.800 MHz	
Temp.	Voltage	RF level (dB?V)	AF output power (mW)
T_{nom} 24 ?C	V_{min} 7.2 V	1.2	145
T_{min} 55 ?C	V_{min} 5.5 V	2.6	117
	V_{max} 9.5 V	2.6	130
T_{max} -20 ?C	V_{min} 5.5 V	2.0	205
	V_{max} 9.5V	1.5	128
Measurement uncertainty		? 0.5 dB	
Limits		Normal test conditions : ✍ RF level : ? +6 dB?V ✍ AF output power : = 50 % of the rated AF output power Extreme test conditions : ✍ RF level : ? +12 dB?V ✍ AF output power : between ? 3 dB rel. to 50 % of the rated AF output power	

Test Equipment used: No.: 12, 208. 1006, 1047 and 1083.

I-ETS 300 225 Clause 10.4

3.5.4 Co-channel Rejection

Channel F_n	**F_{unw} - F_n (Hz)**	**Co-channel rejection (dB)**
Channel 16 F_n :156.800 MHz	3000	-7.6
	2000	-7.8
	1000	-7.8
	-1000	-7.9
	-2000	-7.1
	-3000	-6.7
Measurement uncertainty		? 2 dB
Limits		Between - 10 dB and 0 dB

F_{unw} = frequency of unwanted signal

Test Equipment used: No.: 12, 85, 208. 1006, 1047and 1240

I-ETS 300 225 Clause 10.5

3.5.5 Adjacent Channel Selectivity

Test Conditions		Adjacent channel selectivity (dB)	
		Channel 16 Fn: 156.800 MHz	
Temp.	Voltage	Upper Channel	Lower Channel
T_{nom} 24 ?C	V_{min} 7.2 V	75.5	74.8
T_{min} 55 ?C	V_{min} 5.5 V	76.3	75.8
	V_{max} 9.5 V	75.2	76.6
T_{max} -20 ?C	V_{min} 5.5 V	64.1	64.8
	V_{max} 9.5 V	66.4	65.0
Measurement uncertainty		? 2 dB	
Limits		Normal test conditions : ? 70 dB Extreme test conditions :? 60 dB	

Test Equipment used: No.: 12, 85, 208. 1006, 1047and 1240

I-ETS 300 225 Clause 10.6

3.5.6 Spurious Response Rejection

Channel : 16 Fn : 156.800 MHz

F_{unw} (MHz)	Spurious response rejection ratio (dBA)
21.4	79.1
167.50	70.4
199.60	78.1
Measurement uncertainty	? 2 dB
Limits	? 70 dB

Test Equipment used: No.: 12, 85, 208. 1006, 1047and 1240

I-ETS 300 225 Clause 10.7

3.5.7 Intermodulation Response

Measured on Channel 16

Frequency of unwanted signals B/C	Intermodulation response ratio (dB)
Fn +50 / +100 kHz	71.6
Fn -50 / -100 kHz	71.8
Measurement uncertainty	? 2.5 dB
Limits	> 68 dB

Test Equipment used: No.: 12, 85, 208. 1006, 1025, 1047,1091 and 1240

I-ETS 300 225 Clause 10.8

3.5.8 Blocking or Desensitization

Channel F_n	F_n-F_{unw} (MHz)	Level of unwanted signal (dB?V) for a reduction of : 3 dB in the AF output level	 the SINAD ratio to 14 dB
Channel 16 F_n : 156.800 MHz	+ 10		99.2
	+ 5		96.8
	+2		94.8
	+1		94.8
	-1		94.8
	-2		94.5
	- 5		96.6
	- 10		96.8
Measurement uncertainty		? 2 dB	
Limits		? 90 dB?V except at frequencies on which spurious responses are found.	

Test Equipment used: No.: 12, 85, 208. 1006, 1047and 1240

I-ETS 300 225 Clause 10.9

3.5.9 Amplitude Response of the Receiver Limiter

Channel	AF output power (mW) with a		Variation of the AF output power level (dB)
	Test signal level + 6 dB?V	Test signal level + 100 dB?V	
16	44	47	0.3
Measurement uncertainty	? 0.5 dB		
Limits	? 3 dB		

Test Equipment used: No.: 12, 208. 1006 and 1047.

I-ETS 300 225 Clause 10.10

3.5.10 Receiver Noise

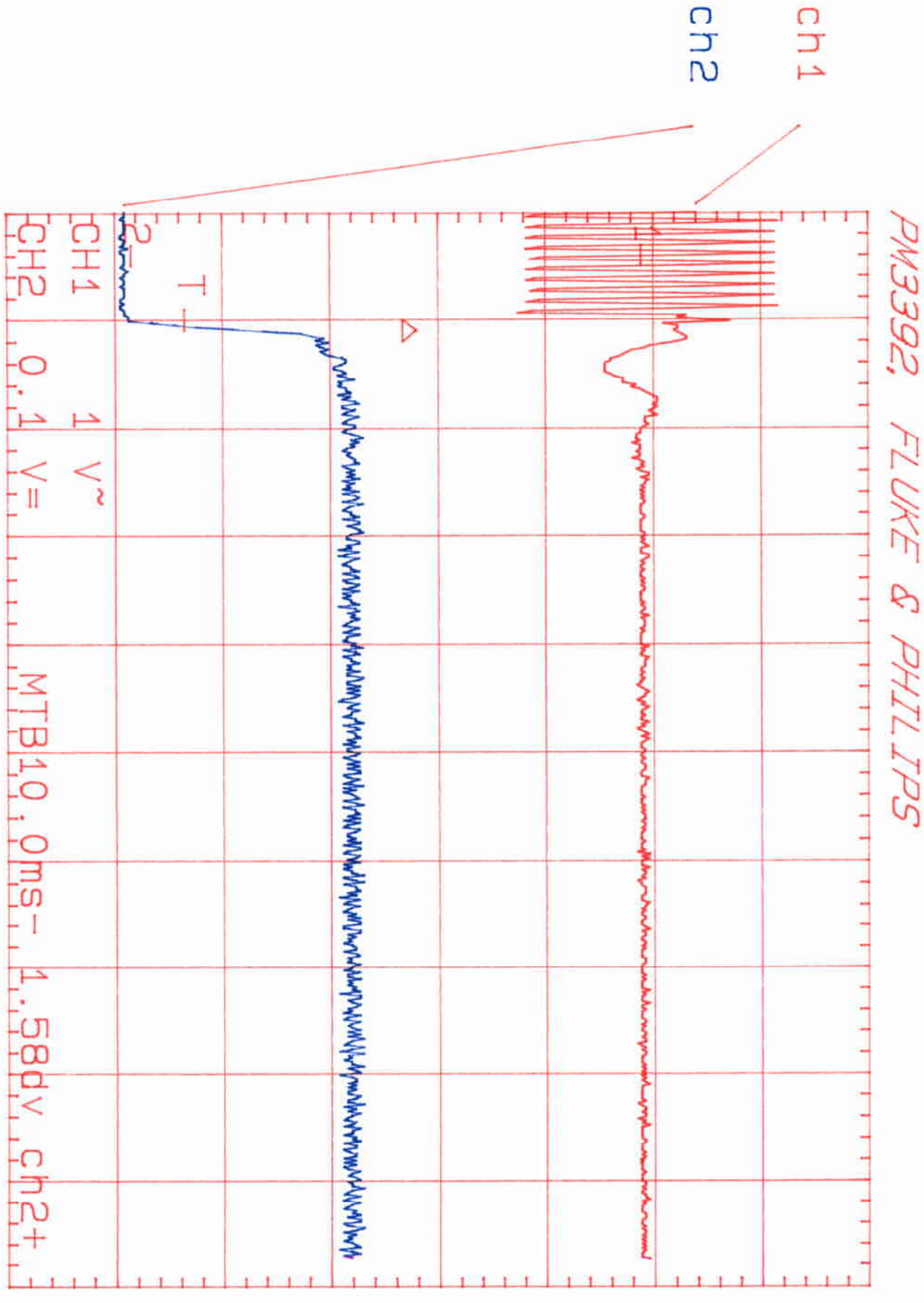
Channel	Noise level (dB)
16	-47.4
Measurement uncertainty	? 2 dB
Limits	? -40 dB

Test Equipment used: No.: 12, 208. 1006 and 1047.

4 TEST EQUIPMENT AND ANCILLARIES

To simplify identification of the test equipment and ancillaries used, all item used are identified by the testhouse on each page of the test report. All numbers are referenced to the list given below.

No	Instrument/Ancillary	Manufacturer	Type
12	Power Supply	Oltronix	B32-10R
85	Hybrid	Anza	H-9
208	Multimeter, Digital	Fluke	77
263	Artificial Voice	BK	4219
264	Sound Level Meter	BK	2203
1006	Attenuator	Narda	765-10
1010	Spectrum Analyzer	HP	HP8561A
1025	Generator, MF/../UHF	HP	HP8657B
1083	Climate Chamber	ACS	TY80
1091	Hybrid	Anza	H-9
1125	Oscilloscope	Phil	PM3392
1207	Detector Crystal	HP	HP8470B
1221	Antenna Log-periodic	EMCO	3146
1237	EMI-Receiver	R&S	ESN
1240	Generator, AF/../UHF	R&S	SMHU52
1260	Antenna Biconical	R&S	HK 116
1331	Antenna Dipole	R&S	HZ-12 633,0886,00
1333	Antenna Dipole	R&S	HZ-13 633,0840,00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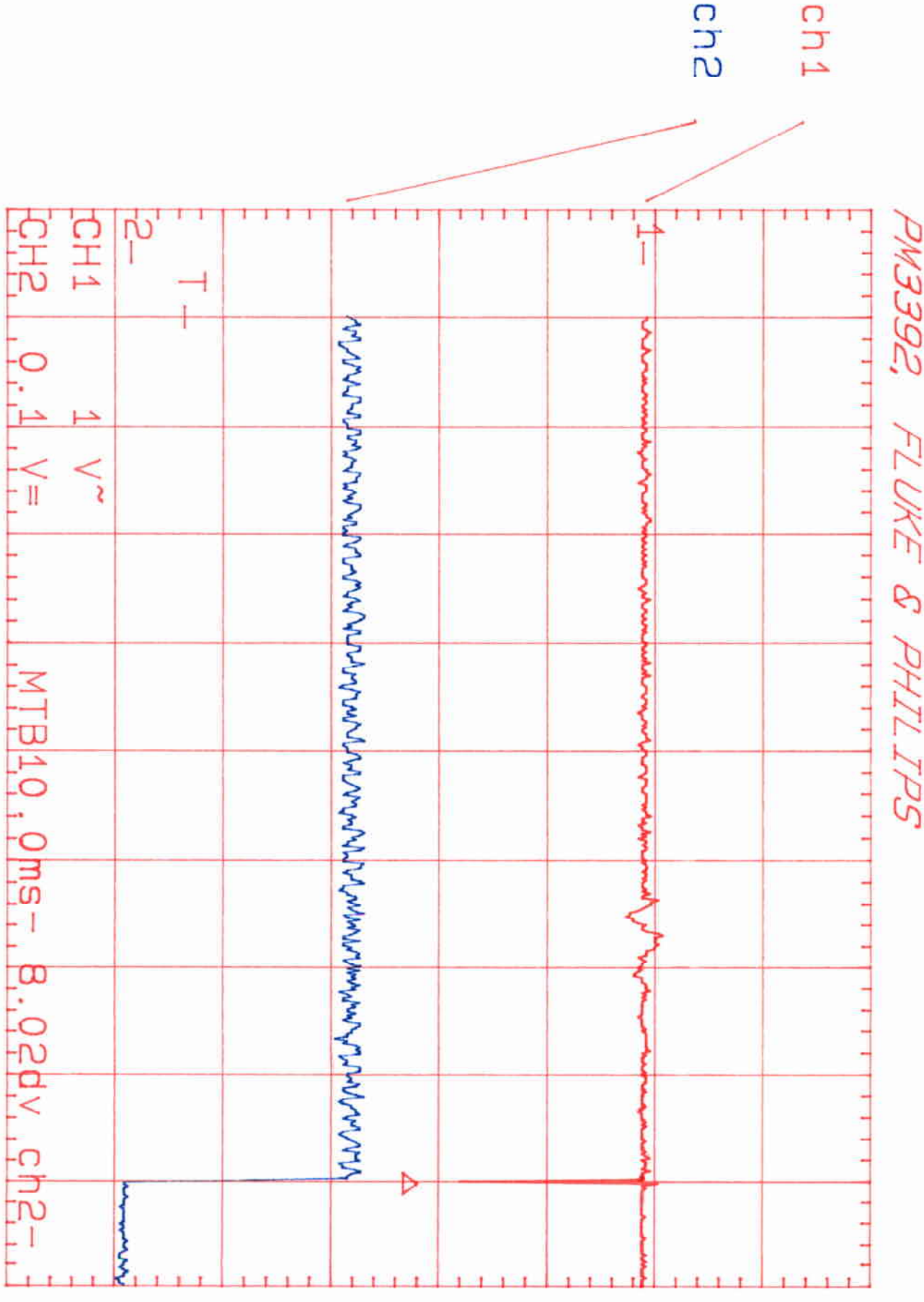
ch2
ch1
PM3392, FLUKE & PHILIPS
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CH2 0.1 V=
MTB10.0ms 8.02dv ch2