Test Report

File Nr. TA913_01.DOC

Matrix-Needleprinter
T2170

EUT:	Matrix Needleprinter
Typ:	T2170
S/N:	PT0011
Configuration:	Serial interface RS232 and parallel I/F Centronics on board.
Options:	xx
Manufacturer:	Tally GmbH Glockeraustr. 4 89275 Elchingen Germany
Regulations:	FCC rules part 15, limit class B
Applicant:	Tally GmbH Glockeraustr. 4 89275 Elchingen Germany
Contact person:	Mr. Böhm -Tally GmbH
Test site:	Test facitlities of the EMCE GmbH Laupheimer-Str. 29 88483 Burgrieden Germany
Test date:	03/29/1999, 03/31/1999
Responsible Engineer:	Mr. Chr. Vogelmann EMCE GmbH Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung

Contents:

1 EMC Instrumentation

EMI:

x	Receiver	ESS 5Hz - 1000 MHz	Rohde & Schwarz
	Probe	ESH2-Z3	Rohde & Schwarz
x	LISN 1	ESH3-Z5	Rohde & Schwarz
x	LISN 2	ESH3-Z5	Rohde & Schwarz
	LISN 4	NNBM 8125	Schwarzbeck
	Absorbing Clamp	MDS 21	Schwarzbeck
	Antenna 9kHz - 30MHz	HFH2-Z2	Rohde & Schwarz
x	Antenna 30 - 300MHz	VHBA9123 / BBA9106	Schwarzbeck
x	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck
	Antenna 9kHz - 30 MHz	Loop-Antenna 1,5m Ø	EMCE
x	Shielded Cabine	6,4m x 4m x 2,25m	Frankonia
x	Open Field Test Site	3m / 10m	EMCE GmbH / Burgrieden
x	AC Source 5kVA	5001i	California Instruments
	Netanalyser	PM3000A	Voltech
	LISN 3	NNB 4/32T	Rolf Heine HF-Technik

Miscellaneous:

x	PC SCENIC 5T/90 PCI	S26361-K345-V711	-	Siemens Nixdorf Informationssysteme AG
x	Monitor MCM 1702	S26361-K373-V318 S/N BU 908484	FCC-ID ARFKDM1788	Siemens Nixdorf Informationssysteme AG
x	Keyboard MF2 LC	S26381-K252-V120		Siemens Nixdorf Informationssysteme AG
x	Mouse Serial Mouse 2.0A	0222829	FCC-ID C3KSMP1	Microsoft Corp.
x	Additional Printer HP Deskjet 850C	S/N US545110NX	FCC-ID B94C2145X	Hewlett Packard

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2170, PT0011
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_01
	TA913_23, Phase L - SCENIC PC + Monitor
Date:	31. Mar 99 11:07

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
6.07500	37.5	48.0
6.12500	38.6	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

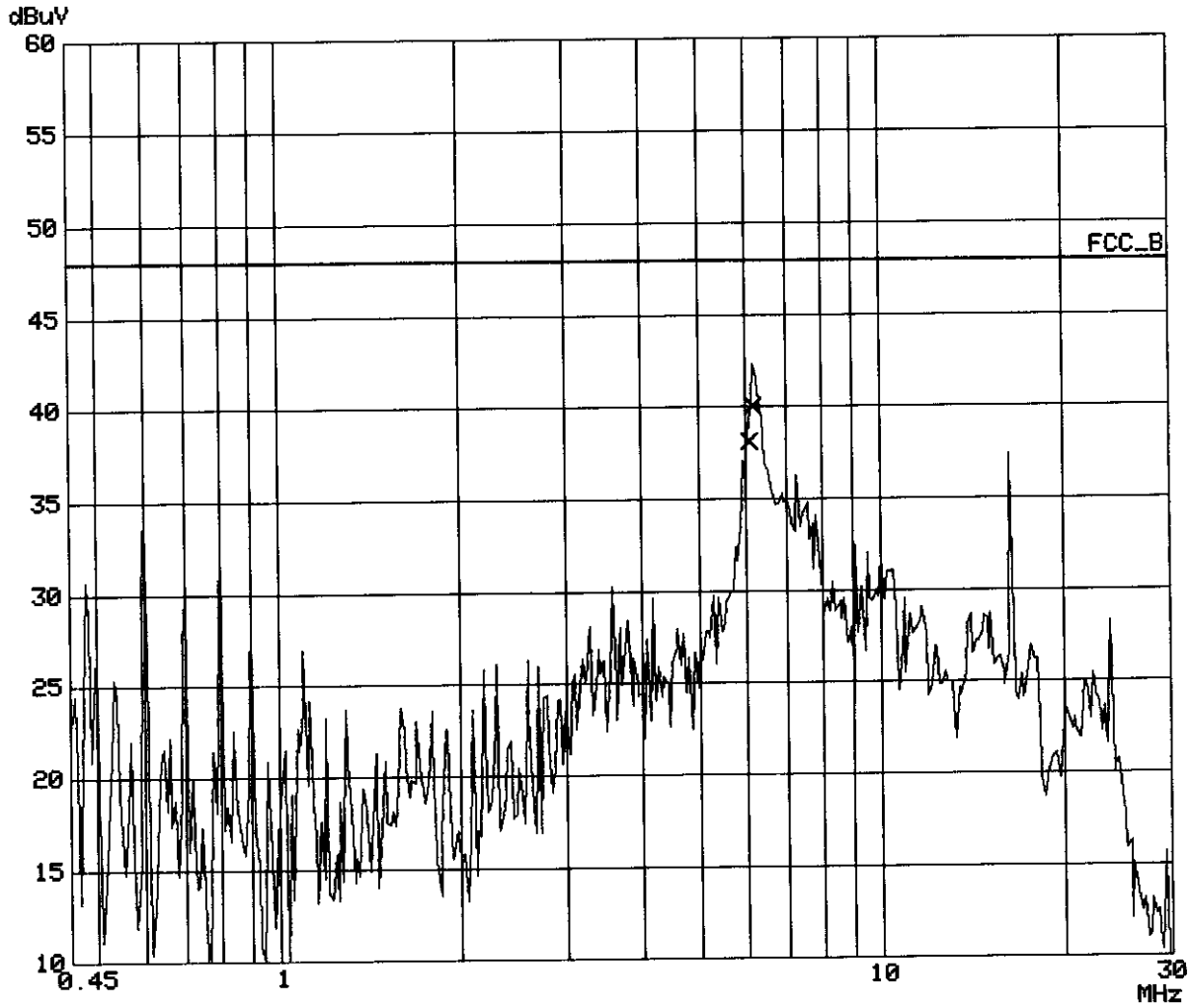
EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_24, Phase N - SCENIC PC + Monitor
Date: 31. Mar 99 11:12

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2170, PT0011
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_01
	TA913_24, Phase N - SCENIC PC + Monitor
Date:	31. Mar 99 11:12

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
6.07500	38.1	48.0
6.17500	40.0	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

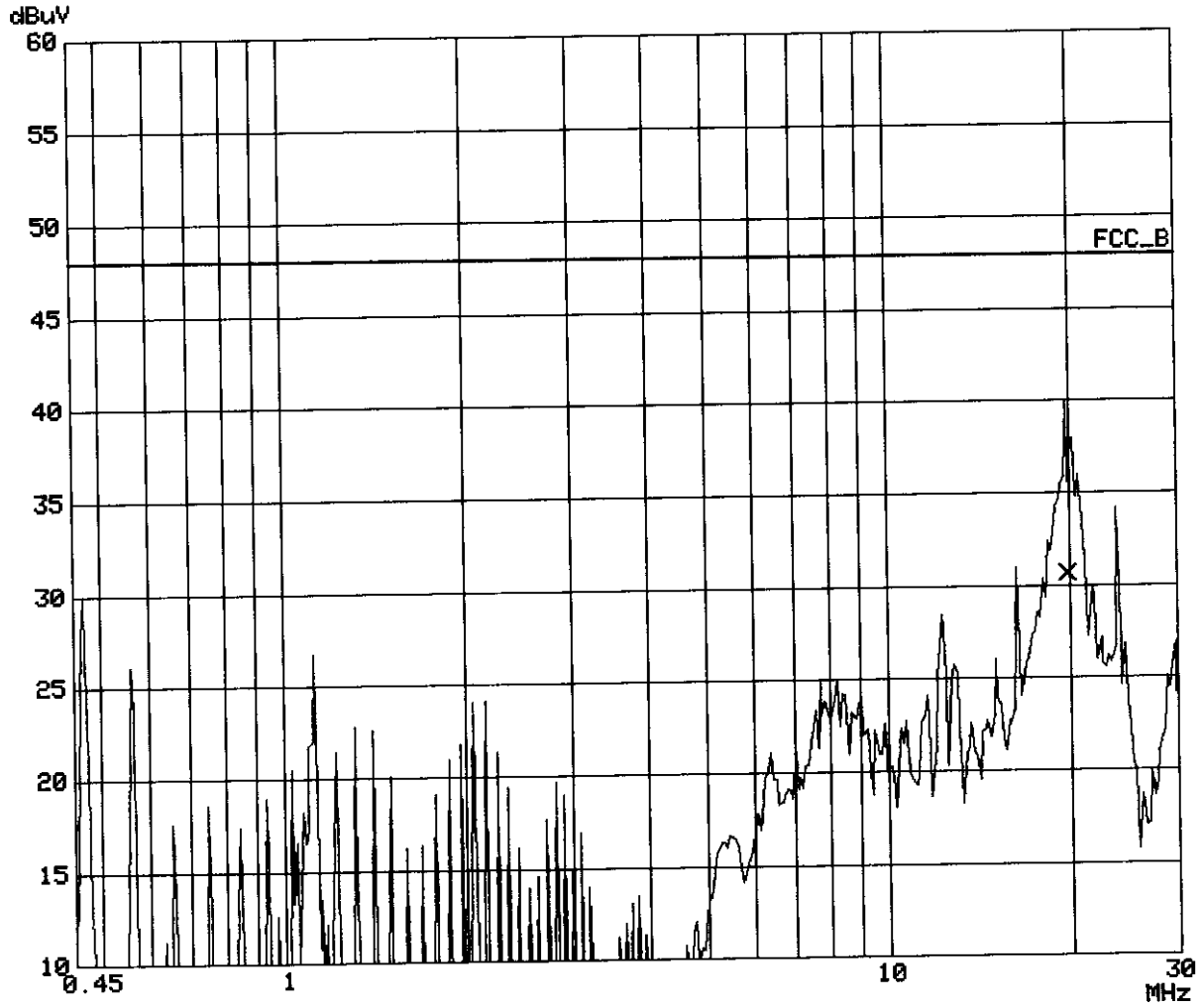
EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_25, Phase L - HP Deskjet 850C
Date: 31. Mar 99 11:26

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2170, PT0011
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_01
	TA913_25, Phase L - HP Deskjet 850C
Date:	31. Mar 99 11:26

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
19.87500	30.7	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

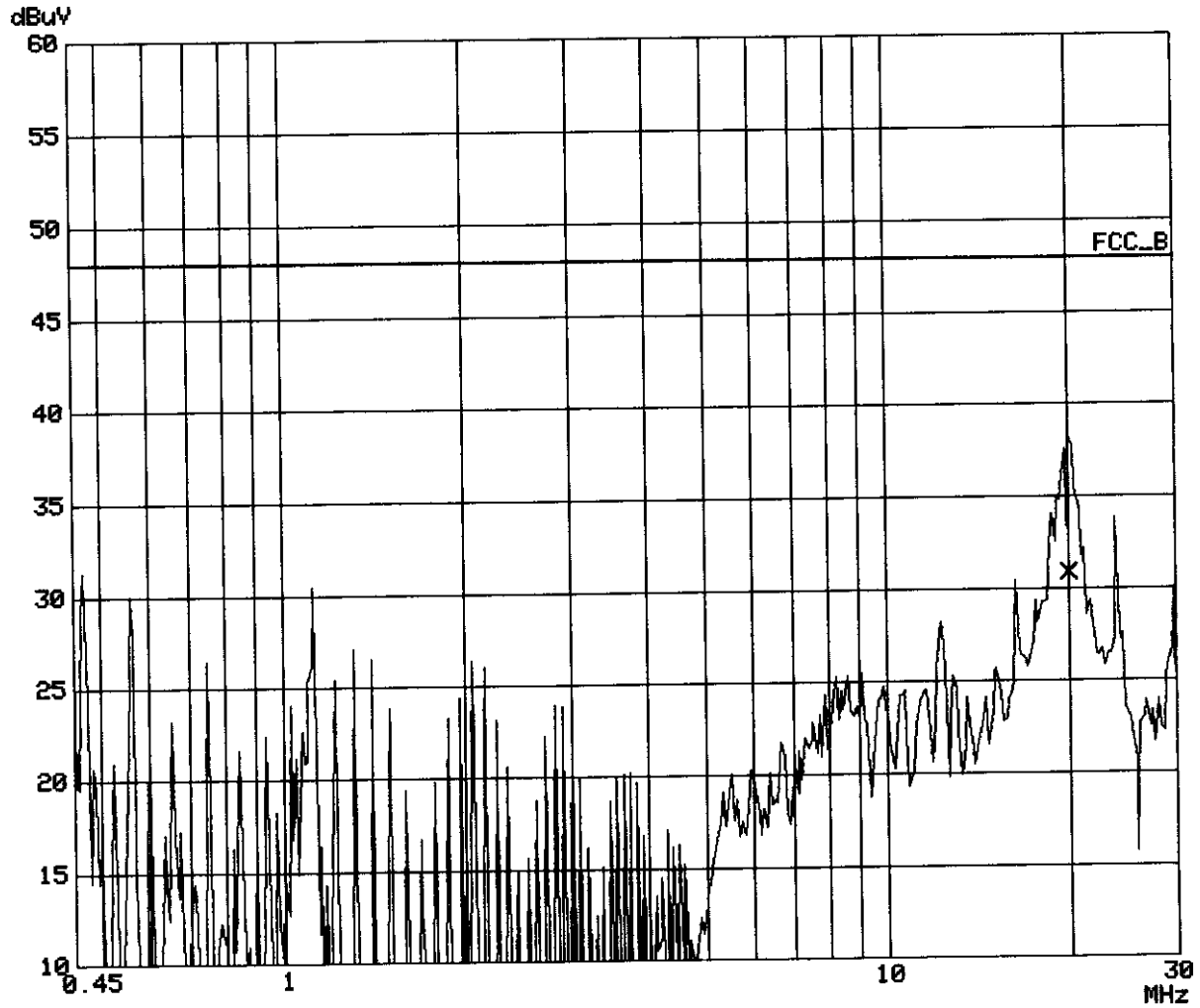
EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_26, Phase L - HP Deskjet 850C
Date: 31. Mar 99 11:32

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2170, PT0011
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_01
	TA913_26, Phase L - HP Deskjet 850C
Date:	31. Mar 99 11:32

Final Measurement Results:

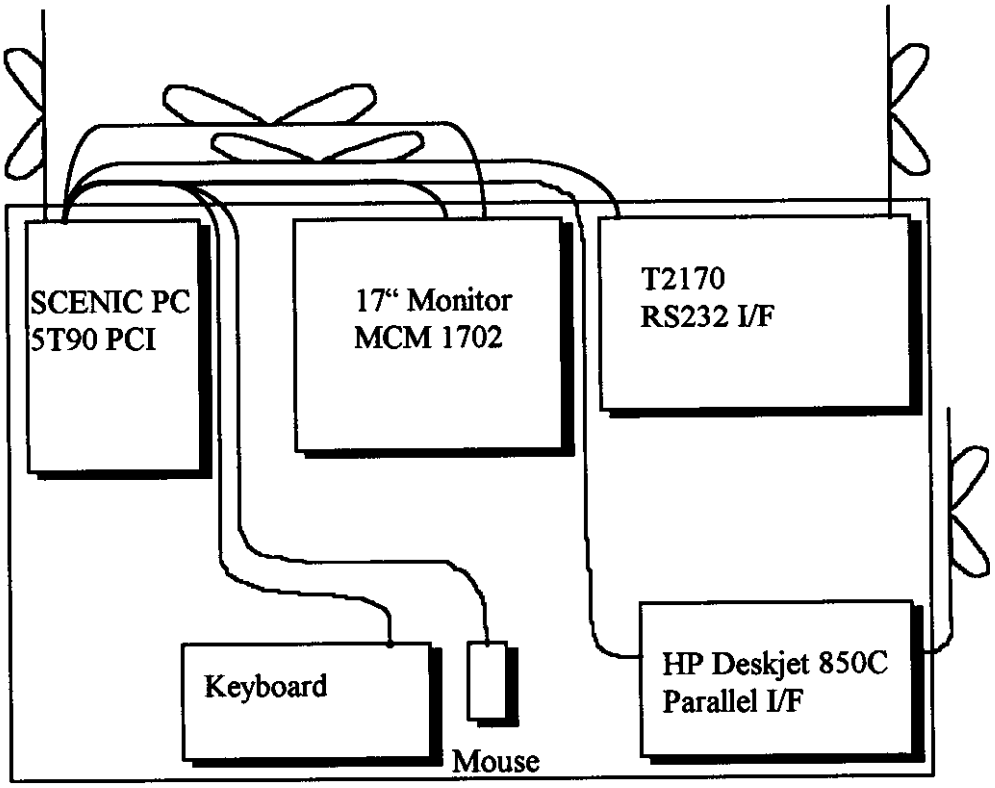
Frequency MHz	QP Level dBuV	QP Limit dBuV
20.07000	30.9	48.0

* limit exceeded

2.1.2 Radiated Emissions

2.1.2.1 Test Configuration

ANSI C63.4-1992
T2170 serial RS232 I/F



2.1.1.2 Test Procedure

Regulations:

FCC part 15 limit class B
0.45 - 30MHz

Test Operation:

During the tests, the system was exercised using a Microsoft Word for Windows document which provided for complete system operation. Data were displayed on the monitor and then transfered to the printers on the parallel port (HP Deskjet 850C) and the serial port (T2170), where it was printed. These tests represented a contious display-transfer-print programm operation which is a worst case mode and provided for a worst case emanated profile. The printed characters were shown in the appendix.

PC:	SCENIC 5T90/PCI
Monitor	MCM 1702
T2170	PT0011
Additional printer	HP Deskjet 850C
Parallel I/F cable:	Shielded cable
Serial I/F cable:	Shielded cable
Fanfoldpaper for the	T2170
Single sheet for the	HP Deskjet 850C
Supply voltage:	120VAC/60Hz

Test results:

Measurements are made with a CISPR receiver with the detector in peak mode. If the emanation is closer than 6dB to the limit or more, the receiver will stop and measure the exact value with quasipeak. The frequency, the maximum quasipeak value and the limit will be printed out.

Summary:

The limits were kept.

Conducted Emission

Protocolscope:

First test run

Conducted emission of the T2170 serial I/F on L1- and N-Phase
Conducted emission of the PC + Monitor on L1- and N-Phase (the monitor was supplied via the PC)
Conducted emission of the HP Deskjet 850C paralle I/F on L1- and N-Phase

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

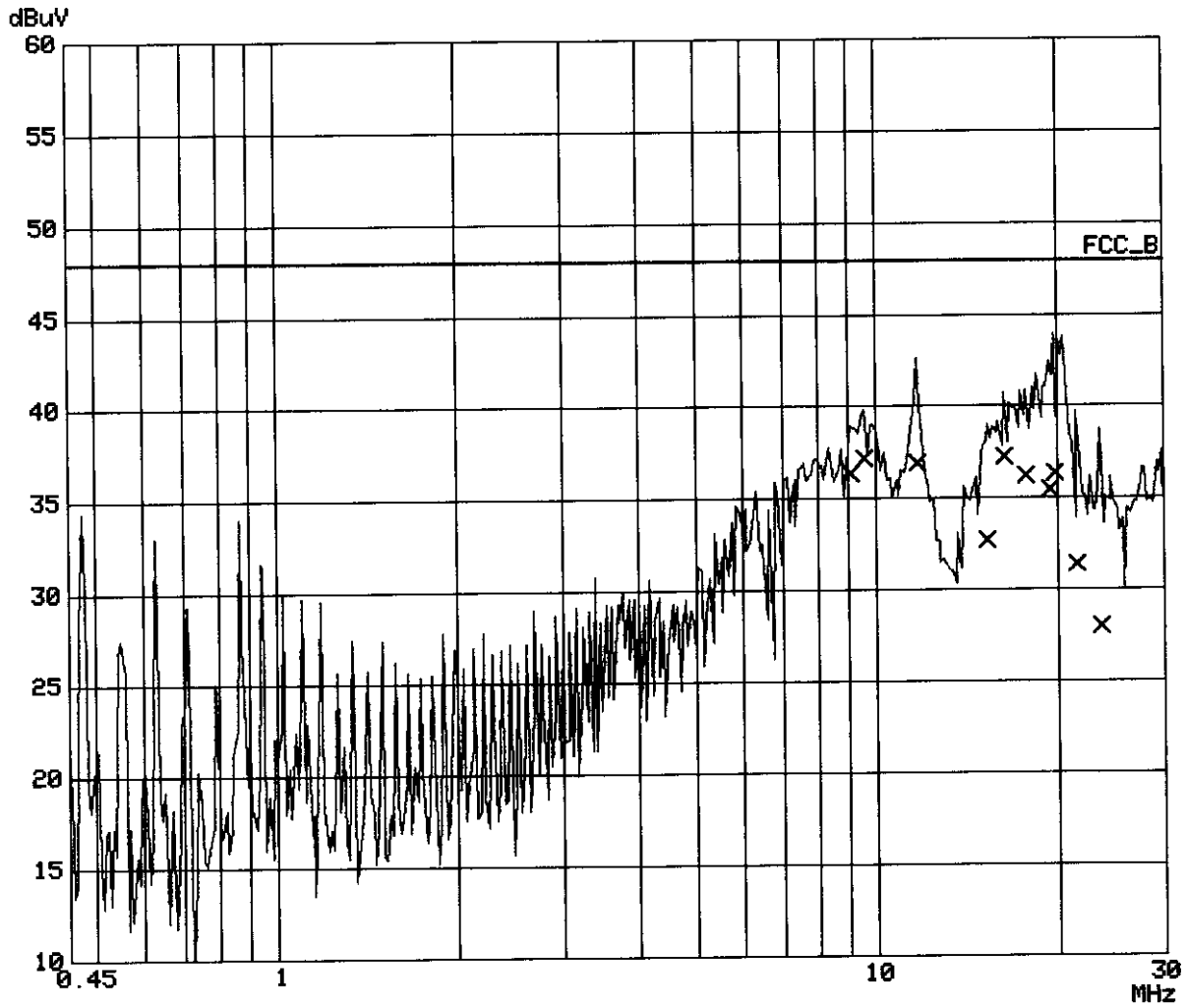
EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_21, Phase L1 - T2170
Date: 31. Mar 99 10:47

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_21, Phase L1 - T2170
Date: 31. Mar 99 10:47

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
9.08500	36.3	48.0
9.56000	37.1	48.0
11.72500	36.9	48.0
15.28000	32.7	48.0
16.38500	37.2	48.0
17.77500	36.2	48.0
19.47500	35.4	48.0
19.87000	36.3	48.0
21.57500	31.4	48.0
23.64000	28.0	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

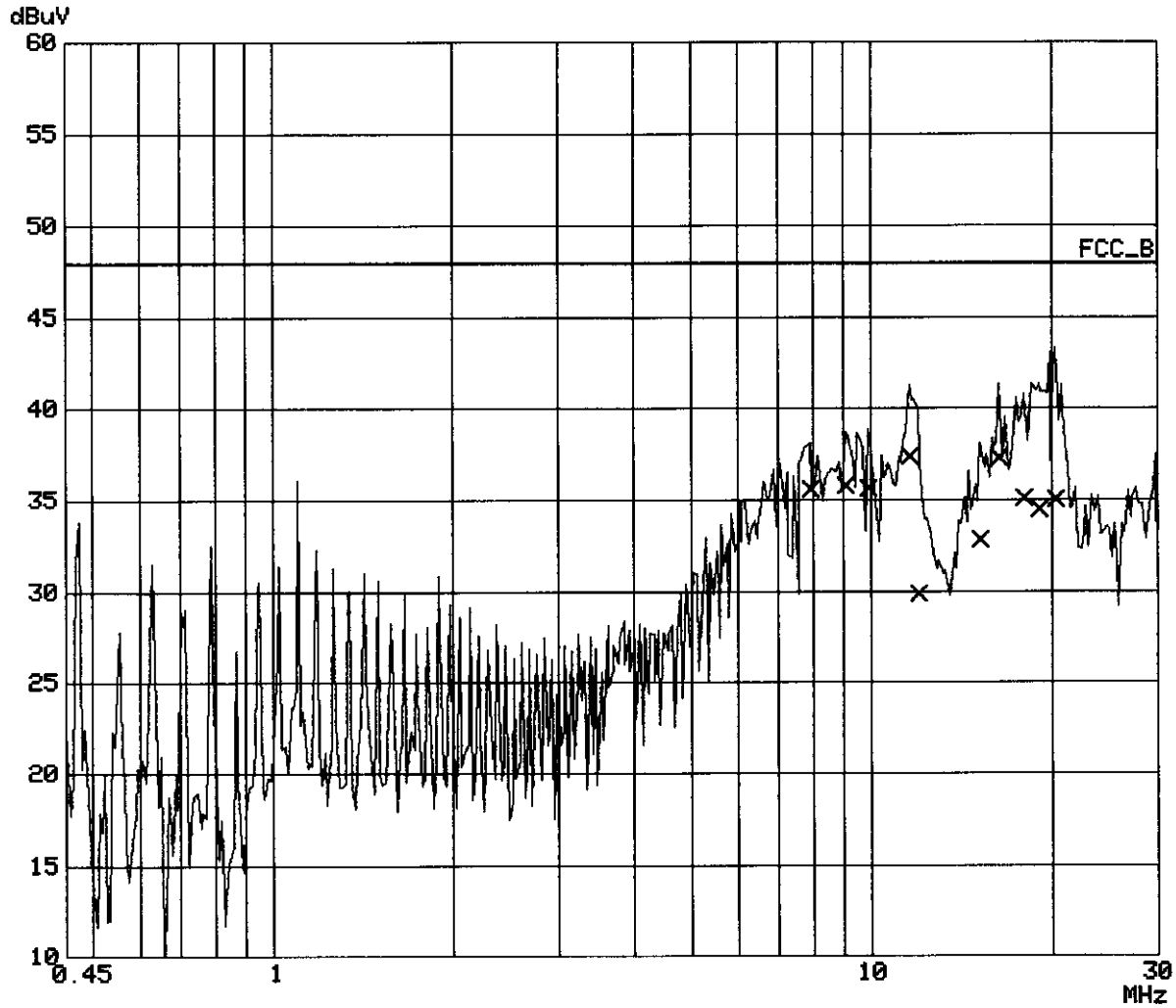
EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_22, Phase N - T2170
Date: 31. Mar 99 10:53

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_22, Phase N - T2170
Date: 31. Mar 99 10:53

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
7.90500	35.6	48.0
9.09000	35.8	48.0
9.88000	35.7	48.0
11.62000	37.4	48.0
12.00000	29.9	48.0
15.18000	32.9	48.0
16.38500	37.3	48.0
17.97500	35.1	48.0
19.07500	34.5	48.0
20.37000	35.0	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

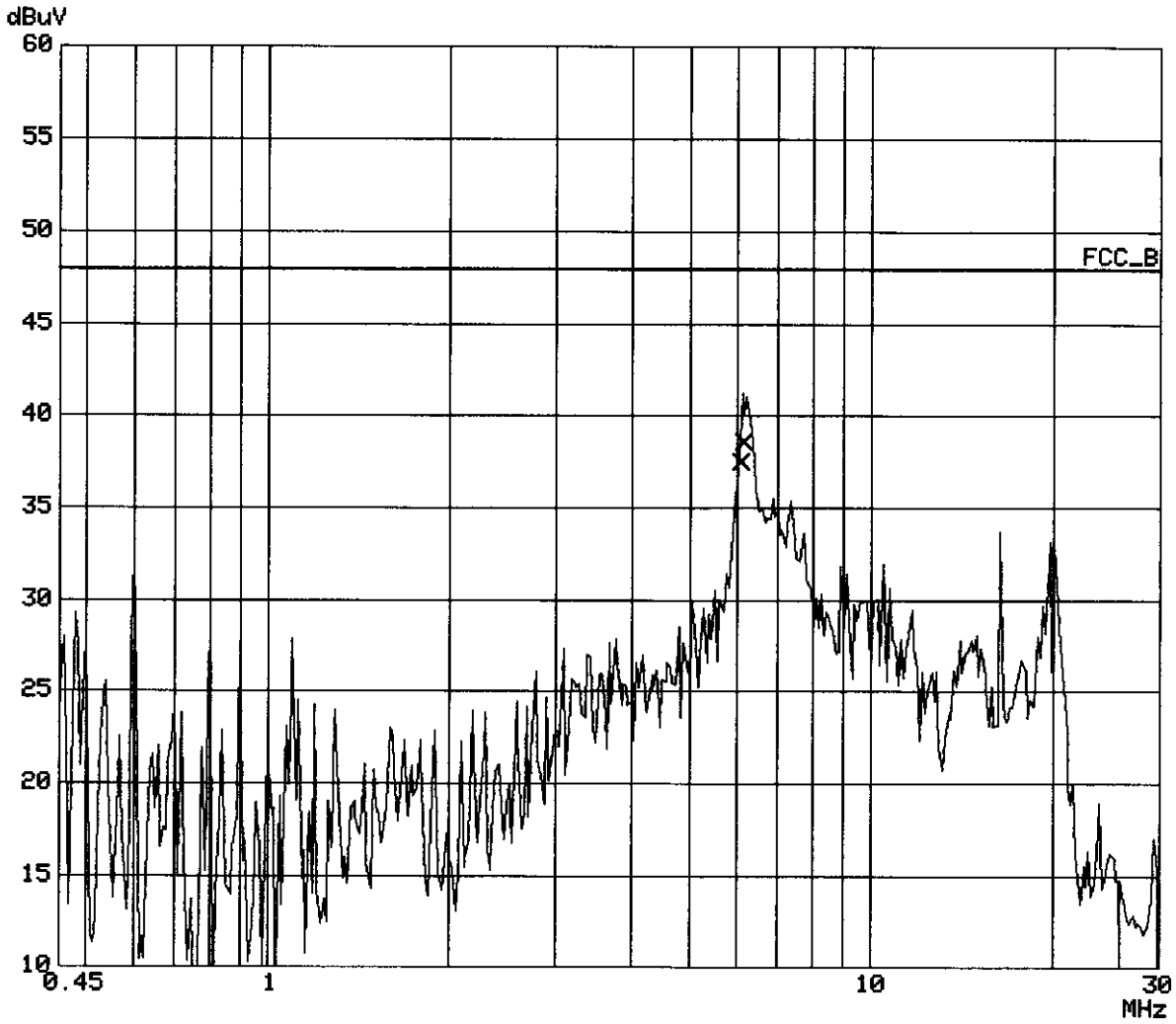
EUT: Matrix needle printer T2170, PT0011
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_01
TA913_23, Phase L - SCENIC PC + Monitor
Date: 31. Mar 99 11:07

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



2.1.2.2 Test Procedure

Regulations:

FCC part 15 limit class B
30 - 1000MHz

Test Operation:

During the tests, the system was exercised using a Microsoft Word for Windows document which provided for complete system operation. Data were displayed on the monitor and then transfered to the printers on the parallel port (HP Deskjet 850C) and the serial port (T2170), where it was printed. These tests represented a contious display-transfer-print programm operation which is a worst case mode and provided for a worst case emanated profile. The printed characters were shown in the appendix.

PC:	SCENIC 5T90/PCI
Monitor	MCM 1702
T2170	PT0011
Additional printer	HP Deskjet 850C
Parallel I/F cable:	Shielded cable
Serial I/F cable:	Shielded cable
Fanfoldpaper for the	T2170
Single sheet for the	HP Deskjet 850C
Supply voltage:	120VAC/60Hz

Test results:

Radiated Emission

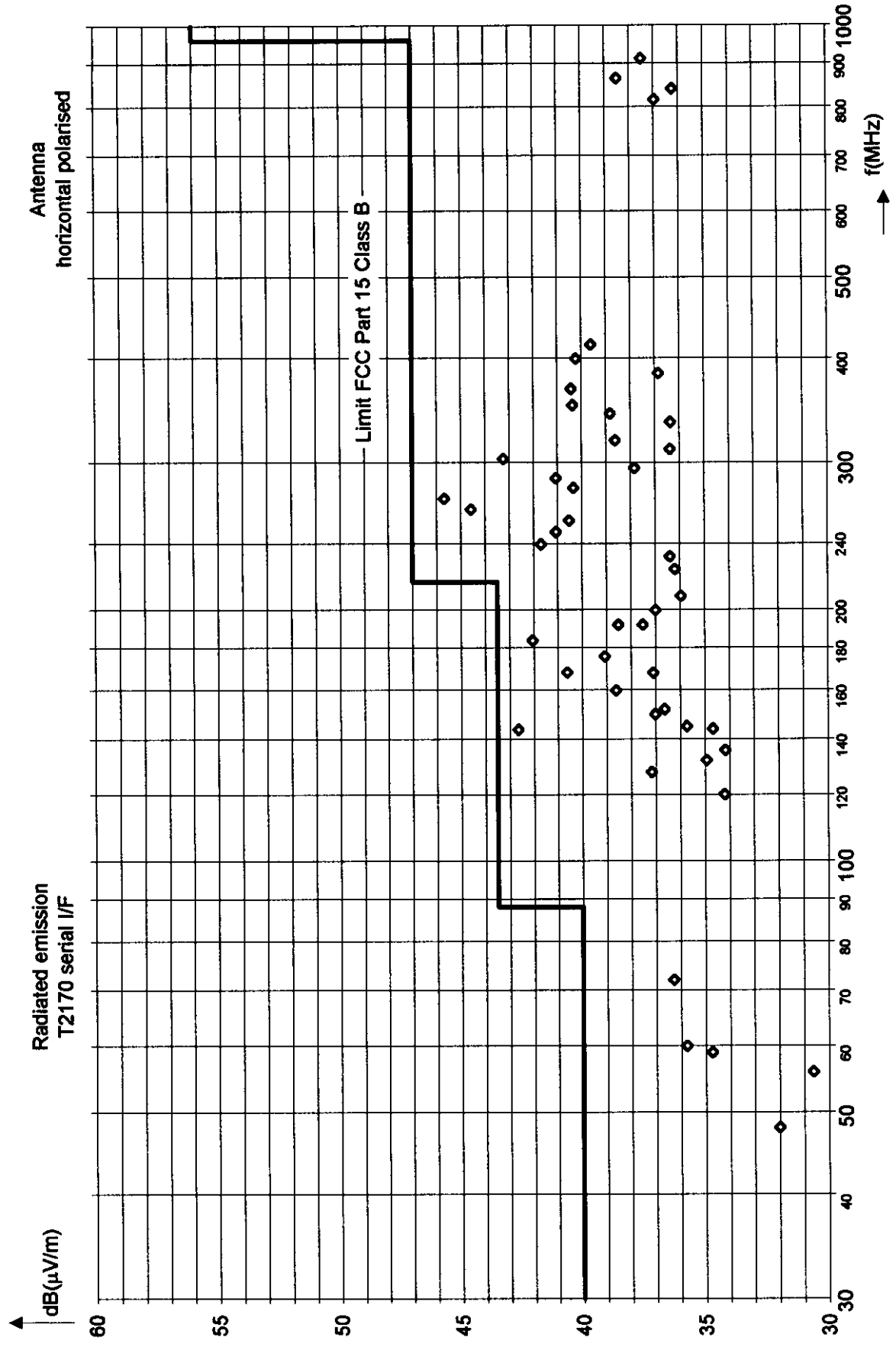
Polarisation of the antenna:
Horizontal

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
47.937	22.5	8.2	1.3	32.0	40.0	8.0	3.5	H
55.926	21.0	8.2	1.4	30.7	40.0	9.3	4.0	H
59.000	25.0	8.3	1.5	34.7	40.0	5.3	4.0	H
60.015	26.0	8.3	1.5	35.8	40.0	4.2	2.7	H
72.018	26.0	8.6	1.7	36.3	40.0	3.7	2.7	H
119.828	21.0	10.9	2.3	34.2	43.5	9.3	2.7	H
120.031	21.0	10.9	2.3	34.2	43.5	9.3	1.7	H
127.820	23.5	11.3	2.3	37.2	43.5	6.3	2.4	H
132.034	21.0	11.5	2.4	34.9	43.5	8.6	1.7	H
135.804	20.0	11.7	2.4	34.2	43.5	9.3	2.7	H
143.797	28.0	12.1	2.5	42.7	43.5	0.8	2.4	H
144.037	20.0	12.2	2.5	34.7	43.5	8.8	2.4	H
145.000	21.0	12.2	2.5	35.7	43.5	7.8	2.5	H
149.800	22.0	12.5	2.6	37.0	43.5	6.5	3.0	H
151.781	21.5	12.6	2.6	36.6	43.5	6.9	1.9	H
159.769	23.0	13.0	2.7	38.6	43.5	4.9	1.9	H
167.757	21.0	13.4	2.7	37.1	43.5	6.4	1.5	H
168.043	24.5	13.4	2.7	40.6	43.5	2.9	1.1	H
175.750	22.5	13.8	2.8	39.1	43.5	4.4	1.3	H
183.734	25.0	14.2	2.9	42.1	43.5	1.4	1.5	H
191.722	21.0	14.6	2.9	38.5	43.5	5.0	1.5	H
191.727	20.0	14.6	2.9	37.5	43.5	6.0	1.5	H
199.717	19.0	15.0	3.0	37.0	43.5	6.5	1.5	H
207.704	17.5	15.4	3.1	36.0	43.5	7.5	1.5	H
223.681	17.0	16.0	3.2	36.2	46.0	9.8	1.5	H
231.669	17.0	16.2	3.2	36.4	46.0	9.6	1.5	H
239.657	22.0	16.4	3.3	41.7	46.0	4.3	1.3	H
247.647	21.0	16.7	3.3	41.1	46.0	4.9	1.3	H
255.635	20.0	17.1	3.4	40.5	46.0	5.5	1.0	H
263.624	23.5	17.6	3.5	44.6	46.0	1.4	1.0	H
271.612	24.0	18.2	3.5	45.7	46.0	0.3	1.2	H

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
279.600	18.0	18.8	3.6	40.3	46.0	5.7	1.1	H
287.589	18.0	19.5	3.6	41.1	46.0	4.9	1.1	H
295.577	14.0	20.2	3.7	37.8	46.0	8.2	1.5	H
303.568	26.0	13.5	3.7	43.2	46.0	2.8	1.0	H
311.556	19.0	13.6	3.8	36.4	46.0	9.6	1.0	H
319.544	21.0	13.8	3.8	38.6	46.0	7.4	1.0	H
335.521	18.0	14.5	3.9	36.4	46.0	9.6	1.0	H
343.509	20.0	14.9	3.9	38.8	46.0	7.2	1.0	H
351.497	21.0	15.4	4.0	40.4	46.0	5.6	1.0	H
367.474	21.0	15.4	4.1	40.4	46.0	5.6	1.0	H
383.451	17.0	15.7	4.1	36.8	46.0	9.2	1.0	H
399.427	20.0	16.0	4.2	40.2	46.0	5.8	1.0	H
415.404	19.0	16.3	4.3	39.6	46.0	6.4	1.0	H
816.206	10.0	21.2	5.8	37.0	46.0	9.0	1.0	H
840.212	9.0	21.4	5.8	36.2	46.0	9.8	1.0	H
864.218	11.0	21.6	5.9	38.5	46.0	7.5	1.0	H
912.230	9.5	22.0	6.0	37.5	46.0	8.5	1.0	H

All other measured emanations were 10 dB or more below the limits.

Summary: The limits were kept.


Radiated emission
T2170 serial I/F
Antenna
horizontal polarised
Limit FCC Part 15 Class B
dB(µV/m)
f(MHz)
60
55
50
45
40
35
30
30
40
50
60
70
80
90
100
120
140
160
180
200
240
300
400
500
600
700
800
900
1000

Polarisation of the antenna:
Vertical

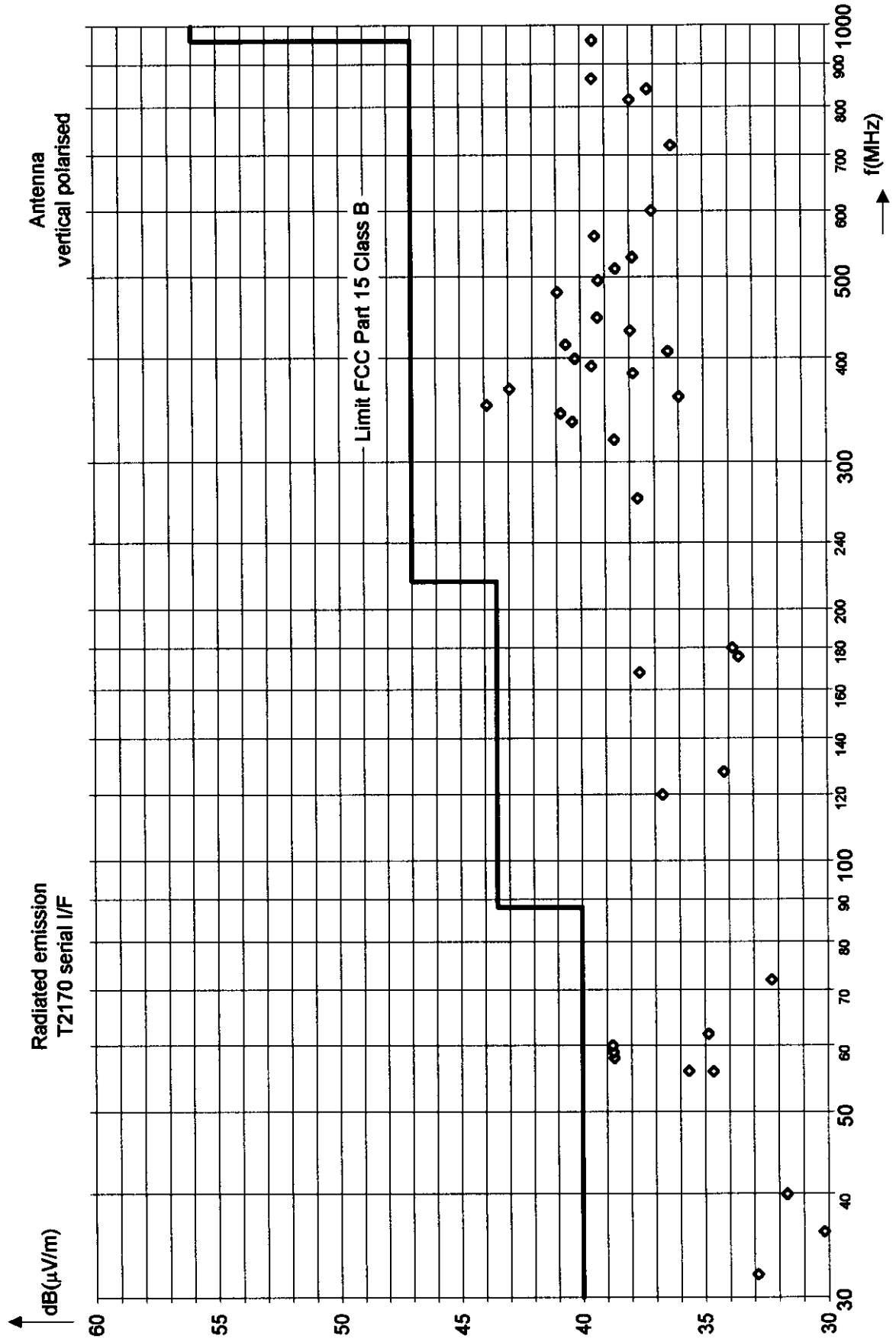
Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
31.961	20.0	11.8	1.0	32.9	40.0	7.1	1.0	V
36.007	19.0	10.1	1.1	30.2	40.0	9.8	1.0	V
39.949	21.5	9.0	1.2	31.7	40.0	8.3	1.0	V
55.926	25.0	8.2	1.4	34.7	40.0	5.3	1.0	V
56.000	26.0	8.2	1.4	35.7	40.0	4.3	1.0	V
58.000	29.0	8.2	1.5	38.7	40.0	1.3	1.0	V
59.000	29.0	8.3	1.5	38.7	40.0	1.3	1.0	V
60.000	29.0	8.3	1.5	38.8	40.0	1.2	1.0	V
62.000	25.0	8.3	1.5	34.8	40.0	5.2	1.0	V
72.016	22.0	8.6	1.7	32.3	40.0	7.7	1.0	V
119.832	23.5	10.9	2.3	36.7	43.5	6.8	1.0	V
127.821	20.5	11.3	2.3	34.2	43.5	9.3	1.0	V
168.040	21.5	13.4	2.7	37.6	43.5	5.9	1.0	V
175.751	17.0	13.8	2.8	33.6	43.5	9.9	1.0	V
180.043	17.0	14.0	2.8	33.8	43.5	9.7	1.0	V
271.610	16.0	18.2	3.5	37.7	46.0	8.3	1.0	V
319.545	21.0	13.8	3.8	38.6	46.0	7.4	1.0	V
335.521	22.0	14.5	3.9	40.4	46.0	5.6	1.0	V
343.510	22.0	14.9	3.9	40.8	46.0	5.2	1.0	V
351.498	24.5	15.4	4.0	43.9	46.0	2.1	1.0	V
359.486	16.0	16.0	4.0	36.0	46.0	10.0	1.0	V
367.474	23.5	15.4	4.1	42.9	46.0	3.1	1.0	V
383.451	18.0	15.7	4.1	37.8	46.0	8.2	1.0	V
391.439	19.5	15.9	4.2	39.5	46.0	6.5	1.2	V
399.431	20.0	16.0	4.2	40.2	46.0	5.8	1.3	V
407.420	16.0	16.2	4.3	36.4	46.0	9.6	1.3	V
415.408	20.0	16.3	4.3	40.6	46.0	5.4	1.3	V
431.384	17.0	16.6	4.4	38.0	46.0	8.0	1.0	V
447.361	18.0	16.9	4.5	39.3	46.0	6.7	1.0	V
479.314	19.0	17.4	4.6	41.0	46.0	5.0	1.0	V
495.291	17.0	17.6	4.7	39.3	46.0	6.7	1.0	V
511.267	16.0	17.8	4.7	38.6	46.0	7.4	1.0	V

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
527.250	15.0	18.1	4.8	37.9	46.0	8.1	1.0	V
559.203	16.0	18.5	4.9	39.4	46.0	6.6	1.0	V
600.152	13.0	19.0	5.1	37.1	46.0	8.9	1.0	V
718.975	10.5	20.3	5.5	36.3	46.0	9.7	1.0	V
816.206	11.0	21.2	5.8	38.0	46.0	8.0	1.0	V
840.212	10.0	21.4	5.8	37.2	46.0	8.8	1.0	V
864.218	12.0	21.6	5.9	39.5	46.0	6.5	1.0	V
960.242	11.0	22.3	6.2	39.5	46.0	6.5	1.0	V

All other measured emanations were 10 dB or more below the limits.

Summary:

The limits were kept.


Radiated emission
T2170 serial I/F
Antenna
vertical polarised
Limit FCC Part 15 Class B
dB(µV/m)
f(MHz)
60
55
50
45
40
35
30
30
40
50
60
70
80
90
100
120
140
160
180
200
240
300
400
500
600
700
800
900
1000

3 Results

EMI:

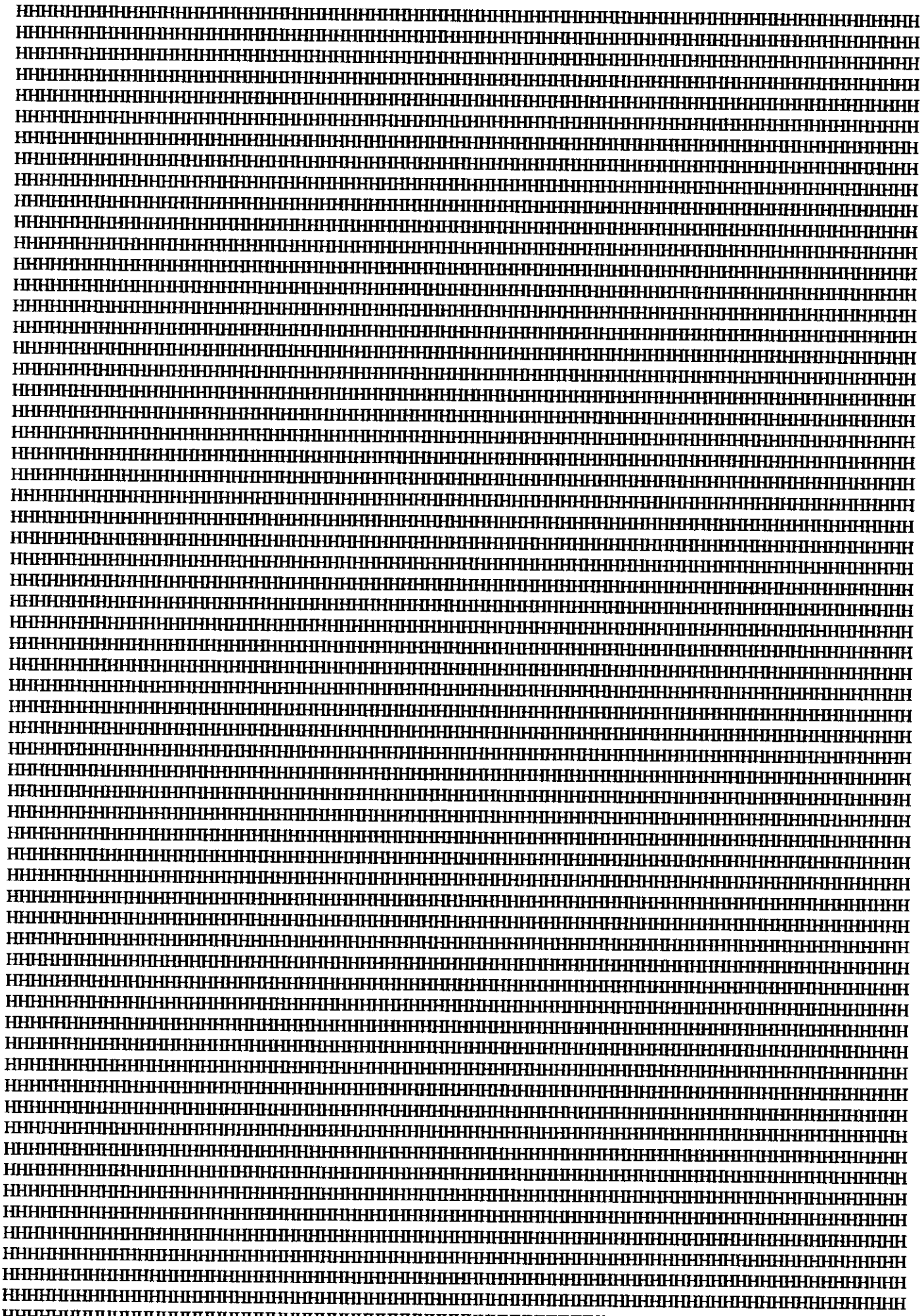
Regulation	Class	Result	Remarks
FCC part 15 limit class B			
Conducted Emission 0.45 - 30MHz	B	kept	
Radiated Emission 30 -1000MHz	B	kept	

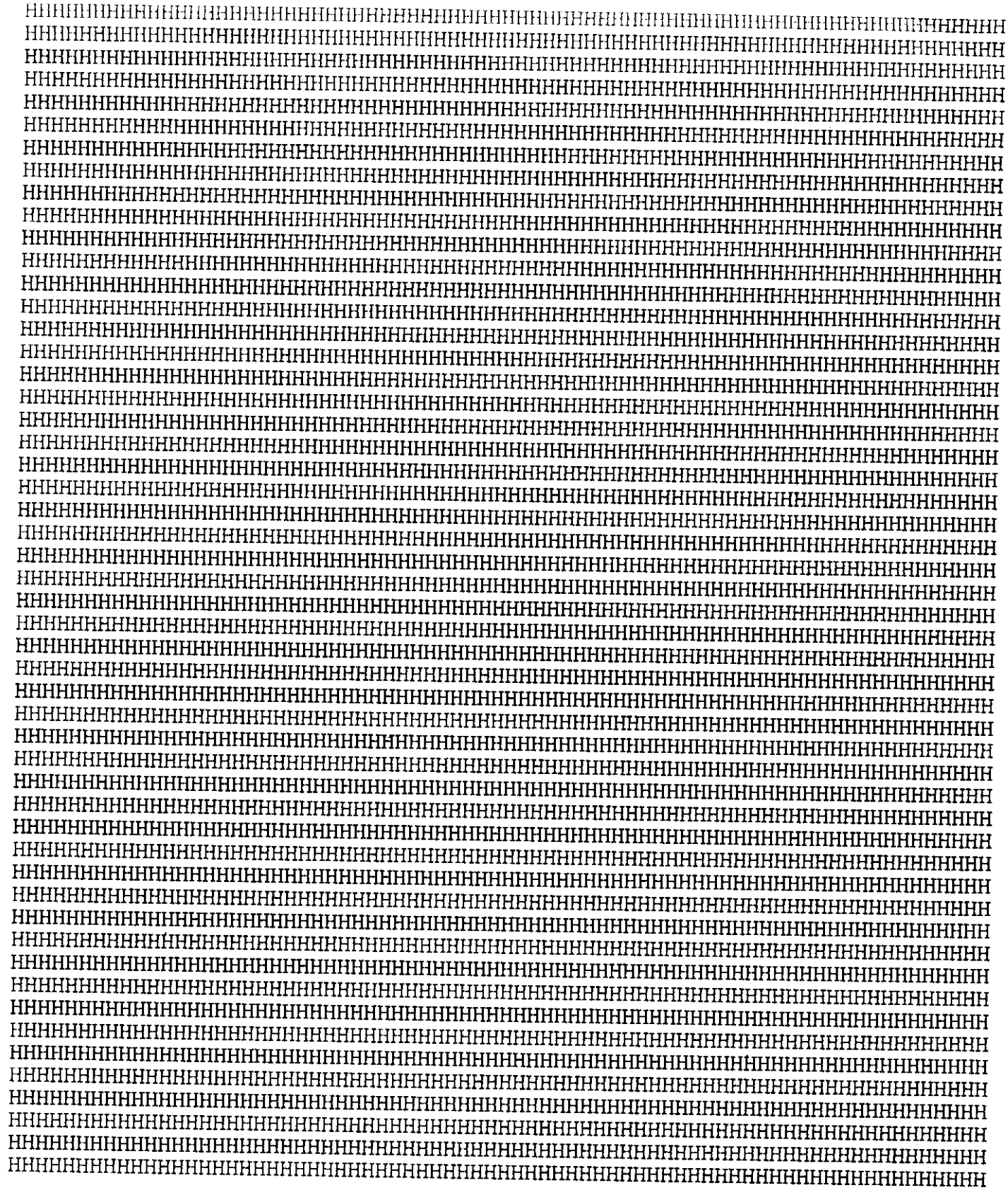
Burgrieden, 03/31/1999

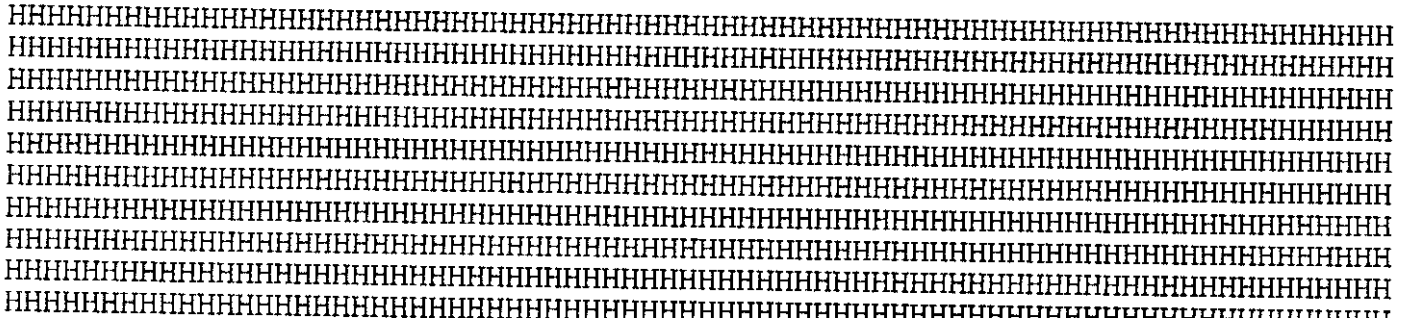
Dipl.Ing.(FH) Christian Vogelmann

4 Appendix

Print Information
- T2170
- HP Deskjet 850C







Test Report

File Nr. TA913_02.DOC

Matrix-Needleprinter
T2155 + cut device

EUT:	Matrix Needleprinter
Typ:	T2155
S/N:	2990002
Configuration:	Serial interface RS232 and parallel I/F Centronics on board.
Options:	Cut device S/N 1002299
Manufacturer:	Tally GmbH Glockeraustr. 4 89275 Elchingen Germany
Regulations:	FCC rules part 15, limit class B
Applicant:	Tally GmbH Glockeraustr. 4 89275 Elchingen Germany
Contact person:	Mr. Böhm -Tally GmbH
Test site:	Test facitlities of the EMCE GmbH Laupheimer-Str. 29 88483 Burgrieden Germany
Test date:	03/29/1999, 03/31/1999
Responsible Engineer:	Mr. Chr. Vogelmann EMCE GmbH Ingenieurbüro für EMV-Prüfungen und Schaltungsentwicklung

Contents:

1 EMC Instrumentation

EMI:

x	Receiver	ESS 5Hz - 1000 MHz	Rohde & Schwarz
	Probe	ESH2-Z3	Rohde & Schwarz
x	LISN 1	ESH3-Z5	Rohde & Schwarz
x	LISN 2	ESH3-Z5	Rohde & Schwarz
	LISN 4	NNBM 8125	Schwarzbeck
	Absorbing Clamp	MDS 21	Schwarzbeck
	Antenna 9kHz - 30MHz	HFH2-Z2	Rohde & Schwarz
x	Antenna 30 - 300MHz	VHBA9123 / BBA9106	Schwarzbeck
x	Antenna 250 -1200MHz	UHALP 9108A	Schwarzbeck
	Antenna 9kHz - 30 MHz	Loop-Antenna 1,5m ∅	EMCE
x	Shielded Cabine	6,4m x 4m x 2,25m	Frankonia
x	Open Field Test Site	3m / 10m	EMCE GmbH / Burgrieden
x	AC Source 5kVA	5001i	California Instruments
	Netanalyser	PM3000A	Voltech
	LISN 3	NNB 4/32T	Rolf Heine HF-Technik

Miscellaneous:

x	PC SCENIC 5T/90 PCI	S26361-K345-V711	-	Siemens Nixdorf Informationssysteme AG
x	Monitor MCM 1702	S26361-K373-V318 S/N BU 908484	FCC-ID ARFKDM1788	Siemens Nixdorf Informationssysteme AG
x	Keyboard MF2 LC	S26381-K252-V120		Siemens Nixdorf Informationssysteme AG
x	Mouse Serial Mouse 2.0A	0222829	FCC-ID C3KSMP1	Microsoft Corp.
x	Additional Printer HP Deskjet 850C	S/N US545110NX	FCC-ID B94C2145X	Hewlett Packard

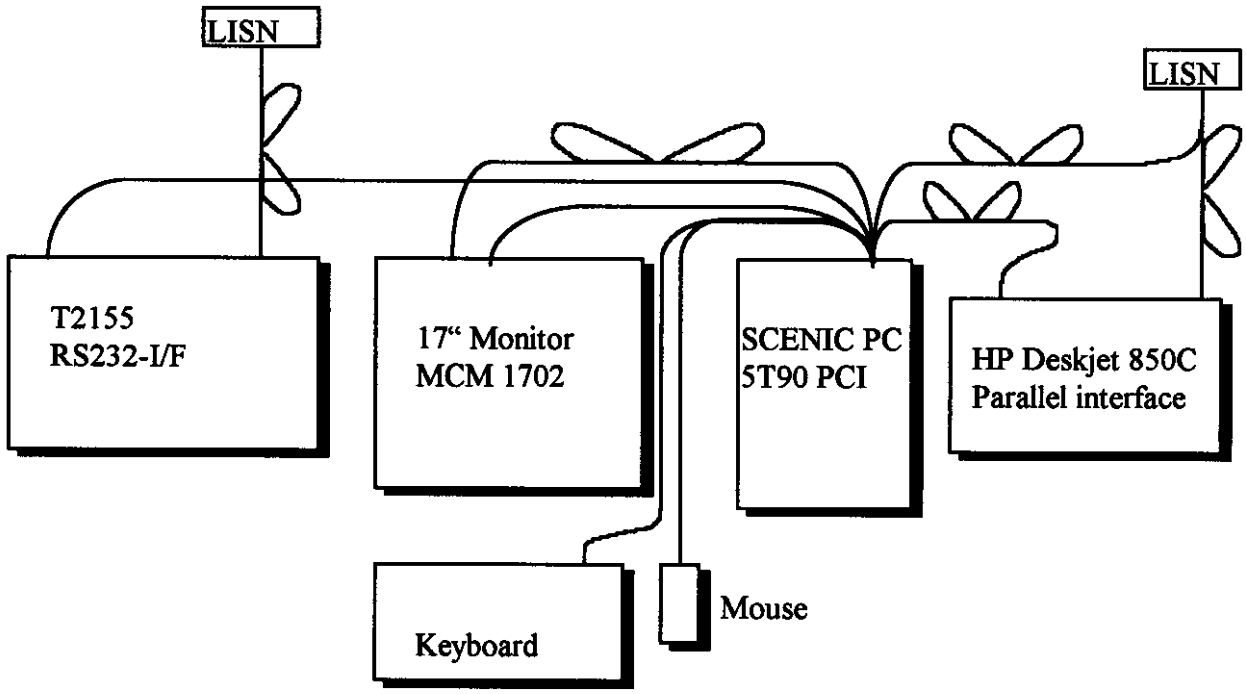
2 Report

2.1 EMI Report FCC part 15 limit class B

2.1.1 Conducted Emissions

2.1.1.1 Test Configuration

ANSI C63.4-1992
T2155 serial RS232 I/F



2.1.1.2 Test Procedure

Regulations:

FCC part 15 limit class B
0.45 - 30MHz

Test Operation:

During the tests, the system was exercised using a Microsoft Word for Windows document which provided for complete system operation. Data were displayed on the monitor and then transfered to the printers on the parallel port (HP Deskjet 850C) and the serial port (T2155), where it was printed. The fanfoldpaper was cutted always after the ninth line, triggerd by a formfeed command. These tests represented a contious display-transfer-print programm operation which is a worst case mode and provided for a worst case emanated profile. The printed characters were shown in the appendix.

PC:	SCENIC 5T90/PCI
Monitor	MCM 1702
T2155	Ser.Nr. 2990002
Additional printer	HP Deskjet 850C
Parallel I/F cable:	Shielded cable
Serial I/F cable:	Shielded cable
Fanfoldpaper for the	T2155
Single sheet for the	HP Deskjet 850C
Supply voltage:	120VAC/60Hz

Test results:

Measurements are made with a CISPR receiver with the detector in peak mode. If the emanation is closer than 6dB to the limit or more, the receiver will stop and measure the exact value with quasipeak. The frequency, the maximum quasipeak value and the limit will be printed out.

Summary:

The limits were kept.

Conducted Emission

Protocolscope:

First test run

Conducted emission of the T2155 serial I/F on L1- and N-Phase
Conducted emission of the PC + Monitor on L1- and N-Phase (the monitor was supplied via the PC)
Conducted emission of the HP Deskjet 850C paralle I/F on L1- and N-Phase

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

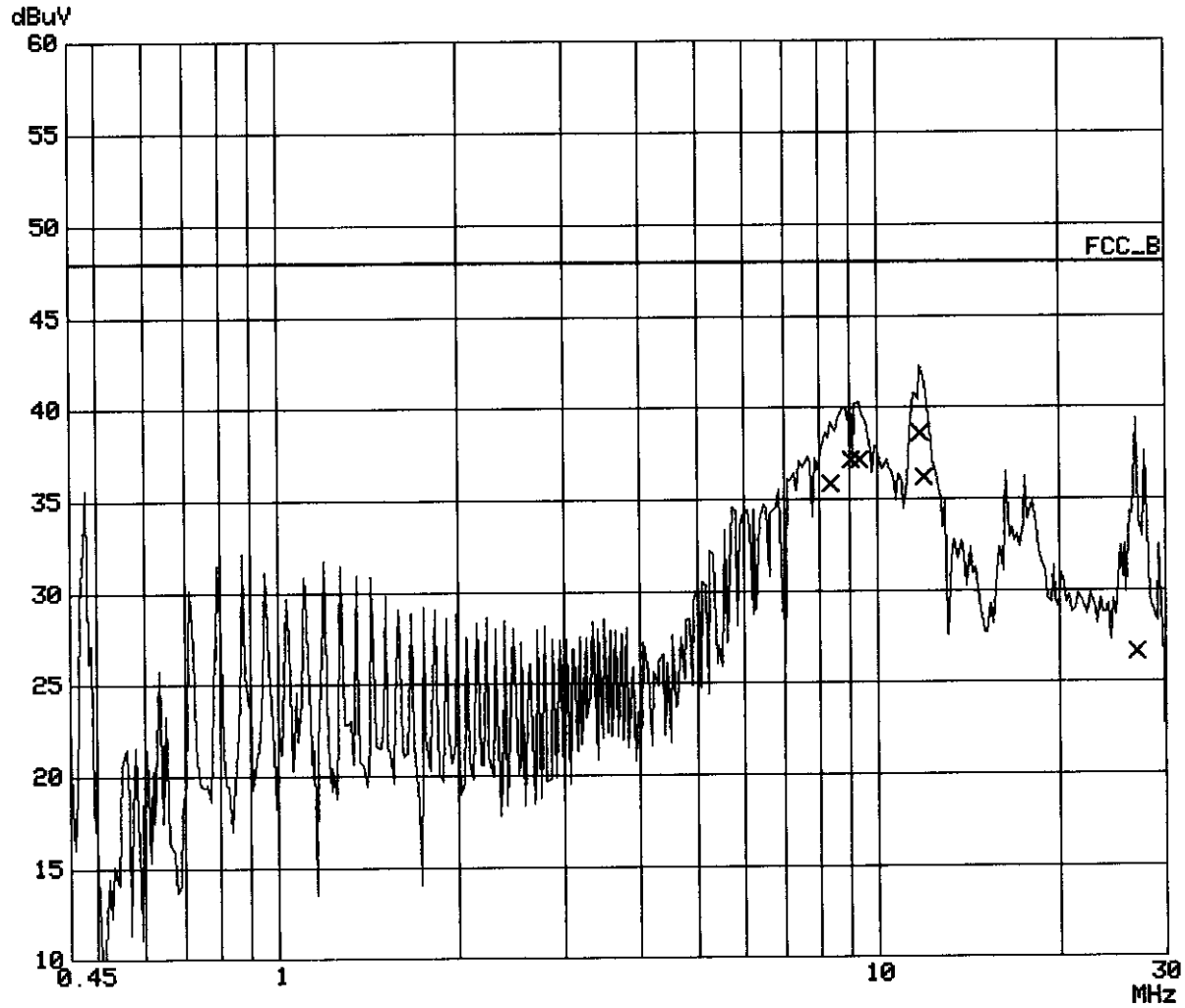
EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_31, Phase L - T2155
Date: 31. Mar 99 12:32

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2155, S/N2990002
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_02, T2155 + cut device S/N 1002299
	TA913_31, Phase L - T2155
Date:	31. Mar 99 12:32

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
8.37000	35.8	48.0
9.01000	37.2	48.0
9.33000	37.2	48.0
11.80000	38.6	48.0
11.96000	36.2	48.0
26.86000	26.7	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

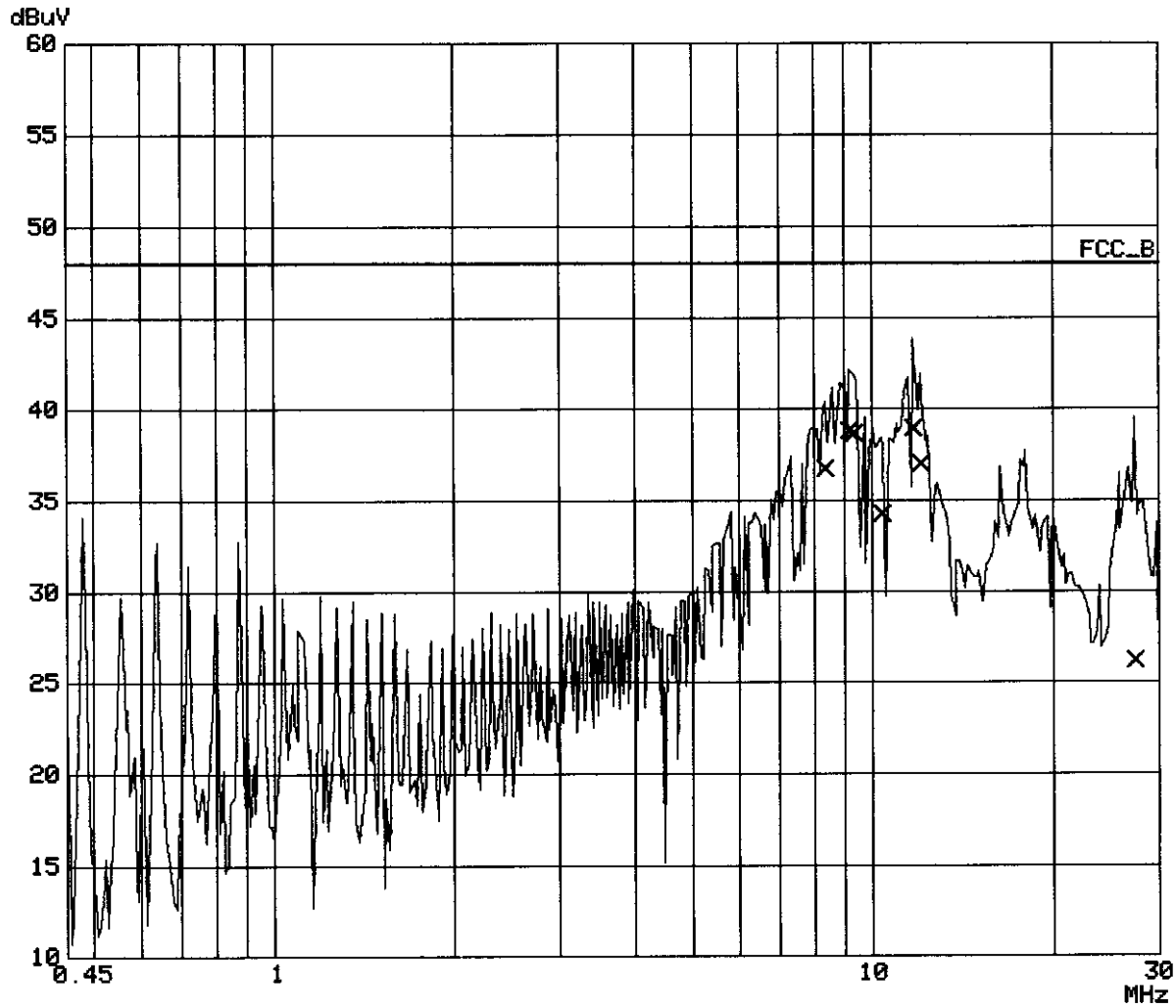
EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_32, Phase N - T2155
Date: 31. Mar 99 12:39

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_32, Phase N - T2155
Date: 31. Mar 99 12:39

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
8.37000	36.7	48.0
9.17000	38.8	48.0
9.33000	38.6	48.0
10.36500	34.3	48.0
11.72500	38.9	48.0
12.04000	37.0	48.0
27.39500	26.2	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

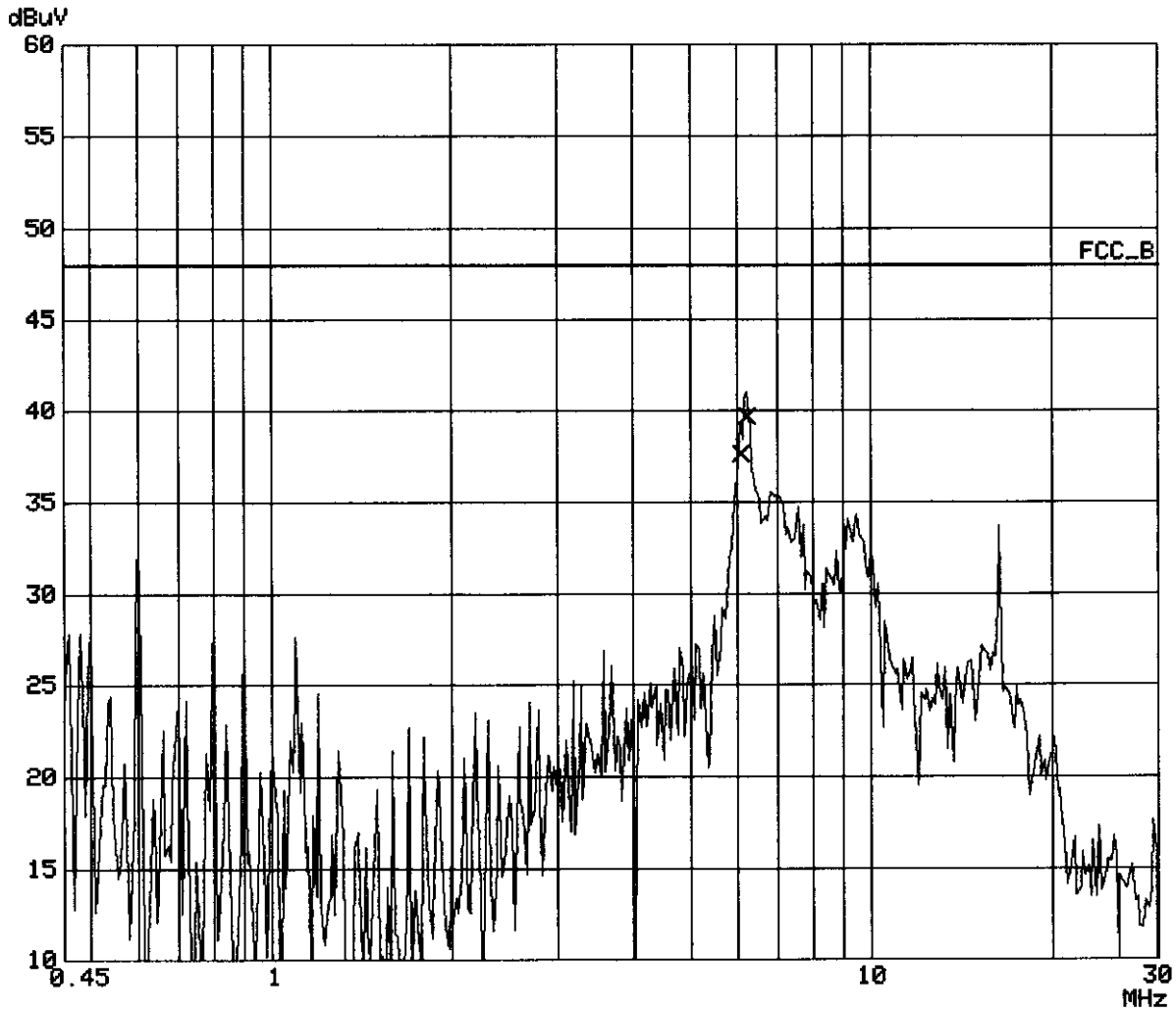
EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_33, Phase L - SCENIC PC + Monitor
Date: 31. Mar 99 12:48

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2155, S/N2990002
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_02, T2155 + cut device S/N 1002299
	TA913_33, Phase L - SCENIC PC + Monitor
Date:	31. Mar 99 12:48

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
6.07500	37.6	48.0
6.22500	39.7	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

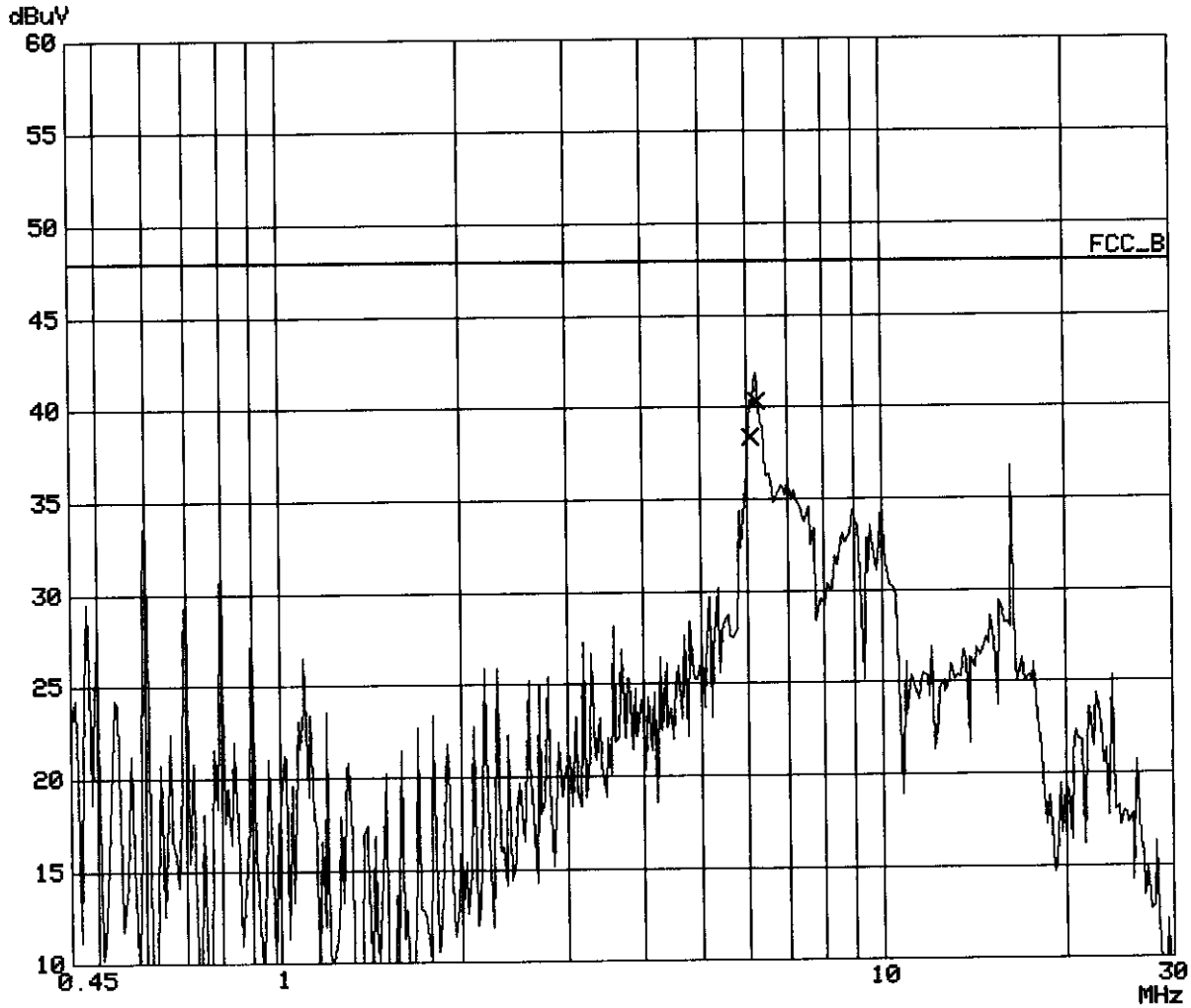
EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_34, Phase N - SCENIC PC + Monitor
Date: 31. Mar 99 12:53

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2155, S/N2990002
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_02, T2155 + cut device S/N 1002299
	TA913_34, Phase N - SCENIC PC + Monitor
Date:	31. Mar 99 12:53

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
6.07500	38.4	48.0
6.22500	40.3	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

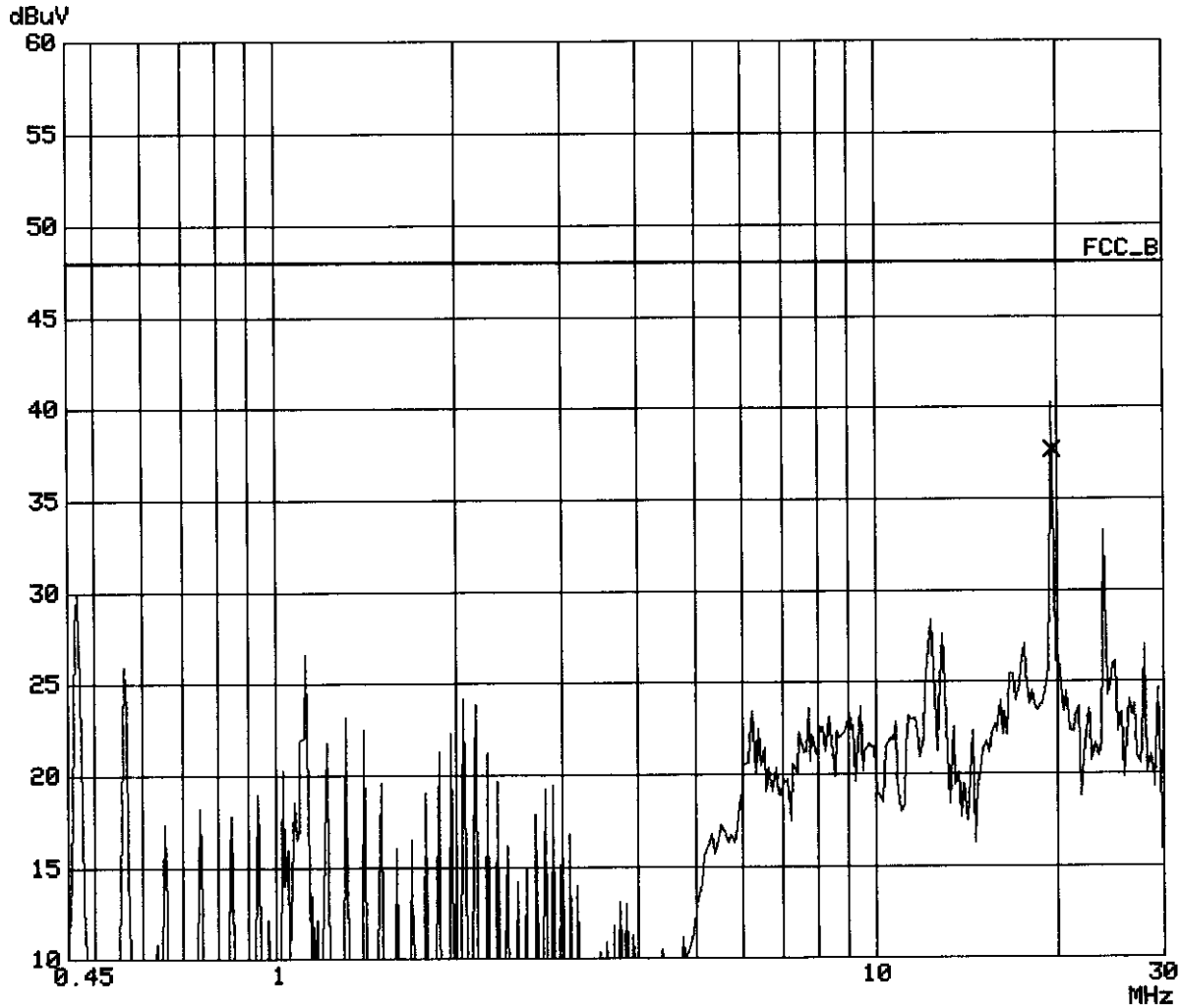
EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_35, Phase L - HP Deskjet 850C
Date: 31. Mar 99 13:01

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_35, Phase L - HP Deskjet 850C
Date: 31. Mar 99 13:01

Final Measurement Results:

Frequency MHz	QP Level dBuV	QP Limit dBuV
19.69000	37.7	48.0

* limit exceeded

EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

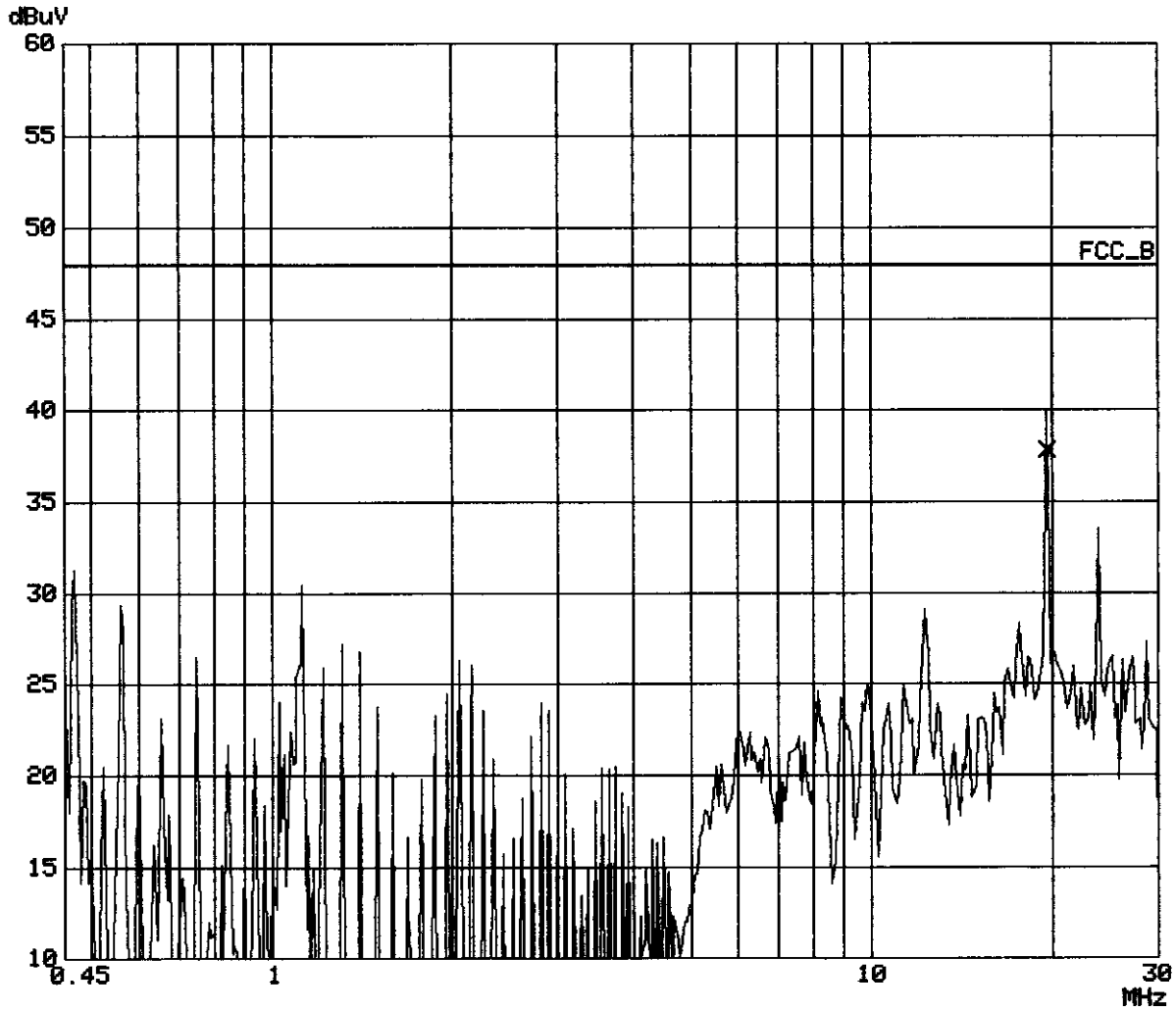
EUT: Matrix needle printer T2155, S/N2990002
Manuf: Tally GmbH / Germany
Op Cond: LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator: Vogelmann
Test Spec: FCC Part 15 Class B
Comment: Test ID: PR913_02, T2155 + cut device S/N 1002299
TA913_36, Phase N - HP Deskjet 850C
Date: 31. Mar 99 13:07

Scan Settings (1 Range)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	30M	5k	10k	PK	20ms	AUTO	LD OFF	60dB

Transducer No.	Start	Stop	Name
2	1Hz	1000M	Kabel_6m

Final Measurement: x QP
Meas Time: 1 s
Subranges: 50
Acc Margin: 10dB



EMCE GmbH Ing büro für EMV_Prüfungen
Conducted emission

EUT:	Matrix needle printer T2155, S/N2990002
Manuf:	Tally GmbH / Germany
Op Cond:	LQ, 10cpi, "HH...",120V/60Hz, RS232
Operator:	Vogelmann
Test Spec:	FCC Part 15 Class B
Comment:	Test ID: PR913_02, T2155 + cut device S/N 1002299
	TA913_36, Phase N - HP Deskjet 850C
Date:	31. Mar 99 13:07

Final Measurement Results:

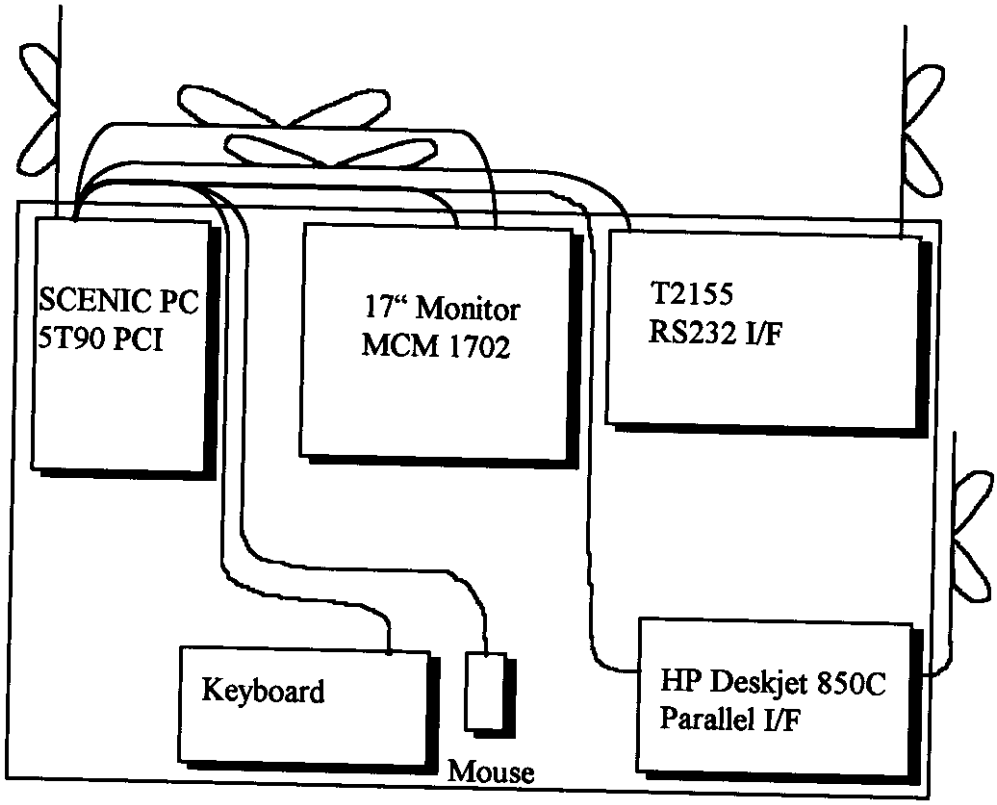
Frequency MHz	QP Level dBuV	QP Limit dBuV
19.69000	37.8	48.0

* limit exceeded

2.1.2 Radiated Emissions

2.1.2.1 Test Configuration

ANSI C63.4-1992
T2155 serial RS232 I/F



2.1.2.2 Test Procedure

Regulations:

FCC part 15 limit class B
30 - 1000MHz

Test Operation:

During the tests, the system was exercised using a Microsoft Word for Windows document which provided for complete system operation. Data were displayed on the monitor and then transfered to the printers on the parallel port (HP Deskjet 850C) and the serial port (T2155), where it was printed. The fanfoldpaper was cutted always after the ninth line, triggerd by a formfeed command. These tests represented a contious display-transfer-print programm operation which is a worst case mode and provided for a worst case emanated profile. The printed characters were shown in the appendix.

PC:	SCENIC 5T90/PCI
Monitor	MCM 1702
T2155	Ser.Nr. 2990002
Additional printer	HP Deskjet 850C
Parallel I/F cable:	Shielded cable
Serial I/F cable:	Shielded cable
Fanfoldpaper for the	T2155
Single sheet for the	HP Deskjet 850C
Supply voltage:	120VAC/60Hz

Test results:

Radiated Emission

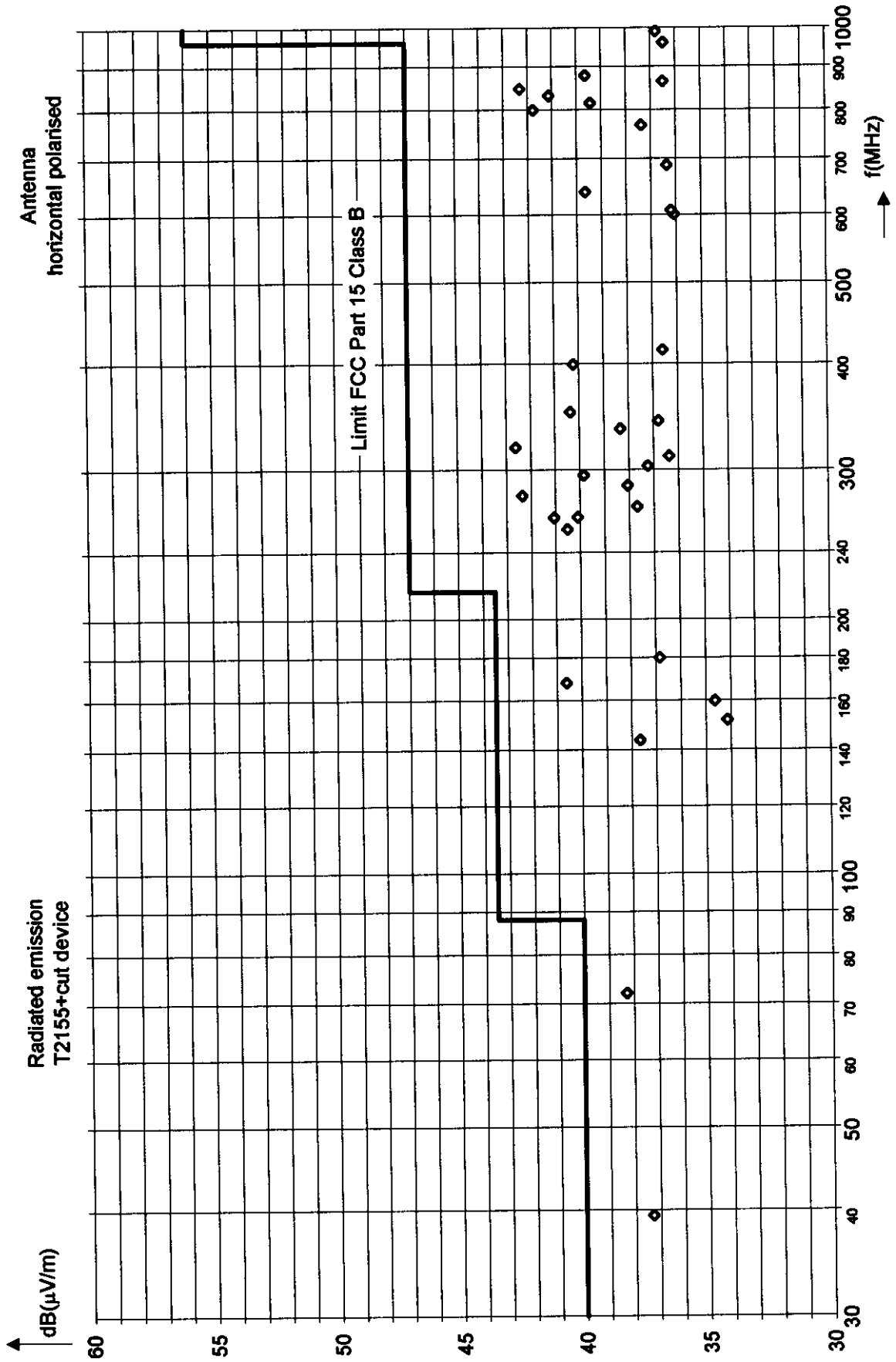
Polarisation of the antenna:
Horizontal

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
39.397	27.0	9.1	1.2	37.3	40.0	2.7	4.0	H
72.019	28.0	8.6	1.7	38.3	40.0	1.7	4.0	H
143.798	23.0	12.1	2.5	37.7	43.5	5.8	1.5	H
151.786	19.0	12.6	2.6	34.1	43.5	9.4	1.5	H
159.775	19.0	13.0	2.7	34.6	43.5	8.9	1.5	H
168.043	24.5	13.4	2.7	40.6	43.5	2.9	1.0	H
180.045	20.0	14.0	2.8	36.8	43.5	6.7	1.6	H
255.638	20.0	17.1	3.4	40.5	46.0	5.5	1.0	H
263.627	20.0	17.6	3.5	41.1	46.0	4.9	1.0	H
264.067	19.0	17.6	3.5	40.1	46.0	5.9	1.6	H
271.615	16.0	18.2	3.5	37.7	46.0	8.3	1.0	H
279.608	20.0	18.8	3.6	42.3	46.0	3.7	1.0	H
287.596	15.0	19.5	3.6	38.1	46.0	7.9	1.0	H
295.584	16.0	20.2	3.7	39.8	46.0	6.2	1.0	H
303.573	20.0	13.5	3.7	37.2	46.0	8.8	1.0	H
311.563	19.0	13.6	3.8	36.4	46.0	9.6	1.0	H
319.551	25.0	13.8	3.8	42.6	46.0	3.4	1.0	H
335.528	20.0	14.5	3.9	38.4	46.0	7.6	1.0	H
343.160	18.0	14.9	3.9	36.8	46.0	9.2	1.0	H
351.504	21.0	15.4	4.0	40.4	46.0	5.6	1.0	H
399.439	20.0	16.0	4.2	40.2	46.0	5.8	1.0	H
415.416	16.0	16.3	4.3	36.6	46.0	9.4	1.0	H
600.151	12.0	19.0	5.1	36.1	46.0	9.9	1.0	H
607.150	12.0	19.1	5.1	36.2	46.0	9.8	1.0	H
639.104	15.0	19.5	5.2	39.7	46.0	6.3	1.0	H
687.033	11.0	20.0	5.4	36.3	46.0	9.7	1.0	H
766.923	11.0	20.8	5.6	37.4	46.0	8.6	1.0	H
798.876	15.0	21.0	5.7	41.8	46.0	4.2	1.0	H
814.853	12.5	21.2	5.8	39.4	46.0	6.6	1.0	H
830.830	14.0	21.3	5.8	41.1	46.0	4.9	1.0	H
846.806	15.0	21.5	5.9	42.3	46.0	3.7	1.0	H

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
864.217	9.0	21.6	5.9	36.5	46.0	9.5	1.0	H
878.766	12.0	21.7	5.9	39.7	46.0	6.3	1.0	H
960.241	8.0	22.3	6.2	36.5	46.0	9.5	1.0	H
990.609	8.0	22.5	6.2	36.8	46.0	9.2	1.0	H

All other measured emanations were 10 dB or more below the limits.

Summary: The limits were kept.


Antenna
horizontal polarised
Limit FCC Part 15 Class B
Radiated emission
T2155+cut device
dB(µV/m)
f(MHz)
60
55
50
45
40
35
30
30
40
50
60
70
80
90
100
120
140
160
180
200
240
300
400
500
600
700
800
900
1000

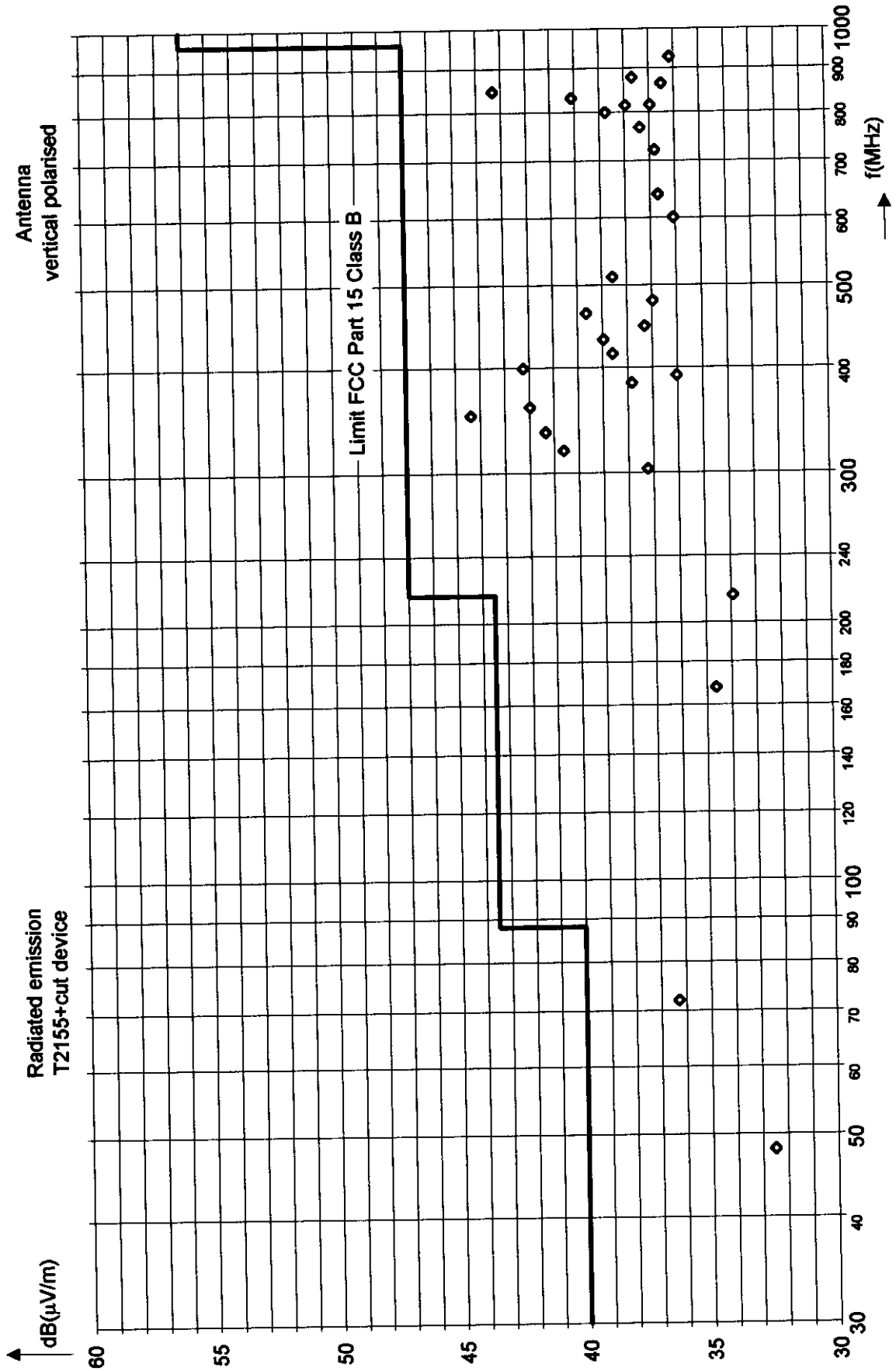
Polarisation of the antenna:
Vertical

Frequency	Measured	+ AF	+ KF	Emission	Limit	Difference	Ant.-	Ant.-
MHz	value	dB/m	dB		dBµV/m	dBµV	Height	Polar.
	dBµV	Antenna	Cable	dBµV/m			meter	H/V
47.939	23.0	8.2	1.3	32.5	40.0	7.5	1.0	V
48.013	23.0	8.2	1.3	32.5	40.0	7.5	1.0	V
72.019	26.0	8.6	1.7	36.3	40.0	3.7	1.0	V
168.043	18.5	13.4	2.7	34.6	43.5	8.9	1.0	V
215.697	15.0	15.8	3.1	33.9	43.5	9.6	1.0	V
303.573	20.0	13.5	3.7	37.2	46.0	8.8	1.8	V
319.549	23.0	13.8	3.8	40.6	46.0	5.4	1.8	V
335.526	23.0	14.5	3.9	41.4	46.0	4.6	1.6	V
351.503	25.0	15.4	4.0	44.4	46.0	1.6	1.5	V
359.491	22.0	16.0	4.0	42.0	46.0	4.0	1.4	V
383.456	18.0	15.7	4.1	37.8	46.0	8.2	1.3	V
391.450	16.0	15.9	4.2	36.0	46.0	10.0	1.3	V
399.438	22.0	16.0	4.2	42.2	46.0	3.8	1.2	V
415.415	18.0	16.3	4.3	38.6	46.0	7.4	1.2	V
431.392	18.0	16.6	4.4	39.0	46.0	7.0	1.2	V
447.368	16.0	16.9	4.5	37.3	46.0	8.7	1.2	V
463.345	18.0	17.1	4.5	39.6	46.0	6.4	1.2	V
479.326	15.0	17.4	4.6	37.0	46.0	9.0	1.2	V
511.279	16.0	17.8	4.7	38.6	46.0	7.4	1.0	V
600.151	12.0	19.0	5.1	36.1	46.0	9.9	1.0	V
639.100	12.0	19.5	5.2	36.7	46.0	9.3	1.0	V
720.181	11.0	20.3	5.5	36.8	46.0	9.2	1.0	V
766.923	11.0	20.8	5.6	37.4	46.0	8.6	1.0	V
798.876	12.0	21.0	5.7	38.8	46.0	7.2	1.0	V
814.852	11.0	21.2	5.8	37.9	46.0	8.1	1.0	V
816.205	10.0	21.2	5.8	37.0	46.0	9.0	1.0	V
830.829	13.0	21.3	5.8	40.1	46.0	5.9	1.0	V
846.806	16.0	21.5	5.9	43.3	46.0	2.7	1.0	V
864.217	9.0	21.6	5.9	36.5	46.0	9.5	1.0	V
878.759	10.0	21.7	5.9	37.7	46.0	8.3	1.0	V
926.698	8.0	22.1	6.1	36.1	46.0	9.9	1.0	V

All other measured emanations were 10 dB or more below the limits.

Summary:

The limits were kept.


Antenna
vertical polarised
Limit FCC Part 15 Class B
Radiated emission
T2155+cut device
dB(µV/m)
60
55
50
45
40
35
30
f(MHz)
30
40
50
60
70
80
90
100
120
140
160
180
200
240
300
400
500
600
700
800
900
1000

3 Results

EMI:

Regulation	Class	Result	Remarks
FCC part 15 limit class B			
Conducted Emission 0.45 - 30MHz	B	kept	
Radiated Emission 30 -1000MHz	B	kept	

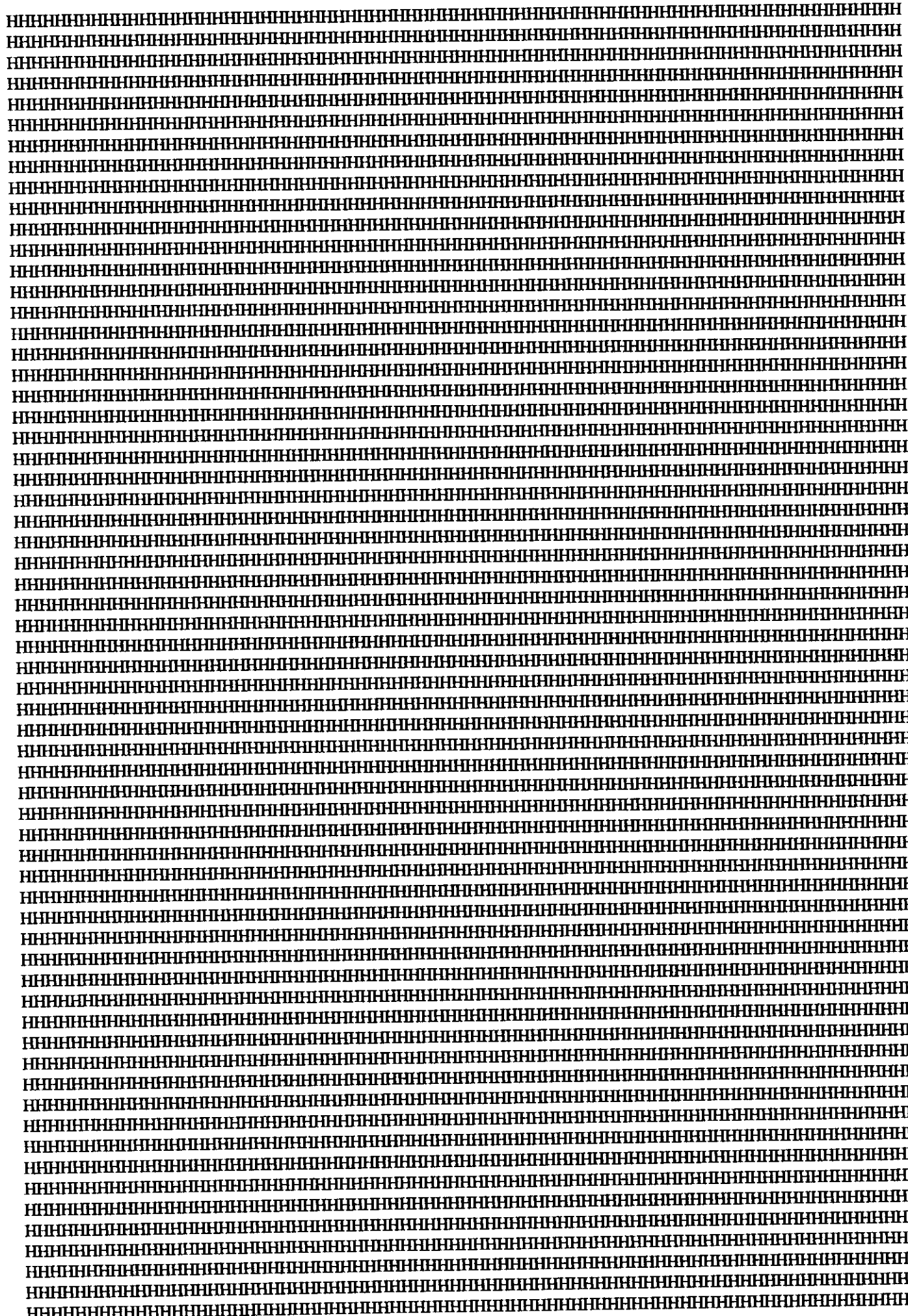
Burgrieden, 03/31/1999

Dipl.Ing.(FH) Christian Vogelmann

4 Appendix

Print Information
- T2155
- HP Deskjet 850C

HHHH



Tally

Tally Computerdrucker GmbH
D-89275 Elchingen
Germany
FCC ID: EUIT2155-70

EXHIBIT C

April 13, 1999
W. Boehm, Dept. TQV

Application for FCC Part 15, Subpart B, Class B Certification

Matrix Printer Model T2155 and T2170

Documentation of Electrical Assemblies

T2170 ASSY 48041 : POWER 47562 + 48015 (IC6 UND FW 48042)
T2155 ASSY 48064 : POWER 47504 + 48018 (IC6 UND FW 48042)

T21XX

MAINS SWITCH 47869

480 MW

POWERS (II) 80kHz
T2170 PCB: 47601 SMD: 47 561 ASSY:47562
T2155 PCB: 47601 SMD: 47603 ASSY:47504

ASSY:47622 (M) 280 MW

FAN. 47046 (O)

CONTROL 15,9744 MHz 250kHz 150kHz
T2170 20kHz PCB: 48013 SMD: 48014 ASSY: 48018 FW:48042 (IB) 110kHz 2,24kHz
T2155 PCB: 48016 SMD: 48017 ASSY: 48018 FW:48042 (IA) 1,84kHz

PARALLEL INTERFACE X3 ON BOARD
RS232 INTERFACE ON BOARD X6

OPTION INTERFACE (MT360-INTERFACES)
2 Centr./RS232
3 RS422
4 SS97
5 20mA C-Loop
6 Ethernet ENI3

OPTION T21XXC ONLY
COLOR MOTOR PCB: 46733 ASSY: 46760 20kHz
1 COLOR MOTOR 63510 (62166)

47527 368 MW

PANEL: 60009 (IV)
PCB: 47807 SMD: 47808 ASSY:47809
280kHz

ASSY: 47620 638 MW
47 632 1165 MW
47 631 1120 MW
615 MW

CONNECT (III) PCB: 48005 ASSY: 48006

PAPER FEET MOTOR 63437
CERRIAGE MOTOR (L) T2170 47668 T2155 64867
FSELECT MOTOR 63441 (63440)
PHDIST MOTOR 63443 (63440)

ASSY: 48027
ASSY: 46807 665 MW
ASSY: 47563 430 MW

PRINT HEAD (J)(K)
T2170 NOK 1/24 PCB: 47818
T2155 NOK 8/24 PCB: 47818

CAR._AD. (A) PCB: 47674 ASSY: 47676

DOUBLE PAPIR END AFI PCB: 48026A
PAPIRMOTION PCB: 48023
(B) 440 MW

680 MW
650 MW
250 MW
400 MW

OPTION S-FEEDER CONTROL PCB: 46733 ASSY: 46760 (1) MOTOR 20kHz

OPTION PCUT CONTROL PCB: 46736 ASSY: 48759 3MHz 20kHz (7) MOTOR

OPTION T2170-2T ONLY
2. TRACTOR CONTROL PCB: 47554 SMD: 47 656 ASSY: 47656 20kHz (8) MOTOR

47836
47 633
100 MW

(I) AGA ASSY: 47640

CLOCK STATION ASSY: 47514 (H)

HEAD FAN. ASSY: 47726 (P)

SHEET FEEDER (D) PCB: 48023 ASSY: 48025

ILOCK SWITCH (E) PCB: 47517 SMD: 47 521 ASSY: 47623

AFI2 (C) PCB: 48023 ASSY: 48024

FSDOPSENS (F) PCB: 47684 ASSY: 48020

OPTSENS (G) PCB: 48021 ASSY: 48022

Peripheral Assemblies, Sensors

NOTE	PCB.REV	CH.REP.NO	DRAW.REV	DATE
-	-	-	-	26.06.1998
REPL.FOR:-	REPL.BY:			

ENGINEER: HOFFART
COPYRIGHT RESERVED BENZ
TALLY
DRAWING BLOCK
PROJECT: T2170
Fri Jan 13 10:22:41 1989
ID-No: 48041 07
SHEET: 1 of: 1

ID-No: 48041 07

Date: 13.04.99 **Name:** Rolf Winterhalder/TEE **File:** fcc2155_70.doc	***Tally Computerdrucker GmbH***

Significant design elements for EMC
Matrix Printer Model T2155, T2170.

1 Generated Frequencies:

1.1 Power-Supply BG 47504 (T2155) or BG 47562 (T2170) ①

Kind	Part Nb.	Frequency	Remarks
Clock	IC3	80kHz	Clock for PWM

1.2 Control-Board BG 48018 (2155) or BG 48015 (T2170) ①A ①B

Kind	Part Nb.	Frequency	Remarks
Clock	G1	15,9744MHz	Clock Processor IC5
Clock	IC15	approx 150kHz	5V DC-DC-Converter
Clock	IC7	approx 20kHz	Horizontal Motor Driver
Clock	IC26, IC28	approx 20kHz	Stepper Motor Driver
Clock	IC18	approx 20kHz	Vertical Motor Driver
Clock	IC23	approx 20kHz	Shift Motor Driver
Clock	IC16 IC17	approx. 250kHz	supply for RS232 Interface
Clock	VA10-VA15	approx 1,8kHz	Needle Driver (only T2155)
Clock	IC50-57	approx 2,2kHz	Needle Driver (only T2170)
Oscillator	V37	approx. 110kHz	Flyback Voltage Provision (only T2170)
Clock	V36	approx. 110kHz	Energy Recovery (only T2170)

1.3 Panel: BG 47809 ④

Kind	Part Nb.	Frequency	Remarks
Clock	IC4	approx. 280kHz	Clock Panel

1.4 Shared Interface-Module Centronics and Serial interface RS 232: BG 046752 ②

Kind	Part Nb.	Frequency	Remarks
Switching	IC4/IC5	approx. 30kHz	supply for RS232 Interface

1.5 Interface Module 20mA BG 046755 ⑤

Kind	Part Nb.	Frequency	Remarks
Clock	V11	approx. 80kHz	DC/DC-Converter

1.6 Option Colour, Sheet Feed Motor Driver BG 046760 ○

Kind	Part Nb.	Frequency	Remarks
Switching	IC2, IC5	approx 20kHz	Motor Driver

1.7 Option Paper Cut BG 046759 ⑦

Kind	Part Nb.	Frequency	Remarks
Clock	IC3/IC4	approx. 20kHz	Motor driver
Clock	Q1	3MHz	Clock for Single Chip Controller IC1

1.8 Option 2. Tractor BG 047556 ⑧

Kind	Part Nb.	Frequency	Remarks
Switching	IC1, IC2	approx. 20kHz	Motor Driver

2 List of Components used for EMI suppression

2.1 Power-Supply BG 47504 (T2155) or BG 47562 (T2170) ⑪ ○

Part	Value	Name	ID-No.	Manufacturer
X-Capacitor	220nF	C16, C19	708512	see attached data sheets
Y-Capacitor	4,7nF	C23, C24	704800	see attached data sheets
Choke	2X10mF	L1	710225	see attached data sheets
Capacitor	1,5nF	C9	710088	see attached data sheets
Resistor	180Ohm	R9	708482	see attached data sheets

2.2 Control-Board BG 48018 (2155) or BG 48015 (T2170) (1A) (1B)

Part	Value	Name	Ident.-Nr	Manufactur.
SMD-Capacitors	330pF	C128, C263*, C247, C232, C256, C261, C248, C240, C223, C262, C260, C247, C239 C231, C222, C207, C199, C264, C224, C233, C216, C249, C257, C241, C237, C253, C196, C206, C190, C221, C246, C230, C238 C259, C254, C195*, C204, C212*, C213*	710331	see attached data sheets
Capacitor	100nF	C13/C91	708660	see attached data sheets
Resistor ***	100R	RA1, RA3, RA5-9, RA11, RA13, RA14**	710213	see attached data sheets
SMD-Ferrite	600R	L114*	710396	see attached data sheets
PCB	4 Layers Multilayer			

* - T2155 only
** - T2170 only
*** - Serial Resistor in adress- and databus

2.3 Shared Interface-Module Centronics and Serial RS232 BG 046752 (2)

Part	Value	Name	ID-No.	Manufacturer
Choke	2,25uH	L1, L2	708518	see attached data sheets

2.4 Interface Module 20mA BG 046755 (5)

Part	Value	Name	ID-No.	Manufacturer
EMIFIL		L1-5	710061	see attached data sheets

2.5 Interface module RS422/SS97 BG 047144/047145 (3) (4)

Part	Value	Name	ID-No.	Manufacturer
EMIFIL		L1-7	710061	see attached data sheets

2.6 Option Paper Cut BG 046759 (7)

Part	Value	Name	ID-No.	Manufacturer
Y-Capacitor	1,5nF			built in by manufacturer
Inductor	2,5uH			built in by manufacturer
Inductor	10uH 5A			built in by manufacturer

2.7 DC-MotorBG 047567 (L)

Part	Value	Name	ID-No.	Manufacturer
Ferrite Core	D16,5/8mm, N=1,5		710242	see attached data sheets

2.8 Cable Connection from Power Supply to Logic Board BG 047522 (M)

Part	Value	Name	ID-No.	Manufacturer
Ferrite Core	D16,5/8mm, N=2,5		710242	see attached data sheets

3 Constructive measures for EMI-suppression

3.1
Full shielded power supply. Shield built of two parts of zinc plated steel, which enclose the power supply PCB.

3.2
U-shaped sheet metal of zinc plated steel under the control board. The board is fixed with the plate by two screws and the chassis is connected to the PCB-filter capacitors. Also is the metal shield of the centronics interface connector screwed to the metal plate. The metal plate is connected to the power supply shield via 3 screws.

3.3
A contact spring, zinc plated steel, under the printer housing connects the metal plate of 3.2. with the metal shield of the additional interface module

3.4
Option additional interface: Metal cover of the additional interface module connects 3.2 and 3.3.

3.5
Optional Cutting Device: Full metal enclosure on top of Printer.

Tally

Tally Computerdrucker GmbH
D-89275 Elchingen
Germany
FCC ID: EUIT2155-70

EXHIBIT C

April 13, 1999
W. Boehm, Dept. TQV

Application for FCC Part 15, Subpart B, Class B Certification

Matrix Printer Model T2155 and T2170

Documentation of Electrical Assemblies

4 Data Sheets

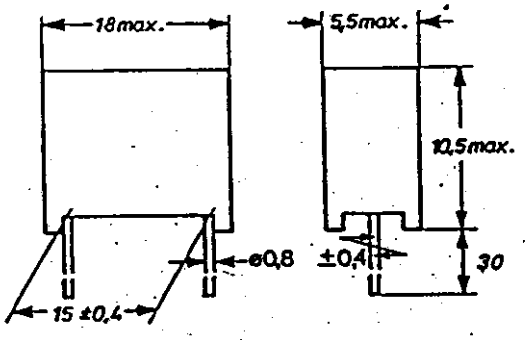
Attached in Order of ID. No.:

ID No.	Part	Rating	Comments
704800	Y Capacitor	4700 pF	
708482	Resistor	180 Ω	
708512	X Capacitor	220 nF	
708518	Choke	2.25 uH	
708660	Capacitor	100 nF	
710061	EMIFIL	70 Ω/100MHz	
710088	Capacitor	1500 pF	
710213	Resistor	100 Ω	
710225	Choke	2 x 10 mH	
710242	Ferrite core	D16.5 / 8mm	
710331	SMD Capacitor	330 pF	
710391	SMD Ferrite	600 Ω	
?	Choke	10 uH, 5 A	at cutter motor

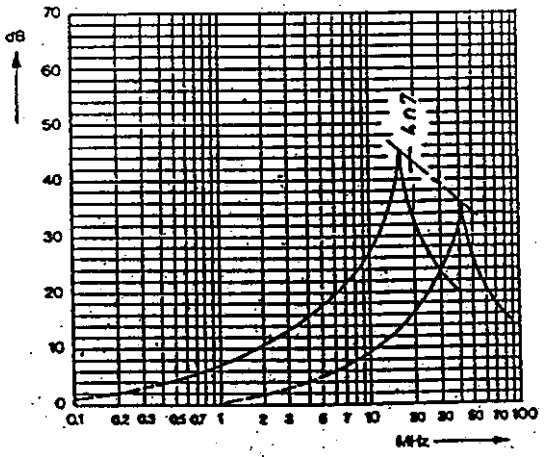
N 60525-0

Technische Unterlagen:	VDE 565, Teil 1, IEC-Publication 384-14; UL 1414 DIN 40040; VDE 0860 Teil 1/8.81 § 14.2 (IEC 65 § 14.2)
Dielektrikum:	Polyester-Film
Belag:	Aluminium aufgedampft
Umhüllung:	Kunststoffgehäuse grün, gießharzvergossen, flammhemmend
Anwendungsklasse:	HMF nach DIN 40040
Prüfklasse:	25 / 085 / 21 / nach IEC 68-1 bzw. DIN 40045
Nennspannung:	250 V~; 50 / 60 Hz
Kapazitätstoleranz:	≤ 0,1 µF ± 20 %
Verlustfaktor tan δ:	< 1 % gemessen bei 1 kHz
Isolationswiderstand:	für C ≤ 0,33 µF 15000 MΩ Mindestanlieferungswert
Prüfspannung: **(Belag / Belag)**	3000 V–; 2 sec. 2000 V~ 2 sec.
Impulsbelastung:	d_u / d_t nach VDE 565-1 100 V / µsec. bei vollem Spannungshub
Prüfzeichen:	VDE 565-1 Klasse Y
	VDE 860-1 / 8.81 § 14.2 (IEC 65 § 14.2)
	SEV 1055, 1978 – beantragt –
	USA 1414 – beantragt –
	SEMKO, DEMKO, NEMKO, FEMKO: IEC 65 § 14.2 – beantragt –

Maßbild:



Anschlüsse:
verzinnter Cu-Draht, radial im Rastermaß herausgeführt.



Einfügungsdämpfung *
Typenreihe F 1710 Klasse Y
Richtwerte

*** Messung im 50 Ω-System**
Anschlüsse je 6 mm

Basistyp:
F1710-247-1900
Fa. Roederstein

ACHTUNG!
Von einer Zulassung
betroffenes Teil
VDE, UL, CSA

ⓑ

Entstörkondensator
4,7nF / 250V~

MANNESMANN TALLY GMBH	9494	-1xb-	13-7-90	Ha.	

Zeichnungs-Nr.: 704 800 / 10
BL-Nr.:
Folgebl.:

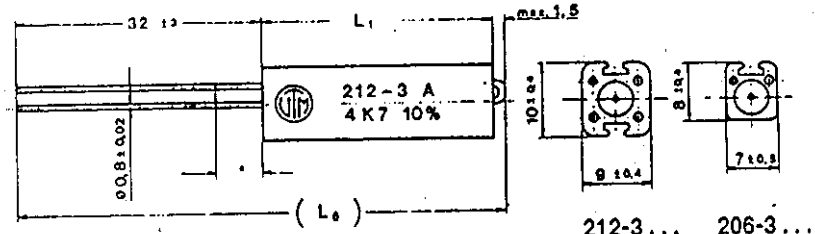
ochlast-Drahtwiderstände
rtikal, Glasfaserträger, Keramikgehäuse

chnische Daten:

Typ	Nennbelastbarkeit [W] ϑ_u = 70°C	Widerstandswerte Min 10%	Min 5%	Max	Abmessungen L_1 [mm]	Therm. Wid. [KW^{-1}]
06-3/5	4	R056	R10	9K1	20 ± 1,0	65
08-3/5	5	R075	R15	15K	25 ± 1,0	50
10-3/5	7	R11	R33	33K	38 ± 1,0	40
12-3/5	7	R075	R15	15K	25 ± 1,0	40
14-3/5	9	R11	R33	33K	38 ± 1,0	30
16-3/5	11	R15	R51	47K	50 ± 1,5	25
18-3/5	17	R27	R91	82K	75 ± 2,0	15

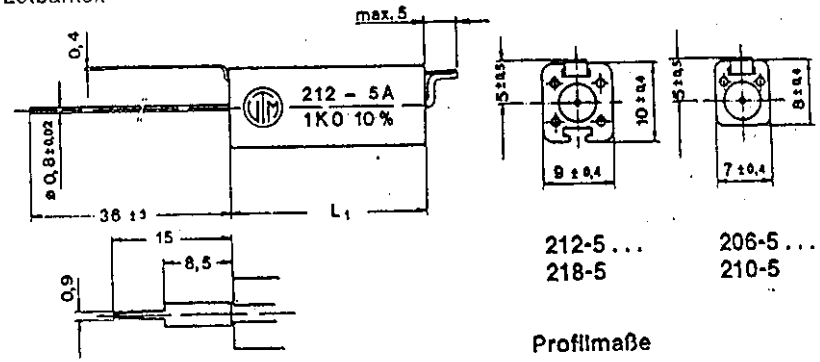
rtreihe		E 24 (5%), E12 (10%)
eranzen	%	± 5, ± 10
mperaturkoeffizient	$10^{-6}K^{-1}$	−80...+500, siehe auch Seite 36
x. zul. Betriebsspannung	V_{eff}	$\sqrt{P_{70} \cdot R}$ für alle Bauformen
rmischer Widerstand	KW^{-1}	siehe oben
ationsspannung	V_{eff}	2000
ationswiderstand	Ω	> 10^4M
nakategorie	—	55 / 200 / 21
mperaturbereich	°C	−55 . . . 350
tminderung	—	linear von 70°C bis 350°C (0W)
sfallrate (Totalausfall, max., 60% conf. Lev.)	$10^{-9}h^{-1}$	ca. 100, wertabhängig
gzeitkonstanz	%	± 3,0 im Mittel
$_{70}$, 70°C, 1000 h)		
uchte Wärme, konstant	%	± 2,0
0°C, 93% r.F., 21 d)		
nafolgeprüfung	%	± 2,0
EC 115 - 1/23)		
ch. Widerstandsfähigkeit	%	± 1,0
er Anschlüsse		
gbelastbarkeit	N	50
er Anschlüsse		
wärmebeständigkeit	%	± 0,2 typ.
60°C, 10 s, 3 mm)		
barkeit der nschlüsse	s	2,5, Umschließungszeit Lötkugelmethode, IEC-68-2-20T DIN 45921 - Teil 2
rmen		
stellbezeichnung:		z.B. 208-3, 1R0, 5%, V0
rpackungseinheiten:		lose, 206...216-3 : 200 Stck., 218-3 : 100 Stck. (V0) 206...210-5 : 200 Stck., 212-5 : 150 Stck. (V0) 214...216-5 : 200 Stck., 218-5 : 100 Stck. (V0)

Abmessungen: Vorzugsversion



212-3 . . . 206-3 . . .
218-3 210-3

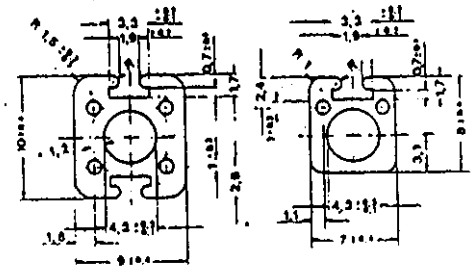
* 6 mm, in diesem Bereich eingeschränkte Lötbarkeit



212-5 . . . 206-5 . . .
218-5 210-5

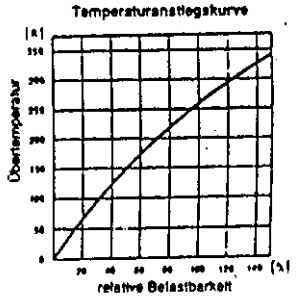
Profilmaße

Wertkennzeichnung:
Klartext-Aufdruck

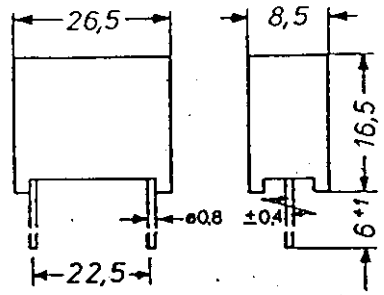


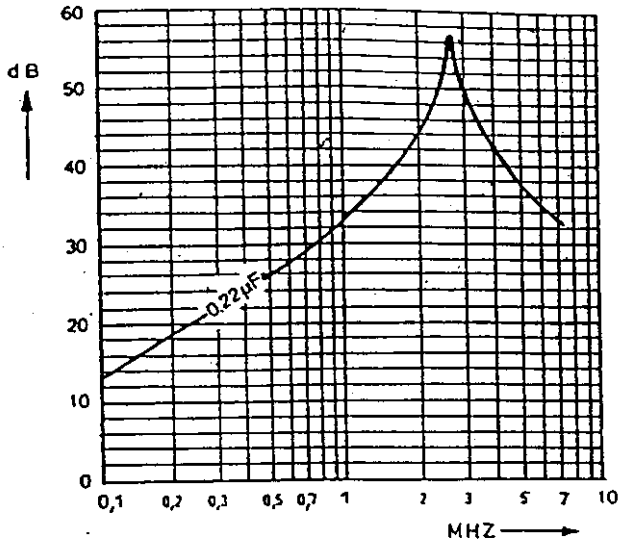
212 . . . 218 206 . . . 210

Temperaturerhöhung:
(im Hot-spot)



Maßbild:





Einfügungsdämpfung — Messung im 60 Ω-System, Anschlüsse je 6 mm

Umhüllung:	Kunststoffgehäuse, gießharzvergossen, flammhemmend	
Anschlüsse:	verzinnter Cu-Draht, radial im Rastermaß herausgeführt	
Prüfzeichen:	VDE	565-1, Klasse X 2
	IMQ	CEI 40-7
	SEMKO	SEN 432901
	DEMKO	Reglementet AF 1962/C/afsnit 21
	USA	UL 1283
	SEV	1055, 1978 – beantragt –
	ÖVE	F 22 / 1974

Technische Unterlagen:	VDE 565, Teil 1, IEC-Publication 161 DIN 40040
Dielektrikum:	Polyester-Film
Belag:	Aluminium aufgedampft
Anwendungsklasse:	≤ 1 µF = HMF ~~> 1 µF = HPF~~ nach DIN 40040
Prüfklasse:	25 / 085 / 21 / nach IEC 68-1 bzw. DIN 40045
Nennspannung:	250 V~; 50 / 60 Hz
Kapazitätstoleranz:	> 0,1 µF ± 10 %
Verlustfaktor tan δ:	< 1 % gemessen bei 1 kHz
Isolationswiderstand:	für C ≤ 0,33 µF 3×10^4 MΩ Mittlerer Anlieferungswert 1×10^4 MΩ Mindestanlieferungswert
Zeitkonstante:	für C > 0,33 µF 10000 sec. Mittlerer Anlieferungswert 3000 sec. Mindestanlieferungswert
Prüfspannung: (Belag / Belag)	1075 V–; 2 sec. (einzelne Aushelleffekte zugelassen)
Impulsbelastung:	d_u / d_t nach VDE 565-1 100 V / µsec. bei vollem Spannungshub

Von der Zulassung betroffenes Teil!			
VDE	X	UL	X
FTZ	X	CSA	
ZZF	X	FCC	X

©

Bestellbez.:

F 1772-422-2900 = gegurtet

F 1772-422-2000 = lose

Fa. Roederstein

Gez.	9.9.	Ha.	9494 NT1	-1xc-	25-9-90	Ha.	
Gepr.			9242 NT2	-b-	14-10-86	Ha.	
Gen.			9187	-a-	04-12-85	Ha.	
Norm.			9085 NT.5	—	9.9.85	Ha.	
1985	Datum	Name	Änderung / Änd.-Nr	Index	Datum	Name	Mittrel.

Werkstoff: | Fertigeinheit: | Maßstab: % | Abt.: M-TAT

Paßmaß | Ob. Abm. | Unt. Abm.

Nicht bemaßte Kanten nach DIN 6784:

Oberflächenbeschaffenheit nach DIN ISO 1302
Vorzugsmeßgrößen: R_a-Werte
▽ ▽ roh 12,5 ▽ 3,2 ▽ 0,8 ▽ 0,2

Halbzeug / Rohteil: | Power Nr.: | Mittrel.:

MANNESMANN TALLY GMBH

Bezeichnung:

Entstörkondensator 220nF I 250V~

Zeichnungs-Nr.: 708 512 / 1 | 10 | Bl. | von | Bl.

Allgemeine technische Daten:

Technische Unterlagen:
DIN 41260
DIN 40040
VDE 0565 Teil 2

Kernmaterial:
Ferrit

Wicklung:
CuL-Draht / Cu-Draht verzinnt

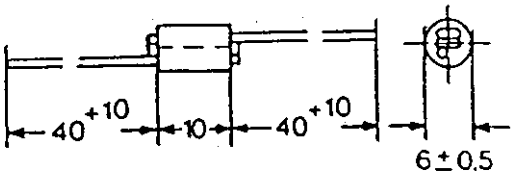
Anschlüsse:
Wicklungsdraht beidseitig herausgeführt, Enden verzinnt

Anwendungsklasse:
H L F nach DIN 40040

Temperaturbereich:
–25°C bis +100°C

Schaltbild:

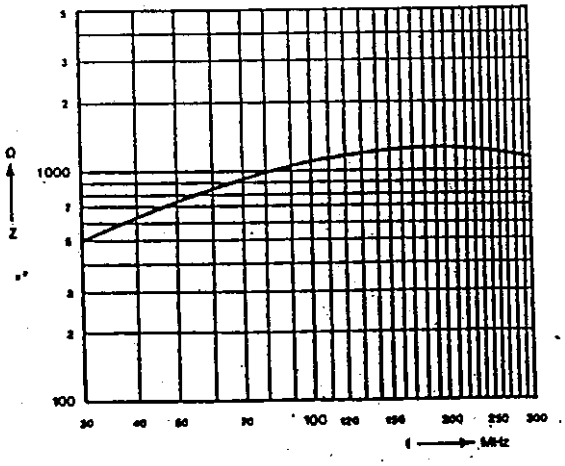
Nennspannung:
250 V~ für isolierte Bauformen



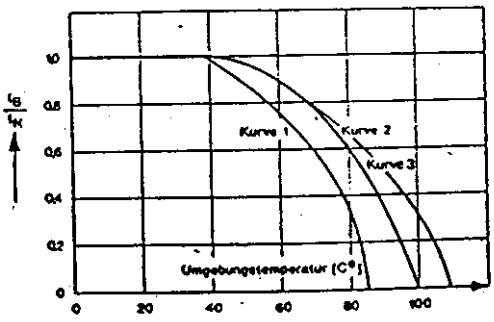
Nennstrom (A) DB	Mindest-induktivität µH	Gleichstrom-widerstand mΩ Richtwert
2,5	2,25	13

Prüfzeichen:

Land	Prüfstelle	Norm	Ausweis-Nr.	Freigabezeichen
Deutschland	VDE	0565 Teil 2	27906	



Scheinwiderstand Z in Abhängigkeit von der Frequenz f.
(Richtwerte)



Kurve 1: max. Betriebstemperatur 85°
I_B: max. Betriebsstrom
Kurve 2: max. Betriebstemperatur 100°C
I_N: Nennstrom bei Umgebungstemperatur +40°C
Kurve 3: max. Betriebstemperatur 110°C

Basistyp: F1750-003-013

Fa. Roederstein

MANNESMANN TALLY GMBH ESCHINGEN	Drossel	Zeichnungs-Nr.: 708 518 / 10	Bl.-Nr.: Folgebl.:

Klasse 1

Eigenschaften

- annähernd lineare Abhängigkeit der Kapazitätsänderung von der Temperatur
- definierter Temperaturkoeffizient der Kapazität
- hohe Stabilität des Kapazitätswertes
- niedrige Verluste
- hoher Isolationswiderstand
- enge Kapazitätstoleranzen
- keine Spannungsabhängigkeit der Kapazität und des Verlustfaktors

Anwendungen

z. B.

- Schwingkreise
- Filterschaltungen
- Temperaturkompensation
- Kopplung und Siebung, besonders in HF-Kreisen

Klasse 2

Eigenschaften

- große Kapazitätswerte bei kleinen Abmessungen
- nichtlineare Abhängigkeit der Kapazität von Temperatur und Spannung
- geringere Stabilität des Kapazitätswertes
- größere Verluste
- hoher Isolationswiderstand
- größere Kapazitätstoleranzen

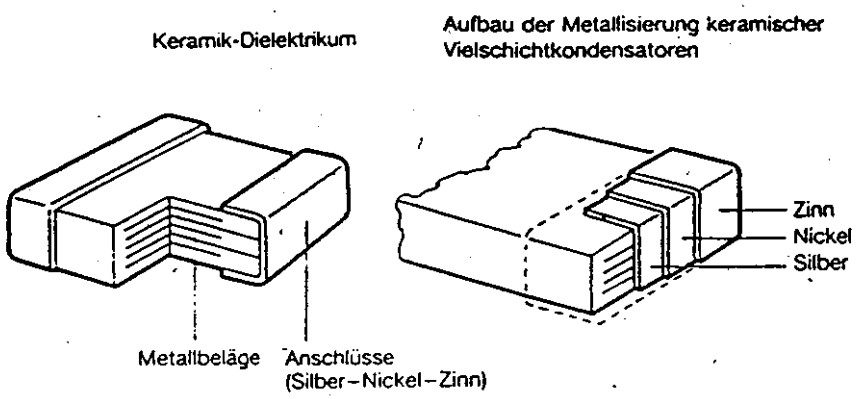
Anwendungen

z. B.

- Kopplung
- Entkopplung
- Funk-Entstörung bei Kleinspannung

Kurzdaten

Keramikart IEC-/CECC-Bezeichnung EIA-Bezeichnung[1]		CG COG	– X7R	2C1 –	– Z5U	2F4 –
Dielektrikum		Klasse 1	Klasse 2			
Temperaturbereich		–55… +125 °C	–55… +125 °C		+10… +85 °C	–25… +85 °C
Max. Kapazitätsänderung $\Delta C/C_{20}$[1] im Temperaturbereich	mit $U_{Meß}$	±30 · 10^{-6}/K	±15%	±20%	+22/–56%	+30/–80%
	mit U_N		–	+20/–30%	–	+30/–90%
Spannungstest		2,5 · U_N				
Verlustfaktor tan δ in 10^{-3} (Grenzwert)	>50 pF	<1,5	<25		<30	
	≤50 pF	$<1{,}5 \cdot \left(\frac{15}{C} + 0{,}7\right)$				
Isolationswiderstand[2] R_{is}	bei 25 °C	>10^5 MΩ	>10^5 MΩ		>10^4 MΩ	
	bei 125 °C	>10^4 MΩ	>10^4 MΩ		–	
Zeitkonstante τ[2] (MΩ · µF)	bei 25 °C	>1000 s	>1000 s		>500 s	
	bei 125 °C	> 100 s	> 100 s		–	
Alterung (Richtwert) Kapazitätsänderung für jede logarithmische Zeitdekade		–	±2%		–5%	
Lieferbare Kapazitätswerte		E12	E12		E6	



Für Chip-Kondensatoren wurde die CECC-Bauartzulassung eingeleitet. Die Fertigung wird bereits nach CECC-Spezifikationen durchgeführt.

Anwendungsbereiche

- Datentechnik
- Nachrichtentechnik
- Uhren-, Fotoindustrie
- Raumfahrt
- Militär-Elektronik
- Kfz-Elektronik
- Medizinische Technik

Eigenschaften

- sehr kleine Abmessungen
- hohe Volumenkapazität
- gut lötbar bei Schwall-, Reflow-Lötung
- klebbar
- zuverlässig und klimabeständig (56 Tage nach IEC)
- beständig gegen Silbermigration
- induktivitätsarm
- polungsunabhängig
- automatisch bestückbar

Sichere und langlebige Kontaktierung

Anforderungen an die Lötflächen:

- gute Benetzbarkeit (auch nach langer Lagerung)
- Ablegierbeständigkeit (sowohl beim Lötvorgang als auch im Betrieb)
- gute Haftung der Lötflächen am Kondensator
- Erfüllung der elektrischen und geometrischen Bedingungen

Um diese Forderungen zu erfüllen, verfügen Siemens-Chip-Kondensatoren über eine spezielle Kontaktierung:

- Verbindung der Innenelektroden/Lötfläche aus Silber
- Als Diffusionssperre wird das Silber durch eine Nickelschicht geschützt
- Die Deckschicht der Metallisierung besteht aus Zinn und gewährleistet eine innige Lötverbindung

Weitere Einzelheiten siehe Sonderdruck »Keramische Vielschichtkondensatoren mit ablegierbeständigen Lötflächen«. Bestell-Nr. B4-2942.

Einbauhinweise (Löten und Leitkleben) siehe Seite 16.

Übersicht

Keramikart / Baugröße	Kapazitätsbereich 0805	1206	1210	1812	2220	Kap.-Toleranz	Nennspannung	Temp.-Bereich
COG CG	1 pF bis 560 pF	1 pF bis 1000 pF	330 pF bis 3300 pF	1000 pF bis 6800 pF	1500 pF bis 15000 pF	±0,25 pF ±0,5 pF ±5% ±10%	63 V- 100 V-	–55 bis +125 °C
X7R 2C1	470 pF bis 15000 pF	1000 pF bis 33000 pF	8200 pF bis 0,12 µF	33000 pF bis 0,27 µF	47000 pF bis 0,68 µF	±10% ±20%	63 V- 100 V-	–55 bis +125 °C
Z5U 2F4	10000 pF bis 47000 pF	10000 pF bis 0,10 µF	0,10 µF bis 0,22 µF	0,22 µF bis 0,47 µF	0,47 µF bis 1,5 µF	±20%	63 V-	+10 bis +85 °C –25 bis +85 °C

Meß- und Prüfbedingungen

Kapazitäts-Messung

Kapazitäts-Meßbedingungen entsprechend MIL-STD-202 F, Methode 305

Meßfrequenz:
1 MHz ± 0,2 MHz für Kapazitäten ≤1000 pF
1 kHz ± 0,2 kHz für Kapazitäten >1000 pF

Meßspannung:
1 V_{eff} ± 0,2 V
für COG-X7R-Kondensatoren
0,5 V_{eff} ± 0,1 V
für Z5U-Kondensatoren

Meßtemperatur:
25 °C ± 1 °C

Verlustfaktor-Messung

Die Verlustfaktor-Meßbedingungen sind identisch mit den Kapazitätsmeßbedingungen.

Isolationswiderstands-Messung

Meßbedingungen entsprechend MIL-STD-202 F, Methode 302.
Die Meßspannung ist gleich der Nennspannung. Der Ladestrom darf 50 mA nicht übersteigen, die Ladezeit beträgt max. 2 Min.
Bei großen Kapazitätswerten wird die Zeitkonstante der Isolation $\tau = C \cdot R_{is}$ angegeben.
Übliche Einheiten der Zeitkonstante: s, MΩ · µF oder Ω · F

Spannungsprüfung

Prüfbedingungen entsprechend MIL-STD-202 F, Methode 301.
Prüfspannung: 2,5 · Nennspannung.
Der Ladestrom darf 50 mA nicht übersteigen. Prüfdauer: 5 s

Beständigkeitsprüfung gegen Lötwärme

Chip-Kondensatoren

Prüfbedingungen entsprechend MIL-STD-202 F, Methode 210 A, Testbedingung B:
260 °C ± 5 °C, 10 ± 1 s

Kapazitätsänderung:

COG, CG	≤ 1% oder 0,5 pF (es gilt der größere Wert)
X7R, 2C1	≤ –5/+10%
Z5U, 2F4	≤ ± 20%

Feuchtigkeitsprüfung

Prüfbedingungen entsprechend MIL-STD-202 F, Methode 103 B, Testbedingung D (konstante Feuchte):

Testtemperatur:	40 °C ± 2 °C
Relative Feuchte:	93 $^{+2}_{-3}$ %
Prüfspannung:	Nennspannung

Zulässige Änderungen

Kapazitätsänderungen:

COG, CG	≤ 2% oder 1 pF (es gilt der größere Wert)
X7R, 2C1	≤ ± 10%
Z5U, 2F4	≤ ± 20%

tan δ-Änderungen:

COG, CG	≤ $3 \cdot 10^{-3}$
X7R, 2C1	≤ $50 \cdot 10^{-3}$
Z5U, 2F4	≤ $70 \cdot 10^{-3}$

Isolationswiderstand:

COG, CG	≥ $5 \cdot 10^3$ MΩ
X7R, 2C1	≥ 10^3 MΩ oder ≥25 s (es gilt der kleinere Wert)
Z5U, 2F4	≥ 1000 MΩ oder ≥25 s (es gilt der kleinere Wert)

Lebensdauerprüfung

Prüfbedingungen entsprechend MIL-STD-202 F, Methode 108 A.

Beanspruchung:	obere Kategorietemperatur
Prüfspannung:	1,5 · Nennspannung
Zeitdauer:	1000 Stunden

Zulässige Änderungen

Kapazitätsänderungen:

COG, CG	≤ 3% oder 1 pF (es gilt der größere Wert)
X7R, 2C1	≤ ± 20%
Z5U, 2F4	≤ ± 20%

tan δ-Änderungen:

COG, CG	≤ $3 \cdot 10^{-3}$
X7R, 2C1	≤ $50 \cdot 10^{-3}$
Z5U, 2F4	≤ $70 \cdot 10^{-3}$

Isolationswiderstand:

COG, CG	≥ 10^4 M
X7R, 2C1	≥ $2 \cdot 10^3$ MΩ oder ≥50 s (es gilt der kleinere Wert)
Z5U, 2F4	≥ $2 \cdot 10^3$ MΩ oder ≥50 s (es gilt der kleinere Wert)

Entflammbarkeitsprüfung

Prüfbedingungen entsprechend MIL-STD-202 F, Methode 111 A. Maximal zulässige Brenndauer: ≤15 s

Lösungsmittelbeständigkeit

entsprechend MIL-STD-202 E, Methode 215

Hinweis

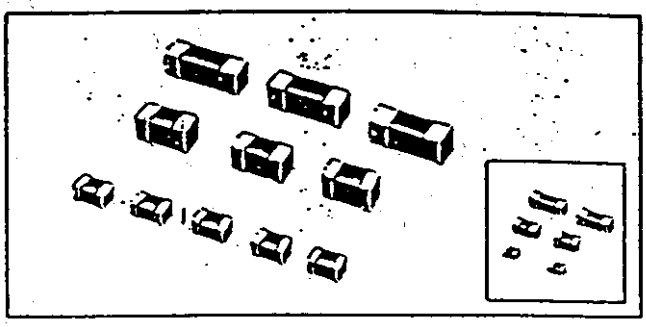
Bei Kondensatoren der Klasse 2 verändert sich die Kapazität bei Spannungs- und/oder Temperaturbeanspruchung. Wenn die Messungen unmittelbar nach einer Spannungsprüfung, Isolationsprüfung oder Prüfung mit thermischer Beanspruchung durchgeführt werden, können sich Kapazitätstoleranz-Überschreitungen zeigen.

CHIP SOLID INDUCTOR

Chip Solid Inductor **BLM21/31/41** Series

Suppresses EMI and Prevents Abnormal Oscillation, Mountable at 2.5mm Pitch.

Chip solid inductor BLM series is excellent in noise suppression from several MHz to several hundreds of MHz and prevents abnormal oscillation of high frequency amplifying circuits.



■FEATURES

1. Excellent for high-density mounting at a uniform pitch of 2.5mm or 2.0mm.
2. Simple structure.Elimination of stray capacitance up to 1GHz effectively suppresses high-frequency noise ranging from several MHz to several hundred MHz.
3. The super-miniature,high-impedance BLM21A05 demonstrates excellent noise suppression.
   - Size : 2.0 × 1.25 × 0.9 (mm)
   - Impedance : 120Ω (Typ.) at 100MHz
4. BLM21B03 is ideal for preventing abnormal oscillation in tuners and similar electronic equipment.
5. Nickel-barrier structure of external electrodes provides excellent solder heat resistance, thus accomodating component soldering by flow or reflow method.

■APPLICATIONS

Computers, and peripherals, TVS, VCRS, car-electronic equipment, tuners, etc.

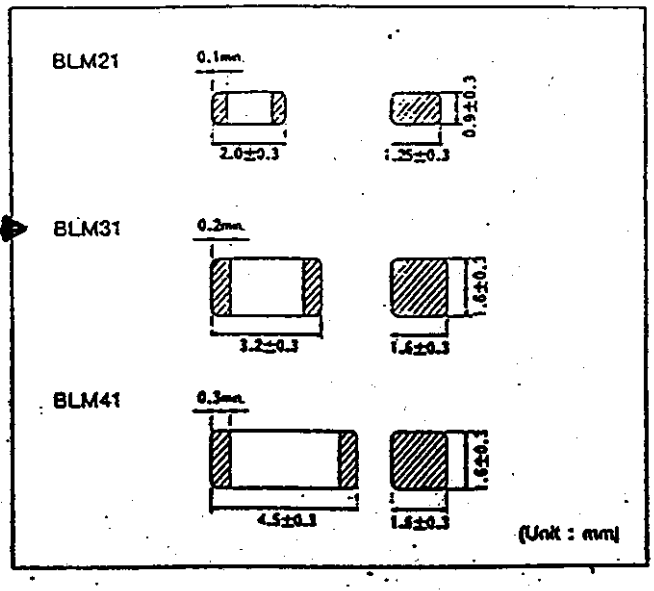
■PART NUMBERING

(※ Please specify the part number when ordering.)

(Ex.) BLM ❶ | 31 ❷ | A02 ❸ | PB ❹

❶Chip solid inductor.
❷Type.
❸Characteristics.
❹Packaging code.
PB : Bulk package
PT : Taped

■DIMENSIONS



■RATING

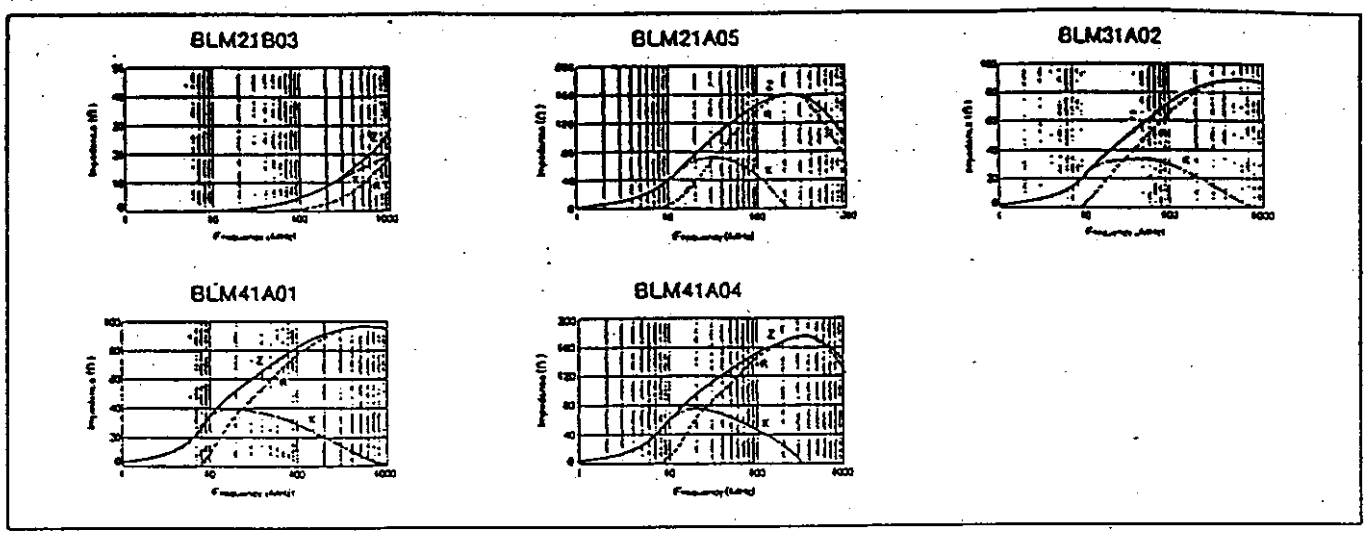
Characteristics / Part Number	Impedance (Ω) (Typ.) at 100MHz	Rated Current (mA)	DC resistance (Ω max)
BLM21A05	120	200	0.6
BLM21B03	5	500	0.2
BLM31A02	70	200	0.5
BLM41A01	80	500	0.3
BLM41A04	150	200	0.7

CHIP SOLID INDUCTOR

muRata

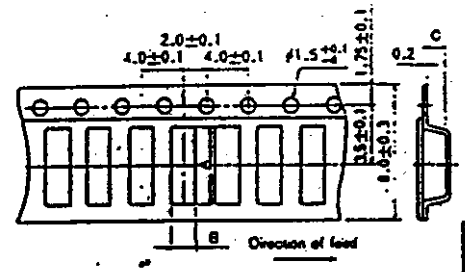
Chip Solid Inductor BLM21/31/41 Series

■IMPEDANCE FREQUENCY CHARACTERISTICS



■DIMENSIONS OF PLASTIC TAPE (based on EIAJ RC-10098)

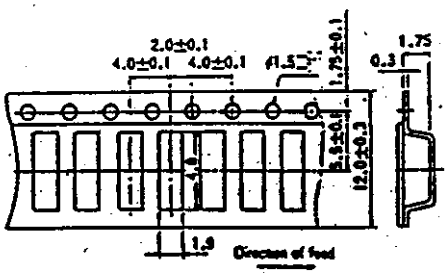
BLM21/31 (8mm width plastic tape)



	A	B	C
BLM21*	2.8	1.55	1.05
BLM31*	3.5	1.9	1.75

Packaging unit : BLM21---4000pcs/reel (φ180mm)
BLM31---2500pcs/reel (φ180mm)

BLM41 (12mm width plastic tape)

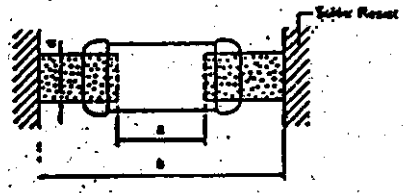


Packaging unit---2500pcs/reel (φ180mm)

(Unit : mm)

■CAUTIONS FOR USE

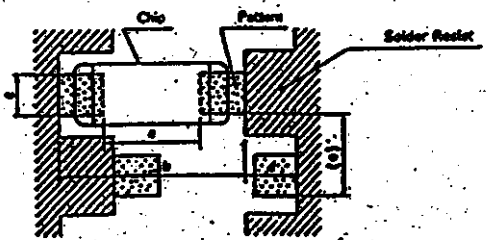
(1) Land Dimensions



Type		BLM21	BLM31	BLM41
Length	L	2.0	3.2	4.5
	W	1.25	1.6	1.6
c		1.2	2.0	2.0
b		3.0---4.0	4.2---5.2	5.5---6.5
a		1.0	1.2	1.2

(Unit : mm)

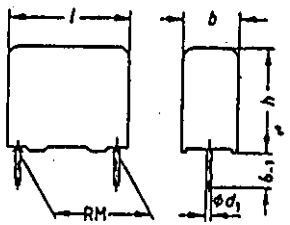
(2) Land Dimension For High Density Mounting



Type	BLM21	BLM31	BLM41
a	1.2	2.0	3.0
b	3.0---4.0	4.2---5.2	5.5---6.5
c	1.0	1.2	1.2
d	0.8	1.3	1.8
e	2.0	2.5	2.5

(Unit : mm)

für erhöhte Anforderungen



Abmessungen in mm

Aufbau

- Dielektrikum: Polyethylenterephthalat
- Schichttechnologie von Rastermaß 5 bis 15 mm
- eingebaut in Kunststoffgehäuse (flammhemmend nach UL 94 V-0)
- Epoxidharzverguß

Anschlüsse

- parallele Anschlußdrähte, verzinnt

Beschriftung

- Mindestangabe: Herstellerzeichen, Kapazität, Kap.-Toleranz, Nennspannung, Herstelldatum

Gurtung

- gegurtet lieferbar; Einzelheiten siehe Kapitel „Gurtung"

Rastermaß RM ± 0,4 mm	Länge $l_{max.}$ mm	Drahtdurchmesser d_1 mm	Bauform
5,0	7,2	0,5	B 32539
7,5	10,0	0,6	B 32530
10,0	13,0	0,6	B 32531
15,0	18,0	0,8	B 32532
22,5	26,5	0,8	B 32533
27,5	31,5	0,8	B 32534

Eigenschaften

- für erhöhte Anforderungen nach DIN 44122
- sehr gutes Selbstheilverhalten
- hohe Impulsfestigkeit
- hohe Volumenkapazität
- geringe Eigeninduktivität

Typische Anwendungen

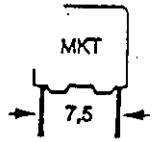
- Sperren von Gleichstrom
- Koppeln von Signalen bis in den VHF-Bereich
- Einsatz in Impuls-, Logik- und Zeitgeberschaltungen
- Einsatz in Filter- und Entstörschaltungen

Gütebestätigung

- CECC 30401-026 CECC-Zulassung für RM 5 mm (100 bis 400 V–) sowie RM 10 bis RM 22,5 mm (63 V–) in Vorbereitung

Bauartspezifikation

- DIN 44122



Rastermaß	7,5 mm			
Nennspannung U_R	63 V–	100 V–	250 V–	400 V–
Zulässige Wechselspannung U_{ss} bis 60 Hz	40 V~	63 V~	160 V~	200 V~
Nennkapazität C_N	Abmessungen $b_{max.} \times h_{max.} \times l_{max.}$ (mm) Bestellbezeichnung: B 32530... (siehe Seite 220)			
1,0 nF				3,0×8,0×10,0
1,5 nF				3,0×8,0×10,0
2,2 nF				3,0×8,0×10,0
3,3 nF				3,0×8,0×10,0
4,7 nF				3,0×8,0×10,0
6,8 nF				3,0×8,0×10,0
10 nF				3,0×8,0×10,0
15 nF			3,0×8,0×10,0	3,0×8,0×10,0
22 nF			3,0×8,0×10,0	4,0×8,5×10,0
33 nF			3,0×8,0×10,0	5,0×10,5×10,0
47 nF		3,0×8,0×10,0	4,0×8,5×10,0	5,0×10,5×10,0
68 nF	3,0×8,0×10,0	3,0×8,0×10,0	5,0×10,5×10,0	6,0×12,0×10,0
0,10 µF	3,0×8,0×10,0	3,0×8,0×10,0	5,0×10,5×10,0	
0,15 µF	3,0×8,0×10,0	3,0×8,0×10,0	6,0×12,0×10,0	
0,22 µF	3,0×8,0×10,0	4,0×8,5×10,0		
0,33 µF	4,0×8,5×10,0	5,0×10,5×10,0		
0,47 µF	5,0×10,5×10,0	6,0×12,0×10,0		
0,68 µF	5,0×10,5×10,0	6,0×12,0×10,0		
1,0 µF	6,0×12,0×10,0			

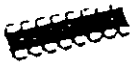
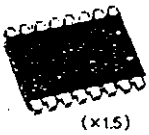
Kapazitätstoleranzen ± 10%, ± 5%

Resistor Chip Networks 〈Surface Mounted Types〉

Two new smallest resistor chip networks are now available. The MNR02, the smallest resistor network in the world and MNR35 which fits into a high densed packaging. These chip networks surely facilitate in building highly reliable, compact industrial equipment.

●Dimensions list

(Unit : mm)

Type	MNR02	MNR12	MNR14	MNR32	MNR34	MNR35	MNR38	MNR78
Dimensions	1.0 / 1.0 (1010)	1.6 / 1.6 (1616)	3.2 / 1.6 (3216)	2.6 / 3.1 (2631)	5.2 / 3.1 (52531)	6.4 / 3.1 (6431)	10.3 / 3.1 (1031)	10.3 / 7.6 (1076)
Real size								
Magnification Dimensions (×2.0)							 (×1.5)	 (×1.5)

Type	No.of elements	Rated dissipation (70℃)	Maximum working voltage (V)	Resistance tolerance	Resistance range	Operating ambient temperature (℃)
MNR02	2	0.063W/Device	25	J (±5%)	10Ω~1MΩ (E12 Series)	−55~125
MNR12	2	0.063W/Device	12			−40~125
MNR14	4	0.063W/Device	12			
MNR32	2	0.063W/Device	50		22Ω~1MΩ (E12 Series)	
MNR34	4	0.063W/Device	50		22Ω~1MΩ (E12 Series)	
MNR35	8	0.063W/Device	50		100Ω~100kΩ (E6 Series)	
MNR38	8	0.063W/Device	50		22Ω~1MΩ (E12 Series)	
MNR78	8~16	0.063W/Device	50		100Ω~330kΩ (E12 Series)	

●Ordering Designation

P2	MNR12/14/78	Bulk	Polyethylene bag
P3	MNR32/34/38		
M0	MNR02	Taping	Paper tape reel
E0	MNR12/14		
J0	MNR32		Embossed tape reel
J5	MNR34/35		
H0	MNR38		
W1	MNR78		Adhesive paper tape reel

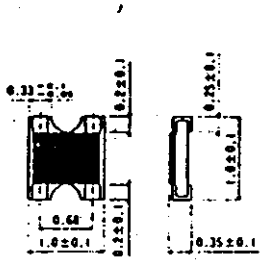
Package and forming specifications

MNR 0 2 – M 0 □ □ – J – □ □ □

710213,1

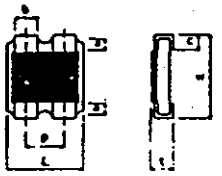
(Unit : mm)

MNR02



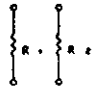
Equivalent Circuit Diagram

MNR12 MNR32

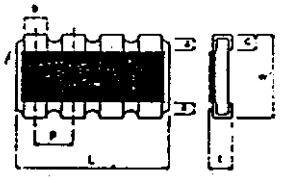


Type	L	W	t	a	b	c	p
MNR12	1.6±0.30	1.6±0.15	0.5±0.10	0.3±0.20	0.5±0.15	0.3Max.	0.80
MNR32	2.6±0.20	3.1±0.20	0.55±0.10	0.5±0.30	0.8±0.20	0.5Max.	1.27

Equivalent Circuit Diagram

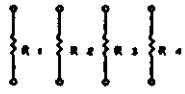


MNR14 MNR34

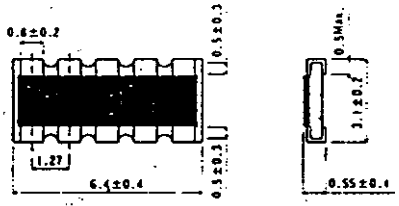


Type	L	W	t	a	b	c	p
MNR14	3.2±0.10	1.6±0.10	0.50±0.10	0.3±0.20	0.5±0.15	0.3Max.	0.80
MNR34	5.2±0.40	3.1±0.20	0.55±0.10	0.5±0.30	0.8±0.20	0.5Max.	1.27

Equivalent Circuit Diagram

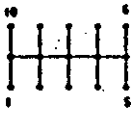


MNR35

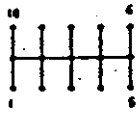


Equivalent Circuit Diagram

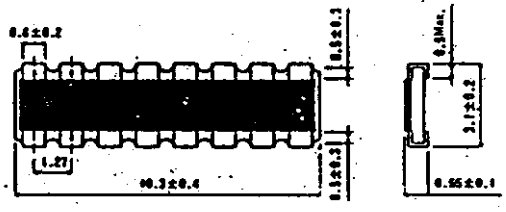
(R circuit)



(S circuit)

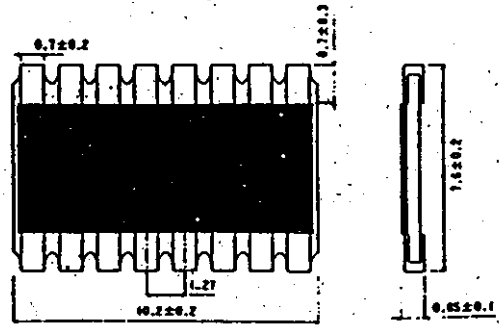


MNR38

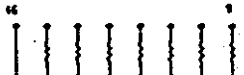


Equivalent Circuit Diagram

MNR78

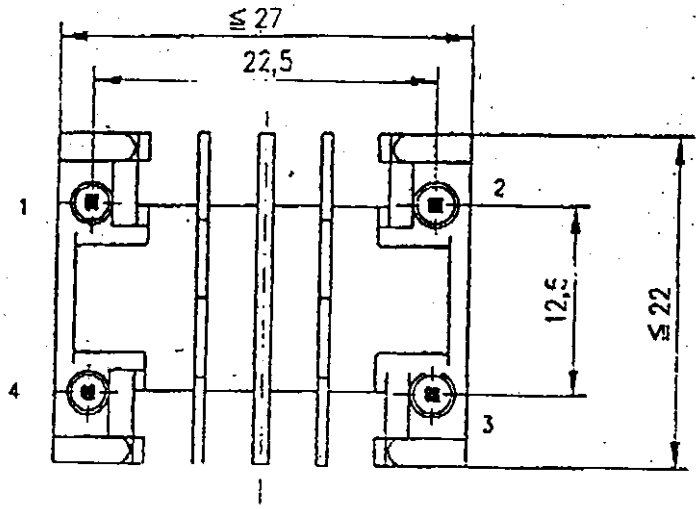


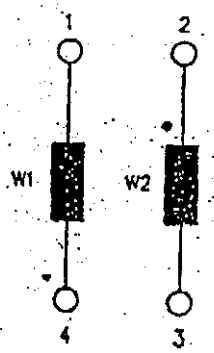
Equivalent Circuit Diagram

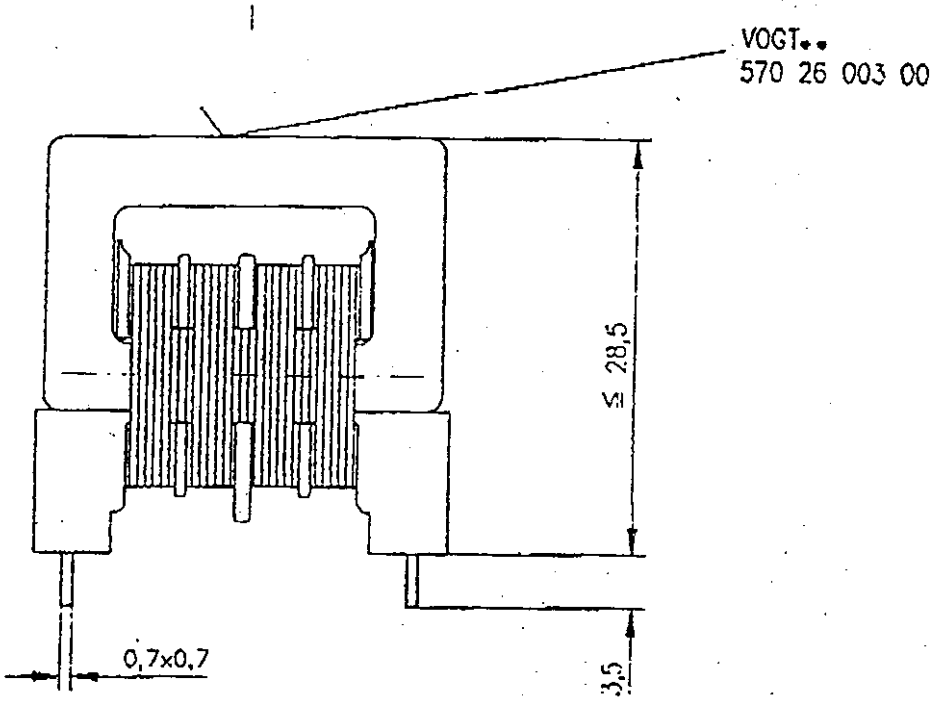


Resistors

Empfohlener Durchmesser für Anschlußlöcher: $1{,}3^{+0{,}1}$







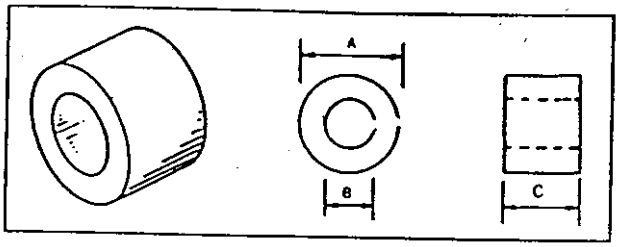
710225

Technische Daten:			
Kern/Material/Luftspalt		Rahmenkern RK 26 / Fi 360 / 0mm	
Induktivität L	4 – 1	10 mH +50% –30%	Tu 25°C
	2 – 3	10 mH +50% –30%	f = 10kHz $U_o \leq$ 50mV
Strom I_N	ⓐ	2,2 A	Tu = 40°C
Kupferwiderstand R_{Cu}	4 – 1	0,17 Ω ±20%	
	2 – 3	0,17 Ω ±20%	
Spannungsfestigkeit	W1–W2	1,5 kV_{eff} 50 Hz	
	W1/W2 – Kern	1,5 kV_{eff} 50 Hz	
Anwendungsklasse DIN 40 040		GKF	

Originalkopie
28.OKT.1994

							CAD-Zeichnung! Manuelle Änderung nicht zulässig	
					VOGT electronic		Benennung RK 2x10mH/2.2A	
					VOGT electronic AG Erlau bei Passau		710225	
a		von 2.3 in 2.2 A	21.10.94	Ko.				
Zust.	Anz.	Änderung	Datum	Name	Datum	Name	Zeichnungsnummer	Pos. Blatt 01

Ferritringe



Anwendung:
Drähte, Koaxialkabel, verdrillte Drähte, Mehrleiter-Kabel

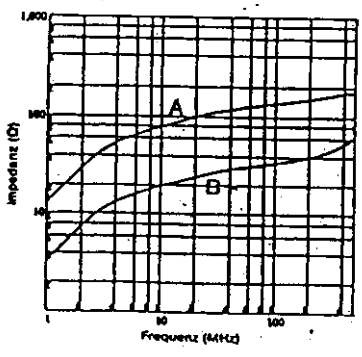
Artikel-Nr.	A mm	B mm	C mm	(1 Win) Impedanz (Ω) (2 Win) 25 MHz	100 MHz	25 MHz	100 MHz	Material	Kabel ø mm	AL-Wert (nH/N²) (Näherung)
742 701 11	7,3	3,3	4,3	29	37	123	151	K 32	2,5	912
742 701 12	9,0	5,3	8,0	33	44	136	199	K 32	4,5	1113
742 701 6	10,0	5,1	5,0	28	34	113	136	3 A 6	4,5	1555
742 701 13	11,0	5,0	9,0	60	80	221	330	K 32	4,5	1584
742 701 05	12,6	8,1	12,0	39	58	147	219	3 A 4	7,5	1646
*742 701 16	12,7	7,9	6,35	45	154			3 W 6	7,5	1374
742 701 14	13,0	7,1	6,3	33	45	123	180	K 32	6,5	1340
742 701 06	13,0	7,1	12,7	67	91	272	342	K 32	6,5	1772
*742 701 17	14,0	10,0	8,0	41	161			3 W 6	9,5	1341
742 701 7	14,5	10,2	8,0	21	34	77	120	3 A 4	9,5	1406
0242 → *742 701 0	16,5	8,0	13,0	79	127	330	513	3 A 4	7,5	2547
742 701 01	16,5	8,0	13,0	69	123	301	488	3 A 6	7,5	3184
742 701 08	16,0	10,0	7,0	77	38	109	160	K 32	9,5	1421
742 701 09	16,0	10,0	10,0	41	55	165	222	K 32	9,5	1650
742 701 1	16,5	8,0	16,0	94	148	395	574	3 A 4	7,5	2748
742 701 8	18,0	10,0	6,0	31	40	124	163	3 A 6	9,5	2155
742 701 9	20,4	10,2	5,0	29	43	112	160	3 A 4	9,5	1692
*742 701 07	20,0	10,0	10,0	68	160			3 W 6	9,5	2551
*742 701 18	21,2	12,7	6,0	40	128			3 W 6	12,0	1768
*742 701 19	22,5	13,8	6,4	30	90			3 W 6	13,0	1854
742 701 2	23,8	11,4	14,0	80	115	328	462	3 A 4	10,5	3306
742 701 02	23,8	11,4	14,0	106	181	361	482	3 A 6	10,5	4133
*742 701 03	25,0	15,0	12,0	60	125			3 W 6	14,5	2743
*742 701 3	28,0	16,0	13,0	72	159			3 W 6	15,5	3137
742 701 4	28,0	16,0	20,0	99	138	409	513	3 A 4	15,5	3771
*742 701 110	28,0	18,0	7,5	45	152			3 W 6	17,5	2155
*742 701 111	29,5	19,0	7,7	55	155			3 W 6	18,5	2234
742 701 04..	31,6	19,4	8,0	33	55	131	232	3 A 4	18,5	2460
*742 701 15	31,5	19,0	16,0	80	167			3 W 6	18,5	3528
*742 701 112	35,6	25,4	7,5	39	127			3 W 6	24,5	2173
742 701 5	40,6	27,4	15,0	55	86	223	352	3 A 4	26,5	3530

*NEU

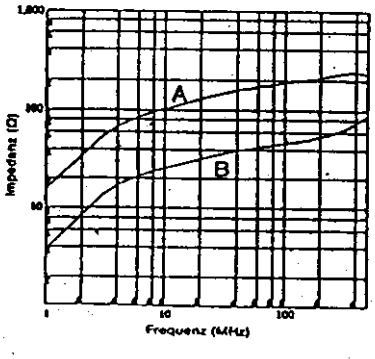
Charakteristik bei zwei (A) und einer (B) Leitungsdurchführung

- Die aufgeführten Diagramme zeigen die charakteristischen Kurven von einer und zwei Windungen der oben beschriebenen Ferrite.

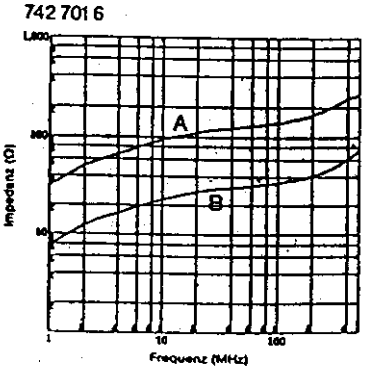
742 701 11



742 701 12



742 701 6

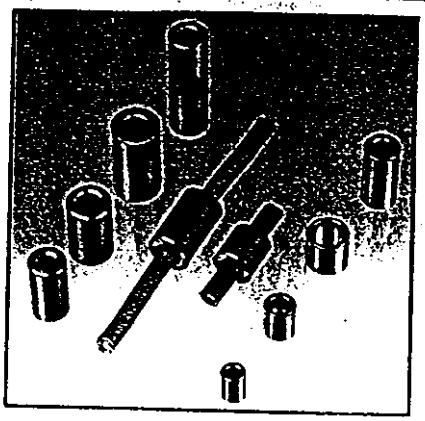


WÜRTH ELEKTRONIK Verbindungstechnik GmbH & Co. KG · Riedenstraße 16 · D-74635 Kupferzell
Telefon 079 44/29 02 · Telefax 079 44/14 80

EMI SHIELDING FERRITE

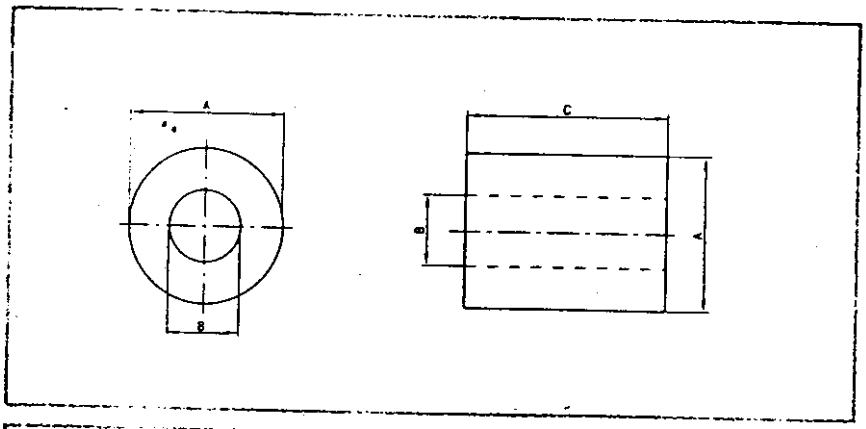
K60525

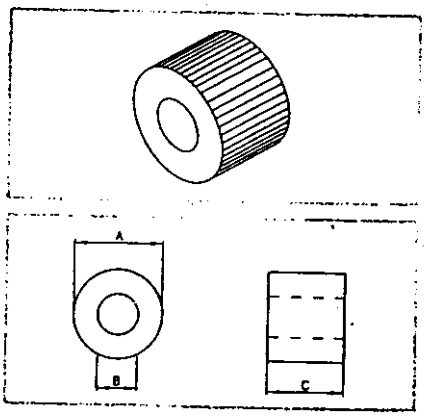
CYLINDRICAL EMI SUPPRESSION CORES (Toroidal Cores TR Type)



Part No.	A	B	C	Applicable cable diameter
TR-7-3-4	7.0	3.0	4.0	
TR-9-5-8	9.0	5.0	8.0	
TR-10-5-5	10.0	5.0	5.0	
TR-11-5-9	11.0	5.0	9.0	
TR-12.5-8-12	12.5	8.0	12.0	
TR-13-7-6	13.0	7.0	6.0	
TR-13-7-12.7	13.0	7.0	12.7	
TR-14.5-10-8	14.5	10.2	8.0	
TR-16-8-13	16.5	8.0	13.0	710242 Less than dimension C
TR-16-8-16	16.5	8.0	16.0	
TR-16-10-7	16.0	10.0	7.0	
TR-16-10-10	16.0	10.0	10.0	
TR-18-10-6	18.0	10.0	6.0	
TR-20-10-5	20.4	10.2	5.0	
TR-20-10-10	20.5	10.2	10.0	
TR-23-11-14	23.8	10.4	14.0	
TR-25-15-12	25.2	15.0	12.0	
TR-28-16-13	28.0	16.0	13.0	
TR-28-16-20	28.0	16.0	20.0	
TR-31-19-8	31.6	19.4	8.0	
TR-40-27-15	40.6	27.4	15.0	

CYLINDRICAL EMI SUPPRESSION CORES (Toroidal Cores TR Type)

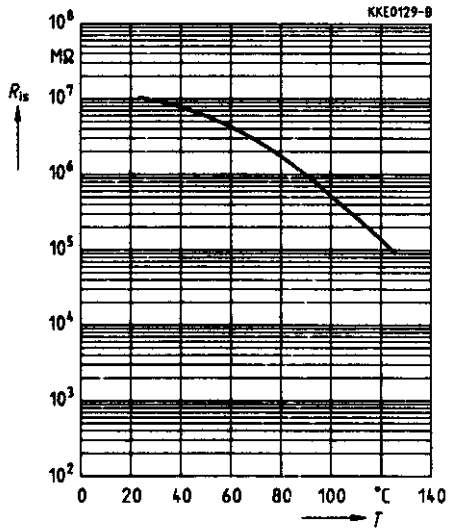




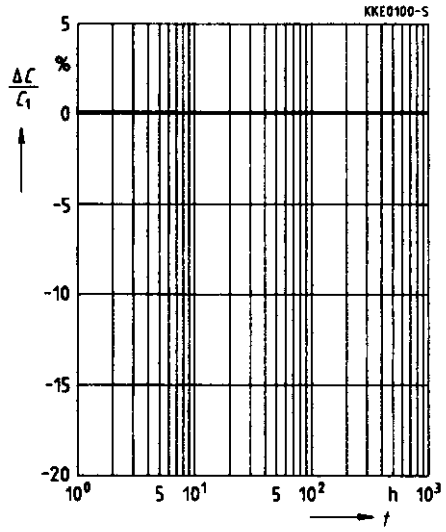
Part No.	A	B	C
	Unit: mm		
TR-2.5x0.76x4	2.5±0.2	0.76±0.15	4±0.2
TR-2.5x0.76x9	2.5±0.2	0.76±0.15	9±0.3
TR-3x1.0x10	3±0.2	1.0±0.15	10±0.3
TR-2.5x1.3x4	2.5±0.2	1.3±0.15	4±0.2
TR-3.5x0.8x4.4	3.5±0.2	0.8±0.18	4.4±0.3
TR-3.5x0.8x5	3.5±0.2	0.8±0.15	5±0.2
TR-3.5x0.8x6	3.5±0.2	0.8±0.15	6.0±0.3
TR-3.5x1.0x6	3.5±0.2	$1.0^{+0.2}_{0}$	6±0.3

Part No.	A	B	C
	Unit: mm		
TR-3.5x1.3x3	3.5±0.2	1.3±0.15	3±0.2
TR-3.5x1.3x4	3.5±0.2	1.3±0.15	4±0.2
TR-3.5x1.3x5	3.5±0.2	1.3±0.15	5±0.2
TR-3.5x1.3x6	3.5±0.2	1.3±0.15	6±0.3
TR-3.5x1.3x9	3.5±0.2	1.3±0.15	9±0.3
TR-3.5x1.6x1.5	3.5±0.2	1.6±0.15	1.5±0.15
TR-3.5x1.6x10	3.5±0.2	1.6±0.15	10±0.3
TR-4x1.5x4	4±0.2	1.5±0.15	4±0.2

Isolationswiderstand R_{is} in Abhängigkeit von der Temperatur T



Kapazitätsänderung $\Delta C/C_1$ in Abhängigkeit von der Zeit t



B 710331

Eigenschaften

- Hohe Volumenkapazität
- Nichtlineare Kapazitätsänderung
- Hoher Isolationswiderstand
- Impulsfest

Anwendungen

- Abblockung
- Kopplung
- Entkopplung
- Entstörung

Anschlüsse

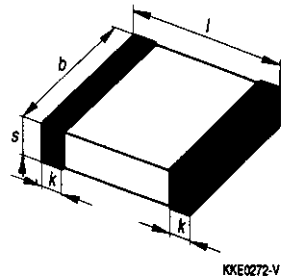
- Für Löttechnik:
  Baugröße 0402 bis 1210:
  Silber-Nickel-Zinn
  Baugrößen 1812, 2220:
  Silber-Palladium
- Für Leitklebetechnik:
  Alle Baugrößen:
  Silber-Palladium

Verpackung

- Blister- und Pappgurt,
  Einzelheiten siehe Kapitel
  „Gurtung und Verpackung", Seite 111.
- Bulk Case für Baugrößen 0603, 0805 und 1206, Einzelheiten siehe Seite 114.

Grenzdaten

Klimakategorie
nach DIN IEC 68-1: 55/125/56



Maße (mm)

Baugröße **inch**/mm	*l*	*b*	*s*	*k*
0402/1005	1,0 ± 0,10	0,50 ± 0,05	0,5 ± 0,05	0,2
0603/1608	1,6 ± 0,15*)	0,80 ± 0,10	0,8 ± 0,10	0,3
0805/2012	2,0 ± 0,20	1,25 ± 0,15	1,3 max.	0,5
1206/3216	3,2 ± 0,20	1,60 ± 0,15	1,3 max.	0,5
1210/3225	3,2 ± 0,30	2,50 ± 0,30	1,7 max.	0,5
1812/4532	4,5 ± 0,30	3,20 ± 0,30	1,3 max.	0,5
2220/5750	5,7 ± 0,40	5,00 ± 0,40	1,3 max	0,5

*) Bei Bulk Case: 1,6 ± 0,1
Toleranzen entsprechen CECC 32101-801

Lieferbare Kapazitätstoleranzen

Toleranz	Symbol
$\Delta C_R/C_R = \pm$ 5 %	J
$\Delta C_R/C_R = \pm$ 10 %	**K**
$\Delta C_R/C_R = \pm$ 20 %	M

Standardwerte sind fett gedruckt

J-Toleranz nicht lieferbar für 16 V, 200 V und 500 V

Nennspannungswerte

V_N = 16 V, 25 V, 50 V,100 V, 200 V, 500 V

Bestellnummern für X7R/B Charakteristik, 50 V–, AgPd-Kontakte

Baugröße	1812/4532	2220/5750		
C_N	Bestellnummer [1]			
	B37953-	B37956-		
100 nF	-J5104-K62 ◆			
120 nF	-J5124-K62 ◆			
150 nF	-J5154-K62 ◆			
180 nF	-J5184-K62 ◆			
220 nF	-J5224-K62 ◆			
270 nF	-J5274-K62 ◆			
330 nF	-J5334-K62 ◆			
390 nF	-J5394-K62 ◆			
470 nF	-J5474-K62 ◆	-J5474-K62 ◆		
560 nF		-J5564-K62 ◆		
680 nF		-J5684-K62 ◆		
820 nF		-J5824-K62 ◆		
1,0 µF		-J5105-K62 ◆		

Chipdicke: ◆: 1,2 ± 0,1 mm

1) In den Tabellen ist die Bestellnummer für die Standard-Kapazitätstoleranz angegeben:
K = ± 10 %. Beispiel: B37953-J5104-K62
Weitere Kapazitätstoleranzen siehe Seite 27

Bestellnummern für X7R/B Charakteristik, 100 V–, AgNiSn-Kontakte

Baugröße	0603/1608	0805/2012	1206/3216	1210/3225	
C_N	Bestellnummer [1]				
	B37931-	B37941-	B37872-	B37950-	
100 pF	-K1101-K60 ○				
120 pF	-K1121-K60 ○				
150 pF	-K1151-k60 ○				
180 pF	-K1181-K60 ○				
220 pF	-K1221-K60 ○				
270 pF	-K1271-K60 ○				
330 pF	-K1331-K60 ○				
390 pF	-K1391-K60 ○				
470 pF	-K1471-K60 ○	-K1471-K60 ❑			
560 pF	-K1561-K60 ○	-K1561-K60 ❑			
680 pF	-K1681-K60 ○	-K1681-K60 ❑			
820 pF	-K1821-K60 ○	-K1821-K60 ❑			
1,0 nF	-K1102-K60 ○	-K1102-K60 ❑	-K1102-K60 ○		
1,2 nF	-K1122-K60 ○	-K1122-K60 ❑	-K1122-K60 ○		
1,5 nF	-K1152-K60 ○	-K1152-K60 ❑	-K1152-K60 ○		
1,8 nF	-K1182-K60 ○	-K1182-K60 ❑	-K1182-K60 ○		
2,2 nF	-K1222-K60 ○	-K1222-K60 ❑	-K1222-K60 ○		
2,7 nF	-K1272-K60 ○	-K1272-K60 ❑	-K1272-K60 ○		
3,3 nF	-K1332-K60 ○	-K1332-K60 ❑	-K1332-K60 ○		
3,9 nF	-K1392-K60 ○	-K1392-K60 ❑	-K1392-K60 ○		
4,7 nF	-K1472-K60 ○	-K1472-K60 ❑	-K1472-K60 ○		
5,6 nF		-K1562-K60 ⊔	-K1562-K60 ○		
6,8 nF		-K1682-K60 ⊔	-K1682-K60 ○		
8,2 nF		-K1822-K60 ❑	-K1822-K60 ○		
10 nF		-K1103-K60 ❑	-K1103-K60 ○	-K1103-K62 ○	
12 nF		-K1123-K60 ❑	-K1123-K60 ○	-K1123-K62 ○	
15 nF		-K1153-K60 ❑	-K1153-K60 ○	-K1153-K62 ○	
18 nF			-K1183-K60 ○	-K1183-K62 ○	
22 nF			-K1223-K60 ○	-K1223-K62 ○	
27 nF			-K1273-K60 ○	-K1273-K62 ○	
33 nF			-K1333-K60 ○	-K1333-K62 ○	
39 nF			-K1393-K60 ○	-K1393-K62 ○	
47 nF			-K1473-K60 ○	-K1473-K62 ○	

Chipdicke: ⊔: 0,6 ± 0,1 mm ○: 0,8 ± 0,1 mm ◆: 1,2 ± 0,1 mm

1) In den Tabellen ist die Bestellnummer für die Standard-Kapazitätstoleranz angegeben::
K = ± 10 %. Beispiel: B37931-K1101-K60
Weitere Kapazitätstoleranzen siehe Seite 27

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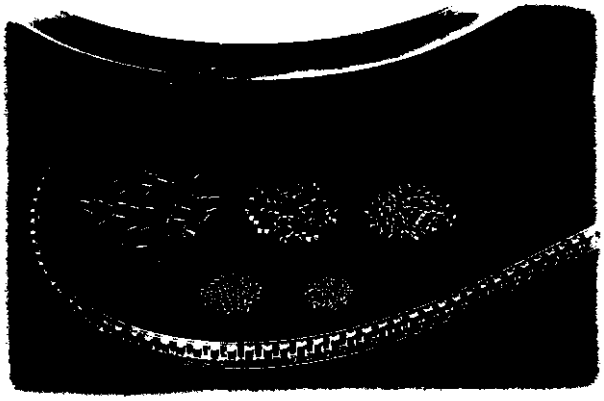
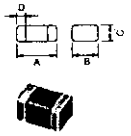
WÜRTH ELEKTRONIK

Verbindungstechnik

EMV-Komponenten

SMD-Ferrite





Bauform	A	B	C	D
0603	$1,6^{\pm 0,2}$	$0,8^{\pm 0,2}$	$0,8^{\pm 0,2}$	$0,5^{\pm 0,3}$
0805	$2,0^{\pm 0,2}$	$1,25^{\pm 0,2}$	$0,9^{\pm 0,2}$	$0,5^{\pm 0,3}$
1206	$3,2^{\pm 0,2}$	$1,60^{\pm 0,2}$	$1,1^{\pm 0,2}$	$0,5^{\pm 0,3}$
1210	$3,2^{\pm 0,2}$	$2,50^{\pm 0,2}$	$1,3^{\pm 0,2}$	$0,5^{\pm 0,3}$
1806	$4,5^{\pm 0,25}$	$1,60^{\pm 0,2}$	$1,6^{\pm 0,2}$	$0,5^{\pm 0,3}$
1812	$4,5^{\pm 0,25}$	$3,2^{\pm 0,2}$	$1,5^{\pm 0,2}$	$0,5^{\pm 0,3}$

Die speziellen Miniatur-SMD-Ferrite in Multilayer-Technik werden direkt auf die Platine gelötet. Sie besitzen sehr gute Anti-EMI Eigenschaften und einen geringen Gleichstrom-Widerstand. Nahe an der Störquelle plaziert können selbst bei kleinster Bauform max. Impedanzen größer 2800 Ω erzielt werden!

- hochwertige Ni-Sn Elektroden
- geeignet sowohl für Reflow, Wellenlötung und Kleben
- ideal als Datenleitungsfilter und zur Versorgungsspannungsentkopplung
- Stromtragfähigkeit bis 4A (mit ϟ gekennzeichnet)

Bauform 0603:

Artikel-Nr.	Impedanz (Ohm) bei 100 MHz	DC Widerstand maximal (Ohm)	Nennstrom maximal (mA)	max. Impedanz	VPE
742 792 68	15	0,30	400	60 Ω @ 1000 MHz	4000
742 792 60	40	0,30	400	70 Ω @ 900 MHz	
742 792 67	60	0,20	500	110 Ω @ 650 MHz	
742 792 61	80	0,70	300	310 Ω @ 540 MHz	
742 792 62	120	0,20	200	200 Ω @ 510 MHz	
742 792 622	180	0,50	200	Datenblatt auf Anfrage	
742 792 63	220	0,90	150	280 Ω @ 350 MHz	
742 792 64	300	1,20	150	320 Ω @ 210 MHz	
742 792 642	470	0,50	200	Datenblatt auf Anfrage	
742 792 65	600	0,70	200	620 Ω @ 90 MHz	
742 792 66	1000	1,60	150	1350 Ω @ 140 MHz	
742 792 69	1200	1,60	100	Datenblatt auf Anfrage	

Bitte beachten:
Über die Güte der Induktivitäten ist im Sprachgebrauch von Würth Elektronik, eine klare Trennung zwischen Induktivitäten und SMD-Ferriten definierbar:

Ferrite für EMV-Anwendungen sind prinzipiell wie Spulen aufgebaut. Das Kernmaterial (NiZn) kann bis in den hohen Frequenzbereich auch als Kernmaterial für Induktivitäten verwendet werden. Ferrite für EMV-Anwendungen sind speziell auf kleine Güten, also hohe Verlustanteile getrimmt. Diese entstehen gewollt im Kernmaterial und dienen zur Absorption von EMI-Störungen. Die Induktivität dieser Bauteile ist bewußt niedrig gehalten.

Induktivitäten sollen hohe Güten aufweisen, also möglichst keine Verluste erzeugen. Außerdem werden hier über einen weiten Frequenzbereich konstante Induktivitätswerte gefordert.

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WÜRTH ELEKTRONIK
Verbindungstechnik
EMV-Komponenten

1

Bauform 0805:

Artikel-Nr.	Impedanz (Ohm) bei 100 MHz	DC Widerstand maximal (Ohm)	Nennstrom maximal (mA)	max. Impedanz	VPE
742 792 0	11	0,10	600	24 Ω @ 1000 MHz	4000
742 792 06	30	0,025	3000 ϟ	60 Ω @ 500 MHz	
742 792 01	32	0,30	500	70 Ω @ 1000 MHz	
742 792 062	80	0,40	500	Datenblatt auf Anfrage	
744 792 063	80	0,03	3000 ϟ	Datenblatt auf Anfrage	
742 792 07	100	0,50	1000 ϟ	150 Ω @ 550 MHz	
742 792 02	120	0,60	500	250 Ω @ 950 MHz	
744 792 023	120	0,03	3000 ϟ	in Vorbereitung	
742 792 03	150	0,50	300	250 Ω @ 420 MHz	
744 792 034	220	0,60	300	Datenblatt auf Anfrage	
744 792 035	300	0,70	250	Datenblatt auf Anfrage	
744 792 036	470	0,70	250	Datenblatt auf Anfrage	
742 792 04	600	1,00	200	800 Ω @ 200 MHz	
742 792 041	600	1,30	100	700 Ω @ 160 MHz	
742 792 042	600	1,60	500	2800 Ω @ 180 MHz	
742 792 05	1000	1,50	200	1050 Ω @ 90 MHz	
742 792 09	1200	1,30	100	Datenblatt auf Anfrage	

Bauform 1206:

Artikel-Nr.	Impedanz (Ohm) bei 100 MHz	DC Widerstand maximal (Ohm)	Nennstrom maximal (mA)	max. Impedanz	VPE
742 792 10	30	0,02	4000 ϟ	Datenblatt auf Anfrage	3000
742 792 1	32	0,15	500	70 Ω @ 1000 MHz	
742 792 151	70	0,30	400	Datenblatt auf Anfrage	
742 792 15	80	0,03	3000 ϟ	160 Ω @ 550 MHz	
742 792 11	90	0,30	400	170 Ω @ 550 MHz	
742 792 113	120	0,03	3000 ϟ	in Vorbereitung	
742 792 12	150	0,50	200	210 Ω @ 280 MHz	
742 792 122	220	0,50	250	Datenblatt auf Anfrage	
742 792 124	470	0,60	200	Datenblatt auf Anfrage	
742 792 13	600	0,40	200	600 Ω @ 100 MHz	
742 792 18	600	0,40	1000 ϟ	700 Ω @ 90 MHz	
742 792 131	600	1,30	300	630 Ω @ 90 MHz	
742 792 14	1000	1,00	100	1250 Ω @ 75 MHz	
742 792 16	1200	1,80	100	1400 Ω @ 70 MHz	

Bauform 1210:

Artikel-Nr.	Impedanz (Ohm) bei 100 MHz	DC Widerstand maximal (Ohm)	Nennstrom maximal (mA)	max. Impedanz	VPE
742 792 30	32	0,30	400	70 Ω @ 1000 MHz	2500
742 792 2	60	0,50	200	120 Ω @ 1000 MHz	
742 792 3	90	0,30	400	180 Ω @ 1000 MHz	

Bauform 1806:

Artikel-Nr.	Impedanz (Ohm) bei 100 MHz	DC Widerstand maximal (Ohm)	Nennstrom maximal (mA)	max. Impedanz	VPE
742 792 4	60	0,30	400	130 Ω @ 1000 MHz	2000
742 792 43	75	0,03	3000 ϟ	160 Ω @ 1000 MHz	
742 792 41	80	0,30	400	160 Ω @ 1000 MHz	
742 792 42	150	0,50	200	280 Ω @ 500 MHz	

Bauform 1812:

Artikel-Nr.	Impedanz (Ohm) bei 100 MHz	DC Widerstand maximal (Ohm)	Nennstrom maximal (mA)	max. Impedanz	VPE
742 792 50	70	0,40	300	180 Ω @ 1000 MHz	1000
742 792 5	120	0,40	300	200 Ω @ 800 MHz	

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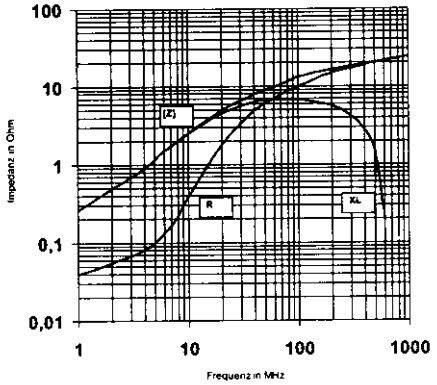
WÜRTH ELEKTRONIK
Verbindungstechnik
EMV-Komponenten

Charakteristik:

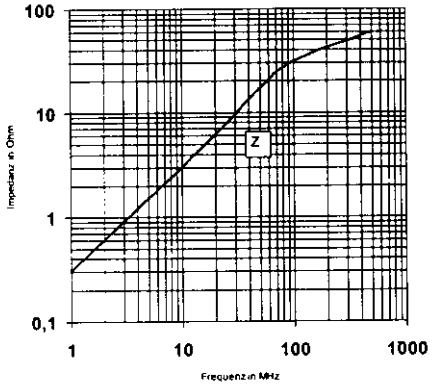
Z, R und X_L zwischen 1 MHz und 1 GHz

Bauform 0805:

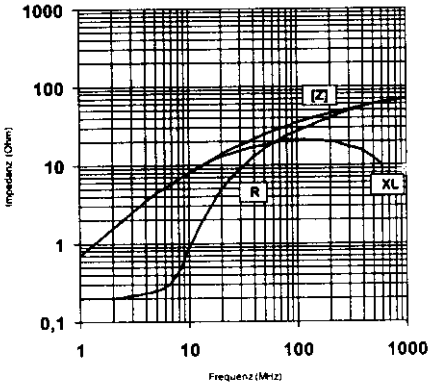
742 792 0



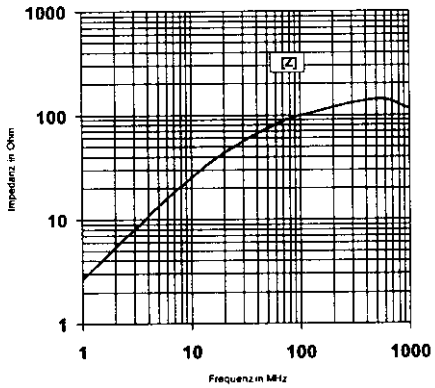
742 792 06



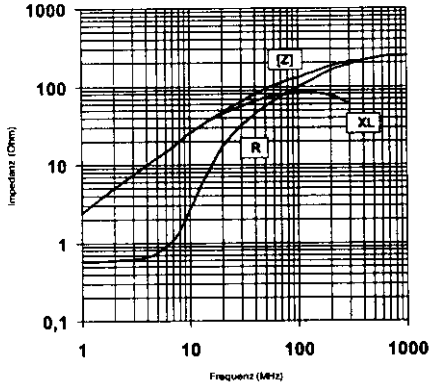
742 792 01



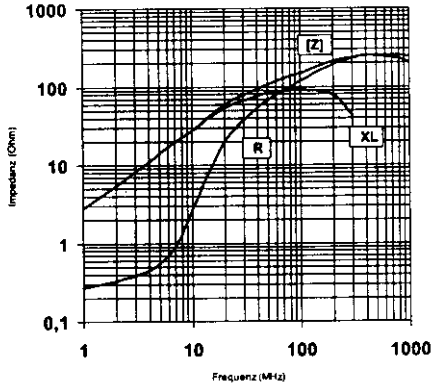
742 792 07



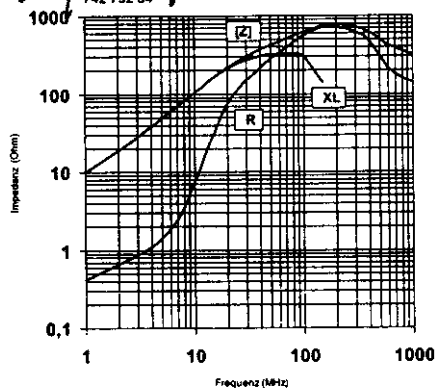
742 792 02



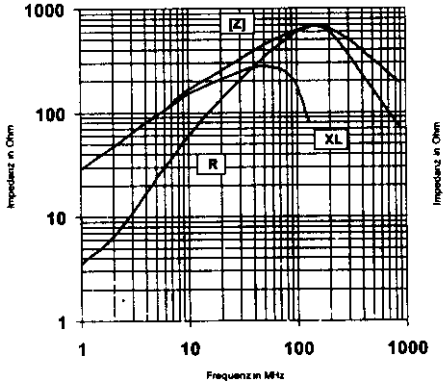
742 792 03



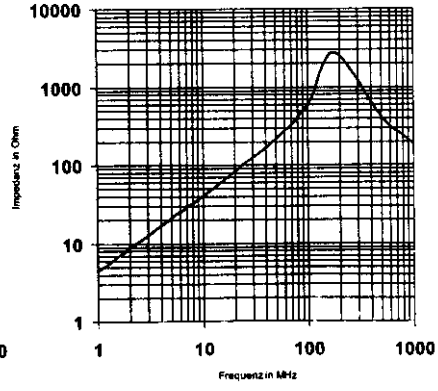
742 792 04



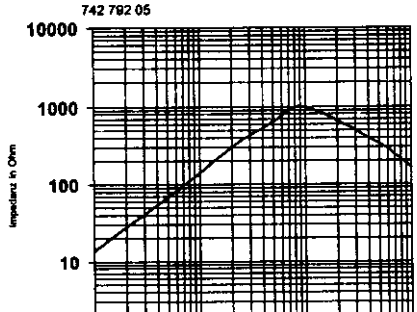
742 792 041



742 792 042



742 792 05



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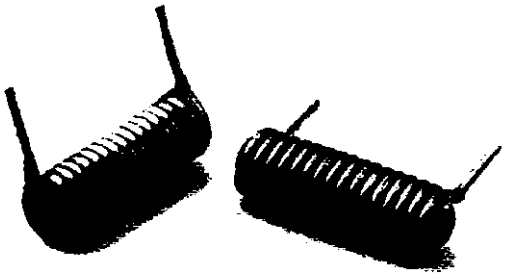
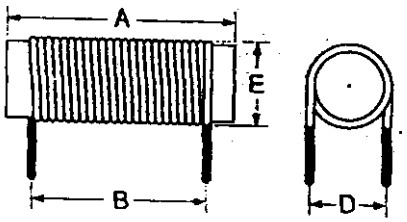
Stabkerndrosseln WE - SD





- Entstörung von Schaltnetzteilen, Motoren, Leistungsverstärker, unterbrechungsfreie Stromversorgungen...
- Ströme bis 14 A
- besonders geeignet für Anwendungen der Automobilindustrie

Maß B und D nach Kundenwunsch

4

Artikel-Nr.	Induktivität (µH)	Stab E x A	Drahtdurch-messer	DC Widerstand (mΩ)	Nennstrom (A)
744 710 1	1,8	5 x 15	1,0	6,0	5
744 711 0	2,4	5 x 20	1,4	4,0	12
744 711 1	10,0	5 x 20	0,6	30,0	2
744 712 0	2,4	5 x 21	1,05	4,0	12
744 712 1	2,1	5 x 21	1,6	4,0	14
744 713 0	2,0	5 x 25	1,6	4,0	14
744 714 0	5,1	6 x 20	0,8	15,0	3
→ **744 715 0**	10,0	6 x 25	1,0	15,0	5
744 716 0	10,0	6 x 30	1,3	10,0	10

weitere kundenspezifische Ausführungen auf Anfrage