

FCC CLASS B

EMI MEASUREMENT TEST REPORT

TEST LAB FCC ID : I6U

This report concerns : Original grant ☒ Class II change ☐

Equipment tested : LML 3033

Equipment FCC ID : KVLML 3033

Designed by : THOMSON CSF COMMUNICATIONS
105 boulevard VALMY - BP 82
92340 COLOMBES - FRANCE

Manufactured by : THOMSON CSF COMMUNICATIONS

Deferred grant requested per 47 CFR 0.457 (d)(1)(ii)

YES ☐ NO ☒if yes, defer until :

Company Named agrees to notify the Commission by : 09-10-1998

of the intended date of announcement of the product so that the grant can be issued on the date

Transition rules requested per 15.37?

YES ☐ NO ☒

If no, assumed Part 15, Subpart B for intentional or
unintentional radiator
The new 47 CFR [10-1-96 edition] provision

Report Prepared by :

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(33) 02 41 73 63 89 Fax : +33 02 41 73 74 74

Test facility :

Bull Electronics Angers
331 Avenue Général Patton - BP 428
49004 ANGERS Cédex - France

EQUIPMENT FCC ID : KVJLML_3033

FCC CLASS B

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DETAILS OF PRODUCT DESCRIPTION

Attachment A, B, C, D, E, F,G, H

RS232 - RS422 - ISO 2 / WIEGAND Interface description

Attachment I, J, K

INSTALLATION MANUEL

Equipment documentation

INTERFACE MANUEL

Equipment documentation

1 - GENERAL INFORMATION

1-1 Product description

The THOMSON-CSF Company name model LML_3033 Modular Reader is a high frequency field sensor, for tag identification with external antenna which cannot disconnect from Reader because the box is locked with a key .

One part is transceiver (CW emission) and detection of CW modulated and reflected by the tag. The second part is computing of detected data which are transmitting towards PC.

The data can be transferred with 3 interfaces data line to a Personnel Computer.

- RS232 interface
- RS422/485 interface
- ISO2/WIEGAND (TTL)

The reader is supplied by 12 VDC (External power supply)

This product is tested as unintentional radiator (ITE) connected to a Personnel Computer, and intentional radiator.

The frequency range of the transceiver is 2.446250 to 2.453750 GHz by 250 KHz step.

A more detailed, technical description of the EUT is contained in Attachment A

EQUIPMENT FCC ID : KVJLML_3033
1-2 Tested systems details

The FCC IDs for all equipment, plus description off all cables used in the tested system (including inserted cards which have grants) are :

Description Model& Serial number	FCC ID	Cable description	Cable terminaison	Length (m)
Reader LML_3033 S/N : 13904 (1) RS232 configuration mode(19.2 Kbauds rate)	KVJLML_3033	1 Shielded cable between Reader LML_3033 and serial port PC # 46322865 with ferrite closer plastic connector # 28B2029- 0A0 manufactured by STEWARD	Plastic /metal 5 pts/9 pts	4.50
Reader LML_3033 S/N : 13904 (1) in RS422 configuration mode(19.2 Kbauds rate) with RS422/RS232 shielded box converter S/N 46322870 (1)	KVJLML_3033	1 Shielded cable # 46322872 between Reader LML_3033 and box converter with ferrite closer plastic connector #28B2029-0A0 manufactured by STEWARD. 1 Shielded cable # 46322871 between box converter and serial port PC	Plastic/Metal 1 5 pts/9 pts Metal/Metal 9 pts/9 pts	4.50 4.50
Reader LML_3033 S/N : 13904 (1) in TTL configuration mode with TTL/Parallel shielded box converter S/N 46322860 (1)	KVJLML_3033	1 Shielded cable # 46322863 between Reader LML_3033 and box converter with ferrite closer plastic connector # 28B2029- 0A0 manufactured by STEWARD 1 Shielded cable # 46322862 between box converter and parallel port PC	Plastic/Metal 1 5 pts/ 9 pts Metal/Metal 25 pts/25 pts	4.50 2
AT3_2749 antenna S/N : P001	KVJLML_3033	RG58 emitted and received coaxial cable	BNC	5
Zenith Data System Personnal Computer Z-386SX/25-80 S/N : XVA PWN 00791	IFO-Z386SX25	1 Unshielded power cord	Plastic	2
Zenith Data System Display ZCM-1495-Xt S/N : 248RK0108R0D	ATO90C2CM1492	1 Unshielded power cord 1 Shielded Video cable(2)	Plastic Metal	2 1.2
Zenith Data System Keyboard 2 KB-3 S/N : E4099	GJK101RX-5	1 Shielded cable (3)	Metal	2
Microsoft PS/2 Mouse S/N : 704195	C3K76FPS26C	1 Shielded cable (4)	Metal	2.5

1-2 Tested systems details (continued)

The FCC IDs for all equipment, plus description off all cables used in the tested system (including inserted cards which have grants) are :

2	Plastic	1 Unshielded power cord with external power module ETT76J2A 1 Shielded serial cable # N086109000.01C(5) 1 Shielded parallel cable # N0856675000.01C (6)	B948JJA2277X	Hewlett Packard Printer Model 2277A S/N : 2906A16132
	Metal/Metal			
3	Metal/Metal			
2	Plastic/Plastic	1 Unshielded power cord 1 Unshielded D.C 12V power supply cable assembly of 2 twisted wires with ferrite # 28B20250A0 manufactured by STEWARD closer plastic connector inside box		Rohde&Schwarz Power supply(7) 120V/60Hz A.C—12V D.C Model NGMD 35/1 Ref : 117.7127.02 S/N : 975

- (1) EUT submitted for grant
 (2) Attached cable includes grantee supplied ferrite
 (3) Keyboard cable permanently attached to keyboard
 (4) Mouse cable permanently attached to mouse
 (5) Used to connect printer to P.C serial port in TTL configuration mode tested
 (6) Used to connect printer to P.C parallel port in RS232 or RS422 mode tested
 (7) External Power supply not submitted for grant, used for delivery 12V D.C to EUT.

1-3 Test Methodology and procedure

Unintentional radiator : ITE

Both conducted and radiated testing were performed in accordance with ANSI C63.4 procedure, as revised in 1992. The specification used was the Class B limits of FCC Rules Part 15 Subpart B for conductive (§ 15-107) and radiated (§ 15-109) interference measurements. Final radiated measurement is performed at an antenna to EUT distance of 3 meters. (Preliminary radiated emission test was realized at one meter in the underground of open area test site)

Intentional radiator :

Radiated testing was performed in accordance with ANSI C63.4 procedure, as revised in 1992. The specification used was the limit of Code of Federal Regulations 47 Part 15 Subpart C (§ 15-245, § 15-205, § 15-209)

Radiated testing was performed at an antenna to EUT distance of 3 meters after a measurement was performed at one meter to determine the emission characteristics of the EUT.(Fundamental and harmonics frequencies)

1-4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at the following address :

BULL ELECTRONICS ANGERS
331 Avenue du General Patton
B.P 428
49004 ANGERS Cedex 01
France

This site has been fully described in a report dated August 21, 1997 submitted to your Office, and accepted in a letter dated October 9, 1997 (31040/SIT 1300F2)

1-5 List of measurement apparatus

APPARATUS	MANUFACTURER	REFERENCE	SERIAL NUMBER	DATE OF VERIFICATION
RECEIVERS				
CISPR Receptive chain :	Hewlett Packard	HP 8574A		
Quasi-Peak Detector	Hewlett Packard	HP 85650A	2811A01134	June 1997
Spectrum Analyser	Hewlett Packard	HP 8568B	2816A116603	June 1997
Preselector	Hewlett Packard	HP 85685A	287A00784	June 1997
Spectrum Analyser 20Hz-26.5GHz (For intentional radiator emission)	Rohde&Schwarz	FSEM30	845112/021	January 1998
EMI Software (For conducted emission)	Hewlett Packard	HP 85869A		
REMS Software (For radiated emission)	Hewlett Packard	HP 85879A Rev A.02.01		
ARTIFICIAL MAINS NETWORKS				
LISN	Rohde&Schwarz	ESH2-Z5	861741/019	June 1997
LISN	Rohde&Schwarz	ESH2-Z5	872094/037	June 1997
ANTENNAS				
Bilog Horn(For intentional radiator emission)	Chase Emco	CBL6112 3115	2290 9504-4496	September 1997 August 1995

3 - SYSTEM TEST CONFIGURATION

3-1 Justification

Unintentional radiator measurement

The system was configured for testing in a typical fashion (as a customer would normally use it), with a host computer.

Communication with the host can be done with three interfaces line. The three possibilities were tested.

The LML_3033 is connected to PC on :

- Serial port for RS232 interface mode configuration. The tests are done with data transfert to P.C with the maximum speed : 19.2 Kbauds.

The RS232 interface is performed by SPI_2110 board of the reader by MAX232 component(RS232 drivers /receiver) repaired by MN13 on equipment plan of SPI_2110 board

- Serial port for RS422/485 interface mode configuration through a RS422/RS232 converter. The tests are done with data transfert to P.C with the maximum speed : 19.2 Kbauds

The RS422 interface is performed by SPI_2110 board of the reader by 75ALS180 component(Differential driver and receiver) repaired by MN14 on equipment plan of LML_3033.

- Parallel port for ISO2 /WIEGAND (TTL) interface mode configuration through TTL/Parallel converter. The tests are done with data transfert to P.C with the maximum speed : 1 Kbauds

The TTL interface is performed by SPI_2110 board of the reader by BSR14 component(Low power NPN transistor) repaired by Q6,Q7, Q8 on equipment plan of LML_3033.

The Personnel computer used for the test is a Zenith Data System Z-386SX/25-80 with mother board equipped with mouse, keyboard, video, serial and parallel connectors.

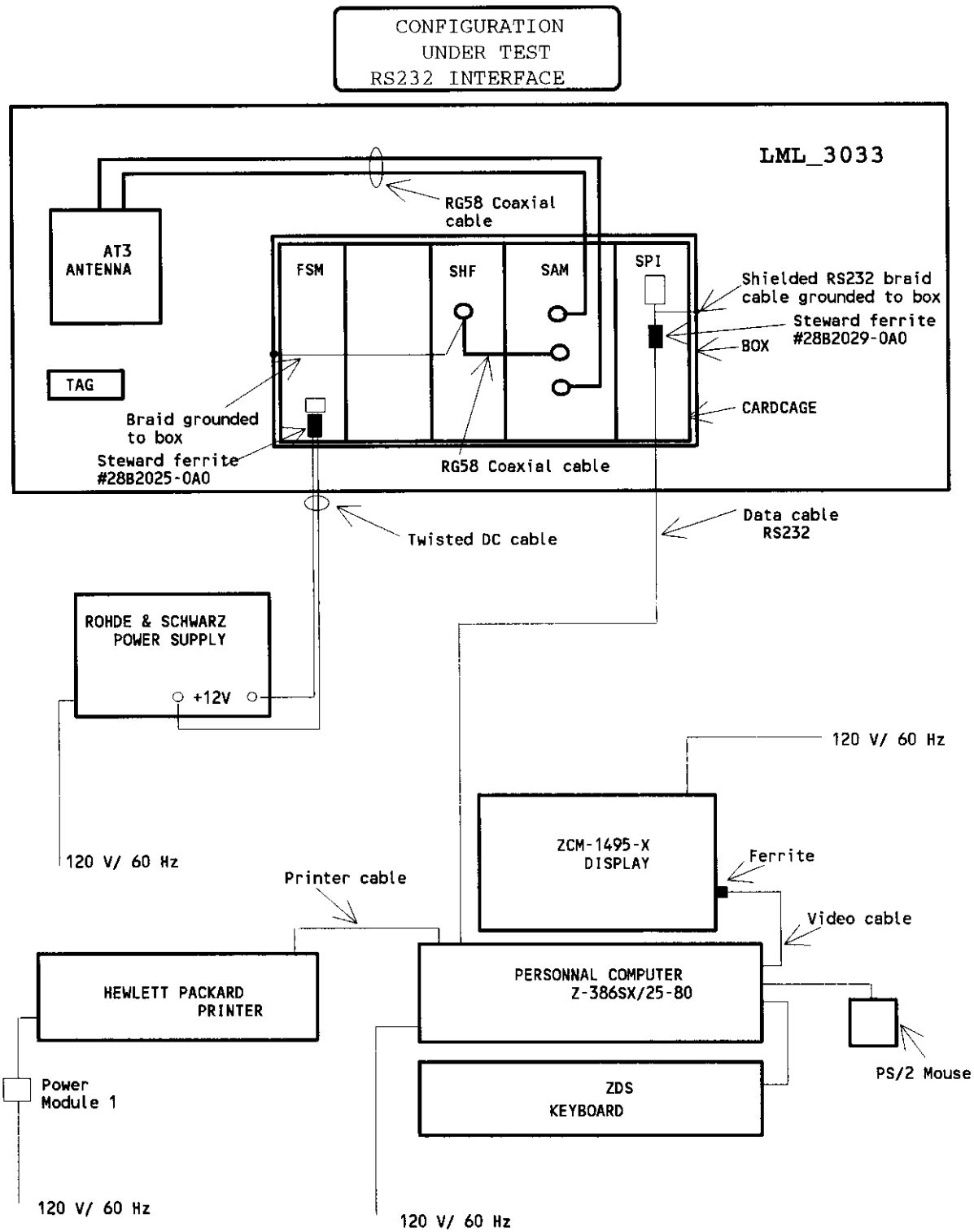
The Reader LML_3033 is powered by 12 Volts D.C external power supply. (Rohde&Schwarz)

For each configuration, two conducted lines perturbations measurements are performed, one on external power supply of the reader, and the other on P.C ,display and printer connected together. The radiated measurements are also performed for each configuration with EUT, P.C , display and printer in the field measurement.

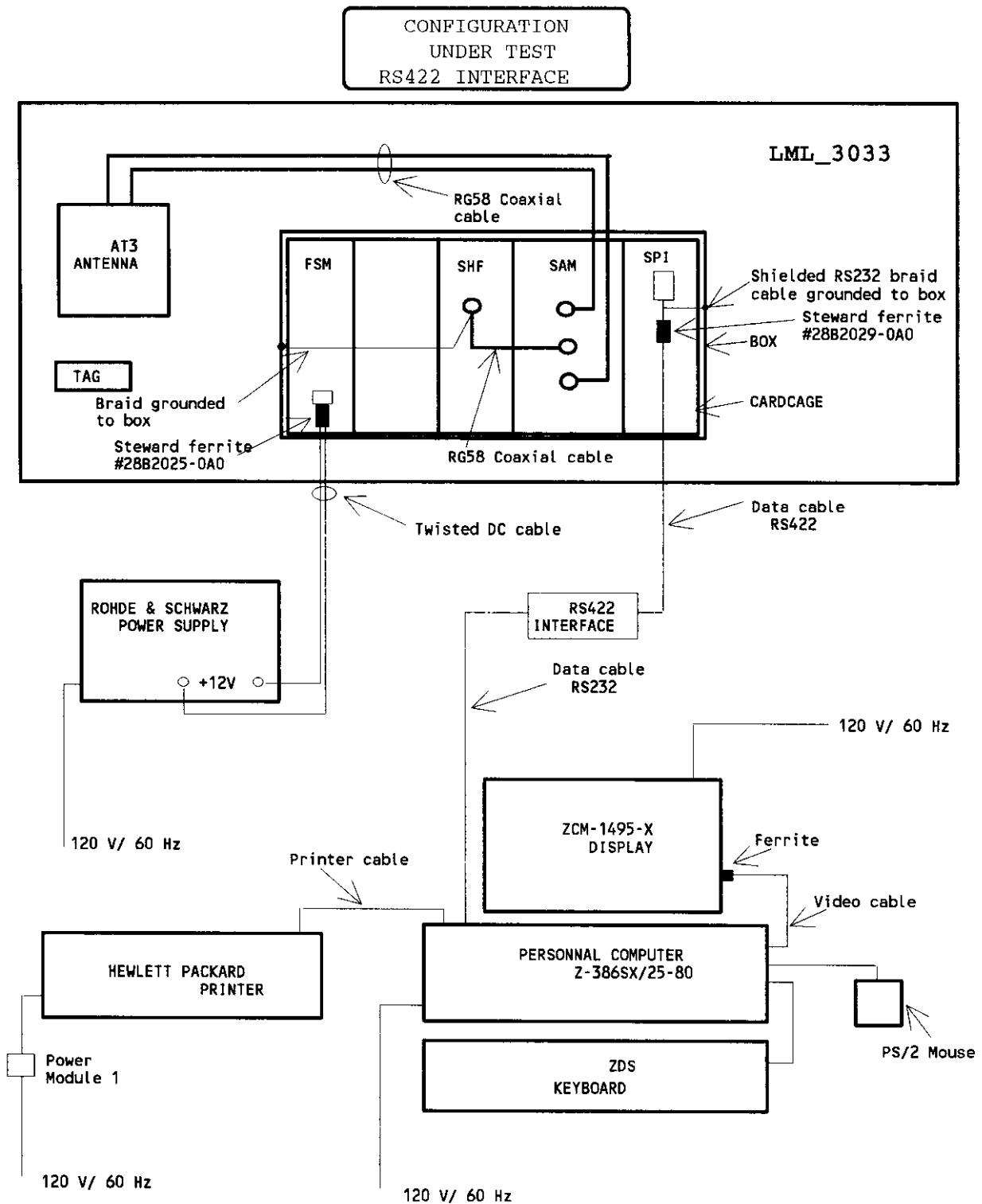
Intentional radiator measurement

The reader is disconnected from the host for radiated measurement.We test it at top, middle and bottom of the reader frequency band, in maximum detection range for the tag.

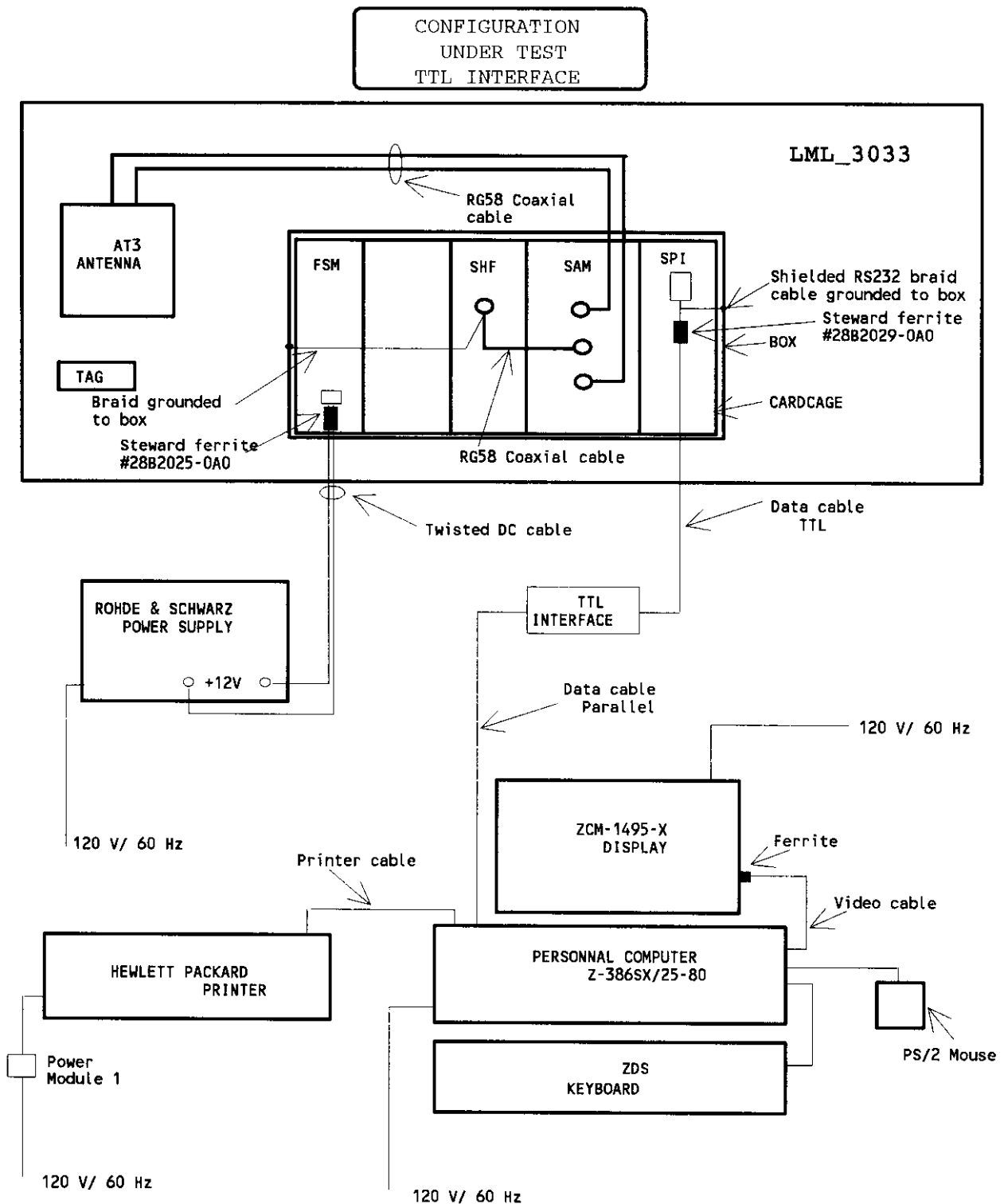
3-1-1 RS232 EUT configuration



3-1-2 RS422 EUT configuration



3-1-3 ISO 2 / WIEGAND (TTL) EUT configuration



3.2 EUT exciser software**Unintentional measurement**

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

The software is contained on a 3-1/2 inch disc and is inserted into the PC drive A.

Interface RS232 or RS422 :

For each one , the software used is COMSPI V3.22 . It was loaded from drive A into RAM memory of the PC and started.

The tag is placed at 0.50m from reader. As soon as reader was powered, a continuous wave at 2.450 Ghz was transmitted in tag direction by external antenna .

This wave was modulated by tag identification code and was reflected by tag back to the reader.

The modulated wave back to the reader was received by external antenna.

The wave was demodulated. Data was processed and sent to P.C at 19.2 Kbauds rate by communication interface.

The P.C interrogated the reader (polling mode) for got data from new tag detected.

If new tag was detected by reader the new data were send to P.C. Cycle duration is 50 ms and is repeated continuously.

Interface ISO2/WIEGAND (TTL) :

The software used is READISO V1.6. It was loaded from drive A into RAM memory of the PC and started.

The tag is placed at 0.50m from reader. As soon as reader was powered, a continuous wave at 2.450 Ghz was transmitted in tag direction by external antenna .

This wave was modulated by tag identification code and was reflected by tag back to the reader.

The modulated wave back to the reader was received by external antenna.

The wave was demodulated. Data was processed and sent to P.C at 1 Kbauds rate by communication interface.

If new tag was detected by reader the new data were send to P.C. (interruption mode)

Intentional radiator

EUT had not need software from host to operate.

The host was removed of field measurement, and reader powered on with tag placed at 0.50m from it.

The measurement was performed at bottom, middle and top of frequency range.

3-3 Required Signatures**Applicant Signature :**

Date

06/26/98

Typed/printed Name : A. BOISSEAU

Position : Director

Test Lab. manager Signature :

Date :

6/23/98

Typed/printed Name : JL. CANDELON

Position : Lab. manager

Staff test**Test Signature :**

Date

06/23/1998

Typed/printed Name : A. LEQUIER

Test Signature :

Date

06/23/1998

Typed/printed Name : D. RAUD

4 - E.U.T TECHNICAL DESCRIPTION**4 - 1 Modular Reader LML_3033 description :**

Assembly of :

CHS_2019 Locked Box S/N : 13904

FSM_2550 Module S/N : 14027

SHF_2339 Module S/N : 13307

SAM_2419 Module S/N : 12511 with RG58 coaxial cable (20cm long) connected to SHF module (The braid of this coaxial cable is grounded to box)
SAM_2419 is composed of HF 2439 board and SAM BF 2480 board.

SPI_2110 Module S/N : 12145

AT3_2749 Antenna S/N : P001 with RG58 emitted and received coaxial cable lenght 5m

BDG_1020 Tag

4 - 2 Block diagram, electric drawing, part list, components location drawing :

4-2-1 LML_3033 Modular Reader general description : see Attachment A

4-2-2 CHS_2019 Locked box description : see Attachment B

4-2-3 FSM_2550 Module description : see Attachment C

4-2-4 SHF_2339 Module description : see Attachment D

4-2-5 SAM_2419 Module description : see Attachment E

4-2-6 SPI_2110 Module description : see Attachment F

4-2-7 AT3_2749 Antenna description : see Attachment G

4-2-8 BDG_1020 Tag description : see Attachment H

4-3 List of EMI critical components :**CHS_2019 Locked Box :**

Shielded box with strip of beryllium around its door
This box is equiped with microwave absorber material to attenuate microwave harmonic signal.

FSM_2550 Module:

Filter : inductance (L1) 7mH

Decoupling capacitor : capacitor 470 μ F (C1,C2)

4-3 List of EMI critical components : (continued)**SHF_2339 Module :**

Oscillator 8 MHz(Y1) ; Dielectric material resonator (HY1)
Decoupling capacitor : 100nF (C6 to C11, C14, C20, C23, C24, C31, C32, C38, C42 to C45, C48, C53, C59, C61, C62) ; 1 μ F (C12, C19, C21, C22, C25 to C27, C33, C34, C39, C46, C49) ; 1000 μ F (C15, C16, C28, C40)
Microwave material absorber located at foil side module
See Clock path at page 17

SAM_2419 Module :**HF 2439 :**

Filter : inductance 68nF (L101 to L103, L201, L202) ; 120 μ H (L1)
Decoupling capacitor : 33 μ F (C1, C4)
HF decoupling capacitor : 47pF(C2, C101 to C107, C110 to C119, C201, C203, C206, C211, C212, C214, C220, C222)
HF filter : printed low-pass filter at the emission output and at the mixer LO input
HF_2439 is completely shielded by mechanical system.

SAM-BF 2480 :

Decoupling capacitor : 100nF (52 capacitor see part list) ; 4.7 μ F(C103, C104, C111, C112 to C114) ; 10 μ F(C115, C121, C128, C215, C216, C219, C220) ; 33 μ F(C100, C102, C107, C108) ; 47 μ F (C117 to C119, C124 to C126)
Filter : inductance : 22 μ H(L102 to L104, L106, L108) ; 120 μ H(L101)

SPI_2110 Module :

Quartz : 3.84MHz(Y1) ; 11.059MHz (Y2)
Decoupling capacitor : 100 μ F(C41, C42) ; 10 μ F(C12 to C15) ; 1 μ F(C11,C30) ; 100nF(C10, C29, C33 to C40) ; 10nF (C1 to C4)
See Clock path page 18

AT3_2749 Antenna :

Shielded RF amplifier
Printed high pass filter
Printed low pass filter
Decoupling capacitor 47pF (C10, C11, C12, C18)
Filter : inductance : 68nH (L1, L2, L3)

5 - POWER LINE CONDUCTED EMISSIONS**5-1 Test results measurements**

The initial step in collecting conducted data is a spectrum analyser peak scan of the measurement range. Significant peaks are then marked as shown on the 12 following data pages, and then are measured with quasi-peak detector

RESUME OF 12 HIGHEST SIGNALS PER WIRE MEASURED ON 3 INTERFACE CONFIGURATIONS

Interface mode	Product	Result	MINIMUM MARGIN				Data and Plot on following Pages
			LINE WIRE		NEUTRAL LINE		
			dB μ V	MHz	dB μ V	MHz	
RS232	E.U.T	Pass	-15.0	20.220	-15.7	6.143	20 and 26
	LML_3033		-18.0	7.357	-16.2	20.220	
	P.C+	Pass	-7.1	0.532	-5.3	3.921	21 and 27
	DISPLAY+PRINTER		-9.2	0.941	-5.8	2.513	
RS422	E.U.T	Pass	-20.8	14.700	-20.4	18.360	22 and 28
	LML_3033		-20.9	4.336	-21.4	14.700	
	P.C+	Pass	-7.0	0.501	-4.8	3.921	23 and 29
	DISPLAY+PRINTER		-9.7	1.439	-5.1	3.516	
TTL	E.U.T	Pass	-15.2	14.700	-14.2	18.360	24 and 30
	LML_3033		-16.1	18.360	-16.2	14.700	
	P.C+	Pass	-7.0	0.501	-5.1	3.531	25 and 31
	DISPLAY+PRINTER		-7.3	0.532	-5.9	2.513	

CISPR RECEPTIVE CHAIN H.P 8574A CONFIGURATION		
Quasi-Peak Adaptator	Normal mode	
	Band With = 9 KHz	
Spectrum Analyser	Resolution Band With = 100 KHz	
	Video Band With = 300 KHz	
	Sweep min	Peak measurement : 100 ms/MHz Quasi-peak measurement : 200s/MHz
Preselector	Normal mode	
	Internal preamplifier : 20 dB	

All readings are quasi-peak unless stated otherwise.

REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : READER LML 3033(WITH SPI,SHF,SAM BOARDS AND AT3 ANTENNA)
 SERIAL NUMBER : CHS 2009 SEE REFERENCES OF BOARDS AND ANTENNA IN SHEET 4
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED PHASE
 CONDITIONS : POWER SUPPLY RHODES&SCHARWZ INPUT:120V/60Hz OUTPUT 12V DC
 DATE : 11/13/1997 RS432 INTERFACE
 MEASUREMENTS DONE BY : A.LEQUIER

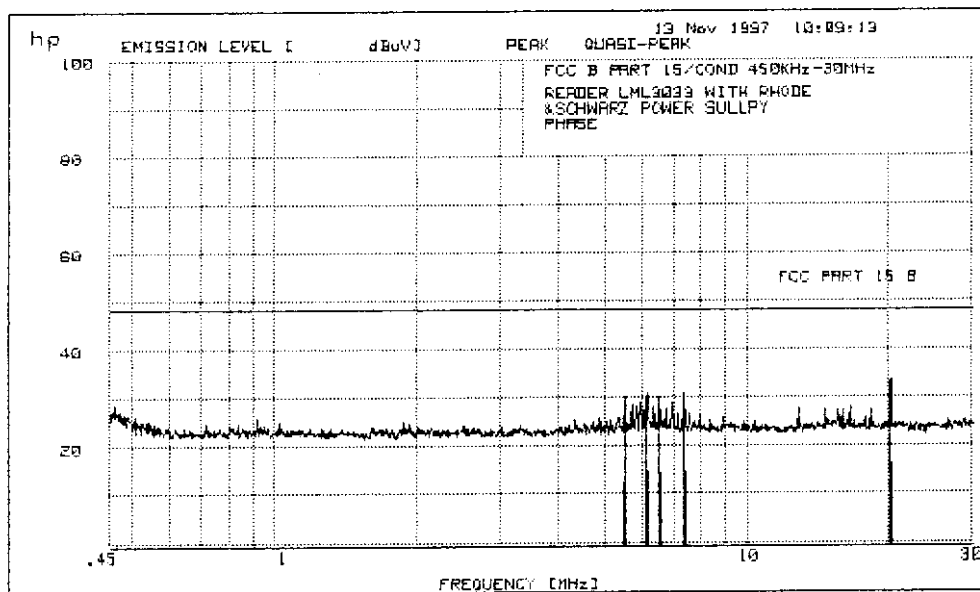
13 Nov 1997 10:09:13

1. AC POWER LINE CONDUCTED
 1.1 FCC B PART 15/COND 450KHz-30MHz

READER LML3033 WITH RHODE
 &SCHWARZ POWER SULLPY
 PHASE

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	5.531	24.9	-23.1
2	6.143	29.8	-18.2
3	6.542	29	-19.0
4	7.357	30	-18.0
5	20.22	33	-15.0



EQUIPMENT FCC ID : KVJLML 3033

REPORT NUMBER : 935-215-12/e APPENDIX:1-3
PRODUCT NAME : PC ZDS-386 + DISPLAY ZDS-1495-X + PRINTER HP 2277A
SERIAL NUMBER : XVA P WN 00791 / 246RK0182R0D / 2906A16132
STANDARD : FCC CFR 47 PART 15 CLASS B
MEASUREMENT : AC POWER LINE CONDUCTED PHASE
CONDITIONS : 120/60Hz - RS232 INTERFACE
DATE : 11/13/1997
MEASUREMENTS DONE BY : A.LEQUIER

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13 Nov 1997 10:38:03

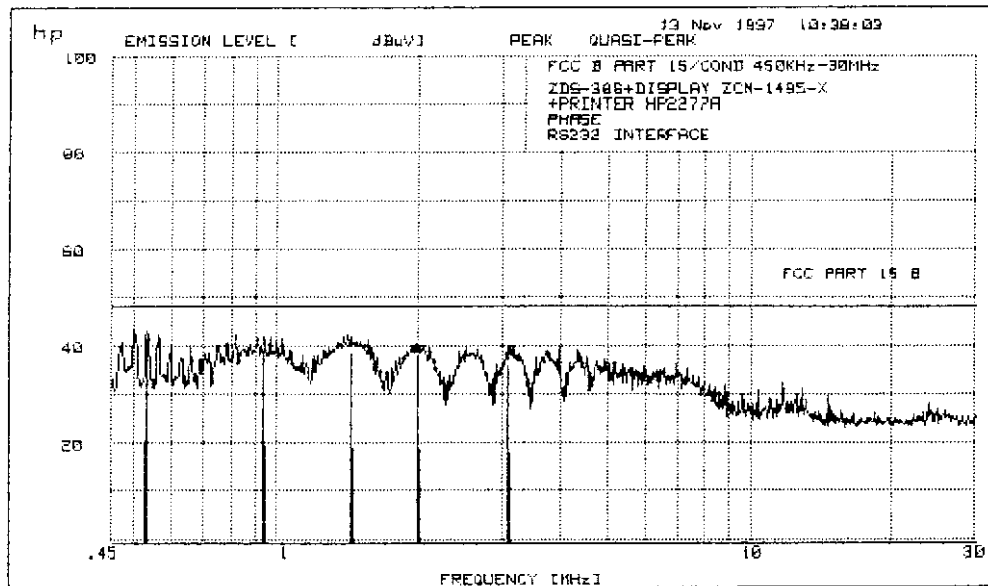
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1. AC POWER LINE CONDUCTED
1.1 FCC B PART 15/COND 450KHz-30MHz
- =====

ZDS-386+DISPLAY ZCM-1495-X
+PRINTER HP2277A
PHASE
RS232 INTERFACE

Quasi-Peaks above -30 dB of Limit Line #1
peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.5322	40.9	-7.1
2	.9417	38.8	-9.2
3	1.445	38.4	-9.6
4	2.004	37.4	-10.6
5	3.1	35.5	-12.5



REPORT NUMBER : 935-215-12/e
 APPENDIX:1-5
 PRODUCT NAME : READER LML 3033(WITH SPI,SHF,SAM BOARDS AND AT3 ANTENNA)
 SERIAL NUMBER : CHS 2009 SEE REFERENCES OF BOARDS AND ANTENNA IN SHEET 4
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED PHASE
 CONDITIONS : POWER SUPPLY RHODES&SCHWARZ INPUT:120V/60Hz OUTPUT 12V DC
 DATE : 11/13/1997 RS422 INTERFACE
 MEASUREMENTS DONE BY : A.LEQUIER

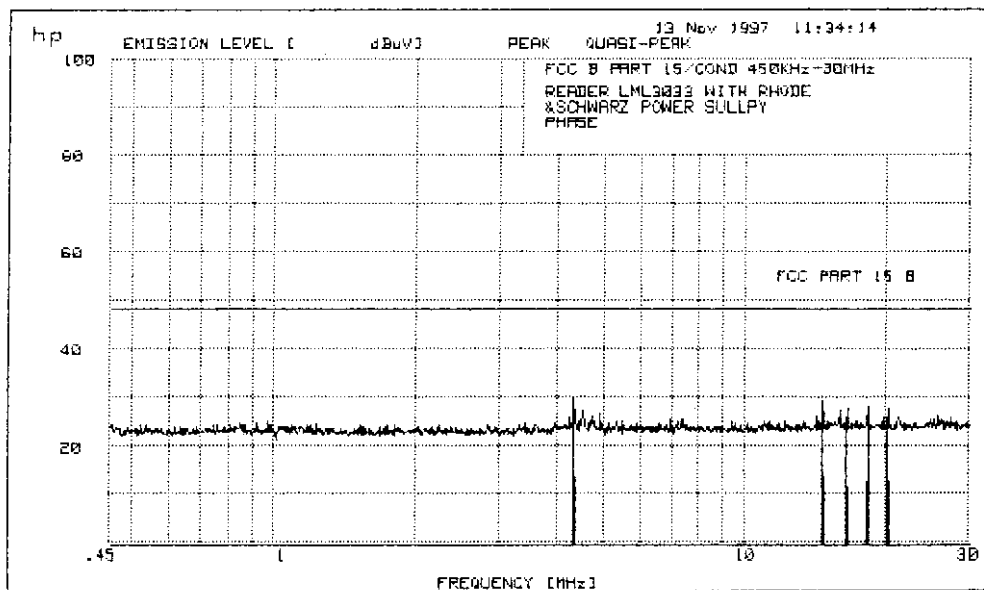
13 Nov 1997 11:34:14

1. AC POWER LINE CONDUCTED
 1.1 FCC B PART 15/COND 450KHz-30MHz

READER LML3033 WITH RHODE
 &SCHWARZ POWER SULLPY
 PHASE

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	4.336	27.1	-20.9
2	14.7	27.2	-20.8
3	16.53	23.4	-24.6
4	18.36	25.8	-22.2
5	20.22	25.5	-22.5



REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : PC ZDS-386 + DISPLAY ZDS-1495-X + PRINTER HP 2277A
 SERIAL NUMBER : XVA P WN 00791 / 246RK0182R0D / 2906A16132
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED PHASE
 CONDITIONS : 120/60Hz - RS422 INTERFACE
 DATE : 11/13/1997
 MEASUREMENTS DONE BY : A.LEQUIER

13 Nov 1997 11:10:42

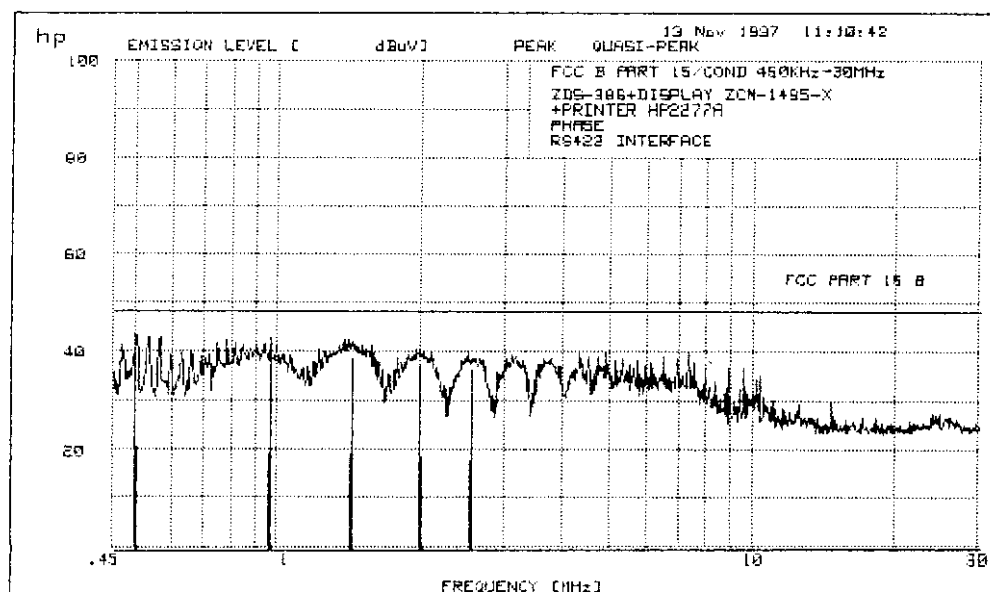
1. AC POWER LINE CONDUCTED

1.1 FCC B PART 15/COND 450KHz-30MHz

ZDS-386+DISPLAY ZCM-1495-X
 +PRINTER HP2277A
 PHASE
 RS422 INTERFACE

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.5019	41	-7.0
2	.9697	38.2	-9.8
3	1.439	38.3	-9.7
4	2.004	37.1	-10.9
5	2.567	36.1	-11.9



REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : READER LML 3033 (WITH SPI, SHF, SAM BOARDS AND AT3 ANTENNA)
 SERIAL NUMBER : CHS 2009 SEE REFERENCES OF BOARDS AND ANTENNA IN SHEET 4
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED PHASE
 CONDITIONS : POWER SUPPLY RHODES & SCHARWZ INPUT: 120V/60Hz OUTPUT 12V DC
 DATE : 11/13/1997 TTL INTERFACE
 MEASUREMENTS DONE BY : A. LEQUIER

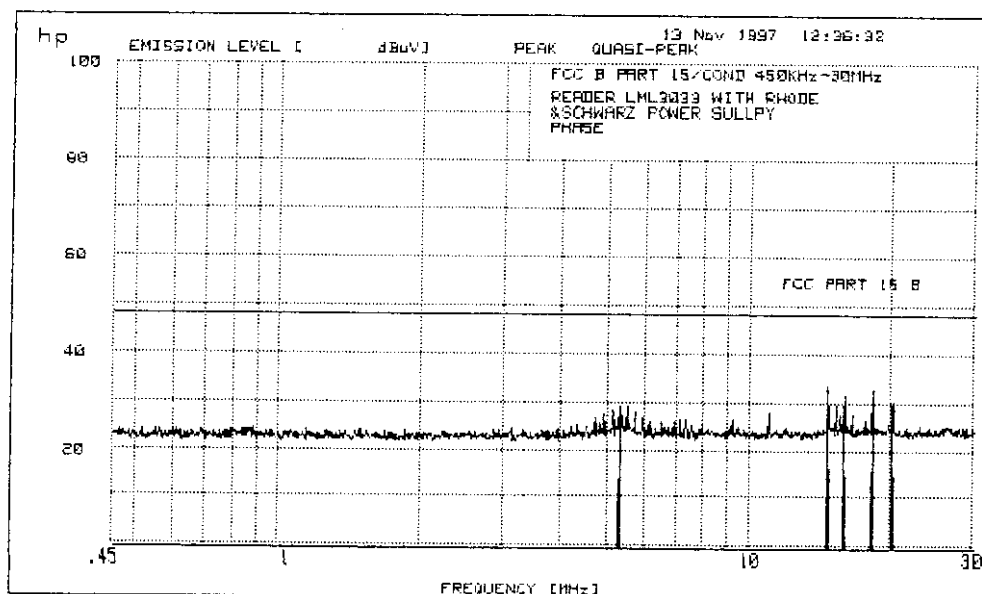
13 Nov 1997 12:36:32

1. AC POWER LINE CONDUCTED
 1.1 FCC B PART 15/COND 450KHz-30MHz

READER LML3033 WITH RHODE
 & SCHWARZ POWER SULLPY
 PHASE

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	5.325	27.9	-20.1
2	14.7	32.8	-15.2
3	15.92	29.4	-18.6
4	18.36	31.9	-16.1
5	20.22	29.3	-18.7



REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : PC ZDS-386 + DISPLAY ZDS-1495-X + PRINTER HP 2277A
 SERIAL NUMBER : XVA P WN 00791 / 246RK0182R0D / 2906A16132
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED PHASE
 CONDITIONS : 120/60Hz - TTL INTERFACE
 DATE : 11/13/1997
 MEASUREMENTS DONE BY : A.LEQUIER

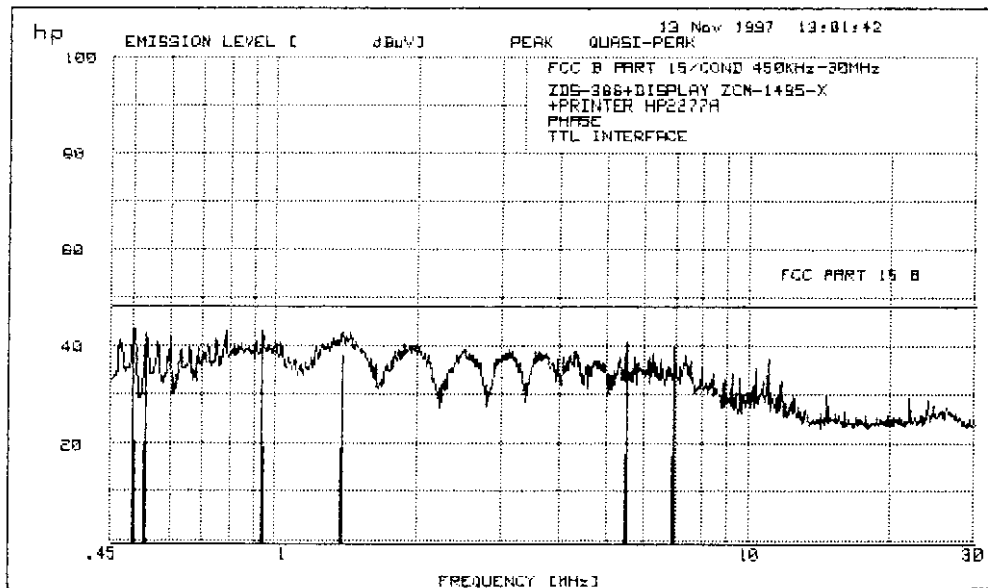
13 Nov 1997 13:01:42

1. AC POWER LINE CONDUCTED
 1.1 FCC B PART 15/COND 450KHz-30MHz

ZDS-386+DISPLAY ZCM-1495-X
 +PRINTER HP2277A
 PHASE
 TTL INTERFACE

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.5019	41	-7.0
2	.5322	40.7	-7.3
3	.9417	38.6	-9.4
4	1.385	37.9	-10.1
5	5.531	36	-12.0
6	6.938	35.3	-12.7



EQUIPMENT FCC ID : KVJLML 3033

REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : READER LML 3033(WITH SPI,SHF,SAM BOARDS AND AT3 ANTENNA)
 SERIAL NUMBER : CHS 2009 SEE REFERENCES OF BOARDS AND ANTENNA IN SHEET 4
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED NEUTRAL
 CONDITIONS : POWER SUPPLY RHODES&SCHARWZ INPUT:120V/60Hz OUTPUT 12V DC
 DATE : 11/13/1997 RS 232 INTERFACE
 MEASUREMENTS DONE BY : A.LEQUIER

APPENDIX:1-2

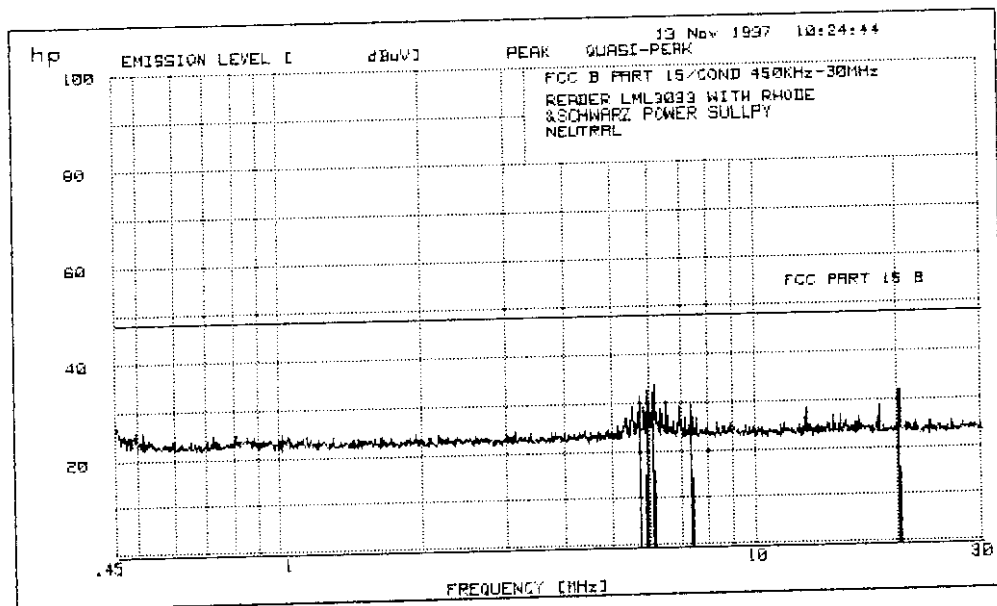
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1. AC POWER LINE CONDUCTED 1.1 FCC B PART 15/COND 450KHz-30MHz

READER LML3033 WITH RHODE
 &SCHWARZ POWER SULLPY
 NEUTRAL

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	5.744	29.7	-18.3
2	5.94	30.5	-17.5
3	6.143	32.3	-15.7
4	7.357	28.9	-19.1
5	20.22	31.8	-16.2



REPORT NUMBER : 935-215-12/e
PRODUCT NAME : PC ZDS-386 + DISPLAY ZDS-1495-X + PRINTER HP 2277A
SERIAL NUMBER : XVA P WN 00791 / 246RK0182R0D / 2906A16132
STANDARD : FCC CFR 47 PART 1995 CLASS B
MEASUREMENT : AC POWER LINE CONDUCTED NEUTRAL
CONDITIONS : 120/60Hz - RS232 INTERFACE
DATE : 11/13/1997
MEASUREMENTS DONE BY : A.LEQUIER

APPENDIX:1-4

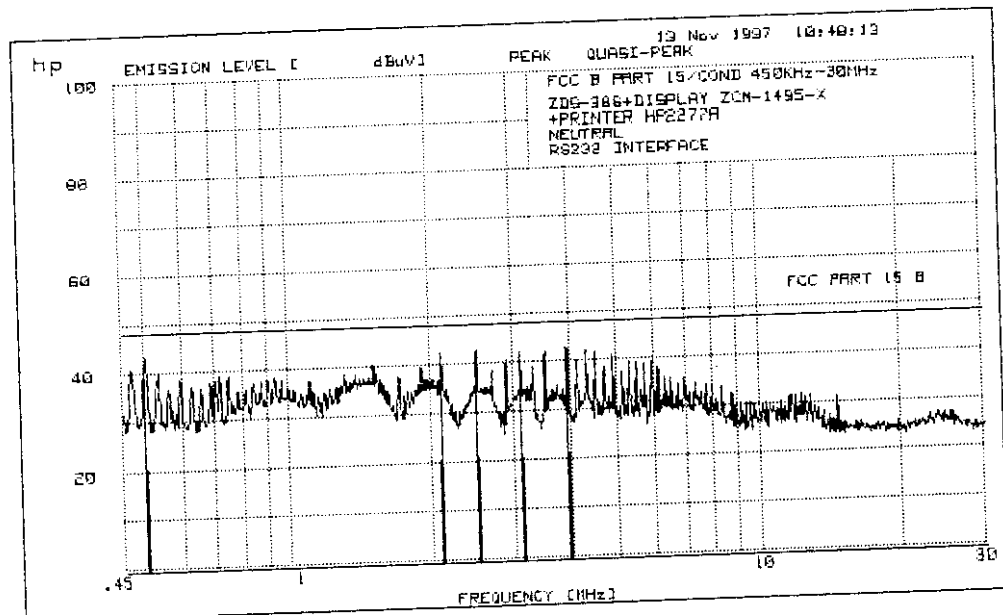
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1. AC POWER LINE CONDUCTED
1.1 FCC B PART 15/COND 450KHz-30MHz

ZDS-386+DISPLAY ZCM-1495-X
+PRINTER HP2277A
NEUTRAL
RS232 INTERFACE

Quasi-Peaks above -30 dB of Limit Line #1
peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.5019	41.3	-6.7
2	2.107	41.2	-6.8
3	2.513	42.2	-5.8
4	3.126	40.9	-7.1
5	3.921	42.7	-5.3



EQUIPMENT FCC ID : KVJLML 3033

APPENDIX:1-6

REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : READER LML 3033(WITH SPI,SHF,SAM BOARDS AND AT3 ANTENNA)
 SERIAL NUMBER : CHS 2009 SEE REFERENCES OF BOARDS AND ANTENNA IN SHEET 4
 STANDARD : FCC CFR 47 PART 15 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED NEUTRAL
 CONDITIONS : POWER SUPPLY RHODES&SCHARWZ INPUT:120V/60Hz OUTPUT 12V DC
 DATE : 11/13/1997 RS422 INTERFACE
 MEASUREMENTS DONE BY : A.LEQUIER

13 Nov 1997 11:42:42

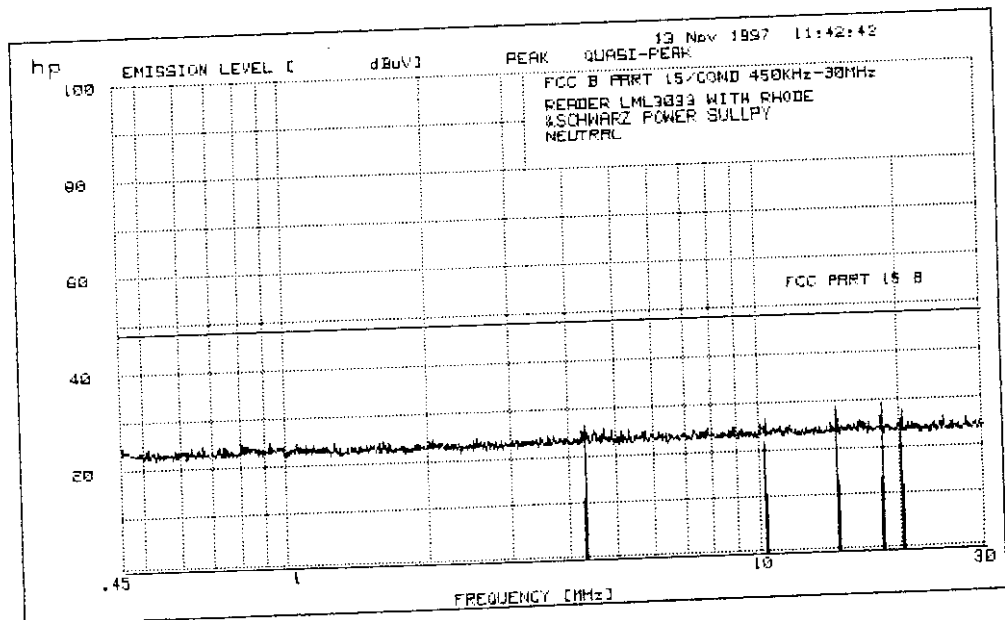
1. AC POWER LINE CONDUCTED

1.1 FCC B PART 15/COND 450KHz-30MHz

READER LML3033 WITH RHODE
 &SCHWARZ POWER SULLPY
 NEUTRAL

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	4.318	22.9	-25.1
2	10.29	21.7	-26.3
3	14.7	26.6	-21.4
4	18.36	27.6	-20.4
5	20.22	24.6	-23.4



APPENDIX:1-8

REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : PC ZDS-386 + DISPLAY ZDS-1495-X + PRINTER HP 2277A
 SERIAL NUMBER : XVA P WN 00791 / 246RK0182R0D / 2906A16132
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED NEUTRAL
 CONDITIONS : 120/60Hz - RS422 INTERFACE
 DATE : 11/13/1997
 MEASUREMENTS DONE BY : A.LEQUIER

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13 Nov 1997 11:21:30

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1. AC POWER LINE CONDUCTED

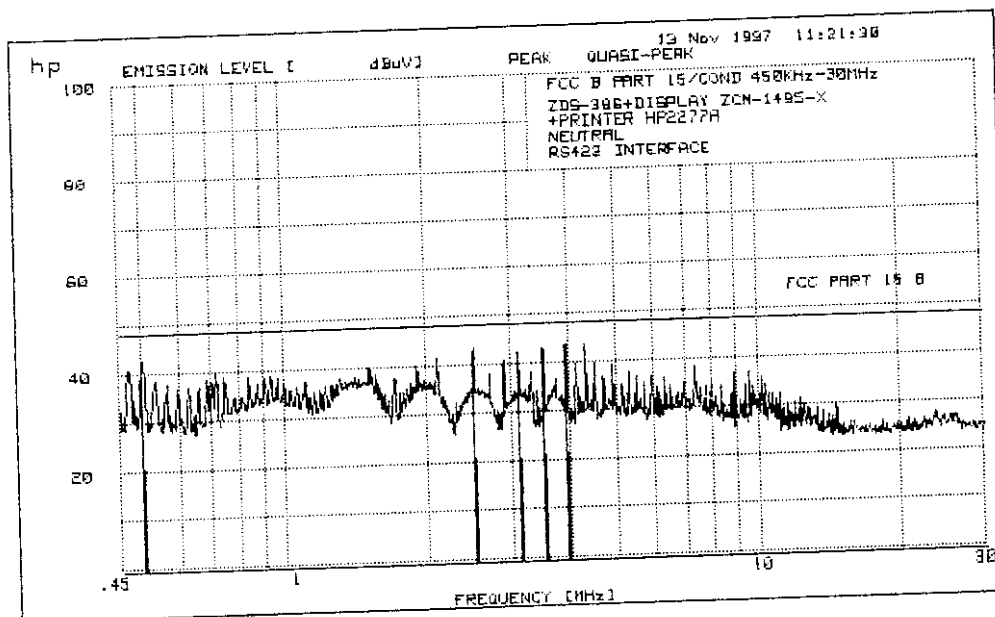
1.1 FCC B PART 15/COND 450KHz-30MHz

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ZDS-386+DISPLAY ZCM-1495-X
 +PRINTER HP2277A
 NEUTRAL
 RS422 INTERFACE

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.5019	41.3	-6.7
2	2.513	42.1	-5.9
3	3.126	41.3	-6.7
4	3.516	42.9	-5.1
5	3.921	43.2	-4.8



REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : READER LML 3033(WITH SPI,SHF,SAM BOARDS AND AT3 ANTENNA)
 SERIAL NUMBER : CHS 2009 SEE REFERENCES OF BOARDS AND ANTENNA IN SHEET 4
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED NEUTRAL
 CONDITIONS : POWER SUPPLY RHODES&SCHARWZ INPUT:120V/60Hz OUTPUT 12V DC
 DATE : 11/13/1997 TTL INTERFACE
 MEASUREMENTS DONE BY : A.LEQUIER

APPENDIX:1-10

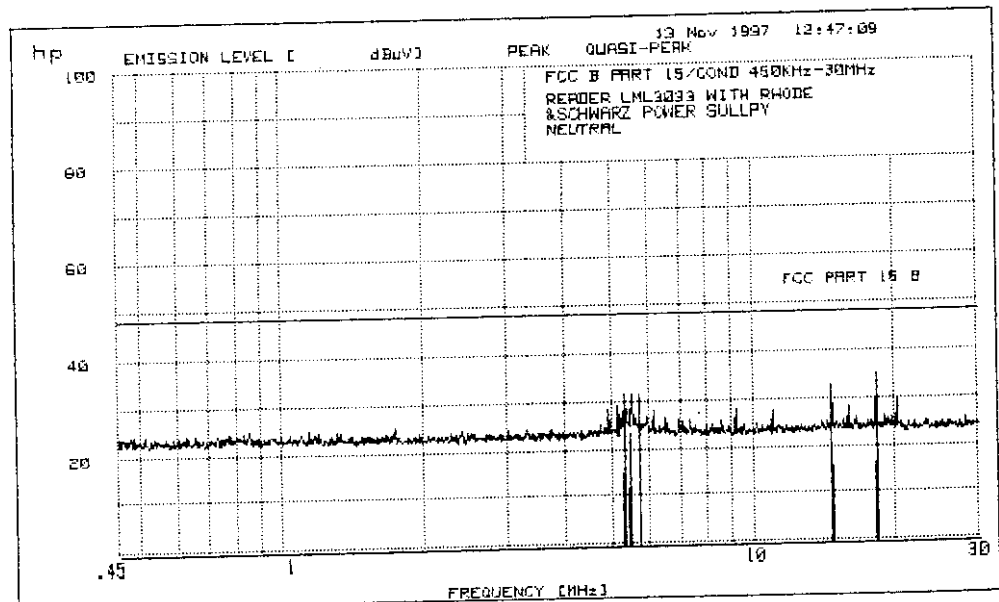
13 Nov 1997 12:47:09

1. AC POWER LINE CONDUCTED
 1.1 FCC B PART 15/COND 450KHz-30MHz

READER LML3033 WITH RHODE
 &SCHWARZ POWER SULLPY
 NEUTRAL

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	5.326	30.3	-17.7
2	5.462	23.2	-24.8
3	5.744	28.7	-19.3
4	14.7	31.8	-16.2
5	18.36	33.8	-14.2



APPENDIX:1-12

REPORT NUMBER : 935-215-12/e
 PRODUCT NAME : PC ZDS-386 + DISPLAY ZDS-1495-X + PRINTER HP 2277A
 SERIAL NUMBER : XVA P WN 00791 / 246RK0182R00 / 2906A16132
 STANDARD : FCC CFR 47 PART 1995 CLASS B
 MEASUREMENT : AC POWER LINE CONDUCTED NEUTRAL
 CONDITIONS : 120/60Hz - TTL INTERFACE
 DATE : 11/13/1997
 MEASUREMENTS DONE BY : A.LEQUIER

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13 Nov 1997 13:13:44

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1. AC POWER LINE CONDUCTED

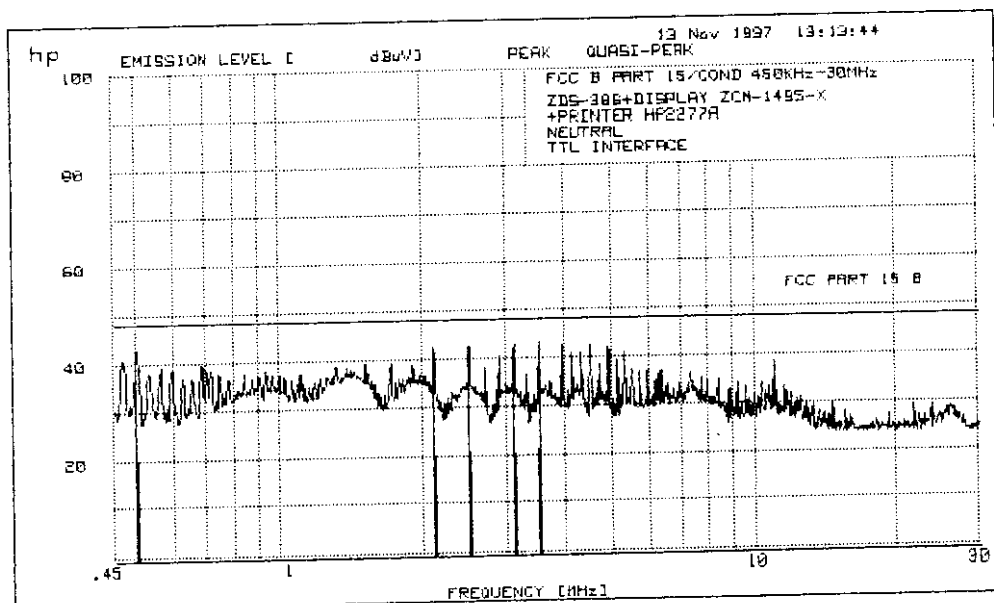
1.1 FCC B PART 15/COND 450KHz-30MHz

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ZDS-386+DISPLAY ZCM-1495-X
 +PRINTER HP2277A
 NEUTRAL
 TTL INTERFACE

Quasi-Peaks above -30 dB of Limit Line #1
 peak criteria = 6 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	.5019	40.8	-7.2
2	2.116	40.6	-7.4
3	2.513	42.1	-5.9
4	3.126	41.5	-6.5
5	3.531	42.9	-5.1



6. OPEN FIELD RADIATED EMISSION FOR UNINTENTIONAL RADIATOR

6-1 Test results measurements

The following data pages lists the significant emission frequencies, measured level, correction factor (includes cable and antenna corrections), corrected reading and the limit. The highest peaks are measured in quasi-peak detection mode . Explanation of the Correction Factor is given in paragraph 6.4.

RESUME OF 12 HIGHEST SIGNALS MEASURED ON 3 INTERFACES CONFIGURATIONS

Interface mode	Product	Result	MINIMUM MARGIN		Data and Plot on following Pages
			dB μ V	MHz	
RS232	E.U.T LML_3033+ P.C+ DISPLAY+PR INTER	Pass	-5.2 -6.3 -6.8 -7.1	624.019 799.972 288.039 296.040	36
RS422	E.U.T LML_3033+ P.C+ DISPLAY+PR INTER	Pass	-5.7 -6.1 -6.8 -7.0	799.990 65.990 296.070 288.044	37
TTL	E.U.T LML_3033+ P.C+ DISPLAY+PR INTER	Pass	-6.5 -7.0 -7.3 -8.4	288.042 656.014 296.080 799.990	38

CISPR RECEPTIVE CHAIN H.P 8574A CONFIGURATION		
Quasi-Peak Adaptator	Normal mode Band With = 120 KHz	
	Resolution Band With = 1 MHz Video Band With = 3 MHz	
Spectrum Analyser	Sweep min	Peak measurement : 1 ms/MHz
		Quasi-peak measurement : 20s/MHz
Preselector	Normal mode Internal preamplifier : 20 dB	

All readings are quasi-peak unless stated otherwise.

EQUIPMENT FCC ID : KVJLML 3033

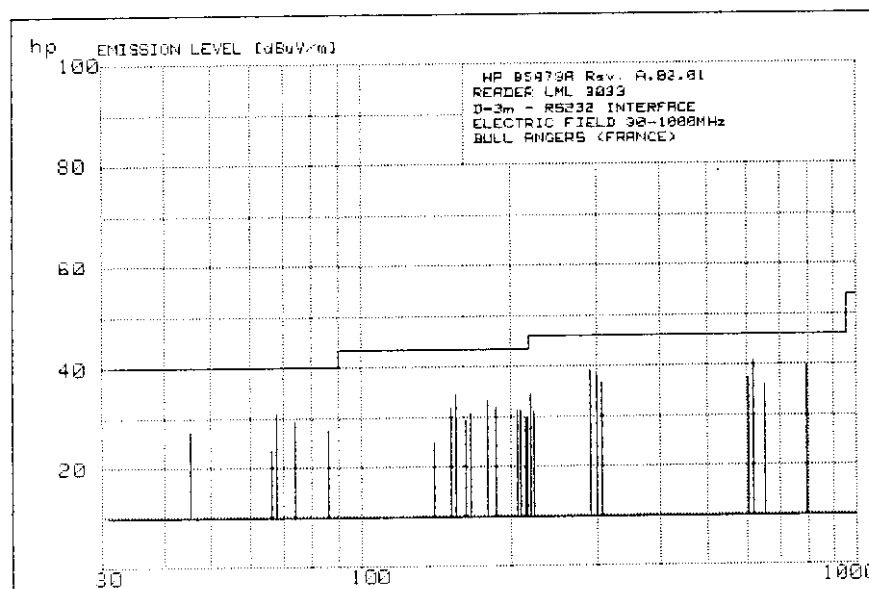
REPORT : 935-215-12/e APPENDIX 2-1
 PRODUCT NAME : READER LML 3033+PC ZDS-386+DISPLAY ZDS-1495+PRINTER HP 2277 A
 SERIAL NUMBER : CHS 2009(READER LML3033)S/N 13904 CONFIGURATION ON APPENDIX A
 STANDARD : FCC CFR 47 PART 15 1995 CLASS B
 MEASUREMENT : ELECTRIC FIELD 30-1000 MHz
 CONDITIONS : 120V/60Hz - RS232 INTERFACE
 DATE : 14 Nov 1997
 MEASUREMENT DONE BY : D.RAUD

PRODUCT EMISSIONS

HP 85879A Rev. A.02.01

Data File: E FIELD RS232 14 Nov 1997 17:35

No	EMISSION FREQUENCY MHz	SPEC LIMIT	MEASUREMENTS			SITE			CORR FACTOR dB	COMMENTS
			ABS	dLIM	MODE	POL	HGT cm	AZM deg		
			dBuV/m	dB						
1	44.220	40.0	27.3	-12.7	PK	V	110	190	13.2	BROADBAND
2	64.46	40.0	23.6	-16.4	PK	V	110	75	7.5	
3	65.994	40.0	30.9	-9.1	QP	V	140	270	7.6	
4	72.010	40.0	29.3	-10.7	PK	V	150	330	8.2	
5	84.010	40.0	27.6	-12.4	PK	V	120	20	10.5	
6	138.232	43.5	25.0	-18.5	PK	V	110	235	13.4	
7	149.269	43.5	31.8	-11.7	PK	H	120	40	13.6	
8	152.983	43.5	34.4	-9.1	PK	H	120	150	13.5	
9	160.342	43.5	29.2	-14.3	PK	H	140	160	13.3	
10	164.020	43.5	30.6	-12.9	PK	H	120	155	13.2	
11	177.085	43.5	33.1	-10.4	QP	H	120	350	12.7	
12	184.502	43.5	32.0	-11.5	PK	H	130	25	12.4	
13	204.576	43.5	31.2	-12.3	PK	H	140	320	12.2	
14	208.251	43.5	31.4	-12.1	PK	H	130	315	12.5	
15	211.929	43.5	29.8	-13.7	QP	H	130	320	12.8	
16	213.791	43.5	30.1	-13.4	QP	H	150	230	13.	
17	217.479	46.0	34.5	-11.5	PK	H	150	240	13.3	
18	221.400	46.0	30.9	-15.1	PK	H	130	10	13.6	
19	288.039	46.0	39.2	-6.8	QP	H	190	300	16.8	
20	296.040	46.0	38.9	-7.1	QP	H	190	300	17.	
21	304.082	46.0	36.8	-8.2	PK	H	200	280	17.2	
22	607.997	46.0	37.6	-8.4	PK	H	120	185	23.5	
23	624.019	46.0	40.8	-5.2	QP	H	120	240	23.6	
24	656.014	46.0	36.2	-9.8	PK	H	110	240	23.8	
25	799.972	46.0	39.7	-6.3	QP	V	160	25	25.6	



EQUIPMENT FCC ID : KVJLML 3033

REPORT : 935-215-12/e
 PRODUCT NAME : READER LML 3033+PC ZDS-386+DISPLAY ZDS-1495+PRINTER HP 2277 A
 SERIAL NUMBER : CHS 2009(READER LML3033)S/N 13904 CONFIGURATION ON APPENDIX A
 STANDARD : FCC CFR 47 PART 15 1995 CLASS B
 MEASUREMENT : ELECTRIC FIELD 30-1000 MHz
 CONDITIONS : 120V/60Hz - RS422 INTERFACE
 DATE : 14 Nov 1997
 MEASUREMENT DONE BY : D.RAUD

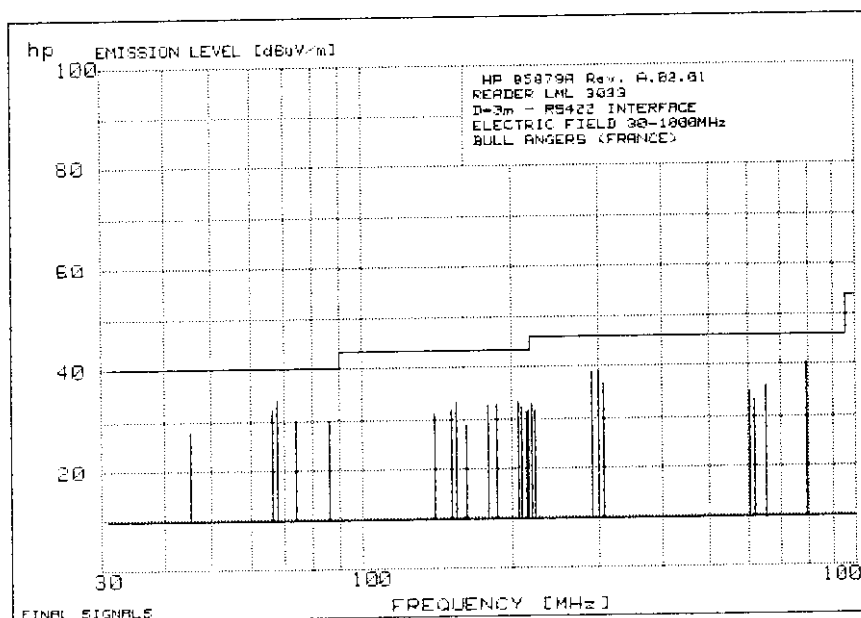
APPENDIX 2-2

PRODUCT EMISSIONS

HP 85879A Rev. A.02.01

Data File: E FIELD RS422 14 Nov 1997 15:11

No	EMISSION FREQUENCY MHz	SPEC LIMIT dBuV/m	MEASUREMENTS			SITE			CORR FACTOR dB	COMMENTS
			ABS	dLIM	MODE	POL	HGT	AZM		
			dBuV/m	dB			cm	deg		
1	44.220	40.0	28.1	-11.9	PK	V	120	190	13.2	BROADBAND
2	64.46	40.0	32.3	-7.7	PK	V	100	110	7.5	
3	65.990	40.0	33.9	-6.1	QP	V	110	280	7.6	
4	72.010	40.0	29.9	-10.1	PK	V	120	240	8.2	
5	84.010	40.0	29.9	-10.1	PK	V	160	200	10.5	
6	138.232	43.5	31.4	-12.1	PK	V	110	145	13.4	
7	149.269	43.5	32.1	-11.4	PK	H	120	130	13.6	
8	152.983	43.5	33.3	-10.2	PK	H	120	140	13.5	
9	160.342	43.5	29.0	-14.5	PK	H	120	185	13.3	
10	177.098	43.5	32.7	-10.8	QP	H	110	0	12.7	
11	184.502	43.5	32.9	-10.6	PK	H	110	360	12.4	
12	204.576	43.5	33.4	-10.1	PK	H	140	180	12.2	
13	208.251	43.5	32.3	-11.2	PK	H	130	0	12.5	
14	211.932	43.5	31.4	-12.1	QP	H	140	220	12.8	
15	213.780	43.5	31.5	-12.0	QP	H	140	225	13.	
16	217.479	46.0	33.1	-12.9	PK	H	120	250	13.3	
17	221.400	46.0	31.7	-14.3	PK	H	150	5	13.6	
18	288.044	46.0	39.0	-7.0	QP	H	190	280	16.8	
19	296.070	46.0	39.2	-6.8	QP	H	190	290	17.	
20	304.082	46.0	36.4	-9.6	PK	H	190	280	17.2	
21	607.997	46.0	34.8	-11.2	PK	H	200	195	23.5	
22	624.000	46.0	33.2	-12.8	PK	V	200	220	23.6	
23	656.014	46.0	35.9	-10.1	PK	H	200	280	23.8	
24	799.990	46.0	40.3	-5.7	QP	V	150	30	25.6	



EQUIPMENT FCC ID : KVJLML 3033

REPORT : 935-215-12/e APPENDIX 2-3
 PRODUCT NAME : READER LML 3033+PC ZDS-386+DISPLAY ZDS-1495+PRINTER HP 2277 A
 SERIAL NUMBER : CHS 2009(READER LML3033)/S/N 13904 CONFIGURATION ON APPENDIX A
 STANDARD : FCC CFR 47 PART 15 1995 CLASS B
 MEASUREMENT : ELECTRIC FIELD 30-1000 MHz
 CONDITIONS : 120V/60Hz - TTL INTERFACE
 DATE : 14 Nov 1997
 MEASUREMENT DONE BY : D.RAUD

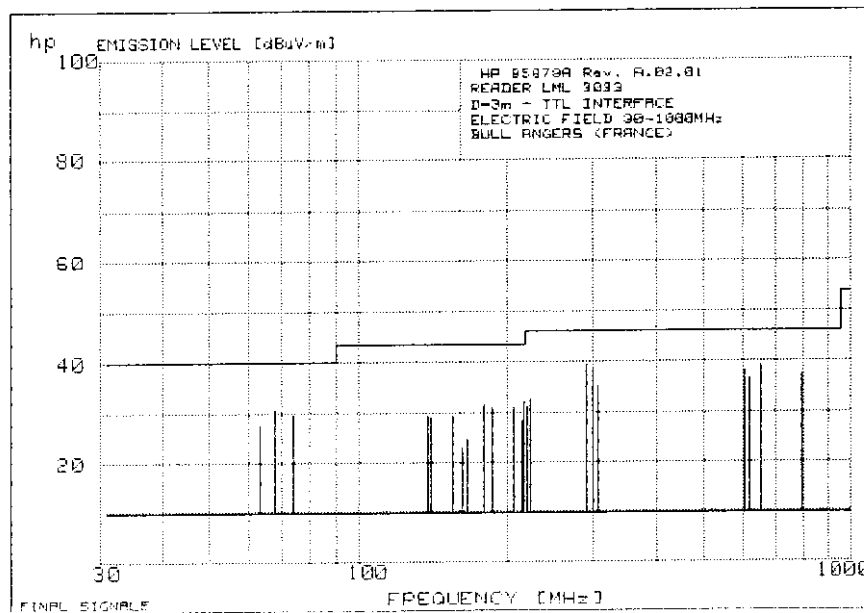
PRODUCT EMISSIONS

HP 85879A Rev. A.02.01

Data File: E FIELD TTL

14 Nov 1997 13:45

No	EMISSION	SPEC	MEASUREMENTS			SITE			CORR	COMMENTS
	FREQUENCY MHz	LIMIT dBuV/m	ABS	dLIM	MODE	POL	HGT cm	AZM deg	FACTOR dB	
1	61.82	40.0	27.7	-12.3	PK	V	120	360	7.7	BROADBAND
2	65.990	40.0	30.5	-9.5	PK	V	110	45	7.6	
3	72.003	40.0	29.6	-10.4	PK	V	100	260	8.2	
4	136.380	43.5	29.3	-14.2	PK	V	120	135	13.4	
5	138.232	43.5	29.0	-14.5	PK	V	100	140	13.4	
6	152.983	43.5	29.2	-14.3	PK	H	130	130	13.5	
7	160.342	43.5	23.1	-20.4	QP	H	130	150	13.3	
8	164.020	43.5	24.7	-18.8	PK	H	130	145	13.2	
9	177.158	43.5	31.6	-11.9	PK	H	120	20	12.7	
10	184.502	43.5	31.0	-12.5	PK	H	120	45	12.4	
11	204.576	43.5	30.9	-12.6	PK	H	140	185	12.2	
12	211.957	43.5	28.5	-15.0	QP	H	140	120	12.8	
13	213.780	43.5	32.3	-11.2	PK	H	140	95	13.	
14	217.479	46.0	31.3	-14.7	PK	H	140	90	13.3	
15	221.400	46.0	32.8	-13.2	PK	H	140	15	13.6	
16	288.042	46.0	39.5	-6.5	QP	H	190	285	16.8	
17	296.080	46.0	38.7	-7.3	QP	H	200	280	17.	
18	304.082	46.0	35.4	-10.6	PK	H	190	270	17.2	
19	607.997	46.0	36.0	-8.0	PK	H	150	315	23.5	
20	624.000	46.0	36.8	-9.2	PK	H	150	120	23.6	
21	656.014	46.0	39.0	-7.0	PK	H	160	195	23.8	
22	799.990	46.0	37.6	-8.4	QP	V	100	100	25.6	



6.3 FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and cable loss, and subtracting the preamplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows :

$$FS = RA + AF + CF - PG$$

FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable loss

PG = Preamplifier Gain (Preselector)

Assume a receiver reading. The antenna factor and the cable loss are added. The internal preselector gain of 20 dB is subtracted, giving the field strength.

REMS software performs calculation and result of table in column ABS (MEASUREMENTS) is FIELD STRENGTH.

6.4 ANTENNA FACTORS AND CABLE LOSS FOR 3m DISTANCE MEASUREMENT

6-4-1 Cable loss

E field 3 meters cable losses

FREQUENCY	LOSS
F (MHz)	(dB)
30	0.4
40	0.8
50	1.1
100	1.1
120	1.3
160	1.8
200	1.7
250	2.3
300	2.7
400	3
500	3.4
600	3.3
700	3.6
800	4.3
900	4.3
1000	4.6
1100	4.6
1200	5.2
1300	5.6
1400	5.8
1500	5.9
1600	6.2
1700	6.3
1800	6.8
1900	7
2000	7.2

6-4-2 Antenna factor BILOG CBL6112 30-2000 MHz (3m)

Frequency (MHz)	Factor antenna (dB)
30	19.4
35	16.9
40	14.3
45	11.9
50	9.5
55	7.7
60	6.7
65	6.4
70	6.7
75	7.6
80	8.6
90	10.5
100	11.9
150	11.9
200	10.1
250	13.7
300	14.4
400	17.1
500	19.0
600	20.2
700	20.4
800	21.3
900	21.8
1000	22.6
1100	23.4
1200	24.3
1300	24.8
1400	25.7
1500	26.6
1600	26.9
1700	28.0
1800	28.1
1900	28.6
2000	29.2

7. OPEN FIELD RADIATED EMISSION FOR INTENTIONAL RADIATOR**7-1 Test procedure**

The reader LML_3033 is placed on a wood table 0.80m in height above ground and is powered on by 12 V DC external power supply . (The tag is near the reader)

We test it at bottom, middle and top of its operating frequency range
The frequency range of the transceiver is 2.446250 to 2.453750 GHz by 250 KHz step.

For each tuned frequency the maximum level amplitude is recorded for fundamental and highest harmonics frequencies.

To increase the signal to noise ratio, a pre- measurement is performed at 1m from E.U.T.
Then the measurement is performed at 3 meters from E.U.T. with spectrum analyser RBW = 100 KHz for fundamental frequencies and RBW = 5 KHz for harmonics frequencies measurement.

CFR 47 Part 15 Subpart C specifications limits applied :

Fundamental frequency : § 15.245 limit

Harmonic frequency in restricted band listed in § 15.205 : § 15.209 limit

Harmonic frequency outside restricted band listed in § 15.205 : § 15.245 limit

Bandedge measurement is performed in accordance of § 15.245 (3).

7.2 Tests results

7-2-1 Fondamental anf harmonics frequencies data

FIELD STRENGTH OF INTENTIONAL RADIATOR VERSUS FCC PART 15SUBPART C §15.245, 15.209, 15.205

PRODUCT: HYPER X Reader LML3033 with AT3 antenna

OPERATOR: A.LEQUIER / D.RAUD

DATE: 03/12/1998

1 Harmonic level measurement :

The measurements are performed on channel number 31 (lowest frequency), 9 (central frequency), and 30 (highest frequency) on fundamental frequency h1, until 10 th harmonic frequency. Preliminary a spectrum signature is performed at one meter from E.U.T. The final measurement is performed at 3 meters from E.U.T. The measurements are performed according to ANSI C63.4 - 1992 method measurement described in § 8. Measurements are performed at maximum range corresponding to 5 meters distance detection (worst case measurement). The tag is reading continuously.

For fundamental frequency measurement peak detection is used instead of average, the result is equal for Continuous Wave (RBW = 100 KHz and VBW=3xRBW=300KHz)

For harmonic frequencies measurement average detection is used to increase the ratio signal/noise. RBW = 5 KHz and VBW=30Hz , therefore noise level is -10dBµV.

Channel	Harmonic number	Frequency GHz	Antenna Factor dB		Cable Loss dB	Measured Level dBµV/m (corrected value)		Limit (D=3m) dBµV/m (**) CFR47 §		Margin (dBµV/m)	Test result
			D=1m	D=3m		D = 1 m	D = 3 m	15.245	15.209		
31	h1	2.446250	28.8	30.7	2.6	116.4	111.3	114		-2.7	Pass
	h2	4.892500	33.7	35.4	3.8	51.5	48.2		54	-5.8	Fail
	h3	7.338750	37.1	38	5	54.1	46		54	-8	Pass
	h4	9.785000	38.5	40.2	6.5	43	36.7	64		-27.3	Pass
	h5*	12.231250	39.2	41.1	7.5	39.7	noise		54	--	Pass
9	h1	2.450000	28.8	30.7	2.6	116.4	111.3	114		-2.7	Pass
	h2	4.900000	33.7	35.4	3.8	54.5	51.7		54	-2.3	Pass
	h3	7.350000	37.1	38	5	51.1	47		54	-7	Pass
	h4	9.800000	38.5	40.2	6.5	45	40.7	64		-23.3	Pass
	h5*	12.250000	39.2	41.1	7.5	37.7	noise		54	--	Pass
30	h1	2.453750	28.8	30.7	2.6	116.4	111.3	114		-2.7	Pass
	h2	4.907500	33.7	35.4	3.8	58.3	51.7		54	-2.3	Pass
	h3	7.381250	37.1	38	5	56.1	49		54	-5	Pass
	h4	9.815000	38.5	40.2	6.5	48	43.7	64		-20.3	Pass
	h5*	12.268750	39.2	41.1	7.5	45.7	39.6		54	-14.4	Pass

(*) For harmonic >h5 to h10 no signal found: analyser level noise = -10 dBµV (RBW = 5 KHz and VBW=30Hz)

(**) unit change : 114 dBµV/m = 500 mV/m, 64 dBµV/m = 1.6mV/m and 54 dBµV/m = 500 µV/m.

2. Measurement outside of specified band (§15-245 (a)(3)) :

-lower frequency of band (2.446250GHz) : attenuation > 67 dB (not signal found)

see page 47

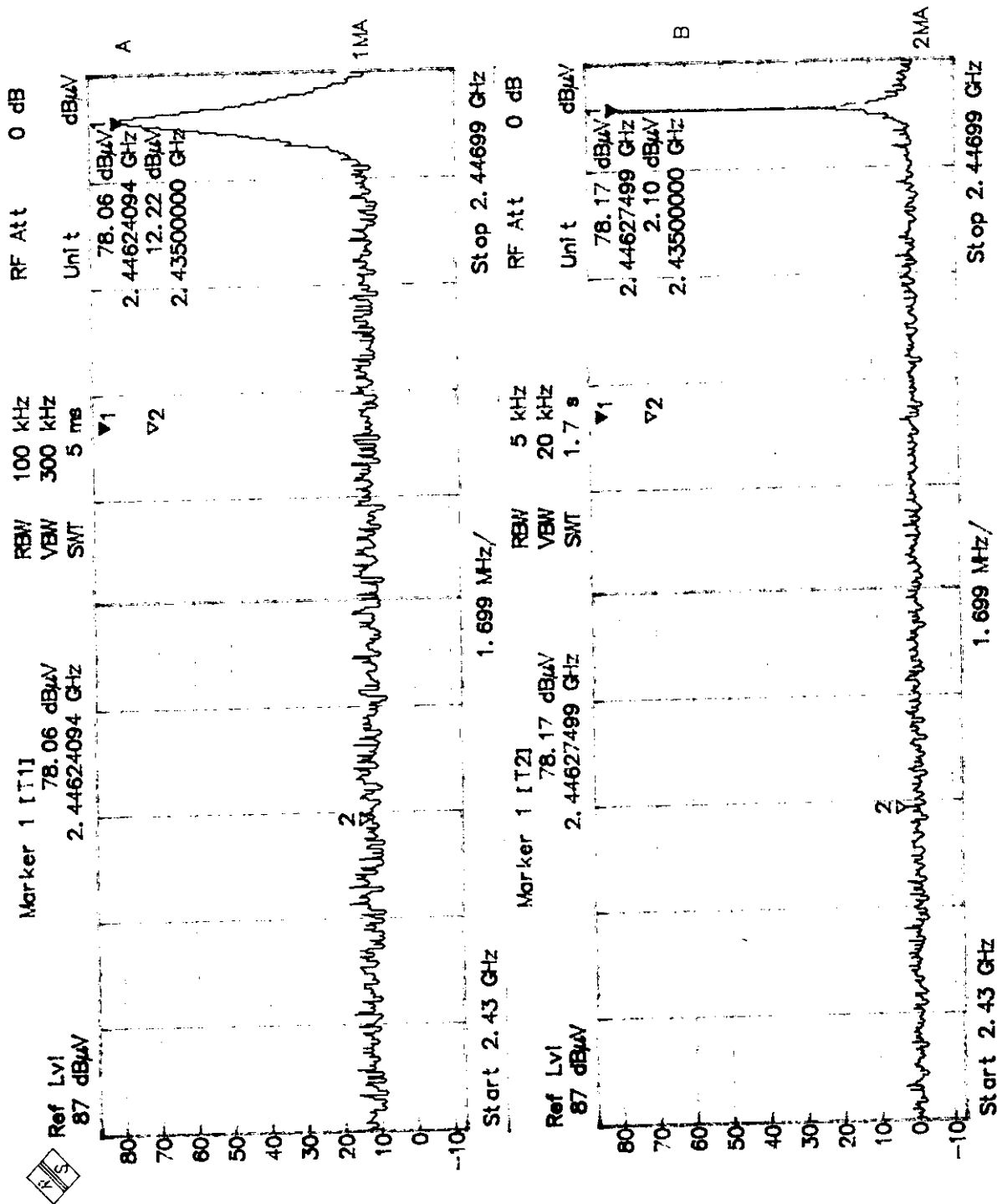
-upper frequency of band (2.453750GHz) : attenuation > 65 dB (not signal found)

see page 48

7-2-2 Lowest Bandedge measurements plot

§ 15.245 (3) PLOT OF BANDEDGE MEASUREMENT (Transmitter operating on the lowest channel)

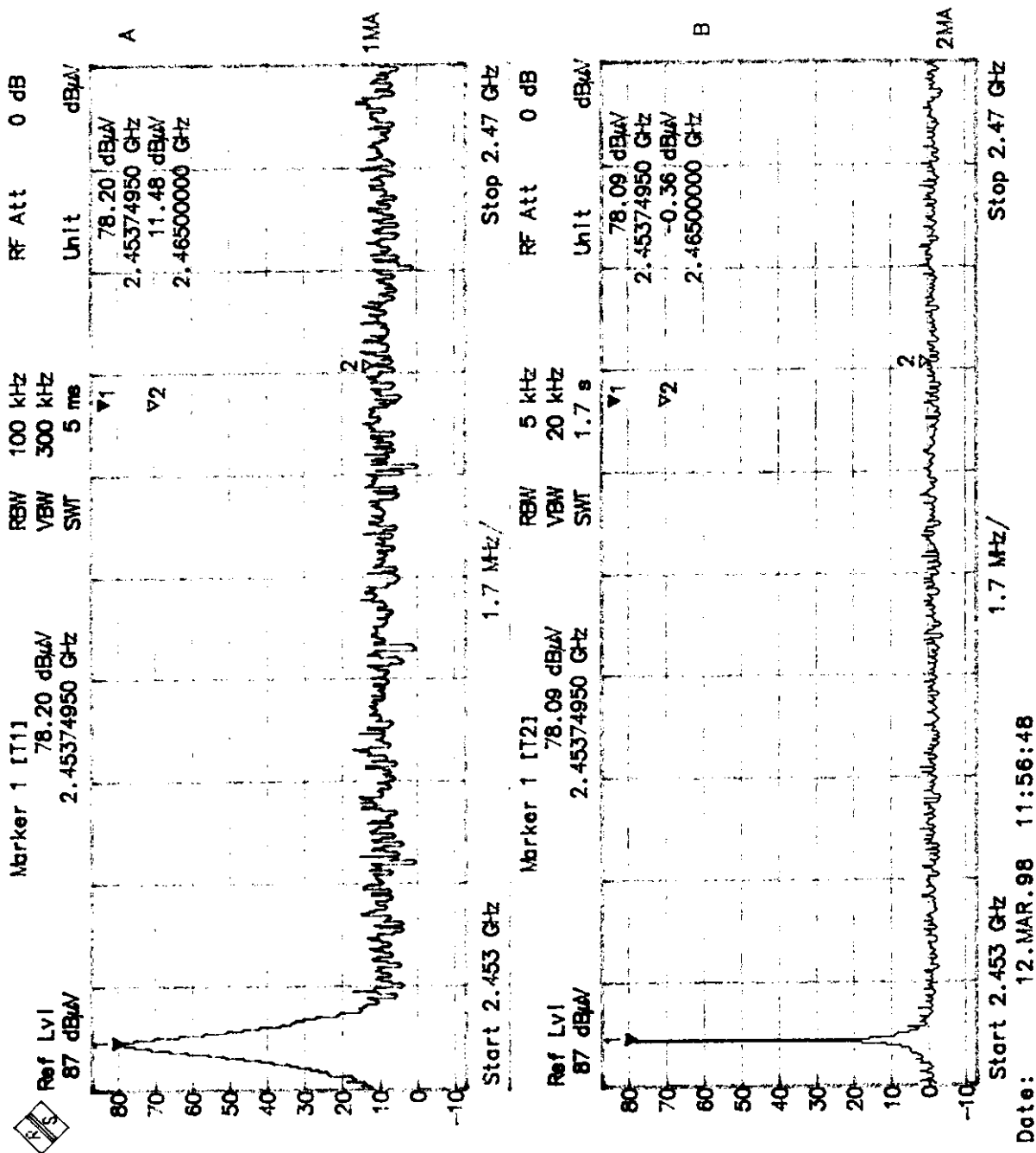
PRODUCT: LML_3033



7-2-3 Highest Bandedge measurement plot

§15.245 (3) PLOT OF BANDEDGE MEASUREMENT (Transmitter operating on the highest channel)

PRODUCT: LML_3033



EQUIPMENT FCC ID : KVJLML 3033**7-2-5 Correction factor****Cable loss**

F (GHz)	Loss (dB)
2	2.2
4	3.3
5	3.5
7	5.5
8	4.9
9	5.1
10	5.5
11	6.0
12	5.1
13	5.8

Antenna factors

F (GHz)	Antenna Factor (dB)	Antenna Factor (dB)
	D=1m	D=3m
1	24.2	25.9
1.5	25.5	27.0
2	27.9	29.2
2.5	28.8	30.7
3	30.6	32.3
3.5	31.5	33.3
4	32.9	34.6
4.5	32.8	34.3
5	33.9	35.6
5.5	34.7	36.4
6	34.8	36.7
6.5	35.2	36.6
7	36.1	37.3
7.5	37.4	38.2
8	37.5	38.9
8.5	37.9	39.1
9	38.3	39.5
9.5	38.3	40.1
10	38.8	40.2
10.5	38.8	40.2
11	38.8	40.3
11.5	39.4	40.8
12	39.2	41.2
12.5	39.2	41.1
13	40.2	41.2
13.5	41.0	40.9
14	41.5	41.1
14.5	41.0	41.6
15	39.3	42.4
15.5	37.8	40.4
16	38.1	40.0
16.5	39.7	41.1
17	41.9	43.5
17.5	45.0	46.3
18	46.7	47.2

7-2-6 Field Strength calculation

The field strength is calculated by adding the Antenna Factor and cable loss. The basic equation with a sample calculation is as follows :

$$FS = RA + AF + CF$$

FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable loss

7-2-7 Human exposure to Radiofrequency Electromagnetic Fields

Calculation of predicting power density

In accordance with the OET Bulletin 65 Edition 97-01 august 1997 page 19,

$$S = EIRP / (4 * \pi * R^2)$$

S : power density (mW/cm²)

EIRP : equivalent isotropically radiated power (mW)

R : distance to the center of radiation of the antenna (cm)

Compact reader LML 3033 :

The antenna of this reader is AT3_2749. The circuit of the antenna is inside the box of the antenna AT3_2749. The distance between the circuit of the antenna and the top of the box is 6 cm and the EIRP is 75 mW, so the power density is :

$$R = 6 \text{ cm and EIRP} = 75 \text{ mW} \rightarrow \mathbf{S = 0.2 \text{ mW/cm}^2}$$

The frequency of the reader is 2.45 GHz, so the limit of the power density is 1 mW/cm². In that way, there is no problem about the human exposure to radiofrequency. No special installation is needed to use this reader.