

**FCC ID PER PART 15.231**  
**EMI MEASUREMENT AND TEST REPORT**  
**FOR**  
**P-SERV TECHNOLOGIES PTE LTD.**

Blk1093, Lower Delta Road,  
#07-05/08 Tiong Bahru Industrial Estate  
Singapore 169204

<b>FCC ID: OZAES315V1</b>
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April 24, 2000

<b>This Report Concerns:</b> <input checked="checked" type="checkbox"/> Original Report	<b>Equipment Type:</b> Electronic Container Seal Transmitter (315 MHz), ITE
<b>Test Engineer:</b> Thomas Huang	
<b>Test Date:</b> April 14, 2000	
<b>Reviewed By:</b> John Y. Chan - Director, Compliance Engineering	
<b>Prepared By:</b> Bay Area Compliance Laboratory Corporation 230 Commercial Street, Suite 2 Sunnyvale, CA 94086 (408) 732-9162	

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## 1 - GENERAL INFORMATION

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### 1.1 Product Description for Equipment Under Test (EUT)

The *P-SERV TECHNOLOGIES PTE LTD.*, model ES315V1 or the "EUT" as referred to in this report is a 315MHz RF transmitter which is a part of the Electronic Container Seal (ECS) designed to be used by all shippers, aimed to improve the efficiency of port operation. The EUT transmits 315MHz FM signal. The EUT output impedance shall be 50Ω.

The EUT measures 2.0" L x 1.0" W x 4.0" H.

### 1.2 Objective

This Type approval report is prepared on behalf of *P-SERV TECHNOLOGIES PTE LTD.* in accordance with Part 2, Subpart J, and Part 15, Subparts A and B of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules, Part 15, sec 231 for conducted and radiated margin.

### 1.3 Related Submittal(s)/Grant(s)

No Related Submittals

### 1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4 –1992, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### 1.5 Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Suite 2, Sunnyvale, California, USA.

Test sites at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-1992.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-674 and R-657. The test sites has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratory Corporation is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program

(NVLAP). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, IEC/CISPR 22: 1993, and AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods under NVLAP Lab Code 200167-0.

### 1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Data
HP	Spectrum Analyzer	8568B	2610A02165	12/6/00
HP	Spectrum Analyzer	8593B	2919A00242	12/20/00
HP	Amplifier	8349B	2644A02662	12/20/00
HP	Quasi-Peak Adapter	85650A	917059	12/6/00
HP	Amplifier	8447E	1937A01046	12/6/00
A.H. System	Horn Antenna	SAS0200/571	261	12/27/00
Com-Power	Log Periodic Antenna	AL-100	16005	11/2/00
Com-Power	Biconical Antenna	AB-100	14012	11/2/00
Solar Electronics	LISN	8012-50-R-24-BNC	968447	12/28/00
Com-Power	LISN	LI-200	12208	12/20/00
Com-Power	LISN	LI-200	12005	12/20/00
BACL	Data Entry Software	DES1	0001	12/20/00

### 1.7 Equipment Under Test (EUT)

Manufacturer	Description	Model	Serial Number	FCC ID
P-SERV TECHNOLOGIES PTE LTD.	315MHz transmitter	ES315V1	N/A	OZAES315V1

### 1.8 Support Equipment

Not Applicable.

### 1.9 EUT Configuration Details and List

Not Applicable.

### 1.10 External I/O Cabling

Not Applicable.

## **2 - SYSTEM TEST CONFIGURATION**

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### **2.1 Justification**

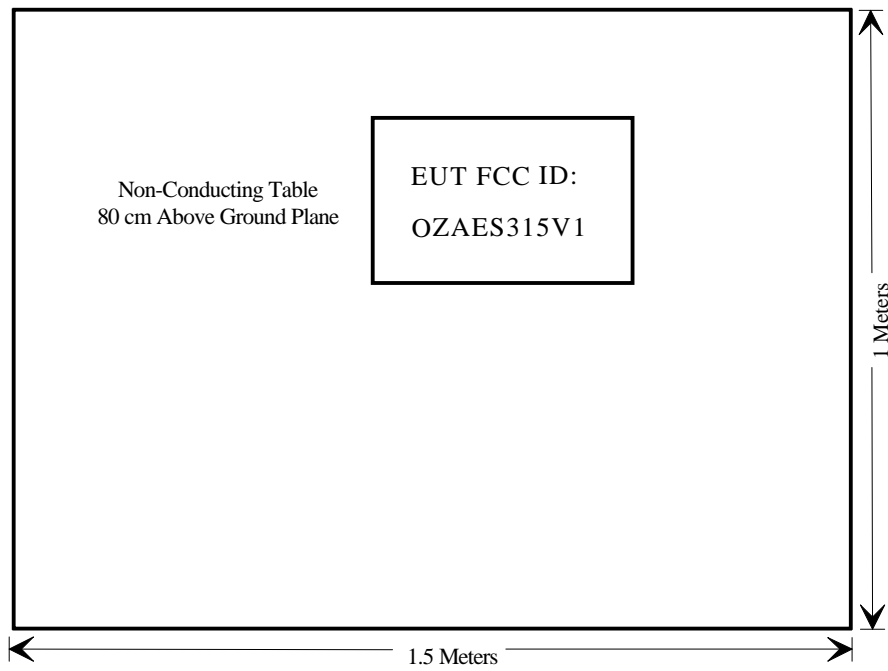
The EUT was configured for testing in a typical fashion (as normally used in a typical application).

The final qualification test was performed with the EUT operating at normal mode.

### **2.2 Block Diagram**

Appendix A contains a copy of the EUT's block diagram as reference.

### 2.3 Test Setup Block Diagram



## **2.4 Equipment Modifications**

No modifications were necessary for the EUT to comply.

### **3 - CONDUCTED EMISSIONS TEST DATA**

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**Not applicable because of battery operation.**



## 4 - RADIATED EMISSION DATA

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### 4.1 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the ANSI C63.4 - 1992. The specification used was the FCC Class B limits.

The spacing between the peripherals was 10 cm.

External I/O cables are draped over edge of test table or bundled when necessary.

### 4.2 Spectrum Analyzer Setup

According to FCC Rules, 47 CFR 15.33, since the internal processor speed operates between 108 MHz and 500 MHz, the EUT was tested to 2000 MHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Start Frequency .....	30 MHz
Stop Frequency.....	2000 MHz
Sweep Speed .....	Auto
IF Bandwidth.....	100 kHz
Video Bandwidth.....	1 MHz
Quasi-Peak Adapter Bandwidth .....	120 kHz
Quasi-Peak Adapter Mode .....	Normal
Resolution Bandwidth .....	1MHz

### 4.3 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combination.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (less than -4 dBμV), and are distinguished with a "QP" in the data table.

The EUT was operating at normal to represent worst case results during final qualification test. Therefore, this configuration was used for final test data recorded in the table(s) listed under section 4.7 of this report.

### 4.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for FCC 15.231. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Limit}$$

## 4.5 Summary of Test Results

According to the final data in section 4.6, the EUT complied with the FCC 15.231 (b) standards and these test results are deemed satisfactory evidence of compliance with RSS210 of the Canadian Interference-Causing Equipment Regulations, and had the worst margin of:

**-2.8 dBμV at 315.00 MHz in the Horizontal polarization for Normal operating mode, 30 to 2000MHz, 3 meters.**

## 4.6 Radiated Emissions Test Result Data

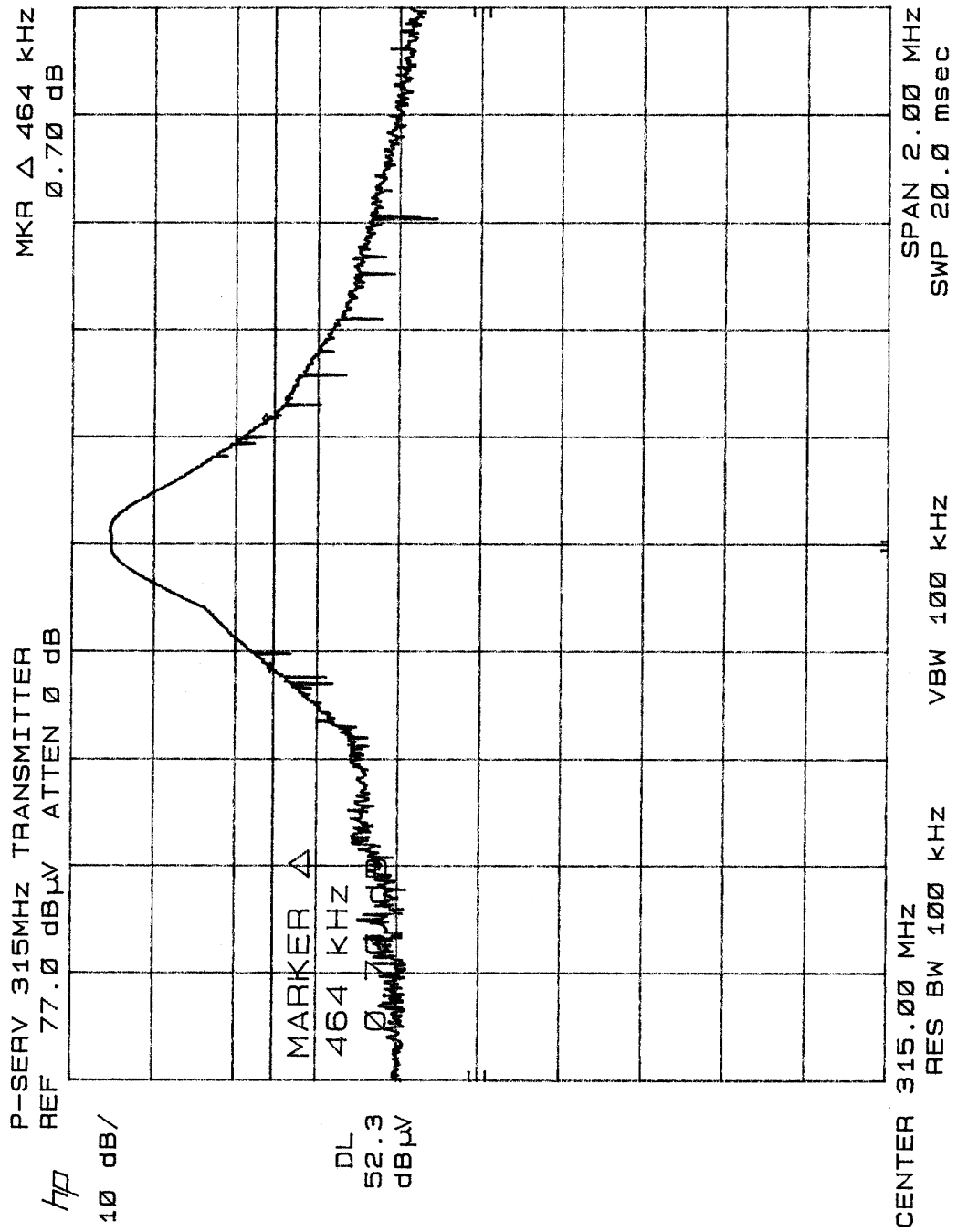
### 4.6.1 Final Test Data for Normal Operating Mode, 30 to 2000 MHz, 3 meters.

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15.231	
Frequency	Ampl.	Angle	Height	Polar	Antenna	Cable	Amp.	Corr. Ampl.	Limit	Margin
MHz	dBμV/m	Degree	Meter	H/ V	dBμV/m	dB	dB	dBμV/m	dBμV/m	dB
315.00	75.6	180	2.3	H	15.9	3.7	22.4	72.8	75.6	-2.8
315.00	73.0	180	1.1	V	15.9	3.7	22.4	70.2	75.6	-5.4
2520.00	40.9	180	1.1	V	29.0	3.7	20.0	53.6	55.6	-2.0
2205.00	38.8	180	1.1	V	28.1	3.4	20.0	50.3	55.6	-5.4
945.00	44.3	180	1.1	V	24.4	3.7	22.7	49.7	55.6	-5.9
2520.00	36.7	180	1.1	H	29.0	3.7	20.0	49.4	55.6	-6.2
630.00	46.5	180	1.1	V	20.5	3.4	21.4	49.0	55.6	-6.6
2835.00	36.3	180	1.2	H	29.0	3.7	20.0	49.0	55.6	-6.6
2835.00	36.1	180	1.1	V	29.0	3.7	20.0	48.8	55.6	-6.8
2205.00	37.2	180	1.1	H	28.1	3.4	20.0	48.7	55.6	-7.0
945.00	42.0	180	1.2	H	24.4	3.7	22.7	47.4	55.6	-8.2
630.00	43.4	180	1.1	H	20.5	3.4	21.4	45.9	55.6	-9.7
420.00	32.3	225	1.2	V	17.2	3.0	19.7	32.8	46	-13.2
425.00	32.1	270	2.3	H	17.2	3.0	19.7	32.6	46	-13.4
189.00	31.8	0	1.1	V	13.8	3.9	22.1	27.4	43.5	-16.1
380.01	29.4	0	1.1	V	16.2	3.9	19.8	29.7	46	-16.3
276.56	31.6	225	2.3	H	13.9	5.2	21.4	29.3	46	-16.7
126.00	32.4	90	2.3	H	12.3	1.8	20.3	26.2	43.5	-17.3
351.99	29.4	270	2.1	H	15.5	4.3	21.8	27.4	46	-18.6
1890.00	28.0	180	1.1	V	25.3	2.6	22.0	33.9	55.6	-21.7
229.45	30.5	190	2.1	H	12.1	3.9	22.7	23.8	46	-22.2
1260.00	25.1	180	1.2	V	25.9	3.7	22.0	32.7	55.6	-22.9
1260.00	24.3	225	1.1	H	25.9	3.7	22.0	31.9	55.6	-23.7
1890.00	24.0	180	1.4	H	25.3	2.6	22.0	29.9	55.6	-25.7

**Appendix A:**

15.231C. 20dB bandwidth

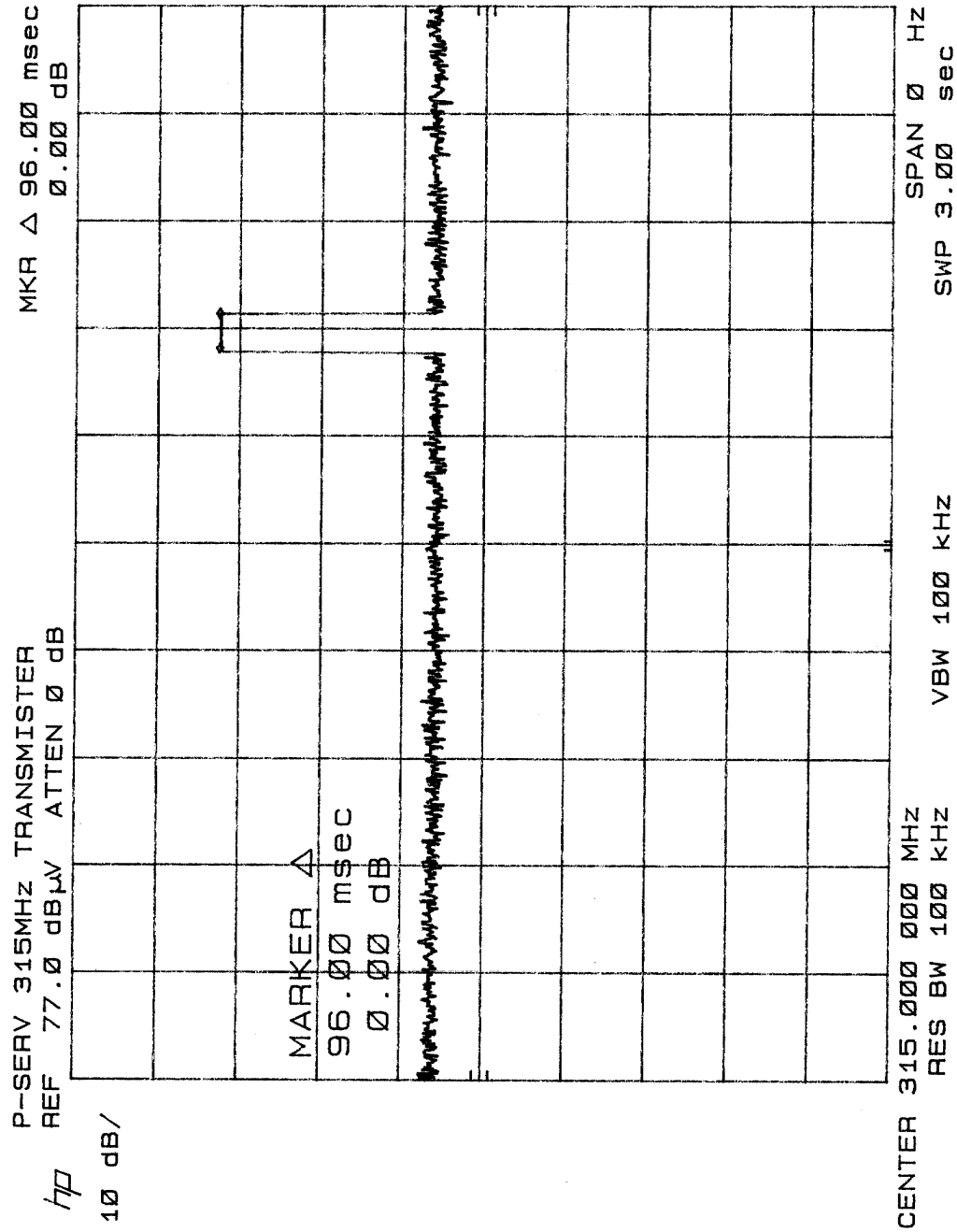
Result: Complies with the requirement.



**Appendix B:**

15.231(a). Activation time less than 5 seconds.

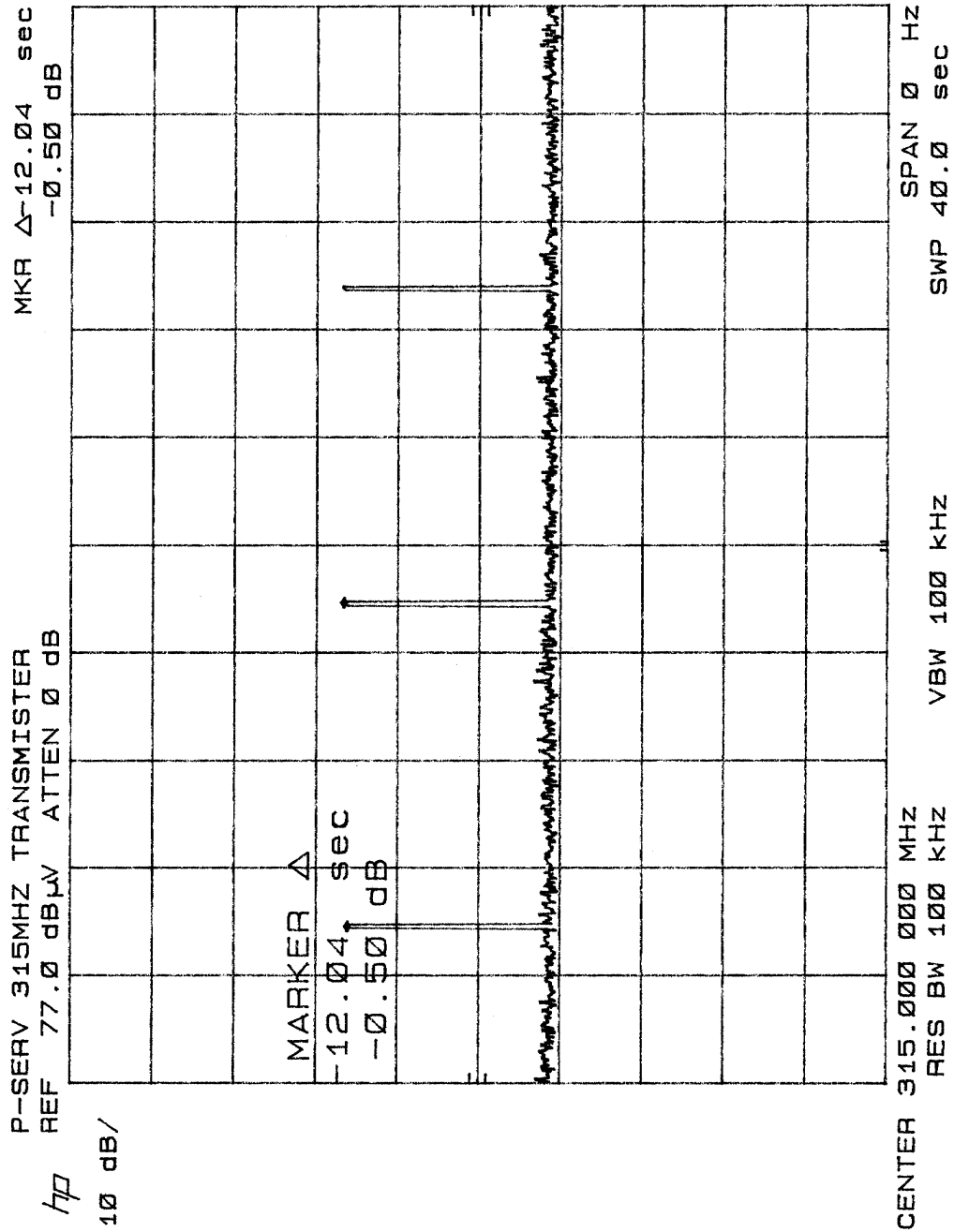
Result: Complies with the requirement.



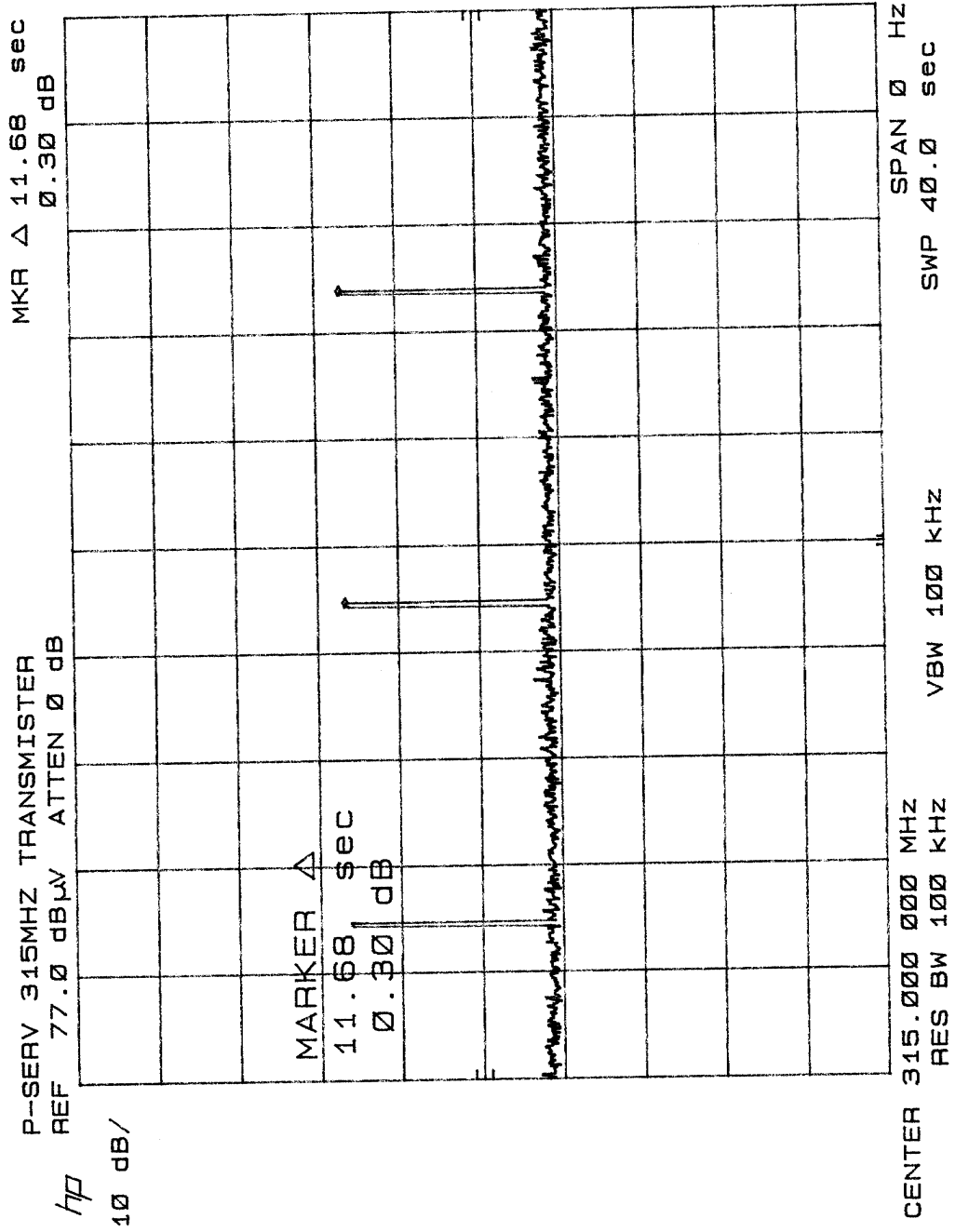
**Appendix C:**

15.231(a). Periodic Transmissions at regular predetermined intervals are not permitted.

Result: Complies with the requirement.







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## **Appendix D – AGENCY AUTHORIZATION LETTER**

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25/04/00

09:38

PST → 01214087329164



17 April 2000

Federal Communications Commission  
7435 Oakland Mills Road  
Columbia, Maryland, 21046

Sir/Madam,

Reg: FCC grand for Eseal(315MHz)

This letter is an authorization to accept Bay Area Compliance Lab. Corporation as an agent for **P-SERV TECHNOLOGIES PTE LTD**, Blk 1093 Lower Delta Road #07-05/08 Tiong Bahru Industrial Estate Singapore 169204, to sign applications before the Commission on our behalf, to make representations to you on our behalf, and to receive and exchange data between our company and the commission in connection with certification of the following **P-SERV TECHNOLOGIES PTE LTD's** products:

	Description	Model number
1)	Eseal (315MHz)	ES315V1

Under FCC docket number 20780 and general docket number 80-284 pursuant to part 15, FCC rules and regulations.

Sincerely,

A handwritten signature in black ink, appearing to read 'Tan Yam Seng'.

Tan Yam Seng  
Senior Hardware Design Engineer

**P-SERV TECHNOLOGIES PTE LTD** Blk 1093 Lower Delta Road #07-05/08 Tiong Bahru Industrial Estate Singapore 169204 Tel : (065) 276-1788 Fax : (065) 270-1788 E-mail : pst@pacific.net.sg