



*Product Integrity Laboratory*

5151-47<sup>th</sup> Street, NE  
Calgary, Alberta T3J 3R2  
Tel: (403) 568-6605  
Fax : (403) 568-6970

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Certification Test Report  
CFR 47 FCC Part 22  
Industry Canada RSS 131  
Emissions and Frequency Stability only  
for  
Telcosat

FCC ID # UBLSIU3A  
IC ID#: 6548A-SIU3A

Project Code CG-316  
(Report CG-316-RA-1-0)

Revision: 1

June 16, 2006

**Prepared for:** Telcosat

**Author:** Glen Moore  
EMC Manager

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**Approved by:** Nick Kobrosly  
Lab Manager

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## Report Summary

### NTS Canada

Product Integrity Laboratory  
5151-47<sup>th</sup> Street, N.E. Calgary Alberta T3J 3R2

Accreditation Numbers: FCC 101386  
IC 46405-3978 File # IC3978-2  
Standards Council of Canada Accredited Laboratory No. 440

Applicant: Telcosat Inc  
116, 1919 – 27<sup>th</sup> Avenue NE  
Calgary, AB T2E 7A4  
Tel:403-291-4031  
Email: carl.bosnyak@telcosat.com

Customer Representative: Carl Bosnyak

#### EUT Description:

EUT Description	Manufacturer	Model	Revision	Serial Number
Cellular Repeater	Telcosat Inc	RPT900	N/A	2060202

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**Test Summary**

Appendix	Test/Requirement Description	Deviations* from:			Pass / Fail	Applicable Rule Parts
		Base Standard	Test Basis	NTS Procedure		
A	Radiated Spurious Emissions	No	No	No	PASS	2.1046/90.210e)
B	Powerline AC conducted emissions	No	No	No	PASS	2.1049/90.210e)
C	Frequency Stability	No	No	No	PASS	RSS Gen section 4.3

Test Result: The product presented for testing complied with test requirements as shown above.

Prepared By: \_\_\_\_\_  
Glen Moore  
EMC Manager

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## REGISTER OF REVISIONS

Revision	Date	Description of Revisions
1	June 21, 2006	Release

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## 1.0 INTRODUCTION

### 1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Canada to demonstrate compliance of the RPT900 to FCC Part 22 and the equivalent sections of Industry Canada's RSS 131

## 2.0 TEST EUT DESCRIPTION

### 2.1 CONFIGURATION

#### Description of EUT

	Name	Model	Revision	Serial Number
<b>EUT</b>	RPT900	RPT900		NA
<b>Classification</b>	Cellular Repeater (Base Station)			
<b>Frequency Range</b>	Uplink 869/894 MHz Downlink 824/894 MHz			
<b>Transmitter duty cycle</b>	100%			
<b>Operating temperature</b>	-30 c to 50 c			
<b>Output power</b>	30.0 dBm – based on two tone			
<b>Functional Description</b>	Cellular repeater			

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**2.1.1 EUT POWER**

Voltage	120 VAC or 14.5 VDC
Number of Feeds	1 (1 Hot, 1 Return)
Description	DSC class 2 transformer

**2.2 SUPPORT CABLES**

Quantity	Model/Type	Routing		Shielded / Unshielded	Description	Cable Length (m)
		From	To			
1	Power	Power Supply	EUT	Unsheilded	Permanent connection to power supply	1.0

**2.3 METHOD OF OPERATION DURING TESTS**

Unless otherwise noted in the test report the EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle, and high channel to perform power, occupied bandwidth, and spurious/harmonic tests. For conducted emissions the device was tuned to its center frequency. While transmitting the EUT was setup to operate at the intended maximum power output available to the end user. For all test cases pre-scans were completed in all modes to determine worst case levels.

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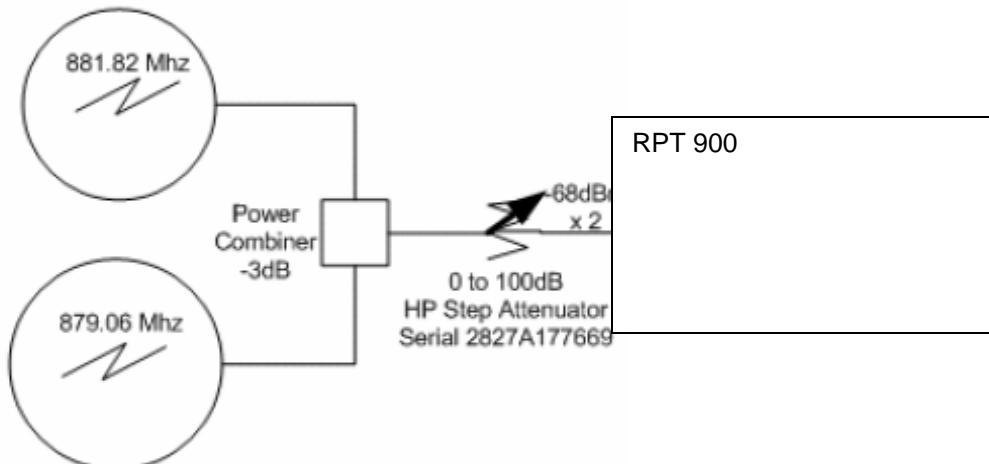
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### 3.0 EUT TEST CONFIGURATION

#### 3.1 CONFIGURATION

##### SIGNAL GENERATOR

Rohde & Schwarz  
Model SME03  
Serial No. 84D699/034  
Calibrated by Agilent  
Ref 840673-026  
22 Feb - 2005



##### SIGNAL GENERATOR

Rohde & Schwarz  
Model SMT03  
Serial No. 826919/005  
Calibrated by R&S  
Ref 24961 July 2004

For all tests the repeater was configured as noted above

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## APPENDICES

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## APPENDIX A: RADIATED E-FIELD EMISSIONS – 30 MHZ – 10 GHZ

### A.1. Base Standard & Test Basis

<b>Base Standard</b>	CFR Title 47 – Telecommunications, Chapter I - FCC Part 22 – Public Mobile Services – Subpart H – Cellular Radiotelephone Service  RSS-131, Issue 2: July 2003 :Spectrum Management and Telecommunications Policy Radio Standards Specification: Zone Enhancers for the Land Mobile Service
<b>Test Basis</b>	EIA/TIA 603
<b>Test Method</b>	NTS Radiated Emissions Test Method E006R4 NTS Radiated Emissions Signal Substitution Method 30MHz - 20GHz. EMC Test Method 11.0, Revision 01

### A.2. Specifications

Frequency	47 CFR FCC Part 22, RSS-131	
	Theoretical Peak @ 3m <sup>1</sup>	ERP <sup>2</sup>
MHz	dB $\mu$ V/m	dBm
30 - 10000	84.3	-13

Note 1: Calculated using:  $Pd - (43 + 10 \log(Pw))$   
where Pd is the EUT power in dBm and Pw is the EUT power in watts  
Note 2: Calculated using:  $120 + 20 \log(\text{SQRT}(49.2 * Pw) / 3)$   
where Pw is the EUT power in watts

### A.3. Measurement Uncertainty

Frequency Range	Measurement Uncertainty (dB)	Expanded Uncertainty (K=2) (dB)
30 MHz – 1 GHz	+2.32/-2.36	+4.65/-4.72
1 GHz – 18 GHz	+3.48/-3.51	+6.96/-7.02

### A.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
None						

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## A.5. Test Results

### Compliance Scan Summary

 Product Integrity Laboratory V2.5	Project Number: CG-316 Model: Telcosat RPT900 Comments: Conf01: Uplink tones at 838 MHz and 839.3 MHz, Conf02: Downlink tones at 875 MHz and 876.25 MHz Conf03: Downlink tones at 892.25 MHz and 894 MHz Conf04: Uplink tones at 824MHz and 825.25 MHz												Tester: Glen Moore / Deniz Demirci RE02c-10m-316 Test ID: RE03-10m-316	
	Standard: FCC Part 22		Measurement Distance: <1GHz >1GHz		10 meters 3 meters									
Configuration / Antenna Polarization	Frequency (MHz)	Measured Level (dB $\mu$ V)	Measurement Detector	Correction Factors (dB/m)	Emission Level (dBm)	Signal Generator Level (dBm)	Tx Cable Loss (dB)	Tx Antenna Gain (dBi)	Dipole Gain (dBi)	ERP (dBm)	ERP Limit (dBm)	Margin (dB)	Mast Height (cm)	Turntable Angle (degrees)
Conf01 / Horizontal	766.98	45.63	Q. Peak	-3.26	42.37	-44.50	11.00	5.40	2.15	-52.25	-13.0	39.3	102.5	66.2
Conf02 / Horizontal	766.98	47	Q. Peak	-3.26	43.74	-43.10	11.00	5.40	2.15	-50.85	-13.0	37.9	102	69
Conf03 / Horizontal	8947.43	32.32	Average	40.13	72.45	-32.10	2.67	14.41	2.15	-22.51	-13.0	9.5	115	3
Conf04 / Horizontal	8947.43	30.68	Average	40.13	70.81	-33.80	2.67	14.41	2.15	-24.21	-13.0	11.2	113	4
Conf01 / Vertical	67.61	49.72	Q. Peak	-20.24	29.48	-58.00	3.40	-1.90	2.15	-65.45	-13.0	52.5	204.3	269.5
Conf02 / Vertical	67.61	45.12	Q. Peak	-20.24	24.88	-62.60	3.40	-1.90	2.15	-70.05	-13.0	57.1	192	261

Positive Margin indicates a Pass

The EUT is in compliance with the limits as specified above. Although a QP detector was used for measurements below 1 GHz, it was verified that the emission was a CW signal, therefore making detector selection irrelevant. Please also note that these signals were 39 dB or more below the limit

## A.6. Observations

Note: For measurements from 1GHz - 10 GHz, no LNA was used; therefore measurement system noise floor seems higher

## A.7. Sample Calculation

$$3m \text{ Limit} = 10m \text{ Limit} - 20 * \log(3/10)$$

Emission Level = Measured Level + Correction Factors

Margin = Limit - Emission Level

ERP Limit (dBm) =  $P_d - (43 + 10 \log(P_w))$  ; where  $P_d$  is the EUT power in dBm and  $P_w$  is the EUT power in watts

Theoretical ERP Limit (dB $\mu$ V/m)  $120 + 20 \log(\text{SQRT}(49.2 \cdot P_w)/3)$  ; where  $P_w$  is the EUT power in watts

## A.8. Test Data & Photographs

The test data collected during this test appear following this page.

## A.9. Tested By

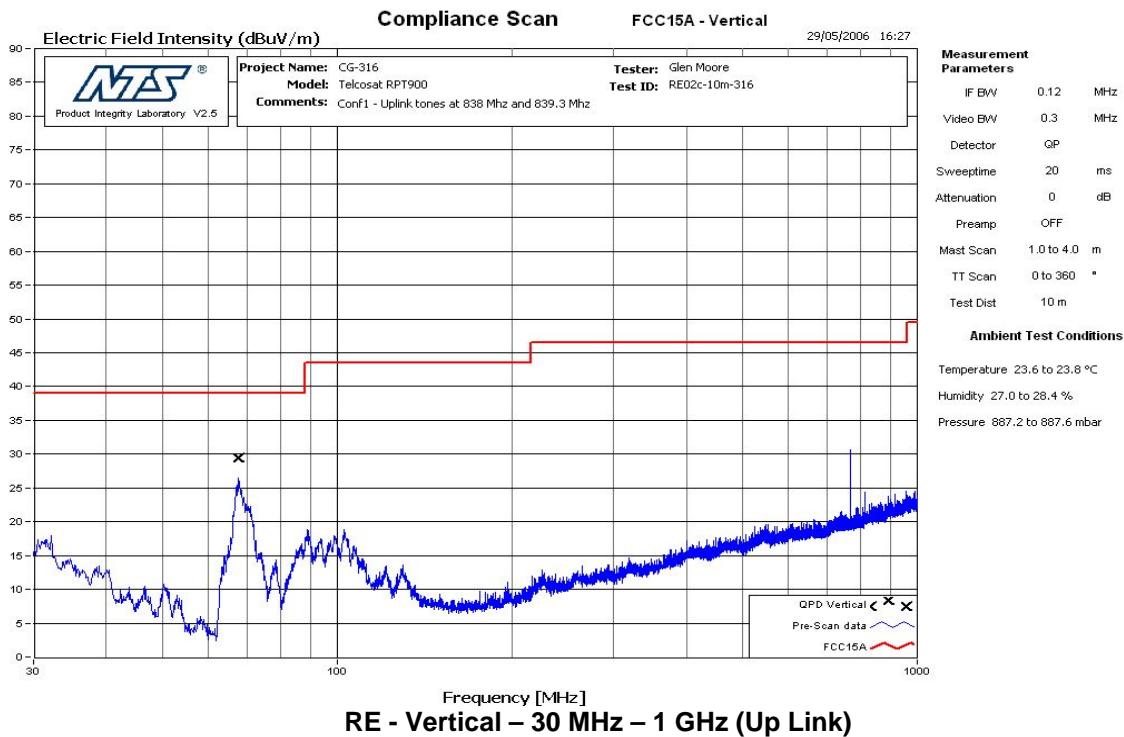
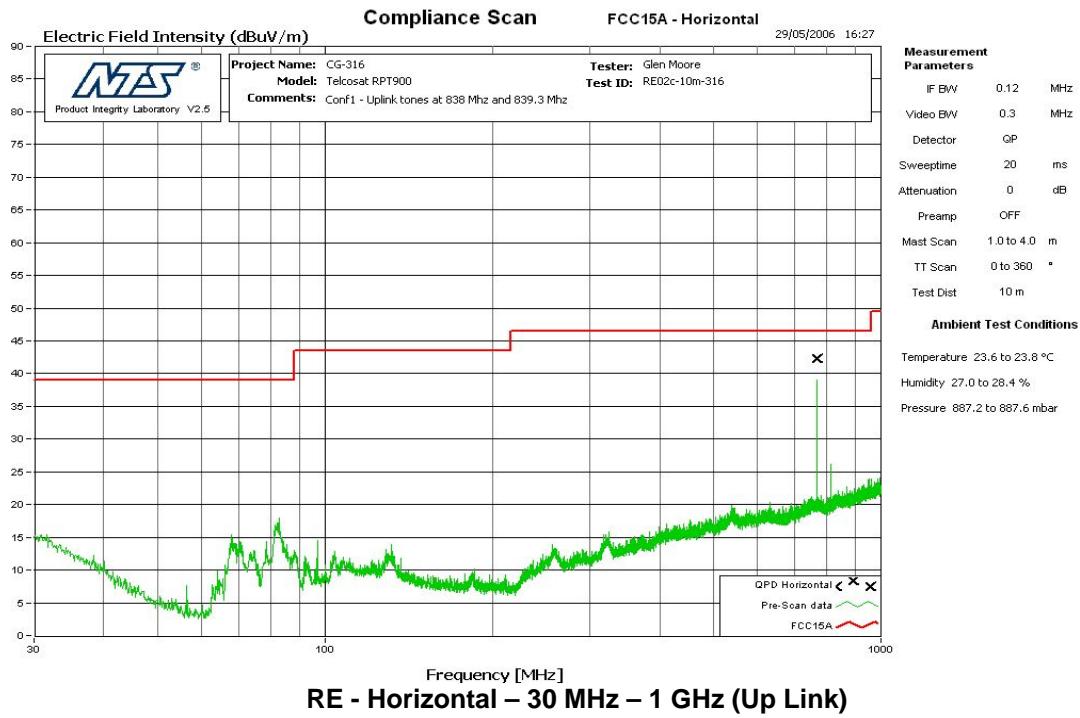
This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1: Quality Manual.

Name: Glen Moore  
Function: EMC Manager

Deniz Demirci  
EMC Engineer

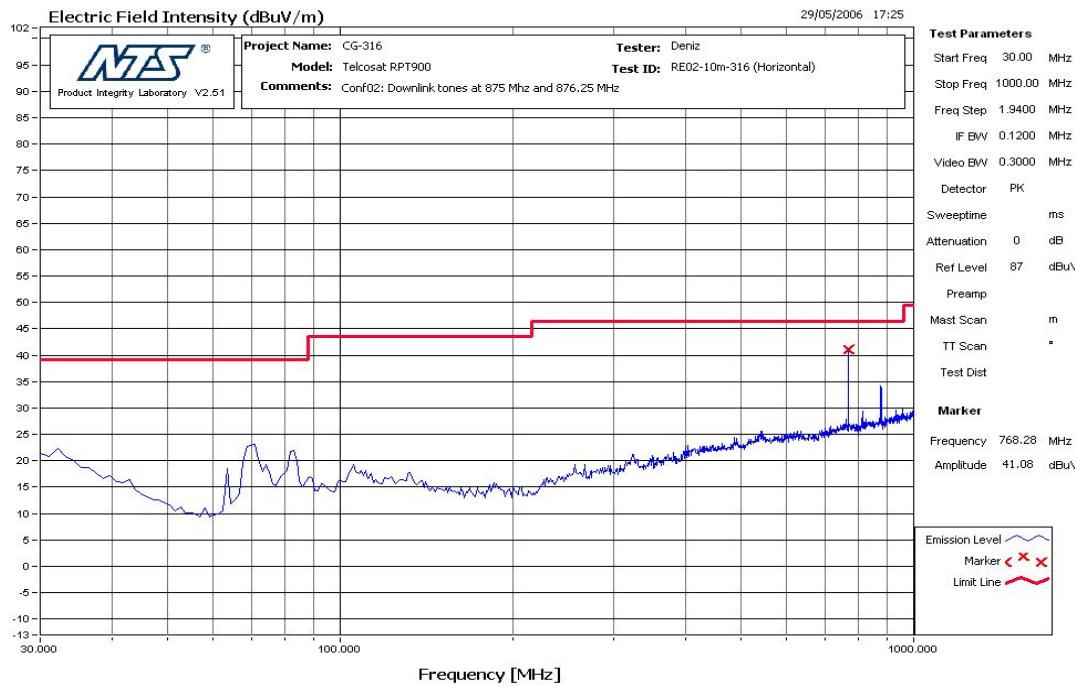
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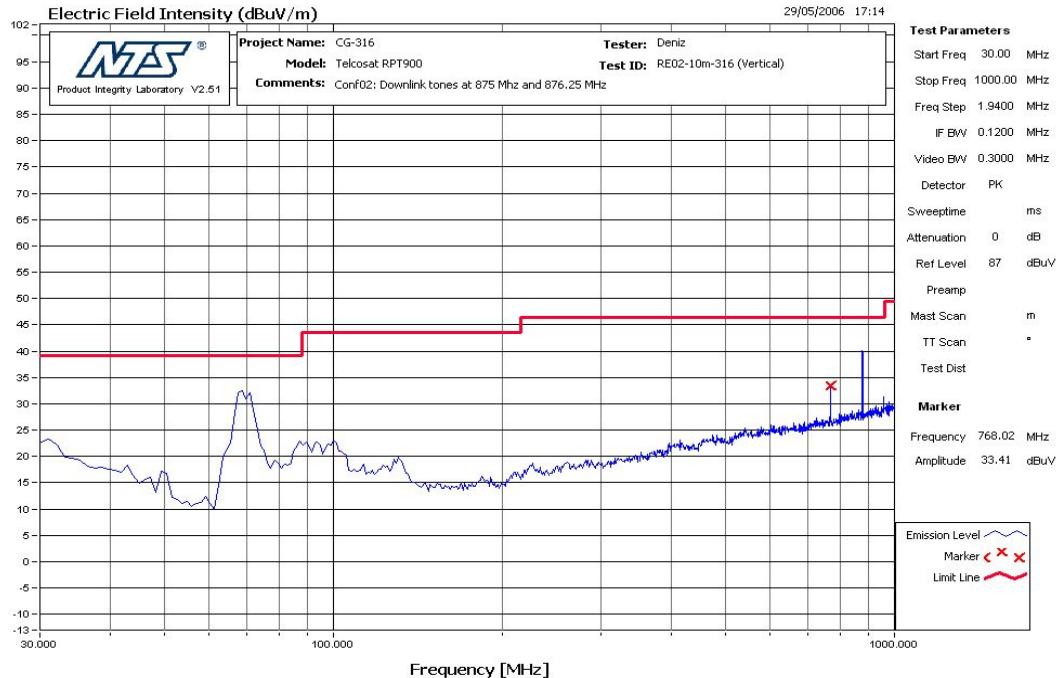


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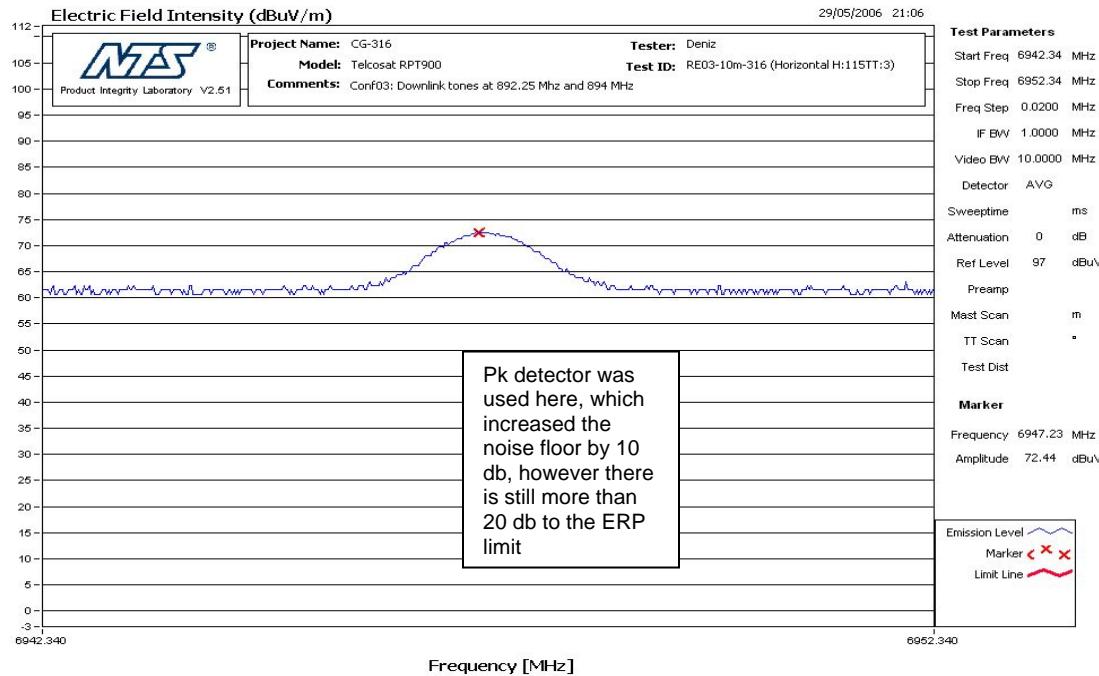
### RE - Horizontal – 30 MHz – 1 GHz (Down Link)



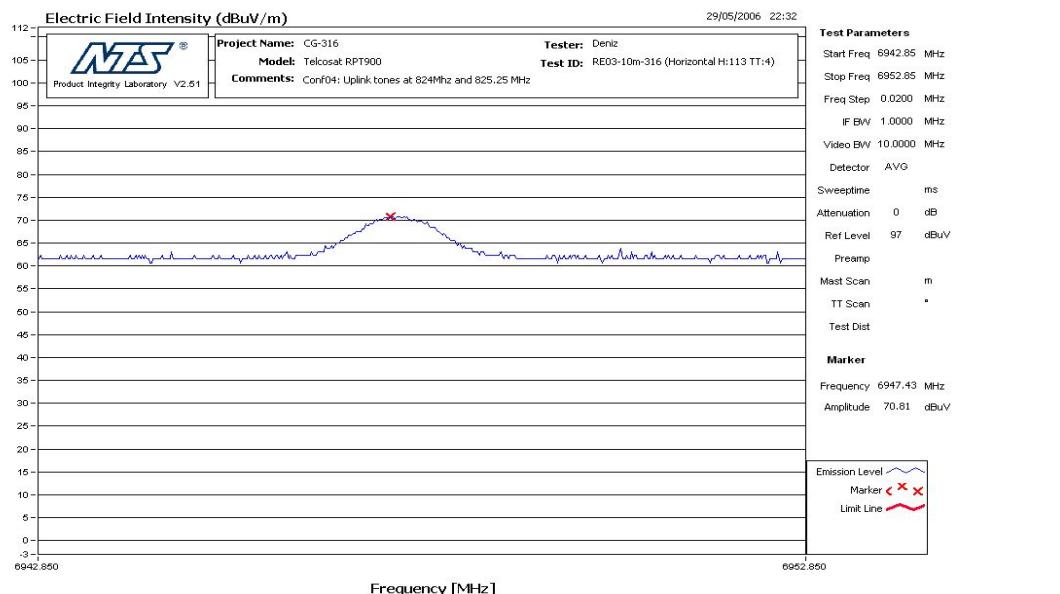
### RE - Vertical – 30 MHz – 1 GHz (Down Link)

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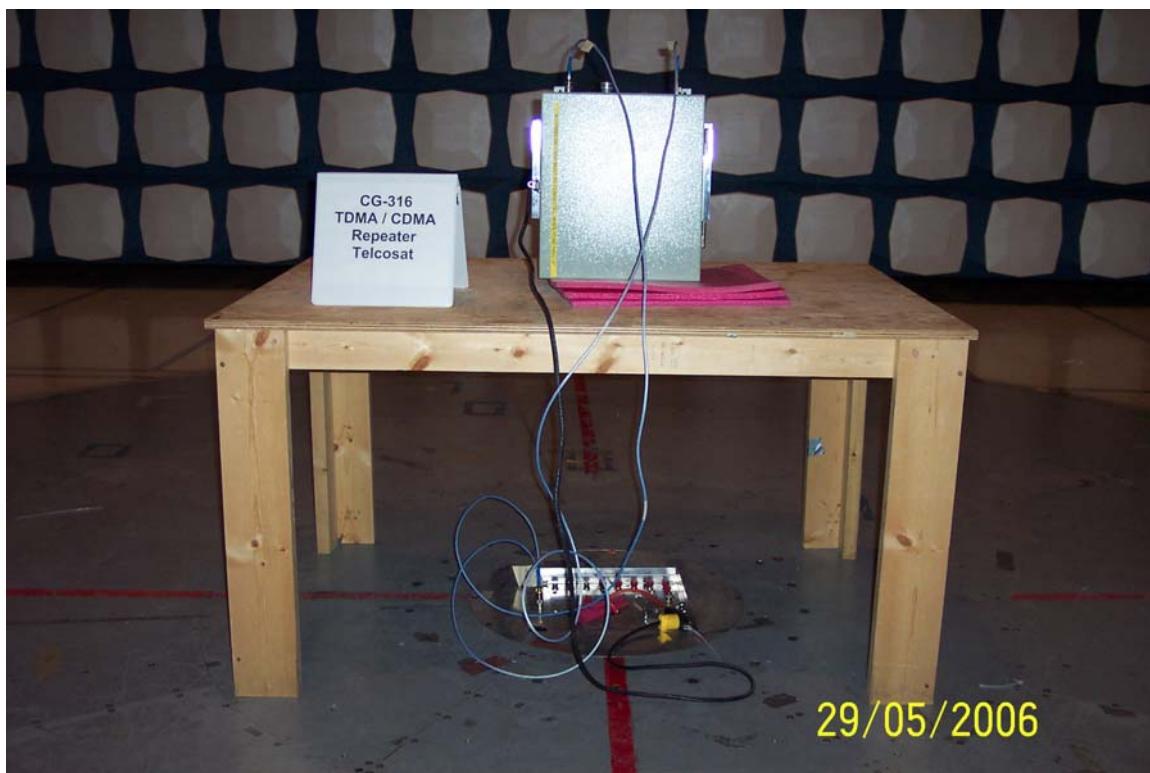
### RE - Horizontal – 6947.23 MHz Compliance-scan



### RE - Horizontal – 6947.43 MHz Compliance-scan

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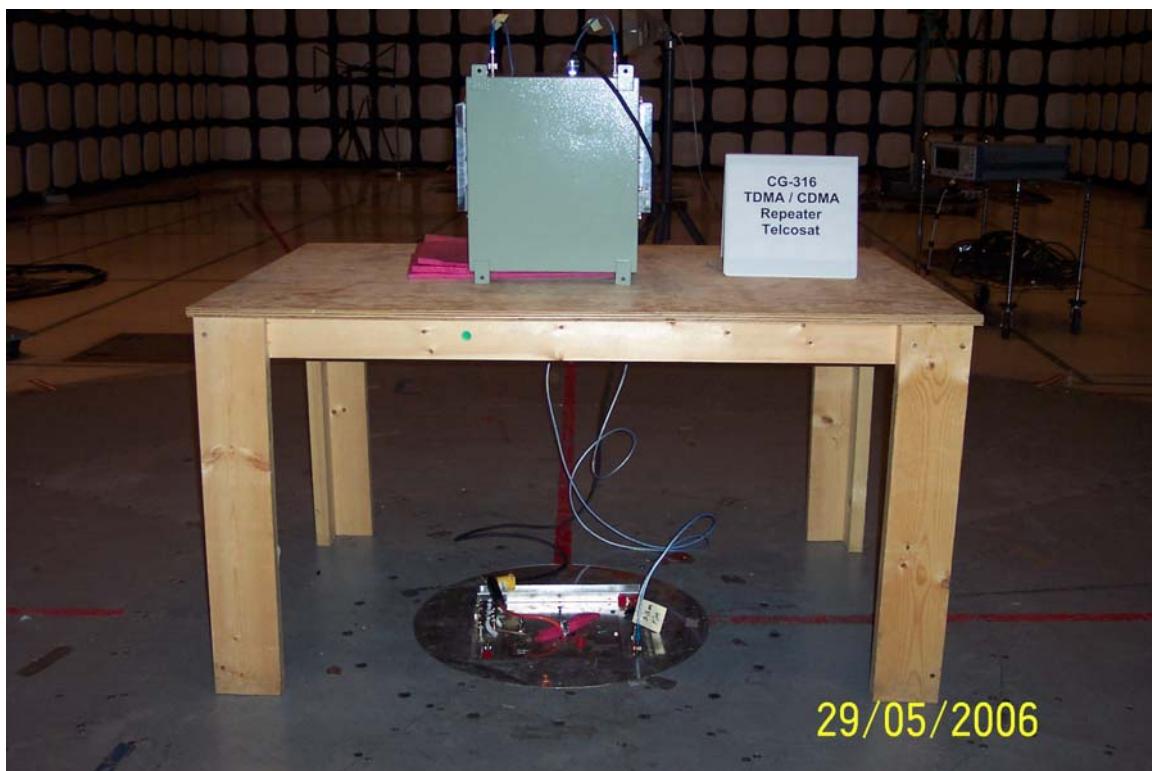


Photograph 1: EUT Set up for Radiated Emissions – Front View

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Photograph 2: EUT Set up for Radiated Emissions – Back View

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## APPENDIX B: CONDUCTED VOLTAGE EMISSIONS – 150 KHZ – 30 MHZ

### B.1. Base Standard & Test Basis

<b>Base Standard</b>	RSS-131, Issue 2: July 2003 :Spectrum Management and Telecommunications Policy Radio Standards Specification: Zone Enhancers for the Land Mobile Service  RSS Gen, Issue 1 FCC Part 15 Subpart B
<b>Test Basis</b>	ANSI C63.4 2003
<b>Test Method</b>	NTS Conducted Emissions 150kHz – 30MHz Automated Test Method 6.0A R2

### B.2. Specifications

Frequency	Class B Limit	
	Quasi-Peak	Average
MHz	dB $\mu$ V	dB $\mu$ V
0.150 – 0.500	66 to 56 <sup>1</sup>	56 to 46 <sup>1</sup>
0.500 – 5.00	56	46
5.00 – 30.00	60	50

Note 1: decrease with the logarithm of the frequency

### B.3. Measurement Uncertainty

Conducted Emissions	Measurement Uncertainty (dB)	Expanded Uncertainty (K=2) (dB)
150 kHz – 30 MHz	+1.21/-1.33	+2.41/-2.66

### B.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

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## B.5. Test Results

 Product Integrity Laboratory V2.5	Project Number:	CG-316	Tester:	Deniz Demirci				
	Model:	TDMA / CDMA Repeater, Telcosat RPT900	Test ID:	CE02c-10M-316				
	Comments:	Conf18: Downlink tones at 875 Mhz and 876.25 MHz with CORCOM 3VQ3 filter						
Standard: FCC15_B								
Voltage/Line	Frequency (MHz)	Measurement Detector	Measured Value (dB $\mu$ V)	Correction Factors (dB)	Emission Level (dB $\mu$ V)	Limit Detector Type	Limit (dB $\mu$ V)	Margin (dB)
AC 120V Line1A	0.1526	AV	34.42	11.77	46.19	AV	55.86	<b>9.67</b>
AC 120V Line1A	0.305	AV	23.88	10.85	34.73	AV	50.11	<b>15.38</b>
AC 120V Line1A	0.4514	AV	20.65	10.66	31.31	AV	46.85	<b>15.54</b>
AC 120V Line1A	0.6027	AV	19.33	10.6	29.93	AV	46.00	<b>16.07</b>
AC 120V Line1A	0.7528	AV	22.61	10.59	33.20	AV	46.00	<b>12.80</b>
AC 120V Line1A	2.5583	AV	13.82	10.77	24.59	AV	46.00	<b>21.41</b>
AC 120V NeutralA	0.1526	AV	34.57	11.76	46.33	AV	55.86	<b>9.53</b>
AC 120V NeutralA	0.3054	AV	24.41	10.84	35.25	AV	50.09	<b>14.84</b>
AC 120V NeutralA	0.4577	AV	22.33	10.64	32.97	AV	46.73	<b>13.76</b>
AC 120V NeutralA	0.6033	AV	19.56	10.59	30.15	AV	46.00	<b>15.85</b>
AC 120V NeutralA	0.7537	AV	22.25	10.57	32.82	AV	46.00	<b>13.18</b>
AC 120V NeutralA	2.4284	AV	19.18	10.74	29.92	AV	46.00	<b>16.08</b>
AC 120V Line1A	0.1524	QP	34.85	11.8	46.65	QP	65.87	<b>19.22</b>
AC 120V Line1A	0.4515	QP	24.41	10.66	35.07	QP	56.85	<b>21.78</b>
AC 120V Line1A	0.6048	QP	23.19	10.6	33.79	QP	56.00	<b>22.21</b>
AC 120V Line1A	0.7531	QP	27.87	10.59	38.46	QP	56.00	<b>17.54</b>
AC 120V Line1A	2.2887	QP	23.27	10.74	34.01	QP	56.00	<b>21.99</b>
AC 120V Line1A	2.4346	QP	25.63	10.75	36.38	QP	56.00	<b>19.62</b>
AC 120V NeutralA	0.1526	QP	34.93	11.76	46.89	QP	65.86	<b>19.17</b>
AC 120V NeutralA	0.4525	QP	24.79	10.65	35.44	QP	56.83	<b>21.39</b>
AC 120V NeutralA	0.6036	QP	24.08	10.59	34.67	QP	56.00	<b>21.33</b>
AC 120V NeutralA	0.7544	QP	28.07	10.57	38.64	QP	56.00	<b>17.36</b>
AC 120V NeutralA	2.2958	QP	25.35	10.73	36.08	QP	56.00	<b>19.92</b>
AC 120V NeutralA	2.4269	QP	26.75	10.74	37.49	QP	56.00	<b>18.51</b>

## B.6. Modifications Required

A Corcom 3VQ3 AC powerline filter was added to the powerline inside the chassis to achieve compliance

## B.7. Sample Calculation

Correction Factor = LISN Correction Factor + Cable Loss

Corrected Value = Measurement + Correction Factor

Margin = Limit – Corrected Emission Level

## B.8. Test Data & Photographs

The test data and photographs collected during this test appear following this page.

## B.9. Tested By

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci  
Function: EMC Engineer

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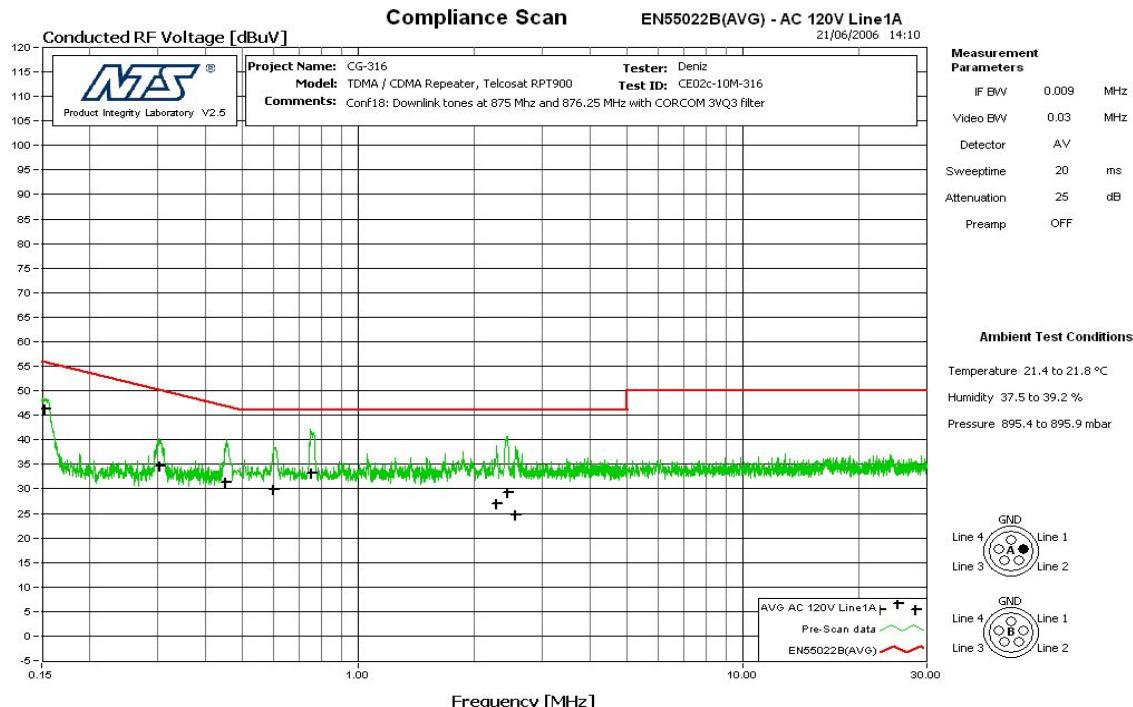
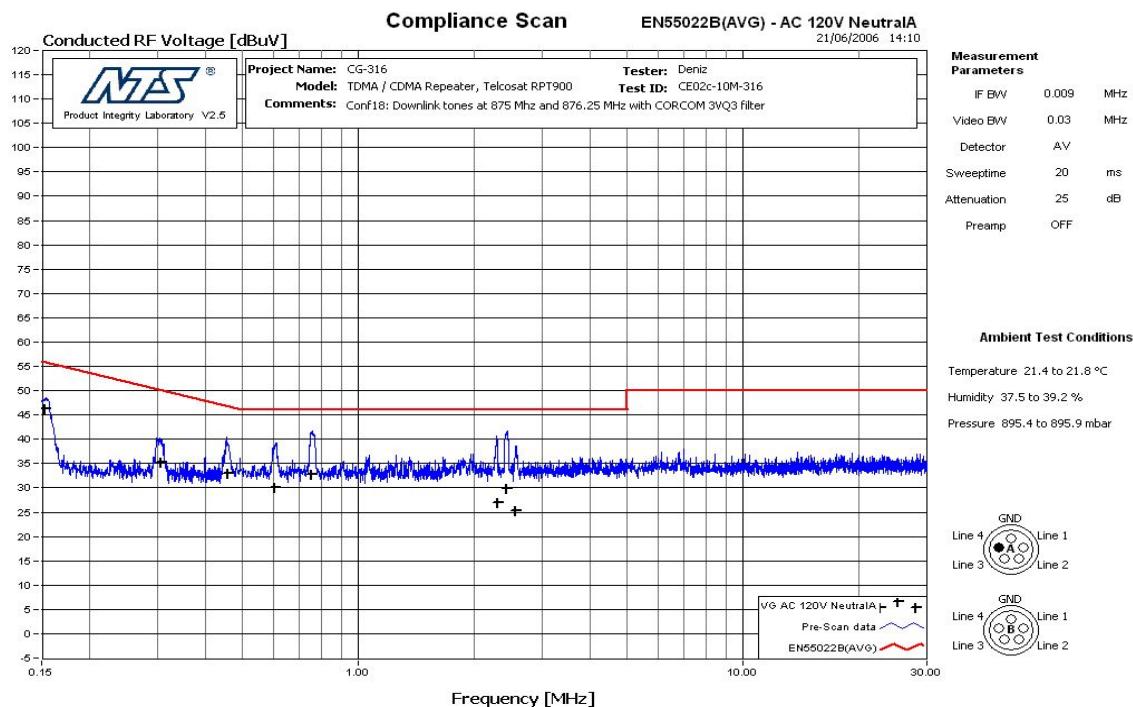


Figure 1: CE – Line 1 – 150 kHz – 30 MHz (Average Detector)



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Figure 2: CE – Return 1 – 150 kHz – 30 MHz (Average Detector)

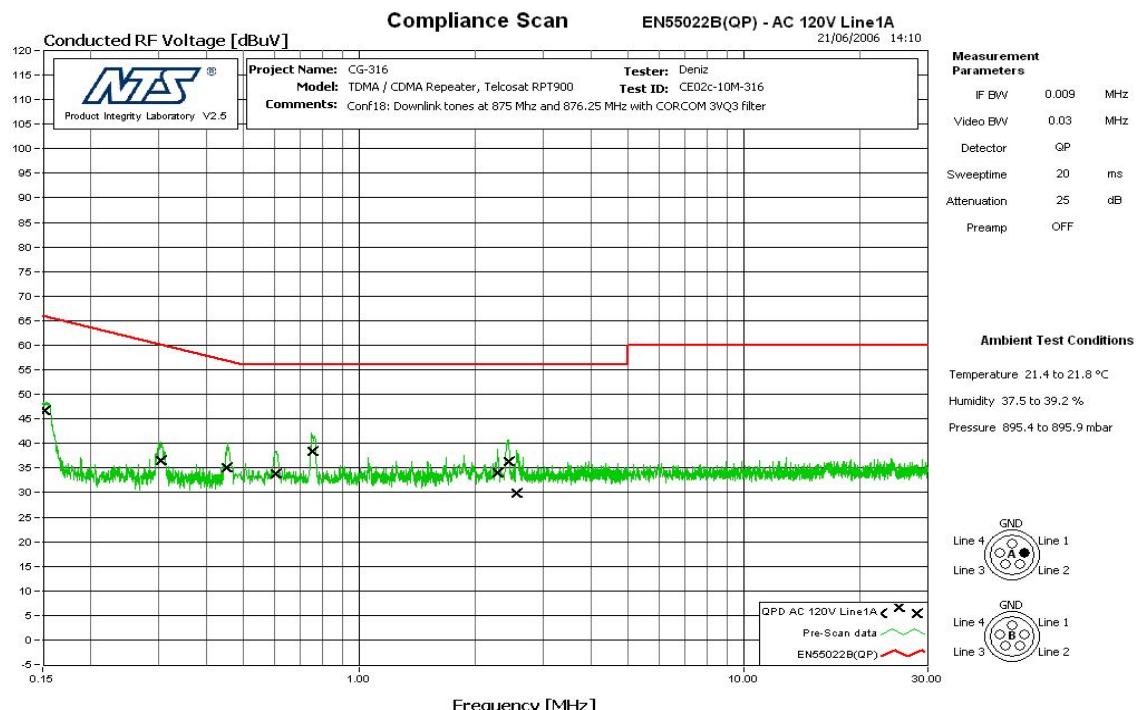


Figure 3: CE – Line 1 – 150 kHz – 30 MHz (Quasi-Peak Detector)

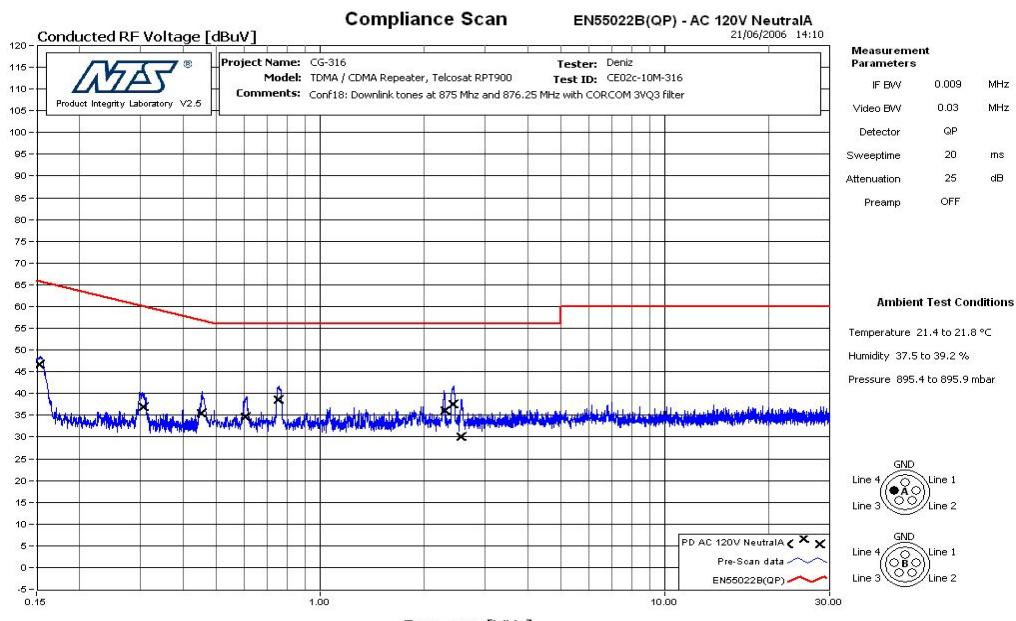
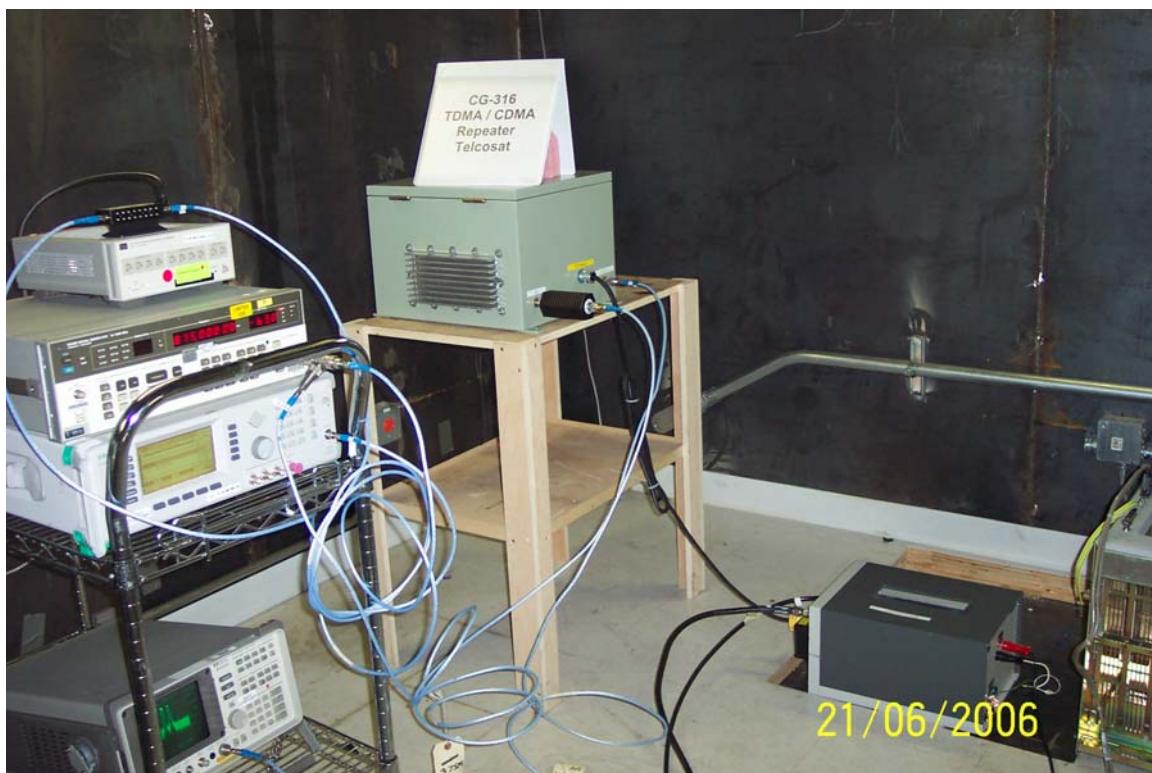


Figure 4: CE – Return 1 – 150 kHz – 30 MHz (Quasi-Peak Detector)

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## APPENDIX C: FREQUENCY STABILITY

### C.1. Base Standard & Test Basis

Base Standard	FCC Part 22, RSS 131
Test Basis/Method	RSS 131, FCC Part 22, EIA/TIA 603

### C.2. Limits

The frequency stability shall not exceed 1ppm (1KHz)

### C.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+1.11/-1.22

### C.4. Test Results

The EUT complies. See data below

#### Frequency Stability - Uplink

Number of Test	Temperature deg.C	Measured Frequency (Hz)	Drift (Hz)	Pass/Fail	Comments
1	-30	839250002	-2	Pass	
2	-30	839250002	-2	Pass	
3	-30	839250002	-2	Pass	
1	-20	839250002	-2	Pass	
2	-20	839250002	-2	Pass	
3	-20	839250002	-2	Pass	
1	-10	839250002	-2	Pass	
2	-10	839250002	-2	Pass	
3	-10	839250002	-2	Pass	
1	0	839250002	-2	Pass	
2	0	839250002	-2	Pass	
3	0	839250002	-2	Pass	
1	10	839250002	-2	Pass	
2	10	839250002	-2	Pass	
3	10	839250002	-2	Pass	
1	20	839250002	-2	Pass	
2	20	839250002	-2	Pass	
3	20	839250002	-2	Pass	
4	20	839250002	-2	Pass	Input: 101.5 Vac

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5	20	839250002	-2	Pass	Input: 137.4 Vac
1	30	839250002	-2	Pass	
2	30	839250002	-2	Pass	
3	30	839250002	-2	Pass	
1	40	839250002	-2	Pass	
2	40	839250002	-2	Pass	
3	40	839250002	-2	Pass	
1	50	839250002	-2	Pass	
2	50	839250002	-2	Pass	
3	50	839250002	-2	Pass	

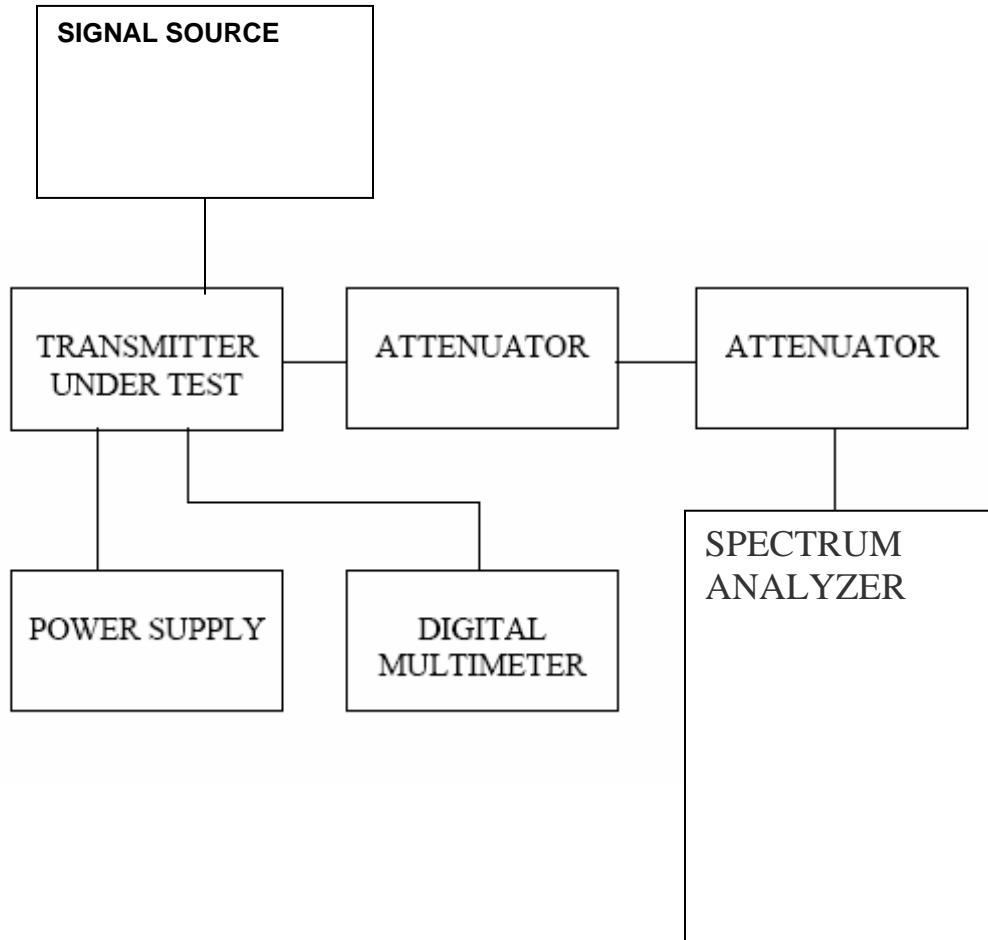
**Frequency Stability - Downlink**

Number of test	Temperature deg.C	Measured Frequency (Hz)	Drift (Hz)	Pass/Fail	Comments
1	-30	875000006	-6	Pass	
2	-30	875000010	-10	Pass	
3	-30	875000010	-10	Pass	
1	-20	875000006	-6	Pass	
2	-20	875000006	-6	Pass	
3	-20	875000006	-6	Pass	
1	-10	875000006	-6	Pass	
2	-10	875000006	-6	Pass	
3	-10	875000006	-6	Pass	
1	0	875000006	-6	Pass	
2	0	875000006	-6	Pass	
3	0	875000006	-6	Pass	
1	10	875000006	-6	Pass	
2	10	875000006	-6	Pass	
3	10	875000006	-6	Pass	
1	20	875000010	-10	Pass	
2	20	875000010	-10	Pass	
3	20	875000010	-10	Pass	
4	20	875000010	-10	Pass	* Input: 102.2 Vac
5	20	875000010	-10	Pass	* Input: 137.9 Vac
1	30	875000006	-6	Pass	
2	30	875000006	-6	Pass	
3	30	875000006	-6	Pass	
1	40	874999998	2	Pass	
2	40	874999998	2	Pass	
3	40	874999998	2	Pass	
1	50	874999998	2	Pass	
2	50	874999998	2	Pass	
3	50	874999998	2	Pass	

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#### C.5. Test Setup diagram



#### C.6. Tested By

This testing was conducted in accordance with the ISO 17025:1999 scope of accreditation, table 1; Quality Manual.

Name: John Yam  
Function: Safety Engineer

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**APPENDIX D: TEST EQUIPMENT LIST****D.1. Conducted Emissions 150 kHz – 30 MHz Measurement Equipment**

Description		Manufacturer	Type/Model	Serial #	Cal Due	Cal Date
<b>10m ANECHOIC CHAMBER</b>						
A LISN Link					07JAN06	07JAN04
-LISN A Switch	<input checked="" type="checkbox"/> A	NA	NA	263177		
-Cable Switch to Limiter	<input checked="" type="checkbox"/> A	NA	NA	263164	07JAN06	07JAN04
- Cable LISN to Switch	<input checked="" type="checkbox"/> A1	Succoflex	NA	263168		
	<input type="checkbox"/> A2	Succoflex	NA	263169		
	<input type="checkbox"/> A3	Succoflex	NA	263170		
	<input checked="" type="checkbox"/> A4	Succoflex	NA	263171		
- LISN	<input type="checkbox"/> A1	EMCO	38100/1SPEC	260454	07JAN06	07JAN04
- LISN	<input type="checkbox"/> A2	EMCO	38100/1SPEC	260268	07JAN06	07JAN04
- LISN	<input type="checkbox"/> A3	EMCO	38100/1SPEC	260458	07JAN06	07JAN04
- LISN	<input type="checkbox"/> A4	EMCO	38100/1SPEC	260265	07JAN06	07JAN04
- Table Top LISN	<input checked="" type="checkbox"/> TT	EMCO	3825	260354	08JAN06	08JAN04
<b>CONTROL ROOM</b>						
Test Receiver		Rohde & Schwarz	ESAI	260110 / 260111	02FEB06	02FEB05
Mast Controller		EMCO	2090	260166	N/A	N/A
Switch Matrix		TDL	SMC-002	260162	07JAN06	07JAN04
Cable Switch Matrix to Receiver		NA	NA	263166	07JAN06	07JAN04
A LISN Link					07JAN06	07JAN04
-LISN A Limiter	<input checked="" type="checkbox"/> A	NA	NA	263178		
-Cable Switch to Limiter	<input checked="" type="checkbox"/> A	NA	NA	263164		

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## D.2. Radiated Emissions 30 MHz – 1 GHz Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due	Cal Date
<b>10m ANECHOIC CHAMBER</b>					
Bilog Antenna	<input type="checkbox"/> Chase	CBL 6111B	260398	09JULY06	09JULY04
	<input checked="" type="checkbox"/> Chase	CBL 6112B	260301		
RF Cable	Suhner Succoflex	Ferrite bead loaded cable	260388	07JAN06	07JAN04
<b>CONTROL ROOM</b>					
Test Receiver	<input checked="" type="checkbox"/> Rohde & Schwarz	ESAI	260110 / 260111	2FEB06	2FEB05
Mast Controller	EMCO	2090	260165	N/A	N/A
Multi Device Controller TT1 (Turntable)	07JAN06	07JAN04		N/A	N/A
RF 10m East site Link				Suhner Succoflex	NA
- Cable 1	Suhner Succoflex	NA	263135		
- Cable 2	Suhner Succoflex	NA	263161		
- Cable 3	Suhner Succoflex	NA	263162		
- Cable 4	TDL	SMC-002	260162		
- Switch Matrix Controller	Hewlett Packard	8447F	260164		
- Amplifier					

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## D.3. Radiated Emissions 1 GHz – 25 GHz and Frequency Stability Measurement Equipment

Description	Manufacturer	Type/Model	Asset #	Cal Due	Cal Date
<b>10m ANECHOIC CHAMBER</b>					
Horn Antenna (Rx) 1 GHz – 18 GHz	EMCO	3115	260092	16Jun06	16JUN04
High pass filter	K&L	11SH10-3860	263124	08JAN06	08JAN04
High frequency Link					
Step Attenuator/Switch (0dB & 10 dB)	HP	11713A	260048 260097	07JAN06	07JAN04
LNA	Miteq	JSD000121	260477		
Cable from LNA to SA	Succoflex	101PEA	263187		
Spectrum Analyzer 9k-40GHz	Rohde & Schwarz	FSEK	260104	05APR06	05APR05
LNA DC Power Supply	Xantrex	LXO 30-2	260483	NA	NA
HPIB Extender	HP	37204	260096	N/A	N/A
<b>CONTROL ROOM</b>					
PC with FSEK Manual ctrl S/W	N/A	N/A	N/A	N/A	N/A
HPIB Extender	HP	37204	260168	N/A	N/A
Mast Controller	EMCO	2090	260166	N/A	N/A
Multi Device Controller TT1	EMCO	2090	260165	N/A	N/A
Horn Antenna (Tx)	EMCO	3160	260088	N/A	N/A

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