Novator

TEST REPORT FOR

PM Orbital Drilling Unit, Orbital PM60

Tested To The Following Standards:

FCC Part 15 Subpart C Sections 15.207, 15.209 and RSS-210

Report No.: 90775-5

Date of issue: August 4, 2010

ACCREDITED

TESTING
CERT #803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Testing the Future

CKC LABORATORIES, INC.

TABLE OF CONTENTS

Administrative Information 3

Test Report Information 3

Report Authorization 3

Test Facility Information 4

Site Registration & Accreditation Information 4

Summary of Results 5

Conditions During Testing 5

Equipment Under Test 6

Peripheral Devices 6

FCC Part 15 Subpart C 7

15.31(m) Number Of Channels 7

15.33(a) Frequency Ranges Tested 7

15.203 Antenna Requirements 7

EUT Operating Frequency 7

FCC 15.207 AC Mains Conducted Emissions 8

FCC 15.209/2.1046 - RF Power Output 21

FCC 15.209/2.1053 Radiated Spurious Emissions 26

2.1049 - Occupied Bandwidth 32

RSS-210 99% Occupied Bandwidth 35

Supplemental Information 38

Measurement Uncertainty 38

Emissions Test Details 38

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Novator
Stormbyvagen 6
Spanga 163 55, Sweden

Representative: Eskil Larsson

REPORT PREPARED BY:

Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 90775

DATE OF EQUIPMENT RECEIPT: July 29, 2010
DATE(S) OF TESTING: July 29 - 30, 2010

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Site Registration & Accreditation Information

Location	Japan	Canada	FCC
Brea A	R-2945, C-3248 & T-1572	3082D-1	90473

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C

Description	Test Procedure/Method	Results
AC Mains Conducted Emissions	FCC Part 15 Subpart C Section 15.207 / ANSI C63.4 (2003)	Pass
RF Power Output	FCC Part 15 Subpart C Section 15.209/2.1046	Pass
Field Strength of Spurious Radiation	FCC Part 15 Subpart C Section 15.209/ 2.1053	Pass
Occupied Bandwidth	FCC 2.1049	Pass
99% Bandwidth	RSS-210	Pass

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
A Ground strap is connected to the chassis of the support Orbital PM Supply Unit to simulate actual installation of the support Orbital PM Supply Unit on grounded structure.

EQUIPMENT UNDER TEST (EUT)

The EUT is a drill with a RFID transmitter at the nose piece. The EUT includes two nose pieces with different antennas.

The following device and model was tested by CKC Laboratories: **PM60 Orbital Drilling Unit, Orbital PM 600.** Since the time of testing the manufacturer has chosen to use the following device name: **PM Orbital Drilling Unit**

In addition there was an error made on the data sheets listing the model as **Orbital PM 600** which should have been **Orbital PM60**

The manufacturer states that there is an additional model **PM40** that is equal to the PM60 except for its stroke of 40 mm instead of 60 mm. Any differences between the names does not affect their EMC characteristics and therefore meets the level of testing equivalent to the tested model name shown on the data sheets.

EQUIPMENT UNDER TEST

PM Orbital Drilling Unit
Manuf: Novator
Model: Orbital PM60
Serial: PM 60 10 M1004

Nose Piece
Manuf: Novator
Model: NG 50
Serial: NA

Nose Piece
Manuf: Novator
Model: NG 60
Serial: NA

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Orbital PM Supply Unit
Manuf: Novator
Model: 13615-00
Serial: PM 10 C10009

Test Jig NG60
Manuf: Novator
Model: NA
Serial: 14672-00

Test Jig NG50
Manuf: Novator
Model: NA
Serial: 14705-00

FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) 47 CFR 15C requirements for Unlicensed Radio Frequency Devices, Subpart C - Intentional Radiators.

15.31(m) Number Of Channels
This device operates on a single channel.

15.33(a) Frequency Ranges Tested
15.207 Conducted Emissions: 150 kHz – 30 MHz
15.209Radiated Emissions: 9 kHz- 1 GHz.

15.203 Antenna Requirements
The antenna is an integral part of the EUT and is non-removable; therefore the EUT complies with Section 15.203 of the FCC rules.

EUT Operating Frequency
The EUT was operating at 116.02kHz

FCC 15.207 AC Mains Conducted Emissions

Test Data Sheets

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Novator**
Specification: **15.207 AC Mains - Average**
Work Order #: **90775** Date: 7/30/2010
Test Type: **Conducted Emissions** Time: 13:32:03
Equipment: **PM60 Orbital Drilling Unit** Sequence#: 7
Manufacturer: Novator Tested By: E. Wong
Model: Orbital PM 600 110V 60Hz
S/N: PM 60 10 M1004

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T1	ANP05613	Attenuator	50FHC-006-10BNC	3/10/2009	3/10/2011
T2	ANP04358	Cable	RG142	5/7/2010	5/7/2012
T3	AN02610	High Pass Filter	HE9615-150K-50-720B	11/16/2009	11/16/2011
T4	AN00847.1	50uH LISN-Line 1 (dB)	3816/2NM	12/9/2008	12/9/2010
	AN00847.1	50uH LISN-Line 2 (dB)	3816/2NM	12/9/2008	12/9/2010

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece	Novator	NG 60	NA
Nose piece*	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

Test Conditions / Notes:

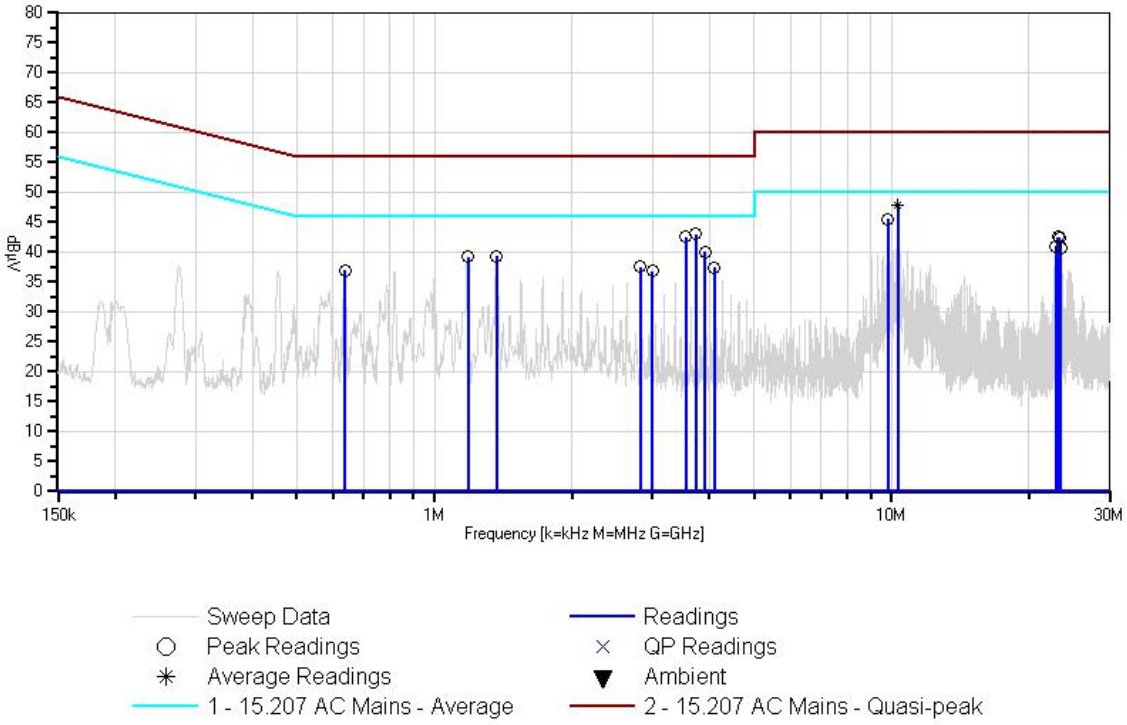
DC power is supplied by a support supply unit placed next to the turntable. The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces.
The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG50
Freq: NG60= 116.02kHz
23°C, 57% Relative Humidity
Ground strap is connected to the chassis of the support Orbital PM Supply Unit to simulate actual installation of the support Orbital PM Supply Unit on grounded structure.

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	10.337M Ave	41.5	+5.6	+0.3	+0.1	+0.5	+0.0	48.0	50.0	-2.0	Black
^	10.337M	42.9	+5.6	+0.3	+0.1	+0.5	+0.0	49.4	50.0	-0.6	Black
3	3.731M	37.0	+5.6	+0.2	+0.1	+0.1	+0.0	43.0	46.0	-3.0	Black
4	3.548M	36.6	+5.6	+0.2	+0.1	+0.1	+0.0	42.6	46.0	-3.4	Black
5	9.824M	39.0	+5.6	+0.3	+0.1	+0.5	+0.0	45.5	50.0	-4.5	Black
6	3.909M	34.0	+5.6	+0.2	+0.1	+0.1	+0.0	40.0	46.0	-6.0	Black
7	1.366M	33.5	+5.6	+0.1	+0.2	+0.0	+0.0	39.4	46.0	-6.6	Black
8	1.183M	33.3	+5.6	+0.1	+0.2	+0.0	+0.0	39.2	46.0	-6.8	Black
9	23.094M	35.1	+5.6	+0.4	+0.2	+1.3	+0.0	42.6	50.0	-7.4	Black
10	23.271M	35.0	+5.6	+0.4	+0.2	+1.3	+0.0	42.5	50.0	-7.5	Black
11	2.821M	31.5	+5.6	+0.2	+0.1	+0.1	+0.0	37.5	46.0	-8.5	Black
12	4.092M	31.4	+5.6	+0.2	+0.1	+0.1	+0.0	37.4	46.0	-8.6	Black
13	22.905M	33.5	+5.6	+0.4	+0.2	+1.3	+0.0	41.0	50.0	-9.0	Black
14	636.501k	31.0	+5.6	+0.1	+0.3	+0.0	+0.0	37.0	46.0	-9.0	Black
15	2.999M	30.9	+5.6	+0.2	+0.1	+0.1	+0.0	36.9	46.0	-9.1	Black
16	23.449M	33.3	+5.6	+0.4	+0.2	+1.3	+0.0	40.8	50.0	-9.2	Black

CKC Laboratories, Inc Date: 7/30/2010 Time: 13:32:03 Novator WO#: 90775
15.207 AC Mains - Average Test Lead: Black 110V 60Hz Sequence#: 7 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Novator**
Specification: **15.207 AC Mains - Average**
Work Order #: **90775** Date: 7/30/2010
Test Type: **Conducted Emissions** Time: 13:41:14
Equipment: **PM60 Orbital Drilling Unit** Sequence#: 8
Manufacturer: Novator Tested By: E. Wong
Model: Orbital PM 600 110V 60Hz
S/N: PM 60 10 M1004

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T1	ANP05613	Attenuator	50FHC-006-10BNC	3/10/2009	3/10/2011
T2	ANP04358	Cable	RG142	5/7/2010	5/7/2012
T3	AN02610	High Pass Filter	HE9615-150K-50-720B	11/16/2009	11/16/2011
	AN00847.1	50uH LISN-Line 1 (dB)	3816/2NM	12/9/2008	12/9/2010
T4	AN00847.1	50uH LISN-Line 2 (dB)	3816/2NM	12/9/2008	12/9/2010

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece	Novator	NG 60	NA
Nose piece*	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

Test Conditions / Notes:

DC power is supplied by a support supply unit placed next to the turntable. The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces.
The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG50
Freq: NG60= 116.02kHz
23°C, 57% Relative Humidity
Ground strap is connected to the chassis of the support Orbital PM Supply Unit to simulate actual installation of the support Orbital PM Supply Unit on grounded structure.

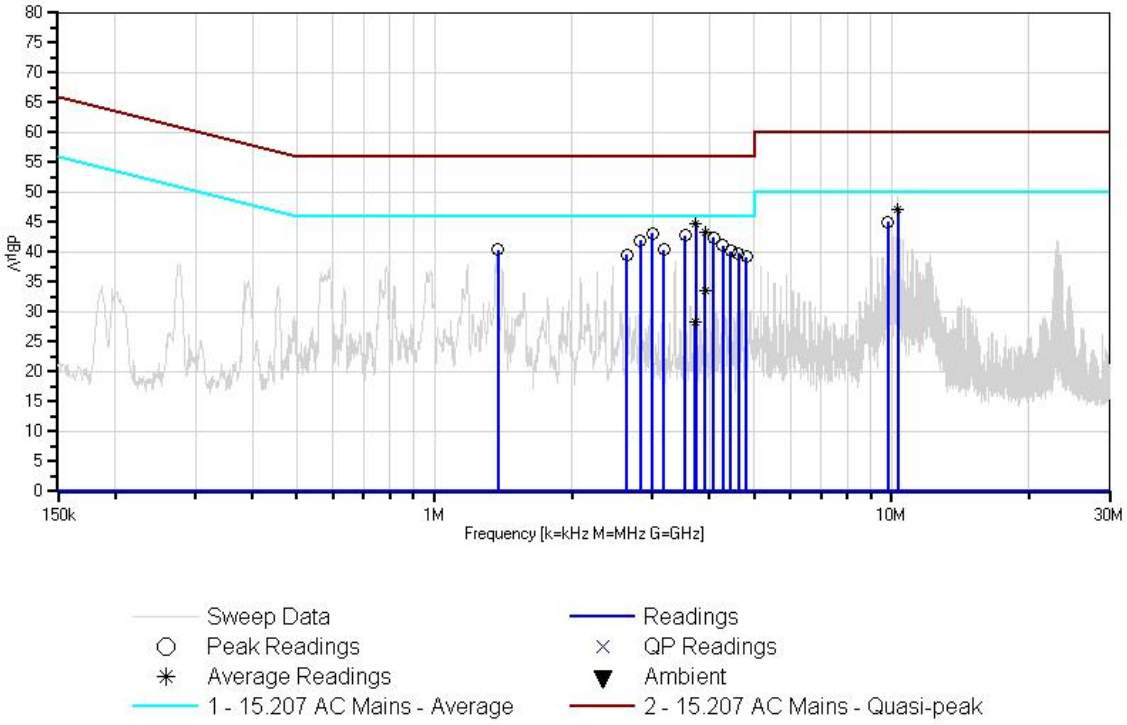
Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: White

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	3.730M Ave	38.6	+5.6	+0.2	+0.1	+0.2	+0.0	44.7	46.0	-1.3	White
2	3.911M Ave	37.3	+5.6	+0.2	+0.1	+0.2	+0.0	43.4	46.0	-2.6	White
3	2.995M	37.0	+5.6	+0.2	+0.1	+0.2	+0.0	43.1	46.0	-2.9	White
4	10.337M Ave	40.7	+5.6	+0.3	+0.1	+0.4	+0.0	47.1	50.0	-2.9	White

^	10.337M	43.0	+5.6	+0.3	+0.1	+0.4	+0.0	49.4	50.0	-0.6	White
6	3.539M	36.7	+5.6	+0.2	+0.1	+0.2	+0.0	42.8	46.0	-3.2	White
7	4.088M	36.4	+5.6	+0.2	+0.1	+0.2	+0.0	42.5	46.0	-3.5	White
8	2.816M	35.9	+5.6	+0.2	+0.1	+0.2	+0.0	42.0	46.0	-4.0	White
9	4.271M	35.0	+5.6	+0.2	+0.1	+0.2	+0.0	41.1	46.0	-4.9	White
10	9.824M	38.6	+5.6	+0.3	+0.1	+0.4	+0.0	45.0	50.0	-5.0	White
11	1.379M	34.4	+5.6	+0.1	+0.2	+0.1	+0.0	40.4	46.0	-5.6	White
12	3.178M	34.3	+5.6	+0.2	+0.1	+0.2	+0.0	40.4	46.0	-5.6	White
13	4.449M	34.1	+5.6	+0.2	+0.1	+0.2	+0.0	40.2	46.0	-5.8	White
14	4.632M	33.7	+5.6	+0.2	+0.1	+0.2	+0.0	39.8	46.0	-6.2	White
15	2.634M	33.5	+5.6	+0.2	+0.1	+0.2	+0.0	39.6	46.0	-6.4	White
16	4.811M	33.1	+5.6	+0.2	+0.1	+0.2	+0.0	39.2	46.0	-6.8	White
17	3.905M Ave	27.4	+5.6	+0.2	+0.1	+0.2	+0.0	33.5	46.0	-12.5	White
^	3.905M	38.0	+5.6	+0.2	+0.1	+0.2	+0.0	44.1	46.0	-1.9	White
19	3.722M Ave	22.3	+5.6	+0.2	+0.1	+0.2	+0.0	28.4	46.0	-17.6	White
^	3.722M	39.0	+5.6	+0.2	+0.1	+0.2	+0.0	45.1	46.0	-0.9	White

CKC Laboratories, Inc Date: 7/30/2010 Time: 13:41:14 Novator WO#: 90775
15.207 AC Mains - Average Test Lead: White 110V 60Hz Sequence#: 8 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer:	**Novator**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**90775**	Date:	7/30/2010
Test Type:	**Conducted Emissions**	Time:	13:25:33
Equipment:	**PM60 Orbital Drilling Unit**	Sequence#:	6
Manufacturer:	Novator	Tested By:	E. Wong
Model:	Orbital PM 600		110V 60Hz
S/N:	PM 60 10 M1004		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T2	ANP05613	Attenuator	50FHC-006-10BNC	3/10/2009	3/10/2011
T3	ANP04358	Cable	RG142	5/7/2010	5/7/2012
T4	AN02610	High Pass Filter	HE9615-150K-50-720B	11/16/2009	11/16/2011
T5	AN00847.1	50uH LISN-Line 1 (dB)	3816/2NM	12/9/2008	12/9/2010
	AN00847.1	50uH LISN-Line 2 (dB)	3816/2NM	12/9/2008	12/9/2010

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece*	Novator	NG 60	NA
Nose piece	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

Test Conditions / Notes:

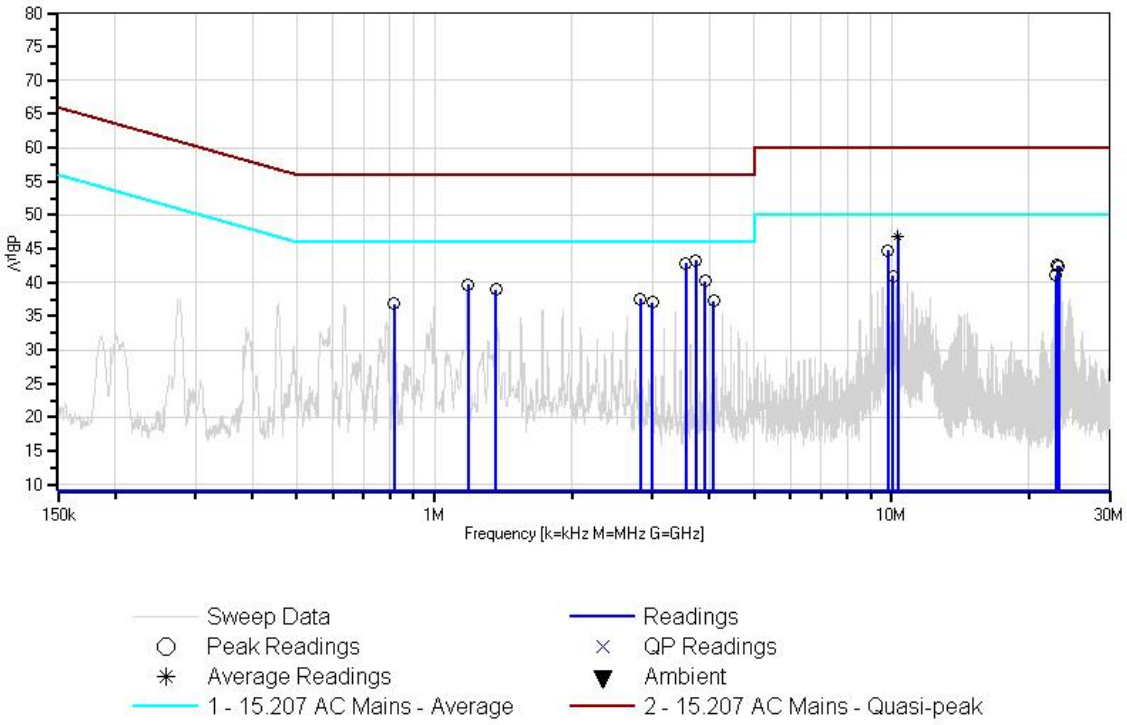
DC power is supplied by a support supply unit placed next to the turntable. The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces. The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG60
Freq: NG60= 116.02kHz
23°C, 57% Relative Humidity
Ground strap is connected to the chassis of the support Orbital PM Supply Unit to simulate actual installation of the support Orbital PM Supply Unit on grounded structure.

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Black

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	3.727M	37.3	+0.0 +0.1	+5.6	+0.2	+0.1	+0.0	43.3	46.0	-2.7	Black
2	3.544M	36.9	+0.0 +0.1	+5.6	+0.2	+0.1	+0.0	42.9	46.0	-3.1	Black
3	10.337M Ave	40.3	+0.0 +0.5	+5.6	+0.3	+0.1	+0.0	46.8	50.0	-3.2	Black
^	10.337M	41.7	+0.0 +0.5	+5.6	+0.3	+0.1	+0.0	48.2	50.0	-1.8	Black
5	9.824M	38.3	+0.0 +0.5	+5.6	+0.3	+0.1	+0.0	44.8	50.0	-5.2	Black
6	3.905M	34.2	+0.0 +0.1	+5.6	+0.2	+0.1	+0.0	40.2	46.0	-5.8	Black
7	1.183M	33.8	+0.0 +0.0	+5.6	+0.1	+0.2	+0.0	39.7	46.0	-6.3	Black
8	1.362M	33.1	+0.0 +0.0	+5.6	+0.1	+0.2	+0.0	39.0	46.0	-7.0	Black
9	23.067M	35.0	+0.0 +1.3	+5.6	+0.4	+0.2	+0.0	42.5	50.0	-7.5	Black
10	23.244M	34.9	+0.0 +1.3	+5.6	+0.4	+0.2	+0.0	42.4	50.0	-7.6	Black
11	2.816M	31.6	+0.0 +0.1	+5.6	+0.2	+0.1	+0.0	37.6	46.0	-8.4	Black
12	4.088M	31.3	+0.0 +0.1	+5.6	+0.2	+0.1	+0.0	37.3	46.0	-8.7	Black
13	22.878M	33.6	+0.0 +1.3	+5.6	+0.4	+0.2	+0.0	41.1	50.0	-8.9	Black
14	10.085M	34.5	+0.0 +0.5	+5.6	+0.3	+0.1	+0.0	41.0	50.0	-9.0	Black
15	2.999M	31.0	+0.0 +0.1	+5.6	+0.2	+0.1	+0.0	37.0	46.0	-9.0	Black
16	816.847k	30.9	+0.0 +0.0	+5.6	+0.1	+0.2	+0.0	36.8	46.0	-9.2	Black

CKC Laboratories, Inc Date: 7/30/2010 Time: 13:25:33 Novator WO#: 90775
15.207 AC Mains - Average Test Lead: Black 110V 60Hz Sequence#: 6 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Novator**
Specification: **15.207 AC Mains - Average**
Work Order #: **90775** Date: 7/30/2010
Test Type: **Conducted Emissions** Time: 13:22:01
Equipment: **PM60 Orbital Drilling Unit** Sequence#: 5
Manufacturer: Novator Tested By: E. Wong
Model: Orbital PM 600 110V 60Hz
S/N: PM 60 10 M1004

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T1	ANP05613	Attenuator	50FHC-006-10BNC	3/10/2009	3/10/2011
T2	ANP04358	Cable	RG142	5/7/2010	5/7/2012
T3	AN02610	High Pass Filter	HE9615-150K-50-720B	11/16/2009	11/16/2011
	AN00847.1	50uH LISN-Line 1 (dB)	3816/2NM	12/9/2008	12/9/2010
T4	AN00847.1	50uH LISN-Line 2 (dB)	3816/2NM	12/9/2008	12/9/2010

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece*	Novator	NG 60	NA
Nose piece	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

Test Conditions / Notes:

DC power is supplied by a support supply unit placed next to the turntable. The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces.
The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG60
Freq: NG60= 116.02kHz
23°C, 57% Relative Humidity
Ground strap is connected to the chassis of the support Orbital PM Supply Unit to simulate actual installation of the support Orbital PM Supply Unit on grounded structure.

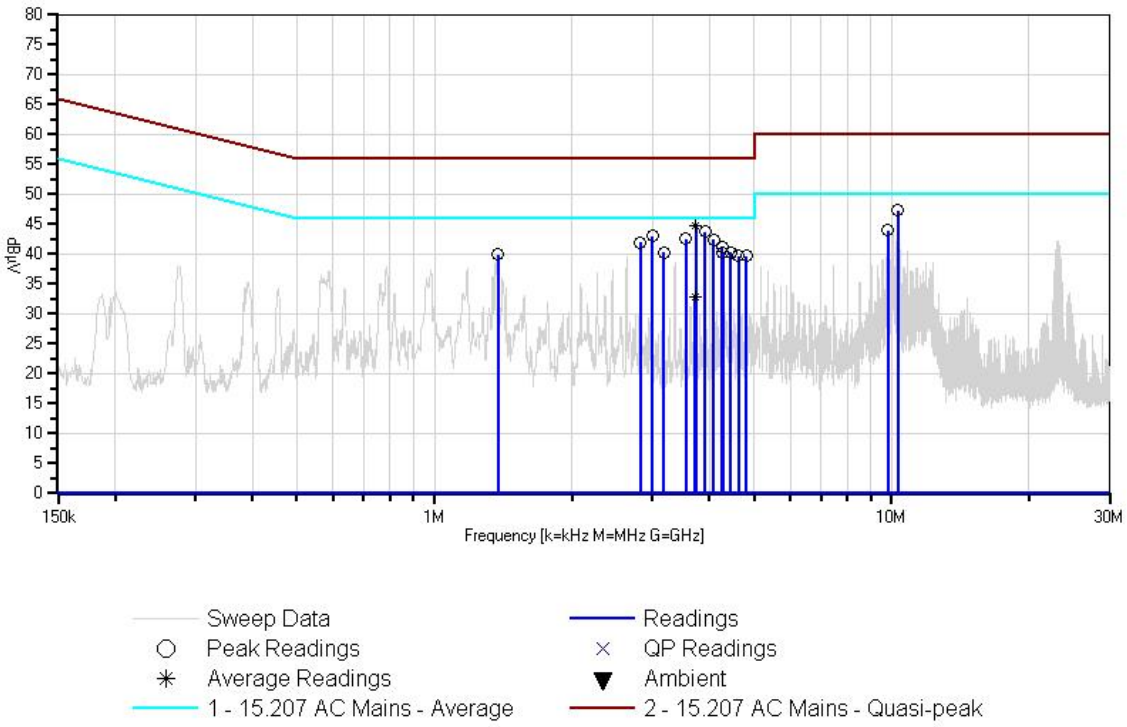
Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: White

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	3.729M Ave	38.6	+5.6	+0.2	+0.1	+0.2	+0.0	44.7	46.0	-1.3	White
2	3.905M	37.7	+5.6	+0.2	+0.1	+0.2	+0.0	43.8	46.0	-2.2	White
3	10.337M	40.9	+5.6	+0.3	+0.1	+0.4	+0.0	47.3	50.0	-2.7	White
4	2.995M	36.9	+5.6	+0.2	+0.1	+0.2	+0.0	43.0	46.0	-3.0	White

5	3.544M	36.5	+5.6	+0.2	+0.1	+0.2	+0.0	42.6	46.0	-3.4	White
6	4.084M	36.3	+5.6	+0.2	+0.1	+0.2	+0.0	42.4	46.0	-3.6	White
7	2.816M	35.9	+5.6	+0.2	+0.1	+0.2	+0.0	42.0	46.0	-4.0	White
8	4.267M	35.2	+5.6	+0.2	+0.1	+0.2	+0.0	41.3	46.0	-4.7	White
9	3.178M	34.2	+5.6	+0.2	+0.1	+0.2	+0.0	40.3	46.0	-5.7	White
10	4.449M	34.2	+5.6	+0.2	+0.1	+0.2	+0.0	40.3	46.0	-5.7	White
11	4.279M	34.1	+5.6	+0.2	+0.1	+0.2	+0.0	40.2	46.0	-5.8	White
12	9.824M	37.6	+5.6	+0.3	+0.1	+0.4	+0.0	44.0	50.0	-6.0	White
13	1.375M	33.9	+5.6	+0.1	+0.2	+0.1	+0.0	39.9	46.0	-6.1	White
14	4.628M	33.6	+5.6	+0.2	+0.1	+0.2	+0.0	39.7	46.0	-6.3	White
15	4.811M	33.6	+5.6	+0.2	+0.1	+0.2	+0.0	39.7	46.0	-6.3	White
16 Ave	3.722M	26.7	+5.6	+0.2	+0.1	+0.2	+0.0	32.8	46.0	-13.2	White
^	3.722M	39.0	+5.6	+0.2	+0.1	+0.2	+0.0	45.1	46.0	-0.9	White

CKC Laboratories, Inc Date: 7/30/2010 Time: 13:22:01 Novator WO#: 90775
15.207 AC Mains - Average Test Lead: White 110V 60Hz Sequence#: 5 Ext ATTN: 0 dB



Test Setup Photos

FCC 15.209/2.1046 - RF Power Output

Test Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Novator**
Specification: **15.209 Radiated Emissions**
Work Order #: **90775** Date: 7/29/2010
Test Type: **Radiated Scan** Time: 10:50:30
Equipment: **PM60 Orbital Drilling Unit** Sequence#: 1
Manufacturer: Novator Tested By: E. Wong
Model: Orbital PM 600
S/N: PM 60 10 M1004

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T2	ANP05198	Cable	8268	1/5/2009	1/5/2011
T3	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece*	Novator	NG 60	NA
Nose piece*	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

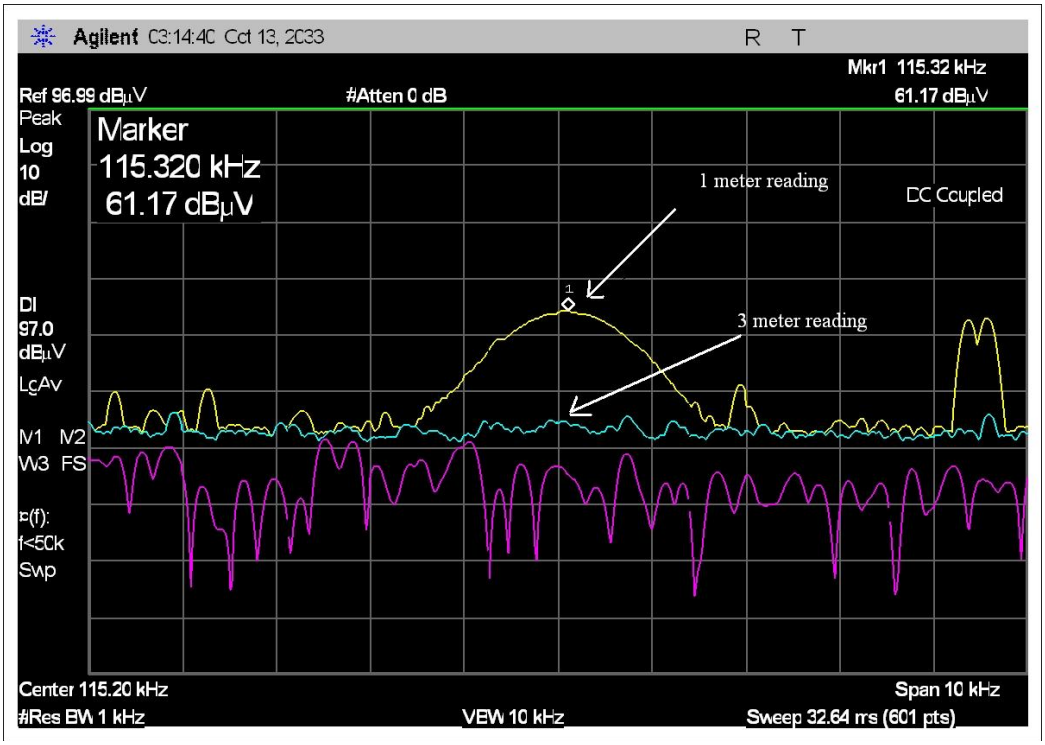
Test Conditions / Notes:

The portable EUT is placed on the wooden table lined with Styrofoam of 10cm in thickness. DC power is supplied by a support supply unit placed next to the turntable. The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces. The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG50, NG60
Frequency range of measurement = 9 kHz- 1 GHz.
Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz- 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz- 1000 MHz RBW=120 kHz, VBW=120 kHz
Emission profile of the EUT rotated along the three orthogonal axes was investigated.
15.31 (e) The variation of the radiated signal level of the fundamental frequency component of the emission was measured with the supply voltage varied between 85% and 115% of the nominal rated supply voltage, no variation in signal level was observed. Measurement was performed at 1 meter test distance due to the lower power nature of the fundamental emission, at 3 meter test distance, **The Emission Was Not Detectable.**
23°C, 57% Relative Humidity

Ext Attn: 0 dB

Measurement Data: Reading listed by order taken. Test Distance: 1 Meter

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	115.370k	61.8	+0.0	+0.0	+8.8		-99.0	-28.4	26.4 NG50_X_Fundamental	-54.8	Vert
2	115.370k	56.6	+0.0	+0.0	+8.8		-99.0	-33.6	26.4 NG50_X_Fundamental	-60.0	Horiz
3	115.370k	66.2	+0.0	+0.0	+8.8		-99.0	-24.0	26.4 NG50_Y_Fundamental	-50.4	Vert
4	115.370k	65.7	+0.0	+0.0	+8.8		-99.0	-24.5	26.4 NG50_Y_Fundamental	-50.9	Horiz
5	115.370k	65.3	+0.0	+0.0	+8.8		-99.0	-24.9	26.4 NG50_Z_Fundamental	-51.3	Vert
6	115.370k	62.7	+0.0	+0.0	+8.8		-99.0	-27.5	26.4 NG50_Z_Fundamental	-53.9	Vert
7	116.050k	64.1	+0.0	+0.0	+8.8		-99.0	-26.1	26.3 NG60_X_Fundamental	-52.4	Vert
8	116.050k	56.9	+0.0	+0.0	+8.8		-99.0	-33.3	26.3 NG60_X_Fundamental	-59.6	Horiz
9	116.050k	65.6	+0.0	+0.0	+8.8		-99.0	-24.6	26.3 NG60_Y_Fundamental	-50.9	Vert
10	116.050k	61.4	+0.0	+0.0	+8.8		-99.0	-28.8	26.3 NG60_Y_Fundamental	-55.1	Horiz
11	116.050k	63.4	+0.0	+0.0	+8.8		-99.0	-26.8	26.3 NG60_Z_Fundamental	-53.1	Vert
12	116.050k	61.2	+0.0	+0.0	+8.8		-99.0	-29.0	26.3 NG60_Z_Fundamental	-55.3	Horiz



RF POWER FUNDAMENTAL 1M-3M

Test Setup Photos

RF POWER 1M

RF POWER X

RF POWER Y

RF POWER Z

FCC 15.209/2.1053 Radiated Spurious Emissions

Test Data Sheet

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Novator**
Specification: **15.209 Radiated Emissions**
Work Order #: **90775** Date: 7/30/2010
Test Type: **Radiated Scan** Time: 10:11:00
Equipment: **PM60 Orbital Drilling Unit** Sequence#: 2
Manufacturer: Novator Tested By: E. Wong
Model: Orbital PM 600
S/N: PM 60 10 M1004

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T2	ANP05198	Cable	8268	1/5/2009	1/5/2011
T3	AN00309	Preamp	8447D	5/7/2010	5/7/2012
T4	ANP05050	Cable	RG223/U	4/16/2009	4/16/2011
T5	AN01995	Biconilog Antenna	CBL6111C	3/8/2010	3/8/2012
T6	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece*	Novator	NG 60	NA
Nose piece*	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

Test Conditions / Notes:

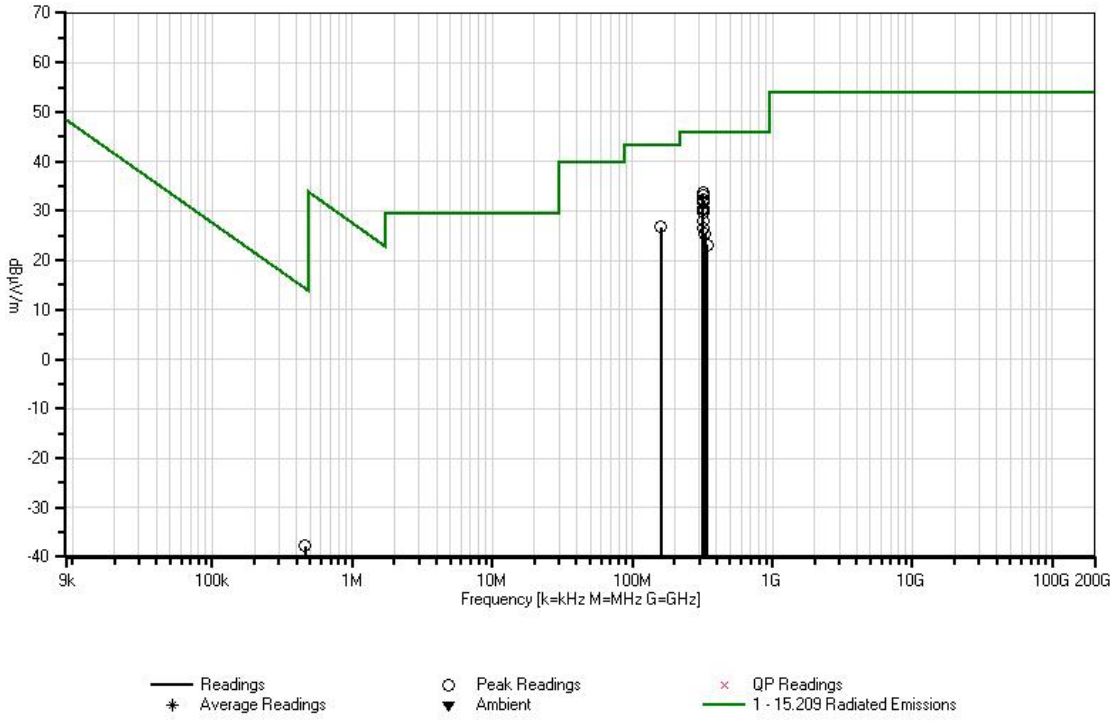
The portable EUT is placed on the wooden table lined with Styrofoam of 10cm in thickness. DC power is supplied by a support supply unit placed next to the turntable. The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces. The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG50, NG60
Freq: NG50 = 115.38 MHz , NG60= 116.02kHz
Frequency range of measurement = 9 kHz- 1 GHz.
Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz- 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz- 1000 MHz RBW=120 kHz, VBW=120 kHz
Emission profile of the EUT rotated along the three orthogonal axes was investigated.
23°C, 57% Relative Humidity

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	320.070M	44.0	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	33.6	46.0 NG_50_X	-12.4	Vert
2	320.070M	43.5	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	33.1	46.0 NG_60_Z	-12.9	Vert
3	320.080M	42.7	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	32.3	46.0 NG_50_Y	-13.7	Horiz
4	320.050M	42.7	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	32.3	46.0 NG_60_X	-13.7	Horiz
5	320.070M	42.7	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	32.3	46.0 NG_60_Y	-13.7	Horiz
6	320.080M	42.0	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	31.6	46.0 NG_50_Z	-14.4	Horiz
7	320.100M	41.0	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	30.6	46.0 NG_50_X	-15.4	Horiz
8	320.080M	40.6	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	30.2	46.0 NG_50_Z	-15.8	Vert
9	320.070M	40.6	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	30.2	46.0 NG_60_Y	-15.8	Vert
10	320.075M	40.2	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	29.8	46.0 NG_60_X	-16.2	Vert
11	160.057M	41.3	+0.0 +10.7	+2.1 +0.0	-27.7	+0.3	+0.0	26.7	43.5	-16.8	Vert
12	320.080M	38.4	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	28.0	46.0 NG_50_Y	-18.0	Vert
13	320.070M	36.8	+0.0 +14.0	+3.1 +0.0	-27.8	+0.3	+0.0	26.4	46.0 NG_60_Z	-19.6	Vert
14	331.780M	35.4	+0.0 +14.3	+3.2 +0.0	-27.8	+0.3	+0.0	25.4	46.0	-20.6	Horiz
15	344.340M	32.7	+0.0 +14.7	+3.3 +0.0	-27.8	+0.3	+0.0	23.2	46.0	-22.8	Vert
16	460.190k	33.7	+0.0 +0.0	+0.0 +8.6	+0.0	+0.0	-80.0	-37.7	14.3	-52.0	Vert
17	347.890k	30.4	+0.0 +0.0	+0.0 +8.5	+0.0	+0.0	-80.0	-41.1	16.8	-57.9	Vert

CKC Laboratories, Inc Date: 7/30/2010 Time: 10:11:00 Novator WO#: 90775
15.209 Radiated Emissions Test Distance: 3 Meters Sequence#: 2 Ext ATTN: 0 dB



Test Setup Photos

RADIATED SPURIOUS EMISSIONS FRONT

RADIATED SPURIOUS EMISSIONS BACK

RADIATED SPURIOUS EMISSIONS 3M

RADIATED SPURIOUS EMISSIONS X

RADIATED SPURIOUS EMISSIONS Y

RADIATED SPURIOUS EMISSIONS Z

2.1049 - Occupied Bandwidth

Test Set Up

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Novator**
Specification:
Work Order #: **90775** Date: 7/29/2010
Test Type: **Radiated Scan** Time: 10:50:30
Equipment: **PM60 Orbital Drilling Unit** Sequence#: 1
Manufacturer: Novator Tested By: E. Wong
Model: Orbital PM 600
S/N: PM 60 10 M1004

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T2	ANP05198	Cable	8268	1/5/2009	1/5/2011
T3	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece*	Novator	NG 60	NA
Nose piece*	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

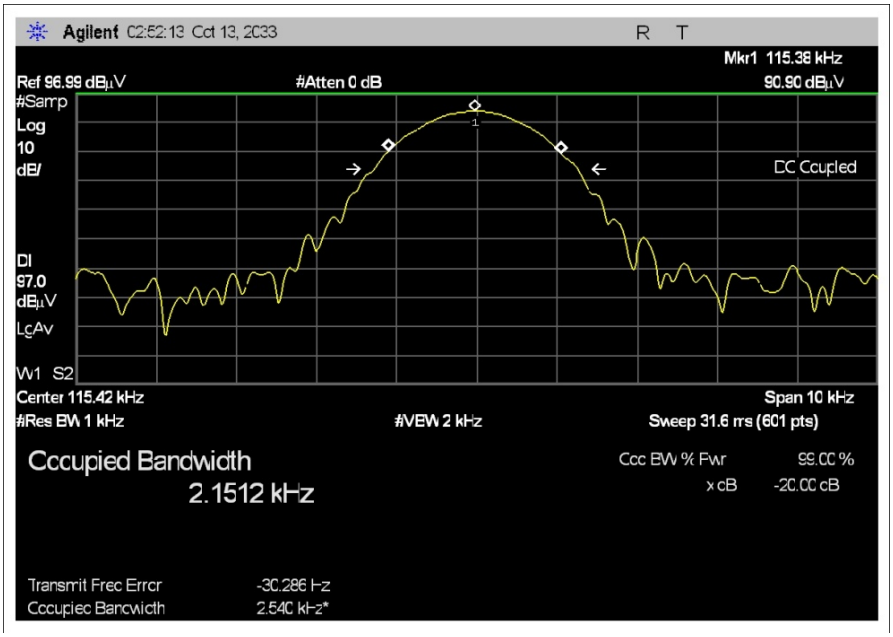
Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

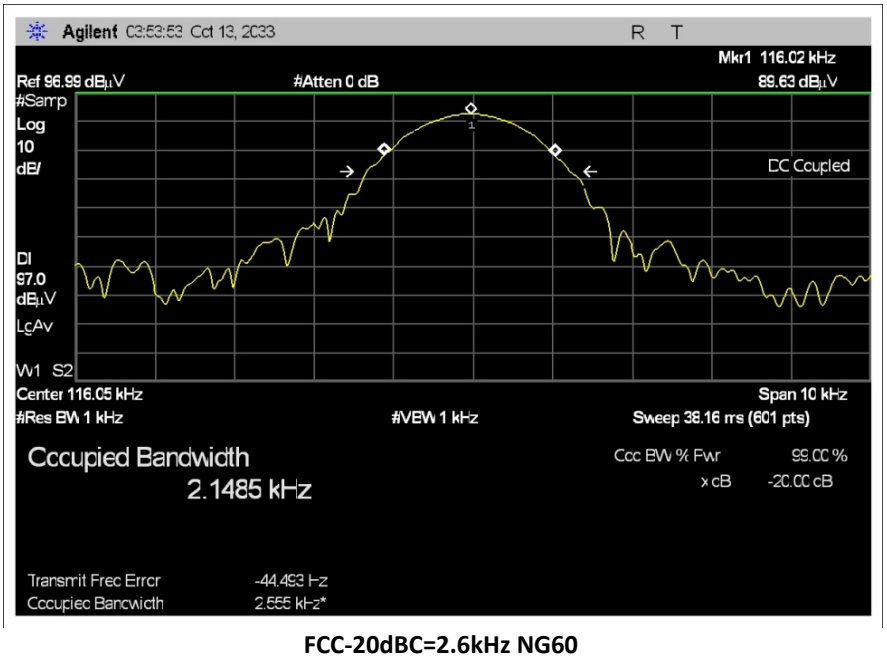
Test Conditions / Notes:

The portable EUT is placed on the wooden table lined with Styrofoam of 10cm in thickness.
DC power is supplied by a support supply unit placed next to the turntable.
The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces.
The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG50, NG60
23°C, 57% Relative Humidity

Test Data



FCC-20dBC=2.5kHz NG50



FCC-20dBC=2.6kHz NG60

Test Setup Photos

OCCUPIED BANDWIDTH TEST SET UP

RSS-210 99% Occupied Bandwidth

Test Set up

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer: **Novator**
Specification:
Work Order #: **90775** Date: 7/29/2010
Test Type: **Radiated Scan** Time: 10:50:30
Equipment: **PM60 Orbital Drilling Unit** Sequence#: 1
Manufacturer: Novator Tested By: E. Wong
Model: Orbital PM 600
S/N: PM 60 10 M1004

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
T2	ANP05198	Cable	8268	1/5/2009	1/5/2011
T3	AN00314	Loop Antenna	6502	6/30/2010	6/30/2012

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Nose piece*	Novator	NG 60	NA
Nose piece*	Novator	NG 50	NA
PM60 Orbital Drilling Unit*	Novator	Orbital PM 600	PM 60 10 M1004

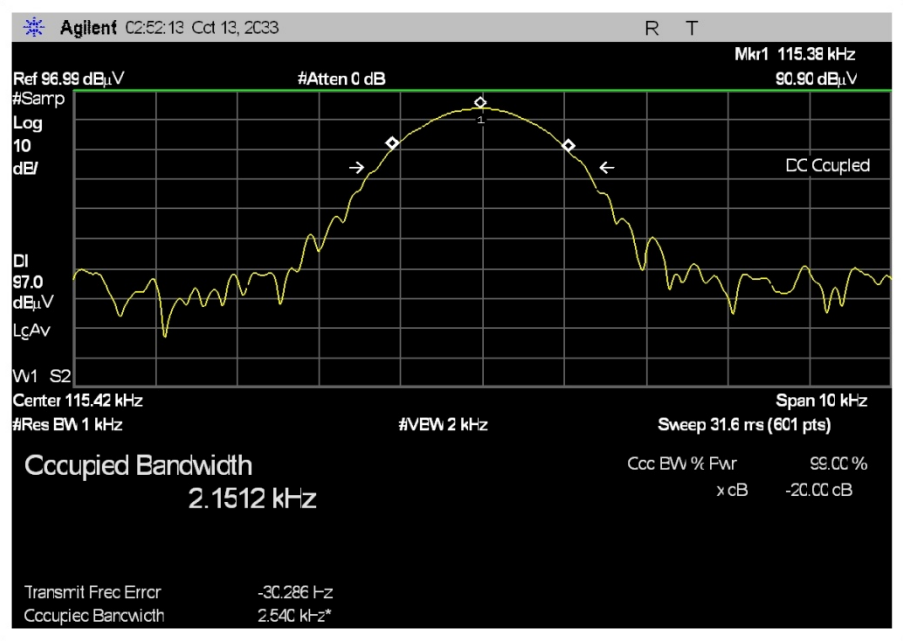
Support Devices:

Function	Manufacturer	Model #	S/N
Orbital PM Supply Unit	Novator	13615-00	PM 10 C10009
Test Jig NG60	Novator	NA	14672-00
Test Jig NG50	Novator	NA	14705-00

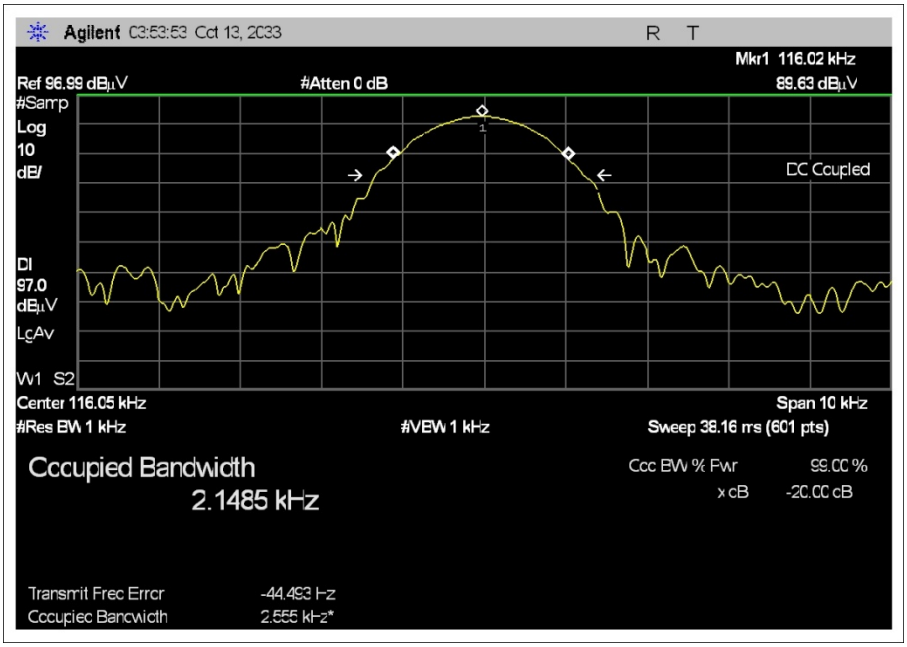
Test Conditions / Notes:

The portable EUT is placed on the wooden table lined with Styrofoam of 10cm in thickness. DC power is supplied by a support supply unit placed next to the turntable. The Nose piece with RFID antenna is attached to a metallic test jig with an embedded RFID chip to simulated drilling of metallic surfaces.
The EUT is set in constant transmit and receive mode, transmitting command to and receive the signal from the RFID chip.
Nose piece under test: NG50, NG60
23°C, 57% Relative Humidity

Test Data



RSS-210 99% BANDWIDTH=2.15kHz NG50



RSS-210 99% BANDWIDTH=2.15kHz NG60

Test Setup Photos

RSS-210 99% BANDWIDTH

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used. When conducted emissions testing was performed, a 10 dB external attenuator was used with internal offset correction in the analyzer.

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer/receiver readings recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the quasi-peak detector.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.