ELECTROMAGNETIC EMISSIONS TEST REPORT

according to Part 15, subpart C, §15.225 and subpart B

FOR

ON TRACK INNOVATIONS Ltd.

EQUIPMENT UNDER TEST:

Gasoline Management System**,** model GMS

FCC ID:JNX-OTI-GMS-V1

Prepared by: _____
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Electrical

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Description of equipment under test

Test items	Automatic control system of vehicle refueling at the gas stations, FCC ID:JNX-OTI-GMS-V1
Manufacturer	On Track Innovations Ltd.
Brand Marks	OTI
Types (Models)	GMS
Receipt date	April 8, 1999

Applicant information

Applicant's representative & responsible person	Mr. Ronnie Gilboa, vice president (R&D)
Company	On Track Innovations Ltd.
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Test performance

Project Number:	13384
Location	Hermon Laboratories
Test started	April 8, 1999
Test completed	April 27, 1999
Purpose of test	The EUT certification in accordance with CFR 47, part 2, §2.1033
Test specification(s)	FCC part 15 subpart C §15.225, §15.207, §15.209 subpart B, §15.107, §15.109

The A2LA logo endorsement applies only to the test methods and the standards that are listed in the scope of Hermon Laboratories accreditation by A2LA.
Through this report a point is used as the decimal separator and the thousands are counted with a comma.
This report is in conformity with EN 45001 and ISO GUIDE 25.
The test results relate only to the items tested.

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1 General Information

1.1 Abbreviations and Acronyms

The following abbreviations and acronyms are applicable to this test report:

AVR	average
BW	bandwidth
cm	centimeter
dB	decibel
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
EMC	electromagnetic compatibility
EUT	equipment under test
FM	frequency modulation
GHz	gigahertz
HL	Hermon Laboratories
Hz	hertz
IF	intermediate frequency
kHz	kilohertz
m	meter
MHz	megahertz
msec	millisecond
NA	not applicable
NARTE	National Association of Radio and Telecommunications Engineers, Inc.
Ω	ohm
ppm	part per million
RBW	resolution bandwidth
RE	radiated emission
RF	radio frequency
QP	quasi-peak (detector)
VBW	video bandwidth
V	volt
V/m	volt per meter
UHF	ultra high frequency

1.2 Specification References

CFR 47 part 15: October 1998	Radio Frequency Devices.
ANSI C63.2:06/1987	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
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.

1.3 EUT Description

The Gasoline Management System (GMS) is designed to provide automatic control of vehicle refueling at the gas stations.
The system comprises reader system, installed in the gas station, and transponder tags, installed in the vehicles and / or carried by the drivers.
The reader system comprises the following:

1. Antenna controller, mounted inside the pumps housing. The antenna controller is a µP. controlled transceiver, operating at 13.56 MHz.
2. A loop antenna is mounted on each refueling nozzle or at the pump. The antenna is connected to the antenna controller via a 50 Ω coax cable which, part of the way in a case of using a refueling nozzle, runs inside the petrol hose. The loop antenna works in inductive close proximity coupling.
3. Site controller, located in the gas station office. The site controller supplies 12 V AC power to the antenna controller and the RS422 communication network. The site controller interfaces between the antenna controllers and the gas station main computer. It also provides protection required since the antenna is located in hazardous area.

The tags are passive transponders which exchange data with the reader by demodulating the carrier on off key, 100% amplitude modulation in one direction, and by varying their internal loading, thereby affecting small variations of the transmitted amplitude in the other direction. In this respect the tags do not transmit any active energy. Exchanging the data in both directions requires continuous transmission of the RF carrier by the reader. In an operative environments at an active gas station, the station main computer, which controls all the actions of the gas pumps, upon detecting a need to read a tag at a specific nozzle, activates a short interrogation sequence via the I.S. terminal and the corresponding antenna controller. The resultant mode of work is highly intermittent, where most of the time the individual transmitter in the antenna controller shut off and is only turned on for a short periods of time upon demand generated by the host computer.
In the EMC tests a continuous transmission mode of operation was enforced by specific settings of jumpers in the antenna controller.
The antenna controller is an inexpensive, compact radio frequency communications electronic interface with contactless read/write capability.
At the Host's command, the antenna controller generates and modulates a 13.56 MHz carrier signal for the transmission of power, commands and data to an in-range smart Tag.
The smart tag, acting as a passive transponder, utilizes variable load modulation on the transmitted carrier wave to transfer data to the antenna controller. Read and write operations have equal data rates and ranges.

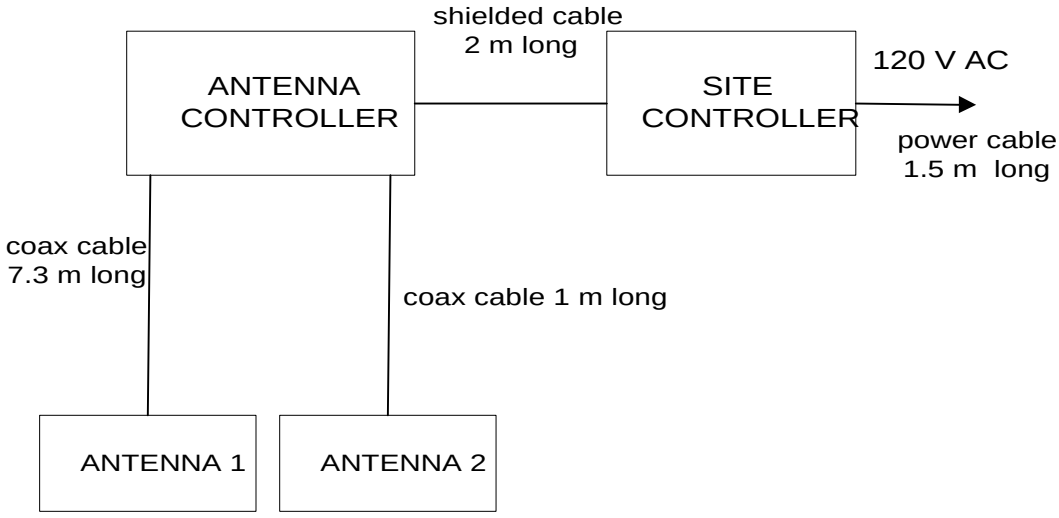
1.4 Changes Made in EUT

To withstand the FCC part 15 class B requirements the additional filter 1VK3 (F2578), manufactured by CORCOM, was installed at the EUT input.

1.5 EUT Test Configuration

The EUT configuration and operation during the tests were defined by the customer. Test configuration is given in Figure 1.1:
1) Antenna controller: S/N D-107C003, model N12-U1-RS485-CE
2) Site controller: S/N M-113E009, model SC-U1-110/12-40-D9F.

Figure 1.1
EUT test configuration



1.6 Statement of Manufacturer

I, Ronnie Gilboa, vice president (R&D) of On Track Innovations Ltd., declare that GMS was tested from April 8 to April 27, 1999 by Hermon Laboratories and which this test report applies to, is identical of the equipment that will be marketed.

The term identical means identical within the variations that can be expected to arise as a result of quantity production technique.

Mr. Ronnie Gilboa, vice president (R&D)
On Track Innovations Ltd

Signature:__ ___

Date:__May 23, 1999 _____

2 Test Facility Description

2.1 General

Tests were performed at Hermon Laboratories, which is a fully independent, private EMC, Safety and Telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), listed by Industry Canada for radiated measurements (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), recognized by VDE (Germany) for witness test, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-809 for anechoic chamber, C-845 for conducted emissions site), assessed by NMi Certin B.V. (Netherlands) for a number of EMC, Telecommunications and Safety standards, recognized by TUV Sudwest (Germany) for Safety testing, and Accredited by AMTAC (UK) for safety of Medical Devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO GUIDE 25/EN 45001 for EMC, Telecommunications and Product Safety Information Technology Equipment (Certificate No. 839.01).

Address: PO Box 23, Binyamina 30550, Israel.

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Person for contact: Mr. Alex Usoskin, testing and QA manager.

2.2 Equipment calibration

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of MIL-STD-45662A.
The laboratory standards are calibrated by the third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements.

2.2.1 Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Conducted emissions with LISN	9 kHz to 30 MHz: ± 2.1 dB
Radiated emissions in the open field test site at 10 m measuring distance	Biconilog antenna: ±3.2 dB Log periodic antenna: ±3 dB Biconical antenna: ±4 dB
Radiated emissions in the anechoic chamber at 3 m measuring distance	Biconilog antenna: ±3.2 dB

2.3 Laboratory Personnel

The three people of Hermon Laboratories that have participated in measurements and documentation preparation are: Dr. Edward Usoskin - C.E.O., Mr. Michael Nikishin - test engineer and Mrs. Marina Cherniavsky - certification engineer.
Dr. E. Usoskin is an EMC specialist, M. Cherniavsky is a telecommunication engineer certified by the National Association of Radio and Telecommunications Engineers (NARTE, USA.).
The Hermon Laboratories' personnel that participated in this project have more than 90 years combined experience time in EMC measurements and electronic products design.

2.4 Statement of Qualification

The test measurement data supplied in this test measurement report having been received by me, is hereby duly certified. The following is a statement of my qualifications:
I am an engineer, graduated from university in 1996 with an MScEE degree, have obtained 2 years experience in EMC measurements and have been with Hermon Laboratories since 1998.

Name: Mr. Michael Nikishin Signature:_ _____
Position: test engineer Date: May 19, 1999

I hereby certify that this test measurement report was prepared by me and is hereby duly certified. The following is a statement of my qualifications.
I am an engineer, graduated from university in 1971, with an MScEE degree, have obtained 26 years experience in electronic products design and development. Also, I am a Telecommunication Class II engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA.), the certificate no. is E2-03410 and have been with Hermon Labs since 1991.

Name: Mrs. Marina Cherniavsky Signature:_ _____
Position: certification engineer Date: May 19, 1999

I hereby certify that this test measurement report was prepared under my direction and that to the best of my knowledge and belief, the facts set in the report and accompanying technical data are true and correct.
The following is a statement of my qualifications.
I have a Ph.D. degree in electronics, have obtained more than 42 years of experience in EMC, Safety, Telecommunications measurements and electronic product design.
Also, I am an EMC engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA). The certificate no. is EMC-000623-NE, Senior Member, and have been with Hermon Labs since 1986.

Name: Dr. Edward Usoskin Signature:_ _____
Position: C.E.O. Date: May 19, 1999

3 Test Measurements

3.1 Field Strength of Emissions according to § 15.225 (a)

3.1.1 Specified limit

Frequency, MHz	Field strength, microvolts/meter	Field strength, dB (µV/m)	Measurement distance, meters
13.553 – 13.567	10,000	80	30
Outside band	30	29.5	30

3.1.2 Extrapolation (distance correction) factor

The test was performed at 10 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The results were extrapolated by using the square of an inverse linear distance extrapolation factor DF:

$$DF = 40 \log (D_1/D_2) = 19.1 \text{ dB, where}$$

D_1 is the 30 meters specified measurement distance
D_2 is the 10 meters test measurement distance.
The DF=19.1 dB was applied for limit calculation at 10 m test distance measurements.

For 13.56 MHz frequency the calculated limit is:
Limit $_{10m}$ = Limit $_{30\ m}$ + DF = 80 dB(µV/m) + 19.1 dB = 99.1 dB(µV/m).
For outside of band emissions the calculated limit is:
Limit $_{10m}$ = Limit $_{30\ m}$ + DF = 29.5 dB(µV/m) + 19.1 dB = 48.6 dB(µV/m).

3.1.3 Test procedure and results

The test was performed at the Hermon Labs open field test site (OFTS) at 10 meters test distance, i.e. the distance between measuring antenna and EUT boundary. Limit for 10 meters test distance was calculated using a square of an inverse linear-distance extrapolation factor.
The EUT was placed on the wooden turntable, as shown in Figure 3.1.1, Photograph 3.1.1 and operated in continuous transmitting mode. The measurements were performed with loop antenna with its center positioned 1 – 4 m above the ground.

To find maximum radiation the turntable was rotated 360°, the antenna was rotated about its vertical axis and the antenna polarization was changed from vertical to horizontal.
The quasi peak detector was used. The test measurement results were recorded into Table 3.1.1. The edge frequencies at which the field strength drops below specified limit for out of band emissions were measured and found inside assigned frequency band 13.553 – 13.567 MHz.

Reference numbers of test equipment used

HL 0027	HL 0028	HL 0038	HL 0275	HL 0287	HL 0446	HL 0812
HL 0813						

Full description is given in Appendix A.

Table 3.1

Radiated emission measurements - test results
Field strength of fundamental frequency

TEST SPECIFICATION: FCC part 15 subpart C § 15.225
COMPANY: On Track Innovations Ltd.
EUT: GMS
DATE: April 18, 1999
RELATIVE HUMIDITY: 49%
AMBIENT TEMPERATURE: 22°C

MEASUREMENTS PERFORMED AT 10 METRES DISTANCE

Frequency MHz	Measured Result dB (µV)	Correction Factor dB (1/m)	Radiated Emissions dB (µV/m)	Calculated Limit dB (µV/m)	Spec. Margin dB	Pass/ Fail
13.563	45	10.4	55.4	99.1	43.7	Pass
13.565	38	10.4	48.4	48.6	0.2	Pass
13.557	38	10.4	48.4	48.6	0.2	Pass

Notes to table:

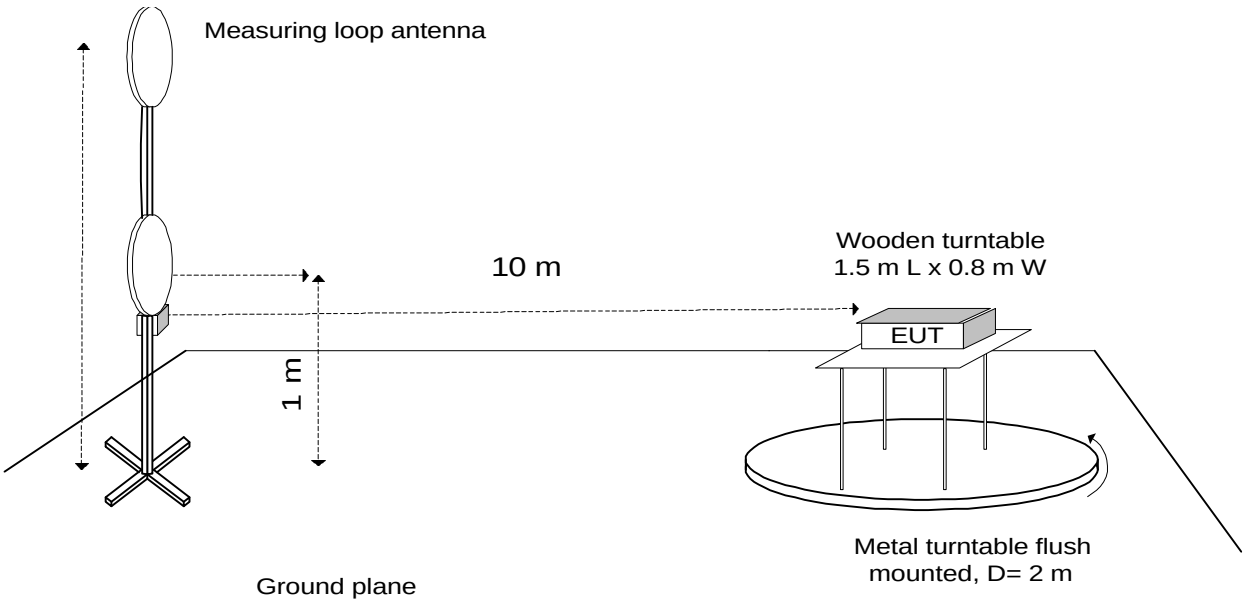
Quasi peak detector with resolution bandwidth = 9 kHz was used.
The test results listed in Table 3.1 were obtained during measurements with loop antenna in vertical polarization.
Radiated emission dB(µV/m) = measured result {dB(µV)} + correction factor {dB(1/m)}.
Correction factor = antenna factor + cable loss (for antenna factor and cable loss refer to Appendix B).
Calculated limit is in accordance with §15.225 (a), (b) and §15.209.

Table abbreviations:
Spec. Margin = Specification margins = dB below (negative if above) specification limit.

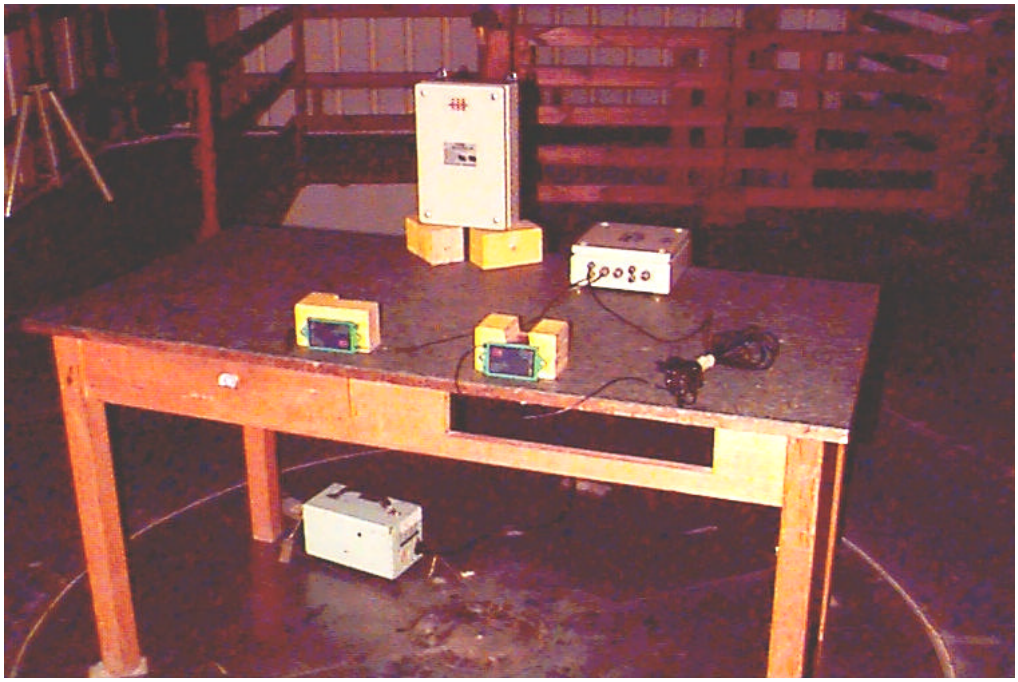
Test performed by:
Mr. Michael Nikishin, test engineer

_____
Hermon Labs

Figure 3.1.1
Radiated emission test setup



Photograph 3.1.1
Radiated emission measurements setup



3.2 Emissions Radiated Outside of the Specified Frequency Band according to §15.225 (b)

3.2.1 Specified limits

The field strength of any emissions appearing outside of this band shall not exceed the general radiated emission limits of § 15.209.

3.2.2 Test procedure and results

The radiated emissions measurements were performed at the open field test site at 3 meters measuring distance The EUT was placed on the wooden table as shown in Photographs 3.2.1, 3.2.2. The frequency range from the lowest generated signal frequency 13.56 MHz up to 10th harmonic (140 MHz) was investigated. The loop and biconical antennas were used. To find maximum radiation the turntable was rotated 360°, the measuring antenna height changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.
The measurements were performed with the following EMI receiver settings:
from 13.56 MHz to 30 MHz - quasi-peak detector, RBW = 9 kHz
from 30 MHz to 140 MHz - quasi-peak detector, RBW=120 kHz.
The test results are given in Tables 3.2 and 3.3.

Reference numbers of test equipment used

HL 0027	HL 0028	HL 0032	HL 0038	HL 0275	HL 0287
HL 0446	HL 0812	HL 0813			

Full description is given in Appendix A.

Radiated emission measurements - test results
frequency range 13 MHz - 140 MHz

TEST SPECIFICATION: FCC part 15 subpart C § 15.225
COMPANY: On Track Innovations Ltd.
EUT: GMS
DATE: April 18, 1999
RELATIVE HUMIDITY: 49%
AMBIENT TEMPERATURE: 22°C

Table 3.2
MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

Frequency MHz	Measured Result dB (µV)	Correction Factor dB (1/m)	Radiated Emissions dB (µV/m)	Specified Limit @30 m distance dB (µV/m)	Spec. Margin dB	Pass/ Fail
27.1166	13	9.8	22.8	29.5	6.7	Pass

Notes: The test result was found below limit specified for 30 m measuring distance.
Quasi peak detector with resolution bandwidth = 9 kHz was used.
The test result listed in Table 3.2 was obtained during measurements with loop antenna in vertical polarization.

Table 3.3
MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

Frequency MHz	Ant. Hgt.	TT Pos. (°)	Radiated Measured Result dB (µV)	Correction Factor dB (1/m)	Radiated Emissions dB (µV/m)	Spec. Limit dB (µV/m)	Spec. Margin dB	Pass/ Fail
54.240	1.13	181	13	11.9	24.9	40	15.1	Pass
67.805	1.0	139	21	9.5	30.5	40	9.5	Pass
81.330	1.49	127	23	9.0	31.0	40	9	Pass

Notes: Quasi peak detector with resolution bandwidth = 120 kHz was used.
The test result listed in Table 3.3 was obtained during measurements with biconical antenna in vertical polarization.

Notes to tables 3.2, 3.3:
Radiated emission dB(µV/m) = measured result {dB(µV)} + correction factor {dB(1/m)}.
Correction factor = antenna factor + cable loss (for antenna factor and cable loss refer to Appendix B).
Specified limit is in accordance with §15.225(b) and §15.209.
Table abbreviations:
Spec. Margin = Specification margins = dB below (negative if above) specification limit.

Test performed by:
Mr. Michael Nikishin, test engineer

Hermon Labs

3.3 Frequency stability test according to §15.225(c)

3.3.1 Definition of the test

This test was performed to measure the frequency stability versus ambient temperatures from -20°C to +50°C at normal supply voltage and versus supply voltage from 0.85 U_{nom} to 1.15 U_{nom} at a temperature of 20 degrees. The maximum allowed frequency tolerance is ±0.01%.

3.3.2 Test results

The test was performed at unmodulated carrier frequency 13.5605 MHz. The test results are given in the Tables 3.3.1, 3.3.2 and Plots 3.3.1 to 3.3.11. Test setup is shown in Photograph 3.3.1.

Table 3.3.1
Frequency stability test results

Measured frequency tolerance, ±% vs temperature, ºC								Pass/ Fail
-20	-10	0	10	20	30	40	50	
-0.0008	-0.0005	0.0003	0.0001	0.0	0.0001	0.0001	0.0003	Pass

Table 3.3.2
Frequency stability test results

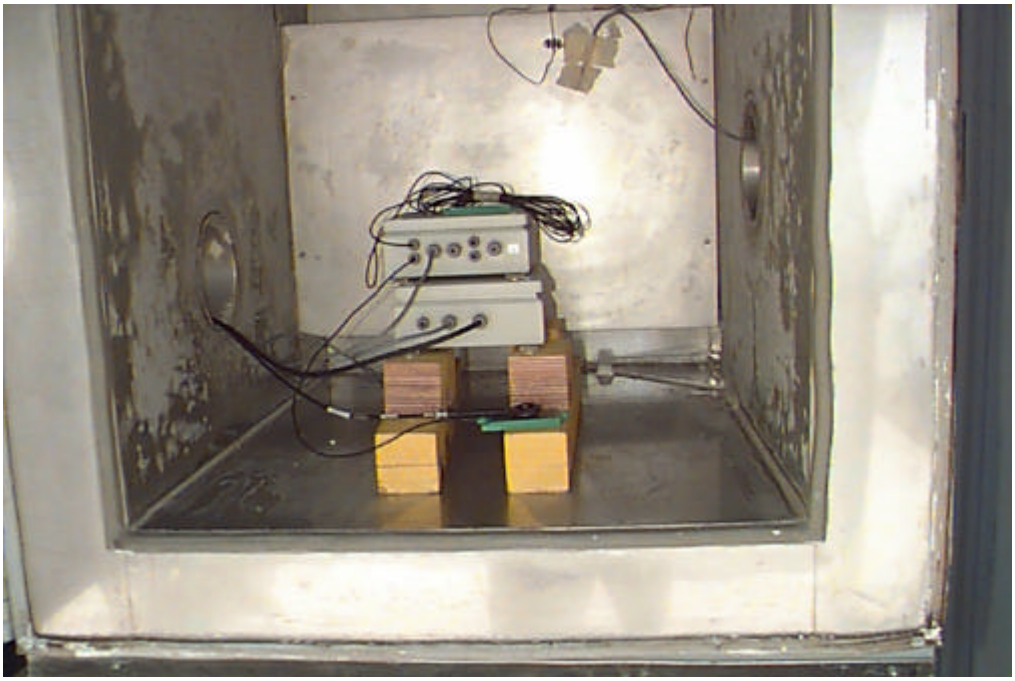
Measured frequency tolerance, ±% vs primary supply voltage, V AC			Pass/ Fail
102	120	138	
0	0	0	Pass

Reference numbers of test equipment used

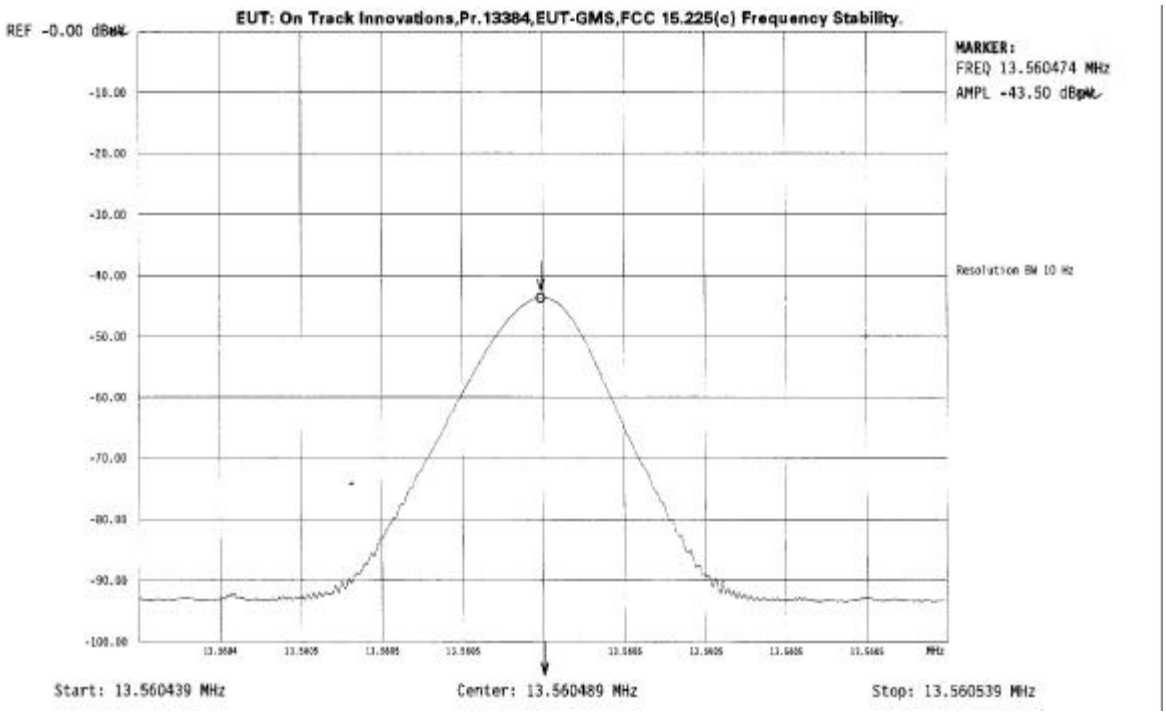
HL 0027	HL 0500	HL 0560	HL 0679	HL 1194		

Full description is given in Appendix A.

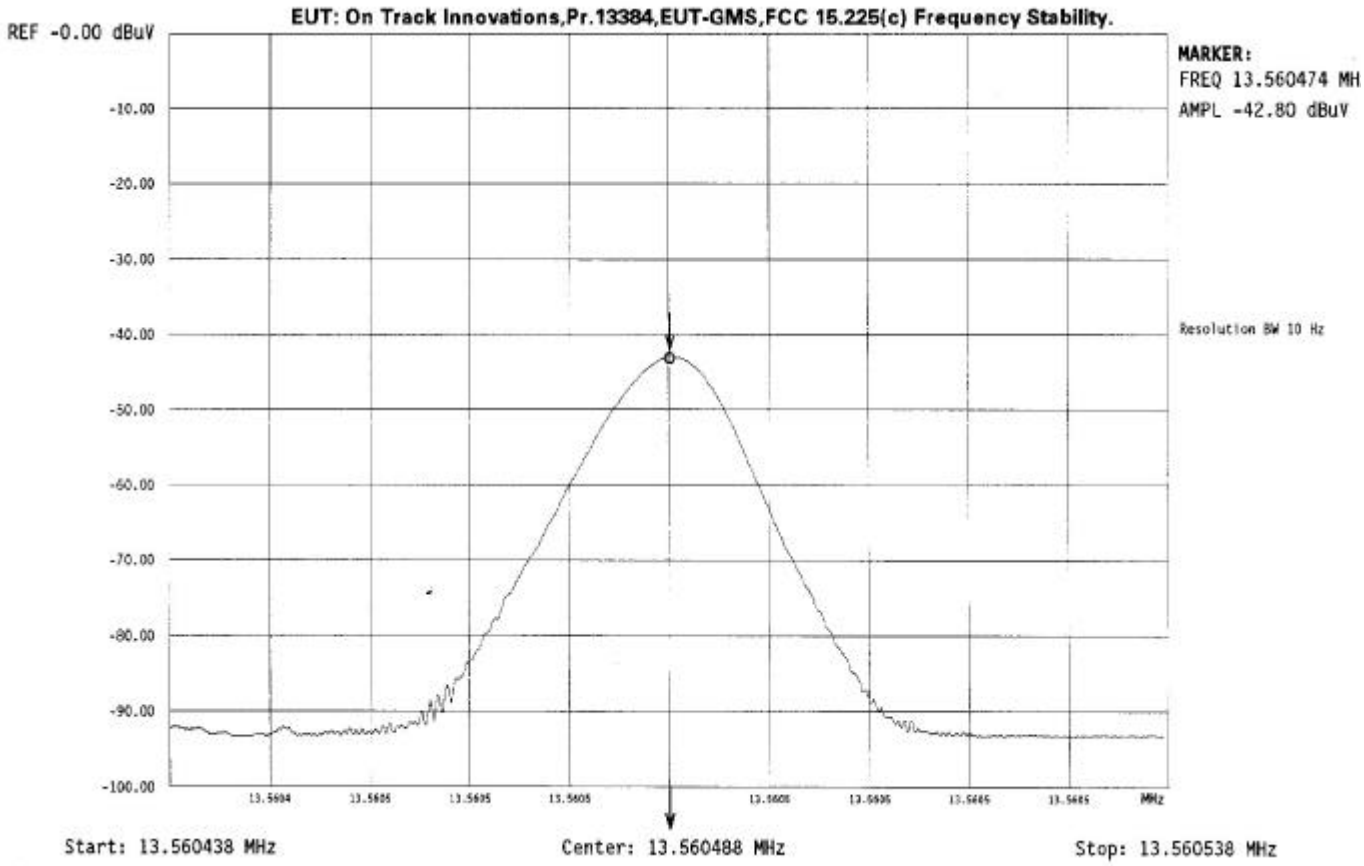
Photograph 3.3.1.
Frequency stability measurement test setup



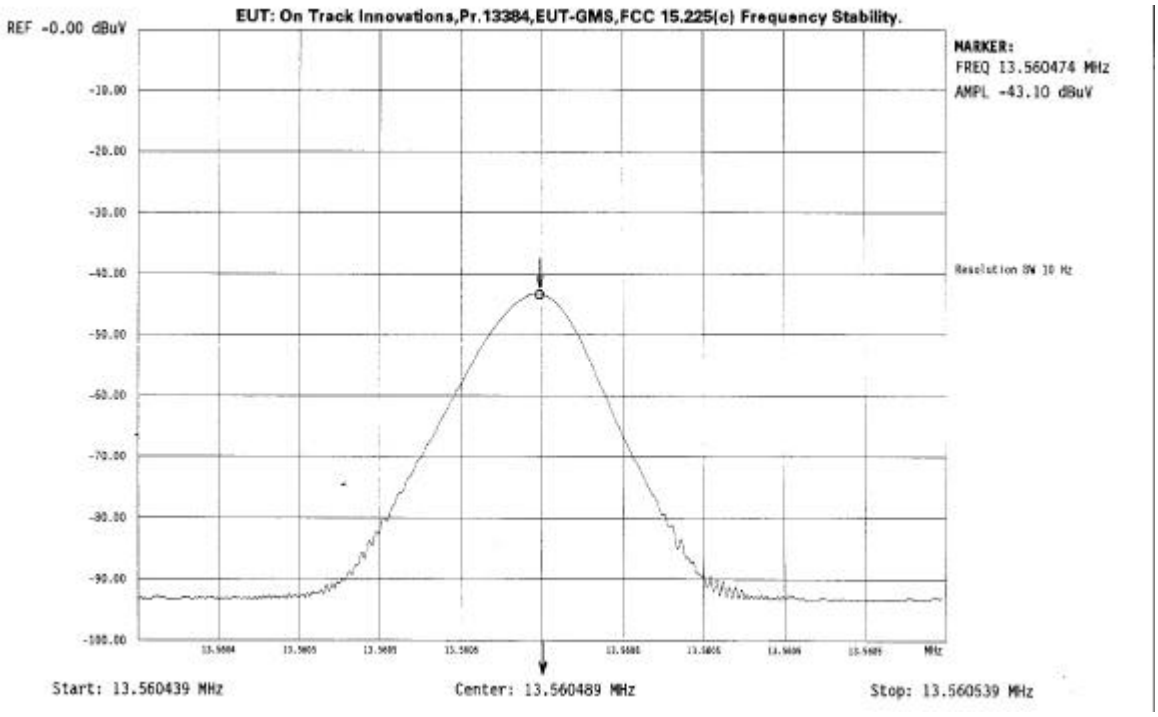
Plot 3.3.1
Frequency stability vs primary supply voltage test
U=120 V AC



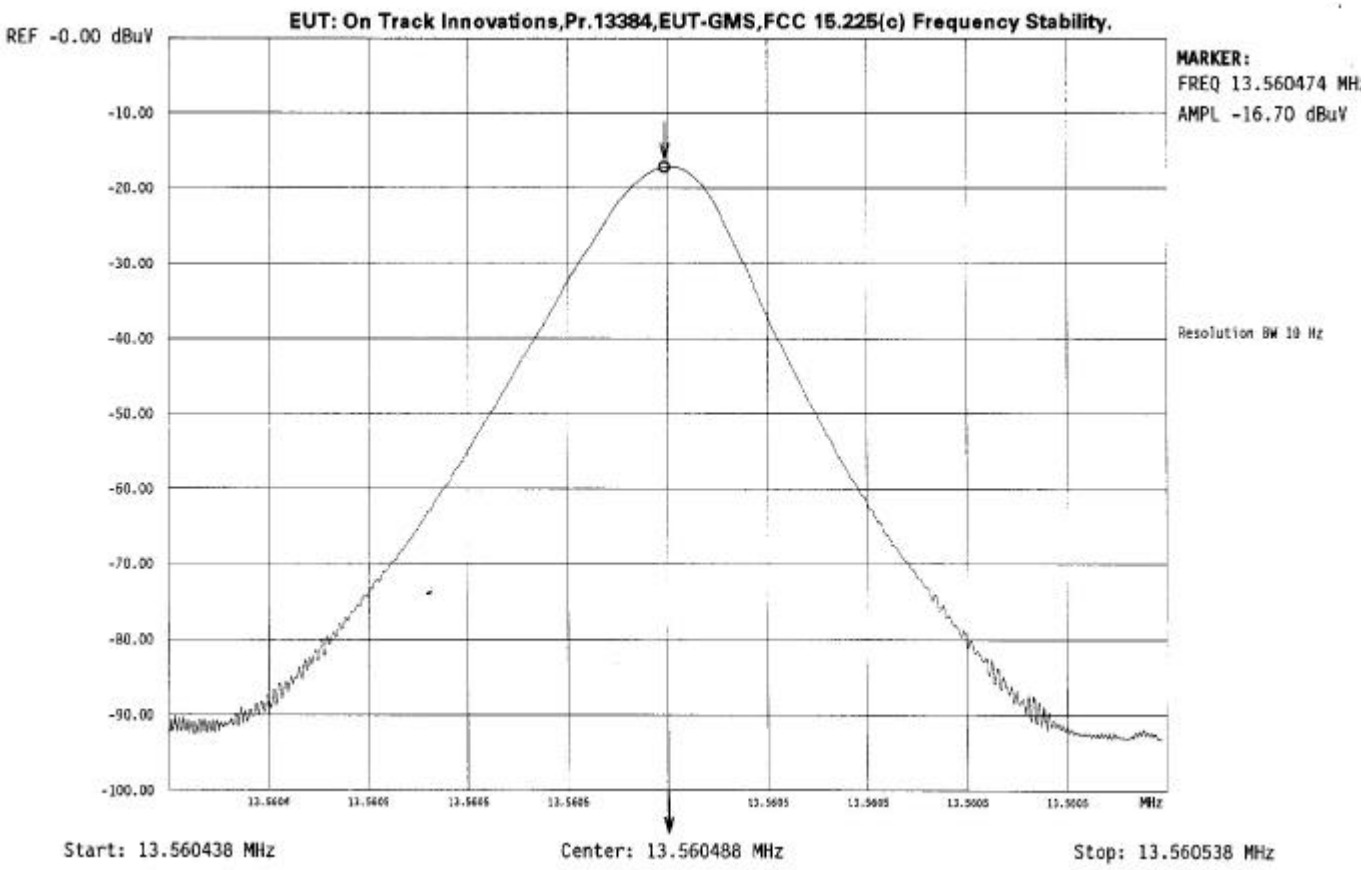
Plot 3.3.2
Frequency stability vs primary supply voltage test
U=138 V AC



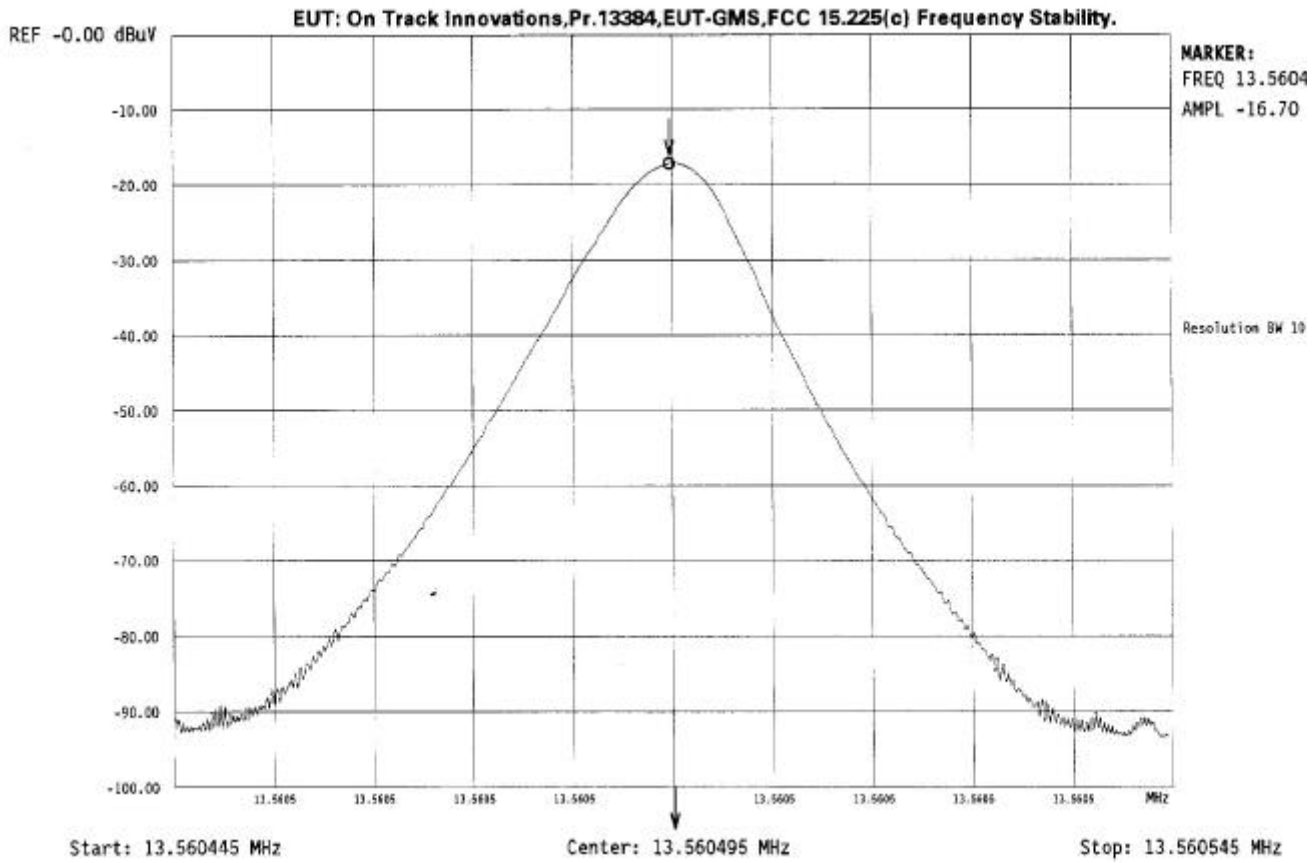
Plot 3.3.3
Frequency stability vs primary supply voltage test
U=102 V AC



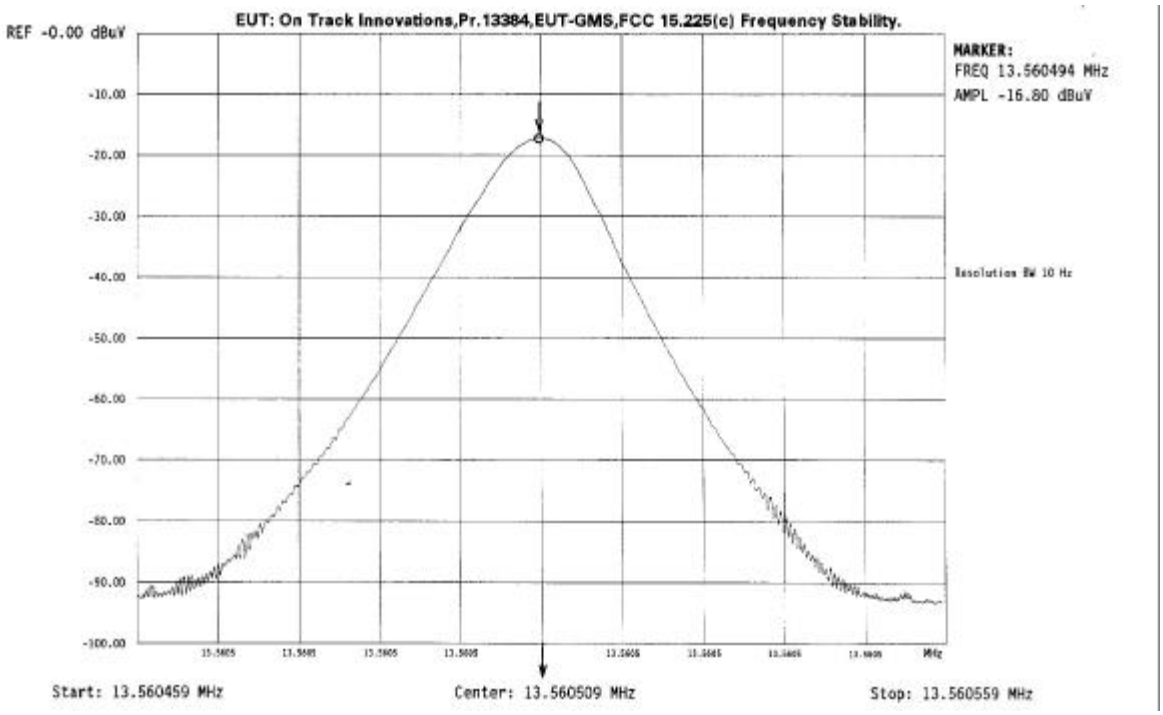
Plot 3.3.4
Frequency stability vs temperature test
T = 20°C



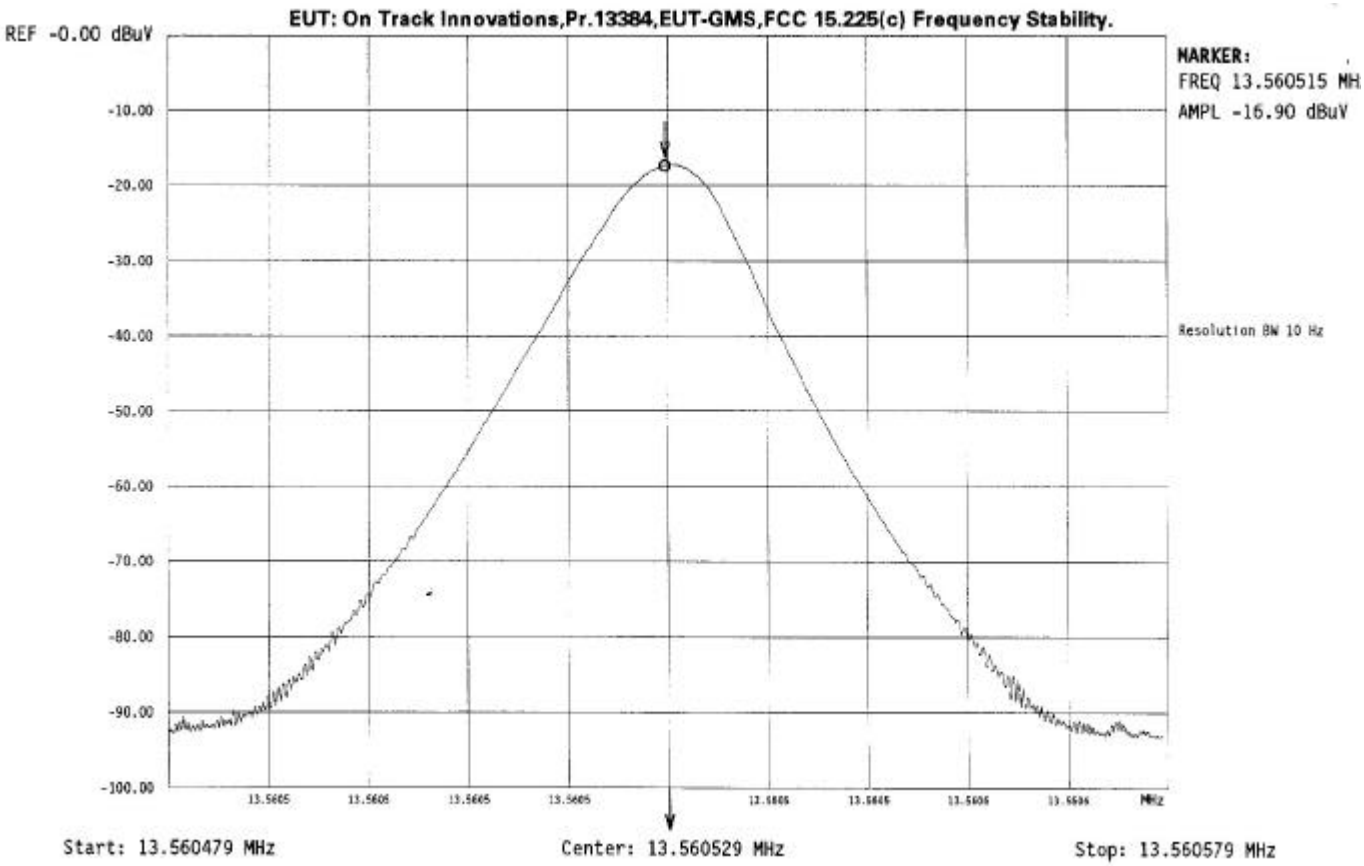
Plot 3.3.5
Frequency stability vs temperature test
T = 30°C



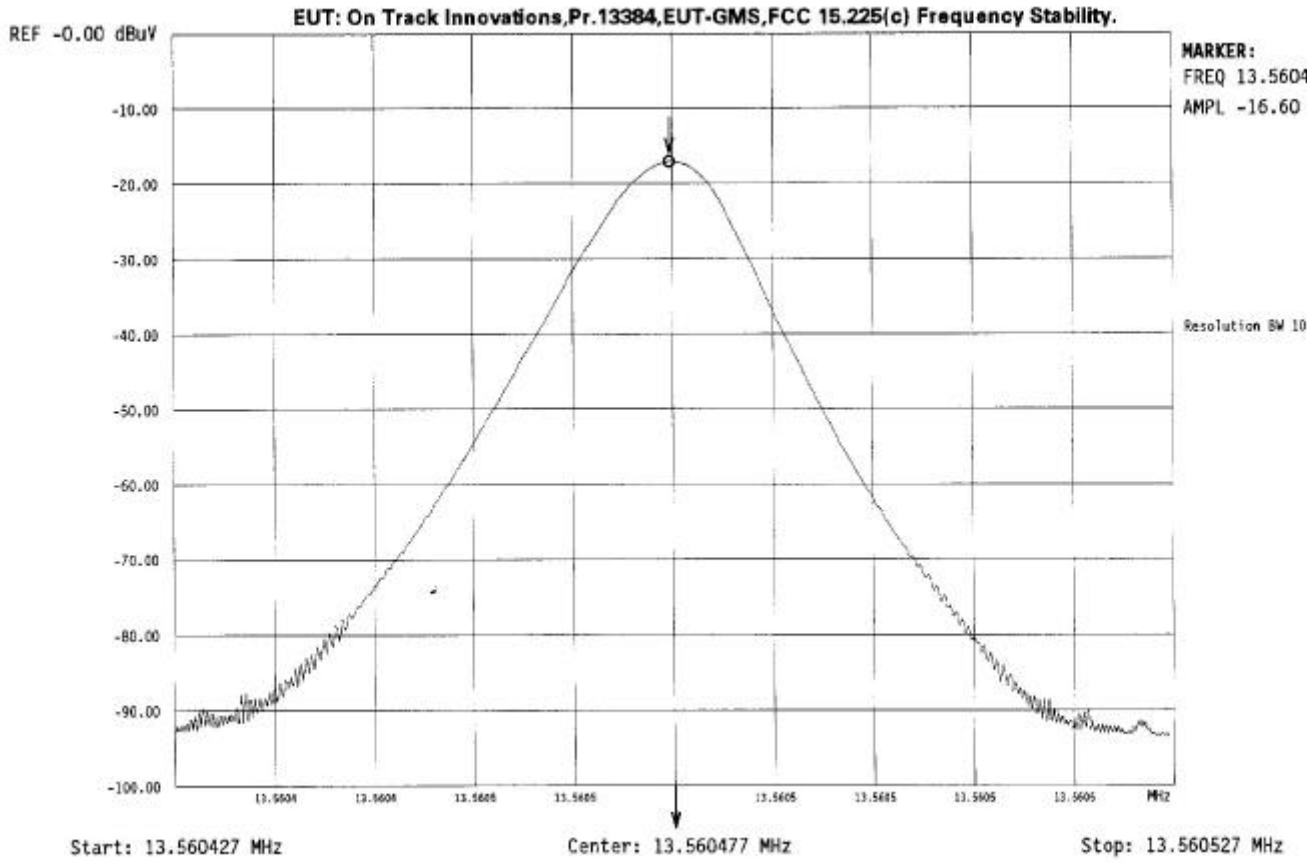
Plot 3.3.6
Frequency stability vs temperature test
T = 40°C



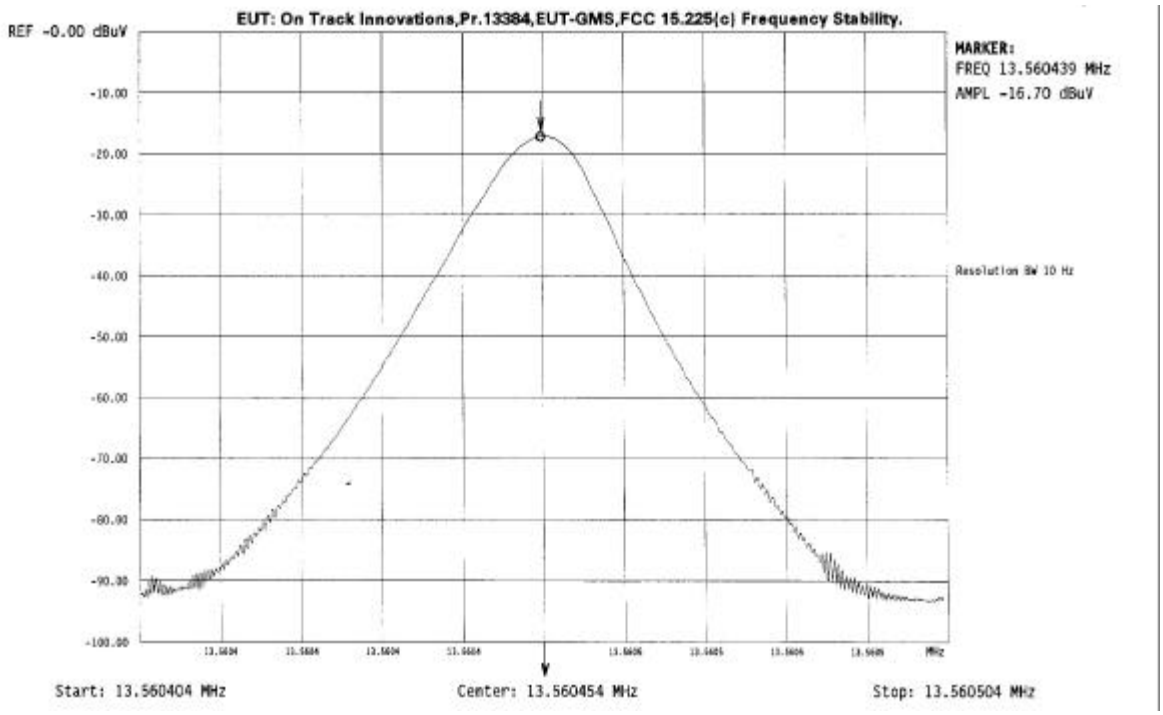
Plot 3.3.7
Frequency stability vs temperature test
T = 50°C



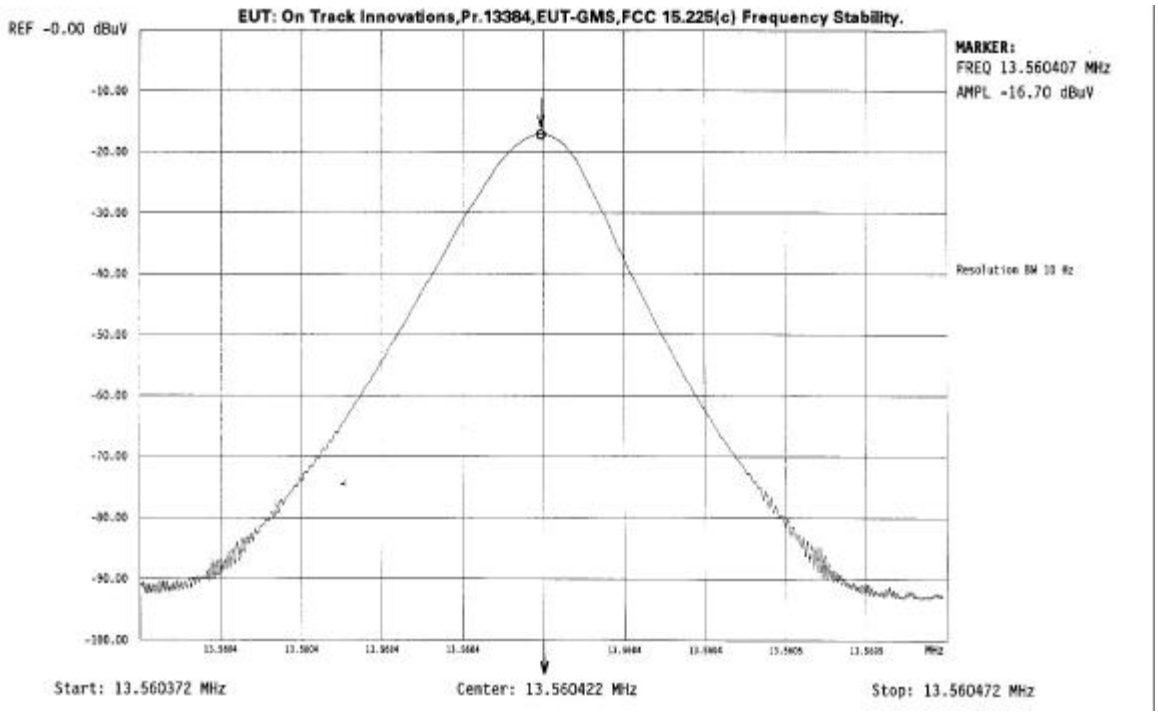
Plot 3.3.8
Frequency stability vs temperature test
T = 10°C



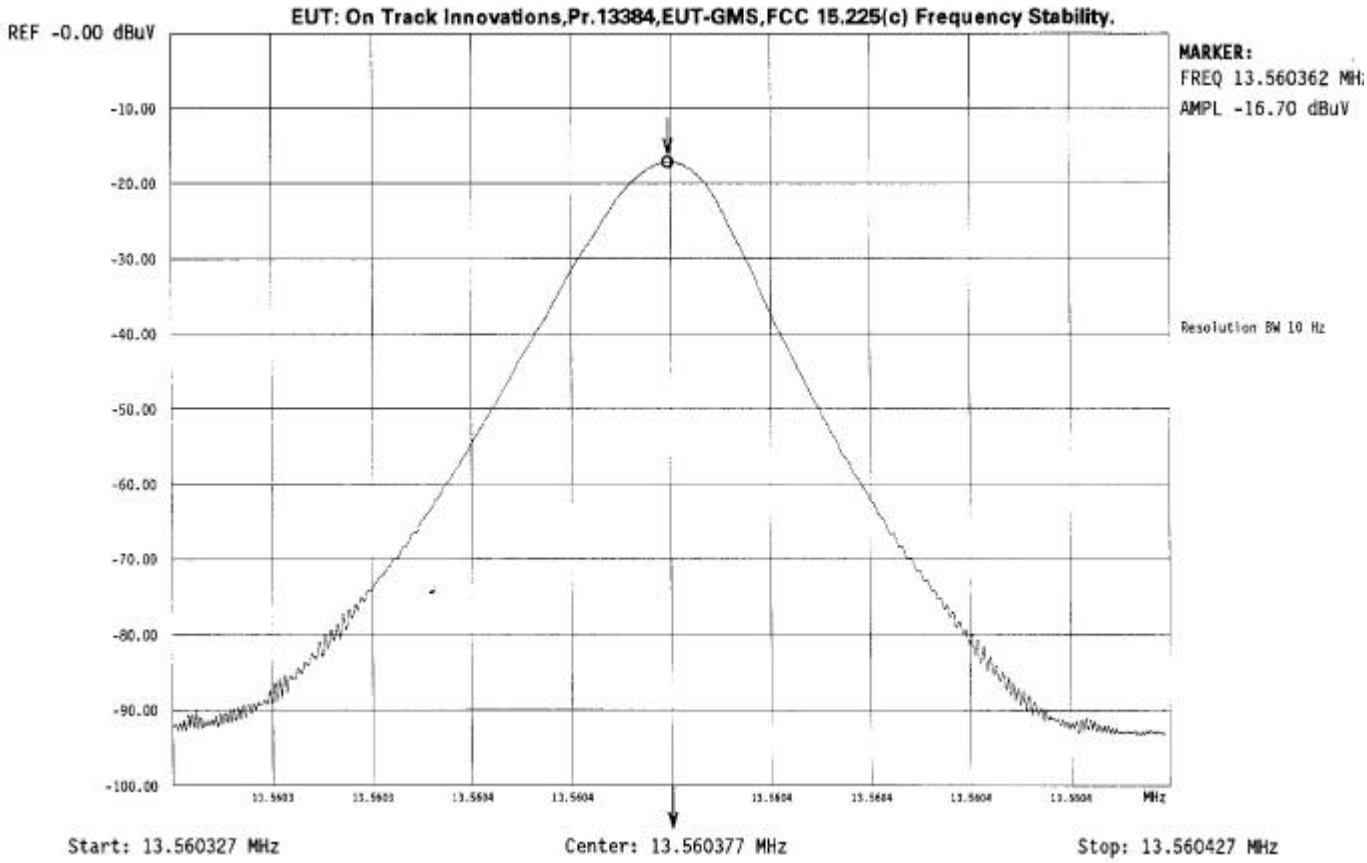
Plot 3.3.9
Frequency stability vs temperature test
T = 0°C



Plot 3.3.10
Frequency stability vs temperature test
T = -10°C



Plot 3.3.11
Frequency stability vs temperature test
T = -20°C



3.4 Unintentional radiated emissions (class B digital device) test according to Part 15, §15.109

3.4.1 Definition of the test

This test was performed to measure radiated emissions from the receiver and incorporated digital device of the EUT.

3.4.2 Test set-up

The radiated emissions measurements of the EUT receiver and incorporated digital device in the frequency range from 30 MHz to 1 GHz were performed at the open field test site at 3 meters measuring distance. The EUT was placed on the wooden table as shown in Figure 3.4.1.
The biconical and log periodic antennas were used. To find maximum radiation the turntable was rotated 360°, the cables position was varied, the measuring antenna height changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal. The measurements were performed with EMI receiver settings: RBW=120 kHz, quasi-peak detector.

The results of measurements were recorded into Table 3.4.1.

Reference numbers of test equipment used

HL 0027	HL 0028	HL 0032	HL 0034	HL 0038	HL 0275	HL 0287
HL 0812	HL 0813					

Full description is given in Appendix A.

Table 3.4.1 Radiated emission measurements test results (Electric field, frequency range 30 MHz - 1 GHz)

TEST SPECIFICATION:	FCC part 15 subpart B Class B
COMPANY:	On Track Innovations Ltd.
EUT:	GMS
DATE:	April 18, 1999
RELATIVE HUMIDITY:	49%
AMBIENT TEMPERATURE:	22°C

MEASUREMENTS PERFORMED AT 3 METERS DISTANCE

Frequency MHz	Ant. Type	Ant. Pol.	Ant. Hgt.	TT Pos. (^{o})	Radiated Measured Result dB (µV)	Correction Factor dB (1/m)	Radiated Emissions dB (µV/m)	Spec. Limit dB (µV/m)	Spec. Margin dB	Pass/ Fail
52.023	Bic	V	1.0	-259	17	12.2	29.2	40	10.8	Pass
72.022	Bic	V	1.0	-314	19	8.9	27.9	40	12.1	Pass
154.04	Bic	V	1.0	16	17	16.9	33.9	43.5	9.4	Pass
230.62	LP	H	1.0	-155	8	15.3	23.3	46	22.7	Pass

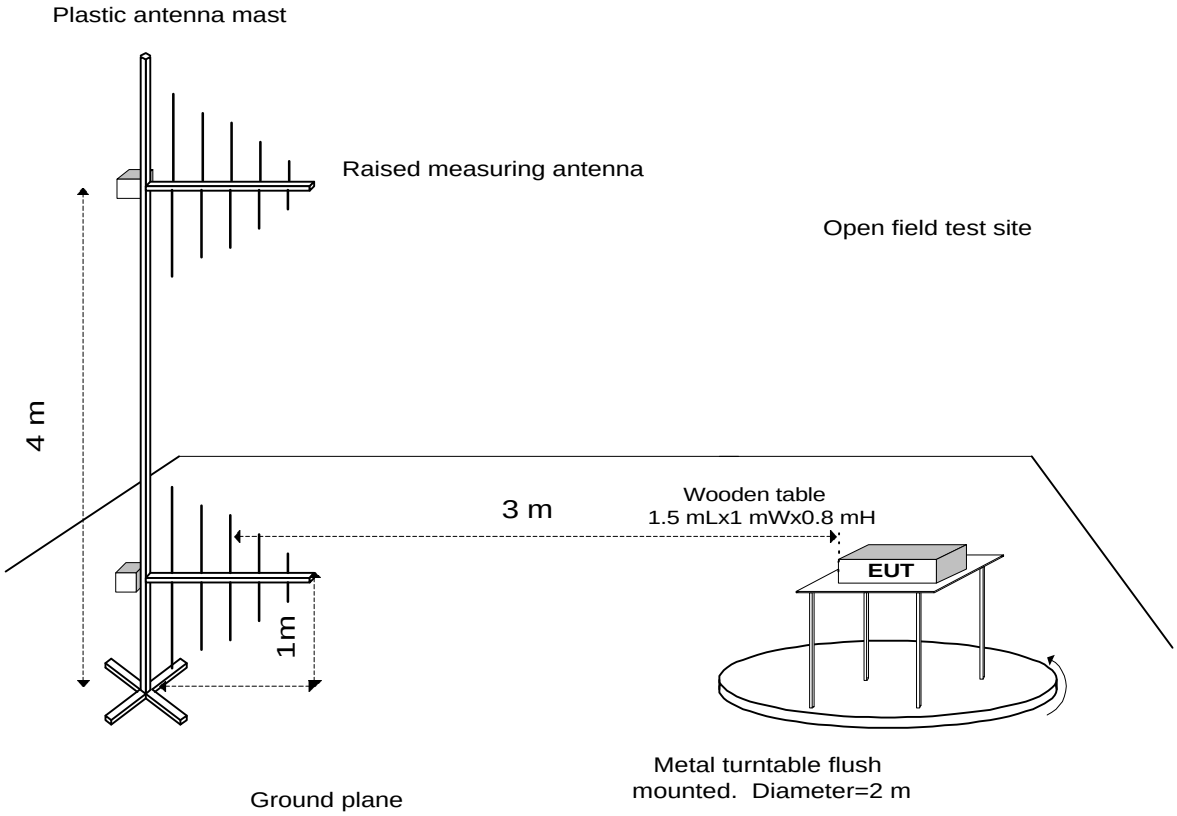
Test parameters:
Detector type = QP (quasi peak).
Resolution bandwidth = 120 kHz.

Table calculations and abbreviations:
Radiated emission dB (µV/m) = measured results dB(µV) + correction factor dB(1/m).
Correction factor = antenna factor + cable loss (for antenna factor and cable loss refer to Appendix B).
Ant. type = antenna type (Bic - biconical, LP - log periodic).
Ant. pol. = antenna polarization (V-vertical, H-horizontal).
Ant. hgt. = antenna height.
TT pos. = turntable position in degrees, (EUT front panel = 0°).
Spec. margin = specification margins = dB below (negative if above) specification limit.

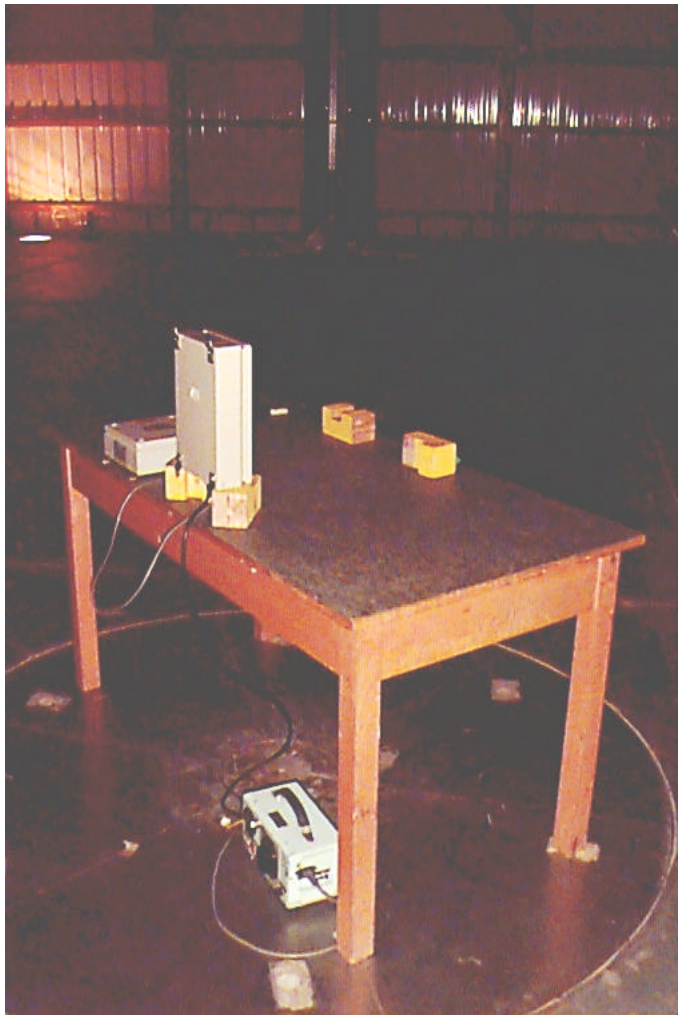
Test performed by:
Mr. Michael Nikishin, test engineer

Hermon Labs

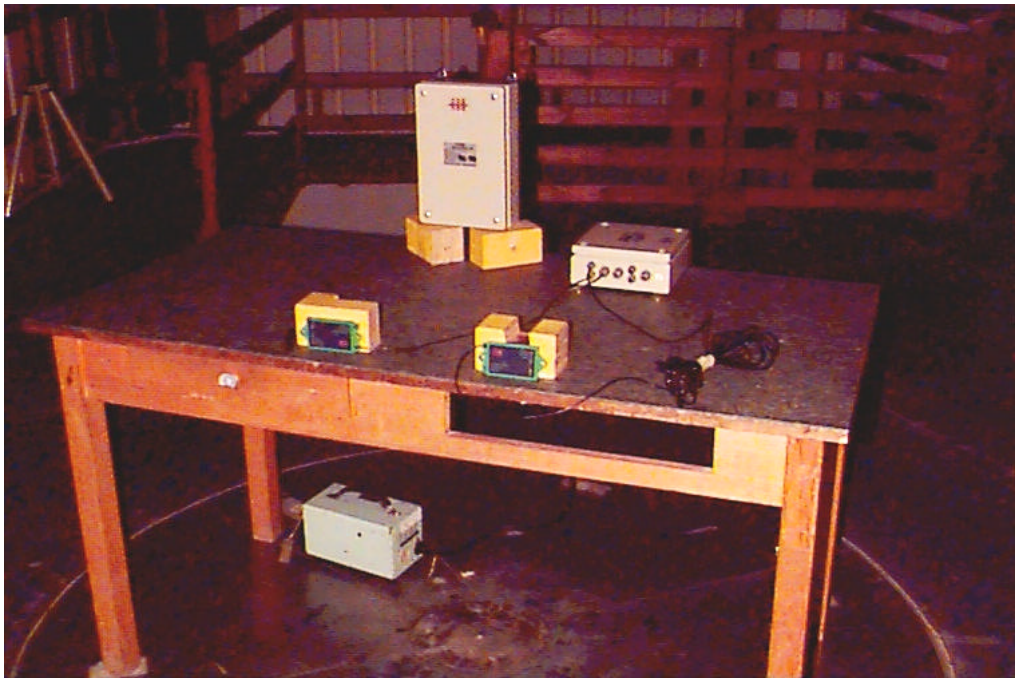
Figure 3.4.1
Radiated emission test setup



Photograph 3.4.1
Radiated emission measurement test setup



Photograph 3.4.2
Radiated emission measurement test setup



3.5 Conducted Emission Measurements according to Part 15, §15.107, §15.207

3.5.1 Definition of the test

This test was performed to measure conducted emissions.

3.5.2 Test set-up

The test was performed in the shielded room. The EUT was setup as shown in Figure 3.5.1 and Photograph 3.5.1.

The frequency range from 450 kHz to 30 MHz was investigated.

The measurements were performed at the adapter 120 V AC power lines (both neutral and phase) by means of the LISN, connected to the spectrum analyzer. The unused 50 Ω connector of the LISN was resistively terminated in 50 Ω when not connected to the measuring instrument. The quasi peak detector (resolution bandwidth = 9 kHz) was used. The measured test result was 36.74 dBµV @ 13.56 MHz frequency (11.26 dB below specified limit). The test results are shown in Plots 3.5.1, 3.5.2.

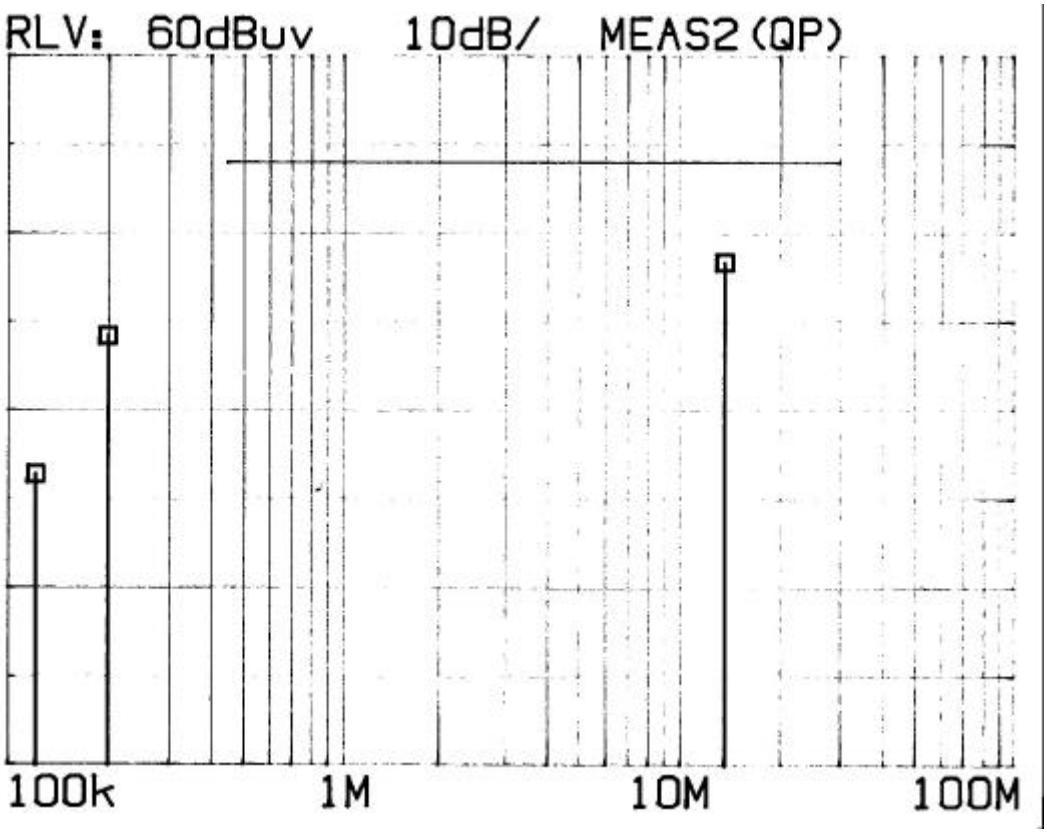
Reference numbers of test equipment used

HL 0026	HL 0185	HL 0447	HL 0580	HL 0591	HL 0672	HL 0817

Full description is given in Appendix A.

Plot 3.5.1

Test Specification: § 15.107, § 15.207, class B
Conducted Emission Measurements on power line
Frequency range: 450 kHz-30 MHz
Line: phase
Detector:quasi peak



Plot 3.5.2

Test Specification: § 15.107, § 15.207, class B
Conducted Emission Measurements on power line
Frequency range: 450 kHz-30 MHz
Line: neutral
Detector:quasi peak

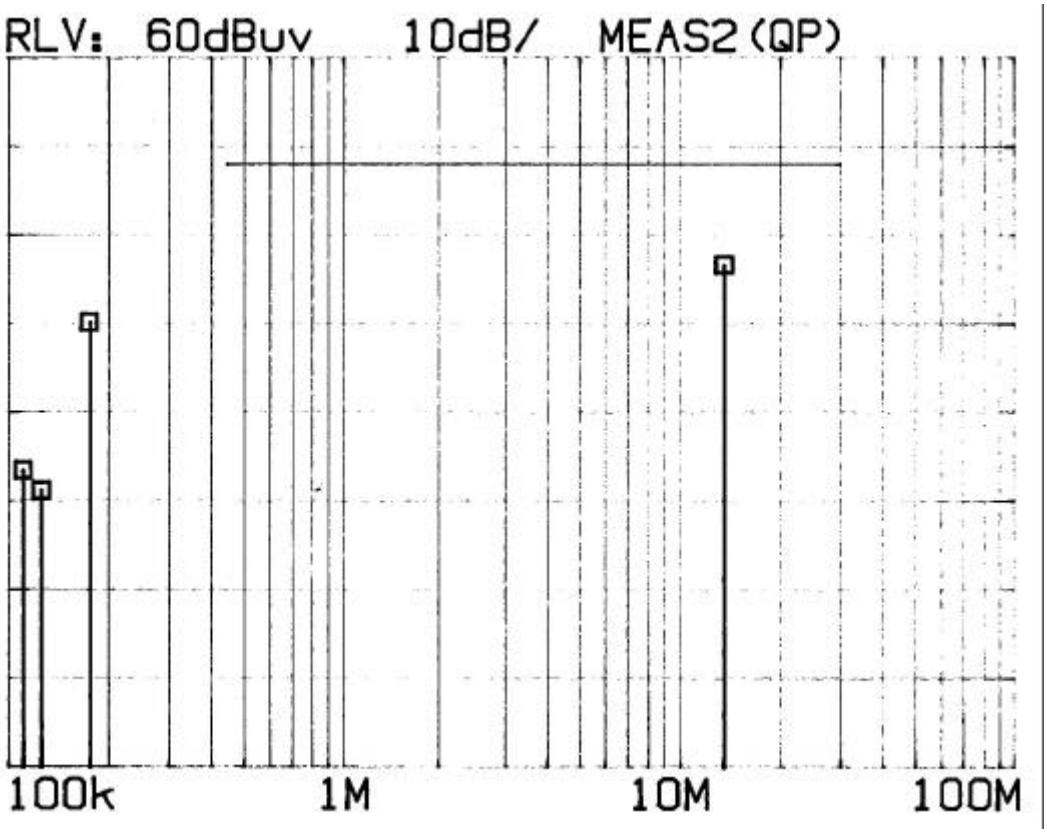
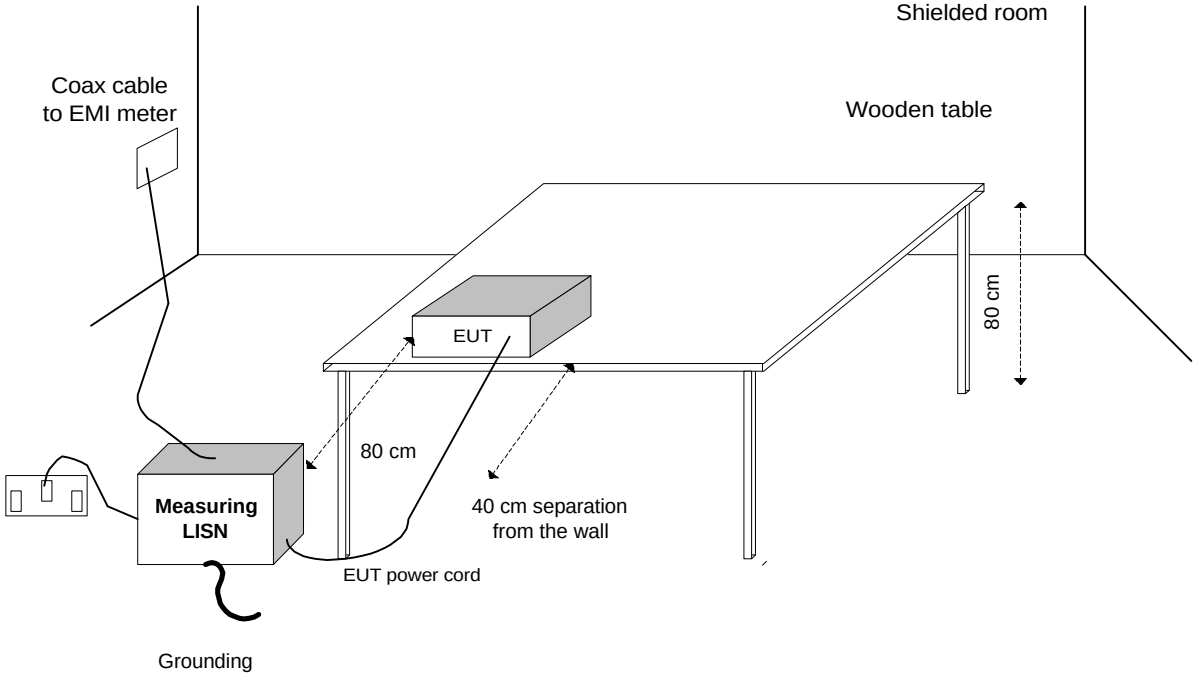
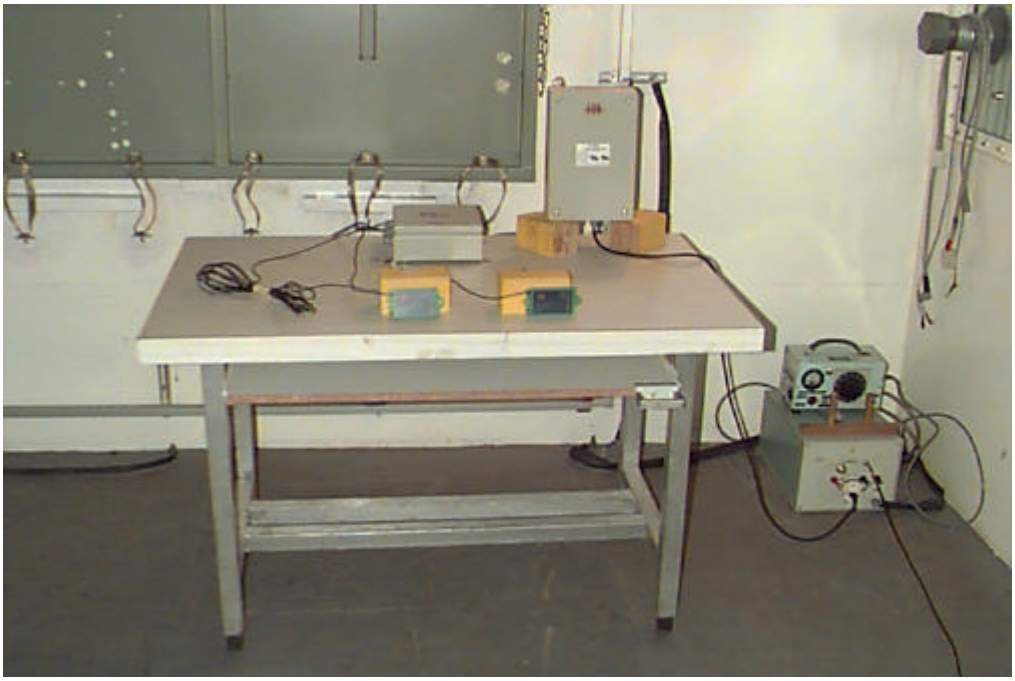


Figure 3.5.1.
Conducted emission test setup



Photograph 3.5.1.
Conducted emission test setup



4 Summary and Signatures

The EUT, Gasoline Management System, was found to be in compliance with the requirements of FCC Part 15, §§15.225, 15.209, 15.107, 15.109, 15.207 class B limits.

Test performed by:

Mr. Michael Nikishin, test engineer _____

Approved by:

Dr. Edward Usoskin, C.E.O. _____

Responsible person from
On Track Innovation Ltd.

Mr. Ronnie Gilboa, vice president (R&D) _____

APPENDIX A - Test equipment and ancillaries used for tests

HL Serial No.	Serial No.	Description	Manufacturer	Model No.	Due Calibr.
0026	3460	Spectrum Analyzer, 100 Hz-2.2 GHz	Anritsu	MS 2601A	8/99
0027	4838	Spectrum Analyzer, 50 Hz-2 GHz	Anritsu	MS-611A	10/99
0028	44147	Interference Analyzer, 9KHz-1GHz	Electro-Metrics	EMC 30MKIV	7/99
0032	3577	Biconical Antenna, 20-200 MHz	Electro-Metrics	BIA-25/30	4/00
0034	1988	Log Periodic Antenna, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	4/00
0038	028	Antenna Mast, 1-4 m	Hermon Labs	AM-1	2/00 Check
0127	15112-45	Generator Tracking	Hewlett Packard	8444A-60031	1/00
0185	1765	Graphics Plotter	Hewlett Packard	7475A	NA
0275	040	Table non-metallic, adjustable height, 1.5 x 1.0 x 0.8 m	Hermon Labs	TNM	3/00 Check
0287	042	Turntable, Motorized Diameter, 2m	Hermon Labs	TMD-2	4/00 Check
0446	2857	Active Loop Antenna 10 kHz-30 MHz	Electro-Mechanics	6502	11/99
0447	0447	LISN, 16/2, 300 V RMS	Hermon Labs	LISN 16-1	12/99
0500	2893-05	Oven temperature	Thermotron	S-16 Mini-Max	11/99
0560	0071	Multimeter Digital	Fluke	87	7/99
0566	3566	Antenna, Biconical, 20-200 MHz	Electro-Metrics	BIA 25/30	4/00
0580	580	DC block adaptor 10 kHz-2.2 GHz	Anritsu	MA8601 A	6/99
0591	3	Attenuator 10 dB, 50 Ohm, N-type, 2W	Elisra Electronic Systems	MW2100-N-Type	6/99
0672	027	Shielded Room 4.6(L) x 4.2(W) x2.4(H) m	Hermon Labs	SR-3	5/99 Check
0679	130	Controller Temperature and Humidity with Adaptor RS232/RS485	Hermon Labs	HTCL-1	10/99
0812	148	Cable, coax, RG-214, 11.5 m, N-type connectors	Hermon Labs	C214-11	8/99
0813	149	Cable, coax, RG-214, 12 m, N-type connectors	Hermon Labs	C214-12	8/99
0817	153	Cable, coax, RG-58, 8 m, N-type connectors	Hermon Labs	C58-8	8/99
1194	2952	Variac, 220 V/ 2.5 A	Hermon Labs	2952	1/00

APPENDIX B-Test Equipment Correction Factors

Correction Factor
Line Impedance Stabilization Network
Model ANS-25/2
Electro-Metrics

Frequency, kHz	Correction Factor
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor dB is to be added to the meter readings (dB/µv) of the interference analyzer or spectrum analyzer.

Antenna Factor
Biconical Antenna Electro-Metrics Model BIA-25/30
Ser.No.3577

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
30	14.6	120	16.0
35	12.8	125	15.1
40	12.5	130	15.0
45	12.8	135	15.0
50	12.6	140	14.8
55	11.7	145	14.7
60	11.6	150	16.5
65	10.3	155	17.0
70	9.0	160	17.0
75	8.0	165	17.4
80	8.9	170	18.0
85	9.4	175	18.9
90	11.1	180	19.1
95	12.3	185	19.8
100	13.6	190	20.4
105	14.3	195	20.1
110	15.5	200	20.4
115	18.6		

Antenna factor is to be added to receiver meter reading in dB(µV) to convert to field intensity in dB(µV/meter).

Antenna Factor
Log Periodic Antenna Electro-Metrics Model LPA-25/30
Ser.No.1988

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
200	15.1	625	25.3
225	15.0	650	25.9
250	16.3	675	27.2
275	17.3	700	27.5
300	18.5	725	28.1
325	19.1	750	28.0
350	19.4	775	28.3
375	20.0	800	28.5
400	20.8	825	29.1
425	21.3	850	29.5
450	22.0	875	29.9
475	22.8	900	30.3
500	23.4	925	30.3
525	23.8	950	30.6
550	24.2	975	31.2
575	24.6	1000	31.8
600	24.8		

Antenna factor is to be added to receiver meter reading in dB(µV) to convert to field intensity in dB(µV/meter)

Antenna factor
Electro-Mechanics active loop antenna
Model 6502, Ser.No.2857

Frequency, MHz	Antenna Factor, dB (1/m)
0.009	18.7
0.010	17.7
0.020	13.2
0.050	10.4
0.075	10.2
0.10	9.9
0.15	9.8
0.25	9.9
0.50	9.8
0.75	9.7
1.0	10.1
2.0	10.0
3.0	10.2
4.0	10.1
5.0	10.1
10.0	9.6
15.0	9.6
20.0	9.3
25.0	8.7
30.0	7.5

Antenna factor dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV)/meter