




TEST REPORT


Test Report No. : UL-RPT-RP10615802JD02A V2.0

Manufacturer : Access-IS
Model No. : NSM01
FCC ID : ZERNSM01
Technology : RFID – 13.56 MHz
Test Standard(s) : FCC Parts 15.207, 15.209(a) & 15.225(d)(e)

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 20 April 2015

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This laboratory is accredited by UKAS. The tests reported herein have been performed in accordance with its' terms of accreditation.

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1. Customer Information







Company Name:	Access-IS
Address:	18 Suttons Business Park Reading Berkshire RG6 1AZ United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.225
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) - Section 15.225
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 15.209
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	14 January 2015 to 15 April 2015

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.207	Transmitter AC Conducted Spurious Emissions	
Part 15.209(a)/15.225(d)	Transmitter Radiated Emissions ≥ 30 MHz	
Part 2.1049	Transmitter 20 dB Bandwidth	
Part 15.225(e)	Transmitter Frequency Stability (Temperature & Voltage Variation)	
Key to Results		
 = Complied  = Did not comply		

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2009)
Title:	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
Reference:	ANSI C63.10 (2009)
Title:	American National Standard for Testing Unlicensed Wireless Devices

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Access-IS
Model Name or Number:	NSM01
Test Sample Serial Number:	1
Hardware Version Number:	PCBM376901
Software Version Number:	1.01
FCC ID:	ZERNM01

3.2. Description of EUT

The equipment under test was an RFID NSM module operating at 13.56 MHz. It is powered from a 5.0 VDC serial to USB port.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing. However, the following modification was made to one of the support equipment used in order to achieve compliance with radiated emissions testing:

Addition of a ferrite clip (Würth Elektronik Part No: 74271111) on to the USB cable.

3.4. Additional Information Related to Testing

Tested Technology:	RFID	
Category of Equipment:	Transceiver	
Channel Spacing:	Single channel device	
Operating Frequency:	13.56 MHz	
Power Supply Requirement:	Nominal	5.0 V
	Minimum	4.25 V
	Maximum	5.75 V
Tested Temperature Range:	Minimum	-20°C
	Maximum	50°C

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Test Laptop
Brand Name:	Dell
Model Name or Number:	Precision
Serial Number:	07898349890528

Description:	9 pin serial to USB (1.5 metre) and to 6 pin serial (0.4 metre) cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	0.2 metre USB to banana plug breakout cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	NSM host adapter board
Brand Name:	Access-IS
Model Name or Number:	PCBP3652
Serial Number:	Not marked or stated

Description:	SIM carrier board
Brand Name:	Access-IS
Model Name or Number:	PCBP3809
Serial Number:	Not marked or stated

Description:	LSR118 antenna board
Brand Name:	Access-IS
Model Name or Number:	PCBP3525
Serial Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Constantly transmitting at full power with a modulated carrier in RFID test mode.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- The EUT was configured to start transmitting continuously as soon as it was powered through the USB port.
- The EUT was placed on a test jig that had an antenna board, an NFS host adapter board and a SIM carrier board. The antenna was connected to the EUT's UFL connectors. The other two boards were connected to the EUT via serial cables.
- Testing at voltage extremes was performed using a USB to banana plugs cable, supplied by the customer. The banana plugs were connected to a DC power supply and the USB end was connected to the USB end of the serial/USB to serial cable, with the remaining cables/ports configured as described above.
- All accessories/peripheral supplied were employed during spurious emissions testing.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6: Measurement Uncertainties* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Sandeep Bharat	Test Date:	15 April 2015
Test Sample Serial Number:	1		

FCC Reference:	Part 15.207
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	38

Note(s):

1. The EUT was plugged into a laptop computer through a USB cable. The laptop computer was connected to its AC charger which was powered by 120 VAC 60 Hz single phase supply via a LISN.
2. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
3. A pulse limiter was fitted between the LISN and the test receiver.

Results: Live / Quasi Peak

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.443	Live	44.0	57.0	13.0	Complied
0.623	Live	34.9	56.0	21.1	Complied
0.875	Live	34.5	56.0	21.5	Complied
1.262	Live	33.9	56.0	22.1	Complied
14.838	Live	43.0	60.0	17.0	Complied
14.861	Live	42.8	60.0	17.2	Complied

Results: Live / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.272	Live	32.5	51.1	18.6	Complied
0.294	Live	34.1	50.4	16.3	Complied
0.533	Live	38.1	46.0	7.9	Complied
0.713	Live	23.4	46.0	22.6	Complied
1.086	Live	26.7	46.0	19.3	Complied
14.897	Live	37.5	50.0	12.5	Complied

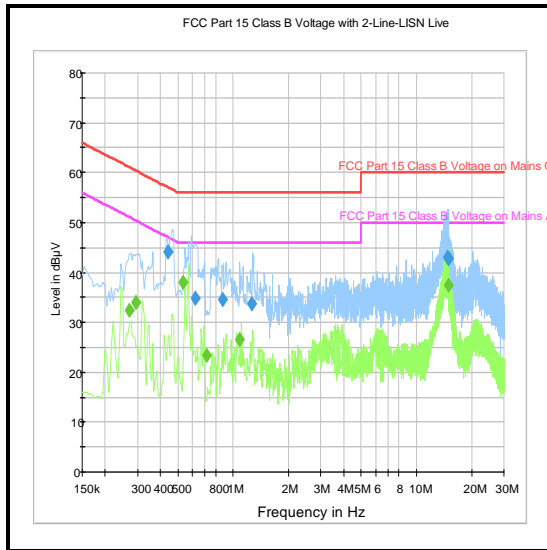
Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.474	Neutral	46.4	56.4	10.0	Complied
0.533	Neutral	43.6	56.0	12.4	Complied
0.758	Neutral	36.0	56.0	20.0	Complied
0.947	Neutral	36.4	56.0	19.6	Complied
3.534	Neutral	32.2	56.0	23.8	Complied
14.757	Neutral	42.0	60.0	18.0	Complied

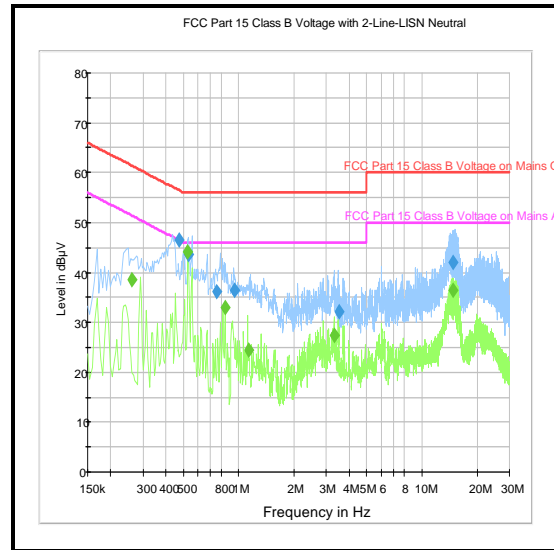
Results: Neutral / Average

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.263	Neutral	38.6	51.4	12.8	Complied
0.528	Neutral	44.2	46.0	1.8	Complied
0.839	Neutral	32.9	46.0	13.1	Complied
1.136	Neutral	24.5	46.0	21.5	Complied
3.336	Neutral	27.3	46.0	18.7	Complied
14.766	Neutral	36.4	50.0	13.6	Complied

Transmitter AC Conducted Spurious Emissions (continued)



Live



Neutral

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1625	Thermohygrometer	JM Handlungspunkt	30.5015.06	None stated	07 Jan 2016	12
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	14 Aug 2015	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	02 Mar 2016	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	14 Oct 2015	12

5.2.2. Transmitter Radiated Spurious Emissions \geq 30 MHz**Test Summary:**

Test Engineer:	Sandeep Bharat	Test Date:	15 January 2014
Test Sample Serial Number:	1		

FCC Reference:	Parts 15.225(d) & 15.209(a)
Test Method Used:	As detailed in ANSI C63.10 Sections 6.3 and 6.5 referencing ANSI C63.4
Frequency Range:	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	37

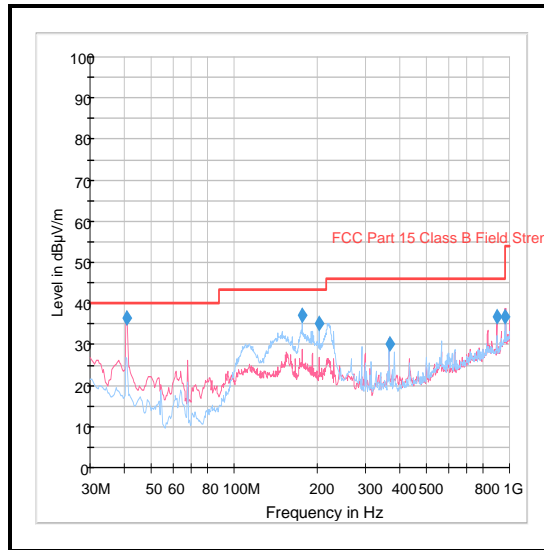
Note(s):

1. Final measurement values include corrections for antenna factor and cable losses.
2. All other emissions shown on the pre-scan plots were investigated and found to be >20 dB below the applicable limit or below the measurement system noise floor.
3. Measurements in the range 30 MHz to 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
40.681	Vertical	36.3	40.0	3.7	Complied
176.296	Horizontal	37.1	43.5	6.4	Complied
203.399	Horizontal	35.1	43.5	8.4	Complied
366.113	Vertical	30.0	46.0	16.0	Complied
900.179	Vertical	36.8	46.0	9.2	Complied
966.848	Vertical	36.8	54.0	17.2	Complied

Transmitter Radiated Spurious Emissions \geq 30 MHz (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1658	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Jan 2015	12
G0543	Amplifier	Sonoma	310N	230801	04 Mar 2015	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
A1834	Attenuator	Hewlett Packard	8491B	10444	Calibrated before use	12

5.2.3. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	Sandeep Bharat	Test Date:	14 January 2015
Test Sample Serial Number:	1		

FCC Reference:	Part 2.1049
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.1

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	32

Results:

20 dB Bandwidth (kHz)
434.295



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handlungspunkt	30.5015.13	None stated	14 Mar 2015	12
A1173	Loop Antenna	Solar Electronics	7429-1	001	N/A	-
A2140	Attenuator	AtlanTecRF	AN18-10	090918-14	25 Apr 2015	12
M1886	Test Receiver	Rohde & Schwarz	ESU 26	100554	09 May 2015	12

5.2.4. Transmitter Frequency Stability (Temperature & Voltage Variation)**Test Summary:**

Test Engineer:	Sandeep Bharat	Test Date:	14 January 2015
Test Sample Serial Number:	1		

FCC Reference:	Part 15.225(e)
Test Method Used:	As detailed in ANSI C63.10 Section 6.8.1 and 6.8.2

Environmental Conditions:

Ambient Temperature (°C):	25
Ambient Relative Humidity (%):	32

Note(s):

1. The USB to banana plug breakout cable which was supplied by the customer was used to connect the EUT to a bench power supply.
2. The EUT was connected to the spectrum analyser through a suitable test fixture.
3. Temperature was monitored throughout the test with a calibrated digital thermometer.
4. Voltage was monitored throughout the test with a calibrated digital voltmeter.

Results: Maximum frequency error of the EUT with variations in ambient temperature

Temperature (°C)	Time after Start-up			
	0 minutes	2 minutes	5 minutes	10 minutes
-20	13.560403	13.560858	13.559754	13.560302
20	13.560147	13.559398	13.560135	13.559815
50	13.560123	13.559743	13.560036	13.560108

Frequency with Worst Case Deviation (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
13.560858	858	0.006327	0.01	0.003673	Complied

Results: Maximum frequency error of the EUT with variations in nominal operating voltage at an ambient temperature of 20°C

Supply Voltage (V)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
4.25	13.56	13.560139	139	0.001025	0.01	0.008975	Complied
5.00	13.56	13.560858	858	0.006327	0.01	0.003673	Complied
5.75	13.56	13.559773	227	0.001674	0.01	0.008326	Complied

Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
A1173	Loop Antenna	Solar Electronics	7429-1	001	N/A	-
A2140	Attenuator	AtlanTecRF	AN18-10	090918-14	25 Apr 2015	12
S021	DC Power Supply	Thurlby Thandar	CPX200	061034	Calibrated before use	-
M1229	Digital Multimeter	Fluke	179	87640015	24 Apr 2015	12
E0520	Environmental Chamber	Thermotron	S-1.2CB	23840	Calibrated before use	-
M1068	Thermometer	Iso-Tech	RS55	93102884	02 May 2015	12
M1886	Test Receiver	Rohde & Schwarz	ESU 26	100554	09 May 2015	12

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
20 dB Bandwidth	13 MHz to 14 MHz	95%	±3.92 %
Frequency Stability	13 MHz to 14 MHz	95%	±0.92 ppm
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±5.65 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause(s)	Details
1.0	-	-	Initial version
2.0	1, 5, 10-12, 18	2.1, 2.2, 5.2.1, 6	Additional test added

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