Certification Test Report

FCC ID: SK9NIC
IC: 864G-NIC

FCC Rule Part: 15.247
ISED Canada Radio Standards Specification: RSS-247

Report Number: AT72157802-1P1

Manufacturer: Itron, Inc.
Model: NIC

Test Begin Date: March 25, 2020
Test End Date: March 27, 2020

Report Issue Date: May 6, 2020

FOR THE SCOPE OF ACCREDITATION UNDER Certificate Number: 2955.09

This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the Federal Government.

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This report contains 20 pages

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1 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Innovation, Science and Economic Development Canada's Radio Standards Specification RSS-247 Certification for a Class II Permissive Change.

The purpose of this Class II Permissive Change is to add a new antenna and host combination.

1.2 Product Description

The Itron NIC is an electricity metering module which includes a 902.4 MHz to 927.6 MHz transmitter. The module operates on AC as well as DC voltage which is supplied by a host device.

For this evaluation, the NIC was installed in a Socket Based Router (SBR) which incorporates the following co-located radios:

FCC ID: SK9ITR9002
FCC ID: SK9WF111
FCC ID: N7NEM7455

Additionally, the utility meter to which the SBR was mounted housed a Zigbee radio:

FCC ID: SK9ITR24

This test report documents the compliance of the 902.8 MHz to 926.8 MHz transceiver mode of operation on the NIC.

Technical Details (SK9NIC):

Detail	Description
Frequency Range	902.4 – 927.6 MHz[1] 902.8 – 926.8 MHz
Number of Channels	64[1] / 31
Channel Spacing	400kHz[1] / 800kHz
Modulation Format	FSK, OFDM, DSSS
Data Rates	FSK: 50kbps, 150kbps OFDM: 200kbps, 600kbps, 1200kbps DSSS: 12.5kbps
Operating Voltage	12Vdc
Antenna Type(s) / Gain(s)	PCB Trace Antenna / 2.04dBi

1) The 64 channels at 400kHz spacing only apply to the FSK, DSSS, OFDM 200kbps, and OFDM 600kbps operation.

Technical Details (SK9ITR9002):

Detail	Description
Frequency Range	902.25 – 927.75 MHz
Number of Channels	52
Channel Spacing	400kHz[1] / 500kHz
Modulation Format	FSK,
Data Rates	FSK: 19.2kbps, 150kbps, 152.3kbps
Operating Voltage	5Vdc
Antenna Type(s) / Gain(s)	PCB Trace Antenna / 1.0dBi

1) 400kHz spacing applies to FSK 150k data rate

Technical Details (SK9WF111):

Detail	Description
Frequency Range	2412 – 2462MHz
Number of Channels	11
Modulation Format	802.11 b/g/n(HT20)
Data Rates (kbps)	802.11b: 1,2,5.5,11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65.5, 72.2 Mbps
Operating Voltage	3.3Vdc (Supplied by host)
Antenna Type(s) / Gain(s)	Taoglas GW26.0112 Monopole / 1.8 dBi

Technical Information (N7NEM7455):

Detail	Description
Frequency Range	2110 – 2155 (LTE B4) 728 – 746 (LTE B12) 746 – 756 (LTE B13)
Operating Voltage	12Vdc
Antenna Type / Gain	PCB Trace 728: -0.94dBi 746: -0.49dBi 2110: 0.10dBi
Manufacturer	Sierra Wireless

Technical Details (SK9ITR24):

Detail	Description
Frequency Range	2405 - 2475 MHz
Number of Channels	15
Channel Spacing	5 MHz
Modulation Format	O-QPSK
Operating Voltage	24Vdc (via host)
Antenna Type(s) / Gain(s)	PCB quarter-wave embedded slot antenna / 3.8dBi

Manufacturer Information:
Itron, Inc.
313 N Hwy 11
West Union, SC 29696

Test Sample Serial Number: Not Labeled

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

All modes of operation, including all available data rates, were evaluated. The data presented in this report represents the worst case where applicable.

For radiated emissions, the EUT was evaluated in the SBR host which was oriented in its intended mounting configuration. The EUT was programmed to generate a continuously modulated signal on each channel evaluated.

Additionally, an intermodulation product evaluation with all radios operating at full power was performed and found to be compliant.

Software power setting during test: RFIC Attn: 9, DMCC Scale 1826

2 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following addresses:

TÜV SÜD America, Inc.
5945 Cabot Pkwy, Suite 100
Alpharetta, GA 30005
Phone: (678) 341-5900

2.2 Laboratory Accreditations/Recognitions/Certifications

TÜV SÜD America, Inc. is accredited to ISO/IEC 17025 by the American Association for Laboratory Accreditation/A2LA accreditation program and has been issued certificate number 2955.09 in recognition of this accreditation.

Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scopes of accreditation.

The Semi-Anechoic Chamber Test Sites and Conducted Emissions Sites have been fully described, submitted to, and accepted by the FCC, ISED Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Designation Accreditation Number:	US1233
FCC Test Site Registration Number:	967699
ISED Canada Lab Code:	23932
VCCI Member Number:	1831
• VCCI Registration Number	A-0295

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site – Chamber A

The Semi-Anechoic Chamber Test Site consists of a 20’ x 30’ x 18’ shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 5’ in diameter and is located 5’6” from the back wall of the chamber. The chamber is grounded via 1 - 8’ copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted EMCO Model 1060 installed in an all steel frame. The table is remotely operated from inside the control room located 25’ from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3’ x 6’ x 4’ deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4” PVC chase from the turntable to the pit that allows for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit, so cables can be supplied to the EUT from the pit.

The chamber rear wall is covered with a mixture of Siepel pyramidal absorber. The side walls of the chamber are partially covered with Siepel pyramidal absorber.

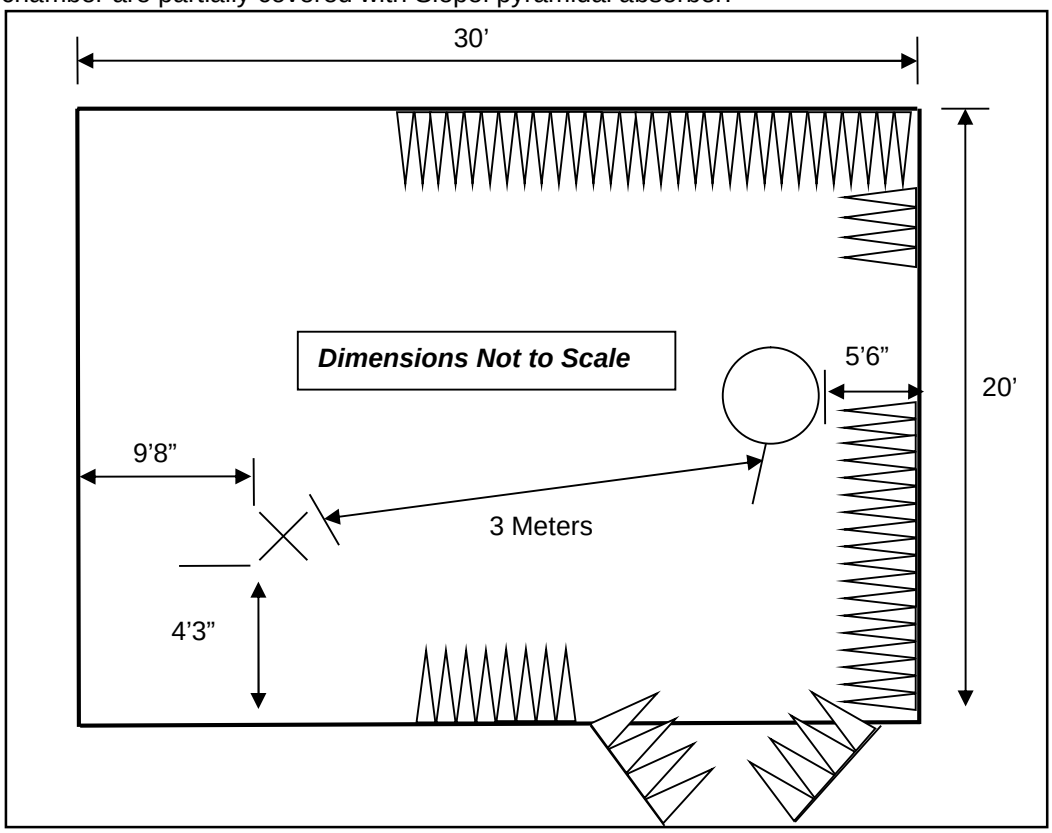


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site – Chamber A

2.3.2 Semi-Anechoic Chamber Test Site – Chamber B

The Semi-Anechoic Chamber Test Site consists of a 20'W x 30'L x 20'H shielded enclosure. The chamber is lined with ETS-Lindgren Ferrite Absorber, model number FT-1500. The ferrite tile 600 mm x 600 mm (2.62 in x 23.62 in) panels and are mounted directly on the inner walls of the chamber shield.

The specular regions of the chamber are lined with additional ETS-Lindgren PS-600 hybrid absorber to extend its frequency range up to 18GHz and beyond.

The turntable is a 2m ETS-Lindgren Model 2170 and installed off the center axis is located 5'6" from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the shield using #8 solid copper wire.

The antenna mast is an EMCO 1060 and is remotely controlled from the control room for both antenna height and polarization.

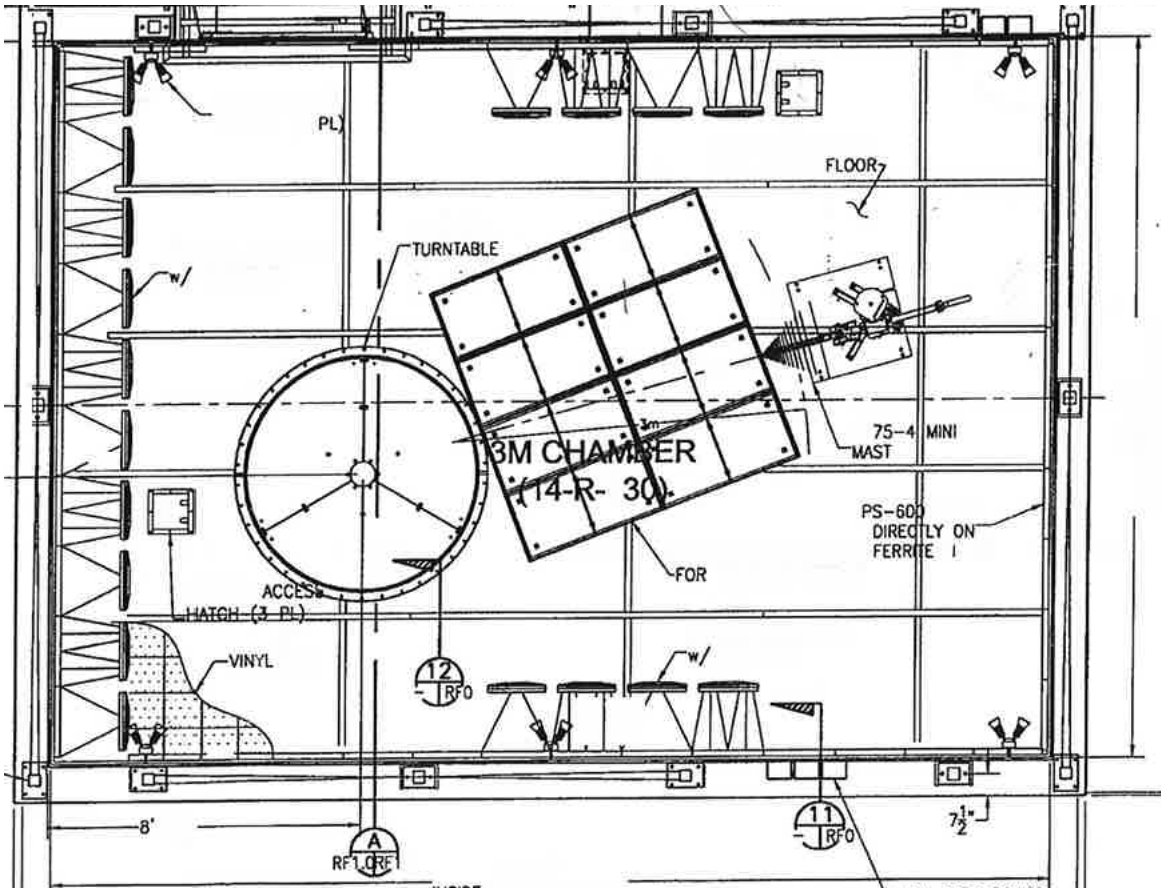


Figure 2.3.2-1: Semi-Anechoic Chamber Test Site – Chamber B

2.4 Conducted Emissions Test Site Description

2.4.1 Conducted Emissions Test Site

The AC mains conducted EMI site is located in the main EMC lab. It consists of a 12' x 10' horizontal coupling plane (HCP) as well as a 12'x8' vertical coupling plane (VCP). The HGP is constructed of 4' x 10' sheets of particle board sandwiched by galvanized steel sheets. These panels are bonded using 11AWG 1/8" x 2" by 10' galvanized sheet steel secured to the panels via by screws. The VCP is constructed of three 4'x8' sheets of 11AWG solid aluminum.

The HCP and VCP are electrically bonded together using 1"x1" angled aluminum secured with screws.

The site is of sufficient size to test tabletop and floor standing equipment in accordance with section 6.1.4 of ANSI C63.10.

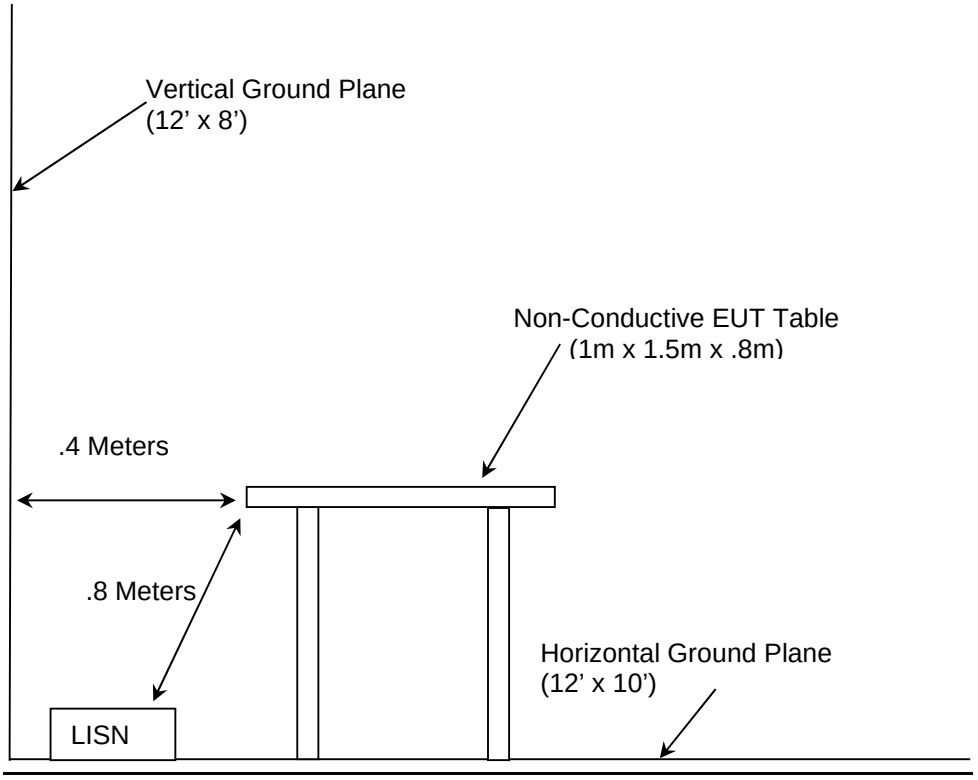


Figure 2.4.1-1: AC Mains Conducted EMI Site

3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.10-2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2020
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2020
- FCC KDB 558074 D01 DTS Meas Guidance v05r02 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247, April 2, 2019
- ISED Canada Radio Standards Specification: RSS-247 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices, Issue 2, February 2017.
- ISED Canada Radio Standards Specification: RSS-GEN – General Requirements for Compliance of Radio Apparatus, Issue 5, April 2018 + Amendment 1, March 2019

4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

Table 4-1: Test Equipment

Asset ID	Manufacturer	Model	Equipment Type	Serial Number	Last Calibration Date	Calibration Due Date
22	Hewlett Packard	8449B	High Frequency Pre-Amp	3008A00526	07/11/2018	07/11/2020
30	Spectrum Technologies	DRH-0118	1-18GHz Horn Antenna	970102	05/29/2019	05/29/2021
321	Hewlett Packard	HPC 8447D	Low Freq. Pre-Amp	1937A02809	09/12/2019	09/12/2020
331	Microwave Circuits	H1G513G1	Microwave Bandpass Filter	31417	05/31/2019	05/31/2020
628	EMCO	6502	Active Loop Antenna 10kHz-30MHz	9407-2877	02/11/2019	11/02/2021
819	Rohde & Schwarz	ESR26	EMI Test Receiver	101345	11/1/2018	05/01/2020
851	TUV ATLANTA	FMC0101951-100CM	ASAC Cable Set Consisting of 566, 619, and 564	N/A	10/01/2019	10/01/2020
852	Teseq	CBL 6112D	Bilog Antenna; Attenuator	51617	10/15/2018	10/15/2020

NOTE: All test equipment was used only during active calibration cycles.

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model/Part Number	Serial Number
1	Socket Based Router	Itron, Inc.	SBR	N/A

Table 5-2: Cable Description

Cable	Cable Type	Length	Shield	Termination
A	AC Power Cable	1.8m	No	Host to AC Mains

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

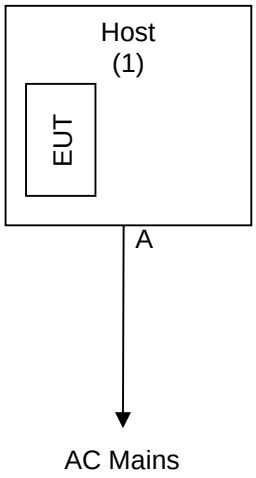


Figure 6-1: Test Setup Block Diagram

7 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement – FCC: Section 15.203

The NIC module utilizes a female QMR connector which meets the unique antenna connector requirements in 15.203.

7.2 Radiated Spurious Emissions – FCC: Sections 15.205, 15.209; ISED Canada: RSS-Gen 8.9 / 8.10

7.2.1.1 Measurement Procedure

The unwanted emissions into restricted bands were measured radiated over the frequency range of 9 kHz to 10 GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1 meter to 4 meters so that the maximum radiated emissions level would be detected. For frequencies below 1000 MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000 MHz, peak and average measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively.

Each emission found to be in a restricted band as defined by section 15.205, including any emission at the operational band-edge, was compared to the radiated emission limits as defined in section 15.209. Emissions not reported were below the noise floor of the measurement system. Peak data below 30MHz was more than 20dB below the applicable limits.

7.2.1.2 Measurement Results

Performed by: Ryan McGann

Table 7.2.1.2-1: Radiated Spurious Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBµV/m)		Limit (dBµV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
902.8 MHz										
2708.4	47.20	33.30	H	4.07	51.27	37.37	74.0	54.0	22.7	16.6
2708.4	44.80	31.30	V	4.07	48.87	35.37	74.0	54.0	25.1	18.6
914.8 MHz										
2744.4	47.20	32.80	H	4.31	51.51	37.11	74.0	54.0	22.5	16.9
2744.4	48.10	32.00	V	4.31	52.41	36.31	74.0	54.0	21.6	17.7
926.8 MHz										
2780.4	48.30	32.40	H	4.55	52.85	36.95	74.0	54.0	21.2	17.1
2780.4	49.60	32.80	V	4.55	54.15	37.35	74.0	54.0	19.9	16.7

7.2.1.3 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation: Peak

Corrected Level: 47.20 + 4.07 = 51.27dBuV/m
Margin: 74dBuV/m – 51.27dBuV/m = 22.7dB

Example Calculation: Average

Corrected Level: 33.30 + 4.07 - 0 = 37.37dBuV
Margin: 54dBuV – 37.37dBuV = 16.6dB

8 ESTIMATION OF MEASUREMENT UNCERTAINTY

The expanded laboratory measurement uncertainty figures (U_{Lab}) provided below correspond to an expansion factor (coverage factor) k = 1.96 which provide confidence levels of 95%.

Parameter	U_{lab}
Occupied Channel Bandwidth	± 0.009 %
RF Conducted Output Power	± 0.349 dB
Power Spectral Density	± 0.372 dB
Antenna Port Conducted Emissions	± 1.264 dB
Radiated Emissions ≤ 1 GHz	± 5.814 dB
Radiated Emissions > 1 GHz	± 4.318 dB
Temperature	± 0.860 °C
Radio Frequency	± 2.832 x 10^{-8}
AC Power Line Conducted Emissions	± 3.360 dB

9 CONCLUSION

In the opinion of TÜV SÜD America, Inc. the NIC, manufactured by Itron, Inc. meets the requirements of FCC Part 15 subpart C and ISED Canada's Radio Standards Specification RSS-247 for the tests documented in this test report.

Appendix A: Plots

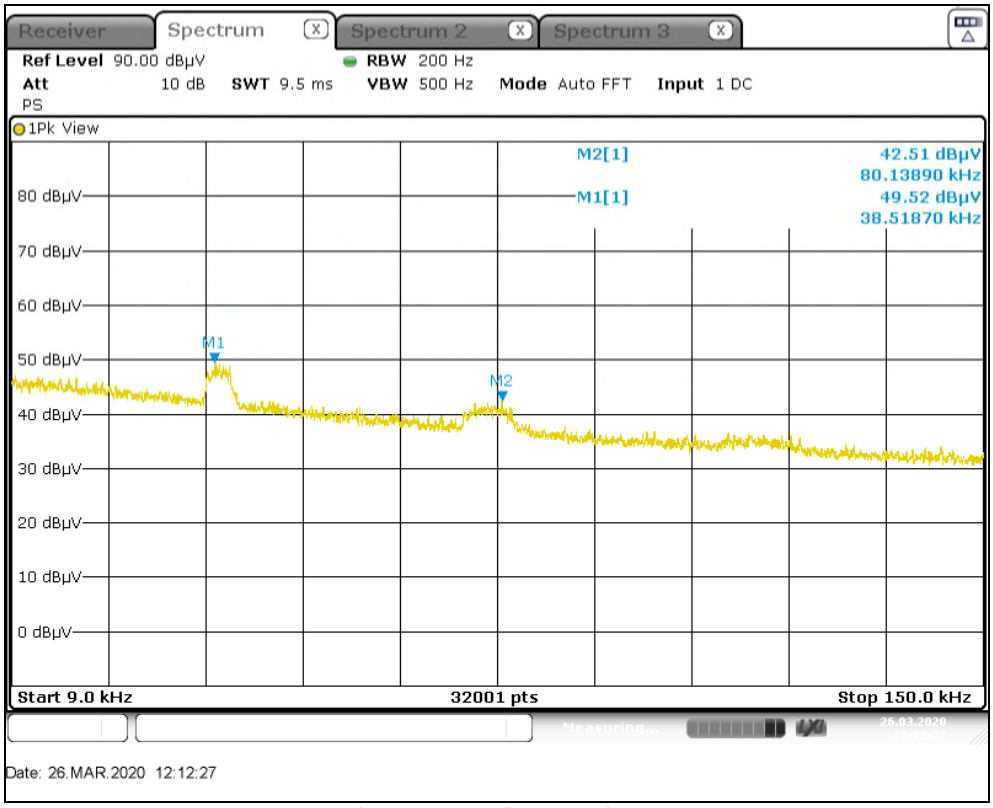
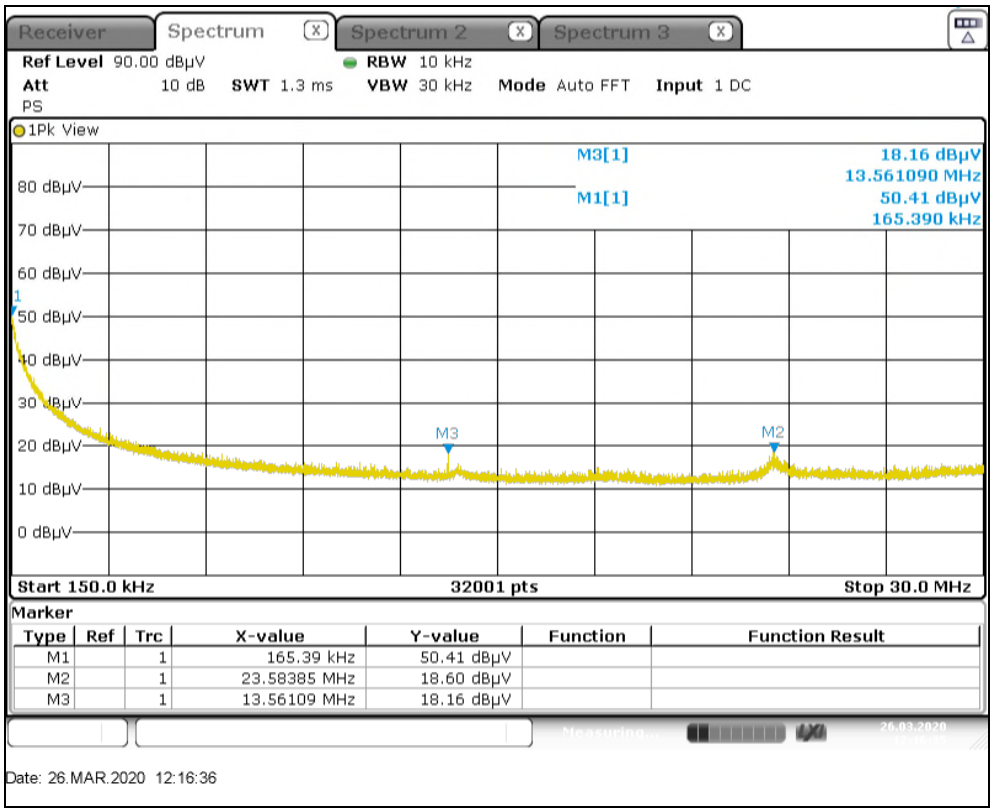
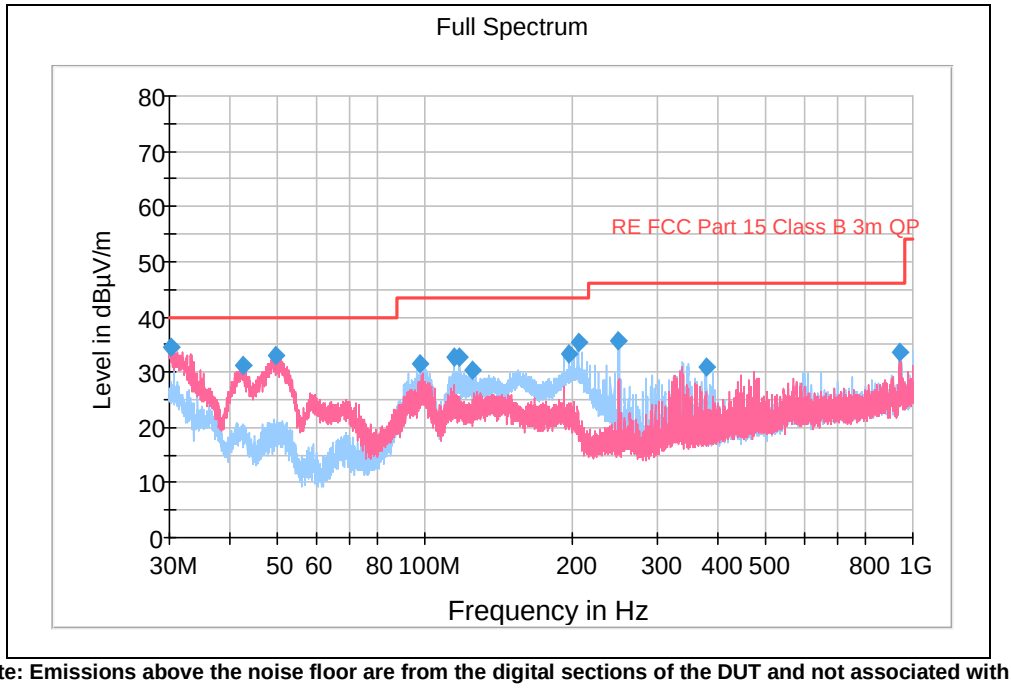


Figure A-1: 9kHz-150kHz



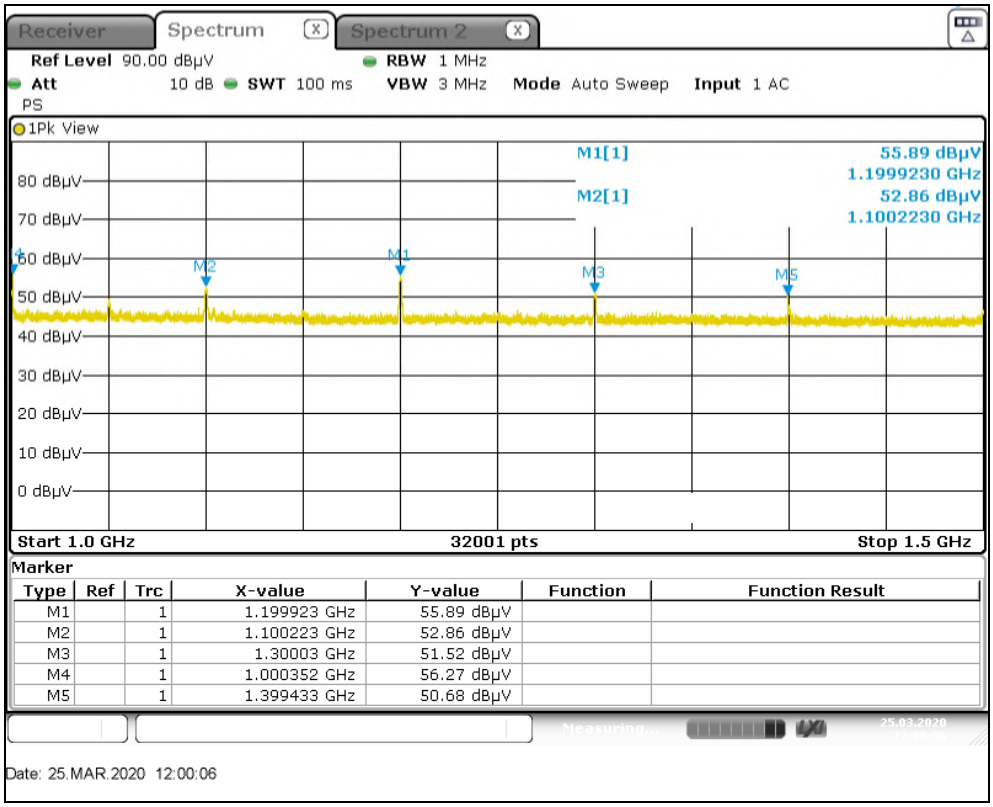
Note: Emissions above the noise floor are related to the driver and not associated with the DUT.

Figure A-2: 150kHz-30MHz



Note: Emissions above the noise floor are from the digital sections of the DUT and not associated with the radio.

Figure A-3: 30MHz-1GHz



Note: Emissions above the noise floor are from the digital sections of the DUT and not associated with the radio.

Figure A-4: 1GHz-1.5GHz

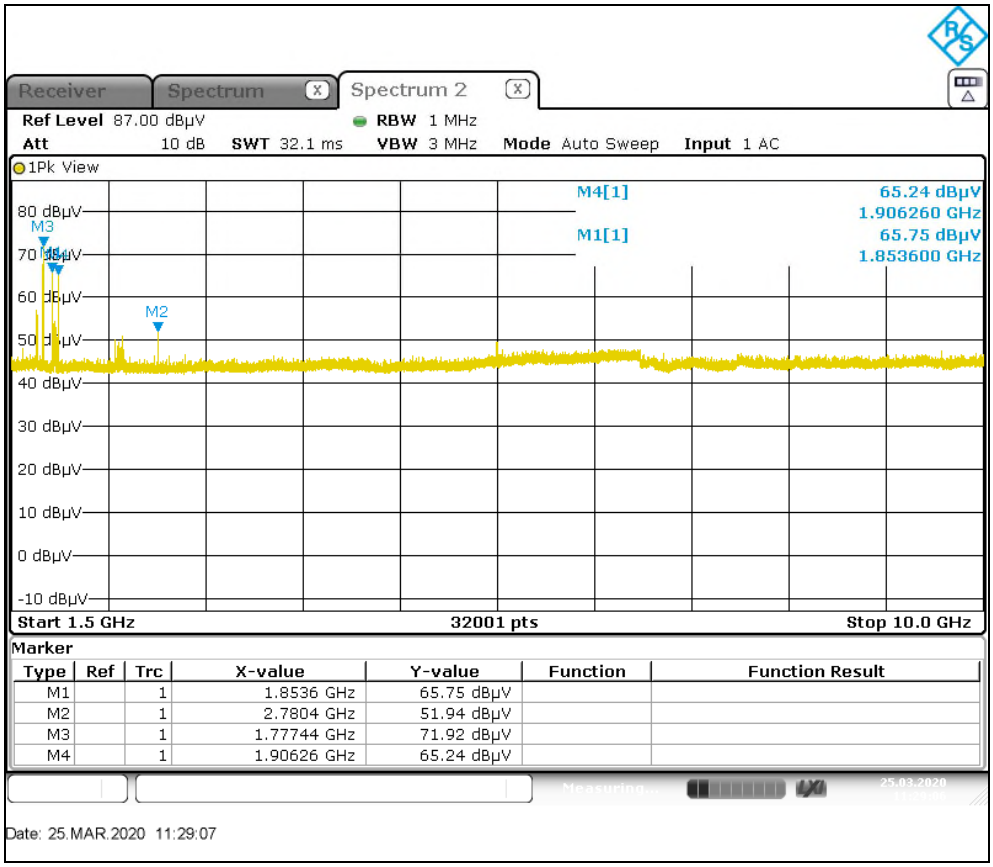


Figure A-5: 1.5GHz-10GHz

END REPORT