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Wireless test report – 359320-4TRFWL

Applicant:

Gemalto

Product name:

Document Reader AT10K

Model:

PV71-02-00-00-01

Model variant:

PV76-02-00-00-01

FCC ID:

2AQL3PR01523

IC Registration number:

22832-PR01523

Specifications:

FCC 47 CFR Part 15 Subpart C – co-location test

Operation in the 13.56 MHz and 2400–2483.5 MHz bands

Date of issue: December 21, 2018

Test engineer(s):	Andrey Adelberg, Senior Wireless/EMC Specialist	Signature:
Reviewed by:	David Duchesne, Senior EMC/Wireless Specialist	Signature:

Nemko Canada Inc., a testing laboratory, is accredited by the Standards Council of Canada. The tests included in this report are within the scope of this accreditation

Lab and test locations

Company name	Nemko Canada Inc.	
Facilities	Ottawa site: 303 River Road, Ottawa, ON, Canada, K1V 1H2 Tel: +1 613 737 9680 Fax: +1 613 737 9691	
Test site registration	**Organization**	**Recognition numbers and location**
	FCC	CA2040 (Ottawa);
	ISED	CA2040A-4 (Ottawa); CA2040A-3 (Almonte)
Website	www.nemko.com	

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.
This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contained in this report are within Nemko Canada's ISO/IEC 17025 accreditation.

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Gemalto Inc.
Address	Arboretum Plaza II, 9442 N. Capital of Texas Hwy., Suite 100, Austin, TX, USA, 78759

1.2 Test specifications

FCC 47 CFR Part 15 Subpart C – co-location test	Operation in the 13.56 MHz and 2400–2483.5 MHz bands

1.3 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was performed against all relevant requirements of the test standard except as noted in section 1.5 below. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See "Summary of test results" for full details.

1.4 Exclusions

None

1.5 Test report revision history

Revision #	Date of issue	Details of changes made to test report
TRF	December 21, 2018	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, intentional radiators test results

Table 2.1-1: *Test summary results*

Test description	Verdict
Co-location operation	Pass

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	October 8, 2018
Nemko sample ID number	2

3.2 EUT information

Product name	Document Reader AT10K
Model	PV71-02-00-00-01
Model variant	PV76-02-00-00-01

3.3 Technical information

Operating bands	13.553–13.567 MHz and 2400–2483.5 MHz
Modulation type	ASK (RFID) and 802.11b,g,n (Wi-Fi)
Power requirements	120 Vac 60 Hz
Emission designator	A1D (RFID) and (W7D) Wi-Fi
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The AT10K Reader is an optical imaging reader designed to capture images of an ID document, for example a passport. In addition to acquiring images of the document, the reader is also capable of reading data encoded into a contactless RFID tag. The AT10K consists of two main PCBs:

1. Main controller and Document imager, which incorporates
    a. a 32-bit RISC processor
    b. Flash and DRAM memory
    c. LED illumination drivers
    d. a 3 mega-pixel CMOS image sensor
    e. USB 2.0 interfaces
2. RFID and Antenna. The optional RFID electronics and antenna support RFID tag reading. The RFID module is a USB device, and is connected to the main controller's USB 2.0 hub where the RFID and optical data are merged into a single USB host connection.

During operation the controller board continually captures images using infra-red (IR) illumination at a rate of approximately 4 frames per second. These images are analyzed by the embedded CPU to determine if a document is present. If a document is detected, a series of document images are then acquired using IR illumination (890nm), Visible white illumination (400-700nm) and Ultra-violet (UV) illumination (365nm). These images are then sent over the USB 2.0 link to the host PC for further analysis or storage.

The main controller board is powered from an external +5V@3A DC universal (110-240VAC input) power supply or via 5V@500 mA available from the USB 2.0 host connection. LEDs used to illuminate the document for imaging are powered via a constant-current switching power supply controlled by the CPU through transistor switches. Switching power supplies convert from 5V to lower supply voltages used by the CPU and memory. Power and ground are distributed throughout the circuit board on separate planes of a multi-layer PCB layout.
The CPU is clocked using a directly connected **24 MHz** crystal. The USB 2.0 hub incorporates its own dedicated **30 MHz** crystal.

3.5 EUT exercise details

The EUT was setup as shown in figure 2.6-1. A sample passport was placed on the EUT and test software on the PC was used to continuously scan the sample passport once every approx. 5 seconds, transferring optical and RFID data over the USB. The EUT was continuously monitored by observing successful scanning on the test laptop PC. In addition, the test software provided audible indication of correct operation. Video surveillance of the unit in the test chamber was also used to monitor status LEDs for correct and continuous operation.

3.6 EUT setup diagram

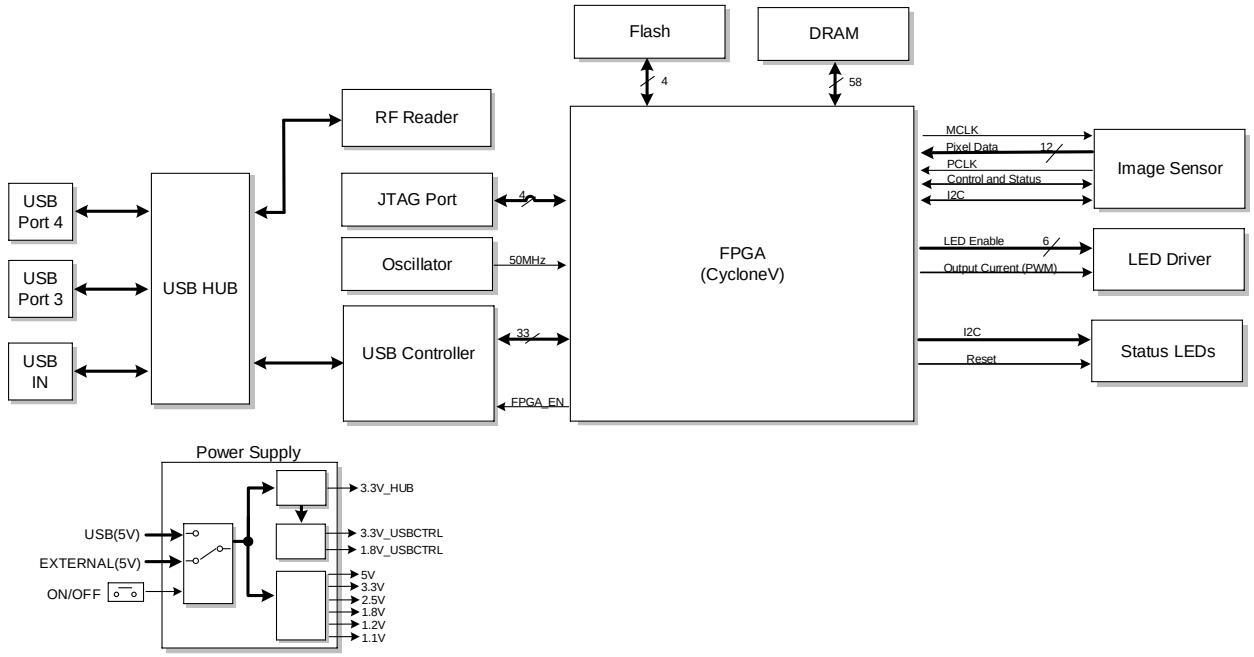


Figure 3.6-1: *Setup diagram*

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

UKAS Lab 34 and TIA-603-B have been used as guidance for measurement uncertainty reasonable estimations with regards to previous experience and validation of data. Nemko Canada, Inc. follows these test methods in order to satisfy ISO/IEC 17025 requirements for estimation of uncertainty of measurement for wireless products.

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Table 6.1-1: *Measurement uncertainty*

Test name	Measurement uncertainty, dB
Radiated spurious emissions	3.78

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: *Equipment list*

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
3 m EMI test chamber	TDK	SAC-3	FA002047	1 year	Dec. 9/18
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	Mar 26/19
Bilog antenna (20–2000 MHz)	Sun AR	JB1	FA003009	1 year	Sept. 6/19
Horn antenna (1–18 GHz)	EMCO	3115	FA000825	1 year	Oct. 8/19
Preamp (1–18 GHz)	ETS-Lindgren	124334	FA002873	1 year	Nov. 4/19
Horn antenna (18–40 GHz)	EMCO	3116	FA001847	1 year	Oct. 9/19
Pre-amplifier (18–26 GHz)	Narda	BBS-1826N612	FA001550	—	VOU

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 Spurious (out-of-band) unwanted emissions

8.1.1 Definitions and limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Table 8.1-1: *FCC §15.209 – Radiated emission limits*

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.1-2: *FCC restricted frequency bands*

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.1.1 Test date

Start date	November 16, 2018

8.1.2 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	10 Hz
Detector mode:	Peak
Trace mode:	Max Hold

8.1.4 Test data

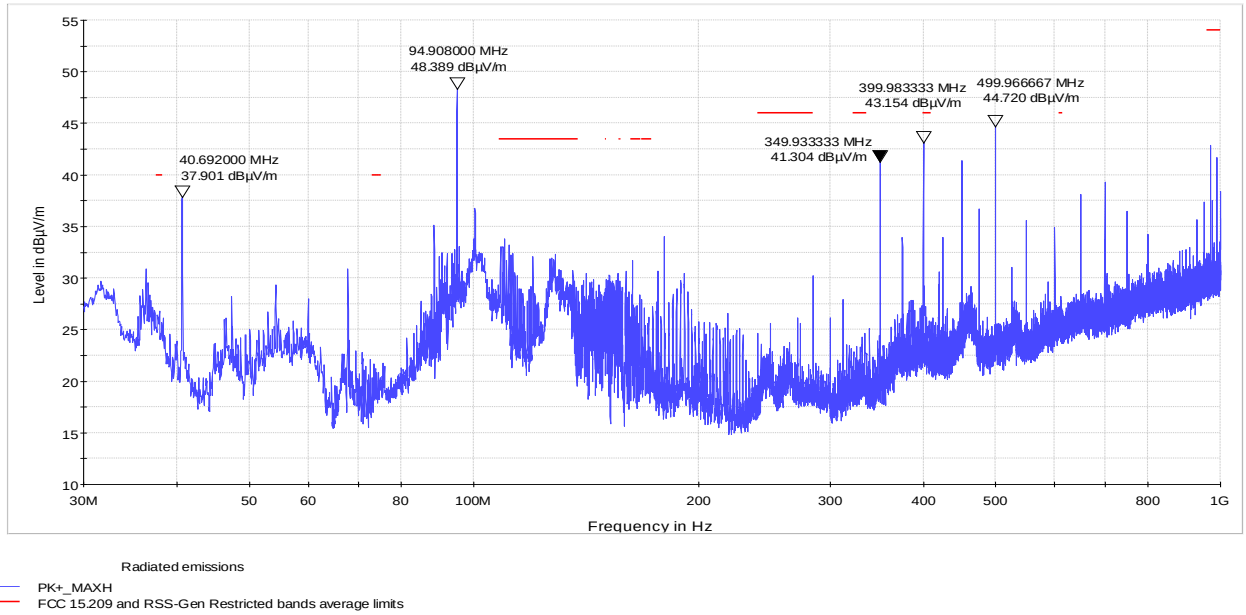


Figure 8.1-1: *Radiated spurious emissions below 1 GHz with RFID and Wi-Fi on low channel*

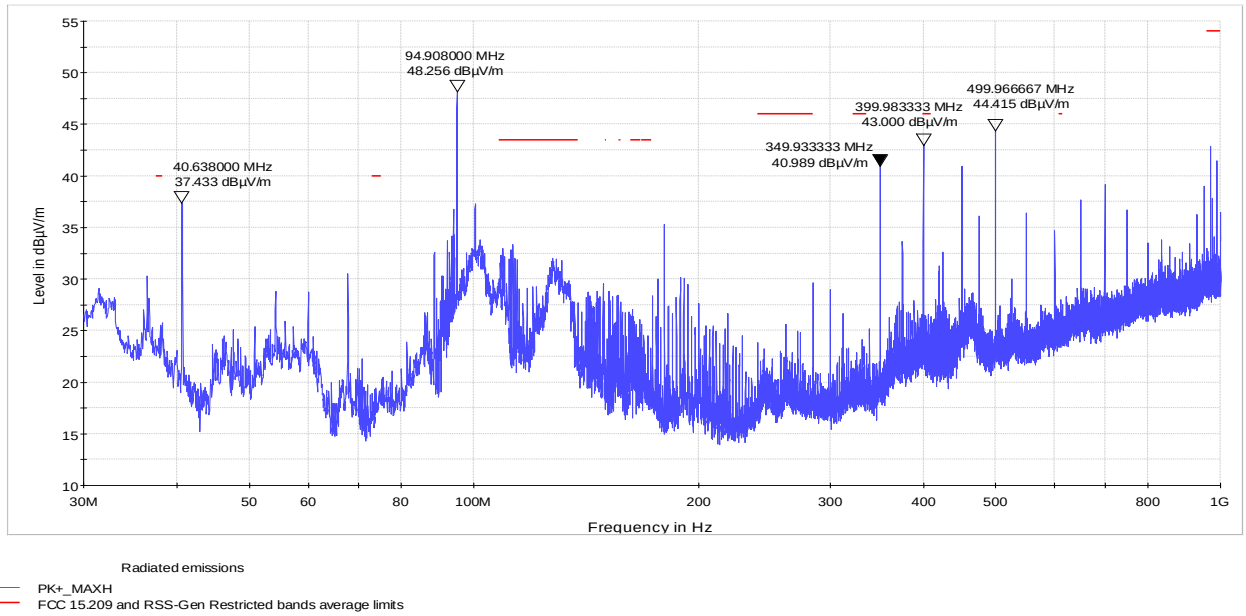


Figure 8.1-2: *Radiated spurious emissions below 1 GHz with RFID and Wi-Fi on mid channel*

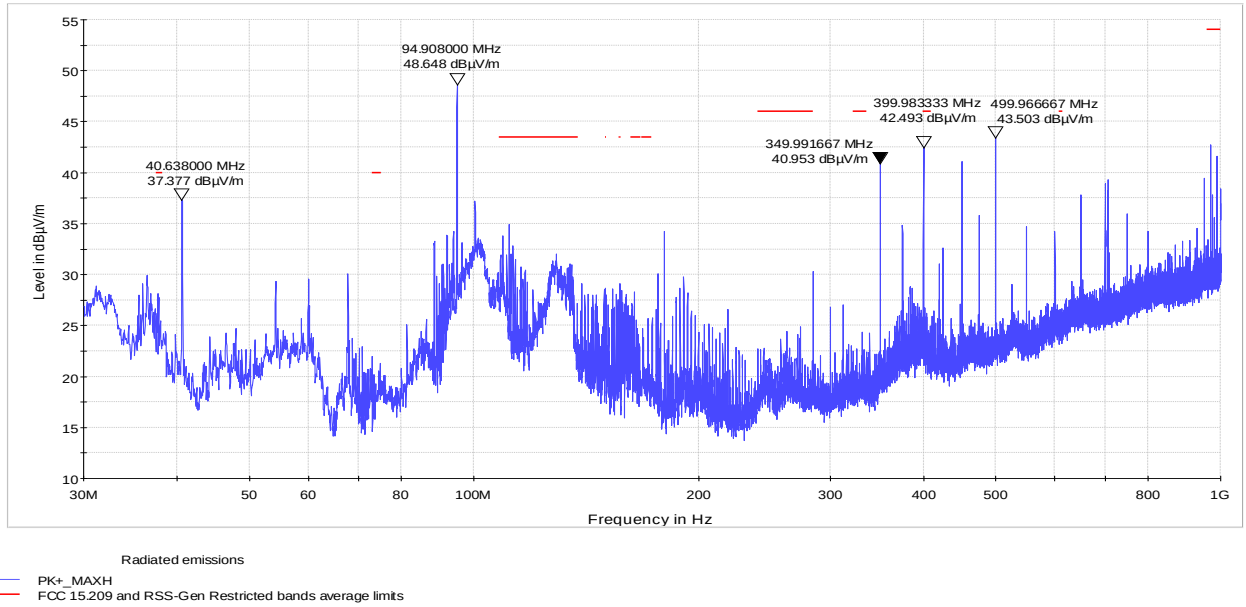


Figure 8.1-3: *Radiated spurious emissions below 1 GHz with RFID and Wi-Fi on high channel*

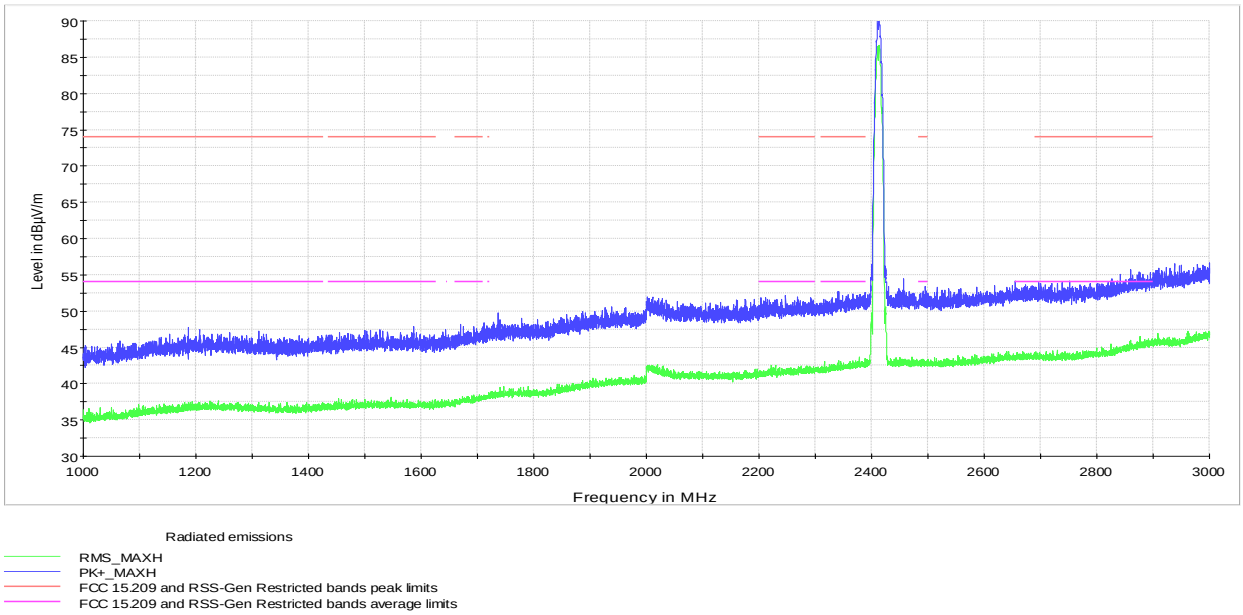


Figure 8.1-4: *Radiated spurious emissions within 1–3 GHz with RFID and Wi-Fi on low channel*

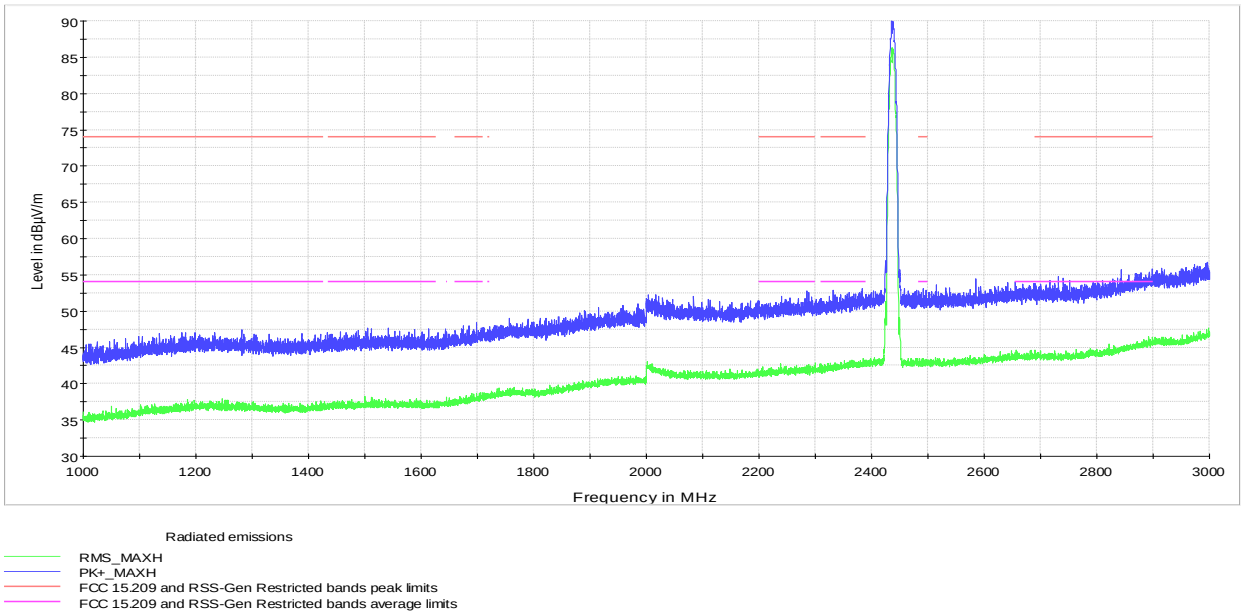


Figure 8.1-5: *Radiated spurious emissions within 1–3 GHz with RFID and Wi-Fi on mid channel*

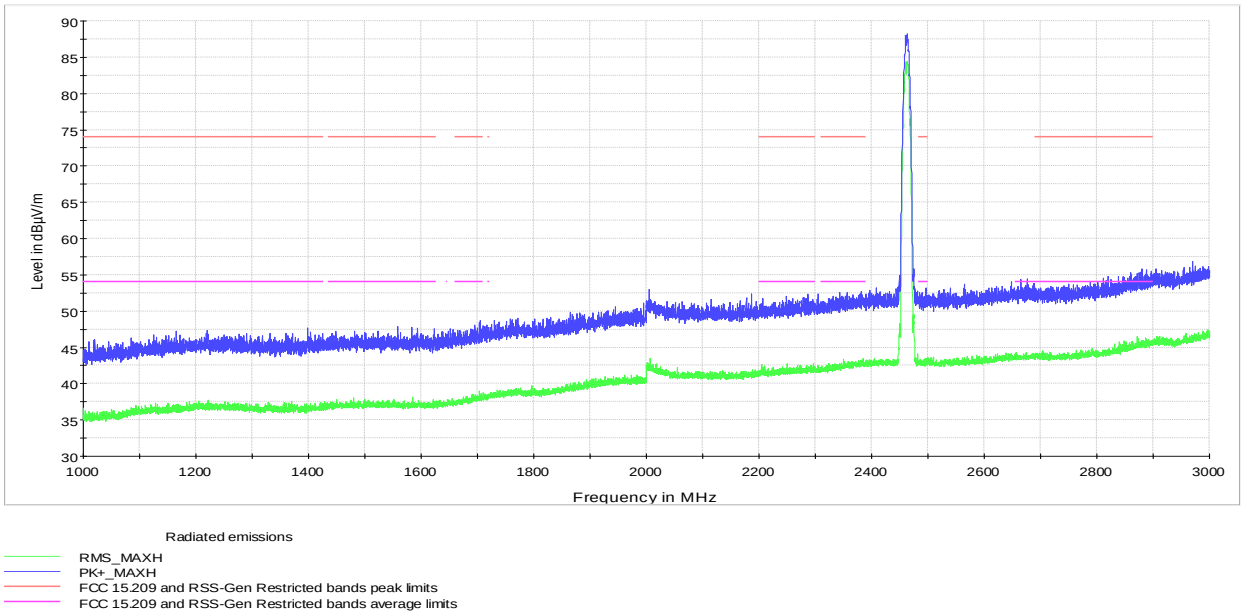


Figure 8.1-6: *Radiated spurious emissions within 1–3 GHz with RFID and Wi-Fi on high channel*

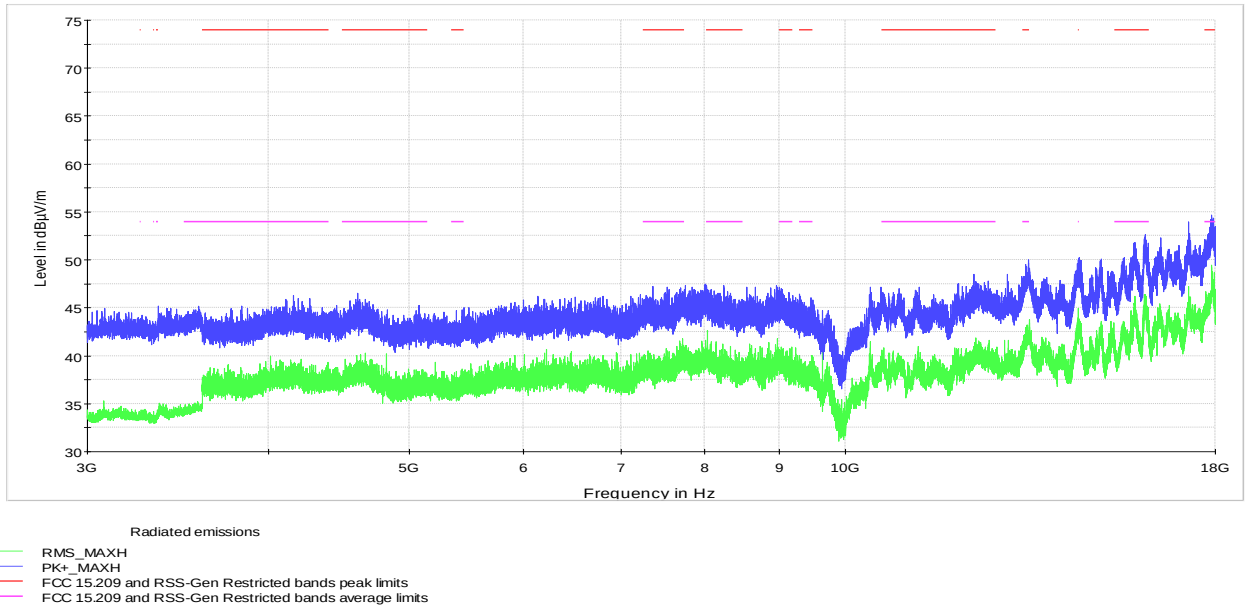


Figure 8.1-7: *Radiated spurious emissions within 3–18 GHz with RFID and Wi-Fi on low channel*

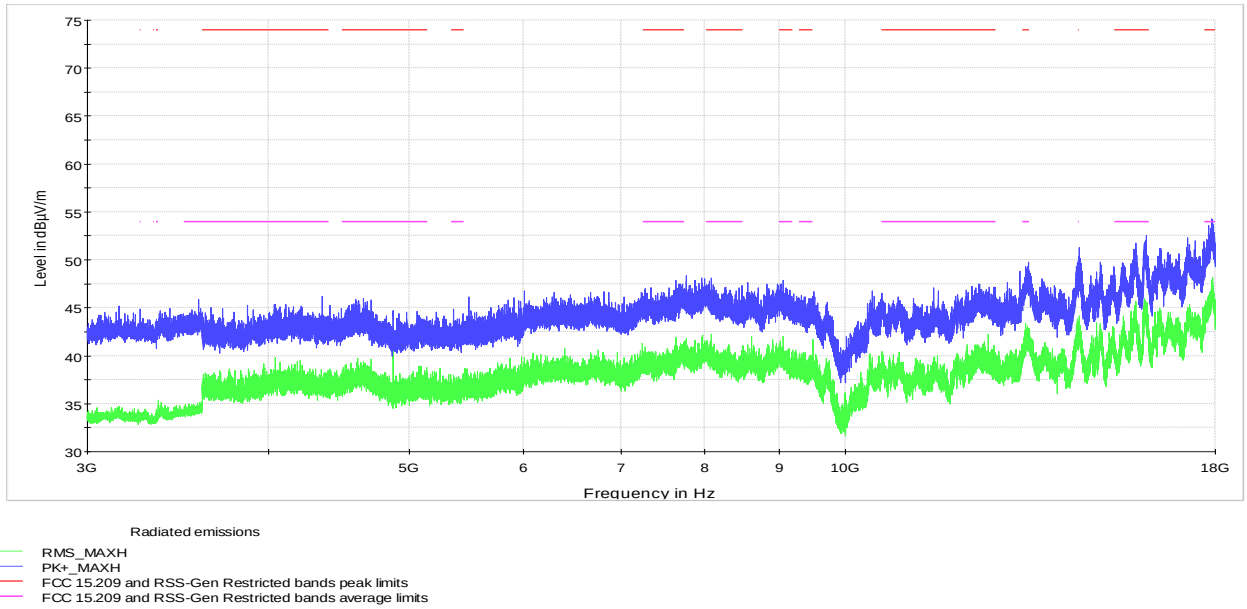


Figure 8.1-8: *Radiated spurious emissions within 3–18 GHz with RFID and Wi-Fi on mid channel*

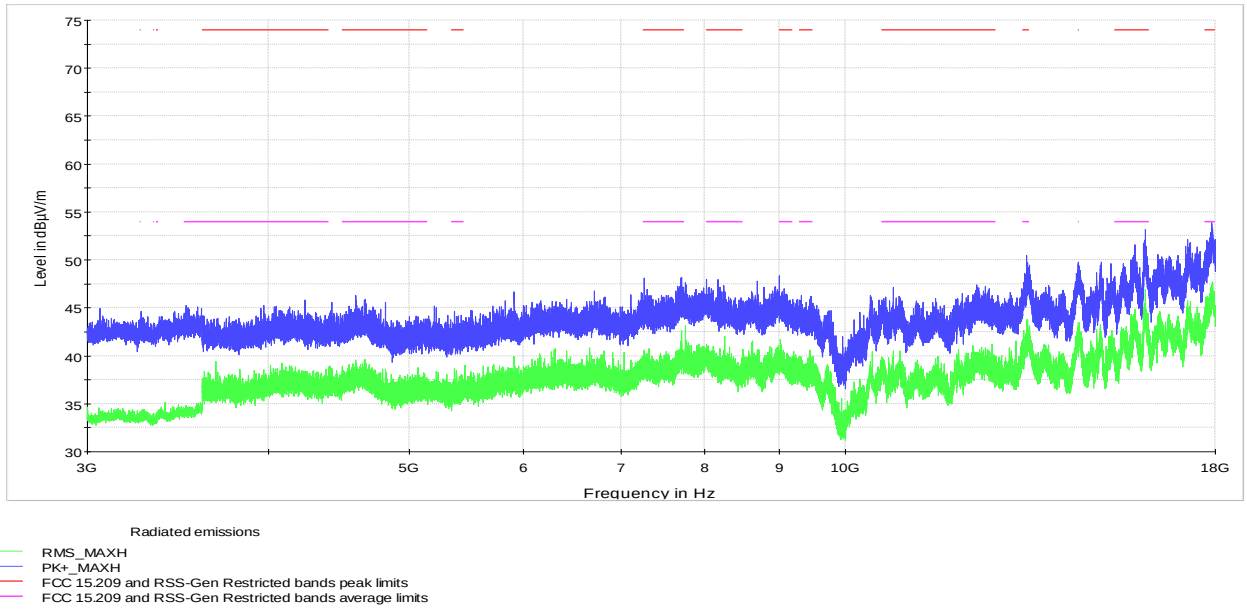
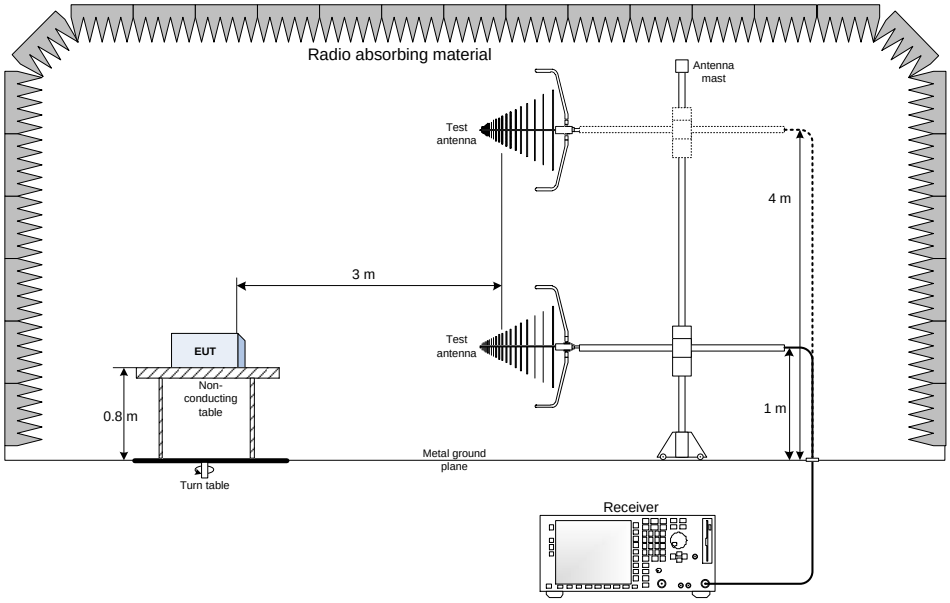


Figure 8.1-9: *Radiated spurious emissions within 3–18 GHz with RFID and Wi-Fi on high channel*

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz