

Prüfbericht-Nr.: <i>Test report no.:</i>	60392919 001	Auftrags-Nr.: <i>Order no.:</i>	238113896	Seite 1 von 17 Page 1 of 17
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	23-Dec-2019	
Auftraggeber: <i>Client:</i>	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States.			
Prüfgegenstand: <i>Test item:</i>	SAMR30 IEEE 802.15.4 Sub-1GHz Module			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	ATSAMR30M18A			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15C / IC RSS-247 Test report (C2PC)			
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.247 ISED RSS-247 (02-2017)			
Wareneingangsdatum: <i>Date of sample receipt:</i>	19-Dec-2019			
Prüfmuster-Nr.: <i>Test sample no.:</i>	A001045032-001~ A001045032-008			
Prüfzeitraum: <i>Testing period:</i>	26-Jan-2020–23-Jul-2020			
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Laboratory Taipei			
Prüflaboratorium: <i>Testing laboratory:</i>	Taipei Testing laboratories			
Prüfergebnis*: <i>Test result*:</i>	Pass			
überprüft von: <i>reviewed by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: 23-Jul-2020 <i>Date:</i>	 Jack H.C. Chang		Datum: 23-Jul-2020 <i>Date:</i>	
Stellung / Position:	Project Manager		 Ryan W.T. Chen	
Stellung / Position:	Project Manager			
Sonstiges / Other:	The modified module will not impact conducted signal and verified the electrically identical in conducted signal characteristics, thus only re-test radiated emissions and reported. Radiated spurious emission was tested for 2nd source BoM change and antenna change. For other test items, refer to original report 50176780 001.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend N/A = nicht anwendbar	4 = ausreichend N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory N/A = not applicable	4 = sufficient N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Prüfbericht - Nr.: 60392919 001
Test Report No.

Seite 2 von 17
Page 2 of 17

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT

RESULT: Passed

5.1.2 SPURIOUS EMISSION

RESULT: Passed

5.2.1 MAINS CONDUCTED EMISSIONS

RESULT: Passed

6.1 RF EXPOSURE COMPLIANCE

RESULT: Passed

Contents

1.	GENERAL REMARKS	4
1.1	COMPLEMENTARY MATERIALS.....	4
2.	TEST SITES	5
2.1	TEST LABORATORY	5
2.2	TEST FACILITY.....	5
2.3	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	6
2.4	TRACEABILITY	7
2.5	CALIBRATION	7
2.6	MEASUREMENT UNCERTAINTY	7
3.	GENERAL PRODUCT INFORMATION.....	8
3.1	PRODUCT FUNCTION AND INTENDED USE	8
3.2	SYSTEM DETAILS AND RATINGS.....	8
3.3	INDEPENDENT OPERATION MODES.....	9
3.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS	9
3.5	SUBMITTED DOCUMENTS.....	9
4.	TEST SET-UP AND OPERATION MODES.....	10
4.1	PRINCIPLE OF CONFIGURATION SELECTION	10
4.2	TEST OPERATION AND TEST SOFTWARE.....	10
4.3	AUXILIARY EQUIPMENT	11
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	11
4.5	TEST SETUP DIAGRAM	12
5.	TEST RESULTS	13
5.1	TRANSMITTER REQUIREMENT & TEST SUITES	13
5.1.1	<i>Antenna Requirement</i>	<i>13</i>
5.1.2	<i>Spurious Emission</i>	<i>14</i>
5.2	MAINS EMISSIONS.....	15
5.2.1	<i>Mains Conducted Emissions.....</i>	<i>15</i>
6.	SAFETY HUMAN EXPOSURE.....	16
6.1	RF EXPOSURE COMPLIANCE	16
7.	LIST OF TABLES	17

1. General Remarks

1.1 Complementary Materials

The following attachments are integral parts of this test report:

Appendix P: Photo Documentation

(File Name: 60392919 001 Appendix P)

Appendix D: Test Result of Radiated Emissions

(File Name: 60392919 001 Appendix D)

Appendix X: Test Result of Radiated Emissions

(File Name: 60392919 001 Appendix X)

Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.247
FCC 47CFR Part 2: Subpart J Section 2.1093
ISED RSS-247 Issue 2, Feb 2017
ISED RSS-102 Issue 5, March 2015
ISED RSS-Gen, Issue 5, March 2019
ANSI C63.10:2013
KDB558074 D01 DTS Meas Guidance v05r02
KDB447498 D01 General RF Exposure Guidance v06

2. Test Sites

2.1 Test Laboratory

Taipei Testing laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

2.2 Test Facility

Taipei Testing laboratories

No. 458-18, Sec 2, Fenliao., Linkou Dist.
New Taipei City 244
Taiwan (R.O.C.)

FCC Registration No.: 226631
IC Canada Registration No.: 25563
TAF Accredited NCC Test Lab. No.:3567
TAF ISO17025 Certification effective period: 6th-May-2019 to 05th-May-2022



Testing Laboratory
3567

2.3 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Radiated emission test date: 2020/01/26~2020/02/14

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	102108	2019/4/17	2020/4/16
Spectrum Analyzer	R&S	FSV40	101508	2020/2/05	2021/2/04
Pre-Amplifier	Agilent	8447D	2944A10772	2019/2/22	2020/2/21
Pre-Amplifier	EMCI	EMC051845SE	980633	2019/2/25	2020/2/24
Pre-Amplifier	EMCI	EMC184045SE	980657	2019/2/23	2020/2/22
Bilog Antenna	SCHWARZBECK	VULB-9168	00951	2020/1/14	2021/1/13
Horn Antenna	ETS-Lindgren	3117	00218930	2019/12/06	2020/12/05
Horn Antenna	SCHWARZBECK	BBHA 9170	00887	2019/4/12	2020/4/11
Loop Antenna	EMCI	LPA600	287	2019/12/20	2020/12/19
Test Software	Audix	e3	Ver. 9	N/A	N/A
Test Cable	HUBER+SUHNER	SUCOFLEX 104EA_9k~18G	800056/4EA	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	804680/4	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 104_9k~18G	MY37202/4	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800898/2EA	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	800901/2EA	2019/4/18	2020/4/17
Test Cable	HUBER+SUHNER	SUCOFLEX 102EA_1G~40G	801027/2EA	2019/4/18	2020/4/17

AC Mains test date: 2020/07/23

Kind of Equipment	Manufacturer	Type	S/N	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	102108	2020/3/16	2021/3/15
Two-Line V-Network (for EUT)	Rohde & Schwarz	ENV216	101243	2019/06/23	2020/06/23
Two-Line V-Network	Rohde & Schwarz	ENV216	101262	2019/07/16	2020/07/16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54-102102-HN	2019/07/25	2020/07/25

2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.5 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are $\pm 3\text{dB}$.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
RF power, conducted	$\pm 1.5 \text{ dB}$
Adjacent channel power	$\pm 3 \text{ dB}$
Radiated emission of transmitter, valid up to 26 GHz	$\pm 6 \text{ dB}$
Radiated emission of receiver, valid up to 26 GHz	$\pm 6 \text{ dB}$
Temperature	$\pm 2 \text{ }^{\circ}\text{C}$
Humidity	$\pm 10 \text{ } \%$

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a SAMR30 IEEE 802.15.4 Sub-1GHz Module. The Module has RF Shield. The Antenna is not part of the module, The RF output is routed to PCB antenna in host ATSAMR30M Sensor Board

For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment	SAMR30 IEEE 802.15.4 Sub-1GHz Module
Type Designation	ATSAMR30M18A
FCC ID	2ADHKR30M
Canada ID	20266-R30M
Canada HVIN	ATSAMR30M18A

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	906 MHz ~ 924 MHz
Channel Spacing	2MHz
Number of Channels	10
Operation Voltage	1.8-3.6 V. EVB is supplied with 5V via USB, this is regulated to 3.3V and supplied to DUT
Modulation	BPSK-ALT-40, OQPSK-SIN-250, OQPSK-SIN-1000-SCR-ON
Antenna gain	Module with Sensor Board: PCB antenna: 0.44dBi

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
 - 1. Low channel
 - 2. Middle channel
 - 3. High channel
- B. Receiving
- C. Standby
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- | | |
|-------------------------|-------------------|
| - Photo Document | - Circuit Diagram |
| - Technical Description | - Block Diagram |
| - Rating Label | |

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

Module with Sensor Board:

Mode	Channel Frequency		
	906 MHz	914 MHz	924 MHz
BPSK	11	11	11
O-QPSK	11	11	11

4.2 Test Operation and Test Software

Setup for testing: Sensor board connected with mikroe's FTDI Click board which has USB interface to control them.

This software (Performance analyzer) was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

The samples were used as follows:

Conducted: A00104532-008

Radiation for Module with Sensor Board (PCB antenna): A001045032-003

The original test report is 50176780 001 which is tested module of ATSAMR30M18A, Radiated spurious emission has been tested according to below the different application.

1. 2nd Source BOM Module with Sensor Board.

Full test was applied on all test modes, but only worst case is shown.

BPSK-ALT-40 mode:

Channel Low (906MHz), Channel Mid (914MHz) and Channel High (924MHz) with 40kbps data rate were chosen for full testing and Channel Mid (914MHz) with 40kbps data rate for spot check testing.

OQPSK-SIN-250 mode:

Channel Low (906MHz), Channel Mid (914MHz) and Channel High (924MHz) with 250kbps data rate were chosen for full testing.

OQPSK-SIN-1000-SCR-ON mode:

Channel Low (906MHz), Channel Mid (914MHz) and Channel High (924MHz) with 1Mbps data rate were chosen for full testing.

4.3 Auxiliary Equipment

The product has been tested together with the following additional accessories:

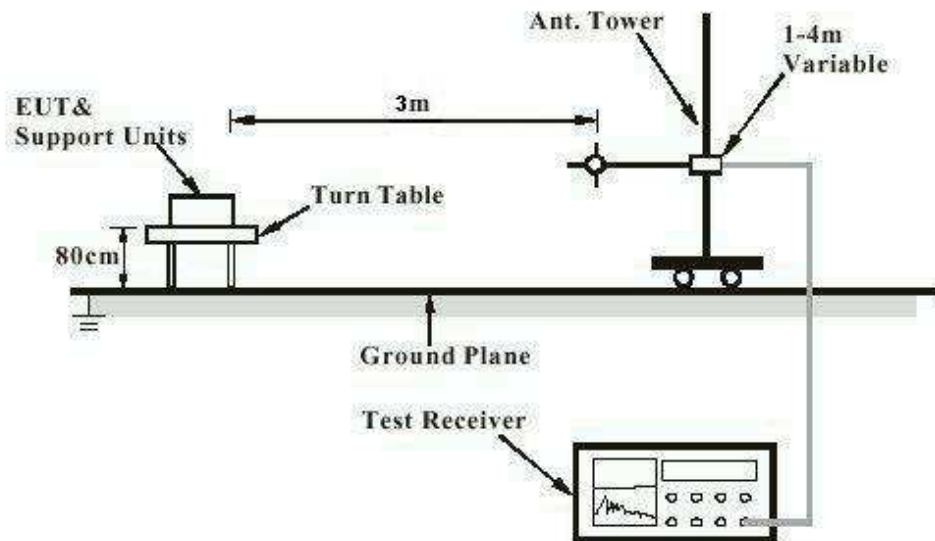
Description	Manufacturer	Model No.	Serial No.
Notebook	Lenovo	TP00048A	PB-0F8B2

4.4 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m.

5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:

Passed

Test standard : FCC Part 15.247(b)(4), Part 15.203 and
ISED RSS-Gen 8.3

According to the manufacturer declaration, EUT on the Sensor Board has PCB antenna on board.
Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Spurious Emission

RESULT:

Passed

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209, ISED RSS-247 5.5 and ISED RSS-Gen Issue 5 8.9
Basic standard	:	ANSI C63.10:2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and ISED RSS-Gen i5, 8.10 (Table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and ISED RSS-Gen i5, 8.9 (Table 5 and 6). Emission radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in FCC15.247(d) and ISED RSS-247 i2, 5.5
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/ Middle/ High
Operation mode	:	A

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

5.2 Mains Emissions

5.2.1 Mains Conducted Emissions

RESULT:**Passed**

Test standard	:	FCC Part 15.207 FCC Part 15.107 RSS-Gen 8.8
Limits	:	Mains Conducted emissions as defined in above test standards must comply with the mains conducted emission limits specified
Kind of test site	:	Shielded Room

Test setup

Test Channel	:	Normal link
Operation mode	:	Normal link
Ambient temperature	:	20-24 °C
Relative humidity	:	50-65 %
Atmospheric pressure	:	100-103 kPa

Remark: For details refer to Appendix D.

6. Safety Human Exposure

6.1 RF Exposure Compliance

RESULT:**Passed**

Separation distance is more than 20 cm, thus mobile device exposure limits can be applied.

Maximum Exposure:

Power to Antenna (mW)	7.4 mW
Power to Antenna (dBm)	8.7 dBm
Antenna Gain	0.44 dBi
Power+Ant Gain	8.2 mW
Distance	20 cm
S=	0.002 mW/cm ²

Limit FCC: 0.61 mW/cm²

Limit Canada: 1.37W

FCC:

0.3-1.34 MHz	(100) mW/cm ²
1.34-30 MHz	(180/f ²) mW/cm ²
30-300 MHz	0.2 mW/cm ²
300-1500 MHz	f/1500 mW/cm ²
1500-100,000 MHz	1.0 mW/cm ²

Canada:

At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz

---End---

7. List of Tables

Table 1: Applied Standard and Test Levels	4
Table 2: List of Test and Measurement Equipment	6
Table 3: Emission Measurement Uncertainty.....	7
Table 4: Basic Information of EUT	8
Table 5: Technical Specification of EUT	8