

TEST REPORT

For

Bluetooth device evaluation board

In conformity with

FCC CFR 47 Part15 Subpart C

Product Marketing Name(PMN)**: SAPPHIRE-680FSG
SAPPHIRE-681FSG****Hardware Version Identification Number(HVIN)****: SAPPHIRE-68XFSG****FCC ID****: 2AKW4-68XFSG****Report No.****: WE180621BD1-11****Issue Date****: July 26, 2018****Prepared for**

SENSYST Co., Ltd.

7F, Masuni Daiichi BLDG, 2-4-6, Shinyokohama,
Kohoku-ku, Yokohama, Kanagawa, 222-0033 Japan**Prepared by**

SGS Japan Inc.

472, Nippa-cho, Kohoku-ku, Yokohama 224-0021, Japan

Telephone: +81-(0)45-534-0645

Faximile: +81-(0)45-592-7506

This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced expert, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは <http://www.sgs.com> で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご確認ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験サンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。

Table of contents

1	General information.....	3
1.1	Product description	3
1.2	Test(s) performed/ Summary of test result	4
1.3	Test facility	5
1.4	Measurement uncertainty.....	6
1.5	Summary of test results.....	6
1.6	Setup of equipment under test (EUT)	7
1.6.1	Test configuration of EUT	7
1.6.2	Operating condition	7
1.6.3	Setup diagram of tested system.....	8
1.7	Equipment modifications	8
1.8	Deviation from the standard	8
2	Test procedure and test data	9
2.1	Occupied Bandwidth (99%).....	9
2.2	Occupied Bandwidth (6 dB)	13
2.3	Power Spectral Density.....	17
2.4	Peak Output Power	21
2.5	Conducted Spurious Emissions.....	25
2.6	Radiated emissions (for restricted frequency band).....	40
2.7	AC power line conducted emissions.....	58
3	Test setup photographs	71
3.1	Radiated emissions	71
3.2	AC power line conducted emissions.....	75
4	List of utilized test equipment / calibration	76

History

Report No.	Date	Revisions	Issued By
WE180621BD1-11	July 26, 2018	Initial Issue	T.Yonemura

This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは <http://www.sgs.com> で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご注意ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験サンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。

1 General information

1.1 Product description

Test item : Bluetooth device evaluation board
 Manufacturer : SENSYST Co., Ltd.
 Address : 7F, Masuni Daiichi BLDG, 2-4-6, Shinyokohama, Kohoku-ku, Yokohama, Kanagawa 222-0033 Japan
 Product Marketing Name(PMN) : SAPPHIRE-680FSG
 SAPPHIRE-681SFG
 Hardware Version Identification Number(HVIN) : SAPPHIRE-68XFSG
 FCC ID : 2AKW4-68XFSG
 Serial number : A060002 (SAPPHIRE-680FSG)
 A070002 (SAPPHIRE-681FSG)
 Hardware version : 1.00
 Software version : 1.00
 Operating frequency : 2402 - 2480 MHz
 Modulation : GFSK
 Antenna Gain : 2.65 dBi
 Receipt date of EUT : June 21, 2018
 Nominal power source voltages : DC 5.0 V or DC 2.5 V

Similar model : This EUT has similar model.

Product Marketing Name(PMN)	Note
SAPPHIRE-680FSG	Tested Flash memory: Not include on RF chip
SAPPHIRE-681FSG	Tested Flash memory: Included on RF chip

This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは <http://www.sgs.com> で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご注意ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験サンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。

1.2 Test(s) performed/ Summary of test result

Test specification(s) : FCC CFR 47 Part 15 Subpart C (01 Oct. 2017)
Test method(s) : ANSI C63.10: 2013
Test(s) started : July 2, 2018
Test(s) completed : July 6, 2018

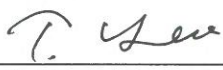
Summary of test result : Complied

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.


The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.

Compliance of the EUT is more probable than non-compliance is case that the margin is less than the measurement uncertainty in the Laboratory.

Test engineer

: 
T. Yonemura
Engineer
Wireless testing laboratory

Reviewer

: 
T. Ikegami
Wireless/EMC Service Manager
Wireless testing laboratory

This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced except, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは<http://www.sgs.com>で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご注意ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験したサンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。

JP 010597

1.3 Test facility

[Yokohama Laboratory]

Address: 472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, Japan
TEL: +81-45-534-0645
FAX: +81-45-592-7506

Accredited by National Voluntary Laboratory Accreditation Program (NVLAP) for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

Registered by ISED Number: The registered facility number is as follows;
Test site (Semi-Anechoic chamber 3m): 6974A-1

Registered by Voluntary Control Council for Interference by Information Technology Equipment (VCCI)
Each registered facility number is as follows;
Test site A-0045

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



This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは <http://www.sgs.com> で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご注意ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験サンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。

1.4 Measurement uncertainty

The treatment of uncertainty is based on the general matters on the definition of uncertainty in “Guide to the expression of uncertainty in measurement (GUM)” published by ISO. The Lab’s uncertainty is determined by referring ETSI TR 100 028-1 V1.4.1 (2001-12).

The uncertainty of the measurement result in the level of confidence of approximately 95% (k=2) is as follows;

Conducted emission (150 kHz - 30 MHz):	± 3.4 dB
Radiated emission (9 kHz - 30 MHz):	± 5.1 dB
Radiated emission (30 MHz - 1000 MHz):	± 5.3 dB
Radiated emission (1 GHz - 6 GHz):	± 5.2 dB
Radiated emission (6 GHz - 18 GHz):	± 5.2 dB
Radiated emission (18 GHz - 26 GHz):	± 5.7 dB

1.5 Summary of test results

Requirement	Section in FCC	Result	Section in this report
Occupied Bandwidth (99 %)	2.1049	Complied	2.1
Occupied Bandwidth (6 dB)	15.247 (a)(2)	Complied	2.2
Power Spectral Density	15.247 (e)	Complied	2.3
Peak Output Power	15.247 (b)(3)	Complied	2.4
Conducted Spurious Emissions	15.247 (d)	Complied	2.5
Tx Radiated Spurious Emissions	15.205 (d)/15.209	Complied	2.6
Tx AC Power Line Spurious Emissions	15.207	Complied	2.7

FCC Part 15.31 (e)

This EUT provides stable voltage (DC 1.2 V) constantly to the wireless transmitter regardless of input voltage. Therefore, the equipment complied with the requirement.

FCC Part 15.203 Antenna requirement

The antenna is not removable from EUT.

Therefore, the equipment complied with the antenna requirement.

This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは <http://www.sgs.com> で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご注意ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験サンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。

1.6 Setup of equipment under test (EUT)

1.6.1 Test configuration of EUT

Equipment(s) under test

No.	Item	Manufacture	Model No.	Serial No.
A1	Bluetooth device evaluation board	SENSYST CO., LTD.	SAPPHIRE-680FSG	A060002
A2	Bluetooth device evaluation board	SENSYST CO., LTD.	SAPPHIRE-681FSG	A070002

Support Equipment(s)

No.	Item	Manufacture	Model No.	Serial No.
B	Laptop Computer	Sony	PCG-5V1N	27509363110825
C	AC Adaptor	Sony	VGP-AC16V11	1479948220241264

Connected cable(s)

No.	Item	Identification (Manu.etc.)	Cable Shielded	Ferrite Core	Length [m]
1	USB	-	Shielded	Yes	0.5
2	USB Extend	Use for radiated test setup	Shielded	None	2.0
3	DC	-	Unshielded	None	1.8
4	AC	-	Unshielded	None	0.9

1.6.2 Operating condition

Operating Mode	Power Setting	Remarks
Continuous Tx, LE, 1 Mbps	8	-
Continuous Tx, LE, 2 Mbps	8	-

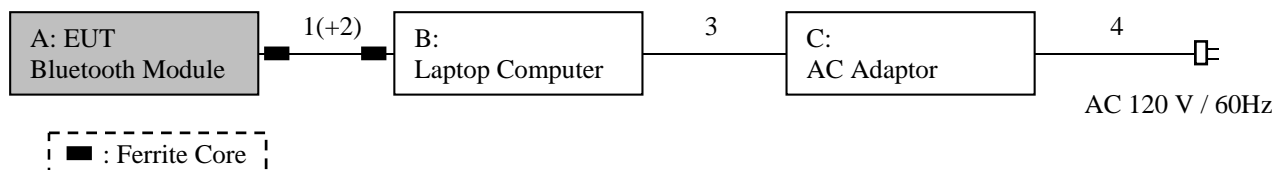
Tested Frequency [MHz]	Remarks
2402	-
2440	-
2480	-

Software for RF test	Version	Remarks
HCITester_100.exe	1.00	-

This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced expert, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは <http://www.sgs.com> で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご注意ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験サンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。

1.6.3 Setup diagram of tested system



1.7 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable standards described in clause 1.2.

1.8 Deviation from the standard

No deviations from the standards described in clause 1.2.

This Test Report is issued by the Company under its General Conditions of Service printed overleaf or available on request and accessible at <http://www.sgs.com>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Unless otherwise stated the results shown in this Test Report refer only to the sample(s) tested. This Test Report cannot be reproduced, in full, without prior approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this test report is unlawful and offenders may be prosecuted to the fullest extent of the law.

この試験報告書は裏面に記載された、もしくは <http://www.sgs.com> で入手が可能なサービスに関する一般的条件に則して発行されます。そちらに明記されている弊社の負うべき債務・補償の範囲及び司法管轄の項目をご注意ください。他に特に明記のない限り、この試験報告書に記載された結果は、試験サンプルのみに属します。この書面全体の複製以外には、弊社からの事前の許可を得ること無く複製することを禁じます。この試験報告書を無断で変更、偽造、改ざんすることは違法であり、違反者に対しては法的手段を講じることとなります。