



TEST REPORT

Test Report No. : UL-RPT-RP-14186885-816

Applicant: Signify (China) Investment Co, Ltd
Model Number: 9290030171A with integral Inverted F antenna
FCC ID: 2AGBW9290030171AX
Test Standard(s): Antenna Gain Measurement
(Derived rom FCC Part 15.247(b)(3))

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2. The results in this report apply only to the sample tested.
3. Test Report Version 1.0

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Date: 16 November 2022

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Date: 16 November 2022



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D-PL-19381-02-00

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1. Customer Information

1.1.Applicant Information

Company Name:	Signify (China) Investment Co, Ltd
Company Address:	Building 9, No.888, Tianlin Road, 200233 Shanghai
Contact Person:	Mr. Tim Su
Contact E-Mail Address:	Tim.su@signify.com
Contact Phone No.:	+86 13482810669

1.2.Manufacturer Information

Company Name:	Signify (China) Investment Co, Ltd
Company Address:	Building 9, No.888, Tianlin Road, 200233 Shanghai
Contact Person:	Mr. Tim Su
Contact E-Mail Address:	Tim.su@signify.com
Contact Phone No.:	+86 13482810669

2. Summary of Testing

2.1. General Information

Applied Standards

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Sections 15.247

Location

Location of Testing:	UL International Germany GmbH Hedelfinger Str. 61 70327 Stuttgart Germany
Test Firm Registration:	399704

Date information

Order Date:	20 January 2022
EUT arrived:	14 September 2022
Test Dates:	22 September 2022 & 28 October 2022
EUT returned:	-/-

2.2. Summary of Test Results

Clause	Measurement
Part 15.247(b)(3) / ANSI C63.10 Annex G	Antenna Gain Measurement

Results:

Frequency (MHz)	Conducted Output Power (dBm)	Radiated Output Power (dBm)	Antenna Gain (dBi)
2405	6.32	6.87	0.55
2480	6.25	6.23	-0.02

Notes:

1. Antenna Gain in dBd was calculated in accordance with ANSI C63.10 G.3:

$$ERP/EIRP = P_T + G_T - L_c$$

Rearranged:

$$G_T = ERP/EIRP - P_T + L_c$$

Lc is ignored since there is no cable connected between transmitter and antenna.

2. The calculated Antenna Gain is in dBi, since the correction factors used in the measurement of Radiated output power were also calculated by considering the Antenna dBi values.

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 558074 D01 DTS Meas Guidance v05r02 April 2, 2019
Title:	Guidance for compliance measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under Section 15.247 of the FCC rules

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:	Philips
Model Name or Number:	9290030171A with integral Inverted F antenna
Test sample Serial Number:	DUT 3 (Radiated Test sample)
Hardware Version:	73405200
Software Version:	73781400
FCC ID:	2AGBW9290030171AX

Brand Name:	Philips
Model Name or Number:	9290030171A with integral Inverted F antenna
Test sample Serial Number:	DUT 11 (Radiated Test sample)
Hardware Version:	73405200
Software Version:	73781400
FCC ID:	2AGBW9290030171AX

Brand Name:	Philips
Model Name or Number:	9290030171A
Test sample Serial Number:	DUT 1 (Conducted Test sample with SMA connector)
Hardware Version:	73405200
Software Version:	73781400
FCC ID:	2AGBW9290030171AX

Brand Name:	Philips
Model Name or Number:	9290030171A
Test sample Serial Number:	DUT 10 (Conducted Test sample with SMA connector)
Hardware Version:	73405200
Software Version:	73781400
FCC ID:	2AGBW9290030171AX

3.2. Description of EUT

The equipment under test was a lightning control module with Model No. 9290030171A with integral Inverted F antenna, supporting ZigBee (IEEE 802.15.4) operations in 2.4 - 2.4835 GHz ISM band.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	ZigBee (IEEE 802.15.4) / (Digital Transmission System)		
Equipment Classification:	Digital Transmission System (DTS)		
Type of Unit:	Transceiver		
Operating Frequency Range:	2405 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	RF Channel Number	Frequency (MHz)
	Bottom	11	2405
	Top	26	2480
Power Supply Requirement(s):	3 V DC via Internal battery Or via External power supply		

3.5. Description of Available Antenna

The radio utilizes an Integrated, inverted F antenna with maximum measured gain stated below. The measured conducted peak output power was subtracted from the measured radiated peak EIRP to obtain the antenna gain in dBi.

Antenna Details	Antenna Type	Frequency (MHz)	Antenna Gain (dBi)
Integral Antenna	Inverted F Antenna	2405	0.55
		2480	-0.02

3.6. Support Equipment

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

A. Support Equipment (In-house)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Laboratory AC/DC Power Supply	Aim - TTI	CPX400S	507111

B. Support Equipment (Manufacturer supplied)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	-/-	-/-	-/-	-/-

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Zigbee Test Mode: Continuously transmitting modulated carrier with combination of
 - Data Rate: 250 kbps
 - Payload Type: PRBS9
 - Power Settings (MAX PWR): 6 dBm
 - Channels: Bottom / Top

4.2. Configuration and Peripherals

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

EUT Power Supply:

- The EUT was powered with a 3V DC via external power supply.

Test Mode Activation:

- The EUT was prepared to transmit continuously with max power when powered. Each EUT was configured to a single channel.

Conducted Measurements:

- All conducted measurements were carried out by using the EUT RF sample with SMA connector. The SMA RF cable's attenuation (maximum 0.5 dB@2.4GHz) was added to as a reference level offset to each of the conducted plots.

Radiated Measurements:

- All radiated measurements were carried out by using the EUT Radiated sample.
- Before starting final radiated measurements "worst case verification" with the EUT in Standing, Laying and 45° tilting position was performed.
- The EUT with its Integral antenna in standing position was found out to be the worst-case. Therefore, this report includes relevant test results
- The radiated measurements above 30 MHz were performed with the EUT positioned on the turn table and rotating 360 degrees while the antenna height varies from 1 to 4 m over the measurement frequency range to find the maximum output power.

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 Uncertainty* for details.

In accordance with DAkkS 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 Maximum (Peak) Output Power

Test Summary:

Test Engineer:	Muhammad Faiq Khan	Test Date:	22 September 2022
Test Sample Serial Number:	DUT 1 and DUT 10 (Conducted Test samples with SMA connector)		
Test Site Identification	SR 9		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	FCC KDB 558074 Section 8.3.1.1 referencing ANSI C63.10 Sections 11.9.1.1

Environmental Conditions:

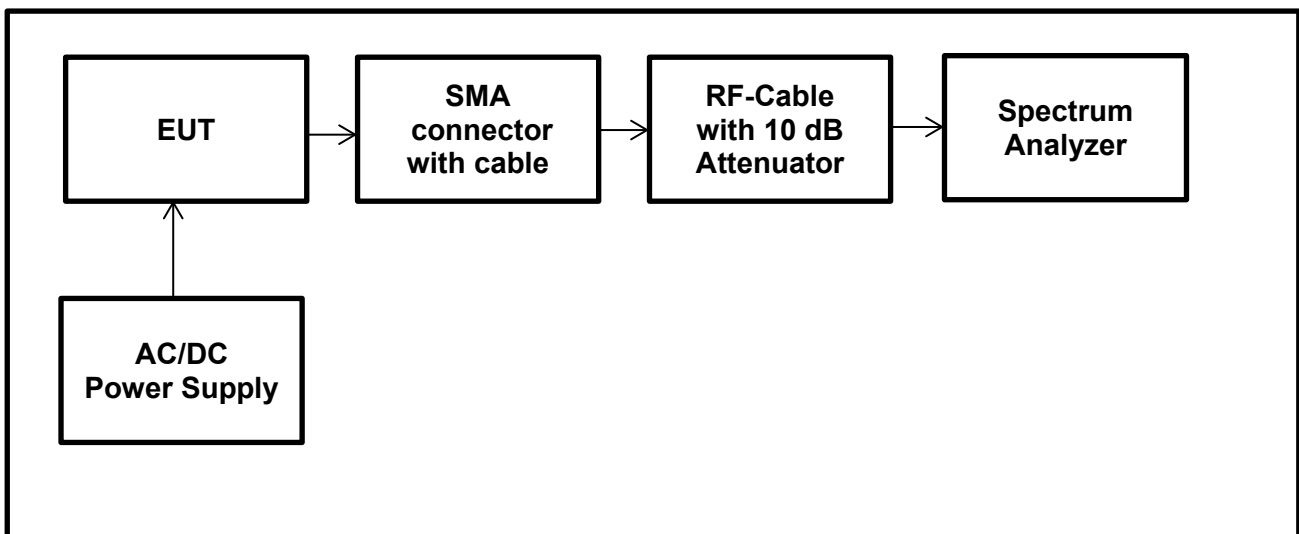
Temperature (°C):	24.3
Relative Humidity (%):	36.1

Notes:

1. The spectrum analyser resolution bandwidth was set to 3 MHz and video bandwidth of 10 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 10 MHz. A marker was placed at the peak of the signal and the results recorded in the table below.
2. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values take into consideration the external attenuation correction factors.
 - o The SMA connector with RF Cable connected to the EUT with maximum attenuation of 0.5 dB at the tested frequencies.
 - o The RF cable from the EUT to Analyzer with maximum attenuation of 0.5 dB at the tested frequencies including the 10 dB attenuator at the input of Spectrum Analyzer

Therefore, total a reference level offset 11.0 dB was added to each of the at the tested frequencies conducted plots.

Test Setup:

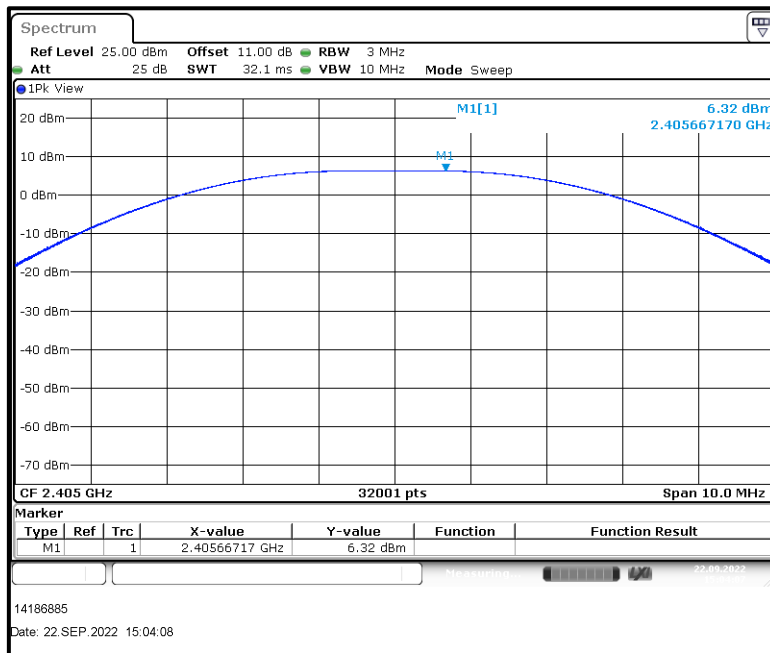


Transmitter Maximum (Peak) Output Power (continued)

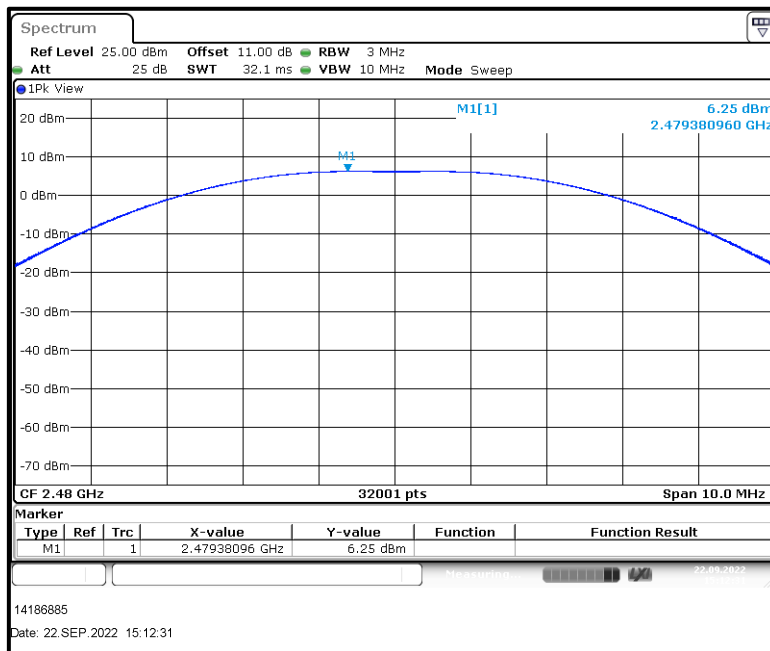
Results :

Channel	Conducted Peak Power (dBm)
Bottom	6.32
Top	6.25

Plots :



Bottom Channel



Top Channel

5.2.2. Transmitter Radiated Output Power

Test Summary:

Test Engineer:	Muhammad Faiq Khan	Test Date:	28 October 2022
Test Sample Serial Number:	DUT 3 and DUT11 (Radiated Test sample)		
Test Site Identification	SR 1/2		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	FCC KDB 558074 Section 8.3.1.1 referencing ANSI C63.10 Sections 6.5 & 11.9.1.1

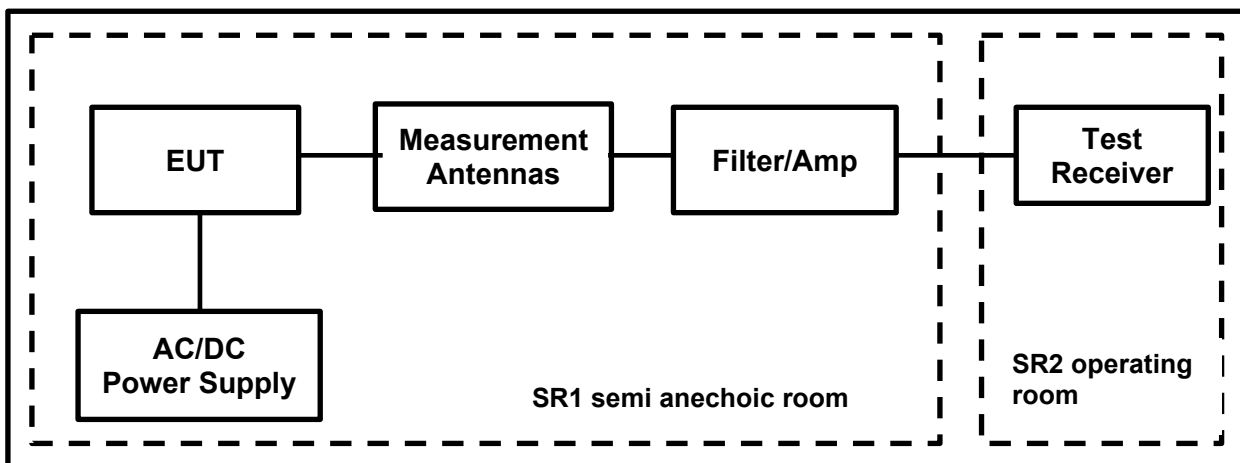
Environmental Conditions:

Temperature (°C):	22.1
Relative Humidity (%):	56.3

Notes:

1. The spectrum analyser resolution bandwidth was set to 1 MHz and video bandwidth of 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 10 MHz. A marker was placed at the peak of the signal and the results recorded in the table below.
2. Before starting final radiated measurements “worst case verification” with the EUT in Standing-position & Laying-position was performed by Lab.
3. The measurements are therefore done at worst-case position i.e EUT in standing position w.r.t to receiver Antenna, so as to give the maximum output power results.
4. The correction factors (offset) used in the measurement of Radiated output power were calculated by considering the Antenna dBi values.

Test Setup:

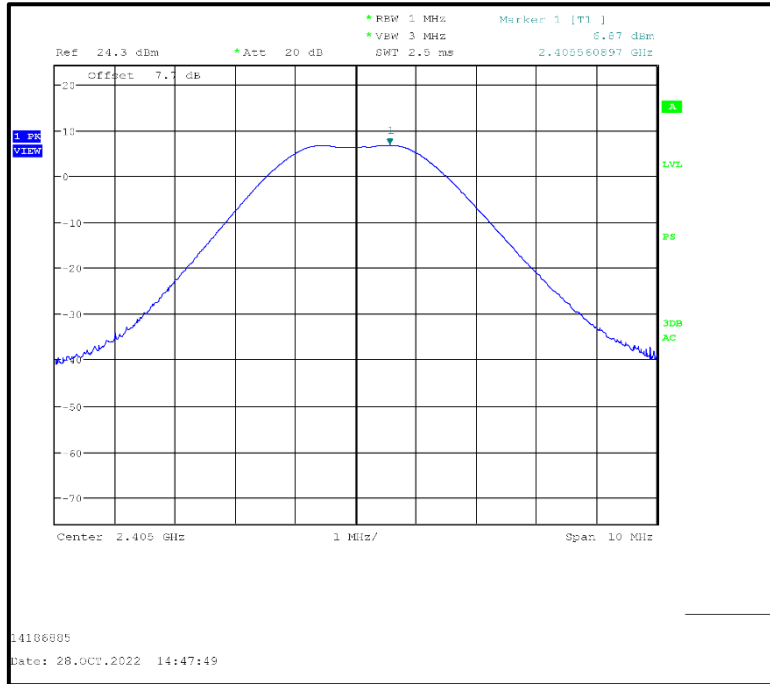


Transmitter Radiated Output Power (continued)

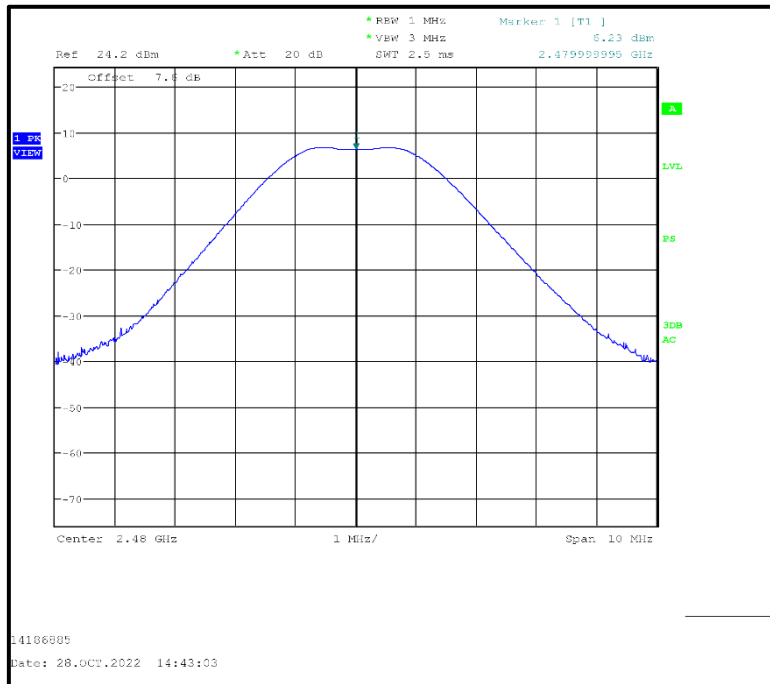
Results :

Channel	Radiated Peak Power (dBm)
Bottom	6.87
Top	6.23

Plots :



Bottom Channel



Top Channel

6. Measurement Uncertainty

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	Confidence Level (%)	Calculated Uncertainty
Conducted Maximum Peak Output Power	95%	±0.59 dB
Radiated Spurious Emissions	95%	±3.10 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. Used equipment

Test site: SR 1/2

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
1	Rohde & Schwarz	Antenna, Loop	HFH2-Z2	831247/012	10/07/2020	36
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	13/07/2022	12
460	Deisel	Turntable	DT 4250 S	n/a	n/a	n/a
452	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	02/09/2020	36
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	05/08/2020	36
587	Maturo	antenna mast, tilting	TAM 4.0-E	011/7180311	n/a	n/a
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
669	Rohde & Schwarz	EMI Test Receiver	ESW 44	103087	03/02/2022	12
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	lab verification	n/a
628	Maturo	Antenna mast	CAM 4.0-P	224/19590716	n/a	n/a
629	Maturo	Kippeinrichtung	KE 2.5-R-M	MAT002	n/a	n/a
-/	Testo	Thermo-Hygrometer	608-H1	01	lab verification	n/a
1603665	Siemens Matsushita Components	semi-anechoic chamber SR1/ 2	-/	B83117-A1421- T161	n/a	n/a

Test site: SR 9

ID	Manufacturer	Type	Model	Serial	Calibration Date	Cal. Cycle (months)
445	Huber & Suhner	RF Attenuator (10 dB)	6810.17.AC	--	lab verification	12
637	Rohde & Schwarz	Spectrum Analyzer	FSV40	101587	15/07/2022	12
-/	Huber+Suhner	RF Cable -OSP120-DUT1	ST18/SMAm/S MAm/72	605505	lab verification	n/a
-/	Testo	Thermo-Hygrometer	608-H1	07	lab verification	n/a
1603668	Siemens Matsushita Components	shielded room	--	B83117- B1422-T161	n/a	n/a

8. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	17	-	Initial Version

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