

Test Data Referencing

Justification of Test Data Referencing, for EMC/RF and SAR

- Parent model: FCC ID: 2AH25T5F1AC
- Variant model: FCC ID: 2AH25T5F1AA

- 1. Product Overview**
- 2. Comparison – Summary**
- 3. Test Strategy**

1. Product Overview

Radio	FCC Rule Part	FCC ID: 2AH25T5F1AC	FCC ID: 2AH25T5F1AA
GSM Band: 850,1900	Part 22, 24	Support	Support
WCDMA Band: 2,4,5	Part 22, 24, 27	Support	Support
LTE Band: 2,4,5,7,12,13,17,25, 26,30,38,41,66,71	Part 22, 24, 27,90	Support	Support
Wi-Fi2.4, 5GHz	Part 15	Support	Support
BT/BLE	Part 15	Support	Support
NFC	Part 15	Support	Support
Halow	Part 15	Support	Not Support

2. Comparison – Summary

2.1 Identical

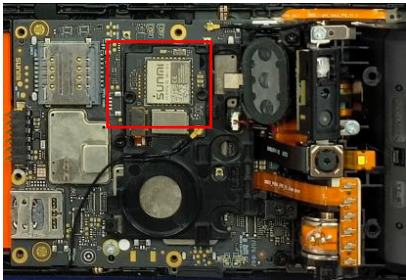
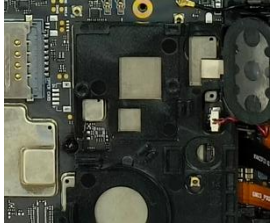
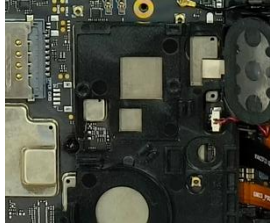
FCC ID : 2AH25T5F1AC, FCC ID : 2AH25T5F1AA are identical in the followings:

- The device form factor, the size of display area and the housing material is identical
- Enclosure and material
- PCB Layout

2.2 Difference:

FCC ID : 2AH25T5F1AA (Variant model) is different from FCC ID : 2AH25T5F1AC (Parent model), in the followings:

- Remove Halow Components
- Remove front camera
- Remove Scanner

FCC ID: 2AH25T5F1AC (Parent Model)	FCC ID: 2AH25T5F1AA (Variant Model)	
	SKU12	SKU13
 With Halow	 Without Halow	 Without Halow
 With Front Camera	 Without Front Camera	 Without Front Camera
 With Scanner	 With Scanner	 Without Scanner

3. Test Strategy

- FCC ID 2AH25T5F1AC: parent model, full test for EMC/RF/SAR.
- FCC ID 2AH25T5F1AA: variant model, data referencing from the reference model for EMC/RF and SAR.
 - Full test for different parts: NFC
 - Identical design parts: Spot check the worst cases in FCC ID 2AH25T5F1AA
- EMC/RF/SAR spot check justification:
Reference KDB484596 D01 Referencing Test Data v03

a) EMC Test Data Spot-Checks

These exhibits for the variant certification shall meet the following criteria:

- Spot-check measurements must correspond to the worst-case scenario reported in the parent device filing, i.e., for conditions closest to non-compliance.
- Spot-check measurements must always show compliance with the rule part(s) applicable to the test under consideration.
- Spot-check measurements may show deviations from the reference data, as specified in sub-sections 3.2.1 and 3.2.2. These specifications differ between EMC data and RF exposure test data.

For EMC compliance test data (e.g., spurious emissions limits), the deviation between the variant and the parent model, for both field and power quantities, is expressed as:

$$d_{dB} = |V_{dB} - R_{dB}| \quad (1),$$

where V_{dB} is the variant spot-check level in dB, and R_{dB} is the corresponding reference measurement level in dB for the parent model.

The spot-check will be deemed acceptable when:

$$d_{dB} \leq d_{dBmax} \quad (2),$$

where d_{dBmax} is the maximum deviation d_{dB} allowed for the EMC data for the spot-check to be considered acceptable. The definition of d_{dBmax} is based on “how far” the reference data R_{dB} is from the compliance threshold C_{dB} (also expressed in dB), for the test under consideration. More specifically, if M_{dB} is the margin in dB from the compliance limit, expressed as

$$M_{dB} = |C_{dB} - R_{dB}| \quad (3),$$

then d_{dBmax} is defined as a function of M_{dB} , which increases linearly from 3 dB to 6 dB (Fig. 2), according to:

$$d_{dBmax}(M_{dB}) = \begin{cases} (3 + M_{dB}/20) \text{ dB} & , \text{ for } 0 \leq M_{dB} \leq 60 \text{ dB} \\ 6 \text{ dB} & , \text{ for } M_{dB} > 60 \text{ dB} \end{cases} \quad (4).$$

b) The Spot-Check Plan for RF Exposure Test Data

By expressing all the quantities in linear units, an RF exposure spot-check must be accepted based on the maximum relative difference between the variant and the parent model test results.

The spot-check acceptance criterion is formulated in terms of the total exposure ratio (TER) to easily include RF exposure evaluations based on MPE and evaluations for simultaneous transmissions, (that may include a mix of MPE and SAR evaluations but not for incident power density related to frequencies above 6 GHz).

Accordingly, proceeding in a similar way to the previous section but operating in linear units, the relative difference (expressed as a percentage) between the TER of the variant (TER_V) and that of the parent model used as a reference (TER_R) is defined as

$$d_{TER} = | TER_V - TER_R | / TER_R \quad (5) ,$$

and the acceptance criterion for the spot-check on the variant will be:

$$d_{TER} \leq d_{TERmax} \quad (6) ,$$

where d_{TERmax} , to be defined further below, is the maximum acceptable d_{TER} , and all the quantities are expressed in linear units.

It is also important to note that if the MPE is considered to refer to a field quantity and not power, the corresponding TER is to be computed as the square of the field ratio, consistent with the other terms that refer to power levels.

The value of d_{TERmax} , the maximum d_{TER} allowed for the spot-check to be deemed acceptable, is established based on the compliance margin M corresponding to the worst-case test scenario (i.e., the most challenging from the compliance perspective) for the parent model.

The margin M is defined as

$$M = TER_T - TER_R = 1 - TER_R \quad (7) ,$$

where TER_T is the TER corresponding to the compliance threshold, which is always $TER_T = 1$.

For instance, for a general population evaluation, $SAR \leq 1.6$ W/kg, as required for any compliant measurement. Thus, since $TER = SAR/1.6$, and $0 \leq TER \leq 1$, then M in eq. (7) will always be a positive number because TER_R cannot be larger than 1 for the parent model to be complaint.

The threshold d_{TERmax} is defined as function of the margin M to provide values between 25% and 50%, linearly increasing between $M = 0.5$ (50% of the compliance limit) and $M = 0.75$ (75% of the compliance limit), in accordance with the following expression:

$$d_{TERmax}(M) = \begin{cases} 0.25 & , \text{ for } 0 \leq M < 0.5 \\ M - 0.25 & , \text{ for } 0.5 \leq M < 0.75 \\ 0.5 & , \text{ for } 0.75 \leq M \end{cases} \quad (8) .$$

- Compliance is determined by both the spot check data and the referenced test data.
- Test strategy is tabulated in next page

Band	Rule Part	Test item	Parent model		Variant model	
			FCC ID 2AH25T5F1AC		FCC ID 2AH25T5F1AA	
			Data	Reference Report No.	Data Referencing	Remark
GSM850/UMTS Band 5/LTE Band 5/26(824~849 MHz)	Part 22.913(a)(5)	Effective (Isotropic) Radiated Power Output Data	Full Test	SUCR260700064209	Y	Check Worse
	Part 22.913(d)	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 22.917(a)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 22.917(a)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 22.917(a)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 22.355	Frequency Stability	Full Test		Y	reuse patrent data
GSM 1900/UMTS Band 2 /LTE Band 2/25	Part 24.232(c)	Effective (Isotropic) Radiated Power Output Data	Full Test		Y	Check Worse
	Part 24.232(d)	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 24.238(a)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 24.238(a)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 24.238(a)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 24.235	Frequency Stability	Full Test		Y	reuse patrent data
UMTS Band 4 /LTE Band 4 /66	Part 27.50(d)(4)	Effective (Isotropic) Radiated Power Output Data	Full Test		Y	Check Worse
	Part 27.50(d)(5)	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 27.53(h)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 27.53(h)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 27.53(h)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 27.54	Frequency Stability	Full Test		Y	reuse patrent data
LTE Band 12/17	Part 27.50(c)(10)	Effective (Isotropic) Radiated Power Output Data	Full Test		Y	Check Worse
	N/A	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 27.53(g)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 27.53(g)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 27.53(g)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 27.54	Frequency Stability	Full Test		Y	reuse patrent data
LTE Band 13	Part 27.50(b)(10)	Effective (Isotropic) Radiated Power Output Data	Full Test		Y	Check Worse
	N/A	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 27.53(c)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 27.53(c)(f)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 27.53(c)(f)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 27.54	Frequency Stability	Full Test		Y	reuse patrent data
LTE Band 7/38/41	Part 27.50(h)(2)	Effective (Isotropic) Radiated Power Output Data	Full Test		Y	Check Worse
	N/A	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 27.53(m)(4)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 27.53(m)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 27.53(m)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 27.54	Frequency Stability	Full Test		Y	reuse patrent data
LTE Band 26(814~824 MHz)	Part 90.635(b)	Transmitter Conducted Power Output	Full Test		Y	Check Worse
	N/A	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse

	Part 90.691(a)	Emission Mask	Full Test		Y	Check Worse
	Part 90.691	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 90.691	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 90.213	Frequency Stability	Full Test		Y	reuse patrent data
LTE Band 30	27.50(a)(3)	Effective (Isotropic) Radiated Power Output Data	Full Test		Y	Check Worse
	N/A	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 27.53(a)(4)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 27.53(a)(4)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 27.53(a)(4)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 27.54	Frequency Stability	Full Test		Y	reuse patrent data
LTE Band 71	Part 27.50(c)(10)	Effective (Isotropic) Radiated Power Output Data	Full Test		Y	Check Worse
	N/A	Peak-Average Ratio	Full Test		Y	Check Worse
	Part 2.1049	Bandwidth	Full Test		Y	Check Worse
	Part 27.53(g)	Band Edges Compliance	Full Test		Y	Check Worse
	Part 27.53(g)	Spurious Emission at Antenna Terminals	Full Test		Y	Check Worse
	Part 27.53(g)	Field Strength of Spurious Radiation	Full Test		Y	Check Worse
	Part 27.54	Frequency Stability	Full Test		Y	reuse patrent data
BLE	15.207	Conducted Emissions at AC Power Line (150kHz-30MHz)	Full Test	SUCR260700064203	Y	reuse patrent data
	15.205 & 15.209	Radiated Emissions which fall in the restricted bands	Full Test		Y	Check Worse
	15.205 & 15.209	Radiated Spurious Emissions Below 1GHz	Full Test		Y	reuse patrent data
	15.205 & 15.209	Radiated Spurious Emissions Above 1GHz	Full Test		Y	Check Worse
	15.247(b)(3)	Maximum Conducted Output Power	Full Test		Y	Check Worse
	15.247a(2)	Minimum 6dB Bandwidth	Full Test		Y	Check Worse
	15.247(e)	Power Spectral Density	Full Test		Y	Check Worse
	15.247(d)	Conducted Band Edges Measurement	Full Test			Check Worse
BT	15.247(d)	Conducted Spurious Emissions	Full Test	SUCR260700064204	Y	Check Worse
	15.207	Conducted Emissions at AC Power Line (150kHz-30MHz)	Full Test		Y	reuse patrent data
	15.205 & 15.209	Radiated Emissions which fall in the restricted bands	Full Test		Y	Check Worse
	15.205 & 15.209	Radiated Spurious Emissions Below 1GHz	Full Test		Y	reuse patrent data
	15.205 & 15.209	Radiated Spurious Emissions Above 1GHz	Full Test		Y	Check Worse
	15.247(b)(1)	Maximum Conducted Output Power	Full Test		Y	Check Worse
	15.247(a)(1)	20dB Bandwidth	Full Test		Y	Check Worse
	15.247(a)(1)	Carrier Frequencies Separation	Full Test		Y	Check Worse
	15.247a(1)(iii)	Hopping Channel Number	Full Test		Y	Check Worse
	15.247a(1)(iii)	Dwell Time	Full Test		Y	Check Worse
	15.247(d)	Conducted Band Edges Measurement	Full Test		Y	Check Worse
	15.247(d)	Conducted Spurious Emissions	Full Test		Y	Check Worse
2.4G WIFI	15.207	Conducted Emissions at AC Power Line (150kHz-30MHz)	Full Test	SUCR260700064205	Y	reuse patrent data
	15.205 & 15.209	Radiated Emissions which fall in the restricted bands	Full Test		Y	Check Worse
	15.205 & 15.209	Radiated Spurious Emissions Below 1GHz	Full Test		Y	reuse patrent data
	15.205 & 15.209	Radiated Spurious Emissions Above 1GHz	Full Test		Y	Check Worse
	15.247(b)(3)	Maximum Conducted Output Power	Full Test		Y	Check Worse
	15.247a(2)	Minimum 6dB Bandwidth	Full Test		Y	Check Worse
	15.247(e)	Power Spectral Density	Full Test		Y	Check Worse
	15.247(d)	Conducted Band Edges Measurement	Full Test		Y	Check Worse
	15.247(d)	Conducted Spurious Emissions	Full Test		Y	Check Worse
5G WIFI	15.407 b(9)	Conducted Emissions at AC Power Line (150kHz-30MHz)	Full Test	SUCR260700064206	Y	reuse patrent data

	15.407(b)	Radiated Emissions (Below 1GHz)	Full Test			reuse patent data
	15.407(b)	Radiated Emissions (Above 1GHz)	Full Test			Check Worse per frequency band
	15.407(b)	Radiated Emissions which fall in the restricted bands	Full Test			Check Worse per frequency band
	C63.10	Duty Cycle	Full Test		Y	Check Worse per frequency band
	C63.10	99% Bandwidth	Full Test			Check Worse per frequency band
	15.407 (a)	26dB Emission Bandwidth	Full Test		Y	Check Worse per frequency band
	15.407(e)	Minimum 6 dB Bandwidth (5.725-5.85 GHz band)	Full Test			Check Worse per frequency band
	15.407 (a)	Maximum Conducted Output Power	Full Test			Check Worse per frequency band
	15.407 (a)	Power Spectral Density	Full Test			Check Worse per frequency band
	KDB 905462 D02	DFS	Full Test		Y	reuse patent data
NFC	15.207	Conducted Emissions at Mains Terminals (150kHz-30MHz)	Full Test	SUCR260700064208	Y	reuse patent data
	15.225(a)&(b)&(C)	Emission Mask	Full Test		Y	Check Worse
	15.225(d) & 15.209	Radiated Emissions (9kHz-30MHz)	Full Test		Y	Check Worse
	15.225(d) & 15.209	Radiated Emissions (30MHz-1GHz)	Full Test		Y	Check Worse
	15.215	20dB Bandwidth	Full Test		Y	Check Worse
	15.225(e)	Frequency tolerance	Full Test		Y	reuse patent data
EMI	Part 15B	AC Conducted Emission	Full Test	SUCR260700064202	N	Full Test
		Radiated Emission	Full Test		N	Full Test
SAR	2.1093	SAR Testing	Full Test	SUCR260700064201	Y	Check Worse

---End of Report---