Test Data Referencing

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

- Parent model: FCC ID: 2AH25T5F1AC
- Variant model: FCC ID: 2AH25T5F1AB

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

1. Product Overview

Radio	FCC Rule Part	FCC ID: 2AH25T5F1AC	FCC ID: 2AH25T5F1AB
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-Fi, 2.4, 5GHz	Part 15	Support	Support
BT/BLE	Part 15	Support	Support
NFC	Part 15	Support	Not Support
Halow	Part 15	Support	Not Support

2. Comparison – Summary

2.1 Identical

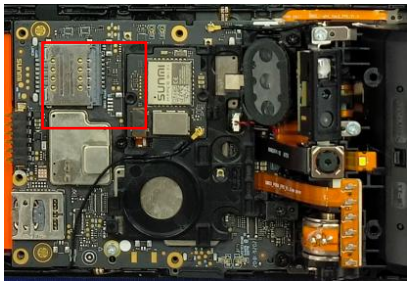
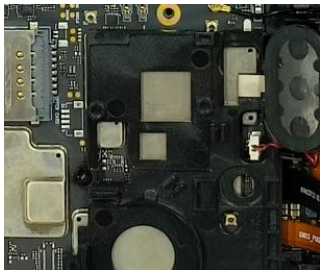
FCC ID：2AH25T5F1AC, FCC ID：2AH25T5F1AB are identical in the followings:

- 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：2AH25T5F1AB (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: 2AH25T5F1AB (Variant Model)
 With Halow	 Without Halow
 With Front Camera	 Without Front Camera
 With Scanner	 Without Scanner

With NFC	Without NFC

3. Test Strategy

- FCC ID 2AH25T5F1AC: parent model, full test for EMC/RF/SAR.

- FCC ID 2AH25T5F1AB: 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 2AH25T5F1AB

  - 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 *VdB* is the variant spot-check level in dB, and *RdB* 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:

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

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 (*TERV*) and that of the parent model used as a reference (*TERR*) 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 ≤ 1.6 W/kg, as required for any compliant measurement. Thus, since TER = SAR/1.6, and 0 ≤ TER ≤ 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:

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

- 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 2AH25T5F1AB	
			Data		Data Referencing	Remark
BT	15.207	AC Power Line Conducted Emission	Full Test		Y	reuse patrent data
	15.207	Conducted Peak Output Power	Full Test		Y	Check Worse
	15.247 (b)(1)	20dB Emission Bandwidth & 99% Occupied Bandwidth	Full Test		Y	Check Worse
	15.247 (a)(1)	Carrier Frequencies Separation	Full Test		Y	Check Worse
	15.247 (a)(1)	Hopping Channel Number	Full Test		Y	Check Worse
	15.247 (a)(1)	Dwell Time	Full Test		Y	Check Worse
	15.247(d)	Band-edge for RF Conducted Emissions	Full Test		Y	Check Worse
	15.247(d)	RF Conducted Spurious Emissions	Full Test		Y	Check Worse
	15.247(d); 15.205/15.209	Radiated Spurious emissions	Full Test		Y	Check Worse
	15.247(d); 15.205/15.209	Restricted bands around fundamental frequency (Radiated Emission)	Full Test		Y	Check Worse
BLE	15.207	AC Power Line Conducted Emission	Full Test		Y	reuse patrent data
	15.247 (b)(3)	Conducted Output Power	Full Test		Y	Check Worse
	15.247 (a)(2)	DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	Full Test		Y	Check Worse
	15.247 (e)	Power Spectral Density	Full Test		Y	Check Worse
	15.247(d)	Band-edge for RF Conducted Emissions	Full Test		Y	Check Worse
	15.247(d)	RF Conducted Spurious Emissions	Full Test		Y	Check Worse
	15.205/15.209	Radiated Spurious Emissions	Full Test		Y	Check Worse
	15.205/15.209	Restricted bands around fundamental frequency (Radiated Emission)	Full Test		Y	Check Worse
2.4G WIFI	15.207	AC Power Line Conducted Emission	Full Test		Y	reuse patrent data
	15.247 (b)(3)	Conducted Output Power	Full Test		Y	Check Worse
	15.247 (a)(2)	DTS (6 dB) Bandwidth & 99% Occupied Bandwidth	Full Test		Y	Check Worse
	15.247 (e)	Power Spectral Density	Full Test		Y	Check Worse
	15.247(d)	Band-edge for RF Conducted Emissions	Full Test		Y	Check Worse
	15.247(d)	RF Conducted Spurious Emissions	Full Test		Y	Check Worse

	15.205/15.209	Radiated Spurious Emissions	Full Test		Y	Check Worse
	15.205/15.209	Restricted bands around fundamental frequency (Radiated Emission)	Full Test		Y	Check Worse
5G WIFI	Band I: 15.407(a)(1)	26dB Emission Bandwidth	Full Test		Y	Check Worse
	Band II-A: 15.407(a)(2)	26dB Emission Bandwidth				
	Band II-C: 15.407(a)(2)	26dB Emission Bandwidth				
	Band III: 15.407(e)	6dB Emission Bandwidth				
	Band I&Band II-A&Band II-C &Band III:	99% Occupied Bandwidth	Full Test		Y	Check Worse
	KDB 789033 D02§ D					
	Band I: 15.407(a)(iv)	Maximum Conducted Output Power	Full Test		Y	Check Worse
	Band II-A: 15.407(a)(2)					
	Band II-C: 15.407(a)(2)					
	Band III: 15.407(a)(3)					
	Band I: 15.407(a)(iv)	Maximum Power Spectral Density	Full Test		Y	Check Worse
	Band II-A: 15.407(a)(2)					
	Band II-C: 15.407(a)(2)					
	Band III: 15.407(a)(3)					
	Band I&Band II-A&Band II-C &Band III:	Radiated Spurious Emissions	Full Test		Y	Check Worse
	15.407(b) 15.205/15.209					
	Band I&Band II-A&Band II-C &Band III:	Restricted bands around fundamental frequency	Full Test		Y	Check Worse
	15.407(b) 15.205/15.209					
	Band I&Band II-A&Band II-C &Band III:	AC Power Line Conducted Emissions	Full Test		Y	reuse patrent data
	15.207					
	Band II-A &Band II-C:	Dynamic Frequency Selection	Full Test		Y	reuse patrent data
	15.407					
	Band I&Band II-A&Band II-C &Band III:	Frequency Stability	Full Test		Y	Check Worse
	15.407(g)					
6G WIFI	15.407(b)(8)	AC Power Line Conducted Emission	Full Test		Y	reuse patrent data
	15.407(a)(8)	Maximum e.i.r.p.	Full Test		Y	Check Worse
	15.407(a)(11)	26dB Emission Bandwidth	Full Test		Y	Check Worse
	NA	99% Occupied Bandwidth	Full Test		Y	Check Worse
	15.407(a)(8)	Maximum Power Spectral Density	Full Test		Y	Check Worse
	15.407(b)(7)	In-Band Emissions	Full Test		Y	Check Worse
	15.407(d)(6)	Contention Based Protocol	Full Test		Y	reuse patrent data
	15.407(b)(6) 15.205, 15.209	Unwanted Emissions that fall Out of the Restricted Bands (Radiated)	Full Test		Y	Check Worse

	15.407(b)(6) 15.205, 15.209	Unwanted Emissions in the Restricted Bands (Radiated)	Full Test		Y	Check Worse
NFC	15.207	AC Power Line Conducted Emission	Full Test		N	Full Test
	15.21(c)	20dB Spectrum Bandwidth & 99% Occupied Bandwidth	Full Test		N	Full Test
	15.225(e)	Frequency Stability	Full Test		N	Full Test
	15.225(a)(b)(c)	Field Strength of Fundamental Emissions	Full Test		N	Full Test
	15.225(d)/15.209	Radiated Spurious Emissions	Full Test		N	Full Test
EMI	Part 15B	AC Conducted Emission	Full Test		N	Full Test
		Radiated Emission	Full Test		N	Full Test
SAR	2.1093	SAR Testing	Full Test		Y	Check Worse
PD SAR			Full Test		N	Full Test

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