WLAN TAS EVALUATION REPORT

For
SMARTPHONE

FCC ID: BCG-E8725A

Model Name: A3212

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Revision History

Rev.	Date	Revisions	Revised By
V1	1/13/2025	Initial Issue	--

1. Wi-Fi Time-Averaged SAR (TAS) Verification

1.1. Introduction

The DUT supports time-averaged SAR (TAS) technology for the WLAN transmitters. This TAS implementation does not monitor actual outpower level, instead it conservatively assumes the WLAN transmitters are operating at the maximum allowable output power for the averaging power calculation. Power levels in different bands with different operating states and power limits are not directly comparable so the TAS algorithm instead tracks the ratio of energy contribution relative to the available energy budget for each transmitter.

This resulting “utilization ratio” for a particular WLAN transmitter can then be added to the utilization ratio for all other WLAN transmitters in the device over the same time-period to derive the total WLAN system utilization ratio. Consistent with FCC guidance on compliance with time averaging exposure limits, the TAS implementation uses the total WLAN utilization ratio over a nominal 60 second time window to manage the transmitter power level and ensure that the DUT does not exceed the average power levels documented in UL FCC SAR report #15175342-S1.

To validate the proper functioning of the time-average algorithm of this device, the following test scenarios were performed. These scenarios define the operation of the algorithm in all operational states:

1. Antenna Switching – switching between different antennas on a given channel
2. P_{lim} Switching – switching between different P_{lims} for a given channel.
3. Band Switching – switching between antennas on channels in different bands and at different P_{lims}.

Predefined transmit profiles for each test scenario were created in test automation software to control the operation of the DUT while synchronized operation data was recorded from internal firmware and external power monitors. The data was plotted over time relative to the utilization limit to demonstrate that the utilization ratio never exceeds 100%. The DUT WLAN chipset applies a 1.5 dB uncertainty budget to all power control functions.

Test scenarios were agreed upon with the FCC via KDB inquiry.

1.2. Test Setup

The DUT supported chipset allows each antenna to have up to 200% Aggregated SAR Utilization, one radio is transmitting while the other is idle for Non-SDB mode. On the active radio, Aggregated SAR Utilization can go up to 200% by leveraging the unused SAR budget of the idle radio. Test results in §1.3 will show that average SAR Utilization ratio never exceeds 100% for all test cases.

The power optimization (P_{opt}) setting for both antennas is a 3dB increase from P_{lim}. This applies to 2.4GHz and 5GHz. The measurements are performed with a fixed P_{lim}. Please see P_{lim} and P_{opt} parameters used for testing in the tables below.

Test automation is used to ensure that all WLAN 2.4GHz and 5GHz transmissions are operating at maximum possible duty cycle during the test.

The DUT does NOT support SDB. Therefore, Non-SDB test procedure outlined in Appendix B of inquiry was followed. Only “reported” SAR Utilization data is required at the host level. For Non-SDB measurements, switching occurs between antennas at 120 seconds during the observation window.

2.4GHz Parameters used during testing

WLAN radios were configured to operate at 100% duty cycle.

Mode	Cellular Status	Power (dBm)			
		Ant 3		Ant 4	
		P_{lim}	P_{opt}	P_{lim}	P_{opt}
802.11b	Cell off (dBm)	21.5	24.5	20.5	23.5
	Cell off (mW)	141	282	112	224
	Cell on (dBm)	18.75	21.75	17.0	20.0
	Cell on (mW)	75	150	50	100

5GHz Parameters used during testing

WLAN radios were configured to operate at 100% duty cycle.

Mode	Cellular Status	Power (dBm)			
		Ant 5		Ant 6	
		P_{lim}	P_{opt}	P_{lim}	P_{opt}
802.11a	Cell off (dBm)	18.50	21.50	20	23
	Cell off (mW)	71	141	100	200
	Cell on (dBm)	14.5	17.5	16.5	19.5
	Cell on (mW)	28	56	45	89

1.3. WLAN TAS Verification Test Results

The TAS implementation uses the total WLAN utilization ratio over a nominal 60 second time window to manage the transmitter power level and ensure that the DUT does not exceed the average power levels documented in UL FCC SAR report #15175342-S1.

1.3.1. WLAN TAS Summary of Test Results

Summary of test results is illustrated below. Please refer to the proceeding sections for detailed test results for each Scenario.

Test Case	Section/ Figure	Band	Antenna / Mode		Reported/ Measured	Antenna	Limit	Time Window	Pass/ Fail	Notes
Scenario 1: Antenna Switching	1.3.2 Figure 1	2.4GHz	Ant 4 802.11b	Ant 3 802.11b	Reported	Ant 4 to Ant 3	100%	60 sec	Pass	Antenna switching at 120 seconds from Ant 4 to Ant 3 for a given channel.
	1.3.2 Figure 2	5GHz	Ant 6 802.11a	Ant 5 802.11a	Reported	Ant 6 to Ant 5	100%	60 sec	Pass	Antenna switching at 120 seconds from Ant 6 to Ant 5 for a given channel.
Scenarion 2: Band Switching	1.3.4 Figure 3	2.4GHz & 5GHz	Ant 4 802.11b	Ant 6 802.11a	Reported	Ant 4 to Ant 6	100%	60 sec	Pass	Band switching at 120 seconds from 2.4GHz Ant 4 to 5GHz Ant 6. Refer to tables in Section 1.2 for Plim values.
Scenario 3: P_{lim} Switching	1.3.3 Figure 4	5GHz	Ant 6 802.11a		Reported	Ant 6	100%	60 sec	Pass	Plim Switching from Cell on (Power state 2) to Cell off (Power state 1). Refer to tables in Section 1.2 for Plim values.

1.3.2. Scenario 1: Antenna Switching Test Cases

The evaluation in Figure 1 shows switching between antennas on the 2.4GHz band at *Time*=120 seconds. The test automation is controlling the WLAN radios to operate at 100% duty cycle. Figure 1 shows that the utilization ratio never exceeds 100%.

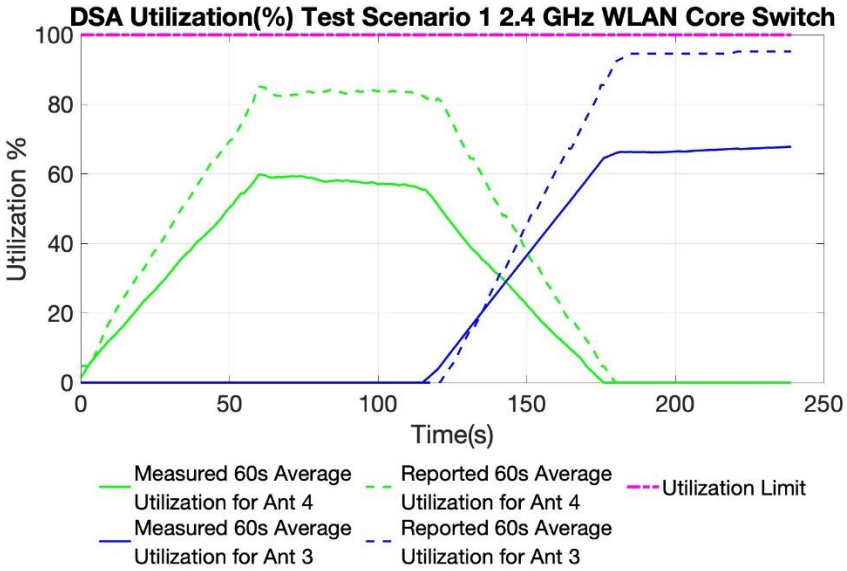

Figure 1: 60 Second Aggregated SAR Utilization vs Time, 2.4GHz band

The evaluation in Figure 2 shows switching between antennas on the 5GHz band at *Time*=120 seconds. The test automation is controlling the WLAN radios to operate at 100% duty cycle. Figure 2 shows that the utilization ratio never exceeds 100%.

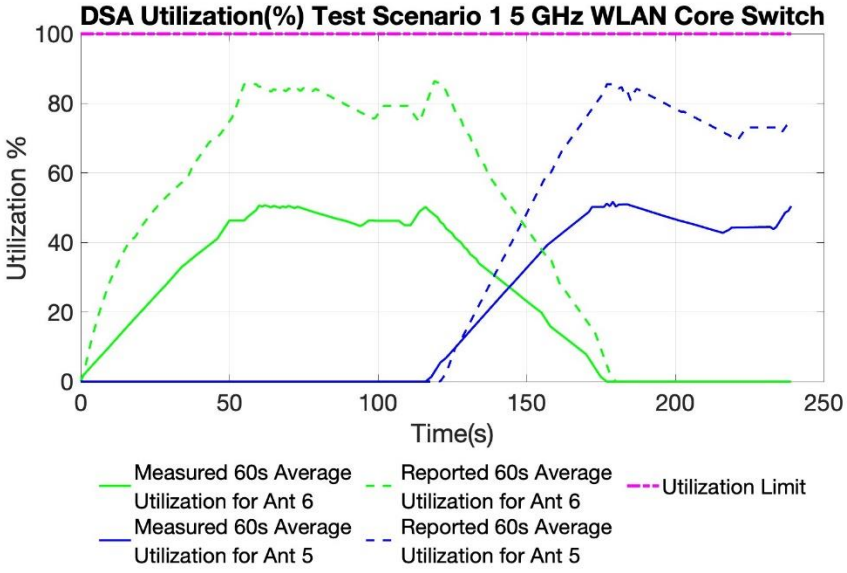

Figure 2: 60 Second Aggregated SAR Utilization vs Time, 5GHz band

1.3.3. Scenario 2 Band Switching Test Case

The evaluation in Figures 3 shows switching between 2.4GHz and 5GHz bands at *Time=120 seconds*. The test automation is controlling the WLAN radios to operate at 100% duty cycle. Figure 3 shows that the utilization ratio never exceeds 100%.

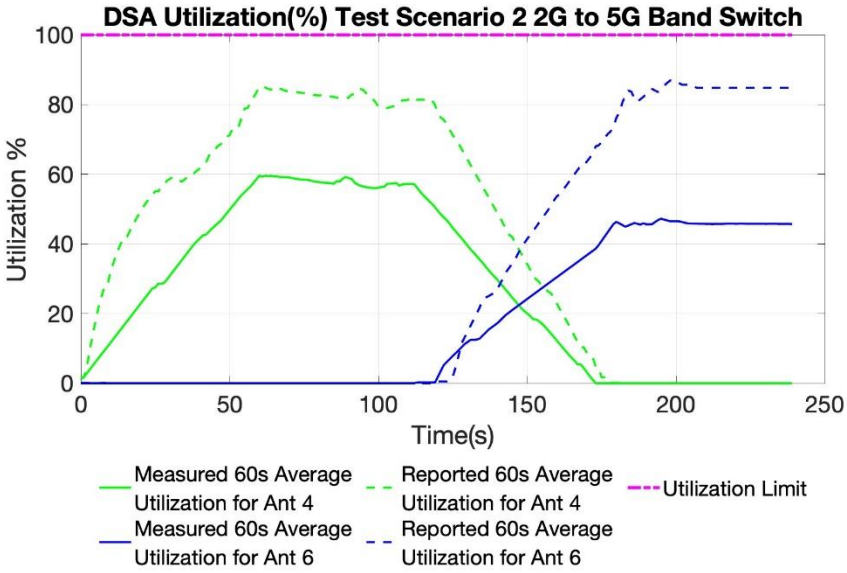

Figure 3: 60 Second Aggregated SAR Utilization vs Time during Band Switch

1.3.4. Scenario 3: P_{lim} Switching Test Cases

The evaluation in Figure 4 shows switching between Cell on (Power State 2) and Cell off (Power State 1) power states in the 5GHz band. The test automation is controlling the WLAN radios to operate at 100% duty cycle. Figure 4 shows that the utilization ratio never exceeds 100%.

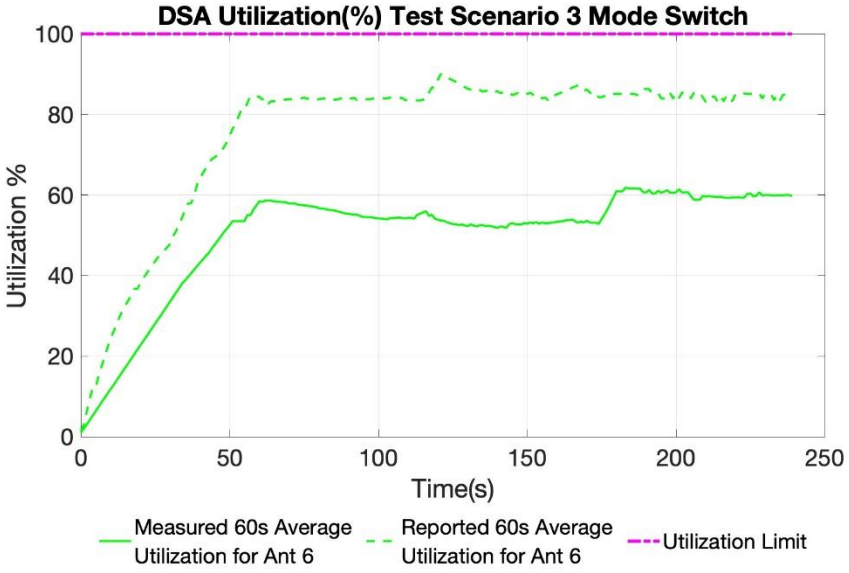

Figure 4: 60 Second Aggregated SAR Utilization vs Time during Mode Switch, 5GHz band