



FCC WiFi TAS Verification Report

FCC ID : A4RGEHN3
Equipment : Phone
Model Name : GEHN3, GN4F5
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, CA, 94043 USA
Standard : 47CFR Part 2.1093

The product was received on Jan. 15, 2025 and testing was started from Mar. 20, 2025 and completed on Mar. 30, 2025. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and has been pass the FCC requirement.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Laboratory, the test report shall not be reproduced except in full.

Approved by: Cona Huang / Deputy Manager

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History of this test report

Report No.	Version	Description	Issued Date
FA4N0917-01D	01	Initial issue of report	Apr. 15, 2025
FA4N0917-01D	02	Update section 3	Apr. 21, 2025



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. The DUT supports 6GHz. Consistent with FCC guidance on compliance with time averaging exposure limits, the TAS implementation uses the total WLAN utilization ratio over a nominal 30 second time window to manage the transmitter power level and ensure that the DUT does not exceed the average power levels documented in Part1 SAR Report.

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. SDB traffic mode- 2.4GHz and 5GHz/6GHz transmit simultaneously.
2. Antenna Switching – switching between different antennas on a given channel
3. Plim Switching – switching between different Plims for a given channel.

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.

2. Test Setup

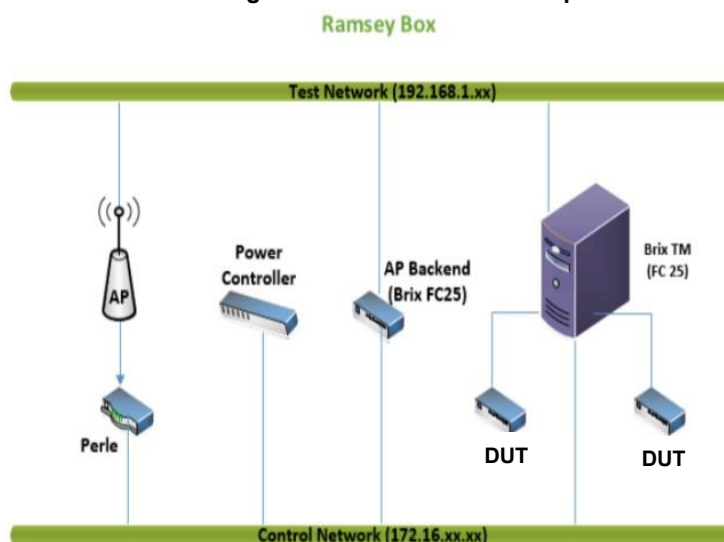
Set up should include the device under test and access points. It is preferred to have attenuation control to achieve the rssi to a known good level of around -80dBm to -85dBm [lower rssi to ensure that transmissions are at lower mcs rates. Lower mcs rates transmission increases the possibility of transmitted power limited by SAR_Limit rather than other regulatory limits.

The power optimization (Popt) setting for both antennas is a 6dB increase from Plim, the instantaneous maximum power (Pmax) is $\text{MIN} \{ \text{Plimit} + \text{Popt}, \text{RL} \}$ during TAS power transmission behavior, this applies to 2.4GHz, 5GHz and 6GHz. The measurements are performed with a fixed Plim. The Plim and Pmax parameters used for testing in the tables below.

Note :RL – Regulatory limit

Test automation is used to ensure that all WLAN 2.4GHz, 5GHz and 6GHz transmissions are operating at maximum possible duty cycle during the test.

Figure.1 – Validation test setup.





3. Validation Summary

Parameters used during testing

2.4GHz Parameters used during testing											
Band	Mode	BW	Channel	Power (dBm)							
2.4GHz	11g	20M	6	Ant 3		Ant 4		Ant 3		Ant 4	
				Plimit Index 2	Pmax Index 2	Plimit Index 2	Pmax Index 2	Plimit Index 4	Pmax Index 4	Plimit Index 4	Pmax Index 4
				12	18	12	18	16.5	22	16.5	22
5GHz Parameters used during testing											
Band	Mode	BW	Channel	Power (dBm)							
5GHz	11n	20M	44	Ant 3		Ant 4		Ant 3		Ant 4	
				Plimit Index 2	Pmax Index 2	Plimit Index 2	Pmax Index 2	Plimit Index 1	Pmax Index 1	Plimit Index 1	Pmax Index 1
				9.5	15.5	9.5	15.5	14	19.5	14	19.5
6GHz Parameters used during testing											
Band	Mode	BW	Channel	Power (dBm)							
6GHz	11ax	160M	47	Ant 3		Ant 4		Ant 3		Ant 4	
				Plimit Index 2	Pmax Index 2	Plimit Index 2	Pmax Index 2	Plimit Index 1	Pmax Index 1	Plimit Index 1	Pmax Index 1
				11	17	11	17	14.5	20	14.5	20

Note: Above power level represents the nominal power plus power tolerance.

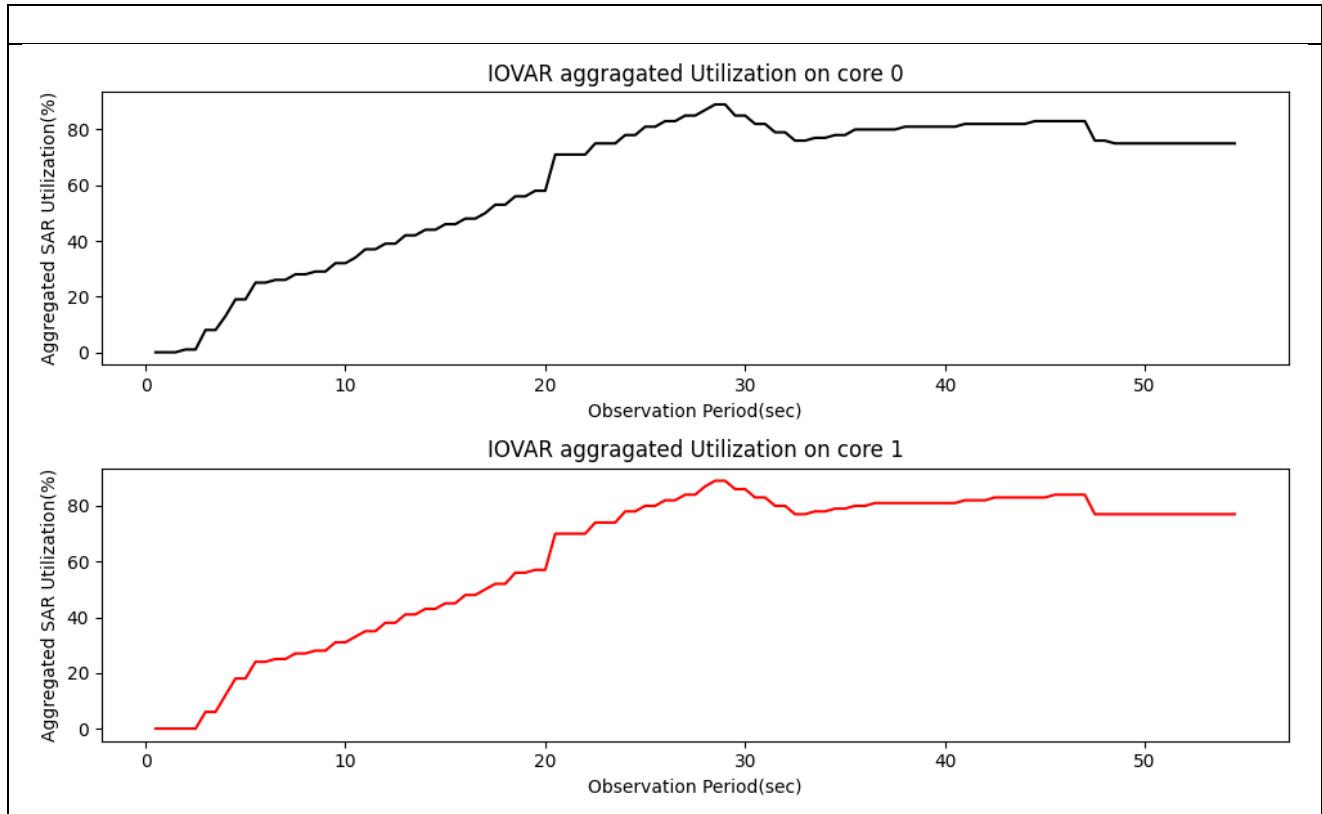
Test case and results

FCC	Test case	Test item	Power index	Reported/measured	Ant	Observation period(s)	Limit	Pass/Fail	Notes
SDB	1a	2.4G and 5G	Index 2	Reported data	Ant 3,4	60s	100%	Pass	Ant3 and Ant 4 transmit simultaneously
	1b	2.4G and 5G +BT	Index 2	Reported data	Ant 3,4	60s	100%	Pass	
	2a	2.4G and 6G	Index 2	Reported data	Ant 3,4	60s	100%	Pass	
	2b	2.4G and 6G +BT	Index 2	Reported data	Ant 3,4	60s	100%	Pass	
Non-SDB	Ant switch	3a	2.4G	Index 2	Reported data	Ant 3 to Ant 4	120s	100%	Antenna switching at 60s from Ant 3 to Ant 4 for a given channel
		3b	2.4GHz+BT	Index 2	Reported data	Ant 3 to Ant 4	120s	100%	
		4a	5G	Index 2	Reported data	Ant 3 to Ant 4	120s	100%	
		4b	5G+BT	Index 2	Reported data	Ant 3 to Ant 4	120s	100%	
		5a	6G	Index 2	Reported data	Ant 3 to Ant 4	120s	100%	
		5b	6G+BT	Index 2	Reported data	Ant 3 to Ant 4	120s	100%	
	SAR limit switch	6a	2.4G	Index 4 to Index 2	Reported data	Ant 3	120s	100%	SAR_Limit switching at 60s based upon changing of SAR_States of the hos
		6b	2.4G+BT	Index 4 to Index 2	Reported data	Ant 3	120s	100%	
		7a	5G	Index 1 to Index 2	Reported data	Ant 3	120s	100%	
		7b	5G+BT	Index 1 to Index 2	Reported data	Ant 3	120s	100%	
		8a	6G	Index 1 to Index 2	Reported data	Ant 3	120s	100%	
		8b	6G+BT	Index 1 to Index 2	Reported data	Ant 3	120s	100%	



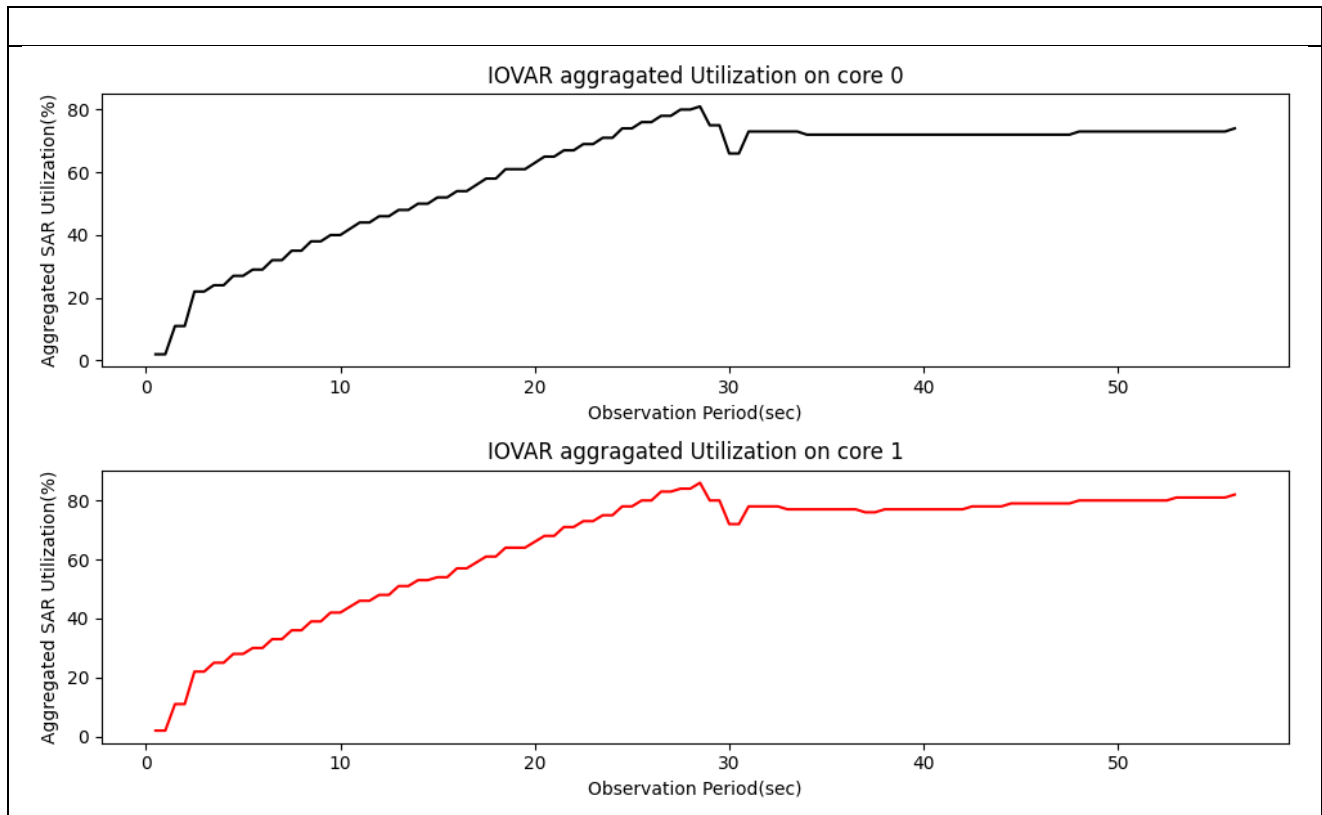
4. Test Result

Test Case 1a: SDB - Reported Aggregated SAR Utilization over observation window - Softap in 5Ghz and sta connection in 2.4Ghz



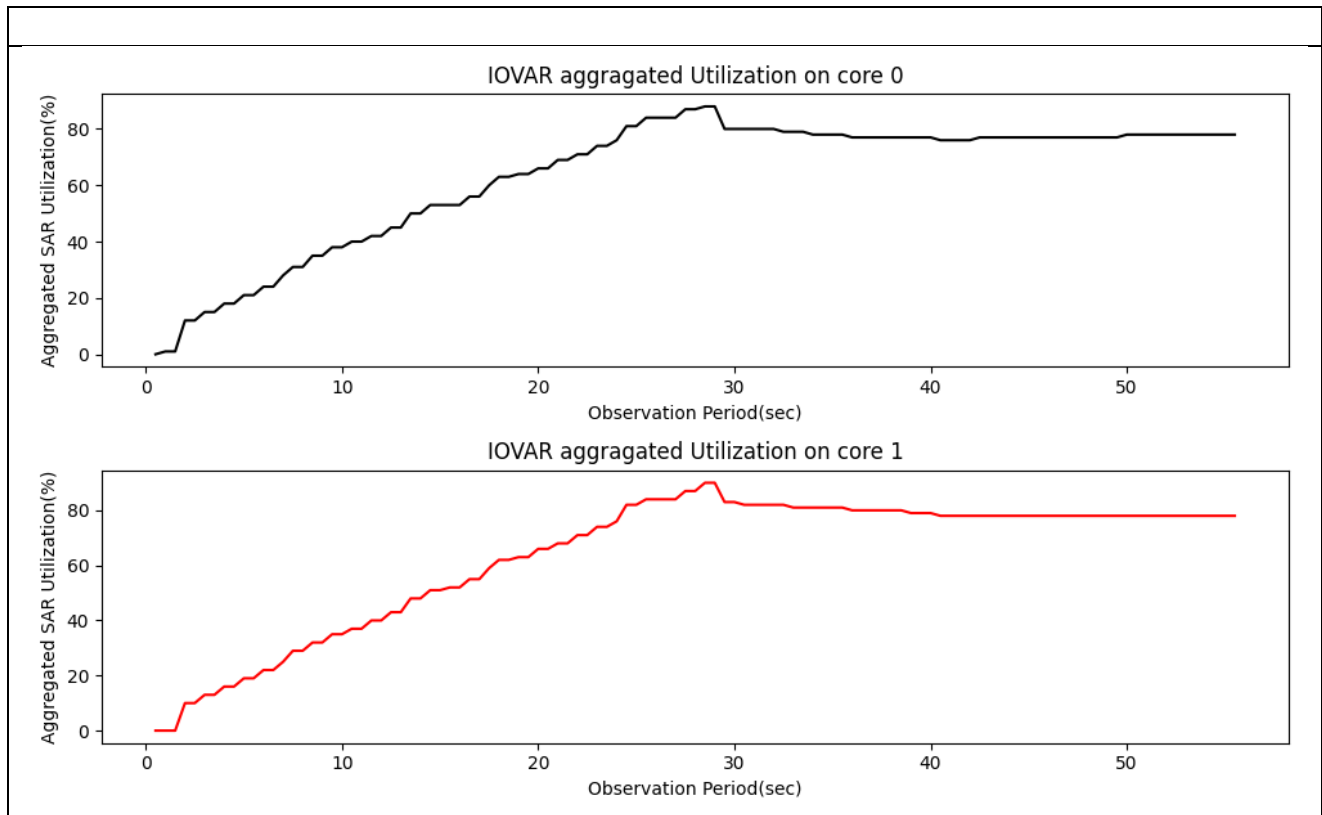


Test Case 1b: SDB - SDB - Reported Aggregated SAR Utilization over observation window - Softap in 5Ghz and sta connection in 2.4Ghz + BT Traffic



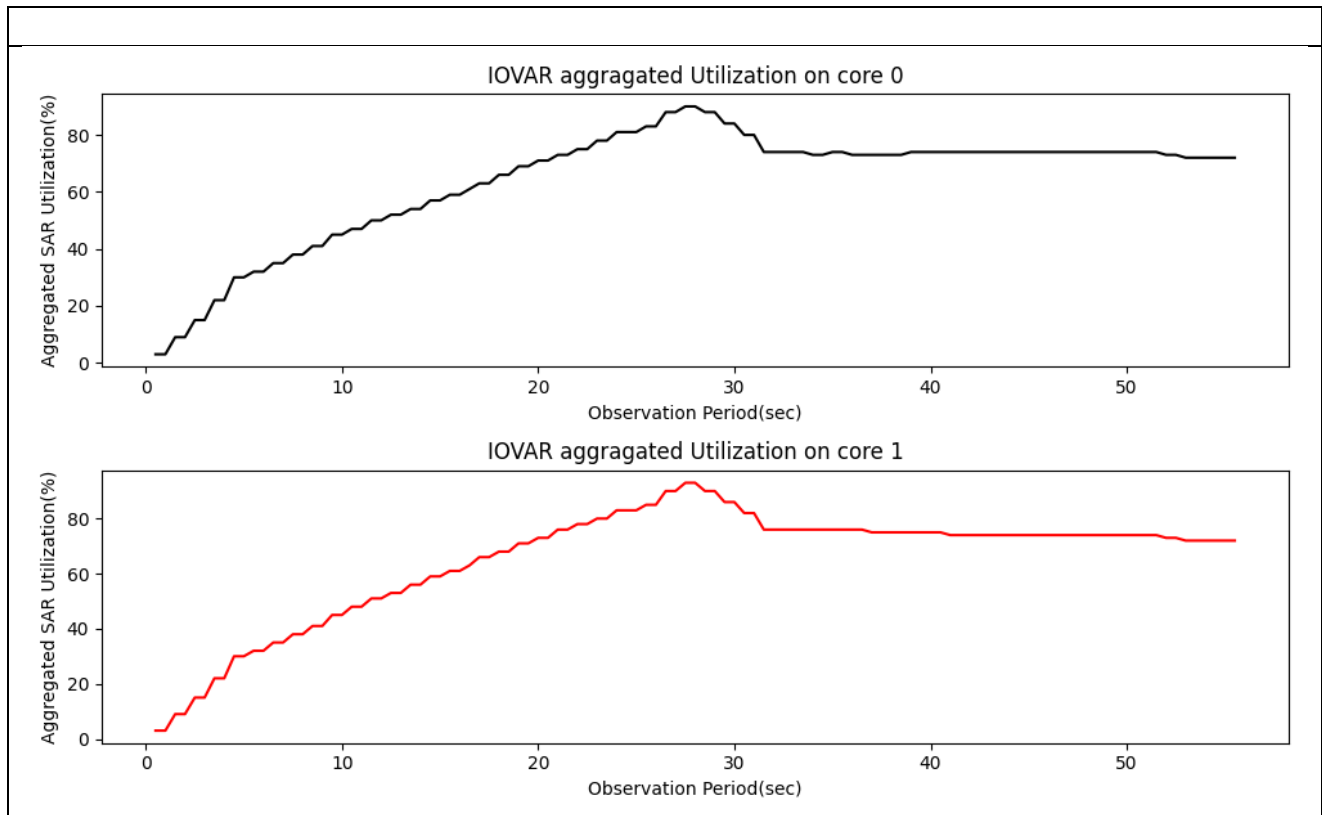


Test Case 2a: SDB - Aggregated SAR Utilization over observation window Softap in 2.4Ghz and sta connection in 6Ghz



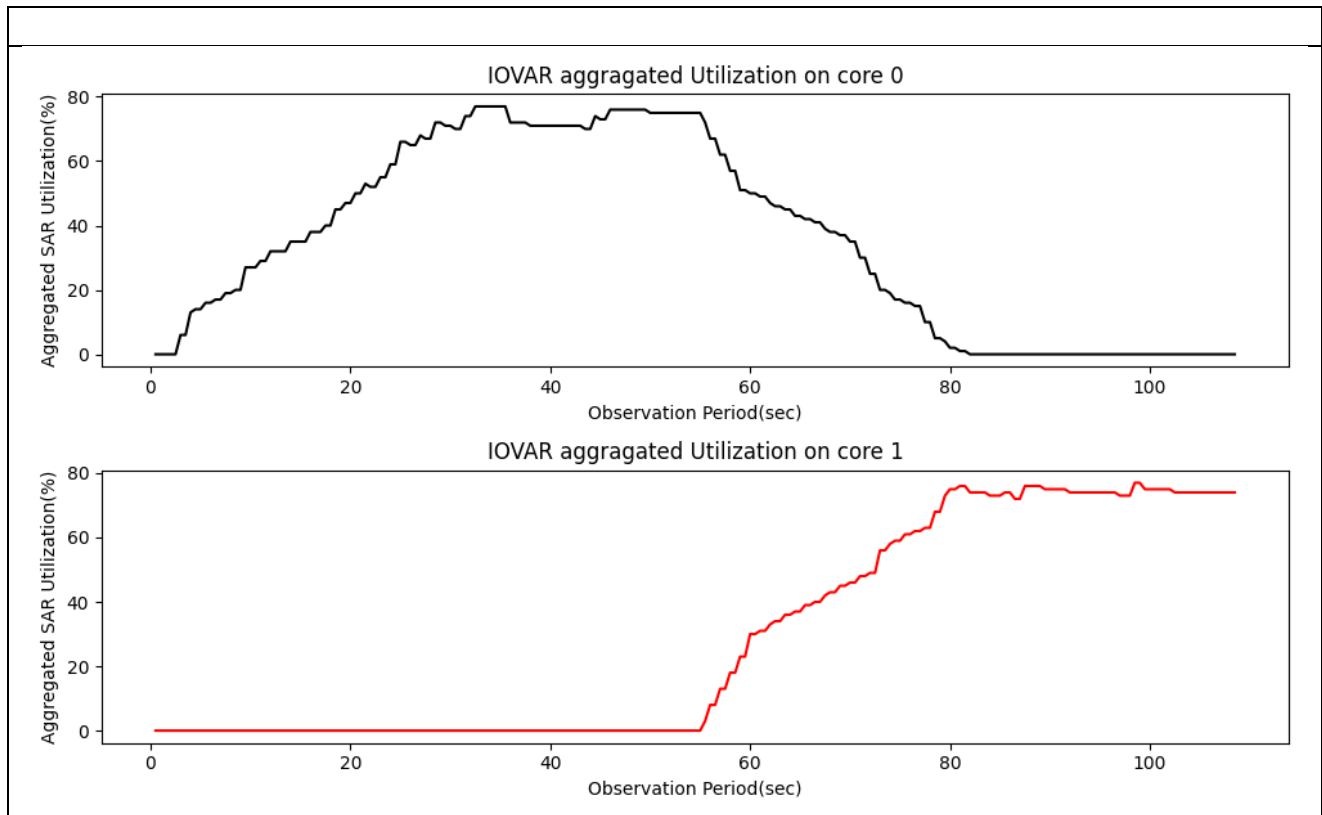


Test Case 2b: SDB - Aggregated SAR Utilization over observation window Softap in 2.4Ghz and sta connection in 6Ghz + BT Traffic



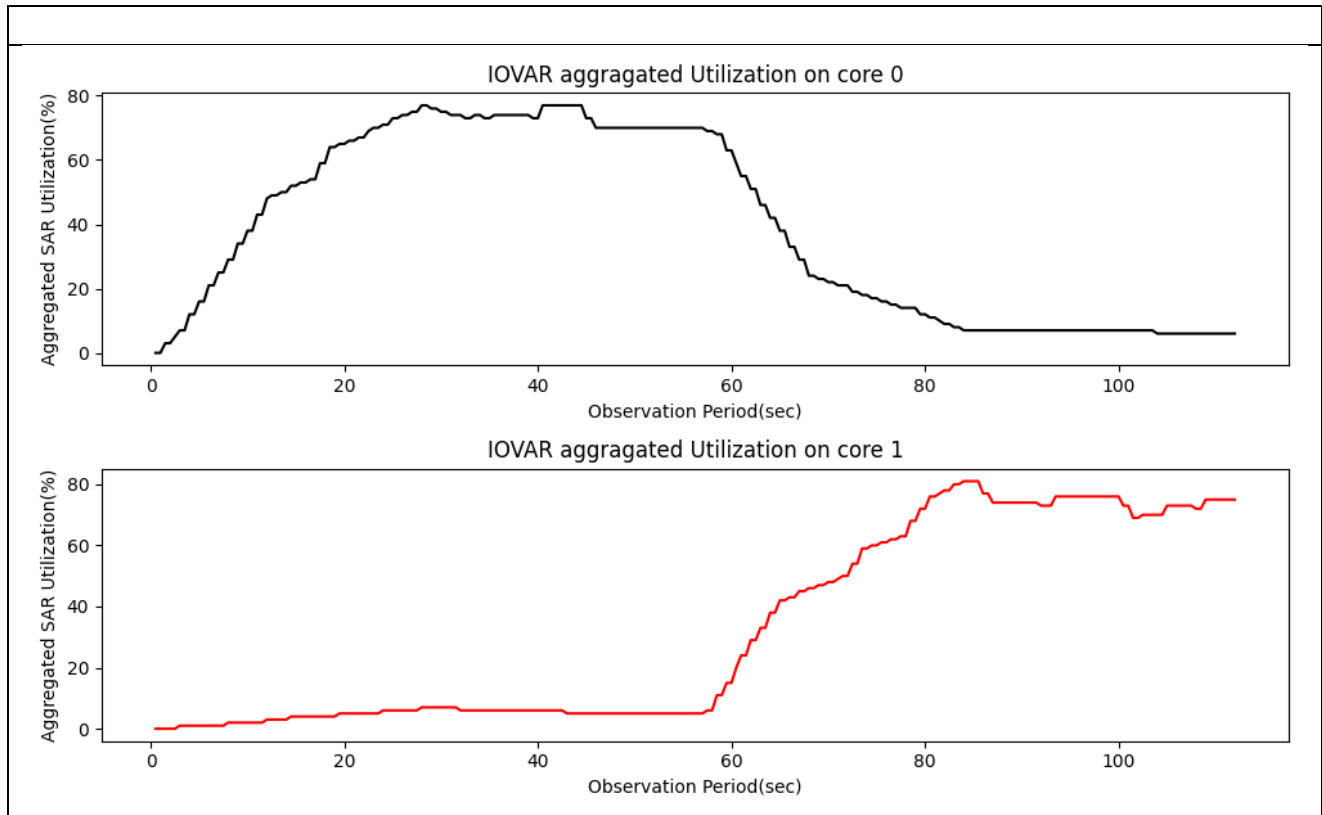


Test Case 3a: Non-SDB –Aggregated 2.4GHz SAR Utilization over observation window (Antenna switching)



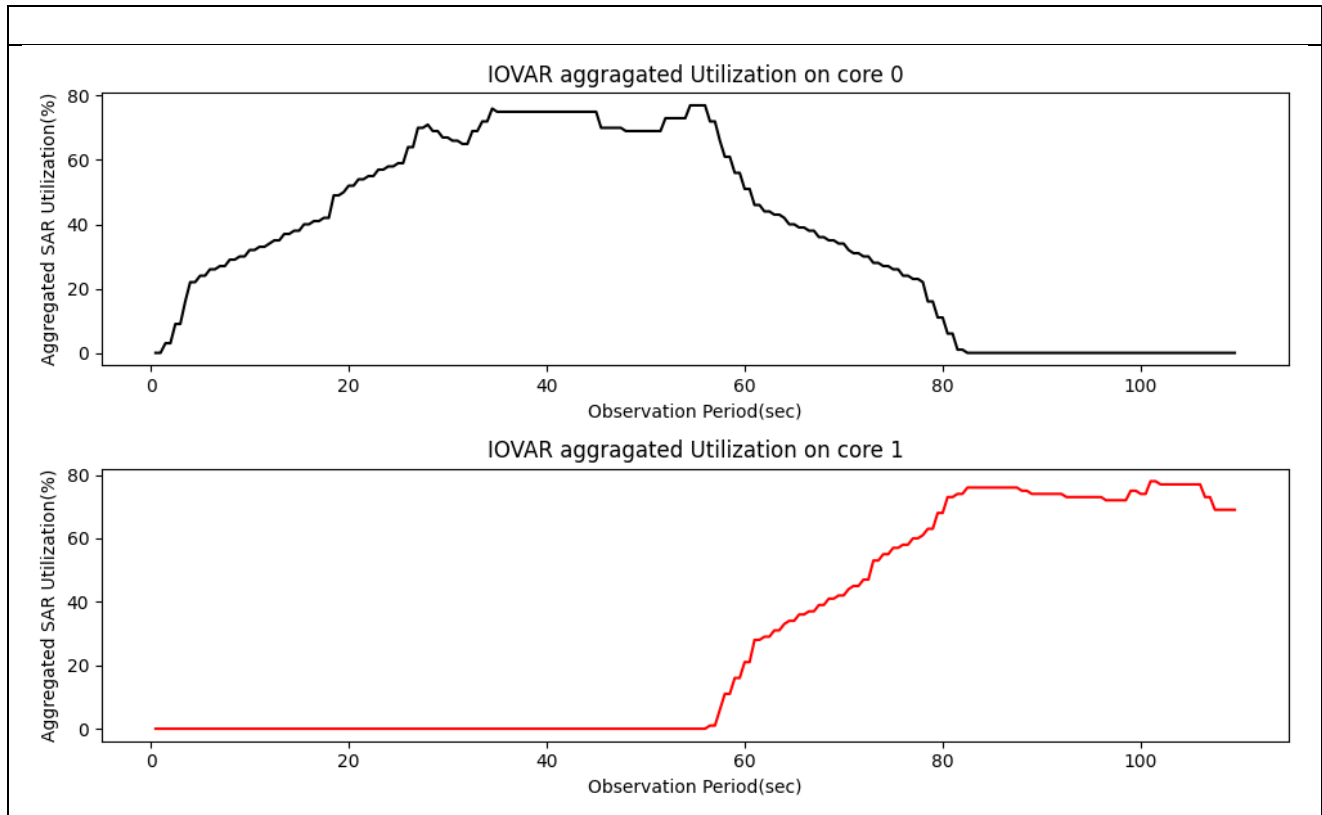


Test Case 3b: Non-SDB –Aggregated 2.4GHz SAR Utilization over observation window + BT Traffic



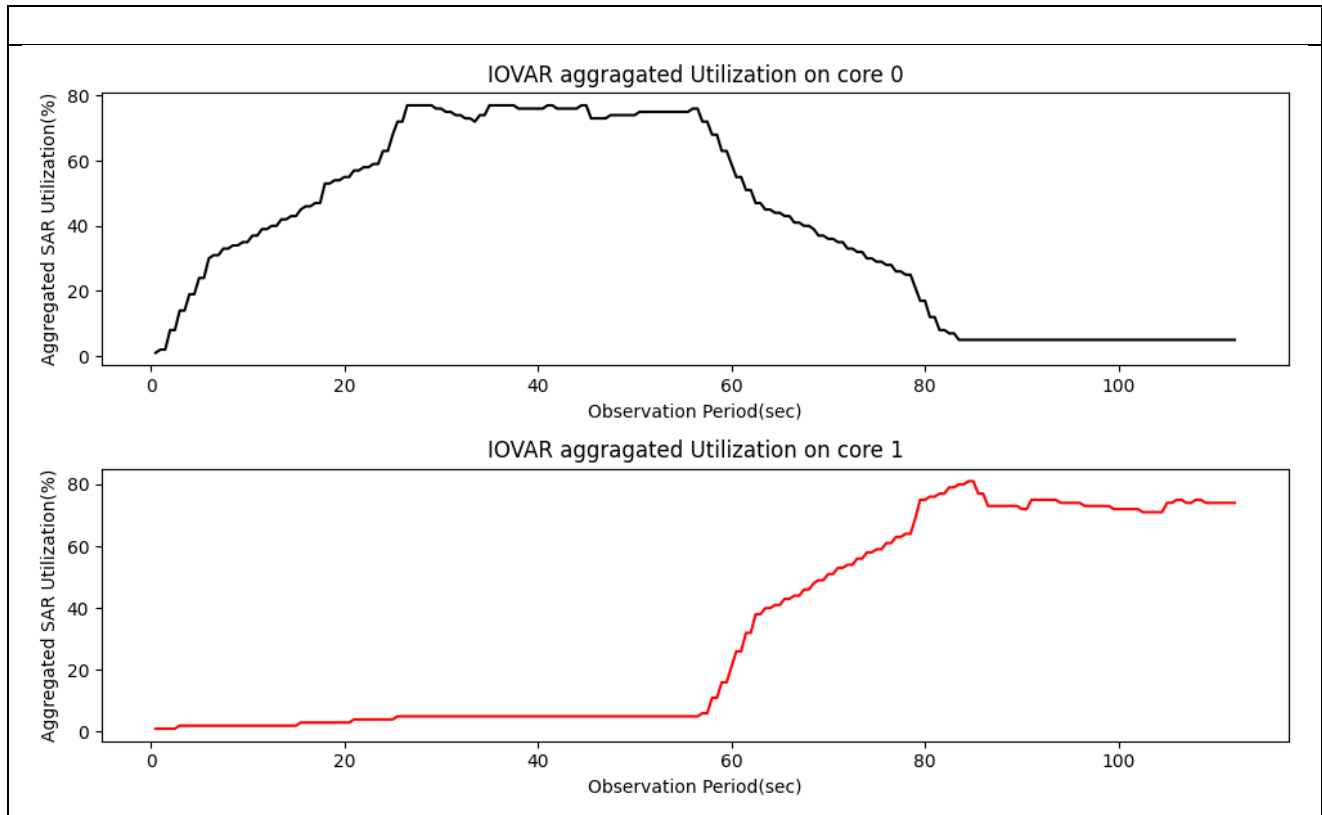


Test Case 4a: Non-SDB –Aggregated 5GHz SAR Utilization over observation window



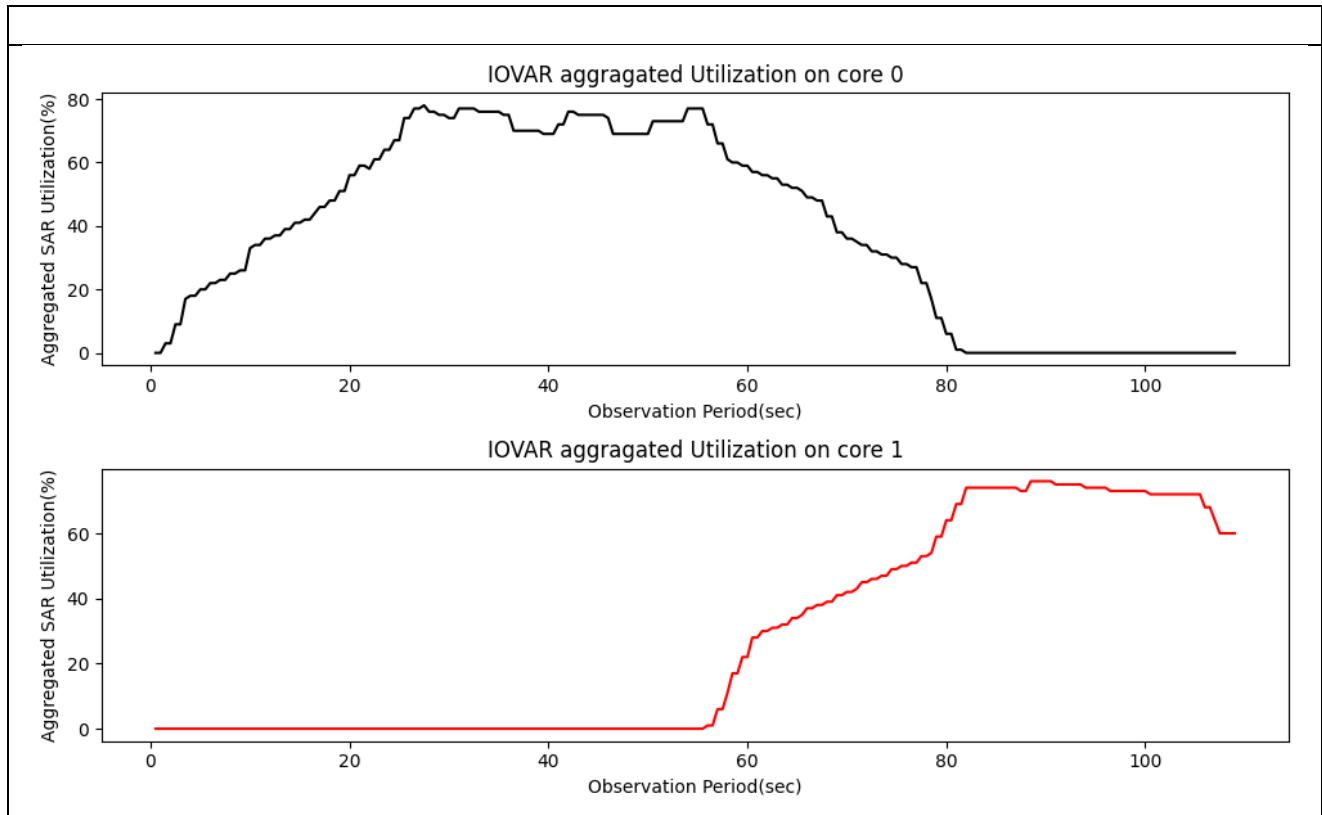


Test Case 4b: Non-SDB –Aggregated 5GHz SAR Utilization over observation window



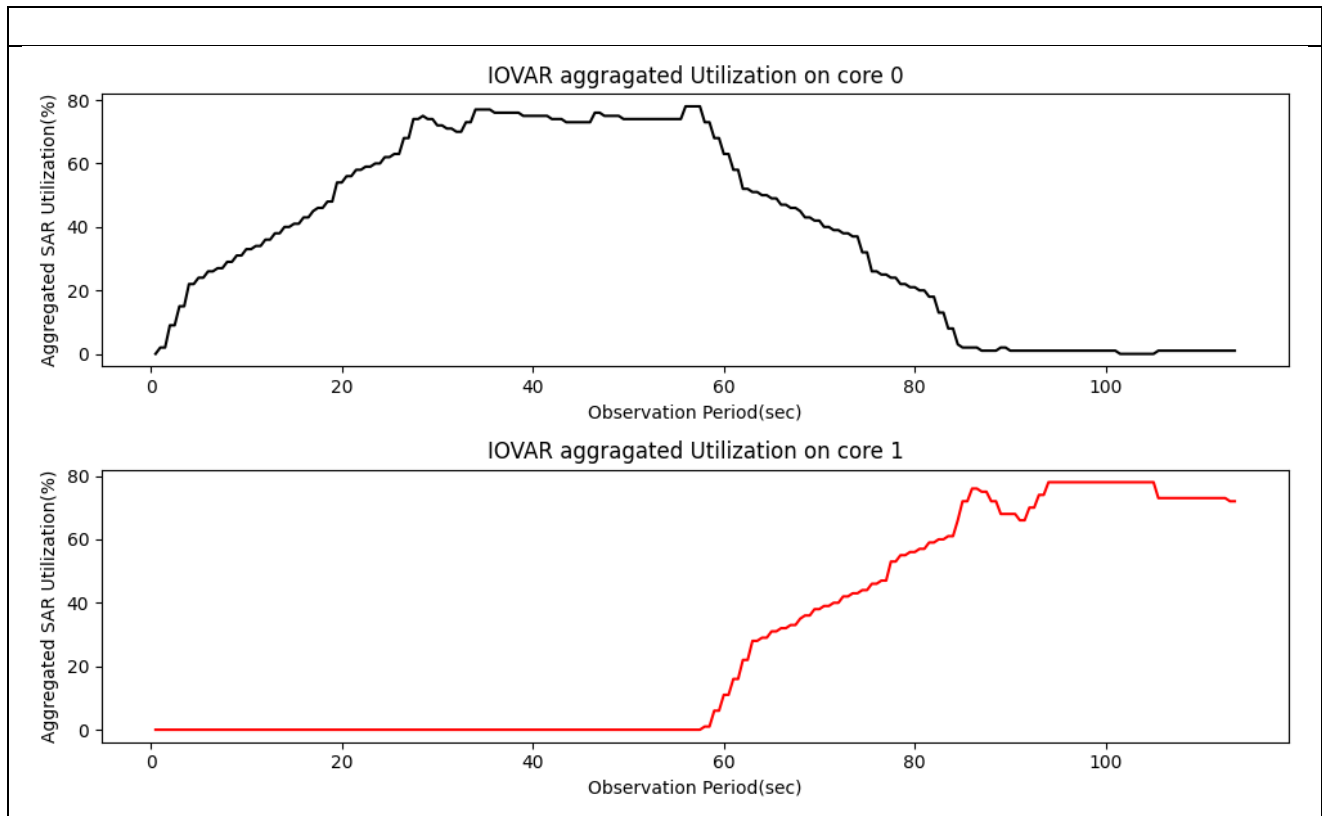


Test Case 5a: Non-SDB –Aggregated 6GHz SAR Utilization over observation window



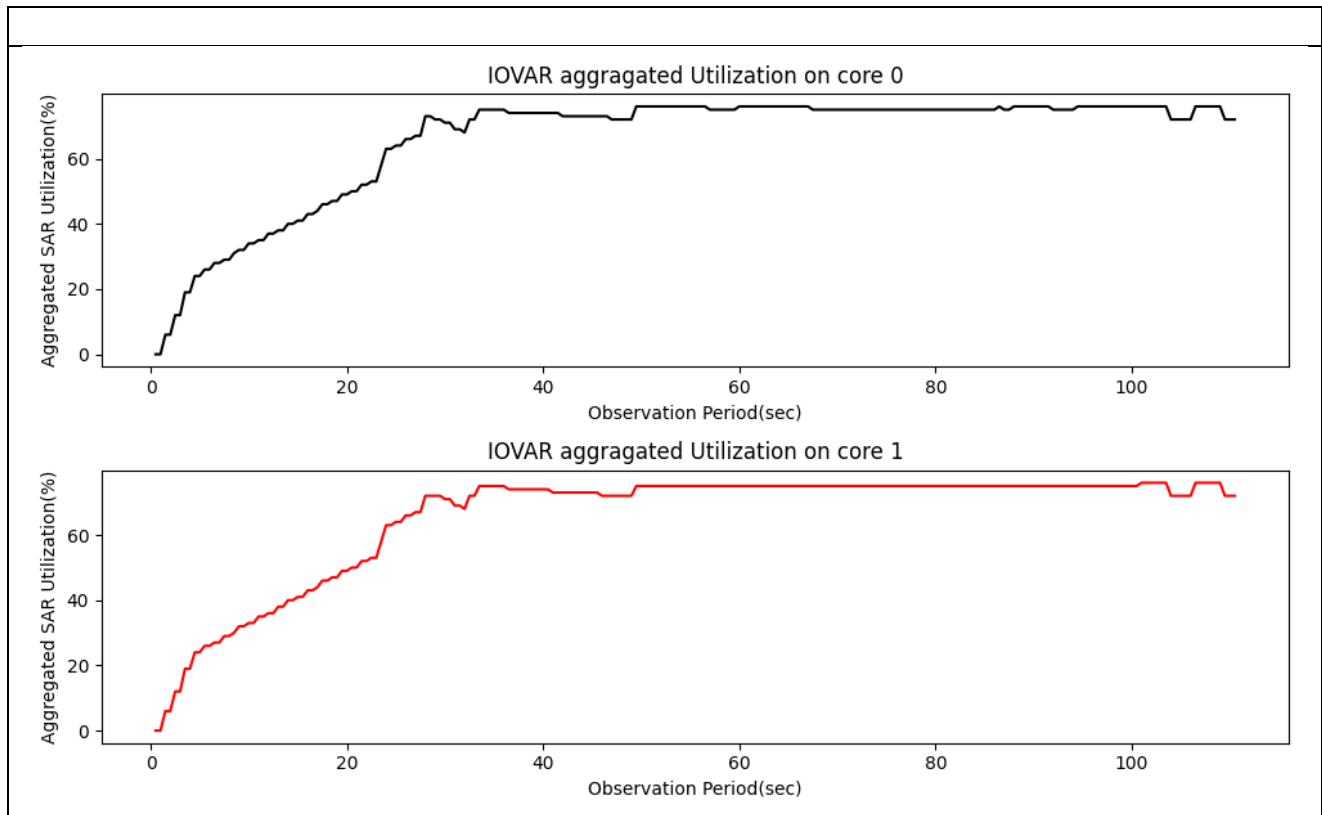


Test Case 5b: Non-SDB –Aggregated 6GHz SAR Utilization over observation window



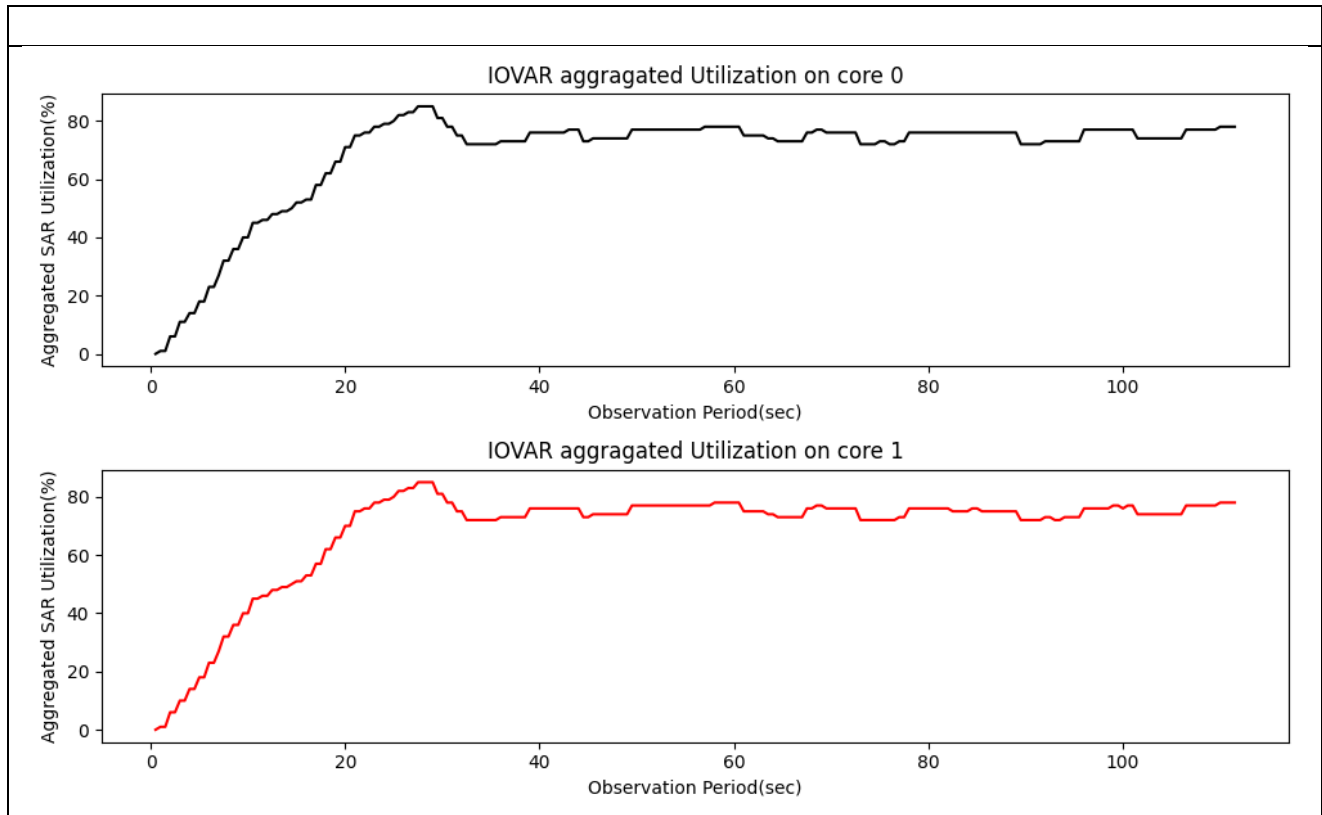


Test Case 6a: Non-SDB –Aggregated 2.4GHz SAR Utilization over observation window



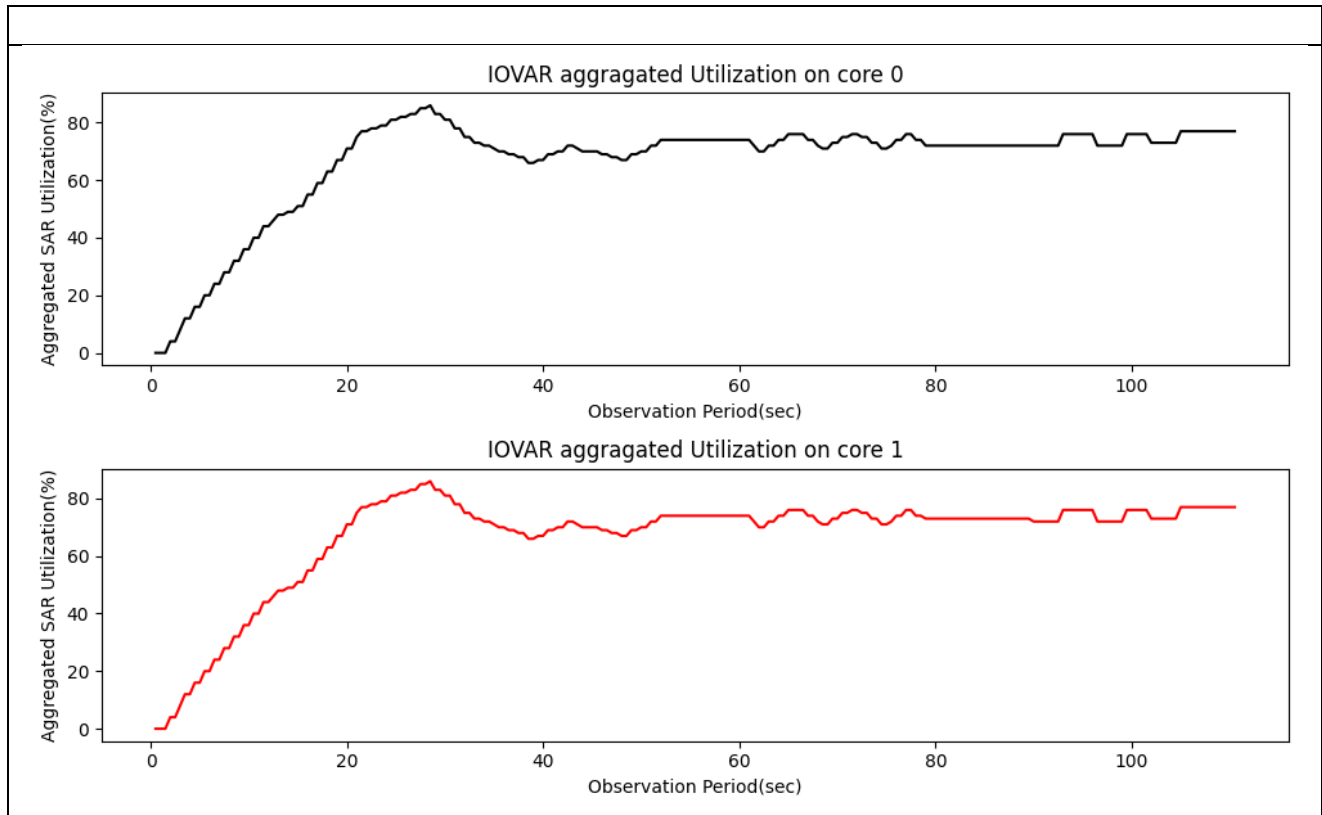


Test Case 6b: Non-SDB –Aggregated 2.4GHz SAR Utilization over observation window



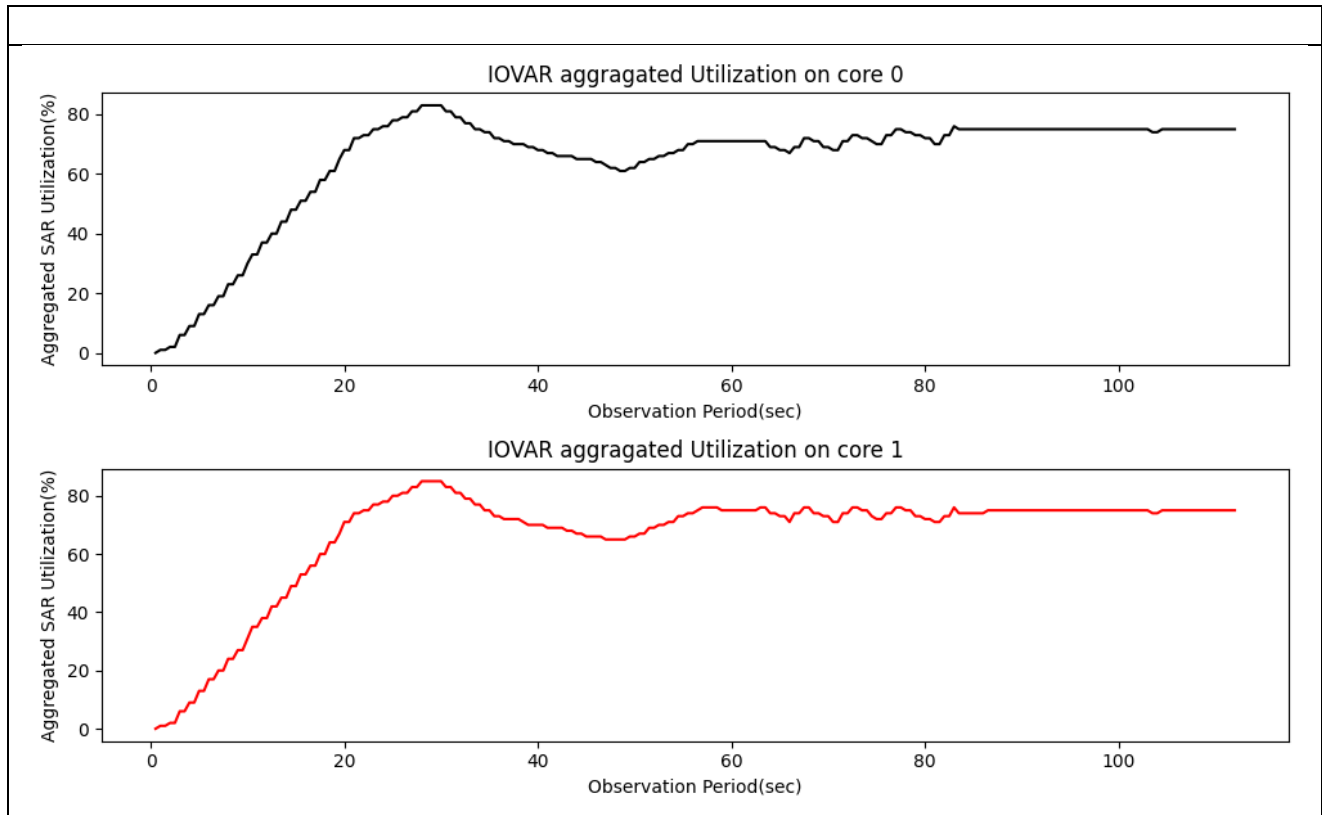


Test Case 7a: Non-SDB –Aggregated 5GHz SAR Utilization over observation window



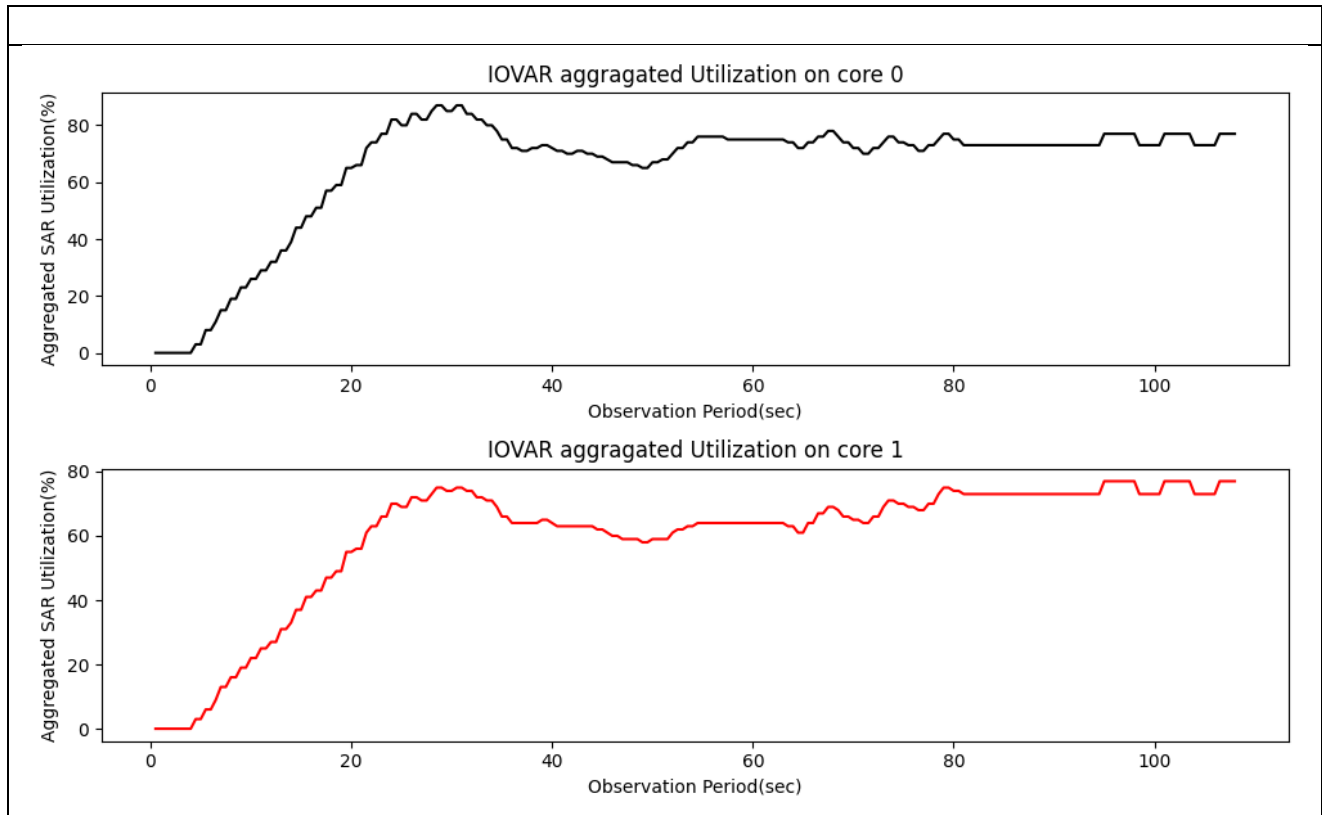


Test Case 7b: Non-SDB –Aggregated 5GHz SAR Utilization over observation window



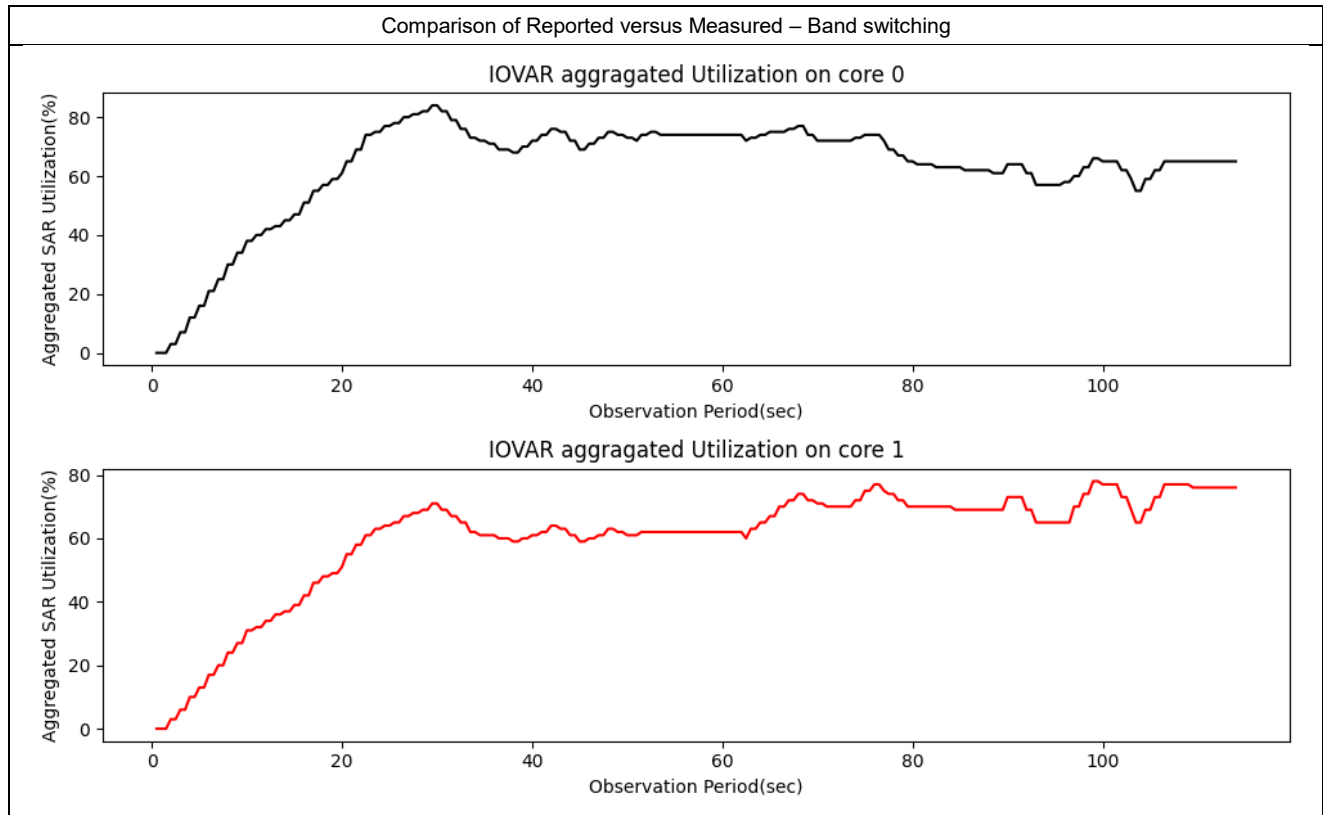


Test Case 8a: Non-SDB –Aggregated 6GHz SAR Utilization over observation window





Test Case 8b: Non-SDB –Aggregated 6GHz SAR Utilization over observation window





5. Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
Boonton	Power Sensor	RTP4018-S1	12965	Oct. 22, 2024	Oct. 21, 2025
Boonton	Power Sensor	RTP4018-S1	12966	Oct. 22, 2024	Oct. 21, 2025
Boonton	Power Sensor	RTP4018-S1	12967	Oct. 22, 2024	Oct. 21, 2025
Boonton	Power Sensor	RTP4018-S1	12969	Oct. 22, 2024	Oct. 21, 2025
Testo	Hygro meter	608-H1	45196600	Oct. 28, 2024	Oct. 27, 2025
ATM	Dual Directional Coupler	C122H-10	P610410z-02	CBT*	
Woken	Attenuator	WK0602-XX	N/A	CBT*	
Mini-Circuits	Diplexer	ZDSS-2R5G5G-S+	N/A	CBT*	
Netgear	Wireless router	RS300	7MM2485WA030D	NA	
Netgear	Wireless router	RAX200	69G6187LA00B1	NA	

Remark:

*CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, coupler, diplexer were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.