



RF Exposure Report

(Part 0: SAR Characterization Evaluation)

FCC ID : A4RG576D
Equipment : Phone
Model Name : G576D
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : FCC 47 CFR Part 2 (2.1093)

We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Approved by: Cona Huang / Deputy Manager

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Table of Contents

1. Introduction	4
2. Product Description	5
3. SAR Characterization.....	6
3.1 SAR design target and uncertainty.....	6
3.2 SAR Characterization – Power Table	9



1. Introduction

The FCC RF exposure limit is based on time-averaged RF exposure. SAR regulatory specifications are defined over certain measurement duration allowing for time-averaging. The Samsung S.LSI proprietary TAS (Time Average SAR) algorithm has been designed to meet the compliance limits over the required duration, while still allowing dynamic control of transmit power for meeting system performance.

This report shows SAR characterization of sub6GHz. The characterization is achieved by determination of Plimit. In the case of sub6GHz, power is measured by antenna connection port power. Plimit is the power level that corresponds to the exposure design target. Design target is defined as SAR_design target for sub6GHz.

The compliance test under static transmission and simultaneous transmission are performed and summarized in Part 1 report. The validation of TAS algorithm under the dynamic transmission scenarios are conducted are reported in Part 2. Terminologies for this report are listed up in the table below.

Pmax	Maximum Tx power that can be transmitted physically from RFIC for a given RAT
SAR_FCC_limit	SAR limit specified by FCC 1.6 W/kg averaged over 1-gram, for head and body exposure, and 4 W/kg averaged over 10-gram, for extremity exposure
SAR_target	Target SAR level used in TAS algorithm. This SAR value should be less than FCC limit and should be determined after accounting for all uncertainties and other design considerations.
Plimit	The time-averaged RF power that corresponds to SAR_target.
SAR characterization	Characterization of SAR value for all sub6GHz technologies



2. Product Description

Product Feature & Specification	
Equipment Name	Phone
Model Name	G576D
FCC ID	A4RG576D
S / N	38031JEKB01480
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 38: 2570 MHz ~ 2620 MHz LTE Band 41: 2496 MHz ~ 2690 MHz LTE Band 66: 1710 MHz ~ 1780 MHz 5G NR n2 : 1850 MHz ~ 1910 MHz 5G NR n5 : 824 MHz ~ 849 MHz 5G NR n7 : 2500 MHz ~ 2570 MHz 5G NR n12 : 699 MHz ~ 716 MHz 5G NR n38 : 2570 MHz ~ 2620 MHz 5G NR n41 : 2496 MHz ~ 2690 MHz 5G NR n66 : 1710 MHz ~ 1780 MHz 5G NR n77: 3700 MHz ~ 3980 MHz, 3450MHz ~ 3550MHz WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2 GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3 GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6 GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8 GHz Band: 5725 MHz ~ 5850 MHz WLAN 5.9 GHz Band: 5850 MHz ~ 5895 MHz WLAN 6E: 5925 MHz ~ 6425 MHz, 6425 MHz ~ 6525 MHz, 6525 MHz ~ 6875 MHz, 6875 MHz ~ 7125 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC: 13.56 MHz WPC Rx: 110 kHz ~ 148.5 kHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA LTE: QPSK, 16QAM, 64QAM, 256QAM 5G NR: DFT-s-OFDM/CP-OFDM, Pi/2 BPSK/QPSK/16QAM/64QAM/256QAM WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/HE20/HE40/HE80 Bluetooth BR/EDR/LE/HR/Channel sounding NFC: ASK WPC Rx: ASK



3. SAR Characterization

SAR characterization must be performed to cover all radio configurations and usage scenarios that the wireless device supports for operating at 6 GHz or below. It will then be used as input for S.LSI TAS feature to control and manage RF exposure for $f < 6$ GHz.

3.1 SAR design target and uncertainty

The power table index 5 and 6 will be designed to meet both 1g and 10 SAR design target

Accounting for total uncertainty, SAR_design_target should meet the following condition:

$$SAR_{design_target} < SAR_{regulatory_limit} \times 10^{\frac{-total\ uncertainty}{10}}$$

Wireless technology/ band	Antenna	Duty cycle	Head		Hotspot	Body-worn		power tolerance (dB)
			Standalone	Simultaneous	Simultaneous	Standalone	Simultaneous	
			Index 2	Index 3	Index 4	Index 5	Index 6	
1g SAR design target (W/Kg)								
GSM850 GSM/GPRS 1TX	0	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 GPRS 2TX	0	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 GPRS 3TX	0	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 GPRS 4TX	0	50.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 1TX	0	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 2TX	0	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 3TX	0	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 4TX	0	50.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 GSM/GPRS 1TX	1	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 GPRS 2TX	1	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 GPRS 3TX	1	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 GPRS 4TX	1	50.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 1TX	1	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 2TX	1	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 3TX	1	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM850 EDGE 4TX	1	50.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GSM/GPRS 1TX	2	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GPRS 2TX	2	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GPRS 3TX	2	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GPRS 4TX	2	50.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 1TX	2	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 2TX	2	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 3TX	2	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 4TX	2	50.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GSM/GPRS 1TX	0	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GPRS 2TX	0	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GPRS 3TX	0	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 GPRS 4TX	0	50.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 1TX	0	12.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 2TX	0	25.00%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 3TX	0	37.50%	0.79	0.65	0.65	0.79	0.65	1.00
GSM1900 EDGE 4TX	0	50.00%	0.79	0.65	0.65	0.79	0.65	1.00



Wireless technology/ band	Antenna	Duty cycle	Head		Hotspot	Body-worn		power tolerance (dB)
			Standalone	Simultaneous	Simultaneous	Standalone	Simultaneous	
			Index 2	Index 3	Index 4	Index 5	Index 6	
1g SAR design target (W/Kg)								
WCDMA B2	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
WCDMA B2	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
WCDMA B4	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
WCDMA B4	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
WCDMA B5	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
WCDMA B5	1	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B2	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B2	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B5	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B5	1	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B7	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B7	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B12	0	100.00%	0.81	0.67	0.67	0.81	0.67	0.90
LTE B12	1	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B17	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B17	1	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B38 PC3	2	63.30%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B38 PC3	0	63.30%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B41 PC3	2	63.30%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B41 PC3	0	63.30%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B41/B38 PC2	2	43.30%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B41/B38 PC2	0	43.30%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B66/B4	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
LTE B66/B4	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00



Wireless technology/ band	Antenna	Duty cycle	Head		Hotspot	Body-worn		power tolerance (dB)
			Standalone	Simultaneous	Simultaneous	Standalone	Simultaneous	
			Index 2	Index 3	Index 4	Index 5	Index 6	
1g SAR design target (W/Kg)								
FR1 n2	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n2	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n5	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n5	1	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n7	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n7	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n12	0	100.00%	0.81	0.67	0.67	0.81	0.67	0.90
FR1 n12	1	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n41/n38 PC3	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n41/n38 PC3	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n66	2	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n66	0	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n77 PC3	6	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n77 PC3	2	100.00%	0.7	0.58	0.58	0.7	0.58	1.50
FR1 n77 PC3	1	100.00%	0.79	0.65	0.65	0.79	0.65	1.00
FR1 n77 PC3	5	100.00%	0.79	0.65	0.65	0.79	0.65	1.00

3.2 SAR Characterization – Power Table

1. The Plimit values correspond to SAR_design_target.
2. GSM don't support time average feature of dynamic power varying, the power will be fixed at the static reduce power level at different exposure conditions for RF exposure compliance. For the GSM (TDD) Plimit power levels in the table correspond to the burst average power levels which don't account for TX duty cycle.
3. UMTS, LTE and 5GNR TDD: Plimit power levels in the table correspond to the time-averaged power levels which accounts for TX duty cycle.
4. Maximum target power, Pmax, is configured in NV settings in EUT to limit maximum transmitting power. This power is converted into peak power in NV settings for TDD scheme.

<P_{limit} for supported technologies and bands (P_{limit} corresponding to SAR design target)>

Wireless technology/ band (No Accounting duty cycle)	Antenna	Duty cycle	Mobile Power condition	Head		Hotspot	Body-worn		P Max Burst average power (dBm)	
				Standalone	Simultaneous	Simultaneous	Standalone	Simultaneous		
				Index 1	Index 2	Index 3	Index 4	Index 5		Index 6
				P limit						
Burst average power (dBm)										
GSM850 GSM/GPRS 1TX	0	12.50%	32.50	37.10	34.70	34.30	37.50	34.30	32.50	
GSM850 GPRS 2TX	0	25.00%	31.50	34.10	31.70	31.30	34.50	31.30	31.50	
GSM850 GPRS 3TX	0	37.50%	30.50	32.40	30.00	29.60	32.80	29.60	30.50	
GSM850 GPRS 4TX	0	50.00%	29.00	31.10	28.70	28.30	31.50	28.30	29.00	
GSM850 EDGE 1TX	0	12.50%	27.00	37.10	34.70	34.30	37.50	34.30	27.00	
GSM850 EDGE 2TX	0	25.00%	26.50	34.10	31.70	31.30	34.50	31.30	26.50	
GSM850 EDGE 3TX	0	37.50%	26.50	32.40	30.00	29.60	32.80	29.60	26.50	
GSM850 EDGE 4TX	0	50.00%	24.50	31.10	28.70	28.30	31.50	28.30	24.50	
GSM850 GSM/GPRS 1TX	1	12.50%	32.00	30.90	28.80	38.50	39.30	38.50	32.00	
GSM850 GPRS 2TX	1	25.00%	31.50	27.90	25.80	35.50	36.30	35.50	31.50	
GSM850 GPRS 3TX	1	37.50%	29.50	26.00	23.90	33.60	34.40	33.60	29.50	
GSM850 GPRS 4TX	1	50.00%	27.00	24.80	22.70	32.40	33.20	32.40	27.00	
GSM850 EDGE 1TX	1	12.50%	26.50	30.90	28.80	38.50	39.30	38.50	26.50	
GSM850 EDGE 2TX	1	25.00%	26.00	27.90	25.80	35.50	36.30	35.50	26.00	
GSM850 EDGE 3TX	1	37.50%	26.00	26.00	23.90	33.60	34.40	33.60	26.00	
GSM850 EDGE 4TX	1	50.00%	23.00	24.80	22.70	32.40	33.20	32.40	23.00	
GSM1900 GSM/GPRS 1TX	2	12.50%	29.50	34.30	32.50	29.30	30.10	29.30	29.50	
GSM1900 GPRS 2TX	2	25.00%	28.50	31.30	29.50	26.30	27.10	26.30	28.50	
GSM1900 GPRS 3TX	2	37.50%	28.00	29.50	27.70	24.50	25.30	24.50	28.00	
GSM1900 GPRS 4TX	2	50.00%	27.00	28.30	26.50	23.30	24.10	23.30	27.00	
GSM1900 EDGE 1TX	2	12.50%	25.00	34.30	32.50	29.30	30.10	29.30	25.00	
GSM1900 EDGE 2TX	2	25.00%	24.00	31.30	29.50	26.30	27.10	26.30	24.00	
GSM1900 EDGE 3TX	2	37.50%	24.00	29.50	27.70	24.50	25.30	24.50	24.00	
GSM1900 EDGE 4TX	2	50.00%	23.00	28.30	26.50	23.30	24.10	23.30	23.00	
GSM1900 GSM/GPRS 1TX	0	12.50%	29.00	34.60	33.80	32.40	34.60	33.80	29.00	
GSM1900 GPRS 2TX	0	25.00%	28.50	31.60	30.80	29.40	31.60	30.80	28.50	
GSM1900 GPRS 3TX	0	37.50%	27.50	29.80	29.00	27.60	29.80	29.00	27.50	
GSM1900 GPRS 4TX	0	50.00%	26.50	28.60	27.80	26.40	28.60	27.80	26.50	
GSM1900 EDGE 1TX	0	12.50%	25.00	34.60	33.80	32.40	34.60	33.80	25.00	
GSM1900 EDGE 2TX	0	25.00%	23.50	31.60	30.80	29.40	31.60	30.80	23.50	
GSM1900 EDGE 3TX	0	37.50%	23.50	29.80	29.00	27.60	29.80	29.00	23.50	
GSM1900 EDGE 4TX	0	50.00%	22.50	28.60	27.80	26.40	28.60	27.80	22.50	



<P_{limit} for supported technologies and bands (P_{limit} corresponding to SAR design target)>

Wireless technology/ band (Accounting duty cycle)	Antenna	Duty cycle	Maximum Power Conditions	Head		Hotspot	Body-worn		P Max Time-average power (dBm)
				Standalone	Simultaneous	Simultaneous	Standalone	Simultaneous	
			Index 1	Index 2	Index 3	Index 4	Index 5	Index 6	
			P limit						
WCDMA B2	2	100.00%	24.00	25.90	25.10	19.50	20.30	19.50	24.00
WCDMA B2	0	100.00%	23.50	25.80	22.80	23.60	25.80	25.00	23.50
WCDMA B4	2	100.00%	24.70	27.50	24.10	22.60	23.40	22.60	24.70
WCDMA B4	0	100.00%	24.20	28.40	27.60	22.80	25.80	22.80	24.20
WCDMA B5	0	100.00%	24.00	28.40	27.60	25.20	28.10	27.30	24.00
WCDMA B5	1	100.00%	23.50	21.40	20.60	28.20	29.00	28.20	23.50
LTE B2	2	100.00%	24.00	25.60	23.70	19.90	20.70	19.90	24.00
LTE B2	0	100.00%	23.50	25.40	24.60	23.10	26.00	23.20	23.50
LTE B5	0	100.00%	24.70	27.60	26.80	25.10	27.50	26.70	24.70
LTE B5	1	100.00%	24.20	20.10	18.00	28.00	28.80	28.00	24.20
LTE B7	2	100.00%	24.70	23.50	21.50	18.20	22.60	21.30	24.70
LTE B7	0	100.00%	24.20	24.50	22.80	20.90	22.70	21.00	24.20
LTE B12	0	100.00%	24.80	30.00	29.20	26.30	28.10	27.30	24.80
LTE B12	1	100.00%	24.30	21.40	19.30	28.20	29.00	28.20	24.30
LTE B17	0	100.00%	24.70	29.90	29.10	26.20	28.00	27.20	24.70
LTE B17	1	100.00%	24.20	21.40	19.30	28.20	29.00	28.20	24.20
LTE B38 PC3	2	63.30%	22.00	22.10	20.10	17.90	22.60	21.50	22.00
LTE B38 PC3	0	63.30%	21.50	24.40	23.60	20.30	23.90	21.20	21.50
LTE B41 PC3	2	63.30%	22.70	22.10	20.10	17.90	22.60	21.50	22.70
LTE B41 PC3	0	63.30%	22.20	24.40	23.60	20.30	23.90	21.20	22.20
LTE B66/B4	2	100.00%	24.70	27.00	24.50	22.00	23.10	22.00	24.70
LTE B66/B4	0	100.00%	24.20	27.30	26.50	22.60	25.20	22.60	24.20



<P_{limit} for supported technologies and bands (P_{limit} corresponding to SAR design target)>

Wireless technology/ band (Accounting duty cycle)	Antenna	Duty cycle	Maximum Power Conditions Index 1	Head		Hotspot	Body-worn		P Max Time-average power (dBm)
				Standalone	Simultaneous	Simultaneous	Standalone	Simultaneous	
				Index 2	Index 3	Index 4	Index 5	Index 6	
				P limit					
Time-average power (dBm)									
FR1 n2	2	100.00%	24.00	25.30	23.50	19.40	20.20	19.40	24.00
FR1 n2	0	100.00%	23.50	27.70	26.90	23.00	25.10	23.00	23.50
FR1 n5	0	100.00%	24.70	27.70	26.90	24.50	27.40	26.60	24.70
FR1 n5	1	100.00%	24.20	21.20	19.20	27.60	28.40	27.60	24.20
FR1 n7	2	100.00%	24.70	25.00	23.00	19.00	22.90	22.00	24.70
FR1 n7	0	100.00%	24.20	24.20	22.70	20.30	22.60	20.70	24.20
FR1 n12	0	100.00%	24.80	28.70	27.90	27.00	28.00	27.20	24.80
FR1 n12	1	100.00%	24.30	22.40	20.30	29.50	30.40	29.60	24.30
FR1 n41/n38 PC3	2	100.00%	24.70	23.30	22.50	19.40	22.50	21.60	24.70
FR1 n41/n38 PC3	0	100.00%	24.20	24.20	23.40	20.30	24.20	23.40	24.20
FR1 n66	2	100.00%	24.70	27.00	26.20	22.70	23.50	22.70	24.70
FR1 n66	0	100.00%	24.20	26.80	26.00	21.70	24.80	21.70	24.20
FR1 n77 PC3	6	100.00%	24.20	22.70	21.90	17.80	20.10	19.30	24.20
FR1 n77 PC3	2	100.00%	23.20	23.50	21.50	18.00	20.10	18.80	23.20
FR1 n77 PC3	1	100.00%	24.00	18.20	17.40	23.30	26.00	25.20	24.00
FR1 n77 PC3	5	100.00%	24.00	15.50	11.30	18.70	23.00	20.60	24.00