APPENDIX E: MULTI-TX AND ANTENNA SAR CONSIDERATIONS

E.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D04v01 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter

E.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1g or 10g SAR.

Per FCC KDB Publication 941225 D06v02r01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("-").

Per FCC KDB Publication 648474 D04 Handset SAR, Phablet SAR tests were not required if wireless router 1g SAR (scaled to the maximum output power, including tolerance) < 1.2 W/kg. Therefore no further analysis beyond the tables included in this section was required to determine that possible simultaneous transmission scenarios would not exceed the SAR limit.

This device is enabled with Samsung S.LSI TAS (Time Average SAR) with pre-defined sub6 antenna groups (AG0 and AG1). Additionally, this device is enabled with Qualcomm FastConnect TAS for WLAN radios. Simultaneous transmission analysis is performed per antenna groups. Analysis demonstrates:

1. The mutually exclusive operation of AG0 and AG1
2. The compliance between AG0 and BT/WLAN/NFC, and between AG1 and BT/WLAN/NFC.

When operating in the same antenna group, Samsung S.LSI TAS algorithm in WWAN directly adds the time-averaged RF exposure from 4G and time-averaged RF exposure from 5G NR. S.LSI algorithm controls the total RF exposure from both 4G and 5G NR to not exceed FCC limit. Therefore, simultaneous transmission compliance between 4G+5G operations within an antenna group is demonstrated in the Part 2 Report during algorithm validation.

Similarly, Qualcomm FastConnect TAS algorithm directly adds the time-averaged RF exposure of all simultaneous transmissions of WLAN radios and controls the total RF exposure from all WLAN radios to not exceed FCC limit. Therefore, simultaneous transmission compliance between WLAN operations is demonstrated in the Part 2 Report during algorithm validation. Simultaneous SAR for WLAN in a DSI is SAR design target + Device total uncertainty for WLAN.

E.3 Conclusion

Detailed numerical summed SAR results, SPLSR, and volumetric simultaneous SAR for all the combinations of sub6 antenna groups are demonstrated in the "FCC Proprietary Analysis for Multi-Tx and Antenna SAR considerations" document and worst-case Simultaneous Tx reported SAR for each exposure condition are reported on SAR summary table on page 1 of SAR RF Exposure Part 1 Test Report (Report SN: 1M2304260063-01.A3L). All results are sufficient to show that AG0 is mutually exclusive from AG1 and that simultaneous transmission cases will not exceed the SAR limit and therefore no more measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528- 2013 Section 6.3.4.1