



RF EXPOSURE REPORT

REPORT NO.: SA980210H07

MODEL NO.: WU600-TS

ACCORDING: FCC Guidelines for Human Exposure
IEEE C95.1

APPLICANT: SONY Corporation

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ISSUED BY: Bureau Veritas Consumer Products Services (H.K.)
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RF Exposure Measurement

1. Introduction

In this document, we try to prove the safety of radiation harmfulness to the human body for our product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed. The Gain of the antenna used in this product is measured in a Fully Anechoic Chamber (FAC) calibrated for antenna measurement in our lab, and also the maximum total power input to the antenna is measured. Through the Friis transmission formula and the maximum gain of the antenna, we can calculate the distance, away from the product, where the limit of MPE is reached.

Although the Friis transmission formula is a far field assumption, the calculated result of that is an over-prediction for near field power density. We will take that as the worst case to specify the safety range.

2. RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
300-1500	F/300	6
1500-100,000	5	6
(B)Limits For General Population / Uncontrolled Exposure				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

3. Friis Formula

Friis transmission formula : $P_d = (P_{out} * G) / (4 * \pi * r^2)$

where

P_d = power density in mW/cm^2

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, $1 mW/cm^2$. If we know the maximum Gain of the antenna and the total power input to the antenna, through the calculation, we will know the MPE value at distance 20cm.

Ref. : David K. Cheng, *Field and Wave Electromagnetics*, Second Edition,
Page 640, Eq. (11-133).

4. EUT Operating condition

The software provided by Manufacturer enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

5. Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. Warning statement to the user for keeping at least 20cm or more separation distance with the antenna should be included in users manual. So, this device is classified as **Mobile Device**

6. Test Results

6.1 Antenna Gain

There are two antennas provided to this EUT, please refer to the following table:

No.	Antenna Type	Antenna Connector	For 2.4GHz Gain (dBi)	For 5GHz Gain (dBi)	Cable Loss (dB)	Cable Length (cm)
1	PCB	Hirose U.FL	2.7	3	0	24
2	PCB	Hirose U.FL	1.5	1.5	0	39

6.2 Output Power Into Antenna & RF Exposure value at distance 20cm:

For 15.247(2.4GHz) :

For Part 802.11b:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	76.033	0.028	1.0
6	2437	82.224	0.030	1.0
11	2462	82.035	0.030	1.0

For Part 802.11g:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	124.738	0.046	1.0
6	2437	133.352	0.049	1.0
11	2462	123.880	0.046	1.0

DRAFT 802.11n (20MHz) OFDM

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	2412	314.874	0.117	1.0
6	2437	393.573	0.146	1.0
11	2462	340.476	0.126	1.0

For 15.247(5GHz) :

For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5745	138.038	0.055	1.0
3	5785	134.896	0.054	1.0
5	5825	141.254	0.056	1.0

For DRAFT 802.11n (20MHz) OFDM:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5745	306.238	0.122	1.0
3	5785	295.900	0.117	1.0
5	5825	279.292	0.111	1.0

For 15.407(5GHz) :

For Part 802.11a:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5180	14.289	0.006	1.0
2	5200	16.982	0.007	1.0
4	5240	15.959	0.006	1.0
5	5260	18.239	0.007	1.0
7	5300	19.187	0.008	1.0
8	5320	20.137	0.008	1.0
9	5500	23.659	0.009	1.0
14	5600	20.045	0.008	1.0
19	5700	22.284	0.009	1.0

For DRAFT 802.11n (20MHz) OFDM:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)
1	5180	36.165	0.014	1.0
2	5200	33.823	0.013	1.0
4	5240	32.127	0.013	1.0
5	5260	41.280	0.016	1.0
7	5300	40.509	0.016	1.0
8	5320	36.647	0.015	1.0
9	5500	40.403	0.016	1.0
14	5600	35.916	0.014	1.0
19	5700	17.224	0.007	1.0