



# RF EXPOSURE REPORT

**REPORT NO.:** SA940428H02

**MODEL NO.:** NTE310AG

**ACCORDING:** FCC Guidelines for Human Exposure  
IEEE C95.1

**APPLICANT:** Nortel Netowrks Limited

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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 ADT, 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 <sup>2</sup> )	Average Time (minutes)
<b>(A)Limits For Occupational / Control Exposures</b>				
300-1500	...	...	F/300	6
1500-100,000	...	...	5	6
<b>(B)Limits For General Population / Uncontrolled Exposure</b>				
300-1500	...	...	F/1500	6
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<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

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

$P_d$  is the limit of MPE, 1 mW/cm<sup>2</sup>. 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

This is a stand alone radio device. So under normal use condition, it is easy to be re-located in the place where at least 20 cm far 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

#### For 2.4GHz

Antenna 1: The maximum Gain of the antenna is 4.0dBi.

#### For 5GHz

##### 5150-5350MHz

Antenna 1: The maximum Gain of the antenna with cable loss is 5.4dBi.

Antenna 2: The maximum Gain of the antenna with cable loss is 11.0dBi.

##### 5450-5875MHz

Antenna 1: The maximum Gain of the antenna with cable loss is 5.4dBi.

Antenna 2: The maximum Gain of the antenna with cable loss is 13.0dBi.

Antenna No.	Brand Name	Model No.	Gain (dBi)	Cable Loss	Antenna Type
1	SmartAnt	FXN05-220200	2400-2500MHz: 4.0dBi	0dB	Omni-Directional Antenna
			5150-5875MHz: 6.5dBi	1.1dB	
2	SmartAnt	FXN05-093310	5150-5350MHz: 12dBi	1.0dB	High Gain Panel Directional Antenna
			5450-5875MHz: 14dBi	1.0dB	



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

### For 2.4GHz

802.11b:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm <sup>2</sup> )	Limit of Power Density (mW/cm <sup>2</sup> )
1	2412	177.827941	0.088864669	1.0
6	2437	174.1806873	0.087042054	1.0
11	2462	168.2674061	0.084087052	1.0

802.11g:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm <sup>2</sup> )	Limit of Power Density (mW/cm <sup>2</sup> )
1	2412	112.2018454	0.056069816	1.0
6	2437	334.19504	0.167004867	1.0
11	2462	107.6465214	0.053793417	1.0

### For 5GHz

Normal Mode : Antenna 1

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm <sup>2</sup> )	Limit of Power Density (mW/cm <sup>2</sup> )
1	5180	43.55118737	0.03004202	1.0
4	5240	41.39996748	0.028558088	1.0
5	5260	175.7923614	0.121263229	1.0
8	5320	43.65158322	0.030111274	1.0
9	5740	174.9846689	0.120706075	1.0
12	5800	162.9296033	0.112390377	1.0
14	5840	103.2761406	0.071240856	1.0

Normal Mode : Antenna 2

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm <sup>2</sup> )	Limit of Power Density (mW/cm <sup>2</sup> )
1	5180	15.31087462	0.0383468	1.0
4	5240	13.83566379	0.034652066	1.0
5	5260	75.50922277	0.189116373	1.0
8	5320	26.6072506	0.066639101	1.0
9	5740	171.3957308	0.680344893	1.0
12	5800	160.6941253	0.637865523	1.0
14	5840	102.3292992	0.406189908	1.0