

# Maximum Permissible Exposure (MPE) Evaluation Report

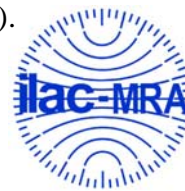
**Report No.** : TS12070053-EME  
**Model No.** : DSL-2402HNU-B1B v2, P8802T,  
Basic Home Station VDSL2 P8802T  
**Issued Date** : Aug. 03, 2012

**Applicant:** ZyXEL Communications Corporation  
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Taiwan

**Test Method/ Standard:** FCC 1.1310

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## Summary of Tests

**MPE Evaluation meet FCC OET No. 65: 1997, IEEE C95.1-2005**

**Wireless N VDSL2 VoIP IAD With USB -Model: DSL-2402HNU-B1B v2  
FCC ID: I88P8802T**

Test	Reference	Results
MPE Evaluation	FCC Guidelines for Human Exposure IEEE C95.1	Complies

## 1. Introduction

The EUT operates in the 2.4 GHz ISM band. Due to the EUT (include antenna) at its normal operation distance is at least 20 cm from the human body, the EUT was defined as a Mobile Device.

The reason to do the MPE Evaluation is to avoid the RF hazard to human body. The maximum output power and gain of the antenna were used to calculate the limited Power density (S) at 20 cm distance away from the product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 and Safety Code 6 are followed.

According to 1.1307 (b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

## 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)
(A) Limits for Occupational / Control Exposures				
30-300	61.4	0.163	1.0	6
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6
(B) Limits for General Population / Uncontrolled Exposure				
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

F= Frequency in MHz



### 3. RF Exposure calculations

From §FCC 1.1310 table 1, the maximum permissible RF exposure for an uncontrolled environment is 1 mW/(cm<sup>2</sup>) (or 10 W/m<sup>2</sup>)\*

Power density (S) is calculated by the following formula:

$$S = (P * G) / 4\pi R^2$$

where, S = Power density (mW/cm<sup>2</sup>)

P = Output power to antenna (mW)

R = Distance between radiating structure and observation point (cm)

G = Gain of antenna in numeric

$\pi = 3.1416$

Example:

Assume a mobile device operates at 2412MHz and its maximum output power is 50mW, and the maximum gain of antenna is 1 (numeric) /0dBi.

Then the power density (S) =  $(50 * 1) / 4 * \pi * 20^2 = 0.00995$  (mW/cm<sup>2</sup>) (or = 0.0995 W/m<sup>2</sup>)

### 4. Description of EUT

The EUT is Wireless N VDSL2 VoIP IAD With USB, and was defined as information technology equipment.

The customer confirmed the models listed below were identical to model DSL-2402HNU-B1B v2 (EUT). Different brands served as marketing strategy.

Trade Name	Model Number
MitraStar	DSL-2402HNU-B1B v2
ZyXEL	P8802T
ZyXEL	Basic Home Station VDSL2 P8802T

For more detail features, please refer to User's manual as file name "Installation guide.pdf"

#### 4.1 Antenna description

##### 1. Chain 0 (18cm)

The EUT uses a permanently connected antenna.

Antenna Model : RFA-02-3C52H070180CW  
Antenna Gain : 3 dBi  
Antenna Type : Dipole antenna  
Connector Type : Fixed type

##### 2. Chain 1 (22cm)

The EUT uses a permanently connected antenna.

Antenna Model : RFA-02-3C52H070220CW  
Antenna Gain : 3 dBi  
Antenna Type : Dipole antenna  
Connector Type : Fixed type

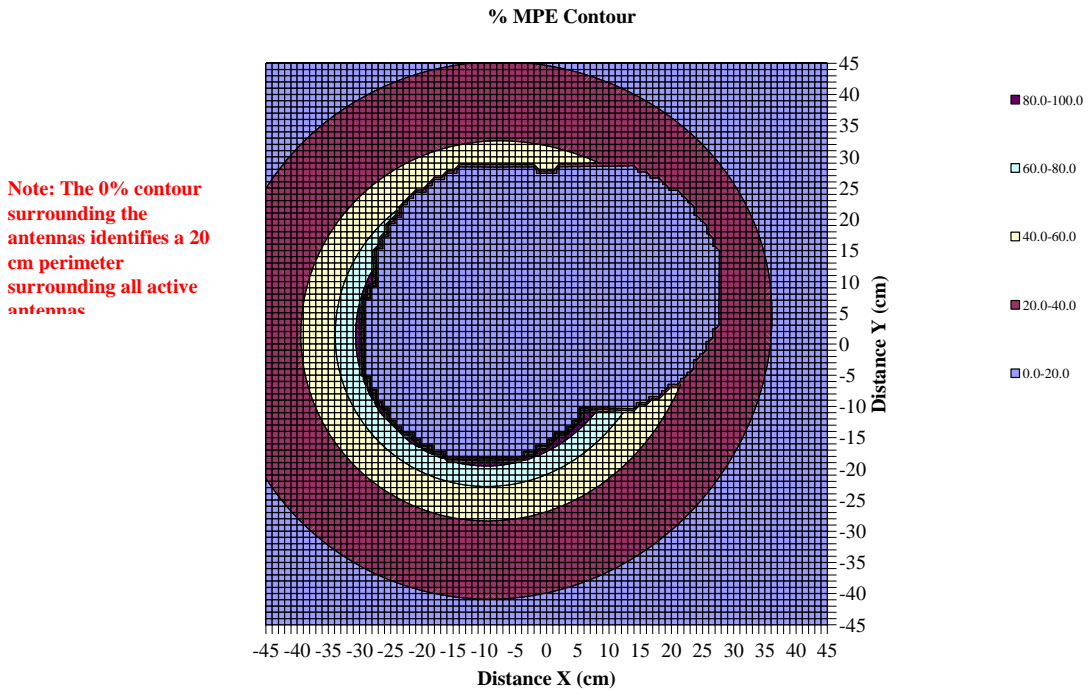
#### 4.2 Adapter information

The EUT will be supplied with a power supply from below list:

No.	Brand	Model no.	Specification
Adapter 1	UMEC	UP0181A-12PA	I/P: 100-240Vac, 50/60Hz, 0.4A MAX. O/P: +12Vdc, 1.5A, 18W MAX.
Adapter 2	UMEC	UP0181A-12PE	I/P: 100-240Vac, 50/60Hz, 0.4A MAX. O/P: +12Vdc, 1.5A, 18W MAX.

### 5. Test results

Antenna No.		Total	1	2	3	4	5	6
Tx Status			On	On	On	Off	Off	Off
Frequency	MHz		850	2450	2450	2450	2450	5800
MPE Limit	mW/cm <sup>2</sup>		0.57	1.00	1.00	0.00	0.00	0.00
Max % MPE	%	90.5	77.8	8.4	6.5	0.0	0.0	0.0
Power	(W)	2.136	1.760	0.211	0.165	0.000	0.000	0.000
Antenna Gain	dBi		1.00	3.00	3.00	5.00	5.00	1.00
EIRP	(W)	2.97	2.216	0.421	0.329	0.000	0.000	0.000
X	(cm)		-10.0	8.0	-8.0	-6.0	6.0	8.0
Y	(cm)		1.0	9.0	9.0	8.0	8.0	0.0
Sector			FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Arc			FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
$\theta_1$	degs	input	180	180	180	0.001	0.001	0.001
$\theta_2$			179	179	179	0.001	0.001	0.001
$\theta_1$	degs	actual	180	180	180	0	0	0
$\theta_2$			179	179	179	-180	-180	-180



The Notice in Installation Manual has been stated as below:  
 While installing and operating this transmitter, the radio frequency exposure limit of 1 mW/(cm<sup>2</sup>) may be exceeded at distances close to the transmitter. Therefore, the user must maintain a minimum distance of 20 cm from the device at all time.

**6. Set-up Photo**

