Engineering Analysis of

Transmitter Model VP1900XX

FCC ID: LDKVP1900XX

To

Federal Communications Commission

Part 1.1310 Radio Frequency Exposure Limits

&

OET 65C

09/19/00

This analysis was done per the requirements of Part 1.1310 and 24.52 of the FCC rules as part of the certification requirements for Part 24 devices. This report is for reference only and to help provide the installer guidance. The license provider installing the system is required to perform the actual MPE study of the installation as well as performing a possible Environmental Assessment of the installation in accordance with the FCC rules.

The Cisco Systems radio transmitter analyzed had a maximum TX power of 250mW (+24dBm) per transmitter and all calculations were based on the measured power of the one and then both transmitters running simultaneously

The formulas and Maximum Permissible Exposure (MPE) limit requirements referenced in this report can be found in FCC Bulletin OET-65 and specifically OET-65 Supplement C which addresses devices such as GSM devices.

All calculations were done in the worse case mode, the Uncontrolled environment with the radio duty cycle at 100%. It should be understood that under normal operating conditions these transmitters will not operate at 100% duty cycle and the assessment done by the installer can be done based on the actual duty cycle as long as the method is documented properly and the actual duty cycle can be verified.

Based on the MPE calculation using the limits of the uncontrolled environment, the Cisco Viper radio did not exceed the MPE requirements set forth in these documents providing the minimum safe distance between antenna and operator is met. Since this system is designed to be ceiling mounted away from the intended users, it can be defined as a fixed system. Therefore no SAR evaluation will be required

_____

David A. Case NCE
Senior Radio Compliance Engineer
Cisco Systems Corporate Compliance
3875 Embassy Parkway
Akron, OH 44333
T 330-664-7396
F 330-664-7301

I Equipment Under Test

FCC ID:	LDKVP1900XX
Model:	VP1900XX Series
Type:	GSM Voice over IP transmitter base station
Max Power	0.25Watts (Per transmitter)
Duty Cycle	100%

Calculated Max EIRP for antenna and single transmitter

6 dBi Omni Antenna	1 Watt EIRP

Measured Transmitter Power Conducted:	0.21mW
Measured EIRP	0.79mW

II MPE Distances

Calculations based on 100% duty cycle for single transmitter at calculated EIRP.

Antenna	TX Power	EIRP	MPE Distance
6.0 dBi Omni	+24dBm	1.0 W	10.5 cm

Calculations based on actual measured power

	EIRP	MPE Distance
TX	0.79 W	10.21 cm

III Maximum Permissible Exposure

Ref: FCC Rules, CFR 47 1.1310

FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	E Field Strength (V/m)	M Field Strength (A/m)	Power Density (mW/cm2)	Average Time (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.88/f	(900/f2)*	6
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

Frequency Range (MHz)	E Field Strength (V/m)	M Field Strength (A/m)	Power Density (mW/cm2)	Average Time (minutes)
0.3-3.0	614	1.63	(100)*	30
3.0-30	824/f	2.19/f	(180/f2)*	30
30-300	27.5	0.163	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	-	-	1	30

The Uncontrolled environment represents the most restrictive limits.

IV. Summary

In an uncontrolled environment, the maximum permissible exposure from a radio device operating at 1.9 Ghz is 1mW/cm2 average over a 30-minute period.

Based on the calculated power density, the radio system must be mounted at a minimum distance of 10.5 cm from the user. The following warning statement will be placed in the user manuals to caution the user on correct and safe use of this antenna.

The following warning will be placed in the manual:

> *This system is designed to be operated indoors as a fixed system device and must be located either up on or near the ceiling away from the user. It must be mounted in a manner to ensure that all user's and bystanders are kept a minimum of 20cm away from the antennas at all times.*

The actual system provider installing the system is required to perform an MPE study as part of the licensing process and may also be required to perform an Environment Assessment of the location as required under 1.1307 of the FCC rules. This Environmental Assessment will depend on the co location of other transmitters of this type and other types of fixed transmitter (including unlicensed transmitter) operating in the immediate area.

In the controlled environment, the maximum permissible exposure from a radio device operating at 1.9 Ghz is 5mW/ cm2 over a 6 minute period. Since the analysis is favorable in the Uncontrolled Environment, it is unnecessary to analyze the device to the less restrictive limits of the Controlled Environment.

Formulas:

$$\sqrt{\frac{EIRP}{4\ \pi\ 10}} =$$

$$\log \cdot(\ 10\ )\ mW \quad = \quad dBm$$

$$\left(\log^{-1}\right) \cdot \frac{dBm}{10} = \quad mW$$

$$\frac{EIRP}{4\ \pi\ r^2} = \quad Pd$$

1) For calculating MPE Distance
2) Conversion mW to dBm
3) Conversion dBm to mW
4) Power Density

Appendix A : Technical Opinion from American TCB and FCC

Dave,

Based on your specifications, your product seems to qualify under fixed mobile transmitters provided your installation instructions clearly demonstrate that. Per FCC 2.1091 (Attached) it is less than 1.5 watt for GSM 900MHz, and certainly less than 3 Watt EIRP for GSM 1800 MHz. In that case I believe it falls under the TCB scope, however MPE evaluation is necessary. I have attached a copy of Kwok's recent opinion on this issue. See also FCC 2.1091. I will concur with Bill Graff and Mike Violette.

<<FCC.2.1091.doc>> <<TCB-Exclusions.doc>>

From: Kwok Chan [mailto:kchan@fcc.gov] <mailto:[mailto:kchan@fcc.gov]>
Sent: Monday, June 05, 2000 11:09 AM
To: bclavier@rheintech.com <mailto:bclavier@rheintech.com>
Cc: Kwok Chan
Subject: Re: Part 24 E (broadband PCS- TDMA) SAR/MPE requirements / RTL,
Inc.

Currently, TCB cannot approve equipment that requires SAR evaluation. For part 24 portable devices, there is no exclusion for routine SAR evaluation. If device qualifies for the requirements of 2.1091 for mobile transmitter operating configurations, depending on antenna gain and output power, it may qualify for MPE categorical exclusion. In this case, the antenna and other qualifying info should be included in the filing. Fixed transmitters such as base stations are generally licensed where RF exposure compliance is addressed at the time of licensing. If a device does not have to go through licensing, when necessary, we may request for RF exposure compliance info during equipment authorization.
Kwok Chan

You wrote:

Desmond
I will let you decide since it might repeat might fall into a gray area. It is a part 24E transmitter 1 Watt EIRP max output power It is designed to be place above or at at the ceiling level. It provides a connection for your GSM phone to the internet or intranet. Systems will be installed by the various PCS carriers. Antennas used are 6dBi Omni. The real question is this a fixed or mobile device. My argument would be fixed operated at a minimum 2 meter distance from user.
Regards David Case NCE

References

1) CFR 47, Federal Communication Commission FCC Parts 1.1310 and FCC Part 15.247 (1998)
2) FCC Office of Engineering and Technology Bulletin 65 Edition 97-01 Evaluating Compliance with the FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
3) FCC Office of Engineering and Technology Bulletin Supplement C Evaluating Compliance with the FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.
4) IEEE (ANSI) C95.1-1991 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3Khz to 300 Ghz.
5) Reference Data For Engineers, 8th Edition, Sams Publishing
6) Radio Frequency Radiation from Fixed, Portable and Mobile Devices, 1998 CE Reference Guide.
7) Technical opinion from Kwok Chan (Appendix A)