

**Date** 01/12/99  
**To** John Shinn  
**Copy** Joe Dichoso  
FCC Application Processing Branch  
**From** Marc POUJET

## **NORTEL NETWORKS CONFIDENTIAL**

**Subject** Answer to John Shinn, Northern Telecom For submission  
S2000 H BTS GSM 1900:FCC Part 24 ClassII Permissive Change Application  
**Ref.** PI/MaP/99/135

### Questions:

1) With regard to the proposed changes, indicate whether the new design is electrically and mechanically interchangeable to the old design.

2) The graphs in pages 28-35 of the report are not readable. Please resend them.

3) Provide conducted plots showing compliance with the bandedge requirements.

4) Compliance with the radiated spurious requirements were not addressed. Please submit appropriate exhibits/data.

5) The original grant was authorized with an output power of 28.6 Watts(2.86 Watts at the bandedges) in the frequency band of 1930.2-1989.8 MHz.

The test report of the new device indicates a measured output power of 44.6 Watts and requests an output power of 20 Watts. Also, a statement regarding bandedge compliance indicates that the frequency range will be adjusted or the power will be lowered to show bandedge compliance.

Please explain all of the discrepancies.

What is the correct output power?

What is the frequency range?

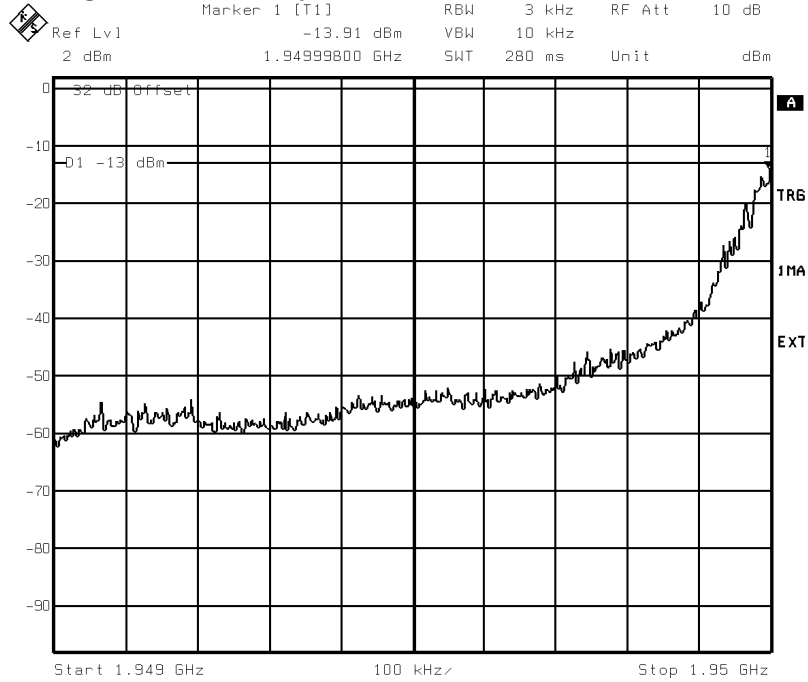
What is the power at the bandedges?

\*\*FYI, changes in output power rating and frequencies will require a new application.

Answers:

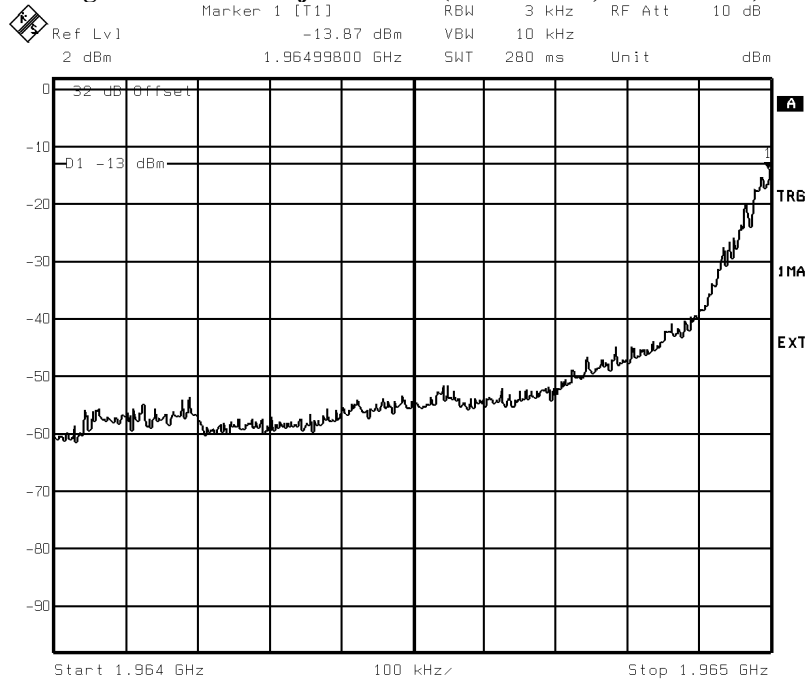
- 1) No electrical or mechanical changes appear between old design and new design. The old and new design are interchangeable.
- 2) Graphs in pages 28-35

**Figure 2 : -1 MHz adjacent band (Channel 612, Pmax -12 dB)**



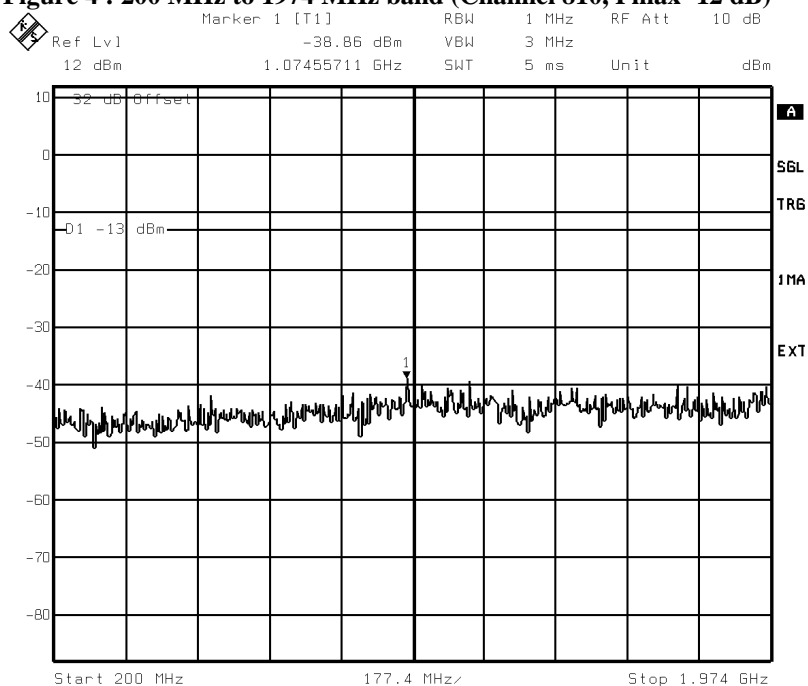
Title: emissions limits S2000 H EP 1900 DRX 1 ch 612 P Max-12dB  
 Comment A: from 1949 MHz to 1950 MHz  
 Date: 28.APR.99 16:22:49

**Figure 3 : -1 MHz adjacent band (Channel 687, Pmax -12 dB)**



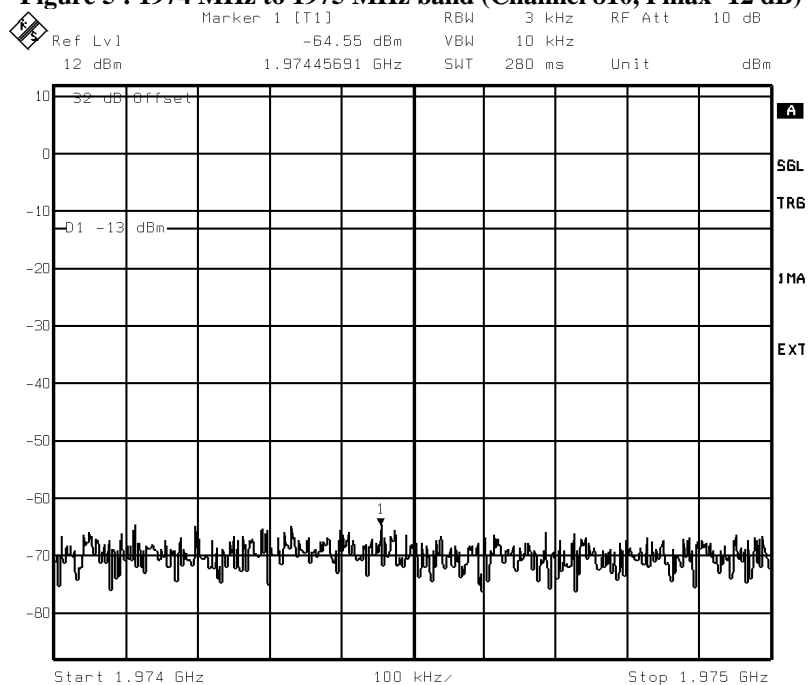
Title: emissions limits S2000 H EP 1900 DRX 1 ch 687 P Max-12dB  
 Comment A: from 1964 MHz to 1965 MHz  
 Date: 28.APR.99 16:56:37

**Figure 4 : 200 MHz to 1974 MHz band (Channel 810, Pmax -12 dB)**



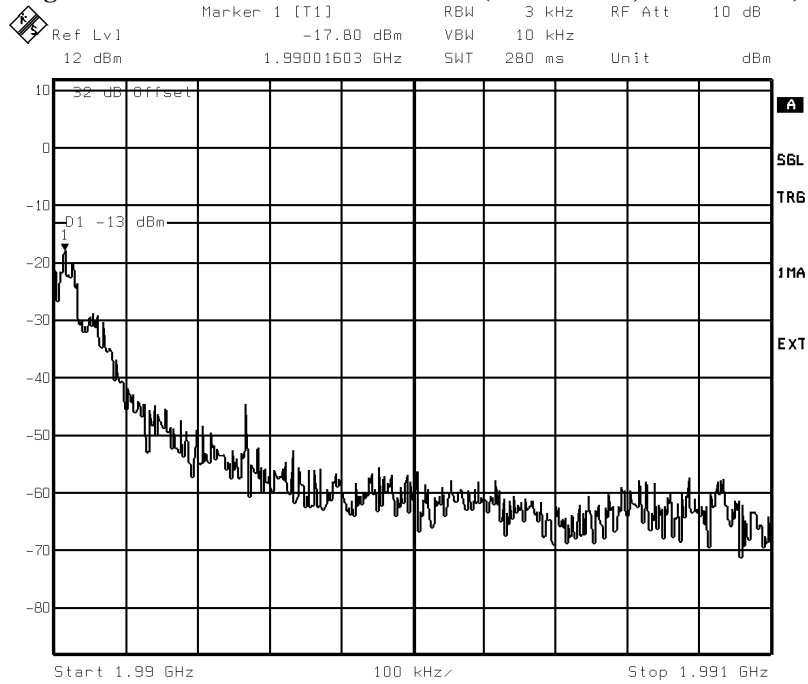
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
Comment A: From 200 MHz to 1974 MHz  
Date: 28.APR.99 18:34:56

**Figure 5 : 1974 MHz to 1975 MHz band (Channel 810, Pmax -12 dB)**



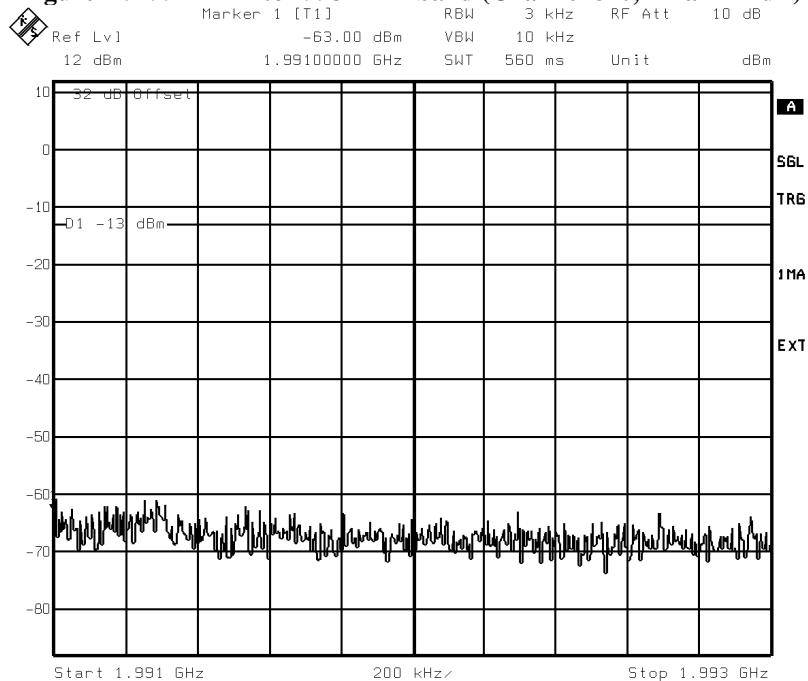
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
Comment A: From 1974 MHz to 1975 MHz  
Date: 28.APR.99 18:33:34

**Figure 6 : 1990 MHz to 1991 MHz band (Channel 810, Pmax -12 dB)**



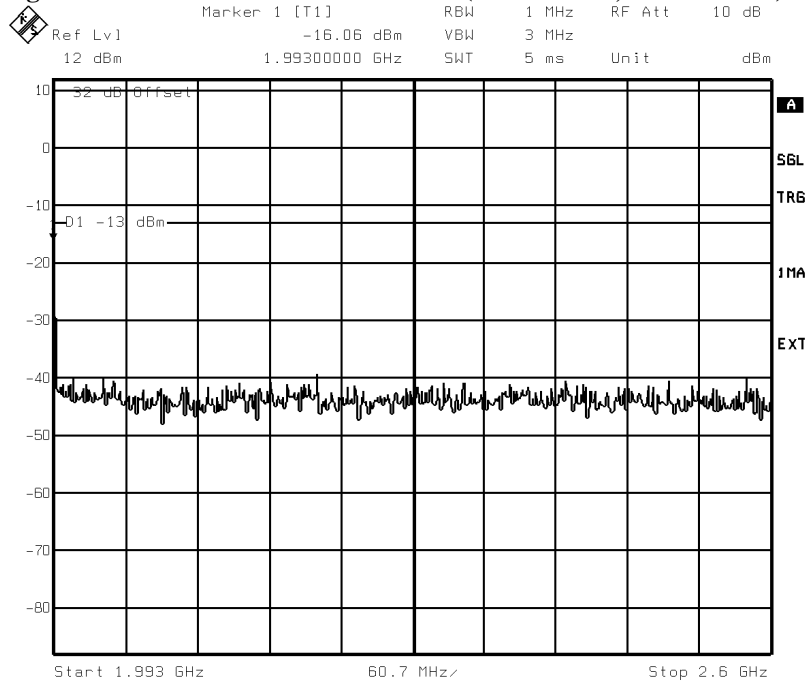
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 1990 MHz to 1991 MHz  
 Date: 28.APR.99 18:32:35

**Figure 7 : 1991 MHz to 1993 MHz band (Channel 810, Pmax -12 dB)**



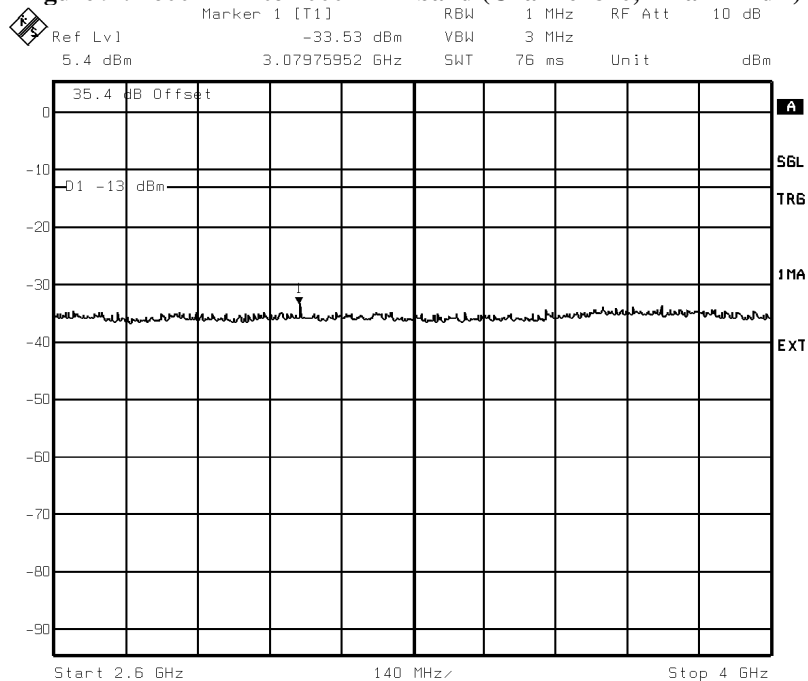
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 1991 MHz to 1993 MHz  
 Date: 28.APR.99 18:38:30

**Figure 8 : 1993 MHz to 2600 MHz band (Channel 810, Pmax -12 dB)**



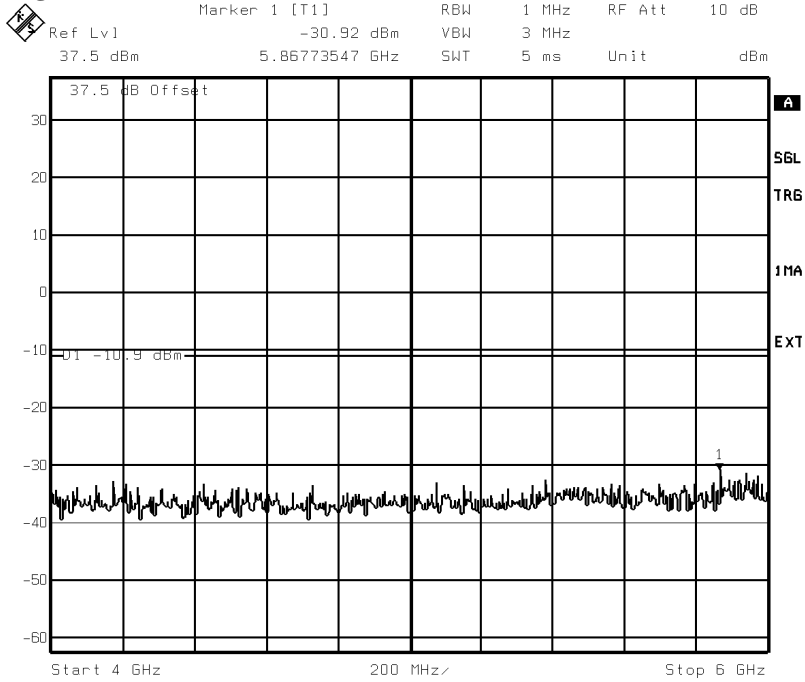
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 1993 MHz to 2600 MHz  
 Date: 28.APR.99 18:41:17

**Figure 9 : 2600 MHz to 4000 MHz band (Channel 810, Pmax -12 dB)**



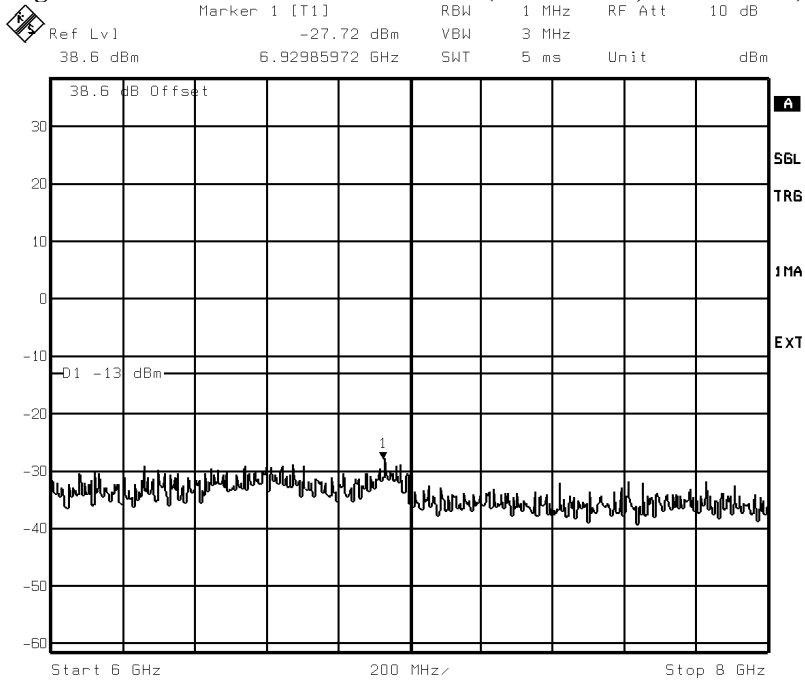
Title: emissions limits S2000 H EP 810 P Max-12dB  
 Comment A: from 2.6 GHz to 4 GHz  
 Date: 28.APR.99 18:43:59

**Figure 10 : 4000 MHz to 6000 MHz band (Channel 810, Pmax -12 dB)**



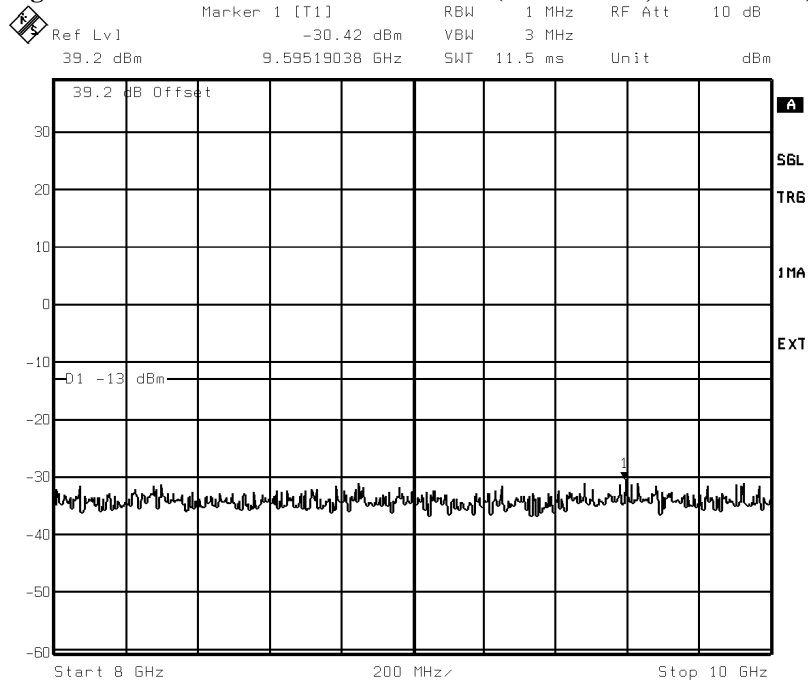
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 4 GHz to 6 GHz  
 Date: 28.APR.99 18:47:11

**Figure 11 : 6000 MHz to 8000 MHz band (Channel 810, Pmax -12 dB)**



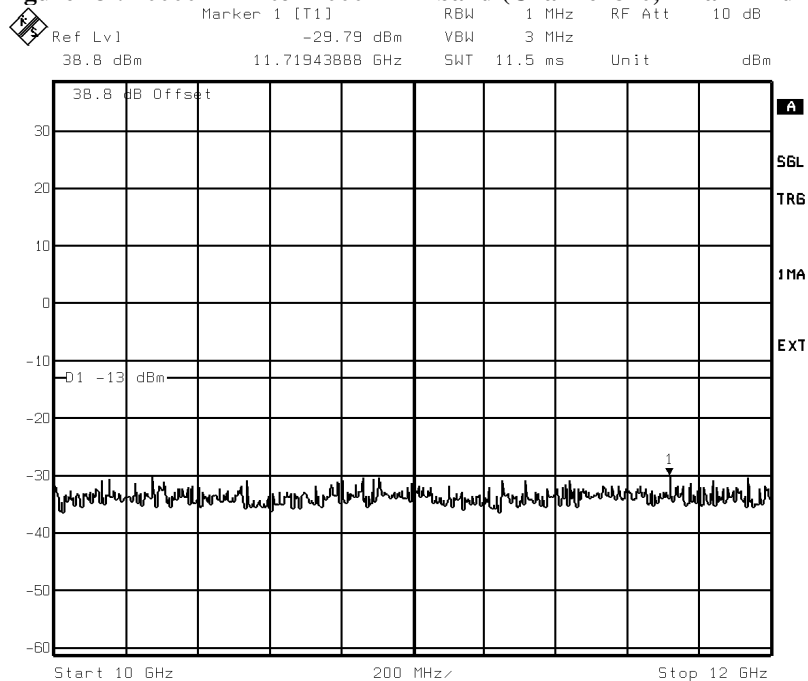
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 6 GHz to 8 GHz  
 Date: 28.APR.99 18:48:52

**Figure 12 : 8000 MHz to 10000 MHz band (Channel 810, Pmax -12 dB)**



Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 8 GHz to 10 GHz  
 Date: 28.APR.99 18:50:26

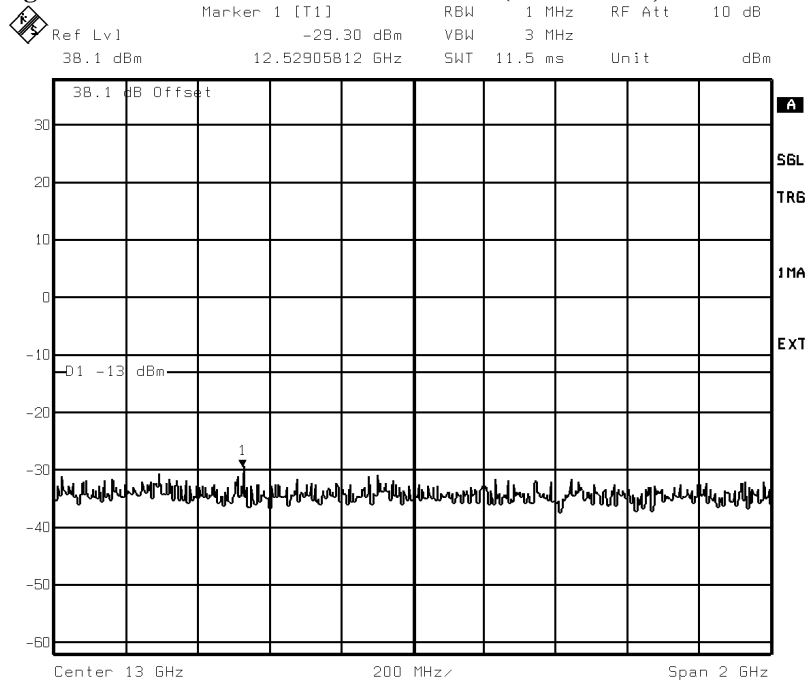
**Figure 13 : 10000 MHz to 12000 MHz band (Channel 810, Pmax -12 dB)**



Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 10 GHz to 12 GHz  
 Date: 28.APR.99 18:54:20

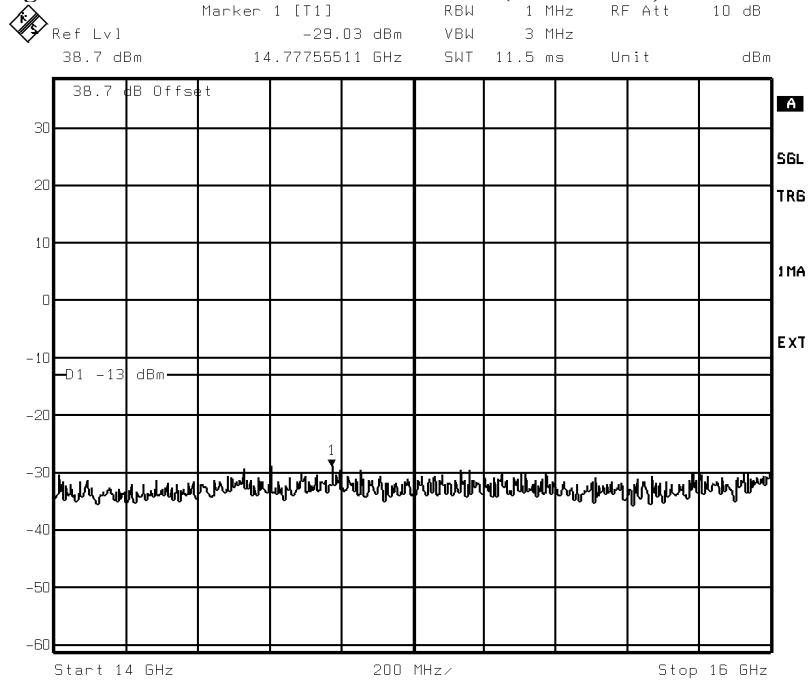


**Figure 14 : 12000 MHz to 14000 MHz band (Channel 810, Pmax -12 dB)**



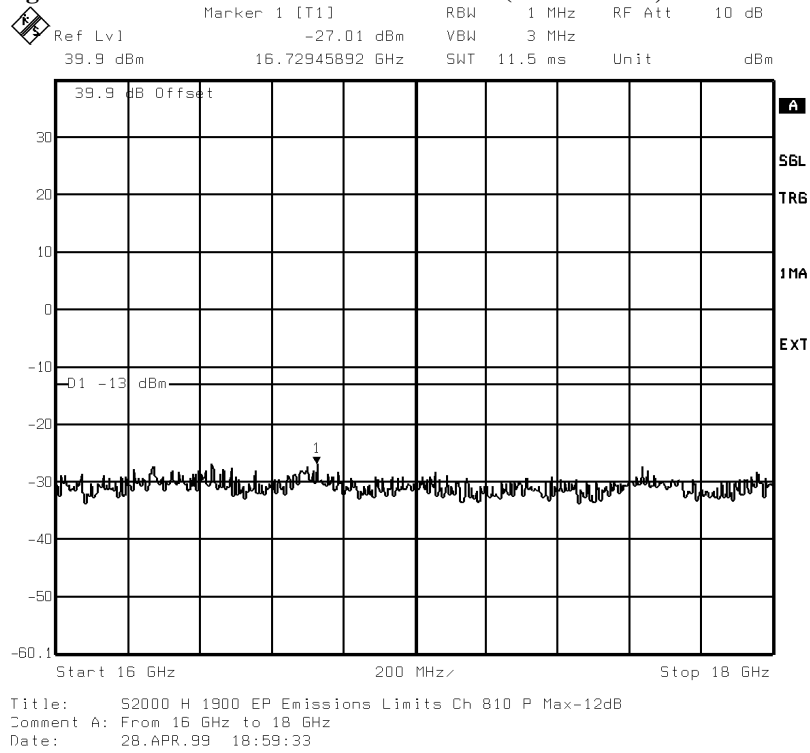
Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 12 GHz to 14 GHz  
 Date: 28.APR.99 18:55:47

**Figure 15 : 14000 MHz to 16000 MHz band (Channel 810, Pmax -12 dB)**

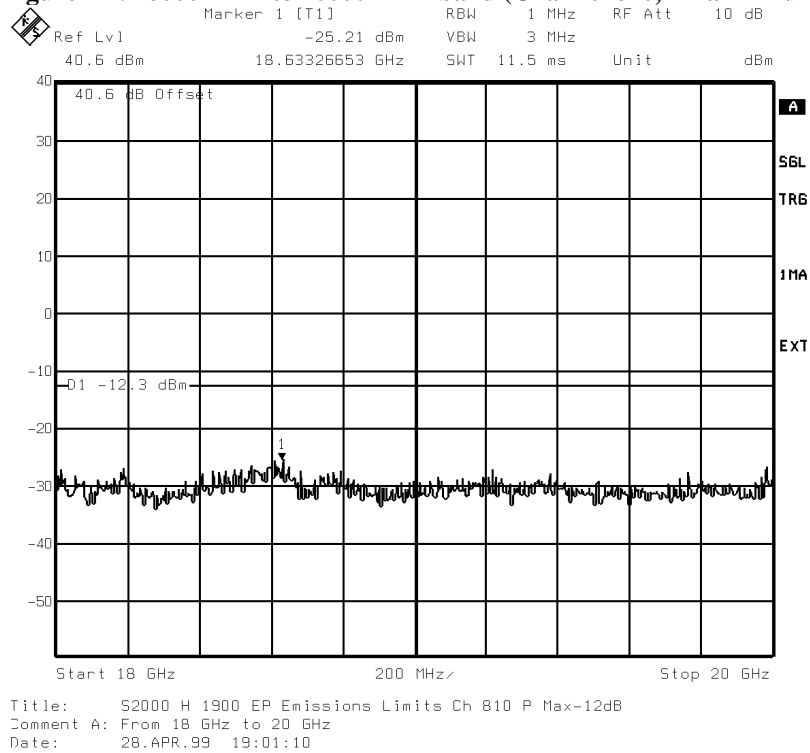


Title: S2000 H 1900 EP Emissions Limits Ch 810 P Max-12dB  
 Comment A: From 14 GHz to 16 GHz  
 Date: 28.APR.99 18:58:12

**Figure 16 : 16000 MHz to 18000 MHz band (Channel 810, Pmax -12 dB)**



**Figure 17 : 18000 MHz to 20000 MHz band (Channel 810, Pmax -12 dB)**



3) Not all the bandedge plots have indeed been included in the document, indeed only the most critical bandedge one are reproduced.

4)

Radiated spurious Emission  
24.236 Field strength limits.

The predicted or measured median field strength at any location on the border of the PCS service area shall not exceed 47 dBuV/m unless the parties agree to a higher field strength.

Datas for radiated spurious emissions have indeed unfortunately been omitted in the submissions.

Please find hereunder the appropriate data extracted BULL (Angers- France) Test Report 888-215-03/e dated 11/01/99

**Electric field 30-1000 MHz.**

D=10m

**Conditions:** 208V/60Hz. The measurement is made at 10m, so the limit is equal to the limit at 3m -10 dB.

N°	Emission	Measurement	Polarization	SITE		CORR factor
	(MHz)	dBµV/m		HGT (cm)	AZM (deg)	
1	31,9	21,8	V	110	300	17,1
2	32,7	24,3	V	110	175	16,9
3	40,9	19,1	V	130	105	14,2
4	45	18,3	V	120	40	11,7
5	48	20,2	V	120	75	9,9
6	91,9	16,5	V	180	170	8
7	90,1	24,1	V	380	325	9,6
8	120	22,6	V	120	255	11,6
9	122,9	19,8	V	140	45	12,4
10	132	17,5	V	120	140	12,7
11	144	19,4	V	380	270	11,8
12	156	20	V	350	55	10,8
13	168	16,8	V	220	250	11
14	192	21,2	V	350	205	10,4
15	204	16,1	P	390	210	10,7
16	224,9	22,1	V	130	135	12,4

Results found show that the requirement is met.

2.993 Field Strength of spurious Radiation

FCC Part 2.993

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission.

Test results

Measurement is done with transmitters on 1930.2 MHz and 1989.8 MHz.

Table 5 shows the results for radiated spurious emissions measurements.

**Table 5 : Test results for spurious emissions**

Frequency (MHz)	Antenna Polarization	Measured Level (dBμV)	Correction Factor (dB)	RBW (MHz)	Limit (dBμV/m) @ 1 m
1930.2	Vertical	99	29.9	1	Fundamental frequency
1989.8	Vertical	75	29.9	1	Fundamental frequency

The field strength is calculate by adding the correction factor to the measured level to obtain the corrected level. A sample calculation is as follows :

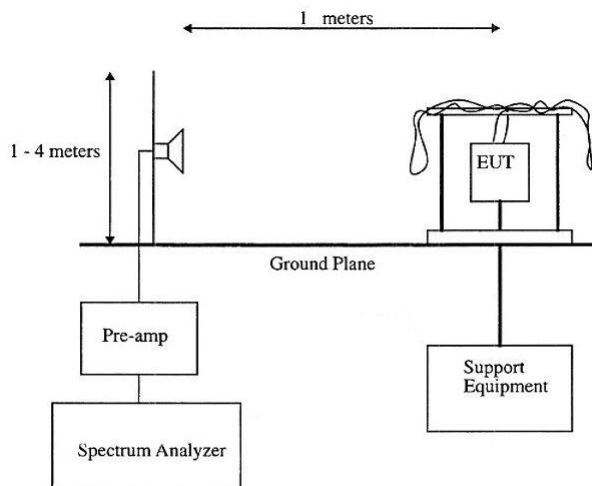
$$\text{Correction Factor}_{(dB)} = \text{Cable Losses}_{(dB)} + \text{Antenna Factor}_{(dB)} - \text{pre-amplifier gain}_{(dB)}$$

$$\text{Corrected Level}_{(dB\mu V/m)} = \text{Measured Level}_{(dB\mu V/m)} + \text{Correction Factor}_{(dB)}$$

No spurious emissions were found with a level upper to noise level in 100 kHz bandwidth (17 dBμV) from 1 GHz to 20 GHz.

Test procedure

The equipment was configured as shown in figure below.



The BTS was configured to transmit at maximum power (static level 0). Measurements were made according to the procedures outline in ANSI C63.4. The emissions were investigated up to the tenth harmonic of the fundamental emission (20 GHz). The measured level of the emissions was recorded and compared to the limit. The reference level for spurious radiation was taken with reference to an ideal dipole antenna excited by the rated output power according to the following relationship :

$$E\left(\frac{V}{M}\right) = \frac{1}{R(m)} * \sqrt{* * * G}$$

Where,

E = Field Strength in Volts/meter,  
R = Measurement distance in meters,  
Pt = Transmitter Rated Power in Watts (5 Watts),  
G = Gain of Ideal Dipole (linear)

Therefore :

$$E\left(\frac{V}{M}\right) = \sqrt{* * * 1.}$$

E = 38.1 V/m = 151.7 dBμV/m

The spurious emissions must be attenuated by at least  $43 + 10 * \text{Log}(30) = 57.7$  dB.

Therefore the field strength limit at 1 meters is :

E = 151.7 dBμV/m – 57.7 dB = 93.9 dBμV/m

5)

The test report of the new device indicates (page 19) a measured output power of 44.6 dBm i.e 28.6 Watts in the frequency band of 1930.2-1989.8 MHz.

Nothing has changed with this new design, the output power stayed the same as the old design.

We have made a mistake with the request of an output power of 20 Watts in fact it's a request of an output power of 28.6 Watts like the original grant.

Thus, it's the same output power between the old design and the new design 28.6 Watts.