Universal Scientific Industrial Co., Ltd.

WM-N-BM-11 EVB

Wi-Fi user manual
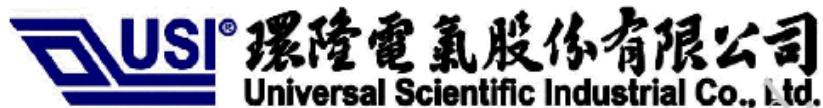
Revision history

Revision	Date	Change description
1.0	2013/5/23	First draft of the document.
1.1	2013/5/23	Added driver installation contents.
1.2	2013/5/24	Adopted new format.

Table of Contents

About this document

Purpose of this document

This document provides an overview of the manufacturing test application and the Iperf application available for use with WM-N-BM-11. The document describes the purpose of these applications and how to use them. The images will have already been downloaded to our WM-N-BM-11 evaluation boards. For more information on programming our device, please refer to "WM-N-BM-11 EVB quick start guide".

Driver Installation and setup

When you receive the EVB, the application will have already been downloaded to it. Plug on the USB cord in the upper left corner and connect it to your PC:

Figure 1. WM-N-BM-11 setup
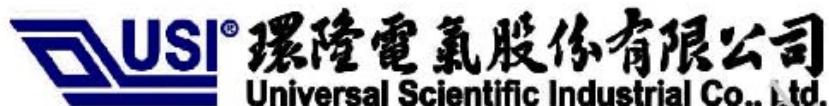
Next, Windows will ask you to install the drivers for the new device. Select the drivers to install from <SDK>/Drivers/BCM9WCD1EVAL1_Drivers.

Figure 2. Install the drivers

Repeat this process until all necessary drivers are installed. You can check the status in "device manager".

Manufacturing test application:

Demonstration requirements

To demonstrate and use the manufacturing test application, you will need a computer to run wl commands (the command in WM-N-BM-11's Wi-Fi firmware), as well as radio test equipments (spectrum analyzers, signal analyzers, signal generators, etc.) to assist in taking measurements resulting from executing wl commands.

Overview

The manufacturing test application is used to test the radio performance of the DUT and to assist with regulatory certification.

This application works in conjunction with the supplied test utility, known as 'wl'. The utility reads packetized IOCTL commands from your PC via a serial UART and forwards the commands to the Wi-Fi device on WM-N-BM-11. Responses to the IOCTL's from the Wi-Fi device are returned over the UART to the PC.
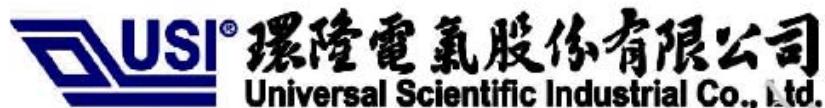
This wl utility is provided with WM-N-BM-11's SDK and is located in <SDK>\Apps\test\mfg_test\src\wl\exe.
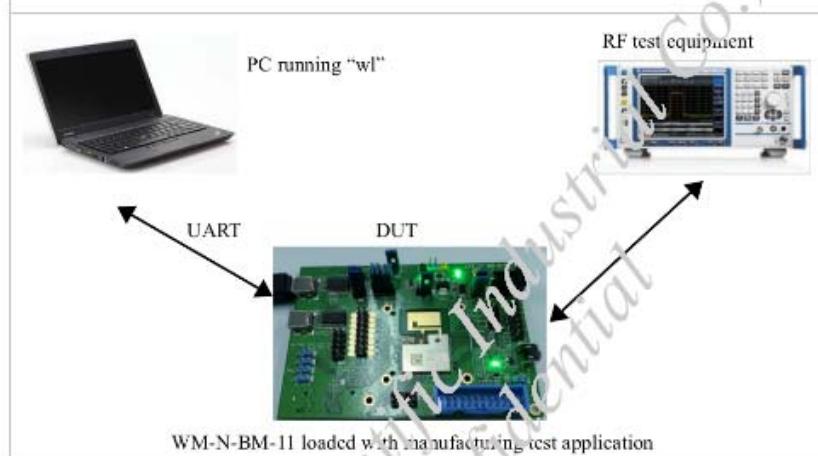

Figure 3. WM-N-BM-11 manufacturing test setup

Using the application

The following steps describe how to use the manufacturing test application.

1. Ensure that the EVB is connected to the PC and loaded with the MFG test application; press the reset button.

2. Use Window's device manager; look in the section "Ports (COM & LPT)" and note the COM port in use by the WICED EVB (e.g., COM99)

3. Open a command prompt and navigate to the following directory:
   <SDK>\Apps\test\mfg_test\src\wl\exe

4. Verify that the application is working by entering the following command at the command prompt (where 99 corresponds to the COM port number of the DUT)
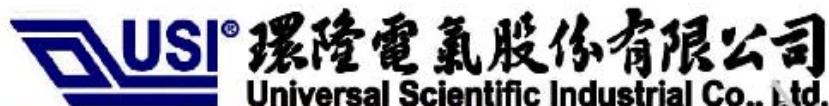
<SDK>\Apps\test\mfg_test\src\wl\exe> wl –serial 99 ver

(This shows the firmware version of the Wi-Fi device.)


```
C:\Windows\system32\cmd.exe

C:\Wiced-SDK\Apps\test\mfg_test\src\wl\exe>wl --serial 27 ver
5.90 RC153.39
wl0: Jun 12 2012 21:13:38 version 5.90.153.75 (WLTEST)

C:\Wiced-SDK\Apps\test\mfg_test\src\wl\exe>
```

Figure 4. Example manufacturing test output

A list of available commands can be displayed using the command: wl –serial 99 cmds
Detailed help is available by entering the command: wl –serial 99 -h

Example commands

This section provides sample command sequences with appropriate wl commands that may be used to test basic Wi-Fi transmit and receive functionality of the DUT. These commands are provided as scripts at the following location: <SDK>/Apps/test/mfg_test/scripts

Transmit test:
For 802.11b transmit testing:
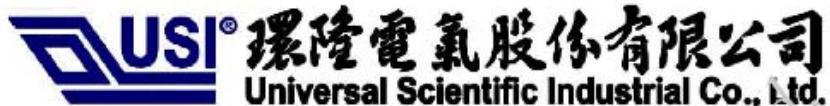
```
wl --serial 99 down
wl --serial 99 country ALL
wl --serial 99 band b
wl --serial 99 chanspec -c 1 -b 2 -w 20 -s 0
wl --serial 99 mpc 0
wl --serial 99 rateset 11b
wl --serial 99 up
wl --serial 99 txant 0
wl --serial 99 antdiv 0
wl --serial 99 nrate -r 11
wl --serial 99 txpwr1 -1
sleep 5
wl --serial 99 pkteng_start 00:90:4c:aa:bb:cc tx 40 1000 0

To stop transmitting:
wl --serial 99 pkteng_stop tx
```

Figure 5. Manufacturing test application: 802.11b Tx test commands

For 802.11g transmit testing:

```
wl --serial 99 down
wl --serial 99 country ALL
wl --serial 99 band b
wl --serial 99 chanspec -c 6 -b 2 -w 20 -s 0
wl --serial 99 mpc 0
wl --serial 99 rateset 11b
wl --serial 99 up
wl --serial 99 txant 0
wl --serial 99 antdiv 0
wl --serial 99 nrate -r 54
wl --serial 99 txpwr1 -1
sleep 5
wl --serial 99 pkteng_start 00:90:4c:aa:bb:cc tx 40 1000 0

To stop transmitting:
wl --serial 99 pkteng_stop tx
```

Figure 6. Manufacturing test application: 802.11g Tx test commands

For 802.11n transmit testing:
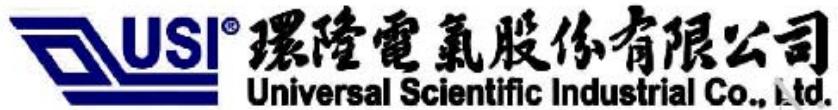
```
wl --serial 99 down
wl --serial 99 country ALL
wl --serial 99 band b
wl --serial 99 chanspec -c 11 -b 2 -w 20 -s 0
wl --serial 99 mpc 0
wl --serial 99 rateset 11b
wl --serial 99 up
wl --serial 99 txant 0
wl --serial 99 antdiv 0
wl --serial 99 nrate -m 7 -s 0
wl --serial 99 txpwr1 -1
sleep 5
wl --serial 99 pkteng_start 00:90:4c:aa:bb:cc tx 40 1000 0

To stop transmitting:
wl --serial 99 pkteng_stop tx
```

Figure 7. Manufacturing test application: 802.11n Tx test commands

Receive testing

For receive test:

```
wl --serial 99 down
wl --serial 99 mpc 0
wl --serial 99 country ALL
wl --serial 99 scansuppress 1
wl --serial 99 channel 1
wl --serial 99 bi 65535
wl --serial 99 up
sleep 10
wl --serial 99 counters
```

Figure 8. Manufacturing test application: 802.11 Rx test commands

Carrier Wave

To transmit a carrier wave:
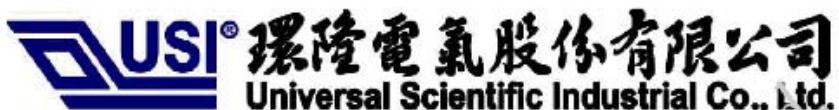
```
wl --serial 99 down
wl --serial 99 country ALL
wl --serial 99 band b
wl --serial 99 mpc 0
wl --serial 99 up
wl --serial 99 out
wl --serial 99 fqacurcy 6

(To stop transmitting)
wl --serial 99 fqacurcy 0
wl --serial 99 down
wl --serial 99 up
```

Figure 9. Manufacturing test application: carrier wave commands

Antenna selection

Antenna selection and diversity is controlled using the *txant* and *antdiv* commands:

```
(Select antenna 0)
wl --serial 99 txant 0
wl --serial 99 antdiv 0

(Select antenna 1)
wl --serial 99 txant 1
wl --serial 99 antdiv 1

(Enable antenna diversity)
wl --serial 99 txant 3
wl --serial 99 antdiv 3
```

Figure 10. Manufacturing test application: antenna selection

The *txant* and *antdiv* commands will not have any effect unless the NVRAM and Wi-Fi firmware image are enabled for diversity.

Note: After executing the *wl --serial 99 mpc 0* command, ensure that a subsequent *wl --serial 99 up* command is issued. To verify that the device is up, a value of 1 is returned when a *wl --serial 99 isup* command is executed
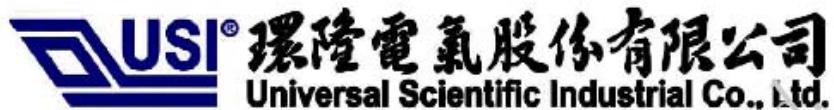
Iperf application

Iperf is already downloaded to the device as a console application. Connect to WM-N-BM-11 with a terminal program (e.g., minicom or PuTTY) with parameters 115200 8N1.

After the program starts, it will try to connect to the default AP. We can connect to another AP by using the "join" command. Type "help" for an explanation of all commands.

Console Commands:
help [<選取表格欄 <example_num>]]
- Print help message or command example.
iperf
- Try *iperf –help* for more information.
status
- Get status.
thread [priority] <cmds>
- Spawns a new thread for the specified command. Optionally run at a specific priority.
thread_kill <threadid>
- Kills the specified running thread.
thread_list
- Lists the current running threads.
thread_spawn [priority] <cmds>
- Spawns a new thread for the specified command. Optionally run at a specific priority.
rtc rtc [] <lse|lsi> <0(OFF)|1(ON)|2(ByPass)>], lsi without "ByPass" option
- Select RTC clock source and set new state.
rtccali rtccau <value:(-31)~31>
- RTC course digital calibration.
settime settime <hh> <mm> <ss>
- Set RTC time.
settimeBySNTP settimeBySNTP

選取表格列
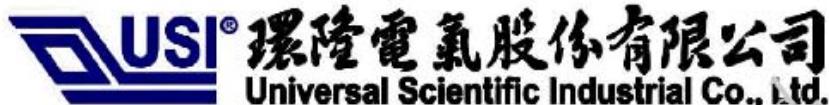
Command	Description
	- Set RTC timer from SNTP timer.
gettime gettime>	
	- Get RTC time.
setdate setdate <yy> <mm> <dd> <wd>	
	- Set RTC date.
getdate getdate	
	- Get RTC date.
time [1 |0], display message to Serial Port	
	- Display current time and date.
stoptime	
	- Stop getting current time.
starttest <value:(-31) ~ 31>	
	- Start RTC external clock test with optional calibration value.
teststatus	
	- Get test status.
stoptest	
	- Stop RTC external clock test.
led [1|0]	
	- Turn on/off LED.
reset	
	- Reset system.
WiFiCfg	
	- Display current Wi-Fi configurations.
join <ssid> <open|wep|wpa|wpa2> [key] [ip netmask gateway]	
	- **Join an AP. Uses DHCP if no IP address is provided .**
scan	
	- Scan all enabled channels and print a list of APs found.
join_default	
	- Join the default AP and obtain an IP address using DHCP.
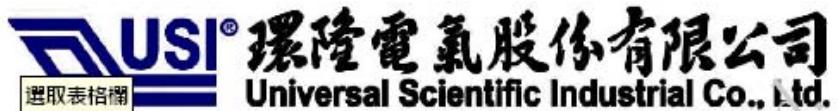
leave
- Leave an AP.
set_data_rate <1|2|5.5|6|9|11|12|18|24|36|48|54>
- Set data rate.
get_data_rate
- Get data rate.
cc [country code]
- Set the country code.
ping <destination> [count] [delay:ms] [data size]
- Pings the specified IP or Host.

Figure 11. Console help

For example, to join an AP with no security enabled:

> **join Buffalo-OPEN open**

SSID=Buffalo-OPEN
Security=open
AP configuration settings are stored
Joining : Buffalo-OPEN
  SSID Len=12
  Security=0
  PMK Len=0
  PMK :
Successfully joined : Buffalo-OPEN
Obtaining IPv4 address via DHCP
Setting IPv6 link-local address
IPv4 network ready IP: 172.18.121.228

Start running Iperf throughput tests:

  After WM-N-BM-11 successfully connect to an AP, we can start running Iperf throughput tests.

Start a TCP server:

> **iperf -s**
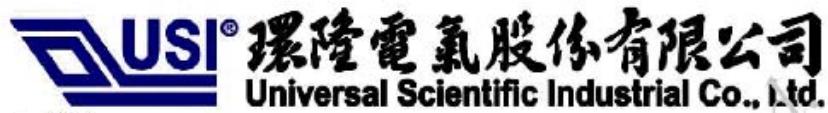
Start an UDP server

```
> iperf -s -u
```

Start an UDP multi-cast server bound to 224.1.1.1:

```
> iperf -s -u -B 224.1.1.1
```

Start a TCP client:

```
>iperf -c 192.168.1.136
```

Start an UPD client and send at void priority (using the "-S" option), for 90 seconds at 10 Mbps, followed by the same command at video, best effort and background levels of priority:

```
> iperf -c 192.168.1.136 -u -S * -t 90 -b 10M
```

The corresponding "-S" option is set to 7, 5, 0, 1, respectively, "-t" specifies the duration of the test in seconds; you can also specify the report interval using "-i".
Start an UDP multi-cast client:

```
> iperf -c 224.1.1.1 -u
```

Start Iperf in a thread to enable concurrent client and server modes for bi-directional testing. The default application priority is 7 so new threads should start at 7, as shown. However, it can be set to 6.

```
> thread 7 iperf -s
```

Start a bi-directional UDP throughput test. Note that each instance of Iperf must start on a separate port using "-p ***"

```
WM-N-BM-11> thread 7 iperf -s -u -i 10 -p 6000
WM-N-BM-11> iperf -c 192.168.1.136 -u -b 10M -t 90 -p 7000
```

```
HOST>iperf -s -u -i 10 -p 7000
HOST>iperf -c <WM-N-BM-11 address> -u -b 10M -p 6000
```
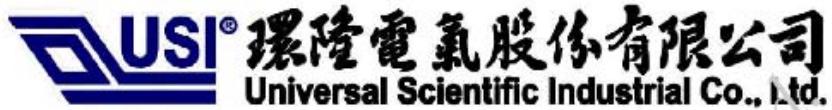
Start a bi-directional TCP throughput test. Note that each instance of Iperf must start on a separate port using "-p ***"

```
WM-N-BM-11> thread 7 iperf -s -i 10 -p 6000
WM-N-BM-11> iperf -c 192.168.1.136 -t 90 -p 7000
```

```
HOST> iperf -s -i 10 -p 7000
HOST> iperf -c <WM-N-BM-11 IP address> -p 6000
```

Note:
  a.   Many Iperf parameters cannot be changed, for example TCP window size and max segment size.
  b.   If the "thread" command is not used then after running an Iperf server the WICED module must be reset, i.e., there is no break key to restore the console prompt.
  c.   The "thread_kill" command is not supported.

Realizing Ideas Together

Industry Canada statement:

This device complies with RSS-210 of the Industry Canada Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2)this device must accept any interference received, including interference that may cause undesired operation.

Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Radiation Exposure Statement:

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product(including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distinct au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 10293A-WMNBM11".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 10293A-WMNBM11".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

Federal Communication Commission Interference Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that
to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and 2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC

authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: COFWMNBM11". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Europe – EU Declaration of Conformity

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the R&TTE Directive 1999/5/EC:

EN 60950-1: 2006+A11:2009+A1:2010+A12:2011
EN 62311:2008
EN300 328 V 1.8.1:2012
EN 301 489-1 V1.9.2:2011
EN 301 489-17 V 2.2.1 :2012
National Authorities were informed according to Article 6.4 of Frequency Notification.
Special Requirements are considered. The product is labeled with CE Marking.

CE 0560

Česky [Czech]	*[Jméno výrobce]* tímto prohlašuje, že tento *[typ zařízení]* je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk [Danish]	Undertegnede *[fabrikantens navn]* erklærer herved, at følgende udstyr *[udstyrets typebetegnelse]* overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch [German]	Hiermit erklärt *[Name des Herstellers]*, dass sich das Gerät *[Gerätetyp]* in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab *[tootja nimi = name of manufacturer]* seadme *[seadme tüüp = type of equipment]* vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, *[name of manufacturer]*, declares that this *[type of equipment]* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente *[nombre del fabricante]* declara que el *[clase de equipo]* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ *[name of manufacturer]* ΔΗΛΩΝΕΙ ΟΤΙ *[type of equipment]* ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Français [French]	Par la présente *[nom du fabricant]* déclare que l'appareil *[type d'appareil]* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente *[nome del costruttore]* dichiara che questo *[tipo di apparecchio]* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo *[name of manufacturer / izgatavotāja nosaukums]* deklarē, ka *[type of equipment / iekārtas tips]* atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo *[manufacturer name]* deklaruoja, kad šis *[equipment type]* atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.

Nederlands [Dutch]	Hierbij verklaart *[naam van de fabrikant]* dat het toestel *[type van toestel]* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, *[isem tal-manifattur]*, jiddikjara li dan *[il-mudel tal-prodott]* jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar [Hungarian]	Alulírott, *[gyártó neve]* nyilatkozom, hogy a *[... típus]* megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Polski [Polish]	Niniejszym *[nazwa producenta]* oświadcza, że *[nazwa wyrobu]* jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Português [Portuguese]	*[Nome do fabricante]* declara que este *[tipo de equipamento]* está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko [Slovenian]	*[Ime proizvajalca]* izjavlja, da je ta *[tip opreme]* v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	*[Meno výrobcu]* týmto vyhlasuje, že *[typ zariadenia]* spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi [Finnish]	*[Valmistaja = manufacturer]* vakuuttaa täten että *[type of equipment = laitteen tyyppimerkintä]* tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska [Swedish]	Härmed intygar *[företag]* att denna *[utrustningstyp]* står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.