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RSC14

issue test report consist of 74 Pages

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TTI-P-G-166/98-30

# **Accredited Bluetooth Test Facility (BQTF)**

Test report no.: 2-2730-1-4/01 FCC Part 15.247 Toshiba Wireless LAN Card PA3171U-1MPC FCC ID: CJ6PA3171WL

CETECOM – ICT Services GmbH Untertürkheimerstr. 6-10 66117 Saarbrücken, Germany

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Test report nr.: 2-2730-1-4/01

Issue date:27.12.01

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### **1** General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5. The CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

1.2 Testing laboratory
CETECOM ICT Services GmbH
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Accredited testing laboratory
DAR-registration number : TTI-P-G 166/98-30



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### **1.3** Details of applicant

Name: Toshiba CorpoStreet: 1-1 Shibaura ,City: Minato-ku, TolCountry: JapanTelephone: +81 (3) 3457 25Telefax: +81 (3) 5444 94Contact: Mr. Hideo AbeTelephone: +81 (3) 3457 25	ration, Digital Media Network Company 1-Chome kyo 105-8001 65 04
1.4 Application details	
Date of receipt of application	: 27.12.01
Date of receipt of test item	: 27.12.01
Date of test	: 27.12.01
<b>1.5 Test item</b>	WLAN Module for lantons (Mini PCI card)
Type designation	PA3171U-1MPC (identical to AGERE Ruby miniPCI 8U354)
Manufacturer :	- applicant -
Street :	TI
City :	
Country :	
Serial number :	MAC: 00022D35D35F
Additional informations:	
Frequency :	2400 – 2483.5 MHz (here 2412 – 2462 MHz)
Type of modulation :	22M0P7D (DSSS)
Number of channels :	11
Antenna :	Coax connection with 3 different external antennas
Power supply :	3.3V DC powered by PC / Laptop
Output power :	83.2 mW max conducted / 141 mW max radiated
Type of equipment :	Class B
Temperature range :	+5°C - +35°C
FCC-identifier :	CJ6PA3171WL

1.6 Test standards: FCC Part 15 §15.247



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2 Technical test

2.1 Summary of test results

The antenna gain measurement was performed by the difference between conducted and radiated output measurement.

All measurement settings were according to FCC 15.35, 15.209, 15.247 and the "Guidance on measurement for DSSS systems".

The settings for RBW, VBW and sweeptime are according to FCC requirements.

The radiated measurements were performed with a Toshiba Laptop Satellite PRO 4600.

The conducted and extreme tests were performed with an extender card in a Desktop PC. For processing gain see separate paper.

Technical responsibility for area of testing :

27.12.01

RSC 8411 Berg

He Ky

Date

Section Name

Signature

Technical responsibility for area of testing :

27.12.01

RSC8414 Ames

d. Emes

Date

Section Name

Signature



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2.2 Testreport

**TEST REPORT** 

Testreport no. : 2-2730-1-4/01

CETECOM	ICT	Services	GmbH
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Test report nr.: 2-2730-1-4/01

Issue date:27.12.01

#### **TEST REPORT REFERENCE**

#### LIST OF MEASUREMENTS

Paragraph	PARAMETER TO BE MEASURED	PAGE
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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### SPECTRUM BANDWITH OF DSSS-SYSTEM

SUBCLAUSE § 15.247 (a)(2)

### 6 dB bandwidth

TEST CONDITIONS		6 dB BANDWIDTH ( kHz )		
Frequency (MHz)		2412	2442	2462
T <sub>nom</sub> (25)°C V <sub>nom</sub> (3.3)V		8727	9022	9371
Measuremen	t uncertainty	±1kHz		•

RBW / VBW as provided in the "Measurement Guidelines" (DA 00-705, March 30, 2000)



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

# SPECTRUM BANDWITH OF DSSS-SYSTEM 2412 MHz

SUBCLAUSE § 15.247 (a)(2)





LIMIT

SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwith shall shall be at least 500 KHz , here 8.721 MHz



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RBW = 100 KHz, Span >> RBW, here 25 MHz

LIMIT

SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwith shall shall be at least 500 KHz , here 9.022 MHz



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LIMIT

SUBCLAUSE §15.247(a) (2)

The minimum 6dB bandwith shall shall be at least 500 KHz , here 9.371 MHz



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

FREQUENCY STABILITY

### SUBCLAUSE §15.231 (d)

#### Method of Measurement:

In order to measure the carrier frequency of the MINI PCI Module under extreme conditions, it is necessary to make measurements with the use of a R&S FSIQ26 SIGNAL ANALYZER.

1. Measure the carrier frequency at room temperature.

2. Subject the card in an adapter connected to a desktop PC at + 20 degrees C.

3. With the card, powered via an external power supply at 3.135 Volt, connected to the FSIQ26 and in a continuous TX-mode at channel 7 (center channel), measure the carrier frequency. These measurements should be made within 2 minutes of powering up the card, to prevent significant self warming.

4. Repeat the measurement with a voltage variation of 0.05 Volt up to 3.465 Volt. (3.3 Volt  $\pm$  5%)

5. Repeat the above measurements at 5 C increments from +5 degrees C to +35 degrees C and a power voltage of 3.3V DC. Allow at least 1/2 hours at each temperature, unpowered, before making measurements.

6. At all temperature levels hold the temperature to +/- 0.5 C during the measurement procedure.

#### **Measurement Limit:**

According to the FCC 15.231 standard the frequency stability of the carrier shall be  $\pm$  0.01% (244.2 kHz). This minipci card is specified to operate with an input voltage of between 3.135 Vdc and 3.465 Vdc, with a nominal voltage of 3.3 Vdc.. Operation above or below these voltage limits is prohibited. For the purposes of measuring frequency stability these voltage limits are to be used.



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

FREQ ERROR vs. VOLTAGE at room temperature (20° C)

Voltage (V)	Frequency Error (Hz)	Frequency Error (%)
3,14	-3000	-0,00001229
3,17	-3000	-0,00001229
3,20	-3000	-0,00001229
3,23	-3000	-0,00001229
3,27	-3000	-0,00001229
3,30	-3100	-0,00001269
3,33	-3100	-0,00001269
3,37	-3100	-0,00001269
3,40	-3150	-0,00001290
3,43	-3150	-0,00001290
3,47	-3180	-0,00001302



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED** (for reference numbers see test equipment listing) 64



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Equipment under test: WLAN Module RUBY MINIPCI 8U354Ambient temperature: 21°CRelative humidity: 51%

### FREQ ERROR vs. TEMPERATURE at 3.3 V DC

TEMPERATURE (°C)	Frequency Error (Hz)	Frequency Error (%)
+ 5	- 5605	-0,00002253
+ 10	- 3700	-0,00001577
+ 15	- 3650	-0,00001487
+ 20	- 3200	-0,00001233
+ 25	- 2500	-0,00001100
+ 30	+ 840	0,0000326
+ 35	+ 5030	0,00002187





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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### MAXIMUM PEAK OUTPUT POWER (CONDUCTED)

SUBCLAUSE § 15.247 (b) (1)

TEST CONDITIONS		MAXIMUM PEAK OUTPUT POWER (dBm)			
Frequen	cy (MHz)	2412	2442	2462	
T <sub>nom</sub> ( 21 )°C	V <sub>nom</sub> ( 3.3 )V	Peak: 19.3 dBm AV: 12.3 dBm	Peak 19.2 dBm AV: 12.3 dBm	Peak 19.1 dBm AV: 12.2 dBm	
Maximum deviation from output		not	not	not	
power under extreme test		performed	performed	performed	
conditions (dBc)					
Measurement uncertainty			±3dB		

Settings: RBW/VBW 10 MHz

LIMIT

### SUBCLAUSE § 15.247 (b) (1)

Frequency range	RF power output
2400-2483.5 MHz / 5725 – 5850 MHz	30 dBm



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SUBCLAUSE § 15.247 (b) (1)

Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (Peak) 2412 MHz

RBW 10 MHz RF Att 20 dB Ref Lvl VBW 10 MHz 20 dBm dBm SWT 5 ms Unit 20 22 dB Offset Α 10 -10 **1VIEW** 1MA -20 -30 -40 -50 -60 -70 -80 Center 2.412 GHz 2.5 MHz/ Span 25 MHz

Date: 27.DEC.2001



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SUBCLAUSE § 15.247 (b) (1)

# Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (average) 2412 MHz

RBW 10 MHz RF Att 20 dB Ref Lvl VBW 10 MHz 20 dBm dBm SWT 5 ms Unit 20 22 dB Offset Α 10 -10 1MAX 1AV -20 -30 -40 -50 -60 -70 -80 Center 2.412 GHz 2.5 MHz/ Span 25 MHz Date: 27.DEC.2001



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SUBCLAUSE § 15.247 (b) (1)

# Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

#### MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (Peak) 2442 MHz

RBW 10 MHz RF Att 20 dB Ŕ Ref Lvl VBW 10 MHz 20 dBm SWT 5 ms Unit dBm 20 22 dB Offset Α 10 -10 1MAX 1MA -20 -30 -40 -50 -60 -70 -80 Center 2.442 GHz 2.5 MHz/ Span 25 MHz 27.DEC.2001 Date:



dBm

Α

1AV

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#### Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

### **MAXIMUM PEAK OUTPUT POWER** SUBCLAUSE § 15.247 (b) (1) (CONDUCTED) (average) 2442 MHz RBW 10 MHz RF Att 20 dB Ŕ Ref Lvl VBW 10 MHz 20 dBm SWT 5 ms Unit 20 22 dB Offset 10 -10 1MAX -20 -30 -40 -50 -60 -70

-80 Center 2.442 GHz 2.5 MHz/ Span 25 MHz



**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED** (for reference numbers see test equipment listing) 18-31,64



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SUBCLAUSE § 15.247 (b) (1)

### Equipment under test :WLAN Module PA3171U-1MPC Ambient temperature :21°C Relative humidity :51%

#### MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (Peak) 2462 MHz





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SUBCLAUSE § 15.247 (b) (1)

# Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

#### MAXIMUM PEAK OUTPUT POWER (CONDUCTED) (average) 2462 MHz





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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

### MAXIMUM PEAK OUTPUT POWER (RADIATED)

SUBCLAUSE § 15.247 (b) (1)

This test was performed to find the antenna gain of this integrated system.

The maximum output was measured in vertikal polarisation with antenna outside laptop. We tested all three different type of antennas with the same WLAN module.

TEST CONDITIONS		MAXIMUM	PEAK OUTPUT	POWER (W)
Frequen	cy (MHz)	2412	2442	2462
T <sub>nom</sub> ( 21 )°C	V <sub>nom</sub> ( <b>3.3</b> )V	cond. Peak: 19.3 dB	cond. Peak 19.2 dBm	cond. Peak 19.1 dBm
Antenna HTL-004		17.9 dB	17.9 dB	18.3 dB
		(gain –1.4dB)	(gain –1.3 dB)	(gain –0.8 dB)
Antenna HTL-007		17.5 dB	17.8 dB	18.5 dB
		(gain –1.7 dB)	(gain –1.4 dB)	(gain –0.6 dB)
Antenna	HTL-008	20.0 dB	21.5 dB	21.2 dB
		(gain +0.7 dB)	(gain +2.3 dB)	(gain +2.1 dB)
Antenna Gain				
Power cond. – Power rad.		-1.4dB - +0.7dB	-1.3dB - +2.3dB	-0.8dB - +2.1dB
Measurement uncertainty ±3dB				

The gain is measured with antennas outside housing. We expect lower gain with build-in antennas.

Settings: RBW/VBW 10 MHz

LIMIT

SUBCLAUSE § 15.247 (b) (1)

Frequency range	<b>RF</b> power output
2400-2483.5 MHz / 5725 – 5850 MHz	1.0 Watt / 30 dBm



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

<u>conducted</u> (radiated emissions in restricted bands see next table)

2412 MHz

	SPURIOUS LIMITATIONS				
f (MHz)		amplitude of emission (dBm)	limit max. allowed emmision		results
2412	cond.	19.3	30.0 dBm		Operating frequency
all	peaks	<<20 dB	below	limits	
Measurement uncertainty ± 3dB					

**RBW/VBW** according to FCC requirements.



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

**EMISSION LIMITATIONS (Transmitter)** 

SUBCLAUSE § 15.247 (c) (2)

radiated (Antenna horizontal polarisation, vertical emissions were up to 20dB lower)

#### 2412 MHz

	SPURIOUS LIMITATIONS							
f (MHz)		amplitude of emission (dBµV/m)	limit max. allowed emmision		results			
56.4	rad.	QP:23.8	40.0 dBµV/m		complies			
60.7	rad.	QP:22.8	40.0 dBµV/m		complies			
62.5	rad.	QP:21.5	40.0 dBµV/m		complies			
456.6	rad.	QP:32.1	46.0 dBµV/m		complies			
461.1	rad.	QP:31.2	46.0 dBµV/m		complies			
5281	rad.	AV:16.6	54.0 dBµV/m		complies			
no	radiated	spurs	above	5300 MHz				
Measurement uncertainty ± 3dB								

Measurement were performed up to 1 GHz with a CISPR quasi peak adapter and 100/120 kHz BW.

Measurements above 1 GHz were performed with RBW/VBW 1 MHz in Peak and Average.

LIMITS

**SUBCLAUSE § 15.247 (c)** 



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

2412 MHz radiated up to 4000 MHz



This is only a scan:

Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz ( blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppresse by a stub tuner to avoid overstearing of the lownoise amplifier of the measuring system.



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

### 2412 MHz up to 12 GHz radiated



This is only a scan. Manual measurements were performed with 1MHz RBW/VBW

LIMITS

**SUBCLAUSE § 15.247 (c)** 



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

2412 MHz up to 18GHz radiated (This plot is valid for all 3 channels, there were no peaks found)





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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

### 2412 MHz up to 25GHz radiated (This plot is valid for all 3 channels, there were no peaks found)





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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%2412 MHz conducted up to 1 GHz

### All unwanted conducted emissions are << 20 dBc.

#### Low channel

	Marker	2 [T1]		RBW	100 k	Hz	RF Att	20	dB
Ref Lvl 20 dBm	705	-41. 5.129066	77 dBm 12 MHz	VBW SWT	100 k 245 m	Hz S	Unit		dBm
20 22.8 dB Offs	et				▼2	[T1]	-4	1.77	dBm A
10							705.1290	6612	MHz
					▼1	[T1]	- 4	1.55	dBm
							800.1705	5904	MHz
0					<u> </u>				
-10									
1MAX									110
-20									
20									
-30					<u> </u>				
-40									
		1 1 1							here.
- 50 mm marken hand	Amphenghie	halfples	phonetallit	Markenker	hopenled	unthe	m many	- Ann	<b>•</b> • • •
50 *									
-60					<u> </u>				
-70					<b> </b>				
- 80									
Center 515 MHz			97 1	MHz/			Span	970	MHz

Date: 27.DEC.2001

The ref level is set to 20 dBm, that is the output of the card at nominal frequency. Manual measurements were performed with a CISPR quasi peak adapter and 100/120 kHz.

#### LIMITS

SUBCLAUSE § 15.247 (c)



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

### 2412 MHz conducted up to 5 GHz Peak



#### This is only a scan.

Manual measurements were performed with 1MHz RBW/VBW

#### LIMITS

**SUBCLAUSE § 15.247 (c)** 



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

### 2412 MHz conducted up to 5 GHz Average



#### This is only a scan.

Manual measurements were performed with 1MHz RBW/VBW.

#### LIMITS

**SUBCLAUSE § 15.247 (c)** 



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### 2412 MHz conducted up to 25 GHz Peak



This is only a scan.

Manual measurements were performed with 1MHz RBW/VBW

LIMITS

**SUBCLAUSE § 15.247 (c)** 



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

### 2412 MHz conducted up to 25 GHz Average



### This is only a scan. Manual measurements were performed with 1MHz RBW/VBW

LIMITS

SUBCLAUSE § 15.247 (c)



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

EMISSION LIMITATIONS (Transmitter)

SUBCLAUSE § 15.247 (c) (1)

<u>conducted</u> (radiated emissions in restricted bands see next table)

#### 2442 MHz

SPURIOUS LIMITATIONS								
		amplitude	limit					
		of emission	max. allowed					
f		(dBm)	emmision		results			
(MHz)								
2442	cond.	19.2	30.0 dBm		Operating			
					frequency			
no	peaks	found	above	2442 MHz				
Measurement uncertainty ± 3dB								

**RBW/VBW** according to FCC requirements.

LIMITS

SUBCLAUSE § 15.247 (c)



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

**EMISSION LIMITATIONS (Transmitter)** 

SUBCLAUSE § 15.247 (c) (2)

radiated (Antenna horizontal polarisation, vertical emissions were up to 20dB lower)

2442 MHz

	SPURIOUS LIMITATIONS						
		amplitude	limit				
		of emission	max. allowed				
f		(dBµV/m)	emmision		results		
(MHz)							
56.4	rad.	QP:23.8	40.0 dBµV/m		complies		
60.7	rad.	QP:22.8	40.0 dBµV/m		complies		
62.5	rad.	QP:21.5	40.0 dBµV/m		complies		
456.6	rad.	QP:32.1	46.0 dBµV/m		complies		
461.1	rad.	QP:31.2	46.0 dBµV/m		complies		
no	radiated	spurs	above	2442 MHz			
Measurement uncertainty ± 3dB							

Measurement were performed up to 1 GHz with a CISPR quasi peak adapter and 100/120 kHz BW.

Measurements above 1 GHz were performed with RBW/VBW 1 MHz in Peak and Average.

LIMITS

SUBCLAUSE § 15.247 (c)



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

2442 MHz radiated up to 4000 MHz



#### This is only a scan:

Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz ( blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppressed by a stub tuner to avoid overstearing of the lownoise amplifier of the measuring system.



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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

2442 MHz up to 12 GHz radiated



### This is only a scan. Measurements were performed with 1MHz RBW/VBW

#### LIMITS

SUBCLAUSE § 15.247 (c)



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51% 2442 MHz conducted up to 1 GHz



This is only a scan.

Manual measurements were performed with a CISPR quasi peak adapter and 100/120 kHz.

LIMITS

**SUBCLAUSE § 15.247 (c)** 



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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

### 2412 MHz conducted up to 5 GHz Peak



#### This is only a scan.

Manual measurements were performed with 1MHz RBW/VBW

#### LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

### 2442 MHz conducted up to 5 GHz Average



### This is only a scan. Manual measurements were performed with 1MHz RBW/VBW

LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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#### This is only a scan. Manual measurements were performed with 1MHz RBW/VBW



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

te:27.12.01 Pa

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### Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

### 2442 MHz conducted up to 25 GHz Average



### This is only a scan. Manual measurements were performed with 1MHz RBW/VBW

#### LIMITS

SUBCLAUSE § 15.247 (c)



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

**EMISSION LIMITATIONS (Transmitter)** 

SUBCLAUSE § 15.247 (c) (1)

<u>conducted</u> (radiated emissions in restricted bands see next table)

2462 MHz

	SPURIOUS LIMITATIONS						
		-					
f (MHz)		amplitude of emission (dBm)	limit max. allowed emmision		results		
2462	cond.	19.1	30.0 dBm		Operating frequency		
no	peaks	found	above	2462 MHz			
Measurement uncertainty ± 3dB							

**RBW/VBW** according to FCC requirements.

### LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

**EMISSION LIMITATIONS (Transmitter)** 

SUBCLAUSE § 15.247 (c) (2)

radiated (Antenna horizontal polarisation, vertical emissions were up to 20dB lower)

2462 MHz

	SPURIOUS LIMITATIONS						
	T	1					
		amplitude	limit				
		of emission	max. allowed				
f		(dBµV/m)	emmision		results		
(MHz)							
56.4	rad.	QP:23.8	40.0 dBµV/m		complies		
60.7	rad.	QP:22.8	40.0 dBµV/m		complies		
62.5	rad.	QP:21.5	40.0 dBµV/m		complies		
456.6	rad.	QP:32.3	46.0 dBµV/m		complies		
461.1	rad.	QP:31.4	46.0 dBµV/m		complies		
no	radiated	spurs	above	2462 MHz			
Measurement uncertainty ± 3dB							

Measurement were performed up to 1 GHz with a CISPR quasi peak adapter and 100/120 kHz BW.

Measurements above 1 GHz were performed with RBW/VBW 1 MHz in Peak and Average.

LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

2462 MHz up to 4 GHz radiated



#### This is only a scan:

Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz ( blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Carrier is suppresse by a stub tuner to avoid overstearing of the lownoise amplifier of the measuring system.

#### LIMITS

SUBCLAUSE § 15.247 (c)



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

2462 MHz up to 12 GHz radiated



### This is only a scan. Measurements were performed with 1MHz RBW/VBW

#### LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

Spurious radiations in the restricted band 2483.5 to 2500 MHz Average

Res.Bw 100.0 kHz[3dB] TG.Lvl off CF.Stp 3.000 MHz Thresh 54.00 dB /uV LVLOFF 1 MHz Vid.Bw 5 dB [dB Marker -46.0 dBm/Hz 2.46200 GHz RF.Att Unit Ref.Lvl 115.00 dB /uV ″uV1 110.0 100.0 90.0 80.0 70.0 60.0 ٩W TH 50.0 40.0 30.0 20.0 Center 2.475 GHz Sweep 20 ms Stop Start 2.46 GHz Span 30 MHz 2.49 GHz

LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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### Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C Relative humidity : 51%

### 2462 MHz conducted up to 1 GHz



#### This is only a scan.

Manual measurements were performed with a CISPR quasi peak adapter and 100/120 kHz.

LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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#### Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** :51%

### 2462 MHz conducted up to 5 GHz Peak



This is only a scan.

### Manual measurements were performed with 1MHz RBW/VBW

#### LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test : WLAN Module PA3171U-1MPC

Ambient temperature : 21°C

**Relative humidity** :51%

### 2462 MHz conducted up to 5 GHz Average



This is only a scan.

### Manual measurements were performed with 1MHz RBW/VBW

#### LIMITS

**SUBCLAUSE § 15.247 (c)** 



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%2462 MHz conducted up to 25 GHz Peak



This is only a scan.

Manual measurements were performed with 1MHz RBW/VBW



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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# Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### 2462 MHz conducted up to 25 GHz Average



This is only a scan.

### Manual measurements were performed with 1MHz RBW/VBW

#### LIMITS

SUBCLAUSE § 15.247 (c)



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** : 51%

### **POWER SPECTRAL DENSITY**

**SUBCLAUSE § 15.247 (d)** 

TEST CONDITIONS		<b>RF POWER LEVEL IN 3 kHz BW</b>				
Frequen	cy (MHz)	2412	2442	2462		
T <sub>nom</sub> ( 23 )°C	V <sub>nom</sub> (3.3)V	-2.5 dBm	-3.4 dBm	-3.5 dBm		
Maximum deviation from output power under extreme test conditions (dBc)						
Measuremen	t uncertainty		±3dB			

The measurement was performed with the power density function of the analyzer. The readout is related to 1 Hz BW. For 3kHz BW we have to add 34.8 dB.

LIMIT

SUBCLAUSE §15.247(d)



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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**SUBCLAUSE § 15.247 (d)** 

Equipment under test :WLAN Module PA3171U-1MPC Ambient temperature :21°C Relative humidity :51%

POWER SPECTRAL DENSITY 2412 MHz

Marker 1 [T1 NOI] 3 kHz RF Att 10 dB RBW Ref Lvl -37.30 dBm/Hz VBW 10 kHz dBm 20 dBm 2.41200666 GHz SWT 200 ms Unit 20 22.8 dB Offset Α 10 -10 1MA -2 -3( -40 -50 -60 -70 -80 Center 2.412 GHz 150 kHz/ Span 1.5 MHz Date: 27.DEC.2001

LIMIT

SUBCLAUSE §15.247(d)



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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**SUBCLAUSE § 15.247 (d)** 

Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### 2442 MHz

#### POWER SPECTRAL DENSITY



#### LIMIT

SUBCLAUSE §15.247(d)



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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### Equipment under test :WLAN Module PA3171U-1MPC Ambient temperature :21°C Relative humidity :51%

# POWER SPECTRAL DENSITY 2462 MHz

**SUBCLAUSE § 15.247 (d)** 



#### LIMIT

SUBCLAUSE §15.247(d)



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### PROCESSING GAIN OF DSSS SYSTEMSSUBCLAUSE §15.247 (e)

It will be provided in an external paper.

It is in all cases over 10 dB.



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### **CONDUCTED EMISSIONS**

### FCC Rule 47 Part 15



The test was performed with a CISPR quasi peak adapter to show that no spurs were distributed via DC power connection. All spurious were << below limit.

Limits were for AC measurements.

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED** (for reference numbers see test equipment listing) 17 - 24



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

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Equipment under test : WLAN Module PA3171U-1MPC Ambient temperature : 21°C **Relative humidity** : 51%

### **RECEIVER SPURIOUS RADIATION**

§ 15.209

### Radiated

	SPURIOUS EMISSIONS LEVEL (dBµV/m)							
	2412 MHz	Z		2442 MH	Z	2472 MHz		
f	Detector	Level	f	Detector	Level	f	Detector	Level
(MHz)		dBµV/m	(MHz)		(µV/m)	(MHz)		(µV/m)
56.1	QP	24.3	56.1	QP	24.3	56.1	QP	24.3
62.5	QP	22.3	62.5	QP	22.3	62.5	QP	22.3
456.6	QP	32.5	456.6	QP	32.5	456.6	QP	32.5
461.1	QP	31.2	461.1	QP	31.2	461.1	QP	31.2
465.6	QP	31.1	465.6	QP	31.1	465.6	QP	31.1
no	peaks	above	486	MHz				
Measu	rement unc	ertainty		±3 dB				

All spurious including such in restricted bands are below the limits.

### Measurement distance see table

Limits

### **SUBCLAUSE § 15.209**

Frequency (MHz)	Field strength (dBµV/m)	Measurement distance (m)
30 - 88	40	3
88 - 216	43.5	3
216 - 960	46	3
above 960	54	3



Test report nr..: 2-2730-1-4/01

**Issue Date:27.12.01** 

12.01 Page 59 (74)

Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

#### **RECEIVER SPURIOUS RADIATION** <u>up to 4 GHz, mid channel</u> The following plots are valid for all three measured frequencies.

CETECOM ICT SERVICES GMBH EMISSION LEVEL[ 27 Dec 2001 QUASI-PEAK **hp**\_100 dBuV/m] PEAK FCC Part 15 Toshiba WLAN PA3171U-1MPC mid channel RX on antenna horizontal 80 FCC Part 15.209 60 40 hnam 20 4000 30 100 1000 FREQUENCY [MHz]

### This is only a scan:

Measurements were performed with a CISPR quasi peak adapter and 100/120 kHz BW up to 1 GHz ( blue lines), higher frequencies with average (yellow lines) and peak (green lines) and RBW/VBW 1MHz.

Limits

#### **SUBCLAUSE § 15.209**

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED** (for reference numbers see test equipment listing) 17 - 24 § 15.209



Test report nr..: 2-2730-1-4/01

Issue Date:27.12.01

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Equipment under test: WLAN Module PA3171U-1MPCAmbient temperature: 21°CRelative humidity: 51%

### **RECEIVER SPURIOUS RADIATION**

§ 15.209

#### up to 12 GHz

la sa	CETECOM ICT SERVICE	S GMBH		:	27 Dec 2001		
np	EMISSION LEVEL[	dBuV/m]	PEAK				
100				FCC Part 15 Toshiba WLAN mid channel RX on antenna horizon	PA3171U-1MF ntal	PC	
80						ECC Pa	rt 15 209
60						10014	
40		J.AM	water	-	www.drawww.um.dr.www	Wyperstation of the set	-hasheshered and market
20	Andrikan dan Arayan Al-maryor Araya	hunneration					
3990						10000	0 12000
			FREQUENCY [N	IHz]			

The measurements were performed up to 25 GHz. There were no peaks found.

Measurements were performed with RBW/VBW 1 MHz.

Limits		SUBCLAUSE § 15.209
Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
above 960	500	3

**REFERENCE NUMBER(S) OF TEST EQUIPMENT USED** (for reference numbers see test equipment listing) 17 - 24



Test report nr..: 2-2730-1-1/01

**Issue Date:26.11.01** 

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### TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Туре	Manufacturer	Serial No.
01	Spectrum Analyzer	8566 A	Hewlett-Packard	1925A00257
02	Analyzer Display	8566 A	Hewlett-Packard	1925A00860
03	Oscilloscope	7633	Tektronix	230054
04	Radio Analyzer	CMTA 54	<b>Rohde &amp; Schwarz</b>	894 043/010
05	System Power Supply	6038 A	Hewlett-Packard	2848A07027
06	Signal Generator	8111 A	Hewlett-Packard	2215G00867
07	Signal Generator	8662 A	Hewlett-Packard	2224A01012
08	Funktionsgenerator	AFGU	<b>Rohde &amp; Schwarz</b>	862 480/032
09	Regeltrenntrafo	MPL	Erfi	91350
10	Netznachbildung	NNLA 8120	Schwarzbeck	8120331
11	<b>Relais-Matrix</b>	PSU	<b>Rohde &amp; Schwarz</b>	893 285/020
12	Power-Meter	436 A	Hewlett-Packard	2101A12378
13	Power-Sensor	8484 A	Hewlett-Packard	2237A10156
14	Power-Sensor	8482 A	Hewlett-Packard	2237A00616
15	Modulationsmeter	9008	Racal-Dana	2647
16	Frequenzzähler	5340 A	<b>Hewlett-Packard</b>	1532A03899
17	Absorber Schirmkabine		MWB	87400/002
18	Spectrum Analyzer	85660 B	Hewlett-Packard	2747A05306
19	Analyzer Display	85662 A	Hewlett-Packard	2816A16541
20	Quasi Peak Adapter	85650 A	Hewlett-Packard	2811A01131
21	<b>RF-Preselector</b>	85685 A	<b>Hewlett-Packard</b>	2833A00768
22	<b>Biconical Antenne</b>	3104	Emco	3758
23	Log. Per. Antenne	3146	Emco	2130
24	Double Ridge Horn	3115	Emco	3088
25	<b>EMI-Testreceiver</b>	ESAI	<b>Rohde &amp; Schwarz</b>	863 180/013
26	EMI-Analyzer-Display	ESAI-D	<b>Rohde &amp; Schwarz</b>	862 771/008
27	<b>Biconical Antenne</b>	HK 116	<b>Rohde &amp; Schwarz</b>	888 945/013
28	Log. Per. Antenne	HL 223	<b>Rohde &amp; Schwarz</b>	825 584/002
29	<b>Relais-Switch-Unit</b>	RSU	<b>Rohde &amp; Schwarz</b>	375 339/002
30	Highpass	HM985955	<b>FSY Microwave</b>	001
31	Amplifier	P42-GA29	<b>Tron-Tech</b>	B 23602
32	Absorber Schirmkabine		Frankonia	
33	Steuerrechner	PSM 7	<b>Rohde &amp; Schwarz</b>	834 621/004
34	<b>EMI Test Reciever</b>	ESMI	<b>Rohde &amp; Schwarz</b>	827 063/010
35	<b>EMI Test Receiver</b>	Display	<b>Rohde &amp; Schwarz</b>	829 808/010



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### TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify the identification on each page of the test equipment used, on each page of the test report, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory, below.

No	Instrument/Ancillary	Туре	Manufacturer	Serial No.
36	Controler	HD 100	Deisel	100/322/93
37	Relais Matrix	PSN	Rohde & Schwarz	829 065/003
38	Control Unit	GB 016 A2	Rohde & Schwarz	344 122/008
39	Relais Switch Unit	RSU	Rohde & Schwarz	316 790/001
40	Power Supply	6032A	Hewlett Packard	2846A04063
41	<b>Spektrum Monitor</b>	EZM	<b>Rohde &amp; Schwarz</b>	883 720/006
42	Meßempfänger	ESH 3	Rohde & Schwarz	890 174/002
43	Meßempfänger	ESVP	Rohde & Schwarz	891 752/005
44	Biconi Ant. 20-300MHz	HK 116	Rohde & Schwarz	833 162/011
45	Logper Ant. 0.3-1 GHz	HL 223	Rohde & Schwarz	832 914/010
46	Amplifier 0.1-4 GHz	AFS4	Miteq Inc.	206461
47	Logper Ant. 1-18 GHz	HL 024 A2	Rohde & Schwarz	342 662/002
48	Polarisationsnetzwerk	HL 024 Z1	Rohde & Schwarz	341 570/002
49	Double Ridge G Horn	3115	EMCO	9107-3696
	Antenne 1-26.5 GHz			
50	Microw. Sys. Amplifier	8317A	Hewlett Packard	3123A00105
	0.5- 26.5 GHz			
51	Audio Analyzer	UPD	Rohde & Schwarz	1030.7500.04
52	Steuerrechner	PSM 7	Rohde & Schwarz	883 086/026
53	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	861 406/005
54	DC V-Netzwerk	ESH3-Z6	Rohde & Schwarz	893 689/012
55	AC 2 Phasen V-	ESH3-Z5	Rohde & Schwarz	861 189/014
	Netzwerk			
56	AC 2 Phasen V-	ESH3- <b>Z</b> 5	Rohde & Schwarz	894 981/019
			Ronde & Senwarz	0/1/01/
·	Netzwerk			0,1,01,01,
57	Netzwerk AC-3 Phasen V-	ESH2-Z5	Rohde & Schwarz	882 394/007
57	Netzwerk AC-3 Phasen V- Netzwerk	ESH2-Z5	Rohde & Schwarz	882 394/007
57 58	Netzwerk AC-3 Phasen V- Netzwerk Stromversorgung	ESH2-Z5 6032A	Rohde & Schwarz Rohde & Schwarz Rohde & Schwarz	882 394/007 2933A05441
57 58 59	Netzwerk AC-3 Phasen V- Netzwerk Stromversorgung HF-Test Empfänger	ESH2-Z5 6032A ESVP.52	Rohde & Schwarz Rohde & Schwarz Rohde & Schwarz	882 394/007 2933A05441 881 487/021
57 58 59 60	Netzwerk AC-3 Phasen V- Netzwerk Stromversorgung HF-Test Empfänger Spectrum Monitor	ESH2-Z5 6032A ESVP.52 EZM	Rohde & SchwarzRohde & SchwarzRohde & SchwarzRohde & SchwarzRohde & Schwarz	882 394/007 2933A05441 881 487/021 883 086/026
57 58 59 60 61	NetzwerkAC-3 Phasen V-NetzwerkStromversorgungHF-Test EmpfängerSpectrum MonitorHF-Test Empfänger	ESH2-Z5 6032A ESVP.52 EZM ESH3	Rohde & SchwarzRohde & SchwarzRohde & SchwarzRohde & SchwarzRohde & SchwarzRohde & SchwarzRohde & Schwarz	882 394/007 2933A05441 881 487/021 883 086/026 881 515/002
57 58 59 60 61 62	NetzwerkAC-3 Phasen V-NetzwerkStromversorgungHF-Test EmpfängerSpectrum MonitorHF-Test EmpfängerRelais Matrix	ESH2-Z5 6032A ESVP.52 EZM ESH3 PSU	Rohde & SchwarzRohde & Schwarz	882 394/007 2933A05441 881 487/021 883 086/026 881 515/002 882 943/029
57 58 59 60 61 62 63	NetzwerkAC-3 Phasen V-NetzwerkStromversorgungHF-Test EmpfängerSpectrum MonitorHF-Test EmpfängerRelais MatrixRelais Matrix	ESH2-Z5 6032A ESVP.52 EZM ESH3 PSU PSU	Rohde & SchwarzRohde & Schwarz	882 394/007 2933A05441 881 487/021 883 086/026 881 515/002 882 943/029 828 628/007
57           58           59           60           61           62           63           64	NetzwerkAC-3 Phasen V-NetzwerkStromversorgungHF-Test EmpfängerSpectrum MonitorHF-Test EmpfängerRelais MatrixRelais MatrixSpectrum Analyzer	ESH2-Z5 6032A ESVP.52 EZM ESH3 PSU PSU FSIQ 26	Rohde & SchwarzRohde & Schwarz	882 394/007 2933A05441 881 487/021 883 086/026 881 515/002 882 943/029 828 628/007 119.6001.27