

**HYUNDAI CALIBRATION & CERTIFICATION TECH. CO., LTD.**

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**TEST REPORT**

**Manufacture;**  
**CEYON TECHNOLOGY CO., LTD.**

**13 Samsung Insurance B/D #942-9, Ingye-Dong,  
Paldal-Gu, Suwon-City, Gyeonggi-Do, Korea 442-776**

**Date of Issue: October 26. 2006**

**Test Report No.: HCT-F06-1007**

**Test Site: HYUNDAI CALIBRATION & CERTIFICATION  
TECHNOLOGIES CO., LTD.**

**HCT FRN : 0005-8664-21**

**EUT TYPE :**

**FCC ID :**

**MODEL :**

**RFID READER/WRITER**

**UDCWIM125-S**

**WIM 125-S**

**Rule Part(s):** Part 15  
**Equipment Class:** DCD - low power transmitter below 1705KHz  
**Standard(s):** Part 15 Subpart C

**This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003**

**I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.**



**Report prepared by**  
**: Kyoung Hee, Yoon**  
**Test engineer of EMC Tech.Part**



**Approved by**  
**: Sang Jun LEE**  
**Manager of EMC Tech.Part**



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# MEASUREMENT REPORT

## 1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.

<b>Applicant Name:</b>	<b>CEYON TECHNOLOGY CO., LTD.</b>
<b>Address:</b>	<b>13 Samsung Insurance B/D #942-9, Ingye-Dong, Paldal-Gu, Suwon-City, Gyeonggi-Do, Korea 442-76</b>

- **FCC ID:** UDCWIM125-S
- **Equipment Class:** DCD - low power transmitter below 1705KHz
- **EUT Type:** RFID READER/WRITER
- **Model(s):** WIM 125-S
- **Power:** DC 12V / 1A
- **Operation temperature range** 0 to +65
- **Operation humidity range** 20 % ~ 90 % (No dewing)
- **Dimensions:** (W)300mm \* (L)350mm \* (H)75mm
- **Rule Part(s):** FCC Part 15 Subpart C
- **Test Procedure(s):** ANSI C63.4 (2003)
- **Dates of Tests:** October 20. 2006 ~ October 23. 2006
- **Place of Tests:** 254-1,MAEKOK-RI,HOBUP-MYUN,ICHON-SI,KYOUNGKI-DO,467-701,KOREA

## 2.1 INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions emanating from **CEYON TECHNOLOGY CO., LTD. RFID READER/WRITER. FCC ID:UDCWIM125-S**  
**Model : WIM 125-S**

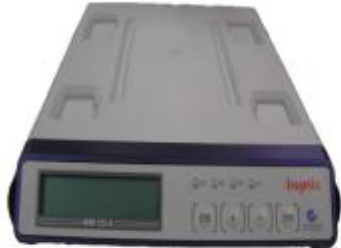
The open area test site and conducted measurement facility used to collect the radiated data are located at the 254-1, MAEKOK-RI, HOBUP-MYUN, ICHON-SI, KYOUNGKI-DO, 467-701, KOREA. The site is constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated July 05, 2006 (Confirmation Number: EA90661)

## 3.1 PRODUCT INFORMATION

### 3.2 Equipment Description

Equipment Under Test (EUT) is **CEYON TECHNOLOGY CO., LTD. RFID READER/WRITER.**  
**FCC ID: UDCWIM125-S (Model : WIM 125-S)**

#### 1.1.1. Product specifications

WIM125-S	Parameter	Description
	Processor	8 bit Processor
	Frequency	125 KHz
	LCD type	16*2 line 32 character display
	Power	DC 12V / 1A
	Communication	RS232 , RS422, RS485 (Menu Setting)
	Dimensions	(W)300mm * (L)350mm * (H)75mm
	Material	ABS
	Host Interface	1ea (RS232 , RS422, RS485)
	Internal ant.	1ea
	LED display	POWER, COM, READ, WRITE
	KEY	4 KEYS
	Keyboard I/F	1ea

#### 1.1.2. Environment Specifications

Item	Specifications
Operation temperature range	0℃ to +65℃
Operation humidity range	20 % ~ 90 % (No dewing)
Operation atmospheric pressure range	1 atmospheric pressure
Conservation temperature range	0℃ to +80℃
Conservation humidity range	20 % ~ 90 % (No dewing)

## 4.1 Description of Tests(Conducted)

### 4.2 Powerline Conducted RFI (150kHz- 30MHz)

The power line conducted RFI measurements were performed according to CISPR 22.

The EUT was placed on a non-conducting 1.0 by 1.5 meter table which is 0.8 meters in height and 0.40 meters away from the vertical wall of the shielded enclosure. Power to the EUT is provided through a Rohde & Schwarz 50  $\Omega$  / 50 uH Line Impedance Stabilization Network (LISN) and the support equipment through a separate Solar 50  $\Omega$  / 50 uH Line- Conducted Test Facility LISN. Sufficient time for the EUT, support equipment, and test equipment were allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME. The spectrum was scanned from 150kHz to 30 MHz. Each maximum EME was remeasured using an EMI receiver. The detector function of the receiver was set to CISPR quasi- peak and average mode with the bandwidth set to 9 kHz. Each emission was maximized consistent with the typical applications by varying the configuration of the test sample. Interface cables were connected to the available interface ports of the test unit. The effect of varying the position of cables was investigated to find the configuration that produces maximum Diagram emission. Excess cable lengths were bundled at the center with 30- 40cm. in length. The worst-case configuration is noted in the test report and the photographs are attached.

RFI CONDUCTED	CISPR 22 CLASS B	
	Limits dB(uV/m)	
Freq. Range	CISPR 22 Quasi-Peak	CISPR 22 Average
150kHz - 0.5MHz	66-56**	56-46**
0.5MHz - 5MHz	56	46
5MHz - 30MHz	60	50
**Limits decreases linearly with the logarithm of frequency		

Table 1. RFI Conducted Limits

## 4.3 TRANSMITTER RADIATED SPURIOUS EMISSIONS (<30 MHz)

### LIMITS

§15.029 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.750	24000F (kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above960	500	3

**Table 2. RFI Radiated Limits**

\*\*Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

§15.209 (d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz.

Radiated emission limits in these three bands are based on measurements employing an average detector.

### TEST PROCEDURE

The EUT is tested on the Open Area Test Site. The antenna to EUT distance is 10 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 150 kHz the resolution bandwidth is set to 3 kHz, or 200 Hz CISPR 6 dB for peak detection measurements or VBW=10 Hz for average detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 150 kHz the resolution bandwidth is set to 90 kHz, or 10 kHz CISPR 6 dB for

peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize missions received. The center of the loop antenna is fixed at 3 meter above the field. Measurements are made with the antenna polarized in both the Face-On and The face-Off positions.

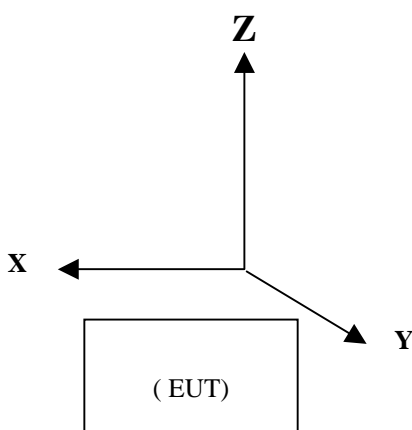
## 4.4 PRELIMINARY TESTS

### 4.5 Radiated Emission Test

During Tests, the following operating conditions were investigated

<b>Axes</b>	<b>The worst operating condition</b>
<b>X</b>	
<b>Y</b>	<b>O</b>
<b>Z</b>	

Note : This transmitter has been investigated with three axes and the reported readings are the worse case.





## 5.1 Support Equipment Used

DEVICE TYPE	MANUFACTURER	MODEL NUMBER	FCC ID / DoC	CONNECTED TO
RFID READER/WRITER	CEYON TECHNOLOGY CO., LTD.	WIM 125-S	-	N/A
Adaptor	HYOSUNG	KNU-1210	-	EUT
Mouse	Logitech	M-BT96a	-	Notebook
Keyboard	DELL	SK-8115	-	Notebook
Printer	H.P	C4569A	-	Notebook
Notebook	Samsung	S830	-	EUT
Notebook Adaptor	Samsung	AD-6019	-	Notebook

## 5.2 Cable Description

		Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (M)
RFID READER/WRITER (EUT)	Din	N/A	Y	D(1.5)
	RS-232	N/A	N	D(1.5)
	DC In	N	N/A	P(1.5)
Notebook	USB	N/A	Y	D(1.2)
	Parallel	N/A	Y	D(1.8)
	DC-In	N	N/A	P(1.5)
	Serial	N/A	N	D(1.5)
Print	Parallel	N/A	Y	D(1.8)
	AC In	N	N/A	P(1.8)

The marked "(D)" means the Data Cable and "(P)" means the Power Cable.

### 5.3 Noise Suppression Parts on Cable. (I/O CABLE)

		Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
<b>RFID READER/WRITER (EUT)</b>	<b>Din</b>	N	N/A	Y	<b>EUT END</b>
	<b>RS-232</b>	N	N/A	Y	<b>Both END</b>
<b>Notebook</b>	<b>USB</b>	N	N/A	Y	<b>Notebook END</b>
	<b>Serial</b>	N	N/A	Y	<b>Both END</b>
	<b>Parallel</b>	Y	<b>Print END</b>	Y	<b>Both END</b>
<b>Print</b>	<b>Parallel</b>	Y	<b>Print END</b>	Y	<b>Both END</b>

## 6.1 LINE-CONDUCTED TEST DATA

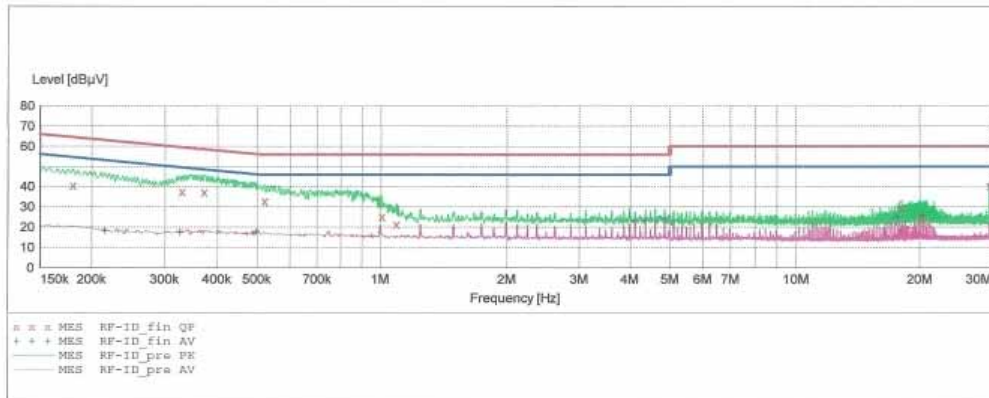
HCT

EMC TEST LAB

EUT: WIM 125-S  
 Manufacturer: CEYON TECHNOLOGY  
 Operating Condition: STANDBY MODE  
 Test Site: SHIELD ROOM  
 Operator: KH, YOON  
 Test Specification: CISPR 22 CLASS B  
 Comment: H

### SCAN TABLE: "CISPR 22 Voltage"

Short Description:		CISPR 22 Voltage					
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
Frequency	Frequency	Width					
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak	10.0 ms	9 kHz	None	
			Average				
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None	
			Average				
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None	
			Average				



### MEASUREMENT RESULT: "RF-ID\_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.180100	40.60	10.1	65	23.9	---	---
0.330100	37.60	10.1	59	21.9	---	---
0.372600	37.30	10.1	58	21.1	---	---
0.520000	32.90	10.1	56	23.1	---	---
1.005000	25.10	10.1	56	30.9	---	---
1.090000	21.50	10.1	56	34.5	---	---
18.100000	29.30	10.5	60	30.7	---	---
20.150000	25.00	10.5	60	35.0	---	---
29.495000	40.30	10.6	60	19.7	---	---

**MEASUREMENT RESULT: "RF-ID\_fin AV"**

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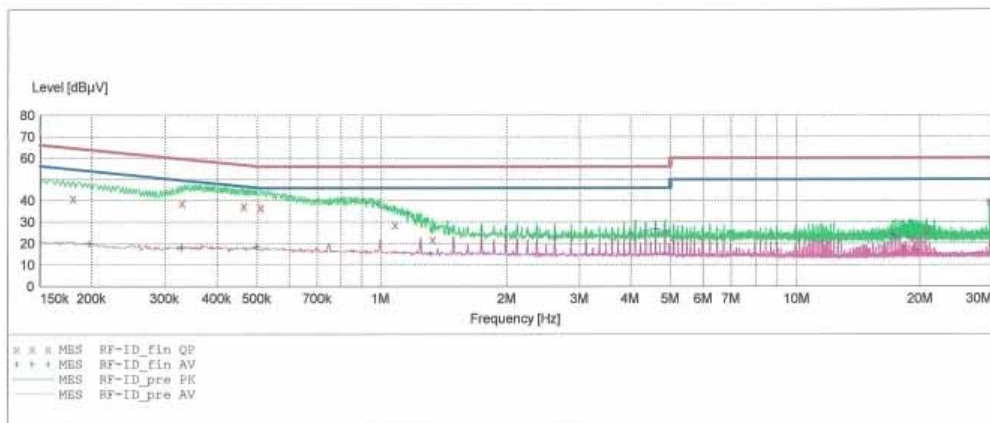
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	FE
0.215100	18.40	10.1	53	34.6	---	---
0.325100	17.60	10.1	50	31.9	---	---
0.497600	18.00	10.1	46	28.0	---	---
4.105000	23.10	10.3	46	22.9	---	---
4.355000	23.50	10.3	46	22.5	---	---
4.850000	24.50	10.3	46	21.5	---	---
17.660000	25.20	10.5	50	24.8	---	---
20.395000	25.80	10.5	50	24.2	---	---
29.495000	40.30	10.6	50	9.7	---	---

**HCT**
**EMC TEST LAB**

EUT: WIM 125-S  
 Manufacturer: CEYON TECHNOLOGY  
 Operating Condition: STANDBY MODE  
 Test Site: SHIELD ROOM  
 Operator: KH, YOON  
 Test Specification: CISPR 22 CLASS B  
 Comment: N

**SCAN TABLE: "CISPR 22 Voltage"**

Short Description:		CISPR 22 Voltage				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency	Width				
150.1 kHz	500.0 kHz	2.5 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	5.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			


**MEASUREMENT RESULT: "RF-ID\_fin QP"**

10/17/2006 8:26PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.180100	41.10	10.1	65	23.4	---	---
0.330100	39.10	10.1	59	20.4	---	---
0.462600	37.60	10.1	57	19.0	---	---
0.510000	36.90	10.1	56	19.1	---	---
1.080000	29.00	10.1	56	27.0	---	---
1.330000	22.00	10.2	56	34.0	---	---
19.090000	22.20	10.5	60	37.8	---	---
20.820000	25.40	10.5	60	34.6	---	---
29.495000	39.30	10.6	60	20.7	---	---

**MEASUREMENT RESULT: "RF-ID\_fin AV"**

10/17/2006 8:26PM

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.197600	19.80	10.1	54	33.9	---	---
0.330100	18.10	10.1	49	31.4	---	---
0.500000	18.50	10.1	46	27.5	---	---
4.350000	25.80	10.3	46	20.2	---	---
4.600000	26.70	10.3	46	19.3	---	---
4.850000	25.90	10.3	46	20.1	---	---
17.155000	24.50	10.5	50	25.5	---	---
17.405000	23.50	10.5	50	26.5	---	---
29.495000	39.10	10.6	50	10.9	---	---

## 7.1 RADIATED TEST DATA

[Fundamental(Face-On)]

Freq.	Level(dBuV)		T.F	Dis C.F	Result(dBuV) @ 300m		Limit Result(dBuV) @ 300m		Margin	
kHz	PK	AV	dB/m	dB	PK	AV	PK	AV	PK	AV
125.3	67.8	61.2	20.0	80.0	7.8	1.2	45.7	25.7	-37.9	-24.5

[Fundamental(Face-Off)]

Freq.	Level(dBuV)		T.F	Dis C.F	Result(dBuV) @ 300m		Limit Result(dBuV) @ 300m		Margin	
kHz	PK	AV	dB/m	dB	PK	AV	PK	AV	PK	AV
125.3	56.0	50.2	20.0	80.0	-4.0	-9.8	45.7	25.7	-49.7	-35.5

[Spurious(Face On)] - Below 30MHz

Freq.	Level(dBuV)		T.F	Dis C.F	Result(dBuV) @ 300m		Limit Result(dBuV) @ 300m		Margin	
kHz	PK	AV	dB/m	dB	PK	AV	PK	AV	PK	AV
250.4	38.0	33.0	20.0	80.0	-22.0	-27.0	45.7	25.7	-67.7	-52.7

[Continuous Transmitting Mode] (30MHz ~ 1GHz)

Freq. kHz	Reading dBuV	Ant. Factor dB/m	Cable Loss dB	ANT POL (H/V)	Total dBuV/m	Limit dBuV/m	Margin dB
42.2	16.8	12.0	1.4	V	30.2	40.0	9.8
120.0	25.0	11.0	2.4	H	38.4	43.5	5.1
134.4	18.9	12.2	2.6	H	33.7	43.5	9.8
149.2	24.2	12.7	2.7	H	39.6	43.5	3.9
162.3	22.9	12.6	2.9	H	38.4	43.5	5.1
178.3	25.4	11.2	3.0	H	39.6	43.5	3.9
216.4	25.6	9.7	3.3	V	38.6	46.0	7.4
224.4	25.7	10.1	3.4	V	39.2	46.0	6.8
286.4	19.2	12.3	3.9	V	35.4	46.0	10.6

Radiated Measurements at 3-meters.

NOTES:

1. All modes of operation were investigated, and the worst-case emissions are reported(Page 18).
2. The radiated limits are listed on Table 2 (Page 7).

\*\*\* Measurements using CISPR quasi-peak mode. Above 1GHz, peak detector function mode is used using a resolution bandwidth of 1MHz and a video bandwidth of 1MHz. The peak level complies with the average limit. Peak mode is used with linearly polarized horn antenna and low-loss microwave cable.

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## 8.1 Sample Calculations

### 8.2 Example 1:

**@ 4.015 MHz**

Class B limit	= 46.0 dB $\mu$ V
Reading	= 40.05 dB $\mu$ V (calibrated level)

<b>Margin</b>	= 40.05 – 46.0 = -5.95 dB $\mu$ V
	= <b>5.95 dB below limit</b>

### 8.3 Example 2:

Result Level = Level + T.F – Distance Correction Factor

T.F = Antenna Factor + Cable loss

Distance Correction Factor =  $40 \log(\text{specific distance} / \text{test distance})$

### 8.4 Example 3:

**@166.5 MHz**

Class B limit	= 43.5 dB $\mu$ V/m
Reading	= 23.3 dB $\mu$ V/m (calibrated level)
Antenna Factor + Cable Loss	= 15.2 dB
Total	= 38.5 dB $\mu$ V/m

<b>Margin</b>	= 43.5 – 38.5 = 5.0 dB $\mu$ V/m
	= <b>5.0 dB Under limit</b>



## 9.1 Test Equipment

<u>Type</u>	<u>Manufacture</u>	<u>Model Number</u>	<u>CAL Due Date</u>
EMI Test Receiver	Rohde & Schwarz	ESI40	2006.11.16
EMI Test Receiver	Rohde & Schwarz	ESCI	2007.08.24
LISN	Rohde & Schwarz	ESH2-Z5	2007.04.26
LISN	EMCO	703125	2007.04.26
Loop Antenna	Rohde & Schwarz	HFH2-Z2	2006.12.20
TRILOG Antenna	Schwarzbeck	VULB 9160	2007.04.17
Antenna Position Tower	HD	MA240	N/A
Turn Table	EMCO	1050	N/A
Power Analyzer	Voltech	PM 3300	2007.03.22
Reference Network Impedance	Voltech	IEC 555	N/A
AC Power Source	PACIFIC	Magnetic Module	N/A
AC Power Source	PACIFIC	360-AMX	2006.11.25
Controller	HD GmbH	HD 100	N/A
SlideBar	HD GmbH	KMS 560	N/A
PULSE LIMITER	Rohde & Schwarz	ESH3-Z2	2007.10.30

## 10.1 Test Software Used

**The EUT should be in continuous transmitting mode.**

NOTE: This is a sample of the basic program used during the test. However, during testing, a different software program may be used; whichever determines the worst-case condition. In addition, the program used also depends on the number and type of devices being tested.

The device under test was operated during the measurement under following conditions:

The EUT was operating the Maximum power at 125 kHz (Below 30 MHz)

The EUT was operating the Maximum power at 125 kHz (30 MHz – 1GHz)