



DSP Research Inc.

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# Wireless Access System WAS" Japanese Requirements

A decorative graphic on the left side of the slide, consisting of a vertical black line and a horizontal black line intersecting at a point. To the left of this intersection are three overlapping squares: a blue one on top, a red one on the left, and a yellow one on the bottom. The background of the slide features a large, faint, circular watermark with the word 'dsp' in a stylized, lowercase font.

IEEE 802.11a/j

Technical & Administrative Requirements  
under the Japanese Radio Law

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# Two Licenses under Radio Law

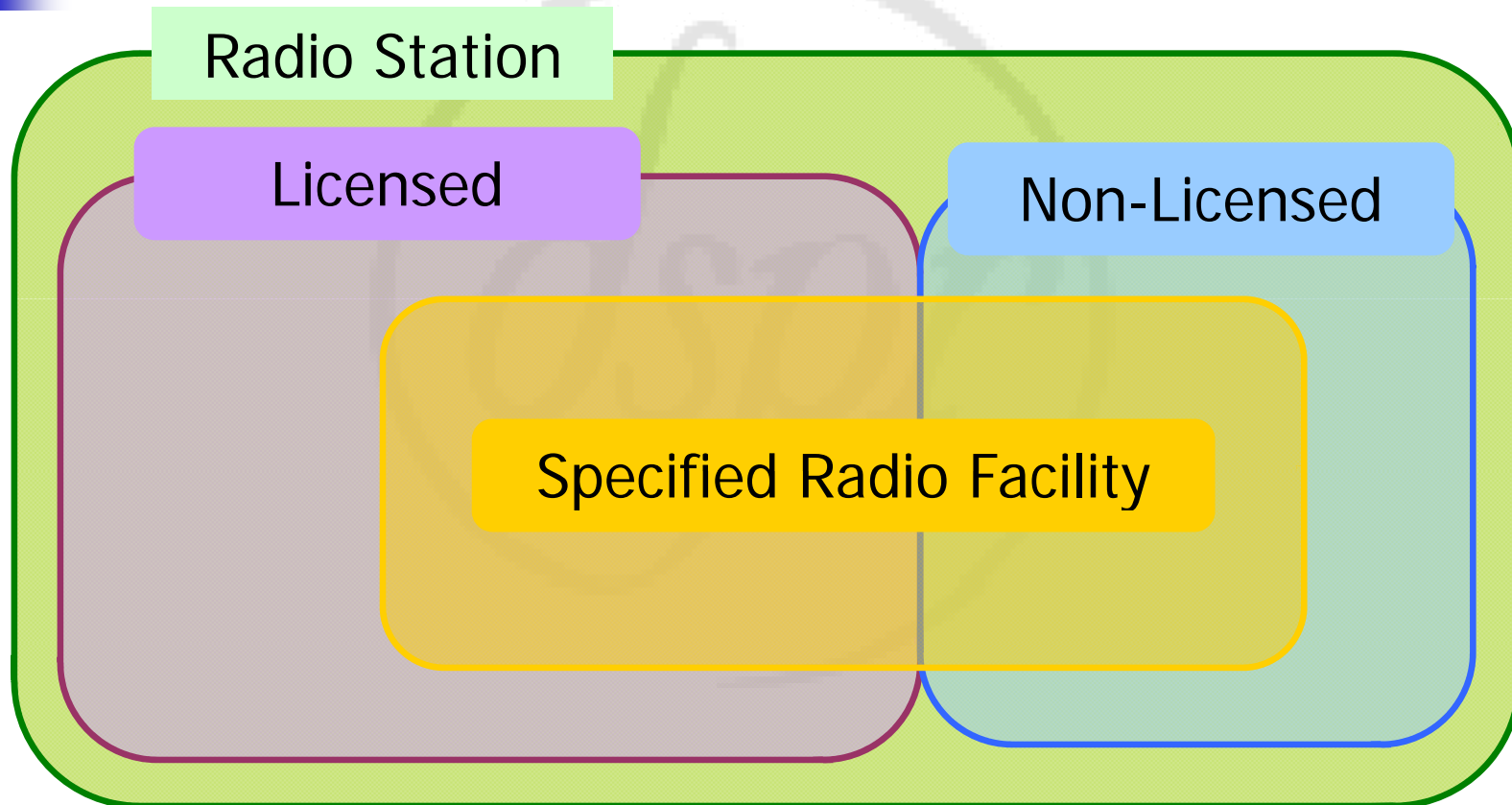
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- Radio Station License
  - For Radio Facility
    - High Pwr Fixed Station, Broadcast Station, etc.
    - Base Station, Land Mobile Station, etc.
    - Non-Licensed Radio Station
- Radio Operator License
  - For person operating the radio facility
    - Radio Law requires to operate for the **Licensed Radio Station**

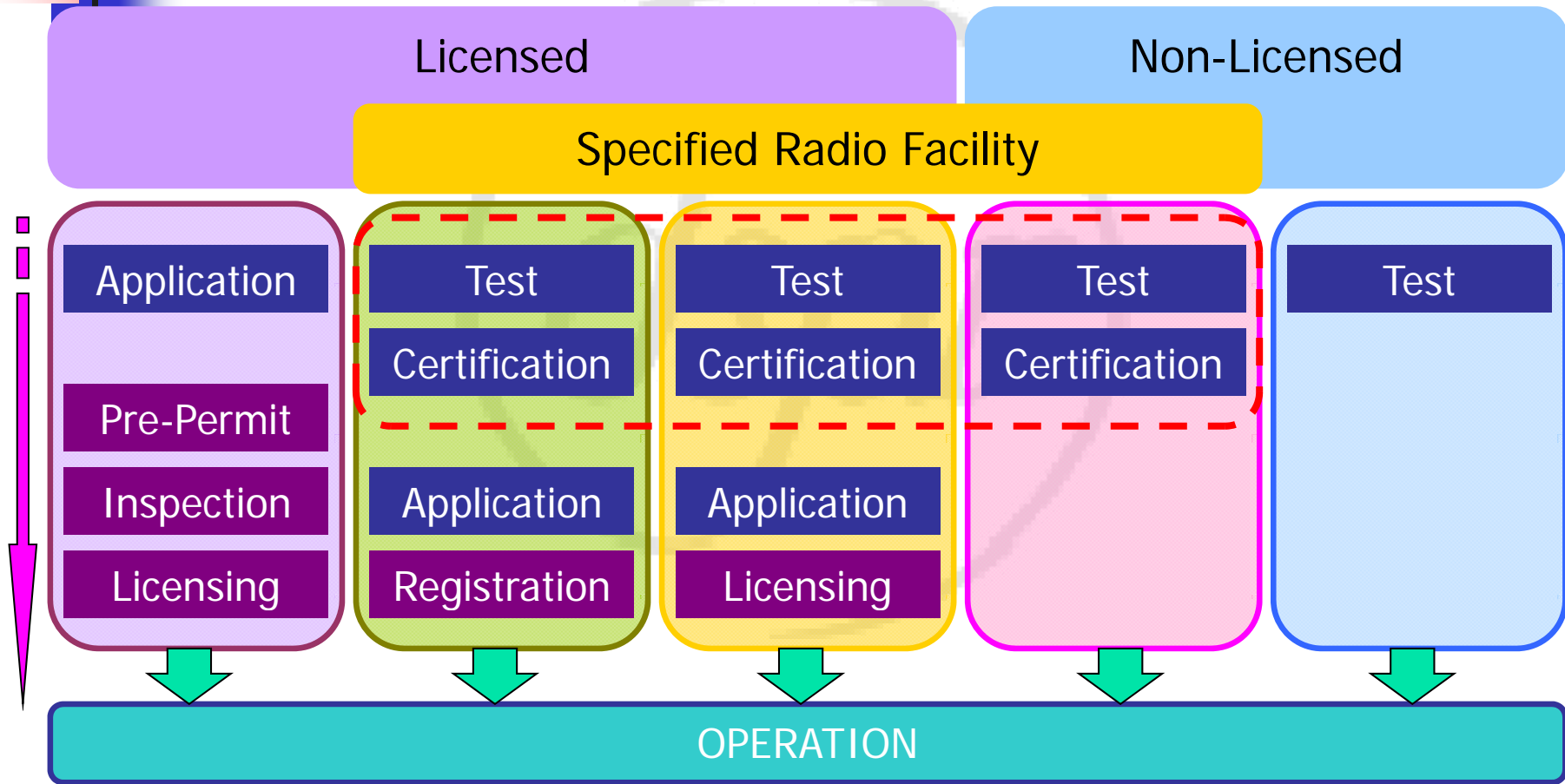


# Radio Station

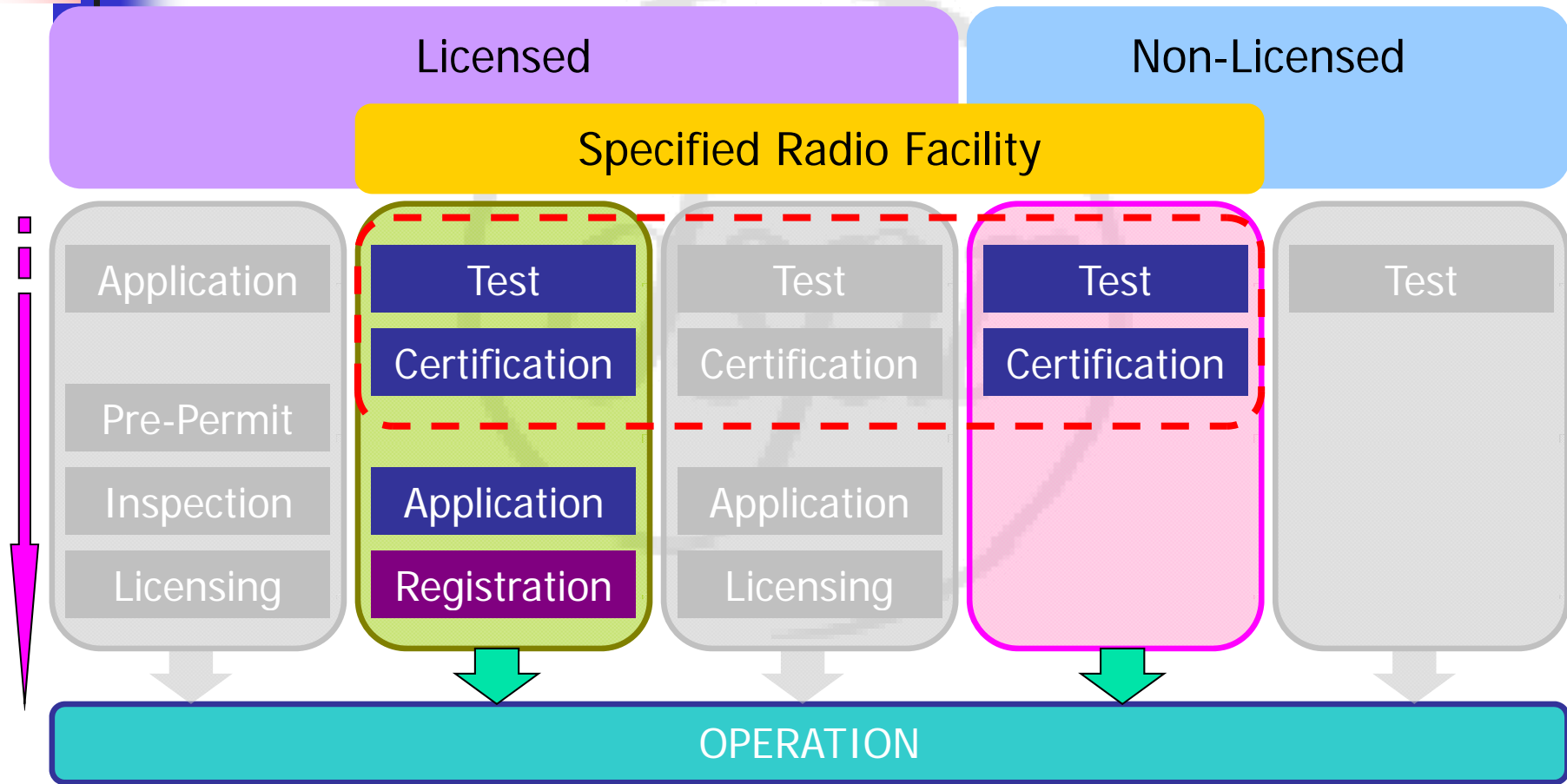
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# Station License



# 5GHz Band WAS



## High Power WAS (Registered/Licensed)

Licensed

Test

Certification

Application

Registration

- Base Station (FB)
- Land Mobile Relayed Station (FBR)
- Land Mobile Station (ML)

RF Output Power:

250 mW (23.98 dBm)

50 mW/MHz (16.99 dBm/MHz)

EIRP: 4.99 W (36.98 dBm)

## Low Power WAS (Non-Licensed)

Non-  
Licensed

Test

Certification

- Land Mobile Station (ML)

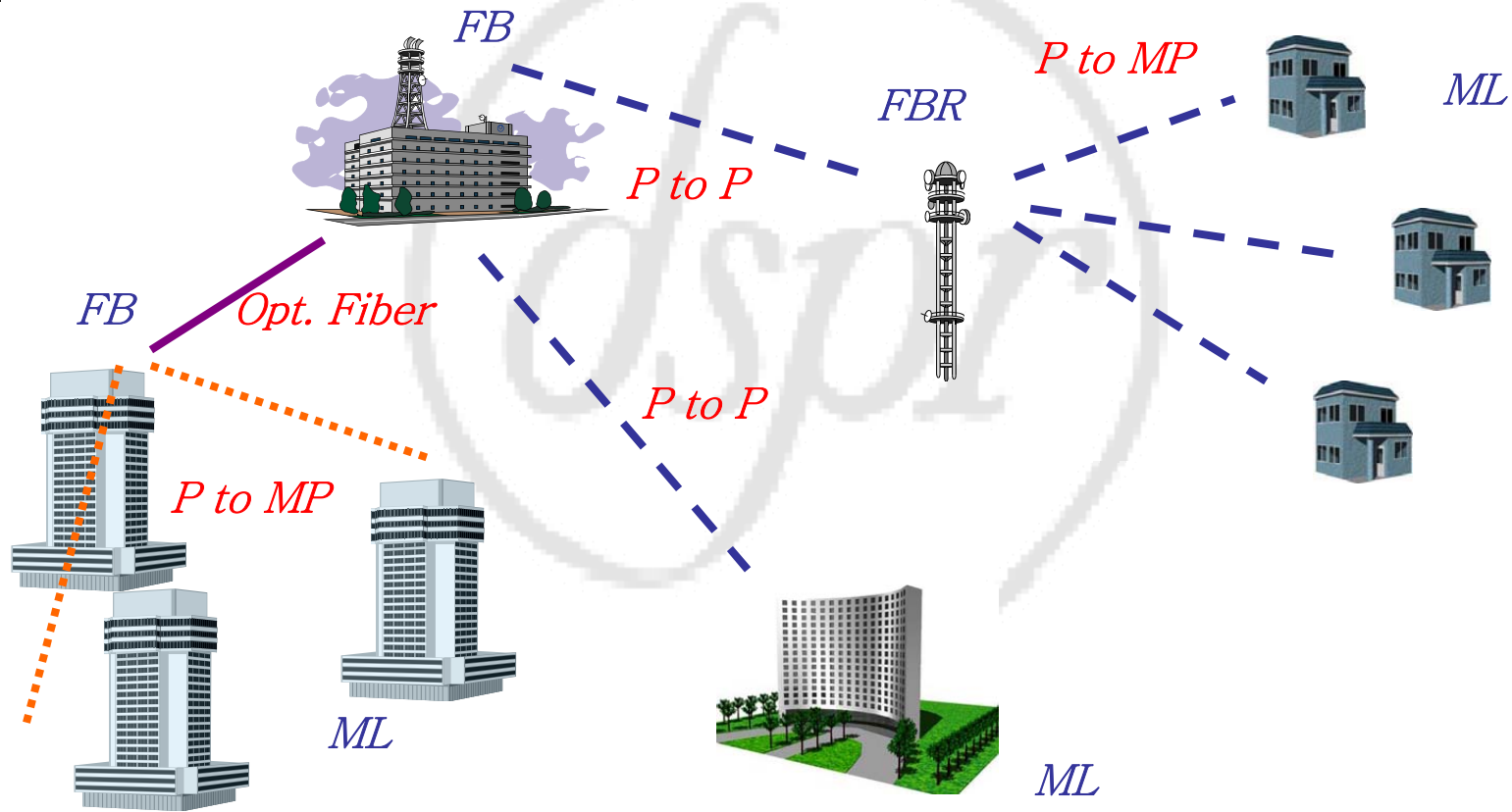
RF Output Power:

10 mW/MHz (10 dBm/MHz)

EIRP: 10 mW/MHz (10 dBm/MHz) ~  
100 mW/MHz (20 dBm/MHz) \*

\* Depends on Half Power Beam Width of using Antenna

# Sample Model of WAS Network



# Certification Category

Article #	5GHz Band Wireless Access System for ...	Stn. Cat.	Cert. Symbol	Out-Band Leakage Power Limit *
2-1-19-5	Base Station	FB	ZW	$\leq 2 \mu\text{W}/\text{MHz}$
2-1-19-6			AV	$\leq 0.2 \mu\text{W}/\text{MHz}$
2-1-19-7	Land Mobile Relay Station	FBR	BV	$\leq 2 \mu\text{W}/\text{MHz}$
2-1-19-8			CV	$\leq 0.2 \mu\text{W}/\text{MHz}$
2-1-19-9	Land Mobile Station	ML	DV	$\leq 2 \mu\text{W}/\text{MHz}$
2-1-19-10			EV	$\leq 0.2 \mu\text{W}/\text{MHz}$
2-1-19-11	Land Mobile Station (Output Power under 10 mW)	ML	FV	$\leq 0.2 \mu\text{W}/\text{MHz}$

\* Refer to Page 19

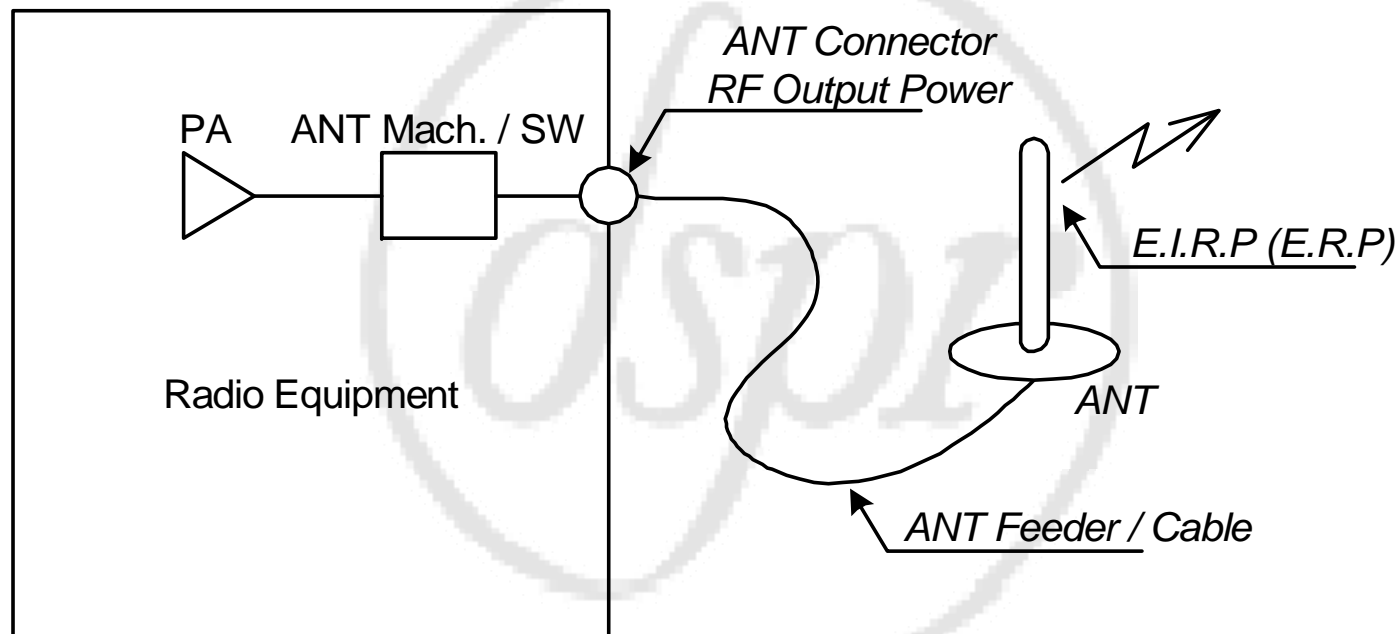


# Frequency Allocation of WAS

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- 40 MHz Band-width System
    - 4930, 4970 MHz
  - 20 MHz Band-width System
    - 4920, 4940, 4960, 4980 MHz <4900 – 5000MHz>
    - 5040, 5060, 5080 MHz (until Nov. 30 2012) <5030 – 5091MHz>
  - 10 MHz Band-width System
    - 4915, 4920, 4925, 4935, 4940, 4945 MHz <4900 – 4950MHz>
    - 5035, 5040, 5045, 5055 MHz (until Nov. 30 2012) <5030 – 5060MHz>
  - 5 MHz Band-width System
    - 4912.5, 4917.5, 4922.5, 4927.5, 4932.5, 4937.5, 4942.5, 4947.5 MHz <4900 – 4950MHz>
    - 5032.5, 5037.5, 5042.5, 5047.5, 5052.5, 5057.5 MHz (until Nov. 30 2012) <5030 – 5060MHz>
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# RF Output Power & E.I.R.P



E.I.R.P: Effective (Equivalent) Isotropic Radiated Power

E.R.P: Effective Radiated Power

# EIRP Limitation for Directional Antenna -1

- Low Power WAS

- EIRP limitation: 10 to 100 mW/MHz depends on HPBW of directional antenna

$$\text{HPBW} \leq 360/A \text{ (deg)}$$

$$A = 10^{((\text{EIRP}(\text{dBm/MHz}) - 10(\text{dBm/MHz}))/10)}$$

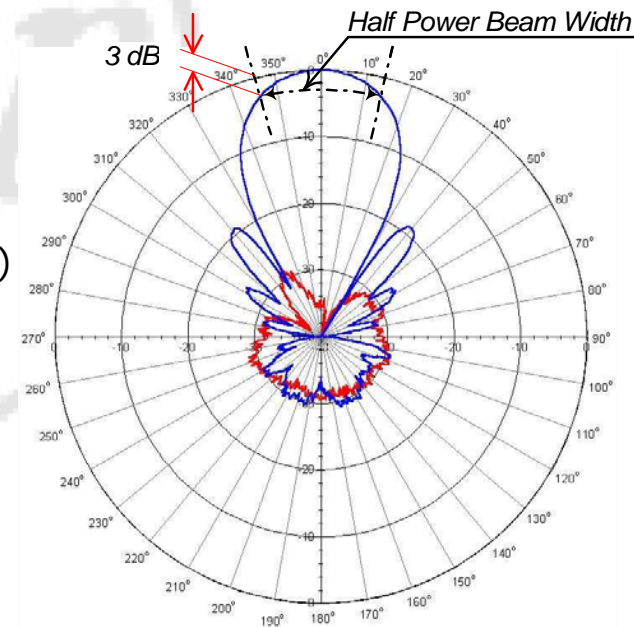
e.g.

RF Power: 5mW/MHz (7 dBm/MHz)

Antenna gain: 9 dBi

HPBW: 60 deg (Hor) 45 deg (Ver)

EIRP: 16 dBm/MHz, A=4, → 90 deg





## EIRP Limitation for Directional Antenna -2

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- High Power WAS
  - EIRP limitation: 4.99 W (36.98 dBm)
  - HPBW: between 72.14 and 360 (deg) depends on Actual EIRP

$$\text{HPBW} \leq 360 / (A/4) \text{ (deg)}$$

$$A = 10^{((\text{EIRP}(\text{dBm}) - 23.98(\text{dBm})) / 10)} \quad * \text{ Min. value is "4"}$$

e.g.

RF Power: 250mW (23.98 dBm)

Antenna gain: 13 dBi

EIRP: 36.98 dBm,  $A = 19.95$ ,  $\rightarrow (A/4) = 4.99 \rightarrow 72.14 \text{ (deg)}$

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Communication Method:	One-way, Simplex, Broadcast ..... Semi-duplex, Duplex (ONLY Time Deviation Duplex Method)		
Modulation Method:	OFDM (for 40MHz system ) ..... OFDM or DSSS, Amplitude, Phase, Frequency, and/or Pulse Modulation (only digital)		
Frequency Tolerance:	$\leq 20$ ppm		YES
Occupied Band Width:	$19.7 \text{ MHz} < \text{OBW} \leq 38 \text{ MHz}$ for 40 MHz System ..... $9 \text{ MHz} < \text{OBW} \leq 19.7 \text{ MHz}$ for 20 MHz System ..... $4.5 \text{ MHz} < \text{OBW} \leq 9 \text{ MHz}$ for 10 MHz System ..... $\text{OBW} \leq 4.5 \text{ MHz}$ for 5 MHz System		YES
Spreading Factor:	$\geq 5$ for SS method only		
Output Power:	$\leq 250 \text{ mW} \ \& \ \leq 50 \text{ mW/MHz}$ $\leq 250 \text{ mW} \ \& \ \leq 25 \text{ mW/MHz}$ for 40MHz system	$\leq 10 \text{ mW/MHz}$ for OFDM & DSSS $\leq 10 \text{ mW}$ for narrow modulations	YES
EIRP & Antenna HPBW:	$\leq 36.98 \text{ dBm}$ ..... $\text{HPBW} = 360 / (A / 4)$	$\leq 10 \text{ dBm/MHz} \sim 20 \text{ dBm/MHz}$ ..... $\text{HPBW} = 360 / A$	YES
Output Power Tolerance:	+20%, -80%		YES

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Spurious Emission Strength: <b>(EIRP)</b>	<b>40 MHz Bandwidth System:</b> <b>In case of operated frequency band "4900 – 5000 MHz"</b>		YES
	$\leq 2 \mu\text{W}/\text{MHz}$ 4840 MHz > f		
	$\leq 2.5 \mu\text{W}/\text{MHz}$ 5060 < f $\leq$ 5270 MHz		
	$\leq 0.2 \mu\text{W}$ 5270 < f $\leq$ 5342 MHz		
	$\leq 1 \mu\text{W}$ 5342 MHz < f		

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Spurious Emission Strength: <b>(EIRP)</b>	<b>20 MHz Bandwidth System:</b>		YES
	<b><i>In case of operated frequency band "4900 – 5000 MHz" for except OFDM</i></b>		
	$\leq 2 \mu\text{W/MHz}$	4870 MHz > f	
	$\leq 2.5 \mu\text{W/MHz}$	4870 $\leq$ f < 4880 MHz, 5020 < f $\leq$ 5270 MHz	
	<b><math>\leq 0.2 \mu\text{W}</math></b>	5270 < f $\leq$ 5342 MHz	
	<b><math>\leq 1 \mu\text{W}</math></b>	5342 MHz < f	
	<b><i>In case of operated frequency band "5030 – 5091 MHz"</i></b>		
	$\leq 2 \mu\text{W/MHz}$	4990 MHz > f	
	$\leq 2.5 \mu\text{W/MHz}$	4990 $\leq$ f < 5000 MHz, 5120 < f $\leq$ 5270 MHz	
	<b><math>\leq 0.2 \mu\text{W}</math></b>	5270 < f $\leq$ 5342 MHz	
<b><math>\leq 1 \mu\text{W}</math></b>	5342 MHz < f		

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Spurious Emission Strength: <b>(EIRP)</b>	<b>20 MHz Bandwidth System:</b> <b>In case of operated frequency band "4900 – 5000 MHz" for OFDM</b>		YES
	$\leq 2 \mu\text{W}/\text{MHz}$ 4870 MHz > f		
	$\leq 2.5 \mu\text{W}/\text{MHz}$ 4870 $\leq$ f < 4875 MHz, 5025 < f $\leq$ 5270 MHz		
	$\leq 0.2 \mu\text{W}$ 5270 < f $\leq$ 5342 MHz		
	$\leq 1 \mu\text{W}$ 5342 MHz < f		
	<b>In case of operated frequency band "5030 – 5091 MHz"</b>		
	$\leq 2 \mu\text{W}/\text{MHz}$ 4990 MHz > f		
	$\leq 2.5 \mu\text{W}/\text{MHz}$ 4990 $\leq$ f < 4995 MHz, 5125 < f $\leq$ 5270 MHz		
	$\leq 0.2 \mu\text{W}$ 5270 < f $\leq$ 5342 MHz		
	$\leq 1 \mu\text{W}$ 5342 MHz < f		

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Spurious Emission Strength: <b>(EIRP)</b>	<b>10 MHz Bandwidth System:</b>		YES
	<b>In case of operated frequency band "4900 – 4950 MHz"</b>		
	$\leq 2 \mu\text{W}/\text{MHz}$	4870 MHz > f	
	$\leq 2.5 \mu\text{W}/\text{MHz}$	4870 $\leq$ f < 4895 MHz, 4965 < f $\leq$ 5270 MHz	
	$\leq 0.2 \mu\text{W}$	5270 < f $\leq$ 5342 MHz	
	$\leq 1 \mu\text{W}$	5342 MHz < f	
	<b>In case of operated frequency band "5030 – 5060 MHz"</b>		
	$\leq 2 \mu\text{W}/\text{MHz}$	4990 MHz > f	
	$\leq 2.5 \mu\text{W}/\text{MHz}$	4990 $\leq$ f < 5015 MHz, 5075 < f $\leq$ 5270 MHz	
	$\leq 0.2 \mu\text{W}$	5270 < f $\leq$ 5342 MHz	
$\leq 1 \mu\text{W}$	5342 MHz < f		

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Spurious Emission Strength: <b>(EIRP)</b>	<b>5 MHz Bandwidth System:</b>		YES
	<b><i>In case of operated frequency band "4900 – 4950 MHz"</i></b>		
	$\leq 2 \mu\text{W}/\text{MHz}$	4870 MHz > f	
	$\leq 2.5 \mu\text{W}/\text{MHz}$	4870 $\leq$ f < 4902.5 MHz, 4957.5 < f $\leq$ 5270 MHz	
	$\leq 0.2 \mu\text{W}$	5270 < f $\leq$ 5342 MHz	
	$\leq 1 \mu\text{W}$	5342 MHz < f	
	<b><i>In case of operated frequency band "5030 – 5060 MHz"</i></b>		
	$\leq 2 \mu\text{W}/\text{MHz}$	4990 MHz > f	
	$\leq 2.5 \mu\text{W}/\text{MHz}$	4990 $\leq$ f < 5022.5 MHz, 5067.5 < f $\leq$ 5270 MHz	
	$\leq 0.2 \mu\text{W}$	5270 < f $\leq$ 5342 MHz	
$\leq 1 \mu\text{W}$	5342 MHz < f		

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.	
Adjacent Channel Emitted Power	<b>40 MHz Bandwidth System: (fs=40)</b>		YES	
	$\leq 0.25 \text{ mW}$	$f \pm 40 \text{ MHz (38 MHz)} \pm 0.45fs$		(fs
	$\leq 8 \mu\text{W}$	$f \pm 80 \text{ MHz (38 MHz)}$		(2fs $\pm 0.45fs$ )
	<b>20 MHz Bandwidth System: (fs=20)</b>			
	$\leq 0.5 \text{ mW}$	$f \pm 20 \text{ MHz (18 MHz)} \pm 0.45fs$		(fs
	$\leq 16 \mu\text{W}$	$f \pm 40 \text{ MHz (18 MHz)}$		(2fs $\pm 0.45fs$ )
	<b>10 MHz Bandwidth System: (fs=10)</b>			
	$\leq 0.25 \text{ mW}$	$f \pm 10 \text{ MHz (9 MHz)} \pm 0.45fs$		(fs
	$\leq 8 \mu\text{W}$	$f \pm 20 \text{ MHz (9 MHz)}$		(2fs $\pm 0.45fs$ )
	<b>10 MHz Bandwidth System: (fs=5)</b>			
	$\leq 0.125 \text{ mW}$	$f \pm 5 \text{ MHz (4.5 MHz)} \pm 0.45fs$		(fs
	$\leq 4 \mu\text{W}$	$f \pm 10 \text{ MHz (4.5 MHz)}$		(2fs $\pm 0.45fs$ )

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Out-band Leakage Power (1) <b>(EIRP)</b>	<b>40 MHz Bandwidth System:</b>	N.A.	YES
	<b><i>In case of operated frequency band "4900 – 5000 MHz"</i></b>		
	$\leq 2 \mu\text{W}/\text{MHz}$ $4840 \leq f < 4870 \text{ MHz}$		
	$\leq 2.5\mu\text{W}/\text{MHz}$ $4870 < f \leq 4880 \text{ MHz}$		
	$\leq 15 \mu\text{W}/\text{MHz}$ $4880 < f \leq 4900 \text{ MHz}$ $5000 \leq f < 5020 \text{ MHz}$		
	$\leq 2.5\mu\text{W}/\text{MHz}$ $5020 \leq f \leq 5060 \text{ MHz}$		
	<b>20 MHz Bandwidth System: (except OFDM)</b>		
	<b><i>In case of operated frequency band "4900 – 5000 MHz"</i></b>		
	$\leq 15 \mu\text{W}/\text{MHz}$ $4880 \leq f \leq 4900 \text{ MHz}$ $5000 \leq f \leq 5020 \text{ MHz}$		
	<b><i>In case of operated frequency band "5030 – 5091 MHz"</i></b>		
	$\leq 30 \mu\text{W}/\text{MHz}$ $5000 \leq f \leq 5020 \text{ MHz}$		
	$\leq 1\text{mW}/\text{MHz}$ $5020 < f \leq 5030 \text{ MHz}$		
$\leq 0.5 \text{ mW}/\text{MHz}$ $5091 \leq f < 5100 \text{ MHz}$			
$\leq 15 \mu\text{W}/\text{MHz}$ $5100 \leq f \leq 5120 \text{ MHz}$			

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Out-band Leakage Power: <b>(EIRP)</b>	<b>20 MHz Bandwidth System: (OFDM)</b>	N.A.	YES
	<b><i>In case of operated frequency band "4900 – 5000 MHz"</i></b>		
	$\leq 2.5\mu\text{W}/\text{MHz}$ $4875 \leq f \leq 4880 \text{ MHz}$		
	$\leq 15 \mu\text{W}/\text{MHz}$ $4880 < f \leq 4900 \text{ MHz}$ $5000 \leq f < 5020 \text{ MHz}$		
	$\leq 2.5\mu\text{W}/\text{MHz}$ $5020 \leq f \leq 5025 \text{ MHz}$		
	<b><i>In case of operated frequency band "5030 – 5091 MHz"</i></b>		
	$\leq 2.5 \mu\text{W}/\text{MHz}$ $4995 \leq f \leq 5000 \text{ MHz}$		
	$\leq 30 \mu\text{W}/\text{MHz}$ $5000 < f \leq 5020 \text{ MHz}$		
	$\leq 1 \text{ mW}/\text{MHz}$ $5020 < f \leq 5030 \text{ MHz}$		
	$\leq 0.5 \text{ mW}/\text{MHz}$ $5091 \leq f < 5100 \text{ MHz}$		
$\leq 15 \mu\text{W}/\text{MHz}$ $5100 \leq f < 5120 \text{ MHz}$			
$\leq 2.5 \mu\text{W}/\text{MHz}$ $5120 \leq f \leq 5125 \text{ MHz}$			

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Out-band Leakage Power: <b>(EIRP)</b>	<b>10 MHz Bandwidth System:</b>	N.A.	YES
	<b><i>In case of operated frequency band "4900 – 4950 MHz"</i></b>		
	$\leq 15 \mu\text{W}/\text{MHz}$ $4895 \leq f < 4905 \text{ MHz}$ $4955 < f \leq 4965 \text{ MHz}$		
	<b><i>In case of operated frequency band "5030 – 5060 MHz"</i></b>		
	$\leq 30 \mu\text{W}/\text{MHz}$ $5015 \leq f < 5025 \text{ MHz}$		
	$\leq 1 \text{ mW}/\text{MHz}$ $5025 \leq f < 5030 \text{ MHz}$		
	$\leq 15 \mu\text{W}/\text{MHz}$ $5065 < f \leq 5075 \text{ MHz}$		
	<b>5 MHz Bandwidth System:</b>		
	<b><i>In case of operated frequency band "4900 – 4950 MHz"</i></b>		
	$\leq 15 \mu\text{W}/\text{MHz}$ $4902.5 \leq f < 4907.5 \text{ MHz}$ $4952.5 < f \leq 4957.5 \text{ MHz}$		
	<b><i>In case of operated frequency band "5030 – 5060 MHz"</i></b>		
	$\leq 30 \mu\text{W}/\text{MHz}$ $5022.5 \leq f < 5027.5 \text{ MHz}$		
$\leq 1 \text{ mW}/\text{MHz}$ $5027.5 \leq f < 5030 \text{ MHz}$			
$\leq 15 \mu\text{W}/\text{MHz}$ $5062.5 < f \leq 5067.5 \text{ MHz}$			

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.	
Out-band Leakage power (2) <b>(EIRP)</b>	<b><i>In case of operated frequency band “4900 – 5000 MHz”</i></b>		YES	
	$\leq 2 \mu\text{W}/20\text{MHz}$ , or $\leq 0.2 \mu\text{W}/20\text{MHz}$	4840 MHz $\pm$ 10 MHz 4860 MHz $\pm$ 10 MHz		$\leq 0.2 \mu\text{W}/20\text{MHz}$ 4840 MHz $\pm$ 10 MHz 4860 MHz $\pm$ 10 MHz
	<b><i>In case of operated frequency band “5030 – 5091 MHz”</i></b>			
	$\leq 2 \mu\text{W}/20\text{MHz}$ , or $\leq 0.2 \mu\text{W}/20\text{MHz}$	4960 MHz $\pm$ 10 MHz 4980 MHz $\pm$ 10 MHz		$\leq 0.2 \mu\text{W}/20\text{MHz}$ 4960 MHz $\pm$ 10 MHz 4980 MHz $\pm$ 10 MHz
Carrier Sensing Function (1)	<p>The equipment shall stop transmitting if the sensing level is exceeding E</p> $E \text{ (mV/m)} = 100 \sqrt{\frac{1}{G}} \times \sqrt{\frac{0.16}{\left(\text{Pt} \times \frac{20}{n}\right)}}$ <p>G: Absolute Antenna Gain Pt: RF Output Power n = 40 (40MHz System), 20 (20MHz System), 10 (10MHz System), 5 (5MHz System)</p>		YES	
Carrier Sensing Function (2)	<p>The equipment must be transmitting after a carrier sensing. However, this function is not required if TX &amp; RX of the equipment are controlled by another equipment, or in the case of the equipment is re-emitting within 4 msec. after carrier sensing.</p>		YES	

# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Data Transmission Speed	<b>40 MHz Bandwidth System:</b> <b>In case of using frequency channel "4930 MHz"</b>		
	equipment capacity: $\geq 20$ Mbits/sec		
	<b>In case of using frequency channel "4970 MHz"</b>		
	equipment capacity: $\geq 40$ Mbits/sec		
	<b>20 MHz Bandwidth System:</b> <b>In case of using frequency channel "4920, 4940, 5040 MHz"</b>		
	equipment capacity: $\geq 10$ Mbits/sec		
	<b>In case of using frequency channel "4960, 4980, 5060, 5080 MHz"</b>		
equipment capacity: $\geq 20$ Mbits/sec			
<b>10 MHz Bandwidth System:</b>			
equipment capacity: $\geq 10$ Mbits/sec			
<b>5 MHz Bandwidth System:</b>			
equipment capacity: $\geq 5$ Mbits/sec			

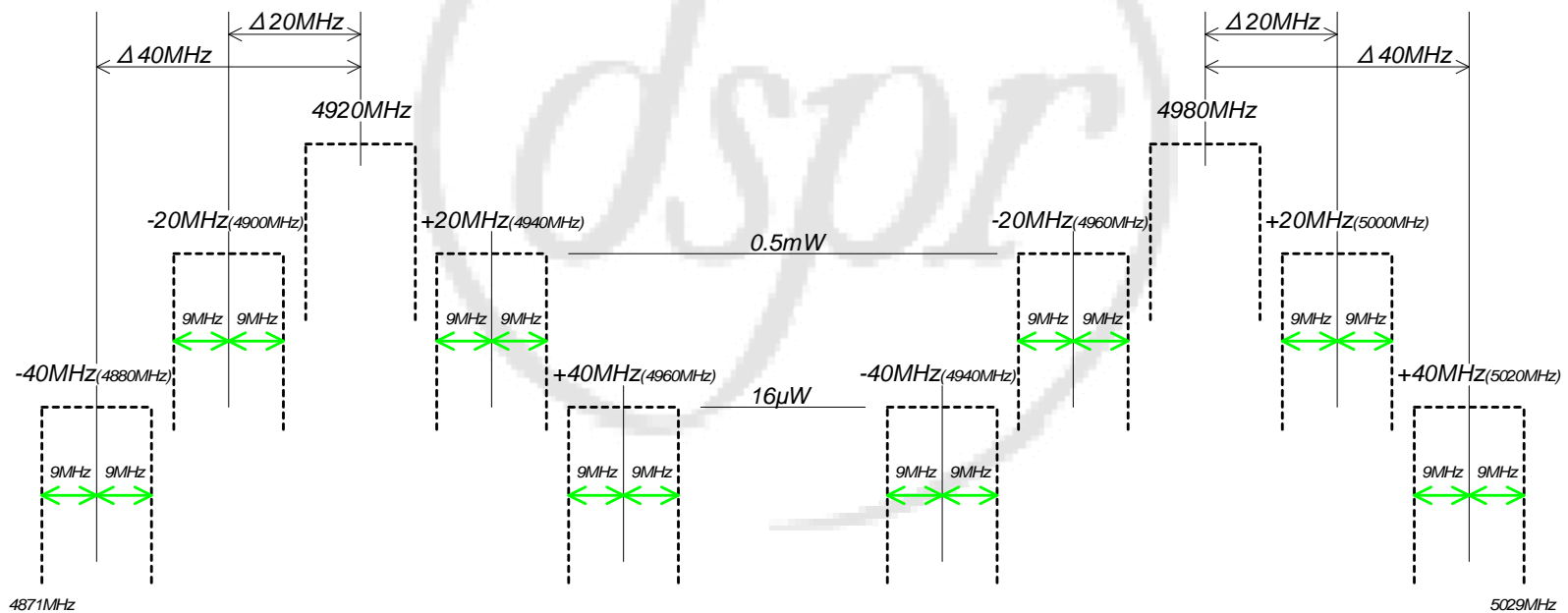
# WAS Tech. Requirement

Item of Technical Requirement	High Power WAS	Low Power WAS	Test Req.
Total Power of All channels:	$\leq 250$ mW		
	Sum power among 4920 $\pm$ 10 MHz, 4940 $\pm$ 10 MHz, 4960 $\pm$ 10 MHz, 4980 $\pm$ 10 MHz, 5040 $\pm$ 10 MHz, 5060 $\pm$ 10 MHz, and 5080 $\pm$ 10 MHz  4930 $\pm$ 20 MHz, 4970 $\pm$ 20 MHz		
Transmission Burst Length:	$\leq 4$ msec.		YES
Number of Carriers	Over 1 carrier at 1 MHz bandwidth for only OFDM method		
For Land Mobile Station:	<b><i>Frequency Channels selected by Base Station</i></b>		
Enclosure Requirement:	N.A.	Could NOT be opened easily both RF & Modulation section of the equipment by end-user	
Function of Interference Prevention:	The equipment should have a function of transmitting and receiving ID code automatically		
ID Code Length:	In case of PSTN connection: 19 bits or over		

# Definition of Adjacent Channel Emitted Power

Adjacent Channel Emitted Power:

e.g. 20MHz System @ Lower band



# ARIB Standard

Regulation	IEEE	ARIB Std.	
2.4 GHz Wide-Band Data Comm.	802.11b/g	ARIB STD-T66	
2.4 GHz Band Data Comm.	802.11b	RCR STD-33	
5 GHz Band Data Comm.	802.11a	ARIB STD-T71	CSMA
Semi-milli. Band Data Comm.	???	ARIB STD-T83	HiSWANb
<b>5 GHz Wireless Access</b>	<b>802.11a/j</b>	<b>ARIB STD-T70</b>	<b>HiSWANa</b>

ARIB: Association of Radio Industries and Businesses

HiSWAN: High Speed Wireless Access Network



DSP Research Inc.

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