



# Radio Resource Management Commands

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## ap dot11 rrm

To configure basic and advanced radio resource management settings for 802.11 devices, use the **ap dot11 rrm** command.

```
ap dot11 {24ghz|5ghz} rrm {ccx location-measurement sec | channel {cleanair-event | dca | device
| foreign | load | noise | outdoor-ap-dca} | coverage {data fail-percentage pct | data packet-count
count | data rssi-threshold threshold} | exception global percentage | level global number | voice
{fail-percentage percentage | packet-count number | rssi-threshold threshold}}
```

Syntax Description		
<b>ccx</b>		Configures Advanced (RRM) 802.11 CCX options.
<b>location-measurement</b>		Specifies 802.11 CCX Client Location Measurements in seconds. The range is between 10 and 32400 seconds.

<b>channel</b>	Configure advanced 802.11-channel assignment parameters.
<b>cleanair-event</b>	Configures cleanair event-driven RRM parameters.
<b>dca</b>	Configures 802.11-dynamic channel assignment algorithm parameters.
<b>device</b>	Configures persistent non-WiFi device avoidance in the 802.11-channel assignment.
<b>foreign</b>	Enables foreign AP 802.11-interference avoidance in the channel assignment.
<b>load</b>	Enables Cisco AP 802.11-load avoidance in the channel assignment.
<b>noise</b>	Enables non-802.11-noise avoidance in the channel assignment.
<b>outdoor-ap-dca</b>	Configures 802.11 DCA list option for outdoor AP.
<b>coverage</b>	Configures 802.11 coverage Hole-Detection.
<b>data fail-percentage</b> <i>pct</i>	Configures 802.11 coverage failure-rate threshold for uplink data packets. The range is between 1 and 100
<b>data packet-count</b> <i>count</i>	Configures 802.11 coverage minimum-failure-count threshold for uplinkdata packets.
<b>data rssi-threshold</b> <i>threshold</i>	Configures 802.11 minimum-receive-coverage level for voice packets.
<b>exception global</b> <i>percentage</i>	Configures 802.11 Cisco APs coverage-exception level. The range is between 0 and 100 percent.
<b>level global</b> <i>number</i>	Configures 802.11 Cisco AP client-minimum-exception level between 1 and 75 clients.

<b>voice</b>	Configures 802.11 coverage Hole-Detection for voice packets.
<b>fail-percentage</b> <i>percentage</i>	Configures 802.11 coverage failure rate threshold for uplink voice packets.
<b>packet-count</b> <i>number</i>	Configures 802.11 coverage minimum-uplink-failure count threshold for voice packets.
<b>rss-threshold</b> <i>threshold</i>	Configures 802.11 minimum receive coverage level for voice packets.

**Command Default**

Disabled

**Command Modes**

Interface configuration

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines**

This command applies for both 802.11a and 802.11b bands. But the appropriate commands must be chosen for configuring the parameter.

This example shows how to configure various RRM settings.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm ?
  ccx          Configure Advanced(RRM) 802.11a CCX options
  channel      Configure advanced 802.11a channel assignment parameters
  coverage     802.11a Coverage Hole Detection
  group-member Configure members in 802.11a static RF group
  group-mode   802.11a RF group selection mode
  logging      802.11a event logging
  monitor      802.11a statistics monitoring
  ndp-type     Neighbor discovery type Protected/Transparent
  profile      802.11a performance profile
  tpc-threshold Configures the Tx Power Control Threshold used by RRM for auto
              power assignment
  txpower      Configures the 802.11a Tx Power Level
```

## ap dot11 rrm ccx

To configure radio resource management CCX options for 2.4 GHz and 5GHz devices, use the **ap dot11 rrm ccx** command.

```
ap dot11 {24ghz | 5ghz} rrm ccx location-measurement interval
```

<b>Syntax Description</b>	<b>location-measurement</b> <i>interval</i> Specifies the CCX client-location measurement interval value. The range is between 10 and 32400 seconds.
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<b>Command Default</b>	None.
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<b>Command Modes</b>	Interface configuration.
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<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

<b>Usage Guidelines</b>	None.
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This example shows how to set CCX location-measurement interval for a 5-GHz device.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm ccx location-measurement 10
```

## ap dot11 rrm channel

To enable radio resource management channel for 2.4 GHz and 5GHz devices, use the **ap dot11 rrm channel** command. To disable the radio resource management for 2.4 GHz and 5 GHz devices, use the **no** form of the command.

```
ap dot11 {24ghz | 5ghz} rrm channel {cleanair-event | dca | device | foreign | load | noise}
no ap dot11 {24ghz | 5ghz} rrm channel {cleanair-event | dca | device | foreign | load | noise}
```

<b>Syntax Description</b>	<b>cleanair-event</b>	Specifies the cleanair event-driven RRM parameters
	<b>dca</b>	Specifies the 802.11 dynamic channel assignment algorithm parameters
	<b>device</b>	Specifies the persistent non-WiFi device avoidance in the 802.11-channel assignment.
	<b>foreign</b>	Enables foreign AP 802.11-interference avoidance in the channel assignment.
	<b>load</b>	Enables Cisco AP 802.11-load avoidance in the channel assignment.
	<b>noise</b>	Enables non-802.11-noise avoidance in the channel assignment.

<b>Command Default</b>	None.
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<b>Command Modes</b>	Interface configuration.
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Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** None.

This example shows all the parameters available for **Channel**.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 24ghz rrm channel ?
  cleanair-event  Configure cleanair event-driven RRM parameters
  dca             Config 802.11b dynamic channel assignment algorithm
                 parameters
  device         Configure persistent non-WiFi device avoidance in the 802.11b
                 channel assignment
  foreign        Configure foreign AP 802.11b interference avoidance in the
                 channel assignment
  load           Configure Cisco AP 802.11b load avoidance in the channel
                 assignment
  noise          Configure 802.11b noise avoidance in the channel assignment
```

## ap dot11 24ghz rrm channel cleanair-event rogue-contribution

To configure cleanair event driven Radio Resource Management (RRM) rogue contribution parameters, use the **ap dot11 24ghz rrm channel cleanair-event rogue-contribution** command.

**ap dot11 24ghz rrm channel cleanair-event rogue-contribution duty-cycle** *threshold-value*

Syntax Description	duty-cycle	Sets event-driven RRM rogue contribution duty cycle.
	<i>threshold-value</i>	Custom ED-RRM rogue contribution duty cycle threshold value. Valid value ranges from 1 -99 percent.

**Command Default** The rogue contribution duty cycle is not set.

Command History	Release	Modification
	16.1	This command was introduced.

**Usage Guidelines** This command sets event-driven RRM rogue contribution duty cycle.

### Example

This example shows how to configure cleanair event driven RRM rogue contribution parameters:

```
Cisco Controller(config)# ap dot11 24ghz rrm channel cleanair-event rogue-contribution
duty-cycle 1
```

## ap dot11 24ghz or 5ghz rrm channel dca add

To add non-default radio resource management DCA channels to the DCA channel list for 2.4 GHz or 5 GHz devices, use the **ap dot11 {24ghz | 5ghz} rrm channel dca add** command. To remove a default channel from the DCA list, use the **no** form of the command. The DCA channel list contains standard channels matching your country of operation. For example, a regulatory default channel list contains channels 1, 6, and 11.

```
ap dot11 [{24ghz|5ghz}] rrm channel dca add number
no ap dot11 [{24ghz|5ghz}] rrm channel dca add number
```

<b>Syntax Description</b>	<i>number</i>	DCA channel number.
<b>Command Default</b>	None.	
<b>Command Modes</b>	Global configuration	
<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.3SE	This command was introduced.
<b>Usage Guidelines</b>	None.	

This example shows how to add a non-default radio resource management DCA channel to the DCA list for a 2.4 GHz device, using the **ap dot11 24ghz rrm channel dca add 10** command:

```
Device(config)# ap dot11 24ghz rrm channel dca add 10
```

## ap dot11 24ghz or 5ghz rrm channel dca remove

To remove a default radio resource management DCA channels from the DCA channel list for 2.4 GHz or 5 GHz devices, use the **ap dot11 {24ghz | 5ghz} rrm channel dca remove *number*** command. To add a default DCA channel back to the DCA channel list, use the **no** form of the command.

```
ap dot11 [{24ghz|5ghz}] rrm channel dca remove number
no ap dot11 [{24ghz|5ghz}] rrm channel dca remove number
```

<b>Syntax Description</b>	<i>number</i>	Specifies the radio resource management DCA channel.
<b>Command Default</b>	None.	
<b>Command Modes</b>	Global configuration.	

Command History	Release	Modification
	Cisco IOS XE 3.3SE	This command was introduced.

**Usage Guidelines** None.

This example shows how to remove default radio resource management DCA channel from the DCA list for a 2.4 GHz device, using the **ap dot11 24ghz rrm channel dca remove** command:

```
Device(config)#ap dot11 24ghz rrm channel dca remove 11
```

## ap dot11 5ghz rrm channel dca chan-width-11n

To configure DCA channel width for all 802.11n radios in the 5-GHz band, enter the **ap dot11 5ghz rrm channel dca chan-width-11n width** command. To disable DCA channel width for all 802.11n radios in the 5-GHz band, use the **no** form of the command.

```
ap dot11 5ghzrrm channel dca chan-width-11n { 20 | 40 }
noap dot11 5ghzrrm channel dca chan-width-11n { 20 | 40 }
```

Syntax Description	chan-width-11n	Specifies DCA channel width for all 802.11n radios in the 5-GHz band.
	20	Sets the channel width for 802.11n radios to 20 MHz.
	40	Sets the channel width for 802.11n radios to 40 MHz.

**Command Default** The default channel width is 20.

**Command Modes** Global configuration.

Command History	Release	Modification
	Cisco IOS XE 3.3SE	This command was introduced.

**Usage Guidelines** None.

This example shows how to set the channel width for the 802.11n radios to 40 MHz, using the **ap dot11 5ghz rrm channel dca chan-width-11n** command:

```
Device(config)#ap dot11 5ghz rrm channel dca chan-width-11n 40
```

## ap dot11 rrm coverage

To enable 802.11 coverage hole detection, use the **ap dot11 rrm coverage** command.

```
ap dot11 {24ghz | 5ghz} rrm coverage [{data {fail-percentage percentage | packet-count count |
rssi-threshold threshold} | exceptional global value | level global value | voice {fail-percentage
percentage | packet-count packet-count | rssi-threshold threshold}]
```

**Syntax Description**

<b>data</b>	Specifies 802.11 coverage hole-detection data packets.
<b>fail-percentage</b> <i>percentage</i>	Specifies 802.11 coverage failure-rate threshold for uplink data packets. The range is between 1 and 100
<b>packet-count</b> <i>count</i>	Specifies 802.11 coverage minimum-failure-count threshold for uplink data packets.
<b>rssi-threshold</b> <i>threshold</i>	Specifies 802.11 minimum-receive-coverage level for voice packets.
<b>exceptional global</b> <i>value</i>	Specifies 802.11 Cisco APs coverage-exception level. The range is between 0 and 100 percent.
<b>level global</b> <i>value</i>	Specifies 802.11 Cisco AP client-minimum-exception level between 1 and 75 clients.
<b>voice</b>	Specifies 802.11 coverage Hole-Detection for voice packets.
<b>fail-percentage</b> <i>percentage</i>	Specifies 802.11 coverage failure rate threshold for uplink voice packets.
<b>packet-count</b> <i>packet-count</i>	Specifies 802.11 coverage minimum-uplink-failure count threshold for voice packets.
<b>rssi-threshold</b> <i>threshold</i>	Specifies 802.11 minimum receive coverage level for voice packets.

**Command Default**

None.

**Command Modes**

Interface configuration.

**Command History**

Release	Modification
Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines**

If you enable coverage hole-detection, the device automatically determines, based on data that is received from the access points, whether any access points have clients that are potentially located in areas with poor coverage.

If both the number and percentage of failed packets exceed the values that you entered in the **ap dot11 {24ghz | 5ghz} rrm coverage packet-count** and **ap dot11 {24ghz | 5ghz} rrm coverage fail-percentage** commands for a 5-second period, the client is considered to be in a pre-alarm condition. The device uses this information to distinguish between real and false coverage holes and excludes clients with poor roaming logic. A coverage hole is detected if both the number and percentage of failed clients meet or exceed the values entered in the **ap dot11 {24ghz | 5ghz} rrm coverage level-global** and **ap dot11 {24ghz | 5ghz} rrm coverage exceptional-global** commands over a 90-second period. The device determines whether the coverage hole can be corrected and, if appropriate, mitigate the coverage hole by increasing the transmit power level for that specific access point.



This example shows how to set the RSSI-threshold for data in 5-GHz band.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm coverage data rssi-threshold -80
```

## ap dot11 rrm group-member

To configure members in 802.11 static RF group, use the **ap dot11 rrm group-member** command. To remove the member, use the **no** form of the command.

```
ap dot11 {24ghz | 5ghz} rrm group-member controller-name controller-ip
no ap dot11 {24ghz | 5ghz} rrm group-member controller-name controller-ip
```

<b>Syntax Description</b>	<i>controller-name</i>	Specifies the name of the controller to be added.
	<i>controller-ip</i>	Specifies the IP address of the controller to be added.

**Command Default** None.

**Command Modes** Interface configuration.

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** None.

This example shows how to add a controller in the 5-GHz automatic-RF group

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm group-member ABC 10.1.1.1
```

## ap dot11 rrm monitor

To monitor the 802.11-band statistics, use the **ap dot11 rrm monitor** command. To disable, use the **no** form of the command.

```
ap dot11 {24ghz | 5ghz} rrm monitor {channel-list | {all | country | dca} | coverage | load | noise | signal}
no ap dot11 {24ghz | 5ghz} rrm monitor {channel-list | coverage | load | noise | signal}
```

<b>Syntax Description</b>	<b>channel-list</b>	Sets the 802.11 noise/interference/rogue monitoring channel-list.
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<b>all</b>	Specifies to monitor all the channels.
<b>country</b>	Specifies to monitor channels used in configured country code
<b>dca</b>	Specifies to monitor channels used by dynamic channel assignment.
<b>coverage</b>	Specifies 802.11 coverage measurement interval. The range is between 60 and 3600 in seconds
<b>load</b>	Specifies 802.11 load measurement interval. The range is between 60 and 3600 in seconds
<b>noise</b>	Specifies 802.11 noise measurement interval (channel scan interval). The range is between 60 and 3600 in seconds
<b>signal</b>	Specifies 802.11 signal measurement interval (neighbor packet frequency). The range is between 60 and 3600 in seconds

**Command Default** None.

**Command Modes** Interface Configuration

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** None.

This example shows how to enable monitoring all the 5-GHz band channels.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm monitor channel-list all
```

## ap dot11 rrm profile

To configure Cisco lightweight access point profile settings on supported 802.11 networks, use the **ap dot11 rrm profile** command.

```
ap dot11 {24ghz | 5ghz} rrm profile {customize | foreign value | noise value | throughput value | utilization value}
```

<b>Syntax Description</b>		
<b>customize</b>	Enables performance profiles.	
<b>foreign value</b>	Specifies the 802.11 foreign 802.11 interference threshold value. The range is between 0 and 100 percent.	
<b>noise value</b>	Specifies the 802.11 foreign noise threshold value. The range is between -127 and 0 dBm	

---

**throughput** *value* Specifies the 802.11a Cisco AP throughput threshold value. The range is between 1000 and 10000000 bytes per second

---

**utilization** *value* Specifies the 802.11a RF utilization threshold value. The range is between 0 and 100 percent

---



---

**Command Default** Disabled.

---

**Command Modes** Interface configuration.

---

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

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**Usage Guidelines** None.

This example shows how to set the threshold value for the noise parameter.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm profile noise -50
```

## ap dot11 rrm tpc-threshold

To configure the tx-power control threshold used by RRM for auto power assignment, use the **ap dot11 rrm tpc-threshold** command. To disable, use the **no** form of the command.

```
ap dot11 {24ghz | 5ghz} rrm tpc-threshold value
no ap dot11 {24ghz | 5ghz} rrm tpc-threshold
```

---

**Syntax Description** *value* Specifies the power value. The range is between -80 and -50.

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---

**Command Default** None.

---

**Command Modes** Interface configuration.

---

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

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**Usage Guidelines** None.

This example shows how to configure the tx-power control threshold used by RRM for auto power assignment.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm tpc-threshold -60
```

## ap dot11 rrm txpower

To configure the 802.11 tx-power level, use the **ap dot11 rrm txpower** command. To disable the 802.11 tx-power level, use the **no** form of the command.

```
ap dot11 {24ghz|5ghz} rrm txpower {auto|max powerLevel|min powerLevel|oncepower-level}
noap dot11 {24ghz|5ghz} rrm txpower {auto|max powerLevel|min powerLevel|oncepower-level}
```

Syntax Description	
<b>auto</b>	Enables auto-RF.
<b>max powerLevel</b>	Configures maximum auto-RF tx power. The range is between -10 to -30.
<b>min powerLevel</b>	Configures minimum auto-RF tx power. The range is between -10 to -30.
<b>once</b>	Enables one-time auto-RF.

**Command Default** None.

**Command Modes** Interface configuration.

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.
	Cisco IOS XE 3.3SE	The <b>no</b> form of the command is introduced.

**Usage Guidelines** None.

This example shows how to enables auto-RF once.

```
Device#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Device(config)#ap dot11 5ghz rrm txpower once
```

## show ap dot11 24ghz

To display the 2.4 GHz RRM parameters, use the **show ap dot11 24ghz** command.

```
show ap dot11 24ghz {ccx|channel|coverage|group|l2roam|logging|monitor|profile|receiver
|summary|txpower}
```

Syntax Description	
<b>ccx</b>	Displays the 802.11b CCX information for all Cisco APs.

<b>channel</b>	Displays the configuration and statistics of the 802.11b channel assignment.
<b>coverage</b>	Displays the configuration and statistics of the 802.11b coverage.
<b>group</b>	Displays the configuration and statistics of the 802.11b grouping.
<b>l2roam</b>	Displays 802.11b l2roam information.
<b>logging</b>	Displays the configuration and statistics of the 802.11b event logging.
<b>monitor</b>	Displays the configuration and statistics of the 802.11b monitoring.
<b>profile</b>	Displays 802.11b profiling information for all Cisco APs.
<b>receiver</b>	Displays the configuration and statistics of the 802.11b receiver.
<b>summary</b>	Displays the configuration and statistics of the 802.11b Cisco APs.
<b>txpower</b>	Displays the configuration and statistics of the 802.11b transmit power control.

**Command Default** None.

**Command Modes** Global configuration.

<b>Command History</b>	<b>Release</b>	<b>Modification</b>
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** None.

This example shows how to display configuration and statistics of the 802.11b coverage.

```
Device#show ap dot11 24ghz coverage

Coverage Hole Detection
 802.11b Coverage Hole Detection Mode           : Enabled
 802.11b Coverage Voice Packet Count           : 100 packet(s)
 802.11b Coverage Voice Packet Percentage       : 50%
 802.11b Coverage Voice RSSI Threshold         : -80 dBm
 802.11b Coverage Data Packet Count           : 50 packet(s)
 802.11b Coverage Data Packet Percentage       : 50%
 802.11b Coverage Data RSSI Threshold         : -80 dBm
 802.11b Global coverage exception level       : 25 %
 802.11b Global client minimum exception level : 3 clients
```

## show ap dot11 5ghz

To display the 5GHz RRM parameters, use the **show ap dot11 5ghz** command.

```
show ap dot11 5ghz {ccx | channel | coverage | group | l2roam | logging | monitor | profile | receiver
| summary | txpower}
```

Syntax Description	ccx	Displays the 802.11a CCX information for all Cisco APs.
	<b>channel</b>	Displays the configuration and statistics of the 802.11a channel assignment.
	<b>coverage</b>	Displays the configuration and statistics of the 802.11a coverage.
	<b>group</b>	Displays the configuration and statistics of the 802.11a grouping.
	<b>l2roam</b>	Displays 802.11a l2roam information.
	<b>logging</b>	Displays the configuration and statistics of the 802.11a event logging.
	<b>monitor</b>	Displays the configuration and statistics of the 802.11a monitoring.
	<b>profile</b>	Displays 802.11a profiling information for all Cisco APs.
	<b>receiver</b>	Displays the configuration and statistics of the 802.11a receiver.
	<b>summary</b>	Displays the configuration and statistics of the 802.11a Cisco APs.
	<b>txpower</b>	Displays the configuration and statistics of the 802.11a transmit power control.

**Command Default** None.

**Command Modes** Global configuration.

Command History	Release	Modification
	Cisco IOS XE 3.2SE	This command was introduced.

**Usage Guidelines** None.

This example shows configuration and statistics of 802.11a channel assignment.

```
Device#show ap dot11 5ghz channel
```

```
Automatic Channel Assignment
Channel Assignment Mode           : AUTO
Channel Update Interval          : 12 Hours
Anchor time (Hour of the day)    : 20
Channel Update Contribution      : SNI..
Channel Assignment Leader        : web (9.9.9.2)
Last Run                          : 16534 seconds ago
DCA Sensitivity Level            : MEDIUM (15 dB)
DCA 802.11n Channel Width       : 40 Mhz
Channel Energy Levels
  Minimum                         : unknown
  Average                         : unknown
  Maximum                         : unknown
Channel Dwell Times
  Minimum                         : unknown
  Average                         : unknown
  Maximum                         : unknown
802.11a 5 GHz Auto-RF Channel List
Allowed Channel List             : 36,40,44,48,52,56,60,64,149,153,1
```

```

                    57,161
Unused Channel List      : 100,104,108,112,116,132,136,140,1

                    65
802.11a 4.9 GHz Auto-RF Channel List
Allowed Channel List    :
Unused Channel List    : 1,2,3,4,5,6,7,8,9,10,11,12,13,14,

                    15,16,17,18,19,20,21,22,23,24,25,26
DCA Outdoor AP option  : Disabled
```

show ap dot11 5ghz