

802.11n and 3G Applications

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About Me

- Jesse Liu, Convergingstream
 - Over 7 years experience using RouterOS
 - Specialization in Wireless, VPN, Traffic control and User management
 - MikroTik MTCNA, MTCWE Certifications (2011)
 - GFI Software LANguard, EventsManager, EndPointSecurity, Network Server Monitor, MailArchiver Certifications (2010)
 - Cisco CCNA, CCDA, CCNP, CCDP Certifications (2001)
 - Novell (1996), Microsoft (1997), Oracle (1997) Certifications

PART 1


- Introduction 11n products
 - RouterBOARD, MIMO Antenna, USB 11n Adapter
- 11n application examples
 - Application examples 1 (Outdoor wireless bridge)
 - Speed test (RB711-5Hn to RB711-5Hn, RB493G to RB493G)
 - Application examples 2 (Indoor wireless access point)
 - Speed test (H3C Dual Band 802.11n USB Adapter)
- New product (RB/SXT)
- AR9380 chipset support

RB493G



Switch

SwitchPortHostVLANRule



Name	Switch	VLAN Mode
cpu	switch1	fallback
ether1	switch1	fallback
ether6	switch1	fallback
ether7	switch1	fallback
ether8	switch1	fallback
ether9	switch1	fallback
ether2	switch2	fallback
ether3	switch2	fallback
ether4	switch2	fallback
ether5	switch2	fallback

10 items

RB493G
AR7161 680MHz
256MB DDR SDRAM
128MB NAND
Nine 10/100/1000 Mbit/s Gigabit Ethernet ports supporting Auto-MDI/X
2x AR8316
Three MiniPCI Type IIIA/IIIB slots
One DB9 RS232C asynchronous serial port
1x USB 2.0 non powered, injector required
Power and User LED
Yes
1x microSD
Power over Ethernet: 10..28V DC (except power over datalines)
Power jack: 10..28V DC
Two DC fan power output headers with rotation sensor and automatic fan switching (maximum output current - 500mA total)
105 mm x 160 mm
160 g
Operational: -20°C to +65°C (-4°F to 149°F)
Operational: up to 70% relative humidity (non-condensing)
~3W without extension cards, maximum - 25W (18W output to extension cards)

RB/GPOE



R52nM and R52Hn



Key Features and Benefits

- Dual band IEEE 802.11a/b/g/n standard
- Output Power of up to **23dBm**
- Support for up to 2x2 MIMO with spatial multiplexing
- Four times the throughput of 802.11a/g
- Atheros AR9220, chipset
- High Performance (up to 300Mbps physical data rates and 200Mbps of actual user throughput) with Low Power Consumption
- Two MMCX antenna connectors
- Modulations:
OFDM: BPSK, QPSK, 16 QAM, 64QAM
DSSS: DBPSK, DQPSK, CCK
- Operating temperatures: -50°C to 60°C
- Power consumption MAX 1.95W
- ESD protection +/- 12kV

802.11b	RX Sensitivity	Composite TX Power
1Mbit	-95	20
11Mbit	-91	21
802.11g		
6Mbit	-95	23
54Mbit	-81	19
802.11n 2.4GHz		
MCS0 20MHz	-95	21
MCS0 40MHz	-90	21
MCS7 20MHz	-78	17
MCS7 40MHz	-75	16

802.11a	RX Sensitivity	Composite TX Power
6Mbit	-95	21
54Mbit	-80	17
802.11n 5GHz		
MCS0 20MHz	-95	21
MCS0 40MHz	-92	19
MCS7 20MHz	-77	16
MCS7 40MHz	-74	13

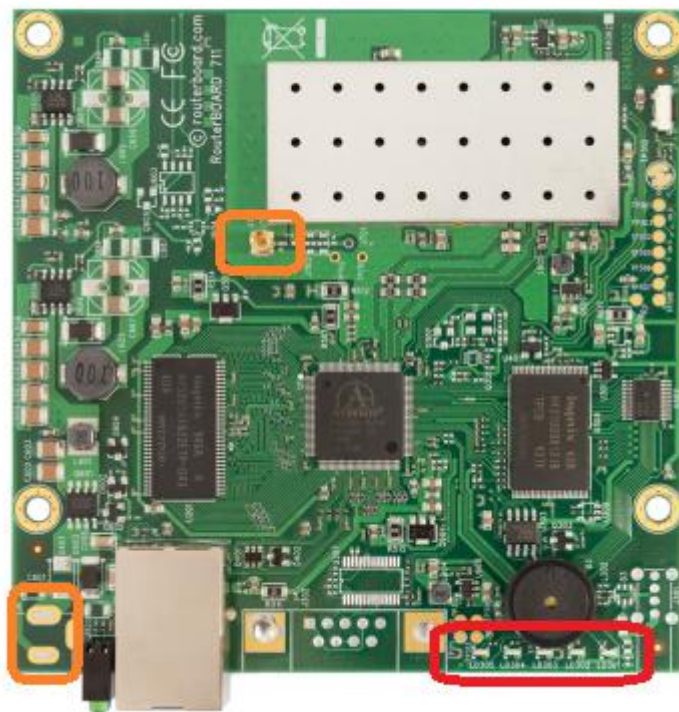


802.11b	RX Sensitivity	TX Power
1Mbit	-93	24
11Mbit	-93	24
802.11g		
6Mbit	-94	25
54Mbit	-81	22
802.11n 2.4GHz		
MCS0 20MHz	-94	25
MCS0 40MHz	-92	24
MCS7 20MHz	-78	21
MCS7 40MHz	-75	20

- Dual band IEEE 802.11a/b/g/n standard
- Output Power of up to **25dBm @ a/g/n Band**
- Support for up to 2x2 MIMO with spatial multiplexing
- Four times the throughput of 802.11a/g
- Atheros AR9220, chipset
- High Performance (up to 300Mbps physical data rates and 200Mbps of actual user throughput) with Low Power Consumption
- 2 X MMCX Antenna Connector (J4 - Chain 0)
- Modulations:
OFDM: BPSK, QPSK, 16 QAM, 64QAM
DSSS: DBPSK, DQPSK, CCK
- Operating temperatures: -50°C to +60°C
- Idle power consumption 0.4W
- Max power consumption 7W
- MiniPCI IIIA+ design (3mm longer than MiniPCI IIIA)
- 1.5mm heatsink, 3mm RF shield thickness
- ±10KV ESD protection on RF ports

802.11a	RX Sensitivity	TX Power
6Mbit	-97	25
54Mbit	-80	21
802.11n 5GHz		
MCS0 20MHz	-97	24
MCS0 40MHz	-92	22
MCS7 20MHz	-77	18
MCS7 40MHz	-74	17

RB711-5Hn-M



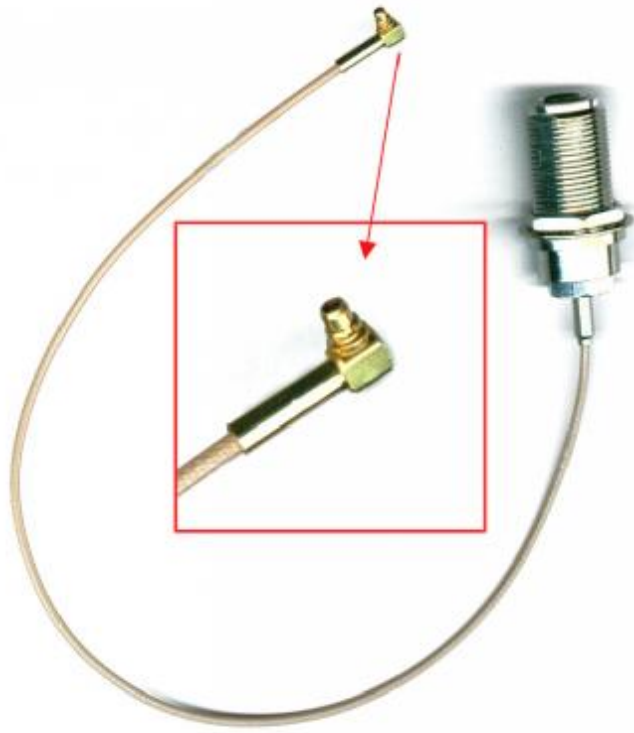
1 LED - on, if wireless client is connected to AP (usually $\geq -89\text{dBm}$)
 2 LEDs - on, if signal strength $\geq -82\text{dBm}$
 3 LEDs - on, if signal strength $\geq -75\text{dBm}$
 4 LEDs - on, if signal strength $\geq -68\text{dBm}$
 5 LEDs - on, if signal strength $\geq -61\text{dBm}$

	RouterBOARD 711
CPU	MIPS24k based, Atheros AR7240 400MHz CPU
Memory	32MB SDRAM onboard memory (64MB on RB711A)
Boot loader	RouterBOOT
Data storage	64MB onboard NAND memory chip
Ethernet	One 10/100 Mbit/s Fast Ethernet port supporting Auto-MDI/X
Wireless	One built-in wireless card AR9280 802.11a/n wireless device
MiniPCI slot	none
Serial port	none
LEDs	Power and User LED, 5 status LEDs
Speaker	Mini PC-Speaker
Power options	Power over Ethernet: 10..28V DC (except power over datalines) Power jack: 10..28V DC (RB711A only)
Dimensions	105mm x 105mm
Weight	82 g (2.9 oz)
Temperature	Operational: -20°C to +65°C (-4°F to 149°F)
Humidity	Operational: up to 70% relative humidity (non-condensing)
Power consumption	280mA (345mA max) at 12V
RouterOS license	Level3 (Level4 on RB711A)

RX sensitivity	802.11a: -92 dBm @ 6Mbps to -76 dBm @ 54 Mbps 802.11n: -92 dBm @ MCS0 to -73 dBm @ MCS7
TX power	802.11a: 23dBm @ 6Mbps to 19dBm @ 54 Mbps 802.11n: 22dBm @ MCS0 to 15dBm @ MCS7

MMCX connector

- MMCX antenna connector provides a secure and sturdy connection to your antenna, and a special screw connection allows you to securely fasten the card in it's place.



MIMO Antenna

- TQJ-2458MIK x 3 2.4G~2.483GHz, 5.15G~5.85GHz-2.5dBi@2.4G, 4dBi@5G
- TQJ-2458MIC x 6 2.4G~2.5GHz, 5.15G~5.85GHz-2.5dBi@2.4G, 4dBi@5G



TQJ-2458MIK×3



TQJ-2458MIC×6

RB411AR

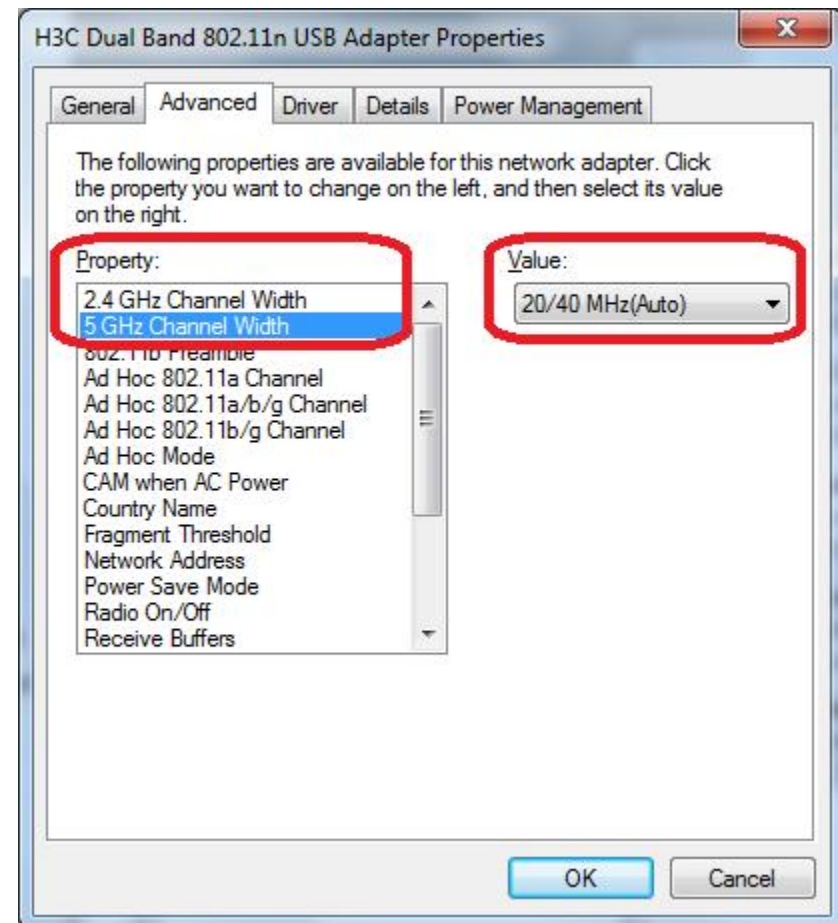
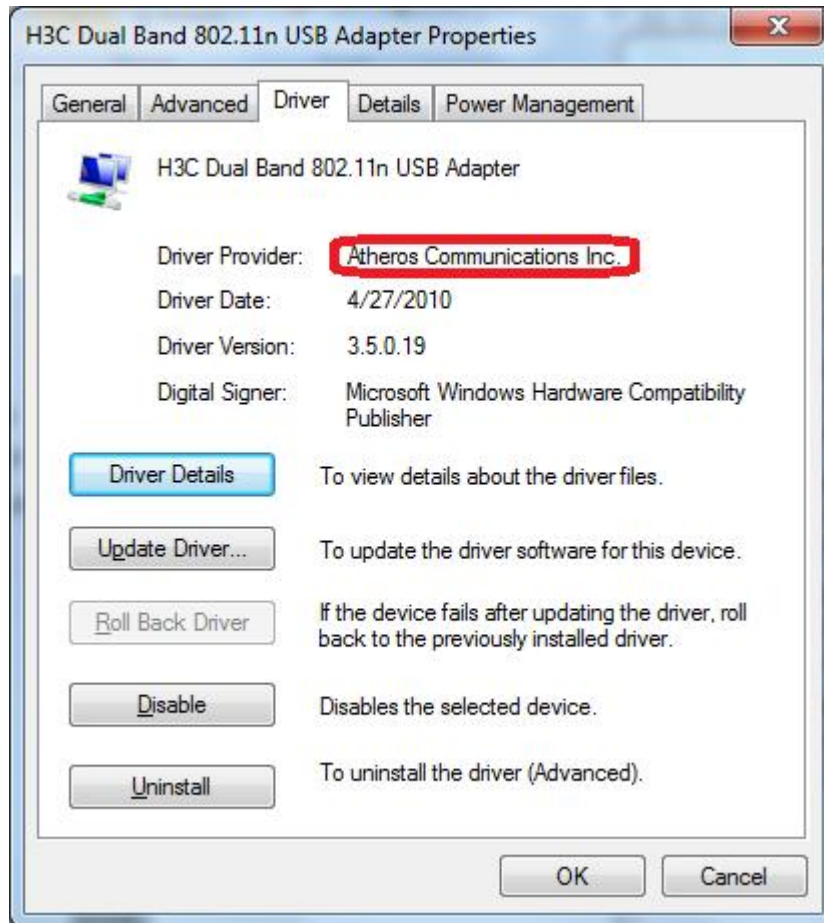


H3C WN612 Dual Band 802.11n USB Adapter



支持主要标准	802.11 局域网协议	802.11, 802.11a, 802.11b, 802.11g, 802.11i WMM, WPA/WPA2, 802.11h, 802.11j 802.11n draft2.0
		802.11a data rates 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11b data rates 1, 2, 5.5, 11Mbps 802.11g data rates 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n (draft) 11n data rates MCS 0 to 15
	速率支持	支持自动速率调整 支持 802.1x 认证 支持 PSK 认证 支持 EAP-TLS、EAP-TTLS、PEAP 支持 WEP-40/WEP-104 加密 支持 TKIP 加密 支持 CCMP 加密
		MIMO 支持帧聚合 支持 20/40MHz 带宽管理, 包括动态 20/40MHz, 静态 20 MHz, 静态 40 MHz 支持 short GI, 包括 400ns, 800ns 和自动选择
	802.11n	支持 SM Power Save
	其他	支持 Adhoc 工作模式

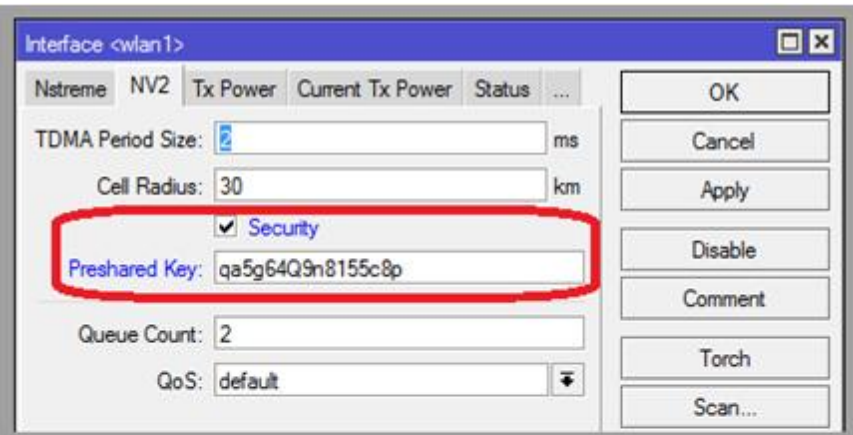
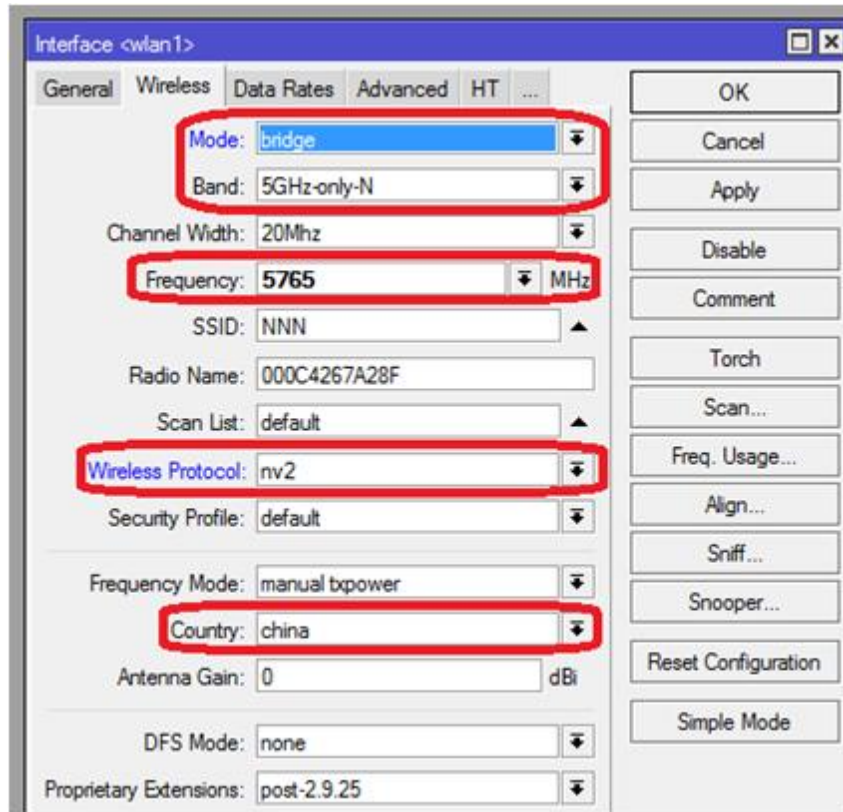
H3C WN612 Dual Band 802.11n USB Adapter



Nv2 protocol

- Nv2 protocol is proprietary wireless protocol developed by MikroTik for use with Atheros 802.11 wireless chips. Nv2 is based on TDMA (Time Division Multiple Access) media access technology instead of CSMA (Carrier Sense Multiple Access) media access technology used in regular 802.11 devices.
- TDMA media access technology solves hidden node problem and improves media usage, thus improving throughput and latency, especially in PtMP networks.
- Nv2 is supported for Atheros 802.11n chips and legacy 802.11a/b/g chips starting from AR5212, but not supported on older AR5211 and AR5210 chips. This means that both - 11n and legacy devices can participate in the same network and it is not required to upgrade hardware to implement Nv2 in network.
- *x86 does not currently support Nv2 (requires RouterBOARD hardware)
x86 may be supported in the future*

Application examples 1 (Outdoor wireless bridge)



Nv2-security" > - specifies Nv2 security mode

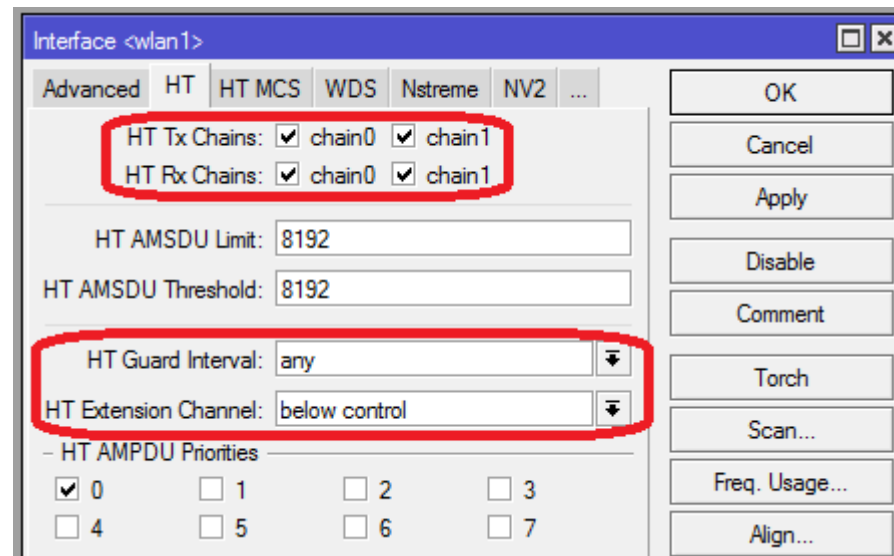
Nv2-preshared-key" > - specifies preshared key to be used

wireless-protocol" > nv2

(default value: *unspecified*) specifies protocol used on wireless interface;

The bridge mode is basically the same as AP, but it only allows one connected client.

Application examples 1 (Outdoor wireless bridge)



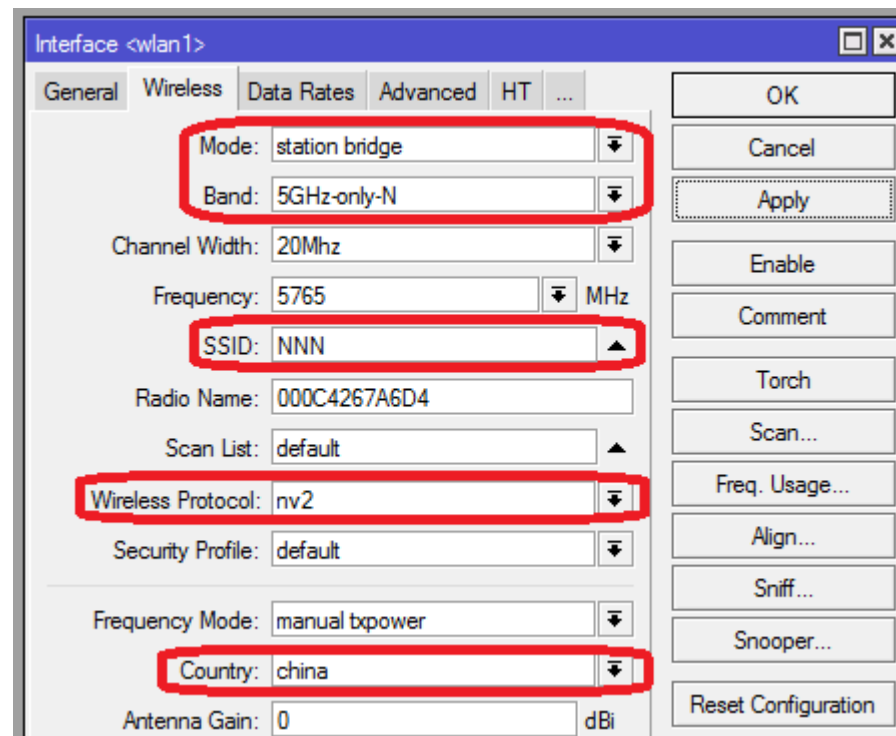
ht-rxchains - which antennas to use for receive.

ht-txchains - which antennas to use for transmit.

ht-guard-interval - whether to allow use of short guard interval. "any" will use either short or long, depending on data rate, "long" will use long.

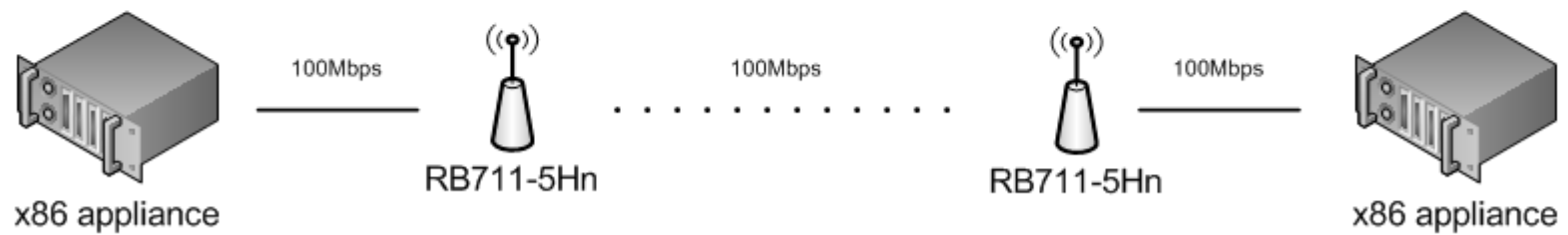
ht-extension-channel - whether to use additional 20MHz extension channel and if it should be located below or above control (main) channel. Extension channel allows 11n device to use 40MHz of spectrum in total thus increasing max throughput.

station-bridge



This mode works only with MikroTik APs and provides support for transparent protocol-independent L2 bridging on station device. This mode is MikroTik proprietary and can't be used to connect other brand devices.

11n speed test



Speed test: RB711-5Hn to RB711-5Hn

RB711-5Hn-MMCX (mipsbe) CPU: 27% ☐ Hide Passwords

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding

Find

	Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	Tx Drops	Rx Drops	Tx Errors	Rx Errors	
R	bridge1	Bridge	1600	41.1 kbps	2.7 kbps	7	4	0	0	0	0	
R	ether1	Ethernet	1600	53.8 Mbps	3.8 kbps	4 440	5	0	0	0	0	
R	wlan1	Wireless (Atheros 11N)	2290	3.8 kbps	53.8 Mbps	5	4 433	0	0	0	0	

20MHz: Up to 50Mbps of actual throughput.

RB711-5Hn-MMCX (mipsbe) CPU: 37% ☐ Hide Passwords

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding

Find

	Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	Tx Drops	Rx Drops	Tx Errors	Rx Errors	
R	bridge1	Bridge	1600	58.5 kbps	3.7 kbps	10	6	0	0	0	0	
R	ether1	Ethernet	1600	98.8 Mbps	6.3 kbps	8 150	9	0	0	0	0	
R	wlan1	Wireless (Atheros 11N)	2290	6.3 kbps	98.8 Mbps	9	8 144	0	0	0	0	

40MHz: Up to 100Mbps of actual throughput.

Speed test: RB493G to RB493G

RB493G (mipsbe) CPU: 36% ☒ Hide Passwords

Wireless Tables

Interfaces Nstream Dual Access List Registration Connect List Security Profiles

Find

Radio Name	MAC Address	Interface	Uptime	AP	WDS	Last Activity (s)	Tx/Rx Signal Strength (dBm)	Tx/Rx Rate
000C4267A28F	00:0C:42:67:A2:8F	wlan1	00:02:42	no	no	0.000	-20/-20	130.0Mbps/130.0Mbps

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding

Find

Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	Tx Drops	Rx Drops	Tx Errors	Rx Errors
bridge1	Bridge	1524	0 bps	0 bps	0	0	0	0	0	0
ether1	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether2	Ethernet	1524	80.3 kbps	4.5 kbps	8	7	0	0	0	0
ether3	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether4	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether5	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether6	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether7	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether8	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether9	Ethernet	1524	103.3 Mbps	1216 bps	8 515	2	0	0	0	0
wlan1	Wireless (Atheros 11N)	2290	1216 bps	103.3 Mbps	2	8 515	0	0	0	0

20MHz: Up to 100Mbps of actual throughput.

Speed test: RB493G to RB493G

RB493G (mipsbe) CPU: 60% ☒ Hide Passwords

Wireless Tables

Interfaces Nstreme Dual Access List Registration Connect List Security Profiles

Find

Radio Name	MAC Address	Interface	Uptime	AP	WDS	Last Activity (s)	Tx/Rx Signal Strength (dBm)	Tx/Rx Rate
000C4267A28F	00:0C:42:67:A2:8F	wlan1	00:19:21	no	no	0.000	-23/-22	270.0Mbps/243.0Mbps

Interface List

Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding

Find

Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	Tx Drops	Rx Drops	Tx Errors	Rx Errors
bridge1	Bridge	1524	0 bps	0 bps	0	0	0	0	0	0
ether1	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
R ether2	Ethernet	1524	82.3 kbps	4.5 kbps	10	7	0	0	0	0
ether3	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether4	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether5	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether6	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether7	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether8	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
R ether9	Ethernet	1524	1216 bps	239.0 Mbps	2	19 690	0	0	0	0
R wlan1	Wireless (Atheros 11N)	2290	212.0 Mbps	1216 bps	17 467	2	0	0	0	0

40MHz: Up to 200Mbps of actual throughput.

Speed test: RB493G to RB493G

RB493G (mipsbe) CPU: 60% ☒ Hide Passwords

Wireless Tables

Interfaces Nstream Dual Access List Registration Connect List Security Profiles

Find

Radio Name	MAC Address	Interface	Uptime	AP	WDS	Last Activity (s)	Tx/Rx Signal Strength (dBm)	Tx/Rx Rate
000C4267A28F	00:0C:42:67:A2:8F	wlan1	00:01:02	no	no	0.000	-21/-21	270.0Mbps/270.0Mbps

Interface List

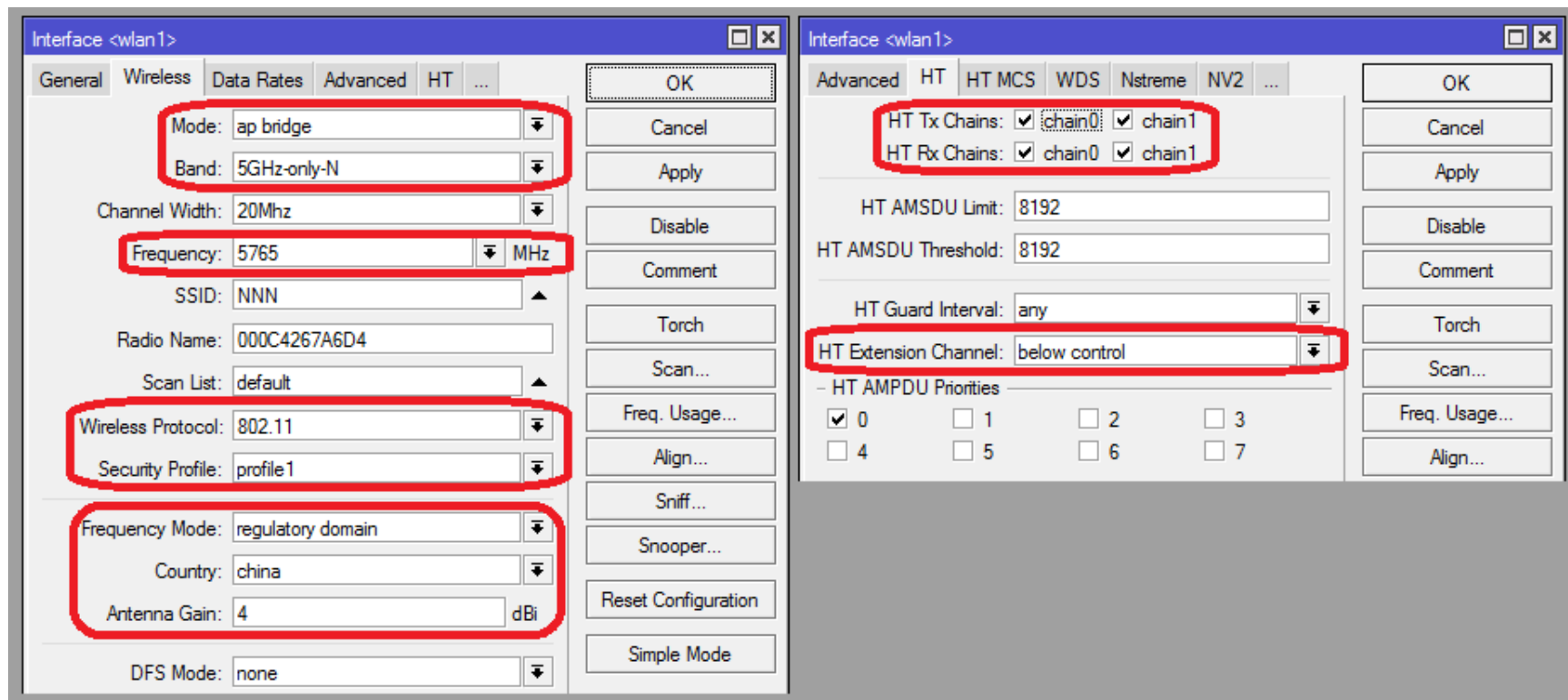
Interface Ethernet EoIP Tunnel IP Tunnel GRE Tunnel VLAN VRRP Bonding

Find

Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	Tx Drops	Rx Drops	Tx Errors	Rx Errors
bridge1	Bridge	1524	0 bps	0 bps	0	0	0	0	0	0
ether1	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether2	Ethernet	1524	81.4 kbps	4.0 kbps	8	6	0	0	0	0
ether3	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether4	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether5	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether6	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether7	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether8	Ethernet	1524	0 bps	0 bps	0	0	0	0	0	0
ether9	Ethernet	1524	96.1 Mbps	100.7 Mbps	7 920	8 297	0	0	0	0
wlan1	Wireless (Atheros 11N)	2290	99.7 Mbps	96.1 Mbps	8 213	7 920	0	0	0	0

40MHz: Up to 100Mbps Full Duplex of actual throughput.

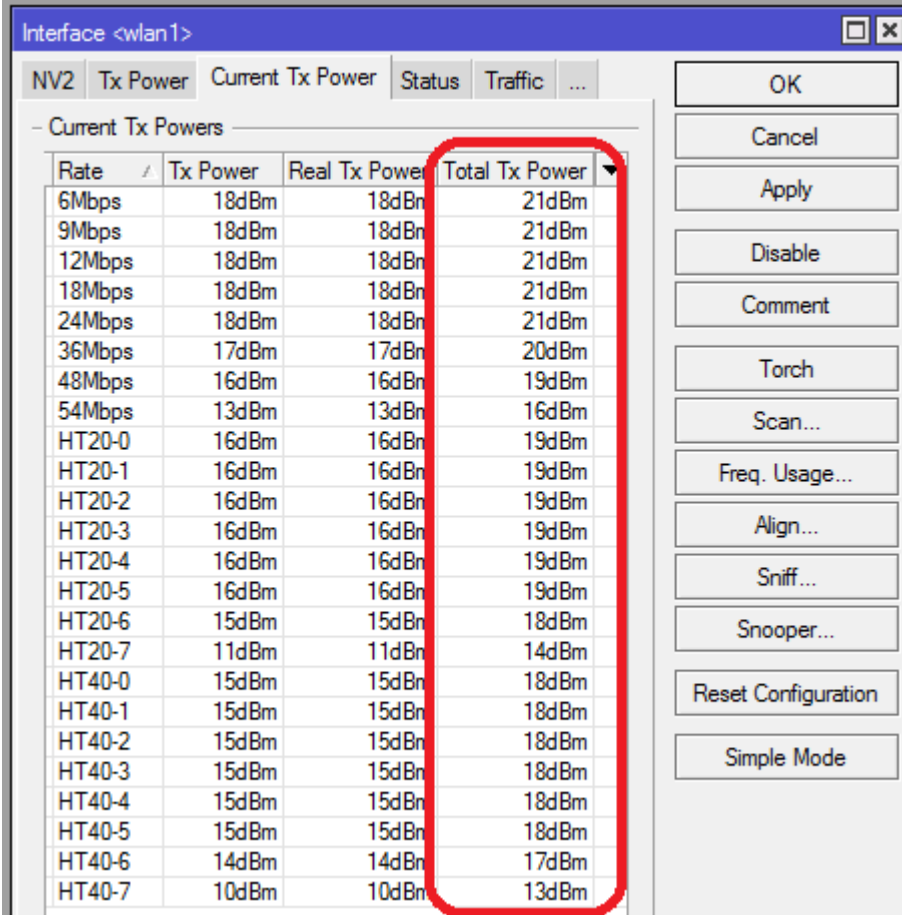
Application examples 2 (Indoor wireless access point)



regulatory-domain - Limit available channels and maximum transmit power for each channel according to the value of country.

If China is set, these frequencies are used
5745, 5765, 5785, 5805, 5825

Total Tx Power



Interface <wlan1>

NV2 Tx Power Current Tx Power Status Traffic ...

- Current Tx Powers -

Rate	/	Tx Power	Real Tx Power	Total Tx Power
6Mbps		18dBm	18dBm	21dBm
9Mbps		18dBm	18dBm	21dBm
12Mbps		18dBm	18dBm	21dBm
18Mbps		18dBm	18dBm	21dBm
24Mbps		18dBm	18dBm	21dBm
36Mbps		17dBm	17dBm	20dBm
48Mbps		16dBm	16dBm	19dBm
54Mbps		13dBm	13dBm	16dBm
HT20-0		16dBm	16dBm	19dBm
HT20-1		16dBm	16dBm	19dBm
HT20-2		16dBm	16dBm	19dBm
HT20-3		16dBm	16dBm	19dBm
HT20-4		16dBm	16dBm	19dBm
HT20-5		16dBm	16dBm	19dBm
HT20-6		15dBm	15dBm	18dBm
HT20-7		11dBm	11dBm	14dBm
HT40-0		15dBm	15dBm	18dBm
HT40-1		15dBm	15dBm	18dBm
HT40-2		15dBm	15dBm	18dBm
HT40-3		15dBm	15dBm	18dBm
HT40-4		15dBm	15dBm	18dBm
HT40-5		15dBm	15dBm	18dBm
HT40-6		14dBm	14dBm	17dBm
HT40-7		10dBm	10dBm	13dBm

OK

Cancel

Apply

Disable

Comment

Torch

Scan...

Freq. Usage...

Align...

Sniff...

Snooper...

Reset Configuration

Simple Mode

Speed test: H3C Dual Band 802.11n USB Adapter

Up to 200Mbps of actual throughput.

The screenshot displays the MikroTik WinBox interface. The left sidebar contains navigation options: Interfaces, Wireless, Bridge, PPP, Switch, Mesh, IP, MPLS, Routing, System, Queues, Files, Log, Radius, Tools, New Terminal, MetaROUTER, Make Supout.sh, Manual, and Exit. The main window shows the 'Wireless Tables' section with tabs for Interfaces, Native Dual, Access List, Registration, Connect List, and Security Profiles. The 'Interfaces' tab is active, showing a table with columns: Radio Name, MAC Address, Interface, Uptime, AP, WDS, Last Activity (s), Tx/Rx Signal Strength (dbm), and Tx/Rx Rate. A red box highlights the 'Tx/Rx Rate' column, showing a value of 243.0Mbps/300.0Mbps. Below this, the 'Interface List' window is open, displaying a table with columns: Name, Type, L2 MTU, Tx, Rx, Tx Packet (p/s), Rx Packet (p/s), Tx Drops, and Rx Drops. A red box highlights the 'Tx' and 'Rx' columns, showing values of 195.5 Mbps and 197.2 Mbps respectively. In the bottom right corner, the 'MikroTik Bandwidth Test v0.1' window is open, showing test parameters: Address: 192.168.189.2, Protocol: udp, Local Tx Size: 1500 bytes, Remote Tx Size: 1500 bytes, Direction: send, Local Tx Speed: 0 bps, Remote Tx Speed: 0 bps, User: admin, Password: , and Random Data: unchecked. A red box highlights the 'Tx: 197.6 Mbps' result in the test window. The bottom status bar shows the system clock as 3:34 PM on 2/2/2011 and the CPU usage as 61%.

Radio Name	MAC Address	Interface	Uptime	AP	WDS	Last Activity (s)	Tx/Rx Signal Strength (dbm)	Tx/Rx Rate
00:23:89:33:43:10		wlan1	00:05:22	no	no	0.000	-76	243.0Mbps/300.0Mbps

Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	Tx Drops	Rx Drops
bridge1	Bridge	1524	88.8 kbps	3.8 kbps	8	7	0	0
ether1	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether2	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether3	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether4	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether5	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether6	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether7	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether8	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether9	Ethernet	1524	0 bps	0 bps	0	0	0	0
wlan1	Wireless (802.11n)	2290	195.5 Mbps	197.2 Mbps	16432	16432	2	0

Name	Type	L2 MTU	Tx	Rx	Tx Packet (p/s)	Rx Packet (p/s)	Tx Drops	Rx Drops
bridge1	Bridge	1524	88.8 kbps	3.8 kbps	8	7	0	0
ether1	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether2	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether3	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether4	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether5	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether6	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether7	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether8	Ethernet	1524	0 bps	0 bps	0	0	0	0
ether9	Ethernet	1524	0 bps	0 bps	0	0	0	0
wlan1	Wireless (802.11n)	2290	195.5 Mbps	197.2 Mbps	16432	16432	2	0

New product (RB/SXT)

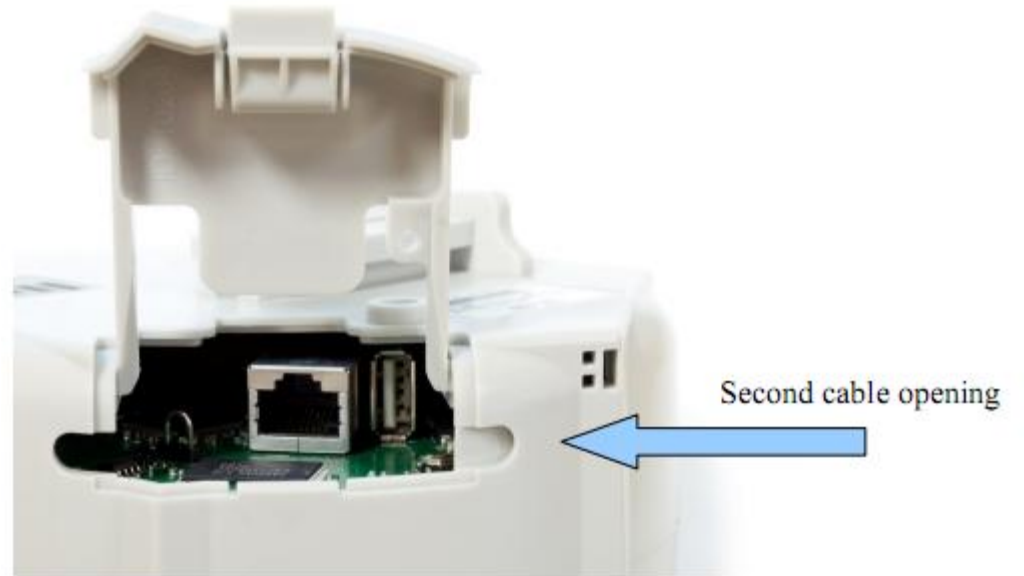
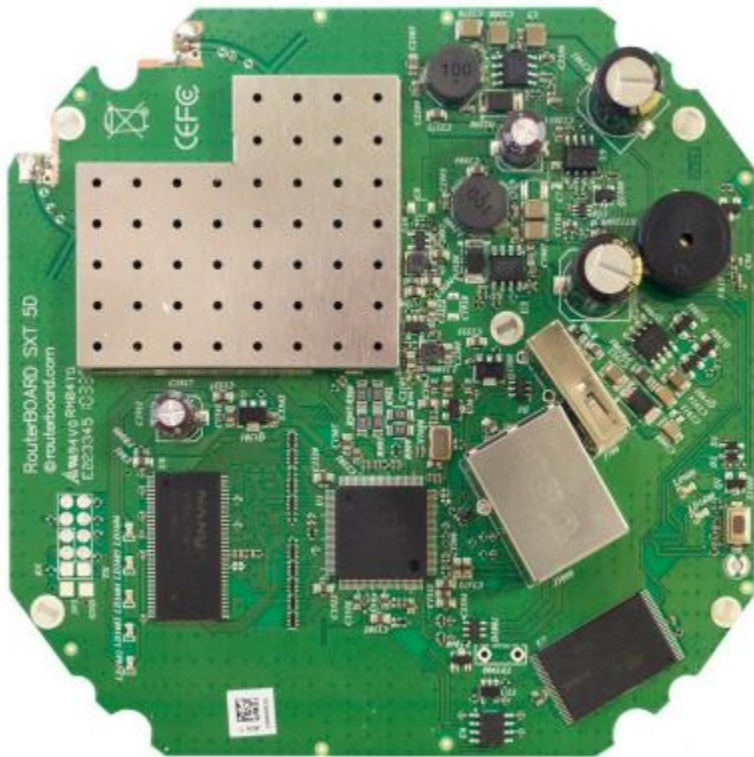


	RouterBOARD SXT 5HnD
CPU	AR7241 400MHz
Memory	32MB DDR SDRAM
Boot loader	RouterBOOT
Data storage	64MB onboard NAND memory chip
Ethernet	One 10/100 with Auto-MDI/X
Wireless	Built-in 5GHz 802.11a/n 2x2 MIMO
Antenna	Dual polarization 2x2 MIMO antenna
ESD protection	15kV ESD protection on each RF port 15kV ESD protection on the Ethernet port
MiniPCI slot	none
Serial port	none
LEDs	Power and User LED, 5 wireless LEDs
Extras	Beeper; Reset switch; USB 2.0 port; Voltage monitor; Temperature monitor
Power options	Power over Ethernet: 8..30V DC (except power over datalines) Packaged with a 24V PSU and a PoE injector
Dimensions	140x140x56mm
Weight	265g
Temperature	Operational: -30C to +80C

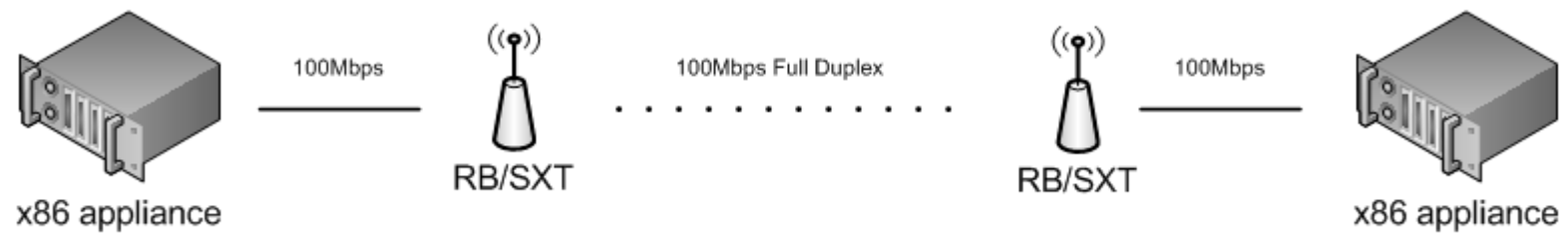
- 16dBi dual chain antenna built-in
- Signal strength LED indicators on back

TX power	26dBm max
----------	-----------

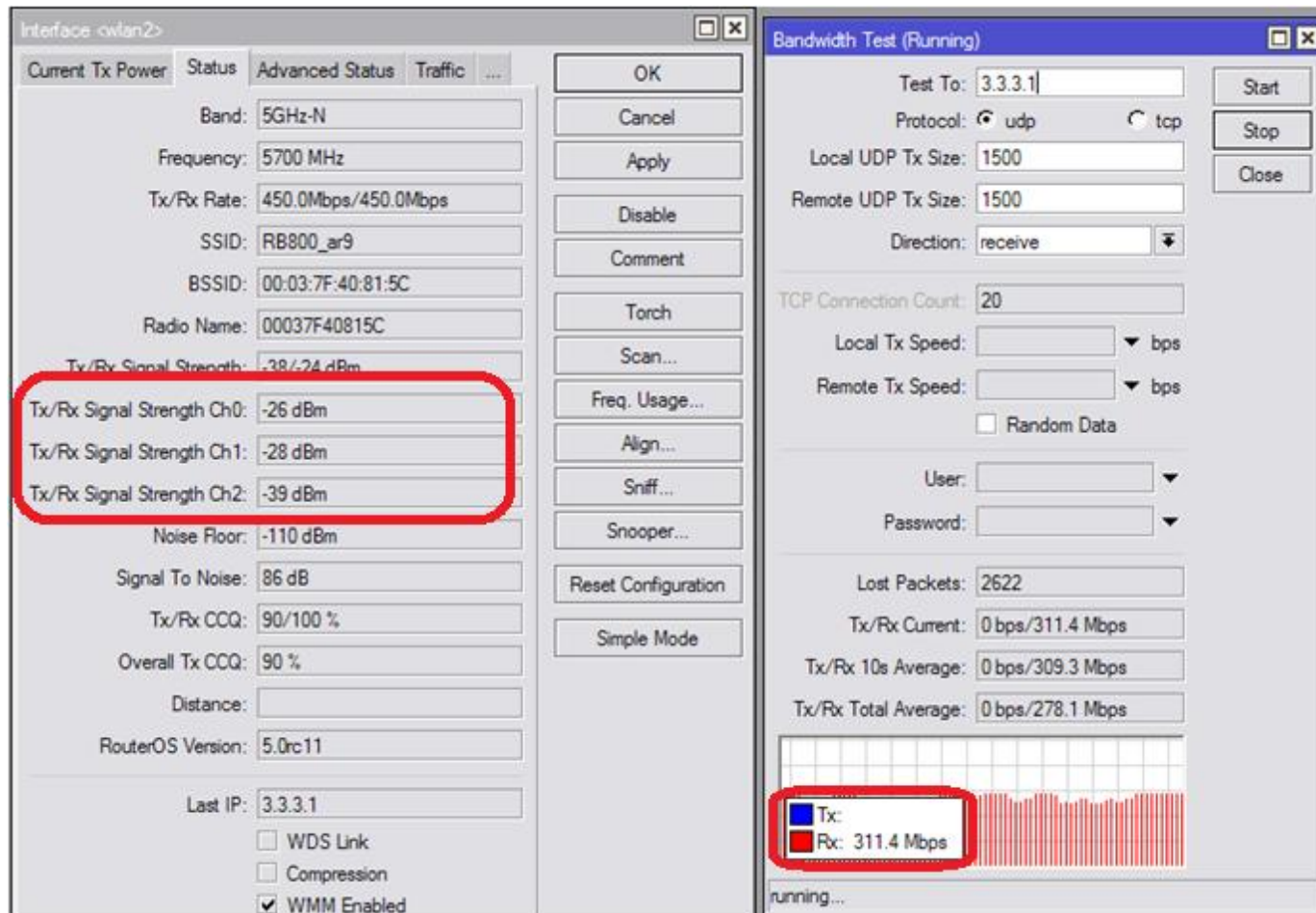
RB/SXT



RB/SXT speed test



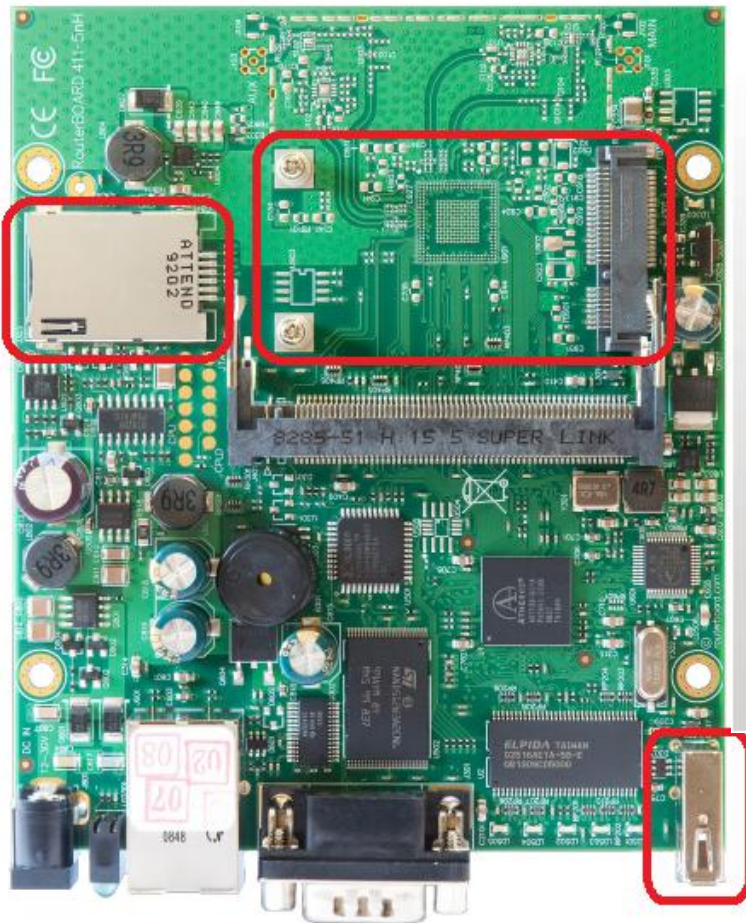
AR9380 chipset support



PART 2

- Introduction 3G products
 - RouterBOARD, 3G Modem, 3G Antenna, USB Accessories
- 3G application examples
 - Application examples 1 (WCDMA and TD-SCDMA)
 - Application examples 2 (CDMA2000)
 - Application examples 3 (VPDN)
- Speed test (WCDMA, CDMA2000, TD-SCDMA)

RB411U



CPU	Atheros AR7130 300MHz network processor
Memory	32MB DDR SDRAM onboard memory
Boot loader	RouterBOOT
Data storage	64MB onboard NAND memory chip
Ethernet	One 10/100 Mbit/s Fast Ethernet port with Auto-MDI/X
miniPCI	One MiniPCI Type IIIA/IIIB slot One MiniPCIe slot for 3G modem (onboard SIM connector)
Wireless	not built in, possible by adding a miniPCI card
Expansion	USB 2.0 with 5V 1A supply
Extras	Reset switch, Beeper, Input voltage monitor
Serial port	One DB9 RS232C asynchronous serial port
LEDs	Power, NAND activity, 5 user LEDs
Power options	Power over Ethernet: 10..28V DC (except power over datalines). Power jack: 10..28V DC
Dimensions	12.5 cm x 10.5 cm, Weight: 104g
Power consumption	3-12W
Operating System	MikroTik RouterOS v3, Level4 license

Huawei E220 (WCDMA)



Huawei EC1260, EC1261 (CDMA2000)



http://wiki.mikrotik.com/wiki/Supported_Hardware#3G_cards

Huawei ET127 (TD-SCDMA)



http://wiki.mikrotik.com/wiki/Supported_Hardware#3G_cards

Sierra Wireless MC8781 (WCDMA)



3G Antenna



Model	
Frequency range	824~960/1710~2500MHz
VSWR	≤ 1.5
Gain	3.5dbi
Polarization	Vertical
Maximum input power	50W
Impedance	50 Ω
Cable type	RG58U
Length	3 M
Input Connector	N male
Dimensions of Antenna	$\Phi 115 \times 55\text{mm}$
Weight	110g

5V power injector for RB493G and RB411UAHR



Linksys USB200M Ethernet Adapter



USB					
Find					
Device	Vendor	Name	Serial Number	Speed	
1:1		RB400 OHCI	rb400_usb	12 Mbps	
1:5	Sierra ...	AirCard		12 Mbps	
2:1		RB400 OHCI	rb400_usb	12 Mbps	
2:8		USB 2.0 Network Adapter ver.2	013050	480 Mbps	

What's new in 5.0beta2 (2010-Apr-30 11:24):

*) added support for ASIX AX88xxx based USB Ethernet Adapters on RB4xx;

Z-TEK USB Serial Port Converter



USB					
Device	Vendor	Name	Serial Number	Speed	
1:1		RB400 OHCI	rb400_usb	12 Mbps	
1:5	Sierra Wireless, Incorporated	AirCard		12 Mbps	
1:9	FTDI	FT232R USB UART	A900ev9U	12 Mbps	
2:1		RB400 EHCI	rb400_usb	480 Mbps	

http://wiki.mikrotik.com/wiki/Serial_Port_Usage

RB411U and all accessories



Application examples 1 (WCDMA and TD-SCDMA)

The image displays two side-by-side screenshots of the 'Interface <ppp-out1>' configuration window, showing different tabs.

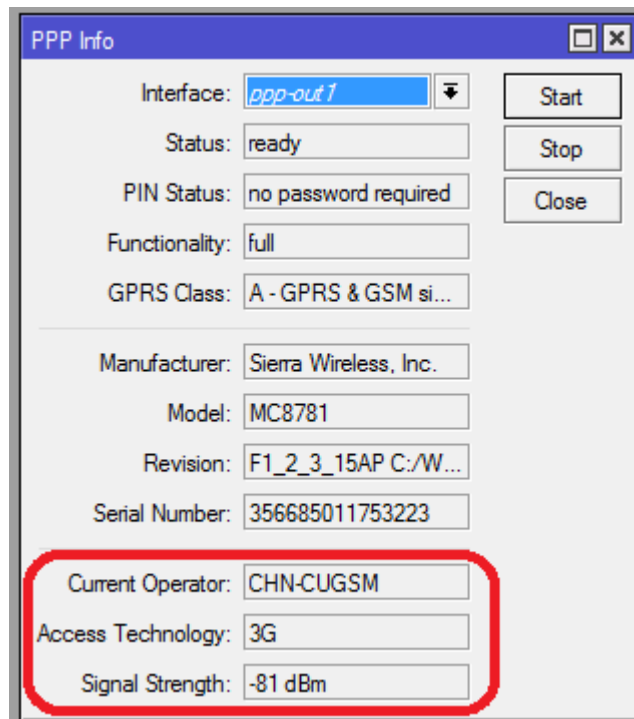
Left Screenshot (General Tab):

- Name:
- Type:
- L2 MTU:
- Max MTU:
- Max MRU:
- MRRU:
- Port:** (highlighted with a red box)
- Data Channel:
- Info Channel:
- Modem Init:
- ☐ Null Modem
- APN:
- PIN:

Right Screenshot (PPP Tab):

- Phone:
- Dial Command:
- User:
- Password:
- Remote Address:
- Profile:
- ☐ Dial On Demand
- ☒ **Add Default Route** (highlighted with a red box)
- ☐ Use Peer DNS
- Keepalive Timeout:
- Allow:
 - ☒ pap
 - ☒ mschap1
 - ☒ chap
 - ☒ mschap2
- Info...** (highlighted with a red box)

Application examples 1 (WCDMA and TD-SCDMA)

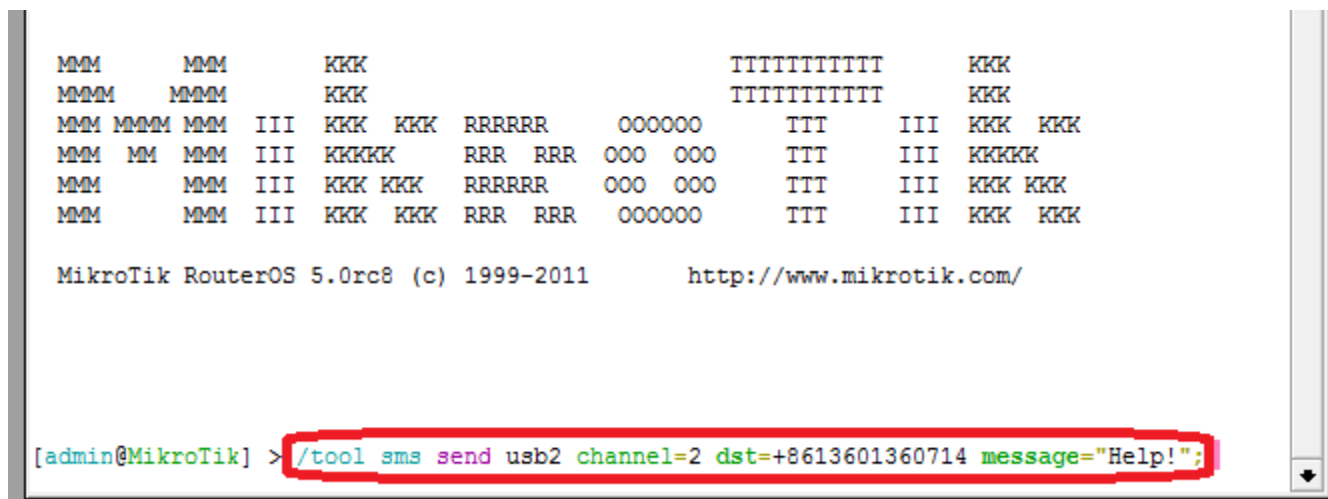


The image shows a 'PPP Info' dialog box with various fields and buttons. The fields are organized into two main sections. The top section contains 'Interface' (set to 'ppp-out 1'), 'Status' (ready), 'PIN Status' (no password required), 'Functionality' (full), and 'GPRS Class' (A - GPRS & GSM si...). The bottom section contains 'Manufacturer' (Sierra Wireless, Inc.), 'Model' (MC8781), 'Revision' (F1_2_3_15AP C:/W...), 'Serial Number' (356685011753223), 'Current Operator' (CHN-CUGSM), 'Access Technology' (3G), and 'Signal Strength' (-81 dBm). On the right side, there are three buttons: 'Start', 'Stop', and 'Close'. The 'Current Operator', 'Access Technology', and 'Signal Strength' fields are grouped together and highlighted with a red rounded rectangle.

Interface:	ppp-out 1	Start Stop Close
Status:	ready	
PIN Status:	no password required	
Functionality:	full	
GPRS Class:	A - GPRS & GSM si...	
Manufacturer: Sierra Wireless, Inc.		
Model: MC8781		
Revision: F1_2_3_15AP C:/W...		
Serial Number: 356685011753223		
Current Operator: CHN-CUGSM		
Access Technology: 3G		
Signal Strength: -81 dBm		

Sending SMS from the RouterBOARD

- Command line example to send an SMS:
 - `/tool sms send usb2 channel=2 dst=+8613601360714 message="Help!"`;
- SMS can be sent while the port is used by other service (PPP or terminal)
- This feature is only supported for China Unicom and China Mobile.



```
MMM      MMM      KKK                      TTTTTTTTTT      KKK
MMMM     MMMM     KKK                      TTTTTTTTTT      KKK
MMM MMMM MMM III KKK KKK RRRRRR      000000      TTT      III KKK KKK
MMM MM  MMM III KKKKK RRR RRR 000 000      TTT      III KKKKK
MMM      MMM III KKK KKK RRRRRR      000 000      TTT      III KKK KKK
MMM      MMM III KKK KKK RRR RRR 000000      TTT      III KKK KKK

MikroTik RouterOS 5.0rc8 (c) 1999-2011      http://www.mikrotik.com/

[admin@MikroTik] > /tool sms send usb2 channel=2 dst=+8613601360714 message="Help!";
```

Application examples 2 (CDMA2000)

The image displays two side-by-side screenshots of the 'Interface <ppp-out1>' configuration window, showing different tabs.

Left Screenshot (General Tab):

- Name: ppp-out1
- Type: PPP Client
- L2 MTU: 1500
- Max MTU: 1500
- Max MRU: 1500
- MRRU: (empty)
- Port: usb3 (highlighted with a red box)
- Data Channel: 0
- Info Channel: 0
- Modem Init: (empty)
- ☐ Null Modem
- APN: (empty)
- PIN: (empty)

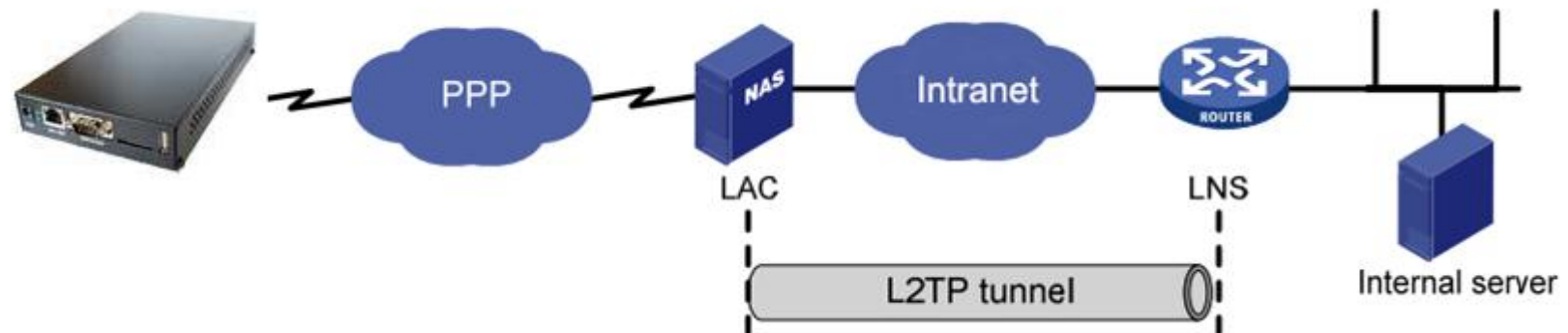
Right Screenshot (PPP Tab):

- Phone: #777 (highlighted with a red box)
- Dial Command: ATDT
- User: (empty)
- Password: (empty)
- Remote Address: (empty)
- Profile: default
- ☐ Dial On Demand
- ☒ Add Default Route
- ☐ Use Peer DNS
- Keepalive Timeout: (empty)
- Allow
 - ☒ pap
 - ☒ mschap1
 - ☒ chap
 - ☒ mschap2

Virtual Private Dialup Network (VPDN)

- A VPDN is a network that extends remote access to a private network using a shared infrastructure. VPDNs use Layer 2 tunnel technologies (L2F, L2TP, and PPTP) to extend the Layer 2 and higher parts of the network connection from a remote user across an ISP network to a private network. VPDNs are a cost effective method of establishing a long distance, point-to-point connection between remote dial users and a private network.
- Instead of making connections directly to the network by using the expensive Public Switched Telephone Network (PSTN), access VPDN users only need to use the PSTN to connect to the ISP local point of presence (POP). The ISP then uses the Internet to forward users from the POP to the customer network. Forwarding calls over the Internet as opposed to making a long-distance PSTN call provides dramatic cost saving for the customer.

Application examples 3 (VPDN)



Application examples 3 (VPDN)

The image displays two side-by-side screenshots of the 'Interface <ppp-out1>' configuration window, showing the 'General' and 'PPP' tabs respectively. Red boxes highlight specific configuration fields in both windows.

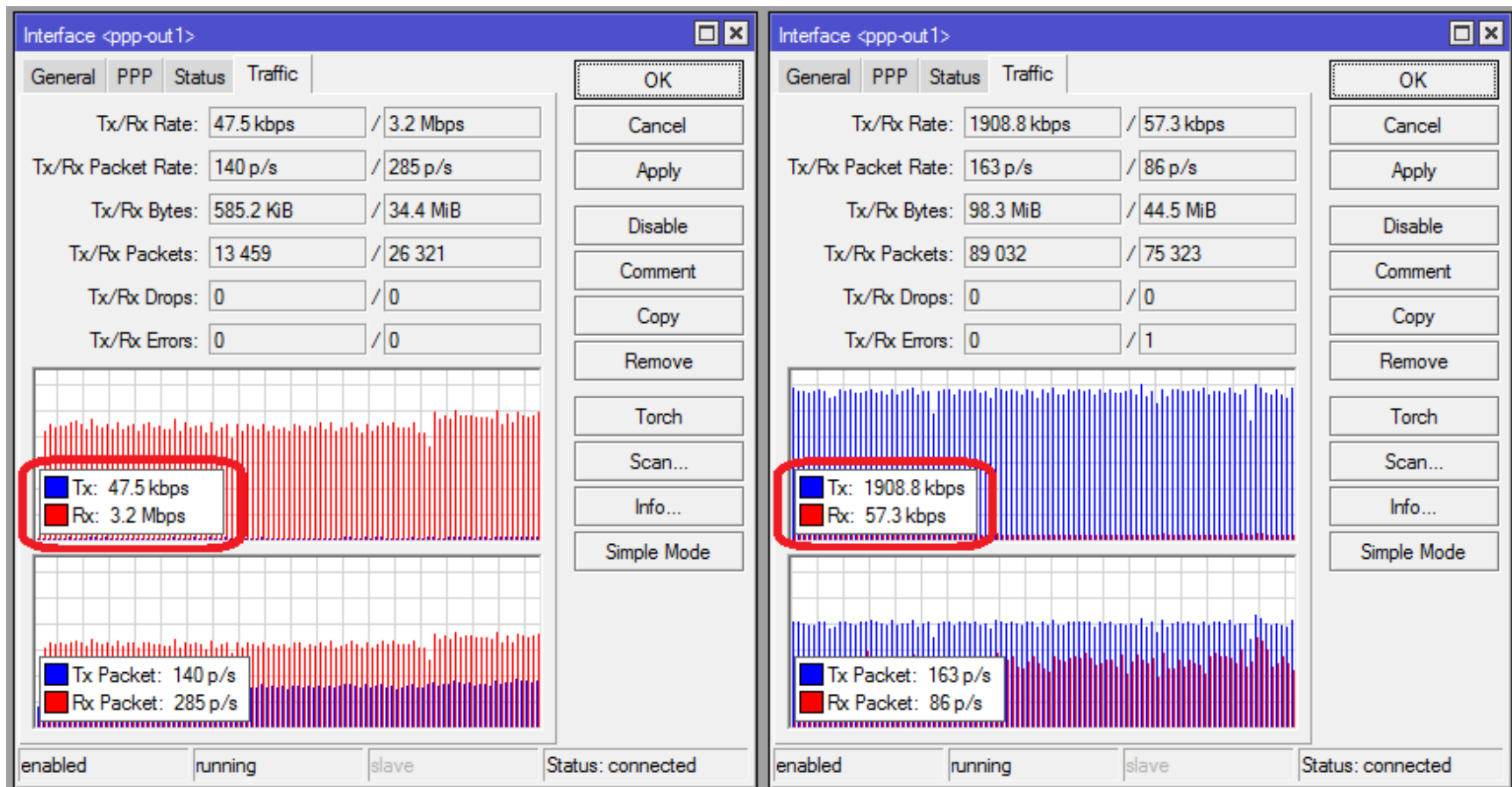
Left Window (General Tab):

- Name: ppp-out1
- Type: PPP Client
- L2 MTU: 1500
- Max MTU: 1500
- Max MRU: 1500
- MRRU: [empty]
- Port: usb2
- Data Channel: 0
- Info Channel: 2
- Modem Init: [empty]
- Null Modem: ☐
- APN: vpdn.bjapn
- PIN: [empty]

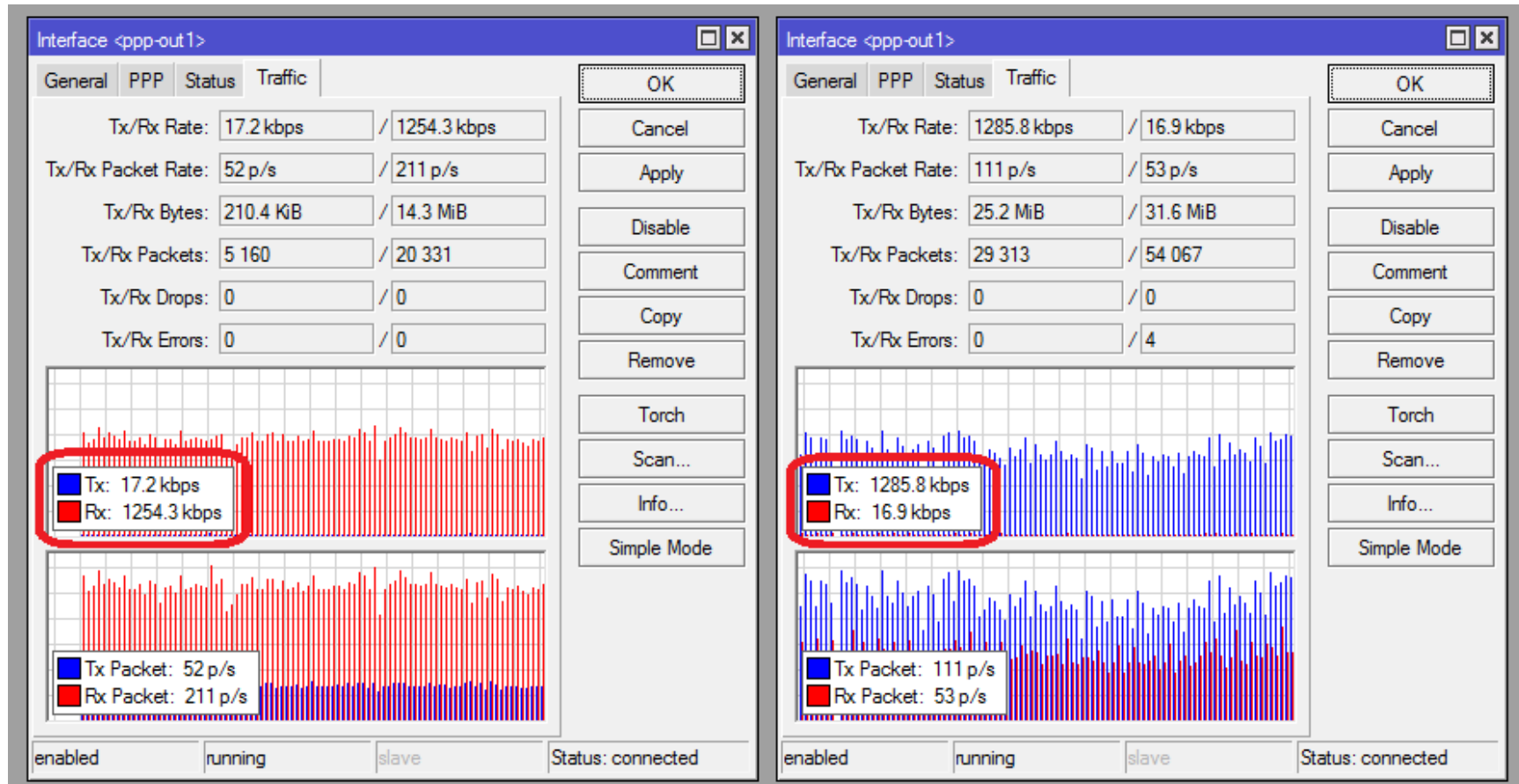
Right Window (PPP Tab):

- Phone: *99#
- Dial Command: ATDT
- User: user5@bjxfl.vpdn
- Password: [masked]
- Remote Address: [empty]
- Profile: default
- Options:
 - ☐ Dial On Demand
 - ☒ Add Default Route
 - ☐ Use Peer DNS
- Keepalive Timeout: [empty]
- Allow:
 - ☒ pap
 - ☒ mschap1
 - ☒ chap
 - ☒ mschap2

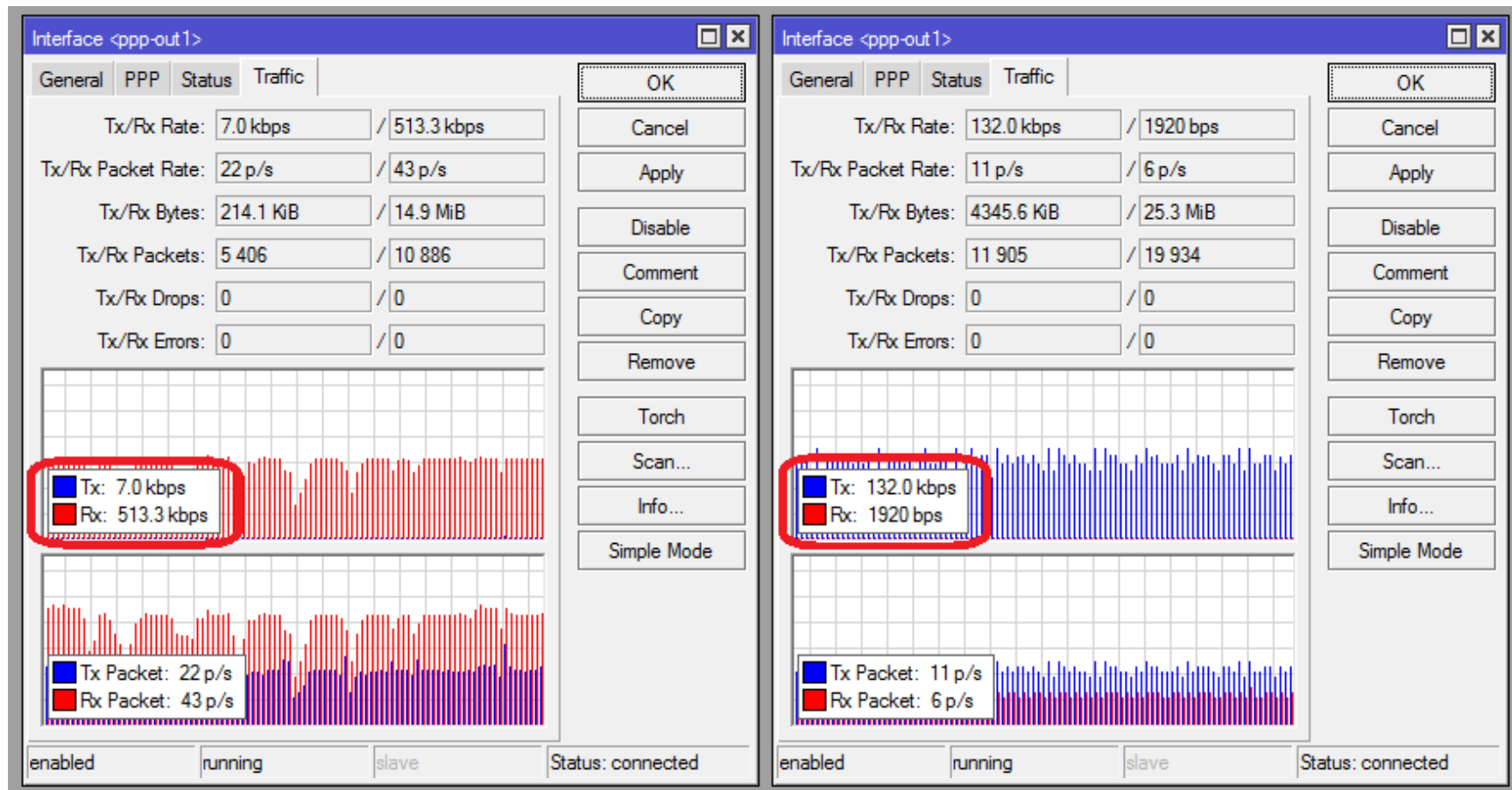
3G speed test: WCDMA



3G speed test: CDMA2000



3G speed test: TD-SCDMA



3G speed test: comparison



China Unicom (WCDMA)

Download – 3Mbps

Upload – 2Mbps

China Telecom (CDMA2000)

Download – 1Mbps

Upload – 1Mbps

China Mobile (TD-SCDMA)

Download – 512kbps

Upload – 128kbps

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End

Thank you for participating