

Solución de Red punto- multipunto de alta densidad con Mikrotik

AMERICA
Telecomunicaciones

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MUM México

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Presentación Personal

- Ing. Figueroa Castañeda Jaime Armando
- Redes y Telecomunicaciones
- Certificaciones



- Email: jaime@jafica.com

Equipo como AP



- MantBox 15s – 19s
- 120°
- RB921, 720Mhz cpu
- Embebida

- RouterOS

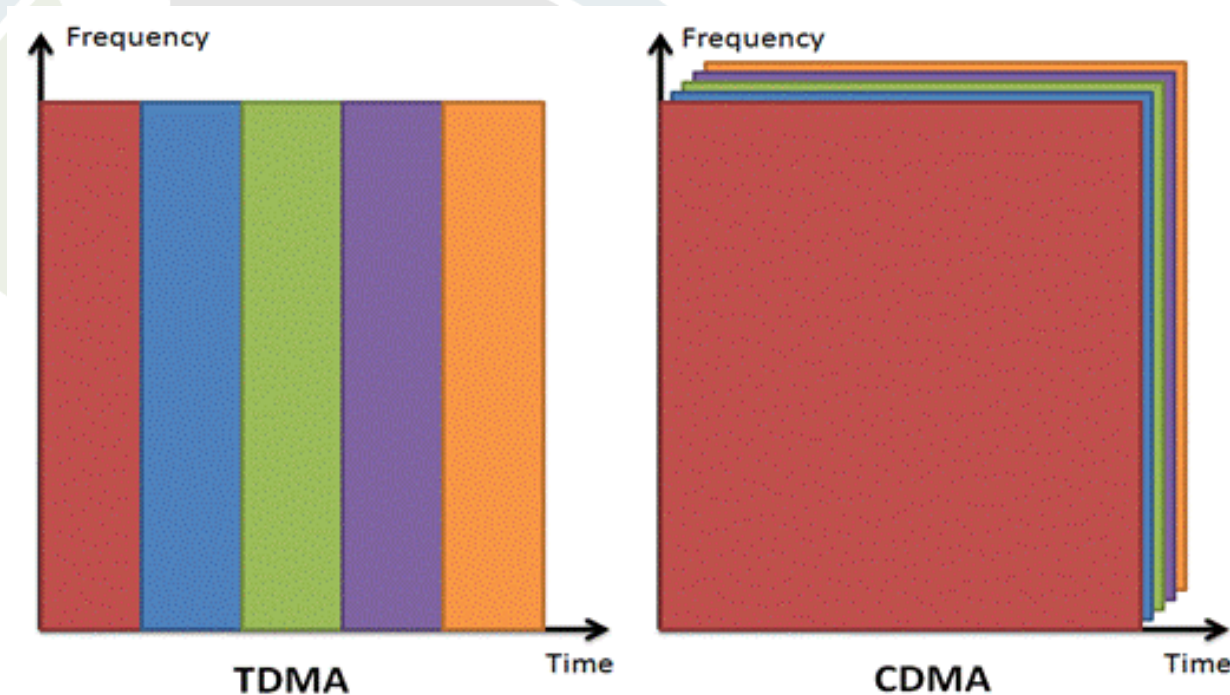
Equipo como CPE



- SXTsq Lite5 16dbi
- SXT Lite 5 16dbi
- Disc Lite 21dbi
- LHG5 24.5dbi

TDMA

- El acceso múltiple por división de tiempo (Time Division Multiple Access o TDMA) (wikipedia)



Modulaciones

HT MCS Index	Spatial Streams	Modulation & Coding	Data Rate GI = 800ns	Data Rate SGI = 400ns	Data Rate GI = 800ns	Data Rate SGI = 400ns	Data Rate GI = 800ns	Data Rate SGI = 400ns
			20MHz	20MHz	40MHz	40MHz	80MHz	80MHz
0	1	BPSK 1/2	6.5	7.2	13.5	15	29.3	32.5
1	1	QPSK 1/2	13	14.4	27	30	58.5	65
2	1	QPSK 3/4	19.5	21.7	40.5	45	87.8	97.5
3	1	16-QAM 1/2	26	28.9	54	60	117	130
4	1	16-QAM 3/4	39	43.3	81	90	175.5	195
5	1	64-QAM 2/3	52	57.8	108	120	234	260
6	1	64-QAM 3/4	58.5	65	121.5	135	263.3	292.5
7	1	64-QAM 5/6	65	72.2	135	150	292.5	325
	1	256-QAM 3/4	78	86.7	162	180	351	390
	1	256-QAM 5/6	n/a	n/a	180	200	390	433.3
8	2	BPSK 1/2	13	14.4	27	30	58.5	65
9	2	QPSK 1/2	26	28.9	54	60	117	130
10	2	QPSK 3/4	39	43.3	81	90	175.5	195
11	2	16-QAM 1/2	52	57.8	108	120	234	260
12	2	16-QAM 3/4	78	86.7	162	180	351	390
13	2	64-QAM 2/3	104	115.6	216	240	468	520
14	2	64-QAM 3/4	117	130.3	243	270	526.5	585
15	2	64-QAM 5/6	130	144.4	270	300	585	650
	2	256-QAM 3/4	156	173.3	324	360	702	780
	2	256-QAM 5/6	n/a	n/a	360	400	780	866.7

CPE SXTsq

Wireless specifications

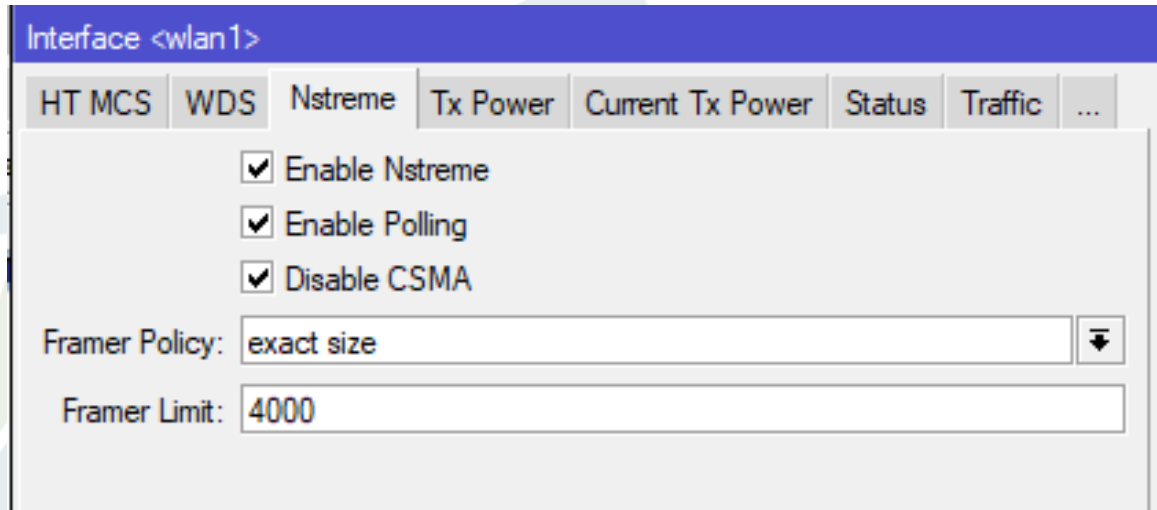
5 GHz	Transmit (dBm)	Receive Sensitivity
6MBit/s	25	-96
54MBit/s	20	-80
MCS0	25	-96
MCS7	19	-75

MantBox15s/19s

Wireless specifications

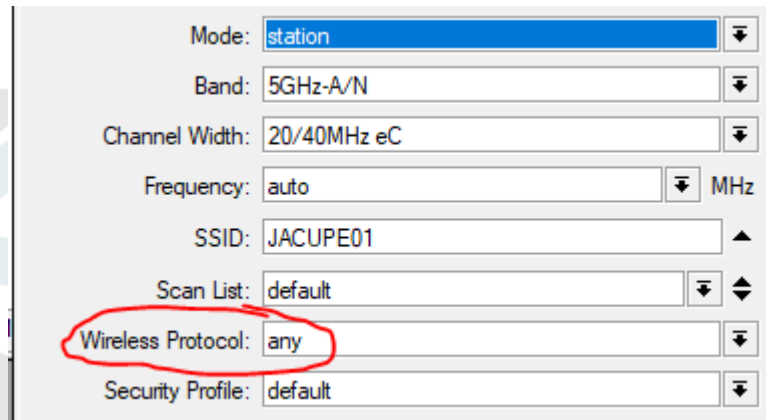
5 GHz	Transmit (dBm)	Receive Sensitivity
6MBit/s	31	-96
54MBit/s	27	-81
MCS0	30	-96
MCS7	27	-77
MCS9	22	-72

Protocolo nstreme



- Aprovecha la tecnología TDMA
- Política para combinar frames en uno mas grande incrementando el rendimiento

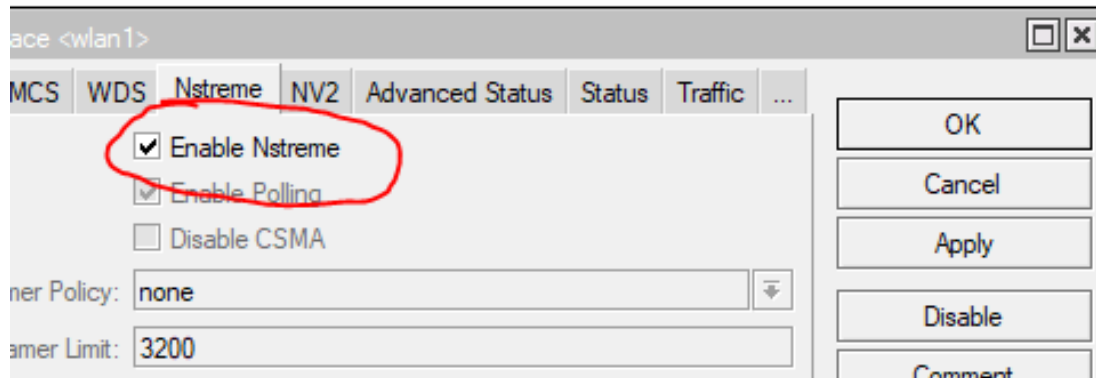
Las estaciones adoptan el protocolo



Mode: station
Band: 5GHz-A/N
Channel Width: 20/40MHz eC
Frequency: auto MHz
SSID: JACUPE01
Scan List: default
Wireless Protocol: any
Security Profile: default

CA
municaciones

Interface Name	MAC Address	Interface	Uptime	AP	W...	Last Activit...	Tx/Rx Signal ...	Tx Rate	Rx Rate
Director Pe...	E4:8D:8C:FE:42:6F	wlan1	00:13:01	yes	no	0.000	-52/-52	270Mbps-40MHz/2S	300Mbps-40MHz/2S/SGL



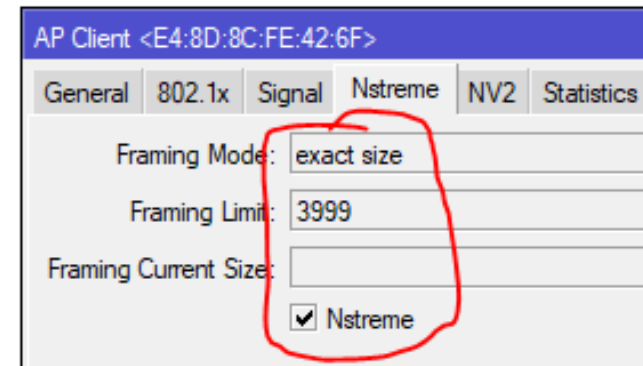
Interface: wlan1

MCS | WDS | **Nstreme** | NV2 | Advanced Status | Status | Traffic | ...

Enable Nstreme
 Enable Polling
 Disable CSMA

Power Policy: none
Power Limit: 3200

OK
Cancel
Apply
Disable
Comment



AP Client <E4:8D:8C:FE:42:6F>

General | 802.1x | **Signal** | Nstreme | NV2 | Statistics

Framing Mode: exact size
Framing Limit: 3999
Framing Current Size:
 Nstreme

Alta Densidad de estaciones

Wireless Tables

WiFi Interfaces W60G Station Nstreme Dual Access List Registration Connect List Security Profiles Channels

Reset

Radio Name	Last IP	Last Activity (s)	Tx/Rx Signal ...	Tx/Rx CCQ (%)	P Throughput (kb...	Tx Rate	Rx Rate
⚡ Karla liz...	172.2...	0.230	-43/-47	106/95	280677	300Mbps-40MHz/...	300Mbps-...
⚡ HECTO...	172.2...	0.230	-58/-61	86/81	256390	300Mbps-40MHz/...	58.5Mbps-...
⚡ LOREN...	172.2...	0.190	-35/-38	115/110	140850	150Mbps-40MHz/...	58.5Mbps-...
⚡ RAFAE...	172.2...	0.170	-40/-43	112/106	280677	300Mbps-40MHz/...	300Mbps-...
⚡ ELI BO...	172.2...	0.170	-41/-48	102/101	280677	300Mbps-40MHz/...	270Mbps-...
⚡ CLAUDI...	172.2...	0.120	-43/-45	115/110	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ ALEJA...	192.1...	0.120	-45/-51	106/95	280129	300Mbps-40MHz/...	240Mbps-...
⚡ RAINIE...	172.2...	0.110	-43/-51	116/110	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ Jose pa...	172.2...	0.110	-47/-51	115/107	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ LEIDA ...	172.2...	0.110	-47/-54	113/109	276358	300Mbps-40MHz/...	58.5Mbps-...
⚡ RUBI D...	192.1...	0.110	-42/-47	112/107	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ TREJO ...	172.2...	0.110	-41/-45	111/107	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ JUAN ...	172.2...	0.110	-38/-44	110/106	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ JIMENA...	172.2...	0.110	-47/-51	105/91	264653	300Mbps-40MHz/...	58.5Mbps-...
⚡ MIGUE...	172.2...	0.110	-44/-50	115/106	140850	150Mbps-40MHz/...	58.5Mbps-...
⚡ ANGEL...	172.2...	0.090	-43/-48	110/102	279857	300Mbps-40MHz/...	58.5Mbps-...
⚡ Isac ren...	172.2...	0.080	-46/-51	116/110	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ gabriela...	172.2...	0.080	-34/-38	116/110	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ CARLO...	172.2...	0.080	-45/-50	115/108	277693	300Mbps-40MHz/...	58.5Mbps-...
⚡ MIGUE...	172.2...	0.080	-40/-41	110/106	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ LETICI...	172.2...	0.080	-48/-49	106/99	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ ERICKA...	172.2...	0.080	-49/-51	102/91	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ SAIRA ...	172.2...	0.080	-33/-39	116/110	140850	150Mbps-40MHz/...	58.5Mbps-...
⚡ ASOCIA...	172.2...	0.080	-26/-38	116/110	140850	150Mbps-40MHz/...	58.5Mbps-...
⚡ JANET ...	172.2...	0.080	-35/-39	115/109	140850	150Mbps-40MHz/...	58.5Mbps-...
⚡ CARLO...	172.2...	0.070	-41/-47	112/106	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ MARIT...	172.2...	0.070	-45/-50	111/102	268861	300Mbps-40MHz/...	58.5Mbps-...
⚡ MAURI...	172.2...	0.070	-33/-37	105/103	280677	300Mbps-40MHz/...	58.5Mbps-...
⚡ CLAUDI...	172.2...	0.070	-29/-39	98/100	261284	300Mbps-40MHz/...	58.5Mbps-...
⚡ ANEL A...	172.2...	0.040	-45/-49	98/97	278501	300Mbps-40MHz/...	270Mbps-...
⚡ alejandr...	172.2...	0.030	-42/-45	104/104	277962	300Mbps-40MHz/...	58.5Mbps-...
⚡ JOSE M...	172.2...	0.030	-38/-42	100/100	280677	300Mbps-40MHz/...	300Mbps-...
⚡ MENA J...	172.2...	0.030	-37/-41	100/99	280677	300Mbps-40MHz/...	300Mbps-...
⚡ Jaxmin ...	172.2...	0.030	-48/-56	100/95	280677	300Mbps-40MHz/...	240Mbps-...
⚡ GEORG...	172.2...	0.030	-45/-51	100/92	280677	300Mbps-40MHz/...	270Mbps-...
⚡ DAVID ...	172.2...	0.030	-47/-54	100/91	280677	300Mbps-40MHz/...	240Mbps-...
⚡ Diana ja...	172.2...	0.030	-41/-47	100/87	280677	300Mbps-40MHz/...	58.5Mbps-...

47 items (1 selected)

Latencia en 20Mhz

Ping (Running)

General **Advanced**

Ping To: 8.8.8.8

Interface:

ARP Ping

Packet Count:

Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # /	Host	Time	Reply Size	TTL	Status
108	8.8.8.8	261ms	50	56	
109	8.8.8.8	138ms	50	56	
110	8.8.8.8	67ms	50	56	
111	8.8.8.8	153ms	50	56	
112	8.8.8.8	207ms	50	56	
113	8.8.8.8	263ms	50	56	
114	8.8.8.8	117ms	50	56	
115	8.8.8.8	109ms	50	56	
116	8.8.8.8	144ms	50	56	
117	8.8.8.8	127ms	50	56	
118	8.8.8.8	178ms	50	56	
119	8.8.8.8	152ms	50	56	

121 items | 121 of 121 pack... | 0% packet loss | Min: 20 ms | Avg: 85 ms | Max: 364

Ping (Running)

General **Advanced**

Ping To: 172.25.2.1

Interface:

ARP Ping

Packet Count:

Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # /	Host	Time	Reply Size	TTL	Status
102	172.25.2.1	100ms	50	64	
103	172.25.2.1	251ms	50	64	
104	172.25.2.1	86ms	50	64	
105	172.25.2.1	12ms	50	64	
106	172.25.2.1	151ms	50	64	
107	172.25.2.1	206ms	50	64	
108	172.25.2.1	224ms	50	64	
109	172.25.2.1	92ms	50	64	
110	172.25.2.1	107ms	50	64	
111	172.25.2.1	143ms	50	64	
112	172.25.2.1	124ms	50	64	
113	172.25.2.1	154ms	50	64	
114	172.25.2.1	130ms	50	64	

116 items | 116 of 116 packets... | 0% packet loss | Min: 7 ms | Avg: 71 ms | Max: 311 ms

Latencia mas estable en 40Mhz

Ping (Running)

General Advanced

Ping To: 8.8.8.8

Interface:

ARP Ping

Packet Count:

Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # /	Host	Time	Reply Size	TTL	Status
86	8.8.8.8	62ms	50	56	
87	8.8.8.8	34ms	50	56	
88	8.8.8.8	40ms	50	56	
89	8.8.8.8	48ms	50	56	
90	8.8.8.8	40ms	50	56	
91	8.8.8.8	23ms	50	56	
92	8.8.8.8	35ms	50	56	
93	8.8.8.8	56ms	50	56	
94	8.8.8.8	72ms	50	56	
95	8.8.8.8	27ms	50	56	
96	8.8.8.8	44ms	50	56	
97	8.8.8.8	15ms	50	56	
98	8.8.8.8	45ms	50	56	
99	8.8.8.8	51ms	50	56	

100 ite... 96 of 100 pack... 4% packet loss Min: 15 ... Avg: 48 ... Max: 99 ms

Ping (Running)

General Advanced

Ping To: 172.25.2.1

Interface:

ARP Ping

Packet Count:

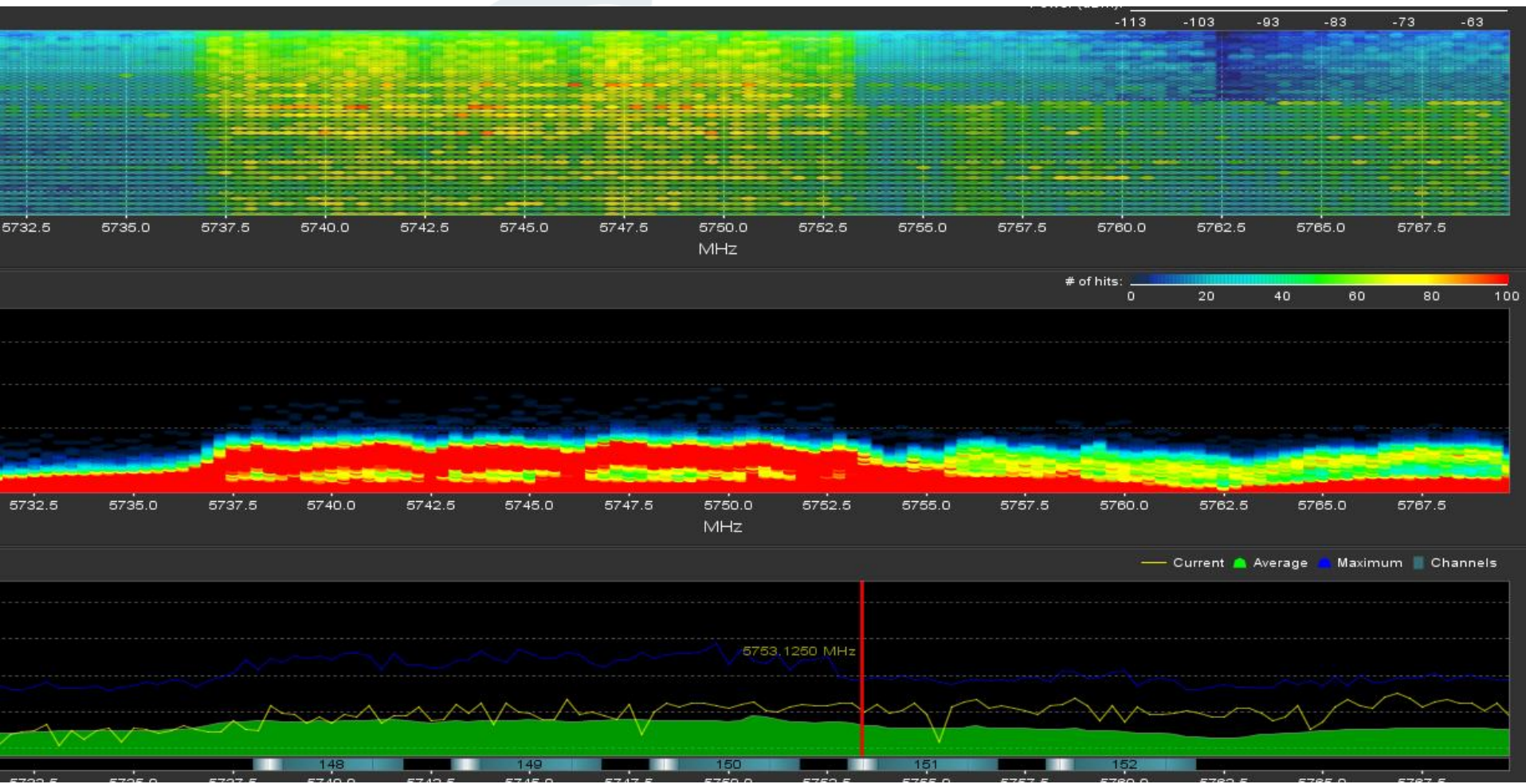
Timeout: 1000 ms

Start
Stop
Close
New Window

Seq # /	Host	Time	Reply Size	TTL	Status
80	172.25.2.1	21ms	50	64	
81	172.25.2.1	19ms	50	64	
82	172.25.2.1	25ms	50	64	
83	172.25.2.1	29ms	50	64	
84	172.25.2.1	13ms	50	64	
85	172.25.2.1	25ms	50	64	
86	172.25.2.1	45ms	50	64	
87	172.25.2.1	47ms	50	64	
88	172.25.2.1	21ms	50	64	
89	172.25.2.1	17ms	50	64	
90	172.25.2.1	2ms	50	64	
91	172.25.2.1	23ms	50	64	
92	172.25.2.1	27ms	50	64	
93	172.25.2.1	21ms	50	64	

93 item... 93 of 93 packets... 0% packet loss Min: 2 ms Avg: 30 ms Max: 92 ms

Menor ruido en canales amplios

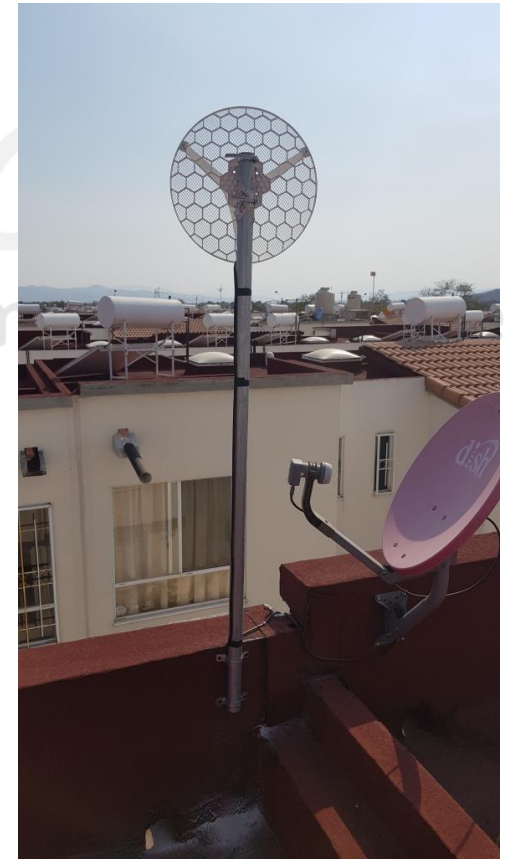


¿Cómo lograr esos niveles de señal?

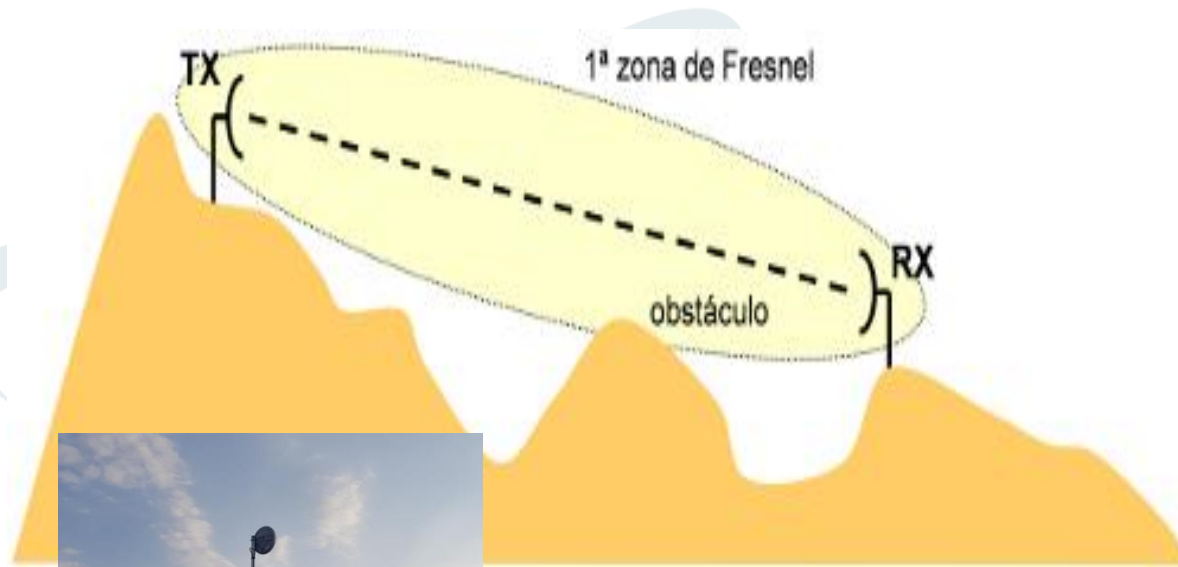
- Línea de Vista Siempre
- Fresnel no comprometido
- Usar Sectorial Adecuada
- Usar Cpe's adecuados a la distancia
- Mayor ganancia
- **Alineación precisa SIEMPRE!!!!**



Línea de vista



Librar siempre zona de fresnel



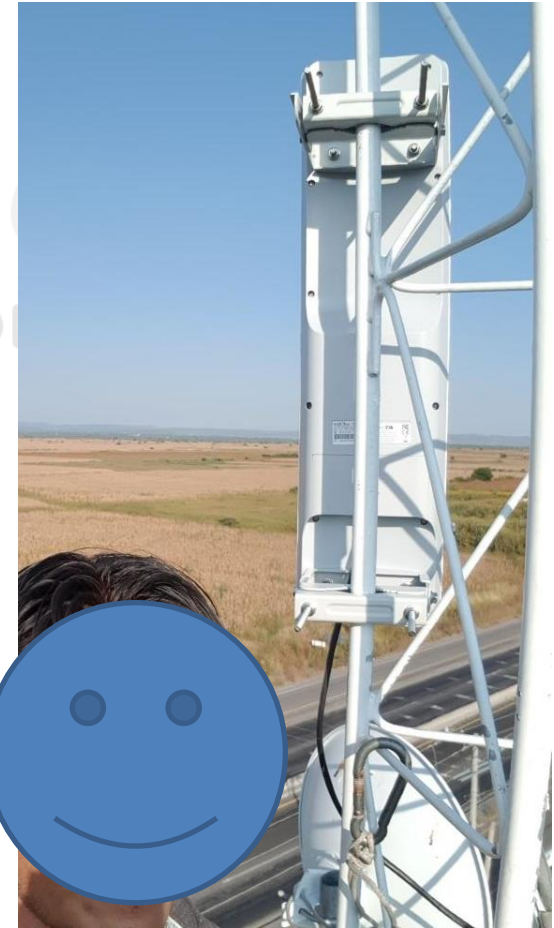
Sectorial Adecuada



1-4km

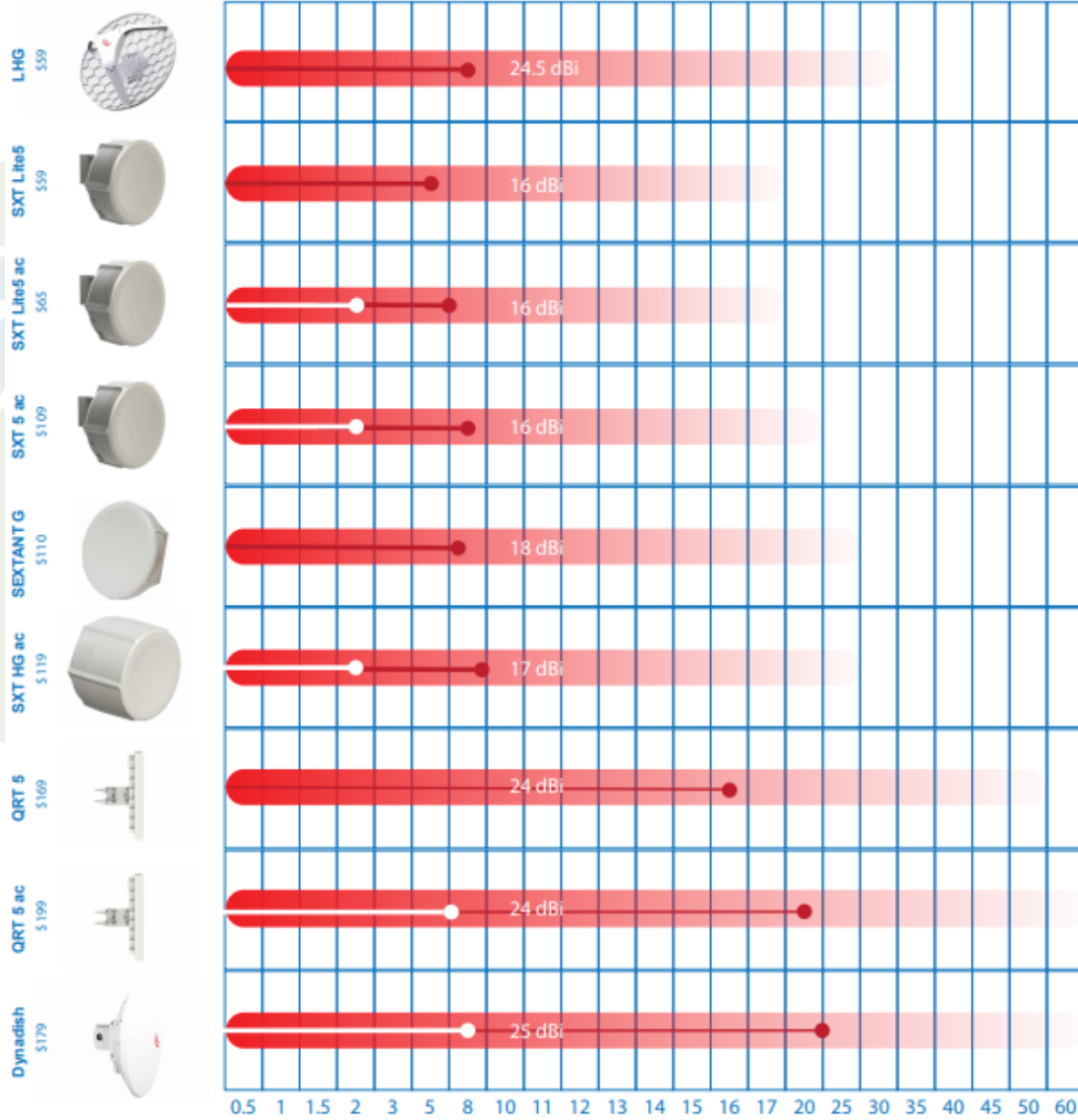


5-12km



14-16km

CPE ADECUADO



iones



¿Preguntas?

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