



# Clients & 6 GHz

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**#WiFiDesignDay**

by Ekahau and Open Reality



# YAY FOR 6 GHz



## Unlicensed Spectrum and Channel Allocations

### 2.4 GHz Channels

80 MHz

ISM Band 2407 + 5 X Ch. Number Wavelength 12.5cm - 4.9" to 12.0cm - 4.7"

Channel	1	6	11
Center Freq	2.412	2.437	2.462

### 5 GHz Channels

500 MHz

Frequency 5000 + 5 X Ch. Number Wavelength 5.8cm - 2.3" to 5.1cm - 2.0"

DFS Channels DFS Channels

Radio Band	U-NII-1				U-NII-2a				U-NII-2c (Extended)								U-NII-3								
	5.180	5.200	5.220	5.240	5.260	5.280	5.300	5.320	5.500	5.520	5.540	5.560	5.580	5.600	5.620	5.640	5.660	5.680	5.700	5.720	5.745	5.765	5.785	5.805	5.825
20 MHz	36	40	44	48	52	56	60	64	100	104	108	112	116	120	124	128	132	136	140	144	149	153	157	161	165
40 MHz	38		46		54		62		102		110		118		126		134		142		151		159		
80 MHz	42				58				106				122				138				155				
160 MHz	50								114												165 was ISM, now U-NII-3				

### 6 GHz Channels

1,200 MHz

FCC - USA 5950 + 5 X Ch. Number Wavelength 5.1cm - 2.0" to 4.2cm - 1.6"

Low Power Indoor		5dBm/MHz - Net EIRP 18dBm																							
Radio Band		UNII-5																							
Center Freq		5.955	5.975	5.995	6.015	6.035	6.055	6.075	6.095	6.115	6.135	6.155	6.175	6.195	6.215	6.235	6.255	6.275	6.295	6.315	6.335	6.355	6.375	6.395	6.415
20 MHz	Qty	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93
40 MHz	Qty	3		11		19		27		35		43		51		59		67		75		83		91	
80 MHz	Qty	7				23				39				55				71				87			
160 MHz	Qty	15				47				79															



# SPEED DATING

Clients move from channel-to-channel probing for service.

Hello?  
Is AwesomeSSID here?  
I'm a 2-stream non-smoking client looking for a connection with a like minded access point

**Channel 1**



Hello?  
Is AwesomeSSID here?  
I'm a 2-stream non-smoking client looking for a connection with a like minded access point

**Channel 36**



\*I wonder if anyone is here\*  
I heard you! Hello?  
Is AwesomeSSID...

**Channel 52**

# WINNING STRATEGIES



Also known as "11k". Clients can request a list of nearby channels & BSSID's from the access point. Usually done shortly after connecting when connection is solid

## Neighbour Reports



Part of 802.11v, not 11k. Unsolicited information about nearby channels & SSID's is included by access points in their Beacons & Probe Responses

## Reduced Neighbour Reports (RNR)



Don't make clients scan all 59 channels, nominate designed channels to operate as the Primary. Doesn't work for 20/40MHz channel widths due to PSC 80MHz spacing

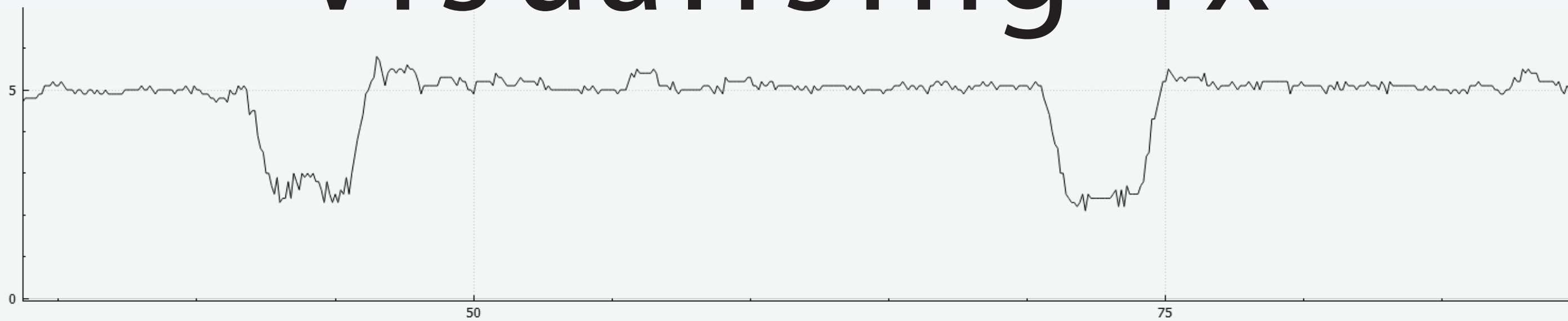
## Preferred Scanning Channels (PSC)

# DATA COLLECTION

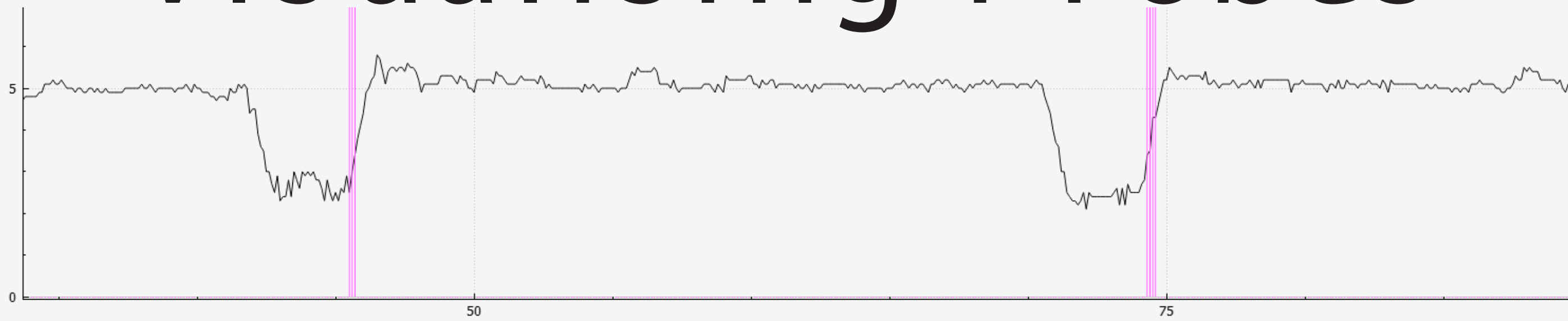


Test	Description	Band	PSC	RNR	Width	11k	SSID	Channels
1	5GHz-Only	5	N/A	N/A	20	✓	5-only	36,40,44
2		6	Ch5	-	20	✓	6-only	1,5,9
3	6GHz only	6	Ch5,21	-	40	✓	6-only	3,11,19
4		6	Ch5,21,37	-	80	✓	6-only	7, 23, 39
5		6	Ch5	-	20	-	6-only-nok	1,5,9
6	6GHz only w/o 11k	6	Ch5,21	-	40	-	6-only-nok	3,11,19
7		6	Ch5,21,37	-	80	-	6-only-nok	7, 23, 39
8		5+6	Ch5	✓	20	-	5-6-dual	36,40,44,1,5,9
9	5+6GHz w/ same SSID	5+6	Ch5,21	✓	40	-	5-6-dual	36,40,44,3,11,19
10		5+6	Ch5,21,37	✓	80	-	5-6-dual	36,40,44,7,23,39
11		5+6	Ch5	✓	20	-	5-only+6-only	36,40,44,1,5,9
12	5+6GHz w/ diff SSID	5+6	Ch5,21	✓	40	-	5-only+6-only	36,40,44,3,11,19
13		5+6	Ch5,21,37	✓	80	-	5-only+6-only	36,40,44,7,23,39
14		2.4+6	Ch5	✓	20	-	2.4-only+6-only	1,6,11,1,5,9
15	2.4+6GHz w/ diff SSID	2.4+6	Ch5,21	✓	40	-	2.4-only+6-only	1,6,11,3,11,19
16		2.4+6	Ch5,21,37	✓	80	-	2.4-only+6-only	1,6,11,7, 23, 39

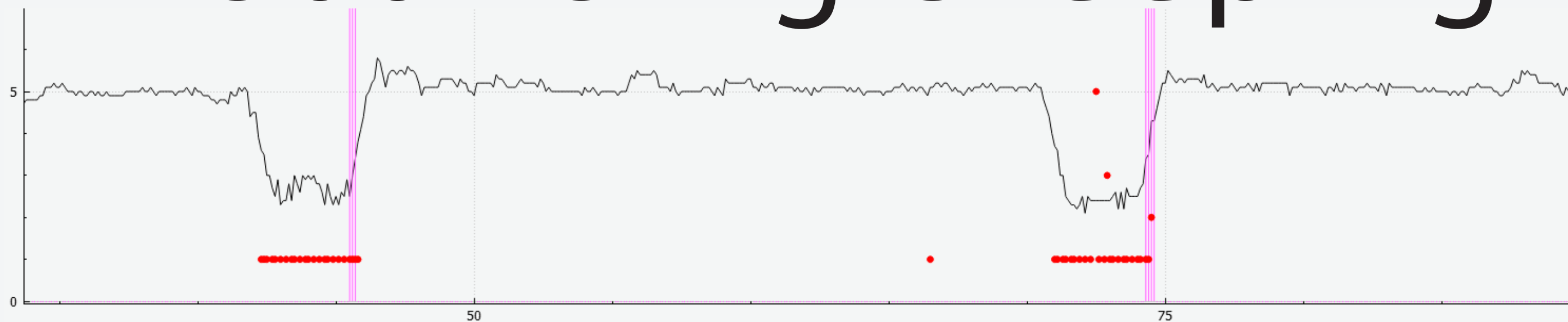
# Visualising Tx



# Visualising Probes

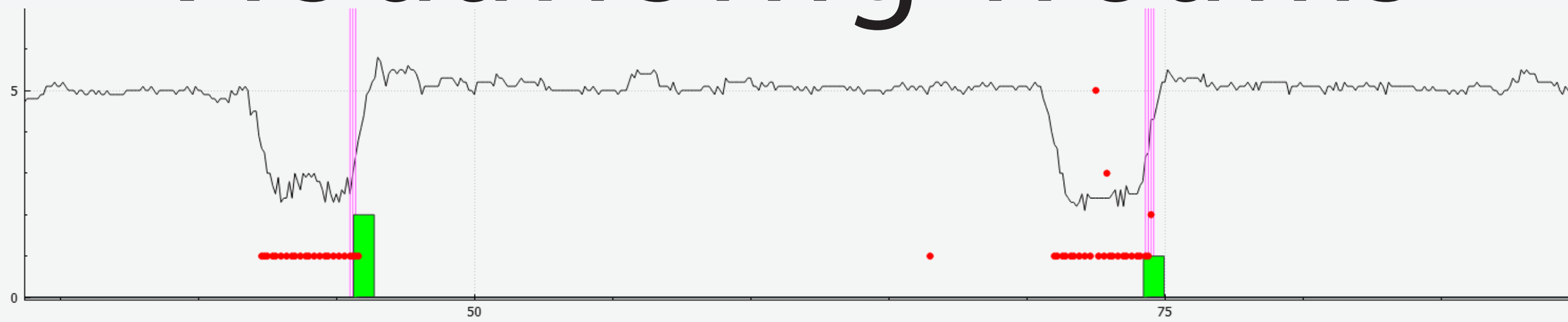


# Visualising Sleeping



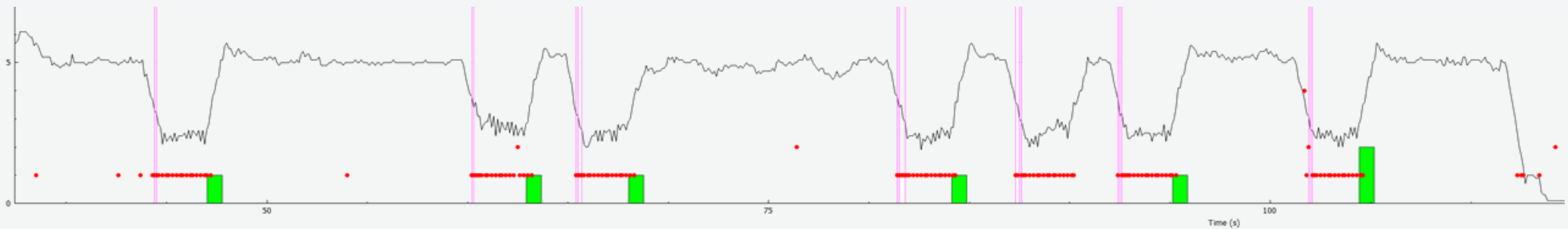


# Visualising Roams

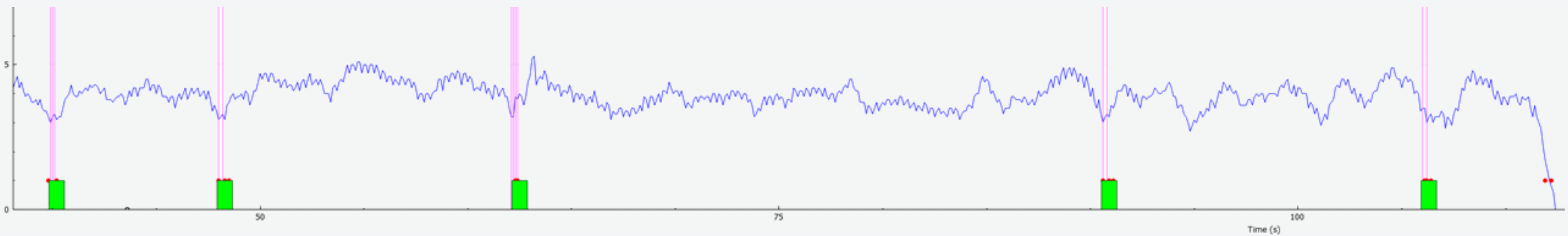


# 5GHz - 20MHz

iPhone 15 Pro Max

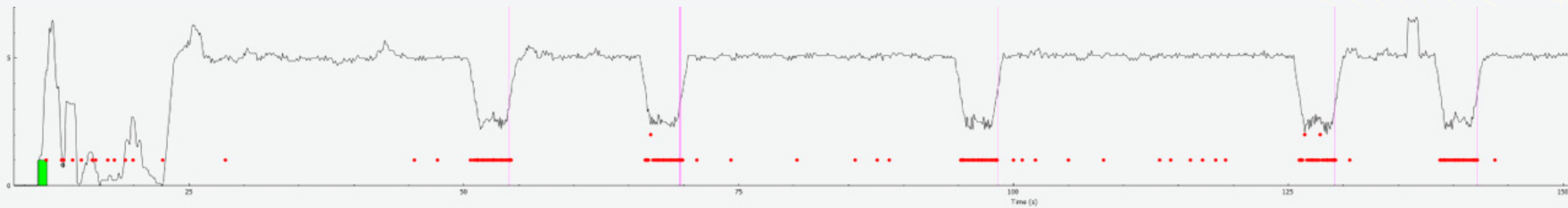


Google Pixel 7a

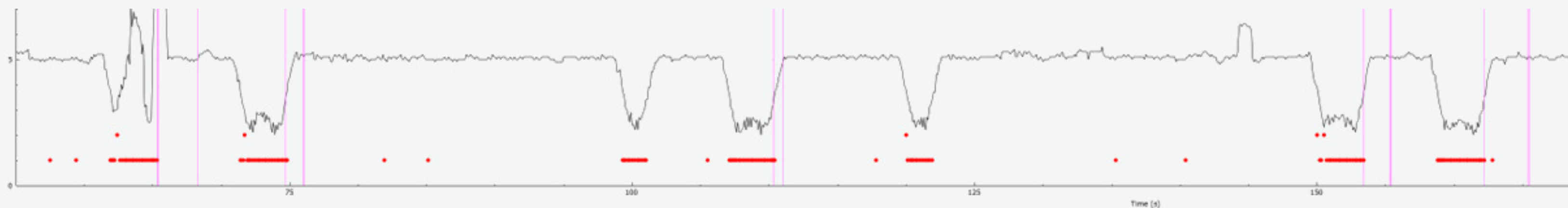


# IPHONE – 20MHz

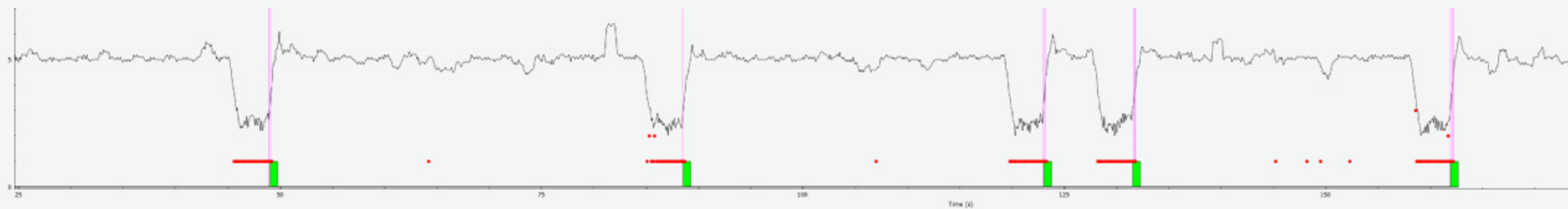
6GHz Only  
SSID  
without 11k



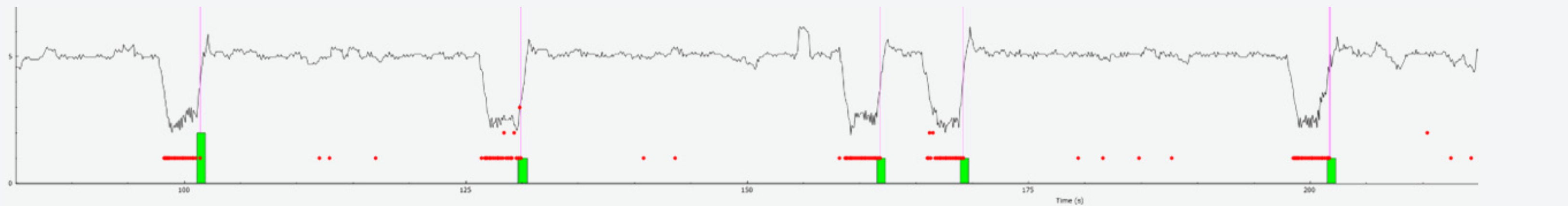
6GHz Only  
SSID  
with 11k



5 & 6GHz  
Dual band  
SSID

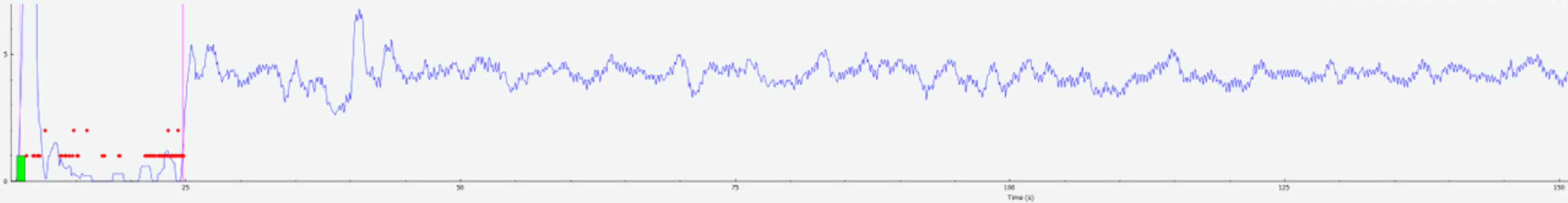


5GHz Only  
&  
6GHz Only  
SSID's

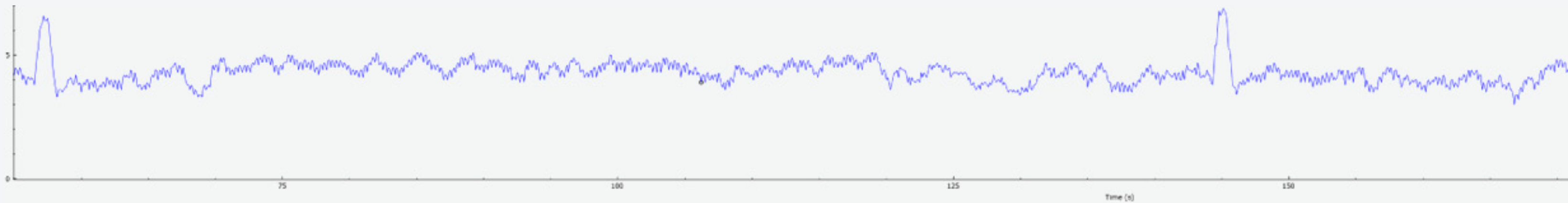


# PIXEL – 20MHz

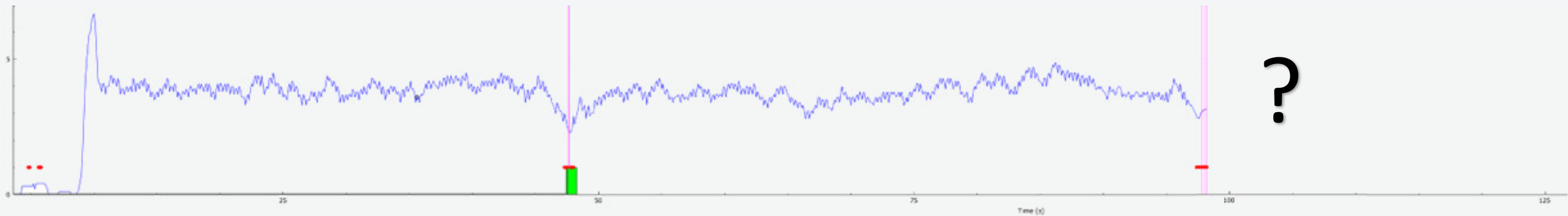
6GHz Only  
SSID  
without 11k



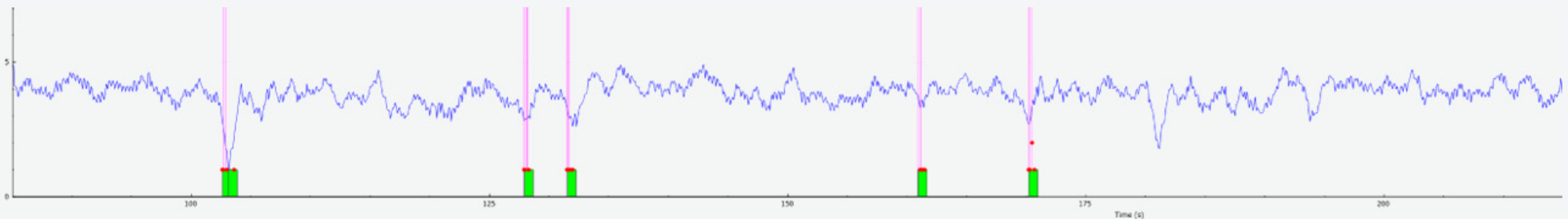
6GHz Only  
SSID  
with 11k



5 & 6GHz  
Dual band  
SSID

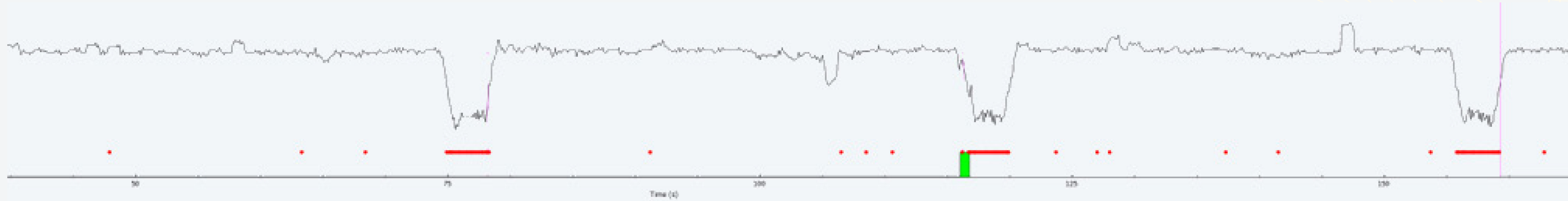


5GHz Only  
&  
6GHz Only  
SSID's

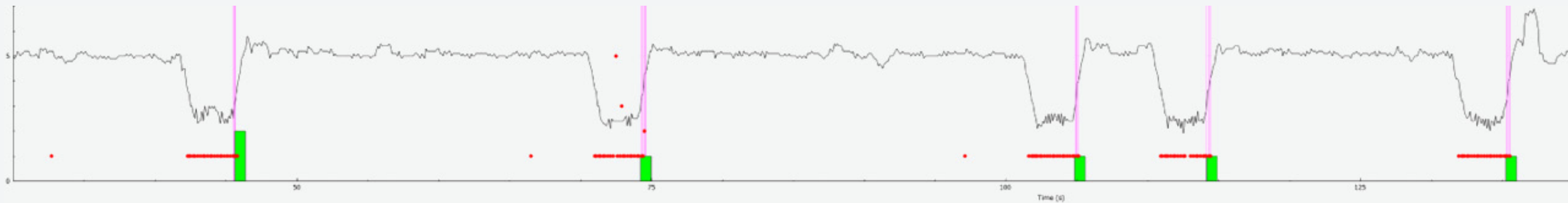


# IPHONE - 40MHz

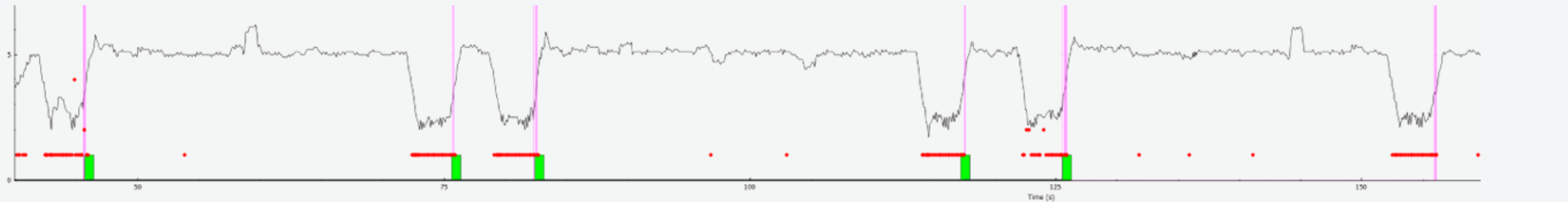
6GHz Only  
SSID  
without 11k



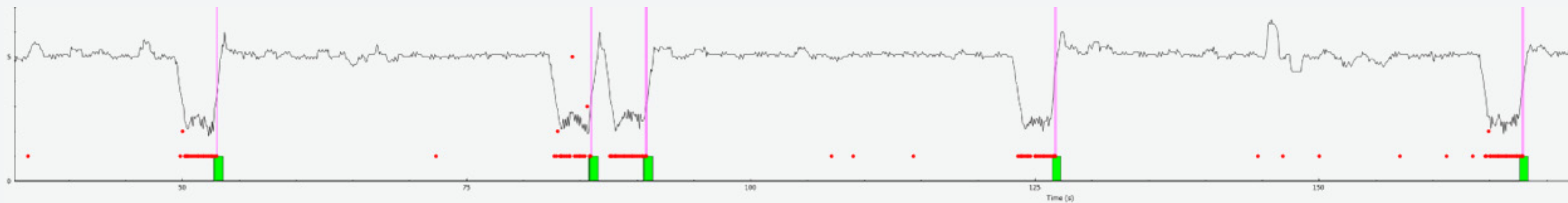
6GHz Only  
SSID  
with 11k



5 & 6GHz  
Dual band  
SSID

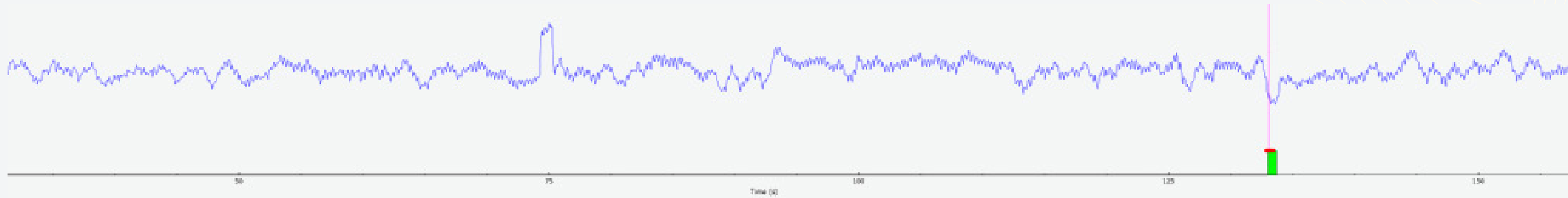


5GHz Only  
&  
6GHz Only  
SSID's

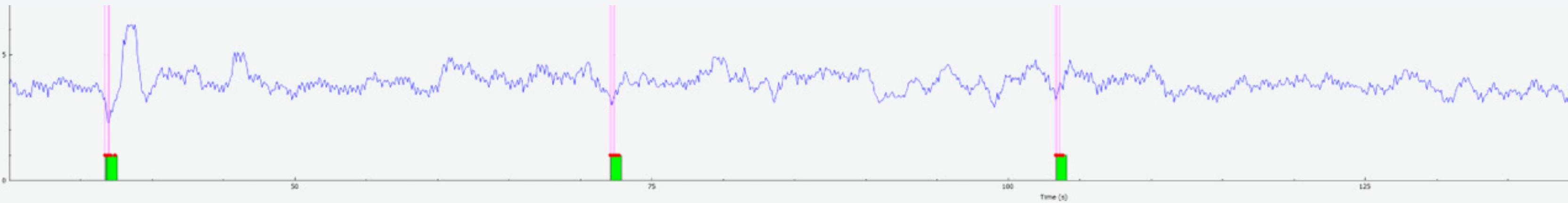


# PIXEL - 40MHz

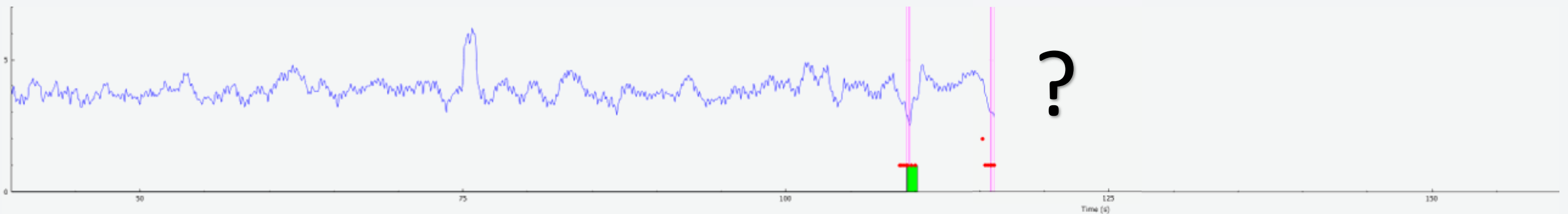
6GHz Only  
SSID  
without 11k



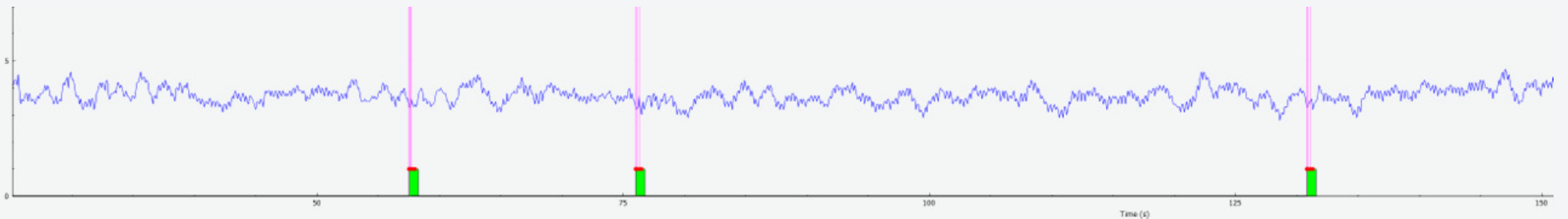
6GHz Only  
SSID  
with 11k



5 & 6GHz  
Dual band  
SSID

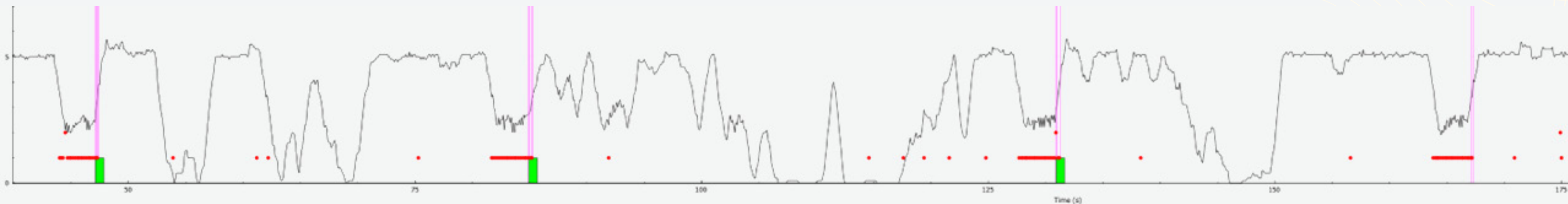


5GHz Only  
&  
6GHz Only  
SSID's

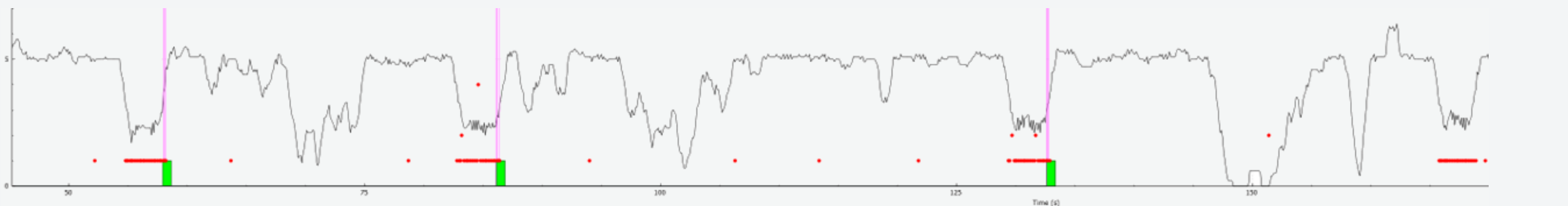


# IPHONE – 80MHz

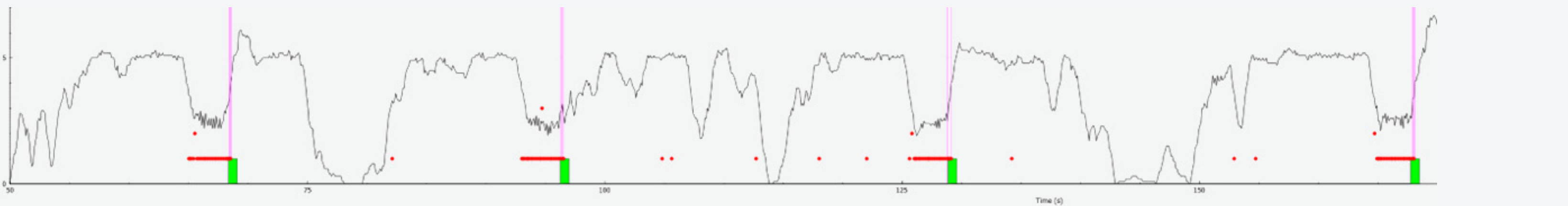
6GHz Only  
SSID  
without 11k



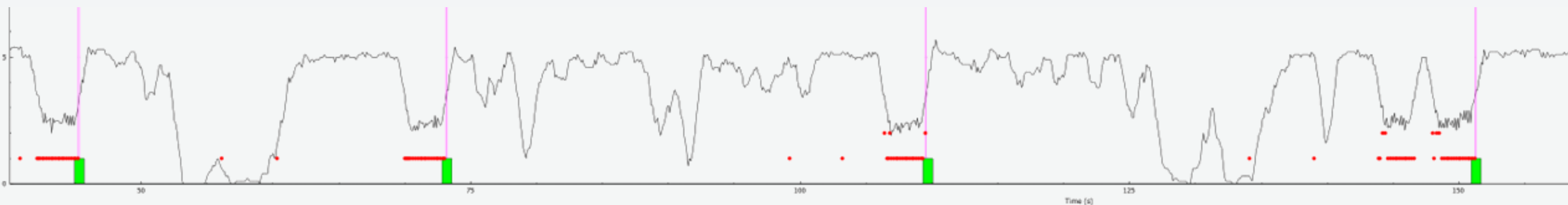
6GHz Only  
SSID  
with 11k



5 & 6GHz  
Dual band  
SSID

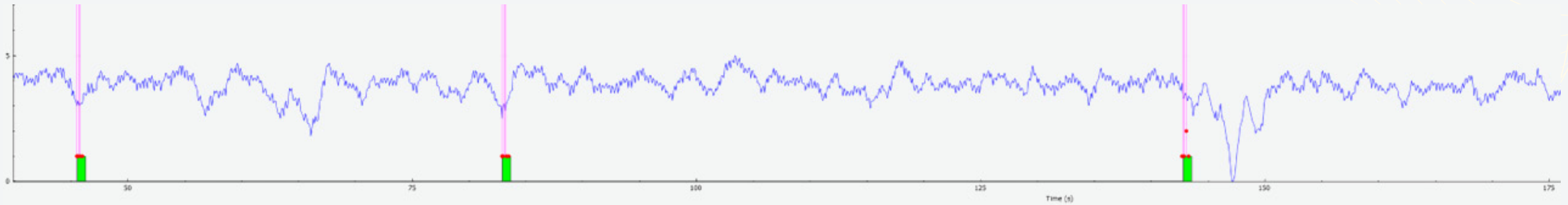


5GHz Only  
&  
6GHz Only  
SSID's

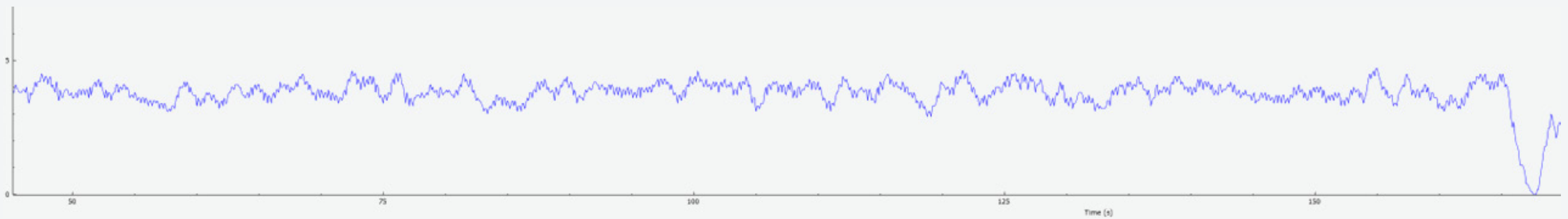


# PIXEL – 80MHz

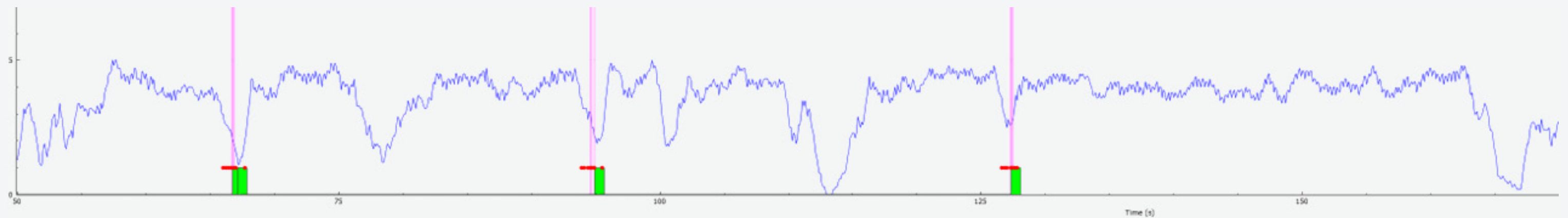
6GHz Only  
SSID  
without 11k



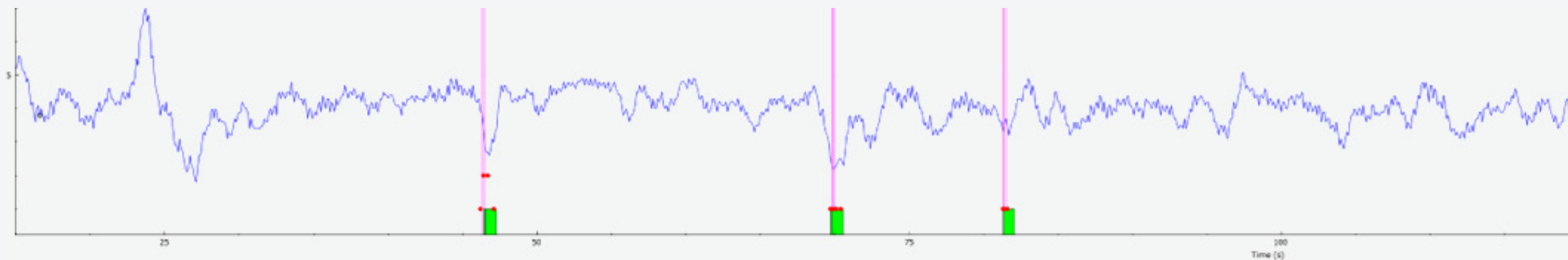
6GHz Only  
SSID  
with 11k



5 & 6GHz  
Dual band  
SSID



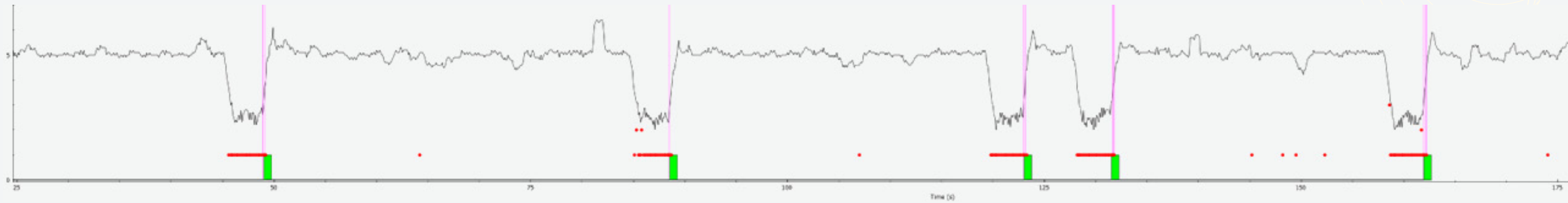
5GHz Only  
&  
6GHz Only  
SSID's



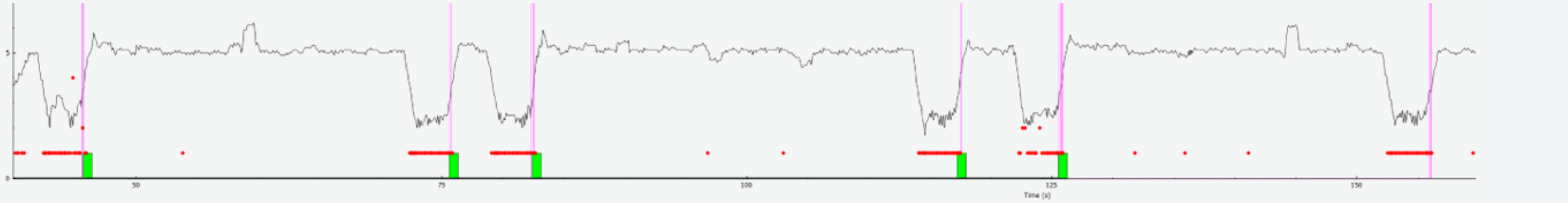


# IPHONE – DUAL BAND SSID

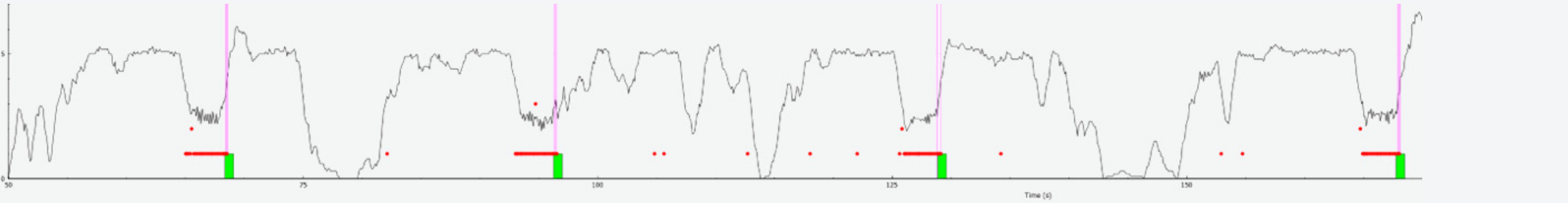
20MHz



40MHz

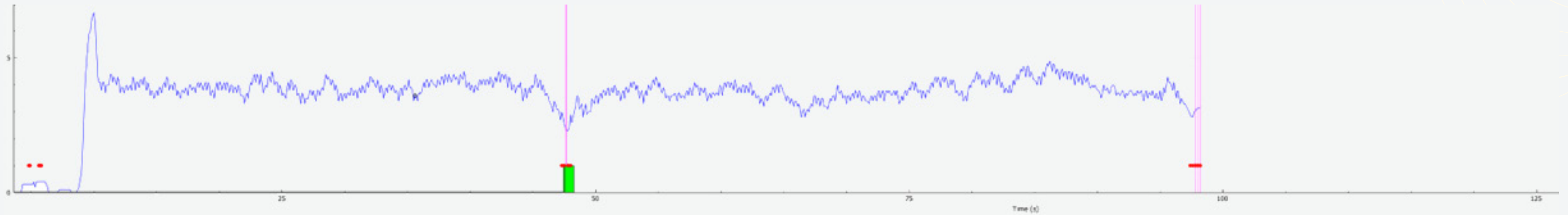


80MHz

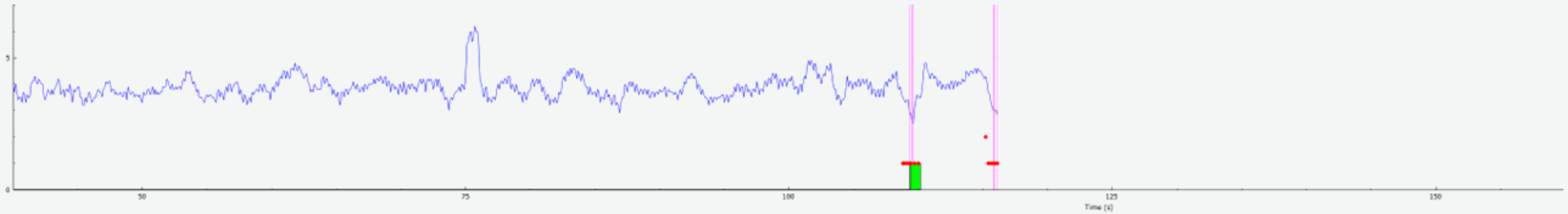


# PIXEL – DUAL BAND SSID

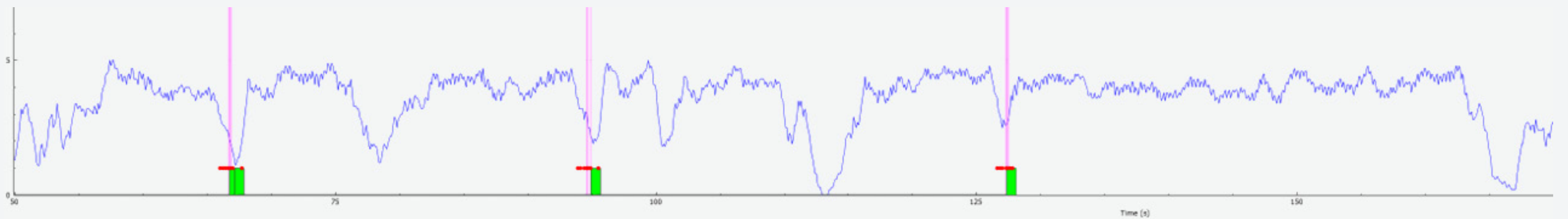
20MHz



40MHz

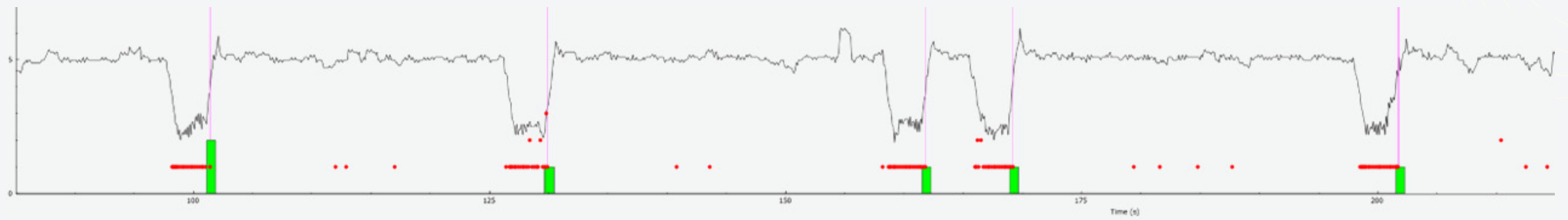


80MHz

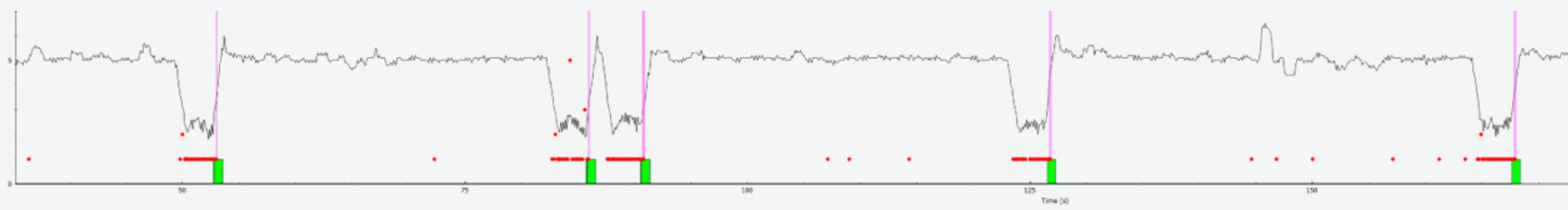


# IPHONE – SPLIT BAND SSID'S

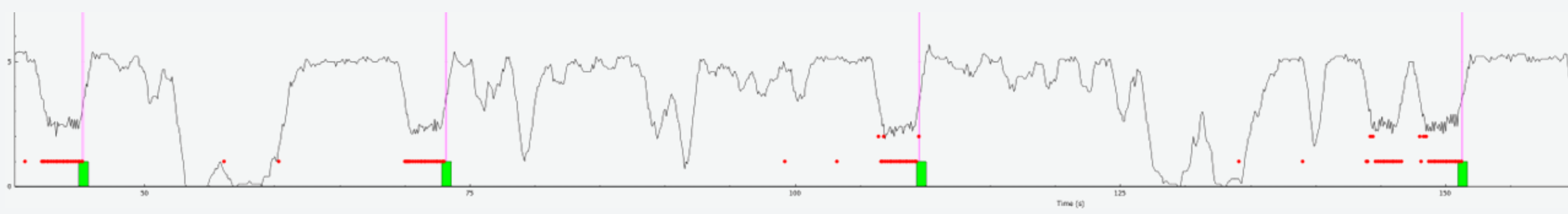
20MHz



40MHz

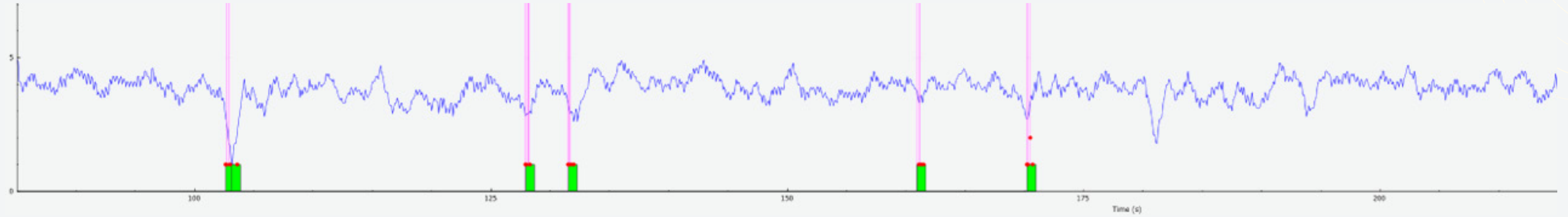


80MHz

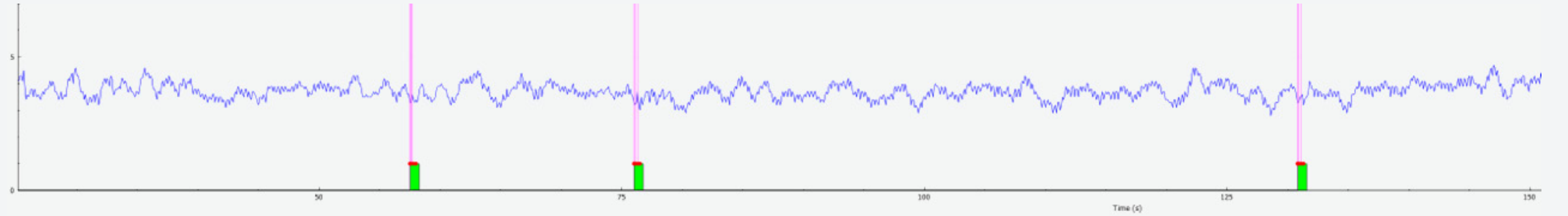


# PIXEL – SPLIT BAND SSID'S

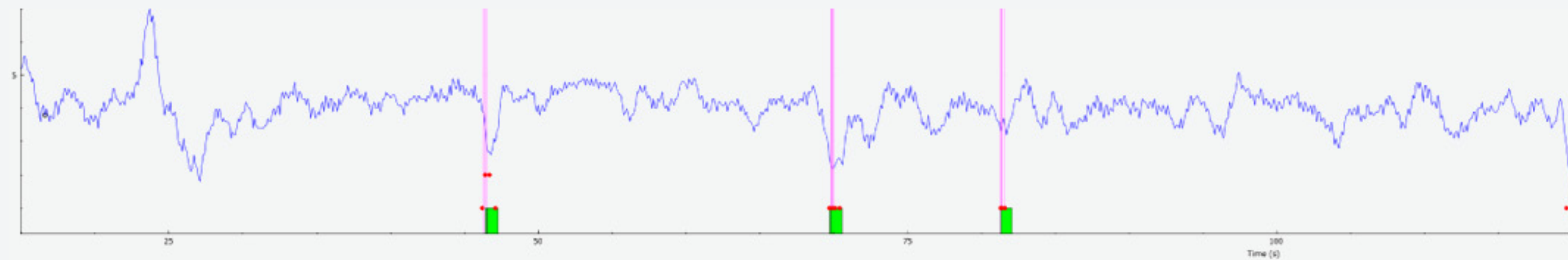
20MHz



40MHz



80MHz



# CONCLUSIONS

n° 1

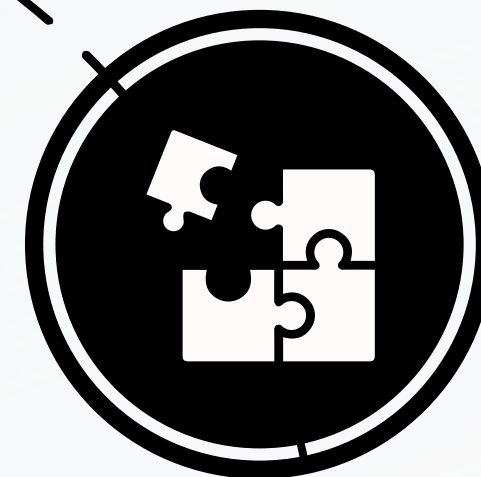
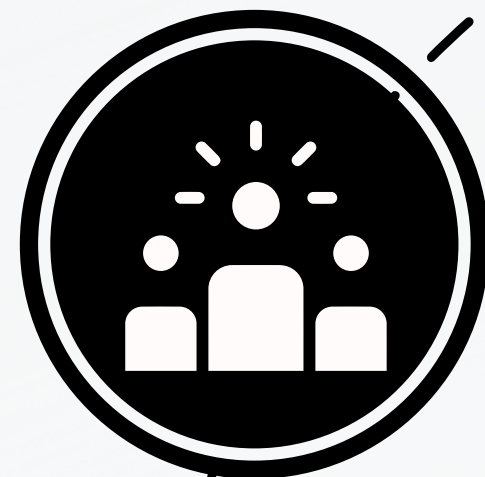
Greenfield 6GHz only installs at 20MHz channel widths won't perform well, even with 11k enabled. Even 40MHz wide will struggle without 11k enabled.

n° 2

Thankfully 6GHz 20MHz channels do perform well when twinned with a 5GHz radio. It doesn't matter whether 5GHz has the same or a different SSID

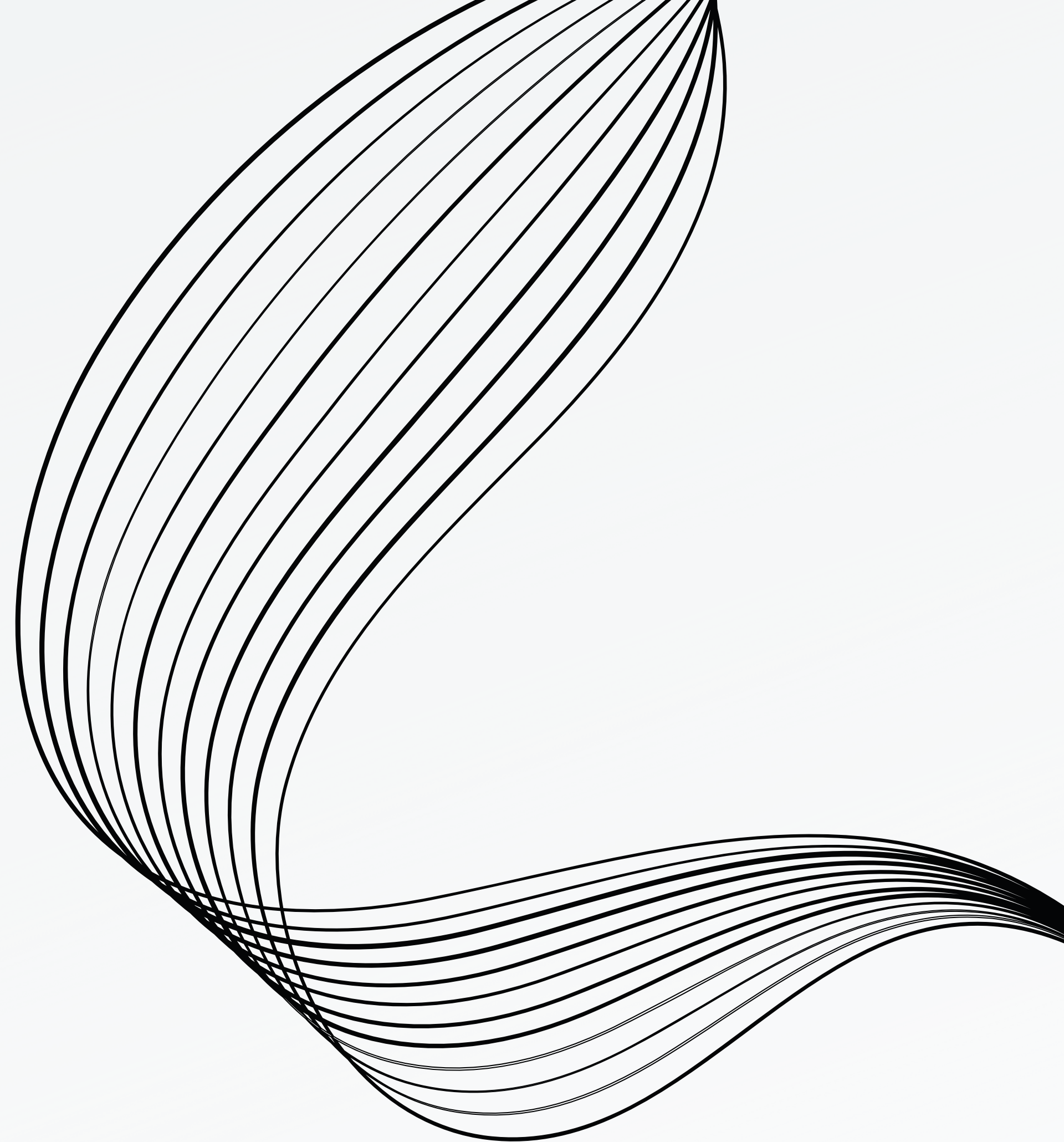
n° 3

The length of time required to scan for a roam candidate has only increased slightly despite the number of channels almost doubling.



# THANK YOU

Andrew McHale  
andrew@mac-wifi.com  
@mac\_wifi





01

02

03

04

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JANUARY

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FEBRUARY

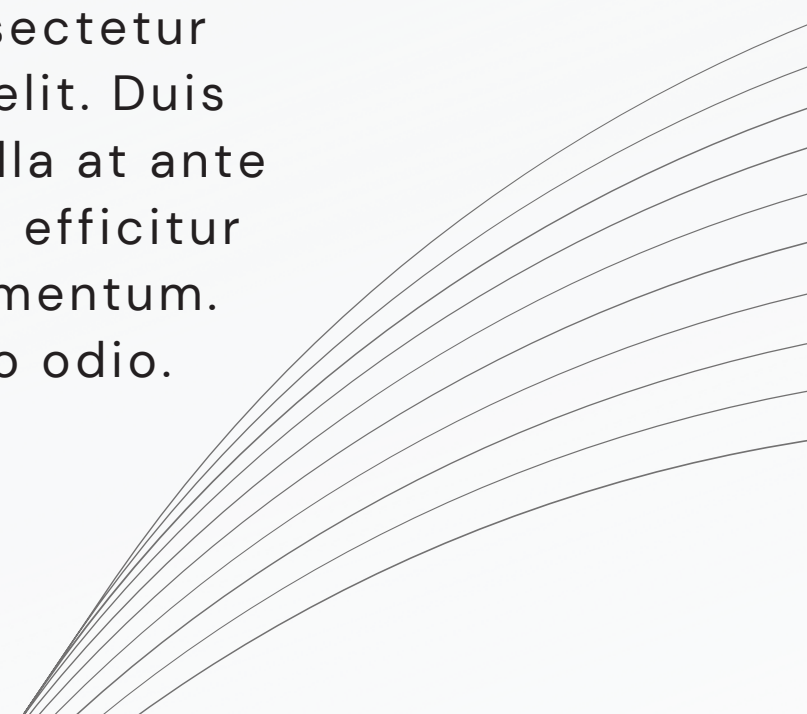
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MARCH

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APRIL

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# IPHONE – 160MHz

6GHz Only  
SSID  
without 11k

6GHz Only  
SSID

5 & 6GHz  
Dual band  
SSID

5GHz Only  
&  
6GHz Only  
SSID's



# IPHONE – 20MHz

6GHz Only  
SSID  
without 11k

6GHz Only  
SSID

5 & 6GHz  
Dual band  
SSID

5GHz Only  
&  
6GHz Only  
SSID's

# VALUES

## Mission



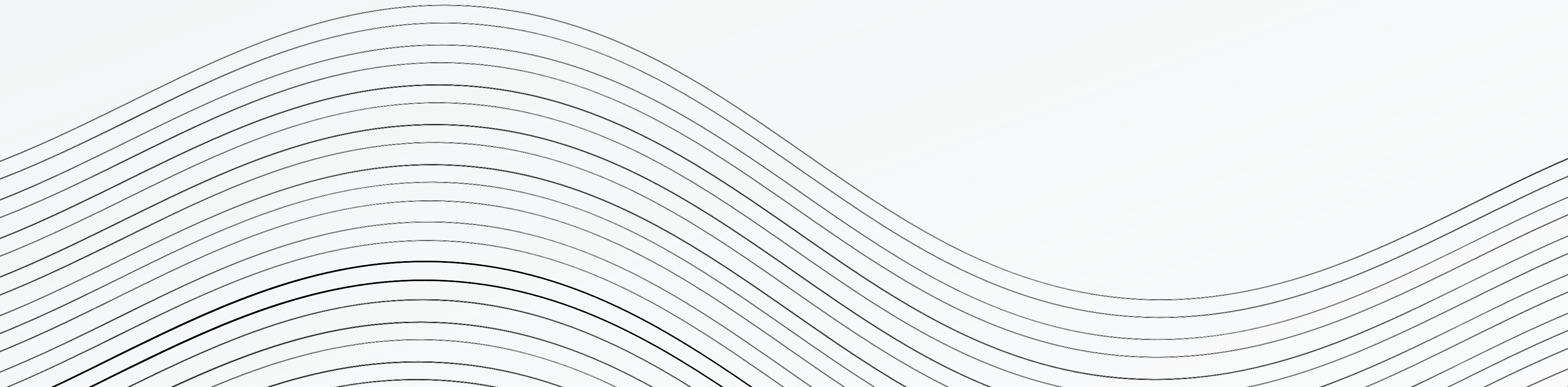
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## Vision



# STRATEGIES





36

40

44

48

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Hello?

Anybody here?

FEBRUARY

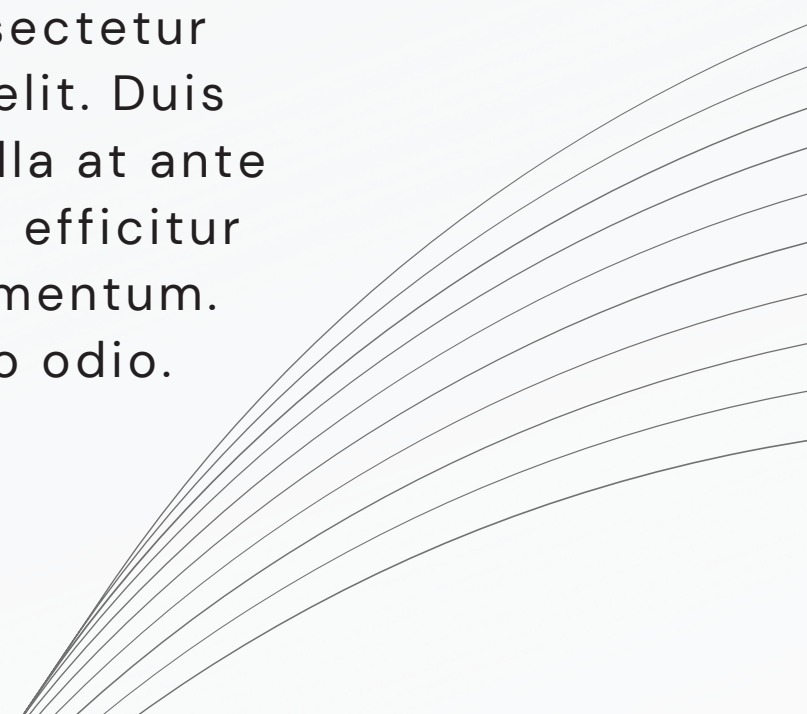
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MARCH

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APRIL

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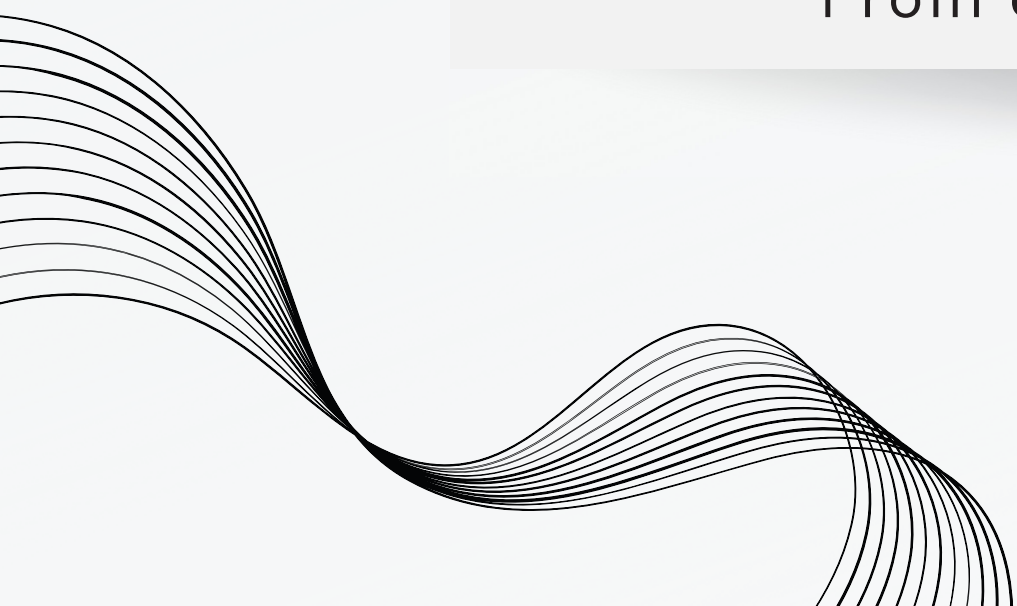
# ABOUT US



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# GOALS AND OBJECTIVES

## Objective n° 1

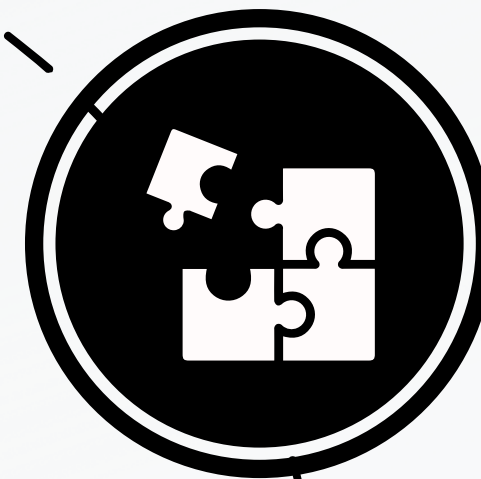
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## Objective n° 2

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## Objective n° 3

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# VALUES

## Mission



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## Vision





# PROJECT TIMELINE

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# CONTENT

- 01 ABOUT US
- 02 OUR TEAM
- 03 STRATEGY
- 04 OUR SERVICES
- 05 EXPERIENCE
- 06 QUARTER
- 07 NEXT PROJECT



01

02

03

04

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JANUARY

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FEBRUARY

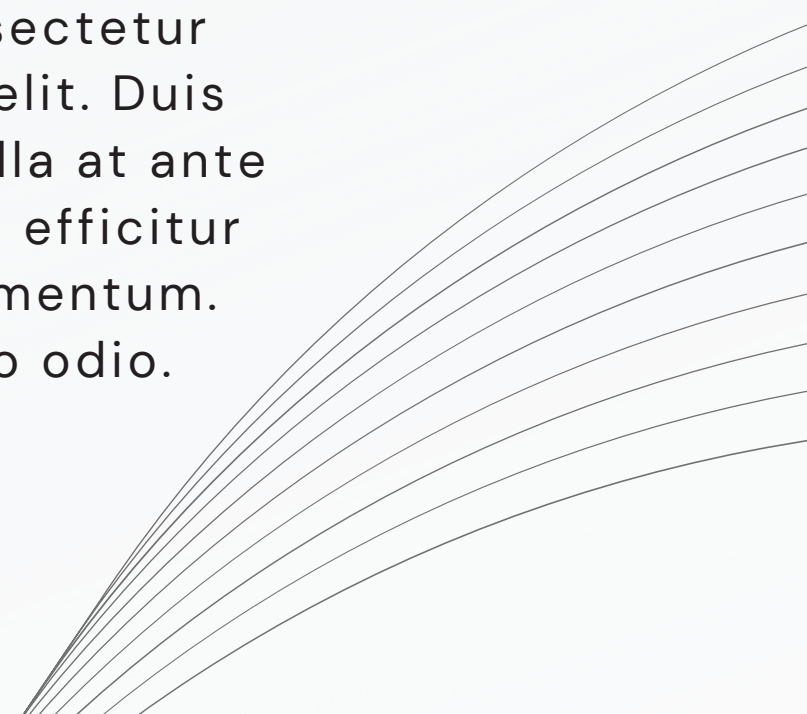
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MARCH

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APRIL

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# CONCEPT IN BUSINESS

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# STATISTICS

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# NEXT PROJECT

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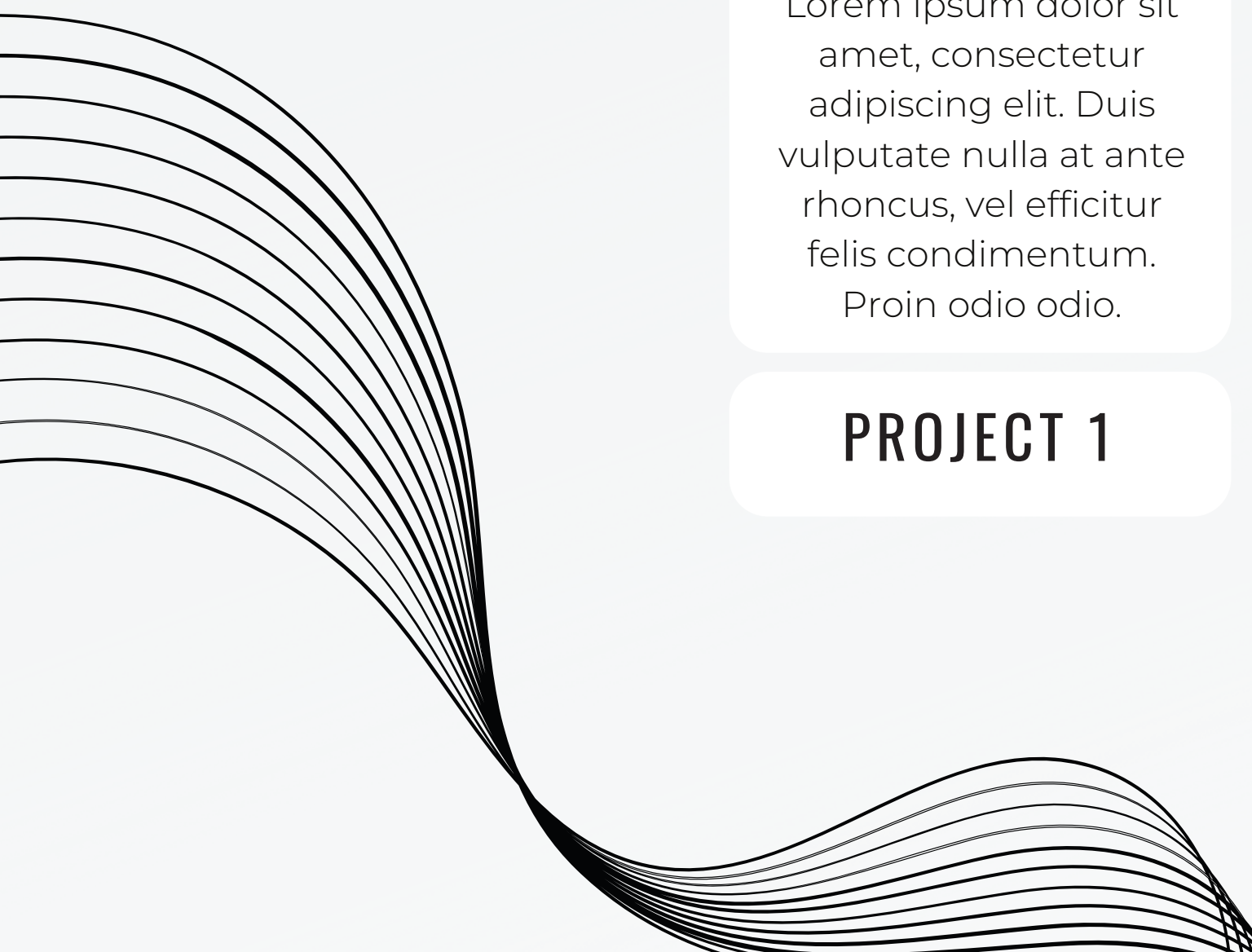
**PROJECT 1**

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**PROJECT 2**

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**PROJECT 3**



# TESTIMONIALS



**Rufus Stewart**



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**Morgan Maxwell**



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# STRATEGIES



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**STRATEGY N°1**



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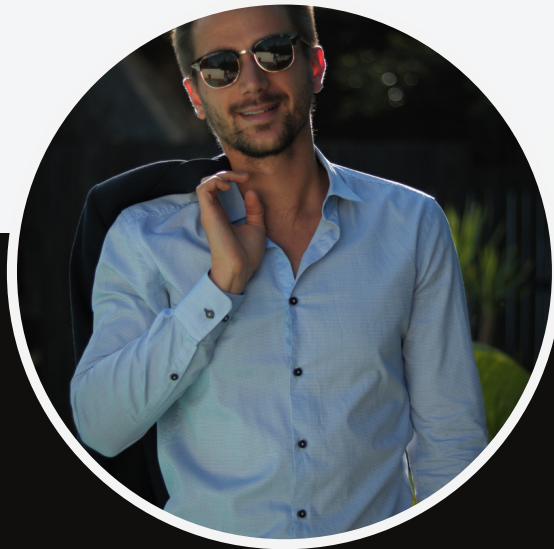
**STRATEGY N°2**



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**STRATEGY N°3**

# OUR TEAM



Everest  
Cantu  
Ceo Of Ingoude  
Company



Drew  
Holloway  
Ceo Of Ingoude  
Company



Remy  
Marsh  
Ceo Of Ingoude  
Company