

EMC Test Report

Project Number: 5179386**Offer Number: SUW-202407006787****Report Number: 5179386EMC09****Revision Level: 0****Client: Alarm.com Incorporated****Equipment Under Test: Premium Video Camera****Model: V730****FCC ID: YL6-143V730****IC ID: 9111A-143V730****FCC Rule Parts: FCC Part 15.407 DFS****ISED: RSS-247, Issue 3 (August 2023)****Test Procedure: KDB 905462 D02 v02****Report issued on: 17 January 2025****Report revised on: 05 March 2025****Test Result: Compliant**

FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER: 3212.01

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1 Summary of Test Results

Summary of test results for a client only device without radar detection

Description of Test	Measurement	Limit	Test Result
Channel Move Time	139 ms	10 seconds	Compliant
Channel Closing Time	144 ms	200 ms + aggregate of 60 ms over remaining 10 second period	Compliant
Client Beacon Test	Moved Channel with Client	No client transmissions	Compliant

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: Alarm.com Incorporated
Address: 8281 Greensboro Drive, Suite 100
City, State, Zip, Country: Tysons, VA 22102, USA

2.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA
FCC Site: US1126
Industry Canada Site: 9984A-2
Accrediting Body: A2LA
Accreditation Certificate: 3212-01

2.3 General Information of EUT

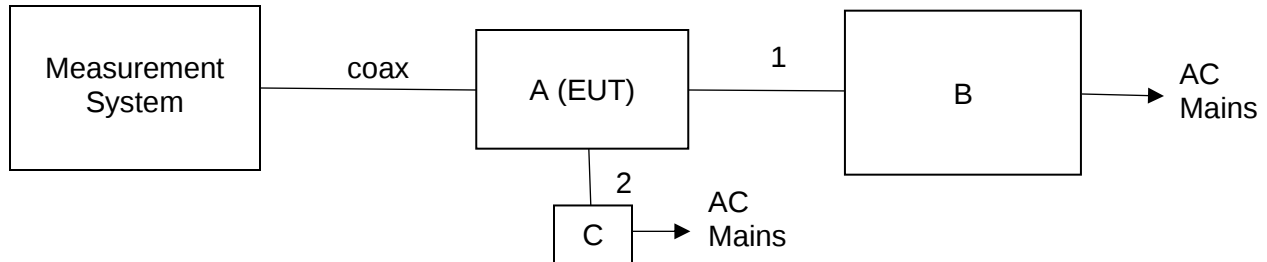
Equipment Under Test: Premium Video Camera
Model: V730
Serial Numbers: 504074C00096 (Conducted Sample)
504074C0250 (Radiated Sample)

Mode of Operation: Client Device (No radar detection)
Frequency: 5260 – 5320 MHz
5500 – 5700 MHz
Output power, conducted: 155.23 mW / 21.91 dBm (802.11a UNII Band 2A)
191.86 mW / 22.83 dBm EIRP (802.11a UNII Band 2C)
Modulation: OFDM
Channel Bandwidth: 20, 40 MHz

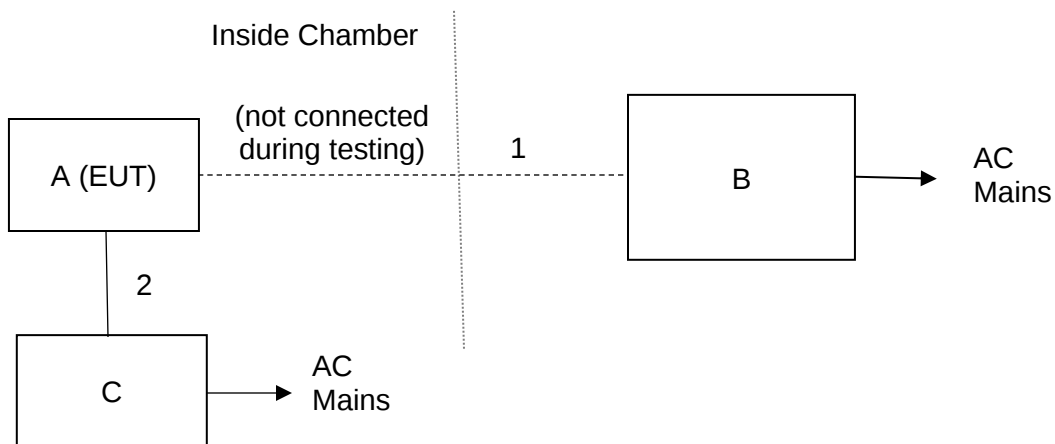
Rated Voltage: 12 VDC
Test Voltage: 12 VDC

Sample Received Date: 06 August 2024
Dates of testing: 16 January 2025 – 17 January 2025

2.4 EUT Connection Block Diagram – Conducted Measurements



2.5 EUT Connection Block Diagram – Radiated Measurements



2.6 System Configurations

Device Reference	Manufacturer	Description	Model Number	Serial Number
A	Alarm.com Incorporated	Premium Video Camera	V730	504074C00096 (Conducted Sample) 504074C0250 (Radiated Sample)
B	Lenovo	Laptop Computer	T440P	PB-00UTCU 14/02
C	Asian Power Devices Inc.	External AC/DC Adapter	WB-12G12FU	D3J120447000 (Conducted Sample) D3F230781700 (Radiated Sample)

2.7 Cable List

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	USB	EUT	Laptop Computer	1.0	N	N
2	DC Power Cable	EUT	External AC/DC Adapter	1.3	N	N

3 Dynamic Frequency Selection Technical Requirements

3.1 Applicability

Applicability of DFS Requirements Prior to Use of a Channel			
Requirement	Operational Mode		
	Master	Client without radar detection	Client with Radar detection
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
U-NII Detection Bandwidth	Yes	Not required	Yes

Applicability of DFS requirements during normal operation			
Requirement	Operational Mode		
	Master	Client without radar detection	Client with Radar detection
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes
U-NII Detection Bandwidth	Yes	Not required	Yes

3.2 Test Requirements for Client Devices

- a) A Client Device will not transmit before having received appropriate control signals from a Master Device.
- b) A Client Device will stop all its transmissions whenever instructed by a Master Device to which it is associated and will meet the Channel Move Time and Channel Closing Transmission Time requirements. The Client Device will not resume any transmissions until it has again received control signals from a Master Device.
- c) If a Client Device is performing In-Service Monitoring and detects a Radar Waveform above the DFS Detection Threshold, it will inform the Master Device. This is equivalent to the Master Device detecting the Radar Waveform and d) through f) of section 5.1.1 apply.
- d) Irrespective of Client Device or Master Device detection the Channel Move Time and Channel Closing Transmission Time requirements remain the same.
- e) The client test frequency must be monitored to ensure no transmission of any type has occurred for 30 minutes. Note: If the client moves with the master, the device is considered compliant if nothing appears in the client non-occupancy period test. For devices that shut down (rather than moving channels), no beacons should appear.

DFS Detection Thresholds	
Maximum Transmit Power	Value ^{1,2,3}
EIRP ≥ 200 milliwatt	-64 dBm
EIRP < 200 milliwatt and power spectral density < 10 dBm/MHz	-62 dBm
EIRP < 200 milliwatt that do not meet the power spectral density requirement	-64 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna. Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response. Note3: EIRP is based on the highest antenna gain. For MIMO devices refer to KDB Publication 662911 D01.	

Response Requirements	
Parameter	Value
Non-occupancy period	Minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds ¹
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. ^{1,2}
U-NII Detection Bandwidth	Minimum 100% of the U-NII 99% transmission power bandwidth. ³
Note 1: Channel Move Time and the Channel Closing Transmission Time should be performed with Radar Type 0. The measurement timing begins at the end of the Radar Type 0 burst. Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate a Channel move (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the U-NII Detection Bandwidth detection test, radar type 0 should be used. For each frequency step the minimum percentage of detection is 90 percent. Measurements are performed with no data traffic.	

3.3 Radar Test Waveforms

For a Client Device without DFS, the Channel Move Time and Channel Closing Transmission Time requirements will be verified with one of the defined Short Pulse Radar Types. Radar Pulse Type 0 was used for the channel move time and channel closing time tests.

Short Pulse Radar Test Waveforms					
Radar Type	Pulse Width (μsec)	PRI (μsec)	Number of pulses	Minimum Percentage of Successful Detection	Minimum Number of Trials
0	1	1428	18		
1	1	Refer to KDB 905462 D02		60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate of Radar Types 1-4				80%	120

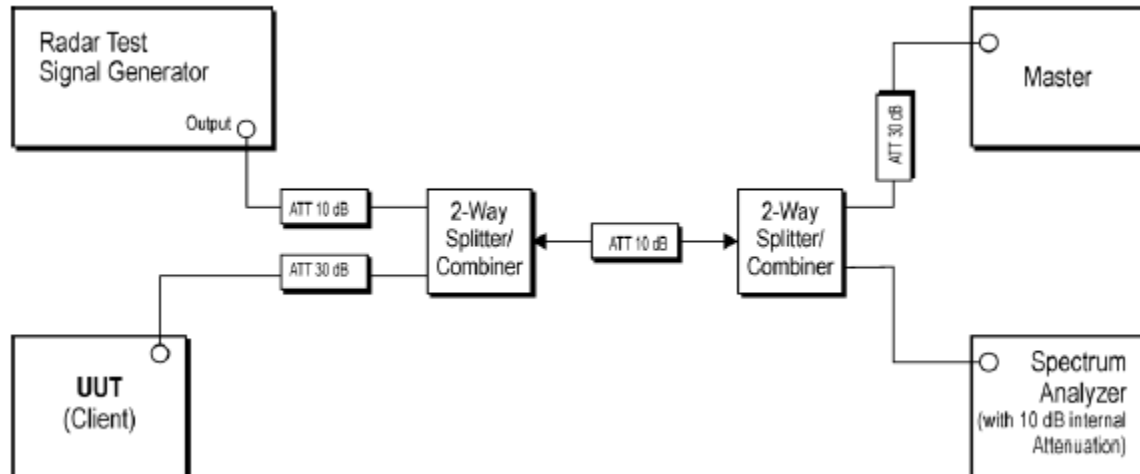
Long Pulse Radar Test Waveforms							
Radar Type	Pulse Width (μsec)	Chirp Width (MHz)	PRI (μsec)	Number of Pulses per Burst	Number of Bursts	Minimum Percentage of Successful Detection	Minimum Number of Trials
5	50-100	5-20	1000-2000	1-3	8-20	80%	30

Frequency Hopping Radar Test Waveform							
Radar Type	Pulse Width (μsec)	PRI (μsec)	Pulses per hop	Hopping rate (kHz)	Hopping Sequence length (msec)	Minimum Percentage of Successful Detection	Minimum Number of Trials
6	1	333	9	0.333	300	70%	30

3.4 Test Procedures

The conducted test setup was used for this testing. One channel was chosen for testing.

1. Connect equipment to the R&S TS8997. The figure below shows the concept of the connections.



2. The radar test signal level was set at the Master Device – Radar Detection Device according to the appropriate DFS Detection Threshold.
3. Communication between the Master and the Client (EUT) was established and was on a channel that contains control signals.
4. System testing was performed with channel-loading using means appropriate to the data types that are used by the unlicensed device. The following method was used:
 - Software with random ping intervals was used to ping the client in order to simulate data transfer.
5. Timing plots were recorded that demonstrate a minimum channel loading of approximately 17% or greater. The channel loading was estimated by setting the spectrum analyzer for zero span which shows the approximate the Time On/ (Time On + Off Time).
6. At T_0 the Radar Waveform generator sent a Burst of Type 0 pulses. The test level was set to the appropriate detection level with 1 dB added to the radar test signal to ensure it was at or above the DFS Detection Threshold.
7. The transmissions of the Client Device were observed and measured at the end of the radar Burst on the operating channel for a duration greater than 10 seconds.
8. After the initial radar burst, the channel is monitored for 30 minutes to ensure no transmissions or beacons occur.

3.5 Test Equipment

Test End Date: 17-Jan-2025

Tester: SGM

Equipment	Manufacturer	Model	Asset Number	Cal Date	Cal Due Date
RF CABLE (TS8997)	HUBER & SUHNER	141	B095587	8-Jul-2024	8-Jul-2025
ATTENUATOR	HEWLETT PACKARD	8496B	B094944	5-Jul-2024	5-Jul-2025
ATTENUATOR, STEP 0-110DB	HEWLETT PACKARD	8494B	B094945	5-Jul-2024	5-Jul-2025
RF CABLE SMA TO SMA, 0.01-40GHZ	TELEDYNE STORM MICROWAVE	084-0505-059	20109	20-Mar-2024	20-Mar-2025
RF ENCLOSURE	LINDGREN RF ENCLOSURE	T/T	17011	CNR	CNR
RF CABLE	HUBER & SUHNER	SF102	B079824	20-Mar-2024	20-Mar-2025
VECTOR SIGNAL GENERATOR (TS8997)	ROHDE & SCHWARZ	SMBV 100A	15002	22-Dec-2021	26-Feb-2025
SIGNAL ANALYZER (TS8997)	ROHDE & SCHWARZ	FSV30	B085749	3-Jan-2024	26-Feb-2025
TSTPASS SWITCHBOX	TSTPASS	SB2	23009	8-Apr-2024	8-Apr-2025

Note: The equipment calibration period is 1 year for the SF102, OSP, OPS-B157. The calibration period is 2 years for the FSV30, SMBV 100A, and SMB 100A. VBU = Verified before use

A DFS-compliant Master device was used for testing. It is the CISCO AIR-SAP2602E-A-K9, FCC ID:LDK1002080, IC:2461B-102080.

3.6 Test Site

SGS EMC Laboratory, Suwanee, GA

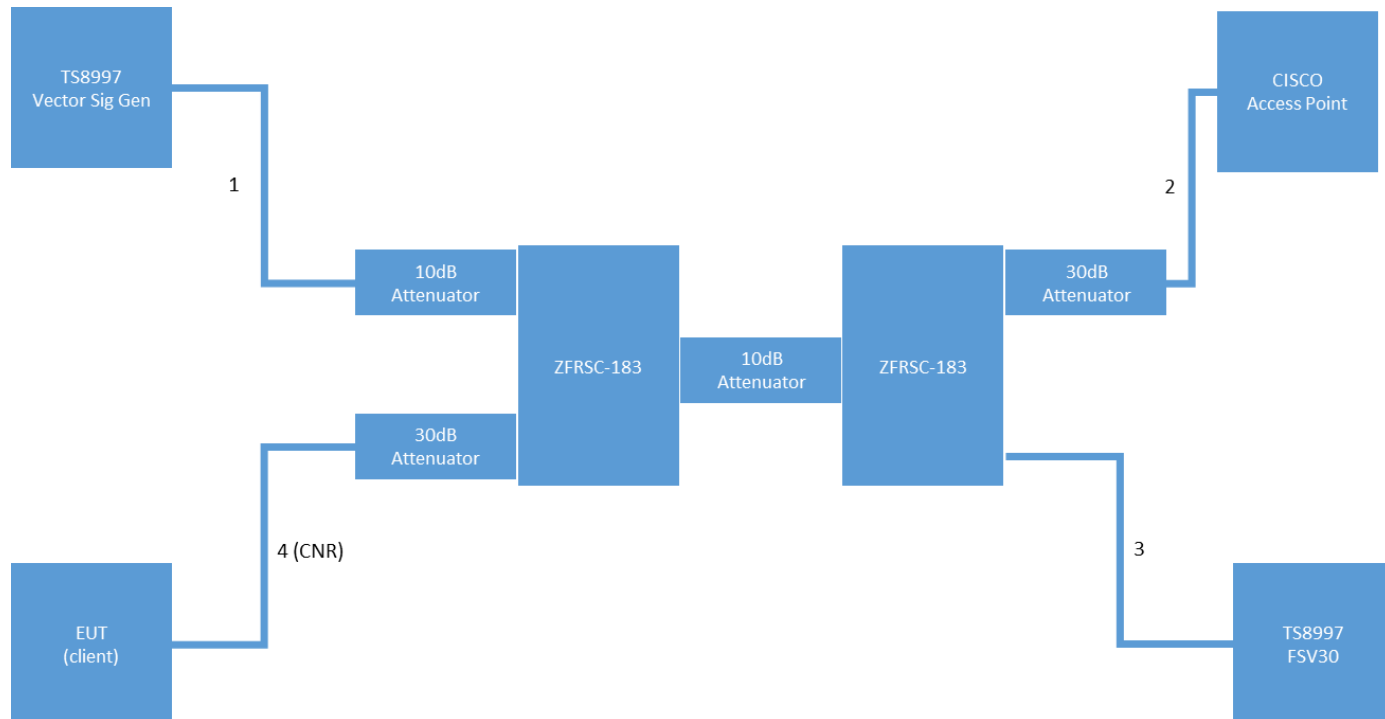
Environmental Conditions

Temperature: 22.5 °C

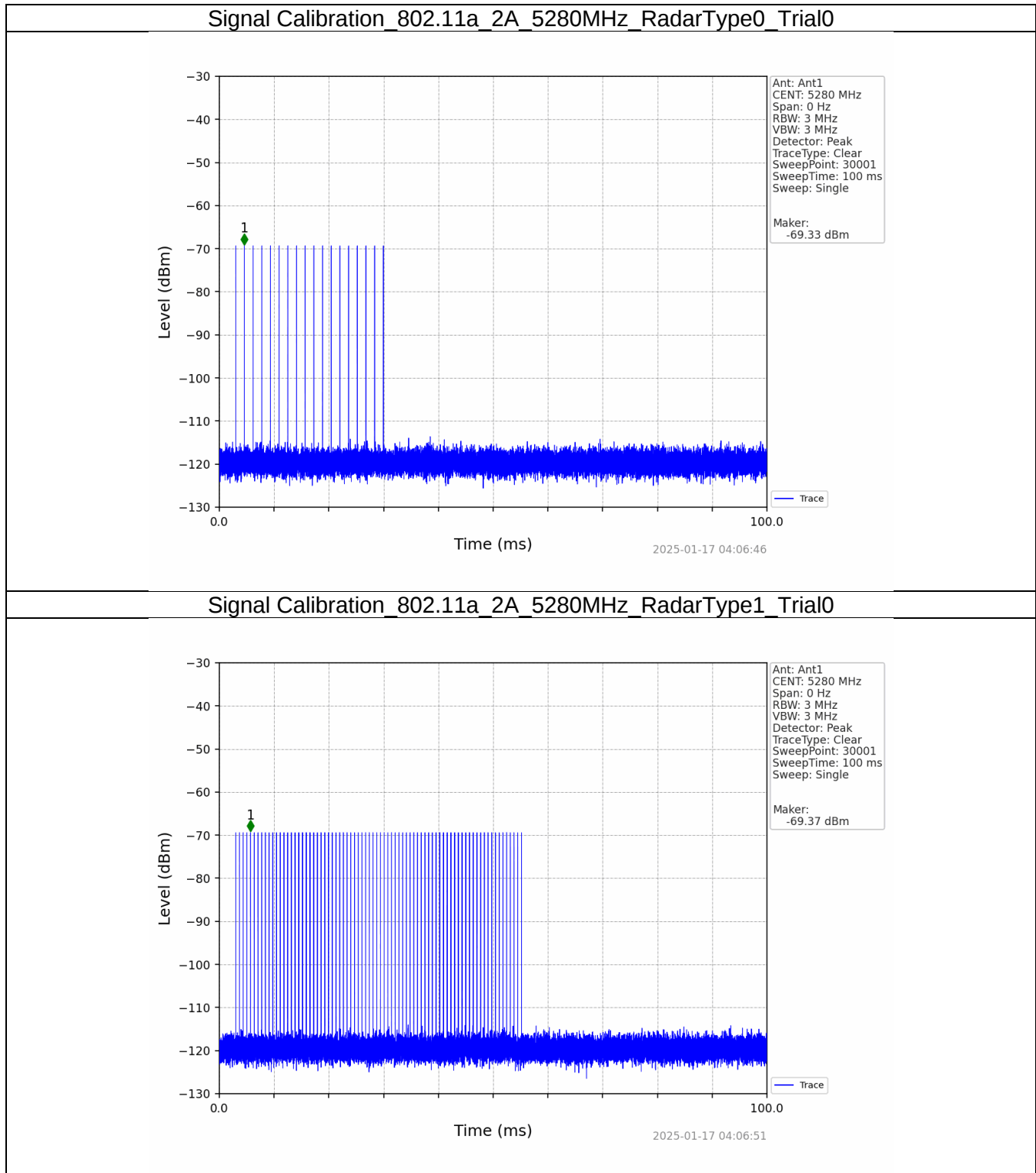
Relative Humidity: 21.5 %

Atmospheric Pressure: 98.81 kPa

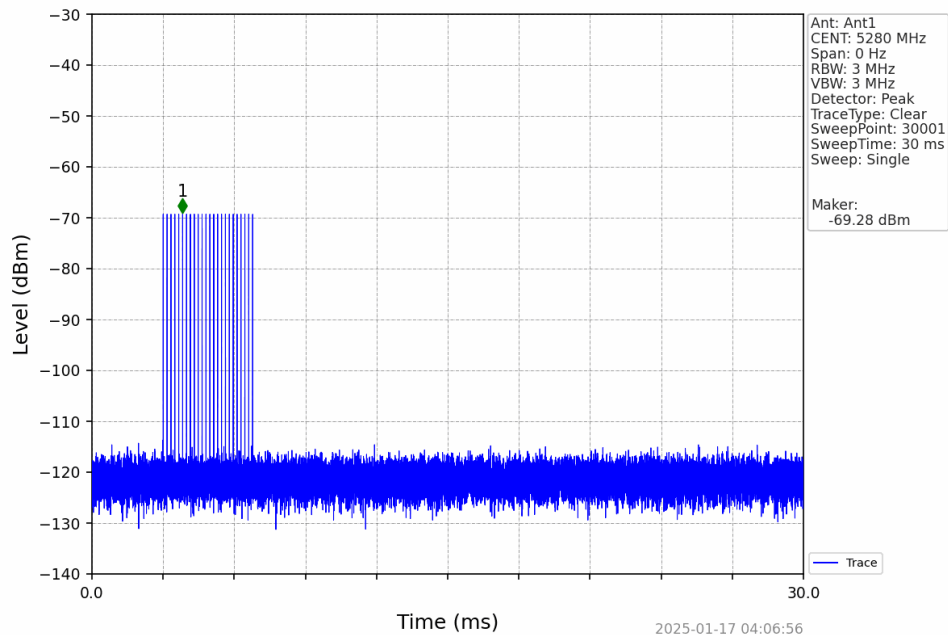
3.7 DFS Setup Diagram



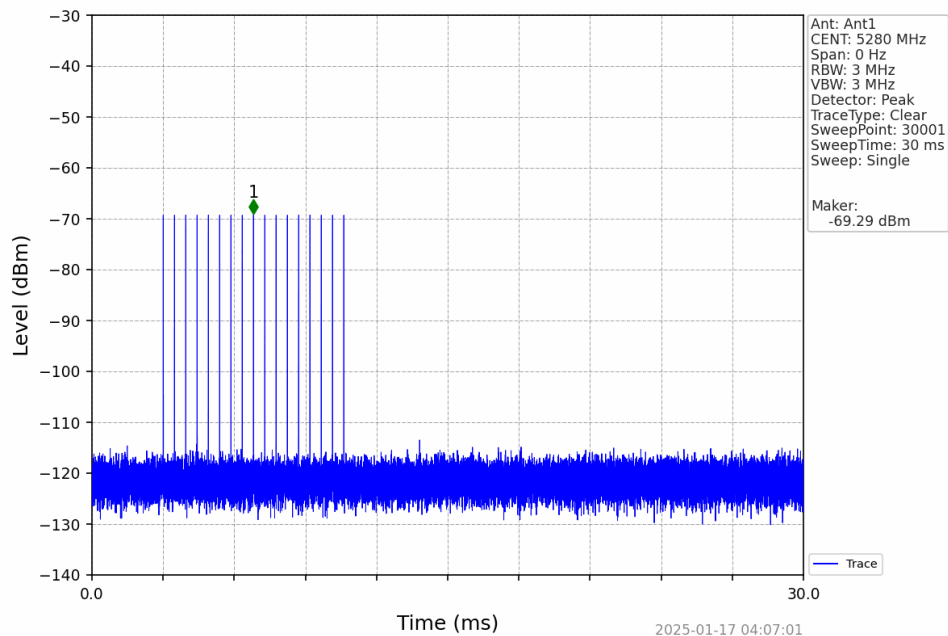
3.8 DFS Cal Level



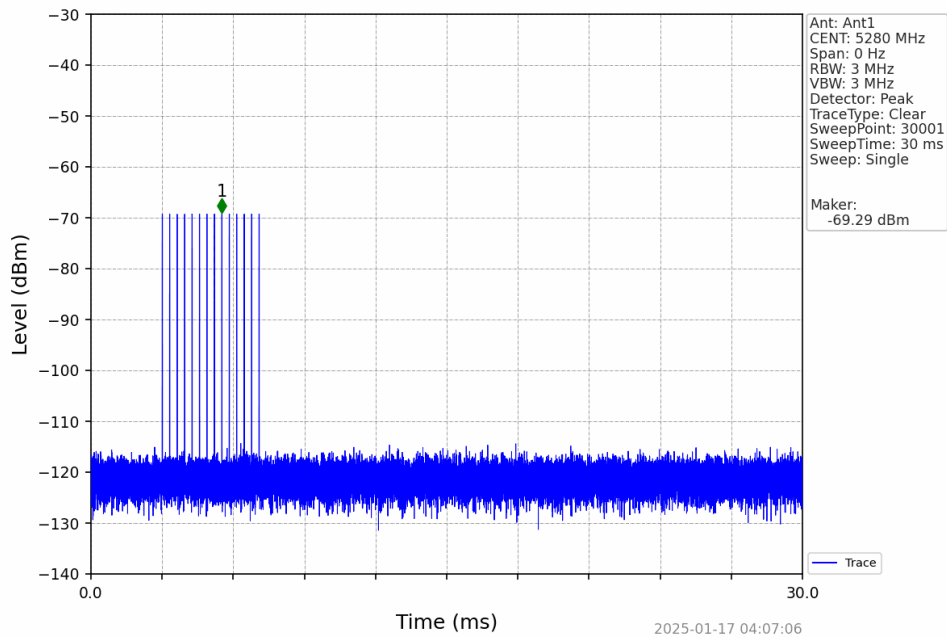
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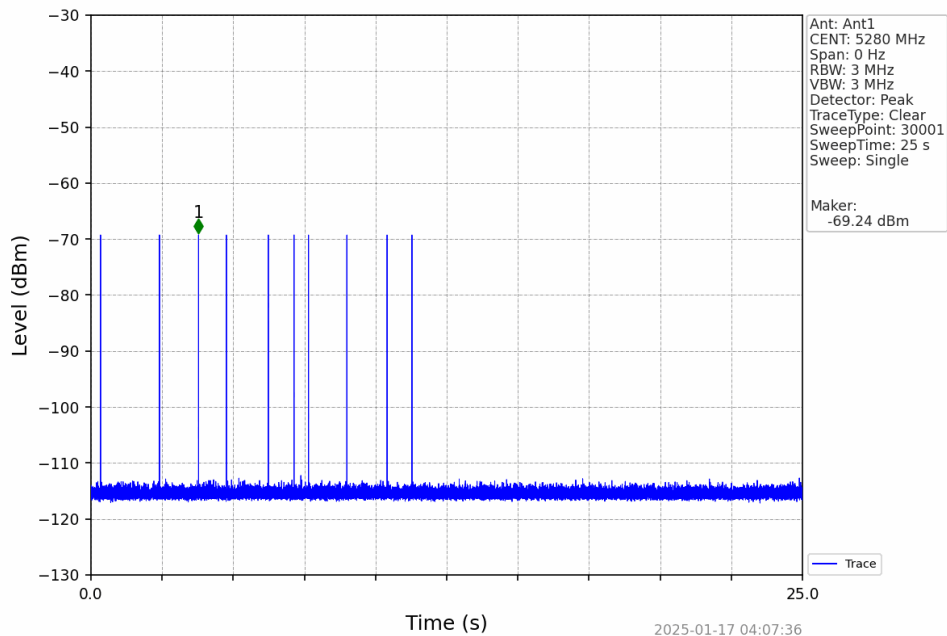
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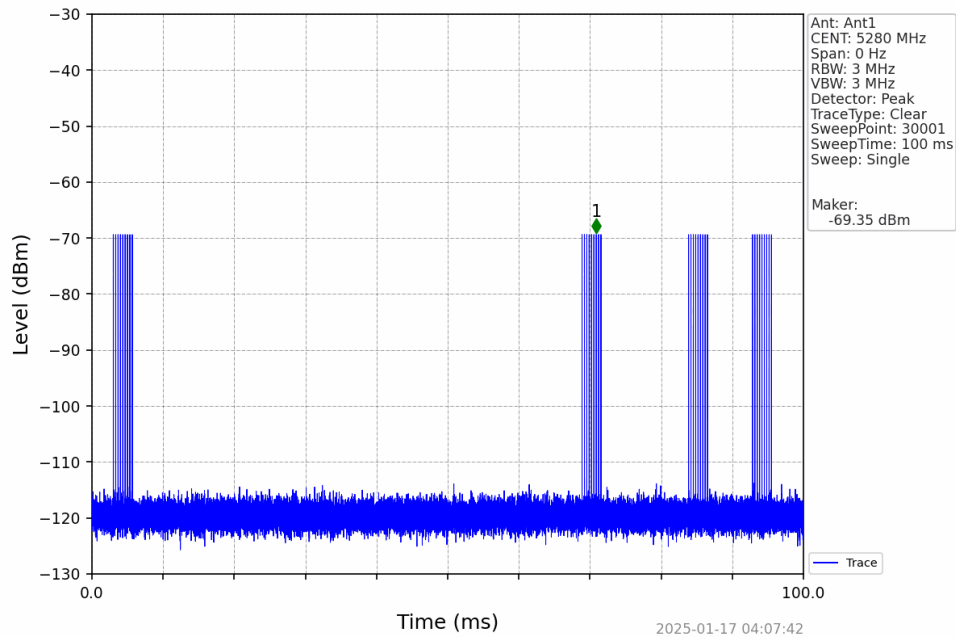
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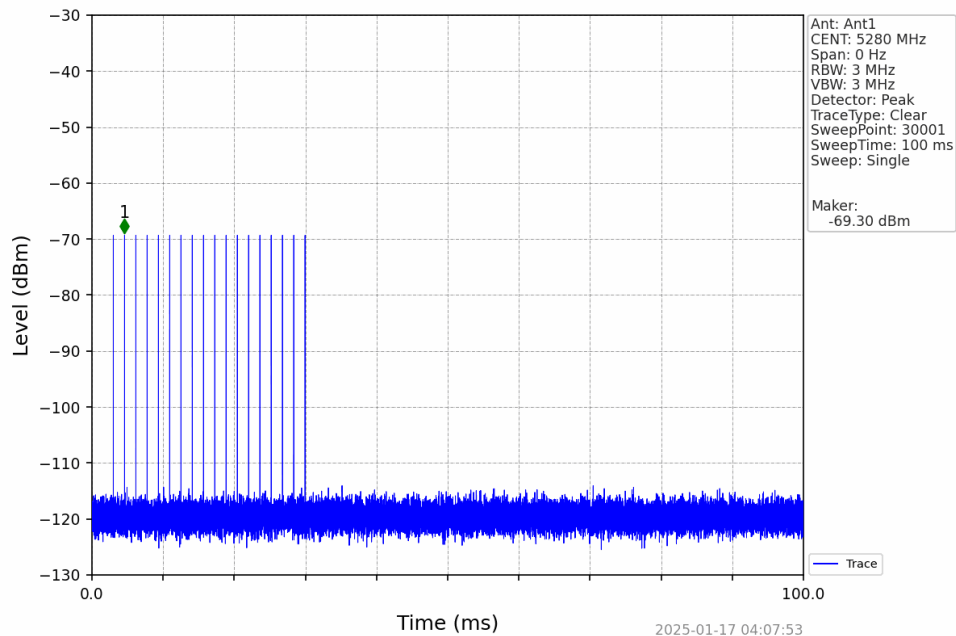
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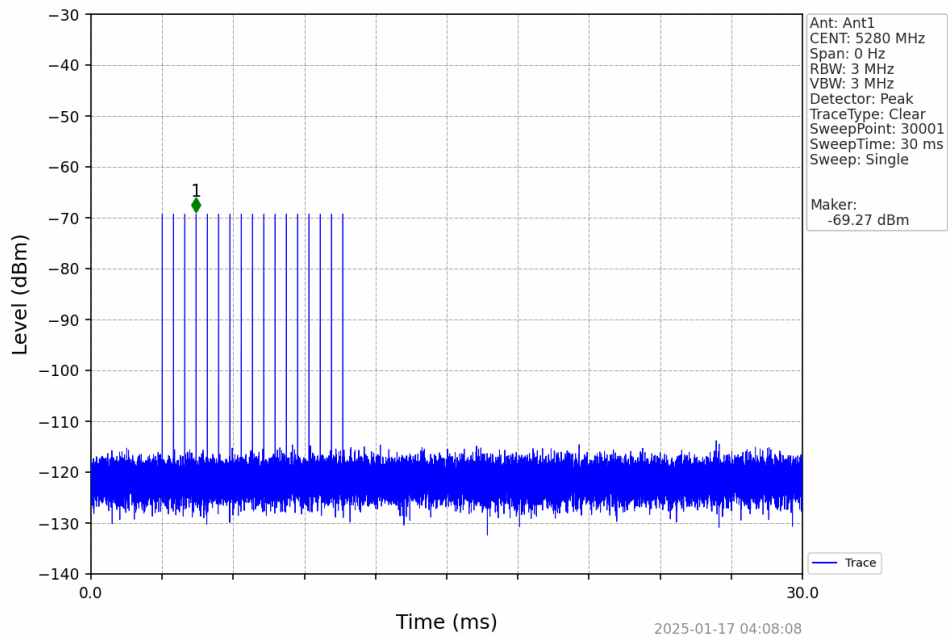
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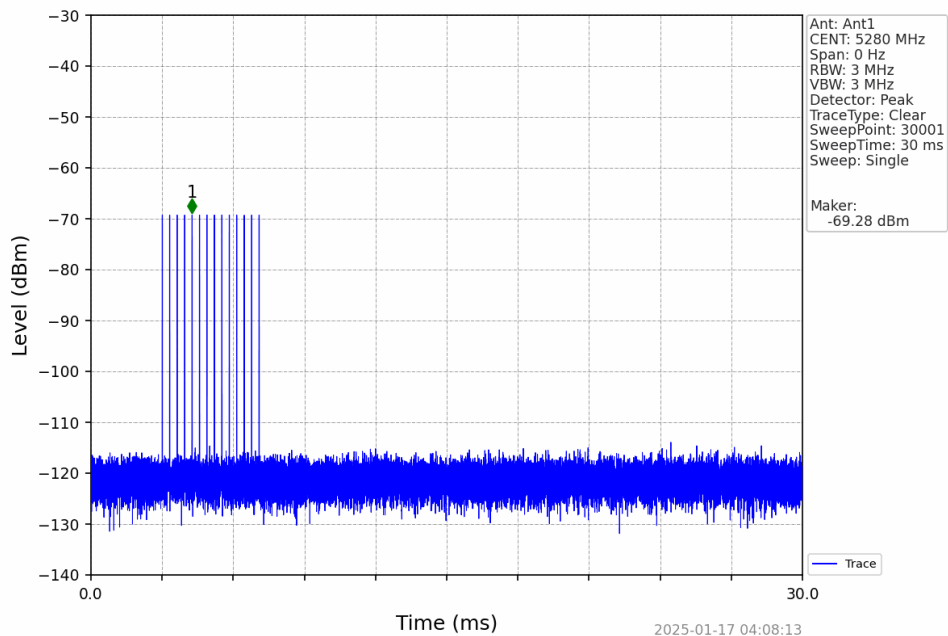
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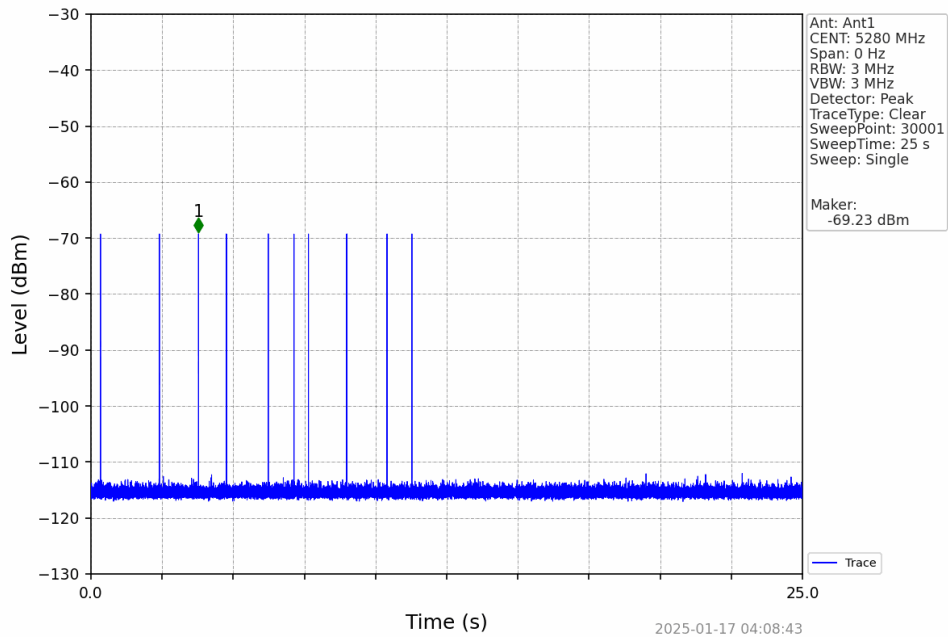
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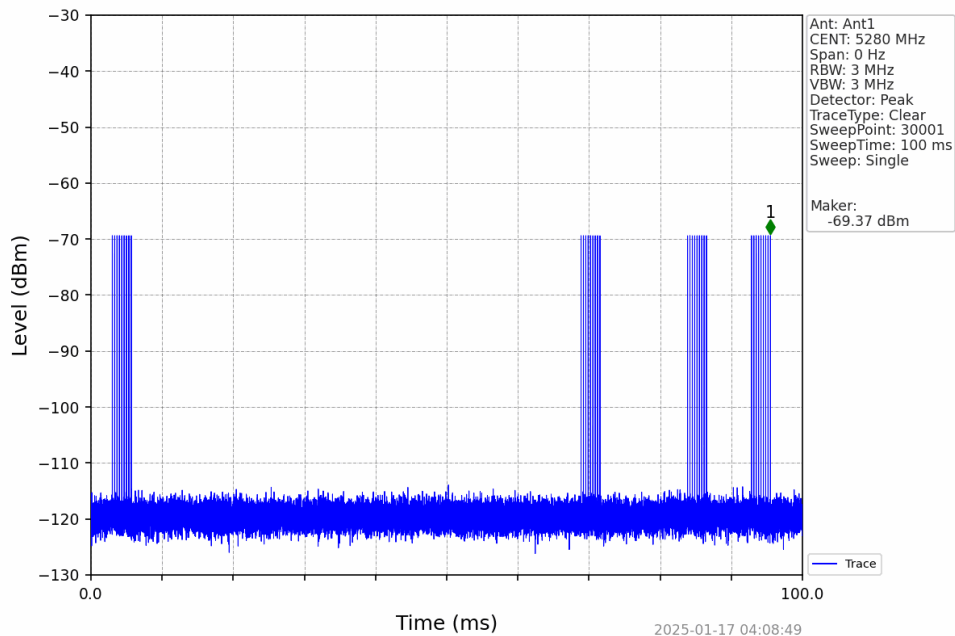
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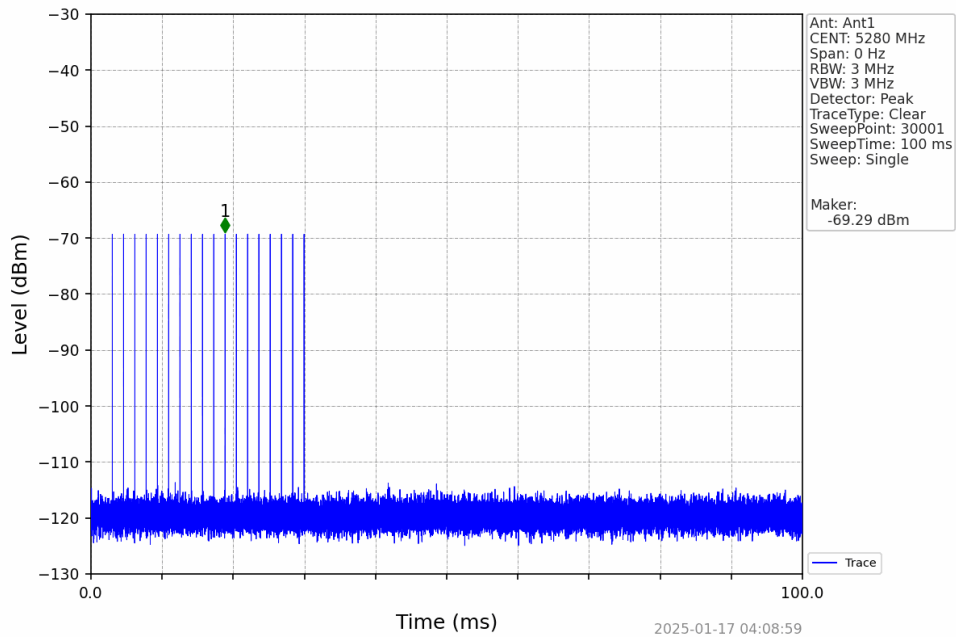
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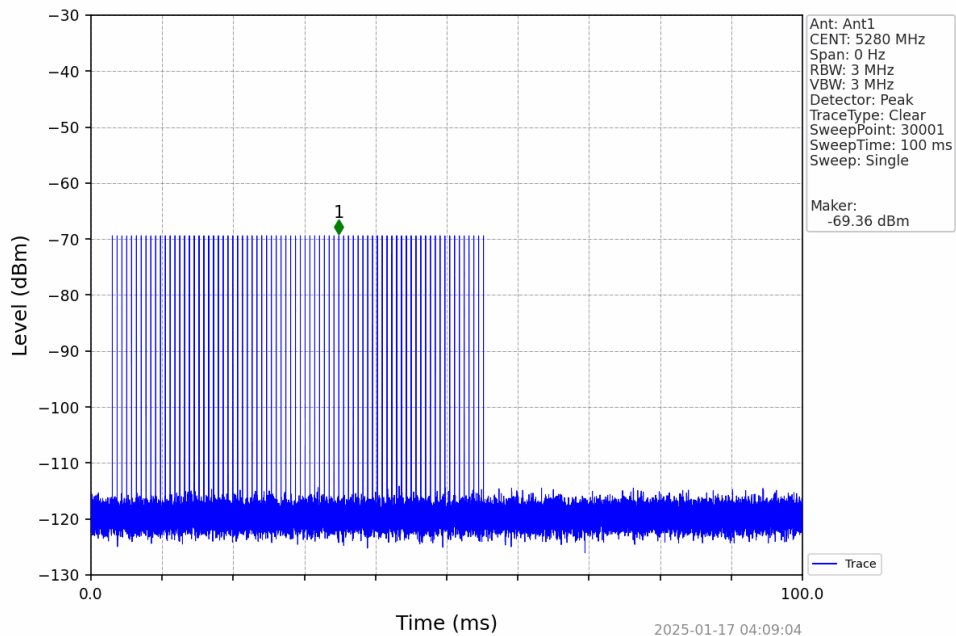
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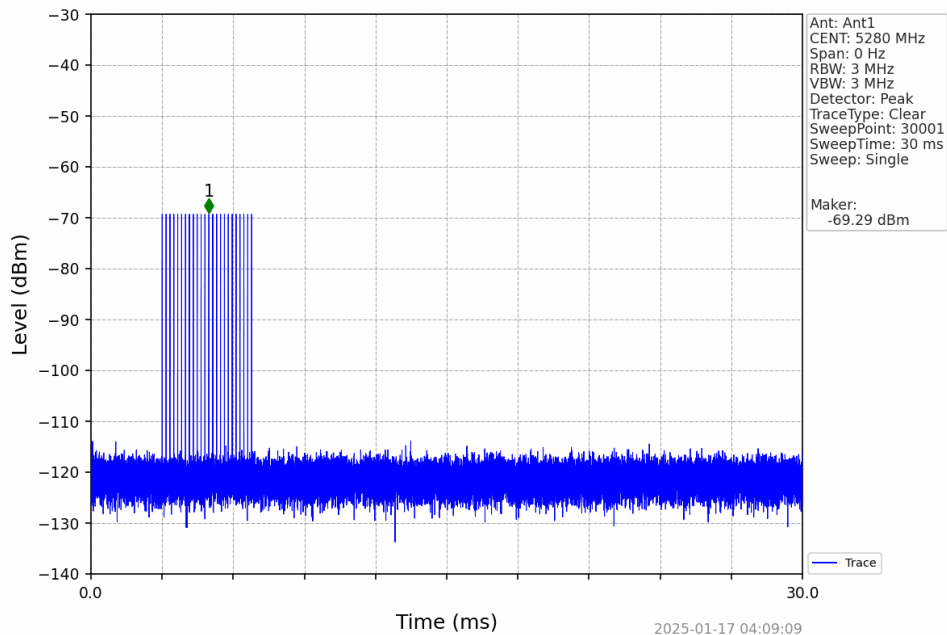
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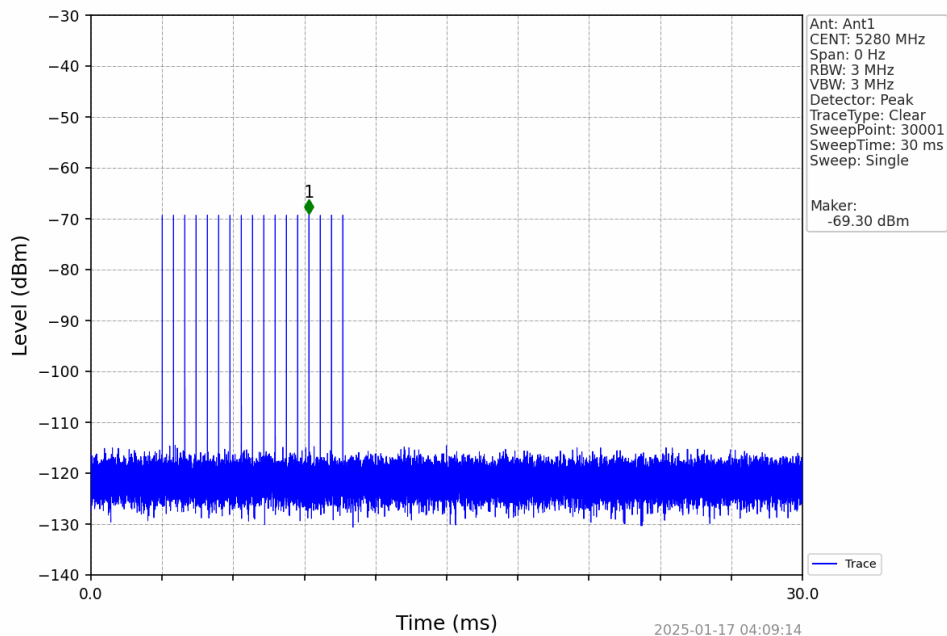
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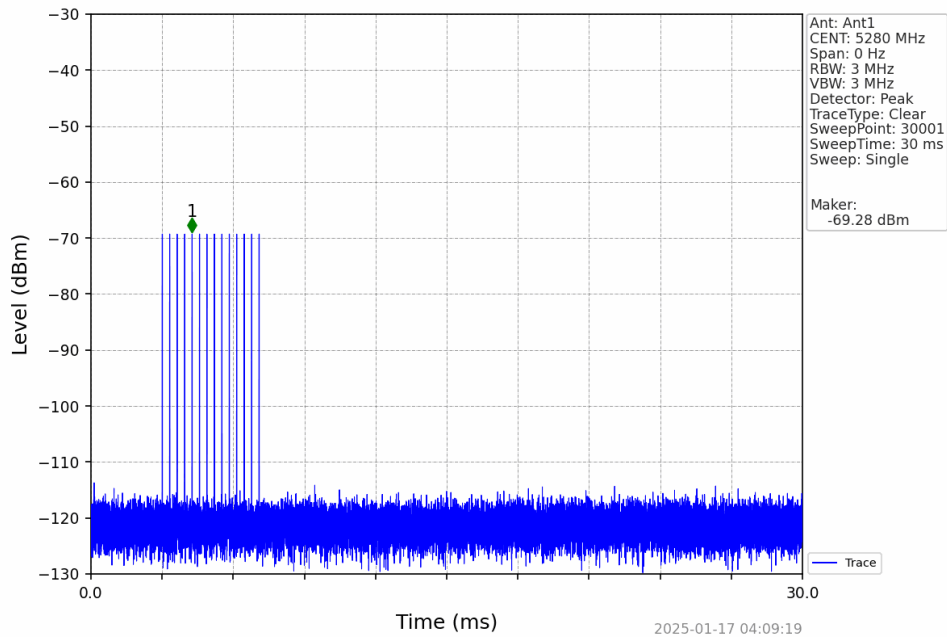
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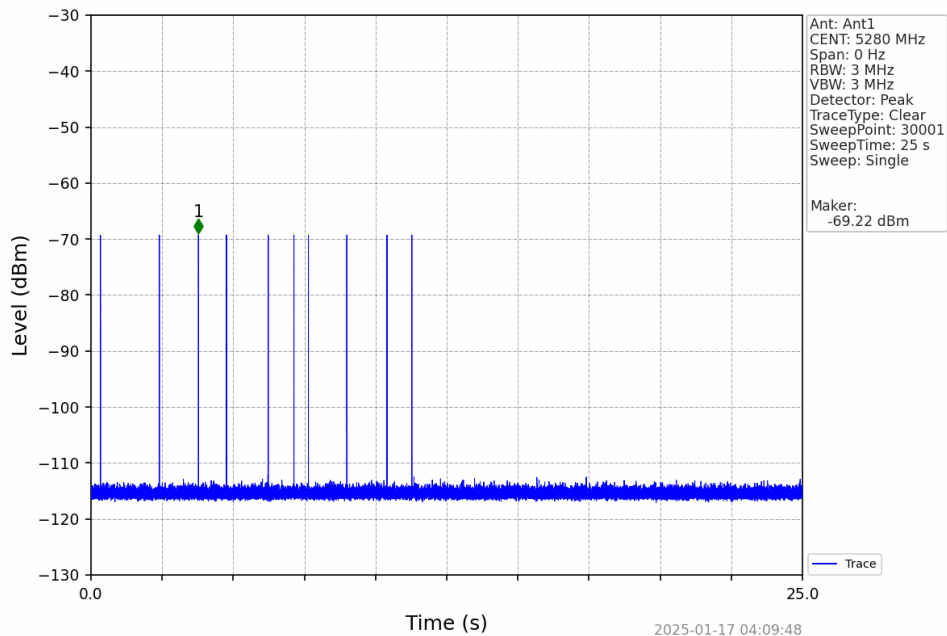
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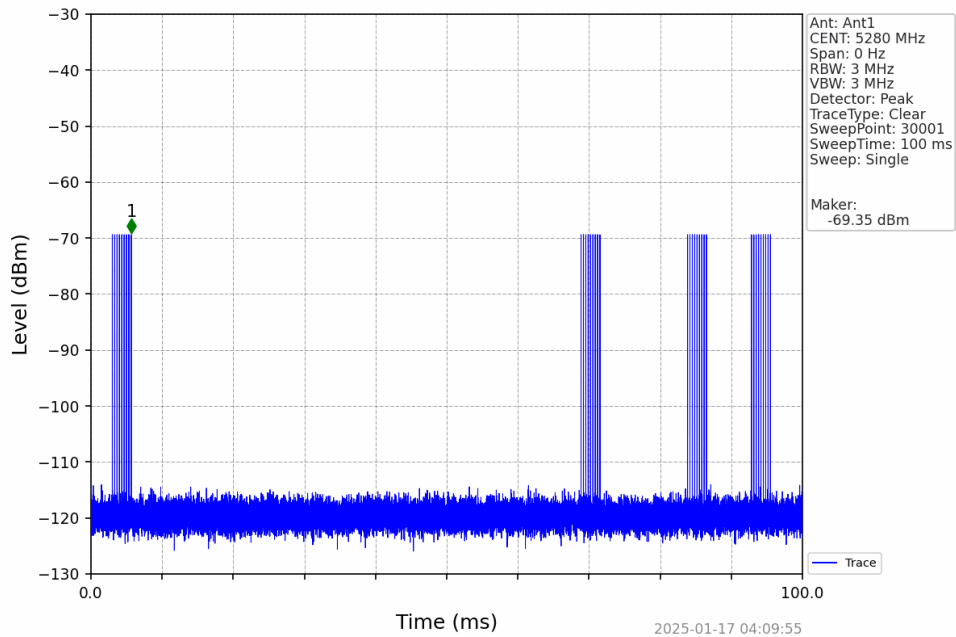
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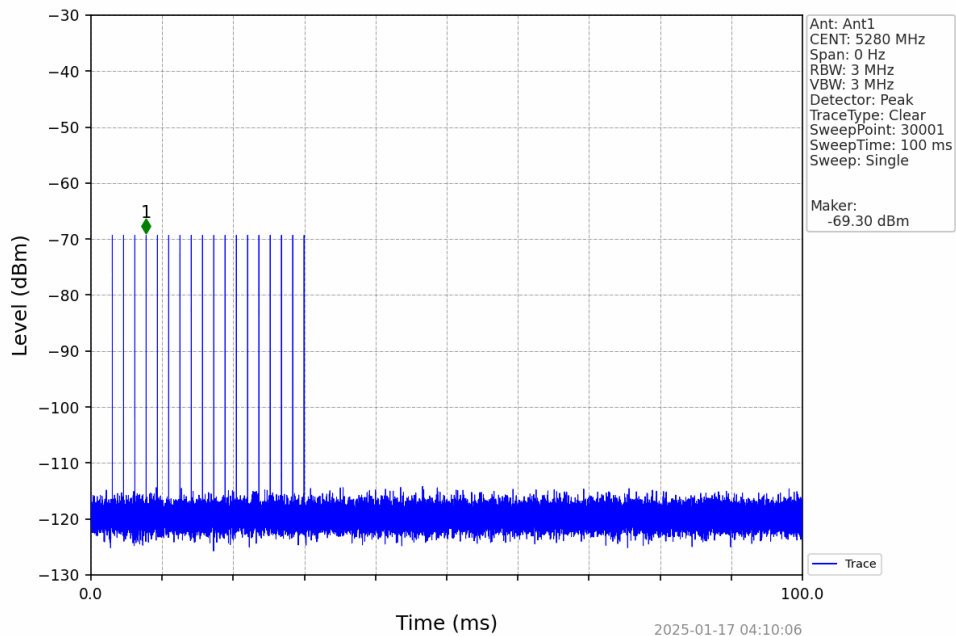
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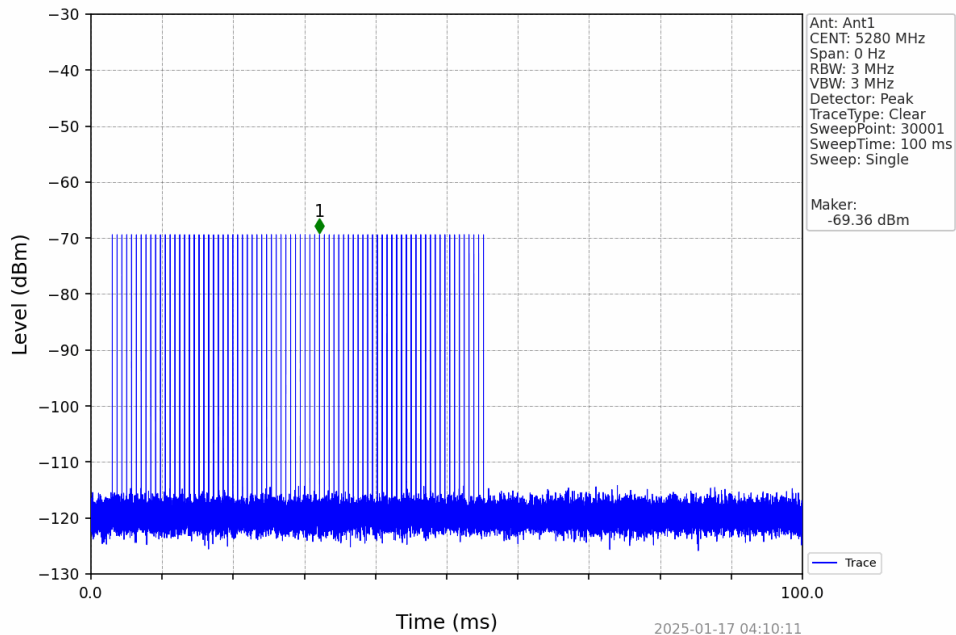
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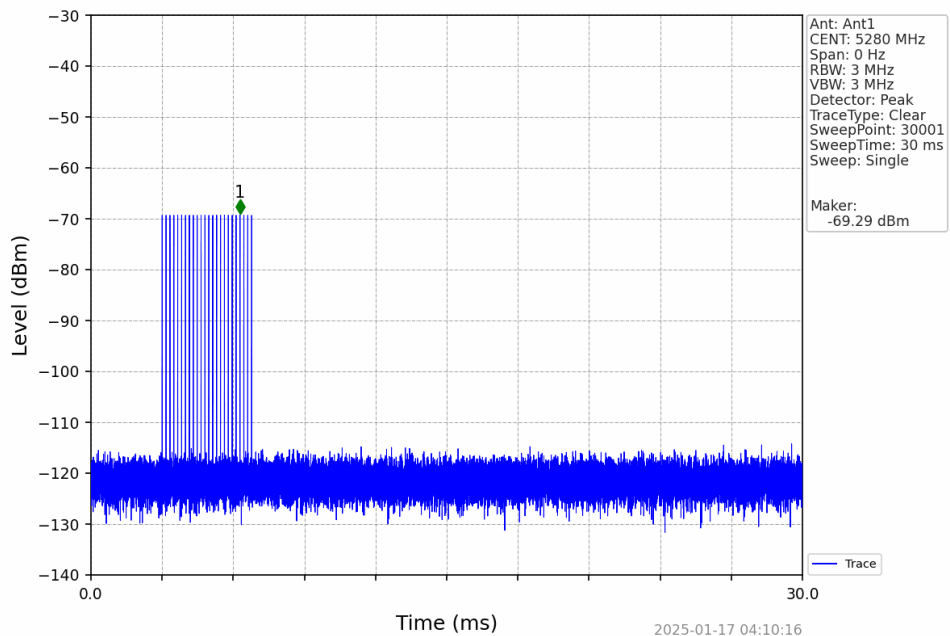
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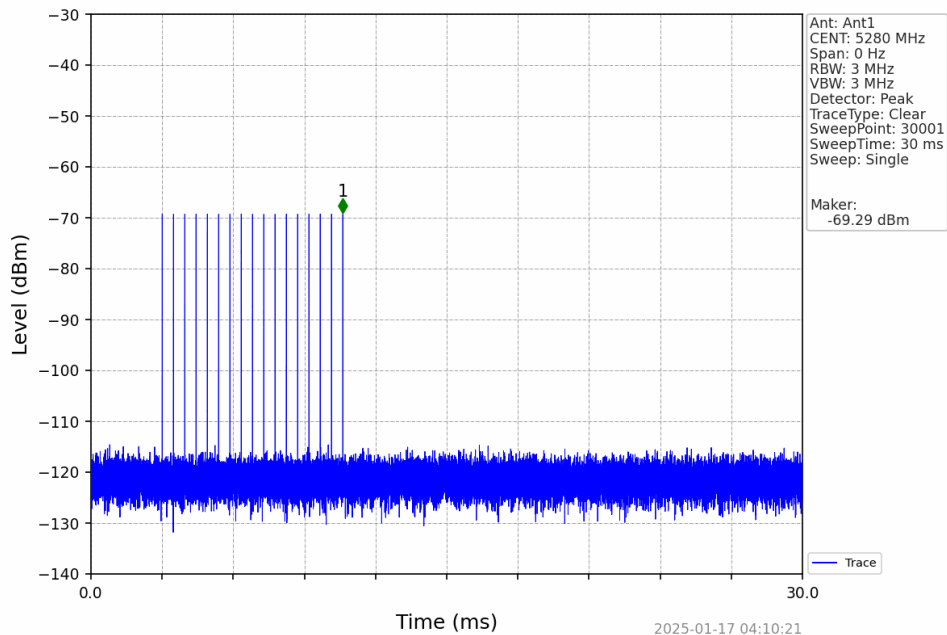
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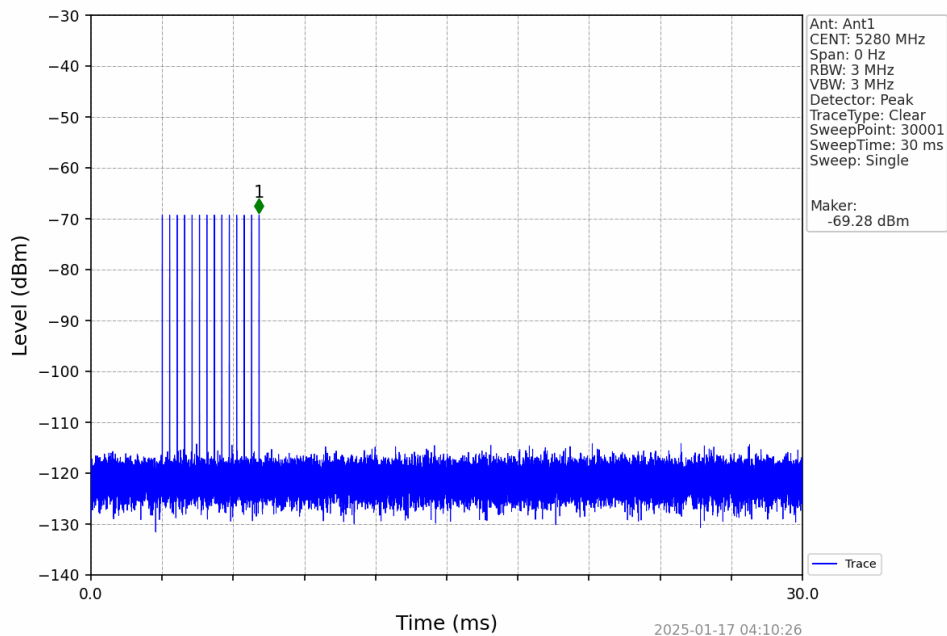
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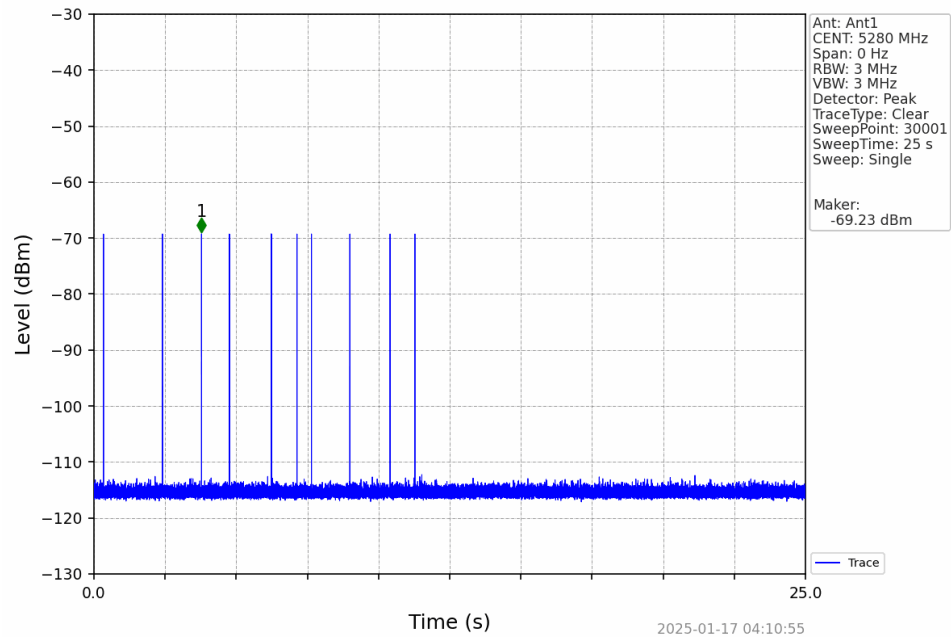
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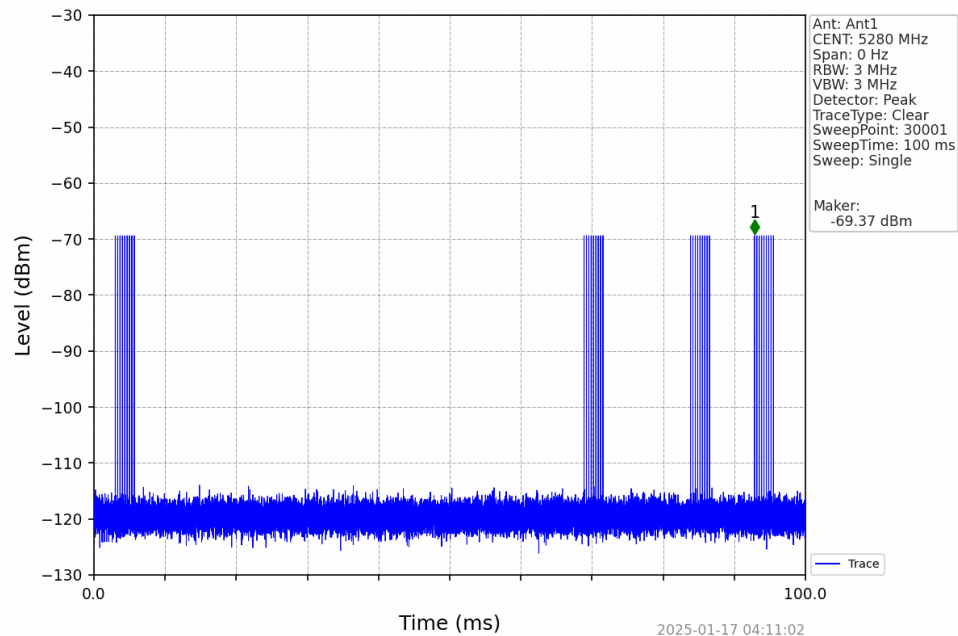
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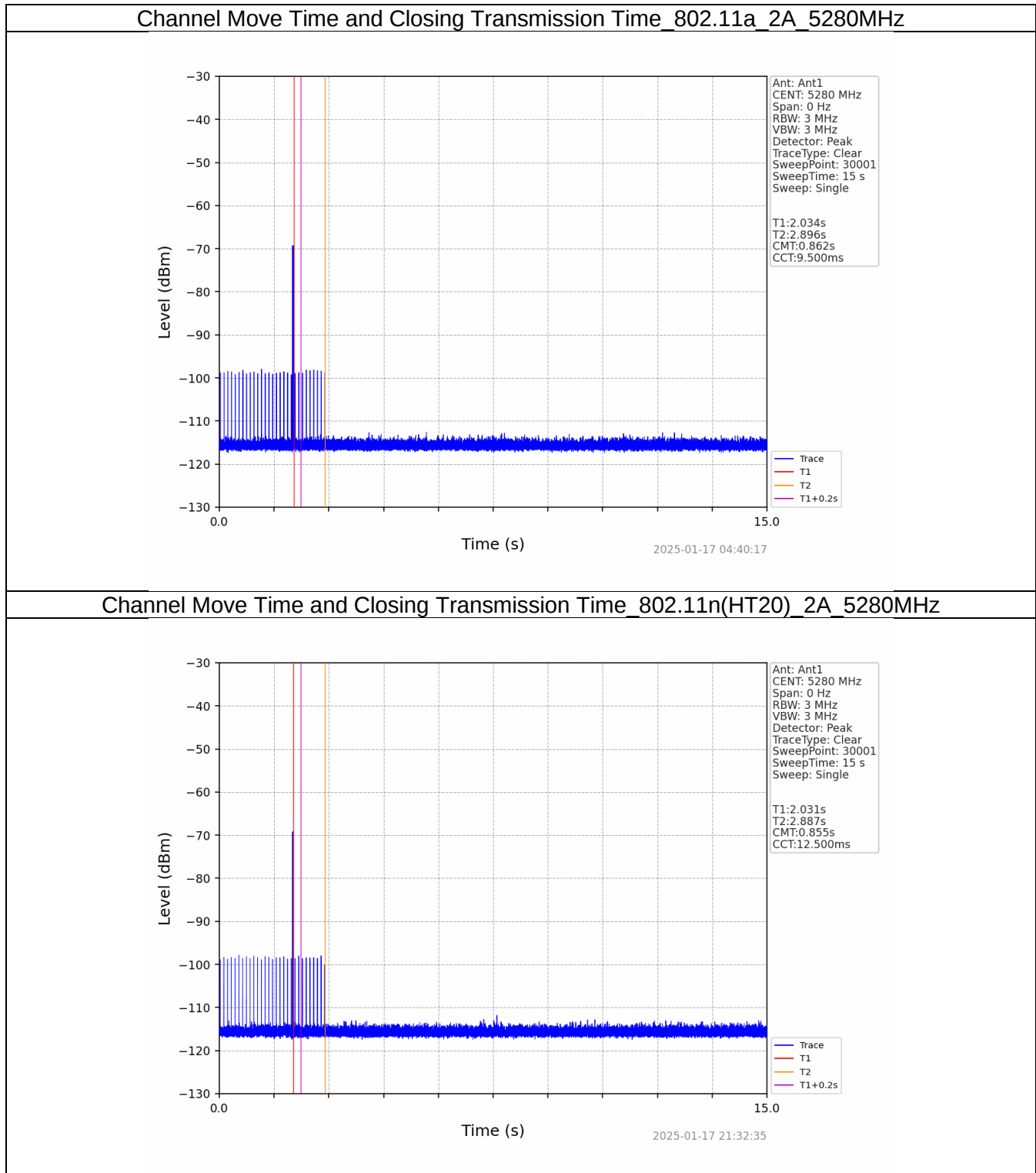
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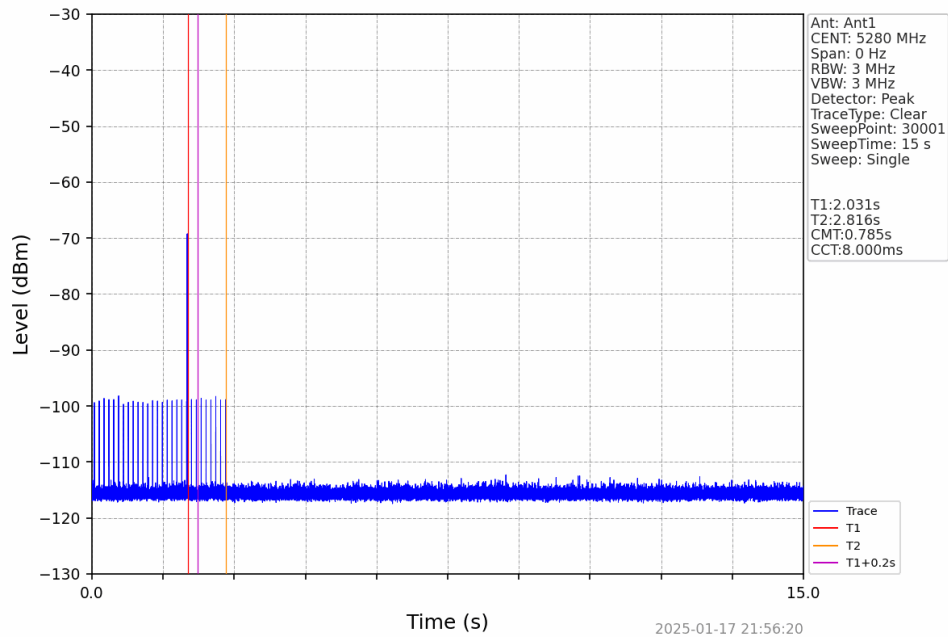
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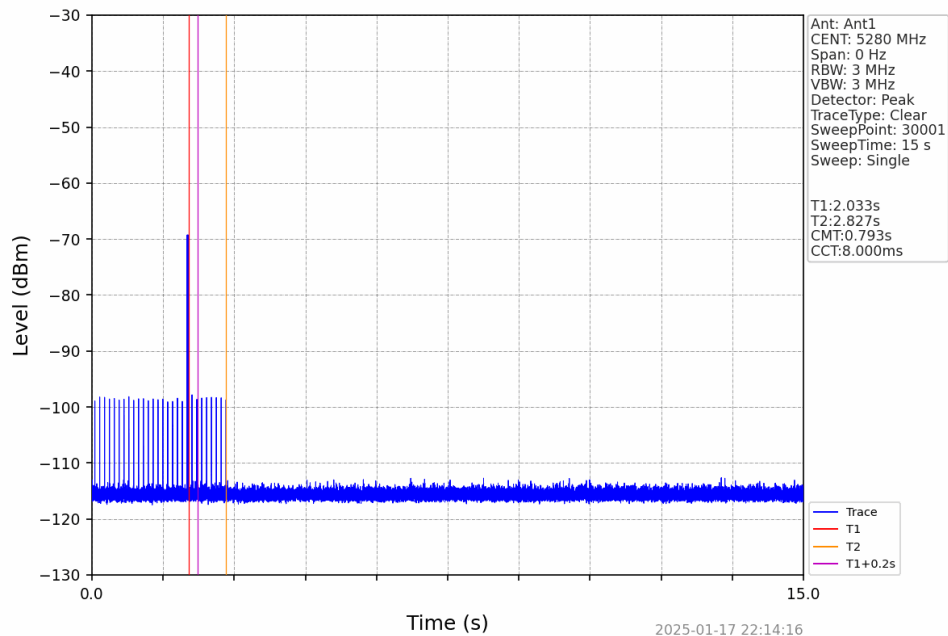
3.9 Move Time and Aggregate Time



Channel Move Time and Closing Transmission Time_802.11ac(VHT20)_2A_5280MHz



Channel Move Time and Closing Transmission Time_802.11ax(HEW20)_2A_5280MHz



4 Revision History

Revision Level	Description of changes	Revision Date
Draft	Draft Release	20 January 2025
0	Initial Release	14 February 2025
1	Updated RSS-247 Standard to Issue 3	05 March 2025