RAK3172 Crystal oscillator verification report

Prepared by	Guosan	Date	2022-6-10
Reviewed by		Date	
Authorized by		Date	

Revision History

Date	Version	Description	Prepared by
2022-6-10	1.0	Initial Release	Guosan

Table of Content

1 Overview

1.1 Product Information

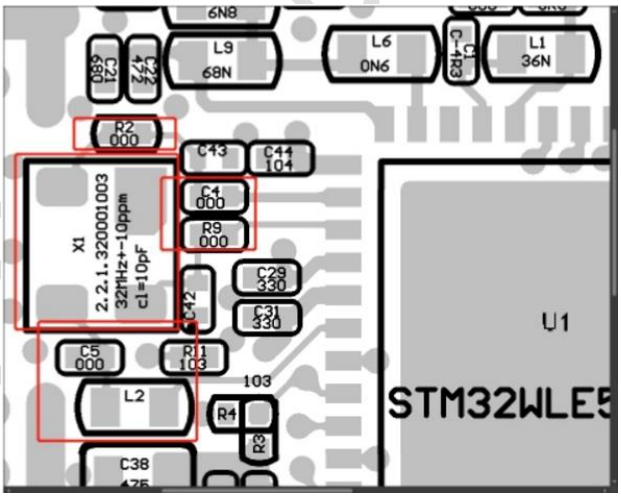
Model	PCB Version	Firmware Version
RAK3272S (RAK3172 breakout board)	Ver A	SIP_LSE_HSE_TEST.hex
		RAK3172_v1.0.4_Boot+App_20220218.hex

1.2 Hardware configuration

RAK3272S (RAK3172 breakout board)

Using TCXO design requires the following component changes:

1. X1 changed to 1202C003 (**32M_TCXO)**.
2. R9 moves to C42.
3. Remove C4, add 0807B00J **(0201_10pF)**.
4. Remove R2, add 0709C03T**(0201_220Ω)**.
5. Remove C5, add 0807B00F **(0201_100nF)**.
6. Add 1007B006 to L2**(0402_120Ω@100MHz)**.



1.3 Test Environment

TEMP：85℃,25℃,-40℃

1.4 Test Equipment list

Manufacturer	Description	Model
Tekronix	Timer/Counter/Analyzer	FCA3000
Keysight	EXA Signal Analyzer	N9010B

Manufacturer	Description	Model
KSON	Temperature BOX	KTHC-415TBS

2 Test Item

2.1 32M

TEMP (℃)	Frequency (MHz)		ppm	
	1#	2#	1#	2#
25	32.0000236527	32.0000203528	0.73	0.63
85	32.0000262378	32.0000201176	0.81	0.62
-40	32.0000673994	32.0000331745	2.10	1.03

2.2 Frequency Error

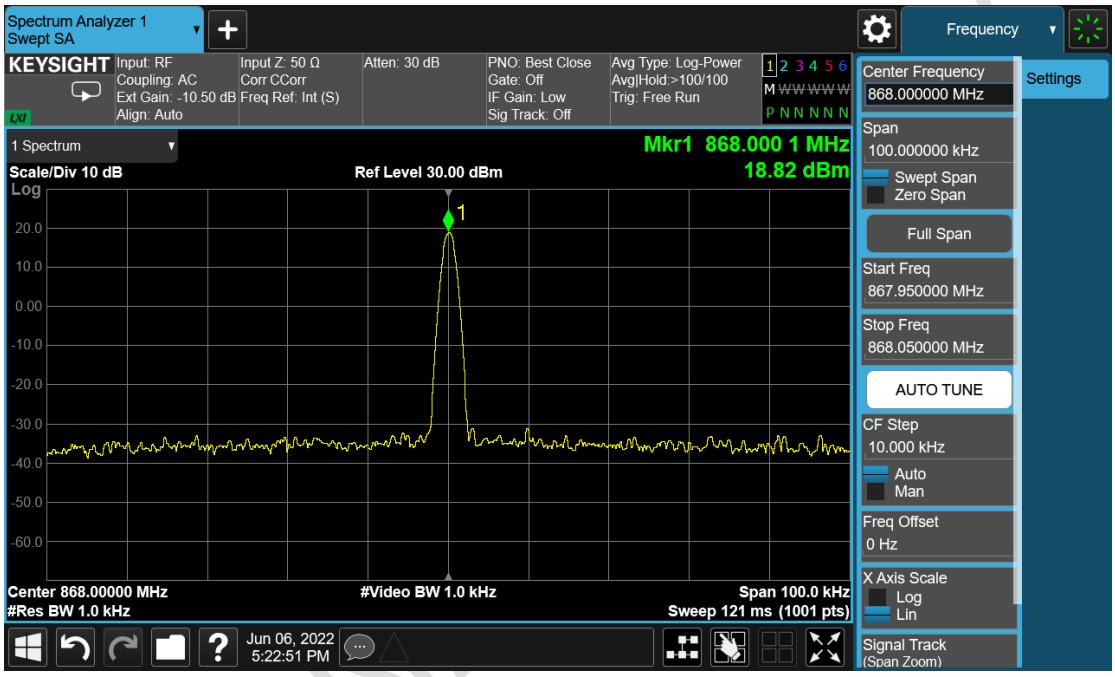
1. **Use RAK3272S (RAK3172 breakout board) at high temperatures(85℃) test.**
2. **Due to the temperature limit of CH340E, it was replaced with the RAK3272S (RAK3172 breakout board) at low temperatures(-40℃) test.**

2.2.1 EU868

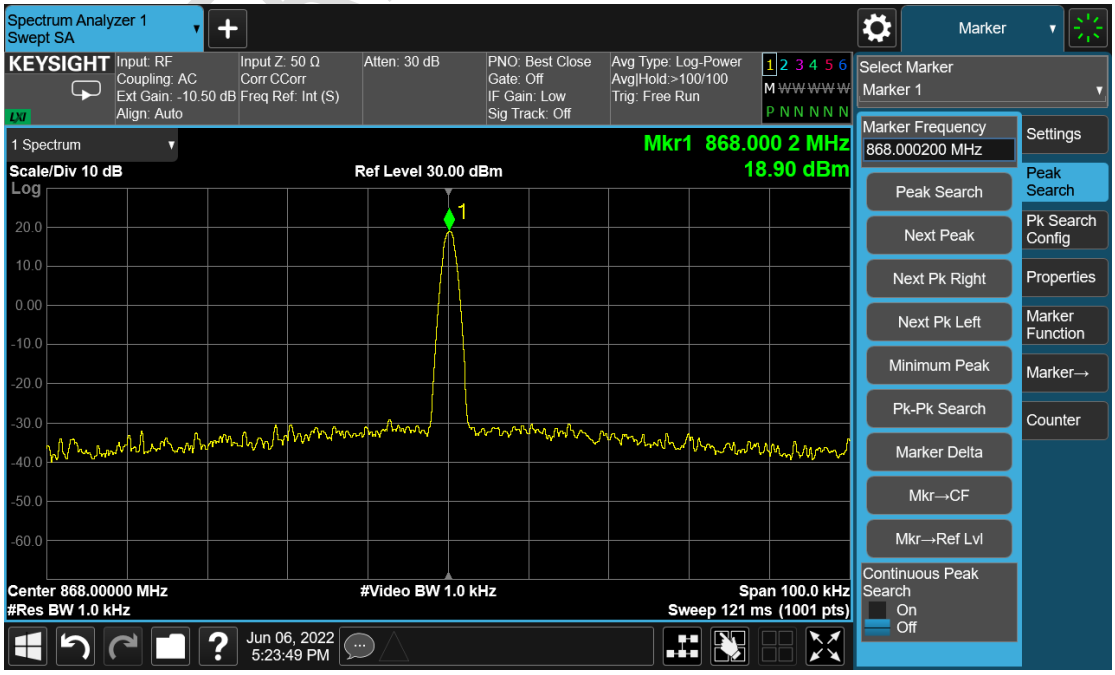
AT Command： AT+CW=868000000:20:60。

TEMP (℃)	Spec (KHz)	1# (MHz)	1# Value (KHz)	1# PPM	2# (MHz)	2# Value (KHz)	1# PPM
25	<±10	868.0001	0.1	0.11	868.0002	0.2	0.23
85		868.0003	0.3	0.34	868.0003	0.3	0.34
-40		868.0004	0.4	0.46	868.0003	0.3	0.34

1# Frequercy error @ 22dBm,25℃

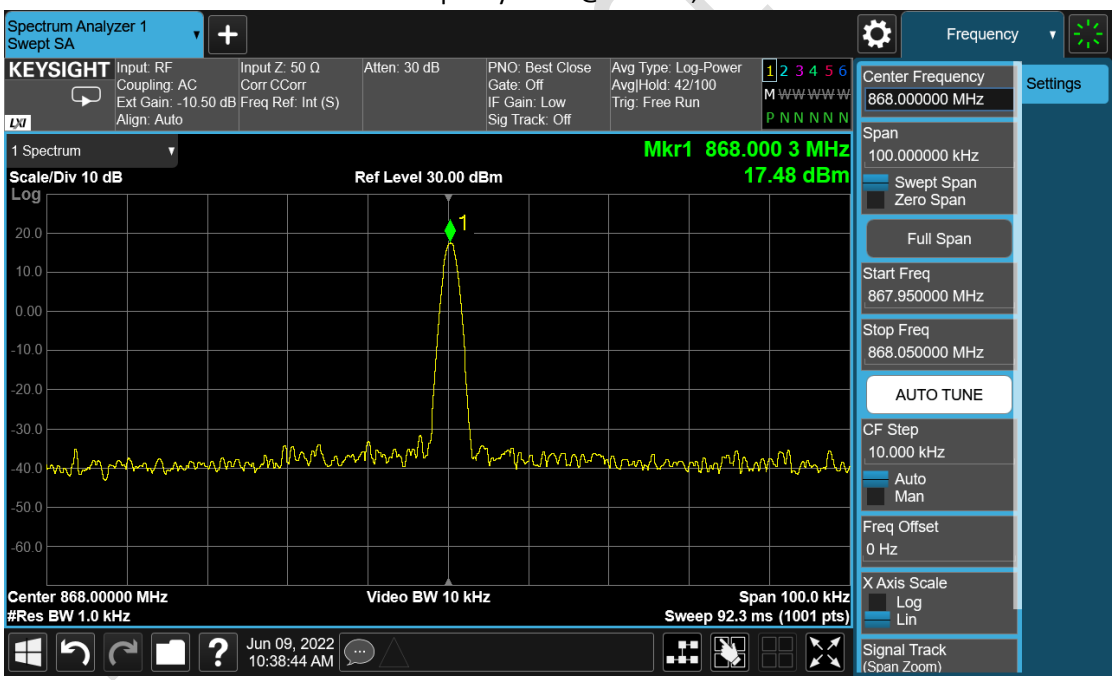


2# Frequercy error @ 22dBm,25℃

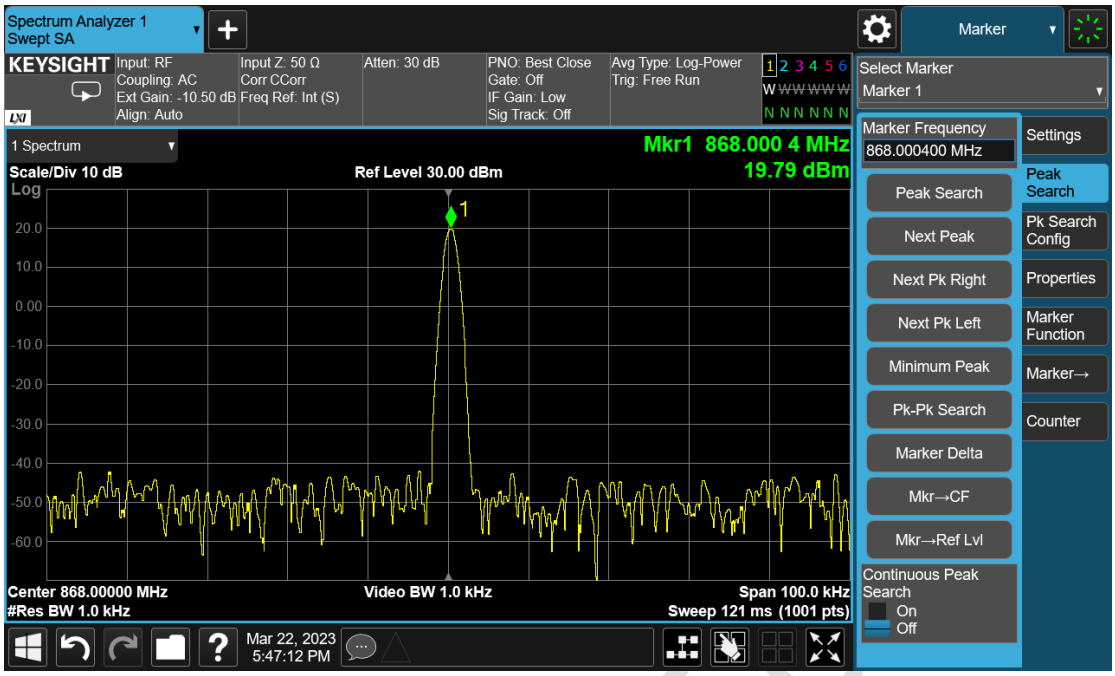


1# Frequency error @ 22dBm,85℃

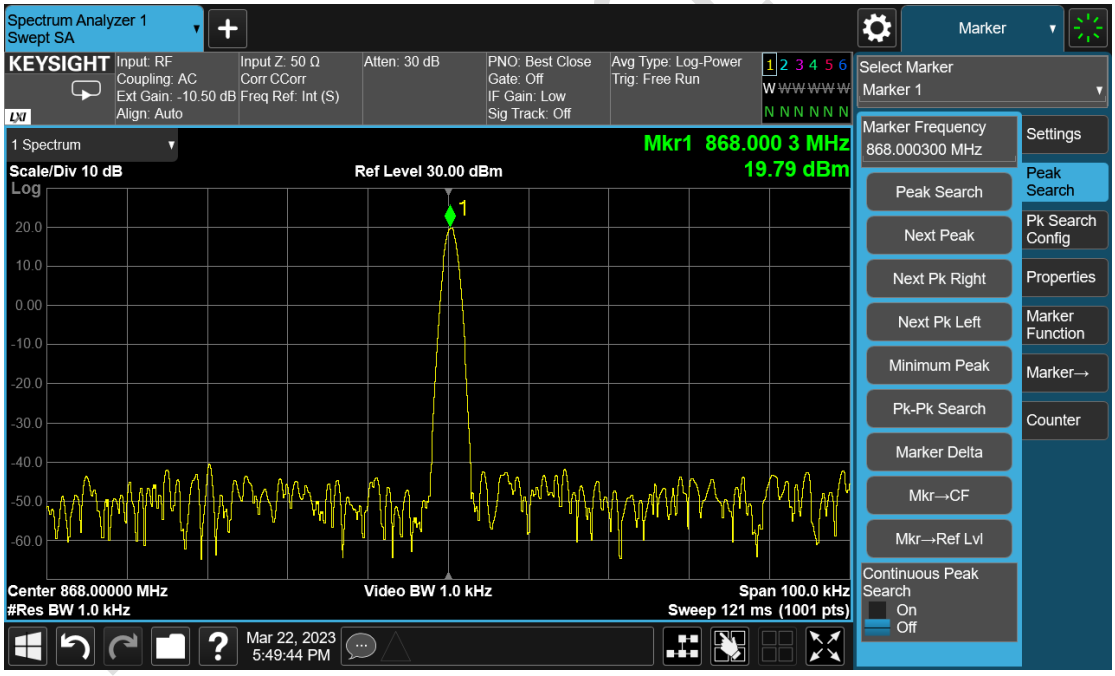
2# Frequency error @ 22dBm,85℃



1# Frequency error @ 22dBm,-40℃



2# Frequency error @ 22dBm,-40℃

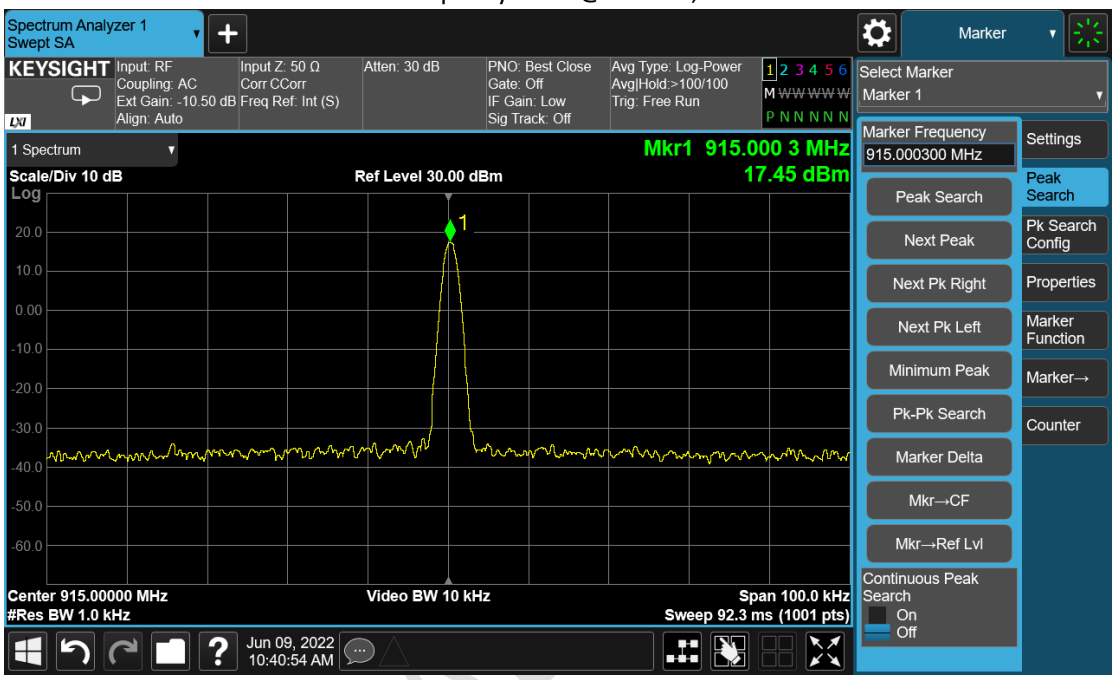


2.2.2 US915

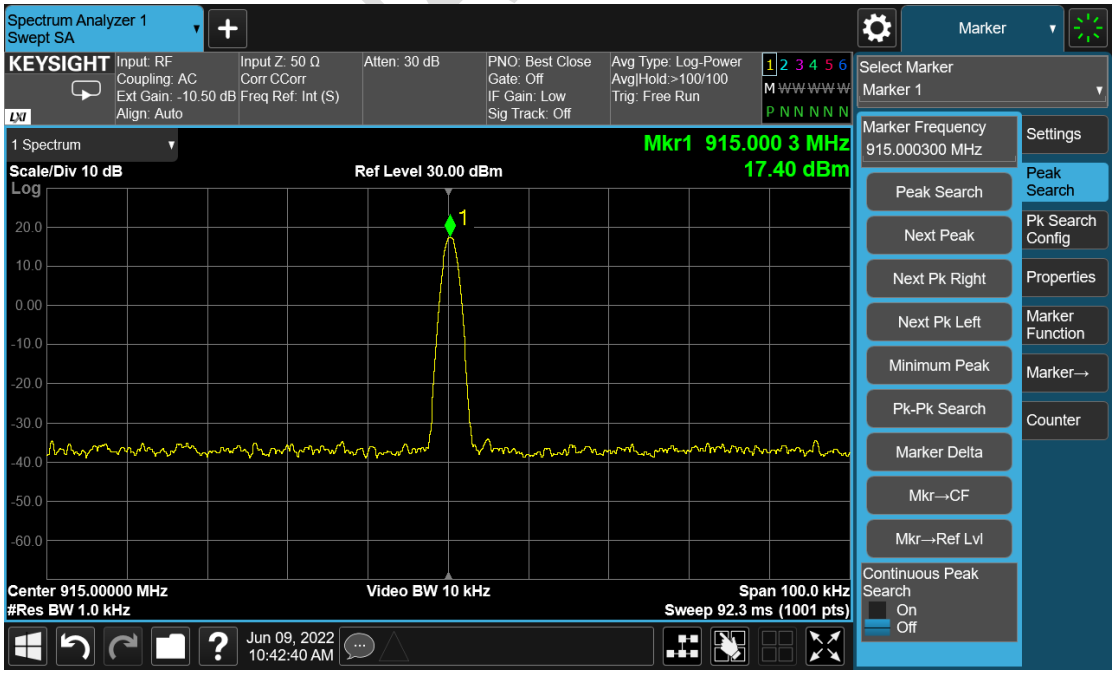
AT Command： AT+CW=915000000:20:60。

TEMP (℃)	Spec (KHz)	1# (MHz)	1# Value (KHz)	1#PPM	2# (MHz)	2# Value (KHz)	2# PPM
85	±10	915.0003	0.3	0.32	915.0003	0.3	0.32
-40		915.0003	0.3	0.32	915.0004	0.4	0.43

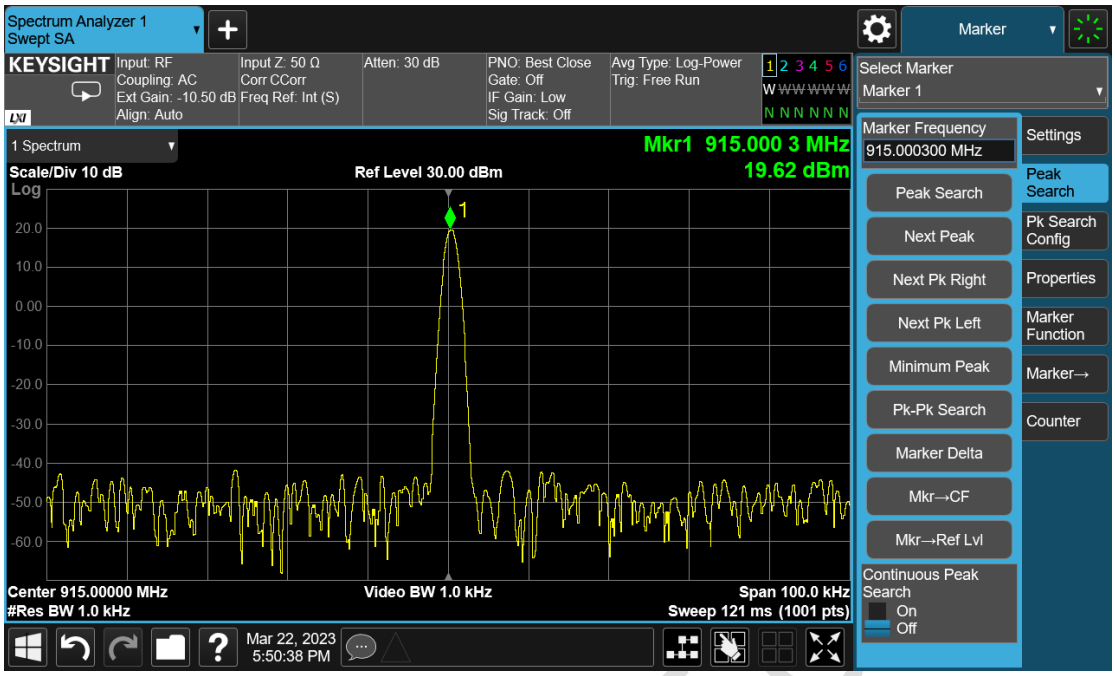
1# Frequency error @ 22dBm,85℃



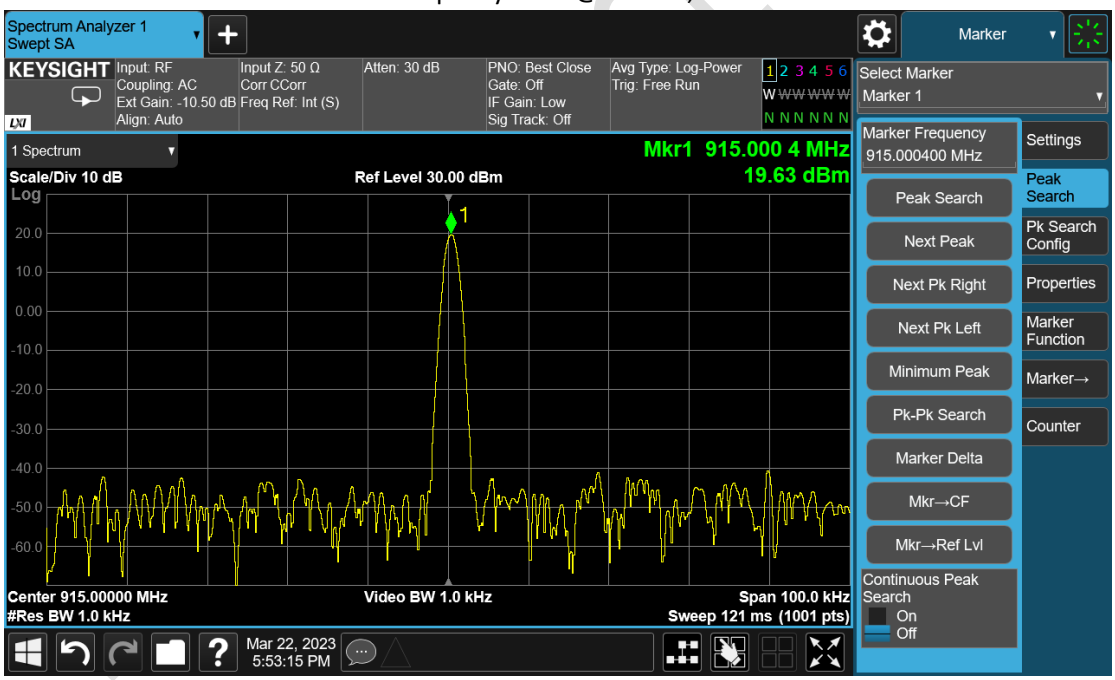
2# Frequency error @ 22dBm,85℃



1# Frequency error @ 22dBm,-40℃



2# Frequency error @ 22dBm,-40℃



3 Test summary

Test item		Result
25℃	32M	OK
	Frequency Error	OK
85℃	32M	OK
	Frequency Error	OK
-40℃	32M	OK
	Frequency Error	OK