| Keysight Spectrum Analyzer - | | | | | - 7 💌 |
|-----------------------------------|------------------------------------------|--------------------------------|------------------------|------------------------------------------------------|-----------------------------|
| RL RF 50 | | SENSE:INT | ALIGN OFF | 02:03:40 PM May 25, 2023 | Frequency |
| enter Freq 17.50 | DOOOOOO GHZ PNO: Fast C IFGain:Low | Trig: Free Run Atten: 30 dB | Avg Type: Log-Pwr | TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P | |
| 0 dB/div Ref 20.00 |) dBm | | Mkr3 2 | 4.764 500 GHz -33.90 dBm | Auto Tune |
| 10.0 | | ` | | | Center Free |
| 0.00 | | | | | 17.500000000 GH |
| 20.0 | | | | DL1 -14.97 dBm | Start Free |
| 30.0 | | | aut tille som | $\bigcirc^2 \Diamond^2 \bigcirc$ | 10.00000000 GH |
| 40.0 | | | | أنكأ شغب | |
| 50.0 | | | | | Stop Free 25.00000000 GH |
| 70.0 | | | | | |
| tart 10.000 GHz Res BW 1.0 MHz | #VB | W 3.0 MHz | Sweep 40 | Stop 25.000 GHz .00 ms (40001 pts) | CF Step 1.50000000 GH |
| KR MODE TRC SCL | Х | | JNCTION FUNCTION WIDTH | FUNCTION VALUE | <u>Auto</u> Ma |
| 1 N 1 f 2 N 1 f | 24.214 000 GHz 23.729 125 GHz | -32.54 dBm -33.36 dBm | | | FreqOffse |
| 3 N 1 f 4 5 | 24.764 500 GHz | -33.90 dBm | | | 0F |
| 6 | | | | = | |
| 8 | | | | | Scale Typ |
| | | | | · · | Log <u>Li</u> |
| G | | | STATUS | • | |
| - | | | 314103 | | |

TM 2 & 2412

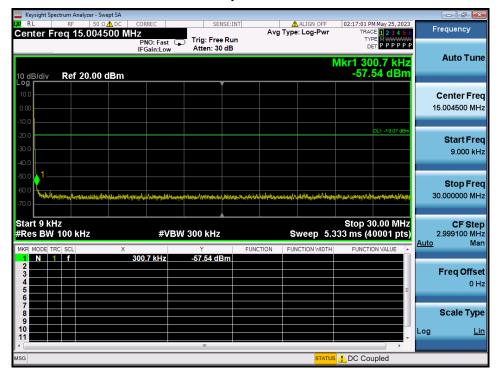
Reference

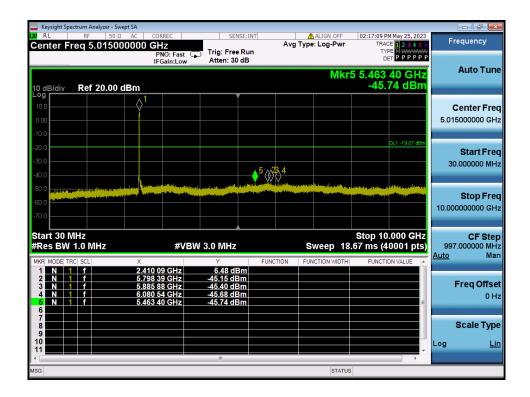


Low Band-edge









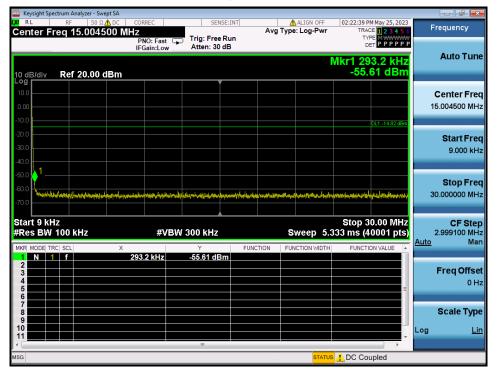




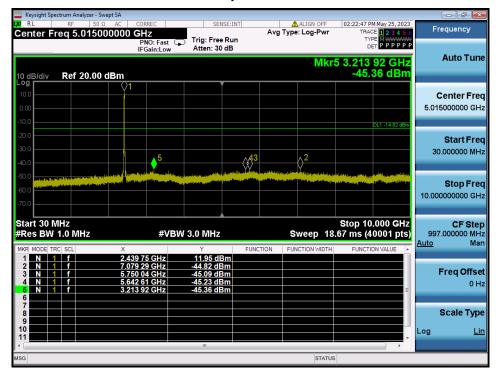
TM 2 & 2437

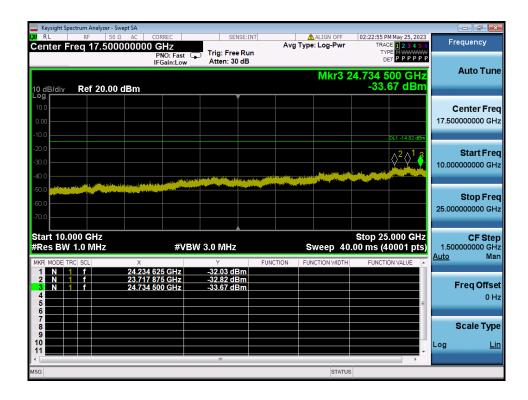
Keysight Spectrum Analyzer - Swept S 02:22:32 PM May 25, 2023 ALIGN OFF Frequency Center Freq 2.437000000 GHz TACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P PNO: Fast IFGain:Low Trig: Free Run Atten: 30 dB Auto Tune Mkr1 2.438 232 GHz 5.18 dBm 10 dB/div Ref 20.00 dBm Center Freq 2.437000000 GHz Start Freq 2.425153000 GHz JN I ø Stop Freq MVV, 2.448847000 GHz CF Step 2.369400 MHz <u>Auto</u> Man Freq Offset 0 Hz Scale Type Center 2.43700 GHz #Res BW 100 kHz Span 23.69 MHz Sweep 2.400 ms (3001 pts) Log Lin #VBW 300 kHz

Reference

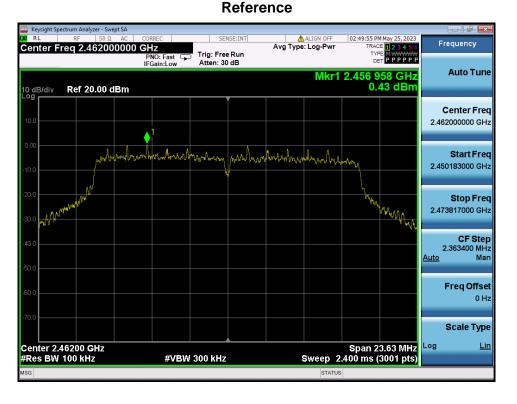




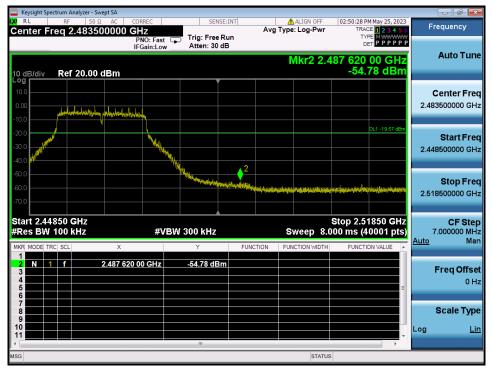




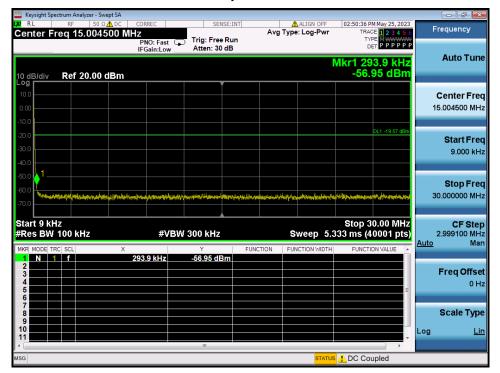
TM 2 & 2462

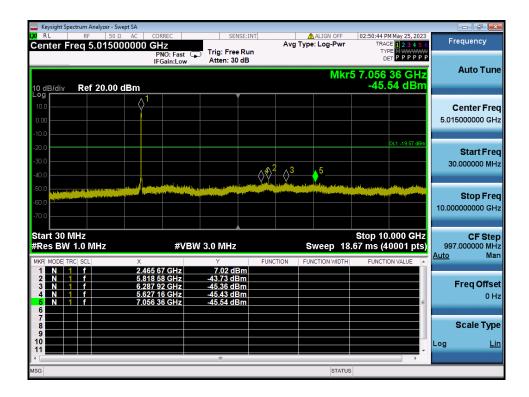


High Band-edge

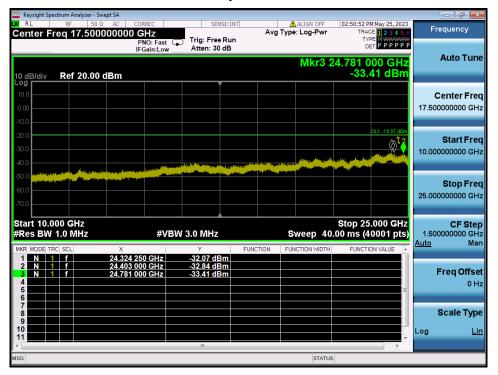












TM 3 & 2412



Reference

Low Band-edge





| Keysight Spectrum Analyzer - Swept SA | | | | | |
|--------------------------------------------------------------------------|----------------------------------------|-----------------------------------|----------------------------------------|------------------------------------------------------------------|---------------------------------------------------|
| ଅଷ୍ଟା ଅକ୍ଟର ସହ ଅଳ୍କ ଅଳ୍କ ଅଲ୍ଲ ଅଳ୍କ ଅଲ୍ଲ ଅଲ୍ଲ ଅଲ୍ଲ ଅଲ୍ଲ ଅଲ୍ଲ ଅଲ୍ଲ ଅଲ୍ଲ ଅଲ | CORREC | SENSE:INT | ALIGN OFF Avg Type: Log-Pwr | 03:18:22 PM May 25, 2023 TRACE 1 2 3 4 5 6 | Frequency |
| 10 dB/div Ref 20.00 dBm | | Atten: 30 dB | | TYPE M WARNAW DET P P P P P P Mkr1 281.9 kHz -57.67 dBm | Auto Tune |
| 10.0 0.00 -10.0 | | | | | Center Freq 15.004500 MHz |
| -20.0 | | | | DL1 -19.98 dBm | Start Freq 9.000 kHz |
| -50.0 1 | schartmonationstration to internations | hathladensit and with a tend of a | halanathranalanasythinanythinanaalanas | adys, ywrastad fawrio ywraitwry henro Marad | Stop Freq 30.000000 MHz |
| Start 9 kHz #Res BW 100 kHz MKR MODE TRC SCL X | #VBW 3 | | Sweep 5.3 | Stop 30.00 MHz 333 ms (40001 pts) FUNCTION VALUE | CF Step 2.999100 MHz <u>Auto</u> Man |
| | 261.9 KHZ - | 57.07 dBm | | E | Freq Offset 0 Hz |
| 7 8 9 10 11 | | | | | Scale Type Log <u>Lin</u> |
| MSG | | | STATIS | DC Coupled | |

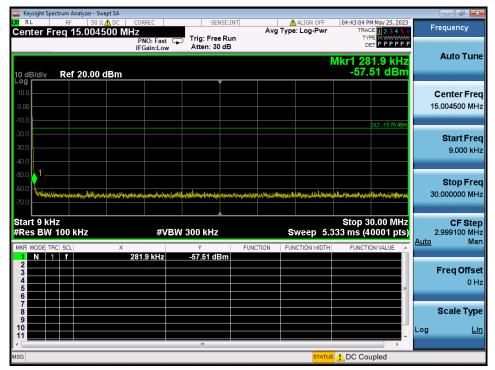
| 🔤 Keysight Spectrum Analyzer - Si | | | | | - F |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------------------------------|----------------|
| Center Freq 5.0150 | | SENSE:INT | ALIGN OFF Avg Type: Log-Pwr | 03:18:30 PM May 25, 2023 TRACE 1 2 3 4 5 6 | Frequency |
| Center Freq 5.0150 | PNO: Fast 🕞 | Trig: Free Run | | | |
| | IFGain:Low | Atten: 30 dB | | | Auto Tune |
| | | | Mkr | 5 6.312 84 GHz | Auto Tulk |
| 10 dB/div Ref 20.00 | dBm | | | -45.67 dBm | |
| 10.0 | 1 | ļĬ | | | Center Free |
| 0.00 | | | | | 5.015000000 GH |
| | | | | | 5.01500000 GH |
| -10.0 | | | | DL1 -19.98 dBm | |
| -20.0 | | | | DET -19.96 GBM | Start Free |
| -30.0 | | | 0 0- | | 30.000000 MH |
| -40.0 | \ \ | $ \longrightarrow $ | ≥ ² (³⁵ | | |
| -50.0 | and a local state of the second se | and a state of the | an and the suggest of the surgery of the local | addition and the art the part of the | |
| -60.0 | | | | | Stop Fre |
| -70.0 | | | | | 10.00000000 GH |
| -70.0 | | | | | |
| Start 30 MHz | | | | Stop 10.000 GHz | CF Ste |
| #Res BW 1.0 MHz | #VBW | / 3.0 MHz | Sweep 18 | .67 ms (40001 pts) | 997.000000 MH |
| MKR MODE TRC SCL | Х | Y FU | NCTION FUNCTION WIDTH | FUNCTION VALUE | <u>Auto</u> Ma |
| 1 N 1 f | 2.413 33 GHz | 5.12 dBm | | | |
| 3 N 1 f | 5.797 89 GHz 6.171 02 GHz | -44.57 dBm -44.62 dBm | | | Freq Offse |
| 4 N 1 f | 3.177 28 GHz | -45.46 dBm | | | 0 H |
| 5 N 1 f | 6.312 84 GHz | -45.67 dBm | | E | |
| 7 | | | | | Scale Typ |
| 8 | | | | | Scale Typ |
| 10 | | | | | Log <u>Li</u> |
| <pre></pre> | | | | | |
| MSG | | | STATU | 6 | |
| | | | | | |



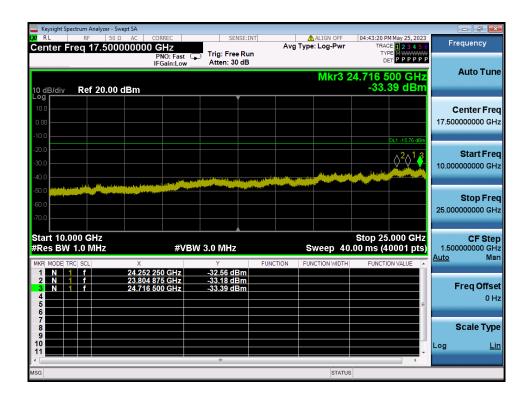
TM 3 & 2437

Reference





| Keysight Spectrum Analyzer - Sv | | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| RL RF 50 Ω enter Freg 5.0150 | | SENSE:INT | ALIGN OFF | 04:43:12 PM May 25, 2023 TRACE 1 2 3 4 5 6 | Frequency |
| | PNO: Fast IFGain:Low | Trig: Free Run Atten: 30 dB | - // - | TYPE MWWWWW DET PPPPP | Auto Tun |
| 0 dB/div Ref 20.00 | A | ¥ | MKr | 5 7.258 00 GHz -45.98 dBm | |
| 10.0 | | | | | Center Fre |
| | | | | | 5.015000000 GH |
| 10.0 | | | | DL1 -15.76 dBm | |
| 20.0 | | | | | Start Fre |
| 40.0 | | | ² ∧ ⁴ ▲ ⁵ | | 30.000000 MI |
| 50.0 | the state of the s | the second standard stress on a debining of the second | | and the second of the second state of the seco | |
| 50.0 Constant and the second se | | | | n de Minister, es en Minister, en Minister, el ballitabilitat | Stop Fre 10.00000000 Gi |
| 70.0 | | | | | 10.00000000000 |
| tart 30 MHz | | A | | Stop 10.000 GHz | CF Ste |
| Res BW 1.0 MHz | | 3W 3.0 MHz | | .67 ms (40001 pts) | 997.000000 M Auto M |
| KR MODE TRC SCL | × 2.441 00 GHz | Y FUI 10.90 dBm | FUNCTION FUNCTION WIDTH | FUNCTION VALUE | |
| 2 N 1 f 3 N 1 f | 5.835 28 GHz 5.664 55 GHz | -44.85 dBm -45.91 dBm | | | Freq Offs |
| 4 N 1 f 5 N 1 f | 6.276 95 GHz 7.258 00 GHz | -45.97 dBm -45.98 dBm | | = | 01 |
| 6 | | | | | |
| 8 | | | | | Scale Ty |
| 1 | | | | | Log <u>L</u> |
| | | III | | • | |
| G | | | STATU | 5 | |



10 dB/div

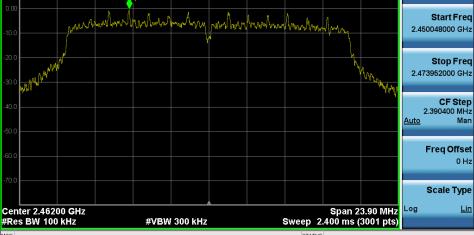
Frequency

Auto Tune

Center Freq 2 462000000 GHz

TM 3 & 2462

Keysight Spectrum Analyzer - Swept SA 04:50:17 PM May 25, 2023 ALIGN OFF TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P P Center Freq 2.462000000 GHz PNO: Fast IFGain:Low Trig: Free Run Atten: 30 dB Mkr1 2.456 972 GHz -0.63 dBm Ref 20.00 dBm



High Band-edge



Reference



| Keysight Spectrum Analyzer - Swept SA | | | | | - đ x |
|------------------------------------------------------|----------------------------------------------|-------------------------------------|--------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------|
| ₩ RL RF 50 Ω ▲ DC Center Freq 15.004500 Γ | CORREC HHZ | SENSE:INT | ALIGN OFF | 04:50:57 PM May 25, 2023 TRACE 1 2 3 4 5 6 TYPE MMAAAAAAA | Frequency |
| 10 dB/div Ref 20.00 dBm | | Atten: 30 dB | | TYPE MWWW DET PPPPPP Wkr1 285.7 kHz -56.32 dBm | Auto Tune |
| 10.0 0.00 -10.0 | | | | | Center Freq 15.004500 MHz |
| -20.0 | | | | DL1 -20.63 dBm | Start Freq 9.000 kHz |
| -50.0 | Madeet, Sorry May 12 to 19 Sorris 100 Sorris | afathirtis,Hadashirangatry,mitashir | enthandiaeathristeliae (patienes), service reter | disenterit kanna andarda di disemutation ma | Stop Freq 30.000000 MHz |
| Start 9 kHz #Res BW 100 kHz MKR MODE TRC SCL X | | Y FUNC | | Stop 30.00 MHz 333 ms (40001 pts) FUNCTION VALUE | CF Step 2.999100 MHz <u>Auto</u> Man |
| 1 N 1 f 2 | 285.7 kHz - | 56.32 dBm | | E | Freq Offset 0 Hz |
| 7 8 9 9 10 11 | | | | | Scale Type |
| • | | III | | Þ | |
| MSG | | | STATUS | L Coupled | |

| 🔤 Keysight Spectrum Analyzer - Si | | | | | - 6 × |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------|------------------------|-----------------------------------------------|-------------------------|
| Center Freq 5.0150 | | SENSE:INT | ALIGN OFF | 04:51:06 PM May 25, 2023 TRACE 1 2 3 4 5 6 | Frequency |
| Center Freq 5.0150 | PNO: Fast 🕞 | Trig: Free Run | Ang Type. Log Thi | TYPE MWWWWW DET P P P P P P | |
| | IFGain:Low | Atten: 30 dB | | | Auto Tune |
| | | | Mkr | 5 5.858 96 GHz | Auto Tulk |
| 10 dB/div Ref 20.00 | dBm | | | -45.52 dBm | |
| 10.0 | | ļĪ | | | Center Fre |
| 0.00 | | | | | 5.015000000 GH |
| -10.0 | | | | | 0.01000000000 |
| | | | | DL1 -20.63 dBm | |
| -20.0 | | | | 021-20.03 0211 | Start Fre |
| -30.0 | . 4 | | ∧ <u>4</u> 5 ∧3 | | 30.000000 MH |
| -40.0 | <u> </u> | | | | |
| -50.0 scall research research the second | | approximation of the lead of the party of | | | Stop Fre |
| -60.0 Printed and the second s | | | | | 10.000000000 GH |
| -70.0 | | | | | 10.00000000 GH |
| | | | | | |
| Start 30 MHz | #\/D\\ | | O | Stop 10.000 GHz | CF Ste 997.000000 MH |
| #Res BW 1.0 MHz | #VBV | / 3.0 MHz | Sweep 18 | .67 ms (40001 pts) | Auto Ma |
| MKR MODE TRC SCL | × 2.457 70 GHz | Y F 5.56 dBm | UNCTION FUNCTION WIDTH | FUNCTION VALUE | |
| 2 N 1 f | 5.762 25 GHz | -44.77 dBm | | | |
| 3 N 1 f | 6.896 09 GHz 3.164 57 GHz | -44.80 dBm -45.13 dBm | | | FreqOffse |
| 5 N 1 f | 5.858 96 GHz | -45.52 dBm | | E | он |
| 6 | | | | | |
| 8 | | | | | Scale Typ |
| 9 | | | | | |
| 11 | | | | | Log <u>Li</u> |
| • | | m | | • | |
| ISG | | | STATUS | | |



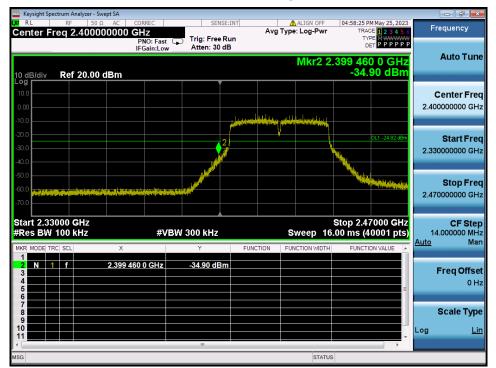


TM 4 & 2422

Keysight Spectrum Analyzer - Swept SA 04:57:29 PM May 25, 2023 ALIGN OFF Frequency TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P Center Freq 2.422000000 GHz PNO: Fast IFGain:Low Trig: Free Run Atten: 30 dB Auto Tune Mkr1 2.433 255 GHz -4.82 dBm 10 dB/div Ref 20.00 dBm Center Freq 2 422000000 GHz البران المرابية Start Freq يتعاييه والمراب المراجع 1. And description of the 2.395579750 GHz Stop Freq 2.448420250 GHz WVWWAL. CF Step 5.284050 MHz <u>Auto</u> Man Freq Offset 0 Hz Scale Type Center 2.42200 GHz #Res BW 100 kHz Span 52.84 MHz Sweep 5.200 ms (3001 pts) Log Lin #VBW 300 kHz

Reference

Low Band-edge





| | ectrum Analyzer | | | | | | | | | | | |
|-----------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------|--------------------|-----------------------|------------------------------------------------|
| LXI RL | | 50 Ω <u>Λ</u> DC | CORREC | | SENSE:I | NT | | ALIGN OFF | | M May 25, 20 | | Frequency |
| Center F | req 15.00 | 04500 MI | | T -1 | | | Avg Typ | e: Log-Pwr | TRAC | | 6 | Frequency |
| 10 dB/div | Ref 20.0 | 00 dBm | PNO: Fas IFGain:Lo | | g: Free Ru ten: 30 dB | | | | <u> Mkr1 28</u> | 2.7 kH | | Auto Tune |
| | KCI 20. | | | | | | | | | | | |
| 10.0 0.00 -10.0 | | | | | | | | | | | | Center Freq 15.004500 MHz |
| -20.0 | | | | | | | | | | | | |
| -30.0 | | | | | | | | | | DL1 -24.82 dE | n | Start Freq 9.000 kHz |
| -50.0 1 | olan kanala katala k | and the second secon | the spin of the second second | aning and a second | an the second | the standed | en son the state of the state o | موايار وارد وارد وارد وارد و موايار وارد و رو و و رو و و و و و و و و و و و و و | he the stand of the section | | • | Stop Freq 30.000000 MHz |
| Start 9 kl #Res BW | 100 kHz | X | #\ | /BW 300 | | FUNC | | weep 5.3 | 333 ms (4 | 0.00 MH 0001 pt | z s) <u>Aut</u> | CF Step 2.999100 MHz <u>o</u> Man |
| 1 N ' | l f | | 282.7 kHz | -56 | .56 dBm | | | | | | | |
| 2 3 4 5 6 | | | | | | | | | | | = | Freq Offset 0 Hz |
| 7 8 9 | | | | | | | | | | | | Scale Type |
| 10 | | | | | | | | | | | Lo |) <u>Lin</u> |
| • | | | | | | | | | | | | |
| MSG | | | | | | | | STATUS | L DC Cou | pled | | |

| 🏧 Keysight Spectrum Analyzer - Sv | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------|-----------------------------------------------|-----------------------------------------------------|
| Center Freq 5.0150 | | SENSE:INT | ALIGN OFF Avg Type: Log-Pwr | 04:58:41 PM May 25, 2023 TRACE 1 2 3 4 5 6 | Frequency |
| 10 dB/div Ref 20.00 | PNO: Fast 🖵 IFGain:Low |) Trig: Free Run Atten: 30 dB | Mkr | 5 4.846 51 GHz -45.66 dBm | Auto Tune |
| | | | | | Center Freq 5.015000000 GHz |
| -20.0 -30.0 -40.0 | | ∳⁵♦ | 2 | DL1 -24.82 dBm | Start Freq 30.000000 MHz |
| -50.0 -60.0 -70.0 | | | | | Stop Freq 10.000000000 GHz |
| Start 30 MHz #Res BW 1.0 MHz | #VBW | 3.0 MHz | Sweep 18 | Stop 10.000 GHz 3.67 ms (40001 pts) | CF Step 997.000000 MH2 <u>Auto</u> Mar |
| 1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f 6 | 2.415 82 GHz 5.733 34 GHz 6.440 46 GHz 6.336 52 GHz 4.846 51 GHz | 2.48 dBm -45.13 dBm -45.29 dBm -45.36 dBm -45.66 dBm | | | Freq Offset 0 Hz |
| 7 8 8 9 10 10 | | | | | Scale Type |
| | | | | • • • • | |
| MSG | | | STATU | 6 | |

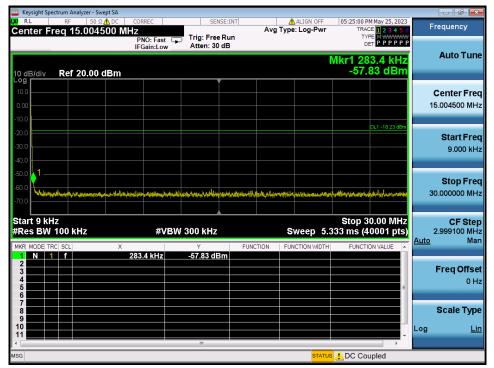




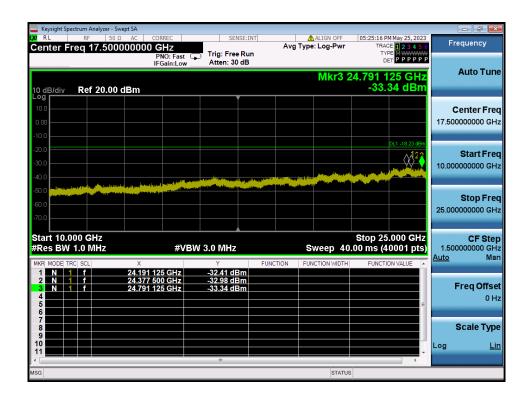
TM 4 & 2437

Reference





| Keysight Spectrum Analyzer - Swept SA | | | | | - # × |
|------------------------------------------------------|---------------------------------------------------------------|---------------------------------|-----------------------|-----------------------------------------------|---------------------------------------------|
| KIRL RF 50Ω AC | CORREC | SENSE:INT | ALIGN OFF | 05:25:08 PM May 25, 2023 TRACE 1 2 3 4 5 6 | Frequency |
| Center Freq 5.015000000 | PNO: Fast | Trig: Free Run Atten: 30 dB | Avg Type. Log-Pwi | | |
| 10 dB/div Ref 20.00 dBm | | | Mkr | 5 5.529 95 GHz -46.09 dBm | Auto Tune |
| 10.0 | | | | | Center Fred 5.015000000 GHz |
| -10.0 | | | | DL1 -18.23 dBm | Start Fred |
| -30.0 | | 5 | § ² 4 | | 30.000000 MH: |
| -50.0 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - | | | | | Stop Free 10.000000000 GH; |
| Start 30 MHz #Res BW 1.0 MHz | #VBW | 3.0 MHz | | Stop 10.000 GHz 3.67 ms (40001 pts) | CF Step 997.000000 MH <u>Auto</u> Mar |
| 2 N 1 f 5.8 3 N 1 f 5.7 4 N 1 f 6.3 | 45 23 GHz 52 73 GHz 55 02 GHz 17 08 GHz 29 95 GHz | Y FU 7.96 dBm | NCTION FUNCTION WIDTH | FUNCTION VALUE | Freq Offse |
| 7 | | | | | Scale Type |
| 10 | | | | | Log <u>Lir</u> |
| | | | | | |



TM 4 & 2452

Reference



High Band-edge





| | | Analyzer - Swe | | | | | | | | | | | |
|----------------------|---------|-----------------------------|----------------------|---------------------------|-----------------------|-----------------|-----------------------|---------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------|---------------------|------|-----------------|
| L <mark>XI</mark> RL | RF | | \Lambda DC 📗 | CORREC | | SEN | SE:INT | | ALIGN OFF | | M May 25, 20 | | Frequency |
| Center | Freq 1 | 15.0045 | 500 MI | | т. | ig: Free | Dum | Avg T | ype: Log-Pwr | TRAC | E 1 2 3 4 | 5 6 | riequency |
| | | | | PNO: Fas IFGain:Lo | | tten: 30 | | | | | | _ | Auto Tun |
| 10 dB/div Log | Ref | 20.00 (| dBm | | | | | | | Mkr1 28 -55. | 4.2 KH 40 dBi | n | |
| 10.0 | | | | | | | | | | | | | Center Fre |
| | | | | | | | | | | | | | 15.004500 MH |
| 0.00 | | | | | | | | | | | | | 15.004500 MH |
| -10.0 | | | | | | | | | | | | | |
| -20.0 | | | | | | | | | | | DL1 -25.37 dt | an I | Start Fre |
| -30.0 | | | | | | | | | | | | | 9.000 kH |
| -40.0 | | | | | | | | | | | | | 9.000 KH |
| 1 | | | | | | | | | | | | | |
| -50.0 | | | | | | | | | | | | | Stop Fre |
| -60.0 | | Res and the second distance | and the section that | han anan | an and distants Mare | والمحمد والمحمد | | a becaudear. | ىرىلىلەر بىر بىر ئۇغا بىر بىر بار ب | ومرادع والمراجع والمراجع | a ana sa kara da ka | | 30.000000 MH |
| -70.0 | | and the strength of the | di internet si di s | يروز والالولاد وتوجد الله | and the second second | | التقريبية وبلقع والشع | for the providence of the | Contrast of Contrast of Contrast of Contrast | and the second | Contraction of the | | 00.000000 1111 |
| | | | | | | | | | | | | | |
| Start 9 k | | | | | | | | | | | 0.00 MH | | CF Ste |
| #Res BV | V 100 | kHz | | # | VBW 30 | 0 kHz | | | Sweep 5.3 | 333 ms (4 | 0001 pt | | 2.999100 MH |
| MKR MODE | TRC SCL | | х | | | Y | FUN | CTION | FUNCTION WIDTH | FUNCTI | ON VALUE | r l | <u>Auto</u> Ma |
| 1 N | 1 f | | | 284.2 kHz | -5 | 5.40 dE | lm | | | | | | |
| 2 | | | | | | | | | | | | | Freq Offse |
| 4 | | | | | | | | | | | | | он |
| 5 | | | | | | | | | | | | = | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | Scale Typ |
| 9 | | | | | | | | | | | | ш. | _og <u>Li</u> i |
| 11 | | | | | | | | | | | | ÷ | |
| • [| | | | | | | | | | | + | | |
| MSG | | | | | | | | | STATUS | DC Co | upled | | |

| | | m Analyzer - | | | | | | | | | | | | | | |
|-----------------|----------------------|-----------------------------------------------------------------------------------------------------------------|--------|---------------------------|-----------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------|---------|----------------------------|-------------------|-----------------------------|-------|-------------|----------------|
| enter | | | 0 Ω AC | | RREC | | SEN | SE:INT | Ava | | ALIGN OFF | | PM May 25, 2 ACE 1 2 3 4 | | Fr | equency |
| Jenner | | 5.015 | 0000 | Р | NO: Fast Gain: Low | | Trig: Free Atten: 30 | | | .,,,,, | | | | P P P | | |
| | | | | | Gameen | | | | | | Mkr | 5 5 87 | 0 92 G | 87 | | Auto Tur |
| I0 dB/div | R | ef 20.0 | 0 dBn | n | | | | | | | | -45 | .68 dE | ŝm | | |
| - ^{og} | | | | ∧1 | | | | | | | | | | | | Center Fre |
| 0.00 | | | | <u> </u> | | | | | | | | | | | | 5000000 GI |
| 10.0 | | | | | | | | | | | | | | | | |
| 20.0 | | | | | | | | | | | | | | | | |
| 30.0 | | | | | | | | | | | | | DL1 -25.37 | dBm | | Start Fr |
| 40.0 | | | | 2 | | | | | 5 | | | | | | 30 | .000000 M |
| | | | | | and the state of the state of the | | ويعقبل متعتد | and | and trees | analara | ورور ومقاومتها ومرووط والم | and in the second | . In subdates to see | | | |
| and a set | or e-cons Andores | a the first of the second s | | A DESCRIPTION OF A | | | and a first state of the state | and the second secon | | Konski | All the state of the local | | | | | Stop Fr |
| 60.0 70.0 | | | | | | | | | | | | | | | 10.00 | 0000000 G |
| /0.0 | | | | | | | | | | | | | | | | |
| Start 30 | | | | | | | | | | | | | 0.000 G | | | CF Ste |
| Res BV | V 1.0 | MHz | | | #V | BW | 3.0 MHz | | | S | weep 18 | .67 ms i | (40001 p | ots) | 997 Auto | .000000 M M |
| IKR MODE | TRC S | CL | | X | | | Y D DD JD | | CTION | FUN | NCTION WIDTH | FUNC | TION VALUE | L. | Auto | IN |
| 1 N 2 N | 1 | f | | <u>2.460 9</u> 2.394 3 | 9 GHz | | 2.06 dB -42.05 dB | m | | | | | | | | |
| 3 N 4 N | 1 | f | | <u>5.728 3</u> 5.776 4 | | | -44.47 dB -45.55 dB | | | | | | | | | olfs ا 0 |
| 5 N | 1 | f | | 5.870 9 | | | -45.68 dB | | | | | | | = | | U |
| 6 7 | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | Scale Ty |
| 10 | | | | | | | | | | | | _ | | | Log | L |
| | | | | | | | | | | | | | | • | | |
| SG | _ | | | | | | | | | | STATUS | | | | | |







5.5. Unwanted Emissions (Radiated)

Test Requirements and limit,

Part 15.247(d), Part 15.205, Part 15.209 & RSS-247 [5.5], RSS-Gen [8.9], RSS-Gen [8.10]

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of Part 15.247 the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

| - Part 15.209 & RSS-Gen[6.9]. General requirement | | | | | | | | | | | |
|---------------------------------------------------|------------------|-------------------|--------------------------|--|--|--|--|--|--|--|--|
| Frequency (MHz) | FCC Limit (uV/m) | IC Limit (µA/m) | Measurement Distance (m) | | | | | | | | |
| 0.009 - 0.490 | 2 400 / F (kHz) | 6.37/F (F in kHz) | 300 | | | | | | | | |
| 0.490 – 1.705 | 24 000 / F (kHz) | 63.7/F (F in kHz) | 30 | | | | | | | | |
| 1.705 - 30.0 | 30 | 0.08 | 30 | | | | | | | | |

Part 15 209 & RSS-Gen[8 9]: General requirement

| Frequency (MHz) | FCC Limit (uV/m) | IC Limit (uV/m) | Measurement Distance (m) |
|-----------------|------------------|-----------------|--------------------------|
| 30 ~ 88 | 100 ** | 100 | 3 |
| 88 ~ 216 | 150 ** | 150 | 3 |
| 216 ~ 960 | 200 ** | 200 | 3 |
| Above 960 | 500 | 500 | 3 |

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.



- Part 15.205(a): Restricted band of operation

| MHz | MHz | MHz | MHz | GHz | GHz |
|---------------------|-----------------------|-------------------------|-------------------|--------------|---------------|
| 0.009 ~ 0.110 | 8.414 25 ~ 8.414 75 | 108 ~ 121.94 | 1 300 ~ 1 427 | 4.5 ~ 5.15 | 14.47 ~ 14.5 |
| 0.495 ~ 0.505 | 12.29 ~ 12.293 | 123 ~ 138 | 1 435 ~ 1 626.5 | 5.35 ~ 5.46 | 15.35 ~ 16.2 |
| 2.173 5 ~ 2.190 5 | 12.519 75 ~ 12.520 25 | 149.9 ~ 150.05 | 1 645.5 ~ 1 646.5 | 7.25 ~ 7.75 | 17.7 ~ 21.4 |
| 4.125 ~ 4.128 | 12.576 75 ~ 12.577 25 | 156.524 75 ~ 156.525 25 | 1 660 ~ 1 710 | 8.025 ~ 8.5 | 22.01 ~ 23.12 |
| 4.177 25 ~ 4.177 75 | 13.36 ~ 13.41 | 156.7 ~ 156.9 | 1 718.8 ~ 1 722.2 | 9.0 ~ 9.2 | 23.6 ~ 24.0 |
| 4.207 25 ~ 4.207 75 | 16.42 ~ 16.423 | 162.012 5 ~ 167.17 | 2 200 ~ 2 300 | 9.3 ~ 9.5 | 31.2 ~ 31.8 |
| 6.215 ~ 6.218 | 16.694 75 ~ 16.695 25 | 167.72 ~ 173.2 | 2 310 ~ 2 390 | 10.6 ~ 12.7 | 36.43 ~ 36.5 |
| 6.267 75 ~ 6.268 25 | 16.804 25 ~ 16.804 75 | 240 ~ 285 | 2 483.5 ~ 2 500 | 13.25 ~ 13.4 | Above 38.6 |
| 6.311 75 ~ 6.312 25 | 25.5 ~ 25.67 | 322 ~ 335.4 | 2 655 ~ 2 900 | | |
| 8.291 ~ 8.294 | 37.5 ~ 38.25 | 399.90 ~ 410 | 3 260 ~ 3 267 | | |
| 8.362 ~ 8.366 | 73 ~ 74.6 | 608 ~ 614 | 3 332 ~ 3 339 | | |
| 8.376 25 ~ 8.386 75 | 74.8 ~ 75.2 | 960 ~ 1 240 | 3 345.8 ~ 3 358 | | |
| | | | 3 600 ~ 4 400 | | |

- RSS-Gen[8.10]: Restricted frequency bands

| MHz | MHz | MHz | MHz | MHz | GHz |
|---------------------|-----------------------|--------------------|-------------------|-----------------|---------------|
| 0.090 ~ 0.110 | 8.362 ~ 8.366 | 73 ~ 74.6 | 608 ~ 614 | 3 345.8 ~ 3 358 | 9.0 ~ 9.2 |
| 0.495 ~ 0.505 | 8.376 25 ~ 8.386 75 | 74.8 ~ 75.2 | 960 ~ 1 427 | 3 500 ~ 4 400 | 9.3 ~ 9.5 |
| 2.173 5 ~ 2.190 5 | 8.414 25 ~ 8.414 75 | 108 ~ 138 | 1 435 ~ 1 626.5 | 4 500 ~ 5 150 | 10.6 ~ 12.7 |
| 3.020 ~ 3.026 | 12.29 ~ 12.293 | 149.9 ~ 150.05 | 1 645.5 ~ 1 646.5 | 5 350 ~ 5 460 | 13.25 ~ 13.4 |
| 4.125 ~ 4.128 | 12.519 75 ~ 12.520 25 | 156.524 75 ~ | 1 660 ~ 1 710 | 7 250 ~ 7 750 | 14.47 ~ 14.5 |
| 4.177 25 ~ 4.177 75 | 12.576 75 ~ 12.577 25 | 156.525 25 | 1 718.8 ~ 1 722.2 | 8 025 ~ 8 500 | 15.35 ~ 16.2 |
| 4.207 25 ~ 4.207 75 | 13.36 ~ 13.41 | 156.7 ~ 156.9 | 2 200 ~ 2 300 | | 17.7 ~ 21.4 |
| 5.677 ~ 5.683 | 16.42 ~ 16.423 | 162.01 25 ~ 167.17 | 2 310 ~ 2 390 | | 22.01 ~ 23.12 |
| 6.215 ~ 6.218 | 16.694 75 ~ 16.695 25 | 167.72 ~ 173.2 | 2 483.5 ~ 2 500 | | 23.6 ~ 24.0 |
| 6.267 75 ~ 6.268 25 | 16.804 25 ~ 16.804 75 | 240 ~ 285 | 2 655 ~ 2 900 | | 31.2 ~ 31.8 |
| 6.311 75 ~ 6.312 25 | 25.5 ~ 25.67 | 322 ~ 335.4 | 3 260 ~ 3 267 | | 36.43 ~ 36.5 |
| 8.291 ~ 8.294 | 37.5 ~ 38.25 | 399.90 ~ 410 | 3 332 ~ 3 339 | | Above 38.6 |

5.5.1. Test Setup

Refer to the APPENDIX I.

5.5.2. Test Procedures

- 1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m.
- 2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3. EUT is set 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
- 4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6. Repeat above procedures until the measurements for all frequencies are complete.

Note: Measurement Instrument Setting for Radiated Emission Measurements.

- KDB558074 D01v05r02 Section 8.6
- ANSI C63.10-2013 Section 11.12

1. Frequency Range Below 1 GHz

RBW = 100 or 120 kHz, VBW = 3 x RBW, Detector = Peak or Quasi Peak

2. Frequency Range > 1 GHz

Peak Measurement > 1 GHz

RBW = 1 MHz, VBW = 3 MHz, Detector = Peak, Sweep time = Auto, Trace mode = Max Hold until the trace stabilizes Average Measurement > 1 GHz

- 1. RBW = 1 MHz (unless otherwise specified).
- 2. VBW \geq 3 x RBW.
- 3. Detector = RMS (Number of points ≥ 2 x Span / RBW)
- 4. Averaging type = power (i.e., RMS).
- 5. Sweep time = auto.
- 6. Perform a trace average of at least 100 traces.
- 7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is $10 \log(1 / D)$, where D is the duty cycle.
 - 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is 20 log(1 / D), where D is the duty cycle.
 - 3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

| Test Mode | Date rate | T _{on} (ms) | T _{on+off} (ms) | $D = T_{on} / (T_{on+off})$ | DCCF = 10 log(1/D) (dB) | | | | | |
|-----------|-----------|----------------------|--------------------------|-------------------------------|-------------------------|--|--|--|--|--|
| TM 1 | 1 Mbps | 12.430 | 12.540 | 0.991 2 | 0.04 | | | | | |
| TM 2 | 6 Mbps | 2.064 | 2.171 | 0.950 7 | 0.22 | | | | | |
| TM 3 | MCS 0 | 1.924 | 2.040 | 0.943 1 | 0.25 | | | | | |
| TM 4 | MCS 0 | 0.948 | 1.082 | 0.876 2 | 0.57 | | | | | |

Duty Cycle Information

Note1: Where, T= Transmission duration / D= Duty cycle Note2: Please refer to the appendix II for duty cycle plots.

Detector Mode : QPK

5.5.3. Test Results

- Test Notes

1. The radiated emissions below 1GHz were investigated 9 kHz to 1 GHz and the worst case data was reported.

2. Information of Distance Correction Factor

For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.

In this case, the distance factor is applied to the result.

- Calculation of distance correction factor

At frequencies below 30 MHz = 40 log(tested distance / specified distance)

At frequencies at or above 30 MHz = 20 log(tested distance / specified distance)

When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + TF+ DCCF + DCF / TF = AF + CL + HL + AL - AG

Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss, AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

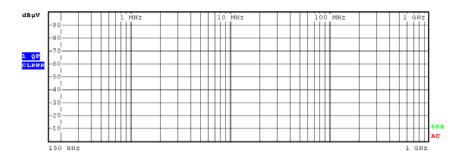
| | Unwanted Emissions data(9 KHZ ~ 1 GHZ) : <u>1M1</u> | | | | | | | | | | |
|------------------------------|-----------------------------------------------------|------------|---------------------------|------------------|-------------------|--------------|--------------|-------------|--------------------|-------------------|------------|
| Tested Frequency (MHz) | Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin(dB) |
| | 31.10 | V | Z | QPK | 42.60 | -9.73 | N/A | N/A | 32.87 | 40.00 | 7.13 |
| 2 412 | 66.78 | V | Z | QPK | 38.50 | -9.77 | N/A | N/A | 28.73 | 40.00 | 11.27 |
| 2412 | - | - | - | - | - | - | - | - | - | - | - |
| | - | - | - | - | - | - | - | - | - | - | - |

Unwanted Emissions data(9 KHz ~ 1 GHz) : TM1

TM 1 & 2412 & Zaxis & Ver

X

REW 120 kHz MT 10 ms Att 0 dB AUTO PREAMP OFF FREQUENCY 31.0950000 MHz QPK 42.29 dBµV (42.6 31.095000 MHz



Date: 23.MAY.2023 16:25:32



- Test Notes

1. The radiated emissions above 1GHz were investigated up to 25 GHz. And no other spurious and harmonic emissions were found below listed frequencies.

2. Information of Distance Correction Factor

For finding emissions, measurements may be performed at a distance closer than that specified in the regulations.

In this case, the distance factor is applied to the result.

- Calculation of distance correction factor

At frequencies below 30 MHz = 40 log(tested distance / specified distance) At frequencies at or above 30 MHz = 20 log(tested distance / specified distance)

When distance factor is "N/A", the measurements were performed at the specified distance and distance factor is not applied.

3. Sample Calculation.

Margin = Limit - Result / Result = Reading + TF+ DCCF + DCF / TF = AF + CL + HL + AL - AG

Where, TF = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain, HL = High pass filter Loss, AL = Attenuator Loss, DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor

Radiated Emissions data(1 GHz ~ 25 GHz) : TM 1

| Tested Frequency (MHz) | Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin(dB) |
|------------------------------|--------------------|------------|---------------------------|------------------|-------------------|--------------|--------------|-------------|--------------------|-------------------|------------|
| | 2 388.94 | Н | Y | PK | 51.26 | 4.60 | N/A | N/A | 55.86 | 74.00 | 18.14 |
| 2 412 | 2 389.86 | Н | Y | AV | 41.29 | 4.60 | N/A | N/A | 45.89 | 54.00 | 8.11 |
| 2 412 | 4 823.86 | V | Х | PK | 50.67 | 2.34 | N/A | N/A | 53.01 | 74.00 | 20.99 |
| | 4 823.93 | V | Х | AV | 42.31 | 2.34 | N/A | N/A | 44.65 | 54.00 | 9.35 |
| 2 437 | 4 873.90 | V | Х | PK | 51.30 | 2.18 | N/A | N/A | 53.48 | 74.00 | 20.52 |
| 2 437 | 4 873.99 | V | Х | AV | 42.41 | 2.18 | N/A | N/A | 44.59 | 54.00 | 9.41 |
| | 2 486.26 | Н | Y | PK | 52.54 | 5.66 | N/A | N/A | 58.20 | 74.00 | 15.80 |
| 2 462 | 2 485.70 | Н | Y | AV | 42.66 | 5.65 | N/A | N/A | 48.31 | 54.00 | 5.69 |
| 2 402 | 4 923.60 | V | Х | PK | 49.39 | 2.57 | N/A | N/A | 51.96 | 74.00 | 22.04 |
| | 4 923.96 | V | Х | AV | 40.44 | 2.57 | N/A | N/A | 43.01 | 54.00 | 10.99 |

Radiated Emissions data(1 GHz ~ 25 GHz) : TM 2

| Tested Frequency (MHz) | Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin(dB) |
|------------------------------|--------------------|------------|---------------------------|------------------|-------------------|--------------|--------------|-------------|--------------------|-------------------|------------|
| | 2 389.01 | Н | Y | PK | 50.19 | 4.60 | N/A | N/A | 54.79 | 74.00 | 19.21 |
| 2 412 | 2 389.24 | Н | Y | AV | 39.34 | 4.60 | 0.22 | N/A | 44.16 | 54.00 | 9.84 |
| 2 412 | 4 824.52 | V | Х | PK | 50.07 | 2.34 | N/A | N/A | 52.41 | 74.00 | 21.59 |
| | 4 824.22 | V | Х | AV | 39.27 | 2.34 | 0.22 | N/A | 41.83 | 54.00 | 12.17 |
| 2 437 | 4 874.30 | V | Х | PK | 50.78 | 2.19 | N/A | N/A | 52.97 | 74.00 | 21.03 |
| 2 437 | 4 874.05 | V | Х | AV | 39.93 | 2.18 | 0.22 | N/A | 42.33 | 54.00 | 11.67 |
| | 2 483.98 | H | Y | PK | 50.97 | 5.62 | N/A | N/A | 56.59 | 74.00 | 17.41 |
| 2 462 | 2 483.54 | Н | Y | AV | 39.56 | 5.62 | 0.22 | N/A | 45.40 | 54.00 | 8.60 |
| 2 402 | 4 924.04 | V | Х | PK | 49.34 | 2.45 | N/A | N/A | 51.79 | 74.00 | 22.21 |
| | 4 924.13 | V | Х | AV | 39.07 | 2.45 | 0.22 | N/A | 41.74 | 54.00 | 12.26 |

| Tested Frequency (MHz) | Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin(dB) |
|------------------------------|--------------------|------------|---------------------------|------------------|-------------------|--------------|--------------|-------------|--------------------|-------------------|------------|
| | 2 389.72 | Н | Y | PK | 48.76 | 4.60 | N/A | N/A | 53.36 | 74.00 | 20.64 |
| 2 412 | 2 389.97 | Н | Y | AV | 39.26 | 4.60 | 0.25 | N/A | 44.11 | 54.00 | 9.89 |
| 2412 | 4 824.31 | V | Х | PK | 49.35 | 2.33 | N/A | N/A | 51.68 | 74.00 | 22.32 |
| | 4 824.09 | V | Х | AV | 39.64 | 2.33 | 0.25 | N/A | 42.22 | 54.00 | 11.78 |
| 2 437 | 4 873.84 | V | Х | PK | 49.96 | 2.16 | N/A | N/A | 52.12 | 74.00 | 21.88 |
| 2 437 | 4 873.70 | V | Х | AV | 39.73 | 2.16 | 0.25 | N/A | 42.14 | 54.00 | 11.86 |
| | 2 484.63 | Н | Y | PK | 52.39 | 5.63 | N/A | N/A | 58.02 | 74.00 | 15.98 |
| 2.462 | 2 483.68 | Н | Y | AV | 41.99 | 5.62 | 0.25 | N/A | 47.86 | 54.00 | 6.14 |
| 2 462 | 4 923.66 | V | Х | PK | 49.33 | 2.57 | N/A | N/A | 51.90 | 74.00 | 22.10 |
| | 4 923.87 | V | Х | AV | 39.27 | 2.57 | 0.25 | N/A | 42.09 | 54.00 | 11.91 |

Radiated Emissions data(1 GHz ~ 25 GHz) : TM 3

Radiated Emissions data(1 GHz ~ 25 GHz) : TM 4

| Tested Frequency (MHz) | Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | TF (dB/m) | DCCF (dB) | DCF (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin(dB) |
|------------------------------|--------------------|------------|---------------------------|------------------|-------------------|--------------|--------------|-------------|--------------------|-------------------|------------|
| | 2 389.43 | Н | Y | PK | 51.24 | 4.60 | N/A | N/A | 55.84 | 74.00 | 18.16 |
| 2 422 | 2 389.87 | Н | Y | AV | 42.36 | 4.60 | 0.57 | N/A | 47.53 | 54.00 | 6.47 |
| 2 422 | 4 843.02 | V | Х | PK | 49.33 | 2.26 | N/A | N/A | 51.59 | 74.00 | 22.41 |
| | 4 843.61 | V | Х | AV | 39.13 | 2.26 | 0.57 | N/A | 41.96 | 54.00 | 12.04 |
| 2 437 | 4 874.63 | V | Х | PK | 50.85 | 2.18 | N/A | N/A | 53.03 | 74.00 | 20.97 |
| 2 437 | 4 874.06 | V | Х | AV | 39.59 | 2.16 | 0.57 | N/A | 42.32 | 54.00 | 11.68 |
| | 2 484.27 | Н | Y | PK | 55.02 | 5.63 | N/A | N/A | 60.65 | 74.00 | 13.35 |
| 2 452 | 2 483.54 | Н | Y | AV | 42.97 | 5.62 | 0.57 | N/A | 49.16 | 54.00 | 4.84 |
| 2 402 | 4 903.32 | V | Х | PK | 49.87 | 2.50 | N/A | N/A | 52.37 | 74.00 | 21.63 |
| | 4 903.14 | V | Х | AV | 39.30 | 2.50 | 0.57 | N/A | 42.37 | 54.00 | 11.63 |



5.6. AC Power-Line Conducted Emissions

Test Requirements and limit, Part 15.207 & RSS-Gen [8.8]

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

| | Conducted Limit (dBuV) | | | | | |
|-----------------------|------------------------|------------|--|--|--|--|
| Frequency Range (MHz) | Quasi-Peak | Average | | | | |
| 0.15 ~ 0.5 | 66 to 56 * | 56 to 46 * | | | | |
| 0.5 ~ 5.0 | 56 | 46 | | | | |
| 5 ~ 30 | 60 | 50 | | | | |

* Decreases with the logarithm of the frequency

5.6.1. Test Setup

NA

5.6.2. Test Procedures

Conducted emissions from the EUT were measured according to the ANSI C63.10-2013.

- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- 2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

5.6.3. Test Results

NA



5.7. Occupied Bandwidth

Test Requirements, RSS-Gen [6.7]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 % emission bandwidth, as calculated or measured.

5.7.1. Test Setup

Refer to the APPENDIX I.

5.7.2. Test Procedures

The 99 % power bandwidth was measured with a calibrated spectrum analyzer.

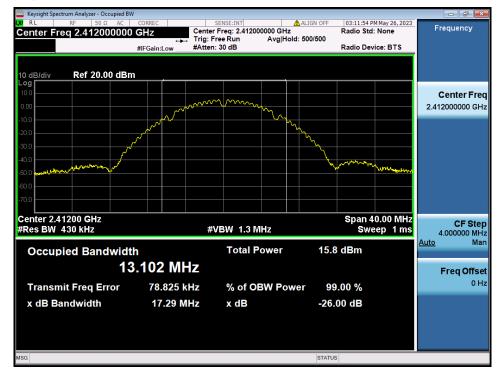
The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3 × RBW.

5.7.3. Test Results

| Test Mode | Frequency | Test Results (MHz) |
|-----------|-----------|--------------------|
| | 2 412 | 13.10 |
| TM 1 | 2 437 | 13.27 |
| | 2 462 | 13.25 |
| | 2 412 | 16.59 |
| TM 2 | 2 437 | 16.75 |
| | 2 462 | 16.68 |
| | 2 412 | 17.68 |
| ТМ 3 | 2 437 | 17.81 |
| | 2 462 | 17.77 |
| | 2 422 | 36.25 |
| TM 4 | 2 437 | 36.50 |
| | 2 452 | 36.23 |

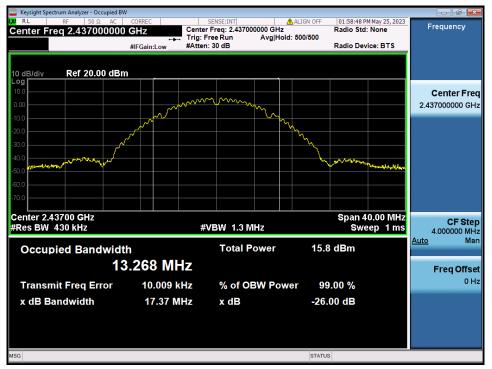
Occupied Bandwidth

TM 1 & 2412

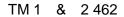


Occupied Bandwidth

TM 1 & 2437



Occupied Bandwidth





Occupied Bandwidth



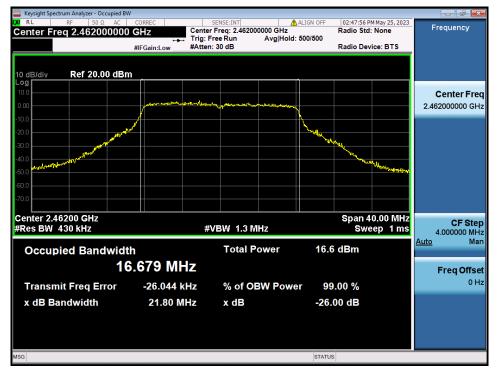


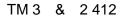
Occupied Bandwidth

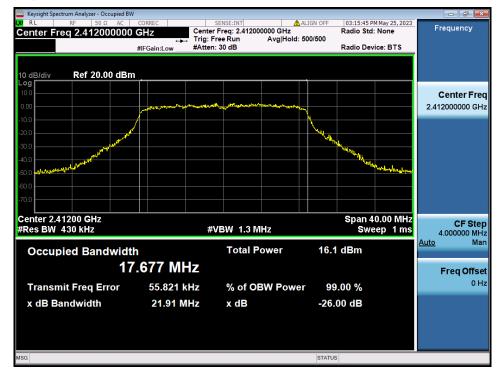
TM 2 & 2437









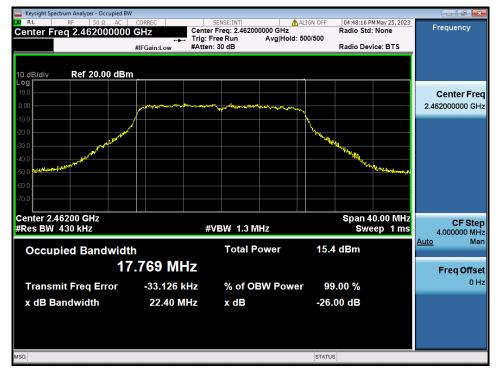


Occupied Bandwidth

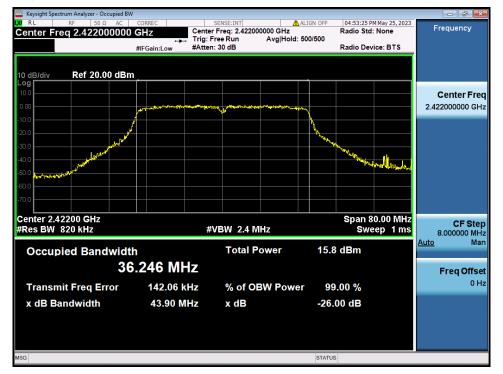
TM 3 & 2437







TM 4 & 2422

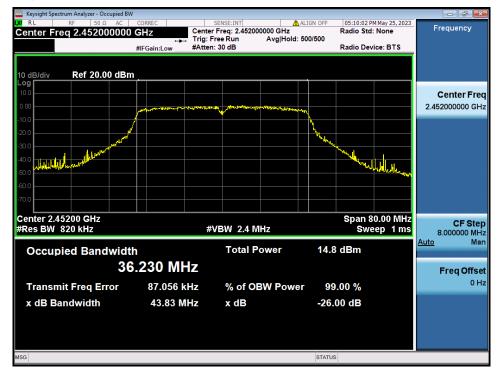


Occupied Bandwidth

TM 4 & 2437



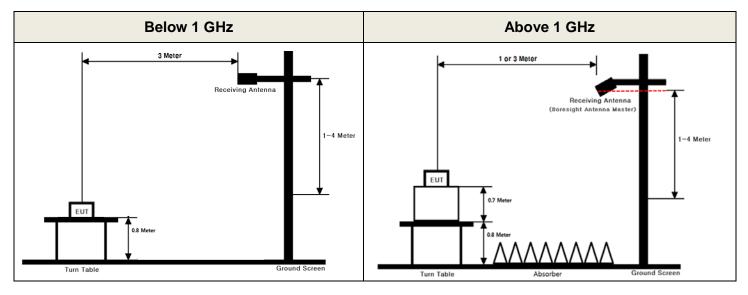
TM 4 & 2452



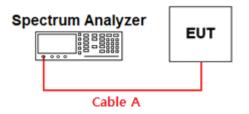
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement





APPENDIX II

Duty cycle plots

Test Procedures

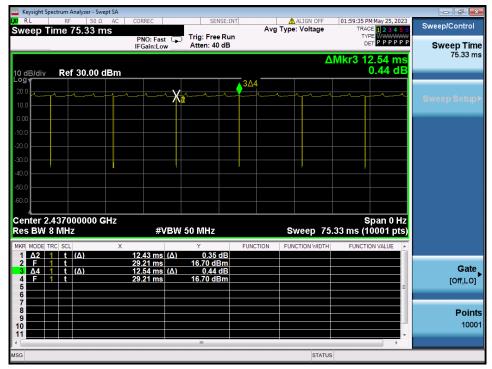
- KDB558074 D01v05r02 - Section 6

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW \geq RBW. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are > 50 /T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zerospan method of measuring duty cycle shall not be used if $T \le 16.7$ microseconds.)

Duty Cycle

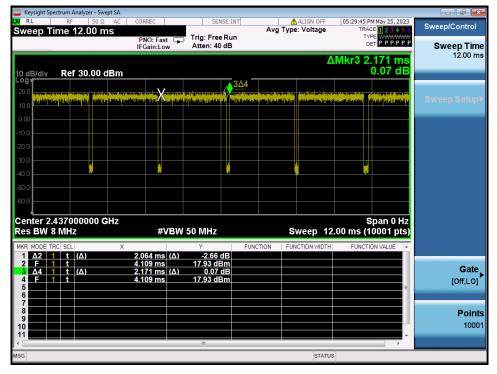
TM 1 2 437 MHz &



Duty Cycle

Duty Cycle

TM 2 & 2 437 MHz



TM 3 & 2 437 MHz

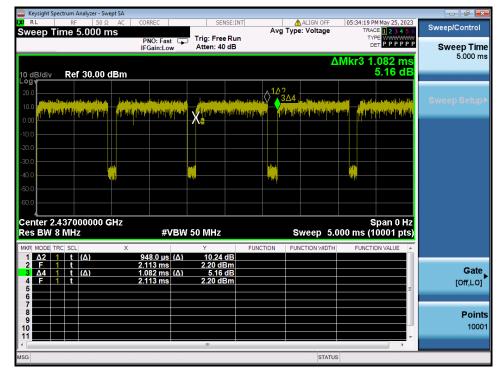
 ight Spectrum Analyzer - Swept SA
 Image: Solution of the state of the state

| | BW | | | 00000 z | | /BW | 50 MHz | | Sweep 10. | Span 0 00 ms (10001 p | | |
|-----|------|-----|----------|------------|-----------------------------|-----|-----------------------|----------|----------------|----------------------------|----|--------|
| MKR | MODE | TRC | SCL | | х | | Y | FUNCTION | FUNCTION WIDTH | FUNCTION VALUE | • | |
| 1 | Δ2 | 1 | t | <u>(Δ)</u> | 1.924 ms | | -2.49 dB | | | | | |
| 2 | F | 1 | t | (A) | <u>3.029 ms</u> 2.040 ms | | 17.22 dBm -0.42 dB | | | | | G |
| 4 | F | 1 | + | (Δ) | 3.029 ms | | 17.22 dBm | | | | 11 | |
| 5 | | - | <u> </u> | | 0.020 1113 | | IT.LL UDIII | | | | = | [Off,I |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | Po |
| 9 | | | | | | | | | | | | 1 |
| 10 | | _ | | | | | | | | | | |

Dt&C

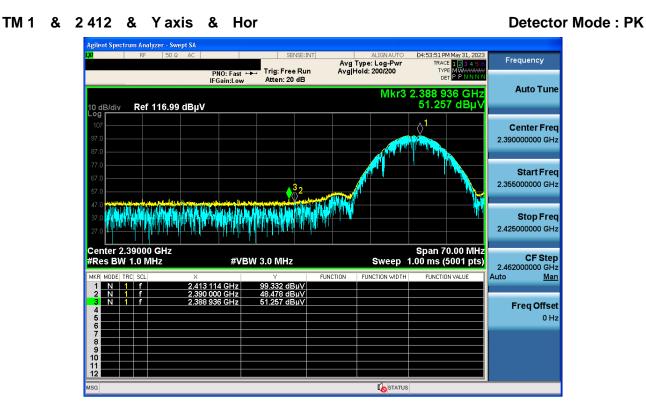
Duty Cycle

TM 4 & 2 437 MHz



APPENDIX III

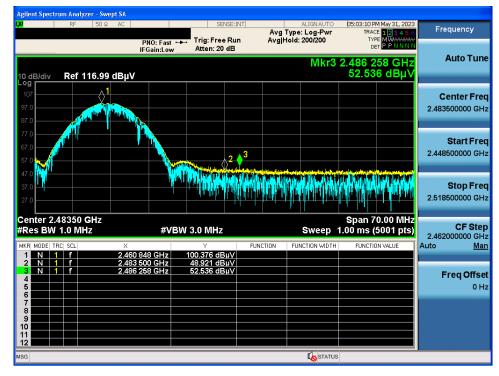
Unwanted Emissions (Radiated) Test Plot



TM 1 & 2412 & Yaxis & Hor

lent Spectrum Analyzer - Swept SA :07 PM May 31, 20 ALIGN AUTO Avg Type: RMS Avg|Hold: 200/200 Frequency Trig: Free Run Atten: 20 dB PNO: Fast + IFGain:Low Auto Tune Mkr3 2.389 860 GHz 41.286 dBµV 10 dB/div Ref 116.99 dBµV **Center Freq** \Diamond 2.390000000 GHz Start Freq 2.355000000 GHz 2 Stop Freq 2.425000000 GHz Center 2.39000 GHz #Res BW 1.0 MHz Span 70.00 MHz 1.00 ms (5001 pts) CF Step 2.46200000 GHz #VBW 3.0 MHz* Sweep Man uto 40.657 dBµ 41.286 dBµ N Freq Offset 0 Hz **I**STATUS

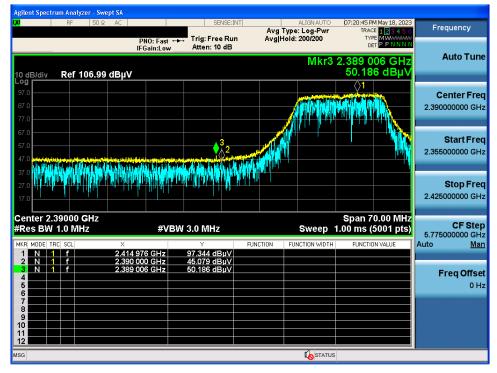
TM 1 & 2462 & Yaxis & Hor



TM 1 & 2462 & Yaxis & Hor



TM 2 & 2412 & Yaxis & Hor



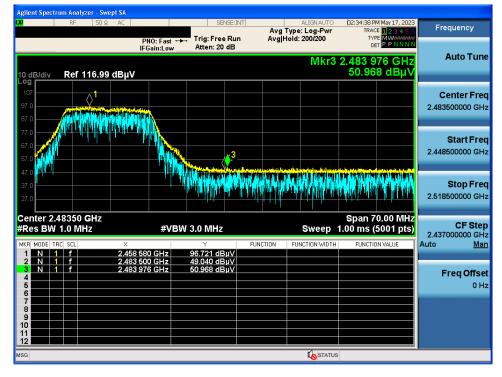
TM 2 & 2412 & Yaxis & Hor

Detector Mode : AV

Agilent Spectrum Analyzer - Swept SA

| X RF 50 S | 2 AC | PNO: Fast ↔ | SENSE:INT | Avg Type Avg Hold: | | TYPE | May 18, 2023 1 2 3 4 5 6 A WWWWWW A P N N N N | Frequency |
|-------------------------------------------|--------|-------------------------------|-------------------------------------------|-----------------------|-----------------|-------------------------------------|---------------------------------------------------------------|---------------------------------------------|
| 10 dB/div Ref 106.99 | 9 dBµV | IFGain:Low | Atten: 10 dB | | Mkr3 | 2.389 24 39.343 | 4 GHz | Auto Tune |
| 97.0 87.0 77.0 | | | | / | | (| | Center Fred 2.390000000 GHz |
| 67.0 57.0 47.0 | | | 3 <u>2</u> | | | | | Start Free 2.355000000 GH; |
| 37.0 27.0 17.0 | | | | | | | | Stop Fred 2.425000000 GH; |
| Center 2.39000 GHz FRes BW 1.0 MHz | × | | V 3.0 MHz* | FUNCTION FUT | Sweep | Span 70. 1.00 ms (50 FUNCTION | 001 pts) | CF Step 5.775000000 GH Auto <u>Ma</u> |
| 1 N 1 f 2 N 1 f 3 N 1 f 4 5 6 | 2.390 | 796 GHz 000 GHz 244 GHz | 89.015 dBµV 38.732 dBµV 39.343 dBµV | | | | | Freq Offse 0 H |
| 7 8 9 10 11 12 | | | | | | | | |
| ISG | | | | | I STATUS | | | |

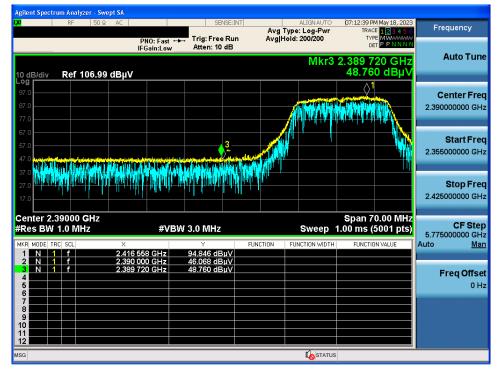
TM 2 & 2462 & Yaxis & Hor



TM 2 & 2462 & Yaxis & Hor

| Agilent Spectrum Analyzer - Swept SA | | | | | |
|--------------------------------------|------------------------|----------------------------|--------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------------------|
| XI RF 50Ω AC | PNO: Fast ↔ | SENSE:INT | ALIGN AUTO Avg Type: RMS Avg Hold: 200/200 | 02:32:43 PM May 17, 2023 TRACE 1 2 3 4 5 6 TYPE A WWWWW DET A P N N N N | Frequency |
| 10 dB/div Ref 106.99 dBµV | IFGain:Low | Atten: 10 dB | Mkr3 | 2.483 542 GHz 39.557 dBµV | Auto Tune |
| P7.0 67.0 77.0 | | | | | Center Fred 2.483500000 GH; |
| 67.0 57.0 47.0 | | 3 | | | Start Fred 2.448500000 GH |
| 37.0 | | | | | Stop Fre 2.518500000 GH |
| | 3 174 GHz | 88.536 dBuV | Sweep | Span 70.00 MHz 1.00 ms (5001 pts) FUNCTION VALUE | CF Stej 2.437000000 GH Auto <u>Ma</u> |
| | 3 500 GHz 3 542 GHz | 38.753 dBµV 39.557 dBµV | | | Freq Offse 0 H |
| 8 9 10 11 12 | | | | | |
| ISG | | | | 3 | |

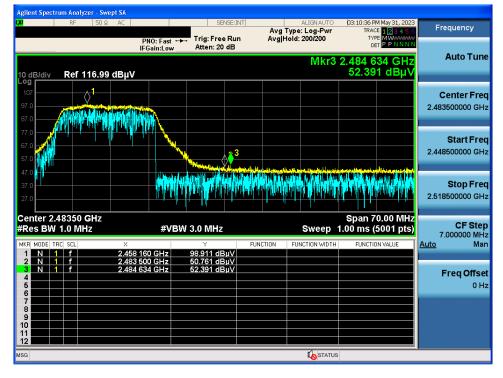
TM 3 & 2 412 & Yaxis & Hor



TM 3 & 2412 & Yaxis & Hor

| Agilent Spectrum XI | n Analyzer - Swe | | | | | | | | |
|-------------------------------------|------------------|-------|-------------------------------|--------------------------------------------|----------|----------------------------------------|----------------------------------|--------------------------------------------------------|-------------------------------------|
| U | RF 50 Ω | AC | PNO: Fast ← | SENSE:IN Trig: Free Run Atten: 10 dB | Avg Ty | ALIGN AUTO /pe: RMS ild: 200/200 | TRACE | May 18, 2023 1 2 3 4 5 6 A WWWWWW A P N N N N | Frequency |
| 10 dB/div | Ref 106.99 | dBµV | IFGain:Low | Atten: 10 dB | | Mkr3 | 2.389 9 | | Auto Tune |
| 97.0 97.0 87.0 77.0 | | | | | | | \$ ¹ | | Center Fre 2.390000000 GH |
| 67.0 57.0 47.0 | | | | 3- | | | | | Start Fre 2.355000000 GH |
| 37.0 27.0 17.0 | | | | | | | | | Stop Fre 2.425000000 GH |
| Res BW 1 | .0 MHz | × | #VB | W 3.0 MHz* | FUNCTION | Sweep | Span 70 1.00 ms (5 FUNCTIO | | CF Ste 5.775000000 GH Auto Ma |
| 1 N 1 2 N 1 3 N 1 4 5 6 | f f f | 2.415 | 900 GHz 000 GHz 972 GHz | 86.688 dBµV 38.946 dBµV 39.259 dBµV | | | | | Freq Offse |
| 7 8 9 10 11 12 | | | | | | | | | |
| 5G | | | | | I | | ; | | |

TM 3 & 2462 & Yaxis & Hor

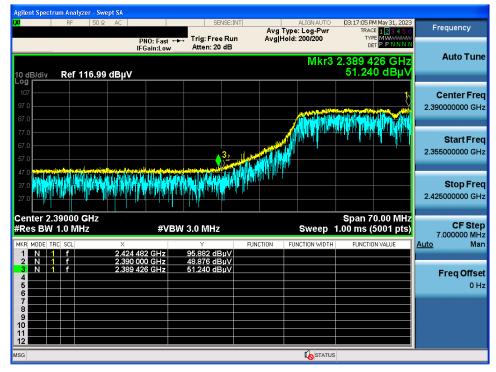


TM 3 & 2462 & Yaxis & Hor

Detector Mode : AV

SENSE:INT 03:08:05 PM Frequency Avg Type: RMS Avg|Hold: 200/200 TRACE TYPE DET PNO: Fast +++ Trig: Free Run IFGain:Low Atten: 20 dB Auto Tune Mkr3 2.483 682 GHz 41.994 dBu Ref 116.99 dBµV **Center Freq** 2.483500000 GHz Start Freq 2.448500000 GHz 3 Stop Freq 2.518500000 GHz Center 2.48350 GHz #Res BW 1.0 MHz Span 70.00 MHz 1.00 ms (5001 pts) CF Step 7.000000 MHz Man #VBW 3.0 MHz* Sweep FUNCTION Auto 41.698 dBµ∖ 41.994 dBµ∖ Freq Offset 0 Hz **I**STATUS

TM 4 & 2 422 & Y axis & Hor



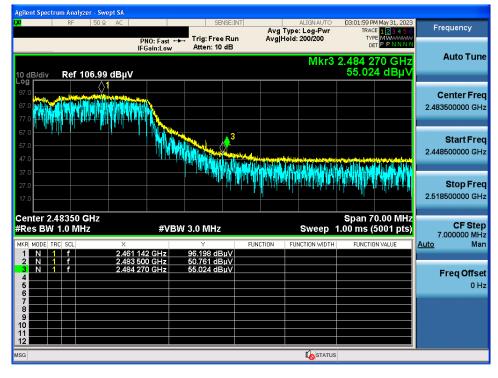
TM 4 & 2 422 & Y axis & Hor

Detector Mode : AV



This test report is prohibited to copy or reissue in whole or in part without the approval of Dt&C Co., Ltd. TRF-RF-236(05)210316

TM 4 & 2 452 & Y axis & Hor



TM 4 & 2 452 & Y axis & Hor

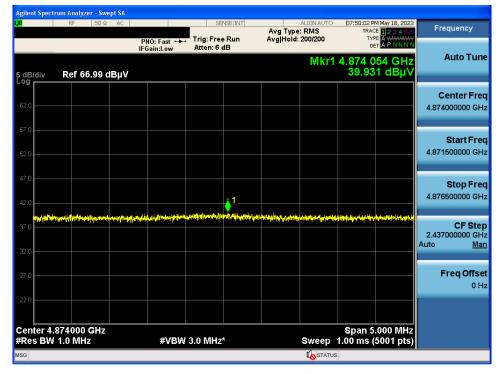


Detector Mode : AV

TM 1 & 2412 & Yaxis & Ver



TM 2 & 2 437 & Y axis & Ver



Detector Mode : AV

TM 3 & 2412 & Xaxis & Ver



TM 4 & 2 452 & Y axis & Ver

