Application Note

TPS22919EVM CISPR-25 EMI Measurement Report

ABSTRACT

This application report presents CISPR-25 Conducted Emission (CE) and Radiated Emission (RE) test results for the TPS22919EVM, load switch evaluation module,and demonstrates how CISPR-25 class-5 limits can be met for this device.

Table of Contents

List of Figures

List of Tables

Trademarks

1 Description of Test Setup

A fully-compliant anechoic chamber and equipment is used for this testing and is carried out according to CISPR-25 test specifications.

For CE and RE measurements, an ultra-low-I_Q LDO (TPS7B8250QKVURQ1) was used to step down the 12-V input supply (car battery) to 5-V, a voltage within the input voltage range of the load switch. The LDO has a maximum output current of 300-mA, hence the 200-mA maximum testing condition.

1.1 Test Conditions

This section provides the test conditions for the CE and RE measurements.

- Input supply:
  - Fully charged 12-V car battery
- Load on load switch evaluation module:
  - Common Use Load, 125 Ω (40 mA)
  - Maximum Current, 25 Ω (200 mA)
- Antenna configurations for radiated emission measurements
  - Monopole: 150 kHz–30 MHz
  - Biconical (Horizontal/Vertical): 30 MHz–200 MHz
  - Log Periodic (Horizontal/Vertical): 200 MHz–1 GHz

Table 1-1 shows EMI receiver settings for the conducted emission measurements.

Table 1-1. EMI Receiver Settings for CE Measurements

Frequency Range	Resolution Bandwidth	Step Size
150 kHz–108 MHz	120 kHz	30 kHz

Table 1-2 shows EMI receiver setting for the radiated emission measurements.

Table 1-2. EMI Receiver Settings for RE Measurements

Frequency Range	Resolution Bandwidth	Step Size
150 kHz–30 MHz	9 kHz	2.25 kHz
150 kHz–30 MHz	120 kHz	30 kHz
200 kHz–1 GHz	120 kHz	30 kHz

1.2 Test Setup Photos

The following photos show the test setup under varying conditions.

Figure 1-1. Test Setup for Conducted Emission Noise Floor Measurement

Figure 1-2. Test Setup for Conducted Emission Loaded Measurement

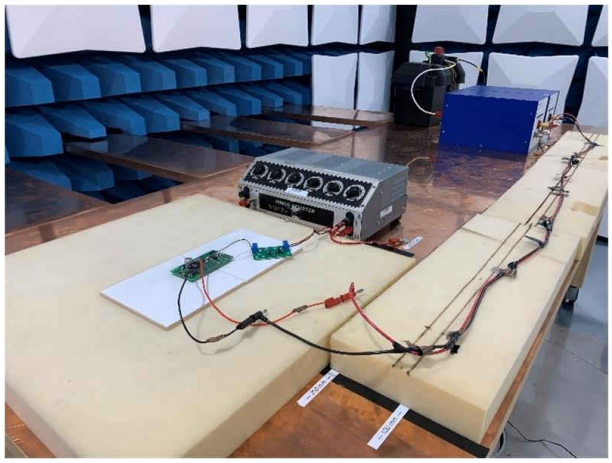


Figure 1-3. Test Setup for Radiated Emission Measurement

Figure 1-4. Test Setup for Radiated Emission Measurement: Biconical Horizontal Antenna

1.3 Pass or Fail Criteria

Pass or fail criteria is shown in the following list:

1. Any peaks below the average limit are an automatic pass.
2. Any peaks above the peak limit are an automatic fail.
3. When the peak is below the peak limit and if the average is below the average limit, it is considered a pass.

2 Test Results

This section contains the test results waveforms for both conducted emissions and radiative emissions.

2.1 Conducted Emission (CE) Results

The following images show conducted emission waveforms.

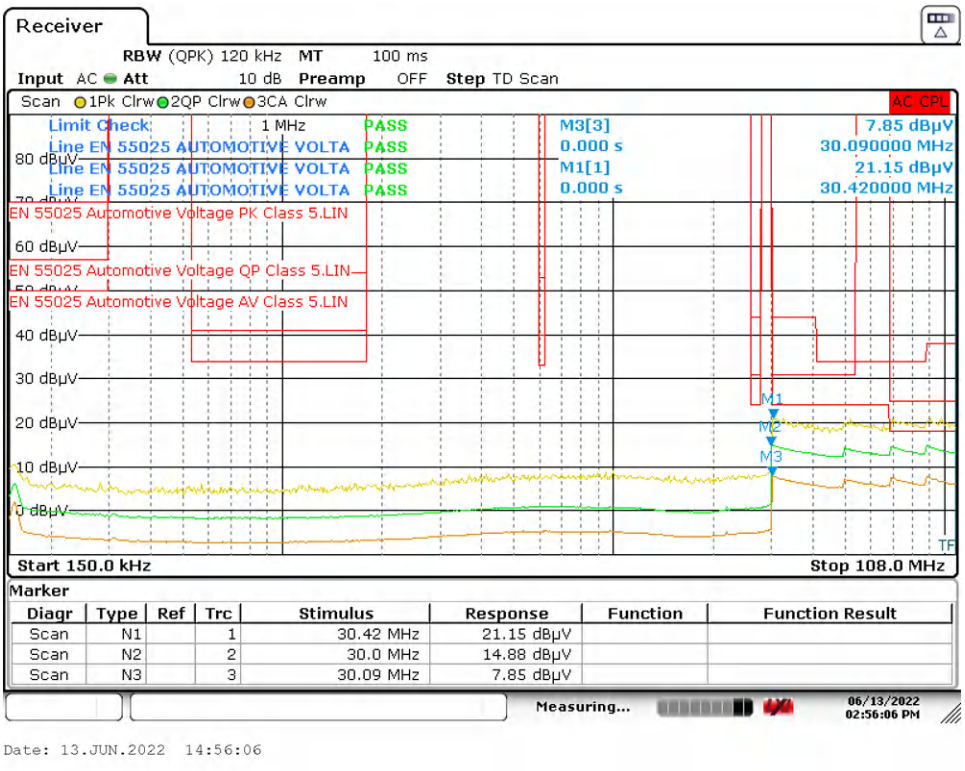


Figure 2-1. CE – Noise Floor

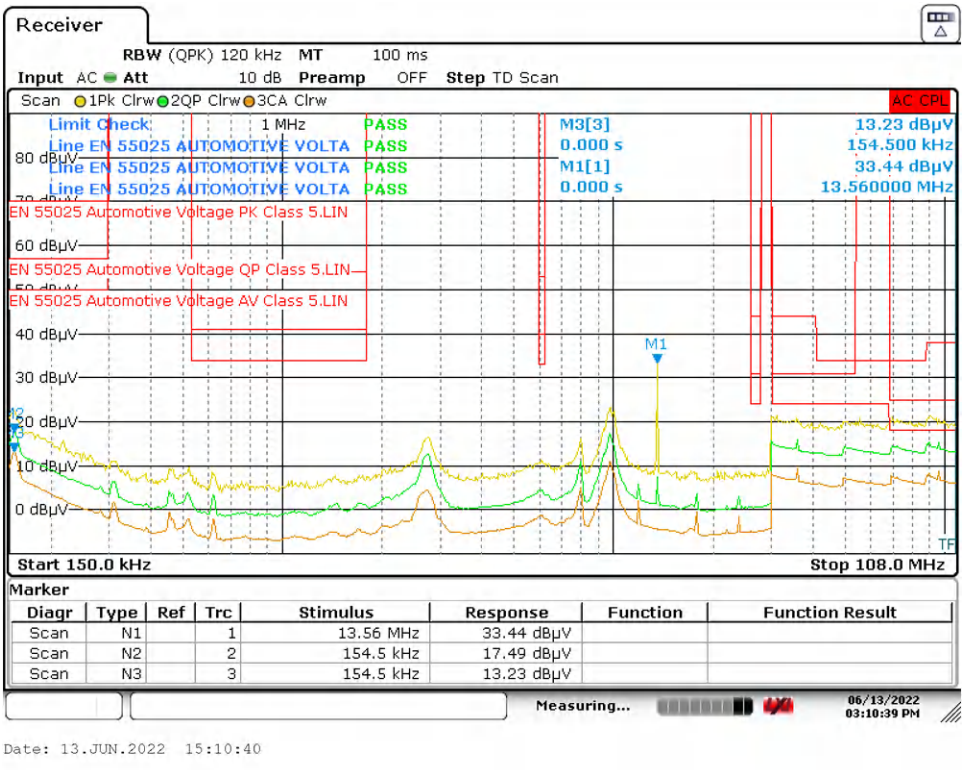


Figure 2-2. CE – 40 mA

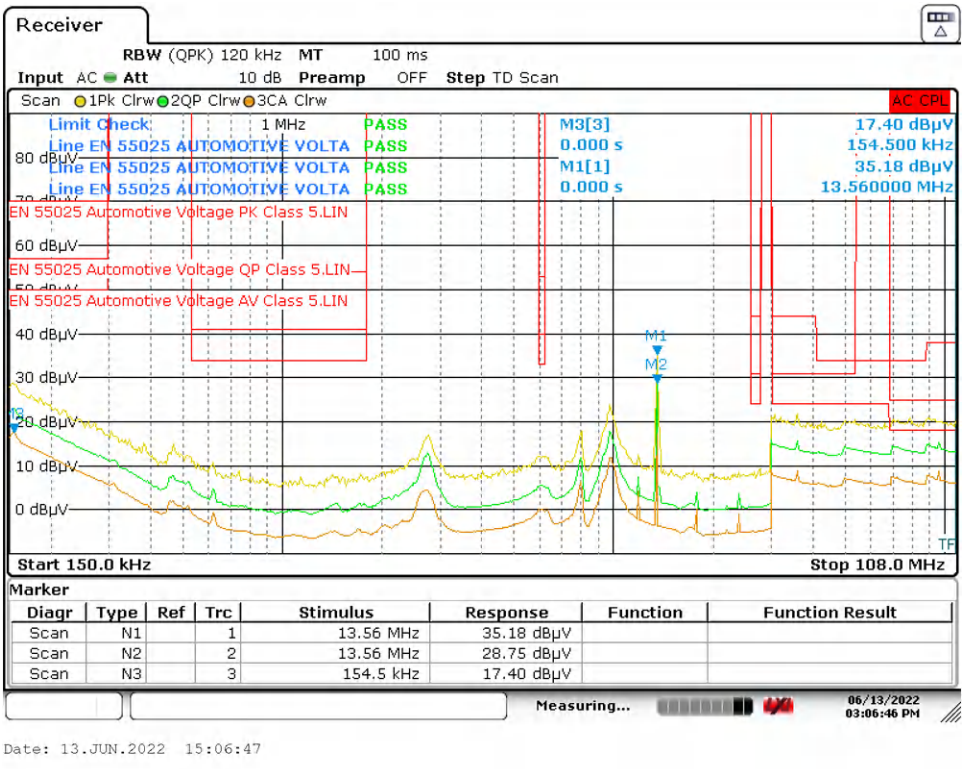


Figure 2-3. CE – 200 mA

2.2 Radiative Emission (RE): 150 kHz to 30 MHz, Monopole Antenna

The following images show radiative emission waveforms at 150 kHz to 30 MHz.

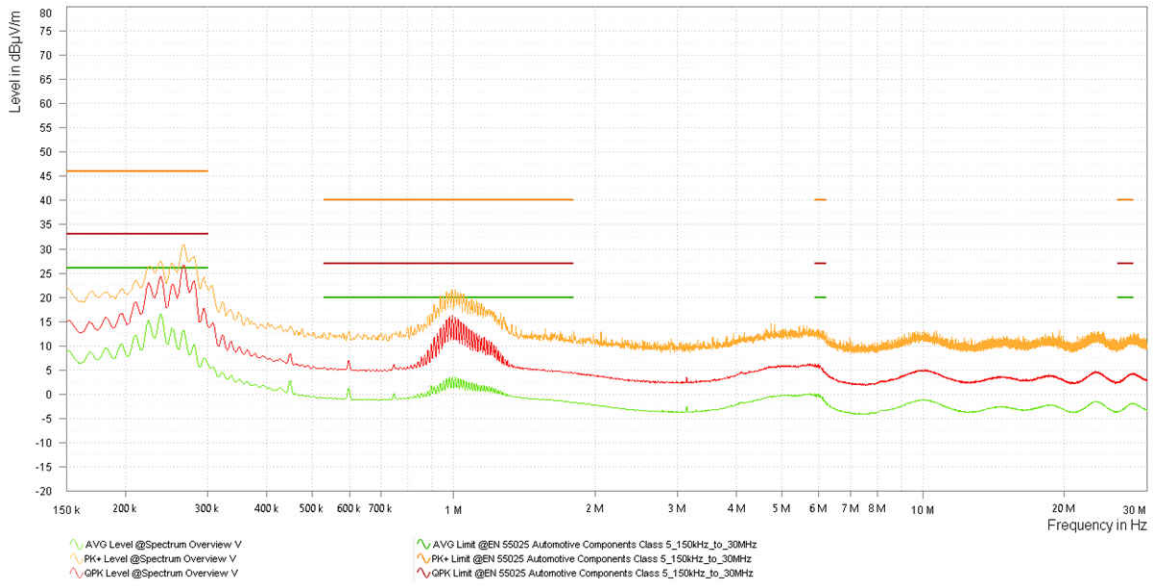


Figure 2-4. RE: 150 kHz to 30 MHz, Monopole Antenna: Noise Floor

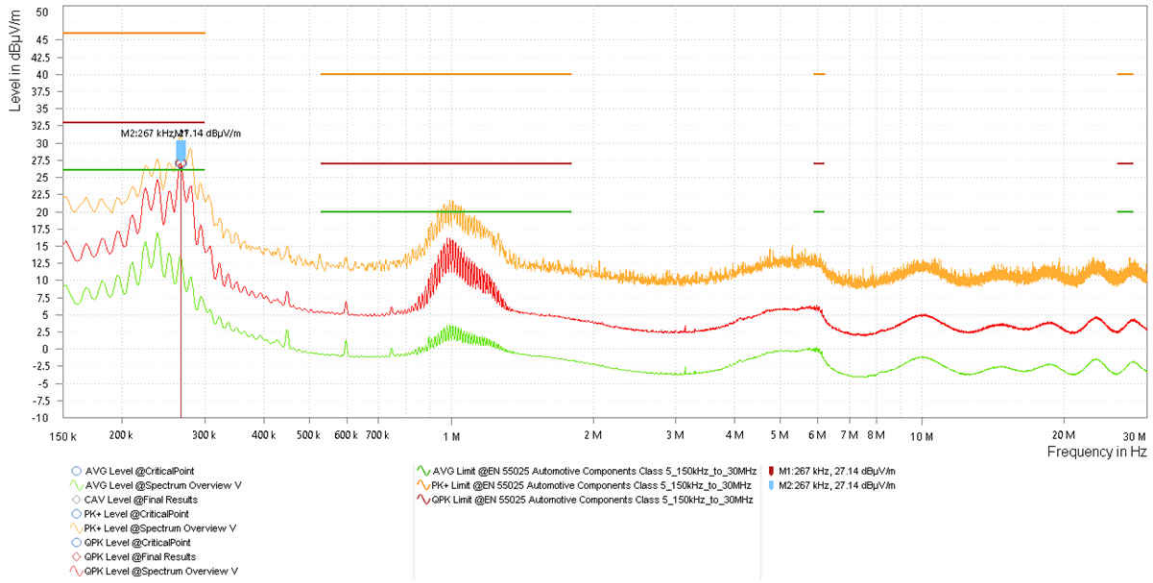


Figure 2-5. RE: 150 kHz to 30 MHz, Monopole Antenna: 40 mA

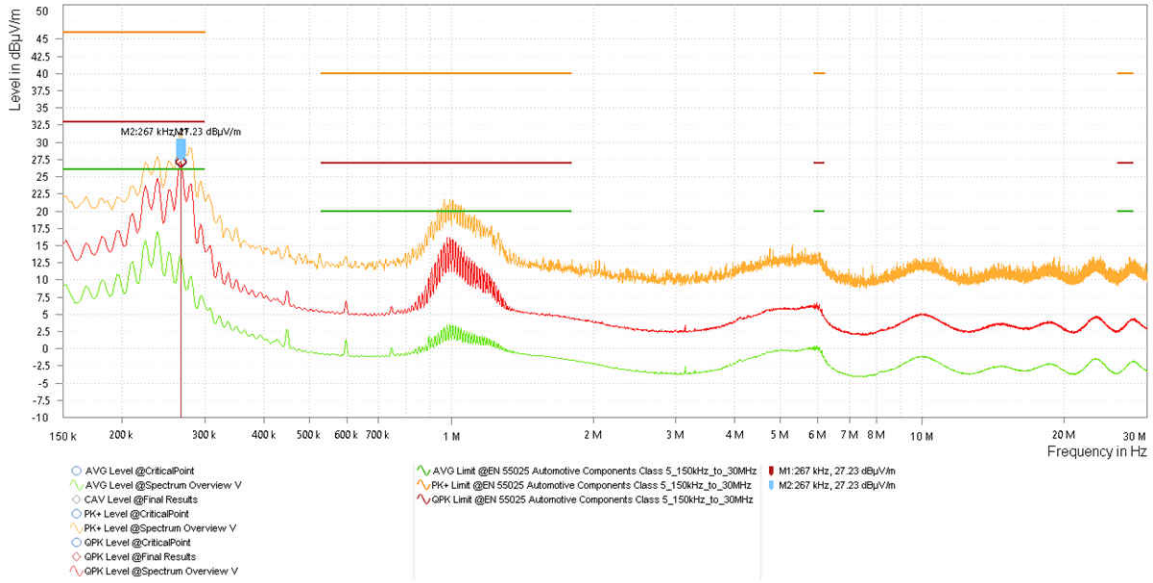


Figure 2-6. RE: 150 kHz to 30 MHz, Monopole Antenna: 200 mA

2.3 Radiative Emission (RE): 30 kHz to 200 MHz, Biconical Antenna

The following images show radiative emission waveforms at 30 kHz to 200 MHz.

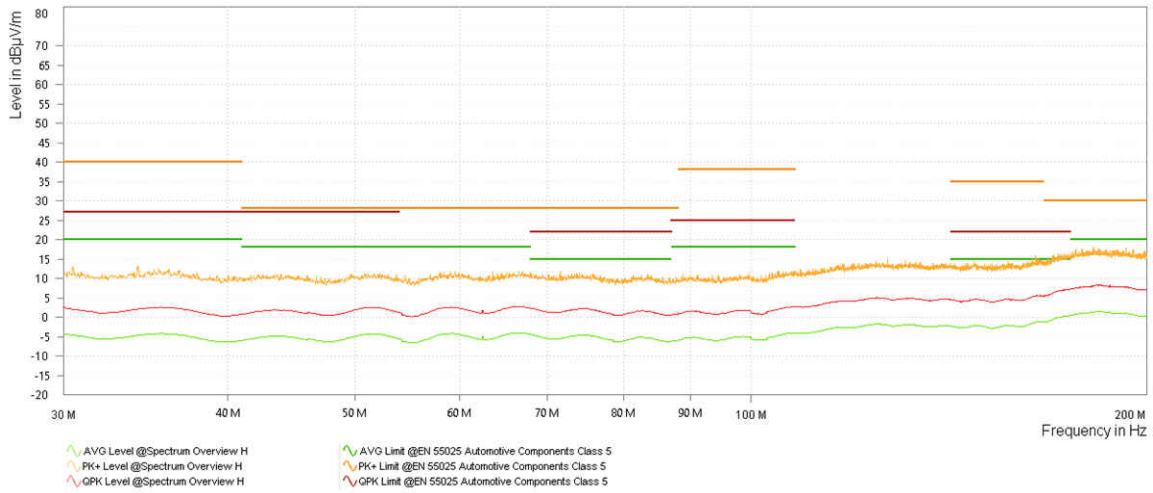
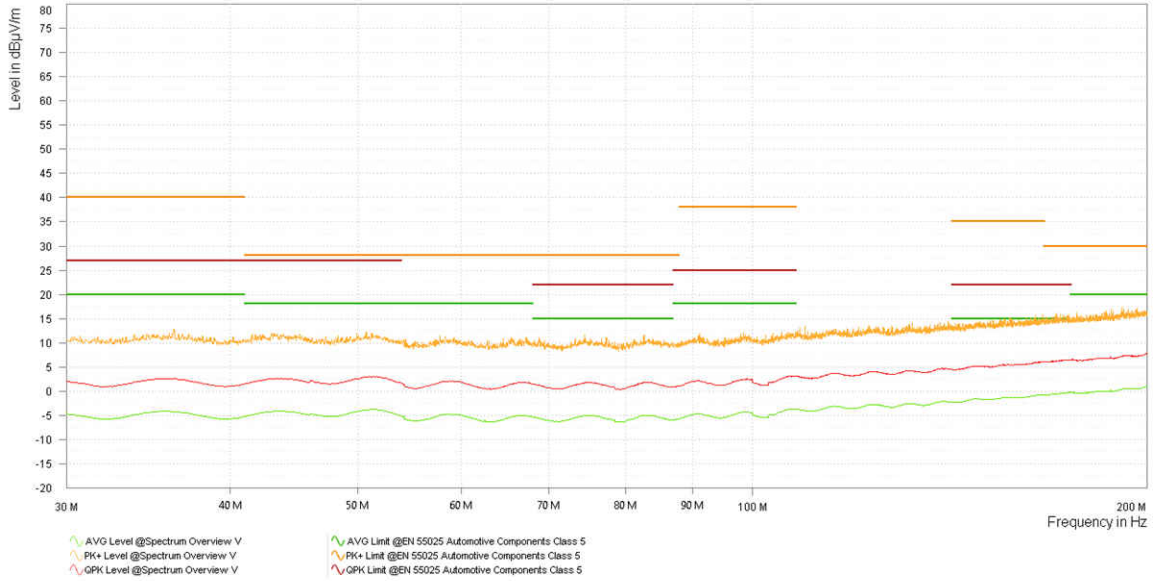


Figure 2-7. RE: 30 kHz to 200 MHz, Biconical Horizontal Antenna: Noise Floor



6

Figure 2-8. RE: 30 kHz to 200 MHz, Biconical Vertical Antenna: Noise Floor

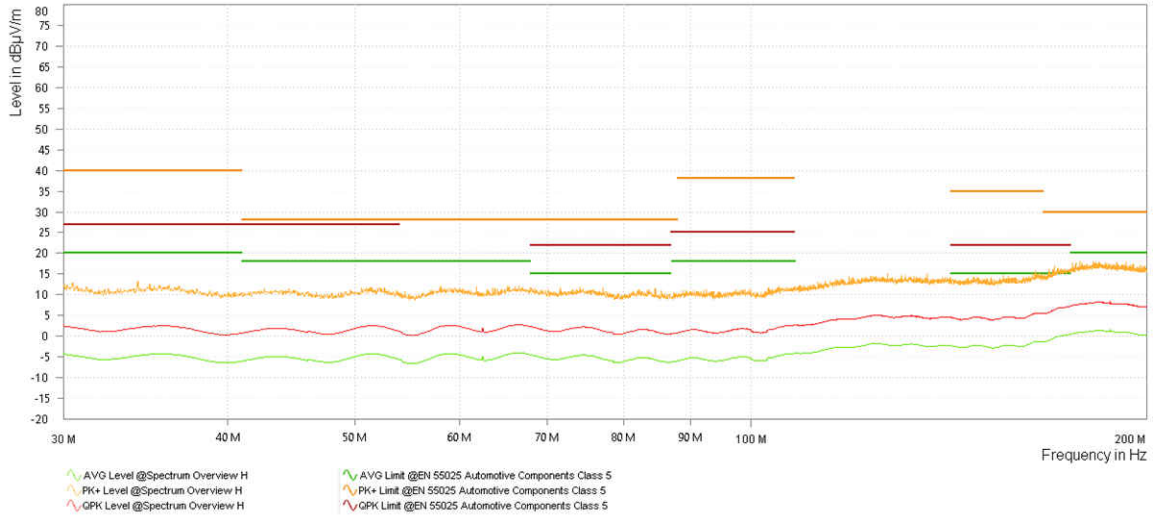


Figure 2-9. RE: 30 kHz to 200 MHz, Biconical Horizontal Antenna: 40 mA

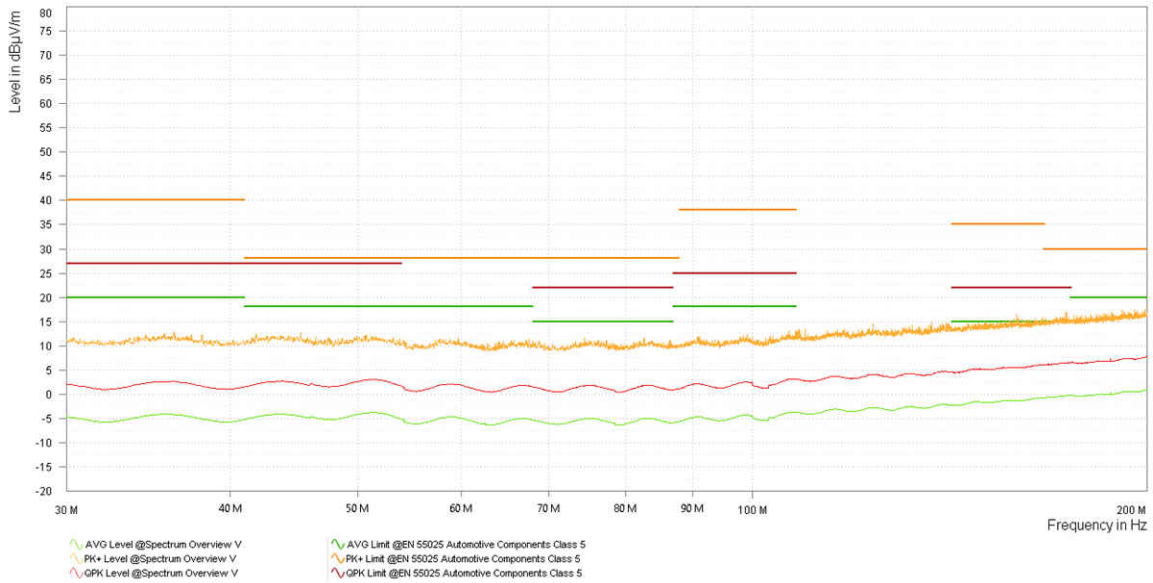


Figure 2-10. RE: 30 kHz to 200 MHz, Biconical Vertical Antenna: 40 mA

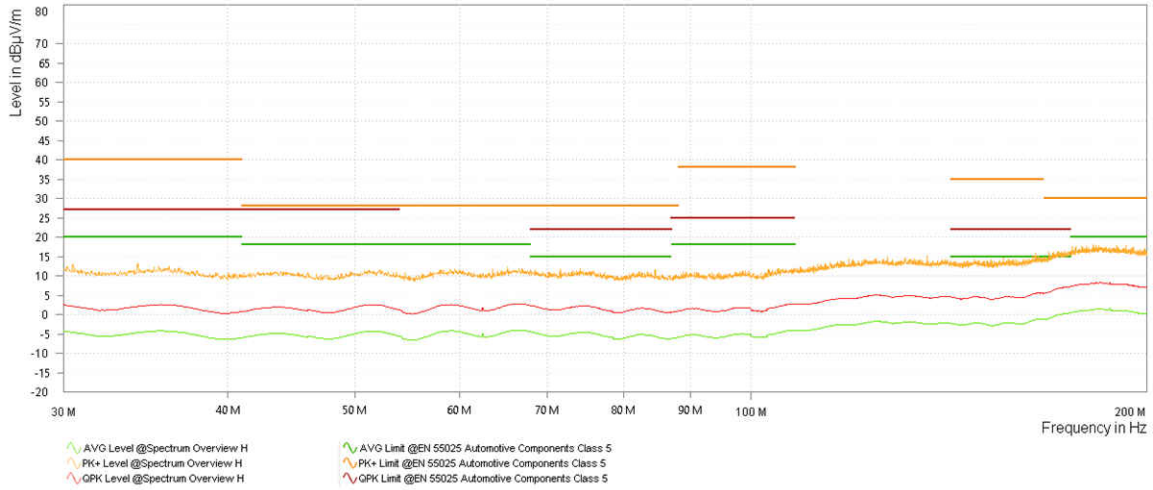


Figure 2-11. RE: 30 kHz to 200 MHz, Biconical Horizontal Antenna: 200 mA

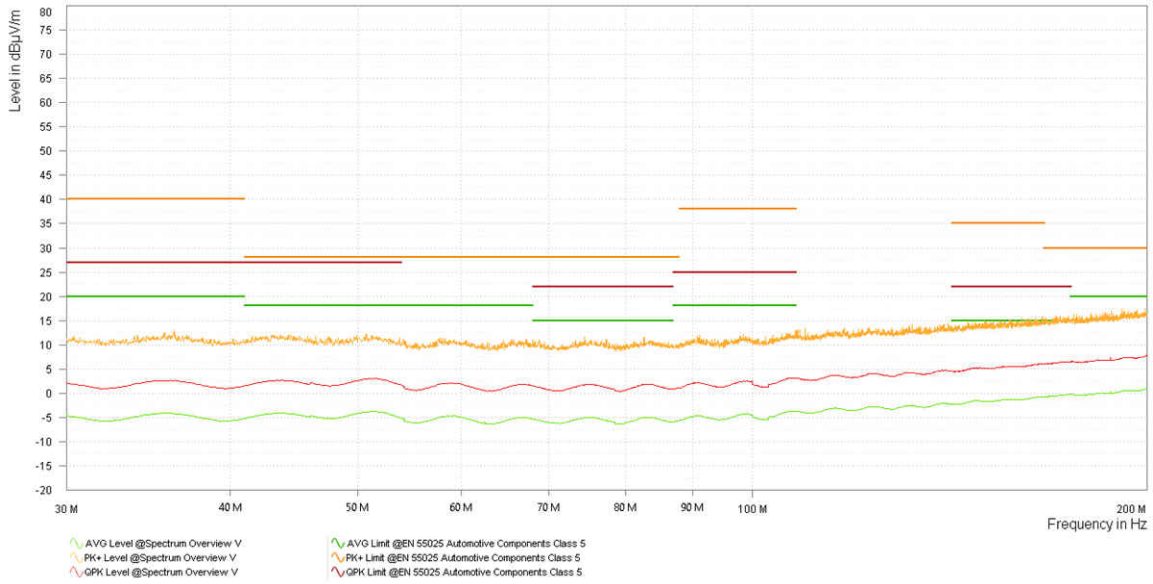


Figure 2-12. RE: 30 kHz to 200 MHz, Biconical Vertical Antenna: 200 mA

2.4 Radiative Emission (RE): 200 MHz to 1 GHz, Log Periodic Antenna

The following images show radiative emission waveforms at 200 MHz to 1 GHz.

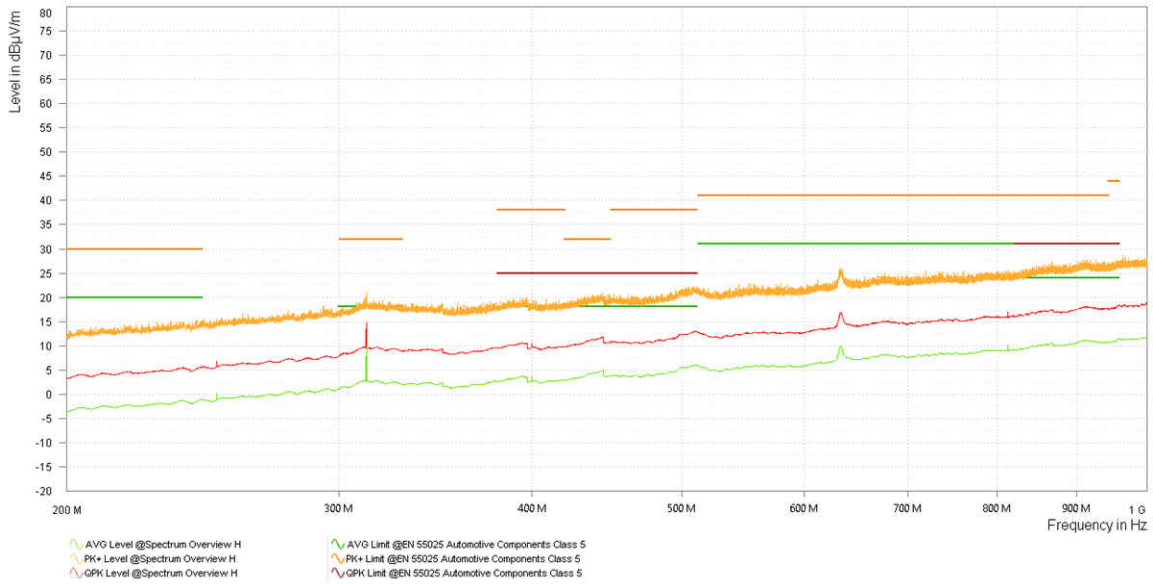


Figure 2-13. RE: 200 MHz to 1 GHz, Log Periodic Horizontal Antenna: Noise Floor

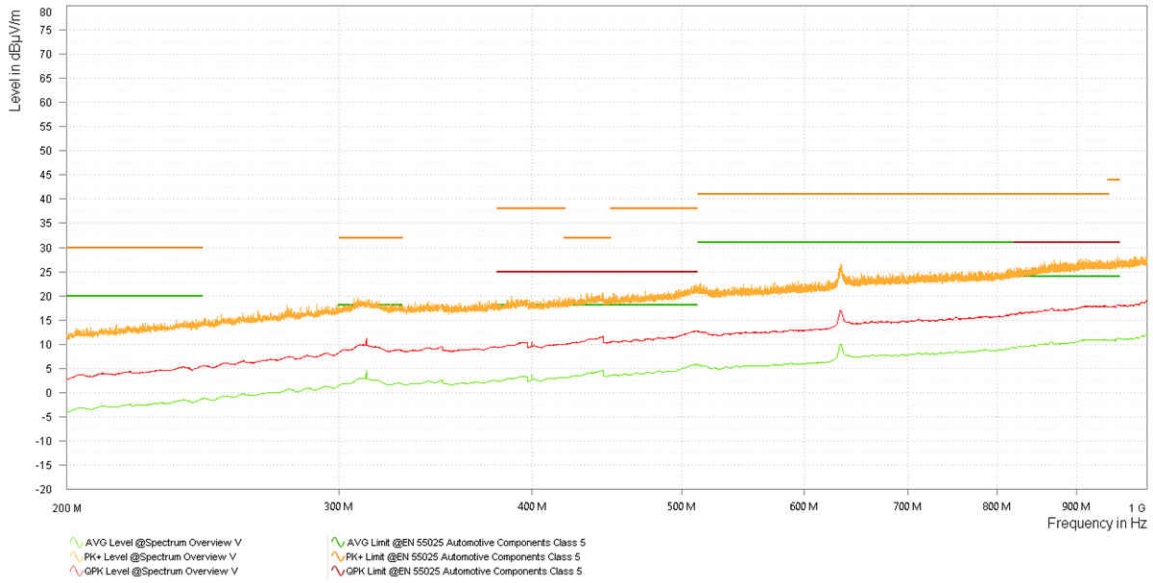


Figure 2-14. RE: 200 MHz to 1 GHz, Log Periodic Vertical Antenna: Noise Floor

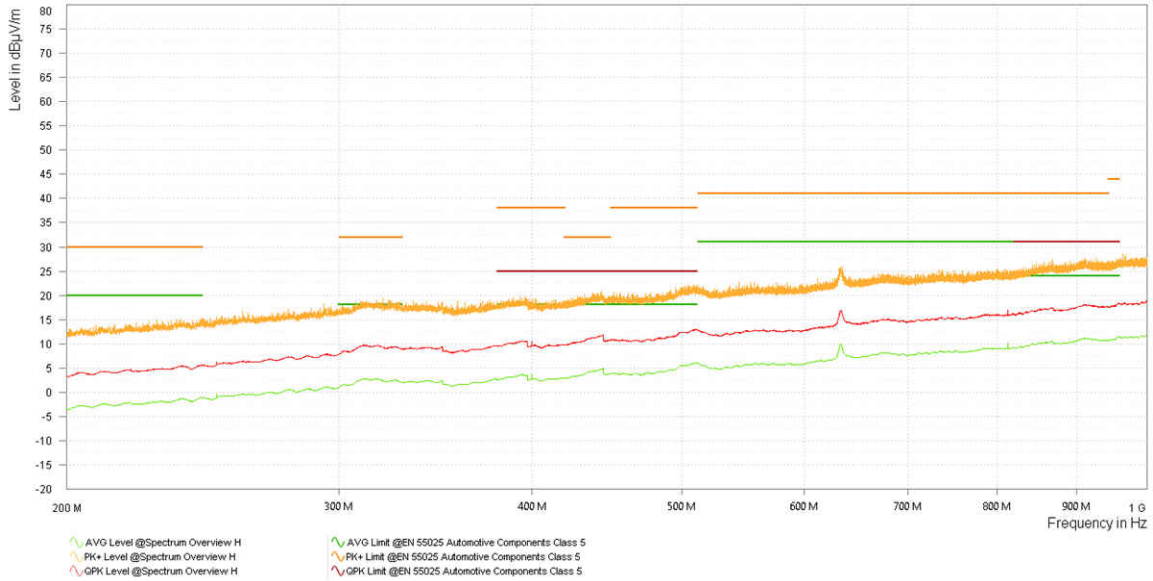


Figure 2-15. RE: 200 MHz to 1 GHz, Log Periodic Horizontal Antenna: 40 mA

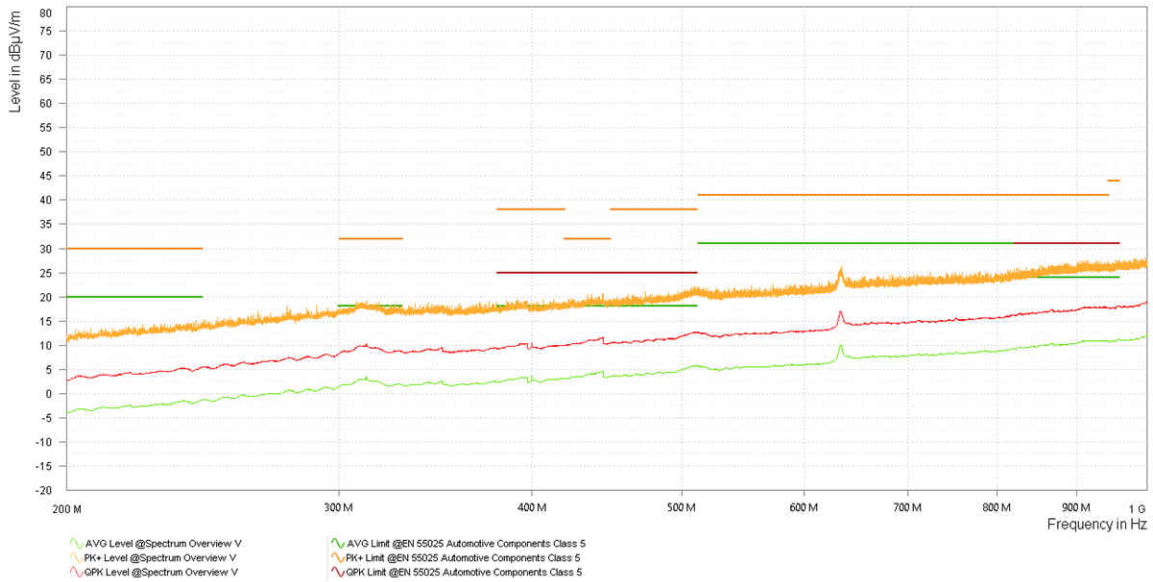


Figure 2-16. RE: 200 MHz to 1 GHz, Log Periodic Vertical Antenna: 40 mA

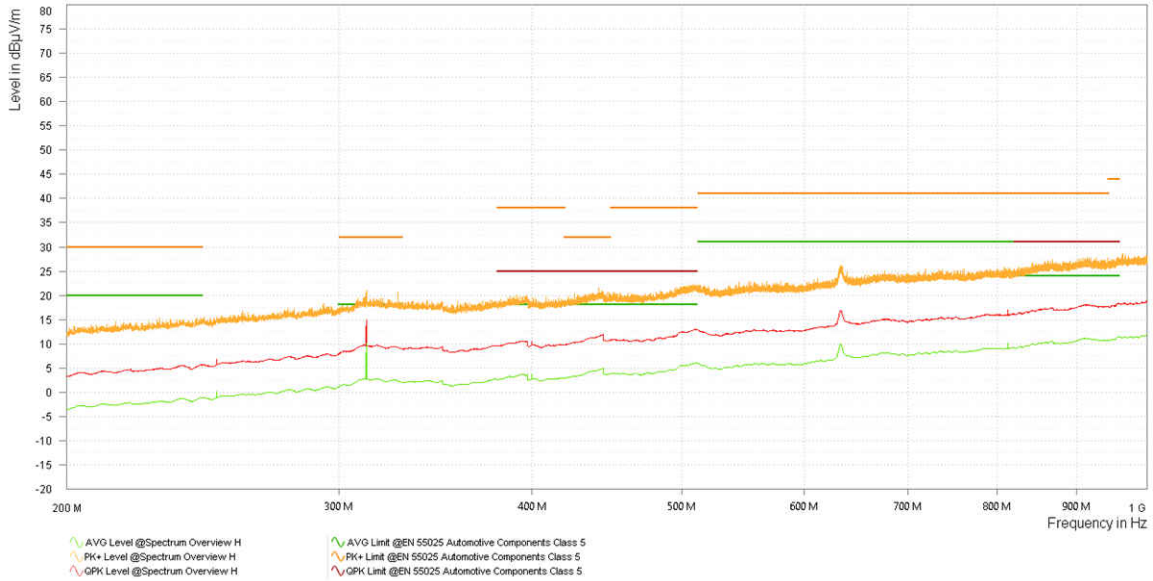


Figure 2-17. RE: 200 MHz to 1 GHz, Log Periodic Horizontal Antenna: 200 mA

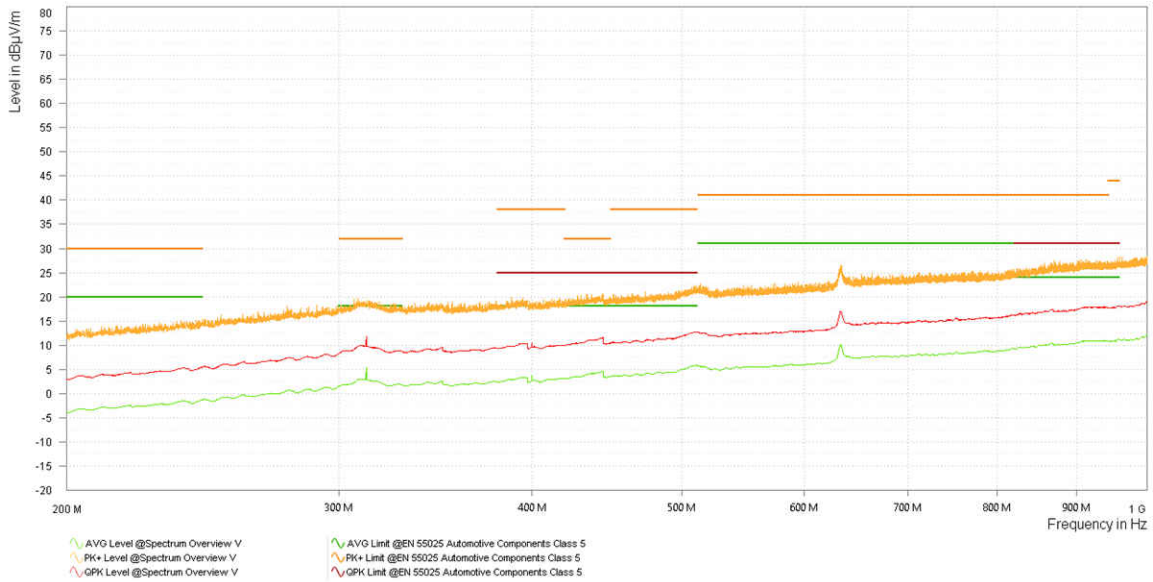


Figure 2-18. RE: 200 MHz to 1 GHz, Log Periodic Vertical Antenna: 200 mA

3 Conclusion

The TPS22919EVM is CISPR-25 class-5 compliant, with margins exceeding 6 dbµV(/m) for both conducted and radiated emissions testing.

Note

Radiative measurements were also conducted with a horn antenna, however the noise floor test failed within 1.15 GHz to 1.6 GHz indicating a testing chamber constraint.

4 References

1. Texas Instruments, *TPS22919 Load Switch Evaluation Module* user's guide
2. Texas Instruments, *TPS7B82-Q1 Automotive 300-mA, High-Voltage, Ultra-Low-I_Q Low-Dropout Regulator* data sheet

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265