

European Microwave Week 2018

Student Design Competition – Thrust 2

The Title of Competition: Video Bandwidth Enhancement for High Power Amplifiers

Submission Deadline: 31st of July, 2018

Sponsor: Ampleon Netherlands BV

Primary contact names:

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Abstract

This competition will introduce the students to the video bandwidth (VBW) concept of high power amplifiers. VBW is an important performance parameter of a PA and wide VBW is required for wideband communication systems to prevent the low frequency products of IMD. A design competition with the title of Video Bandwidth Enhancement for High Power Amplifiers will take place at 2018 European Microwave Week in Madrid/Spain. This competition is open to all students. The main target of the contest is the VBW enhancement of high power amplifiers. The competitors will design and fabricate a power amplifier having the widest VBW possible with the provided transistor by the sponsor. Although students are free to use any topology, they need to meet a given set of specifications.

The winner will be the PA that demonstrates the widest video bandwidth. If there is a tie, higher peak power added efficiency design will be selected as the winner.

A representative of the design team must be present at the competition day. Maximum of two amplifiers are allowed for each team/student.

Questions can be sent to Dr. Osman Ceylan.

Awards

1st :

2nd :

3rd :

Additional prizes for promising designs:

(to be decided later)

Design Specifications and Rules

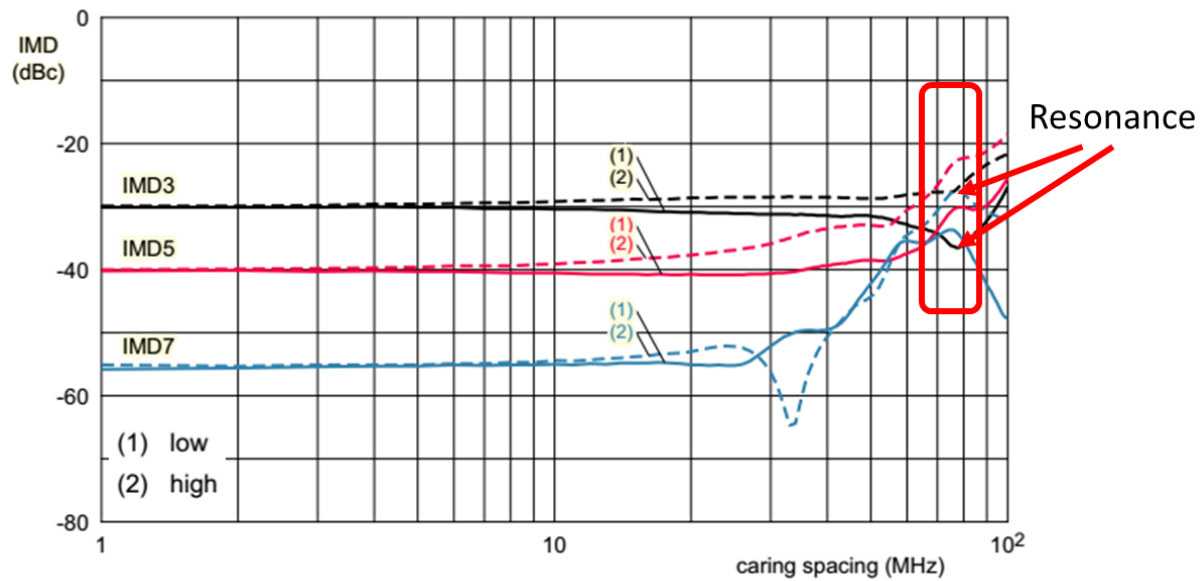
- 1) The amplifier should meet these specifications
 - a. Operating frequency: 3.6 GHz
 - b. Larger than 20 W output power @p3dB (>43 dBm)
 - c. Larger than 60 % PAE @p3dB
 - d. Larger than 12 dB power gain at linear region
 - e. SMA Female connector at input and output
- 2) All measurement tools and attenuators will be provided by the organizer. All tools such as couplers, adapters, and attenuators are 50 Ω and measurement will be carried out with 50 Ω measurement devices and signal generators.
- 3) The implemented PA should be suitable for visual inspection. No sealed casing is allowed.
- 4) A maximum of two DC power supplies are allowed. They will be provided by the organizer during the competition day. Additional sources such as embedded battery or supercapacitors are not allowed.
- 5) No changes are allowed during the measurements.
- 6) At first, output power, gain, and PAE will be measured with a single tone signal at 3.6 GHz. All measurements will be under CW operation.
- 7) The video bandwidth measurement will be carried using two signal generators, each one with a different frequency (f_1 and f_2). The central frequency $[(f_2-f_1)/2+f_1]$ is always at 3.6 GHz and the difference (f_2-f_1) start from 1 MHz, and will be increased with 1 MHz steps until a strong resonance of the IMD3 is observed. The carriers will have equal amplitudes at 10 dB input back-off regarding p1dB of the PA.
- 8) A low asymmetry of the low and high values of the IMD3 will also be valued.
- 9) There will be an aluminum heat sink supported with a fan and non-conductive thermal paste during the competition day. Students can bring their heat sink. Liquid based cooling systems are not allowed.
- 10) Before the competition day, a detailed report including measured data and design files (such as ADS or AWR workspace) should be submitted to the organization committee.

How to Participate

1. Request the entry form (osman.ceylan@ampleon.com)
2. Submit the entry form to Osman Ceylan before 31st of July 2018
 - a. Early submission is recommended to receive design materials and transistors.
 - b. Provide a support letter by your advisor/professor stating that you are working on this project and you are able to attend competition
 - c. After receiving the letter, Ampleon will send the design material such as nonlinear transistor model and measured data.
3. Submit a brief report including simulations and if possible circuit layout.
 - a. After receiving the report, Ampleon will provide transistors for implementation.
 - b. Ampleon will consider fabricating PBCs for the promising designs.
4. The selected projects will receive an acceptance letter to attend competition.

How to measure VBW?

An example of IMD measurements for VBW investigation:



Note: Only high and low values of IMD3 will be considered for the competition!

Nonuniform and large asymmetry between the IMD-H and IMD-L can be also considered as VBW limits.

Resources for VBW

[1] Ampleon web page, application documents: www.ampleon.com

[2] High-Efficiency Load Modulation Power Amplifiers for Wireless Communications, Zhancang Wang, Artech House

[3] A. Khanifar, N. Maslennikov and B. Vassilakis, "Bias circuit topologies for minimization of RF amplifier memory effects," 33rd European Microwave Conference Proceedings (IEEE Cat. No.03EX723C), Munich, Germany, 2003, pp. 1349-1352 Vol.3. doi: 10.1109/EUMC.2003.177737