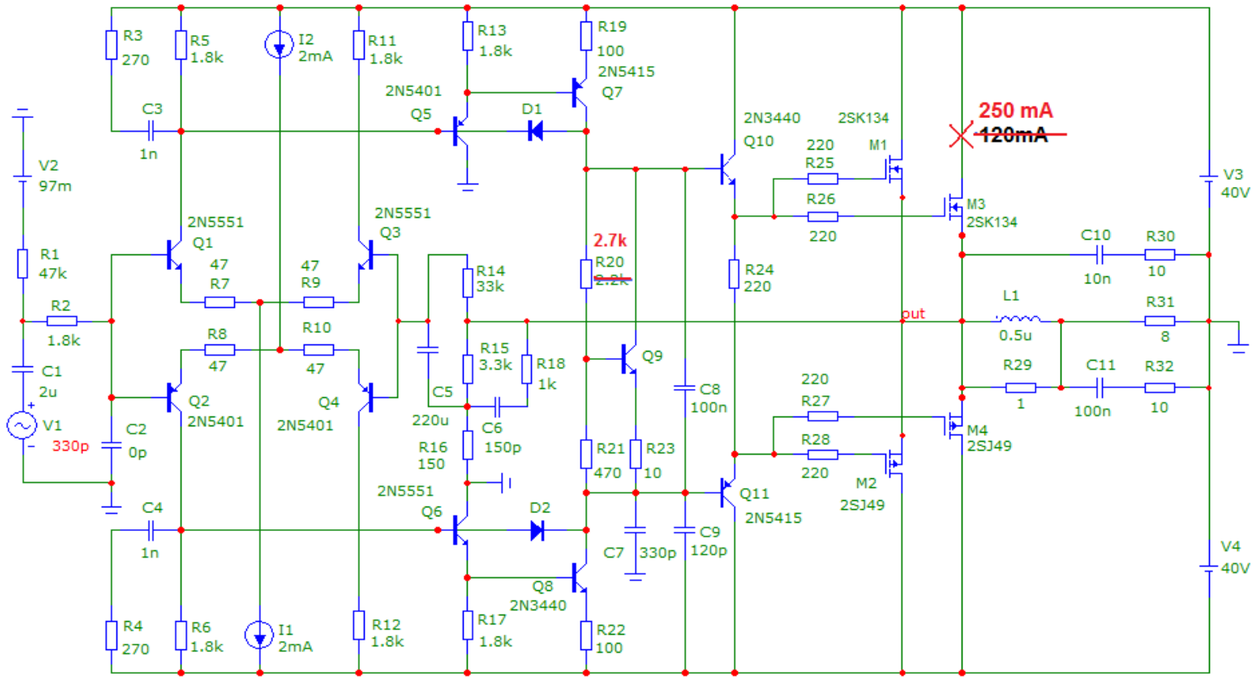
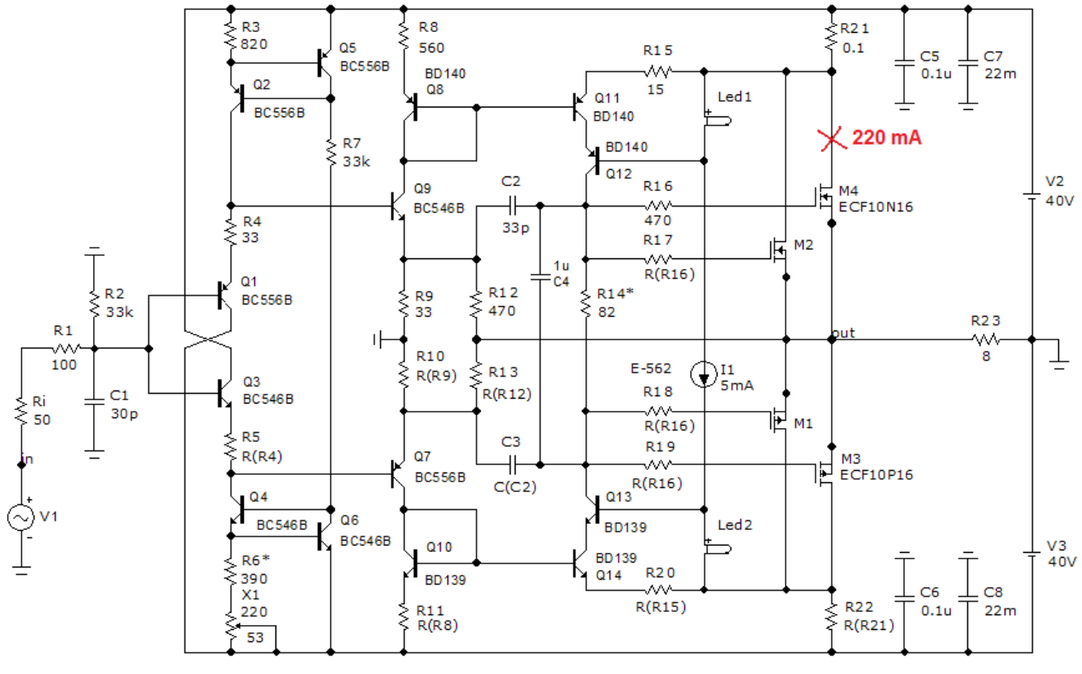
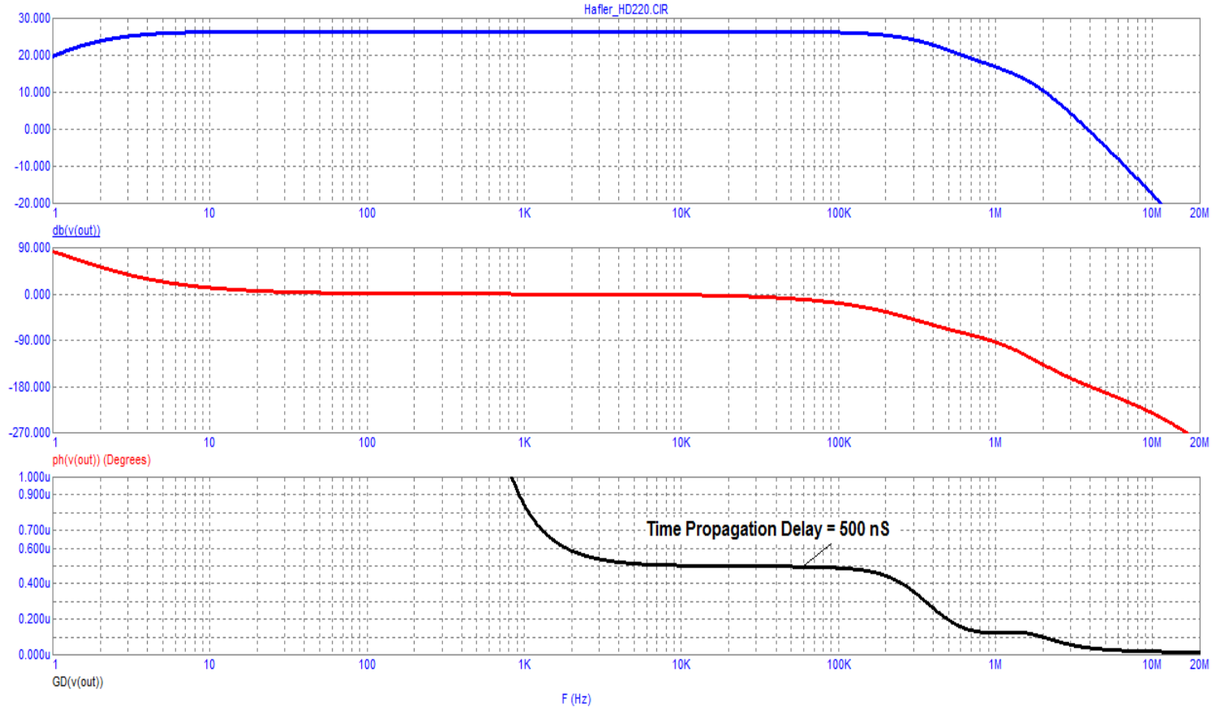
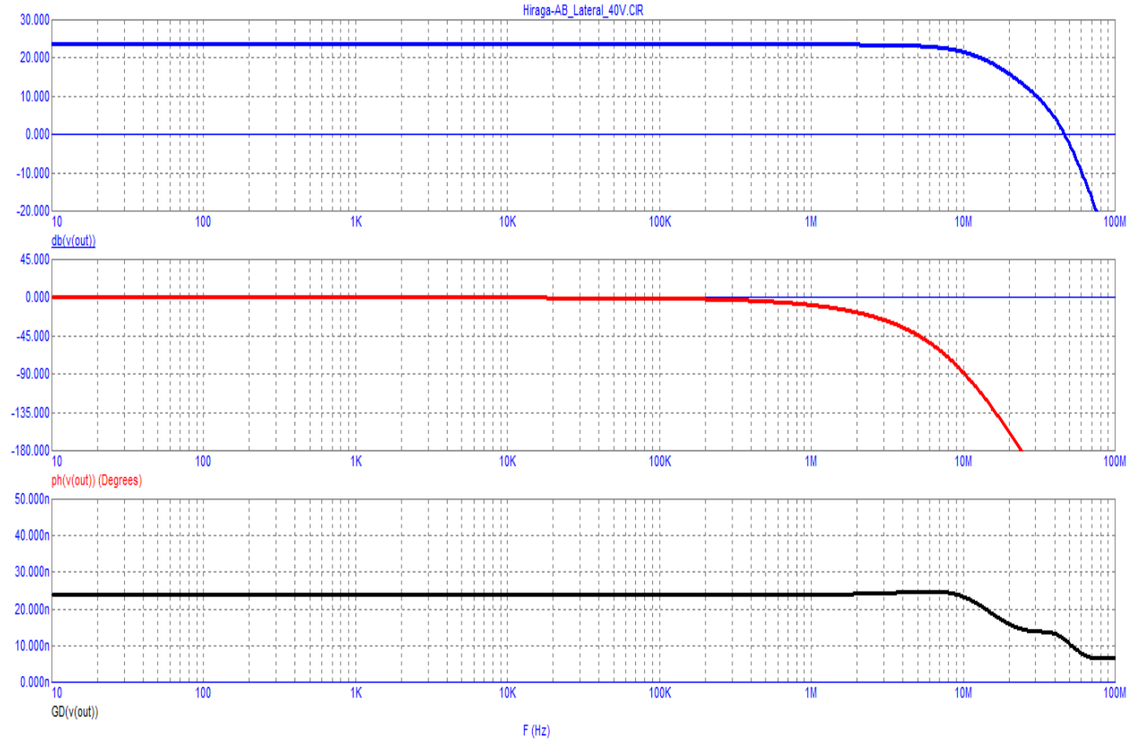
Comparison of parameters of two amplifiers : Hafler HD-220 and Hiraga AB

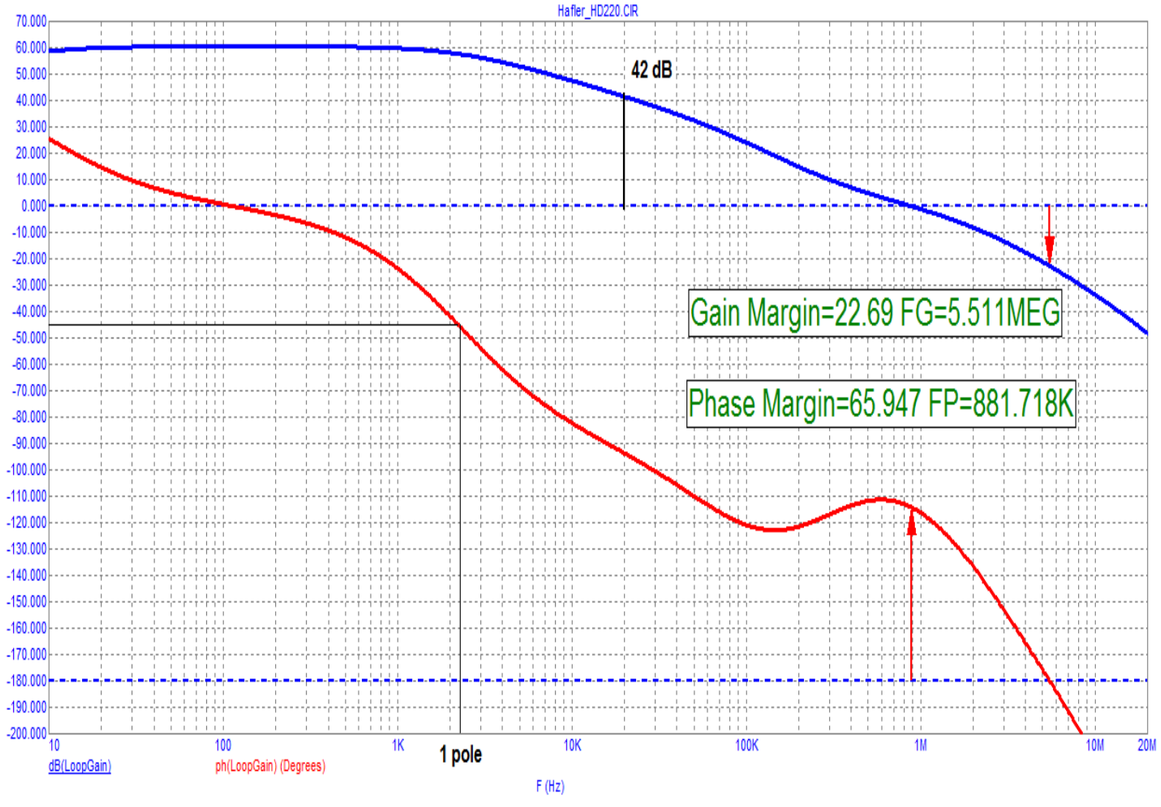


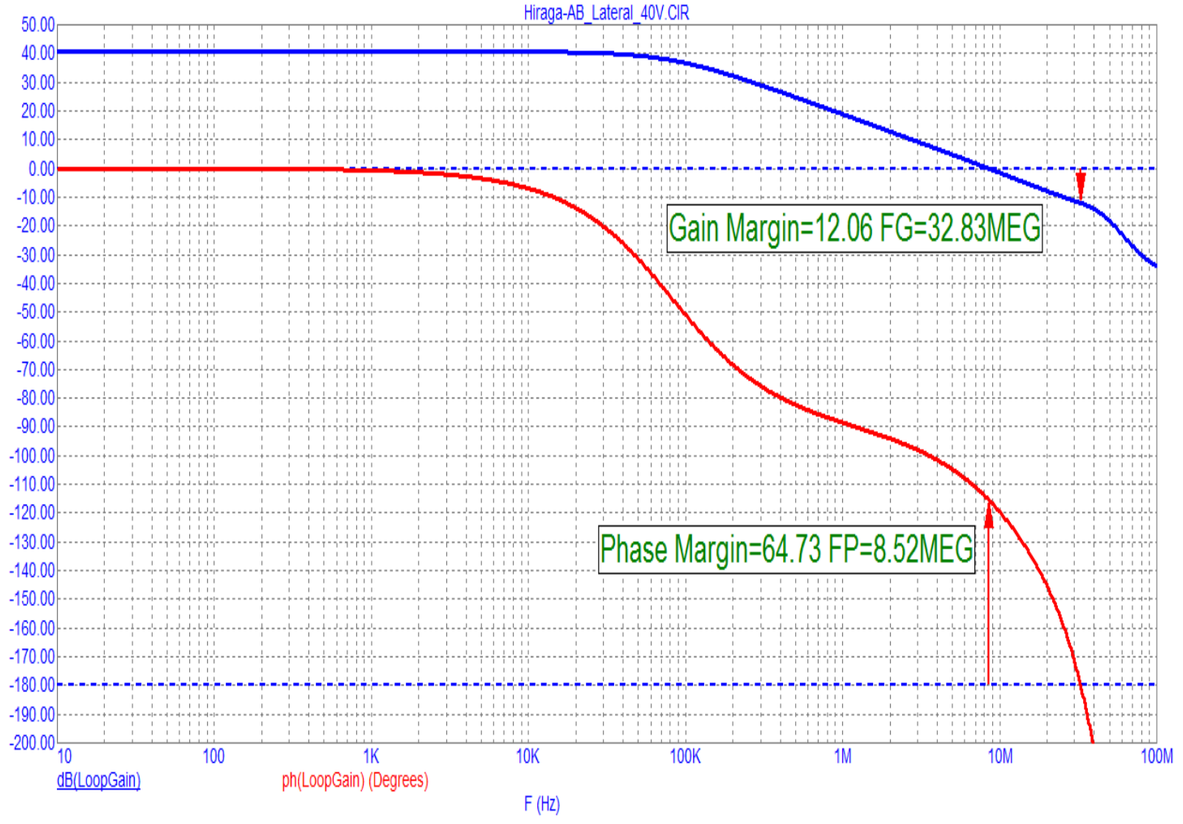




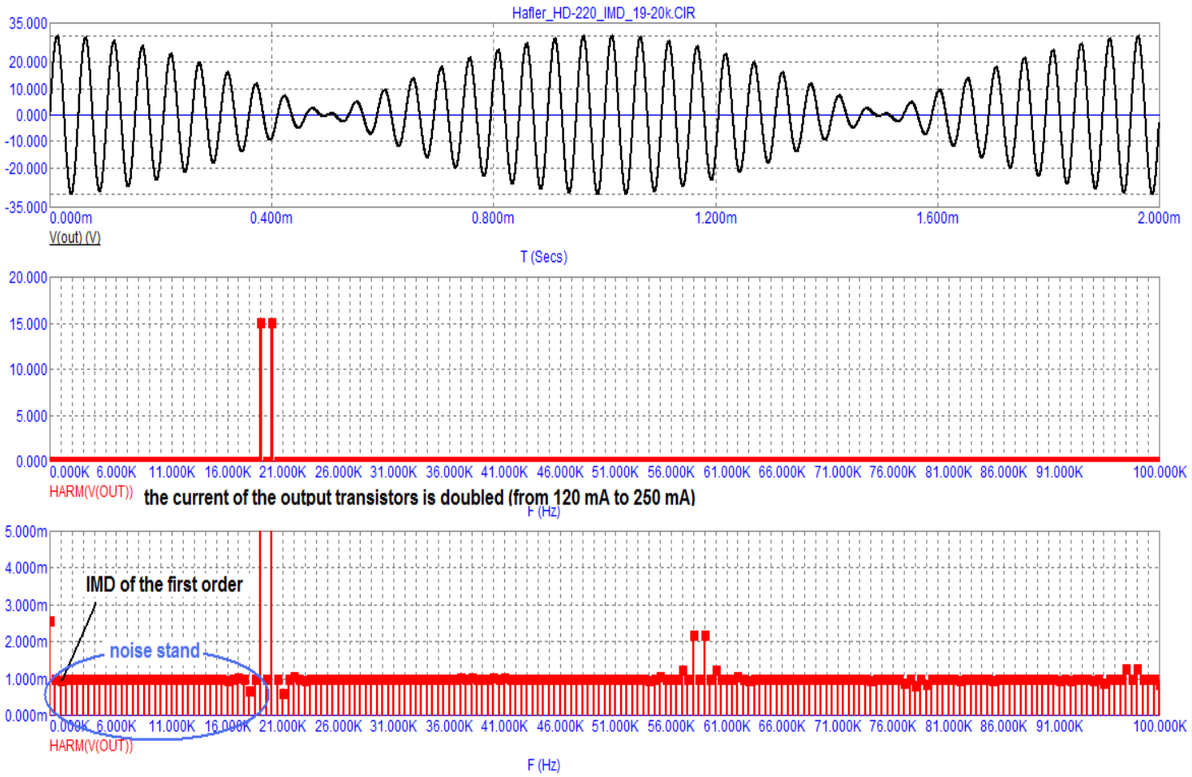


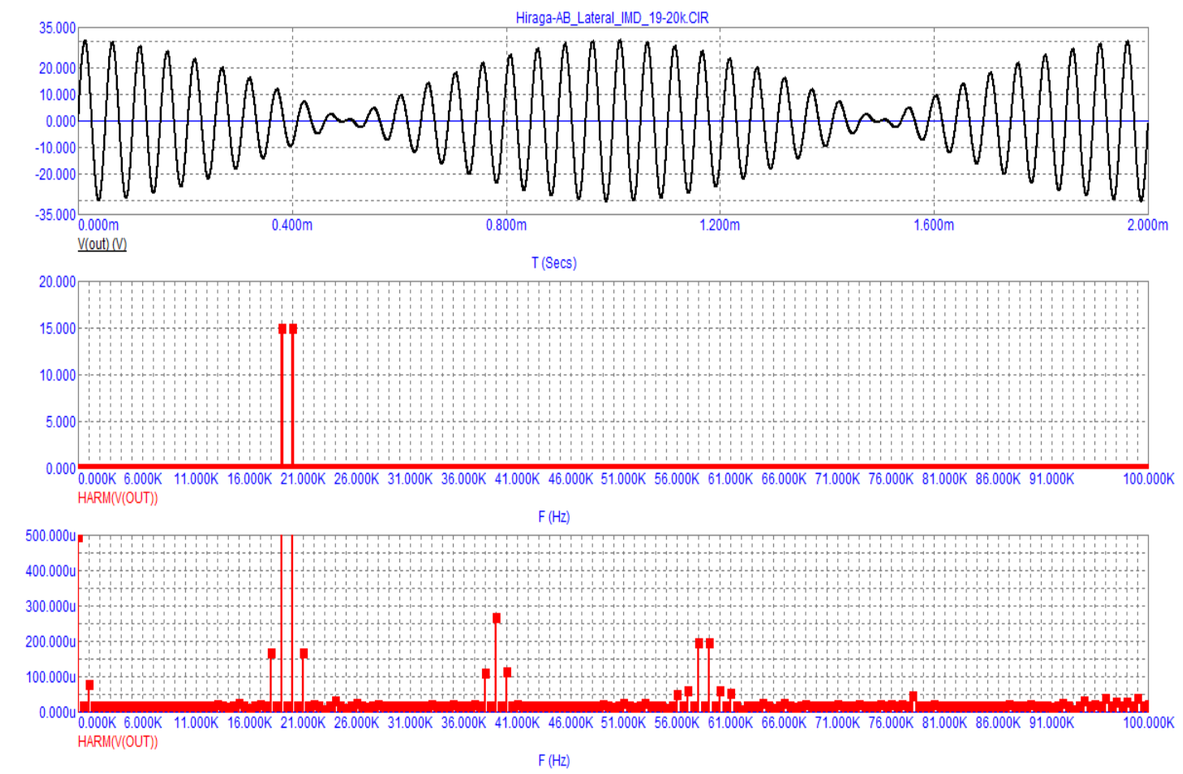
Bode (GD: 500 nS and 22 nS)

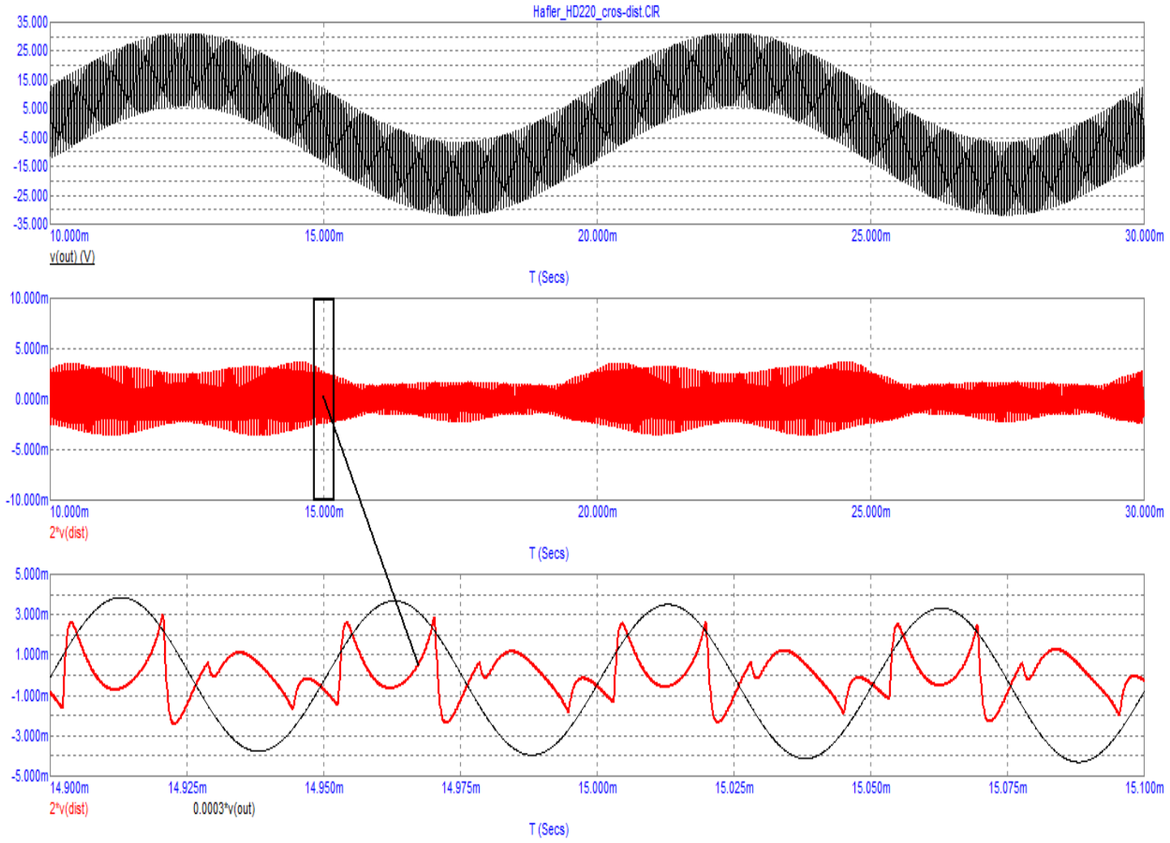


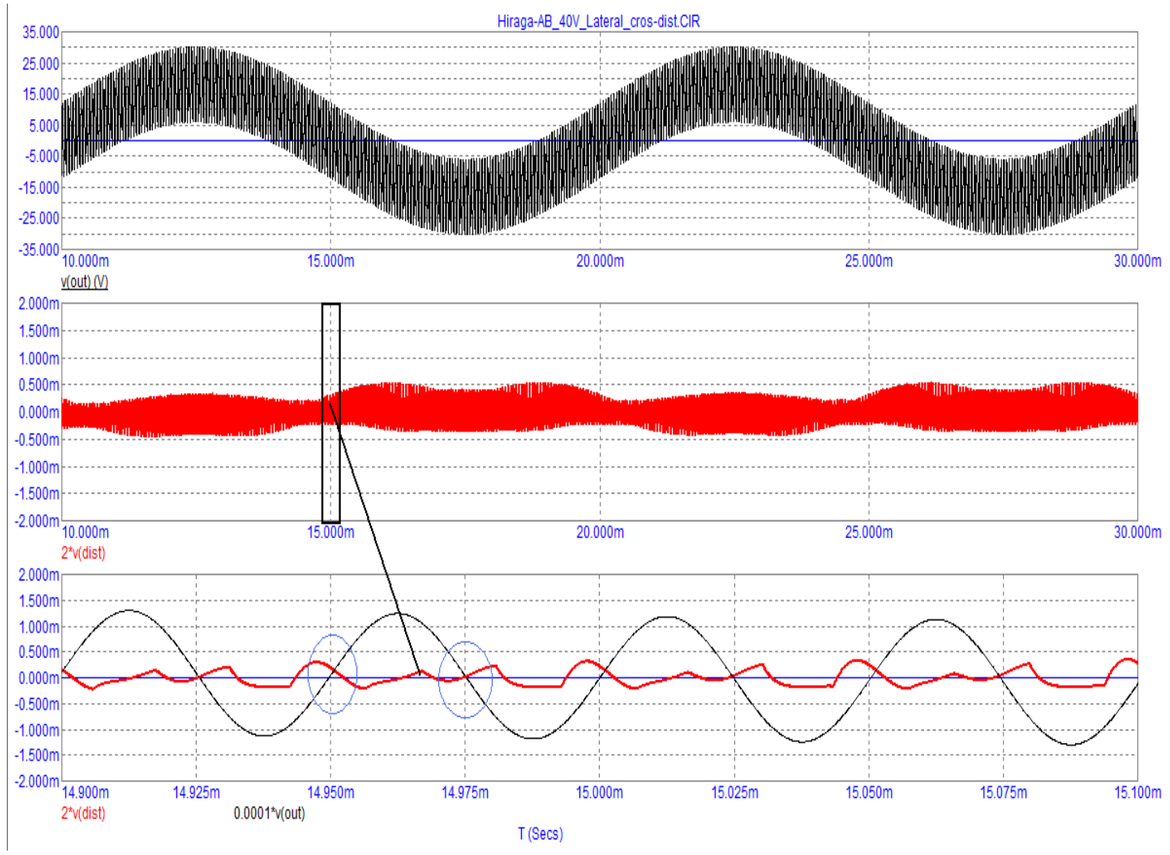


Loop-Gain (42 dB and more and 40 dB)









Test comments

Bode diagram

- for the first AMP, the group delay time is 500 ns and falls off 100 kHz;
- the second has a group delay time of 22 ns and falls off 10 MHz

Loop Reinforcement and Stability Margins

- in the first, the loop gain at a frequency of 20 kHz is 42 dB, at lower frequencies it grows and to a frequency of 1 kHz and below it reaches 60 dB; 1 pole – 2 kHz
- the second has 40 dB in the entire sound band; 1 pole – 80 kHz

Intermodulation distortion

- the first IMD of the first order is equal to 1 mV and the same level is the noise damping in the sound band;
- the second IMD of the first order is less than 0.1 mV and the noise bias is 20 μV

Switching distortion

- for the first amplifier, switching distortions are sharp and reach 3 mV;
- in the second amplifier, the distortions are of a soft nature and are an order of magnitude lower in amplitude

Both amplifiers have the same supply voltage + -40 V and the same current output transistors: 220 ... 250 mA per transistor.

Both amplifiers use lateral transistors as output transistors.

Both amplifiers have approximately the same loop gain, with the former even higher.

The fundamental difference is in the group delay time: 500 and 22 ns, respectively. A short time Propagation Delay has a good effect on reducing speed distortions, which in turn are reflected in a decrease in both intermodulation and switching distortions.

Here it is appropriate to quote the statement of Cyril Hammer [1]. "Impeccable performance is equally important. This is especially true for amplifiers with general feedback. The theoretical concept of negative feedback is very powerful, and the simplified mathematical equations describing this concept are always valid. But they are only valid if the design takes into account limitations concept. Entry to exit delay must be zero! Obviously, this is not possible in real life. There are two ways to solve this problem. 1. You just don't use any negative FB in your project at all (giving up the benefits of the concept). 2. You speed up your amplifier to a few nanoseconds time delays from input to output (corresponding to a frequency band of 200 MHz in the case of Soulution 700 and 710), when the compensation errors are so small that they have no noticeable effect on the sound. As soon as you decide to go along the second path, suddenly many new problems arise: thermal conditions, stability of the supply voltage, design, corresponding to high-frequency devices, the occurrence of noise, interference, etc. ".

1. Cyrill Hammer. — The Absolut Sound, 2012, may/june p. 58, 59.

Best regards
Alexander Petrov