

The simulation models are created with respect to the article named as “Evaluation and design for an integrated modular motor drive (IMMD) with GaN devices, p.3”

Conventional Motor Drive

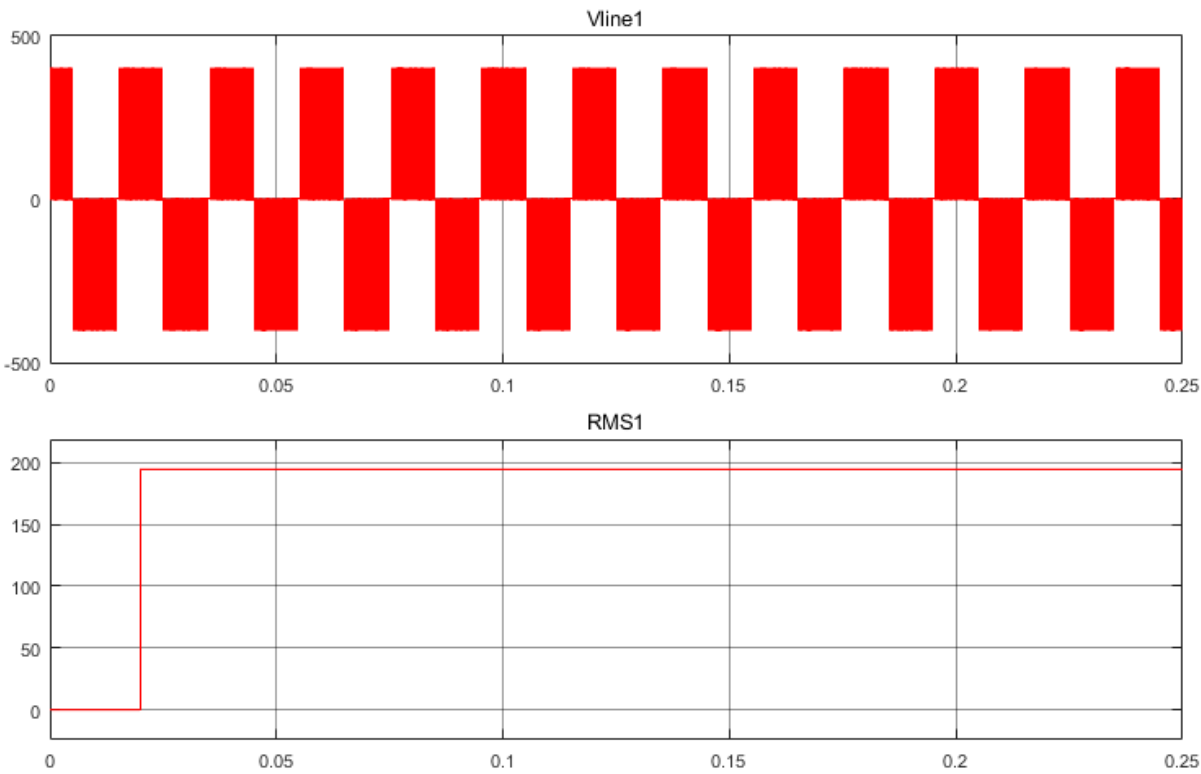


Figure 1: Inverter Output Line to Line Voltage and RMS Value

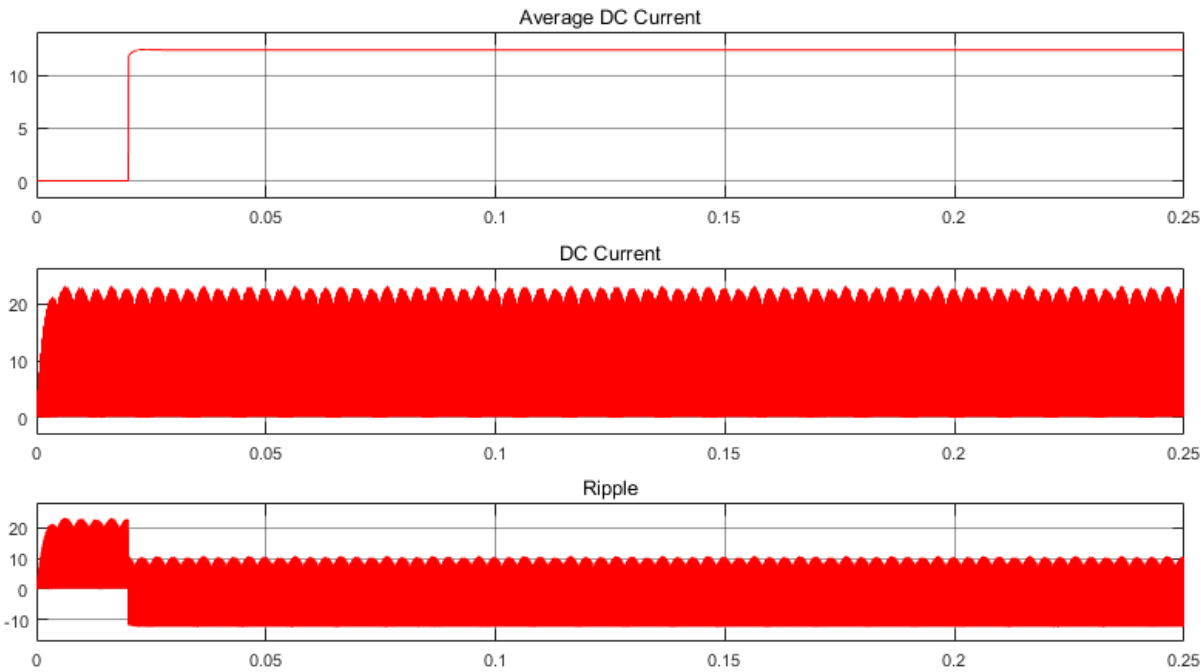


Figure 2: DC Current and Average Current

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Conventional IMMD(Parallel Modules)

Gate Signals in Phase, DC Voltage Halved

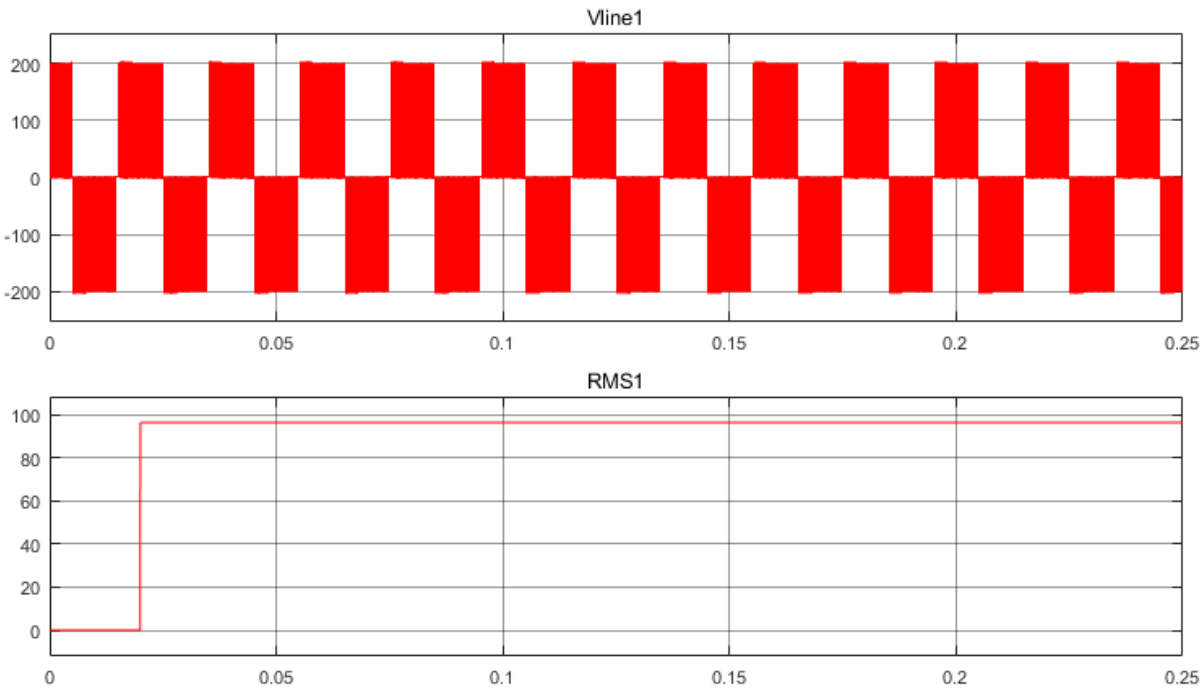


Figure 3: Module 1 Line to Line Voltage

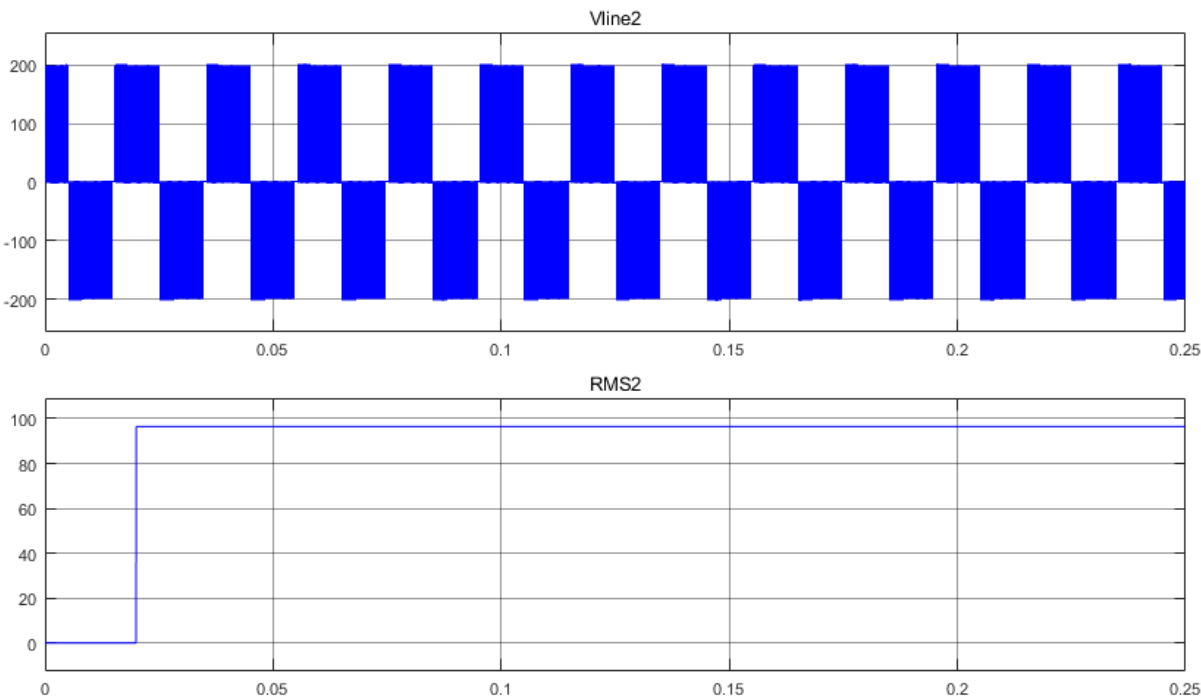


Figure 4: Module 2 Line to Line Voltage

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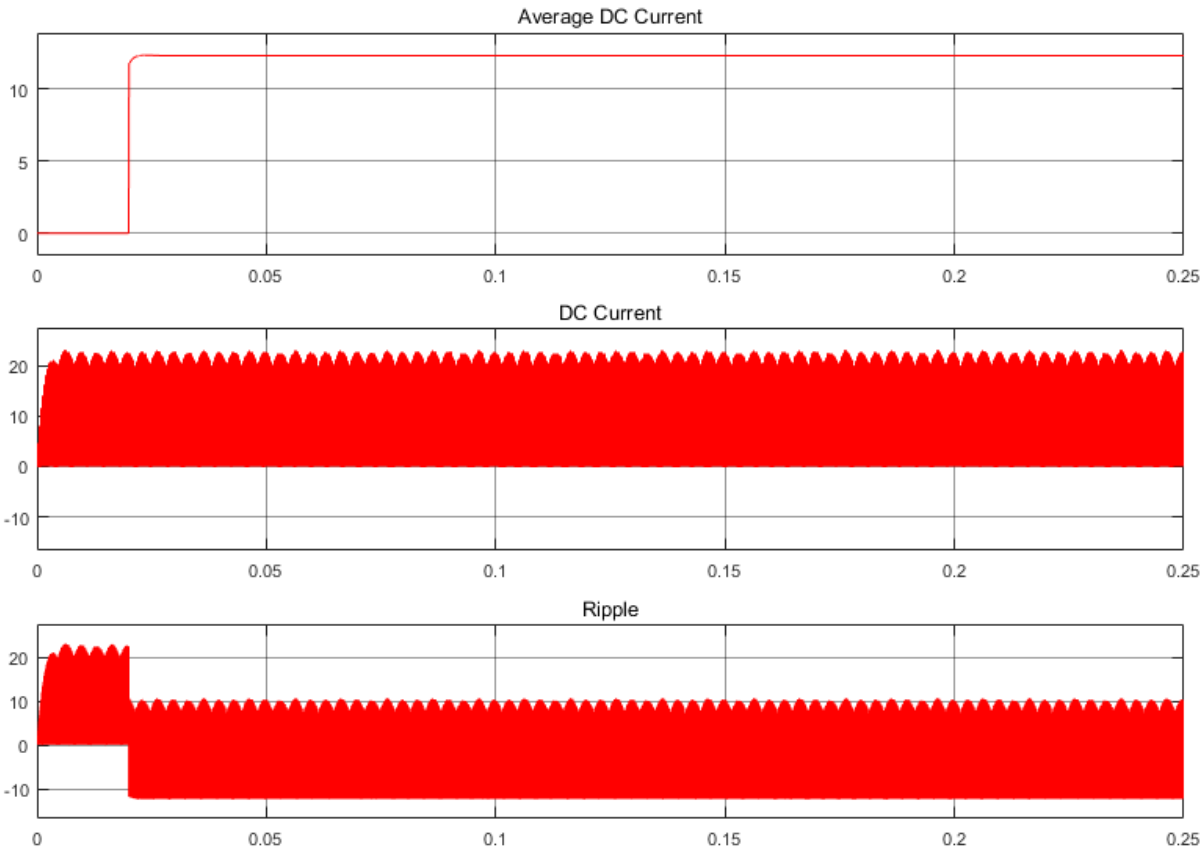


Figure 5: DC Current

Gate Signals Out of Phase (180), DC Voltage is Halved

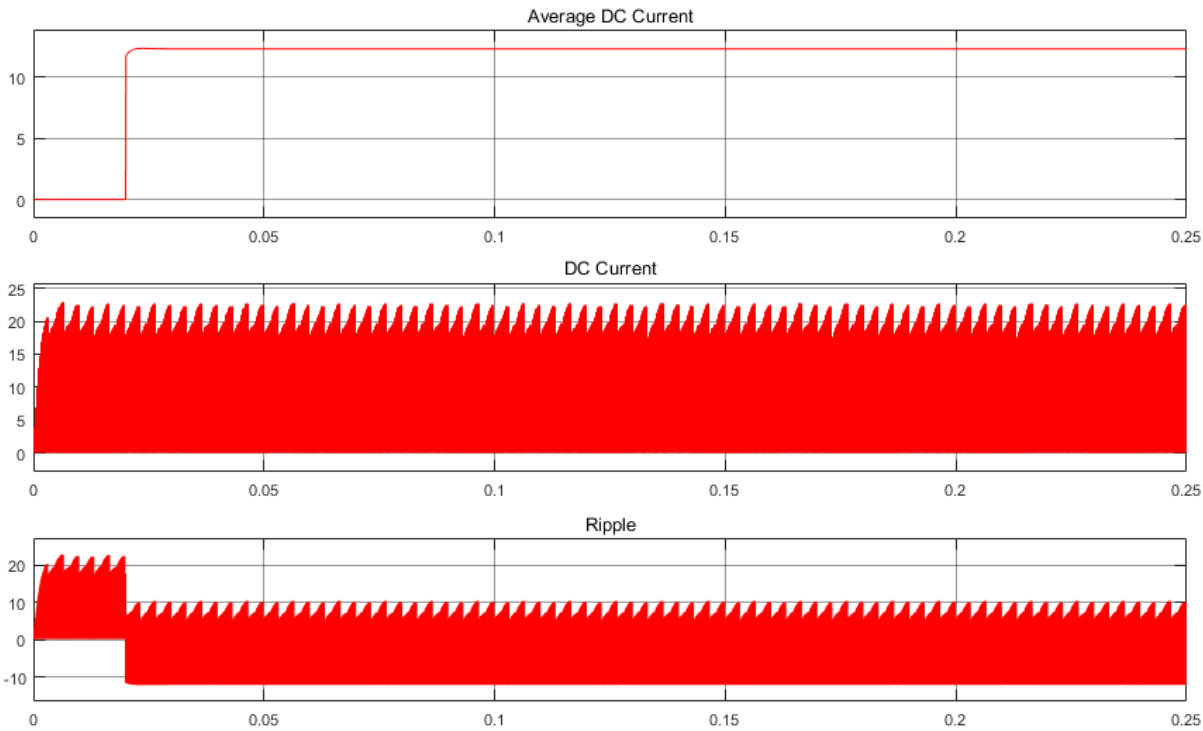


Figure 6: DC Current

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Even though the ripple shape is changed with phase, the magnitude didn’t change significantly. These simulations were done to compare DC current ripple to estimate whether it is beneficial. Up to now, a significant result could not be obtained.

Proposed IMMD (Series Modules)

Gates Signal in Phase

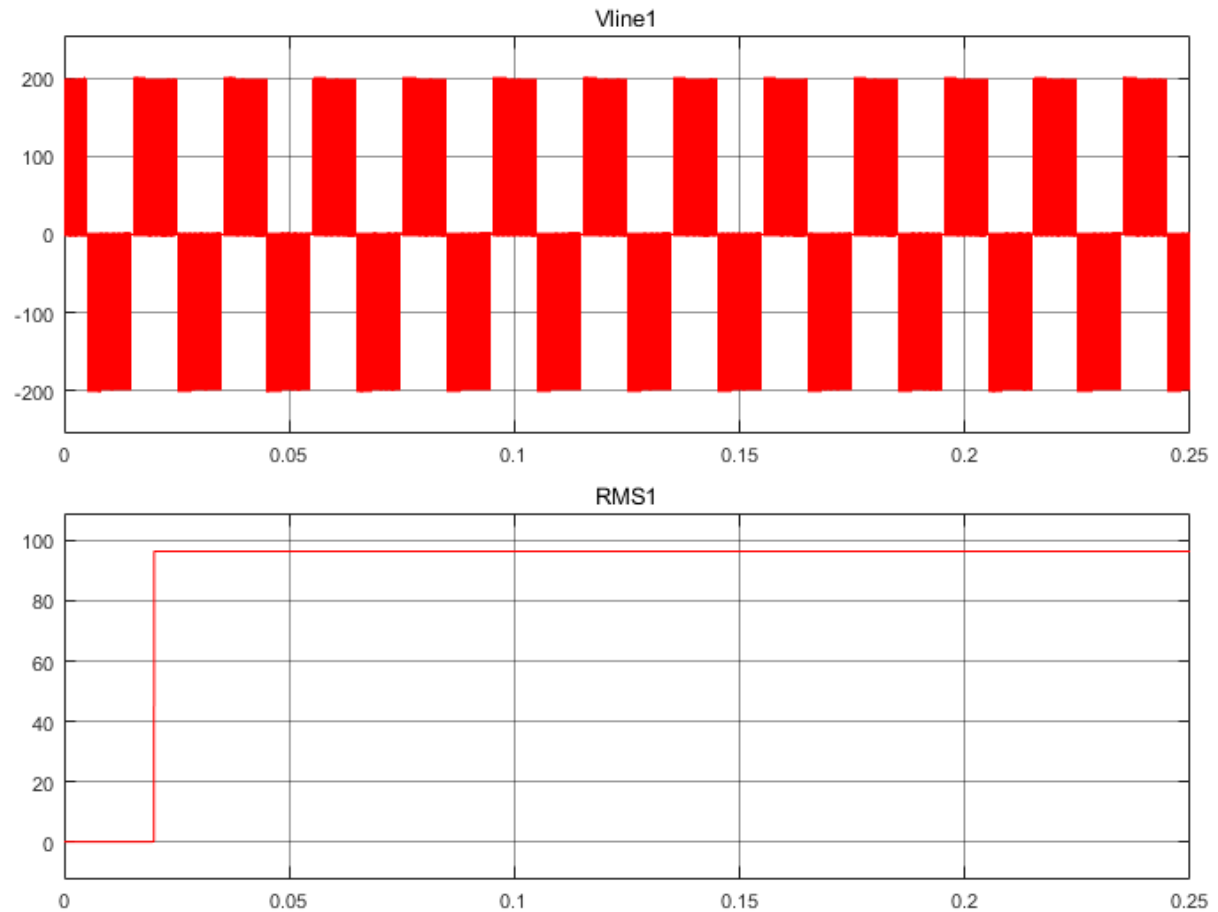


Figure 7: Module 1 Line to Line Voltage

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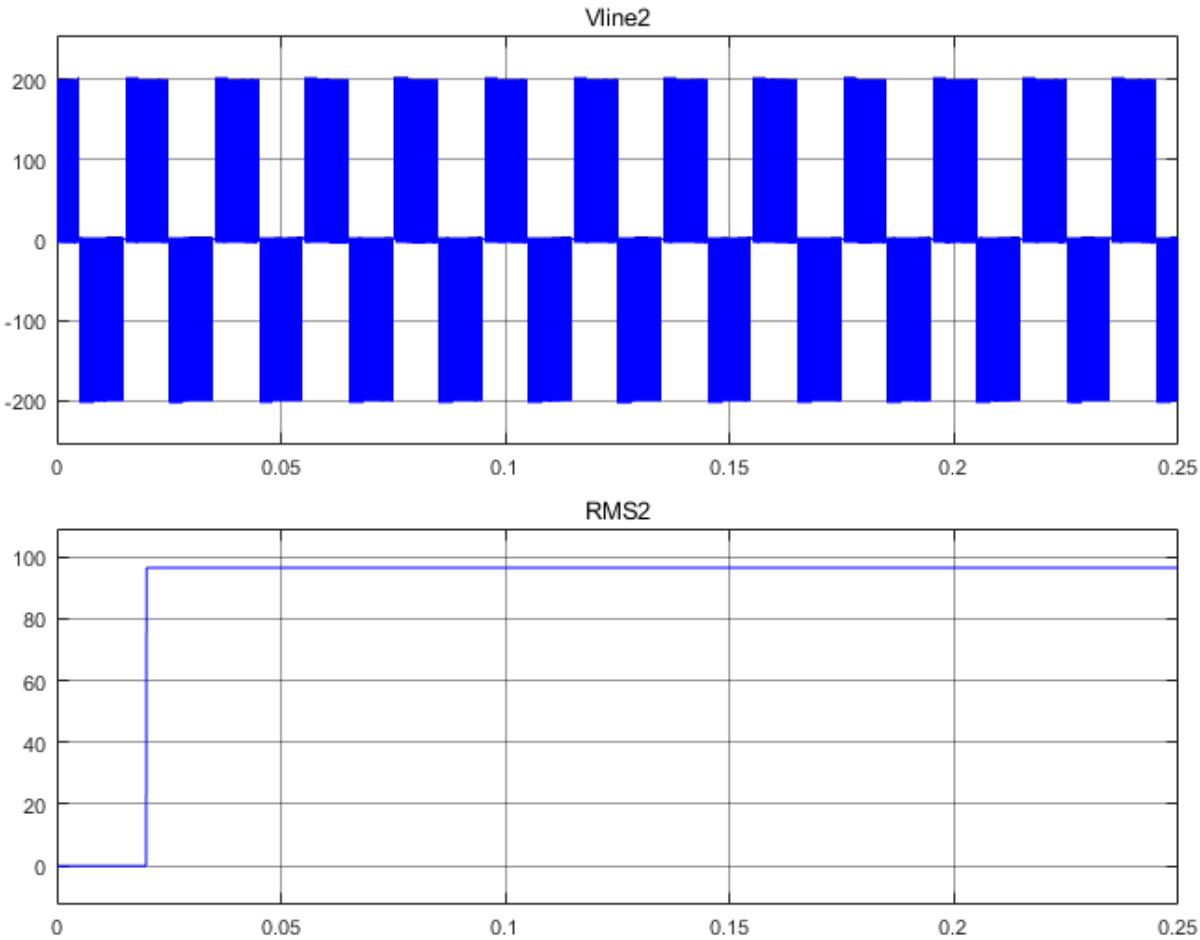


Figure 8: Module 2 Line to Line Voltage

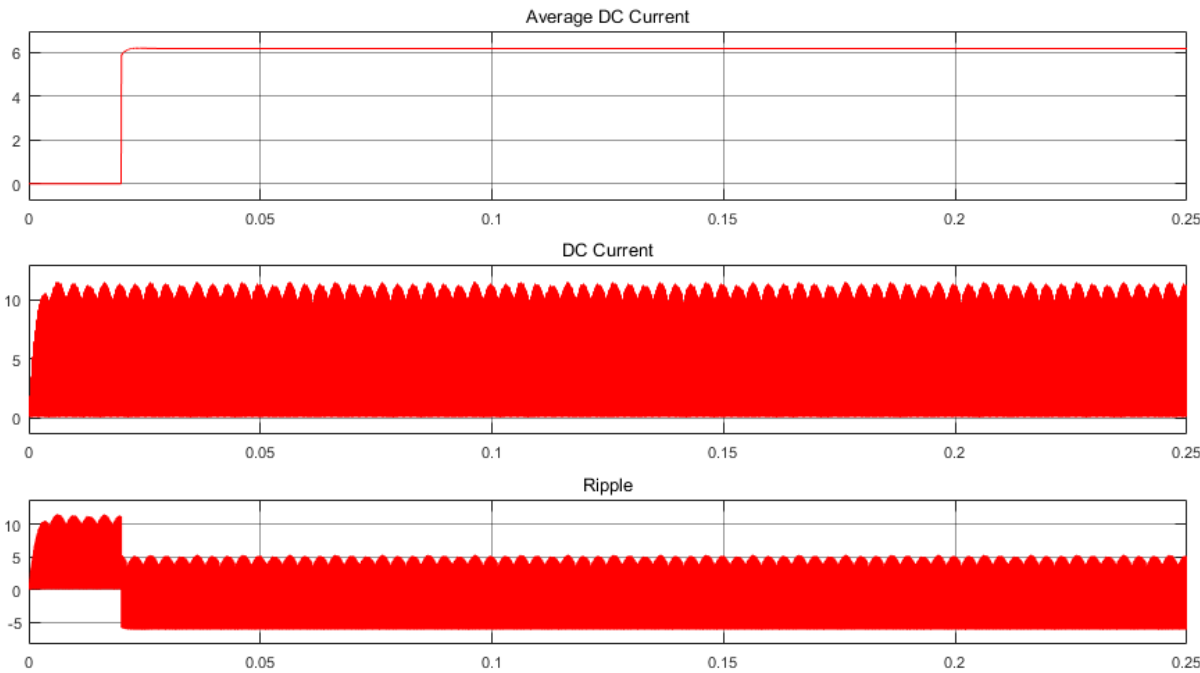


Figure 9: DC Current

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Gate Signals Out of Phase (180)

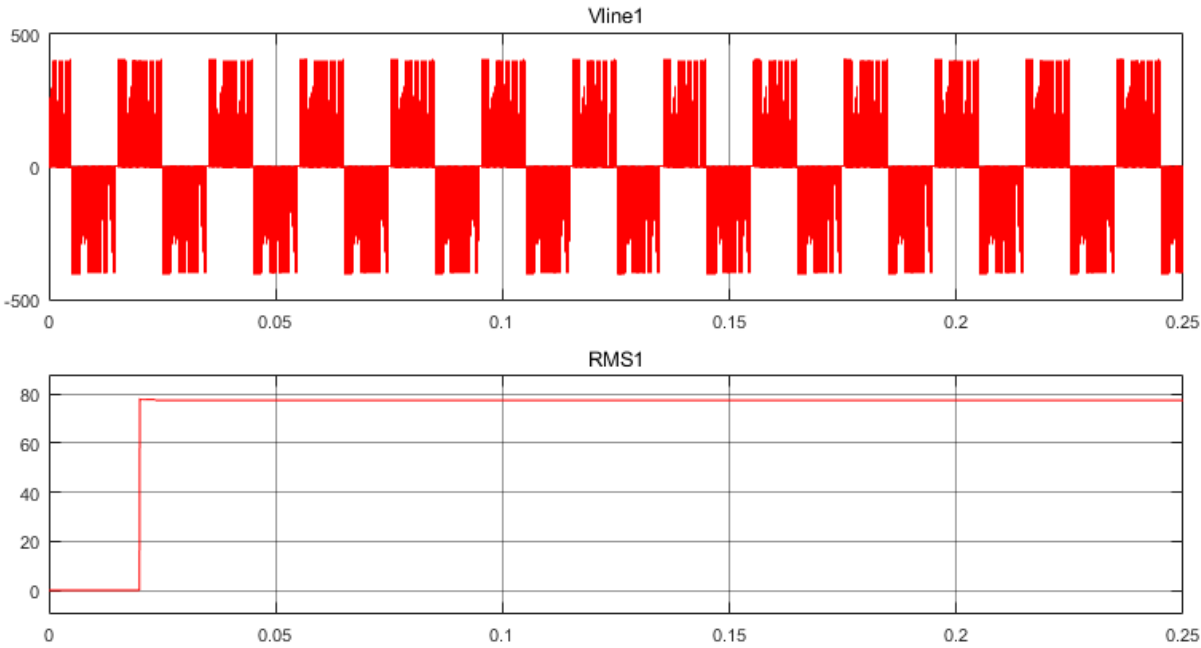


Figure 10: Module 1 Line to Line Voltage

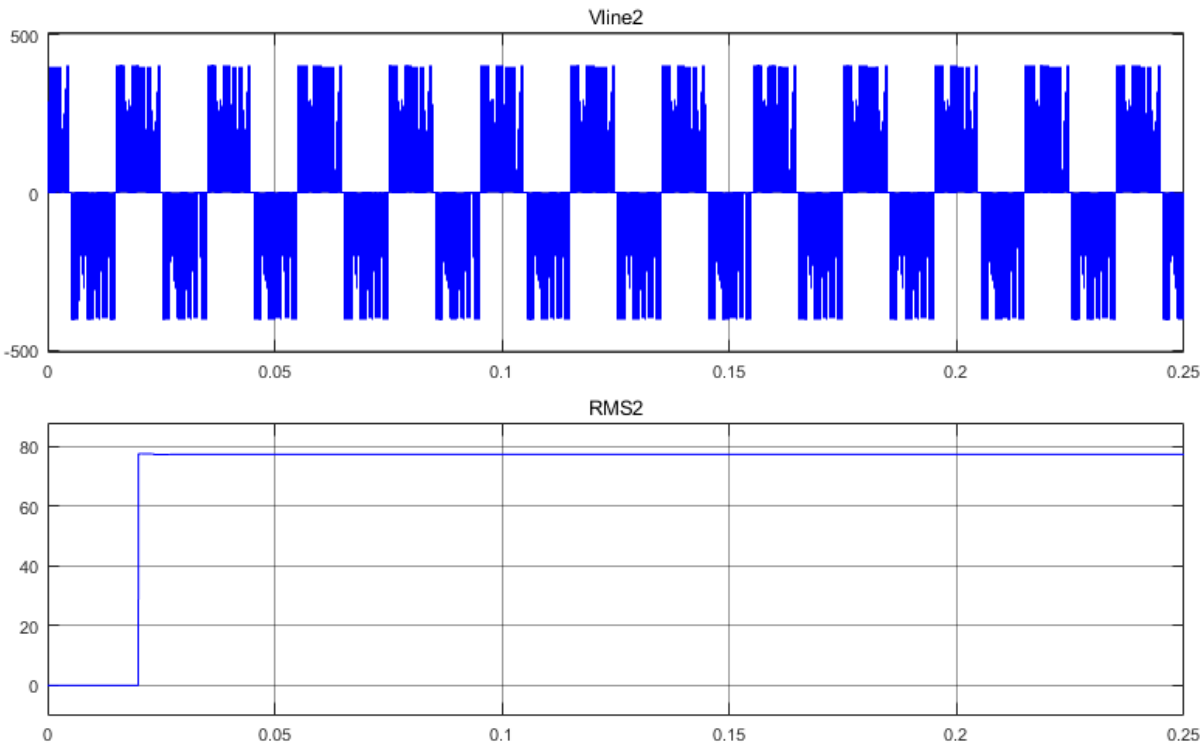


Figure 11: Module 2 Line to Line Voltage

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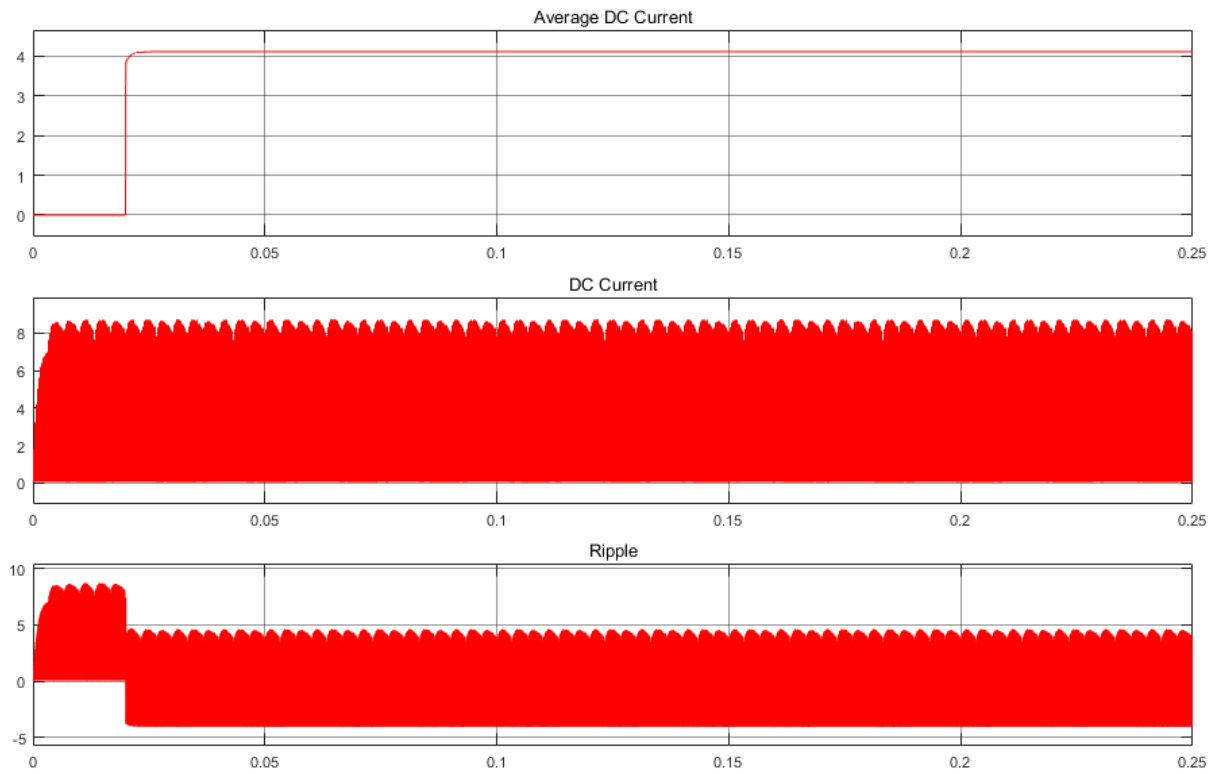


Figure 12: DC Current

Comparison to conventional IMMD, in proposed DC current is lower. That shows, the power consumption of the modules changed. On the other hand, the modules have balanced voltages which is good. Secondly, different phase samples change the results greatly. The average current is decreased and RMS voltage level of the inverter output is decreased also. Probably, the simulation is required to be redone.