

Fig. 9. The magnified view of the output waveform of the cascade inverter showing voltage modulation.

Next Figure shows the voltage waveforms illustrating the operation of the compensator in response to grid voltage disturbances.

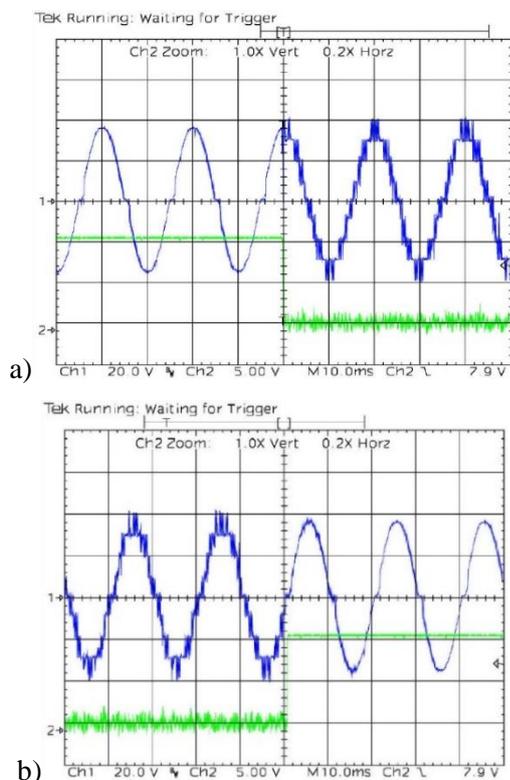


Fig.10. Laboratory test waveforms showing the start (a) and the end (b) of the voltage generation by the cascade inverter.

Figure 9 shows the voltage waveforms illustrating the process of the compensator reaction in response to grid voltage disturbances. The fast switching from network to supercapacitor storage supply is shown in Figure 10a and back switching after restoring the network voltage is shown in Figure 10b. The slight deformation of the obtained voltage around zero crossing points is caused by the properties of the thyristor switch K at low voltage.

10. Conclusion

A great and still escalating number of non-linear loads and growing share of energy from distributed resources result in decreasing the reliability of the public power grids. Therefore, the issues related to the improvement of the

quality and reliability of the electrical energy supply are particularly important.

The presented compensator model allows for compensating dips and short-term interruptions in a three-phase four-wire grid. The device consists of three one phase cascade multilevel voltage converters. The high voltage stacked supercapacitors are used as energy storage for the compensator.

The usage of such an energy storage device has many advantages, but till now is not practically implemented in energetic supply systems, mainly because this technology is not widely known yet and high voltage supercapacitors are still very expensive.

The observed rapid progress in supercapacitors' technology will undoubtedly lead to mass production of these components with better parameters and much lower price, which will allow the wide usage of supercapacitor based compensators for protection of the sensitive processes and devices against interruptions or voltage dips in supply networks or for suppressing disturbances in networks with disruptive sources.

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