



Fig. 9. Synchronous generated voltage V_p of one phase measured in generator operation mode with a rotational speed of $S \approx 5000$ rpm.

is a little bit smaller than the theoretical calculated one. The reasons therefore are probably eddy currents in the stator iron core. However it is possible to say that the functionality of the prototype could successfully be proofed with the test setup. Also operation in Motor mode will be able soon. Therefore the biggest problem is to find a appropriate power electronics and transducer.

VII. CONCLUSION

In this paper it is shown that it is possible to produce a screen printed winding for small-power energy converters especially electrical machines. Furthermore it was proved that the classic motor design calculations can be used to calculate electric motors with screen printed air-gap windings. A 2D-FEM calculation, the numerical calculation and the measured values were equal respectively comparable in the main points and verify each other.

In the future more detailed calculations concerning temperature behaviour and the reactances of the motor will be done. Therewith it is attempted to find new optimal structures for the geometry of the screen printed winding and achieve a much higher efficiency of the motor. Within it is useful to optimize the used materials for the stator iron core. Beside classic metals also soft magnetic compounds (SMC) could be useful to avoid eddy currents caused by higher rotational speeds. Also important is the effective use of the screen printing technology for the design of electrical energy converters. Mainly the conductivity of the printing paste and the thickness and line width of the conductors have to be optimized in the future. Aim of all improvements has to be the increase of the efficiency of the motor.

However with the low production costs and the easy way of assembly the screen printed winding is an interesting solution for motors with high production quantity and a small-power range of some milliwatts to same watts.

Analysis of the reliability and durability of the screen printed winding as well as an objective comparison to motors

that are customary in the trade is in progress at the moment. The results will be presented in the near future.

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