SIMULASI *DUAL ACTIVE BRIDGE* PADA METODE *VEHICLE-TO-VEHICLE* DENGAN MODE TEGANGAN KONSTAN MENGGUNAKAN MODULASI *DUAL PHASE SHIFT*

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ABSTRAK

Penggunaan kendaraan listrik (EV) masih sering terkendala oleh kekhawatiran jarak tempuh pengguna, yang sebenarnya dapat diatasi melalui teknologi pengisian daya *Vehicle-to-Vehicle* (V2V). Transfer energi secara langsung ini membutuhkan konverter *Dual Active Bridge* (DAB) yang mampu bekerja stabil saat beroperasi pada mode *Constant Voltage* (CV) di tengah fluktuasi arus yang dinamis. Penelitian ini bertujuan memodelkan sistem kontrol V2V pada konverter DAB menggunakan modulasi *Dual Phase Shift* (DPS) guna mengoptimalkan stabilitas dan efisiensi bila dibandingkan metode *Single Phase Shift* (SPS) konvensional. Simulasi dilakukan menggunakan MATLAB/Simulink, mengimplementasikan algoritma kontrol Proportional-Integral (PI) yang dilengkapi dengan *Disturbance Observer* (DOb) untuk mengompensasi gangguan luar. Hasil simulasi menunjukkan bahwa kontroler berhasil menjaga kestabilan tegangan output di angka 549.42 V dari target 550 V dengan tingkat error keadaan tunak yang sangat kecil, yaitu 0.145%. Sistem terbukti tangguh dalam merespons variasi beban ekstrem serta penurunan tegangan dengan batas overshoot 2.73% dan undershoot 1.18%. Selain itu, penggunaan modulasi DPS mampu mencapai efisiensi 98.34%, secara signifikan mengungguli modulasi SPS yang hanya mencapai 96.12%.

Kata Kunci: Kendaraan Listrik, *Vehicle-to-Vehicle*, Konverter *Dual Active Bridge*, *Dual Phase Shift*

SIMULATION OF DUAL ACTIVE BRIDGE IN VEHICLE-TO-VEHICLE METHOD WITH CONSTANT VOLTAGE MODE USING DUAL PHASE SHIFT MODULATION

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ABSTRACT

The widespread adoption of electric vehicles (EVs) is still hindered by user range anxiety, which can be mitigated through Vehicle-to-Vehicle (V2V) charging technology. This direct energy transfer requires a Dual Active Bridge (DAB) converter capable of remaining stable in Constant Voltage (CV) mode amidst dynamic current fluctuations. This study aims to model a V2V control system on a DAB converter using Dual Phase Shift (DPS) modulation to optimize both stability and efficiency compared to the conventional Single-Phase Shift (SPS) method. Simulations were conducted in MATLAB/Simulink, implementing a Proportional-Integral (PI) control algorithm equipped with a Disturbance Observer (DOb) to compensate for external disturbances. The simulation results demonstrated that the controller successfully maintained output voltage stability at 549.42 V against a 550 V target, achieving a minimal steady-state error of 0.145%. The system proved highly robust in responding to extreme load variations and voltage drops, with a recorded overshoot of 2.73% and an undershoot of 1.18%. Furthermore, the implemented DPS modulation achieved an efficiency of 98.34%, significantly outperforming the SPS modulation which only reached 96.12%.

Keywords: *Electric Vehicle (EV), Vehicle-to-Vehicle (V2V), Dual Active Bridge (DAB) Converter, Dual Phase Shift (DPS)*