Modeling and Simulation of Hybrid Electric Vehicle Power Systems

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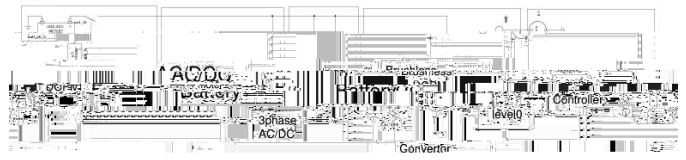*All SAE papers, standards, and selected*

ABSTRACT

INTRODUCTION
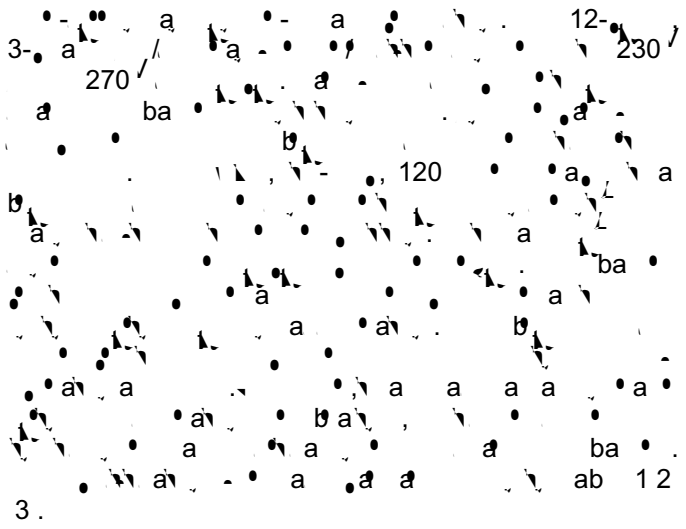
Figure 1 Virtual Hybrid Vehicle System

Table 1 – Design Specifications
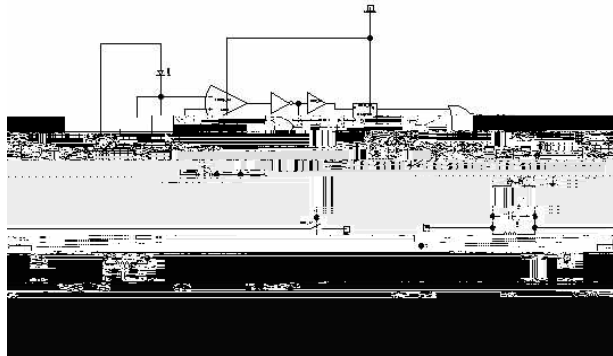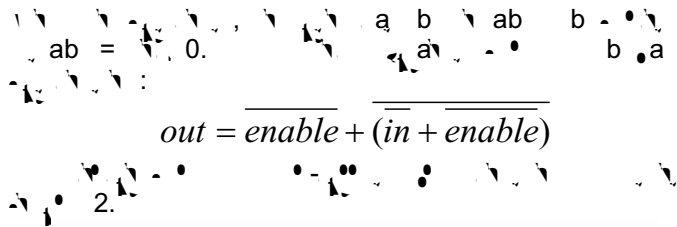
$$out = \overline{enable} + \overline{(in + \overline{enable})}$$

Figure 2 Over-current Protection
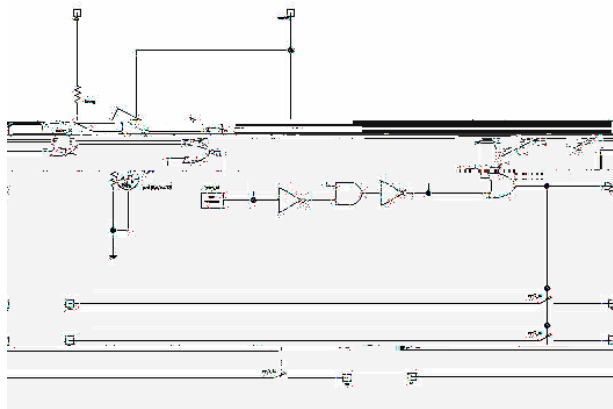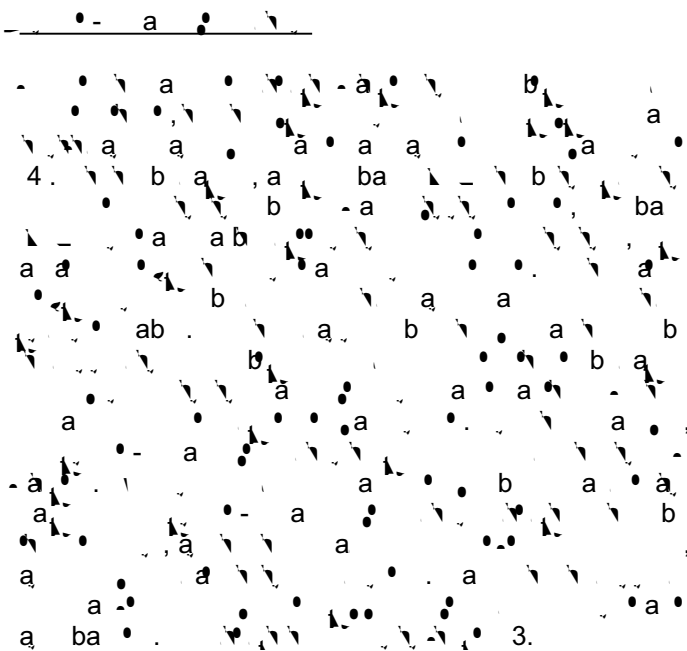
Figure 3 Under-voltage Protection
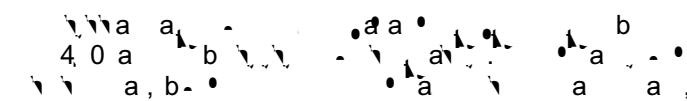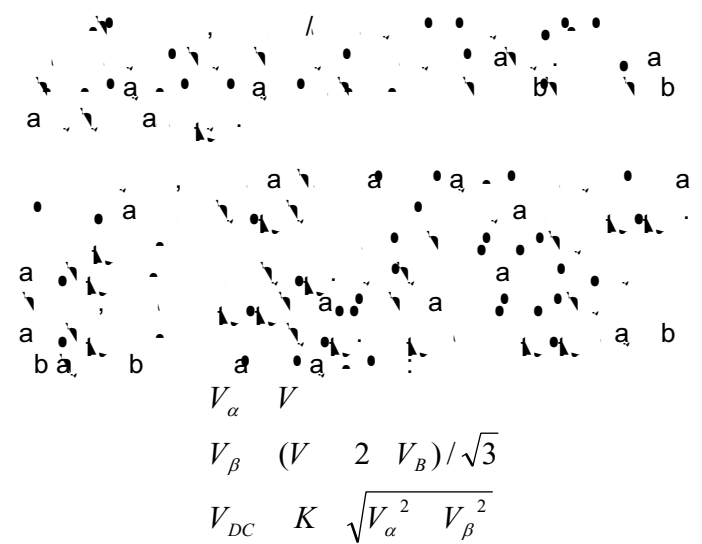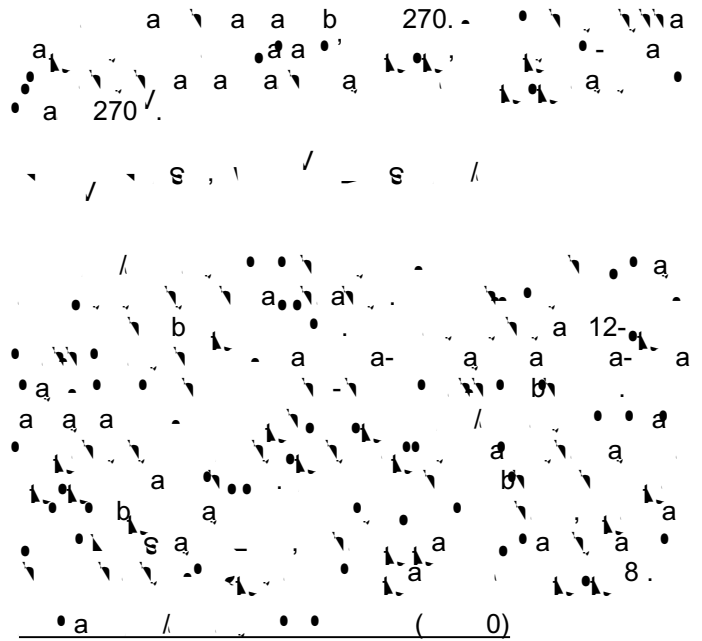
$$V_\alpha = V$$
$$V_\beta = (V + 2 V_B)/\sqrt{3}$$
$$V_{DC} = K \sqrt{V_\alpha{}^2 + V_\beta{}^2}$$

a b a (=0.581).

a / (1)

a b a 3- a , 12-
/ , a /
ab a , a a
a- a- , a a- a a- ,
a b a a a 3- a ,
12- / , a 4.
a a a a a a
a a , 0.581,
a - 0.29- a- a
a a 0.17 - a- a - -
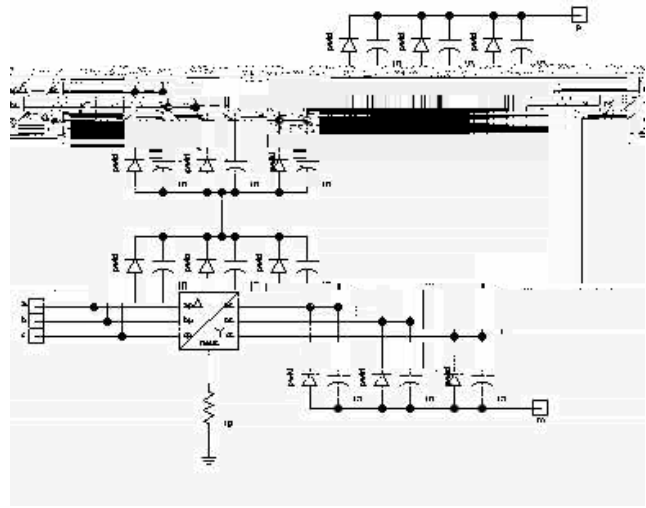
Figure 4 3-phase, 12-pulse AC/DC Converter

a - a /
a a a- a a , a
a a a1 > 0.110a   82

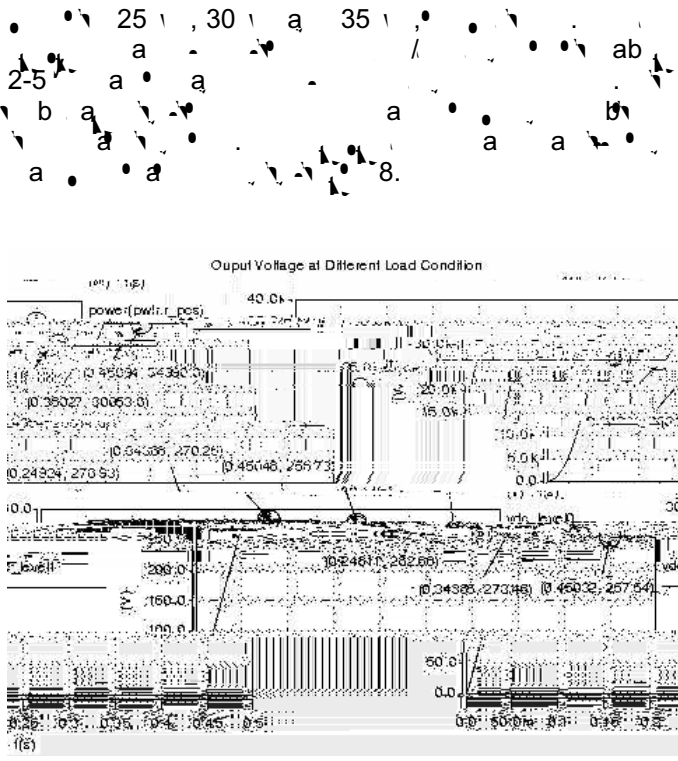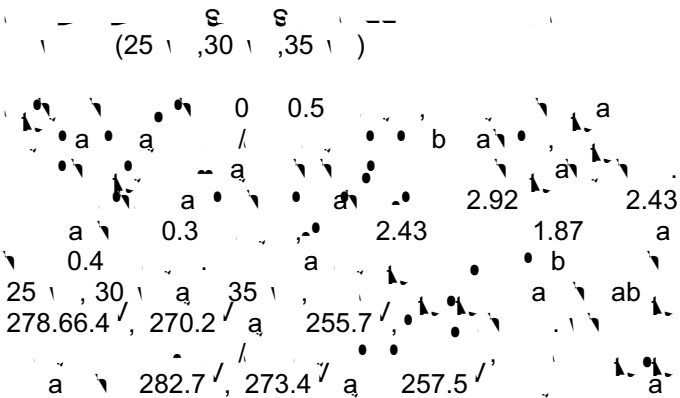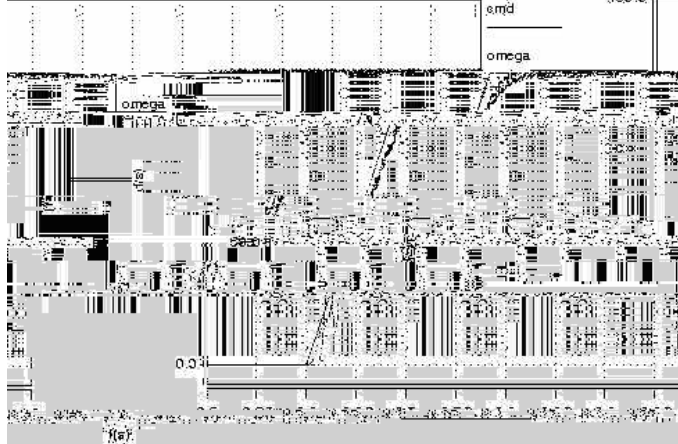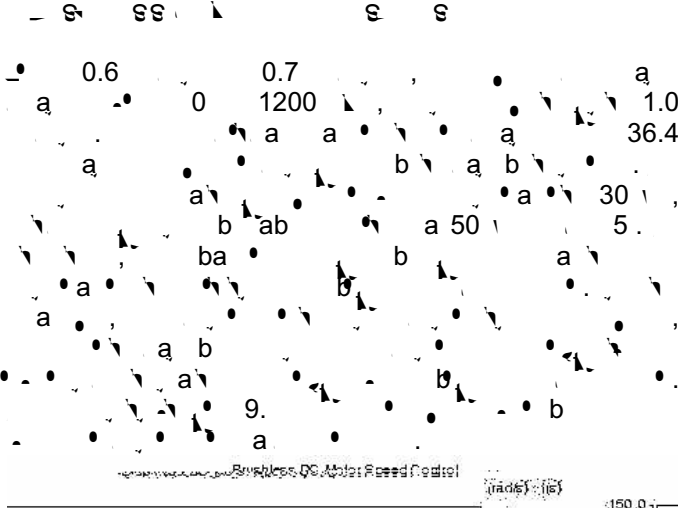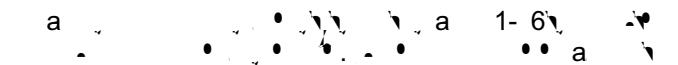Figure 8 DC Output Voltage at Different Load Power
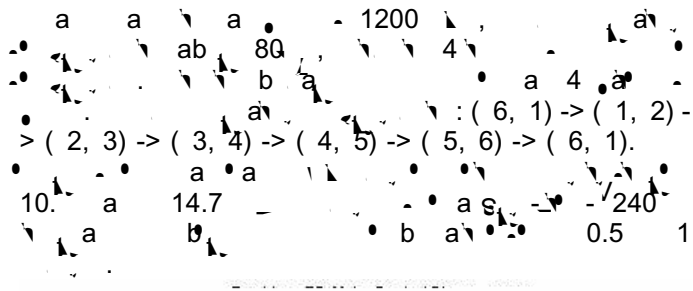

Figure 9 Brushless DC Motor Speed

Figure 7 Brushless DC Motor Controller (level 1)

SIMULATION RESULTS

: (6, 1) -> (1, 2) -> (2, 3) -> (3, 4) -> (4, 5) -> (5, 6) -> (6, 1).

Figure 10 Brushless DC Motor Commutation Signal without PWM (level 0)

Brushless DC Motor Control Signal - level 1

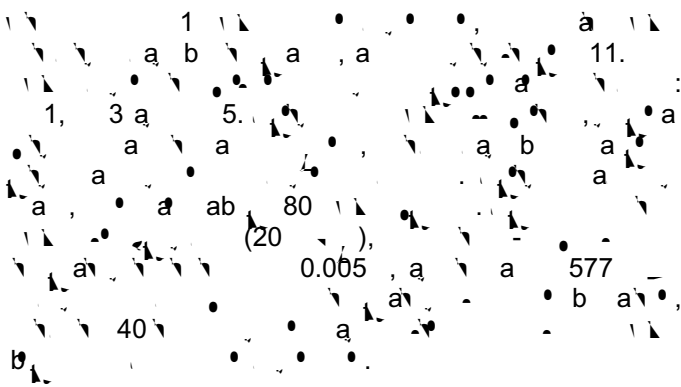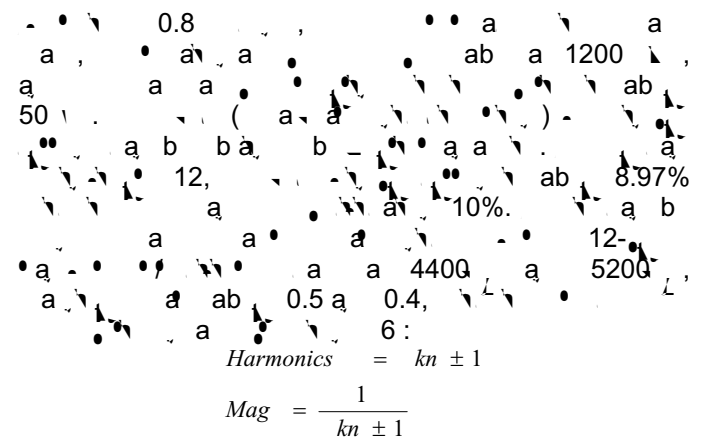**Figure 11 Brushless DC Motor Commutation Signals with PWM (level 1)**

THD of Input Current
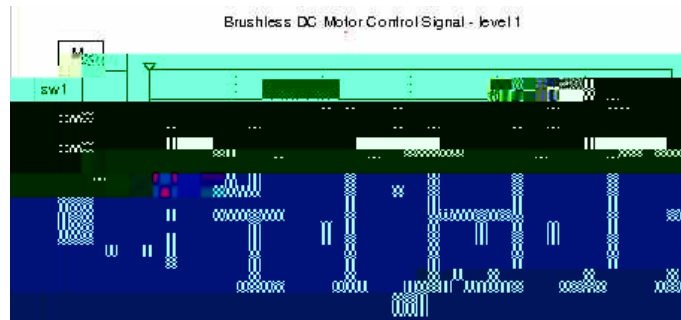
Figure 12 THD of Input Current

$$Harmonics = kn \pm 1$$
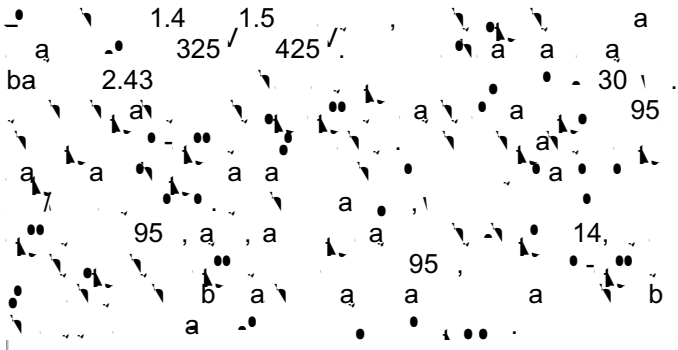
$$Mag = \frac{1}{kn \pm 1}$$

DC Output at Different Input Frequency

Figure 13 DC Output Voltage vs. Input Frequency

Figure labels and readable fragments:

1.4   1.5
325   425   30   95
ba   2.43
95   14,
95
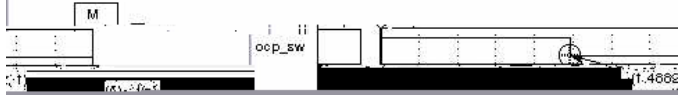
Figure 14 Over-current Protection

1.7   1.8
2.43   0.5,
30   150   15.
240
b   240
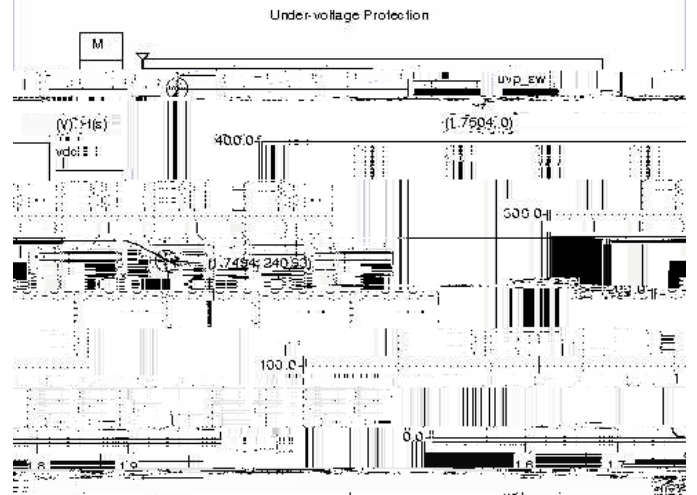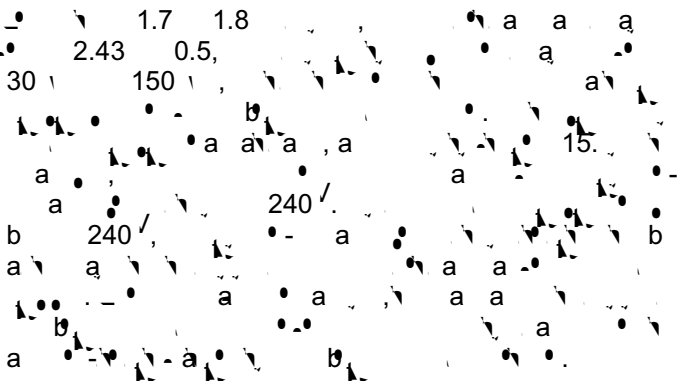
Figure 15 Under-voltage Protection

CONCLUSION
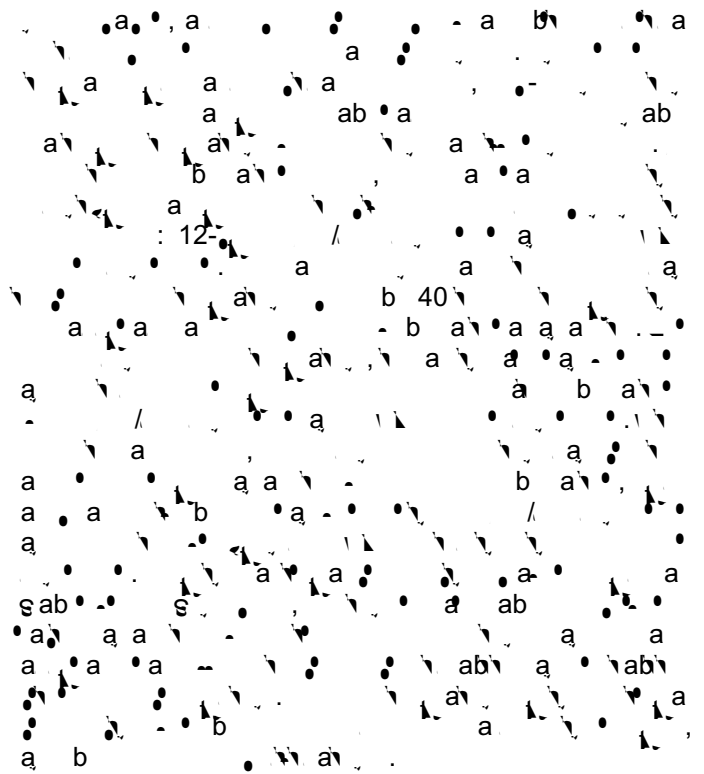
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CONTACT

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