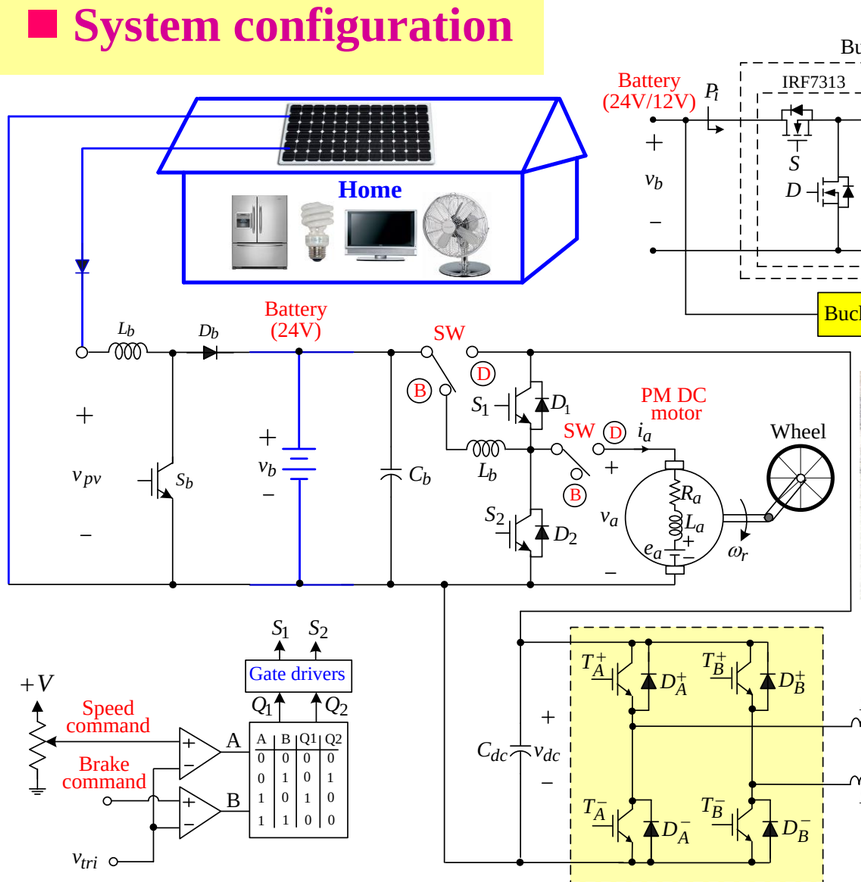
國立清華大學電機工程學系:實作專題研究成果報告 (B03)

具車輛至家庭/電網至車輛及太陽電池能源收集功能之電動機車

(An electric motorcycle with vehicle-to-home/grid-to-vehicle and PV energy harvesting functions)

組員：許奕鈞、高聖程　　◆ 指導教授: 廖聰明教授

■ System configuration

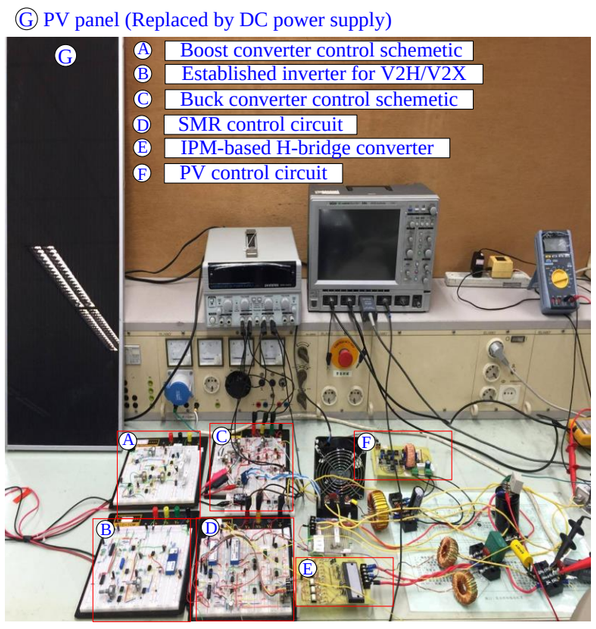


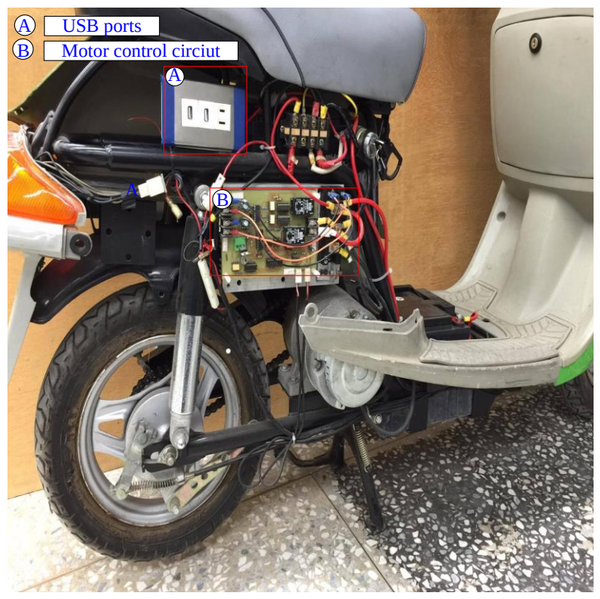
Ⓓ: Motor driving mode
Ⓑ: Battery conditioning mode

G2V: Grid-to-vehicle opeartion
V2H: Vehicle-to-home opeartion

■ Setup photos

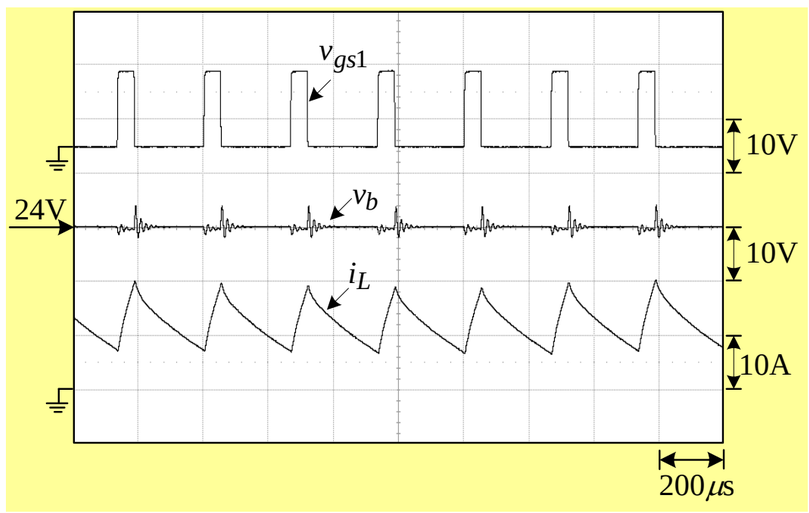
Ⓐ Boost converter control schemetic
Ⓑ Established inverter for V2H/V2X
Ⓒ Buck converter control schemetic
Ⓓ SMR control circuit
Ⓔ IPM-based H-bridge converter
Ⓕ PV control circuit
Ⓖ PV panel (Replaced by DC power supply)





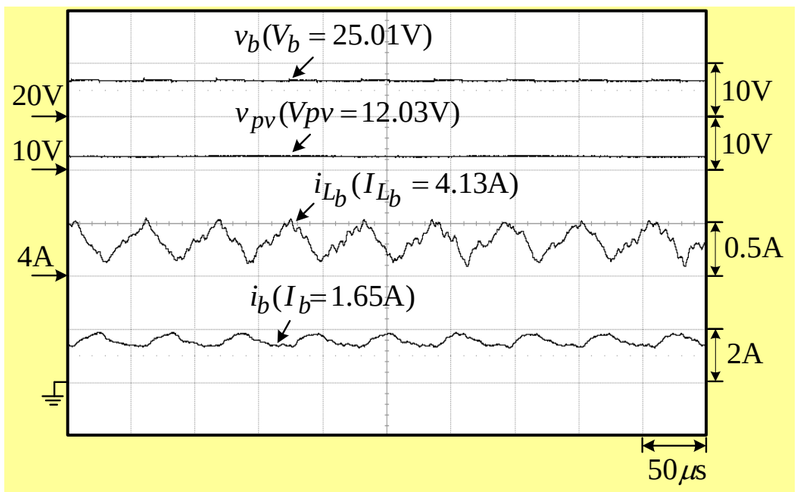
A. Electric motorcycle DC motor drive

- Battery: 24V (12V/55AH*2).
- Motor acceleration/deceleration can be achieved via the bidirectional DC-DC converter. The regenerative braking recovered kinetic energy can be sent back to the battery.
- Measured results: At wheel speed 200rpm.



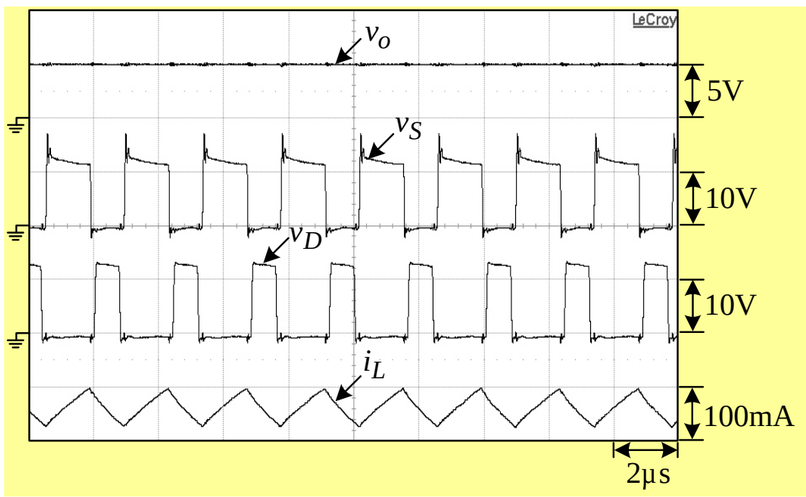
B. PV energy harvesting

- PV source: DC 12V.
- Output voltage: DC 24V.
- The on-board battery can be directly charged using the harvested PV energy via the boost DC-DC converter.



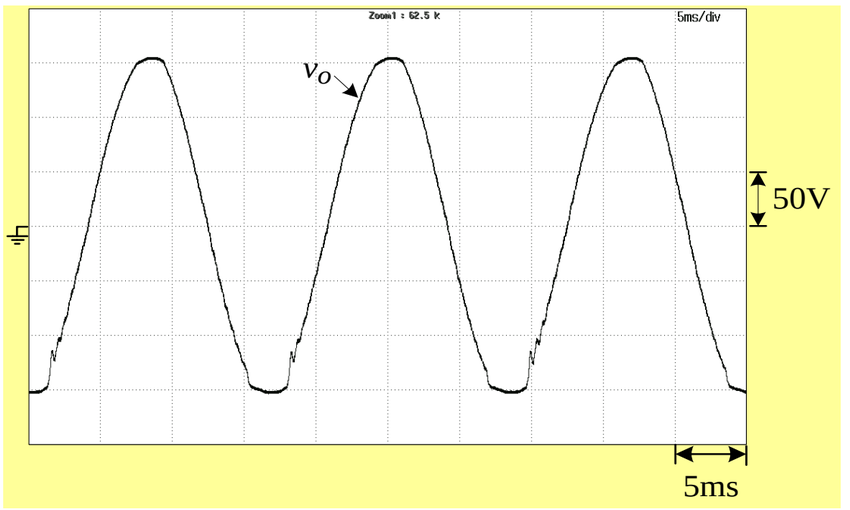
C. Buck DC-DC converter based 5V USB source

- Input source: DC 12V.
- Output voltage: USB DC 5V.
- USB 5V source is generated by the synchronous rectifier based buck DC-DC converter.
- The USB DC source can provide emergency charging power.



D. V2H operation (Battery to home appliance discharging)

- Battery: 24V (12V/55AH*2).
- DC link voltage: DC 200V.
- Inverter output: AC 110V/60Hz.



E. G2V operation (Utility grid charges the battery with PFC function)

- Input source: AC 110V/60Hz.
- DC link voltage: DC 200V.
- Power factor *PF* = 0.966, *THDi* = 9.01%.