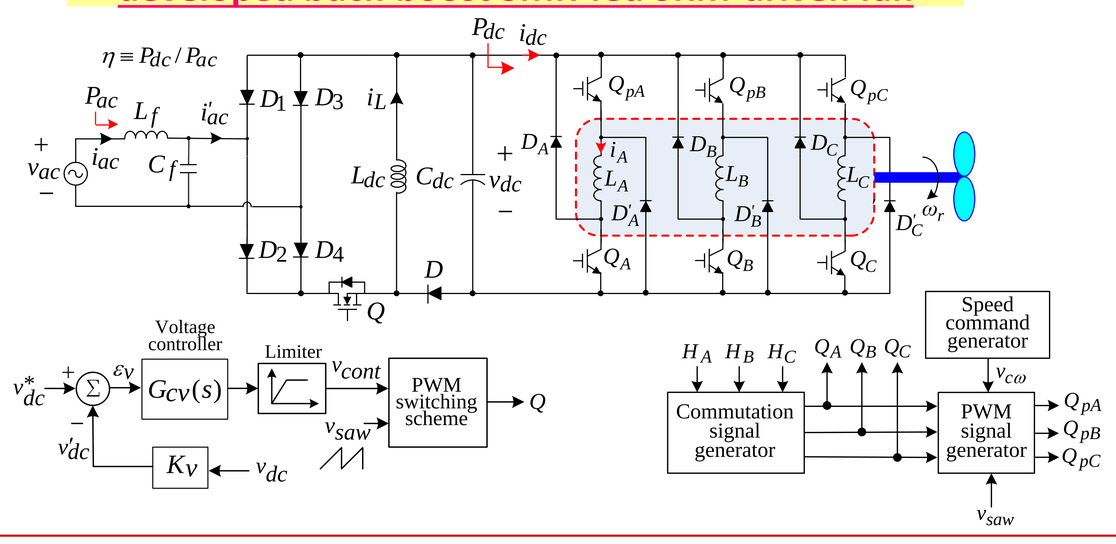
電機資訊學院 2021 作 BRAIN PLUS HAND 實作專題競賽

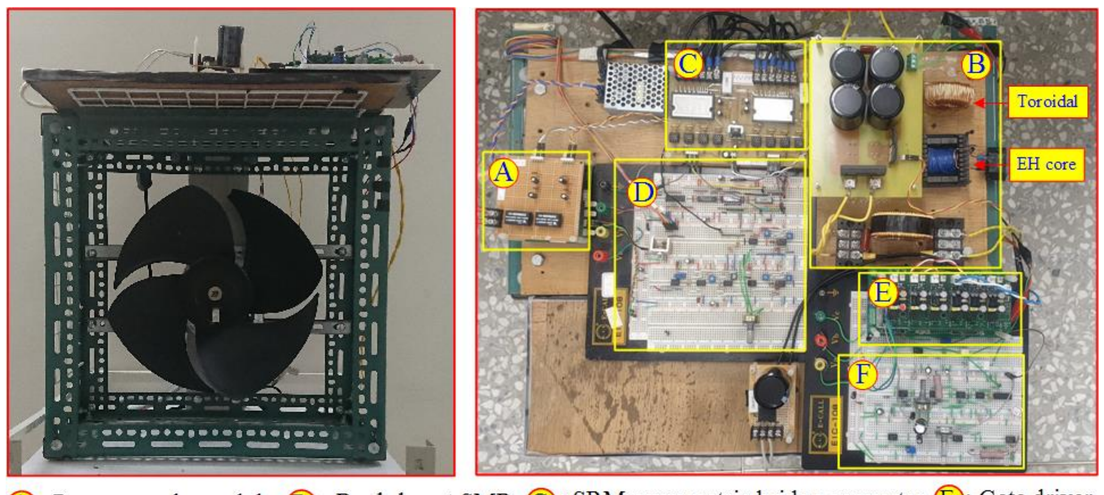
昇降壓切換式整流器供電之散熱風扇
(Buck-boost switch-mode rectifier powered cooling fan)

EECS10 組員：顧唯楷、倪詠量

Circuit and control schemes of the developed buck-boost SMR-fed SRM-driven fan

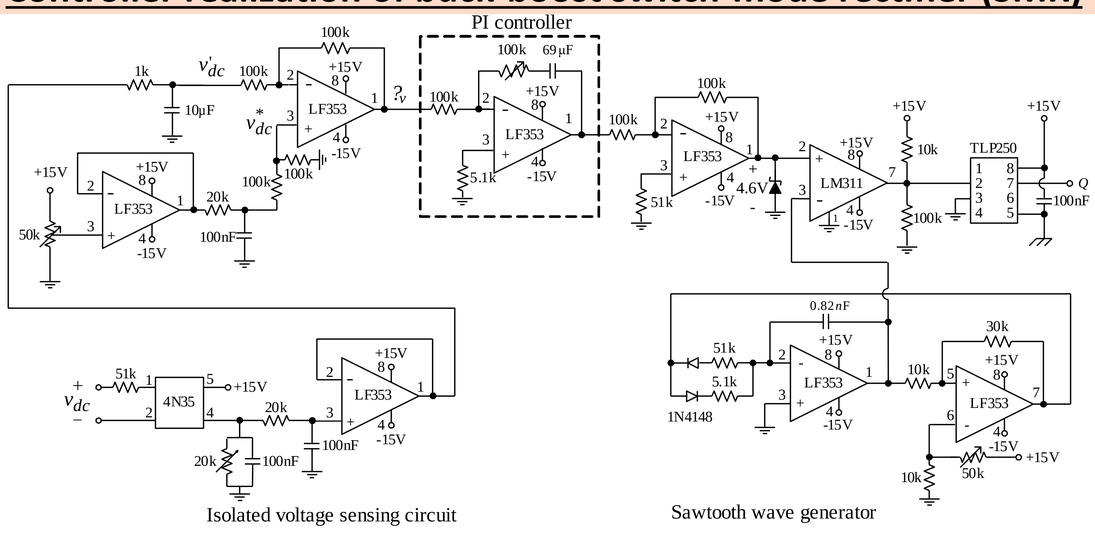


Photos of the buck-boost SMR-fed SRM-driven fan

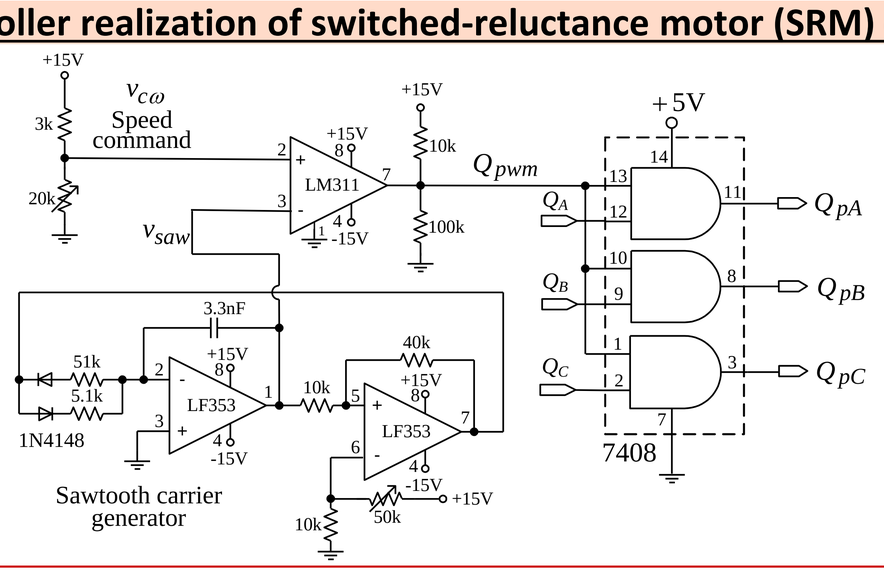


A: Power supply module B: Buck-boost SMR C: SRM asymmetric bridge converter E: Gate driver
D: Analog control circuit of SRM drive F: Analog control circuit of buck-boost SMR

Controller realization of buck-boost switch-mode rectifier (SMR)

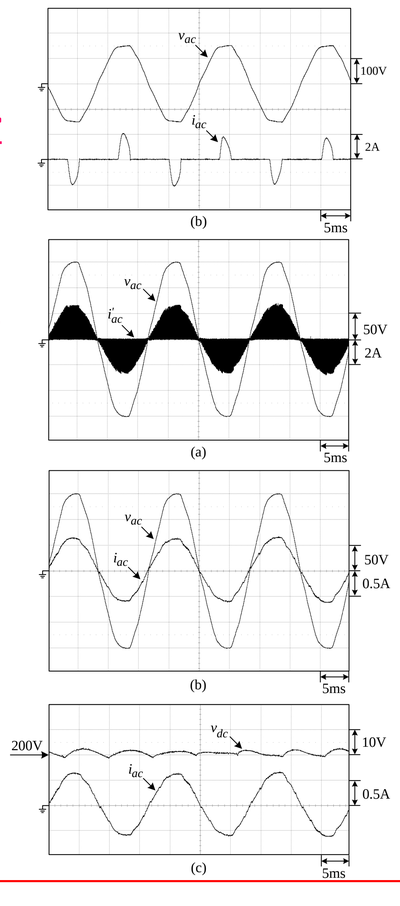


Controller realization of switched-reluctance motor (SRM) drive



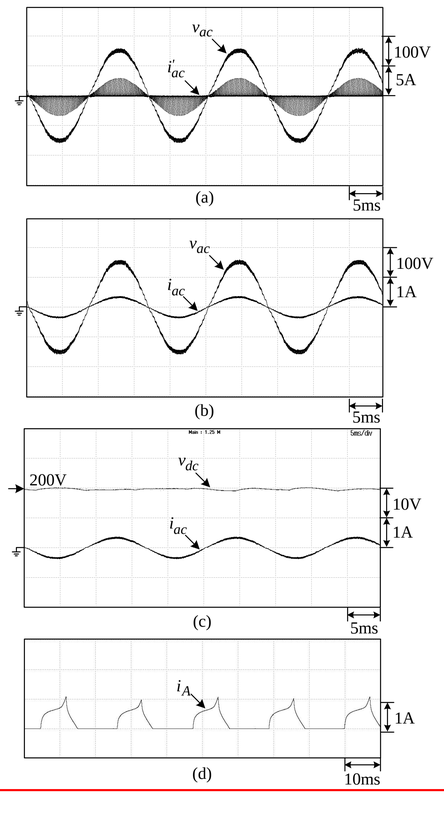
■ Comparative evaluation of three AC/DC converter powered SRM driven cooling fans (700rpm):

Diode rectifier

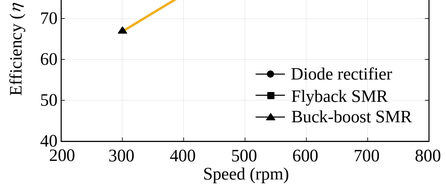


Flyback SMR

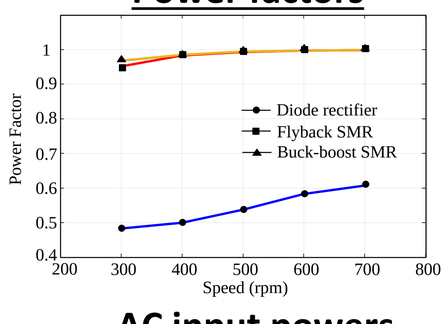
Buck-boost SMR



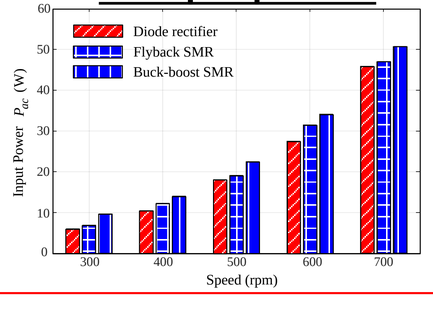
Efficiencies



Power factors



AC input powers



■ Conclusions:

A buck-boost SMR powered SRM driven cooling fan has been developed. The compara- tive evaluation for the cooling fans powered by three types of AC-DC front-end converters has also been conducted. Some comments are given:

(1) Diode rectifier possesses the highest efficiencies due to the absence of converter losses, but its line drawn power quality is unacceptably bad.

(2) Flyback SMR has the best characteristics in efficiency and power quality.

(3) Buck-boost SMR has almost identical power quality characteristics to the flyback SMR, but its efficiency is slightly lower.