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Title

EXERCISE 6: SPACE VECTOR MODULATION FOR THREE-PHASE INVERTER

Course Name

EE-465 Industrial Electronics I

1 INTRODUCTION

A three-phase 2L inverter is connected to the 3ph grid (400 V, 50 Hz) through a RL filter. By appropriately setting the phase and magnitude of the voltage synthesized by the inverter, the power exchange with the AC grid can be modified or set.

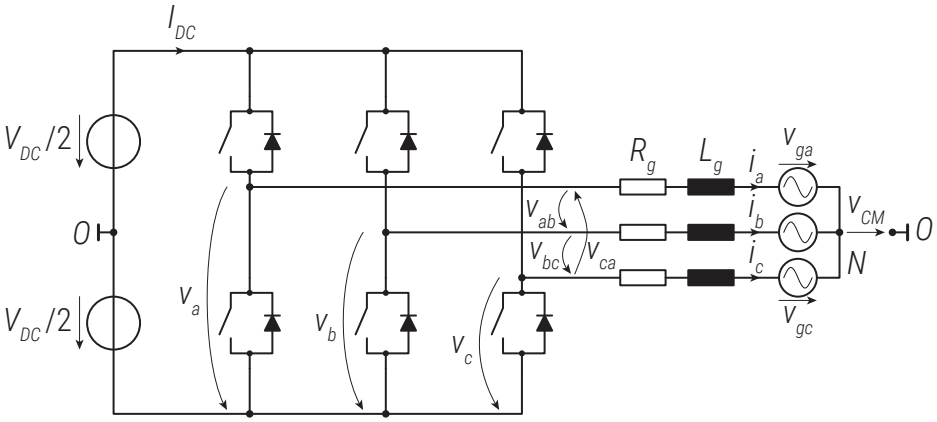

Fig. 1 PV system output stage. The input stage has been replaced by an equivalent voltage source.

2 TASKS DESCRIPTION

1. Create a space vector PWM (SV-PWM) block following the implementation steps presented during the lecture according to the following steps/subsystems:
   (a) Determine the magnitude (M) of the reference space vector (given in the $\alpha\beta$ frame)
   (b) Determine the angle (θ) of the reference space vector
   (c) Determine the sector (s) where the reference space vector is
   (d) Calculate the duty-cycles (δ) for the active and zero space vectors
   (e) Assemble the switching pattern for odd and even sectors -> add as well in the report
   (f) Send the PWM signals out (sw) -> add as well in the report

   Compare SV-PWM with CB-PWM with min/max zero sequence for modulation index. In the report show a scope capture of that comparison, is there a difference ?

2. Apply a converter voltage with 427V magnitude and 0.2203rad phase angle to transfer an apparent power of approximately $S = 20$ kVA and $\varphi = -\pi/4$, what modulation index does it correspond to ?
   Compare SV-PWM with CB-PWM with min/max zero sequence, and with CB-PWM without zero sequence injection.
   In your report, show a scope capture of the converter voltages and grid currents for these 3 different modulation strategy. What do you notice ?

V_{DC}	750 V	V_g	400 $V_{l\text{-}l,rms}$	f_g	50 Hz
f_{sw}	10 kHz	L_g	10 mH	R_g	20 mΩ

Table 1 Parameters set.