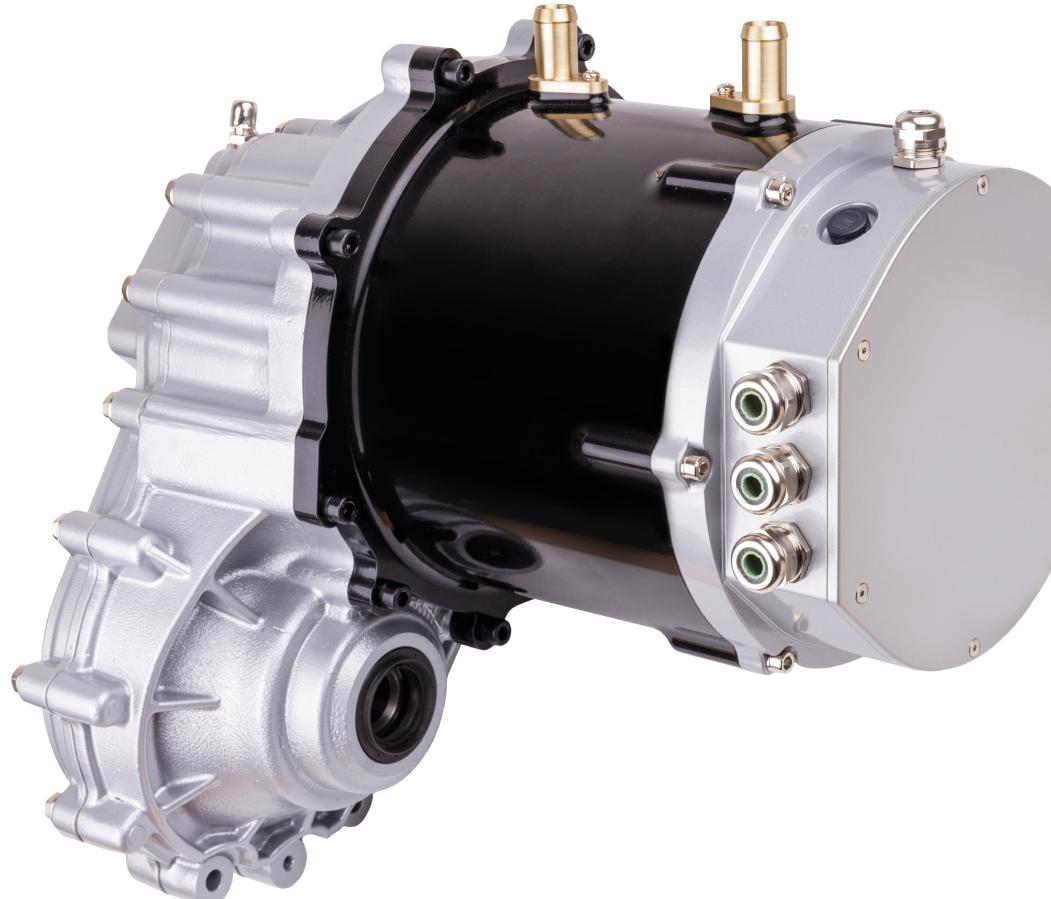
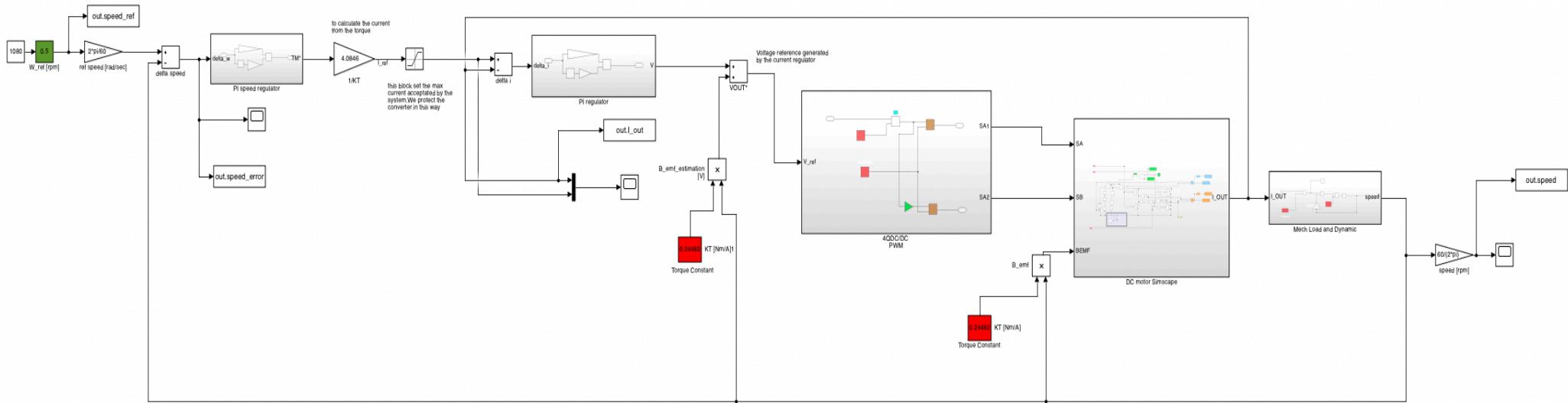


Laboratory of Electric Drives

Project by Edoardo Panichi



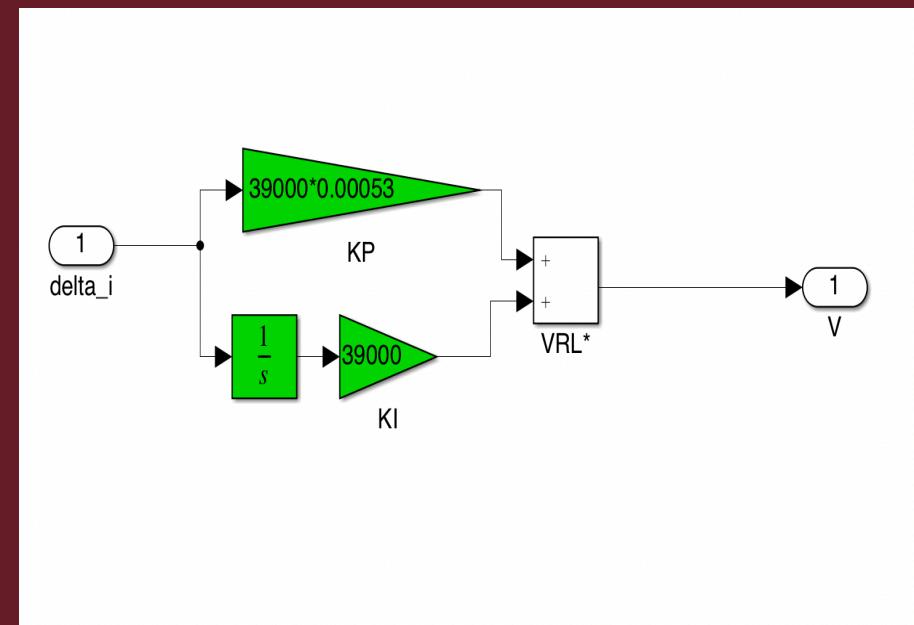
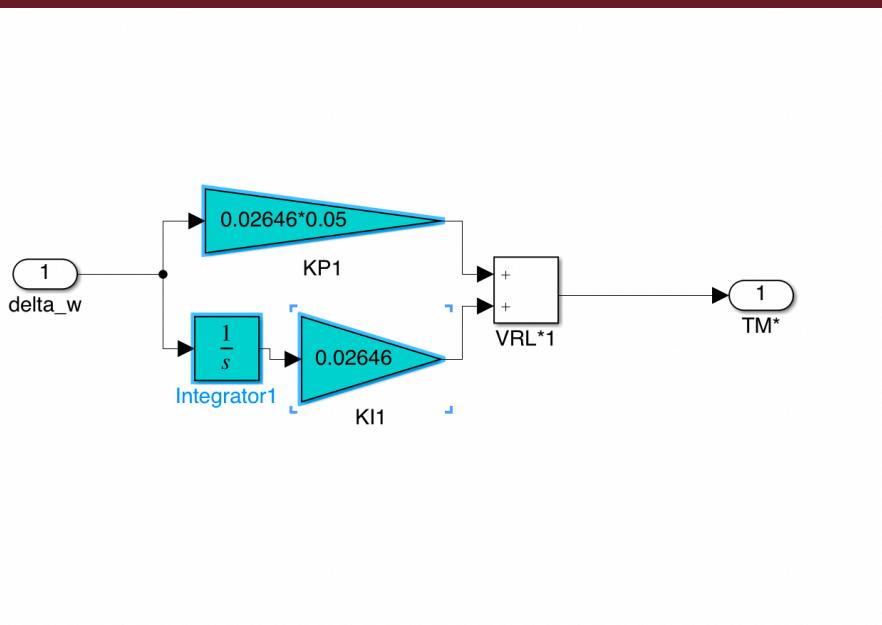
COMPLETE SCHEME



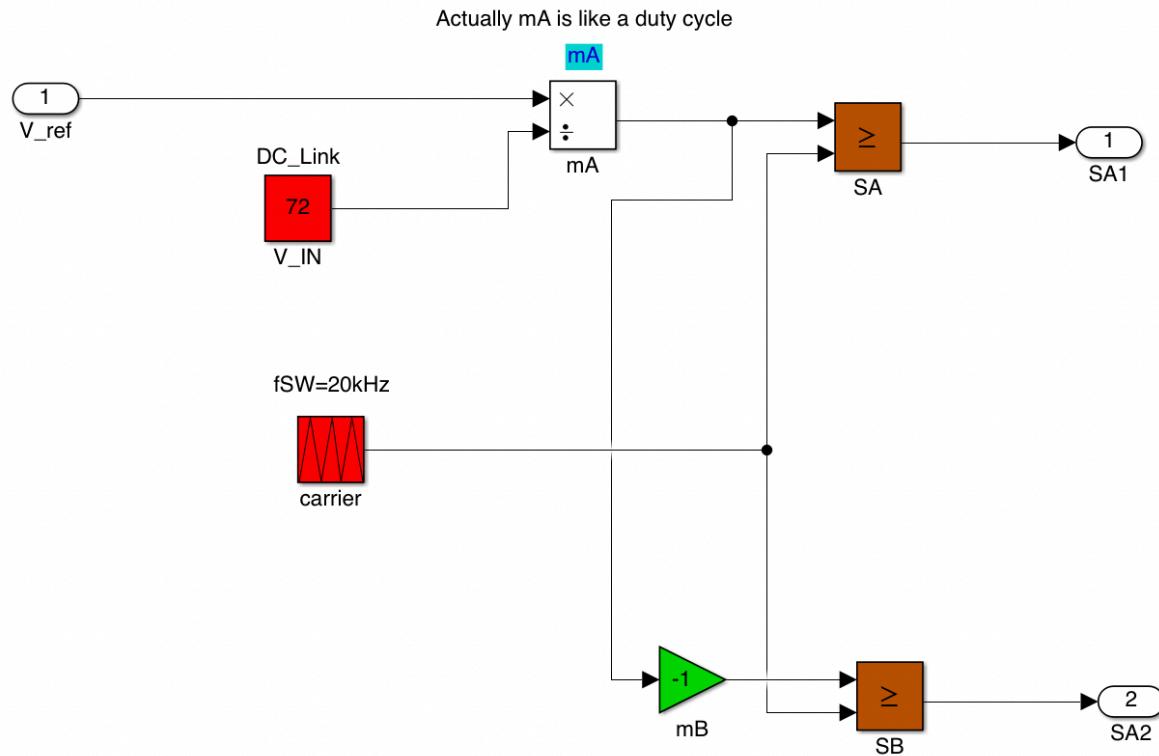
PI REGULATORS

SPEED CONTROLLER	VALUES
K_p	$0.02646 * 0.05$
K_i	0.02646

CURRENT CONTROLLER	VALUES
K_p	$39000 * 0.00053$
K_i	39000

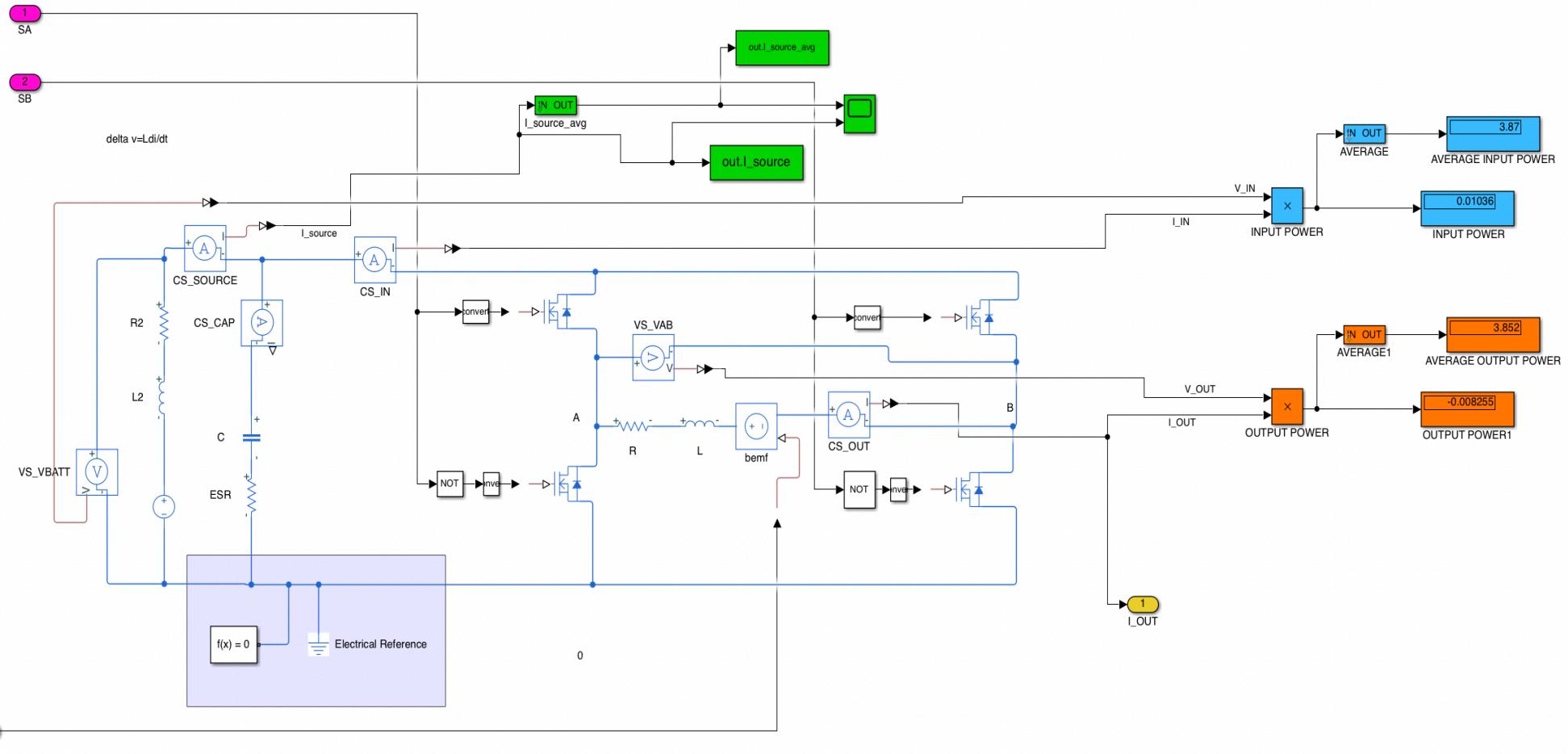


PWM MODULATOR



FREQUENCY	SUPPLY VOLTAGE
20 kHz	72 V

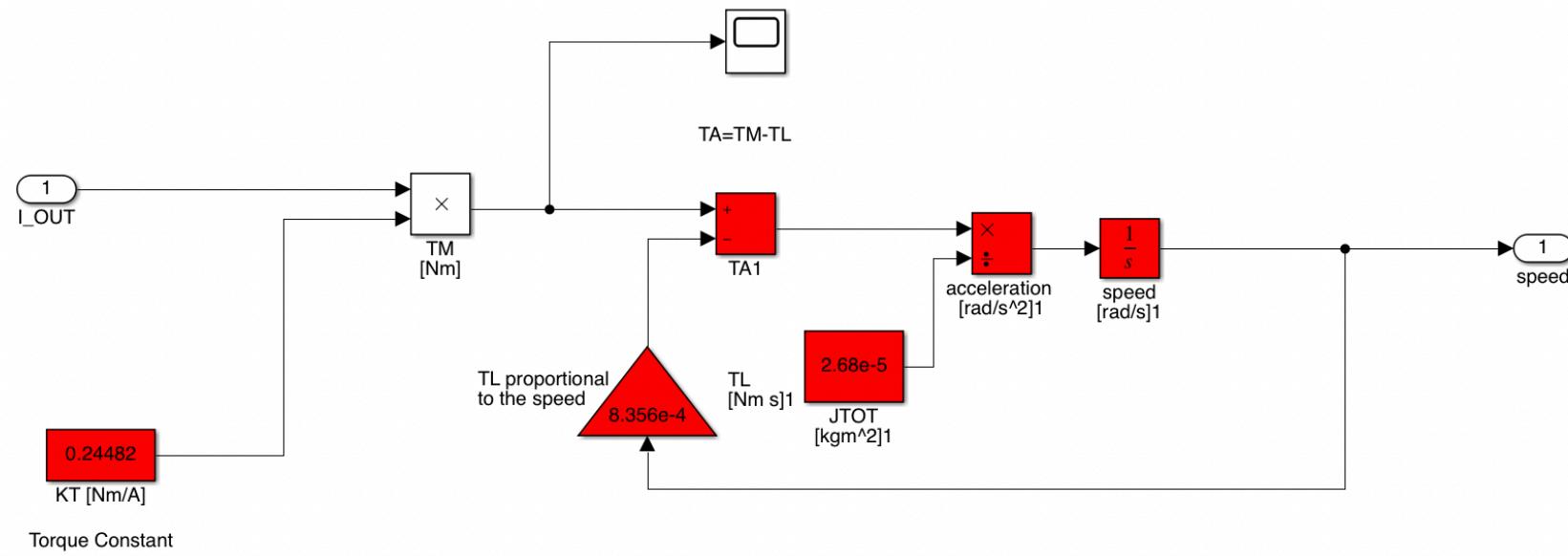
ELECTRIC CIRCUIT OF THE DC MOTOR



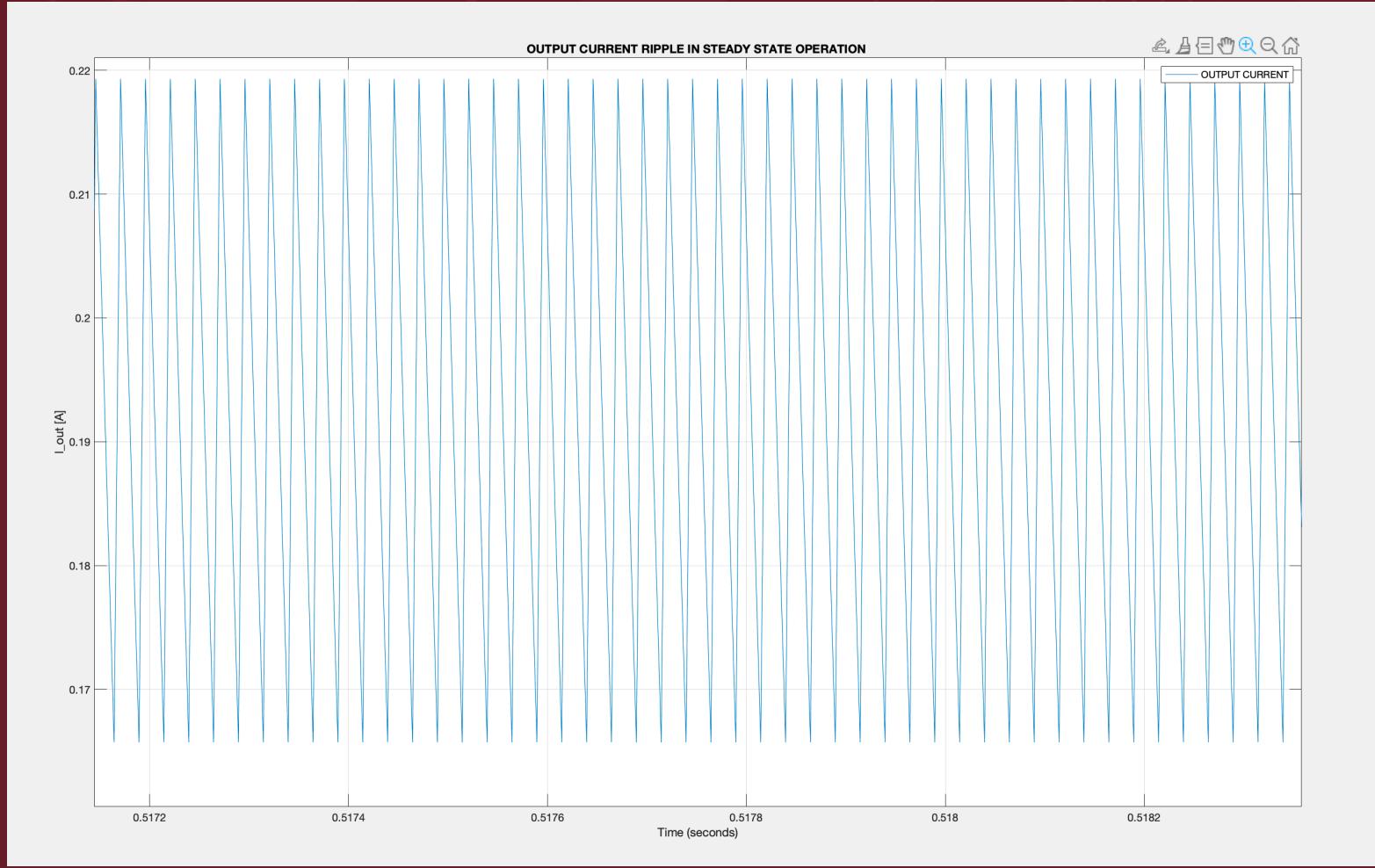
SOME PARAMETERS

ITEM	VALUES
CAPACITOR (DC-LINK)	$C=0.1\text{mF}$, $\text{ESR}= 0.01 \text{ ohm}$
MOSFET	Drain-source on resistance, $R_{DS(\text{on})} = 0.1 \text{ ohm}$ Off-state conductance = $1\text{E-}6 \text{ 1/ohm}$ Threshold voltage, $V_{th} = 0.5 \text{ V}$
SATURATION	$[-1.4, +1.4]$

MECH LOAD AND DYNAMIC

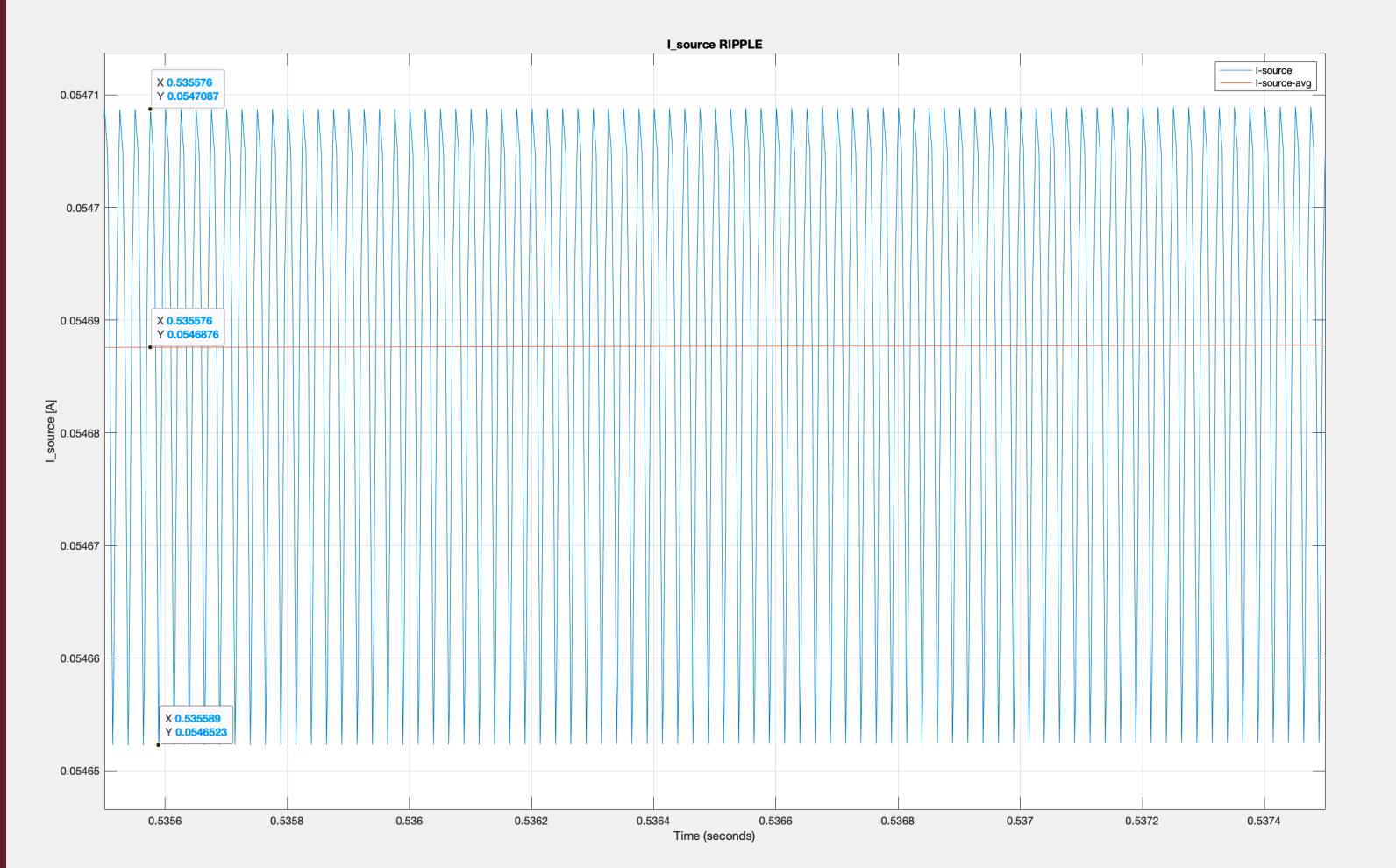


OUTPUT CURRENT RIPPLE IN STEADY STATE



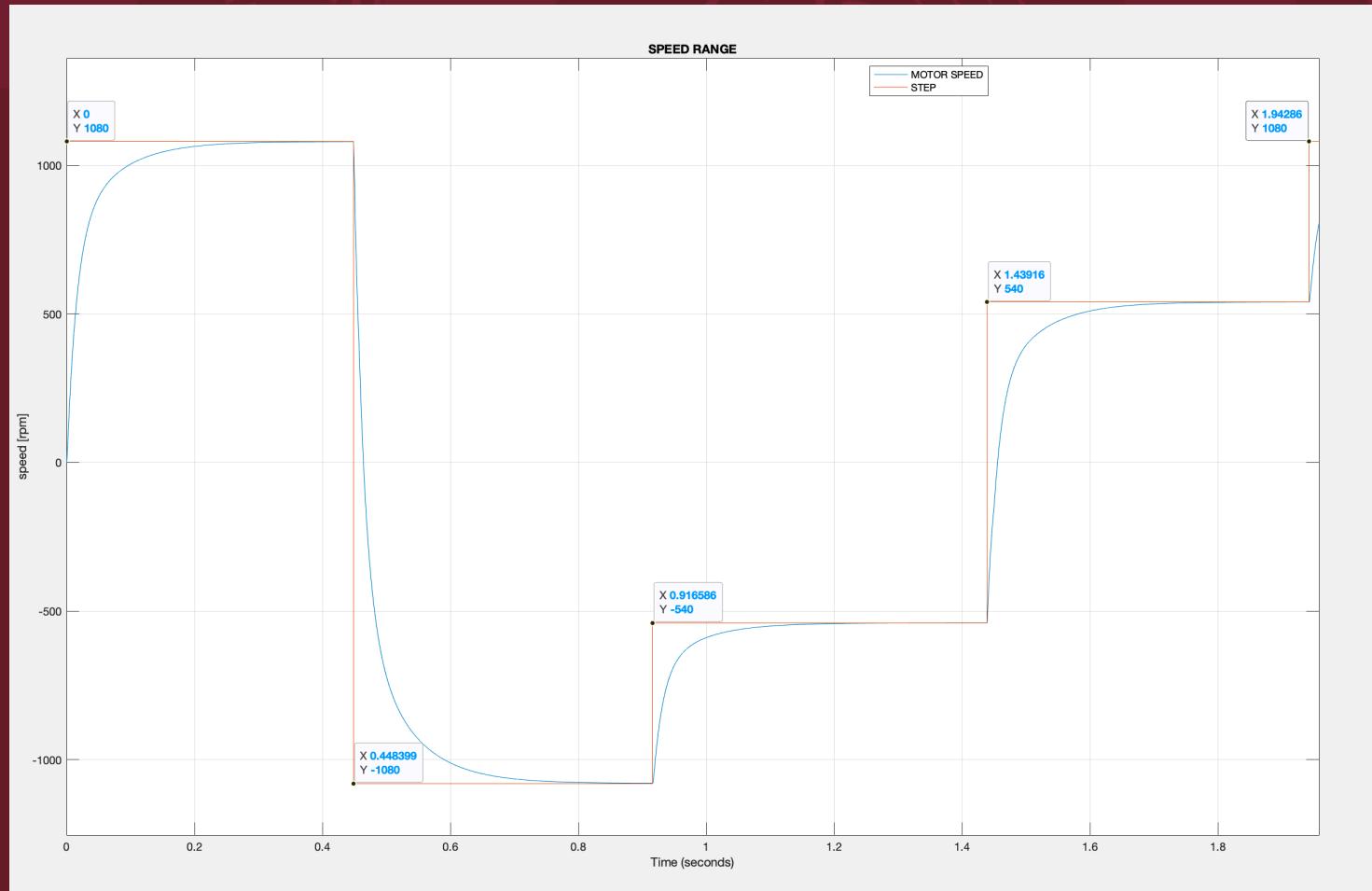
EXPECTED (< 10%)	ACTUAL
< 0.0772	≈ 0.055

INPUT CURRENT RIPPLE IN STEADY STATE OPERATION < 1%

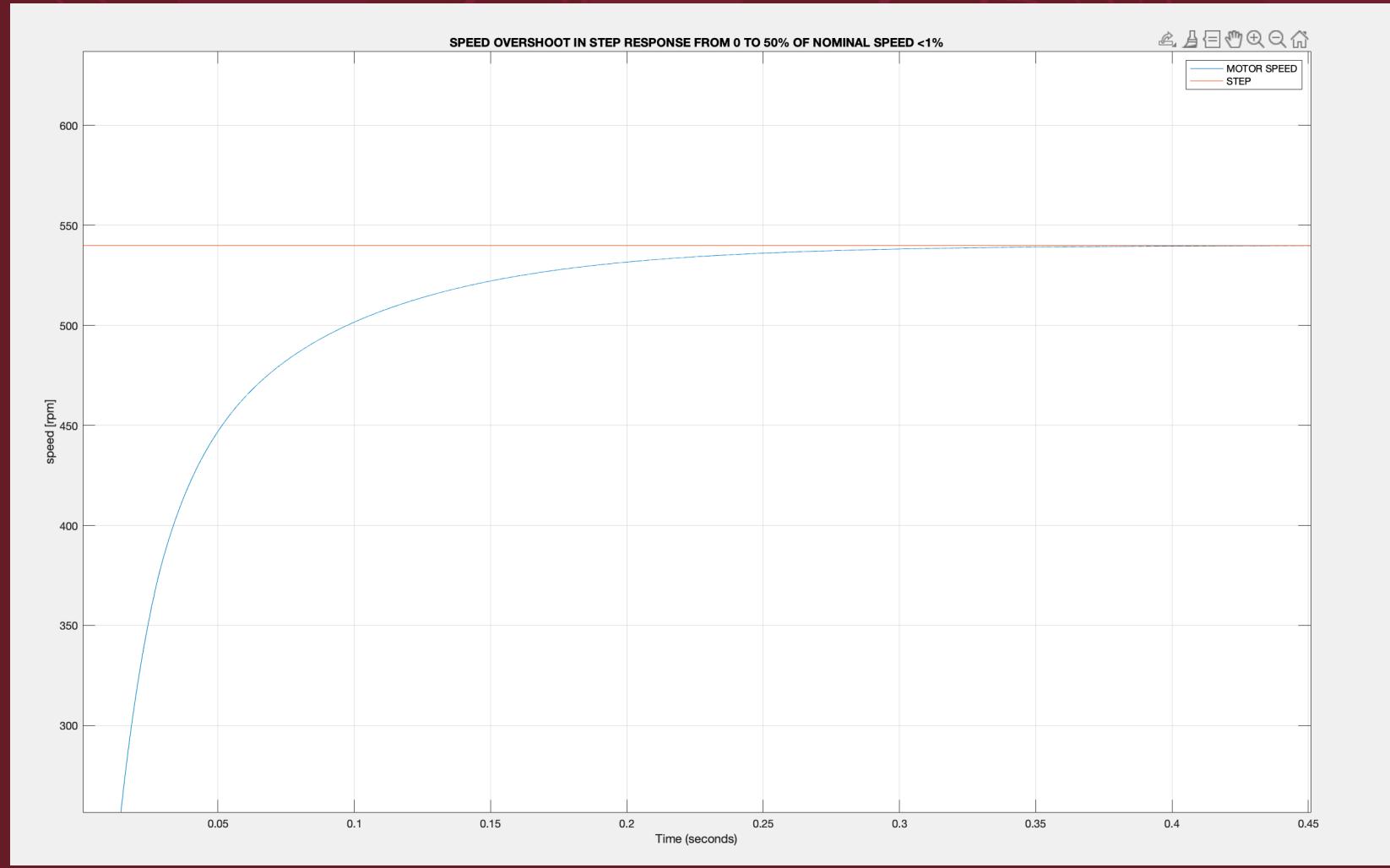


EXPECTED (< 1%)	ACTUAL
< 5.47E-4	$\approx 5.64\text{E-}5$

SPEED RANGE OF STABLE OPERATION FROM 100% TO -100%

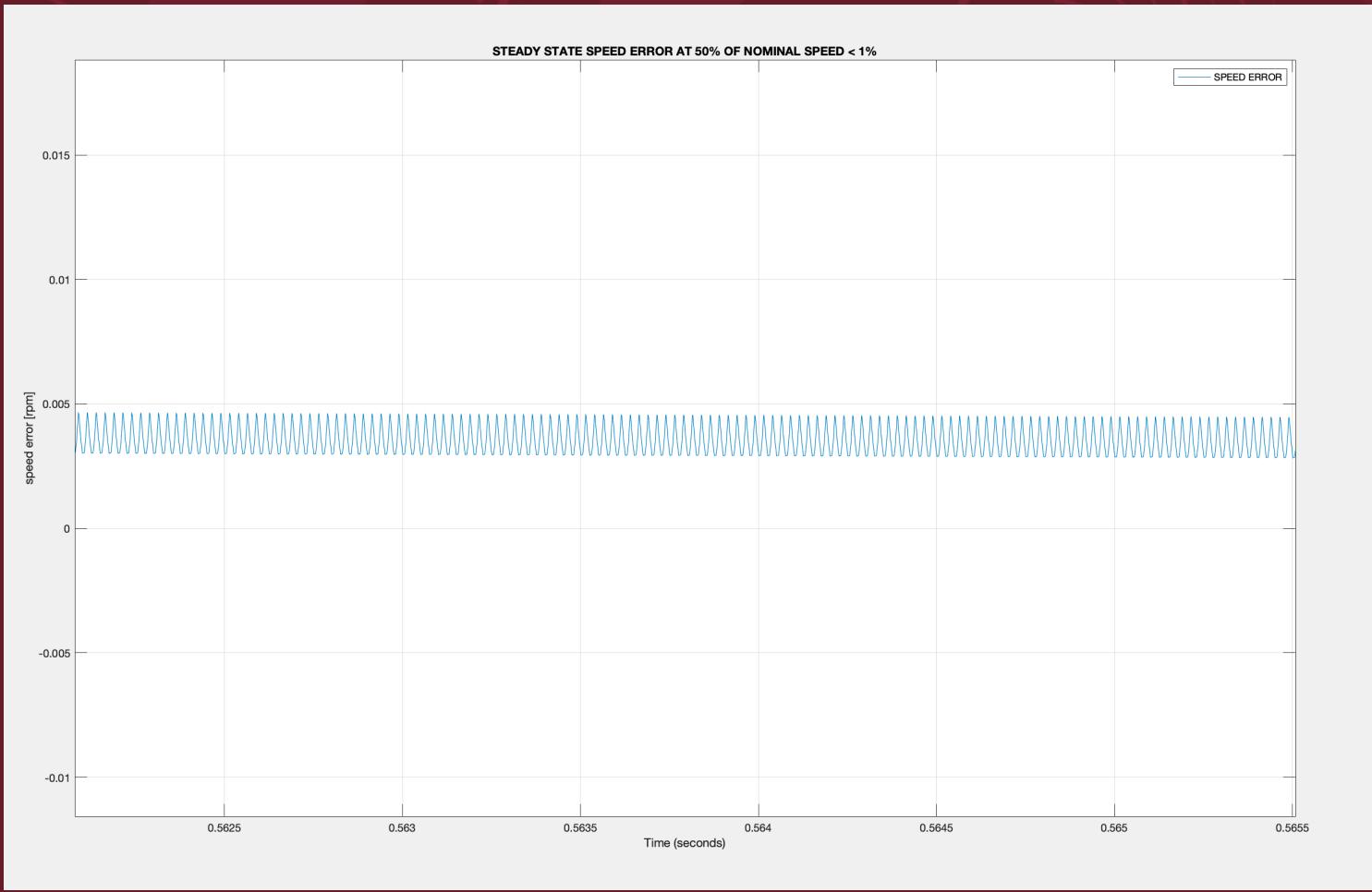


SPEED OVERSHOOT AT 50% < 1%



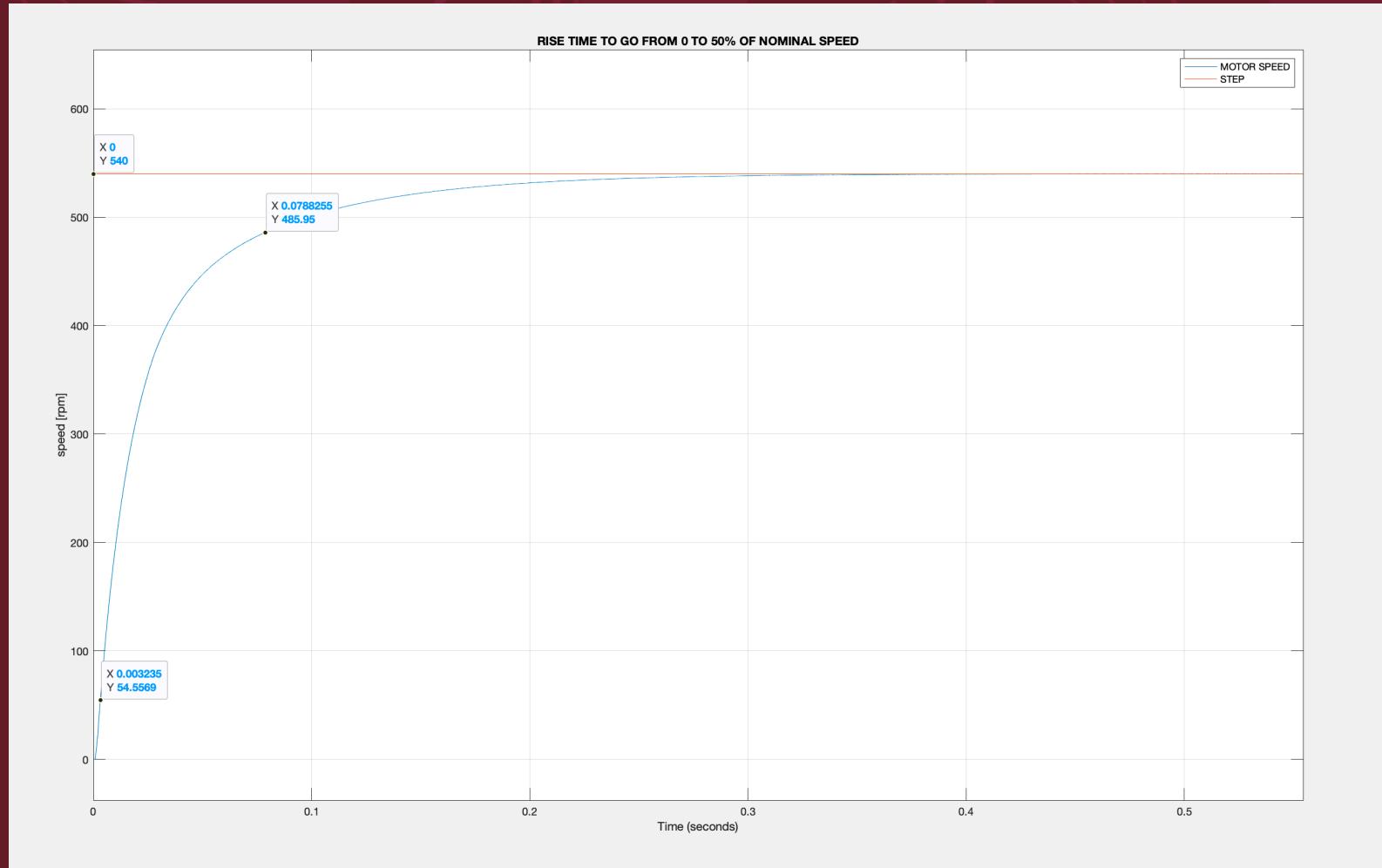
EXPECTED (< 1%)	ACTUAL (0%)
< 545.4 rpm	540 rpm

STEADY STATE SPEED ERROR AT 50% OF NOMINAL SPEED < 1%



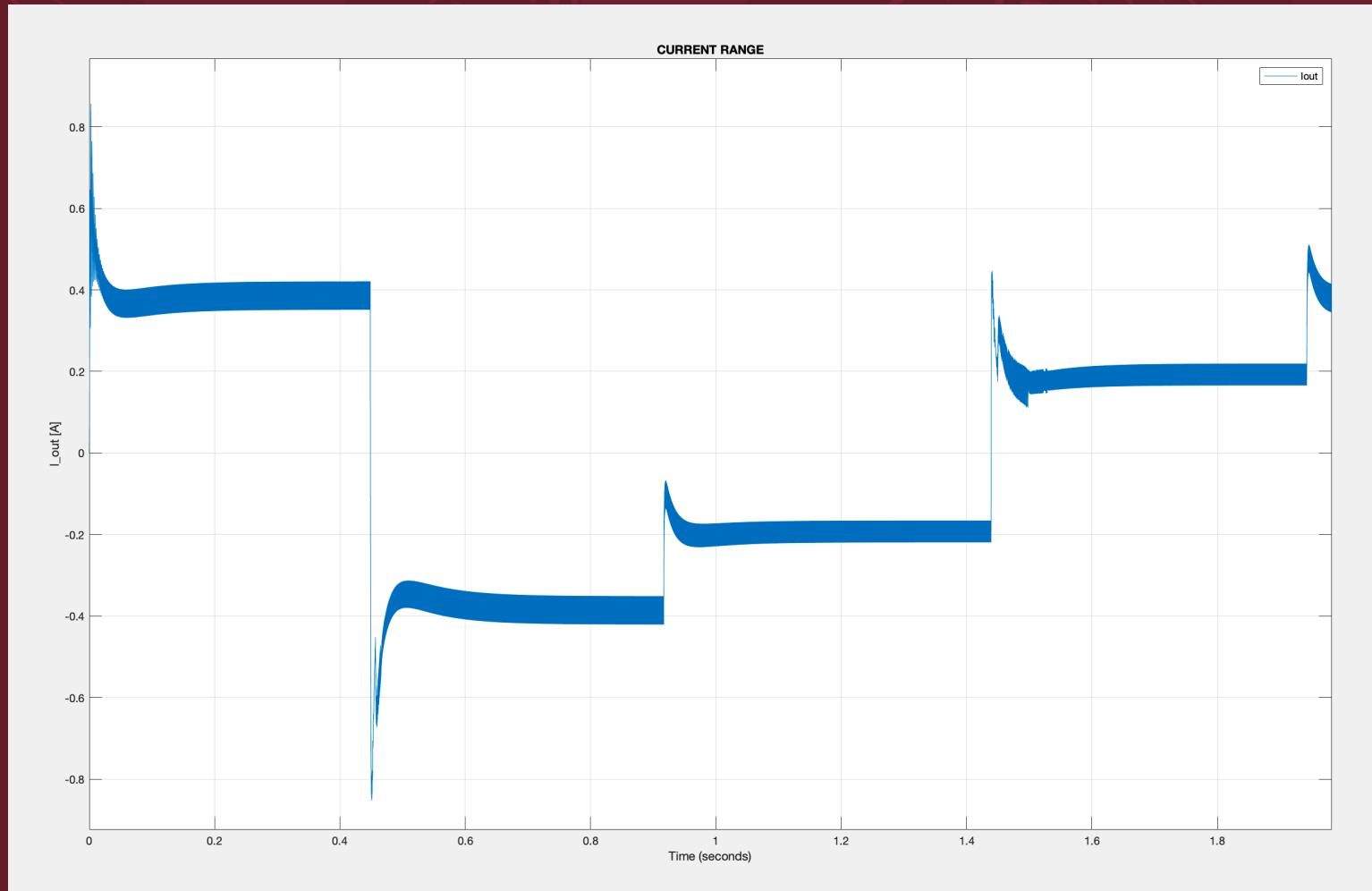
EXPECTED (< 1%)	ACTUAL
< 5.4 rpm	≈ 0.005 rpm

RISE TIME TO GO FROM 0 TO 50% OF NOMINAL SPEED



EXPECTED (10% to 90%)	ACTUAL (10% to 90%)
< 0.1s	$\approx 0.08s$

CURRENT RANGE



MAX OUTPUT CURRENT

1.4 A

SPEEDS TESTED

+1080 rpm

-1080 rpm

-540 rpm

+540 rpm