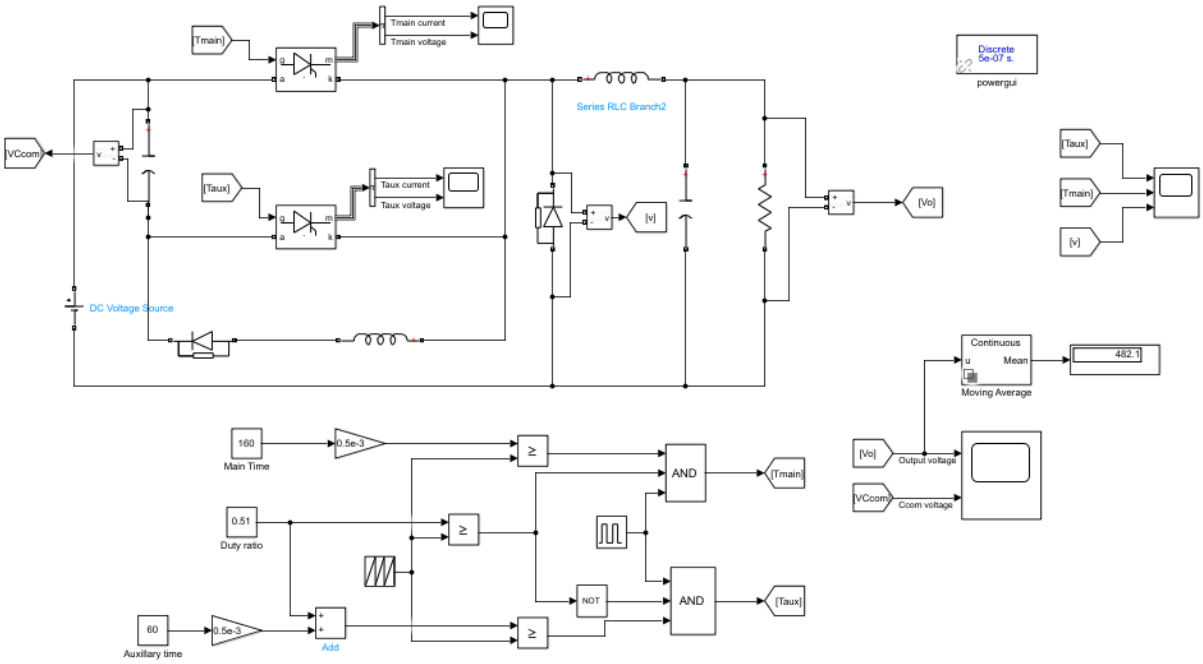


[1] Choose the commutation inductor Lc in such a way that the peak current through the main thyristor remains at 95 A (±5% is considerable).

PE lab 3.

Buck converter circuit:

$\Delta I_L = \frac{(V_i - V_o)}{L} DT_s$

$= \frac{(800-480) \times 0.6 \times 2 \times 10^{-3}}{24 \times 10^{-3}}$

$= \frac{320}{20} = 16A.$

$I_{L\,min} = 8A$

$V_i = 800V$

$V_O = 480V$

$F_S = 500Hz$

$T_S = \frac{1}{F_S} = 2 \times 10^{-3} s.$

$= 2ms$

$C_f = 330\,\mu F$

$L_f = 24mH$

$R_L = 30\Omega.$

$C_c = 3\,\mu F$

Diodes switches drop = 0V

initial $V_{cc} = +Vi$

Commutation circuit:

$C_C = 3\,\mu F.$

$I_{peak} = 95 (\pm 5\%)$

$I_{peak} = I_L + Vi \sqrt{\frac{C_c}{L_c}}.$

$95 = 8 + 800 \sqrt{\frac{3 \times 10^{-6}}{L_c}}$

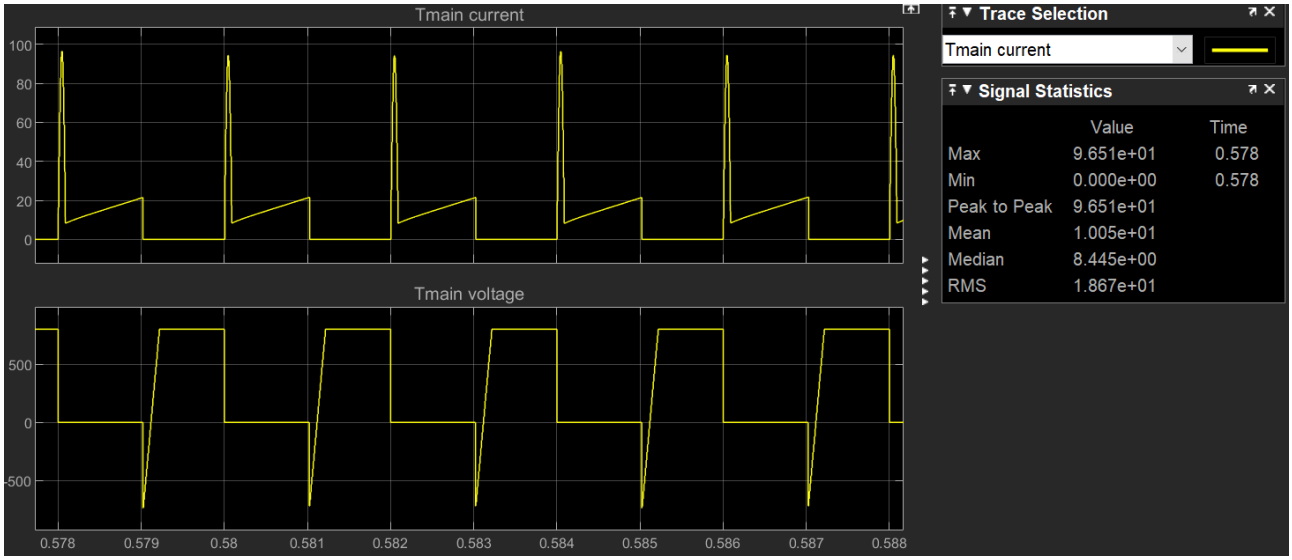
$L_c = \frac{3 \times 10^{-6}}{0.01182}$

$\boxed{L_c = 253.67\,\mu H.}$

① choose L_c st. $I_{peak} = 95A$ $(\pm 5\%)$

$D = \frac{480}{800} = 0.6.$

Lc used is ~ 254e-6 H

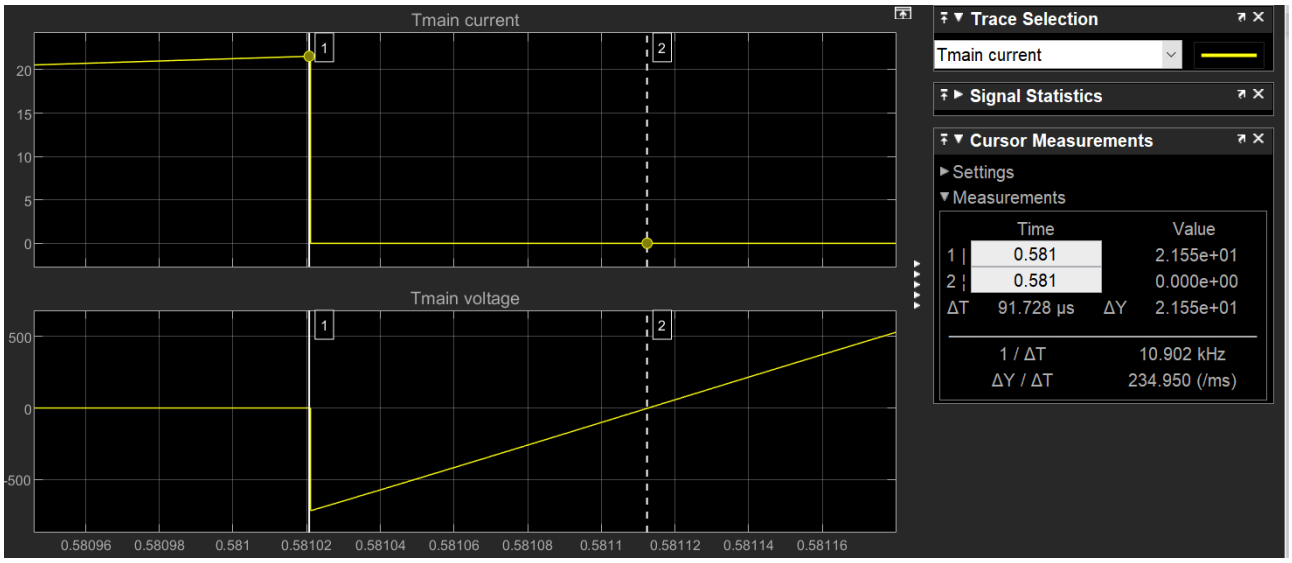


Experimental I main max is 96.7A.
The theory I main max is 95A.

[2]
(i) Note the required turn-on time manipulation to get 480V output voltage.

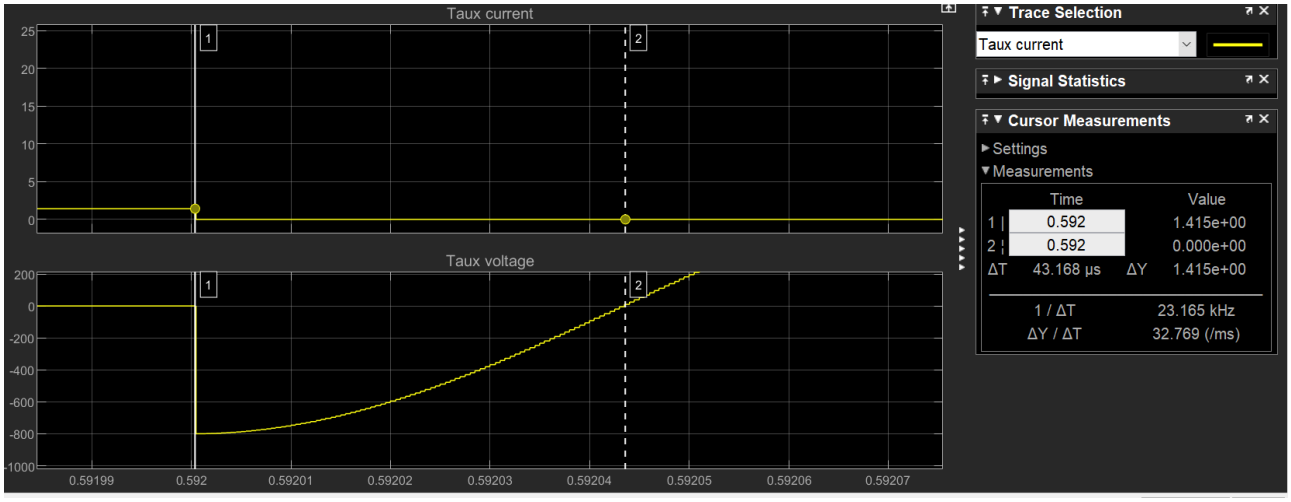
Experimentally duty ratio value is 0.51
Ton = DxTs = 0.51*2 = 1.02ms

(ii) Note the circuit turn-off time of main & auxiliary thyristors.
MAIN:



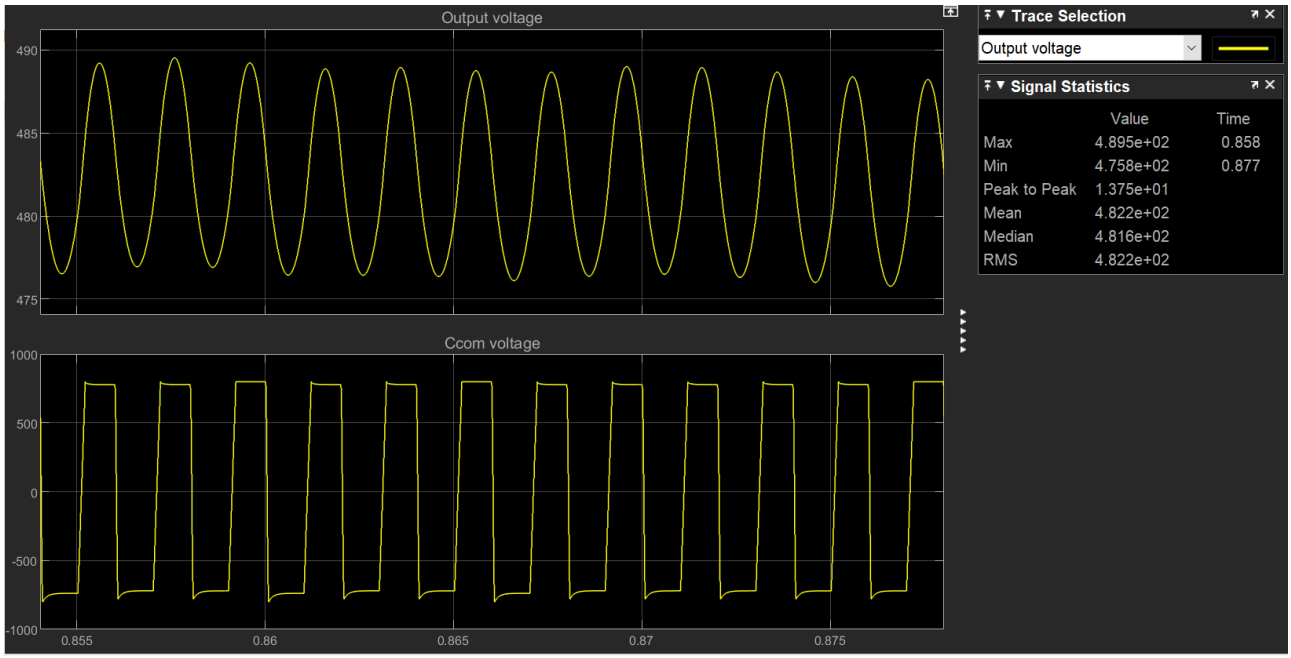
Toff = 0.0917ms

AUXILLIARY:

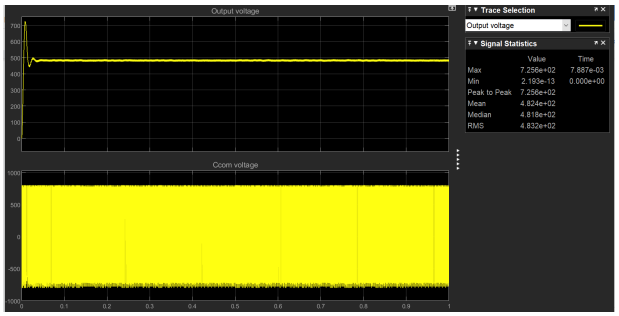
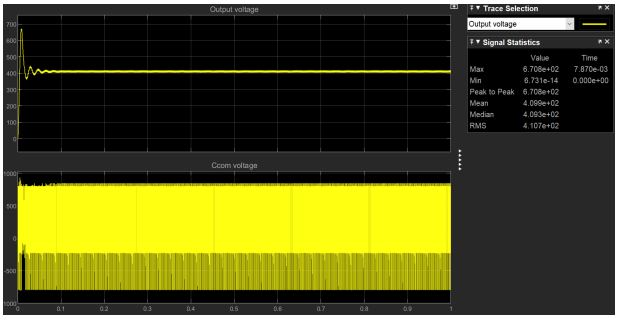
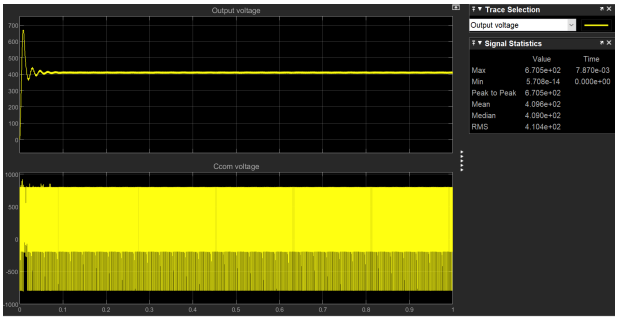
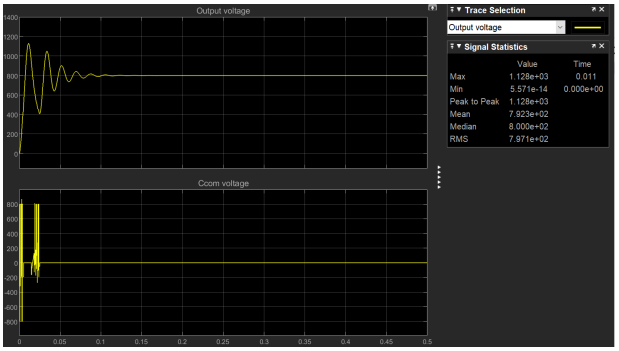


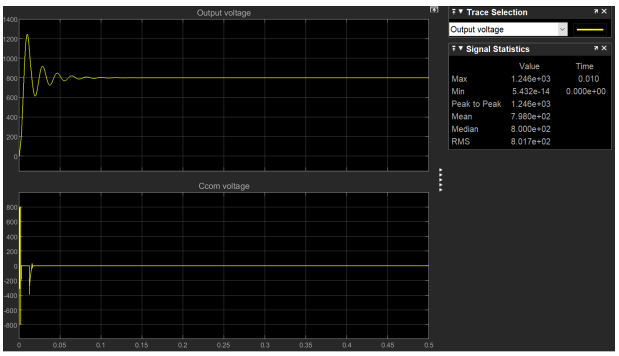
Toff = 0.043ms

(iii)
Voltage across Cc



(iv) Commutation failure of the main thyristor happens at Cc=77.5 nF approximately.

Cc=3 micro F	
Cc=0.1 micro F	
Cc=80 nF	
Cc=77.5 nF	

Cc=75 nF	 Output voltage Ccom voltage Trace Selection Output voltage Signal Statistics Value Time Max 1.246e+03 0.010 Min 5.432e-14 0.000e+00 Peak to Peak 1.246e+03 Mean 7.980e+02 Median 8.000e+02 RMS 8.017e+02