Group 2

Effects of Pressure and Current Drive in GOLEM

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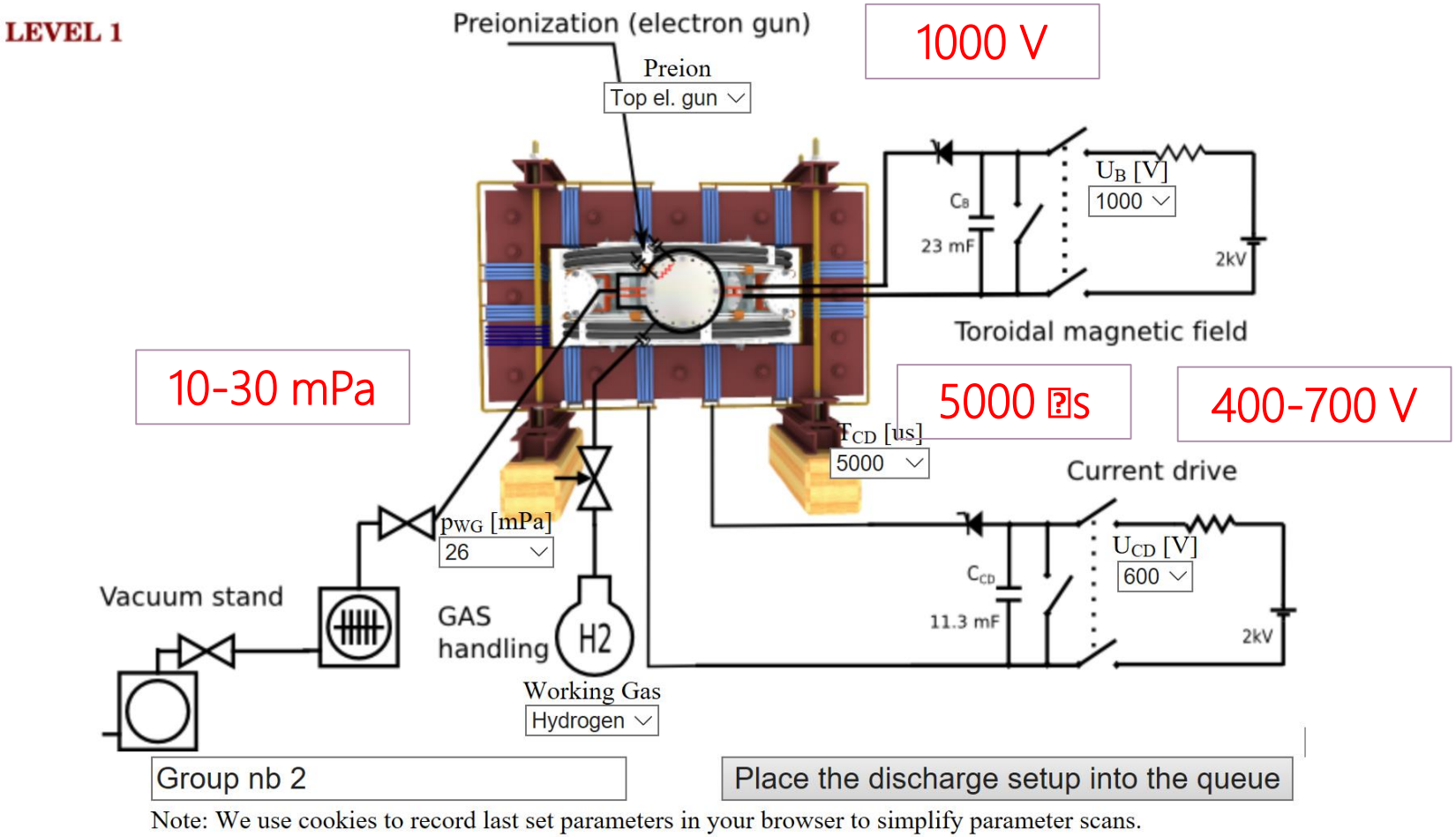
Objectives



- Find the plasma density as the function of pressure
- Find the plasma current as the function of U_{CD}

P = 30 mPa

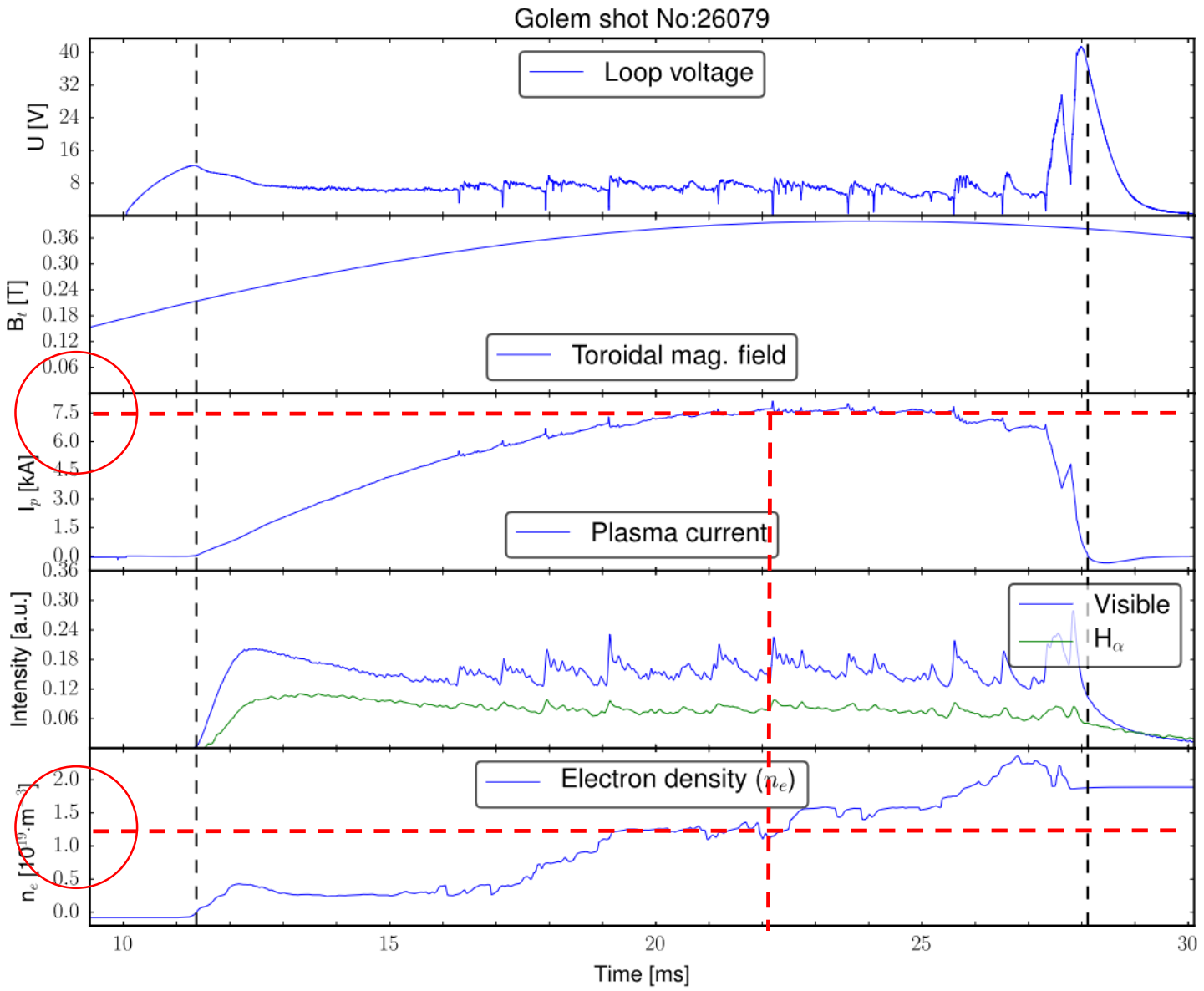
U_B = 1000 V

U_{CD} = 600 V

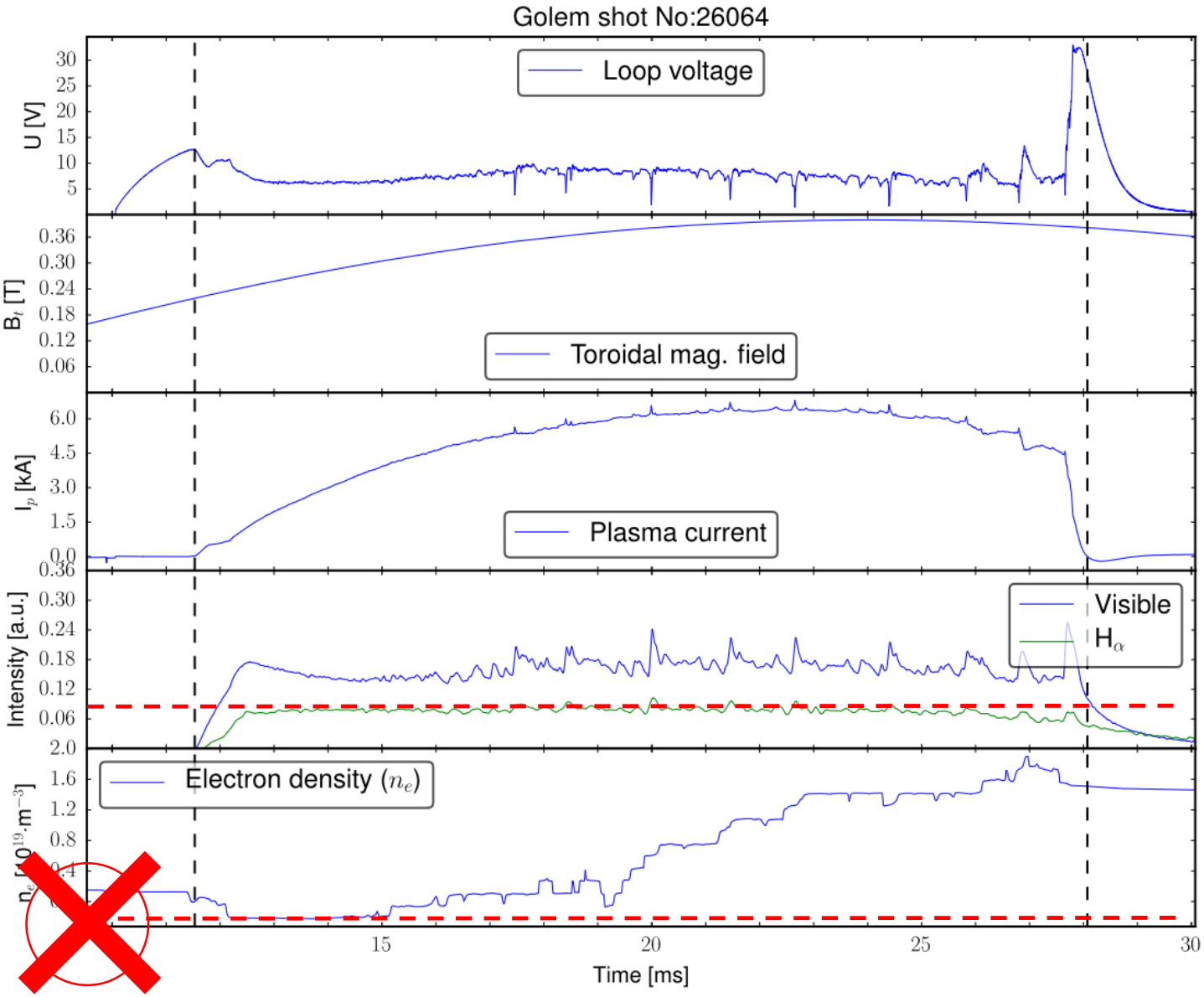
τ_{CD} = 5000 ?s

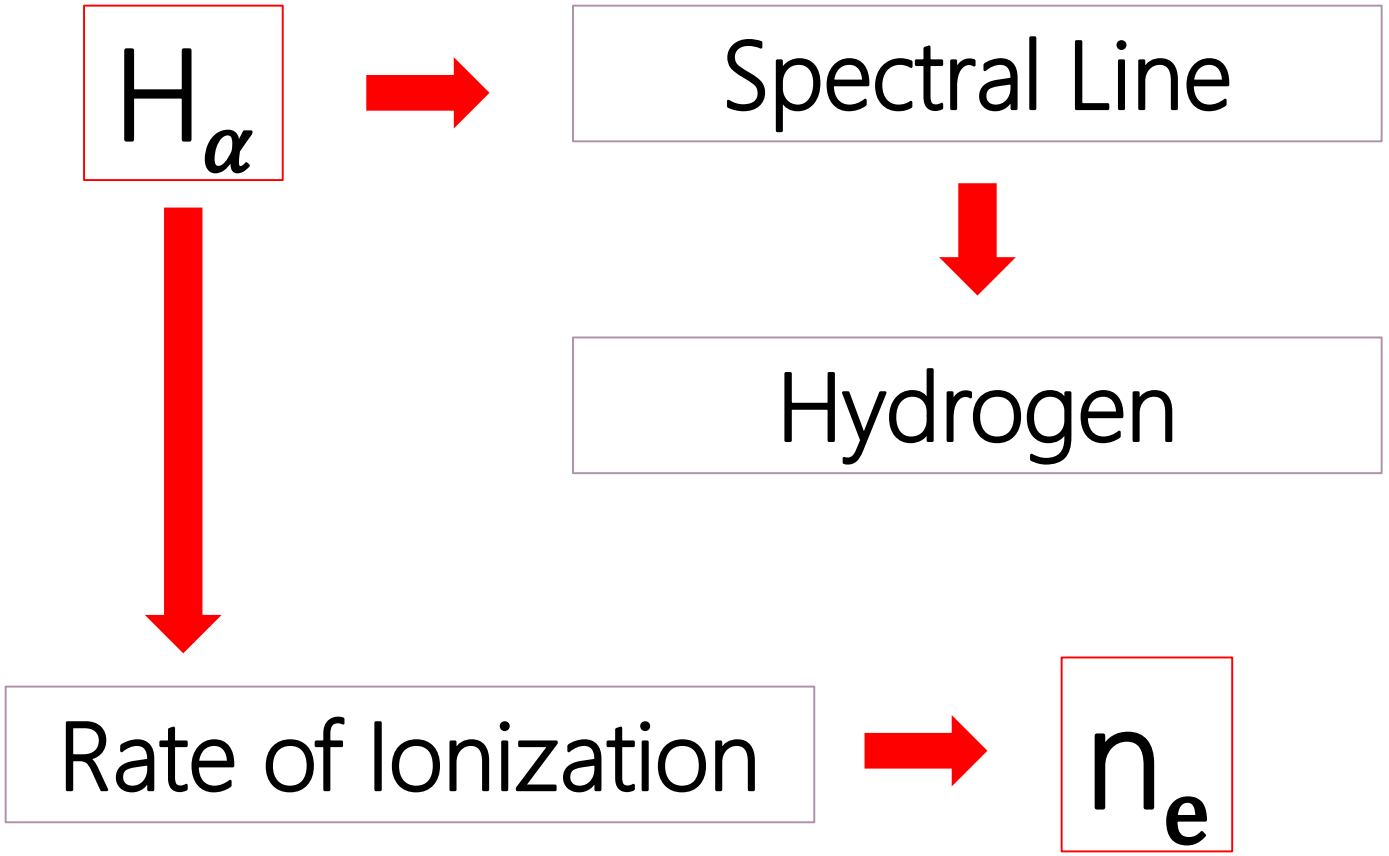
7.5 kA

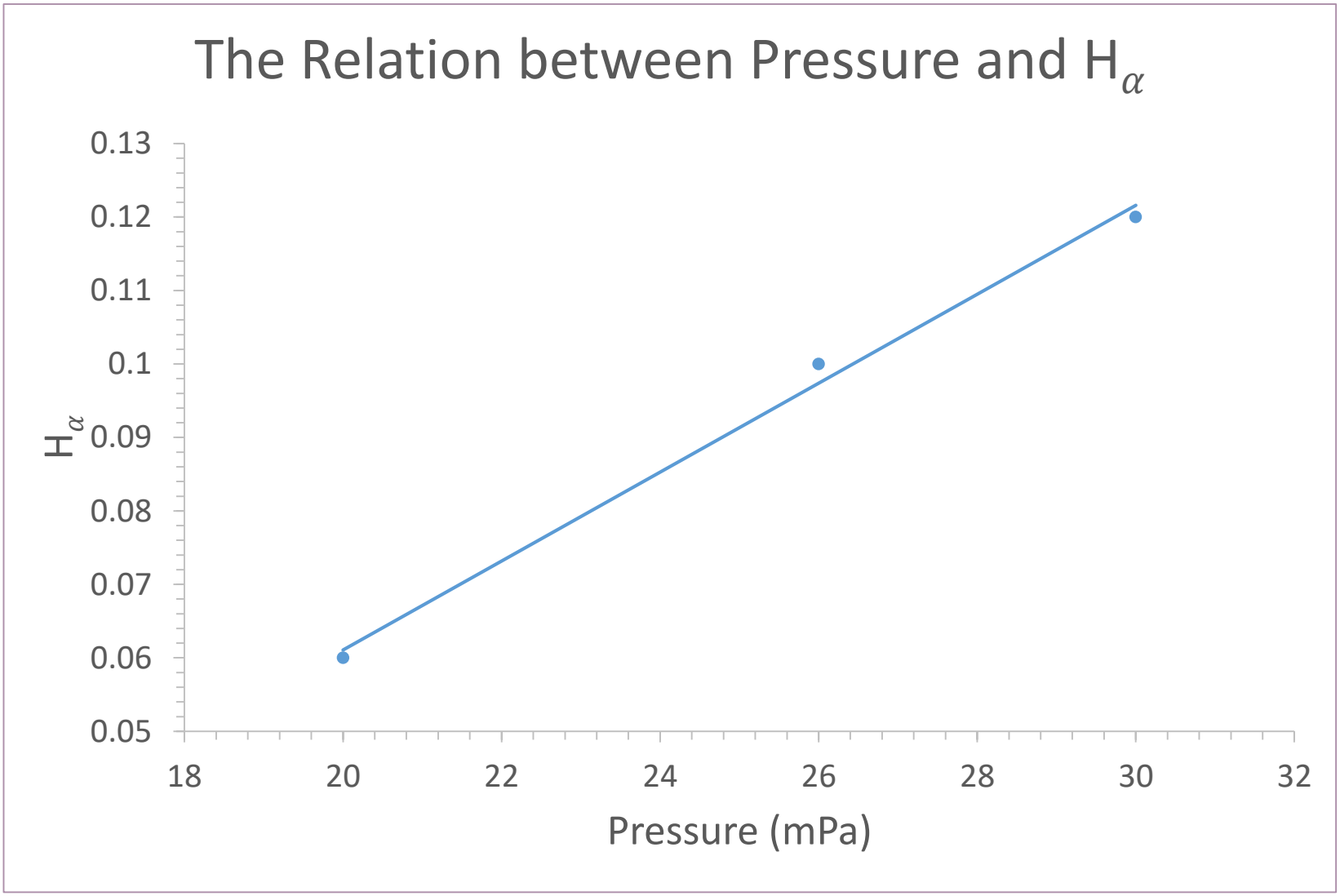
1.25×10^{19} m^{-3}

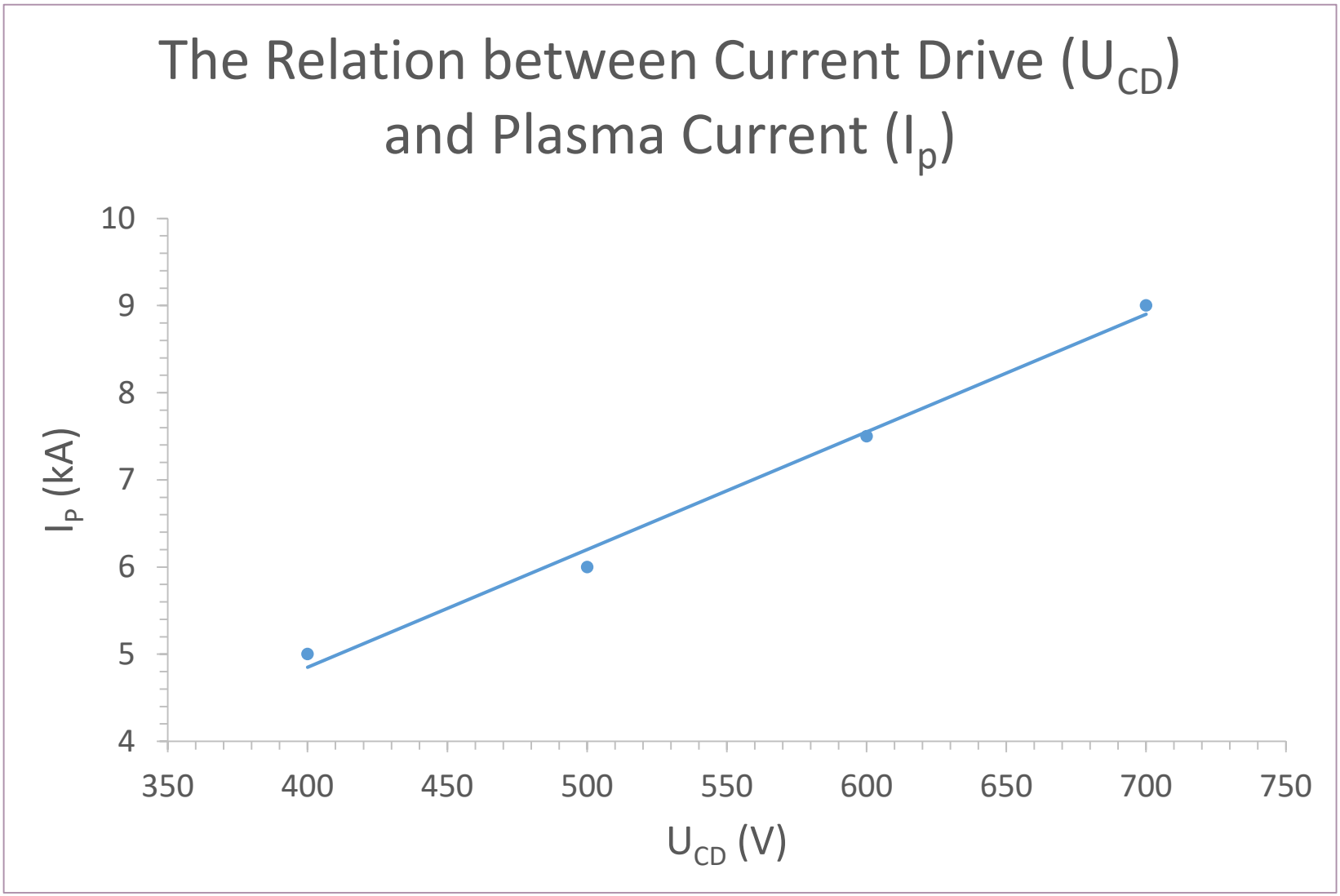


H_α


Golem shot No:26064
Loop voltage
U [V]
Toroidal mag. field
B_t [T]
Plasma current
I_p [kA]
Visible
H_α
Intensity [a.u.]
Electron density (n_e)
n_e [10^{19}.m^{-3}]
Time [ms]


H_α
Spectral Line
Hydrogen
Rate of Ionization
n_e


The Relation between Pressure and H_α
0.13
0.12
0.11
0.1
0.09
0.08
0.07
0.06
0.05
H_α
18
20
22
24
26
28
30
32
Pressure (mPa)


The Relation between Current Drive (U_{CD}) and Plasma Current (I_p)
10
9
8
7
6
5
4
I_P (kA)
350
400
450
500
550
600
650
700
750
U_{CD} (V)

P ↑ → H_α ↑

Ionization Cross Section

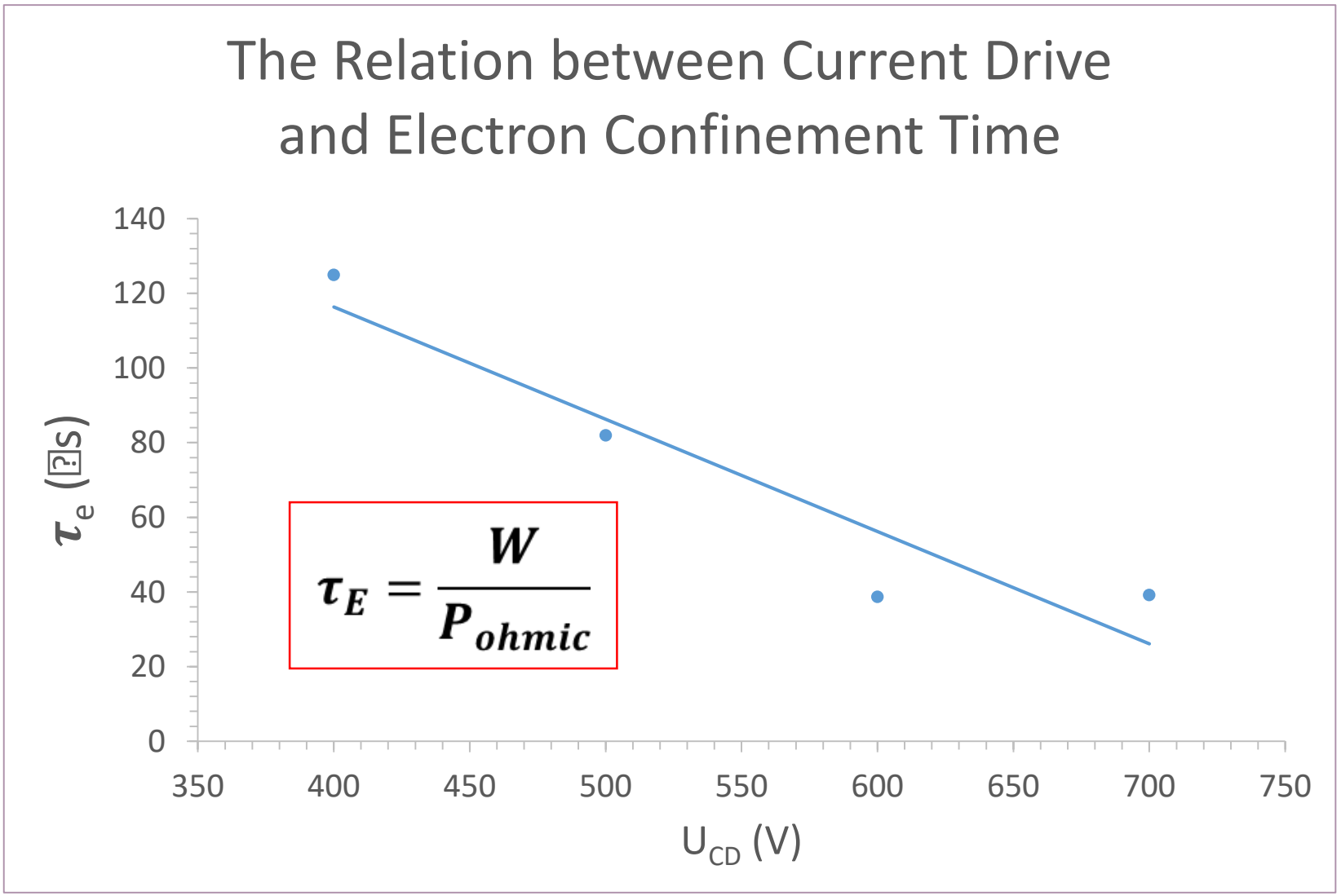
$H_\alpha \propto n_e n_o \langle \sigma v \rangle$

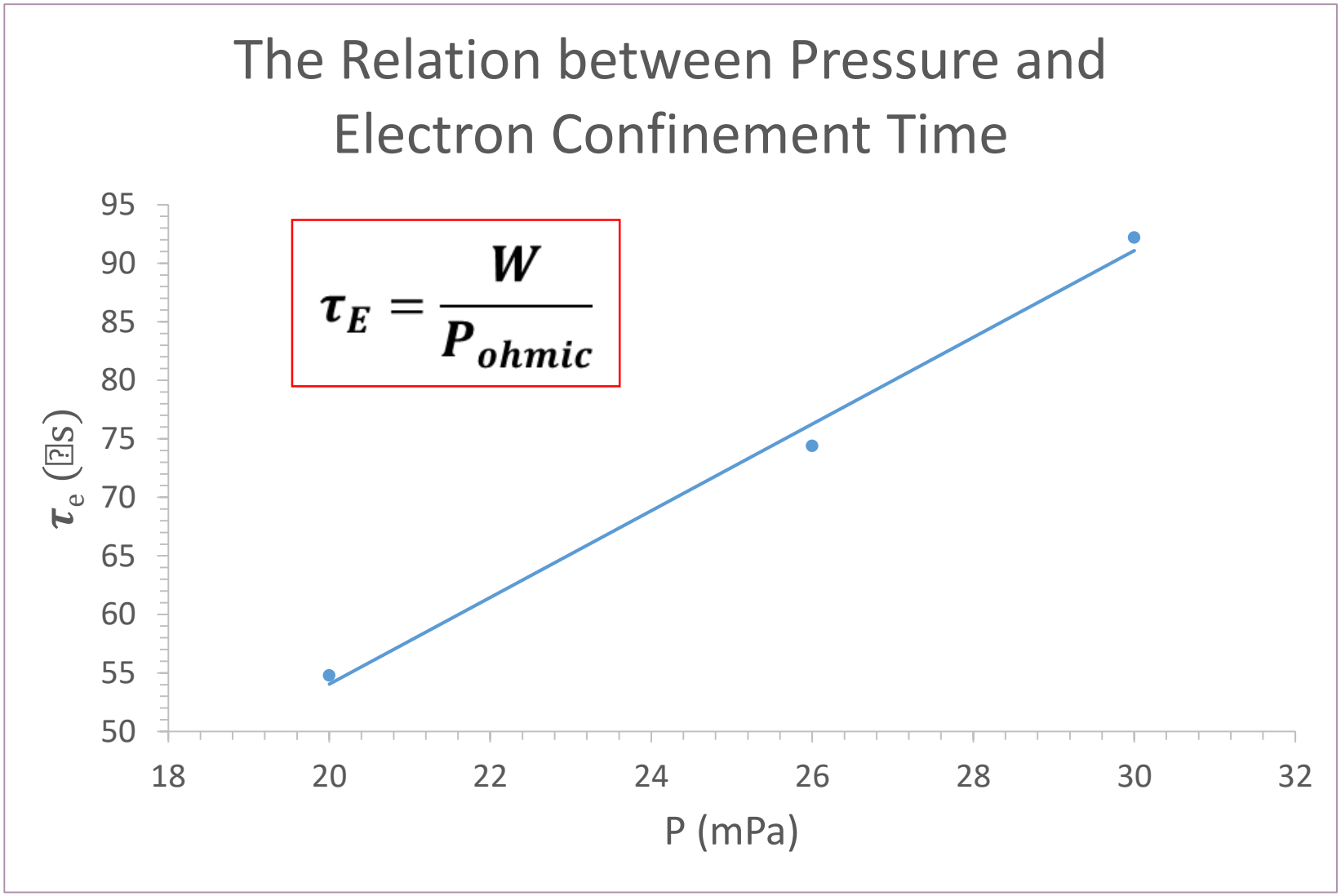
U_{CD} ↑ → I_p ↑

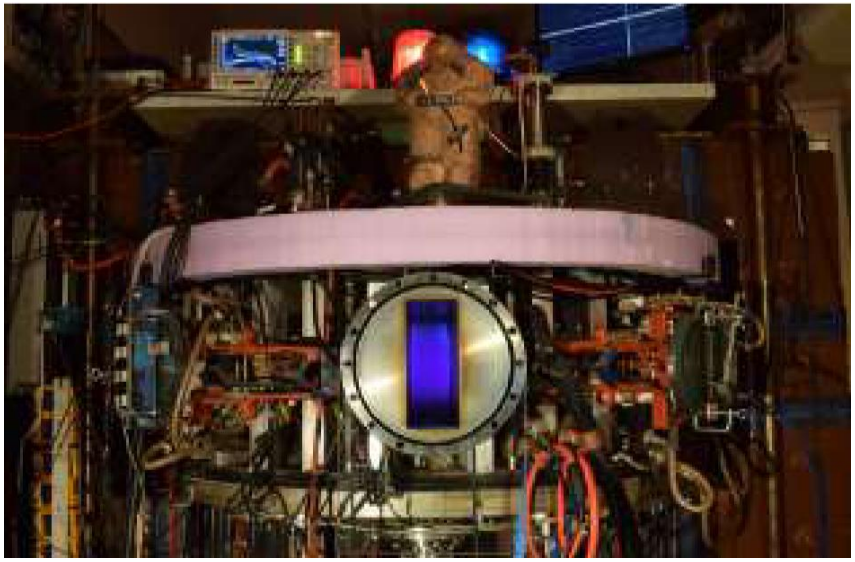
Ohmic

Thank you

Super Blue Blood Moon
31 Jan 2018, Chiang Mai, Thailand


The Relation between Current Drive and Electron Confinement Time
140
120
100
80
60
40
20
0
350
400
450
500
550
600
650
700
750
τ_e (□s)
U_{CD} (V)
$\tau_E = \frac{W}{P_{ohmic}}$


The Relation between Pressure and Electron Confinement Time
$\tau_E = \frac{W}{P_{ohmic}}$
95
90
85
80
75
70
65
60
55
50
τ_e (μs)
18
20
22
24
26
28
30
32
P (mPa)



Vessel major radius : R0 = 0.4 m

Vessel minor radius : R0 = 0.4 m

Plasma minor radius : a = 0.06 m

Toroidal magnetic field : Bt < 0.5 T

Plasma Current : Ip = 8 kA

Electron density : ne ? 0.2-3 × 1019 m-3

Electron temperature : Te = 100 eV