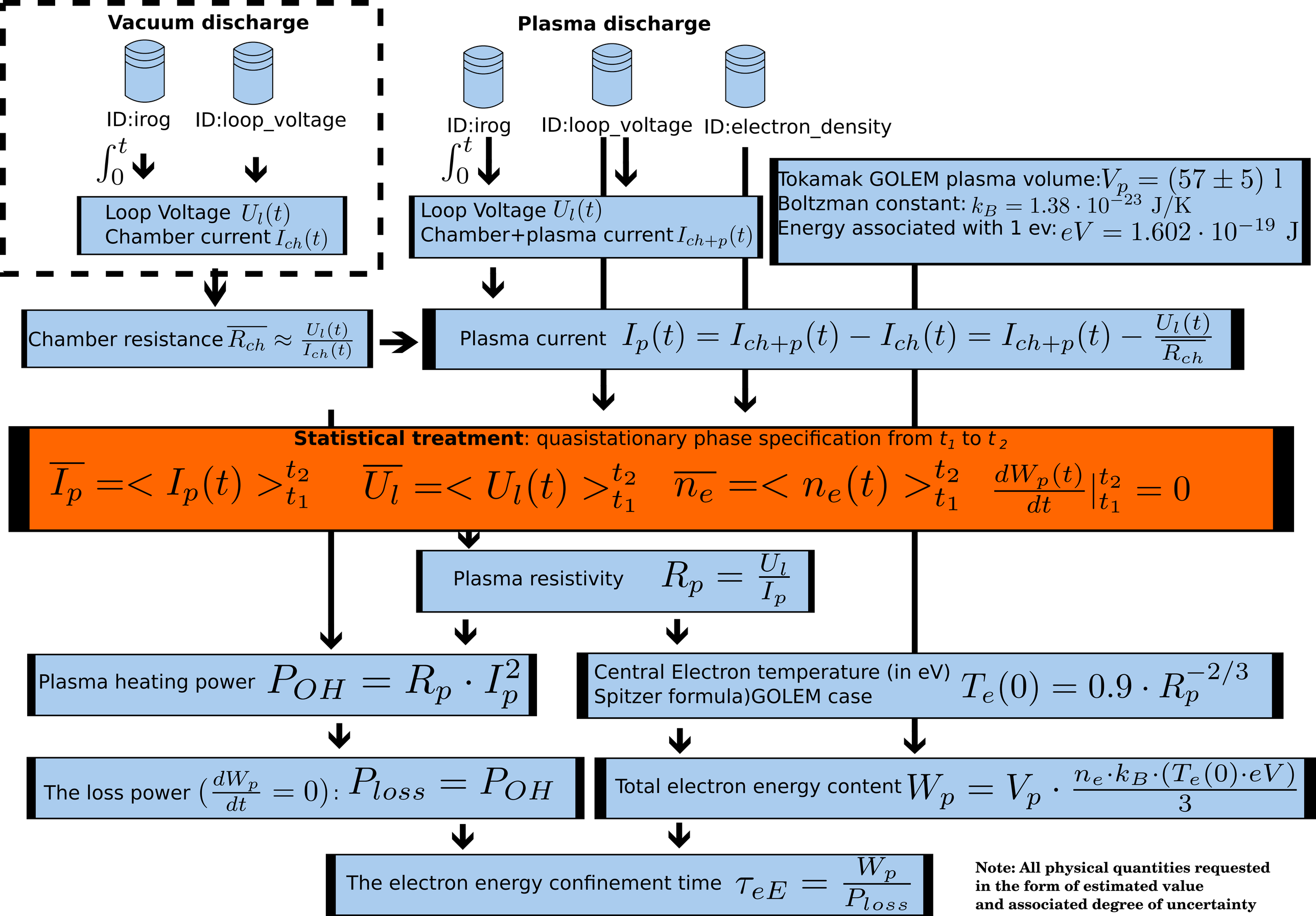
Vacuum discharge
ID:irog
ID:loop_voltage
$\int_0^t$
Loop Voltage $U_l(t)$
Chamber current $I_{ch}(t)$
Plasma discharge
ID:irog
ID:loop_voltage
ID:electron_density
$\int_0^t$
Loop Voltage $U_l(t)$
Chamber+plasma current $I_{ch+p}(t)$
Tokamak GOLEM plasma volume: $V_p = (57 \pm 5)$ l
Boltzman constant: $k_B = 1.38 \cdot 10^{-23}$ J/K
Energy associated with 1 ev: $eV = 1.602 \cdot 10^{-19}$ J
Chamber resistance $\overline{R_{ch}} \approx \frac{U_l(t)}{I_{ch}(t)}$
Plasma current $I_p(t) = I_{ch+p}(t) - I_{ch}(t) = I_{ch+p}(t) - \frac{U_l(t)}{\overline{R_{ch}}}$
Statistical treatment: quasistationary phase specification from t_1 to t_2
$\overline{I_p} =< I_p(t) >_{t_1}^{t_2}$ $\overline{U_l} =< U_l(t) >_{t_1}^{t_2}$ $\overline{n_e} =< n_e(t) >_{t_1}^{t_2}$ $\frac{dW_p(t)}{dt}\Big|_{t_1}^{t_2} = 0$
Plasma resistivity $R_p = \frac{U_l}{I_p}$
Plasma heating power $P_{OH} = R_p \cdot I_p^2$
Central Electron temperature (in eV) Spitzer formula)GOLEM case $T_e(0) = 0.9 \cdot R_p^{-2/3}$
The loss power $(\frac{dW_p}{dt} = 0)$: $P_{loss} = P_{OH}$
Total electron energy content $W_p = V_p \cdot \frac{n_e \cdot k_B \cdot (T_e(0) \cdot eV)}{3}$
The electron energy confinement time $\tau_{eE} = \frac{W_p}{P_{loss}}$
Note: All physical quantities requested in the form of estimated value and associated degree of uncertainty