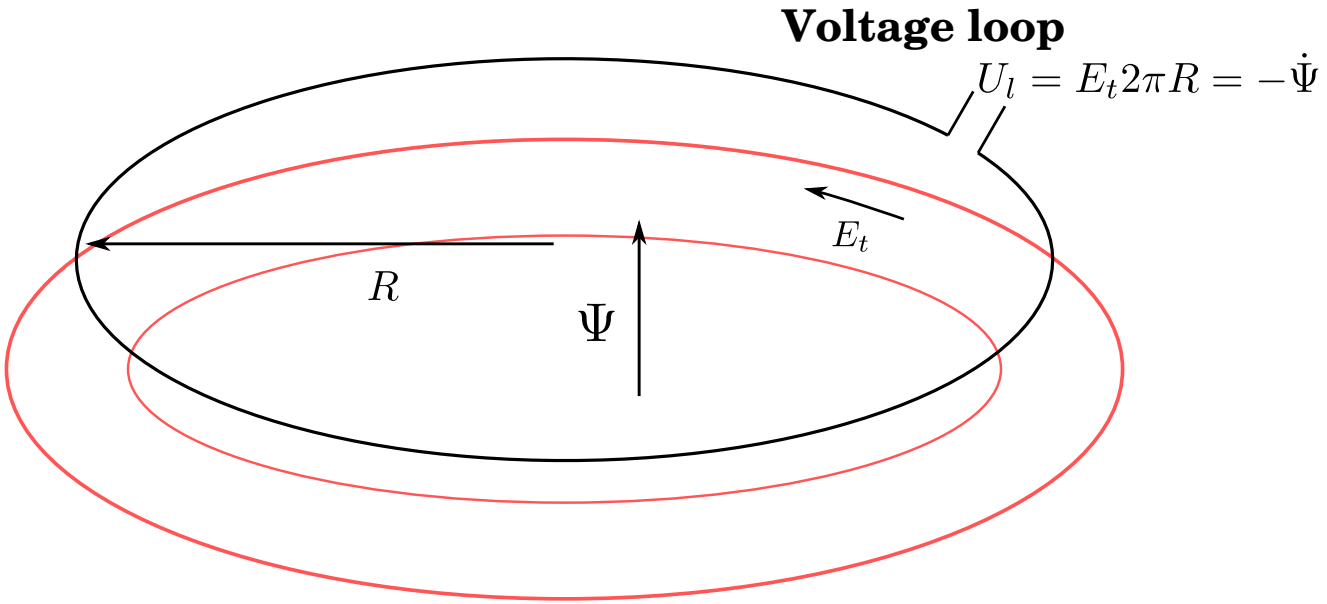
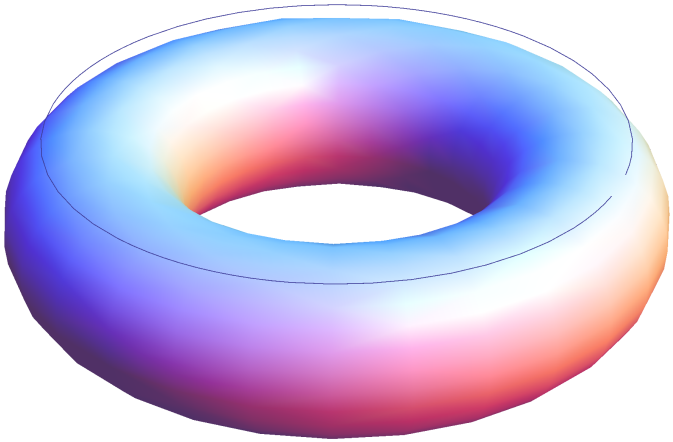
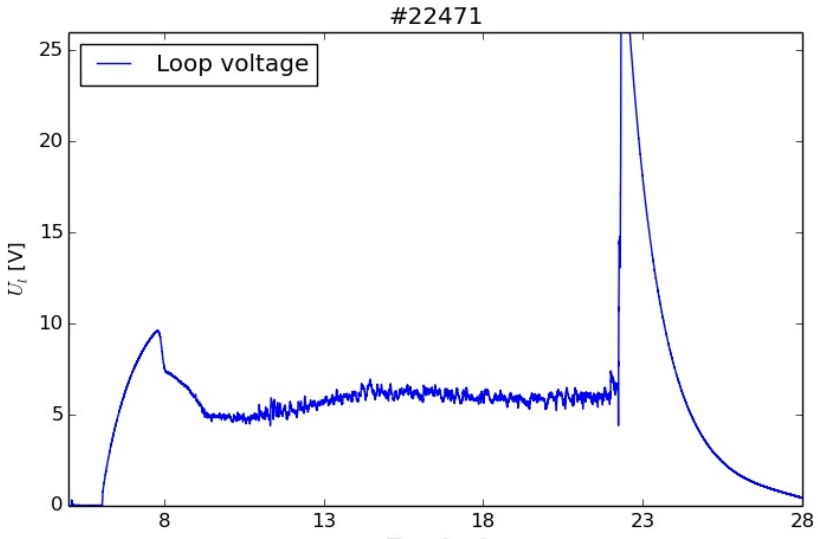
Loop voltage - theoretical introduction

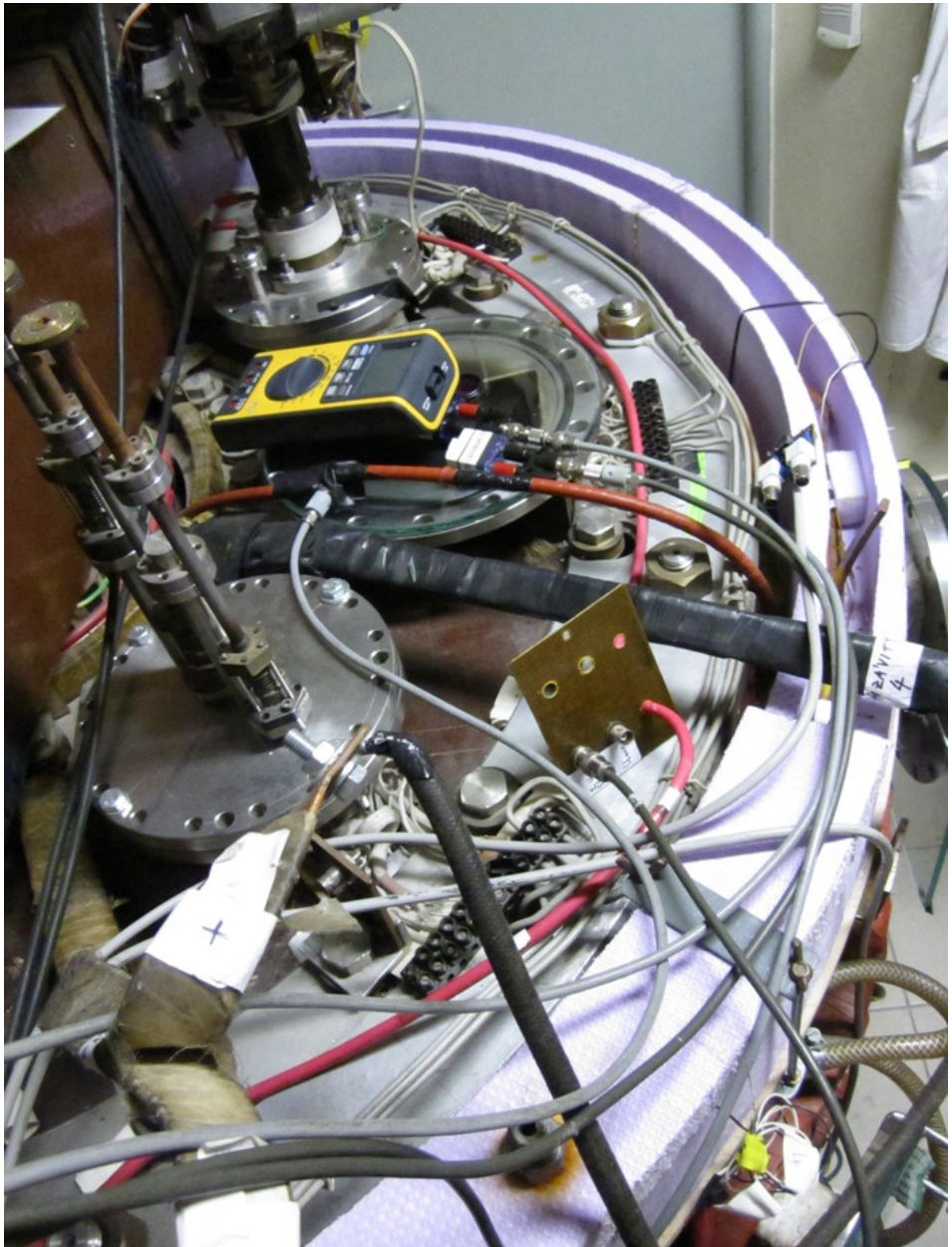


- Corresponds to the toroidal electric field E_t or time variance of Ψ
- Voltage induced in a one loop of wire: $U_l = \oint_l \mathbf{E}_t \cdot d\mathbf{l}$
- On a circular path: $U_l = E_t 2\pi R$
- Kelvin-Stokes theorem transforms closed boundary curve integral $\oint_l \mathbf{E}_t \cdot d\mathbf{l}$ into the "circulations of the fields": $\iint_S \nabla \times \mathbf{E}_t \cdot d\mathbf{S}$
- From Faraday law $\nabla \times \mathbf{E}_t = -\partial \mathbf{B}/\partial t$ the induced voltage $U_l = -\iint_S \partial \mathbf{B}/\partial t \cdot d\mathbf{S} = -\partial/\partial t \iint_S \mathbf{B} \cdot d\mathbf{S} = -\dot{\Psi}$

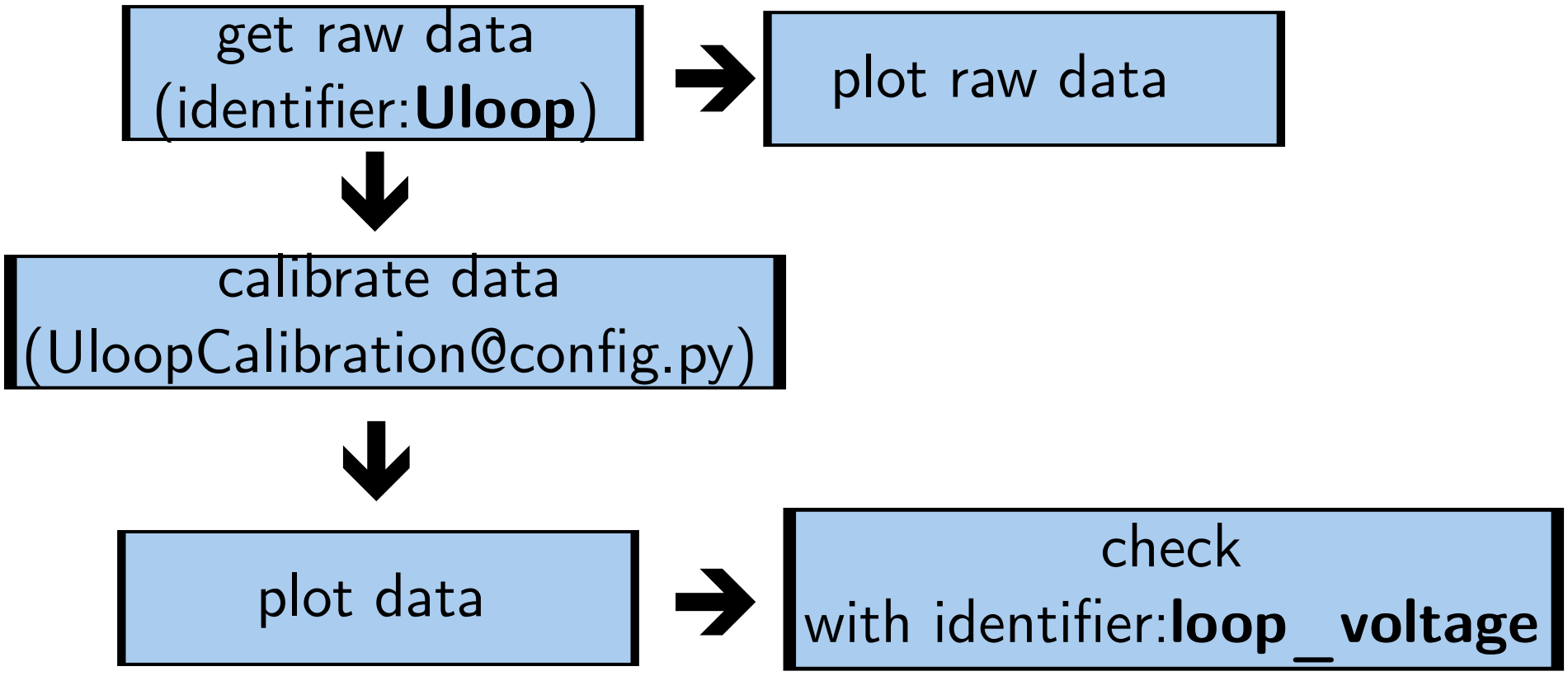
Loop voltage U_l @ the GOLEM tokamak







Flowchart for U_l generation



credit:[The GOLEM team, acc]

The GOLEM team ([Online; accessed January 22, 2019]). The GOLEM overal config file.
http://golem.fjfi.cvut.cz/shots/0/basicdiagn/config.py.