OJIP Protocol

The AquaPen device offers the possibility to capture rapid fluorescence transient – OJIP, which occurs during exposure of photosynthesizing organisms to high irradiance. The FluorPen software enables data downloading to a personal computer and subsequent OJIP analysis.

The OJIP protocol includes the following extracted and technical parameters*:

Abbreviation	Explanation
Bckg	Background
F_0	$F_0 = F_{50\mu s}$, fluorescence intensity at 50 µs
F_j	F_j = fluorescence intensity at J-step (at 2 ms)
F_i	F_i = fluorescence intensity at i-step (at 30 ms)
F_m	F_m = maximal fluorescence intensity
F_v	$F_v = F_m - F_0$ (maximal variable fluorescence)
V_j	$V_j = (F_j - F_0) / (F_m - F_0)$
V_i	$V_i = (F_i - F_0) / (F_m - F_0)$
F_m / F_0	
F_v / F_0	
F_v / F_m	
M_0 or $(dV/dt)_0$	$M_0 = TR_0 / RC - ET_0 / RC = 4 (F_{300} - F_0) / (F_m - F_0)$
Area	Area between fluorescence curve and F_m (background subtracted)
Fix Area	Area below the fluorescence curve between $F_{40\mu s}$ and F_{1s} (background subtracted)
S_M	S_M = Area / ($F_m - F_0$) (multiple turn-over)
S_S	S_S = the smallest S_M turn-over (single turn-over)
N	$N = S_M . M_0 . (1 / V_J)$ turn-over number Q_A
Phi_P_0	Phi_P_0 = 1 – (F_0 / F_m) (or F_v / F_m)
Psi_$_0$	Psi_$_0$ = 1 - V_J
Phi_E_0	Phi_E_0 = (1 – (F_0 / F_M)) . Psi_$_0$
Phi_D_0	Phi_D_0 = 1 – Phi_P_0 – (F_0 / F_m)
Phi_Pav	Phi_Pav = Phi_P_0 (S_M / t_{Fm}) t_{Fm} = time to reach F_m (in ms)
ABS / RC	ABS / RC = $M_0 . (1 / V_J) . (1 / Phi\_P_0)$
TR_0 / RC	TR_0 / RC = $M_0 . (1 / V_J)$
ET_0 / RC	ET_0 / RC = $M_0 . (1 / V_J)$. Psi_$_0$
DI_0 / RC	DI_0 / RC = (ABS / RC) – (TR_0 / RC)

Formulas Derived From:

R.J. Strasser, A. Srivastava and M. Tsimilli-Michael (2000): The fluorescence transient as a tool to characterize and screen photosynthetic samples. In: Probing Photosynthesis: Mechanism, Regulation and Adaptation (M. Yunus, U. Pathre and P. Mohanty, eds.), Taylor and Francis, UK, Chapter 25, pp 445-483.