

OJIP Protocol

The FluorPen 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 _{50μs} , 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 _{40μs} 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	$N = S_M \cdot M_0 \cdot (1 / V_j)$ turn-over number Q _A
Phi_P ₀	$\Phi_{P_0} = 1 - (F_0 / F_m)$ (or F _v / F _m)
Psi_0	$\Psi_{i_0} = 1 - V_j$
Phi_E ₀	$\Phi_{E_0} = (1 - (F_0 / F_m)) \cdot \Psi_{i_0}$
Phi_D ₀	$\Phi_{D_0} = 1 - \Phi_{P_0} - (F_0 / F_m)$
Phi_P _{av}	$\Phi_{P_{av}} = \Phi_{P_0} (S_M / t_{F_m})$ t _{Fm} = time to reach F _m (in ms)
ABS / RC	$ABS / RC = M_0 \cdot (1 / V_j) \cdot (1 / \Phi_{P_0})$
TR ₀ / RC	$TR_0 / RC = M_0 \cdot (1 / V_j)$
ET ₀ / RC	$ET_0 / RC = M_0 \cdot (1 / V_j) \cdot \Psi_{i_0}$
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.