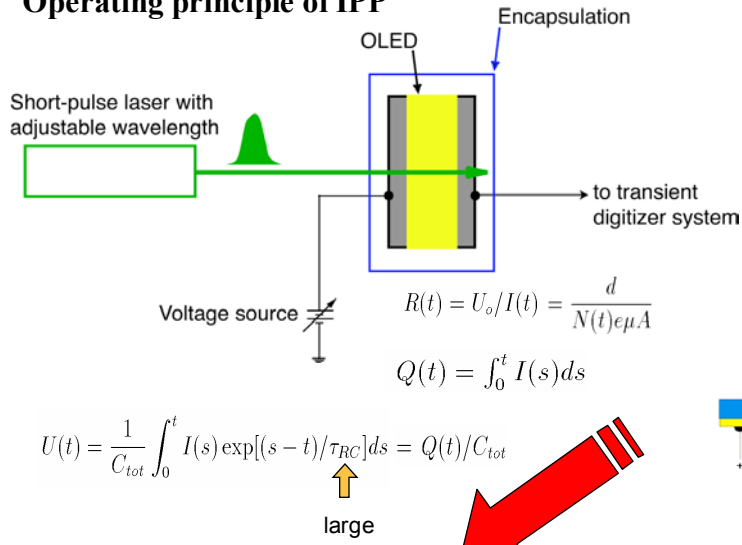


# Integrated pulsed photoconductivity for the diagnostics of packaged organic light emitting diodes

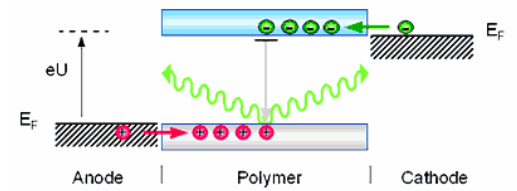
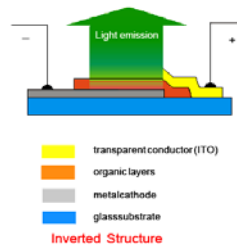
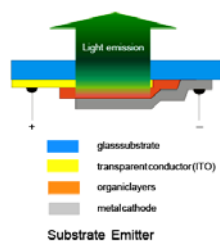
Departments of Physics\* and Electrical and Computer Engineering†

Hikmat Najafov\*, Ivan Biaggio\*, Ta-Ko Chuang†, and Miltiadis Hatalis†

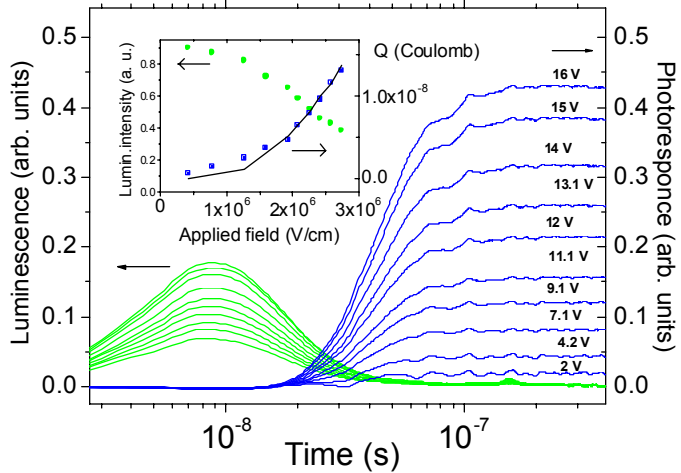
## Operating principle of IPP



- Transient photoconductivity induced by short pulses
- High time-resolution detection of charge transport dynamics in finished devices
- Determine and characterize the presence of traps



## Luminescence and photoresponse from bottom emitting device



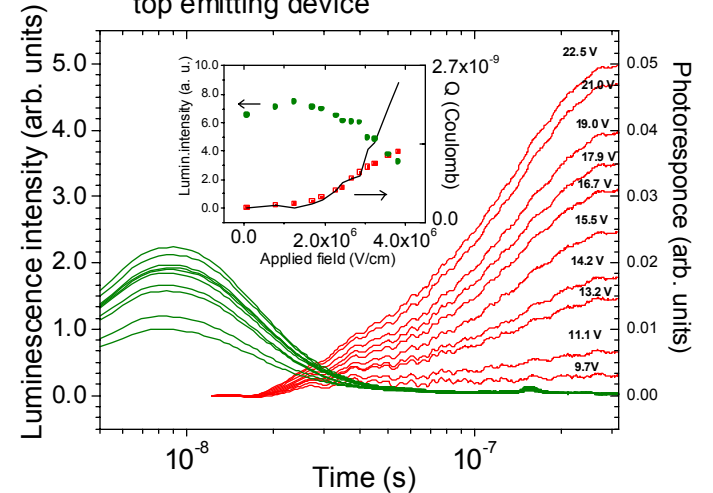
- Inverted emitter: - needed for intransparent substrate
- n-channel active matrix
- difficulty: work function control of contacts

$$\Delta Q^\infty(E) = N^p \left[ 1 - \frac{I^{PL}(E)}{I^{PL}(0)} \right] e\mu_c \tau E$$

$$N_p \approx F \exp(-\alpha d) / (h\nu d) \approx 1.0 \times 10^{18} \text{ cm}^{-3}$$

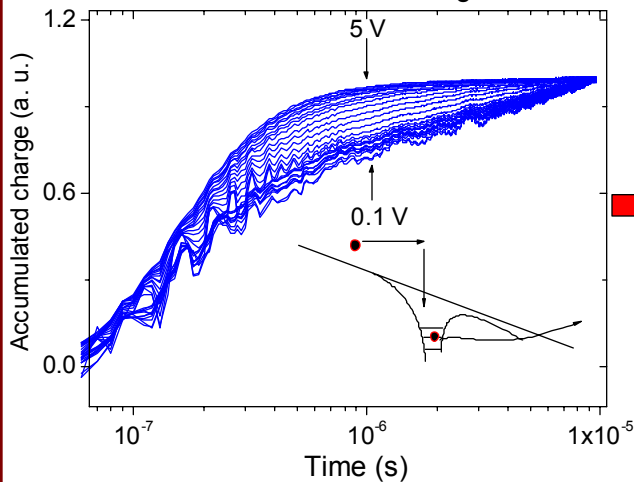
$$\mu_c / \phi \approx 6.0 \times 10^{-6} \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$$

## Luminescence and photoresponse from top emitting device

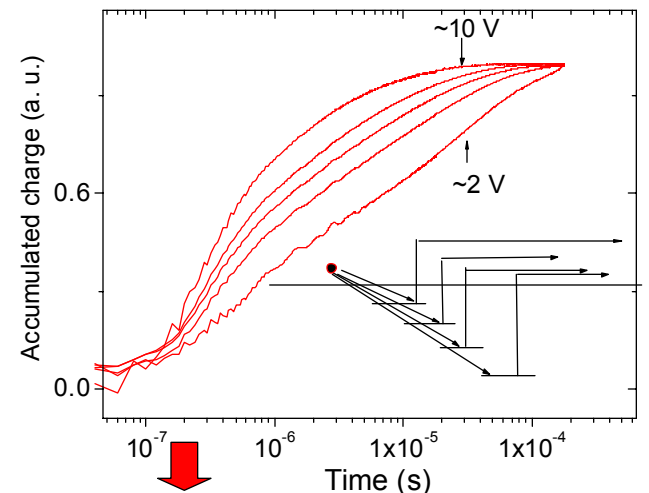
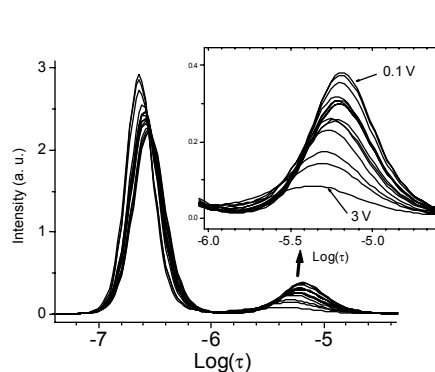


## Analysis of dispersive charge transport in bottom and top emitting devices by Method of Maximum Entropy (MME)

### IPP curves of bottom emitting device



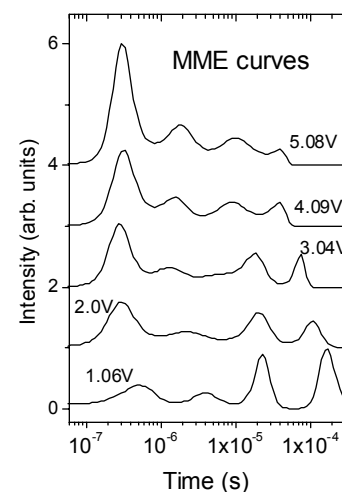
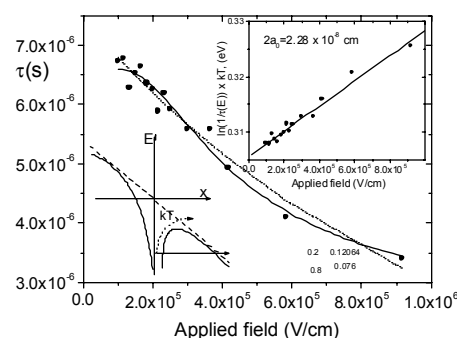
### MME curves



$$\mu_T = \mu_c \frac{\tau_t}{\tau_t + \tau_T(E, T)}$$

Dispersive charge transport governed by one shallow trap

### Field-induced trap's dissociation



Dispersive charge transport through multiple trapping and de-trapping events