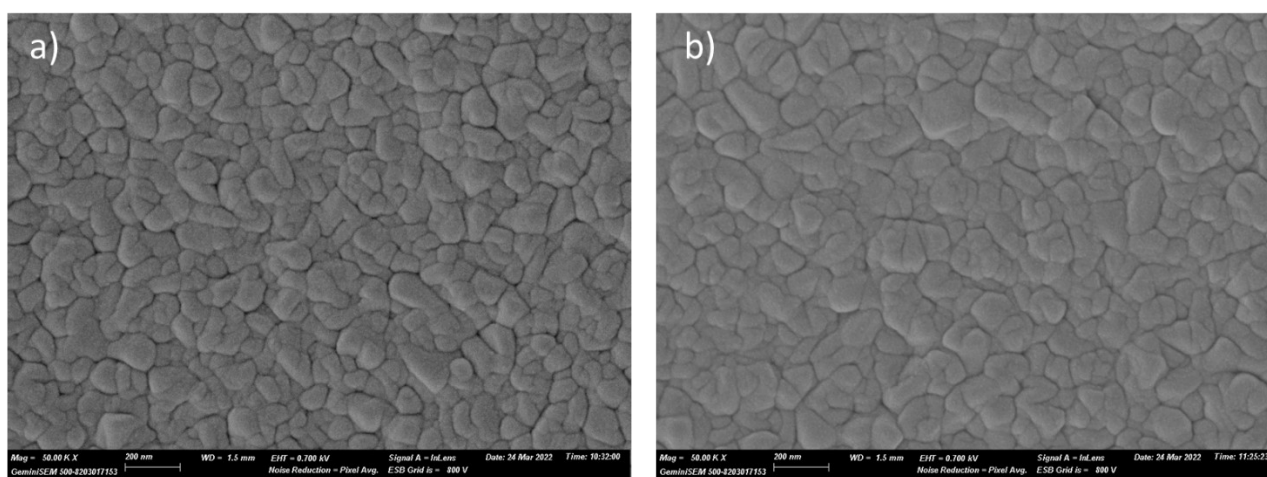


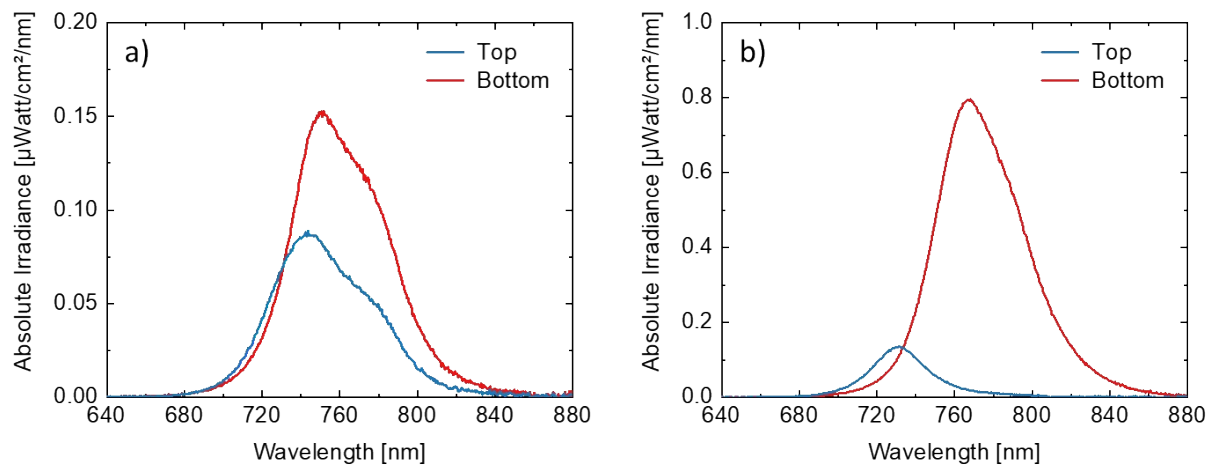
## Supporting Information

### Multimodal photodetectors with vacuum deposited perovskite bilayers

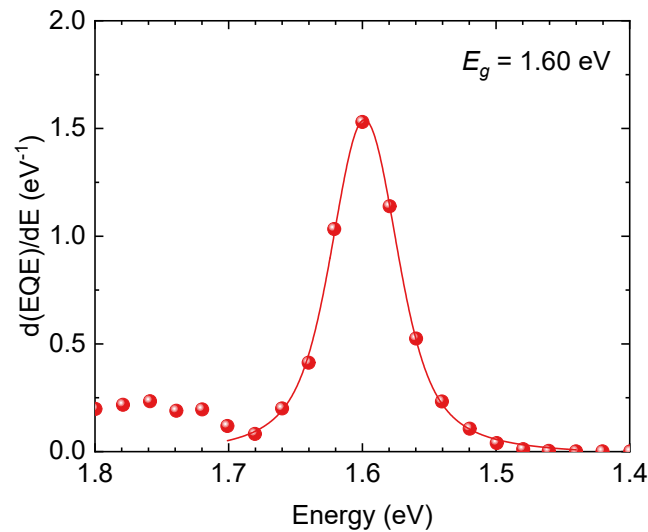
Lucía Martínez-Goyeneche, Lidón Gil-Escrig, Daniel Tordera, Cristina Roldán-Carmona,  
Henk J. Bolink, Michele Sessolo\*



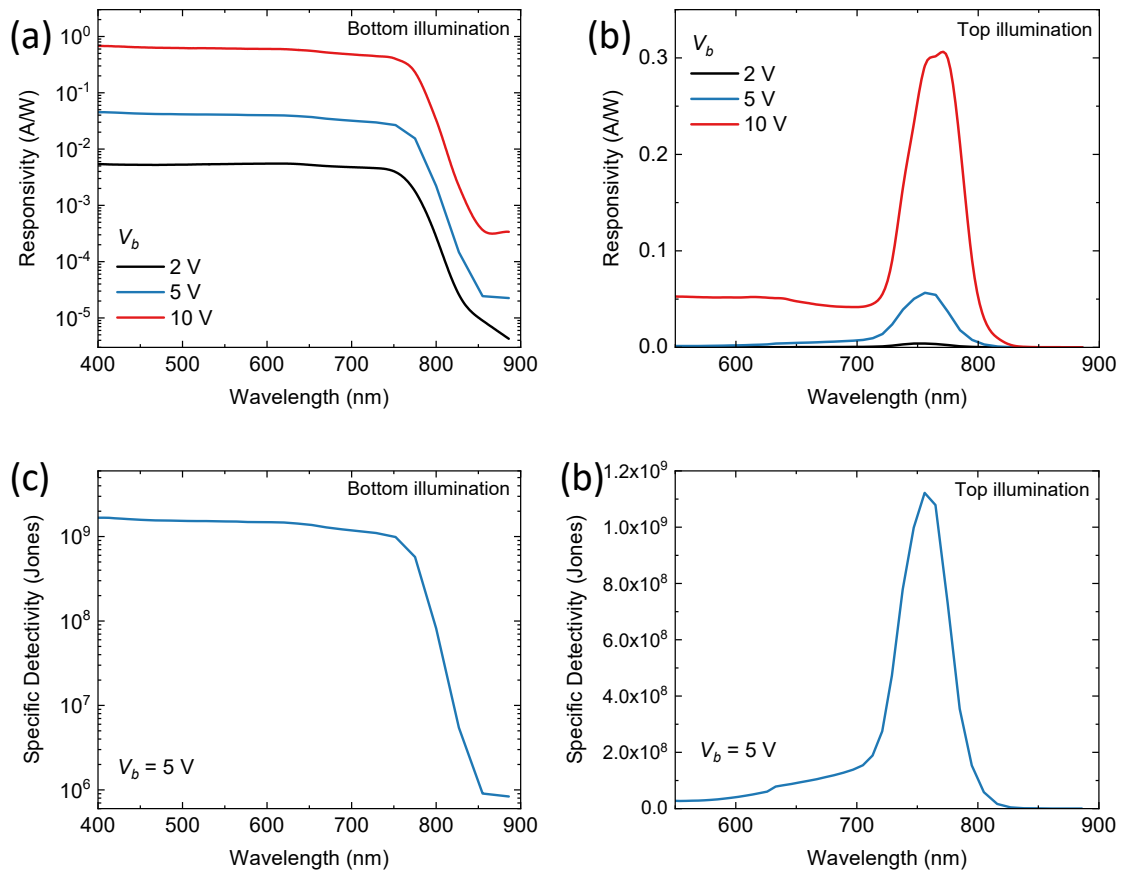
**Figure S1.** Surface morphology of photoconductive devices as observed by SEM: (a) ITO/MAPI (500 nm)/CsFAPbIBr (1  $\mu\text{m}$ ) and (b) ITO/MAPI (500 nm)/Al<sub>2</sub>O<sub>3</sub> (30 nm)/CsFAPbIBr (1  $\mu\text{m}$ ). Scale bar corresponds to 200 nm.



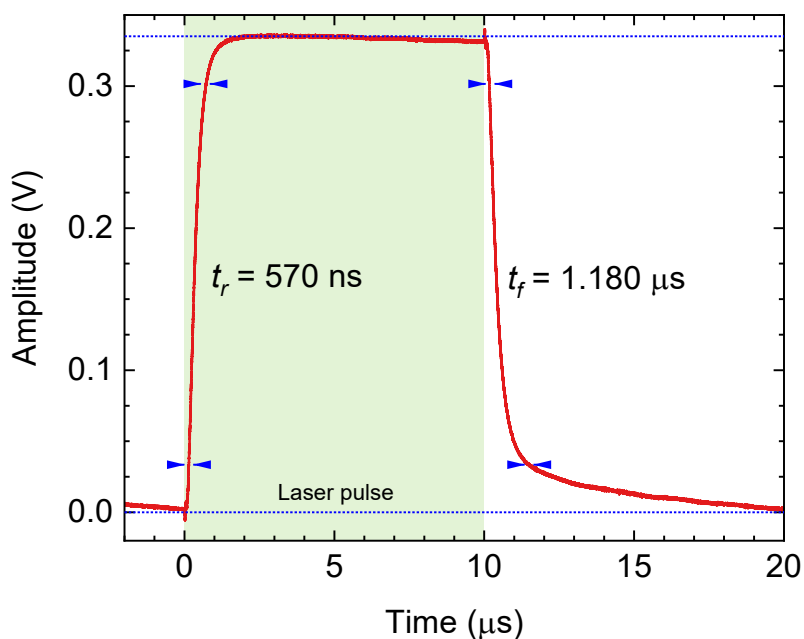
**Figure S2.** Photoluminescence (PL) spectra under laser excitation (515 nm) of (a) ITO/ MAPI (500 nm)/CsFAPbIBr (1  $\mu\text{m}$ ) and (b) ITO/MAPI (500 nm)/Al<sub>2</sub>O<sub>3</sub> (30 nm)/CsFAPbIBr (1  $\mu\text{m}$ ). The spectra are collected upon excitation from the top (through the CsFAPbIBr, blue) and from the bottom (through the MAPI, red line).



**Figure S3.** Derivative of the EQE spectrum measure from the bottom (MAPI side) for a photoconductor with structure ITO/MAPI (500 nm)/Al<sub>2</sub>O<sub>3</sub> (30 nm)/CsFAPbIBr (1  $\mu\text{m}$ ). The bandgap energy is estimated by the center of the derivative peak, fitted with a Voigt function.



**Figure S4.** Responsivity spectra of the dual mode photodetector when illuminated (a) from the bottom (broadband mode) and (b) from the top (narrowband mode), at different applied bias. Specific detectivity (estimated using the dark current of the device) of the same device in (c) broadband mode and in (d) narrowband mode, at 5 V applied bias



**Figure S5.** Photodetector speed with an applied bias of 5 V. Transient voltage output to pulsed input light signal (520 nm, 20 μs period square wave with 50% duty cycle, 50 kHz). The output photocurrent was sourced into a current preamplifier ( $10^4$  V/A) and directly sourced into a 1 GHz oscilloscope, triggered with the laser diode driving pulse. Rise ( $t_r$ ) and fall ( $t_f$ ) times are defined as the time to transition between 10% of the minimum signal to 90% of the maximum, and from 90% down to 10%, respectively (indicated as blue symbols in the curve).