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CPV for the rooftop market: novel approaches to tracking integration in photovoltaic modules HARRY APOSTOLERIS, Masdar Institute of Science and Technology, MARCO STEFANCICH, National Research Council, Parma (Italy), ALFREDO ALEXANDER-KATZ, Massachusetts Institute of Technology, MATTEO CHIESA, Masdar Institute of Science and Technology — Concentrated photovoltaics (CPV) has long been recognized as an effective approach to enabling the use of high cost, high-efficiency solar cells for enhanced solar energy conversion, but is excluded from the domestic rooftop market due to the requirement that solar concentrators track the sun. This market may be opened up by integrating of the tracking mechanism into the module itself. Tracking integration may take the form of a miniaturization of a conventional tracking apparatus, or optical tracking, in which tracking is achieved through variation of optical properties such as refractive index or transparency rather than mechanical movement of the receiver. We have demonstrated a simple system using a heat-responsive transparency switching material to create a moving aperture that tracks the position of a moving light spot. We use this behavior to create a concentrating light trap with a moving aperture that reactively tracks the sun. Taking the other approach, we have fabricated 3D-printed parabolic mini-concentrators which can track the sun using small motors in a low-profile geometry. We characterize the performance of the concentrators and consider the impact of tracking integration on the broader PV market.

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