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**Classifying symmetry-protected topological phases through the anomalous action of the symmetry on the edge** DOMINIC ELSE, CHETAN NAYAK, Department of Physics, University of California, Santa Barbara, CA — It is well known that (1+1)-D bosonic symmetry-protected topological (SPT) phases with symmetry group  $G$  can be identified by the projective representation of the symmetry at the edge. Here, we generalize this result to higher dimensions. We assume that the representation of the symmetry on the spatial edge of a  $(d + 1)$ -D SPT is local but not necessarily on-site, such that there is an obstruction to its implementation on a region with boundary. We show that such obstructions are classified by the cohomology group  $H^{d+1}(G, U(1))$ , in agreement with the classification of bosonic SPT phases proposed by Chen et al [Science 338, 1604 (2012)]. Our analysis allows for a straightforward calculation of the element of  $H^{d+1}(G, U(1))$  corresponding to physically meaningful models such as non-linear sigma models with a theta term in the action. SPT phases outside the classification of Chen et al are those in which the symmetry cannot be represented locally on the edge. With some modifications, our framework can also be applied to fermionic systems in (2+1)-D.

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