Localization Microscopy approaches allowing an optical resolution down to the single molecule level in fluorescence labeled biostructures have already found a variety of applications in cell biology, as well as in virology. Here we focus on some perspectives of a special localization microscopy embodiment, Spectral Precision Distance/Position Determination Microscopy (SPDM)1,2, most advantageous for the analysis of both viral pathogens as well as virus-derived nanotools. SPDM permits the use of conventional fluorophores or fluorescent proteins together with standard sample preparation conditions employing an aqueous buffered milieu, and monochromatic excitation. Thereby, SPDM allowed super-resolution imaging and studies on the aggregation state of modified tobacco mosaic virus (TMV) particles on the nanoscale with an accuracy of better than 8 nm, using standard fluorescent dyes in the visible spectrum. To gain an improved understanding of cell entry mechanisms during influenza A virus (IAV) infection, SPDM was used in conjunction with algorithms for distance and cluster analyses to study changes of the distribution of virus particles themselves or of the distribution of infection-related proteins, the hepatocyte growth factor receptors (HGFR), in the cell membrane on the single molecule level. Not requiring TIRF (total internal reflection) illumination, SPDM was also applied to study the molecular arrangement of gp36.5/m164 glycoprotein (essentially associated with murine cytomegalovirus infection) in the endoplasmic reticulum inside cells with single molecule resolution. On the basis of the experimental evidence so far obtained, we finally discuss additional application perspectives of localization microscopy approaches for the fast detection and identification of viruses by multi-color SPDM and combinatorial oligo fluorescence in situ hybridization (COMBO-FISH), as well as SPDM techniques for optimization of virus-based nanotools and biodetection devices.