Gaining a more detailed insight into the underlying biomolecular mechanisms of biology and medicine is the main interest of the research group at the FH Upper Austria, Linz Campus. Their most important instrument in this context is high-resolution single-molecule fluorescence microscopy (SM-FM). This method is used to monitor specific molecules in living cells, tissue as well as in whole organisms. With fluorescence microscopy, both biomolecular (antibodies – antigens) and cellular (migration and invasion of cells, cell-division and apoptosis) dynamics, co-localizations as well as interactions can be investigated. This is done by selectively and specifically marking predefined cell components.

In order to conduct an analysis, the generated series of images are converted into a film sequence. After that, the multi-scale-parameters of dynamic cellular processes (e.g. dynamics, movement and interactions of proteins) and static cellular processes (e.g. morphology of cells, protein clusters, localization of biomolecules) are evaluated using specialized software packages.

Super resolution microscopy (PALM/STORM) is a technique used to represent fixed or living cells and different kinds of tissue in a three-dimensional space. Its resolution is only limited by the accuracy of the localization of single molecules, which is usually around 20 nanometers.

Processes like the localization of single bio-molecules in tissue or in a cell, the migration of cells or the dynamics of biomolecules can be recorded and quantified automatically by means of computers. The imaging procedure is supported by molecular biological methods (e.g. real time-qPCR-device, FACS, multiwell plate reader, western-blot-tools) used to characterize bio-molecules as well as by a fully equipped cell culture.