Vortex matter in active and passive superconducting devices

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In this contribution we will demonstrate (i) that active as well as passive superconducting devices can be use as very sensitive tools for detecting motion and penetration of vortices in superconducting material and (ii) that the analysis of the distribution of vortices in the device can be used for optimisation of these devices for application. The potential for applications of superconducting devices strongly depends upon the reduction of dissipative processes due to vortex motion. Whereas vortex motion in active devices lead among others to increased low−frequency noise and, thus, reduced the sensitivity of e.g. SQUIDs, vortices in microwave devices reduce the quality factor and, finally, the power handling capability. For both types of devices vortex penetration at extremely low magnetic induction can be observed and the position of penetrating vortices can be deduced by adequate analysis of the recorded magnetic flux or power handling property for SQUIDs or resonator, respectively. The effect of vortex penetration and trapping of flux upon the performance of the device will be demonstrated and, finally, methods to reduce or avoid the negative impact of vortices in these devices are sketched.