Abstract: The γ decay of highly excited nuclear levels can be described within the statistical model of nucleus in terms of the level density and a set of photon strength functions. The knowledge of these quantities enables more accurate calculations of reaction rates in many different reactions which are important especially in nuclear astrophysics and in the development of advanced nuclear reactors. Despite the fact that the photon strength functions have been studied for decades, there are still contradicting experimental results regarding the low energy behavior of dipole strength. One of these cases is the shape of electric dipole photon strength function and the strength of the scissors mode in well-deformed rare-earth nuclei. In this thesis the analyses of γ-ray spectra measured by two different experimental setups are presented. The two-step γ cascades measurements with odd gadolinium targets were performed at the research reactor LVR-15 at the Research Centre Řež. In the multi-step γ cascades experiments the γ rays following resonance neutron capture on $^{161-163}$Dy targets were measured with the highly-segmented γ-ray calorimeter Detector for Advanced Neutron Capture Experiments in the Los Alamos Neutron Science Center at Los Alamos National Laboratory. Experimental spectra were compared to their simulated counterparts obtained by the Monte Carlo based code for simulation of radiative decay DICEBOX. The common result for all analysed isotopes is the clear influence of the scissors mode on the decay of excited levels, which persists quite high in the excitation energy. The preference of the Back Shifted Fermi Gas model of level density and the Modified Generalized Lorentzian model of electric dipole photon strength function is also a common feature. The models best describing present gadolinium data are in agreement with previously published multi-step γ cascades results on even-even Gd isotopes, confirming the consistency of two methods. The wealth and precision of the resonance experimental data on dysprosium isotopes enabled, for the first time, the analysis of fluctuations for a sizeable set of neutron resonances.