Brassinosteroids (BRs) are plant hormones that are perceived by plasma membrane (PM)-located receptors such as BRI1 in Arabidopsis thaliana. Additionally, BR signalling is also dependent on the function of the SERK co-receptor family. Transgenic plant lines expressing BRI1-GFP and SERK3-mCherry were analyzed by confocal microscopy and FRET-FLIM. We show that only a subset of BRI1 and SERK3 receptors co-localizes at the PM and intracellularly during BR signalling. Using FRET-FLIM we could visualize for the first time in planta BRI1-SERK3 hetero-oligomers. Upon exogenous ligand application, resulting in full BR signalling response, only a fraction of 5% hetero-oligomers was found. Interacting areas were distributed heterogeneously along the PM. Signal transduction of the BRI1 kinase is initiated by auto-phosphorylation after ligand binding enabling downstream trans-phosphorylation events. In addition, we aim to develop a FRET biosensor monitoring BRI1 activation in planta. Different sensor constructs have been generated and stably transformed in plants.