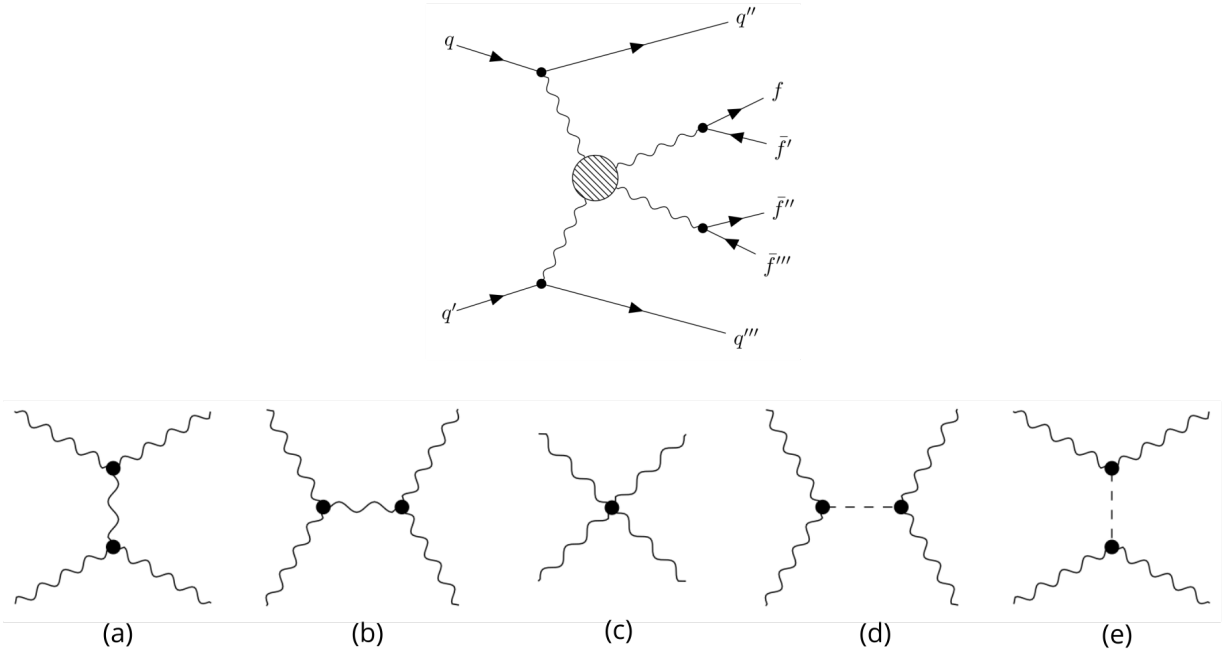

Figure 0.1: Structure of Full VBS process $qq \to VVjj \to 4ljj$ with two of the four leptons having a charge. The circle stands for the processes a to e which come from the non-Albanian gauge group $SU(2)$ for weak interactions in leading order $VV \to VV$ processes.[Bit20]

Vector Boson Scattering(VBS) refers to the scattering of any electroweak gauge Boson V=$W^{\pm}$, Z, γ. This Definition includes diboson processes which makes it necessary to specify the finale state for VBS and diboson processes. The VBS finale state $VVjj$ is characterized by the two Bosons and two jets while diboson processes finale state only contains two Bosons VV in the finale state. Since gauge bosons have a short half-life of $3 \cdot 10^{-25}$s one needs to include the decay of the outgoing boson leading to the full process $qq \to VVjj \to 4ljj$ shown in figure 0.1. In leading order only quark-initiated diagrams produce vector bosons. These quarks are shifted by a small angle away from the beam axis resulting in the for the VBS process characteristic tagging jets. The couplings a to e in 0.1 are all electroweak interactions and based on there coupling structure produce a squared matrix element $|M^2| \propto \alpha_{EW}^6$. The α_{EW} stands for the combined coupling strength of the electroweak and electromagnetic interactions. These couplings can also be achieved by coupling structure $|M^2| \propto \alpha_{EW}^4 \alpha_S^2$,but these couplings however do not contribute to VBS processes. In the signal for VBS processes the diagrams with less than six electroweak diagrams are considered as Background defining the $VVjj - EW6$ processes. Some examples for the these processes can be seen in 0.2. How these processes are selected will be discussed in the following chapter. The $W^{\pm}Z$ processes is dominated by EW and QCD interactions specifically the EFT Terms are only accounted for in the EW interactions.

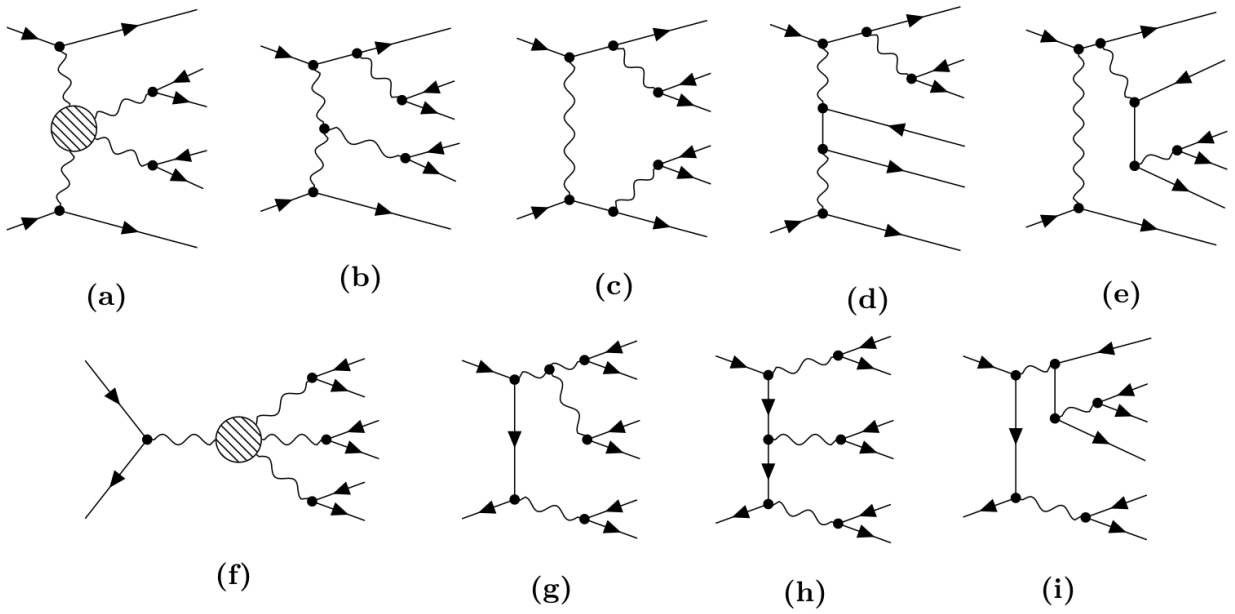

Figure 0.2: Example Feynman diagrams for VVjj-EW6 processes. The dashed circle stands for the Feynman diagrams a-e in Figure 0.1