8.701

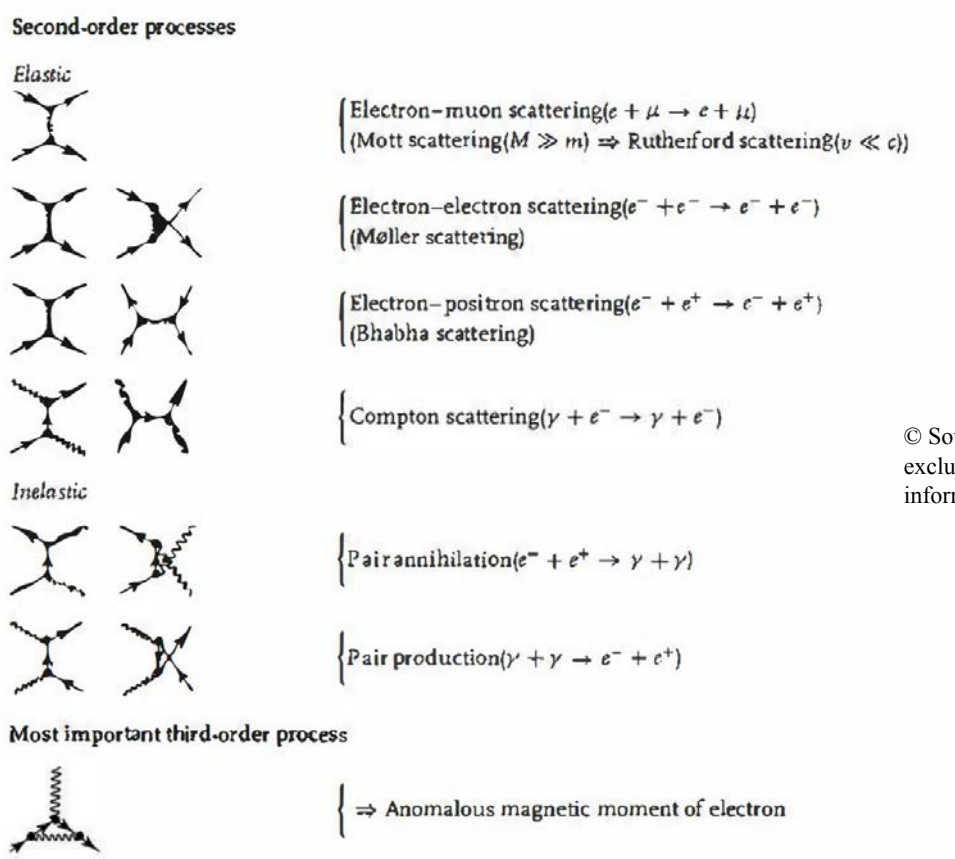
Introduction to Nuclear and Particle Physics

Markus Klute - MIT

4. QED

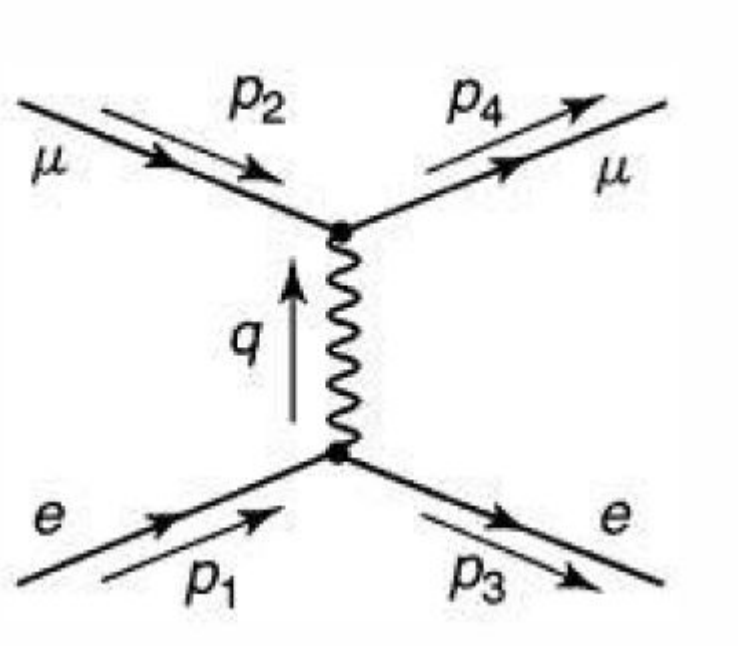
4.6 Examples

Catalog of basic QED processes

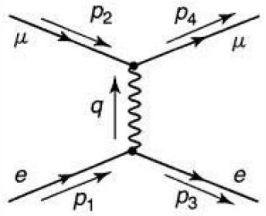


Electron-Muon Scattering

Only one diagram contributes in 2nd order



Electron-Muon Scattering



Applying the Feynman rules

$$(2\pi)^4 \int [\bar{u}^{(s3)}(p_3)(ig_e\gamma^\mu)u^{(s1)}(p_1)] \frac{-ig_{\mu\nu}}{q^2} [\bar{u}^{(s4)}(p_4)(ig_e\gamma^\nu)u^{(s2)}(p_2)]$$
$$\times \delta^4(p_1 - p_3 - q)\delta^4(p_2 + q - p_4)\, d^4q$$

Carrying out the q integration and dropping the delta functions

$$\mathscr{M} = -\frac{g_e^2}{(p_1 - p_3)^2} [\bar{u}^{(s3)}(p_3)\gamma^\mu u^{(s1)}(p_1)][\bar{u}^{(s4)}(p_4)\gamma_\mu u^{(s2)}(p_2)]$$

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