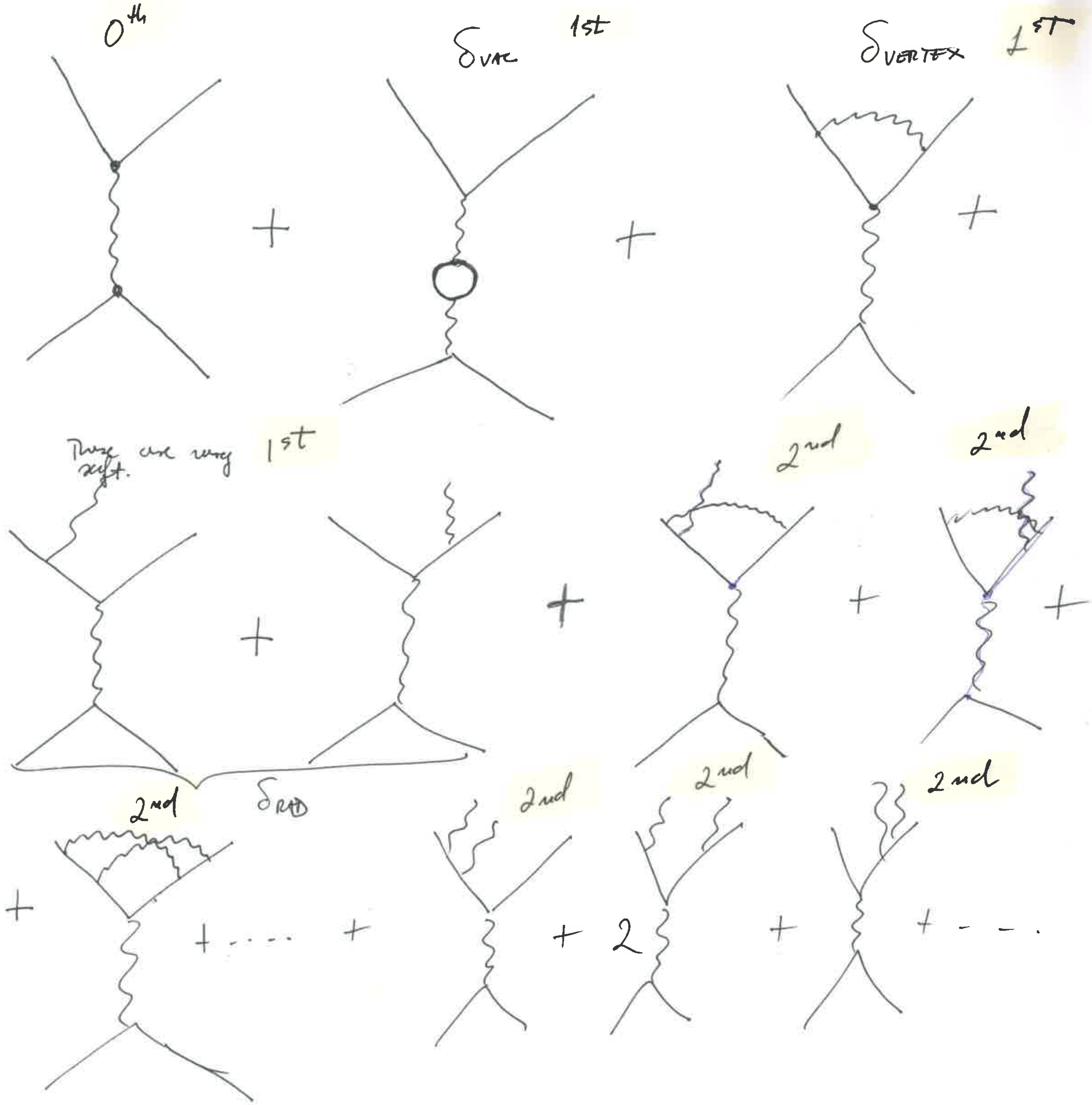
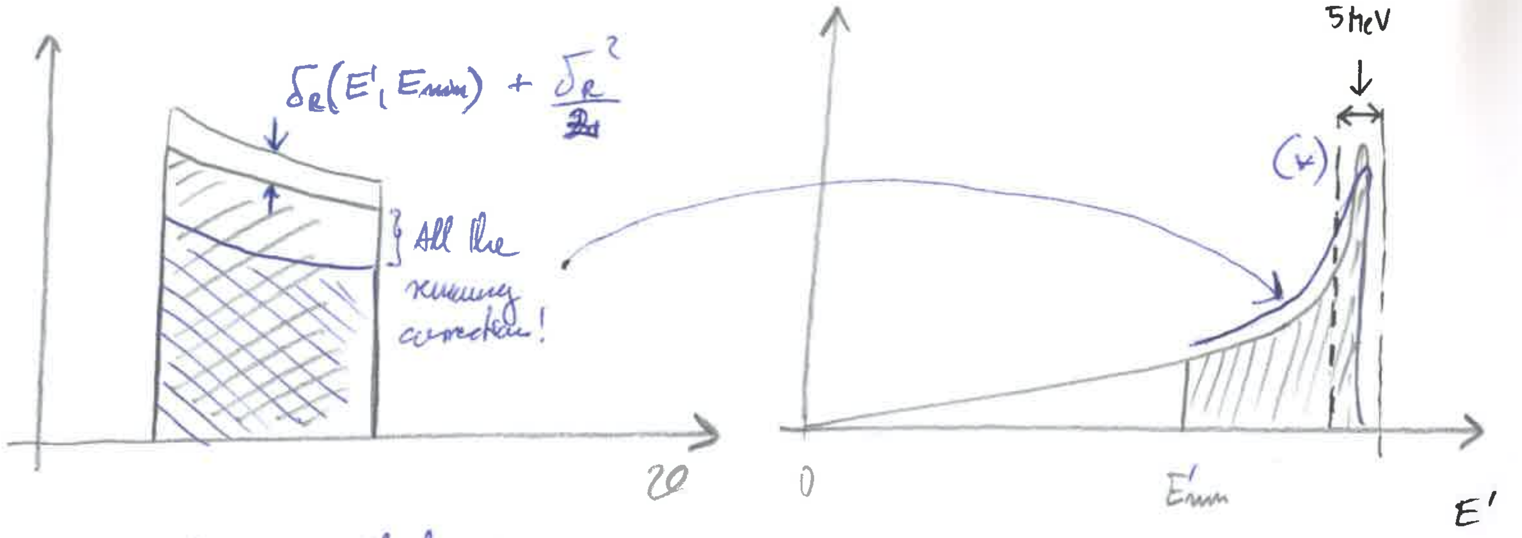


At the elastic peak (first bin)

$$\sigma = \sigma \cdot \frac{e^{\delta_{RAD} + \delta_{VERT}}}{\left(1 - \frac{\delta_{VAC}}{2}\right)^2} = \frac{\sigma}{\left(1 - \frac{\delta_{VAC}}{2}\right)^2}\left(1 + (\delta_{RAD} + \delta_{VERT}) + \right.$$

$$\left. + \frac{\left(\delta_{RAD} + \delta_{VERT}\right)^2}{2} + \cdots \right.$$



Correction that is a multiplicative factor on θ-plot, can (does) exhibit a distribution in the E'-plot!

$$\sigma = \frac{\sigma_0}{\left(1 - \frac{\delta_{VAC}}{2}\right)^2}\left(1 + \delta_{RAD} + \delta_{VERT} + \frac{1}{2}\left(\delta_{RAD}^2 + 2\delta_{RAD}\delta_{VERT} + \delta_{VERT}^2\right) + \dots\right)$$

(*) We know the behaviour of this correction up to the first bin. There we have a problem. Let's say, that the first bin is 5 MeV broad.

How big is the correction there?

$$\tilde{\delta}(E'_{min}) = \delta_{VERT} + \frac{2\,\delta_{RAD}^{(E'_{min})}\,\delta_{VERT}}{2} + \frac{\delta_{VERT}^2}{2} + \dots$$

$$\equiv \delta_{VERT} + \delta_{RADVERTEX}$$

25.5.16

For a 5 MeV bin @ 495 MeV setting

$E_0 = 0.495$
$E' = 0.481$
$\vartheta = 15.25^\circ$
$Q^2 = 0.0169074$

$\delta_{vac} = 0.0145845$
$\delta_{vertex} = -0.104579$
$\delta_R = -0.0754015$

$\delta_{vertex} \cdot \delta_R = 7.9 \cdot 10^{-3}$

For a 1 MeV bin @ 495 MeV.

$E' = 0.485$

$\delta_{vac} = 0.0145743$
$\delta_{vert} = -0.104763$
$\delta_R = -0.151975$

$\delta_v \cdot \delta_R = +0.015$

$$\sigma(E'+\Delta E) - \sigma(E') = \frac{\sigma_0}{(\dots)} e^{\delta_{vertex}} e^{\delta_R} \cdot \frac{2a}{\Delta E'} d\Delta E'$$

$\Delta E' = E'_{el} - E'$

$$\frac{d\sigma}{d\Omega\, dE'} = \frac{\sigma_0}{(\dots)} e^{\delta_{vertex} + \delta_R(\Delta E')} \cdot \frac{2a}{\Delta E'} =$$

$=$

The vertex diagram causes as a multiplicative factor in!

3

Something is wrong with the vertex corrections! It seems, that they are turned around!

In the full calculation of the Virtual correction, the Elastic correction is wrong. For 495 MeV it is -0.090228 instead of $-0.105\ldots$!

Why?

It is the vacuum correction + vertex. 26.5.16

Hence, it is a bit smaller!

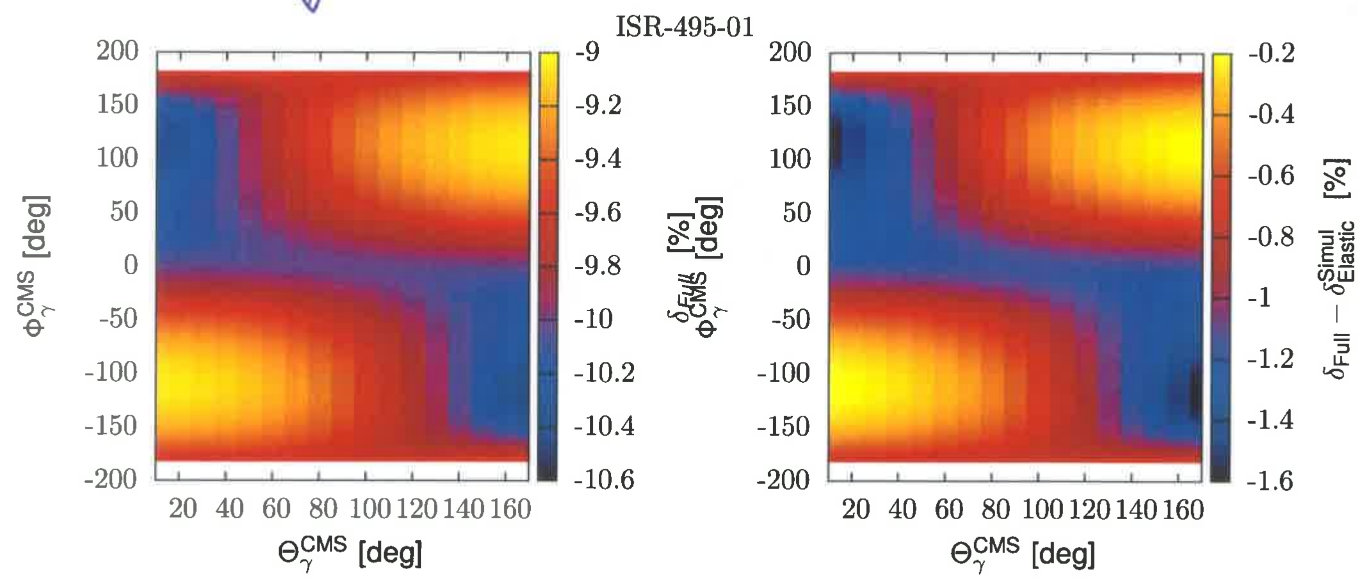
$$\frac{d\sigma}{d\Omega\, d\Delta E'} \simeq \frac{\sigma_0}{(\ldots)} \underbrace{\left(1+\delta_{\text{vertex}}\right)} \left(\frac{\Delta E'}{E'_{el}}\right)^{2a} \cdot \frac{2a}{\Delta E'}$$

This always come as a multiplicative factor

We do not detect real photons! This means, that we are not limited only to diagrams, where real photons are emitted! When away from the elastic line, it is clear that we have these diagrams, since only these diagrams can change the energy of the outgoing electron. However, when at the elastic peak, we also have virtual diagrams! I believe that also in the first order, not only in the second order!

25.5.16

These calculations include also vacuum polarization!



All virtual corrections!

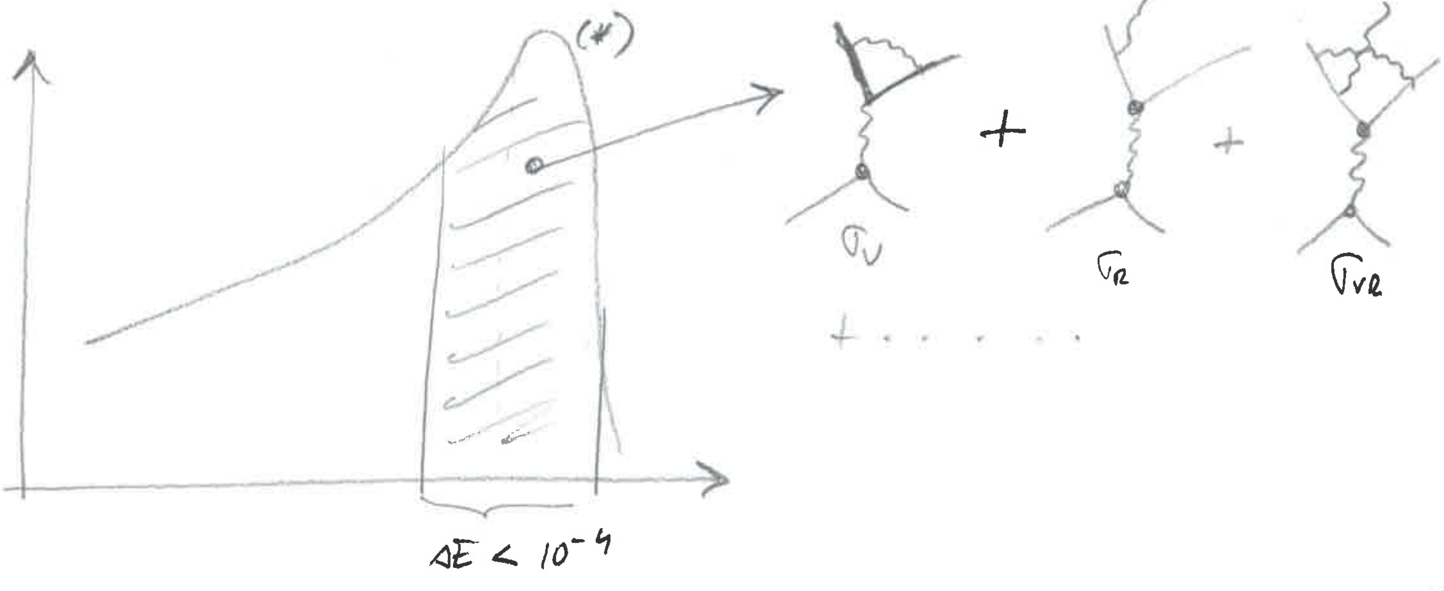
For the elastic case, the correction is −10.5%.
How come, can the difference be negative?

It is ok, because, the elastic correction is the sum of vertex + vacuum!

Additional argument: We could start our generator by calculating exactly the vertex diagram and then add corrections to it. Then, we could write out our 1^{st} order B-H diagrams! However, these would be <u>negative events</u>.

The only thing, that is bothering me is, that the second order corrections from tables are so large $\sim -10\%$. I would expect something in order of <u>1%</u>. (Since the second order rad. correction is also large, this is not so unbelievable)

The pure virtual corrections are important in the bins below our resolution, where we can no longer see if we have emitted a photon or not! However, there are both type of processes present. The majority of B-H processes, is those with very soft photons



So, not all of the events in elastic peak are elastic. Need a criterion, to determine which are and which are not! We need a cut.

$$N = \mathcal{L}\cdot\underbrace{\left(\sigma_R + \sigma_{RV}\right)}_{\substack{1st \quad 2nd \\ \sigma_R\cdot(1+\delta_0)}} + \mathcal{L}\cdot \underbrace{\delta_V \sigma_V}_{= \sigma_R \cdot \delta_V}$$

$$\tilde{\delta}_R$$

$$N = \mathcal{L}\cdot\sigma_{EL}\cdot\left(1 + \delta_R + \delta_V + \delta_R\cdot\delta_V + \ldots\right)$$

$$= \mathcal{L}\,\sigma_{EL}\left(1 + \tilde{\delta}_R + \delta_V + \ldots\right) =$$

$$= \underbrace{\mathcal{L}\cdot\sigma_{EL}\cdot(1+\delta_R)}_{\mathcal{L}\tilde{\sigma}}(1+\delta_V)$$

$$\mathcal{L}\tilde{\sigma}\,(1+\delta_V)$$

$$N = \mathcal{L}\cdot\underset{\substack{\uparrow\\ \text{corrected}}}{\sigma}\left(1 + \frac{a}{(1+\delta_R)}\,\delta_V\right)$$

We want this to be one!

$$a = (1+\delta_R)$$

$$\frac{7\%}{10.5\%} = 0.67$$

Since the CS we are correcting is smaller, the correction should be also smaller!

Now very close to the elastic line, the rad correction a ...

$$\delta_R = (-30\%) - (-40\%)$$

which agrees with the correction!

$$\delta = \frac{\alpha}{\pi}\left\{\ln\left(\frac{\Delta E_s^2}{E\,E'}\right)\left[\ln\frac{Q^2}{m^2} - 1\right]\right\}$$

$$= \ln\left(\frac{\Delta E_s^2}{EE'}\right)\cdot\underbrace{\frac{\alpha}{\pi}\cdot\left[\ln\frac{Q^2}{m^2} - 1\right]}_{a}$$

$$= \ln\left(\frac{\eta^2\,\Delta E'^2}{E\,E}\right)\cdot a \approx \ln\left(\eta\,\frac{\Delta E^2}{E'^2}\right)\cdot a$$

$$\underline{e^{\delta} = \eta^{a}\cdot\left(\frac{\Delta E'}{E'}\right)^{2a}}$$

The rate of higher order:

$$e^{\delta} - \delta - 1 = \eta^{a}\left(\frac{\Delta E'}{E'}\right)^{2a} - 2a\ln\left(\sqrt{\eta}\cdot\frac{\Delta E'}{E'}\right) - 1$$

This is my estimate for uncertainty!