\section{Ethanol estimation by $CO\_2$ removal}

\subsection{Motivation for $CO\_2$ removal}

When looking closer at the measured absorbance and the absorbance of $CO\_2$ from the calculated concentrations as in \autoref{fig:close up of measurement with calculated CO2 overlay}, it can be seen that they do not completely match.

[Closer look at the measured absorbance and calculated $CO\_2$ and ethanol][blabla description]

The $CO\_2$ peaks specifically are quite a bit off in some places, more so than just the noise level as judged from other regions. This also affects the estimation of concentration for the other major molecule present in this region, namely ethanol. Hence it could prove useful to remove $CO\_2$ and its uncertainties in order to get a better estimate of the ethanol concentration.

\subsection{Implementation of $CO\_2$ removal for ethanol estimation}

Using the concentrations as found using \autoref{concentration determination}, the absorbance contributions of all molecules except for $CO\_2$ are subtracted from the measured absorbance. All that should be left is noise around zero absorbance and the contribution of $CO\_2$. The peaks from $CO\_2$ are now identified using a peak detection algorithm, and then fitted by normal distributions. This way the actual measured $CO\_2$ peaks are fitted including any deviations they have from the $CO\_2$ spectrum according to the database. The fits are then subtracted from the signal, and all that should be left is the difference between the measurement and the absorbance contributions of all molecules as calculated using \autoref{concentration determination}. The contributions of all other molecules are now summed back on this in order to get the full measurement back minus any absorbance by $CO\_2$, as plotted in \autoref{closer look measured absorbance without $CO\_2$}. From this the concentrations are once again determined. The ethanol concentration before was XXX and is now YYY.

[Closer look at the measured absorbance and calculated ethanol without $CO\_2$][blabla description]