Erdfeld-NMR Remote

Physikalisches Fortgeschrittenenpraktikum an der Universität Konstanz

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Abstract

TEXT

Alle Autoren haben zu jedem Abschnitt wesentliche Beiträge geleistet. Die Autoren bestätigen, dass sie die Ausarbeitung selbstständig verfasst haben und alle genutzten Quellen angegeben wurden.

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3 Noisemeasurement

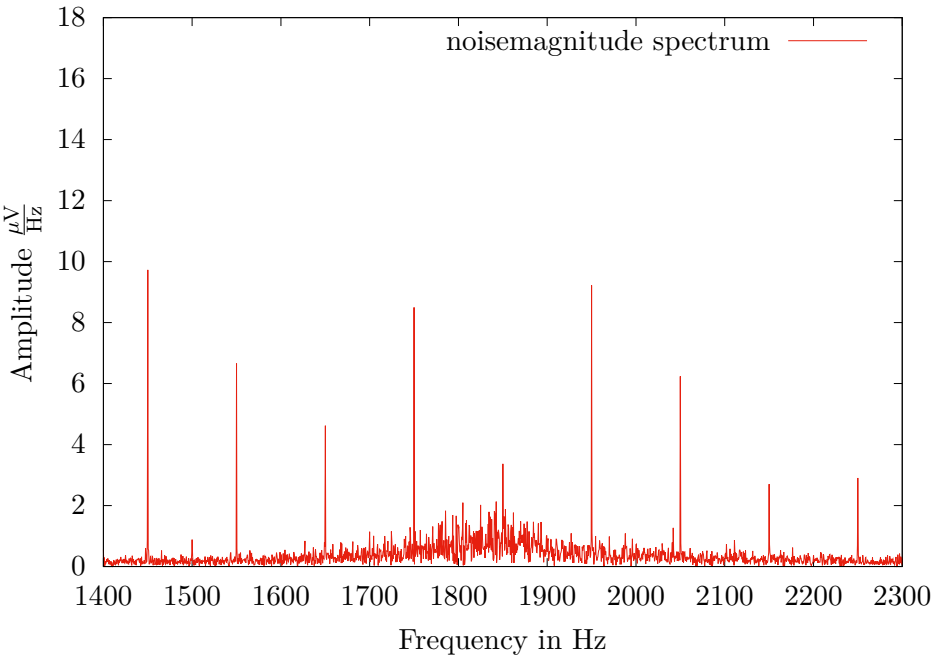

Figure 3.1: ask: which range should we plot
why is there an maximum at around 1850 Hz-> resonance frequency
sharp peaks come from electric noise. how exactly? Johnson-Noise or shot noise?
in comparison to 14.2 nF capacity the magnitude doesn´t change. Is this important?
Noise level of 14.2 nF is 7.6 nF and of 13.8 nF it is 7.5 nF. Is that the reason?
What is noise level?

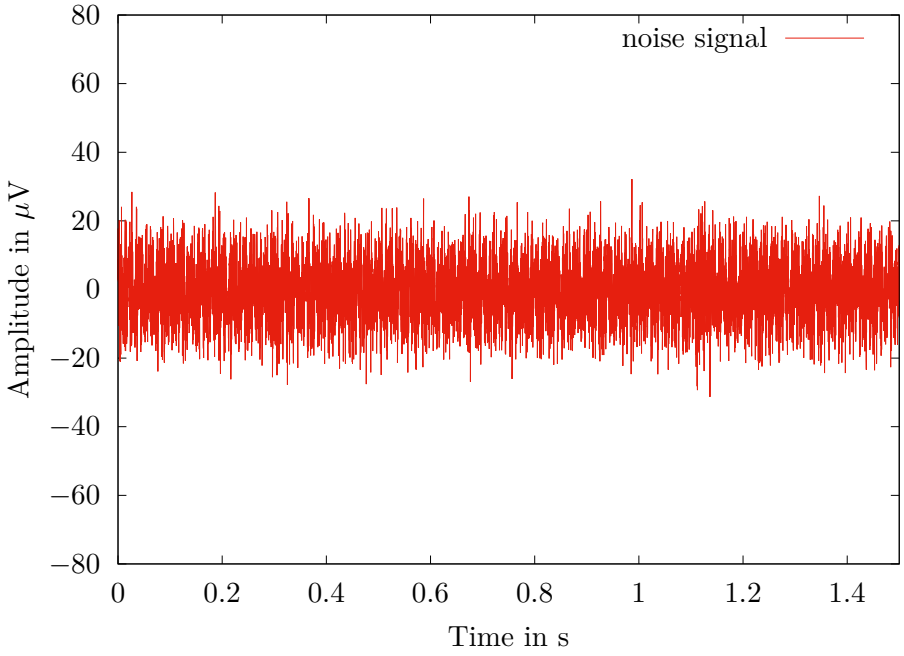
noise signal
Amplitude in μV
Time in s
80
60
40
20
0
−20
−40
−60
−80
0
0.2
0.4
0.6
0.8
1
1.2
1.4

Figure 3.2

4 Coil Analyssis

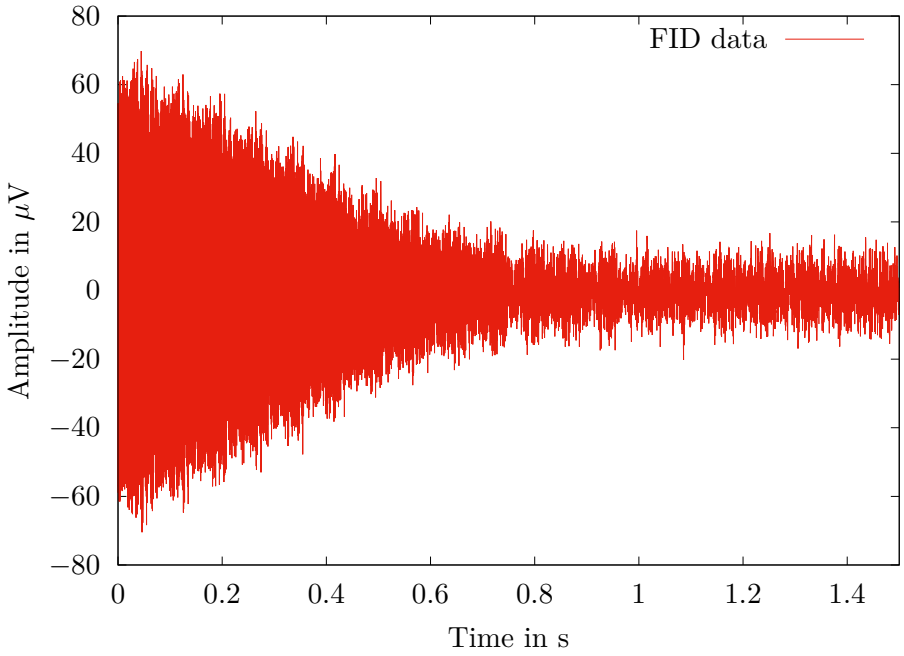

Figure 4.1: ask: is it ok to plot examplarly one signal and explain how it works and later on there will just be the spectra

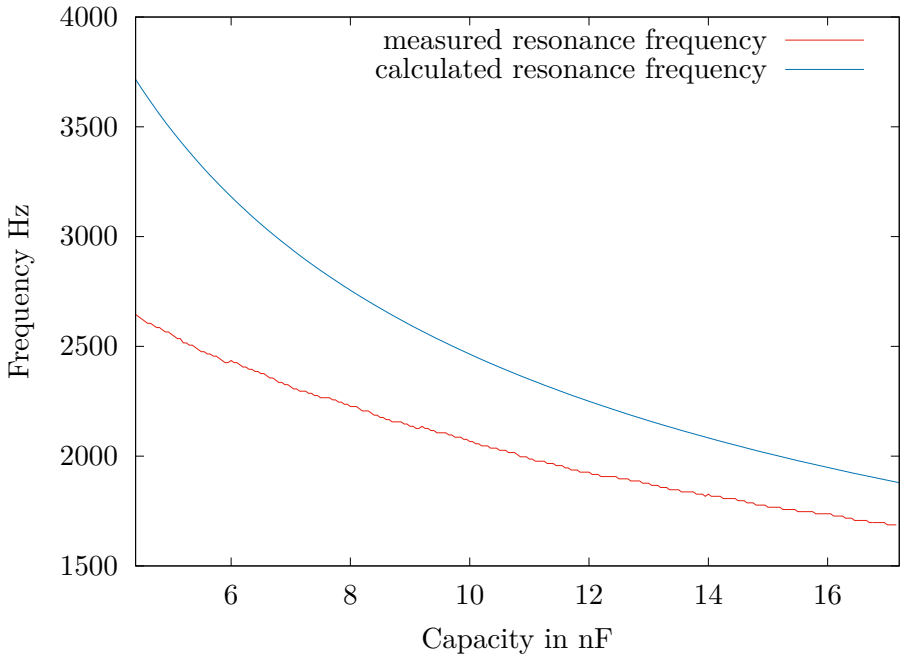

Figure 4.2: ask: who do we calculate lamorfrequency (1834) -> show excel. Vertical compnent?
why is calculated curve different to measured curve? maybe L is wrong or something else.

5 Optimization and Characterisation of FID in water sample

insert previous values

ask: is it ok to explain what autoshim does and don´t plot any graphs at all? We don´t have data for an example plot

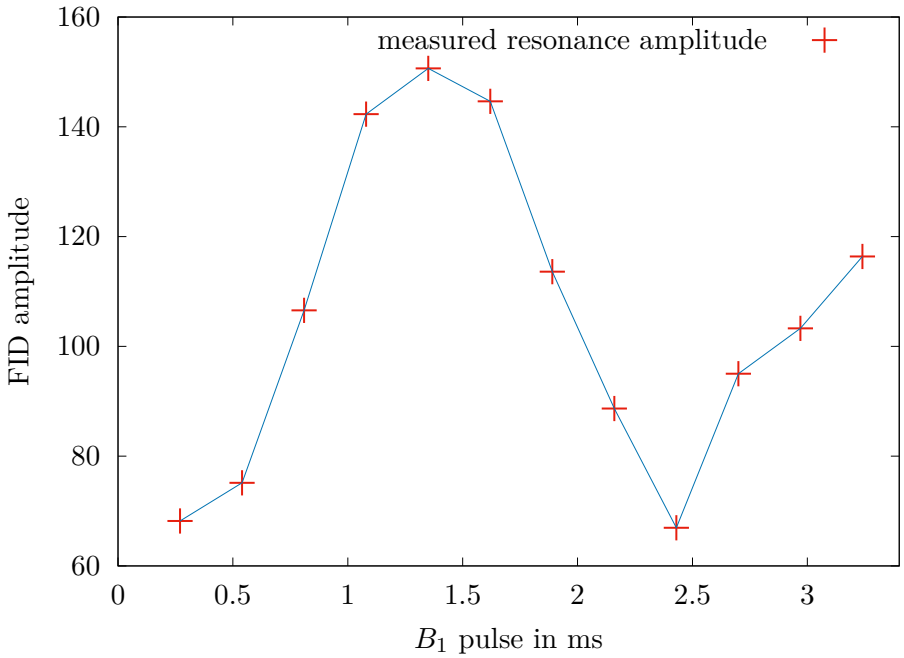

Figure 5.1: ask: periodicity due to duration of B_1, 0° -> 90° -> 180° -> 270°?

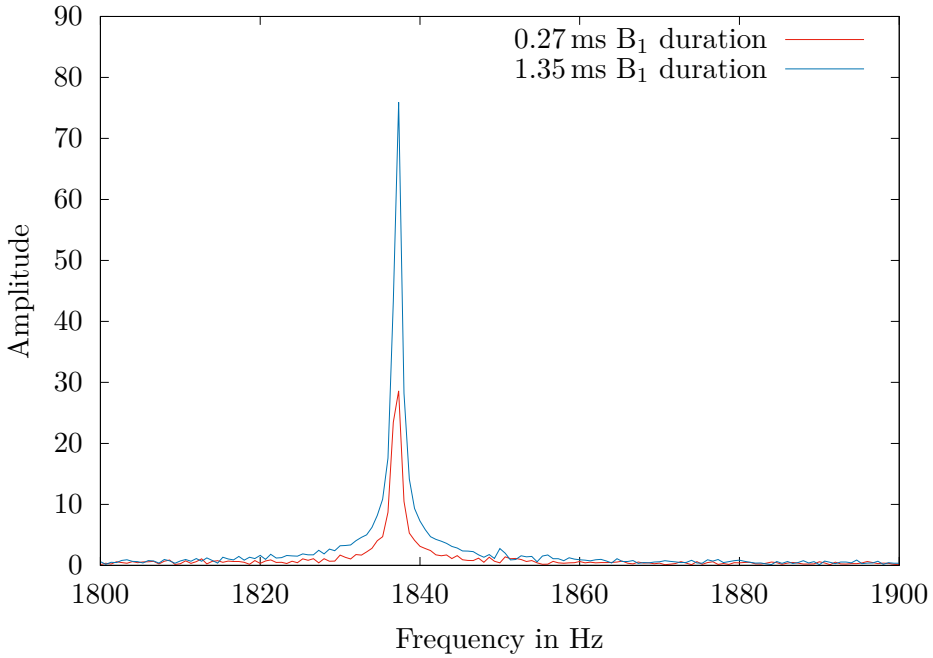

Figure 5.2

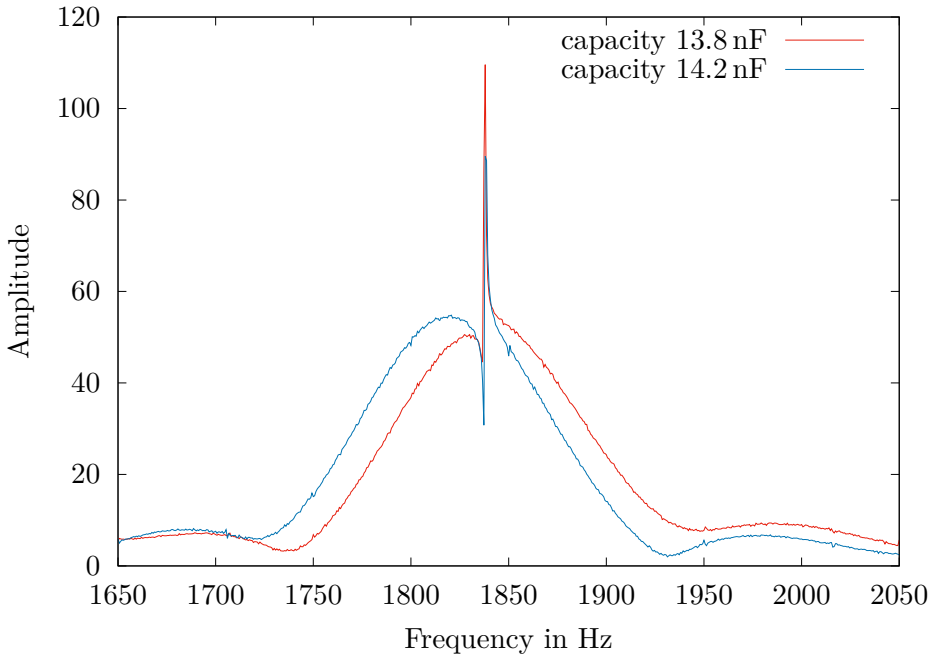

Figure 5.3: ask: what is the peak corresponding? hydrogen signal?

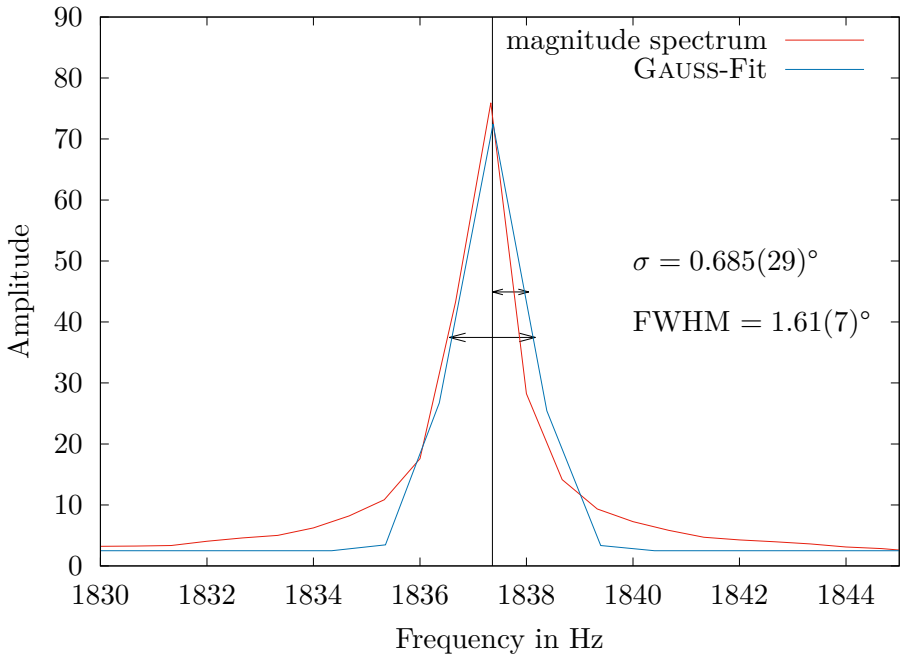

Figure 5.4: ask: gauss or voigt. this is gauss
longer acquisition 25 ms -> only hydrogen siganal? is the peak the same than in the previous diagramm?
integral under curve with our measured fit?
signal to noise ratio: what to do?
calculate: amplitude

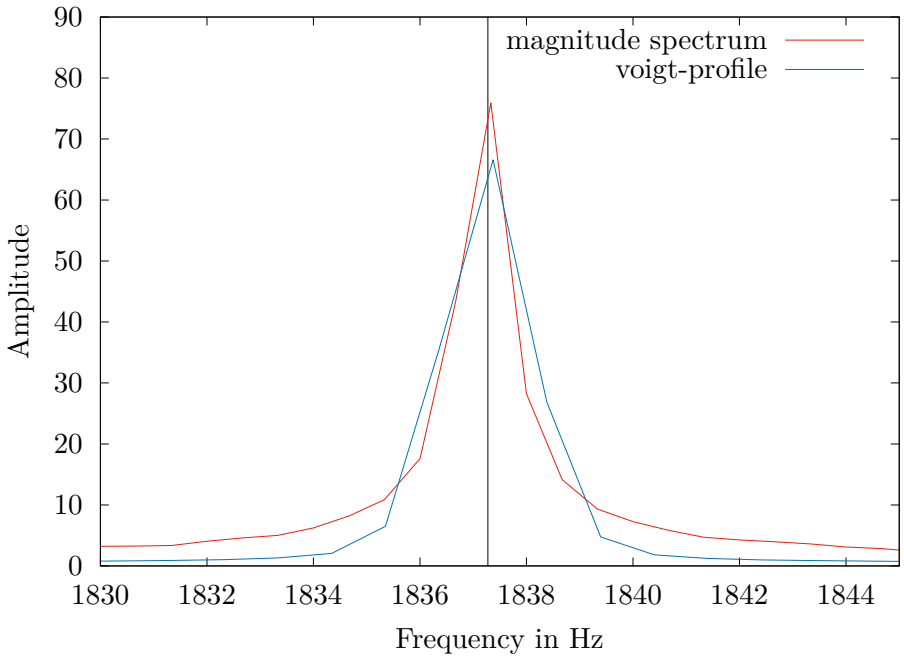

Figure 5.5: ask: gauss or voigt. this is voigt

real and imaginary signal

6 Longitudinal relaxation measurements T1

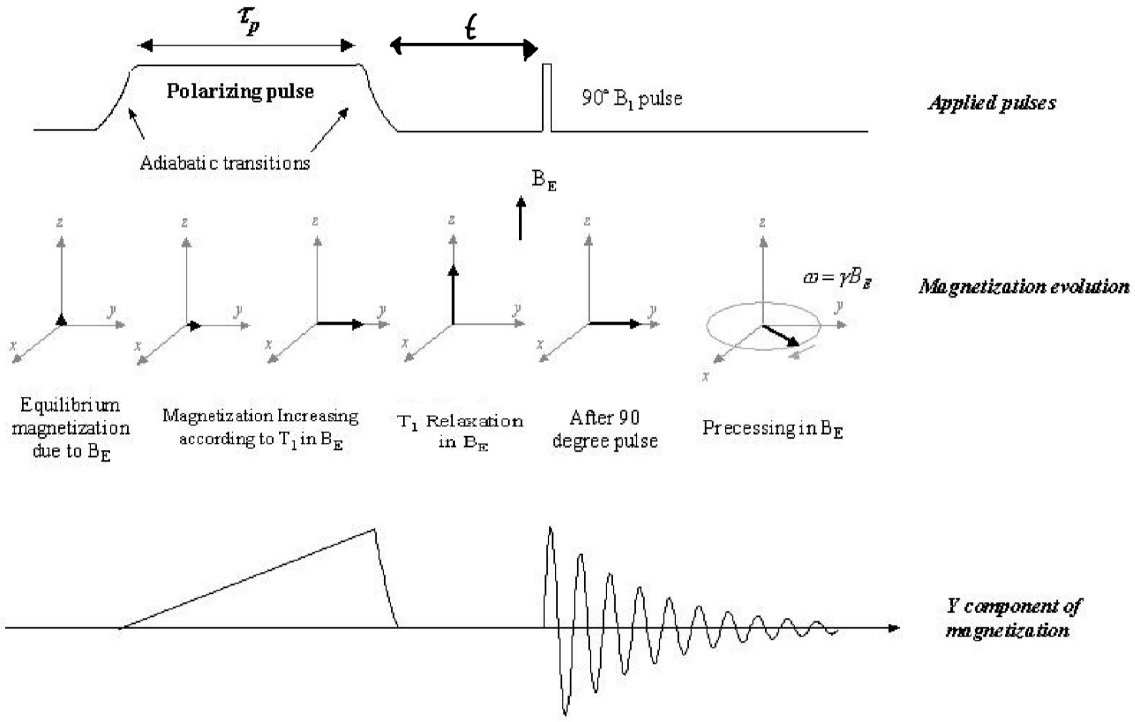

Figure 6.1: Anleitung von T Messung [**?**]

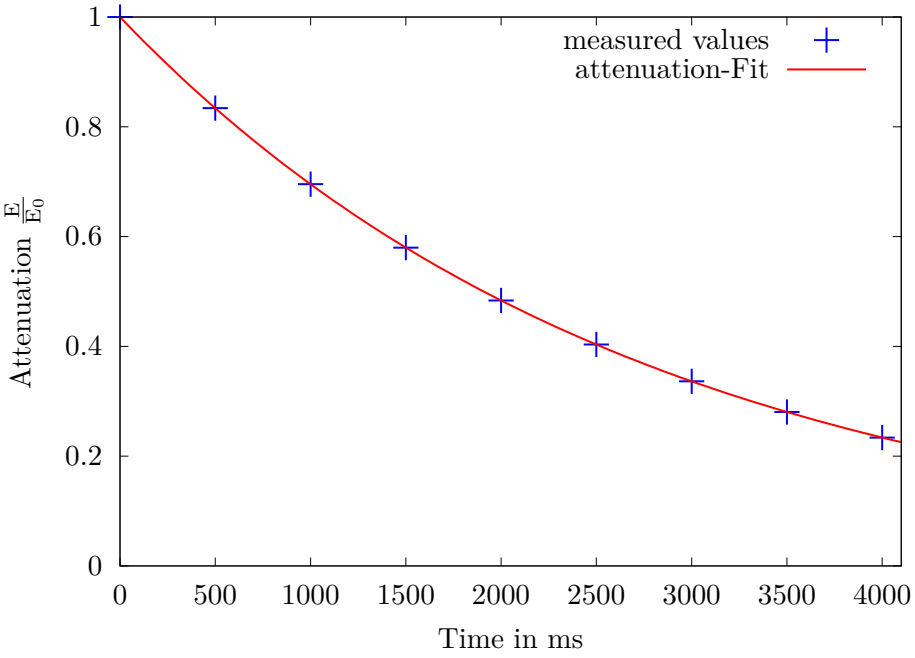

Figure 6.2: explain what happens; $S_0 * exp(-x/T_1)$ mit $T_1 = 2753.05\,\text{ms}$

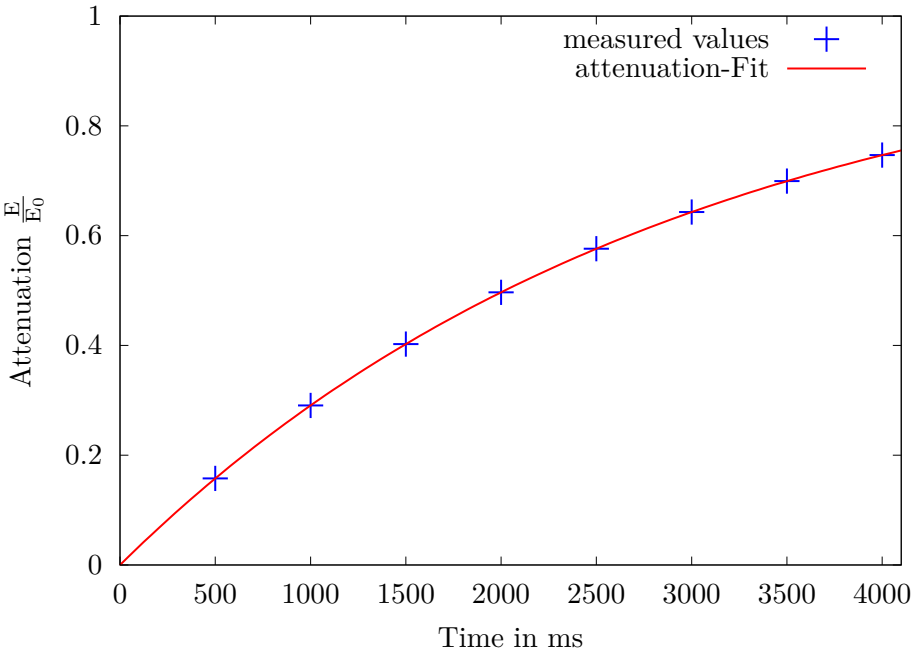

Figure 6.3: explain what happens. wieso 0.2 überall unterschied; $S_0 * [1 - exp(-x/T_1)]$ with $T_1 = 2912\,88ms$

7 Hahn echo

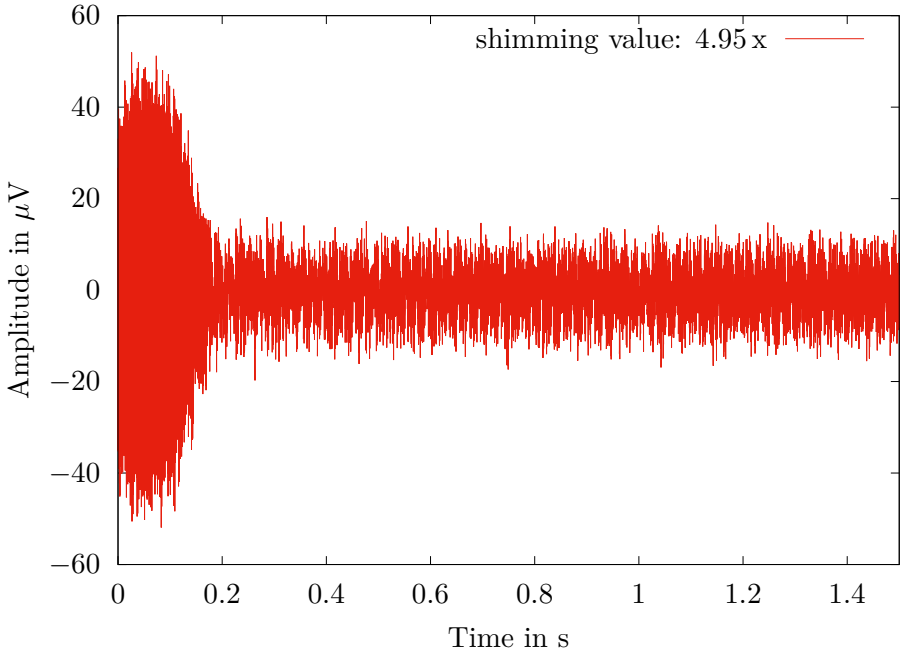

Figure 7.1: ask: wie safed no data for differnet τ, is it ok just to explain it that the amplitude will decrease and the maximum will be shifted to a different time?

this is an example for a hahn echo with shimming value 4.95 x.

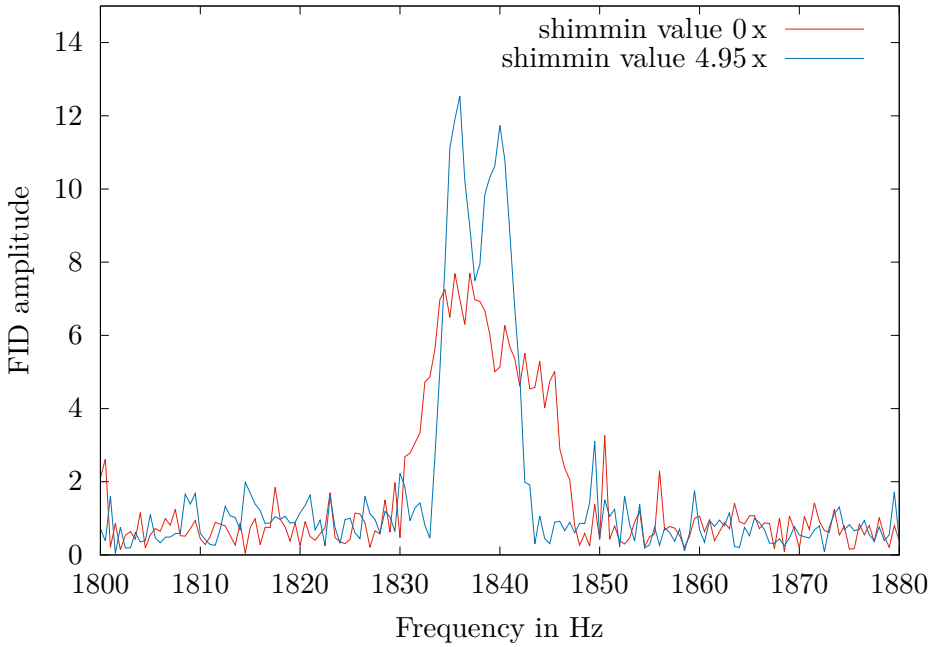

Figure 7.2: ask: why are there different peaks a different shimming values? which formula should we use to fit it?

for us: wieso signal schwächer-> mehr abweichung beim shimming (ursprünglich 10.11)-> abschwächung. integrale bei unterschiedlichen shimming; echo time 300ms bei beiden.

We can measure T_2 when we don´t change the shimming values, because T_2^* is dependent on a field inhomogeniousity. -> CPMG, Spin Hahn echo

8 Multiple echo sequences

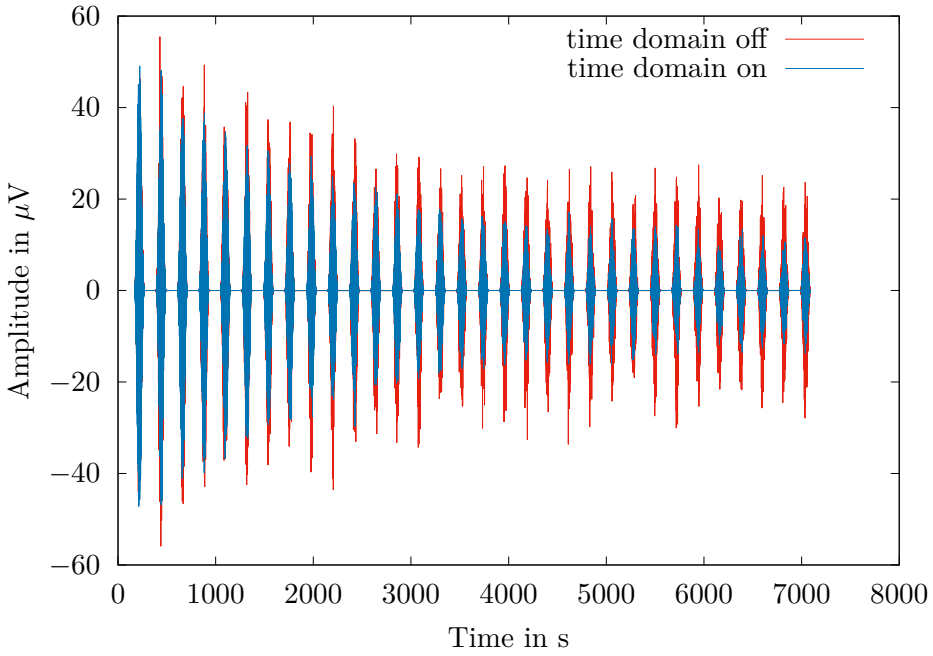

Figure 8.1: time domain filter. it might be that at this picture both signals were taken with time domain filter on, because there should be a change in the shortness of the peaks, but it is not there.

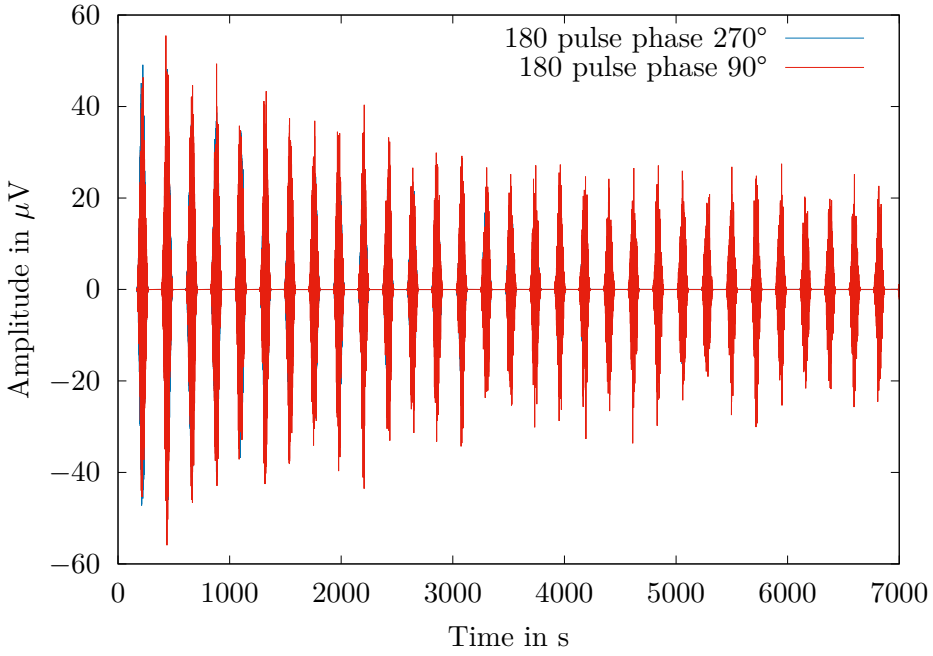

Figure 8.2: ask: what does pulse phase degree between 90° and 180° (or also between 180° and 180°) mean (Anleitung 9.)? Is it the time between the pulses?
difference between alternating and constant 180° pulse phase
we only have data for 180 pulse phase degrees in 270° and 90°, but those two are the same and this is good, but we don´t hae values for 180° example.
we didn´t make measurements about 90 pulse phase degree

9 Transversal relaxation measurements

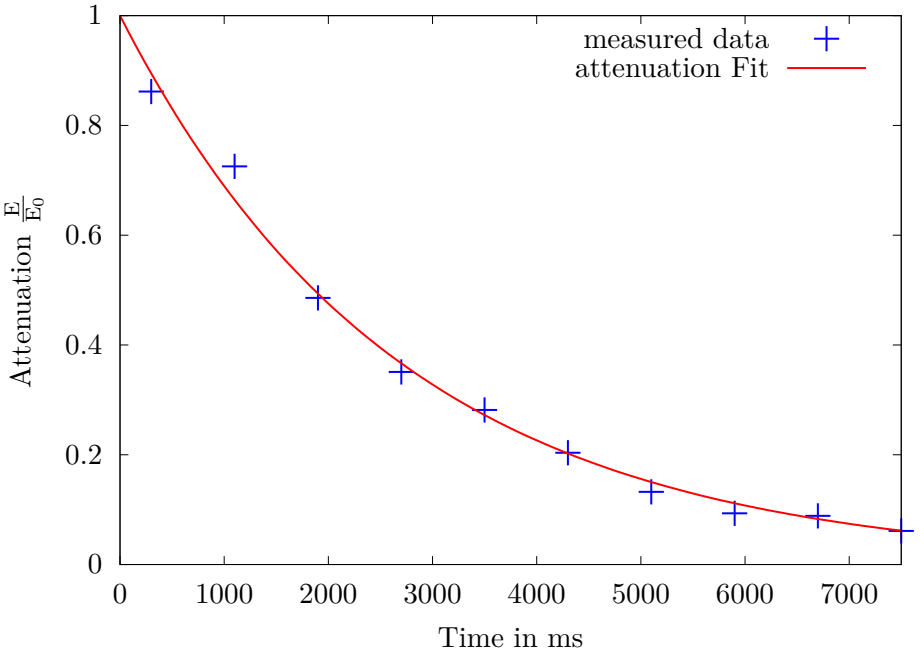

Figure 9.1: ask: why are two peaks visible in the magnitude spectrum?
normal FID-> T_2
$M(x) = M_0 \cdot exp(-x/T_2)$ with $T_2 = 2691\,06ms$

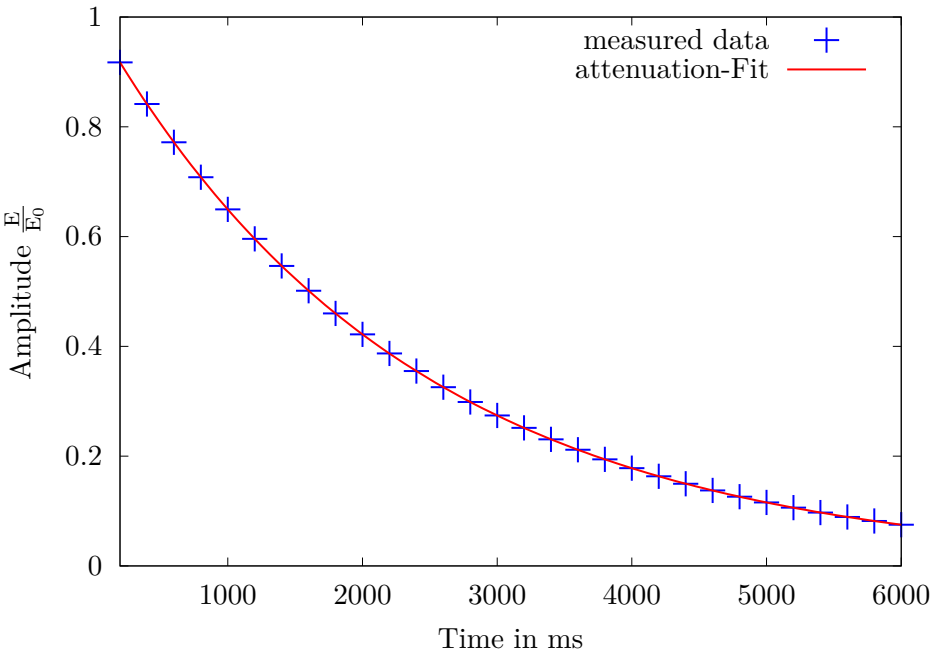

Figure 9.2: This is an CPMG with changeed values in the shimming; shimming value 0.45 x -> T_2^*.
Good to see that the T_2^* is here shorter than in the previous picture, due to inhomogeniousity of the magnetic field.
$M(x) = M_0 \cdot exp(-x/T_2)$ with $T_2 = 2317.76\,\text{ms}$

10 Fehlerdiskussion und Fazit

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