

Trieste Feb 2022 ready data

```
In [1]: import pandas as pd
import scipy.signal
import matplotlib.pyplot as plt
import math
import numpy as np
```

```
In [2]: #plt.rcParams.update(plt.rcParamsDefault)
plt.rcParams["figure.figsize"] = (8.26,6.66*1.1)
plt.rcParams['xtick.major.size'] = 10
plt.rcParams['xtick.major.width'] = 1
plt.rcParams['xtick.minor.size'] = 5
plt.rcParams['xtick.minor.width'] = 1
plt.rcParams['ytick.major.size'] = 10
plt.rcParams['ytick.major.width'] = 1
plt.rcParams['ytick.minor.size'] = 5
plt.rcParams['ytick.minor.width'] = 1
plt.rcParams['xtick.direction'] = 'in'
plt.rcParams['ytick.direction'] = 'in'
plt.rc(['xtick','ytick'], labelsiz = 20)
```

```
In [3]: path = r"C:\Users\MancaM\switchdrive\NCCR_CP4_Optical_Micromanipulation\Marco_Manca\
file_name = ["Marco"]
file_extension = ".csv"

df = pd.read_csv(path + file_name[0] + file_extension, sep = ",", decimal = '.', hea
df = df.iloc[10:1071]
```

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In [4]: df.iloc[:,360:372]
```

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Out[4]:
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	EM1PW_75_t5_1M_00000_ic	EM1PW_75_t5_1M_00001_ic	EM1PW_75_t5_1M_00002_ic	EM1PW_75_t5_1M_00003_ic
qa				
0.073375	102.44900	100.81000	101.11900	
0.080363	193.54600	192.29800	191.76600	
0.087351	169.26200	169.20000	167.96100	
0.094339	125.08800	123.02800	123.09100	
0.101327	93.45820	92.89780	92.37140	
...	
7.452810	2.31919	2.37196	2.27519	
7.459800	2.28903	2.33594	2.31170	
7.466780	2.16828	2.32505	2.36136	
7.473770	2.15588	2.39451	2.28835	
7.480760	2.62596	2.55852	2.29389	

1061 rows × 12 columns

```
In [5]: ratio = df.iloc[:,123]/df.iloc[:,371]
ratio
```

```
Out[5]: qa
0.073375    10.611167
0.080363    10.611205
0.087351    10.611201
0.094339    10.611177
0.101327    10.611169
...
7.452810    10.611174
7.459800    10.611137
7.466780    10.611146
7.473770    10.611154
7.480760    10.611149
Length: 1061, dtype: float64
```

```
In [6]: data = df.iloc[:,372:]
```

```
In [7]: df_W65 = pd.concat([df.iloc[:,372:373],df.iloc[:,377:378],df.iloc[:,382:383],df.iloc
df_W70 = pd.concat([df.iloc[:,373:374],df.iloc[:,378:379],df.iloc[:,383:384],df.iloc
df_W75 = pd.concat([df.iloc[:,374:375],df.iloc[:,380:381],df.iloc[:,384:385],df.iloc
df_F70 = pd.concat([df.iloc[:,375:376],df.iloc[:,379:380],df.iloc[:,385:386],df.iloc
df_ref = pd.concat([df.iloc[:,376:377],df.iloc[:,381:382],df.iloc[:,386:387],df.iloc
```

```
In [8]: df_F70
```

```
Out[8]:
```

	EM1PF70_t0_1M_av_ic	EM1PF70_t1_1M_av_ic	EM1PF75_t2_1M_av_ic	Em1PF70_t3_1M_av_ic
qa				
0.073375	424.80600	436.64000	408.71100	324.34500
0.080363	365.47200	415.19000	409.42500	410.72800
0.087351	290.10000	338.90600	337.24800	352.22500
0.094339	222.13300	258.48900	256.89200	269.56000
0.101327	171.88200	204.51900	200.21100	212.04000
...
7.452810	2.39179	2.33112	2.53550	2.47455
7.459800	2.39409	2.26631	2.57772	2.48009
7.466780	2.32003	2.33967	2.42697	2.63033
7.473770	2.27218	2.27594	2.45353	2.34061
7.480760	2.42368	2.41262	2.62071	2.35925

1061 rows × 6 columns



In [9]:

```

df_W65.columns = range(df_W65.columns.size)
df_W70.columns = range(df_W70.columns.size)
df_W75.columns = range(df_W75.columns.size)
df_F70.columns = range(df_F70.columns.size)

df_ref.columns = range(df_ref.columns.size)
W65 = pd.DataFrame(df_W65-df_ref)
W70 = pd.DataFrame(df_W70-df_ref)
W75 = pd.DataFrame(df_W75-df_ref)
F70 = pd.DataFrame(df_F70-df_ref)

fd3mh2_peak = [2.127876262800443, 1.3242448334997827, 1.9531737781698644, 3.37874605]
fd3m_peak = [2.127876262800443, 1.3242448334997827]
#h2 = [element * fd3mh2_peak[2] for element in [1,math.sqrt(3),2,math.sqrt(7),3]]
h2 = [element * fd3mh2_peak[2] for element in [1,math.sqrt(3),2]]
Fd3m = [element * fd3m_peak[1] for element in [1,math.sqrt(8/3),math.sqrt(11/3),2,ma
spacing = 2.5*10
M = 100
m = 0

```

In the following cells there are the graphs as used in the first attempt of the figures for the new paper that I sent to Stefan

In [10]:

```

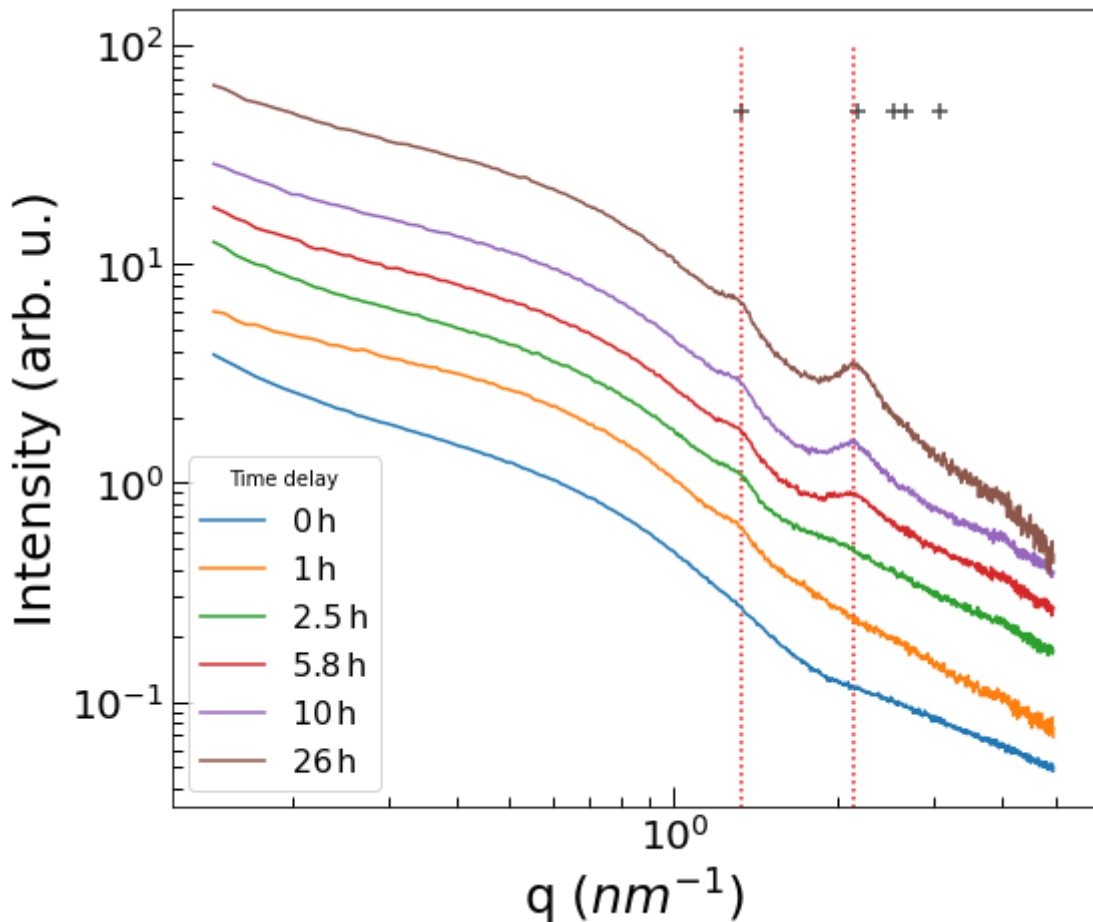
plt.vlines(fd3m_peak, m, M, color='r',linestyles='dotted', label="Extracted peaks")
plt.scatter(Fd3m, [M-2*spacing] * len(Fd3m), c='0.3', s=50, marker="+", label="Fd3

plt.plot(W65.iloc[10:700,0]*0.17)
plt.plot(W65.iloc[10:700,1]*0.4)
plt.plot(W65.iloc[10:700,2]*0.6)
plt.plot(W65.iloc[10:700,3]*1)
plt.plot(W65.iloc[10:700,4]*1.9)
plt.plot(W65.iloc[10:700,5]*5+0.2)

#plt.plot(W65.iloc[10:100,0])
#plt.plot(W65.iloc[10:100,1])
#plt.plot(W65.iloc[10:100,2])
#plt.plot(W65.iloc[10:100,3])
#plt.plot(W65.iloc[10:100,4])
#plt.plot(W65.iloc[10:100,5])
plt.ylabel("Intensity (arb. u.)", fontsize=25)
plt.xlabel("q ($nm^{-1}$)", fontsize=25)
plt.xscale('log')
plt.yscale('log')
#plt.legend(["$0$, $h$ $00$, $min$", "$1$, $h$ $14$, $min$", "$2$, $h$ $31$, $min$", "$5$, $h$ $48$, $
plt.legend(["$0$, $h$", "$1$, $h$", "$2.5$, $h$", "$5.8$, $h$", "$10$, $h$", "$26$, $h$"], fontsize=1

```

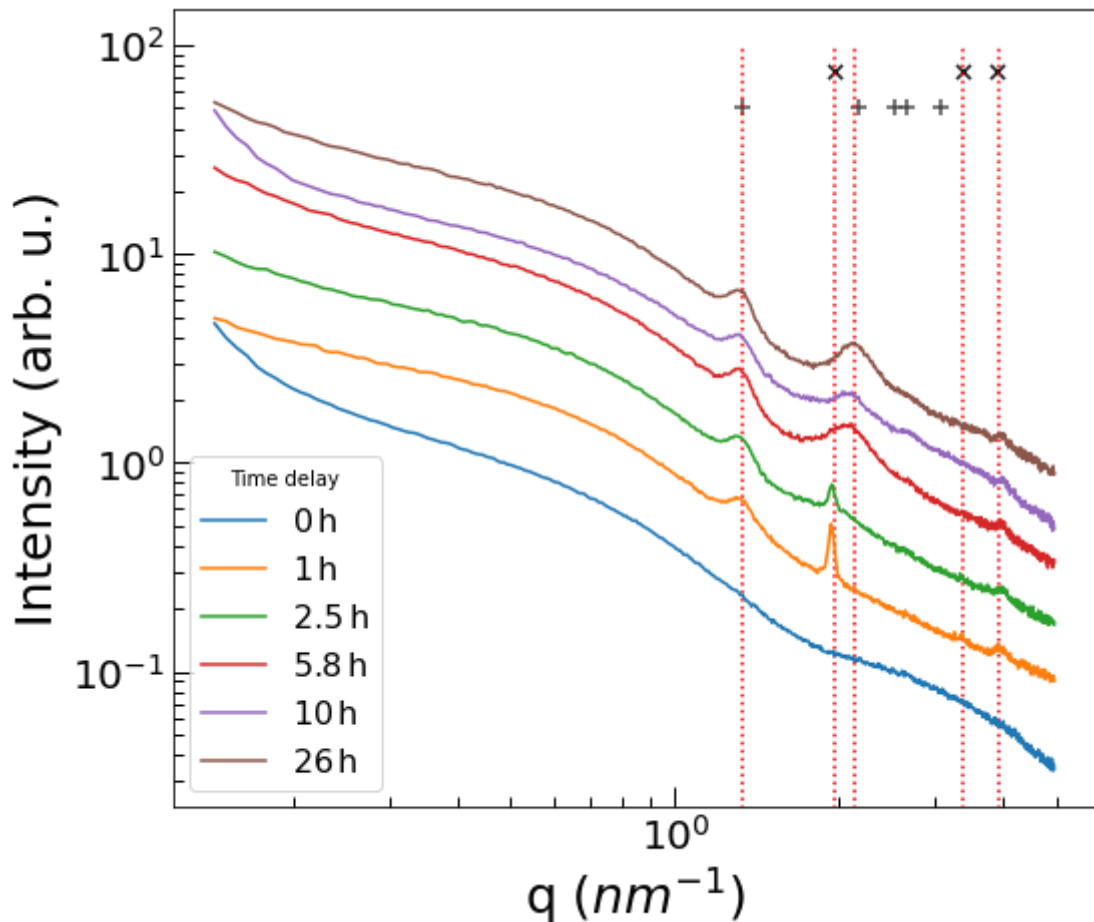
Out[10]: <matplotlib.legend.Legend at 0x14c89eac9a0>



```
In [11]: plt.vlines(fd3mh2_peak, m, M, color='r',linestyles='dotted', label="Extracted peaks
plt.scatter(h2, [M-spacing] * len(h2), c='0.1', marker="x", s=50, label="h2")
plt.scatter(Fd3m, [M-2*spacing] * len(Fd3m), c='0.3', s=50, marker="+", label="Fd3

plt.plot(W70.iloc[10:700,0]*0.17)
plt.plot(W70.iloc[10:700,1]*0.3)
plt.plot(W70.iloc[10:700,2]*0.6)
plt.plot(W70.iloc[10:700,3]*1.3)
plt.plot(W70.iloc[10:700,4]*2.4+0.3)
plt.plot(W70.iloc[10:700,5]*3.4)
plt.ylabel("Intensity (arb. u.)", fontsize=25)
plt.xlabel("q ( $\text{nm}^{-1}$ )", fontsize=25)
plt.xscale('log')
plt.yscale('log')
#plt.Legend(["$0$, $h$ $00$, $min", "$1$, $h$ $13$, $min", "$2$, $h$ $30$, $min", "$5$, $h$ $48$, $
plt.legend(["$0$, $h", "$1$, $h", "$2.5$, $h", "$5.8$, $h", "$10$, $h", "$26$, $h"], fontsize=1
```

```
Out[11]: <matplotlib.legend.Legend at 0x14c8a26ee80>
```



```

In [12]: plt.vlines(fd3mh2_peak, m , M, color='r',linestyles='dotted', label="Extracted peaks
plt.scatter(h2, [M-spacing] * len(h2) , c='0.1', marker="x", s=50, label="h2")
plt.scatter(Fd3m, [M-2*spacing] * len(Fd3m) , c='0.3', s=50, marker="+", label="Fd3

plt.plot(W75.iloc[10:600,0]*0.17+1)
plt.plot(W75.iloc[10:600,1]*0.3+1)
plt.plot(W75.iloc[10:600,2]*0.6+1)
plt.plot(W75.iloc[10:600,3]*1.3+1.3)
plt.plot(W75.iloc[10:600,4]*2.3+1)
plt.plot(W75.iloc[10:600,5]*3+1)

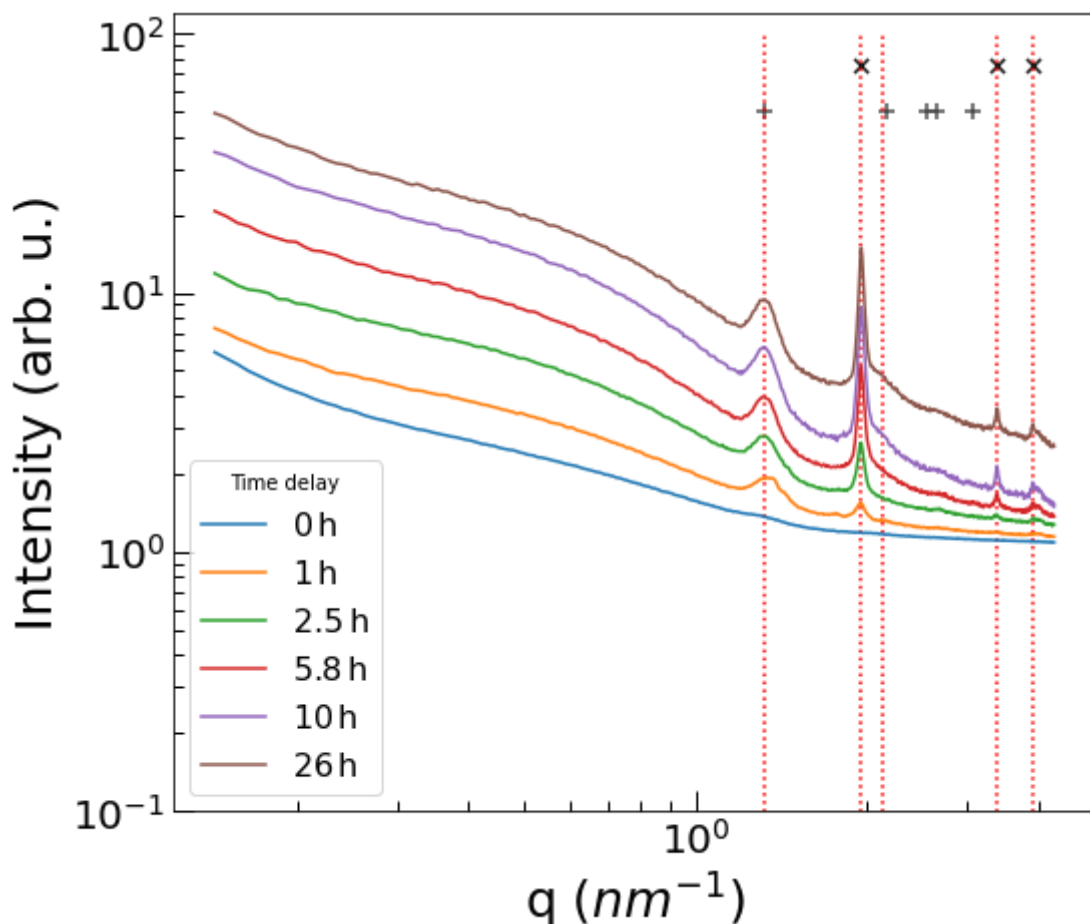
plt.ylim((0.1,120))
plt.ylabel("Intensity (arb. u.)", fontsize=25)
plt.xlabel("q (nm-1)", fontsize=25)
plt.xscale('log')
plt.yscale('log')
#plt.legend(["$0$, $h $00$, $min", "$1$, $h $14$, $min", "$2$, $h $28$, $min", "$5$, $h $45$, $
plt.legend(["$0$, $h", "$1$, $h", "$2.5$, $h", "$5.8$, $h", "$10$, $h", "$26$, $h"], fontsize=1

```

```

Out[12]: <matplotlib.legend.Legend at 0x14c8a25f4c0>

```

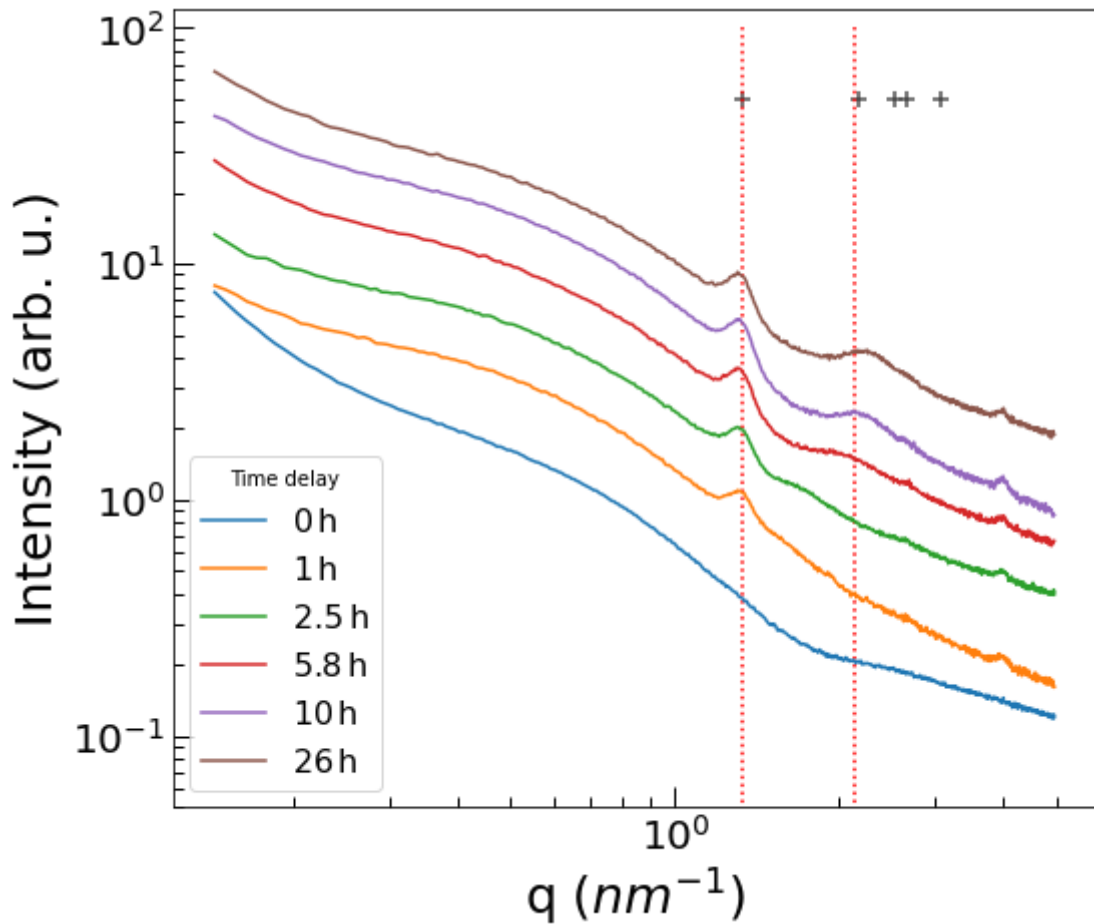


```
In [13]: plt.vlines(fd3m_peak, m , M, color='r',linestyles='dotted', label="Extracted peaks")
plt.scatter(Fd3m, [M-2*spacing] * len(Fd3m) , c='0.3', s=50, marker="+", label="Fd3
```

```
plt.plot(F70.iloc[10:700,0]*0.17)
plt.plot(F70.iloc[10:700,1]*0.4)
plt.plot(F70.iloc[10:700,2]*0.6)
plt.plot(F70.iloc[10:700,3]*1.1)
plt.plot(F70.iloc[10:700,4]*2.3)
plt.plot(F70.iloc[10:700,5]*3)

plt.ylim((0.05,120))
plt.ylabel("Intensity (arb. u.)", fontsize=25)
plt.xlabel("q (nm-1)", fontsize=25)
plt.xscale('log')
plt.yscale('log')
#plt.legend(["$0$, $h$ $00$, $min", "$1$, $h$ $09$, $min", "$2$, $h$ $29$, $min", "$5$, $h$ $47$, $
plt.legend(["$0$, $h", "$1$, $h", "$2.5$, $h", "$5.8$, $h", "$10$, $h", "$26$, $h"], fontsize=1
```

```
Out[13]: <matplotlib.legend.Legend at 0x14c8cd51790>
```

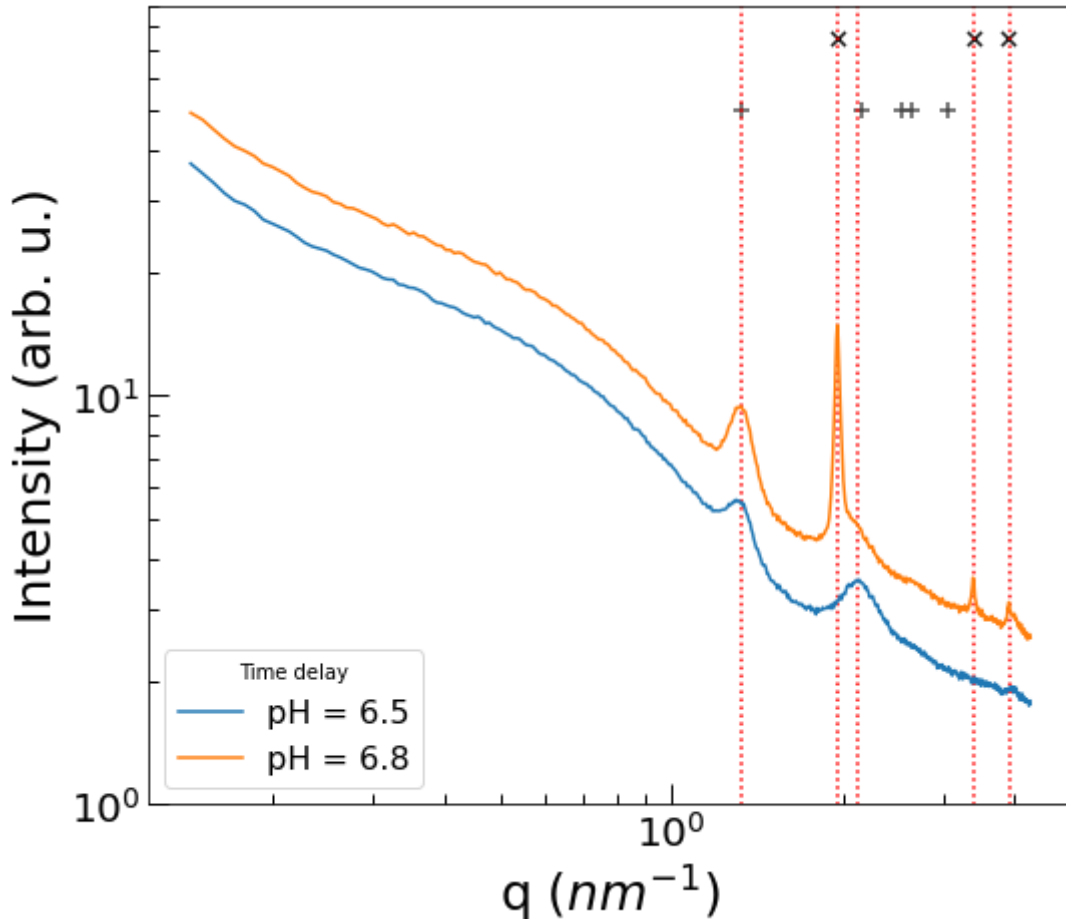


```
In [14]: plt.vlines(fd3mh2_peak, m , M, color='r',linestyles='dotted', label="Extracted peaks
plt.scatter(h2, [M-spacing] * len(h2) , c='0.1', marker="x", s=50, label="h2")
plt.scatter(Fd3m, [M-2*spacing] * len(Fd3m) , c='0.3', s=50, marker="+", label="Fd3

plt.plot(W70.iloc[10:600,5]*2.3+1)
plt.plot(W75.iloc[10:600,5]*3+1)

plt.ylim((1,90))
plt.ylabel("Intensity (arb. u.)", fontsize=25)
plt.xlabel("q ($nm^{-1}$)", fontsize=25)
plt.xscale('log')
plt.yscale('log')
plt.legend(["pH = 6.5", "pH = 6.8"], fontsize=16, title="Time delay", loc='lower left
```

```
Out[14]: <matplotlib.legend.Legend at 0x14c8ccf7f40>
```



In [81]:

```

plt.rcParams['xtick.major.size'] = 25
plt.rcParams['xtick.major.width'] = 3
plt.rcParams['xtick.minor.size'] = 12
plt.rcParams['xtick.minor.width'] = 3
plt.rcParams['ytick.major.size'] = 25
plt.rcParams['ytick.major.width'] = 3
plt.rcParams['ytick.minor.size'] = 12
plt.rcParams['ytick.minor.width'] = 3
plt.rcParams['xtick.direction'] = 'in'
plt.rcParams['ytick.direction'] = 'in'
plt.rcParams['axes.linewidth'] = 2
plt.rcParams['axes.labelpad'] = 10
plt.rc(['xtick','ytick'], labelsz = 60)

fig, ((ax0),(ax1),(ax2)) = plt.subplots(1, 3 , figsize=(8.26*2*3 , 7.326*4))
plt.subplots_adjust(wspace=0, hspace=0)
font={'family': 'garamond'}

ax0.set_title('$pH = 7.0$', fontsize=60)
ax0.vlines(fd3mh2_peak, m , M, color='r',linestyles='dotted', label="Extracted peaks
ax0.scatter(h2, [M-spacing] * len(h2) , c='0.1', marker='x', s=500, linewidths=4, la
ax0.scatter(Fd3m, [M-2*spacing] * len(Fd3m) , c='0.3', s=600, linewidths=4, marker=
ax0.plot(W70.iloc[10:700,0]*0.17, linewidth=6)
ax0.plot(W70.iloc[10:700,1]*0.3, linewidth=6)
ax0.plot(W70.iloc[10:700,2]*0.6, linewidth=6)
ax0.plot(W70.iloc[10:700,3]*1.3, linewidth=6)
ax0.plot(W70.iloc[10:700,4]*2.4+0.3, linewidth=6)
ax0.plot(W70.iloc[10:700,5]*3.4, linewidth=6)
ax0.set_ylim((0.05,120))
ax0.set_ylabel("Intensity (arb. u.)", fontsize=60)
#ax0.set_xlabel("q ($nm^{-1}$)", fontsize=25)
ax0.set_xscale('log')
ax0.set_yscale('log')

```



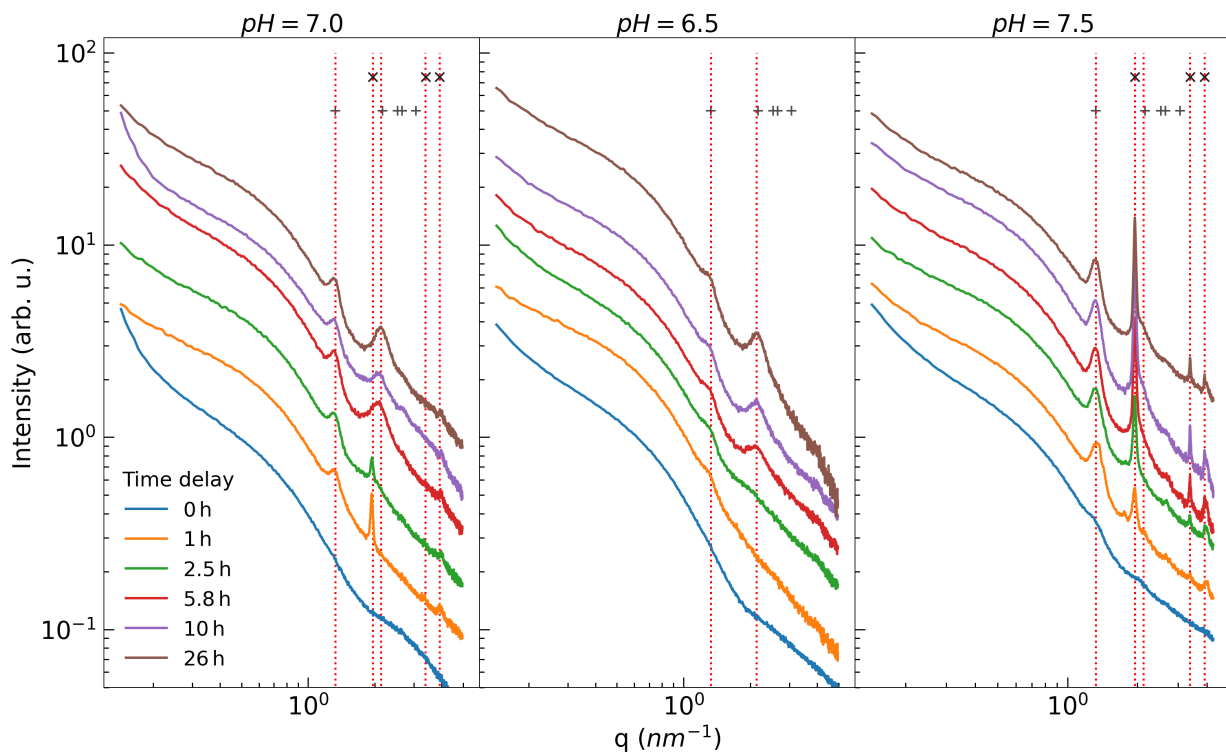
```

ax0.legend(["$0\,$h", "$1\,$h", "$2.5\,$h", "$5.8\,$h", "$10\,$h", "$26\,$h"],
           fontsize=50, title="Time delay", title_fontsize=50, loc='lower left', fra
ax0.tick_params(axis='both', which='major', pad=20)

ax1.set_title('$pH = 6.5$', fontsize=60)
ax1.vlines(fd3m_peak, m, M, color='r', linestyle='dotted', label="Extracted peaks",
ax1.scatter(Fd3m, [M-2*spacing] * len(Fd3m), c='0.3', s=600, linewidths=4, marker=
ax1.plot(W65.iloc[10:700,0]*0.17, linewidth=6)
ax1.plot(W65.iloc[10:700,1]*0.4, linewidth=6)
ax1.plot(W65.iloc[10:700,2]*0.6, linewidth=6)
ax1.plot(W65.iloc[10:700,3]*1, linewidth=6)
ax1.plot(W65.iloc[10:700,4]*1.9, linewidth=6)
ax1.plot(W65.iloc[10:700,5]*5+0.2, linewidth=6)
ax1.set_ylim((0.05,120))
#ax1.set_ylabel("Intensity (arb. u.)", fontsize=25)
ax1.set_xlabel("q ($nm^{-1})$", fontsize=60)
ax1.set_xscale('log')
ax1.set_yscale('log')
ax1.tick_params('y', labelleft=False)
#ax1.legend(["$0\,$h", "$1\,$h", "$2.5\,$h", "$5.8\,$h", "$10\,$h", "$26\,$h"],
#           fontsize=50, title="Time delay", title_fontsize=50, loc='lower left', fr
ax1.tick_params(axis='both', which='major', pad=20)

ax2.set_title('$pH = 7.5$', fontsize=60)
ax2.vlines(fd3mh2_peak, m, M, color='r', linestyle='dotted', label="Extracted peak
ax2.scatter(h2, [M-spacing] * len(h2), c='0.1', marker="x", s=500, linewidths=4, la
ax2.scatter(Fd3m, [M-2*spacing] * len(Fd3m), c='0.3', s=600, linewidths=4, marker=
ax2.plot(W75.iloc[10:600,0]*0.17, linewidth=6)
ax2.plot(W75.iloc[10:600,1]*0.3, linewidth=6)
ax2.plot(W75.iloc[10:600,2]*0.6, linewidth=6)
ax2.plot(W75.iloc[10:600,3]*1.3+0.25, linewidth=6)
ax2.plot(W75.iloc[10:600,4]*2.3, linewidth=6)
ax2.plot(W75.iloc[10:600,5]*3, linewidth=6)
ax2.set_ylim((0.05,120))
#ax2.set_ylabel("Intensity (arb. u.)", fontsize=25)
#ax2.set_xlabel("q ($nm^{-1})$", fontsize=25)
ax2.set_xscale('log')
ax2.set_yscale('log')
ax2.tick_params('y', labelleft=False)
#ax2.legend(["$0\,$h", "$1\,$h", "$2.5\,$h", "$5.8\,$h", "$10\,$h", "$26\,$h"],
#           fontsize=50, title="Time delay", title_fontsize=50, loc='lower left', fr
ax2.tick_params(axis='both', which='major', pad=20)

```



In []: