exp_michelson

June 23, 2023

[ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sn
```

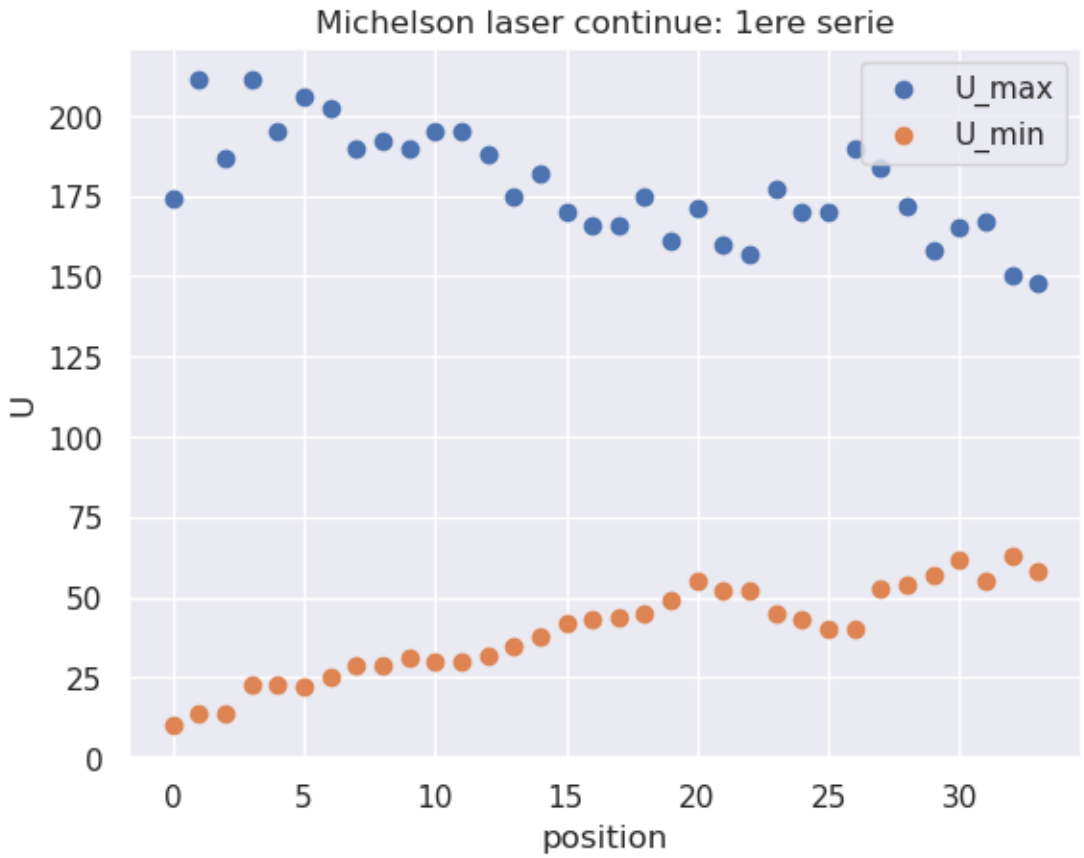
[ ]:
```
continue_data_1 = pd.read_csv("data_HeNe_michelson.csv")
continue_data_2 = pd.read_csv("data2_HeNe_michelson.csv")
continue_data_3 = pd.read_csv('HeNe_continue_michelson_7.csv')
pulsed_data = pd.read_csv("data_pulse_michelson.csv")
pulsed_data_2 = pd.read_csv('HeNe_pulse_michelson_2_slow_method.csv')
pulsed_data_3 = pd.read_csv('pulse_michelson_3.csv')
pulsed_data_filtre = pd.read_csv('pulse_michelson_filtrage.csv')
```

[ ]:
```
x_1 = continue_data_1["x"]
x_2 = continue_data_2["x"]
x_3 = continue_data_3['position']
x_p = pulsed_data["x"]
x_p_2 = pulsed_data_2['position']
x_p_3 = pulsed_data_3['position']
x_p_f = pulsed_data_filtre['position']

U_max_1 = continue_data_1['Umax']
U_min_1 = continue_data_1['Umin']
U_max_2 = continue_data_2['Umax']
U_min_2 = continue_data_2['Umin']
U_max_p = pulsed_data['Umax']
U_min_p = pulsed_data['Umin']
U_max_3 = continue_data_3['u_max']
U_min_3 = continue_data_3['u_min']
U_max_p_2 = pulsed_data_2['u_max']
U_min_p_2 = pulsed_data_2['u_min']
U_min_p_3 = pulsed_data_3['u_min']
U_max_p_3 = pulsed_data_3['u_max']
U_min_p_f = pulsed_data_filtre['u_min']
U_max_p_f = pulsed_data_filtre['u_max']
```

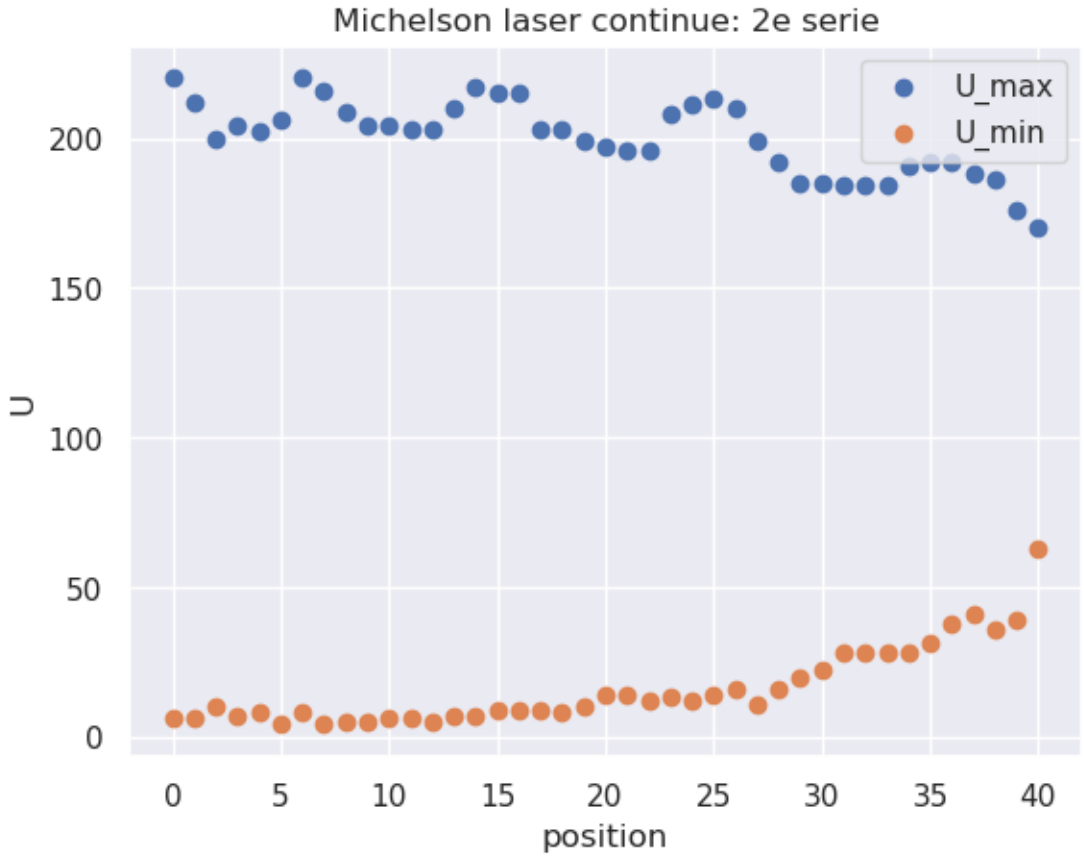
[ ]:
```
n = 0

sn.set()
plt.figure(n)
plt.scatter(x_1, U_max_1, label='U_max')
plt.scatter(x_1, U_min_1, label='U_min')
plt.title('Michelson laser continue: 1ere serie')
plt.xlabel('position')
plt.ylabel('U')
plt.legend()
plt.show()
sn.set_style("white")
n=n+1
```



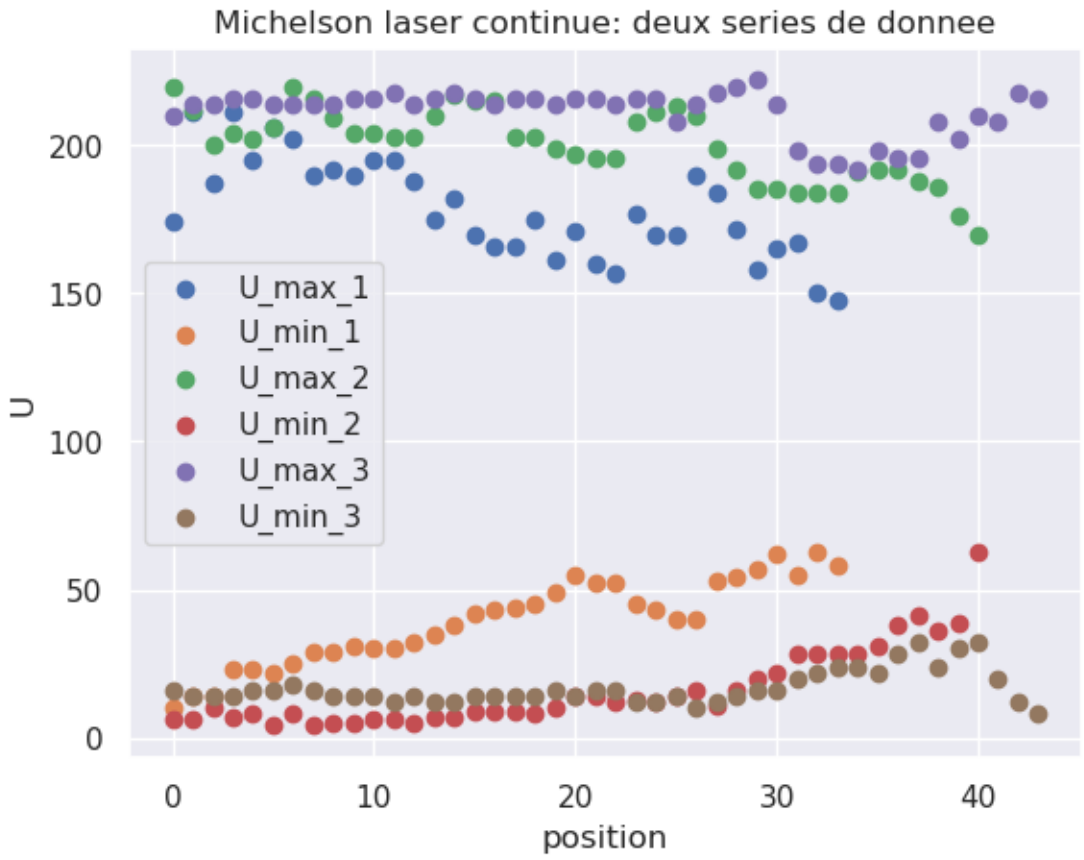
[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_2, U_max_2, label='U_max')
plt.scatter(x_2, U_min_2, label='U_min')
plt.title('Michelson laser continue: 2e serie')
```

```
plt.xlabel('position')
plt.ylabel('U')
plt.legend()
plt.show()
sn.set_style("white")
n=n+1
```

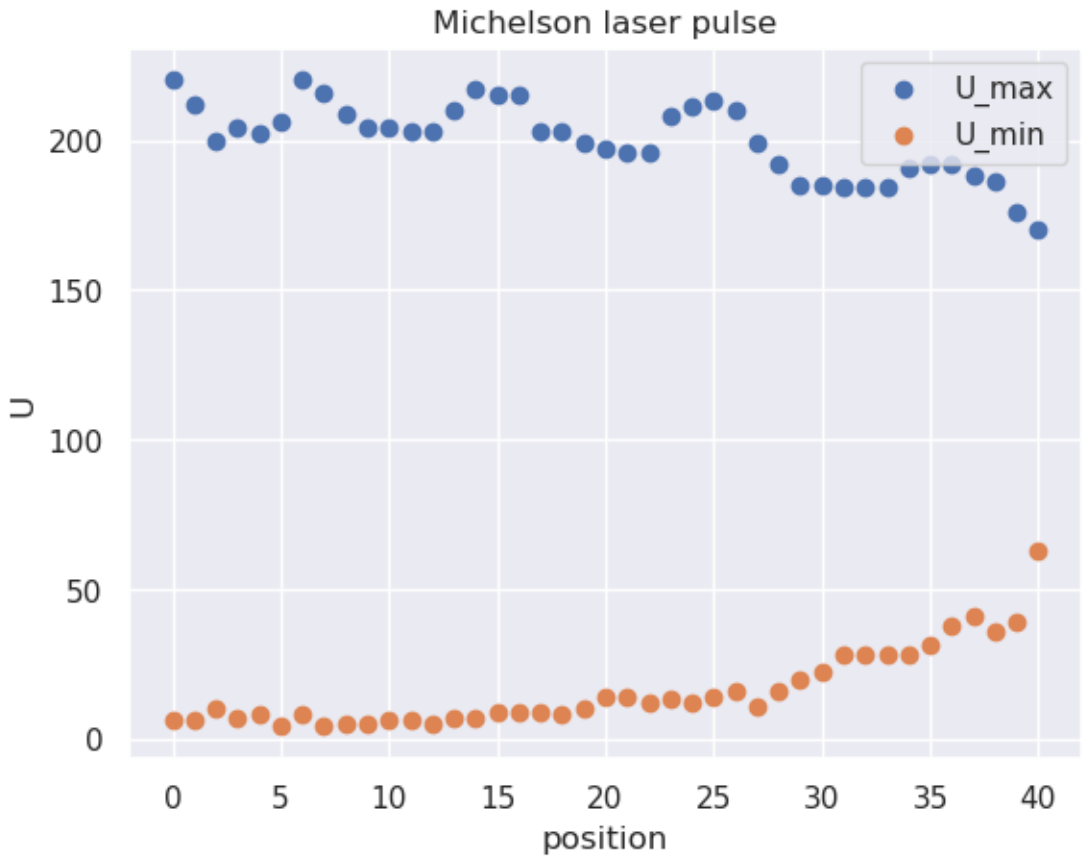


[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_1, U_max_1, label='U_max_1')
plt.scatter(x_1, U_min_1, label='U_min_1')
plt.scatter(x_2, U_max_2, label='U_max_2')
plt.scatter(x_2, U_min_2, label='U_min_2')
plt.scatter(x_3, U_max_3, label='U_max_3')
plt.scatter(x_3, U_min_3, label='U_min_3')
plt.title('Michelson laser continue: deux series de donnee')
plt.xlabel('position')
plt.ylabel('U')
plt.legend()
```

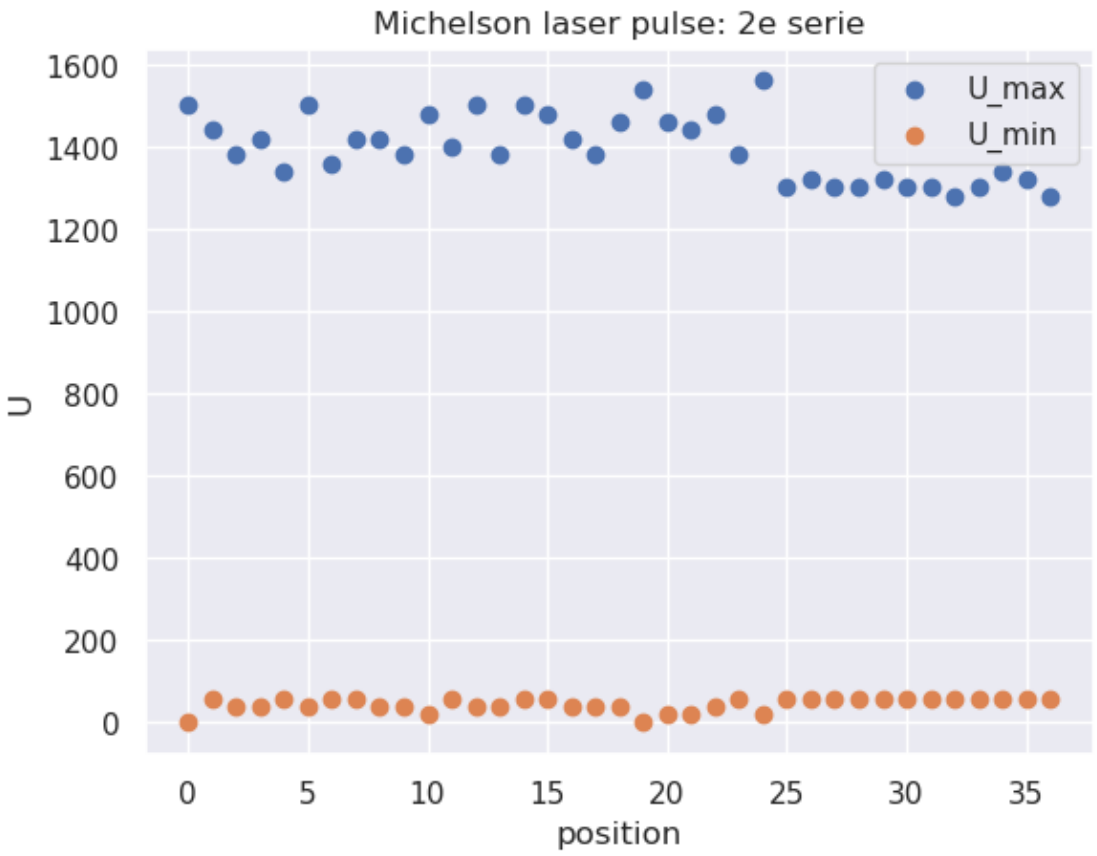
```
plt.show()
sn.set_style("white")
n=n+1
```



[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_p, U_max_p, label='U_max')
plt.scatter(x_p, U_min_p, label='U_min')
plt.title('Michelson laser pulse')
plt.xlabel('position')
plt.ylabel('U')
plt.legend()
plt.show()
sn.set_style("white")
n=n+1
```



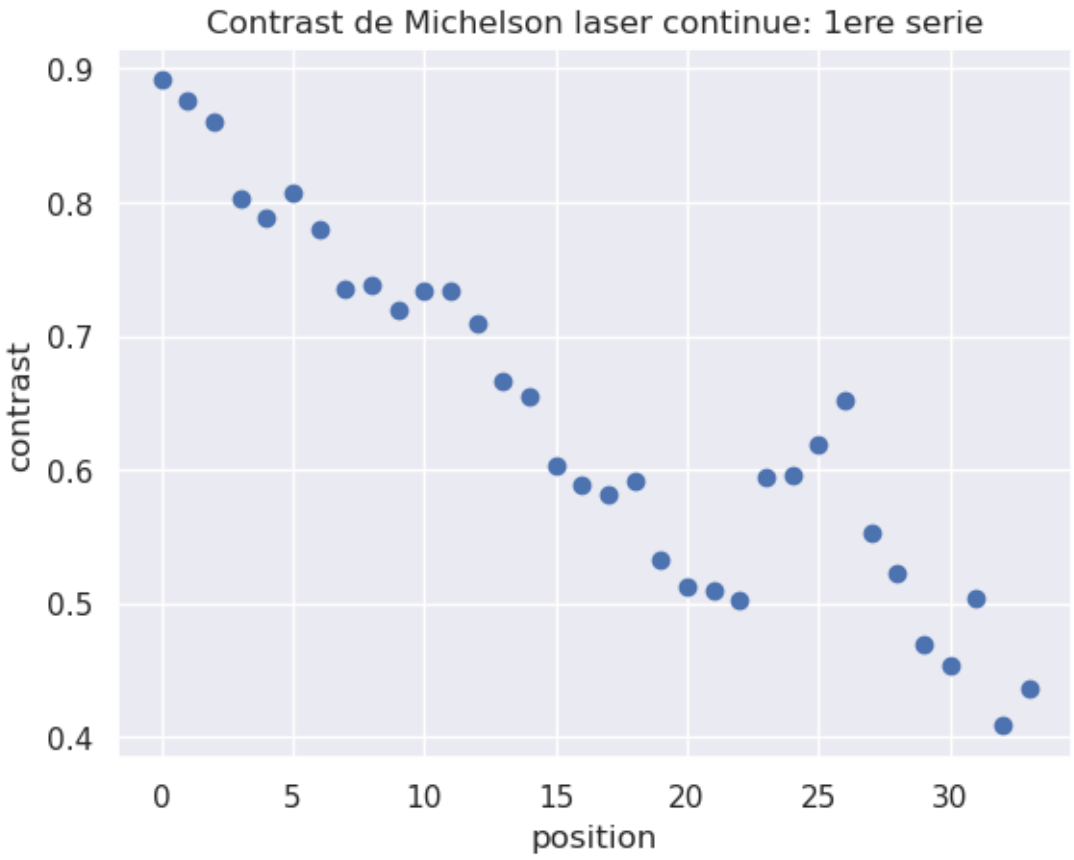
[ ]:
```
pusle_data_2_minimum = -1*np.min(U_min_p_2)
sn.set()
plt.figure(n)
plt.scatter(x_p_2, U_max_p_2+pusle_data_2_minimum, label='U_max')
plt.scatter(x_p_2, U_min_p_2+pusle_data_2_minimum, label='U_min')
plt.title('Michelson laser pulse: 2e serie')
plt.xlabel('position')
plt.ylabel('U')
plt.legend()
plt.show()
sn.set_style("white")
n=n+1
```



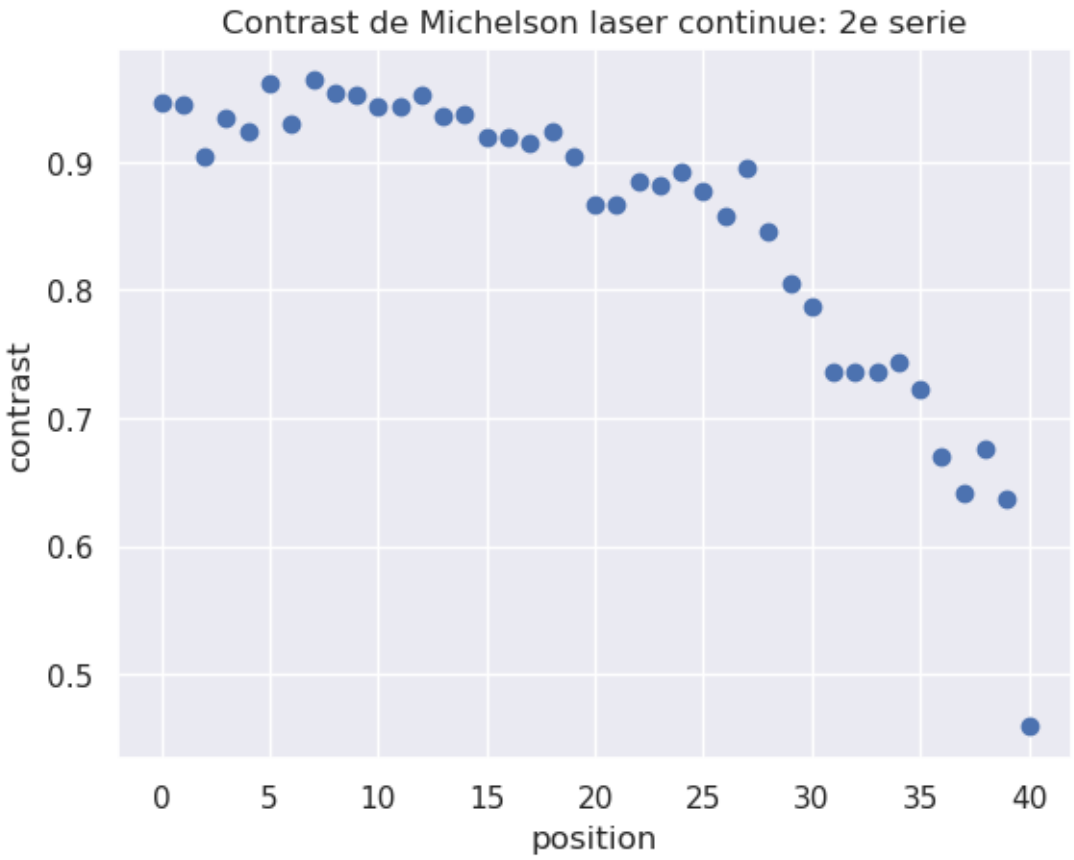
[ ]:
```
contrast_cont_1 = (U_max_1 - U_min_1)/(U_max_1+U_min_1)
contrast_cont_2 = (U_max_2 - U_min_2)/(U_max_2+U_min_2)
contrast_cont_3 = (U_max_3 - U_min_3)/(U_max_3+U_min_3)
contrast_cont_p = (U_max_p - U_min_p)/(U_max_p+U_min_p)
#contrast_cont_p_2 = ((U_max_p_2+pusle_data_2_minimum) -␣
 ↪(U_min_p_2+pusle_data_2_minimum))/
 ↪((U_max_p_2+pusle_data_2_minimum)+(U_min_p_2+pusle_data_2_minimum))
contrast_cont_p_2 = np.empty([len(U_max_p_2)])
for i in range(len(U_max_p_2)):
    contrast_cont_p_2[i] = ((U_max_p_2[i]+pusle_data_2_minimum) -␣
 ↪(U_min_p_2[i]+pusle_data_2_minimum))/
 ↪((U_max_p_2[i]+pusle_data_2_minimum)+(U_min_p_2[i]+pusle_data_2_minimum))
```

[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_1, contrast_cont_1)
plt.title('Contrast de Michelson laser continue: 1ere serie')
plt.xlabel('position')
plt.ylabel('contrast')
```

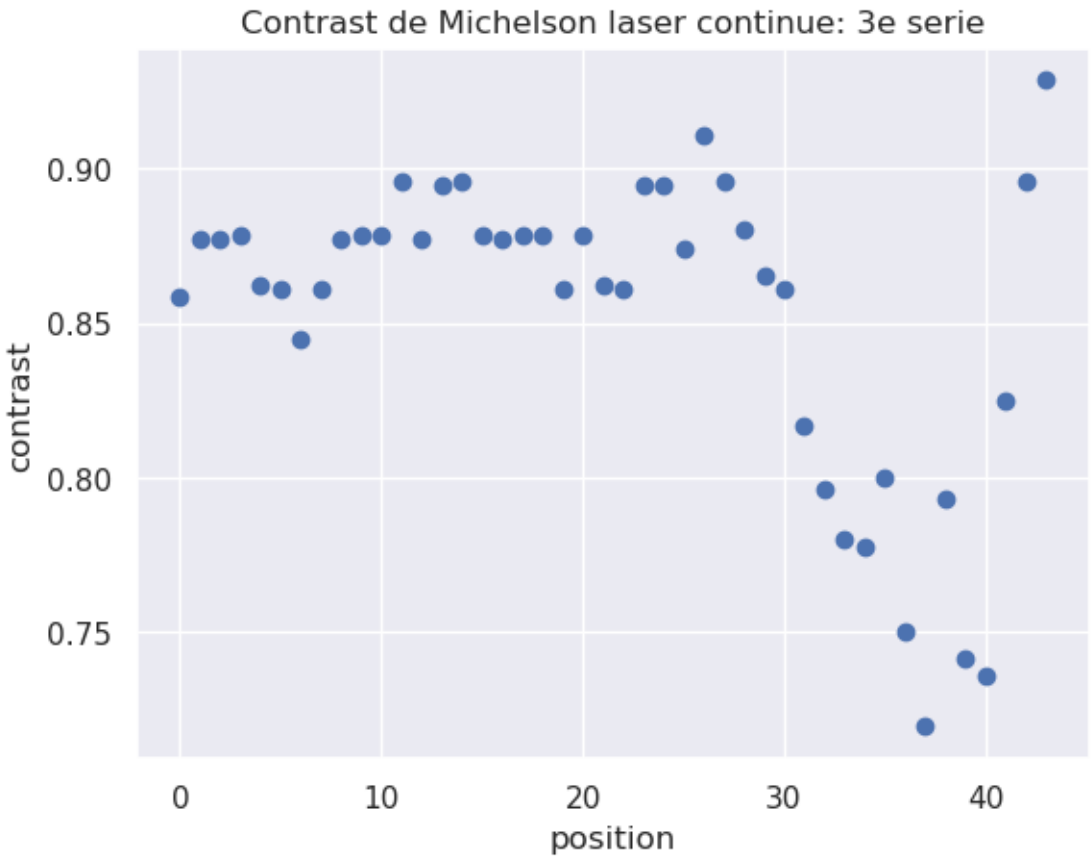
```
plt.show()
sn.set_style("white")
n=n+1
```



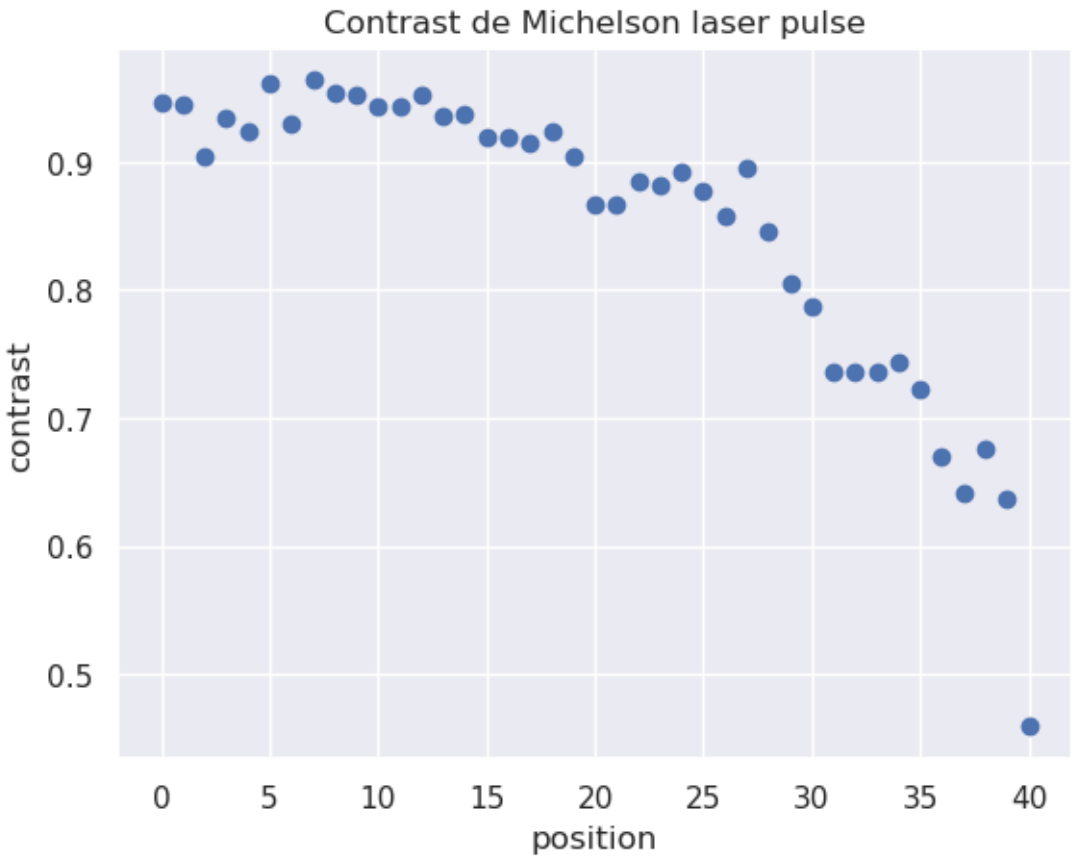
[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_2, contrast_cont_2)
plt.title('Contrast de Michelson laser continue: 2e serie')
plt.xlabel('position')
plt.ylabel('contrast')
plt.show()
sn.set_style("white")
n=n+1
```



[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_3, contrast_cont_3)
plt.title('Contrast de Michelson laser continue: 3e serie')
plt.xlabel('position')
plt.ylabel('contrast')
plt.show()
sn.set_style("white")
n=n+1
```

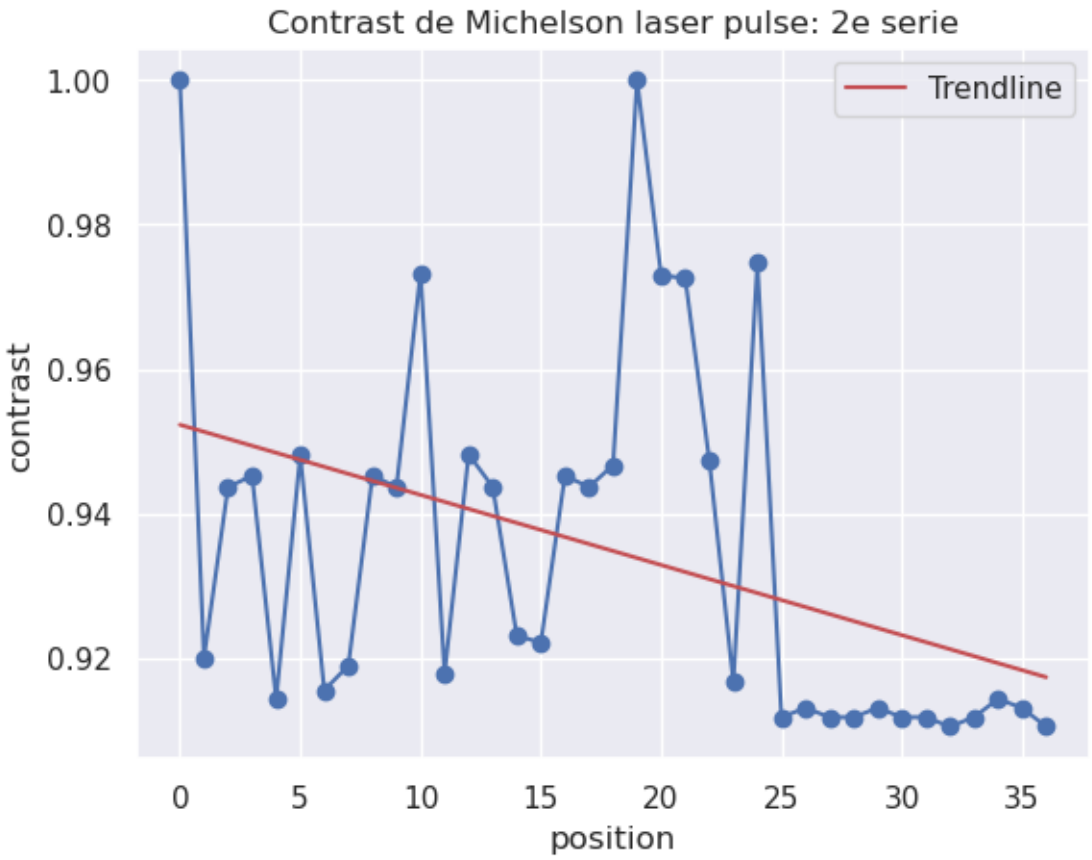


[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_p, contrast_cont_p)
plt.title('Contrast de Michelson laser pulse')
plt.xlabel('position')
plt.ylabel('contrast')
plt.show()
sn.set_style("white")
n=n+1
```



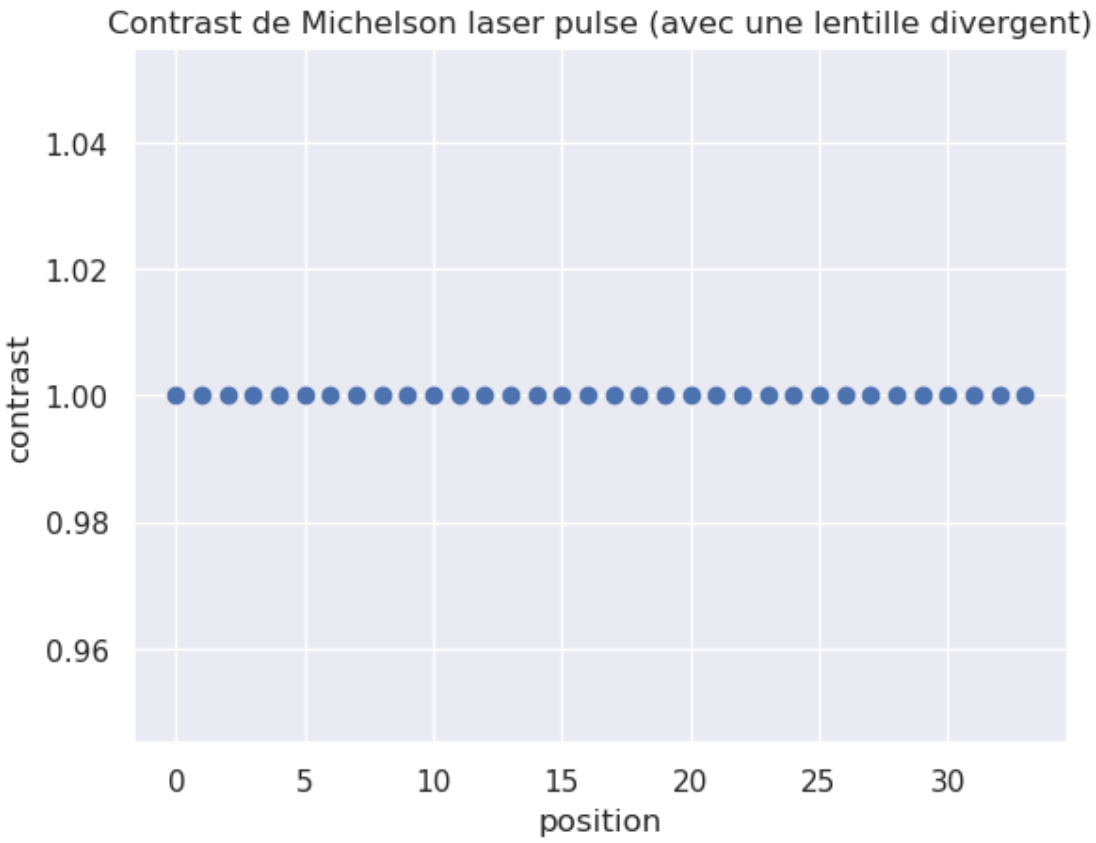
[ ]:
```
coefficients = np.polyfit(x_p_2, contrast_cont_p_2, 1)
trendline_x = np.array([np.min(x_p_2), np.max(x_p_2)])
trendline_y = np.polyval(coefficients, trendline_x)

sn.set()
plt.figure(n)
#plt.scatter(x_p_2, contrast_cont_p_2)
plt.plot(x_p_2, contrast_cont_p_2, '-o')
plt.plot(trendline_x, trendline_y, c='r', label='Trendline')
plt.title('Contrast de Michelson laser pulse: 2e serie')
plt.xlabel('position')
plt.ylabel('contrast')
plt.legend()
plt.show()
sn.set_style("white")
n=n+1
```



[ ]:
```
pusle_data_3_minimum = -1*np.min(U_min_p_3)
contrast_cont_p_3 = np.empty([len(U_max_p_3)])
for i in range(len(U_max_p_3)):
    contrast_cont_p_3[i] = ((U_max_p_3[i]+pusle_data_3_minimum) -␣
 ↪(U_min_p_3[i]+pusle_data_3_minimum))/
 ↪((U_max_p_3[i]+pusle_data_3_minimum)+(U_min_p_3[i]+pusle_data_3_minimum))
```

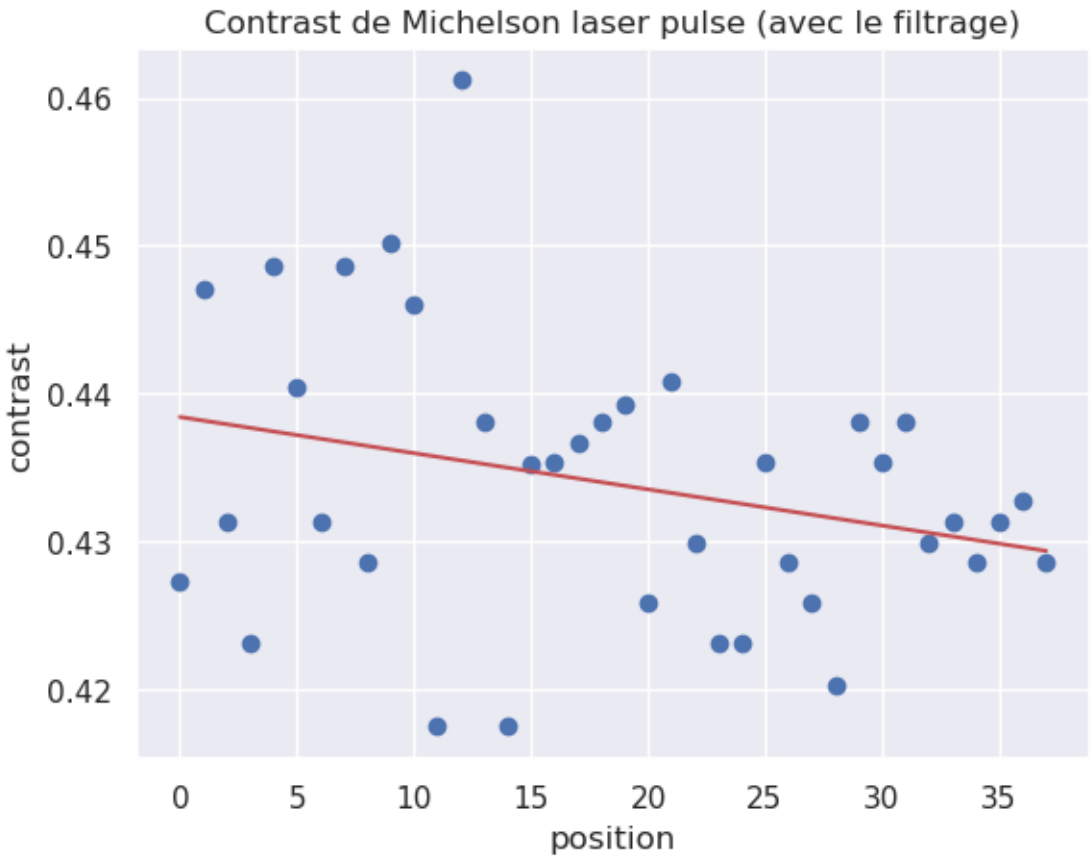
[ ]:
```
sn.set()
plt.figure(n)
plt.scatter(x_p_3, contrast_cont_p_3)
plt.title('Contrast de Michelson laser pulse (avec une lentille divergent)')
plt.xlabel('position')
plt.ylabel('contrast')
plt.show()
sn.set_style("white")
n=n+1
```



[ ]:
```
contrast_cont_p_f = (U_max_p_f - U_min_p_f)/(U_max_p_f+U_min_p_f)
```

[ ]:
```
coefficients = np.polyfit(x_p_f, contrast_cont_p_f, 1)
trendline_x = np.array([np.min(x_p_f), np.max(x_p_f)])
trendline_y = np.polyval(coefficients, trendline_x)

sn.set()
plt.figure(n)
plt.scatter(x_p_f, contrast_cont_p_f)
plt.plot(trendline_x, trendline_y, c='r', label='Trendline')
plt.title('Contrast de Michelson laser pulse (avec le filtrage)')
plt.xlabel('position')
plt.ylabel('contrast')
plt.show()
sn.set_style("white")
n=n+1
```


Contrast de Michelson laser pulse (avec le filtrage)
contrast
position
0.46
0.45
0.44
0.43
0.42
0
5
10
15
20
25
30
35

[ ]: