```python
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import scipy
from uncertainties import ufloat
import toolkit as tk


nm2m = 1e-9
m2nm = 1e9

# Constants
LAM0_n = 284.6*nm2m # meters
LAM0_u = 0.4*nm2m # meters

LAM0 = (LAM0_n, LAM0_u)


def load_data(path):
    df = pd.read_csv(path).dropna()

    return df


def equation(lam, m, b):
    return m/(lam + LAM0[0]) + b


def analyze(df_scope, df_wvlen, nm):
    # Average out scope values

    df = pd.DataFrame()
    df['reading'] = df_scope.groupby('color')['reading'].mean()
    df['uncert'] = df_scope.groupby('color')['reading'].std()

    df['wavelength'] = df_wvlen.set_index('color')['wavelength']

    df.dropna(inplace=True)

    df.plot(x='wavelength', y='reading', kind='scatter')


    plt.show()

    print(df, nm)

    plot(df, nm)


def plot(df, nm):
    meta = {'title':f'Spectrascope Data {nm}',
            'xlabel':'Wavelength',
            'ylabel':'Readings',
            'data-label':'Measurements',
            'fit-label':r'$\frac{m}{\lambda+\lambda_0} + b$',
            'loc':'upper right',
            'save-name':'spec-ideal'}

    data = tk.curve_fit_data(df['wavelength'], df['reading'], fit_type='custom',
                             model_function_custom=equation, chi=True, res=True,
                             uncertainty=df['uncert'], guess=(5e3, 3e-1))
```

```
    tk.quick_plot_residuals(df['wavelength'], df['reading'],
                            data['graph-horz'], data['graph-vert'],
                            data['residuals'], uncertainty=df['uncert'],
                            meta=meta)


    plt.show()



if __name__ == '__main__':
    df_H_scope = load_data('../Data/ExpB-H-2025.02.03-1.csv')
    df_H_wvlen = load_data('../Data/ExpB-H-2025.02.03-2.csv')

    analyze(df_H_scope, df_H_wvlen, 'Hydrogen')

    df_He_scope = load_data('../Data/ExpB-He-2025.02.03-1.csv')
    df_He_wvlen = load_data('../Data/ExpB-He-2025.02.03-2.csv')

    df_He_scope['color'].replace({'red2':'red'}, inplace=True)

    analyze(df_He_scope, df_He_wvlen, 'Helium')
```