60-60-86-6-beta-10.80-twist-1

November 4, 2024

```python
[65]: %load_ext autoreload
      %autoreload 2
      from modules import read_and_write
      from modules import polyakov
      from modules import utility
      from modules import fourier_surface
      from modules import surface_amplitudes as sf
      from modules import globals
      import pandas as pd
      import numpy as np
      import os
      import glob
      indices = None
      surface_tension_dict = {}
```

The autoreload extension is already loaded. To reload it, use:
  %reload_ext autoreload

For reference with integration method the following surface tensions were computed

z_1: $\alpha_{o-o}/T^3(\beta = 10.85) = 1.2316804724774406$

z_2: $\alpha_{o-o}/T^3(\beta = 10.85) = 1.5433288477348852$

1 Load data

```python
[66]: folders = utility.list_all_folders(globals.data_path,"60-60-86-6")
```

../data/output-measure-surface/su4-60-60-86-6/beta-10.80-twist-1-60-60-86-6 ,
index: 0
../data/output-measure-surface/su4-60-60-86-6/beta-10.80-twist-2-60-60-86-6 ,
index: 1
../data/output-measure-surface/su4-60-60-86-6/beta-10.82-twist-1-60-60-86-6 ,
index: 2
../data/output-measure-surface/su4-60-60-86-6/beta-10.82-twist-2-60-60-86-6 ,
index: 3
../data/output-measure-surface/su4-60-60-86-6/beta-10.83-twist-1-60-60-86-6 ,
index: 4
../data/output-measure-surface/su4-60-60-86-6/beta-10.85-twist-1-60-60-86-6 ,

```
index: 5
../data/output-measure-surface/su4-60-60-86-6/beta-10.85-twist-2-60-60-86-6 ,
index: 6
../data/output-measure-surface/su4-60-60-86-6/beta-11.5-twist-1-60-60-86-6 ,
index: 7
../data/output-measure-surface/su4-60-60-86-6/beta-11.5-twist-2-60-60-86-6 ,
index: 8
```

```python
[67]: choose_folder = 0
      fourier_profiles = {}
      folder = folders[choose_folder]
      files = glob.glob(os.path.join(folder, "fourier_profile_*"))
      for file in files:
          file_name = file.split("/")[-1]
          smearing_level = file_name.split("_")[-1]
          volume, modes, fourier_profile = read_and_write.
       ↪read_fourier_profile(folder,file_name=file_name)
          fourier_profiles[smearing_level] = fourier_profile
      fourier_profiles = dict(sorted(fourier_profiles.items(), key=lambda item:␣
       ↪int(item[0])))
      utility.display_markdown_title(folder)
```

2 SU(4), $V = $ ['60', '60', '86', '6'], $\beta = 10.80$, twist coeff = 1

2.1 Perform post processing

```python
[68]: f_n_list = []
      errors_list = []
      for smearing_level, profile in fourier_profiles.items():
          if indices is not None:
              sample_size = len(profile)
              indices_set = indices[smearing_level]
              profile = np.delete(profile, list(indices_set), axis=0)
              print(f"Dropped {sample_size-len(profile)} samples")
          f_n, errors = utility.compute_with_aa_jackknife_fourier(profile, 10,␣
       ↪thermalization=1000)
          f_n_list.append(f_n)
          errors_list.append(errors)
```

2.2 Plot Fourier modes for different smearing steps

```python
[69]: %matplotlib widget
      smearing_levels = list(fourier_profiles.keys())
      show_plot = True
      twist = folder.split("/")[4].split('-')[3]
      temp = folder.split("/")[4].split('-')[1]
```
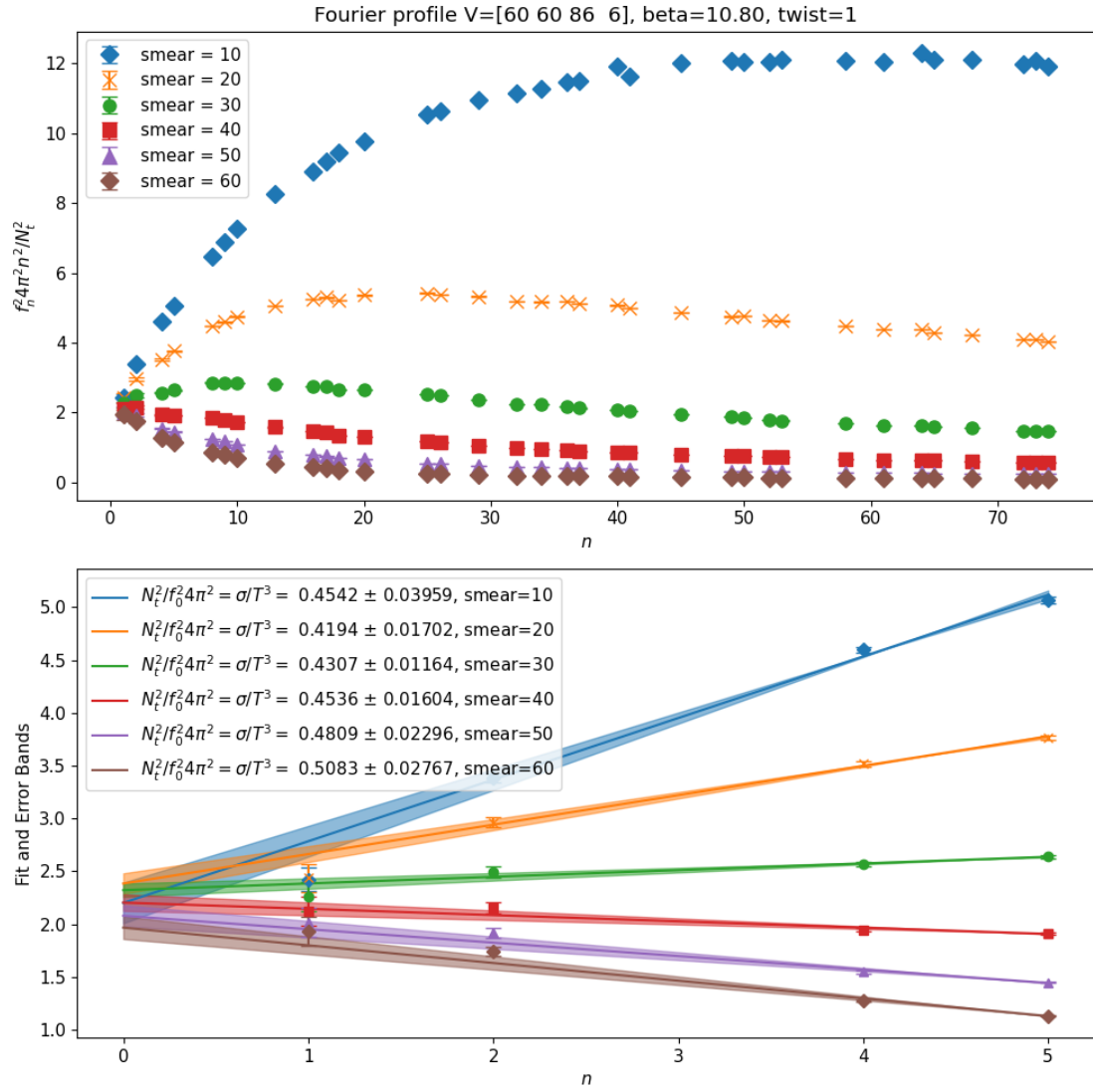
```python
data = {
    "smearing": smearing_levels,
    "linear": [
        fourier_surface.compute_fourier_profile(
            modes, f_n, volume, errors=error, beta=temp, twist=twist,␣
 ↪fit_range=4, smearing=smear, show_plot=show_plot
        ) for f_n, error, smear in zip( f_n_list, errors_list, smearing_levels)
    ]
    # "exponential": [
    #     fourier_surface.compute_fourier_profile_exponential_fit(
    #         n_2, f_n, volume, errors=error, beta=10.85, smearing=smear,␣
 ↪show_plot=show_plot
    #     ) for n_2, f_n, error, smear in zip(n_2_list, f_n_list, errors_list,␣
 ↪smearing_levels)
    # ]
}
surface_tension_dict[folder.split("/")[-1]] = data
df = pd.DataFrame(data)
utility.print_df_as_markdown_fourier_modes(df)
fourier_surface.global_fig = None
```

smearing	Linear fit (σ/T^3)
10	0.4542 ± 0.03959
20	0.4194 ± 0.01702
30	0.4307 ± 0.01164
40	0.4536 ± 0.01604
50	0.4809 ± 0.02296
60	0.5083 ± 0.02767

Fourier profile V=[60 60 86 6], beta=10.80, twist=1