44-44-44-64-6-beta-10.85-twist-1

October 28, 2024

[1]:
```
%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
import numpy as np
import matplotlib.pyplot as plt
import os
import glob
```

1 Load data

[2]:
```
from modules.globals import folder_names

smooth_surfaces= {}
choose_folder = 11
folder = folder_names[choose_folder-1]
files = glob.glob(os.path.join(folder, "surface_smooth_*"))
for file in files:
    file_name = file.split("/")[-1]
    smearing_level = file_name.split("_")[-1]
    volume, surface = read_and_write.read_surface_data(folder, file_name)
    smooth_surfaces[smearing_level] = surface
```

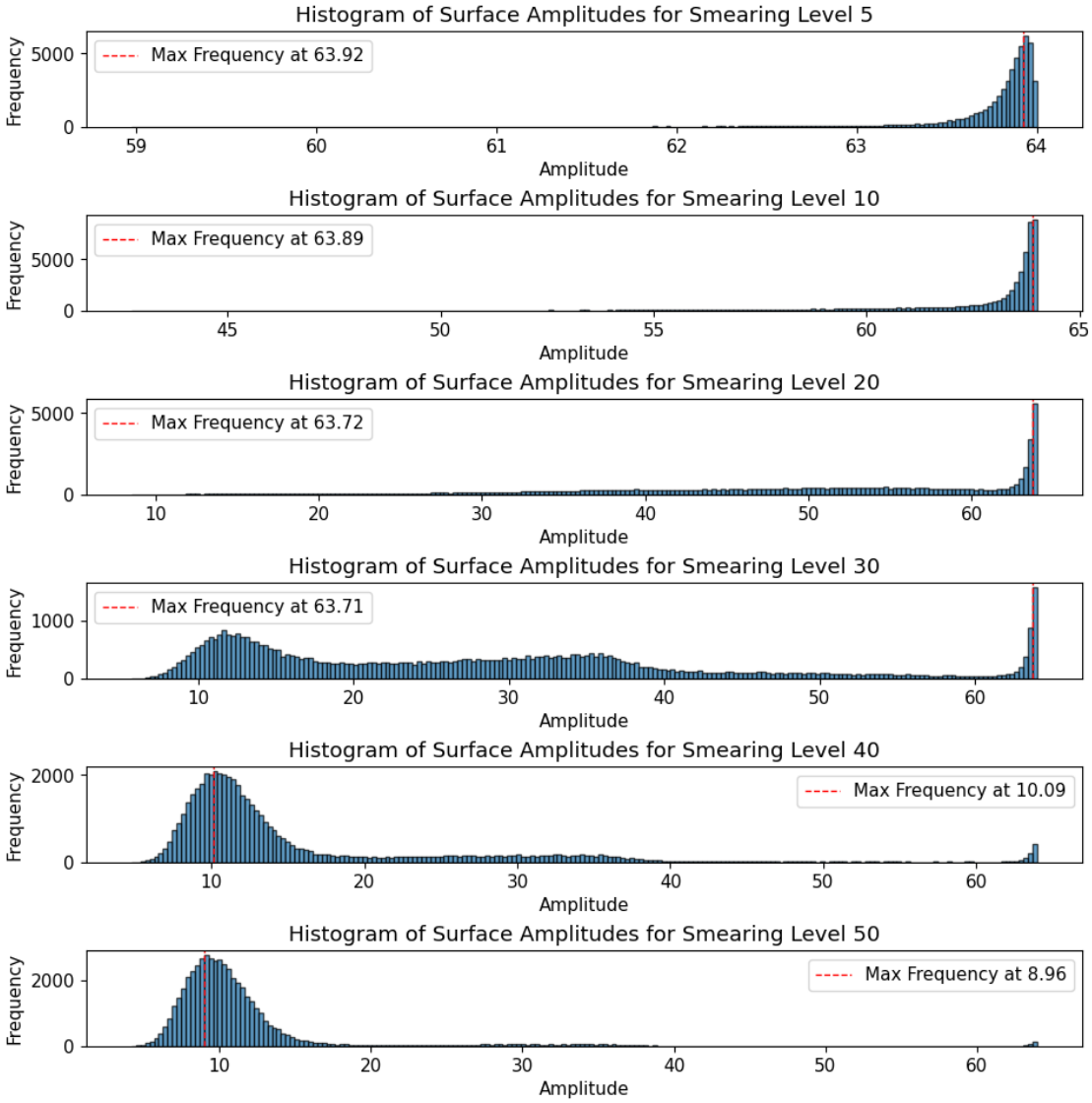
[3]:
```
smooth_surfaces = dict(sorted(smooth_surfaces.items(), key=lambda item:␣
 ↪int(item[0])))
```

[4]:
```
utility.display_markdown_title(folder)
```

2 SU(4), V = ['44', '44', '64', '6'], β = 10.85, twist coeff = 1

[5]:
```
indices = sf.surface_amplitudes(smooth_surfaces=smooth_surfaces,␣
↪return_threshold=40,thermalization=10)
```

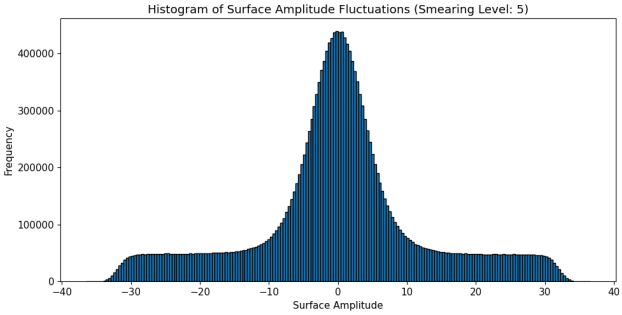
```
Smearing Level: 5
Smearing Level: 10
Smearing Level: 20
Smearing Level: 30
Smearing Level: 40
Smearing Level: 50
```

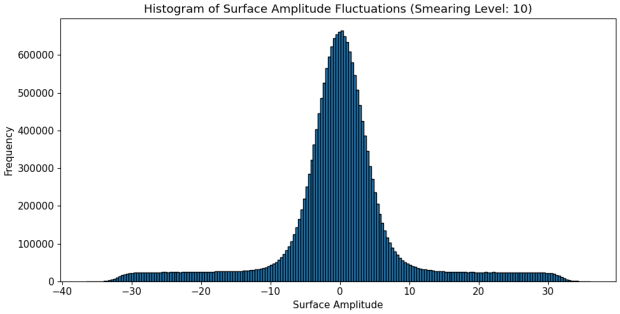


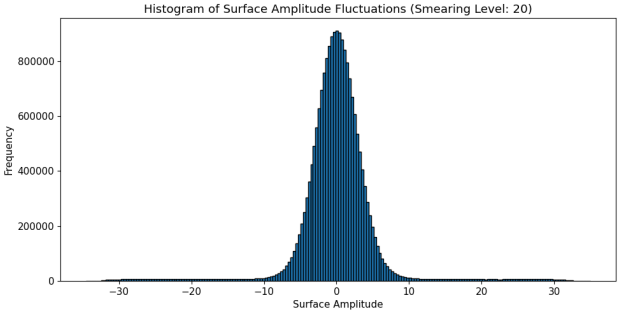

```
{'5': (63.804632933266625, 58.9724, 63.999700000000004), '10': (62.838599789485,
```

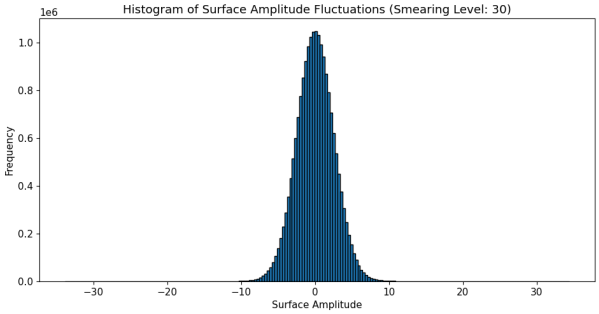
```
42.74555, 63.9997), '20': (50.57788185343056, 8.523900000000001,
63.998799999999996), '30': (28.020172625317525, 5.69459, 63.99820000000001),
'40': (15.58633947269628, 4.75522, 63.9928), '50': (11.15011424433698,
4.1777000000000015, 63.994099999999996)}
```

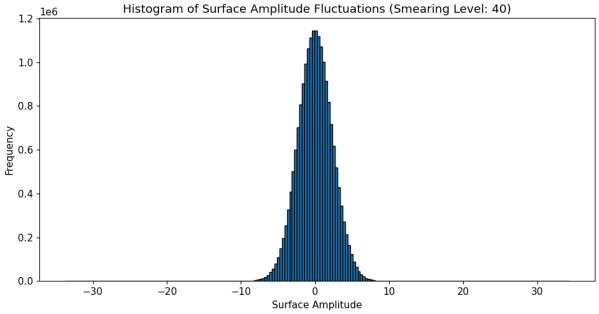
[37]:
```
# Create a dictionary to store fluctuations for each smearing level
fluctuations_dict = {}
thermalization = 1000

for smearing_level, surface_data in smooth_surfaces.items():
    post_thermalization_data = surface_data[thermalization:thermalization+10000]
    mean_z_values = np.mean(post_thermalization_data[:, :, 2], axis=1)
    fluctuations = post_thermalization_data[:, :, 2] - mean_z_values[:, np.
 ↪newaxis]
    fluctuations_dict[smearing_level] = fluctuations.flatten()

# Plotting all histograms in subplots
num_plots = len(fluctuations_dict)
fig, axes = plt.subplots(num_plots, 1, figsize=(10, 5 * num_plots))

for ax, (smearing_level, fluctuations) in zip(axes, fluctuations_dict.items()):
    ax.hist(fluctuations,edgecolor='black', bins=200)
    ax.set_xlabel('Surface Amplitude')
    ax.set_ylabel('Frequency')
    ax.set_title(f'Histogram of Surface Amplitude Fluctuations (Smearing Level:␣
 ↪{smearing_level})')

plt.tight_layout()
plt.show()
```

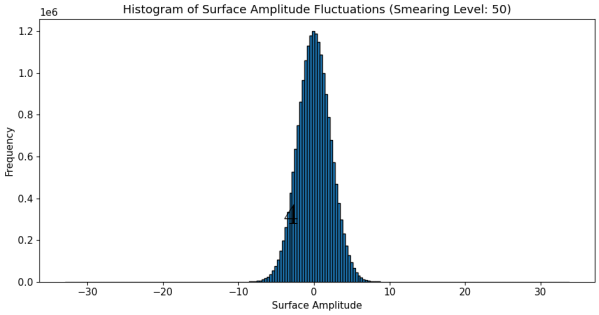

Histogram of Surface Amplitude Fluctuations (Smearing Level: 5)
Frequency
Surface Amplitude


Histogram of Surface Amplitude Fluctuations (Smearing Level: 10)
Frequency
Surface Amplitude


Histogram of Surface Amplitude Fluctuations (Smearing Level: 20)
Frequency
Surface Amplitude


Histogram of Surface Amplitude Fluctuations (Smearing Level: 30)
1e6
Frequency
Surface Amplitude


Histogram of Surface Amplitude Fluctuations (Smearing Level: 40)
1e6
Frequency
Surface Amplitude


Histogram of Surface Amplitude Fluctuations (Smearing Level: 50)
1e6
Frequency
Surface Amplitude

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