I want to see how the pointing drift compares between algorithms and without active feedback

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
from scipy.signal.windows import boxcar
from Packages.UpdateManager import UpdateManager
```

First, we should analyze some unlocked data:

In [2]:
```
manager_unlock = UpdateManager()


dx = np.loadtxt('Data/2020-08-28Measure_dx', dtype=float)
t1 = np.loadtxt('Data/2020-08-28Measure_t1', dtype=float)
t2 = np.loadtxt('Data/2020-08-28Measure_t2', dtype=float)

"""
dx = np.loadtxt('Data/2020-09-03_Measure_dx', dtype=float)
t1 = np.loadtxt('Data/2020-09-03_Measure_t1', dtype=float)
t2 = np.loadtxt('Data/2020-09-03_Measure_t2', dtype=float)
"""

#Convert to more meaningful units:
dx[:,0] = dx[:,0]*5.2  #Convert to um
dx[:,1] = dx[:,1]*5.2  #Convert to um
# Convert the drift of the focal spot to angular drift [radians] via
# eqn. 2 of  Appl. Sci. 2020, 10(11), 4047; https://doi.org/10.3390/app
10114047
f = 200*1000 # um
dx[:,2] = np.arctan((dx[:,2]*5.2)/(f)) #Convert to radians
dx[:,3] = np.arctan((dx[:,3]*5.2)/(f))  #Convert to radians

manager_unlock.load_data(dx, t1, t2)
```

In [3]:
```
print("The standard deviation of the dx data (in units explained above)
is:", manager_unlock.standard_deviation)
```

```
The standard deviation of the dx data (in units explained above) is:
[1.06033865e+01 9.45512887e+00 8.97514714e-06 4.77594020e-06]
```

Let us look in the frequency domain as well:

In [4]:
```
FrequencyData = manager_unlock.frequency_data
```

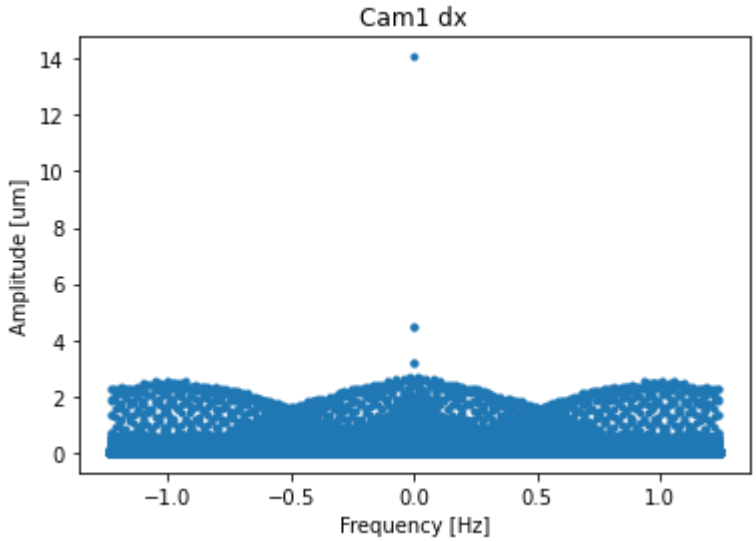
In [5]:
```
Frequency_Domain = manager_unlock.frequency_domain
```

In [6]:
```
for i in range(2):
    FrequencyData[i] = FrequencyData[i]/(manager_unlock.t1[-1]-manager_
unlock.t1[0])  # Convert to Units of [dx]
for i in range(2):
    FrequencyData[i+2] = FrequencyData[i+2]/(manager_unlock.t2[-1]-mana
ger_unlock.t2[0])  # Convert to Units of [dx]
```

Now, let's plot this data

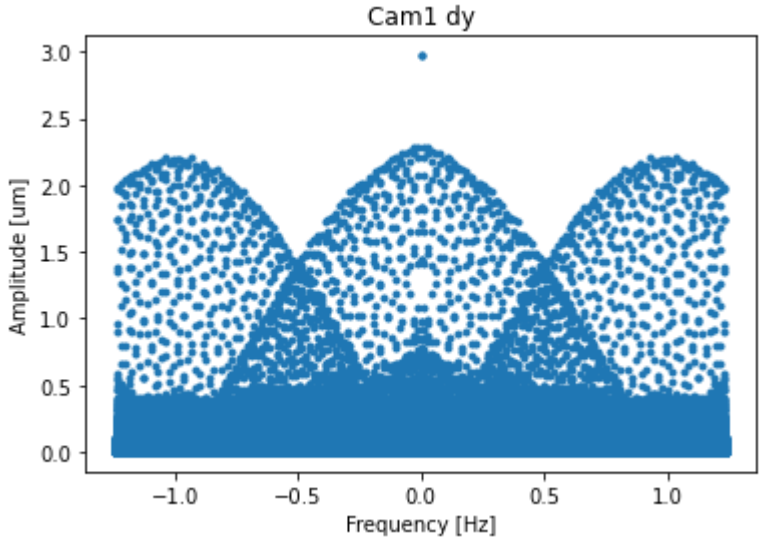
cam1_dx

In [7]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[0],np.abs(FrequencyData[0]), ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [um]")
plt.title("Cam1 dx")
plt.savefig("cam_1_dx")
```



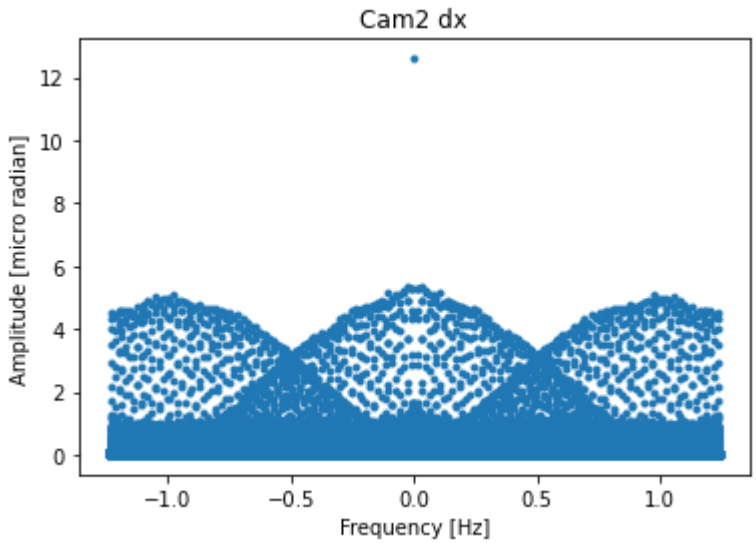
cam1 dy

In [8]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[0],np.abs(FrequencyData[1]), ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [um]")
plt.title("Cam1 dy")
plt.savefig("cam_1_dy")
```



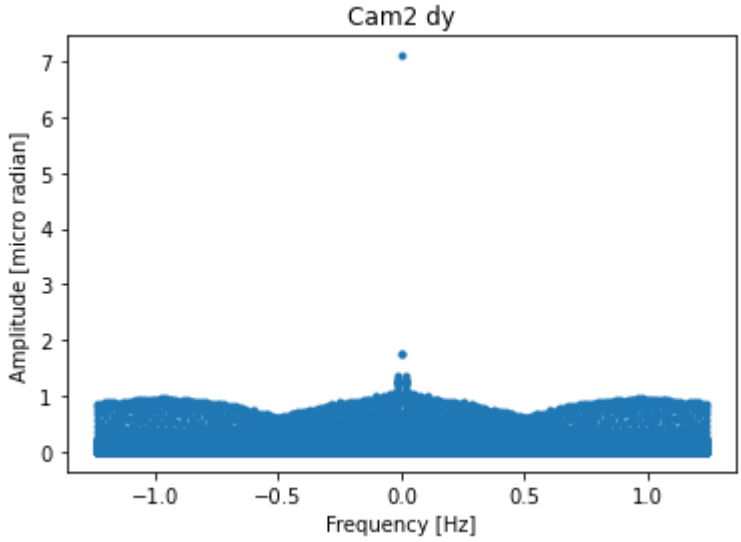
cam2 dx

In [9]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[1],np.abs(FrequencyData[2])*10**6, ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [micro radian]")
plt.title("Cam2 dx")
plt.savefig("cam_2_dx")
```



cam2 dy

In [10]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[1],np.abs(FrequencyData[3])*10**6, ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [micro radian]")
plt.title("Cam2 dy")
plt.savefig("cam_2_dy")
```



Now, let us compare this to some locked data:

In [11]:
```
manager_lock = UpdateManager()

dx = np.loadtxt('Data/2020-09-03_Locked_Vis_dx', dtype=float)
t1 = np.loadtxt('Data/2020-09-03_Locked_Vis_t1', dtype=float)
t2 = np.loadtxt('Data/2020-09-03_Locked_Vis_t2', dtype=float)

#Convert to more meaningful units:
dx[:,0] = dx[:,0]*5.2  #Convert to um
dx[:,1] = dx[:,1]*5.2  #Convert to um
# Convert the drift of the focal spot to angular drift [radians] via
# eqn. 2 of  Appl. Sci. 2020, 10(11), 4047; https://doi.org/10.3390/app
10114047
f = 200*1000 # um
dx[:,2] = np.arctan((dx[:,2]*5.2)/(f)) #Convert to radians
dx[:,3] = np.arctan((dx[:,3]*5.2)/(f))  #Convert to radians

manager_lock.load_data(dx, t1, t2)
```

In [12]:
```
print("The standard deviation of the dx data (in units explained above)
is:", manager_lock.standard_deviation)
```

```
The standard deviation of the dx data (in units explained above) is:
[5.97522752e+00 8.89194486e+00 9.26919676e-06 7.16131202e-06]
```

Let us look in the frequency domain as well:

In [13]:
```
FrequencyData = manager_lock.frequency_data
```

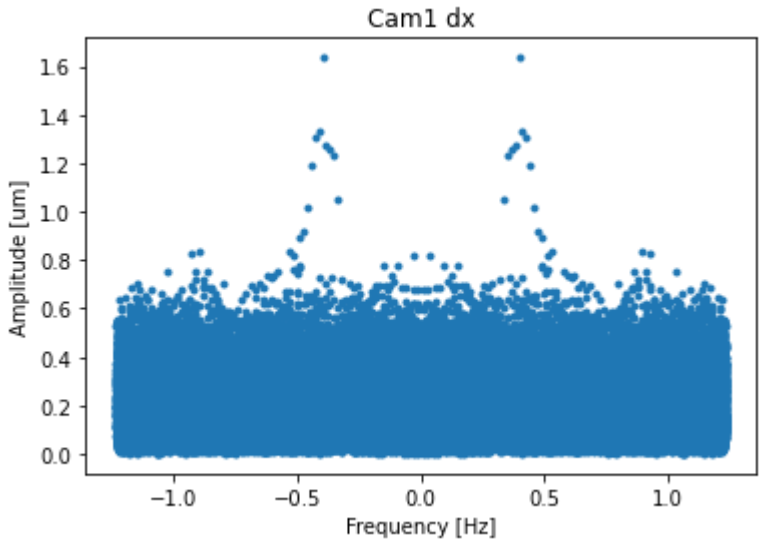
In [14]:
```
Frequency_Domain = manager_lock.frequency_domain
```

In [15]:
```
for i in range(2):
    FrequencyData[i] = FrequencyData[i]/(manager_lock.t1[-1]-manager_lo
ck.t1[0])  # Convert to Units of [dx]
for i in range(2):
    FrequencyData[i+2] = FrequencyData[i+2]/(manager_lock.t2[-1]-manage
r_lock.t2[0])  # Convert to Units of [dx]
```

Now, let's plot this data

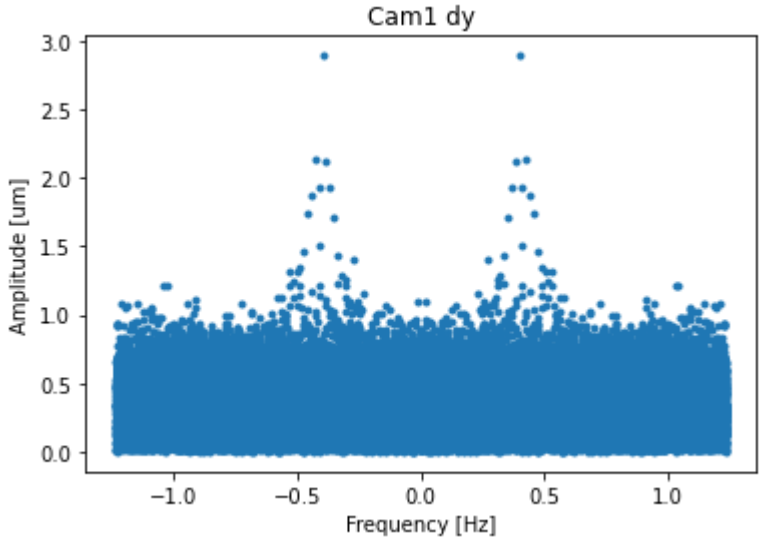
cam1_dx

In [16]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[0],np.abs(FrequencyData[0]), ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [um]")
plt.title("Cam1 dx")
plt.savefig("cam_1_dx Locked")
```



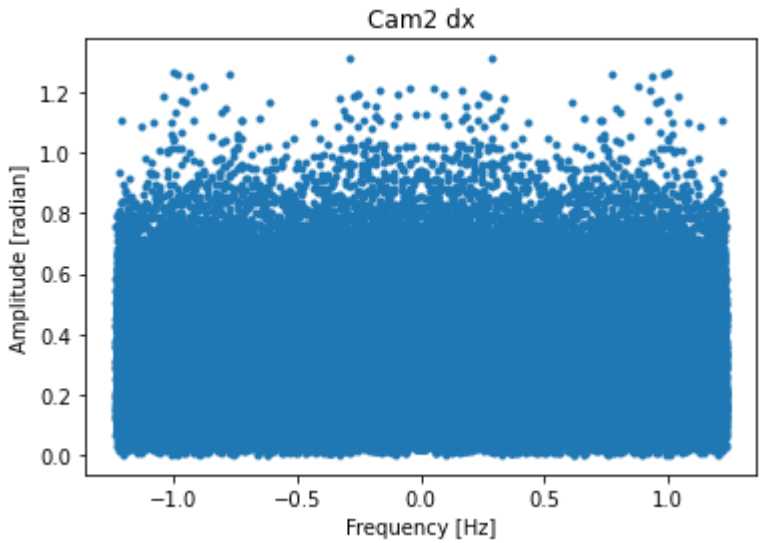
cam1 dy

In [17]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[0],np.abs(FrequencyData[1]), ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [um]")
plt.title("Cam1 dy")
plt.savefig("cam_1_dy Locked")
```



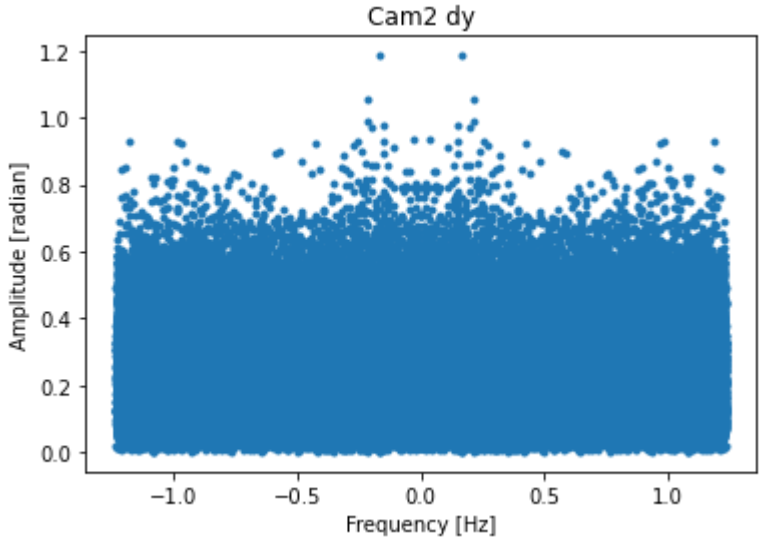
cam2 dx

In [18]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[1],np.abs(FrequencyData[2])*10**6, ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [radian]")
plt.title("Cam2 dx")
plt.savefig("cam_2_dx Locked")
```



cam2 dy

In [19]:
```
fig, ax = plt.subplots()
plt.plot(Frequency_Domain[1],np.abs(FrequencyData[3])*10**6, ".")
plt.xlabel("Frequency [Hz]")
plt.ylabel("Amplitude [radian]")
plt.title("Cam2 dy")
plt.savefig("cam_2_dy Locked")
```



In [ ]:
```
```