Genie 4.0 Python SDK Examples

==========

Example: **getParameter, setParameter**

python code:

```
from com.canberra.datasources.spectroscopy.cam import Datasource, \
    ParameterCodes,OpenOptions, CloseOptions

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)
STITLE = ds.getParameter(ParameterCodes.CAM_T_STITLE)
print(f'The original Sample Title is: "{STITLE}"')
ds.setParameter(ParameterCodes.CAM_T_STITLE,"Something New")
STITLE = ds.getParameter(ParameterCodes.CAM_T_STITLE)
print(f'Now the Sample Title is: "{STITLE}"')
ds.close(CloseOptions.NOFLUSHCHANGES)
```

output:

```
The original Sample Title is: "GENIE-PC Spectrum No. 1"
Now the Sample Title is: "Something New"
```

==========

Example: **getParameters**

python code:

```
from com.canberra.datasources.spectroscopy.cam import Datasource, \
    ParameterCodes,OpenOptions, CloseOptions

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)
P = ParameterCodes
params = [P.CAM_T_STITLE,
          P.CAM_X_ASTIME,
          P.CAM_X_STIME,
          P.CAM_X_ELIVE]
vals = ds.getParameters(params)

print(vals)

ds.close(CloseOptions.NOFLUSHCHANGES)
```

output:

```
['GENIE-PC Spectrum No. 1', datetime.datetime(1978, 11, 13, 12, 0), datetime.datetime(1978, 9, 1,
6, 0), 4000.0]
```

==========

Example **getParameters**

python code:

```
from com.canberra.datasources.spectroscopy.cam import Datasource, \
    ParameterCodes,OpenOptions, CloseOptions

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)
P = ParameterCodes
params = [P.CAM_T_NCLNAME,
          P.CAM_G_NCLWTMEAN,
          P.CAM_G_NCLMDA,
          P.CAM_G_NCLDECAY]
for i in [1,2,3,4,5]:
    vals = ds.getParameters(params,i,1)
    print(f"Nuclide: {vals[0]}, Activity: {vals[1]:.3e} (uCi), MDA: {vals[2]:.3e} (uCi), Decay
Factor {vals[3]:.4f}")

ds.close(CloseOptions.NOFLUSHCHANGES)
```

output:

```
Nuclide: CO-57, Activity: 2.920e-02 (uCi), MDA: 1.207e-03 (uCi), Decay Factor 1.2062
Nuclide: CO-60, Activity: 9.751e-02 (uCi), MDA: 1.266e-03 (uCi), Decay Factor 1.0267
Nuclide: SR-85, Activity: 7.793e-02 (uCi), MDA: 2.648e-03 (uCi), Decay Factor 2.1887
Nuclide: Y-88, Activity: 2.914e-01 (uCi), MDA: 1.619e-03 (uCi), Decay Factor 1.6103
Nuclide: CD-109, Activity: 3.745e-01 (uCi), MDA: 2.959e-02 (uCi), Decay Factor 1.1156
```

==========

Example: **getParameterArray**

python code:

```
from com.canberra.datasources.spectroscopy.cam import Datasource, \
    ParameterCodes,OpenOptions, CloseOptions

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)
P = ParameterCodes
params = [P.CAM_T_NCLNAME,
          P.CAM_G_NCLWTMEAN,
          P.CAM_G_NCLMDA,
          P.CAM_G_NCLDECAY]
for i in [1,2,3,4,5]:
    vals = ds.getParameterArray(params,i,1)
    print(f"Nuclide: {vals[0]}, Activity: {vals[1]:.3e} (uCi), MDA: {vals[2]:.3e} (uCi), Decay
Factor {vals[3]:.4f}")

ds.close(CloseOptions.NOFLUSHCHANGES)
```

output:

```
Nuclide: CO-57, Activity: 2.920e-02 (uCi), MDA: 1.207e-03 (uCi), Decay Factor 1.2062
Nuclide: CO-60, Activity: 9.751e-02 (uCi), MDA: 1.266e-03 (uCi), Decay Factor 1.0267
Nuclide: SR-85, Activity: 7.793e-02 (uCi), MDA: 2.648e-03 (uCi), Decay Factor 2.1887
Nuclide: Y-88, Activity: 2.914e-01 (uCi), MDA: 1.619e-03 (uCi), Decay Factor 1.6103
Nuclide: CD-109, Activity: 3.745e-01 (uCi), MDA: 2.959e-02 (uCi), Decay Factor 1.1156
```

==========

Example: **count, getParameterArrayEx**

python code:

```
from com.canberra.datasources.spectroscopy.cam import Datasource, \
    ParameterCodes,ClassCodes,OpenOptions, CloseOptions

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)
P = ParameterCodes
param = P.CAM_F_PSENERGY
numrecs = ds.count(ClassCodes.CAM_CLS_PEAK)
vals = ds.getParameterArrayEx(param,numrecs,0,1,1)
print(vals)

ds.close(CloseOptions.NOFLUSHCHANGES)
```

output:

```
[87.87476348876953, 122.03295135498047, 136.4302520751953, 165.89010620117188, 238.67991638183594,
279.25634765625, 295.3576965332031, 352.0253601074219, 391.7592468261719, 514.078125,
583.3094482421875, 604.8381958007812, 609.4556274414062, 661.6935424804688, 795.9525146484375,
814.0103149414062, 898.0369262695312, 911.3499145507812, 968.8124389648438, 1120.3673095703125,
1173.1953125, 1325.1085205078125, 1332.4171142578125, 1460.9249267578125, 1764.5679931640625,
1836.042236328125]
```

==========

Example

python code:

```
from com.canberra.datasources.spectroscopy.cam import Datasource, OpenOptions

import pandas as pd

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)

peaks = ds.peaks

df = pd.DataFrame(columns=['peak','energy','area','background'])

for i, peak in enumerate(peaks):
    df.loc[i] = [i+1,peak.energy.value,
                 peak.area.value,
                 peak.background]

print(df.to_markdown())

ds.close()
```

output:

	peak	energy	area	background
0	1	87.8748	8844.66	14904.3
1	2	122.033	18123.2	16894.8
2	3	136.43	2733.02	12836
3	4	165.89	9082.35	13815.7
4	5	238.68	1279.59	8448.41
5	6	279.256	9171.13	7207.87
6	7	295.358	568.972	6699.03

7	8	352.025	1206.66	5730.34
8	9	391.759	11966.8	5163.22
9	10	514.078	11771.3	4663.74
10	11	583.309	606.412	3258.59
11	12	604.838	1804.47	3043.68
12	13	609.456	1135.94	3528.96
13	14	661.694	9415.66	4673.34
14	15	795.953	1875.19	2573.81
15	16	814.01	724.24	2238.76
16	17	898.037	33039.6	3306.42
17	18	911.35	449.937	2155.06
18	19	968.812	213.71	1769.29
19	20	1120.37	263.317	1403.68
20	21	1173.2	14606.9	1830.1
21	22	1325.11	503.307	1203.74
22	23	1332.42	12889.3	1265.38
23	24	1460.92	2581.05	1235.95
24	25	1764.57	275.89	177.11
25	26	1836.04	18049.4	295.613

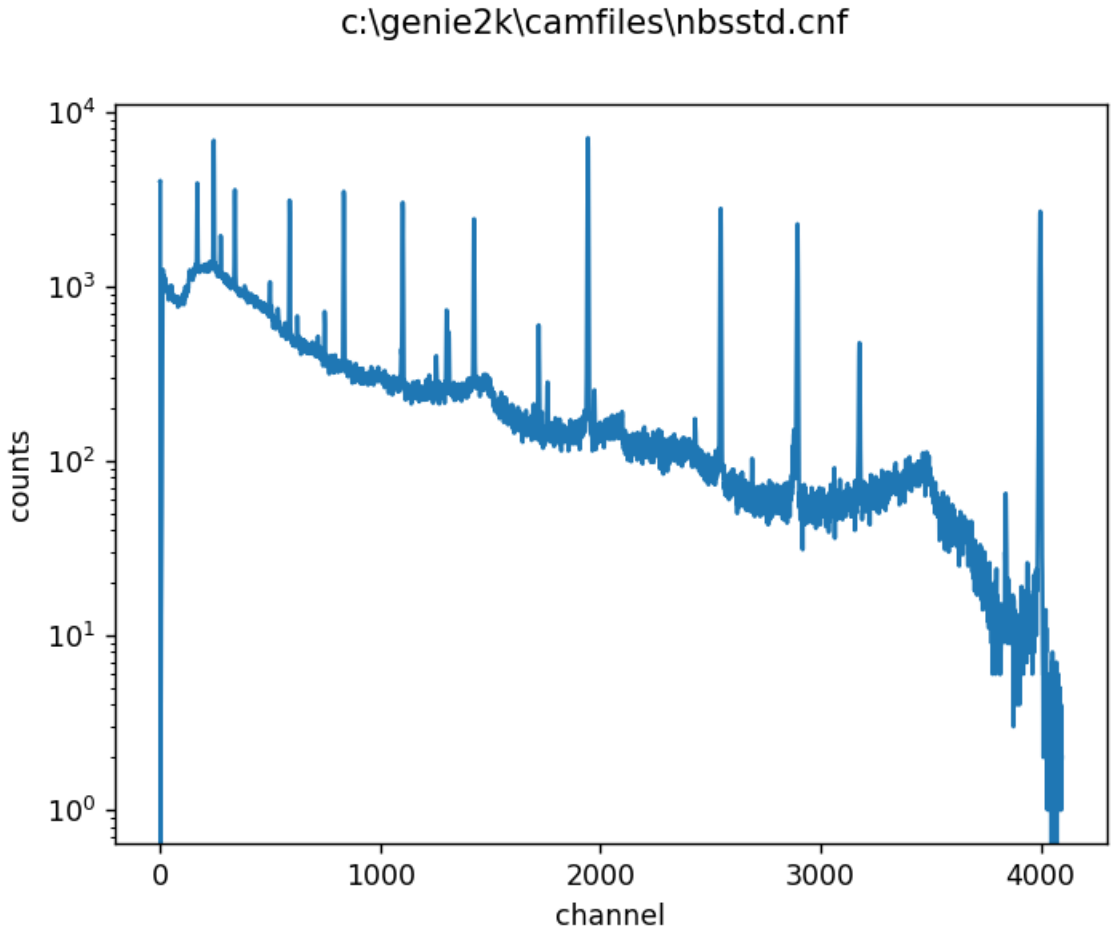
==========

Example: **spectrum**

python code:

```
from com.canberra.datasources.spectroscopy.cam import Datasource, OpenOptions
from matplotlib import pyplot as plt

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)
spectrum = ds.spectrum

x = []
y = []

for i,j in enumerate(spectrum):
    x.append(i+1)
    y.append(j)


plt.xscale('linear')
plt.yscale('log')

plt.xlabel('channel')
plt.ylabel('counts')
plt.suptitle(ds.name)

plt.plot(x,y)
plt.show()

ds.close()
```

output:


c:\genie2k\camfiles\nbsstd.cnf
counts
channel
10^0
10^1
10^2
10^3
10^4
0
1000
2000
3000
4000

==========

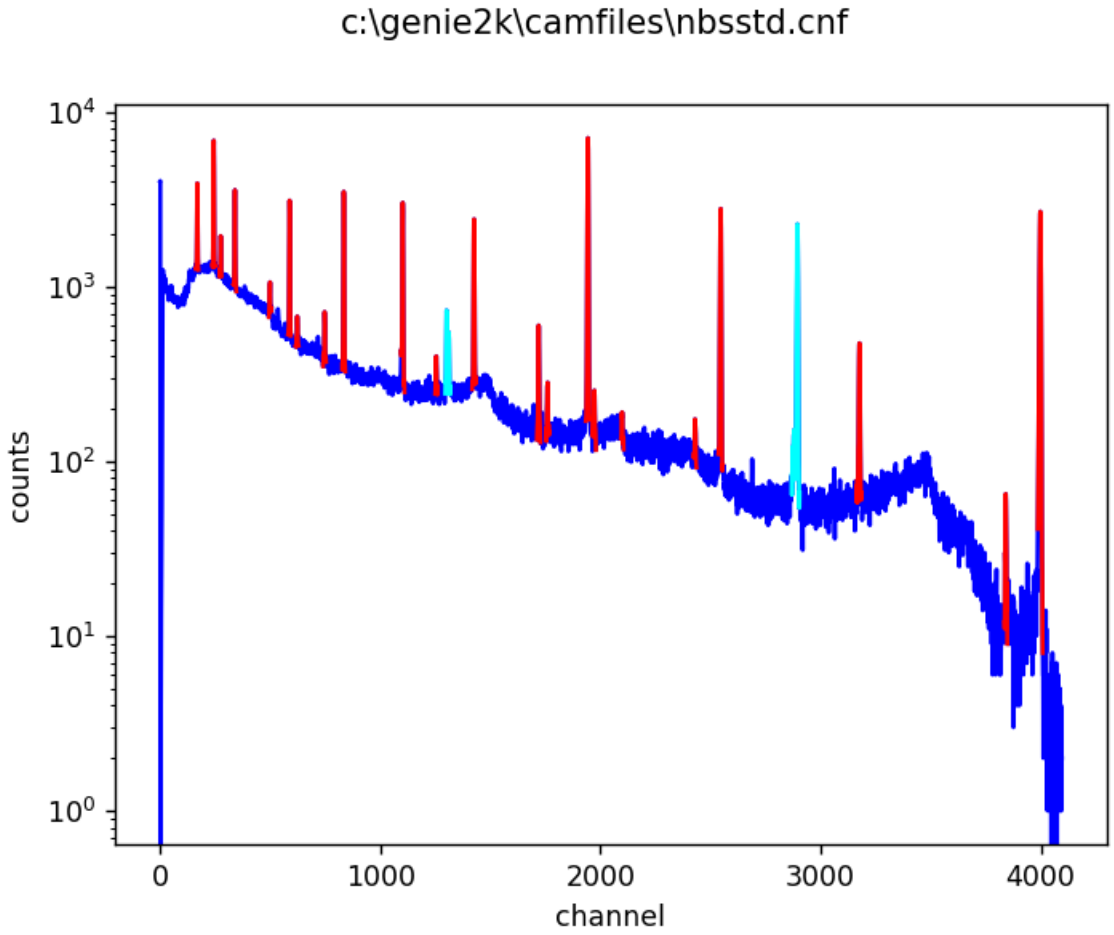
Example: **spectrum, regionsOfInterest**

python code:

```
import numpy as np
from com.canberra.datasources.spectroscopy.cam import Datasource, OpenOptions
from matplotlib import pyplot as plt

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)
spectrum = ds.spectrum

x = []
y = []

for i,j in enumerate(spectrum):
    x.append(i+1)
    y.append(j)

plt.xscale('linear')
plt.yscale('log')

plt.xlabel('channel')
plt.ylabel('counts')
plt.suptitle(ds.name)
plt.plot(x,y,color='blue')

ROIs = ds.regionsOfInterest
for roi in ROIs:
    x = np.linspace(roi.leftChannel,roi.rightChannel,roi.rightChannel-roi.leftChannel+1).tolist()
    y = spectrum[(roi.leftChannel-1):(roi.rightChannel)]
    if roi.typeOfRegion == 1:
        plt.plot(x,y,color='red')
    if roi.typeOfRegion == 2:
        plt.plot(x, y, color='cyan')
```

```
plt.show()

ds.close()
```

output:



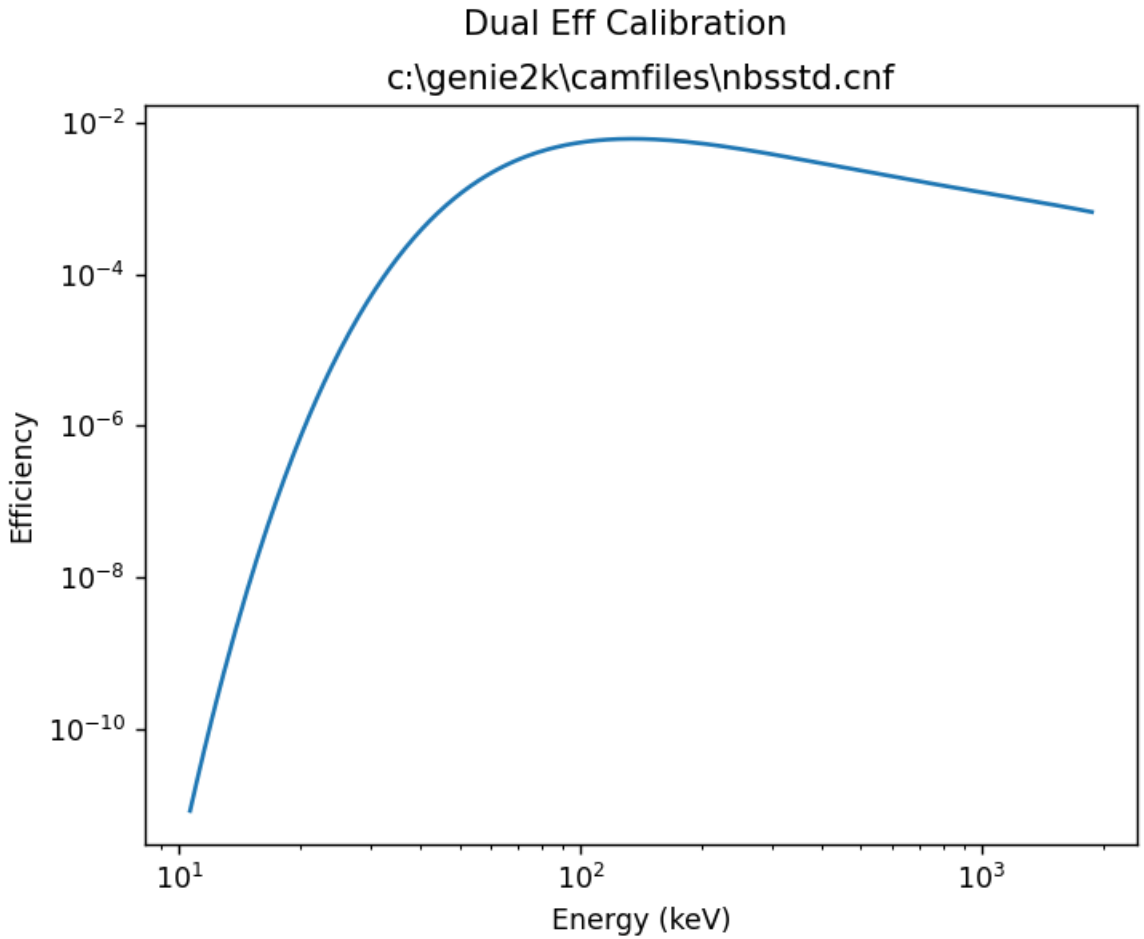
==========

Example: **evaluate**

python code:

```
import numpy as np
from com.canberra.datasources.spectroscopy.cam import Datasource, OpenOptions
from com.canberra.datasources.cam import EvaluationOption
from matplotlib import pyplot as plt

ds = Datasource()
ds.open(r"c:\genie2k\camfiles\nbsstd.cnf",OpenOptions.READWRITE)

channels = np.linspace(1,4096,4096).tolist()

# working with measurement points
energy = [ds.evaluate(x,EvaluationOption.CHANNEL2ENERGY).value for x in channels]
efficiency = [ds.evaluate(y,EvaluationOption.ENERGY2DUAL).value for y in energy]

plt.xlabel('Energy (keV)')
plt.ylabel('Efficiency')

plt.xscale('log')
plt.yscale('log')

plt.suptitle("Dual Eff Calibration")
plt.title(ds.name)

plt.plot(energy,efficiency)
plt.show()

ds.close()
```

output:


Dual Eff Calibration
c:\genie2k\camfiles\nbsstd.cnf
Efficiency
10^{-2}
10^{-4}
10^{-6}
10^{-8}
10^{-10}
10^{1}
10^{2}
10^{3}
Energy (keV)