In [1]:
```
from astropy.table import Table
from astropy.io import fits

from nicergof.bkg import bkg_estimator as be

```

Test of background estimator

Obsid 2012040205

Obsid 2012040205 is an observation of BKGD_RXTE_4 with an exposure time of 4891.0 seconds whether the 4891.0 background was reliably recovered.

I created the background spectrum using

```
corcoran% nibkgestimator ni2012040205.pha ../auxil/ni2012040205.mkf3
Downloading https://heasarc.gsfc.nasa.gov/FTP/caldb/data/nicer/xti/pc
|=====================================================================
192M (100.00%)        19s

For GTI #0; Duration = 1.0
For GTI #1; Duration = 740.0
For GTI #2; Duration = 3.0
For GTI #3; Duration = 200.0
For GTI #4; Duration = 276.0
For GTI #5; Duration = 1.0
For GTI #6; Duration = 1222.0

    No Events Found

For GTI #7; Duration = 1226.0

    No Events Found

For GTI #8; Duration = 945.0
For GTI #9; Duration = 277.0

Done
```

NOTE:

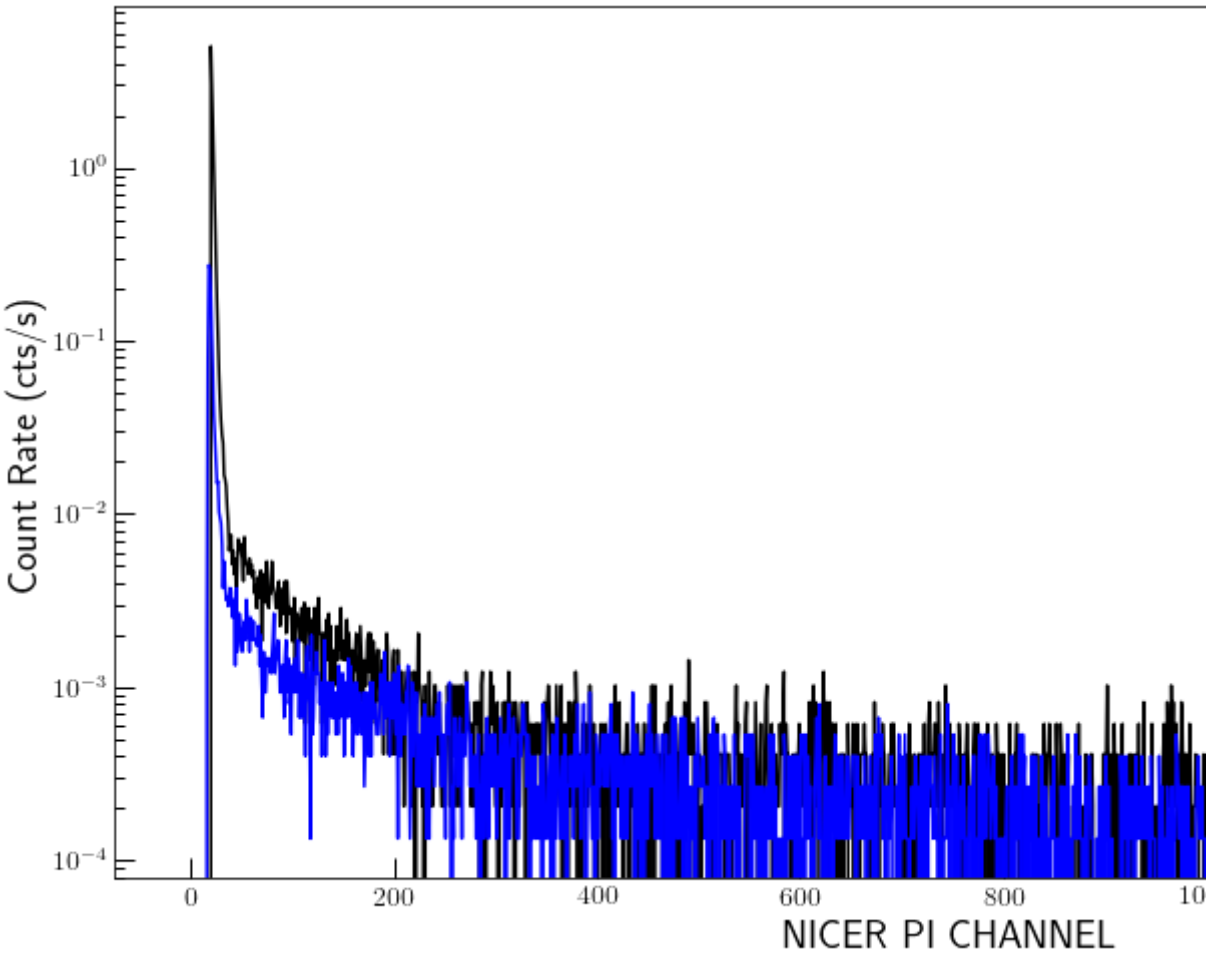
- for the 2 longest duration GTIs no events were found in the enhanced background event file

Now let's compare the spectra

In [2]:
```
src = Table.read('2012040205/xsel/ni2012040205.pha', hdu='spectrum
bkg = Table.read('2012040205/xsel/ni2012040205_bkg.pha', hdu='spect
```

In [3]:
```
fig = figure(figsize=(15, 8))
yscale('log')
ylabel('Count Rate (cts/s)',fontsize=20)
xlabel('NICER PI CHANNEL',fontsize=20)
plot(src['CHANNEL'],src['COUNTS']/src.meta['EXPOSURE'])
plot(bkg['CHANNEL'],bkg['COUNTS']/bkg.meta['EXPOSURE'])
```

Out[3]:
```
[<matplotlib.lines.Line2D at 0x1172ceb90>]
```



Results:

- pretty good recovery of the shape of the spectrum
- underestimate of the spectrum from channels 1-200, possibly due to the lack of events in GT

2012060217

Obsid 2012060217 is an observation of BKGD_RXTE_6 with an exposure time of 3735.0 seconds whether the BKGD_RXTE_6 background was reliably recovered.

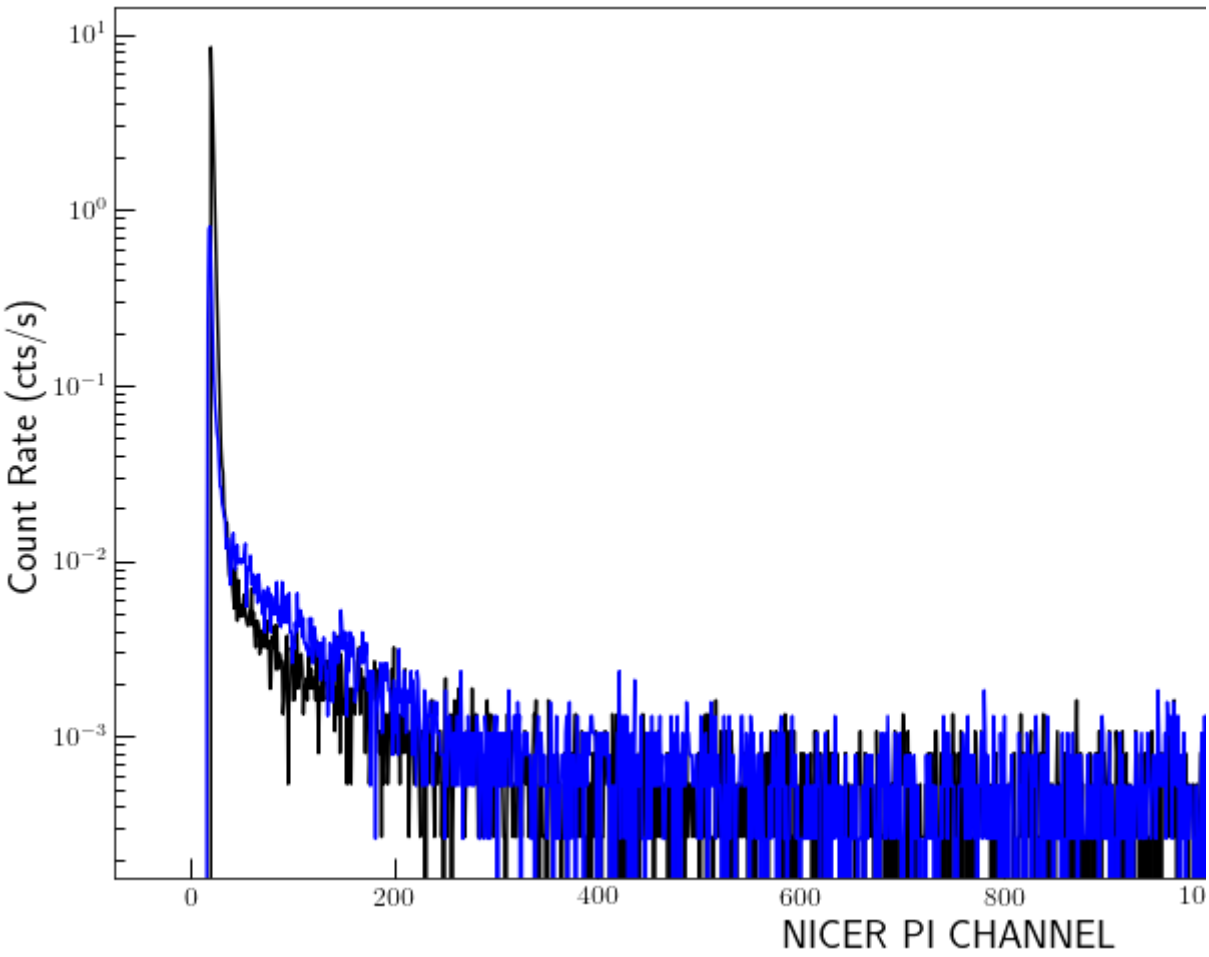
I created the background spectrum using

```
corcoran% nibkgestimator 2012060217/xsel/ni2012060217.pha 2012060217/
Downloading https://heasarc.gsfc.nasa.gov/FTP/caldb/data/nicer/xti/pc
|=====================================================================
192M (100.00%)        18s

For GTI #0; Duration = 406.0
For GTI #1; Duration = 385.0
For GTI #2; Duration = 388.0
For GTI #3; Duration = 385.0
For GTI #4; Duration = 366.0
For GTI #5; Duration = 1.0
For GTI #6; Duration = 342.0
For GTI #7; Duration = 347.0
For GTI #8; Duration = 397.0
For GTI #9; Duration = 705.0
For GTI #10; Duration = 13.0
Done
```

In [4]:
```
src = Table.read('2012060217/xsel/ni2012060217.pha', hdu='spectrum
bkg = Table.read('2012060217/xsel/ni2012060217_bkg.pha', hdu='spect
fig = figure(figsize=(15, 8))
yscale('log')
ylabel('Count Rate (cts/s)',fontsize=20)
xlabel('NICER PI CHANNEL',fontsize=20)
plot(src['CHANNEL'],src['COUNTS']/src.meta['EXPOSURE'])
plot(bkg['CHANNEL'],bkg['COUNTS']/bkg.meta['EXPOSURE'])
```

Out[4]:
```
[<matplotlib.lines.Line2D at 0x119881e90>]
```



2012080116

Obsid 2012080116 is an observation of BKGD_RXTE_8 with an exposure time of 1652.0 seconds whether the 1652.0 background was reliably recovered.

I created the background spectrum using

```
corcoran% nibkgestimator 2012080116/xsel/ni2012080116.pha 2012080116/
Downloading https://heasarc.gsfc.nasa.gov/FTP/caldb/data/nicer/xti/pc
|=====================================================================
192M (100.00%)        17s

For GTI #0; Duration = 810.0
For GTI #1; Duration = 13.0
For GTI #2; Duration = 829.0
Done
```

In [5]:
```
src = Table.read('2012080116/xsel/ni2012080116.pha', hdu='spectrum
bkg = Table.read('2012080116/xsel/ni2012080116_bkg.pha', hdu='spect
fig = figure(figsize=(15, 8))
yscale('log')
ylabel('Count Rate (cts/s)',fontsize=20)
xlabel('NICER PI CHANNEL',fontsize=20)
plot(src['CHANNEL'],src['COUNTS']/src.meta['EXPOSURE'])
plot(bkg['CHANNEL'],bkg['COUNTS']/bkg.meta['EXPOSURE'])
```

Out[5]: [<matplotlib.lines.Line2D at 0x119810090>]