SpeX

1. Limited Flux needs

- Observing mode
- Slit width
- Seeing
- S/N
- On-chip itime
- Total itime

Quantity to be estimated:	Limiting Flux		
Select Observing Mode:	Short-Wavelength (0.8-2.5 microns) XD		
Slit width (arcsec):	0.5		
Seeing (FWHM) in arcsec at 2.2 microns:	0.8		Required for all
Required Signal-to-Noise ratio:	50		Required for Limiting Flux, Total ITIME
Single frame integration time (sec):	120		Required for all
Total integration time(sec):	1800		Required for Limiting Flux, Signal-to-Noise
Source Flux at 2.2 microns:		W/m2/micron	Required for Total ITIME, Signal-to-Noise
Source blackbody temperature (K):			Required for Total ITIME, Signal-to-Noise
Submit	Reset		

Simple to estimate limiting magnitude at any wavelength

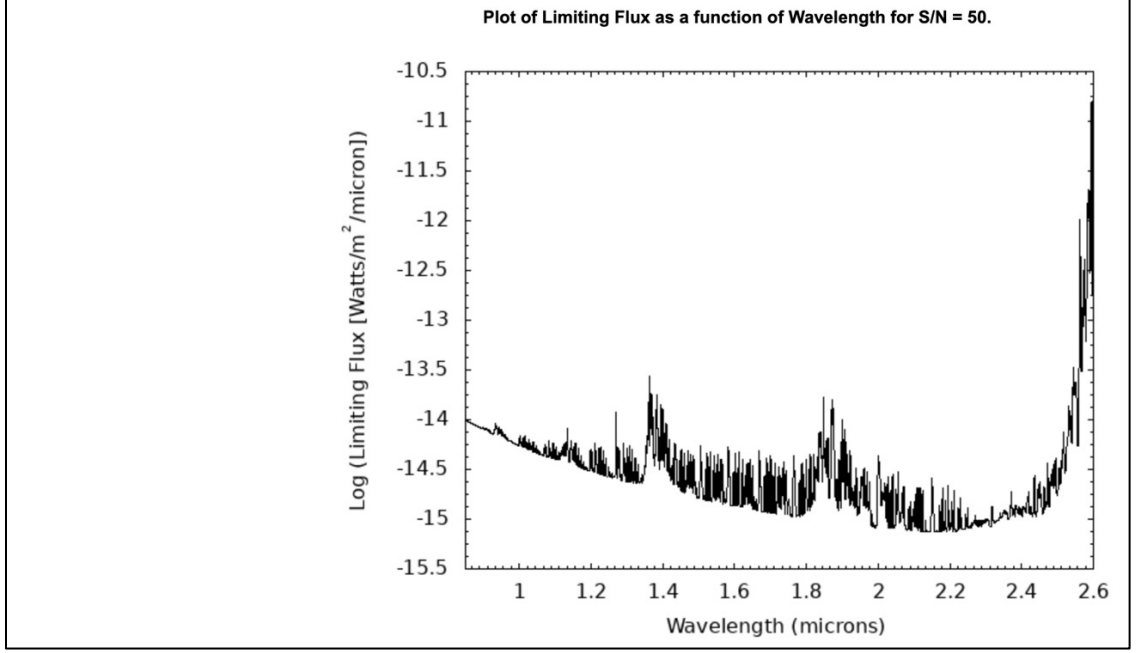
```
spex_calc2's output: ./odir/260213.095545.out.txt:
  Slit size  =  0.500 arcsec
  Resolution = 1200.0
  Single frame exposure time =  120.000 sec
  Number of Coadds           =    15.0000000
  Total Exposure Time        =    1800.00000

  Wavelength (microns)     FWHM (arcsec)      Fractional Slit Transmission
  --------------------     -------------      ----------------------------
     0.860                    1.28                     0.21
     0.950                    1.22                     0.22
     1.250                    1.06                     0.24
     1.650                    0.92                     0.26
     2.200                    0.80                     0.28

  Limiting Fluxes (mJy)    Fluxes (W/m2/micron)    Limiting Magnitudes
  ---------------------    --------------------    -------------------
  I       =     2.333           0.9456E-14           15.297
  Z       =     2.383           0.7917E-14           15.041
  J       =     1.693           0.3247E-14           14.989
  H       =     3.054           0.3363E-14           13.871
  K       =     1.369           0.8480E-15           14.230

Plot's Data files: ./odir/260213.095545.plt.dat
```

coadds is effectively the number of images (total/on-chip), typically executed as AB pairs



SpeX

2a. Total Integration Time needs

- Observing mode
- Slit width
- Seeing
- S/N
- On-chip itime
- Source flux at 2.2 μm
- Estimated source BB temp

Quantity to be estimated:	Total Integration Time		
Select Observing Mode:	Short-Wavelength (0.8-2.5 microns) XD		
Slit width (arcsec):	0.5		
Seeing (FWHM) in arcsec at 2.2 microns:	0.8		Required for all
Required Signal-to-Noise ratio:	50		Required for Limiting Flux, Total ITIME
Single frame integration time (sec):	120		Required for all
Total integration time(sec):			Required for Limiting Flux, Signal-to-Noise
Source Flux at 2.2 microns:	15.0	mag	Required for Total ITIME, Signal-to-Noise
Source blackbody temperature (K):	5500		Required for Total ITIME, Signal-to-Noise
Submit	Reset		

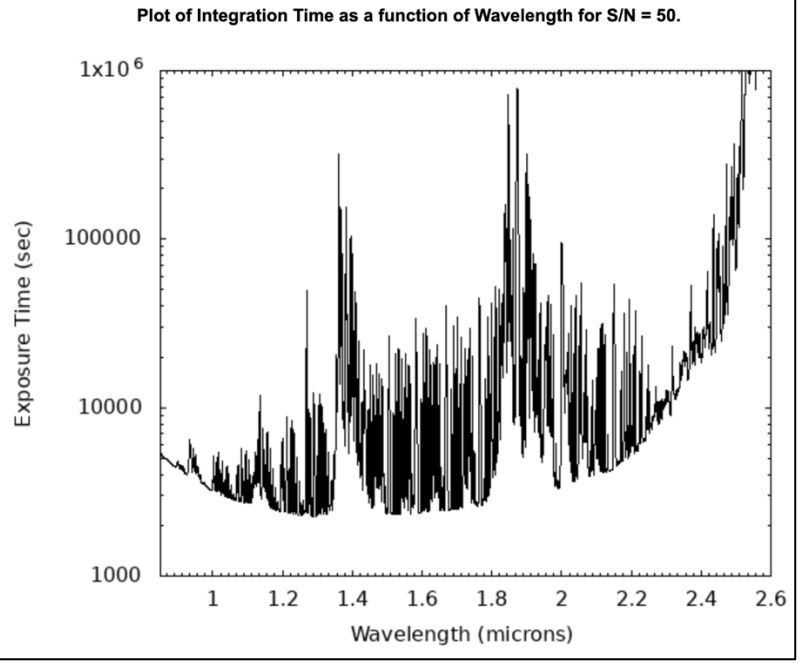
Useful to estimate the sensitivity simultaneously across a range of wavelengths given a particular source. In this example a 5500K BB source (G2V) is used

```
spex_calc2's output: ./odir/260213.101621.out.txt:
  Slit size  =  0.500 arcsec
  Resolution = 1200.0
  Single frame exposure time =  120.000 sec
  Input flux at 2.2 microns :  0.4256E-15 W/m2/micron = 15.000 mag

  Wavelength (microns)     FWHM (arcsec)      Fractional Slit Transmission
  --------------------     -------------      ----------------------------
     0.860                    1.28                    0.21
     0.950                    1.22                    0.22
     1.250                    1.06                    0.24
     1.650                    0.92                    0.26
     2.200                    0.80                    0.28

Plot's Data files: ./odir/260213.101621.plt.dat
```

coadds is effectively the number of images (total/on-chip), typically executed as AB pairs



SpeX

2b. Total Integration Time needs

- Observing mode
- Slit width
- Seeing
- S/N
- On-chip itime
- Source flux at 2.2 μm
- Estimated source BB temp

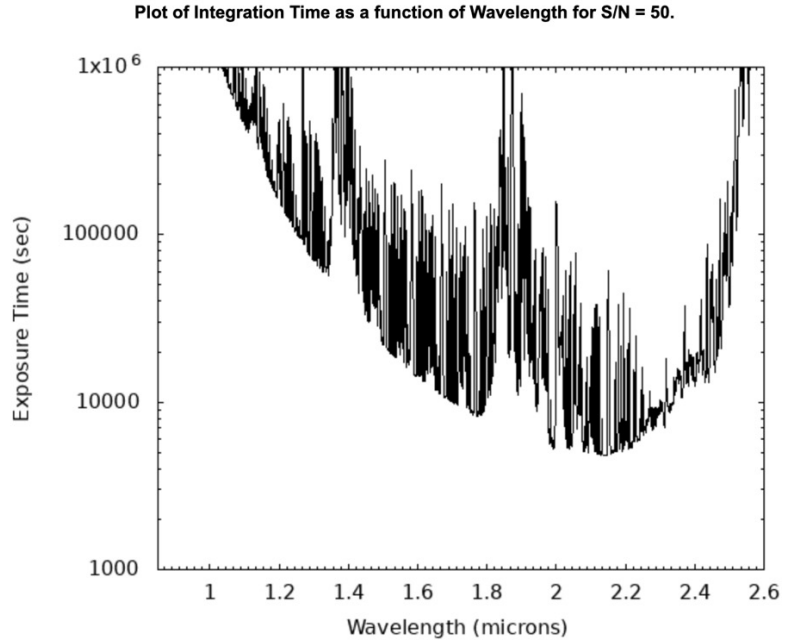
Quantity to be estimated:	Total Integration Time		
Select Observing Mode:	Short-Wavelength (0.8-2.5 microns) XD		
Slit width (arcsec):	0.3		
Seeing (FWHM) in arcsec at 2.2 microns:	0.8		Required for all
Required Signal-to-Noise ratio:	50		Required for Limiting Flux, Total ITIME
Single frame integration time (sec):	120		Required for all
Total integration time(sec):			Required for Limiting Flux, Signal-to-Noise
Source Flux at 2.2 microns:	15.0	mag	Required for Total ITIME, Signal-to-Noise
Source blackbody temperature (K):	1600		Required for Total ITIME, Signal-to-Noise
Submit	Reset		

```
spex_calc2's output: ./odir/260213.102042.out.txt:
  Slit size  =  0.500 arcsec
  Resolution = 1200.0
  Single frame exposure time =  120.000 sec
  Input flux at 2.2 microns :  0.4256E-15 W/m2/micron = 15.000 mag

  Wavelength (microns)     FWHM (arcsec)      Fractional Slit Transmission
  --------------------     -------------      ----------------------------
     0.860                    1.28                     0.21
     0.950                    1.22                     0.22
     1.250                    1.06                     0.24
     1.650                    0.92                     0.26
     2.200                    0.80                     0.28

Plot's Data files: ./odir/260213.102042.plt.dat
```

coadds is effectively the number of images (total/on-chip), typically executed as AB pairs



In this example a 1600K BB source is used. This also roughly simulates a visual extinction of Av=10 mags assuming an intrinsic BB temp of 5500K. (A 1000K BB also simulates a visual extinction of Av=20 mags assuming an intrinsic BB temp of 5500K). You will need to estimate the color temp corresponding to a desired Av separately

SpeX

3a. Signal-to-Noise needs

- Observing mode
- Slit width
- Seeing
- On-chip itime
- Total itime
- Source flux at 2.2 μm
- Estimated source BB temp

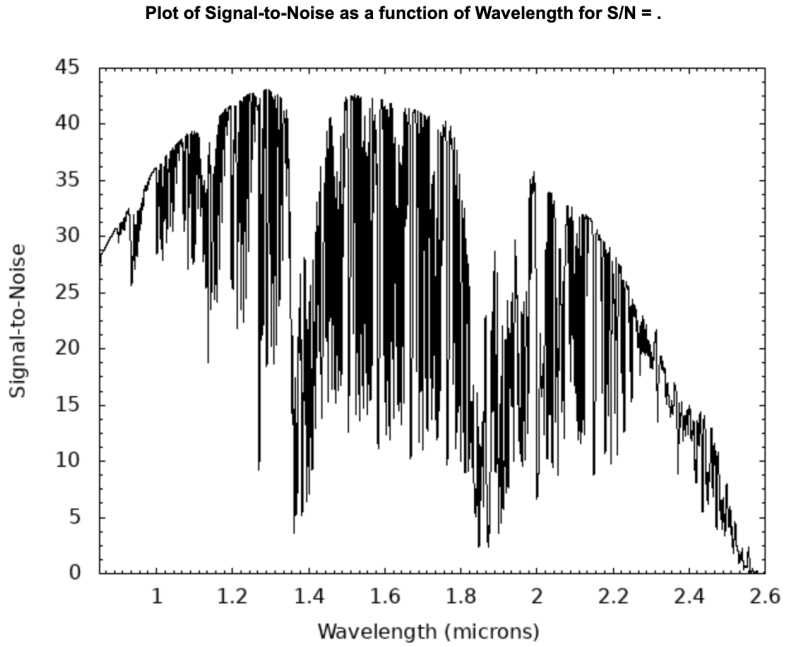
Quantity to be estimated:	Total Integration Time		
Select Observing Mode:	Short-Wavelength (0.8-2.5 microns) XD		
Slit width (arcsec):	0.3		
Seeing (FWHM) in arcsec at 2.2 microns:	0.8		Required for all
Required Signal-to-Noise ratio:	50		Required for Limiting Flux, Total ITIME
Single frame integration time (sec):	120		Required for all
Total integration time(sec):			Required for Limiting Flux, Signal-to-Noise
Source Flux at 2.2 microns:	15.0	mag	Required for Total ITIME, Signal-to-Noise
Source blackbody temperature (K):	1600		Required for Total ITIME, Signal-to-Noise
Submit	Reset		

```
spex_calc2's output: ./odir/260213.010852.out.txt:
  Slit size  =  0.500 arcsec
  Resolution = 1200.0
  Single frame exposure time =  120.000 sec
  Number of Coadds           =    14.0000000
  Total Exposure Time        =    1680.00000      sec
  Input flux at 2.2 microns :  0.4256E-15 W/m2/micron = 15.000 mag

  Wavelength (microns)     FWHM (arcsec)      Fractional Slit Transmission
  --------------------     -------------      ----------------------------
     0.860                    1.28                    0.21
     0.950                    1.22                    0.22
     1.250                    1.06                    0.24
     1.650                    0.92                    0.26
     2.200                    0.80                    0.28

Plot's Data files: ./odir/260213.010852.plt.dat
```

coadds is effectively the number of images (total/on-chip), typically executed as AB pairs



Useful to estimate the sensitivity simultaneously across a range of wavelengths given a particular source. In this example a 5500K BB source (G2V) is used

SpeX

3b. Signal-to-Noise needs

- Observing mode
- Slit width
- Seeing
- On-chip itime
- Total itime
- Source flux at 2.2 μm
- Estimated source BB temp

Quantity to be estimated:	Signal-to-Noise		
Select Observing Mode:	Short-Wavelength (0.8-2.5 microns) XD		
Slit width (arcsec):	0.5		
Seeing (FWHM) in arcsec at 2.2 microns:	0.8		Required for all
Required Signal-to-Noise ratio:			Required for Limiting Flux, Total ITIME
Single frame integration time (sec):	120		Required for all
Total integration time(sec):	1680		Required for Limiting Flux, Signal-to-Noise
Source Flux at 2.2 microns:	15.0	mag	Required for Total ITIME, Signal-to-Noise
Source blackbody temperature (K):	1600		Required for Total ITIME, Signal-to-Noise
Submit	Reset		

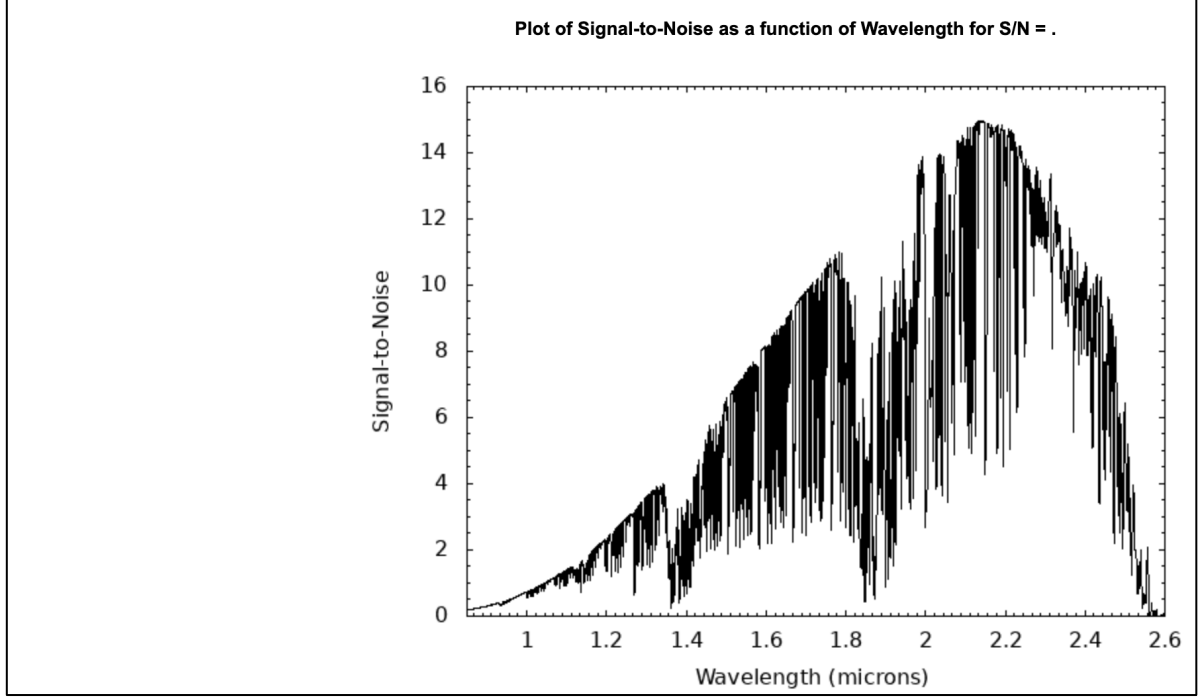
In this example a 1600K BB source is used. This also roughly simulates a visual extinction of Av=10 mags assuming an intrinsic BB temp of 5500K. (A 1000K BB also simulates a visual extinction of Av=20 mags assuming an intrinsic BB temp of 5500K). You will need to estimate the color temp corresponding to a desired Av separately

```
spex_calc2's output: ./odir/260213.011315.out.txt:
  Slit size  =  0.300 arcsec
  Resolution = 2000.0
  Single frame exposure time =  120.000 sec
  Number of Coadds           =    14.0000000
  Total Exposure Time        =    1680.00000      sec
  Input flux at 2.2 microns :  0.4256E-15 W/m2/micron = 15.000 mag

  Wavelength (microns)     FWHM (arcsec)      Fractional Slit Transmission
  --------------------     -------------      ----------------------------
     0.860                    1.28                    0.13
     0.950                    1.22                    0.13
     1.250                    1.06                    0.15
     1.650                    0.92                    0.16
     2.200                    0.80                    0.18

Plot's Data files: ./odir/260213.011315.plt.dat
```

coadds is effectively the number of images (total/on-chip), typically executed as AB pairs



iSHELL

iSHELL ETC needs

- Slit width
- On-chip itime
- Coadds
- Cycles
- Seeing
- SN

Slit Width (arcsec): 0.75 selected

itime (sec) 180

coadds 1

cycles 10

seeing (arcsec) 0.8

SN 100

Submit Request

The iSHELL ETC is simpler than the SpeX ETC since iSHELL covers a much smaller one-shot wavelength range. Note that the ETC *R* for a given slit-width is slightly smaller than the actual values (see the iSHELL PASP paper)

INPUT PARAMETERS

- Slit width (arcsec)= 0.750000
- SN= 100.000
- on-chip ITIME (sec)= 180.000
- number of coadds= 1.00000
- number of cycles= 10.0000
- R (per spectral resolution element)= 38000
- Seeing FWHM at K (arcsec)= 0.800000

(1)	(2)	(3)	(4)	(5)
1.10um	9.4879374	9.9693583	2.3195521e-14	1.4887980e-14
1.25um	9.6790971	10.130847	1.4632401e-14	9.6519624e-15
1.65um	10.230420	10.623293	4.0385956e-15	2.8124260e-15
2.22um	10.022064	10.362918	2.3699773e-15	1.7314197e-15
2.50um	9.8260599	10.150282	2.3166142e-15	1.7185609e-15
3.00um	9.2049662	9.5097861	1.9703003e-15	1.4880052e-15
3.55um	8.3970556	8.6922990	2.7355749e-15	2.0842570e-15
4.00um	7.0776486	7.3722780	6.2126507e-15	4.7361470e-15
4.77um	5.7064570	6.0121534	1.3817658e-14	1.0426916e-14

(1) Wavelength (microns)
(2) Point source magnitude (Vega)
(3) Extended source magnitude per square arcsecond (Vega)
(4) Point source line flux (erg per second per square cm)
(5) Extended source line flux (erg per second per square cm per arcsec)