#this example is somewhat contrived, but serves to show toolkit use

#load atmospheric transmittance from file created in Modtran in wavenumbers

# the transmittance is specified in the wavenumber domain with

# 5 cm-1 intervals, but we want to work in wavelength with 2.5 cm-1

waven **=** numpy**.**arange**(**2000.0**,** 3300.0**,** 2.5**).**reshape**(-**1**,** 1**)**

wavel**=** ryutils**.**convertSpectralDomain**(**waven**,** type**=**'nw'**)**

#remove comment lines, and scale path radiance from W/cm2.sr.cm-1 to W/m2.sr.cm-1

tauA **=** ryfiles**.**loadColumnTextFile**(**'data/path1kmflamesensor.txt'**,** **[**1**],**abscissaOut**=**waven**,**   
 comment**=**'%'**)**

lpathwn **=** ryfiles**.**loadColumnTextFile**(**'data/pathspaceflamesensor.txt'**,** **[**9**],** abscissaOut**=**waven**,** ordinateScale**=**1.0e4**,** comment**=**'%'**)**

#convert path radiance spectral density from 1/cm^-1 to 1/um, at the sample wavenumber points

**(**dum**,** lpathwl**)** **=** ryutils**.**convertSpectralDensity**(**waven**,** lpathwn**,** type**=**'nw'**)**

#load the detector file in wavelengths, and interpolate on required values

detR **=** ryfiles**.**loadColumnTextFile**(**'data/detectorflamesensor.txt'**,** **[**1**],**abscissaOut**=**wavel**,**

comment**=**'%'**)**

#construct the flame emissivity from parameters

emis **=** ryutils**.**sfilter**(**wavel**,**center**=**4.33**,** width**=**0.45**,** exponent**=**6**,** taupass**=**0.8**,**

taustop**=**0.1 **)**

#construct the sensor filter from parameters

filter **=** ryutils**.**sfilter**(**wavel**,**center**=**4.3**,** width**=**0.8**,** exponent**=**12**,** taupass**=**0.9**,**

taustop**=**0.0001**)**

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print**(**'Optics : area={0} m^2 FOV={1} [sr]'**.**format**(**opticsArea**,** opticsFOV **))**

print**(**'Amplifier: gain={0} [V/A]'**.**format**(**transZ**))**

print**(**'Detector : peak responsivity={0} [A/W]'**.**format**(**responsivity**))**

print**(**'Flame : temperature={0} [K] area={1} [m^2] distance={2} [m] fill={3} [-]'**.**format**(**flameTemperature**,** flameArea**,** distance**,** fill**))**

print**(**'Flame : irradiance={0:9.2e} [W/m^2] signal={1:7.4f} [V]'**.**format**(**totalirradianceFlame**,** signalFlame**))**

# now do path

inbandirradiancePath **=** lpathwn **\*** detR **\*** filter **\*** opticsFOV

totalirradiancePath **=** numpy**.**trapz**(**inbandirradiancePath**.**reshape**(-**1**,** 1**),**waven**,** axis**=**0**)[**0**]**

signalPath **=** totalirradiancePath **\*** transZ**\***responsivity **\***opticsArea

print**(**'Path : irradiance={0:9.2e} [W/m^2] signal={1:7.4f} [V]'**.**format**(**totalirradiancePath**,** signalPath**))**

**(**dum**,** iFlamewl**)** **=** ryutils**.**convertSpectralDensity**(**waven**,** inbandirradianceFlame**,** type**=**'nw'**)**

**(**dum**,** iPathwl**)** **=** ryutils**.**convertSpectralDensity**(**waven**,** inbandirradiancePath**,** type**=**'nw'**)**

plot1**.**plot**(**3**,** "Irradiance"**,**"Wavelength [$\mu$m]"**,** "Iradiance [W/(m$^2$.$\mu$m)]"**,** wavel**,** iFlamewl**,**plotCol**=[**'r'**],** label**=[**'Flame'**])**

plot1**.**plot**(**3**,** "Irradiance"**,**"Wavelength [$\mu$m]"**,** "Iradiance [W/(m$^2$.$\mu$m)]"**,** wavel**,** iPathwl**,**plotCol**=[**'b'**],** label**=[**'Path'**])**

plot1**.**plot**(**4**,** "Irradiance"**,**"Wavenumber [cm$^{-1}$]"**,** "Irradiance [W/(m$^2$.cm$^{-1}$)]"**,** waven**,** inbandirradianceFlame**,**plotCol**=[**'r'**],** label**=[**'Flame'**])**

plot1**.**plot**(**4**,** "Irradiance"**,**"Wavenumber [cm$^{-1}$]"**,** "Irradiance [W/(m$^2$.cm$^{-1}$)]"**,** waven**,** inbandirradiancePath**,**plotCol**=[**'b'**],** \

label**=[**'Path'**],** maxNX**=**10**,** maxNY**=**10**)**

plot1**.**saveFig**(**'flamesensor01.eps'**)**