All of the MAIN FUNCTIONS need the keyword minxss\_instrument\_structure\_data\_file = ‘full\_path\MINXSS\_FM1\_RESPONSE\_STRUCTURE.SAV'

* Information on the contents of the MINXSS\_FM1\_RESPONSE\_STRUCTURE.SAV is in the document “MINXSS\_FM1\_RESPONSE\_STRUCTURE\_INFO.docx”

1. MAIN FUNCTIONS
   1. **x123\_invert\_count\_to\_photon\_estimate**
      1. Purpose: estimates the incident photon flux (photons per keV) on the x123 aperture from the *measured* x123 count flux per keV,
         1. Option to return 3 independent estimates for the count inverted photon flux
            1. Be\_Si\_photopeak - Parameter returned from x123\_invert\_count\_to\_photon\_estimate
            2. Be\_Transmission
            3. Be\_Photoelectrons
            4. *Where all 3 agree, there is strong confidence in the photon flux estimate from the inverted count spectrum*
            5. x123\_inverted\_count\_to\_photon\_estimate\_valid\_flag\_array = 1, where all 3 independent estimates agree to within **10%,** can set an arbitrary fractional agreement value by setting the keyword X123\_inverted\_valid\_flag\_fractional\_difference\_level=fractional\_value
            6. *Independent from a spectral emission model*

No assumed elemental abundance, plasma temperature nor emission measure

Should confirm inverted estimates with future spectral model fits from OSPEX

* + - 1. Use the /use\_detector\_area keyword to include instrument area (cm2) in the inversion
    1. functions needed to run:
       1. x123\_be\_photoelectron\_si\_escape\_count\_correction
       2. gaussfold
       3. gauss\_variable\_fwhm\_convolve
  1. **minxss\_xp\_signal\_from\_x123\_signal** 
     1. Purpose: estimates xp fC or DN from the estimated input photon flux per keV from the *measured* x123 count flux per keV
        1. Option to use an alternative signal gain by setting the keyword, input\_minxss\_xp\_gain\_fC\_per\_dn = alternative\_gain\_value
        2. Use the /use\_detector\_area keyword to include instrument area (cm2)
     2. functions needed to run:
        1. x123\_invert\_count\_to\_photon\_estimate
        2. x123\_be\_photoelectron\_si\_escape\_count\_correction
        3. minxss\_xp\_signal\_estimate
        4. gaussfold
        5. gauss\_variable\_fwhm\_convolve
  2. **minxss\_x123\_full\_signal\_estimate** 
     1. Purpose: estimates x123 count flux per keV, from an input photon flux per keV
        1. Also computes slow counts and count contribution from each aspect of the detector response matrix (photopeak, be photoelectrons, Si-k, Si-l 2s and 2p escape processes)
        2. Use the /use\_detector\_area keyword to include instrument area (cm2)
     2. functions needed to run:
        1. gauss\_variable\_fwhm\_convolve
        2. gaussfold
        3. x123\_si\_escape\_signal
        4. x123\_photoelectron\_signal
        5. x123\_be\_photoelectron\_si\_escape\_count\_correction
  3. **minxss\_xp\_signal\_estimate**
     1. Purpose: estimates xp fC or DN from an input photon flux per keV
        1. Option to use an alternative signal gain by setting the keyword, input\_minxss\_xp\_gain\_fC\_per\_dn = alternative\_gain\_value
        2. Use the /use\_detector\_area keyword to include instrument area (cm2)
     2. functions needed to run:
        1. None extra

1. ANCILLARY FUNCTIONS
   1. **gauss\_variable\_fwhm\_convolve**
      1. Purpose: convolves an intensity array with a spectral resolution that is a function of the photon wavelength or energy, caution: calculation is slow!
      2. functions needed to run:
         1. gaussfold
   2. **gaussfold**
      1. Purpose: convolves an intensity array with a constant fwhm spectral resolution that is has a Gaussian shape
      2. functions needed to run:
         1. None extra
   3. **x123\_si\_escape\_signal**
      1. Purpose: calculates the estimated x123 count flux per keV contribution from Si escape processes estimates, from an input photon flux per keV
         1. count contribution from Si-k, Si-l 2s and 2p escape processes
      2. functions needed to run:
         1. gaussfold
         2. gauss\_variable\_fwhm\_convolve
      3. Needs the MINXSS\_FM1\_RESPONSE\_STRUCTURE.SAV if run independently from the MAIN FUNCTIONS
   4. **x123\_photoelectron\_signal**
      1. Purpose: calculates the estimated x123 count flux per keV contribution from Be photoelecton estimates, from an input photon flux per keV
      2. functions needed to run:
         1. gaussfold
         2. gauss\_variable\_fwhm\_convolve
      3. Needs the MINXSS\_FM1\_RESPONSE\_STRUCTURE.SAV if run independently from the MAIN FUNCTIONS
   5. **x123\_be\_photoelectron\_si\_escape\_count\_correction**
      1. Purpose: calculates the corrected count flux per keV from the *measured* x123 count flux per keV contribution from Be photoelecton estimates, from an input photon flux per keV
         1. Option to return the count contribution from the main process
            1. Corrected counts - Parameter returned from x123\_be\_photoelectron\_si\_escape\_count\_correction,

be photoelectrons are removed and Si escape fluorescence photons are accounted for

* + - * 1. Be\_Si\_photopeak corrected counts
        2. Be\_Photoelectrons corrected counts
        3. All Si escape corrected counts
        4. Si-k escape corrected counts only
        5. Si-l 2s escape corrected counts only
        6. Si-l 2p escape corrected counts only
        7. Si-k escape corrected counts only
    1. functions needed to run:
       1. gaussfold
       2. gauss\_variable\_fwhm\_convolve
    2. Needs the MINXSS\_FM1\_RESPONSE\_STRUCTURE.SAV if run independently from the MAIN FUNCTIONS

1. ANCILLARY FILE
   1. MINXSS\_FM1\_RESPONSE\_STRUCTURE.SAV
      1. **Use** minxss\_instrument\_structure\_data\_file = ‘full\_file\_path\ MINXSS\_FM1\_RESPONSE\_STRUCTURE.SAV’ as input for the above MAIN FUNCTIONS