

目前，头文件的程序是在张天萌提供的 WCS 程序的基础上修改的，头文件包含 Primary header, 和 image extension  
primary header 如下：

```
SIMPLE =                      T / conforms to FITS standard
BITPIX =                      8 / array data type
NAXIS =                      0 / number of array dimensions
EXTEND =                      T
NEXTEND =                    4.0 / Number of extensions
NAMPS =                      4.0 / Number of amplifiers
DATE = '2020-01-01'          / Date this file was written
FILENAME= 'CSST_CCD01_GI_RA60.0_DEC-40.0' / Name of file
FILETYPE= 'zero'             / Type of data
COMMENT =====
COMMENT Target information
COMMENT =====
EXPNUM =          99999999.0 / Exposure sequence number
TARGNAME= 'CSST_ '          / Observation title
RADECSYS= 'FK5'            / Default coordinate system
RADECEQ =          2000.0 / Default equinox
RA = '00:00:00.00'          / RA of observation (hr)
DEC = '+00:00:00.00'        / Dec of observation (deg)
EQUINOX =          2000.0 / Epoch(year)
COMMENT =====
COMMENT Exposure information
COMMENT =====
TIMESYS = 'UT'              / Time system
DATE-OBS= '2020-01-01'      / UTC date of start of observation
TIME-OBS= '00:00:00'        / UTC time of start of observation
EXPTIME =          0.0 / Exposure time (sec)
MJD-OBS =          58849.0 / MJD of observation start
MJDSTART=          58849.0 / MJD of observation start
MJDEND =          58849.0 / MJD of observation end
COMMENT =====
COMMENT Telescope information
COMMENT =====
TELESCOP= 'CSST'            / Telescope name
TELRADEC= 'FK5'             / Telescope coordinate system
TELEQUIN=          2000.0 / Equinox of tel coords
TELRA = '00:00:00.00'        / RA of telescope (hr)
TELDEC = '00:00:00.00'      / Dec of telescope (deg)
TELFOCUS=          -9999.0 / Telescope focus
SUNANGLE=          30.0 / Angle between sun and direction
MOONANGL=          30.0 / Angle between moon and direction
REFFRAME= 'GSC1'            / guide star catalog version
COMMENT =====
COMMENT Detector information
COMMENT =====
INSTRUME= 'MBI'              / Instrument used to acquire data
DETSIZE = '[1:9232,1:9216]' / Detector size
NUMDETE =          1.0 / Number of detectors
NUMAMPS =          4.0 / Number of amplifiers
PIXSCAL1= '0.074'           / Pixel scale for axis 1 (arcsec/pixel)
PIXSCAL2= '0.074'           / Pixel scale for axis 2 (arcsec/pixel)
SHUTSTAT= 'closed'          / Shutter status
DETETEMP=          -100.0 / Detector temperature
FILTER = 'GI'               / Filter name
COMMENT =====
COMMENT Other information
COMMENT =====
CHECKSUM= 'abcdefg'         / checksum of global headers
ITL-HEAD= 'OK'              / ITL Header flag
N-AMPS-X=          2.0 / Number of amplifiers in X
N-AMPS-Y=          2.0 / Number of amplifiers in Y
END
```

Image extension header 如下：

```

XTENSION= 'IMAGE'           / Image extension
BITPIX   =                  -64 / array data type
NAXIS    =                   2 / number of array dimensions
PCOUNT   =                   0 / number of parameters
GCOUNT   =                   1 / number of groups
NAXIS1   =                  9232
NAXIS2   =                  9216
EXTNAME  = 'IM1'            / Extension name
OBSID    = 'CSST.20200101T000000' / Observation ID
COMMENT  =====
COMMENT  Readout information
COMMENT  =====
CCDNAME  = 'ccd01'          / CCD name
AMPNAME  = 'ccd01:1'        / Amplifier name
GAIN     =                  1.0 / Gain (e-/ADU)
RDNOISE  =                   5.0 / Readout noise (e-/pixel)
DARK     =                   0.02 / Dark noise (e-/pixel/s)
SATURATE =                9000.0 / Saturation (e-)
RSPEED   =                  10.0 / Read speed
CHITEMP  =                 -100.0 / Chip temperature
COMMENT  =====
COMMENT  Chip information
COMMENT  =====
CCDCHIP  = 'ccd01'          / CCD chip ID
DATASEC  = '[1:9232,1:9216]' / Data section
CCDSUM   = '1 1'           / CCD pixel summing
NSUM     = '1 1'           / CCD pixel summing
LTM1_1   =                  1 / CCD to image transformation
LTM2_2   =                  1 / CCD to image transformation
LTV1     =                   0 / CCD to image transformation
LTV2     =                   0 / CCD to image transformation
ATM1_1   =                  1 / CCD to amplifier transformation
ATM2_2   =                  1 / CCD to amplifier transformation
ATV1     =                   0 / CCD to amplifier transformation
ATV2     =                   0 / CCD to amplifier transformation
DTV1     =                   0 / CCD to detector transformation
DTV2     =                   0 / CCD to detector transformation
DTM1_1   =                  1 / CCD to detector transformation
DTM2_2   =                  1 / CCD to detector transformation
COMMENT  =====
COMMENT  WCS information
COMMENT  =====
EQUINOX  =                2000.0 / Equinox of WCS
WCSDIM   =                   2.0 / WCS Dimensionality
CTYPE1   = 'RA---TAN'        / Coordinate type
CTYPE2   = 'DEC---TAN'      / Coordinate type
CRVAL1   =                   60.0 / Coordinate reference value
CRVAL2   =                  -40.0 / Coordinate reference value
CRPIX1   =                24876.0 / Coordinate reference pixel
CRPIX2   =                29758.0 / Coordinate reference pixel
CD1_1    = 1.88506793068053E-05 / Coordinate matrix
CD1_2    = 8.19650863901894E-06 / Coordinate matrix
CD2_1    = -8.1965086390189E-06 / Coordinate matrix
CD2_2    = 1.88506793068053E-05 / Coordinate matrix
END

```

程序运行需要用到两个文件 global\_header.param 和 filter.lst, 直接运行程序需要包含几个参数：

探测器 x 方向长度,

探测器 y 方向长度,

指向 ID (目前指向 ID 从 1 到 371) ,

RA,

DEC,

像元大小,

探测器所在行位置（y 方向位置，从 1 开始，见 CCD 图），  
探测器所在列位置（x 方向位置，从 1 开始，见 CCD 图），  
焦面绕视轴旋转角度，

增益，

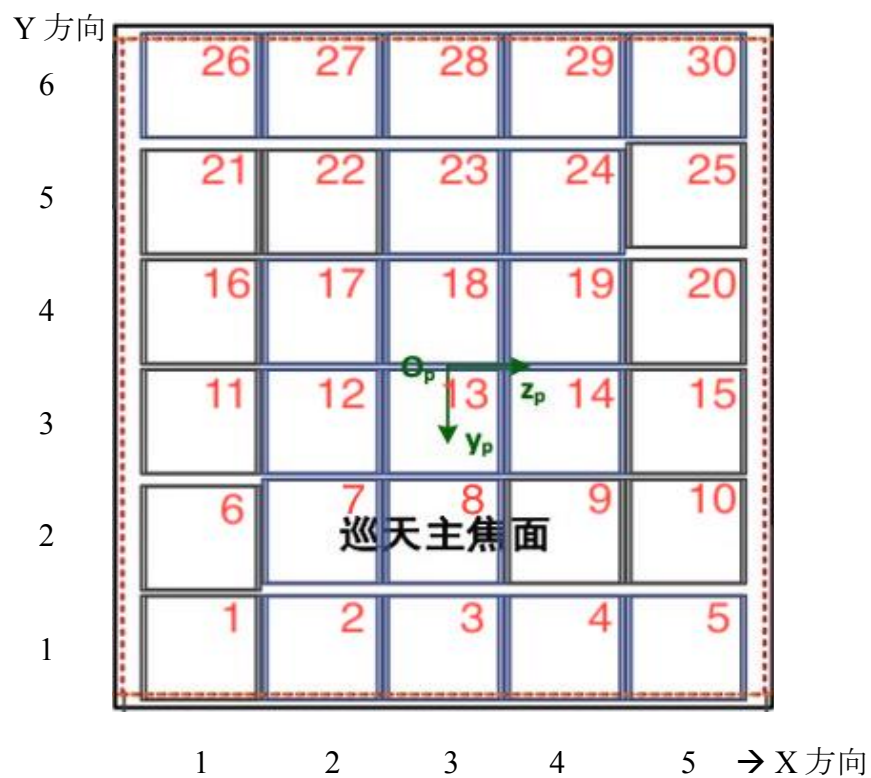
读出噪声，

暗电流，

满阱

example：

```
python imageHeader.py 9232 9216 1 60 -40 0.074 2 3 23.5 1.0 5.0  
0.02 9000
```



运行程序后生成 fits 文件，可以查看生成的头文件。