

## Level 0 Header Example

```
SIMPLE = T / Written by IDL: Mon Jul 15 07:59:02 2013
BITPIX = -32 / Number of bits per data pixel
NAXIS = 2 / Number of data axes
NAXIS1 = 1024 /
NAXIS2 = 120 /
EXTEND = T / FITS data may contain extensions
DATE = '2013-07-15T05:59:03' / Creation date of FITS header (UTC)
FILENAME= 'sum_20101116_21595334_12166_05.fits' /Name of the FITS file
SORIG = 'GenuineIntel GNU/Linux' /Architecture and OS
DATASRC = 'Final Distribution (CDROM)' /Data Source
TELESCOP= 'SOHO' /
INSTRUME= 'SUMER' /
DATE_MOD= '2013-07-15T05:59:02.811' /Last modified
ORIGIN = 'SOHO MPS Lindau' /Where Data is Produced
OBS_SEQ = 'Temporal Series' /Name of observing sequence
DATE_OBS= '2010-11-16T21:59:53.345' /Beginning of Observation Date (UTC)
DATE_END= '2010-11-16T22:00:03.345' /End of Observation Date (UTC)
OBT_TIME= 1668636027.345 /Starting time of acquisition (TAI)
OBT_END = 1668636037.345 /End time of acquisition (TAI)
LEVEL = '0' /Data processing level
PRODLVL = 'LZ' /Data calibration level
DETECTOR= 'B' /Detector used
EXPTIME = 10.00 /Exposure time [s]
IXWIDTH = 0.300000 /Image width ["]
IYWIDTH = 120.000 /Image height ["]
SLIT = '<7> 0.3" * 120" centered' /SUMER slit
INSTITUT= ' ' /Name of institutes for campaign
CMP_TYPE= 'None' /Type of coordinated program
CMP_NAME= 'None' /Name of campaign observation
CMP_ID = 0 /Campaign number
STUDY_ID= 2975 /Study number
STUDY_NM= 'GER LY_ALPHA_SI3' /Study name
OBJECT = 'SS' /Target
SCI_OBJ = 'Sunspot' /The science objective
SCI_SPEC= 'LY_ALPHA_SI3' /The specified objective
POPUDP = 2 /POP/UDP number
OBS_PROG= 'LY_ALPHA_SI3.SCL' /Name of scientist program
SCIENTIS= '< 94> Dietmar Germerott' /Scientist responsible of POP/UDP
FFONOFF = 'OFF' /On board flat field ON/OFF
BINX = 1 /Binning X (1 - 1024)
BINY = 1 /Binning X (1 - 360)
ROTCMP = 0.00000 /Solar rotation compensation
PIMGTYP = 'MULTIPLE' /Processing image Type (Single/Multiple)
COMPRESS= 5 /Compression method
COMPAR1 = 33 /Compression parameter 1
COMPAR2 = 351 /Compression parameter 2
COMPAR3 = 0 /Compression parameter 3
DECOMP = T /Decompression (F=No/T=Yes)
FLATCORR= F /Flatfield corrected on ground (F=No/T=Yes)
```

## Level 0 Header Example

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GEOMCORR=          F /Geometry corrected on ground (F=No/T=Yes)
WCSAXES =          3 /Number of WCS axis
CTYPE1  = 'WAVE    ' /Type of CRVAL1
CUNIT1  = 'ANGSTROM' /Axis unit along axis 1
CRPIX1  =           958 /Reference pixel along axis 1
CRVAL1  =          1216.64 /Value at reference pixel of axis 1
CDELTA1 =          0.0432680 /Axis increments along axis 1
CTYPE2  = 'HPLT-TAN' /Type of CRVAL2
CUNIT2  = 'ARCSEC  ' /Axis unit along axis 2
CRPIX2  =           60.5000 /Reference pixel along axis 2
CRVAL2  =          350.844 /Value at reference pixel of axis 2
CDELTA2 =           1 /Axis increments along axis 2
CTYPE3  = 'HPLN-TAN' /Type of CRVAL3
CUNIT3  = 'ARCSEC  ' /Axis unit along axis 3
CRPIX3  =           1 /Reference pixel along axis 3
CRVAL3  =          629.336 /Value at reference pixel of axis 3
CDELTA3 =          0.300000 /Axis increments along axis 3 (Set to slit width)
REFPIX  =           66 /Original reference Pixel
DETXSTR=           0 /Detector readout start / X
DETXEND =          1023 /Detector readout end / X
DETYSTR=           120 /Detector readout start / Y
DETYEND =           239 /Detector readout end / Y
WAVEMIN =          1205.45 /Minimum wavelength in image <mulmod>
WAVEMAX =          1217.72 /Maximum wavelength in image <mulmod>
CORORB  =           F /Orbitology corrected
INS_X   =         -666.188 /Pointing of instrument / instrument X-axis
INS_Y   =         -274.500 /Pointing of instrument / instrument Y-axis
SOLAR_X =          629.336 /Instrument pointing / solar X-axis
SOLAR_Y =          350.844 /Instrument pointing / solar Y-axis
RASTYPE = 'TEMPORAL' /Sequence type
SC_XO   =           0.00000 /Spacecraft pointing / solar X-axis
SC_YO   =           0.00000 /Spacecraft pointing / solar Y-axis
SC_ROLL =         -173.255 /Spacecraft roll angle relative to the solar coor
SOLAR_P0=        20.9018072935 /Solar angle P0 (degree)
SOLAR_B0=        2.69290137291 /Solar angle B0 (degree)
GEIX_OBS=        -3.42516E+08 /Geocentric equatorial inertial X
GEIY_OBS=        -1.22981E+09 /Geocentric equatorial inertial Y
GEIZ_OBS=        -4.64937E+08 /Geocentric equatorial inertial Z
GSEX_OBS=         1.26628E+09 /Geocentric solar ecliptic X
GSEY_OBS=         4.88386E+08 /Geocentric solar ecliptic Y
GSEZ_OBS=         6.25772E+07 /Geocentric solar ecliptic Z
GSMX_OBS=         1.26628E+09 /Geocentric solar magnetic X
GSMY_OBS=         4.91444E+08 /Geocentric solar magnetic Y
GSMZ_OBS=         3.03241E+07 /Geocentric solar magnetic Z
HAEX_OBS=         8.59967E+10 /Heliocentric Aries Ecliptic X
HAEY_OBS=         1.18802E+11 /Heliocentric Aries Ecliptic Y
HAEZ_OBS=         5.87081E+07 /Heliocentric Aries Ecliptic Z
DSUN_OBS=         1.46661E+11 /Distance from Sun
HGLN_OBS=         -0.171889 /Stonyhurst heliographic longitude

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```
HGLT_OBS=          2.69290 /Stonyhurst heliographic latitude
CRLN_OBS=          129.145 /Carrington heliographic longitude
CRLT_OBS=          2.69290 /Carrington heliographic latitude
XCEN   =           629.336 /Center of the instrument FOV / solar X-axis
YCEN   =           350.844 /Center of the instrument FOV / solar Y-axis
ANGLE  =          -173.255 /Orientation of instrument FOV (degree)
UDP_ID =             3569 /Reference to observing program
PROG_NM = 'GER LY_ALPHA_SI3' /Name of observing program
T3TELE =           52.8000 /Telescope (MC2) temperature (degree C)
T3REAR =           21.1200 /SUMER rear (MC3) temperature (degree C)
T3FRONT =          22.7200 /SUMER front (MC4) temperature (degree C)
T3SPACER=          24.7600 /SUMER spacer (MC6) temperature (degree C)
MC2ENC =             1684 /SUMER MC2 Encoder Position
MC3ENC =             1838 /SUMER MC3 Encoder Position
MC4ENC =             2247 /SUMER MC4 Encoder Position
MC6ENC =             2097 /SUMER MC6 Encoder Position
MC8ENC =          138439 /SUMER MC8 Encoder Position
HKOTIME = '2010-11-16T22:00:04.592' /Time stamp of HKO Record (UTC)
```

### /Multiple Image Header Entries

```
OTYPIMG =           10 / Original Image Type
IREFPIX1=           958 / Image Refpix 1
REFPIX1 =            66 / Refpix 1
WAVEL1  =          1216.64 / Wavelength (Angstroem) 1
IMGCNT1 =            658 / Image Counter 1
BPCNTS1 =            351 / Brightest Pixel Counts 1
TOTCNTS1=          77138 / Total Counts in Image 1
XSSMDU1 =             0 / Missing data in image 0=no,1=yes 1
XSSQAC1 =             0 / Quality of image data 0=OK,1=NOTOK 1
IREFPIX2=           908 / Image Refpix 2
REFPIX2 =            116 / Refpix 2
WAVEL2  =          1214.50 / Wavelength (Angstroem) 2
IMGCNT2 =            659 / Image Counter 2
BPCNTS2 =            347 / Brightest Pixel Counts 2
TOTCNTS2=          94576 / Total Counts in Image 2
XSSMDU2 =             0 / Missing data in image 0=no,1=yes 2
XSSQAC2 =             0 / Quality of image data 0=OK,1=NOTOK 2
IREFPIX3=           724 / Image Refpix 3
REFPIX3 =            300 / Refpix 3
WAVEL3  =          1206.53 / Wavelength (Angstroem) 3
IMGCNT3 =            660 / Image Counter 3
BPCNTS3 =            136 / Brightest Pixel Counts 3
TOTCNTS3=          17082 / Total Counts in Image 3
XSSMDU3 =             0 / Missing data in image 0=no,1=yes 3
XSSQAC3 =             0 / Quality of image data 0=OK,1=NOTOK 3
```

### /SUMER Raw Image Header Entries

## Level 0 Header Example

```

SSYNCO =                235 /Header Sync Byte 0 (0xEB)
SSYNC1 =                144 /Header Sync Byte 1 (0x90)
IMG_REC =               128 /Header Record Id (0x80)
SSTYPIMG=                5 /SUMER image format index
XSSTAI =      1668636027.345 /Exposure start time (TAI)
SSOPCNT =                32 /Operations counter. 0 after switch on, increased
SSPOUDP=                2 /POP/UDP number. 0 no POP/UDP executing
SSIMGCNT=              658 /Image counter, 0 at start of op +1 at spectrohel
SSLOC =                 94 /Scientist ID (after Jun 1996)
SSTARGET=              159 /Target as set by SYS_Operator
SSFLDATE=                0 /Never really used
SSFLREQN=                0 /Never really used
SSREFPIX=              2719 /Reference pixel where lambda is on
FREFPIX =                66 /Ref pixel reduced by det B offset (2653)
SSSTAT =                16 /Status
SSEETRIG=               0 /Explosive event trigger
SSFF =                  0 /Flatfield correction 1=on,0=off
SSFF_T = 'OFF'          ' /Flatfield correction status as text
SSDETTYP=                2 /Current detector in use (1=A,2=B,3=RSC)
SSDET_T = 'B'          ' /Detector in use as text
SSINTSTA=               0 /IIF/TC spectrohelio interrupt status
SSDETSTA=               255 /Detector status
SSSUNY =              -10659 /SUMER coordinate Y [0.0625"]
SSSUNZ =                4392 /SUMER coordinate Z [0.0625"]
P_SUNY =             -666.188 /SUMER coordinate Y ["]
P_SUNZ =                274.500 /SUMER coordinate Z ["]
SSEXPTIM=              10.0003 /Exposure time [s]
SSIIDZ =                0 /Inter instrument sun z coordinate
SSIIDY =                0 /Inter instrument sun y coordinate
SSBPADDY=              935 /Brightest pix addr Y (spec dir 0..1023) <mulmod>
SSBPADDZ=               74 /Brightest pix addr Z (spat dir 0..359) <mulmod>
SSIMGTOT=             188796. /Total counts in image <mulmod>
SSROTCOM=              0.00000 /Rotation compensation time
SSBPCNTS=              351 /Brightest pixel counts <mulmod>
SSACIMGC=              9257 /Accumulative image counter (0 after boot)
SSSTEPN =             -319 /Number of raster steps (+ E->W, - W->E)
SSSTEPsz=               0 /Raster step size in motor steps (neg=Schmierschr
SSSLITN =               7 /Number of slit selected
SSBINNY =               1 /Binning factor spectral dimension
SSBINNZ =               1 /Binning factor spatial direction
SSXCNT =               3116 /X event count (raw value)
SSYCNT =               3115 /Y event count (raw value)
X_EVCNT =              22195.3 /X event count (corrected for detector)
Y_EVCNT =              22076.0 /Y event count (corrected for detector)
S_MCPV =                245 /High voltage raw value
S_MCPVF =              5434.00 /High voltage [V]
SIMCPI =                217 /MCP current (Raw value)
SIMCPIF =              130.020 /MCP current [uA]
SSMC2POS=              4050 /MC2-Azimuth position [0.38"]

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## Level 0 Header Example

```
SSMC3POS=          4498 /MC3-Elev position [0.38"]
SSMC4POS=          774 /MC4-Slit select position [half step]
SSMC6POS=        10580 /MC6-Grat position [half step]
SSMC8POS=          5134 /MC8-Scan mirror position [half step]
SSMCERR =           0 /Motor controller error
SSCOMPRM=           5 /Compression method
SSWAVEL =        1216.64 /Wavelength at reference pixel (Angstroem)
SSCOMP1=           33 /Compression parameter 1
SSCOMP2=          351 /Compression parameter 2
SSCOMP3=           0 /Compression parameter 3
SSADMCNT=         3569 /Admin cnt (gives the database udp id)
XSSMDU  =           0 /Missing data in image 0=no,1=yes
XSSQAC  =           0 /Quality of image data 0=OK,1=NOTOK
XSSFID  =           0 /File id from TM file catalog
XSSFPTR =        15296360 /Pointer to image position in bin file
XSCDID  =           5298 /CD ID of TM file
XSSEQID =            1 /CD Sequence ID of TM file
XSTMFIL=        3210101 /TM filename without ext
PROCVERS=          396 /SVN Version of write_sumerfits
COMMENT FITS (Flexible Image Transport System) format is defined in 'Astronomy
COMMENT and Astrophysics', volume 376, page 359; bibcode 2001A&A...376..359H
COMMENT The original raw image header is stored in the extention sumer-orig-raw-
COMMENT The wavelength is stored low -> high
COMMENT SOHO at 180 degree / The data is stored with north down!
COMMENT Detector B degraded - center part not usable
COMMENT This Image is a collection of multiple Images
HISTORY Written with write_sumerfits Version:$Revision: 396 $
HISTORY Applied update_fits $Revision: 395 $ 15-Jul-2013 05:59:02.814
END
```