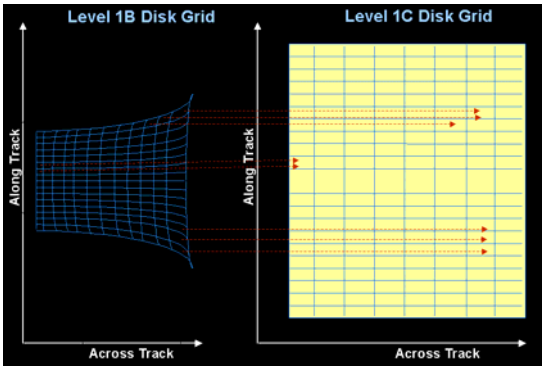
GUVI Level 1A Data Products

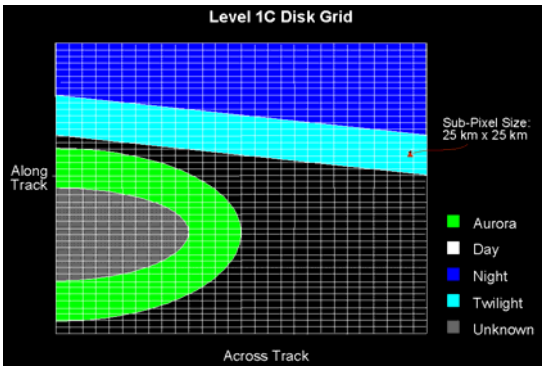
Overview

The GUVI Data Processing Payload Operations Center will routinely create scientific data products that are available for distribution via the web. In order for the data to be of use to scientists, industry and the public, rapid, efficient, and accurate operational algorithms have been developed to produce environmental parameters. Data from the GUVI instrument is processed on the ground to generate data products at the different levels.

GUVI DATA LEVELS	
Data Level	**Brief Description**
1A	time and position tagged data
1B	calibrated and geolocated
1C	binned in GUVI coordinates
2B	routine key parameters
3	multiple orbits
4	higher level analysis

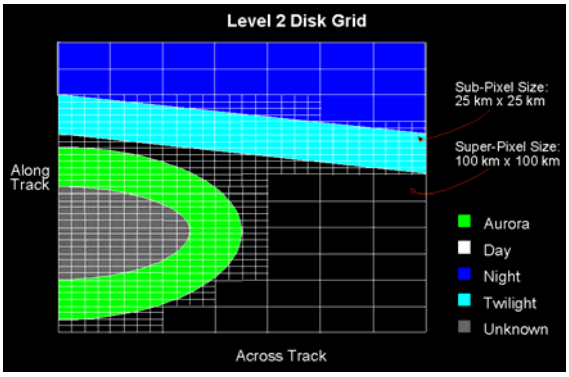
Level 1A is a "virtual" data product file in the sense that the data is not directly outputted to a data file. It consists of raw sensor data at full resolution. Level 1B is also a "virtual" data product file and it contains uncompressed instrument data, using a simple constrained maximum error compression algorithm that achieves modest compression factors, and has been calibrated to convert to units of radiance within the specified "color" of the GUVI data (Rayleighs/color).





The Level 1C data products contain data directly measured by the sensors, such as photometer counts, uncertainties, light intensities and pointing information derived from the GUVI raw sensor data and the TIMED Satellite ephemeris data. The data are gridded into a GUVI based coordinate system consisting of the along orbit position of the sensor and the angle of the scan from the nadir position. This gridding eliminates overlap from scan to scan due to the large instantaneous

field-of-view of GUVI (about 12 degrees) and involves coaddition to place the values on a uniform instrument shared grid. The data is then determined whether its from day, night, aurora or twilight pixels.



The Level 2B data products contain environmental parameters which are derived from the sensor data by scientific algorithms specific to day, night, and auroral regions. The data is averaged into 100 x 100 km^2 resolution to form "super pixels" on the day and night and 25 x 25 km^2 for the auroral products. The "super pixels" are then processed by the algorithms to yield geophysical parameters which are calculated from the radiance of the different colors.

GUVI DATA PRODUCTS	
Aurora	**Day**
Boundary Specification	Solar EUV flux index, Q_{env}
Effective* energy flux, Q	O/N_2 ration on disk
Effective* average energy, <E>	Temperature profile
Height of peak ionization rate	Neutral density profiles [NDPs] O, N_2, O_2 on limb
Column ionization rate	
Total vertical column density	

Data Definition for L1A Data Products

Data Product Filenames

- GUVI_mm_vaaarbb_yyyyddd _REVooooo.filetype: for Level 1A in imaging mode that encompass a single orbit
- GUVI_mm_scan_vaaarbb_yyyyddd _REVooooo.filetype: for Level 1B and Level 1C files in imaging mode that encompass a single orbit
- GUVI_mm_vaaarbb_yyyyddd _REVooooo.name: for Level 1A, Level 1B and Level 1C files in static imaging or spectrograph mode that encompass a single orbit
- GUVI_mm_scan_rrr_vaaarbb_yyyyddd_ REVooooo.name: for Level 2B files that encompass a single orbit
- GUVI_mm_scan_vaaarbb_yyyyddd_REVooooo_yyyyddd_REVooooo.name for files that encompass multiple but consecutive orbits

- GUVI_mm_scan_rrr_vaaarbb_yyyyddd_REVooooo_yyyyddd_REVooooo.name for files that encompass multiple but consecutive orbits for a specific data region
- where
  - mm is the instrument mode. Allowable modes are as follows and are case sensitive:
    - im - for imaging mode
    - si - for static imaging mode
    - sp - for spectrograph mode
  - scan is the scan type. Allowable choices are as follows and are case sensitive:
    - disk
    - limb
  - rrr is the data region that the data in this file covers. Allowable regions are as follows and are case sensitive:
    - day - for day
    - nit - for night
    - aur - for aurora
    - twi - for twilight
    - unk - for unknown
  - aaa is the 3 digit data product version number (this number combined with the revision number makes the data product file unique). "v" always precedes this indicating that this is a version number.
  - bb is the 2 digit data product revision number (this number combined with the version number makes the data product file unique). "r" always precedes this indicating that this is a revision number.
  - yyyy is the year. For multiple orbits, the first is start and the second is stop
  - ddd is the day of the year. For multiple orbits, the first is start and the second is stop
  - ooooo is the orbit number. For multiple orbits, the first is start and the second is stop
  - Filetype is the type of data product type. These are the file types for the GUVI routine data product files. Allowable names are as follows and are case sensitive:
    - L1A: level 1A data product files
    - L1B: level 1B data product files
    - L1C: level 1C data product files
    - L2B: level 2B data product files

File Header

- data product file headers

Data Item	Needed when….	Description	Data Type	Field Size (Bytes)	Range or Nominal Value	Requirement
Title	Always	Succinct description of what is in the data set	Character	256	Up to 255 characters	TIMED standard header
Data product type	Always	Type of data product	Character	256	Up to 255 characters	TIMED standard header
Source	Always	Person or facility that created this facility.	Character	33	Up to 32 characters	TIMED standard header
Mission	Always	Mission - always TIMED	Character	6	“TIMED”	TIMED standard header
Data product version number	Routine data products	Indicates how many times the content or format for the	Integer	2	0 .. 999	TIMED standard header

		product type has changed.				
Data product revision number	Routine data products	Indicates how many times this version of the data product has been updated	Integer	2	0 .. 99	GUVI standard header
Product format version number	Routine data products	Indicates how many times the format of the product type has changed.	Integer	2	0 .. 999	TIMED standard header
Software version number – major and minor	Routine data products	Major and minor software version number. This is 2 sets of 2 numbers. Indicates number of major and minor changes in processing algorithms.	Character	6	i.e. "01.02"	TIMED standard header
Software name	Always	Name of the software that created this product	Character	65	Up to 64 characters	TIMED standard header
Input/Cal version number – major and minor	Routine data products	Major and minor software version number. This is 2 sets of 2 numbers. Indicates number of major and minor changes in input/calibration processing algorithms.	Character	6	i.e. "02.03"	TIMED standard header
Description	Always	Description of this data product	Character	256	Up to 255 characters	TIMED standard header
Comment	Optional	Comment lines	Character	256	Up to 255 characters	TIMED standard header
History	Non-routine data products	Optional global attribute for an audit trail, i.e. date, time of day, user name, program name and command arguments	Character	256	Up to 255 characters	TIMED standard header
File name	Always	Name of this file	Character	81	Up to 80 characters	TIMED standard header
Date and time generated	Always	Data and time that this data product was generated	Character	14	yyyydoyhh mmss	TIMED standard header
Starting time	Always	Starting time/date of data used in this data product	Character	14	yyyydoyhh mmss	GUVI standard header
Stopping time	Always	Stopping time/date of data used in this	Character	14	yyyydoyhh mmss	GUVI standard

		data product				header
Starting orbit number	Always	Starting orbit number of data used in this data product	Integer	2	0 .. 21,900	GUVI standard header
Stopping orbit number	Data product encompasses multiple orbits. 0 otherwise.	Stopping orbit number of data used in this data product, if this product encompasses multiple orbits	Integer	2	0 .. 21,900	GUVI standard header
Instrument mode	Always	Instrument mode for this data product	Character	15	"Imaging", "Static Imaging" or "Spectrograph"	GUVI standard header
Instrument scan type	Imaging mode data products.	Instrument scan type when in imaging mode	Character	5	"Disk", "Limb" or "None"	GUVI standard header
Data region	Level 2B Imaging mode data products. Level 3 or higher data products if files encompasses only a single data region	Data region when in imaging mode.	Character	9	"Day", "Night", "Aurora", "Twilight", "Unknown" or "N/A"	GUVI standard header
Grid size	Level 1C and Level 2B data products. 0 otherwise	Size of the grid utilized when binning the data products	Integer	2		GUVI standard header
Data product version(s)	Non-routine data products. 0 otherwise	Data product version number for data products utilized to derive this data product. If multiple files are used, then multiple version numbers are to be included here.	Integer	2	0 .. 999	GUVI standard header
Data product revision number(s)	Non-routine data products. 0 otherwise	Data product revision number for data products utilized to derive this data product. If multiple files are used, then multiple version numbers are	Integer	2	0 .. 999	GUVI standard header

		to be included here.				
Purpose of data product	Non-routine data products. Blank otherwise.	Describe the purpose of this data product	Character	256	Up to 255 characters	GUVI standard header
Intended recipient	Non-routine data products. Blank otherwise.	Document the intended recipient/viewer of this data product	Character	133	Up to 132 characters	GUVI standard header
File type	Non-routine data products not utilizing NetCDF. "NetCDF" otherwise.	Type of file	Character	33	Up to 32 characters	GUVI standard header
81 day F10.7	Routine data products	81 day solar EUV flux value used to generate this routine data product	Float	4		GUVI standard header
Daily F10.7	Routine data products	Current day solar EUV flux value used to generate this routine data product	Float	4		GUVI standard header
F10.7 source	Routine data products	Qualify source of F10.7	Character	10	"Estimated" or "Final"	GUVI standard header
3 hour Kp	Routine data products	3 hour Kp value used to generate this routine data product	Float	4		GUVI standard header
daily Kp	Routine data products	daily Kp value used to generate this routine data product	Float	4		GUVI standard header
Kp/Ap source	Routine data products	Qualify source of Kp and Ap	Character	10	"Estimated" or "Final"	GUVI standard header
daily Ap	Routine data products	daily Ap value used to generate this routine data product	Float	4		GUVI standard header
Total size of header				2026		

<u>Level 1A Data File</u> (only output upon selection from the DP POC)

The data in this file contains uncompressed pixel data. It is unprocessed instrument data at full resolution, time-tagged, s/c location specified and tagged with a preliminary data quality flag

- per file

Data Item	Data Type	Field Size (Bytes)	Range or Nominal Value	Units
Header	N/A	2026	N/A	N/A

- data per scan for imaging mode

Data Item	Netcdf Variable Name	Data Type	Field Size (Bytes)	Range or Nominal Value	Units
Day of Year		Integer	2	1..366	
Time		Integer	4		Milliseconds since 00:00:00 of current day for the start of the current scan
Detector # of detector being used		Integer	1	1 .. 2	N/A
Slit position being used		Integer	1	0 = closed, 1 = wide, 2 = medium, 3 = narrow, 4 = unknown	N/A
Mirror start position		Integer	2		
Mirror nadir position		Integer	2		
Dark count pixels (4)		Integer	4 * 2		N/A
Background count pixels (7 * 3)		Integer	21 * 2		N/A
Total per scan			62		

- data per scan for static imaging modes

Data Item	Netcdf Variable Name	Data Type	Field Size (Bytes)	Range or Nominal Value	Units
Day of Year		Integer	2	1..366	
Time		Integer	4		Millisecon

					ds since 00:00:00 of current day for the start of the current scan
Detector # of detector being used		Integer	1	1 .. 2	N/A
Slit position being used		Integer	1	0 = closed, 1 = wide, 2 = medium, 3 = narrow, 4= unknown	N/A
Mirror step position		Integer	1		N/A
Dark count pixels (4)		Integer	4 * 2		N/A
Background count pixels (7 * 3)		Integer	21 * 2		N/A
Total per scan			59		

- data per scan for spectrograph modes

Data Item	Netcdf Variable Name	Data Type	Field Size (Bytes)	Range or Nominal Value	Units
Day of Year		Integer	2	1..366	
Time		Integer	4		Milliseconds since 00:00:00 of current day for the start of the current scan
Detector # of detector being used		Integer	1	1 .. 2	N/A
Slit position being used		Integer	1	0 = closed, 1 = wide, 2 = medium, 3 = narrow, 4 = unknown	N/A
Mirror step position		Integer	1		N/A
Input rate for detector being used		Integer	4		N/A

Output rate		Integer	4		N/A
Dark count pixels (4)		Integer	4 * 2		N/A
Background count pixels (7 * 3)		Integer	21 * 2		N/A
Total per scan			67		

- Uncompressed imaging data per cross track (191) - only when instrument is in imaging mode.

Data Item	Netcdf Variable Name	Data Type	Field Size (Bytes)	Range or Nominal Value	Units
Pixel data (for each of the five colors and for each along track index). Along track index will vary first and color last.		Float	4 * 14 * 5		Counts
Decompression error (for each of the five colors and for each along track index). Along track index will vary first and color last.		Scaled integer (by a factor of 10)	2 * 14 * 5		Percent scaled by 10
Input rate data for detector being used		Integer	4		N/A
Output rate data for detector being used		Integer	4		N/A
Total			428		
Total (191)			81,748		

- Compressed static imaging data per along track index (191) - only when instrument is in static imaging mode.

Data Item	Netcdf Variable Name	Data Type	Field Size (Bytes)	Range or Nominal Value	Units
Fine time		Float	4		Milliseconds since start of scan
Pixel data (for each of the five colors and for each along track index). Along track index will		Float	4 * 14* 5		Counts

vary first and color last.					
Decompression error (for each of the five colors and for each along track index). Along track index will vary first and color last.		Scaled integer (by a factor of 10)	2 * 14 * 5		Percent scaled by 10
Input rate data for detector being used		Integer	4		N/A
Output rate data for detector being used		Integer	4		N/A
Total			432		
Total (191)			82,512		

- Compressed spectrograph data per along track index (14) - only when instrument is in spectrograph mode.

Data Item	Netcdf Variable Name	Data Type	Field Size (Bytes)	Range or Nominal Value	Units
Pixel data (for each of the 176 colors)		Float	4 * 176		Counts
Decompression error (for each of the 176 colors)		Scaled integer (by a factor of 10)	2 * 176		Percent scaled by 10
Total			1,056		
Total (14)			14,784		

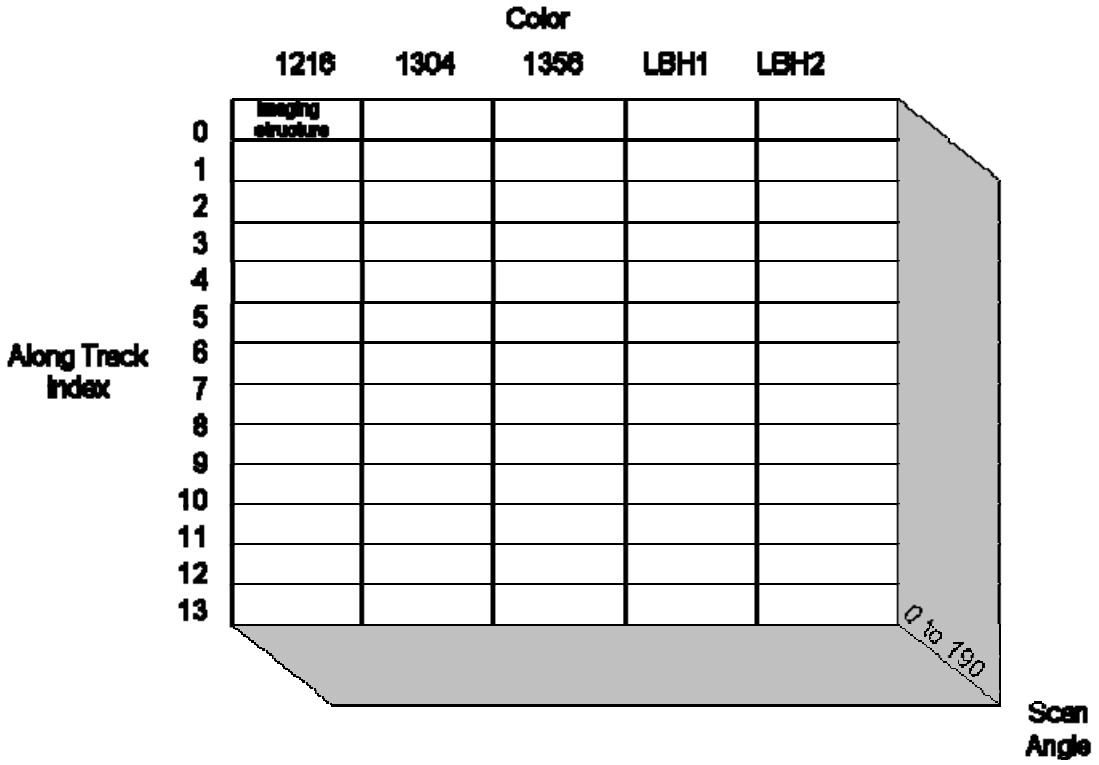
Total Level 1A Imaging data file:

Header: 2026 bytes

Data per scan: 57 bytes * (100 min. orbit / 15 sec. Scan) = 22,800 bytes

Imaging data per scan: 81,748 bytes * (100 min. orbit / 15 sec. Scan) = 32,699,200 bytes

Total: 32,724,026 bytes = ~33 Mbytes per orbit



Total Level 1A Static Imaging data file:

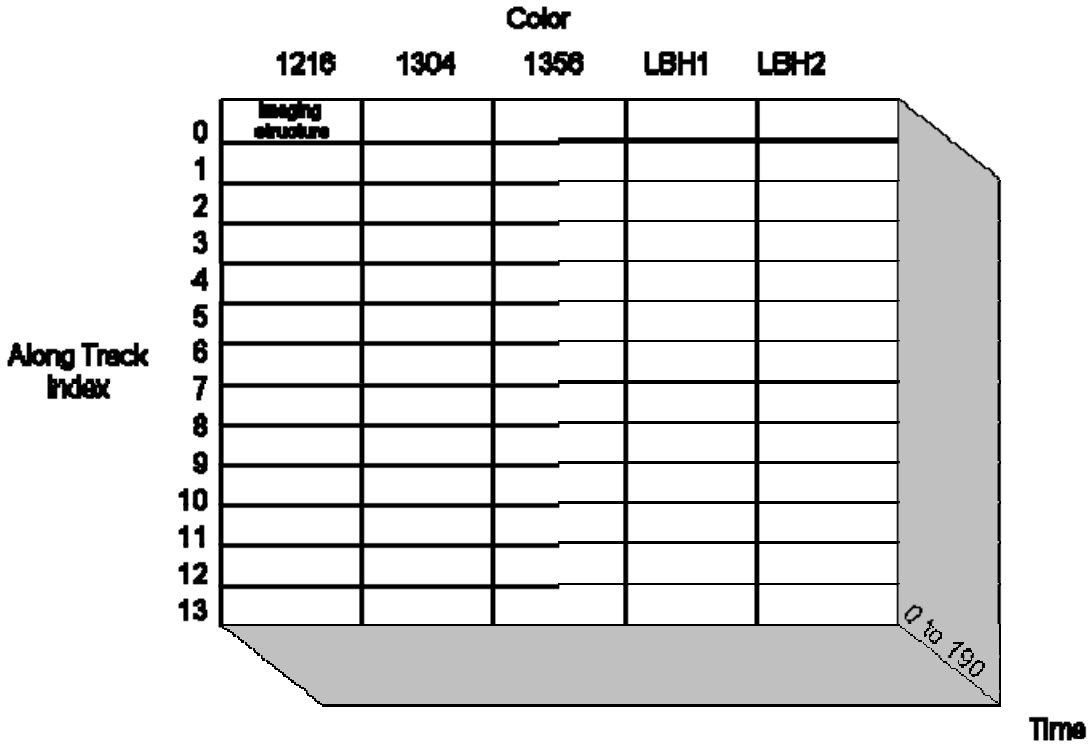
Header: 2026 bytes

Data per scan: 58 bytes * (100 min. orbit / 15 sec. Scan) = 23,200 bytes

Imaging data per scan: 82,512 bytes * (100 min. orbit / 15 sec. Scan) = 33,004,800 bytes

Total: 33,030,026 bytes = ~34 Mbytes per orbit

GUVI Static Imaging Mode Level 1A Data Logical Representation



Total Level 1A Spectrograph data file:

Header: 2026 bytes

Data per scan: 66 bytes * (100 min. orbit/ 3 sec. Scan) = 132,000 bytes

Spectrograph data per scan: 14,784 bytes * (100 min. orbit / 3 sec. Scan) = 29,568,000 bytes

Total: 29,702,026 bytes = ~30 Mbytes per orbit

GUVI Spectrograph Mode Level 1A Data Logical Representation