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# **Lucy Mission LDD**

**Lucy Archive Team**

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# USER GUIDE

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The *Lucy* mission's local data dictionary is used to describe and enumerate *Lucy* mission specific classes and attributes in PDS4 labels. It also includes Lucy Instrumentation specific classes and attributes for those instruments that require instrument nuanced metadata.

{August 12, 2024}  
{C. Gobat and M.K. Crombie}



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**CHAPTER  
ONE**

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**INTRODUCTION**

1. Purpose of this User's Guide
2. Audience
3. Applicable Documents



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**CHAPTER  
TWO**

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## **OVERVIEW OF THE LUCY LOCAL DATA DICTIONARY**

The *Lucy* mission's local data dictionary is used to describe and enumerate *Lucy* Mission specific classes and attributes in PDS4 labels. It also includes Lucy Instrumentation specific classes and attributes.



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**CHAPTER  
THREE**

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## **ORGANIZATION OF CLASSES AND ATTRIBUTES**

The *Lucy* mission dictionary is organized as set of four general classes and four instrument specific classes. The general classes are used to describe either observational parameters common to all mission instruments, or general data processing parameters. The instrument specific classes are used to describe instrument specific metadata that does not easily fit into a discipline specific data dictionary due to a mission specific nuance.

The *Lucy* mission dictionary hierarchy is an alphabetical list of the eight main classes. There is not a generic wrapper class. The eight main classes are as follows:

```
LEISA_Instrument_Parameters
LLORRI_Instrument_Parameters
LRalph_Instrument_Common_Parameters
Lucy_Observation_Planning
Lucy_Observation_Time_Information
Lucy_Product_Information
Lucy_Target_List
MVIC_Instrument_Parameters
```

General classes used for all Lucy products begin with the “Lucy\_”, whereas instrument specific classes begin with the instrument or instrument suite name. Instrument specific classes may contain sub-classes. Use case examples for each class can be found in the Examples section of this document.

### **3.1 Lucy\_Observation\_Time\_Information**

The Lucy\_Observation\_Time\_Information class is used to record the observation identification and timing information attached to each science observation sequence. The attributes in this class are listed below:

```
lucy:observation_id
lucy:observation_id_count
lucy:observation_complete
lucy:observation_missing_packets
lucy:start_sclk
lucy:mid_sclk
lucy:stop_sclk
lucy:mid_utc
lucy:mid_sclk_string
lucy:mid_utc_doy
lucy:mid_utc_jd
lucy:mid_ephemeris_time
lucy:ccsds_sclk_time
```

The observation\_id attribute is the only required element.

## 3.2 Lucy\_Observation\_Planning

The Lucy\_Observation\_Planning class is a general *Lucy* class used to record the science planning metadata that describes how the observation sequence was planned and the status of the instruments during that observation. The attributes included in this class are as follows:

```
lucy:load_identifier  
lucy:mission_segment  
lucy:sap_identifier  
lucy:visit_name  
lucy:instrument_side  
lucy:llorri_status  
lucy:lralph_status  
lucy:ltes_status  
lucy:ttcam_status
```

The mission\_segment attribute is the only required element in this class.

## 3.3 Lucy\_Target\_List

The Lucy\_Targt\_List class and attributes describe the list of potential targets in a given science observation. This information is supplemental to the Target\_Identification class found in all observational data products and is derived from SPICE calculations. The attributes included in this class are as follows:

```
lucy:target_fov_count  
lucy:target_fov_name
```

The target\_fov\_count attribute is the only required element in the class.

## 3.4 Lucy\_Product\_Information

The Lucy\_Product\_Information class and attributes describe any *Lucy* data processing pipeline specific data product information. Attributes collected in this class do not have counterparts in any PDS4 discipline dictionary. For general data processing information the processing dictionary (proc:) is used. The attributes found in the Lucy\_Product\_Information are as follows:

lucy:internal\_product\_version\_id

The internal\_product\_verion\_id is the only element in this class and is required. It is possible that additional attributes could be added over the course of the mission.

### 3.5 LLORRI\_Instrument\_Parameters

The LLORRI\_Instrument\_Parameters class is the wrapper class for all L'GORRI instrument specific parameters. This class only appears in L'GORRI data products. The LLORRI\_Instrument\_Parameters class contains the attributes and sub-classes listed below:

```
lucy:attached_sync_marker_dec
lucy:attached_sync_marker_hex
lucy:latch_count
lucy:calibration_lamp_level_1
lucy:calibration_lamp_level_2
lucy:bias_level
lucy:read_noise
lucy:ccd_gain
lucy:bias_offset
lucy:frame_transfer_scrub_time
Radiometric_Conversion_Constants
```

The lucy:Radiometric\_Conversion\_Constants class provides the values needed to perform the conversion from the calibrated pixel values to physical units. This conversion is dependent on the spectral distribution of the source, the detector wavelength range, and whether or not the source is resolved. A description of how to convert from data values to physical units is provided in the LLORRI SIS document. The sub-class contains attributes and sub-sub-classes as follows:

```
lucy:pivot_wavelength
lucy:Diffuse_Source
lucy:Point_Source
lucy:photometric_zero_point
```

All attributes and classes are required for the Radiometric\_Conversion\_Constants class.

The lucy:Diffuse\_Source sub-class presents radiometric conversion constants for converting calibrated pixel values into physical units for unresolved sources.

```
lucy:units_of_conversion_constants
lucy:solar_constant
lucy:red_trojan_constant
lucy:gray_trojan_constant
lucy:dinkinesh_constant
```

The units, solar, red and gray constant attributes are required. Target specific constants are not required and will be extended as the mission progresses.

The lucy:Point\_Source sub-class presents radiometric conversion constants for converting calibrated pixel values into physical units for resolved/extended sources.

```
lucy:units_of_conversion_constants
lucy:solar_constant
lucy:red_trojan_constant
lucy:gray_trojan_constant
lucy:dinkinesh_constant
```

The units, solar, red and gray constant attributes are required. Target specific constants are not required and will be extended as the mission progresses.

## **3.6 LRalph\_Instrument\_Common\_Paramters**

The LRalph\_Instrument\_Common\_Paramters class is a set of instrument attributes that are specific to the LRalph instrument suite which comprises the LEISA and MVIC components. This class only appears in LEISA or MVIC data products. The LRalph\_Instrument\_Common\_Paramters class contains the following attributes:

```
lucy:playback_start
lucy:playback_end
lucy:playback_bad_pixel_mask_status
lucy:playback_truncation_status
lucy:playback_header_type
lucy:test_pattern_setting
lucy:hs_xtrack_start_row
lucy:scan_row_pixels
lucy:fpecrc_error_flag
lucy:m4_calibration_state
lucy:m4_blackbody_setting
lucy:m4_filament_setting
lucy:fpe_drop_frames
lucy:mce_scan_rate
lucy:first_packet_timestamp
lucy:last_packet_timestamp
lucy:xsum_error_flag_status
lucy:lr_acquisition_start_block
lucy:mce_start_positon
lucy:mce_end_positon
lucy:board_selection
lucy:blocks_allocated
```

None of the attributes are required for this class.

## **3.7 LEISA\_Instrument\_Parameters**

The LEISA\_Instrument\_Parameters class contains attributes specific to the LEISA instrument and only appears in LEISA dt products. The attributes contained in this class area as follows:

```
lucy:leisa_mode
lucy:leisa_observation_allocation
lucy:leisa_integration_time
lucy:leisa_atrack_start_channel
lucy:leisa_atrack_num_channels
lucy:leisa_xtrack_start_row
lucy:leisa_xtrack_num_rows
lucy:leisa_offset
lucy:leisa_fpa_temperature
```

None of the attributes are required.

## 3.8 MVIC\_Instrument\_Parameters

The MVIC\_Instrument\_Parameters class contains attributes specific to the MVIC instrument and only appears in LEISA dt products. The attributes contained in this class are as follows:

```
lucy:mvic_ccd_list
lucy:mvic_actual_atrack_summing
lucy:mvic_actual_xtrack_summing
lucy:mvic_planned_atrack_summing
lucy:mvic_planned_xtrack_summing
lucy:mvic_summing_mode
lucy:actual_ccd1_tdi_configuration
lucy:actual_ccd2_tdi_configuration
lucy:actual_ccd3_tdi_configuration
lucy:actual_ccd4_tdi_configuration
lucy:actual_ccd5_tdi_configuration
lucy:actual_ccd6_tdi_configuration
lucy:planned_ccd1_tdi_configuration
lucy:planned_ccd2_tdi_configuration
lucy:planned_ccd3_tdi_configuration
lucy:planned_ccd4_tdi_configuration
lucy:planned_ccd5_tdi_configuration
lucy:planned_ccd6_tdi_configuration
lucy:mvic_fpe_vis_temperature
lucy:mvic_observation_allocation
lucy:mvic_tdi_row_integration_time
```

None of the attributes are required.



**DEFINITIONS**

Type	Name	Description
Class	Lucy_Observation_Time_Information	Lucy Mission observation identification and timing information.
Attribute	observation_id	The lucy:observation_id attribute appears in all mission science data products and reports.
Attribute	observation_id_count	The lucy:observation_id_count attribute appears in all mission science data products and reports.
Attribute	observation_complete	The lucy:observation_complete attribute appears in all mission science data products and reports.
Attribute	observation_missing_packets	The lucy:observation_missing_packets attribute appears in all mission science data products and reports.
Attribute	start_sclk	The lucy:start_sclk attribute appears in all mission science data products and reports.
Attribute	mid_sclk	The lucy:mid_sclk attribute appears in all mission science data products and reports.
Attribute	stop_sclk	The lucy:stop_sclk attribute appears in all mission science data products and reports.
Attribute	mid_utc	The lucy:mid_utc attribute appears in all mission science data products and reports.
Attribute	mid_sclk_string	The lucy:mid_sclk_string attribute appears in all mission science data products and reports.
Attribute	mid_utc_doy	The lucy:mid_utc_doy attribute appears in all mission science data products and reports.
Attribute	mid_utc_jd	The lucy:mid_utc_jd attribute appears in all mission science data products and reports.
Attribute	mid_ephemeris_time	The lucy:mid_ephemeris_time attribute appears in all mission science data products and reports.
Attribute	ccsds_sclk_time	The lucy:ccsds_sclk_time attribute appears in all mission science data products and reports.
Class	Lucy_Observation_Planning	The Lucy Mission observation planning class and attributes describe the observation planning process.
Attribute	load_identifier	The lucy:load_identifier attribute appears in all mission science data products and reports.
Attribute	mission_segment	The lucy:mission_segment attribute appears in all mission science data products and reports.
Attribute	sap_identifier	The lucy:sap_identifier attribute appears in all mission science data products and reports.
Attribute	visit_name	The lucy:visit_name attribute appears in all mission science data products and reports.
Attribute	instrument_side	The lucy:instrument_side attribute appears in all mission science data products and reports.
Attribute	llorri_status	The lucy:llorri_status attribute appears in all mission science data products and reports.
Attribute	lralph_status	The lucy:lralph_status attribute appears in all mission science data products and reports.
Attribute	ltes_status	The lucy:ltes_status attribute appears in all mission science data products and reports.
Attribute	ttcam_status	The lucy:ttcam_status attribute appears in all mission science data products and reports.
Class	Lucy_Target_List	The Lucy Mission class that contains the target list of potential targets in a given observation.
Attribute	target_fov_count	The lucy:target_fov_count attribute appears in all mission science data products and reports.
Attribute	target_fov_name	The lucy:target_fov_name attribute appears in all mission science data products and reports.
Class	Lucy_Product_Information	The Lucy Mission class that contains attributes specific to the labeled data products.
Attribute	internal_product_version_id	The lucy:internal_product_version_id attribute appears in all mission science data products and reports.
Class	LLORRI_Instrument_Parameters	The Lucy LORRI instrument class that contains instrument specific attributes.
Attribute	attached_sync_marker_dec	The lucy:attached_sync_marker_dec attribute appears in L'LORRI science data products and reports.
Attribute	attached_sync_marker_hex	The lucy:attached_sync_marker_hex attribute appears in L'LORRI science data products and reports.
Attribute	latch_count	The lucy:latch_count attribute appears in L'LORRI science data products and reports.
Attribute	calibration_lamp_level_1	The lucy:calibration_lamp_level_1 attribute appears in L'LORRI science data products and reports.
Attribute	calibration_lamp_level_2	The lucy:calibration_lamp_level_2 attribute appears in L'LORRI science data products and reports.
Attribute	bias_level	The lucy:bias_level attribute appears in calibrated L'LORRI data products and reports.
Attribute	read_noise	The lucy:read_noise attribute appears in calibrated L'LORRI data products and reports.
Attribute	ccd_gain	The lucy:ccd_gain attribute appears in calibrated L'LORRI data products and reports.

Type	Name	Description
Attribute	bias_offset	The lucy:bias_offset attribute appears in calibrated L'LORRI data products and reports the bias offset.
Attribute	frame_transfer_scrub_time	The lucy:frame_transfer_scrub_time attribute appears in calibrated L'LORRI data products and reports the time taken for frame transfer scrubbing.
Class	LRalph_Instrument_Common_Parameters	The Lucy LRalph instrument class that contains the common (LEISA and MVIC) instrument parameters.
Attribute	playback_start	The lucy:playback_start attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the start time of playback.
Attribute	playback_end	The lucy:playback_end attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the end time of playback.
Attribute	playback_bad_pixel_mask_status	The lucy:playback_bad_pixel_masl_status attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the status of bad pixels in the playback mask.
Attribute	playback_truncation_status	The lucy:playback_truncation attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the truncation status of playback.
Attribute	playback_header_type	The lucy:playback_header_type attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the type of playback header.
Attribute	test_pattern_setting	The lucy:test_pattern_setting attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the test pattern setting.
Attribute	hs_xtrack_start_row	The lucy:hs_xtrack_start_row attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the start row of the horizontal scan.
Attribute	scan_row_pixels	The lucy:scan_row_pixels attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the number of pixels in a scan row.
Attribute	scan_row_pixels	The lucy:scan_row_pixels attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the number of pixels in a scan row.
Attribute	fpecrc_error_flag	The lucy:fpecrc_error_flag attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the error flag for the FPECRC.
Attribute	m4_calibration_state	The lucy:m4_calibration_state attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the calibration state of the M4 filter.
Attribute	m4_blackbody_setting	The lucy:m4_blackbody_setting attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the blackbody setting of the M4 filter.
Attribute	m4_filament_setting	The lucy:m4_filament_setting attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the filament setting of the M4 filter.
Attribute	fpe_drop_frames	The lucy:fpe_drop_frames attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the number of frames dropped by the FPE.
Attribute	mce_scan_rate	The lucy:mce_scan_rate attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the scan rate of the MCE.
Attribute	first_packet_timestamp	The lucy:first_packet_timestamp appears in L'Ralph (MVIC and LEISA) science data products and reports the timestamp of the first packet.
Attribute	last_packet_timestamp	The lucy:last_packet_timestamp attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the timestamp of the last packet.
Attribute	xsum_error_flag_status	The lucy:xsum_error_flag_status attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the status of the xsum error flag.
Attribute	lr_acquisition_start_block	The lucy:lr_acquisition_start_block attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the start block of the acquisition.
Attribute	mce_start_postion	The lucy:mce_start_postion attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the start position of the MCE.
Attribute	mce_end_postion	The lucy:mce_end_postion attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the end position of the MCE.
Attribute	board_selection	The lucy:board_selection attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the selected board.
Attribute	blocks_allocated	The lucy:blocks_allocated attribute appears in L'Ralph (MVIC and LEISA) science data products and reports the number of blocks allocated.
Class	LEISA_Instrument_Parameters	The Lucy LRalph LEISA class that contains the instrument specific attributes.
Attribute	leisa_mode	The lucy:leisa_mode attribute appears in LEISA science data products and reports the mode of operation.
Attribute	leisa_observation_allocation	The lucy:leisa_observation_allocation attribute appears in LEISA science data products and reports the allocation of observations.
Attribute	leisa_integration_time	The lucy:leisa_integration_time attribute appears in LEISA science data products and reports the integration time.
Attribute	leisa_atrack_start_channel	The lucy:leisa_atrack_start_channel appears in LEISA science data products and reports the start channel of the Atrack.
Attribute	leisa_atrack_num_channels	The lucy:leisa_atrack_num_channels appears in LEISA science data products and reports the number of channels in the Atrack.
Attribute	leisa_xtrack_start_row	The lucy:leisa_xtrack_start_row appears in LEISA science data products and reports the start row of the Xtrack.
Attribute	leisa_xtrack_num_rows	The lucy:leisa_xtrack_num_rows appears in LEISA science data products and reports the number of rows in the Xtrack.
Attribute	leisa_offset	The lucy:leisa_offset appears in LEISA science data products and reports the offset.
Attribute	leisa_fpa_temperature	The lucy:leisa_offset appears in LEISA science data products and reports the fpa temperature.
Class	MVIC_Instrument_Parameters	The Lucy LRalph MVIC class that contains the instrument specific attributes.
Attribute	mvic_ccd_list	The lucy:mvic_ccd_list attribute appears in MVIC science data products and reports the list of CCDs.
Attribute	mvic_actual_atrack_summing	The lucy:mvic_actual_atrack_summing attribute appears in MVIC science data products and reports the actual Atrack summing.
Attribute	mvic_actual_xtrack_summing	The lucy:mvic_actual_xtrack_summing attribute appears in MVIC science data products and reports the actual Xtrack summing.
Attribute	mvic_planned_atrack_summing	The lucy:mvic_planned_atrack_summing attribute appears in MVIC science data products and reports the planned Atrack summing.
Attribute	mvic_planned_xtrack_summing	The lucy:mvic_planned_xtrack_summing attribute appears in MVIC science data products and reports the planned Xtrack summing.
Attribute	mvic_summing_mode	The lucy:mvic_summing_mode attribute appears in MVIC science data products and reports the summing mode.
Attribute	actual_ccd1_tdi_configuration	The lucy:actual_ccd1_tdi_configuration attribute appears in MVIC science data products and reports the actual Ccd1 TDI configuration.
Attribute	actual_ccd2_tdi_configuration	The lucy:actual_ccd2_tdi_configuration attribute appears in MVIC science data products and reports the actual Ccd2 TDI configuration.
Attribute	actual_ccd3_tdi_configuration	The lucy:actual_ccd3_tdi_configuration attribute appears in MVIC science data products and reports the actual Ccd3 TDI configuration.
Attribute	actual_ccd4_tdi_configuration	The lucy:actual_ccd4_tdi_configuration attribute appears in MVIC science data products and reports the actual Ccd4 TDI configuration.
Attribute	actual_ccd5_tdi_configuration	The lucy:actual_ccd5_tdi_configuration attribute appears in MVIC science data products and reports the actual Ccd5 TDI configuration.
Attribute	actual_ccd6_tdi_configuration	The lucy:actual_ccd6_tdi_configuration attribute appears in MVIC science data products and reports the actual Ccd6 TDI configuration.
Attribute	planned_ccd1_tdi_configuration	The lucy:planned_ccd1_tdi_configuration attribute appears in MVIC science data products and reports the planned Ccd1 TDI configuration.

Type	Name	Description
Attribute	planned_ccd2_tdi_configuration	The lucy:planned_ccd2_tdi_configuration attribute appears in MVIC science
Attribute	planned_ccd3_tdi_configuration	The lucy:planned_ccd3_tdi_configuration attribute appears in MVIC science
Attribute	planned_ccd4_tdi_configuration	The lucy:planned_ccd4_tdi_configuration attribute appears in MVIC science
Attribute	planned_ccd5_tdi_configuration	The lucy:planned_ccd5_tdi_configuration attribute appears in MVIC science
Attribute	planned_ccd6_tdi_configuration	The lucy:planned_ccd6_tdi_configuration attribute appears in MVIC science
Attribute	mvic_fpe_vis_temperature	The lucy:mvic_fpe_vis_temperature attribute appears in MVIC science data
Attribute	mvic_observation_allocation	The lucy:mvic_observation_allocation attribute appears in MVIC science data
Attribute	mvic_tdi_row_integration_time	The lucy:mvic_tdi_row_integration_time attribute appears in MVIC science
Class	Point_Source	The lucy:Point_Source class presents radiometric conversion constants for co
Attribute	units_of_conversion_constants	For resolved sources, the radiometric conversion produces data in units of rad
Attribute	solar_constant	The lucy:solar_constant attribute supplies the constant to be used for sources
Attribute	red_trojan_constant	The lucy:red_trojan_constant attribute supplies the constant to be used for so
Attribute	gray_trojan_constant	The lucy:gray_trojan_constant attribute supplies the constant to be used for s
Attribute	dinkinesh_constant	The lucy:dinkinesh_constant attribute supplies the constant to be used for sou
Class	Radiometric_Conversion_Constants	The lucy:Radiometric_Conversion_Constants class provides the values needed
Attribute	pivot_wavelength	The value contained in the lucy:pivot_wavelength attribute is used when con
Attribute	photometric_zero_point	The lucy:photometric_zero_point attribute supplies the photometric zero poi
Class	Diffuse_Source	The lucy:Point_Source class presents radiometric conversion constants for co
Attribute	units_of_conversion_constants	For resolved sources, the radiometric conversion produces data in units of rad
Attribute	solar_constant	The lucy:solar_constant attribute supplies the constant to be used for sources
Attribute	red_trojan_constant	The lucy:red_trojan_constant attribute supplies the constant to be used for so
Attribute	gray_trojan_constant	The lucy:gray_trojan_constant attribute supplies the constant to be used for s
Attribute	dinkinesh_constant	The lucy:dinkinesh_constant attribute supplies the constant to be used for sou



## EXAMPLES

Note: the examples below reside within the Mission\_Area section of their PDS4 labels.

### 5.1 Observational parameters common to all instruments

```
<lucy:Lucy_Observation_Planning>
  <lucy:load_identifier>22289 </lucy:load_identifier>
  <lucy:mission_segment>EGA_1</lucy:mission_segment>
  <lucy:sap_identifier>SAP.RA.C.013.v01_Earth_Radiometry</lucy:sap_identifier>
  <lucy:visit_name>22289.ega1.RA.C.013.v01.288ae_Earth_Radiometry</lucy:visit_name>
  <lucy:instrument_side>SIDE_1</lucy:instrument_side>
  <lucy:llorri_status>UNKNOWN</lucy:llorri_status>
  <lucy:lralph_status>ACTIVE</lucy:lralph_status>
  <lucy:ltes_status>ACTIVE</lucy:ltes_status>
  <lucy:ttcam_status>UNKNOWN</lucy:ttcam_status>
</lucy:Lucy_Observation_Planning>
<lucy:Lucy_Observation_Time_Information>
  <lucy:observation_id>2230</lucy:observation_id>
  <lucy:observation_complete>COMPLETE</lucy:observation_complete>
  <lucy:observation_missing_packets>0</lucy:observation_missing_packets>
  <lucy:start_sclk unit="s"> 719078053.248</lucy:start_sclk>
  <lucy:mid_sclk unit="s">719078082.0999761 </lucy:mid_sclk>
  <lucy:stop_sclk unit="s">719078110.9519521</lucy:stop_sclk>
  <lucy:mid_utc>2022-10-15T03:54:59.454Z</lucy:mid_utc>
  <lucy:mid_sclk_string>1/0719078082-06552</lucy:mid_sclk_string>
  <lucy:mid_utc_doy>2022-288T03:54:59.454Z</lucy:mid_utc_doy>
  <lucy:mid_utc_jd unit="julian day">JD 2459867.6631881</lucy:mid_utc_jd>
  <lucy:mid_ephemeris_time unit="s">719078168.6364158 </lucy:mid_ephemeris_time>
  <lucy:ccsds_sclk_time unit="s"> 71942620</lucy:ccsds_sclk_time>
</lucy:Lucy_Observation_Time_Information>
<lucy:Lucy_Target_List>
  <lucy:target_fov_count>1</lucy:target_fov_count>
  <lucy:target_fov_name>Earth</lucy:target_fov_name>
</lucy:Lucy_Target_List>
<lucy:Lucy_Product_Information>
  <lucy:internal_product_version_id>1</lucy:internal_product_version_id>
</lucy:Lucy_Product_Information>
```

## 5.2 L'LORRI instrument parameters

```

<lucy:LLORRI_Instrument_Parameters>
    <lucy:attached_sync_marker_dec>449838109</lucy:attached_sync_marker_dec>
    <lucy:attached_sync_marker_hex>0x1ACFFC1D</lucy:attached_sync_marker_hex>
    <lucy:latch_count>0</lucy:latch_count>
    <lucy:calibration_lamp_level_1 unit="DN">0</lucy:calibration_lamp_level_
    ↵1>
    <lucy:calibration_lamp_level_2 unit="DN">0</lucy:calibration_lamp_level_
    ↵2>
    <lucy:bias_level unit="DN">120.0531862745098</lucy:bias_level>
    <lucy:read_noise unit="DN">0.9</lucy:read_noise>
    <lucy:ccd_gain unit="electron/DN">21.1</lucy:ccd_gain>
    <lucy:bias_offset unit="DN">3.2</lucy:bias_offset>
    <lucy:frame_transfer_scrub_time unit="ms">11.7762</lucy:frame_transfer_
    ↵scrub_time>
    <lucy:Radiometric_Conversion_Constants>
        <lucy:pivot_wavelength unit="Angstrom">6030.0</lucy:pivot_wavelength>
        <lucy:Diffuse_Source>
            <lucy:units_of_conversion_constants>(DN/s/pixel)/(erg/cm^2/s/
            ↵Angstrom/sr)</lucy:units_of_conversion_constants>
            <lucy:solar_constant>271300.0</lucy:solar_constant>
            <lucy:red_trojan_constant>278400.0</lucy:red_trojan_constant>
            <lucy:gray_trojan_constant>271200.0</lucy:gray_trojan_constant>
            <lucy:dinkinesh_constant>286000.0</lucy:dinkinesh_constant>
        </lucy:Diffuse_Source>
        <lucy:Point_Source>
            <lucy:units_of_conversion_constants>(DN/s)/(erg/cm^2/s/Angstrom)
        ↵</lucy:units_of_conversion_constants>
            <lucy:solar_constant>1.101e+16</lucy:solar_constant>
            <lucy:red_trojan_constant>1.13e+16</lucy:red_trojan_constant>
            <lucy:gray_trojan_constant>1.101e+16</lucy:gray_trojan_constant>
        </lucy:Point_Source>
        <lucy:photometric_zero_point>18.93</lucy:photometric_zero_point>
    </lucy:Radiometric_Conversion_Constants>
</lucy:LLORRI_Instrument_Parameters>

```

## 5.3 L'Ralph common instrument parameters (shared between MVIC and LEISA)

```

<lucy:Lralph_Instrument_Common_Parameters>
    <lucy:playback_start unit="s">719548332</lucy:playback_start>
    <lucy:playback_end unit="s">719549015</lucy:playback_end>
    <lucy:playback_bad_pixel_mask_status>false</lucy:playback_bad_pixel_mask_status>
    <lucy:playback_truncation_status>true</lucy:playback_truncation_status>
    <lucy:playback_header_type>MVIC</lucy:playback_header_type>
    <lucy:test_pattern_setting>0</lucy:test_pattern_setting>
    <lucy:hs_xtrack_start_row>79</lucy:hs_xtrack_start_row>
    <lucy:scan_row_pixels>5024</lucy:scan_row_pixels>
    <lucy:fpecrc_error_flag>false</lucy:fpecrc_error_flag>

```

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```

<lucy:m4_calibration_state>0</lucy:m4_calibration_state>
<lucy:m4_blackbody_setting>0</lucy:m4_blackbody_setting>
<lucy:m4_filament_setting>0</lucy:m4_filament_setting>
<lucy:fpe_drop_frames>25</lucy:fpe_drop_frames>
<lucy:mce_scan_rate unit="rad/s">0.004</lucy:mce_scan_rate>
<lucy:first_packet_timestamp unit="s">719212908.1950001 </lucy:first_packet_timestamp>
<lucy:last_packet_timestamp unit="s">719212919.048</lucy:last_packet_timestamp>
<lucy:xsum_error_flag_status>false</lucy:xsum_error_flag_status>
<lucy:lr_acquisition_start_block>2419</lucy:lr_acquisition_start_block>
<lucy:mce_start_postion>-18200</lucy:mce_start_postion>
<lucy:mce_end_postion>17000</lucy:mce_end_postion>
<lucy:board_selection>FM 1</lucy:board_selection>
<lucy:blocks_allocated>24</lucy:blocks_allocated>
</lucy:L Ralph_Instrument_Common_Parameters>

```

## 5.4 L’Ralph/MVIC-specific instrument parameters

```

<lucy:MVIC_Instrument_Parameters>
  <lucy:mvic_ccd_list>2,3,4,5,6</lucy:mvic_ccd_list>
  <lucy:mvic_actual_atrack_summing>0</lucy:mvic_actual_atrack_summing>
  <lucy:mvic_actual_xtrack_summing>0</lucy:mvic_actual_xtrack_summing>
  <lucy:mvic_planned_atrack_summing>0</lucy:mvic_planned_atrack_summing>
  <lucy:mvic_planned_xtrack_summing>0</lucy:mvic_planned_xtrack_summing>
  <lucy:mvic_summing_mode>0</lucy:mvic_summing_mode>
  <lucy:actual_ccd1_tdi_configuration>NO_PLAYBACK</lucy:actual_ccd1_tdi_configuration>
  <lucy:actual_ccd2_tdi_configuration>TDI_4 </lucy:actual_ccd2_tdi_configuration>
  <lucy:actual_ccd3_tdi_configuration>TDI_4 </lucy:actual_ccd3_tdi_configuration>
  <lucy:actual_ccd4_tdi_configuration>TDI_4 </lucy:actual_ccd4_tdi_configuration>
  <lucy:actual_ccd5_tdi_configuration>TDI_4 </lucy:actual_ccd5_tdi_configuration>
  <lucy:actual_ccd6_tdi_configuration>TDI_4 </lucy:actual_ccd6_tdi_configuration>
  <lucy:planned_ccd1_tdi_configuration>NO_PLAYBACK</lucy:planned_ccd1_tdi_configuration>
  <lucy:planned_ccd2_tdi_configuration>4_ROWS </lucy:planned_ccd2_tdi_configuration>
  <lucy:planned_ccd3_tdi_configuration>4_ROWS </lucy:planned_ccd3_tdi_configuration>
  <lucy:planned_ccd4_tdi_configuration>4_ROWS </lucy:planned_ccd4_tdi_configuration>
  <lucy:planned_ccd5_tdi_configuration>4_ROWS </lucy:planned_ccd5_tdi_configuration>
  <lucy:planned_ccd6_tdi_configuration>4_ROWS </lucy:planned_ccd6_tdi_configuration>
  <lucy:mvic_fpe_vis_temperature unit ="degC">9.009289875250857</lucy:mvic_fpe_vis_
  ↵temperature>
  <lucy:mvic_observation_allocation unit ="s">10</lucy:mvic_observation_allocation>
  <lucy:mvic_tdi_row_integration_time unit ="microseconds">7250</lucy:mvic_tdi_row_
  ↵integration_time>
</lucy:MVIC_Instrument_Parameters>

```

## 5.5 L’Ralph/LEISA-specific instrument parameters

```
<lucy:LEISA_Instrument_Parameters>
  <lucy:leisa_mode>T</lucy:leisa_mode>
  <lucy:leisa_observation_allocation unit="s">59</lucy:leisa_observation_allocation>
  <lucy:leisa_integration_time unit="microseconds">26.640</lucy:leisa_integration_time>
  <lucy:leisa_atrack_start_channel>4</lucy:leisa_atrack_start_channel>
  <lucy:leisa_atrack_num_channels>23</lucy:leisa_atrack_num_channels>
  <lucy:leisa_xtrack_start_row>647</lucy:leisa_xtrack_start_row>
  <lucy:leisa_xtrack_num_rows>20</lucy:leisa_xtrack_num_rows>
  <lucy:leisa_offset>1111</lucy:leisa_offset>
  <lucy:leisa_fpe_ir_temperature unit="degC">-1.701436782829319</lucy:leisa_fpe_ir_
  ↳temperature>
</lucy:LEISA_Instrument_Parameters>
```

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**CHAPTER  
SIX**

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**LUCY MISSION LDD**

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Steward: M. Katherine Combie

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Detailed documentation is in development. In the meantime, refer to the user's guide sections for information about this dictionary.