Sensitivity for LAPYUTA spectroscopy

Ver. 0.1 26 December 2024

# **Point source.**

* 1. **Point source sensitivity [(counts/s/pix) / (erg/cm2/s/A)].**

effective area [cm2]

dispersion [A/pix]

wavelength

Plank constant

speed of light

* 1. **Count rate for point source [counts/s].**

flux [erg/cm2/s/A]

number of pixels in dispersion direction [pix]

For un-resolved line, . Then,

For continuum source or resolved line, .

: spectral resolution of interest [A]

# **Diffuse source.**

* 1. **Flux [erg/cm2/s/A/arcsec2] versus surface brightness [Rayleigh/A].**

flux [erg/cm2/s/A/arcsec2 or erg/cm2/s/arcsec2]

surface brightness[Rayleigh/A or Rayleigh]

solid angle [str] for 1[arcsec2],

photon energy [erg]

* 1. **Resolved line or continuum.**
     1. **Diffuse source sensitivity .**

plate scale in spatial direction [arcsec/pix]

slit width [arcsec]

* + 1. **Count rate for diffuse source [counts/s].**

number of pixels in spatial direction [pix]

(: spatial resolution of interest [arcsec])

number of pixels in dispersion direction [pix]

(: spectral resolution of interest [A])

* 1. **Un-resolved line.**
     1. **Diffuse source sensitivity .**

plate scale in dispersion direction [arcsec/pix]

* + 1. **Count rate for diffuse source [counts/s].**

Flux for un-resolved line [erg/cm2/s/arcsec2]

number of pixels in dispersion direction [pix]

# **S/N.**

* 1. **Signal to noise ratio (SNR).**

integration time [s]

count rate of detector dark noise.

contamination from the radiation belt (h=1,000km)

0.3-10.0 counts/s/cm2 (Hisaki heritage)

detector dark noise

0.43 counts/s/cm2 (Hisaki heritage)

detector pixel size [cm/pix]

For point source, .

count rate [counts/frame] of detector read-out.

This is negligible for LAPYUTA.

Limiting count rate for given SNR

* 1. **Limiting flux for point source.**
  2. **Limiting flux for diffuse source.**

or

# **LAPYUTA specification.**

* 1. **Mid-resolution spectrograph (MRS)**
     1. **Specification for MRS**

|  |  |
| --- | --- |
| pixel size | 15 [/pix] |
| dispersion | 0.1 [A/pix] |
| plate scale (spatial direction) | 0.055 [arcsec/pix] |
| plate scale (spectral direction) | 0.055 [arcsec/pix] |
| slit width | 0.027, 0.55, 1, 2, 2.8, or 20 [arcsec] |

* + 1. **Effective area for mid-resolution spectrograph (MRS) [cm2] (28 March 2024)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Wavelength  [nm] | Baseline  (MRS) | Target  (MRS) | Baseline (UVSI) \*1 | Target  (UVSI) \*1 |
| 115 | 203 | 444 | 184 | 558 |
| 120 | 305 | 468 | 361 | 615 |
| 125 | 312 | 436 | 396 | 574 |
| 130 | 265 | 355 | 343 | 448 |
| 135 | 280 | 343 | 357 | 434 |
| 140 | 213 | 243 | 273 | 308 |
| 145 | 155 | 180 | 188 | 235 |
| 150 | 125 | 155 | 145 | 214 |
| 155 | 87 | 117 | 101 | 163 |
| 160 | 64 | 93 | 75 | 133 |
| 165 | 46 | 64 | 53 | 95 |
| 170 | 29 | 36 | 33 | 59 |
| 175 | 17 | 21 | 20 | 35 |
| 180 | 11 | 13 | 13 | 24 |

\*1 without filter