EIS Observing Programs

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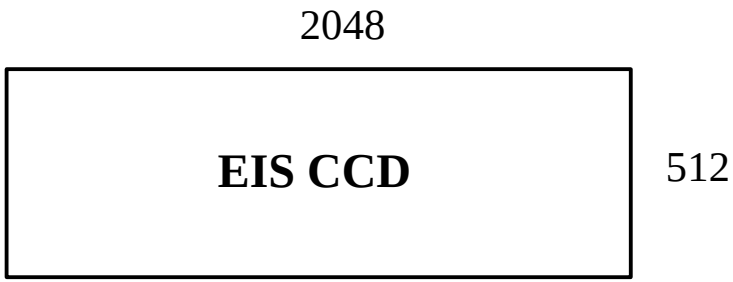
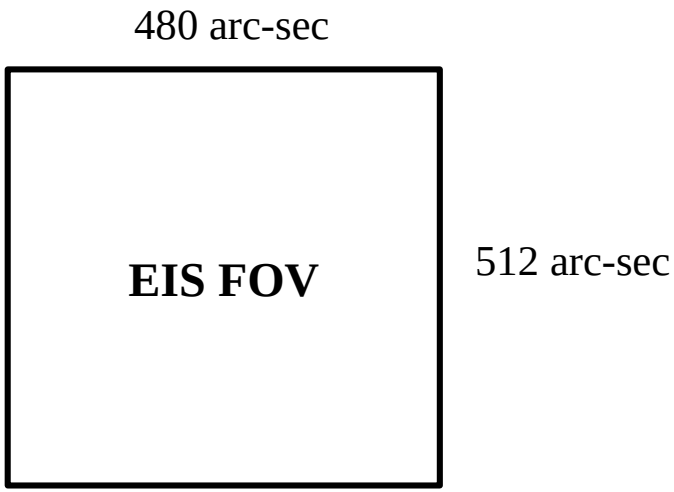
Web document on EIS data throughput
Operations
Data Throughput Notes



Readout Rate = 500 kHz with 2 ports per CCD

Readout Time = 2.1 s = 1s

A/D conversion at 14 bits



EIS Data Rates

At each KSC/DSN contact, 2.5 Gbits are downloaded and the EIS share of this telemetry is 0.125 (1/8)

Average data rate assuming on downlink per orbit:

DR = 2.4Gb / (8 * 1.5 hr) = 55 kb/s

Average data rate assuming 10 hours between contacts:

DR = 2.4 Gb / (8 * 10 hr) = 8 kb/s

Nominal maximum EIS data rate into the onboard Data Recorder

DR = 167 kb/s

Short Wave Band - Quiet Sun

Ion	Wvl	Time to reach 100 counts S/N > 10	Time to reach 1000 counts S/N > 30 $\Delta v < 1$ km/s	Time to reach 10000 counts S/N > 100 $\Delta v_{NT} < 1$ km/s
Fe X	184.54	79s		
Fe XII *	186.88	94s		
Fe XI	188.23	27s		
Fe XII	195.12	7s	72s	
Fe XII *	196.65	85s		
Fe XIII	202.02	57s		

Long Wave Band - Quiet Sun

Ion	Wvl	Time to reach 100 counts S/N > 10	Time to reach 1000 counts S/N > 30 $\Delta v < 1$ km/s	Time to reach 10000 counts S/N > 100 $\Delta v_{NT} < 1$ km/s
He II	256.32	21s		
Si X	258.37	100s		

Observing Program: Quiet Sun Structure and Evolution

1 Supergranular cell = 30,000 km in diameter = 40”

Exposure time: 100s

Measurements: Fe XII intensities S/N >30
Fe XII densities
Fe XII velocities to 1 km/s
He II intensities S/N = 22

FOV: 80” x 512” (2 SG cell wide)

Raster time: 80 x 100s = 8000s = 133m = 2 hr.

Data rate:

9 spectral lines, each window 25 pixels wide

14 bit A/D

DR = 9 x 25 x 512 x 14 / (100s + 1s) = 16 kb/s

Compress by a factor of 3

DR = 5.3 kb/s

Compare to downlink rate: 8 / 55 / 167 kbps

Observing Program: Quiet Sun Dynamics

Exposure time: 20s

Measurements: Fe XII S/N = 17 (21)

Fe XII Δv = 2 km/s

He II S/N = 10

He II Δv = 5 km/s

FOV: 512” x 40” (1 SG cell) in 1” raster steps

Raster time = 40 x (20 + 1)s = 840s = 14m

Data rate:

3 spectral lines (Fe XII 193.52, 195.12, and He II 256)

DR = 3 x 25 x 512 x 14 / (20 + 1)s = 26 kbps

Compress by 5

DR = 5.1 kbps

Compare to downline rate: 8 / 55 / 167 kbps

Observing Program: Quiet Sun dynamics with the Slot

$\Delta\lambda$ = Fe XII 193.52 - 195.12 = 1.6Å

@ 0.023 Å/pixel = 70 pixels

$\Delta\lambda$ = Fe XXIV 255.10 - He II 256.32 = 1.22Å

@ 0.023 Å/pixel = 53 pixels

Exposure time = 20s

Measurements: .. Fe XII S/N = 17

He II S/N = 10

FOV : 512” x 50”

Repetition time: 20 s + 1 s = 21 s

Data rate:

3 x 50 x 512 x 14 / (20 +1 s) = 49 kbps

Compression by factor of 5

data rate = 10 kbps

Compare to downlink rate: 8 / 55 / 167 kbps

Short Wave Band - Active Region

Ion	Wvl	Time to reach 100 counts S/N > 10	Time to reach 1000 counts S/N > 30 $\Delta v < 1$ km/s	Time to reach 10000 counts S/N > 100 $\Delta v_{NT} < 1$ km/s
Fe XII *	186.8	1.74 s		
Fe XI	188.23	1.0 s		
Fe X	190.0	4 s		
Fe XII	193.51	0.41 s		
Fe XII	195.12	0.24 s	2.4 s	24 s
Fe XII *	196.65	2.4 s		
Fe XIII	202.02	1.4 s		
Fe XIII *	203.8	1.6 s		

Long Wave Band – Active Region

Ion	Wvl	Time to reach 100 counts S/N > 10	Time to reach 1000 counts S/N > 30 $\Delta v < 1$ km/s	Time to reach 10000 counts S/N > 100 $\Delta v_{NT} < 1$ km/s

Observing Program: Active Region Structure and Evolution

Medium Active region extent = 200” E-W

FOV = 512” x 200”

Exposure time: 3 s

Measurements:

Fe XII (DS) S/N = 17

Fe XII 195 S/N = 36

.....Δv = 1 km/s

He II 256 S/N = 10

Fe XV 284 S/N = 20

Δv = 3 km/s

Raster time: 200 x (3 + 1) s = 800 s = 13 m

Data rate:

13 spectral lines

DR = 13 x 25 x 512 x 14 / (3 + 1) s = 582 kb/s

Compress by factor of 5

DR = 116 kb/s

Compare to downlink rate: 8 / 55 / 167 kbps

Observing Program: Active Region dynamics with the Slot

FOV: 512” x 200”

Exposure time: 3 s

Measurements:

Fe XII (DS) S/N = 17

Fe XII 195 S/N = 36

He II 256 S/N = 10

Fe XV 284 S/N = 20

Raster time: 4 x (3 + 1) s = 16 s

Data rate:

DR = 4 x 50 x 512 x 14 / (3 + 1) s = 358 kbps

Compress by factor of 5

DR = 72 kbps

Compare to downlnk rate: 5 / 55 / 167 kbps