Appendix D
Draft Science Photon Collecting Time Calculation

All SIs use the same formula for calculating photon collecting time. This version is a draft. There will be updates as we add new readout patterns.

For FGS and NIRISS full frame exposures:

Photon Collecting Time(sec) = FrameReadTime
* ((NGROUPS * nframes) + ((NGROUPS – 1) * GroupGap)+ 1)
* NINTS

For all other exposure types:

Photon Collecting Time(sec) = FrameReadTime
* ((NGROUPS * nframes) + ((NGROUPS – 1) * GroupGap))
* NINTS

where:

NGROUPS value comes from template
NINTS value comes from template

Nframes, GroupGap, and FrameReadTime values come from the tables below

Instrument	Readout Pattern	nframe	GroupGap
MIRI	SLOW	1	0
	FAST	1	0
	FASTGRPAVG	1	0
	FASTINTAVG	1	0
NIRCam	DEEP8	8	12
	DEEP2	2	18
	MEDIUM8	8	2
	MEDIUM2	2	8
	SHALLOW4	4	1
	SHALLOW2	2	3
	BRIGHT2	2	0
	BRIGHT1	1	1
	RAPID	1	0
NIRSpec	NRSRAPID	1	0
	NRS	4	0
GUIDER1 & GUIDER2	FGSRAPID	1	0
	FGS	4	0
NIRISS	NISRAPID	1	0
	NIS	4	0

Instrument	Subarray	Readout Pattern	FrameReadTime
MIRI	FULL	SLOW	27.11552
	BRIGHTSKY	SLOW	12.61568
	SUB256	SLOW	4.41856
	SUB128	SLOW	0.53760
	SUB64	SLOW	0.19712
	SUBPRISM	SLOW	0.94336
	MASK1065	SLOW	1.74592
	MASK1140	SLOW	1.74592
	MASK1550	SLOW	1.74592
	MASKLYOT	SLOW	2.59072
	FULL	FAST	2.78528
	BRIGHTSKY	FAST	1.32608
	SUB256	FAST	0.50176
	SUB128	FAST	0.11136
	SUB64	FAST	0.07616
	SUBPRISM	FAST	0.15712
	MASK1065	FAST	0.23392
	MASK1140	FAST	0.23392
	MASK1550	FAST	0.23292
	MASKLYOT	FAST	0.31984
	FULL	FASTGRPAVG	2.78528
	BRIGHTSKY	FASTGRPAVG	1.32608
	SUB256	FASTGRPAVG	0.50176
	SUB128	FASTGRPAVG	0.11136
	SUB64	FASTGRPAVG	0.07616
	SUBPRISM	FASTGRPAVG	0.15712
	MASK1065	FASTGRPAVG	0.23392
	MASK1140	FASTGRPAVG	0.23392
	MASK1550	FASTGRPAVG	0.23292
	MASKLYOT	FASTGRPAVG	0.31984
	FULL	FASTINTAVG	2.78528
	BRIGHTSKY	FASTINTAVG	1.32608
	SUB256	FASTINTAVG	0.50176
	SUB128	FASTINTAVG	0.11136
	SUB64	FASTINTAVG	0.07616
	SUBPRISM	FASTINTAVG	0.15712
	MASK1065	FASTINTAVG	0.23392
	MASK1140	FASTINTAVG	0.23392
	MASK1550	FASTINTAVG	0.23292
	MASKLYOT	FASTINTAVG	0.31984

Instrument	Subarray	Readout Pattern	FrameReadTime
NIRCam	FULL		10.73676
	SUB160		0.27692
	SUB320		1.06572
	SUB640		4.17932
	MASK210R		4.17932
	MASKSWB		4.17932
	MASK335R		1.06572
	MASK430R		1.06672
	MASKLWB		1.06572
	SUB400		1.65212
	SUB64		0.04940
NIRSpec	FULL		10.73676
	S200A1		1.33900
	S200A2		1.33900
	S200B1		1.33900
	S400A1		1.33900
	ALLSLITS		5.29420
	SUB2048		0.67980
	SUB1024A		0.34188
	SUB1024B		0.34188
	SUB512		0.17292
	SUB32		0.01452
GUIDER1 & GUIDER2	FULL		10.73676
NIRISS	FULL		10.73676
	SUB64		0.04940
	SUB80		0.07452
	SUB128		0.18060
	SUB256		0.68876
	SUBSTRIP80		1.88508
	SUBSTRIP256		5.49132

Note for developers: these tables will come from the S&OC PRD eventually.