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LSSTCam and ComCam Focal Plane Layouts

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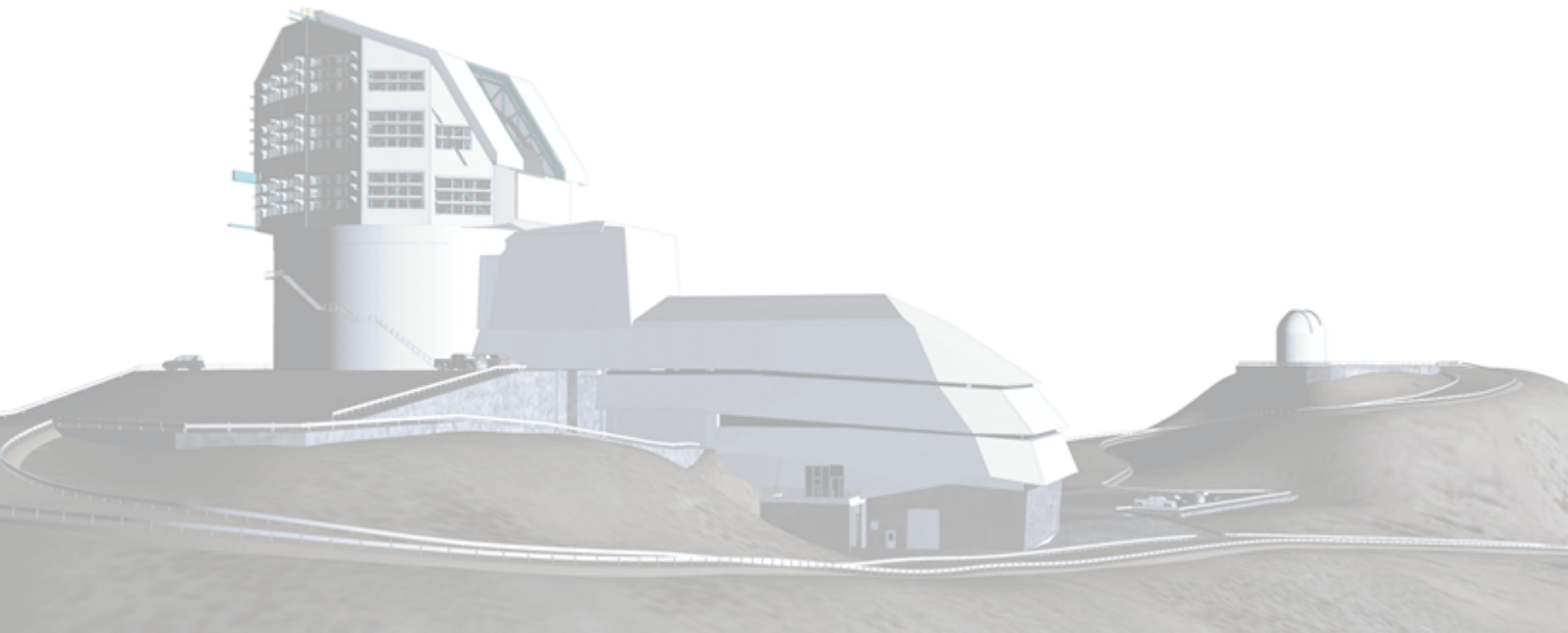
CTN-001

Latest Revision: 2025-05-23



Abstract

This document includes figures depicting the layouts of the LSST Camera and ComCam, highlighting the arrangement and identification of science, wavefront, and guider sensors, as well as their individual readout image segments.

Change Record

Version	Date	Description	Owner name
1	2025-02-27	Create document.	Andrés A. Plazas Malagón, Seth Digel
1.1	2025-03-15	Add ComCam.	Andrés A. Plazas Malagón, Seth Digel
1.2	2025-05-20	Add treering center	HyeYun Park, Yousuke Utsumi

Document source location: `https://github.com/lsst/ctn-001`

Contents

LSSTCam and ComCam Focal Plane Layouts

1 Focal Plane Layouts

This document provides an overview of the LSSTCam and ComCam focal plane layouts. Figures 1 and 2 below illustrate the placement of science, wavefront, and guider sensors of the LSST Camera, from both ITL and e2v. The view is looking down from above the focal plane, i.e., through the LSSTCam lenses.

Figure 2 also includes the serial numbers of the raft tower modules (RTM-###), the corner raft tower modules (CRTM-###), and the individual CCDs. The latter are the three-digit numbers immediately below the positional designator of the CCD. For example, R11_S10 is E2V-CCD-354) and R20_S10 is ITL-CCD-351. The raft and CCD serial numbers come from the *eTraveler* database accessed using `datacat-utilities`[1]. Appendix A tabulates the mapping of raft and sensor slots to serial numbers.

The set of dead segments and high-noise segments is somewhat dynamic; dead or high-noise segments sometimes revive/recover and functioning segments sometimes die or become noisy. The set of bad segments indicated in the figures is current as of the end of Run 7 electro-optical testing. The corners of the treering centers are also displayed; for clarity, the markers are shown slightly inside each sensor, though the actual centers lie just outside the sensors.

Figure 3 shows the LSSTCam photographed in the LSST clean room, with the camera rotated 90 deg clockwise with respect to the diagrams in Figures 1 and 2. For more comprehensive technical details on the layout of the CCDs in the focal plane, consult the reference document LCA-13381 (LSSTCam, 2020).

Corresponding diagrams and a photo for ComCam are shown in Figures 4, 5, and 6.

The source code used to generate the figures is available in the GitHub repository associated with this Camera Technical Note.

[1] `https://github.com/lsst-camera-dh/datacat-utilities`

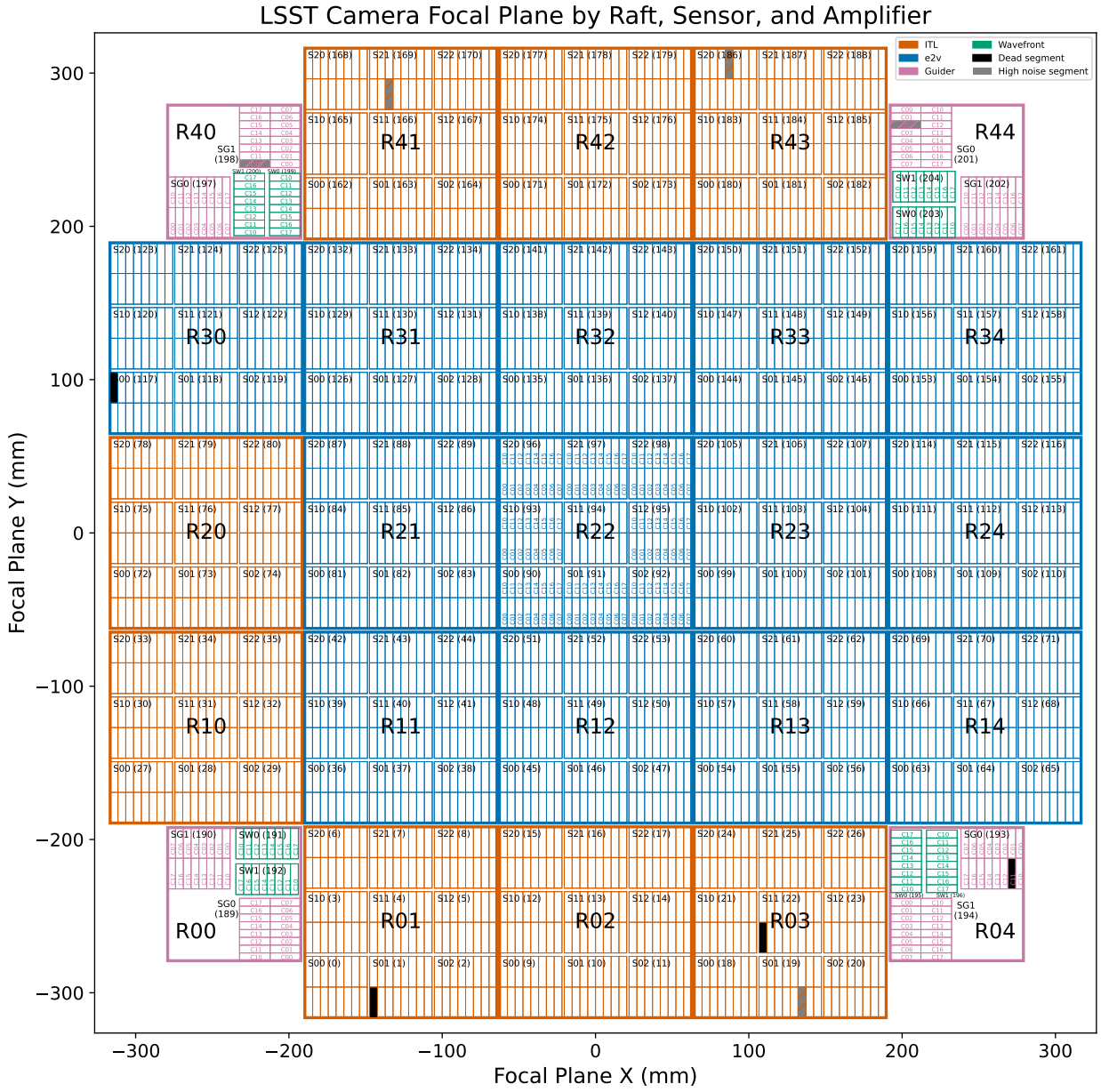


FIGURE 1: LSSTCam focal plane layout. The following amplifiers (segments) are identified as either "dead" or "sometimes dead" due to readout noise being less than 4 e^- or an anomalous Photon Transfer Curve gain: `R30_S00_C10`, `R01_S01_C00`, `R03_S11_C00`, `R04_SG0_C11`. Additionally, the following amplifiers exhibit high readout noise (> 18 e^-): `R41_S21_C02`, `R43_S20_C14`, `R03_S01_C05`, `R40_SG1_C10`, `R44_SG0_C02`. These classifications are based on Tables 8 and 9 of SITCOMTN-148 (Utsumi & et al., 2025). Code source: `https://github.com/lsst/ctn-001`

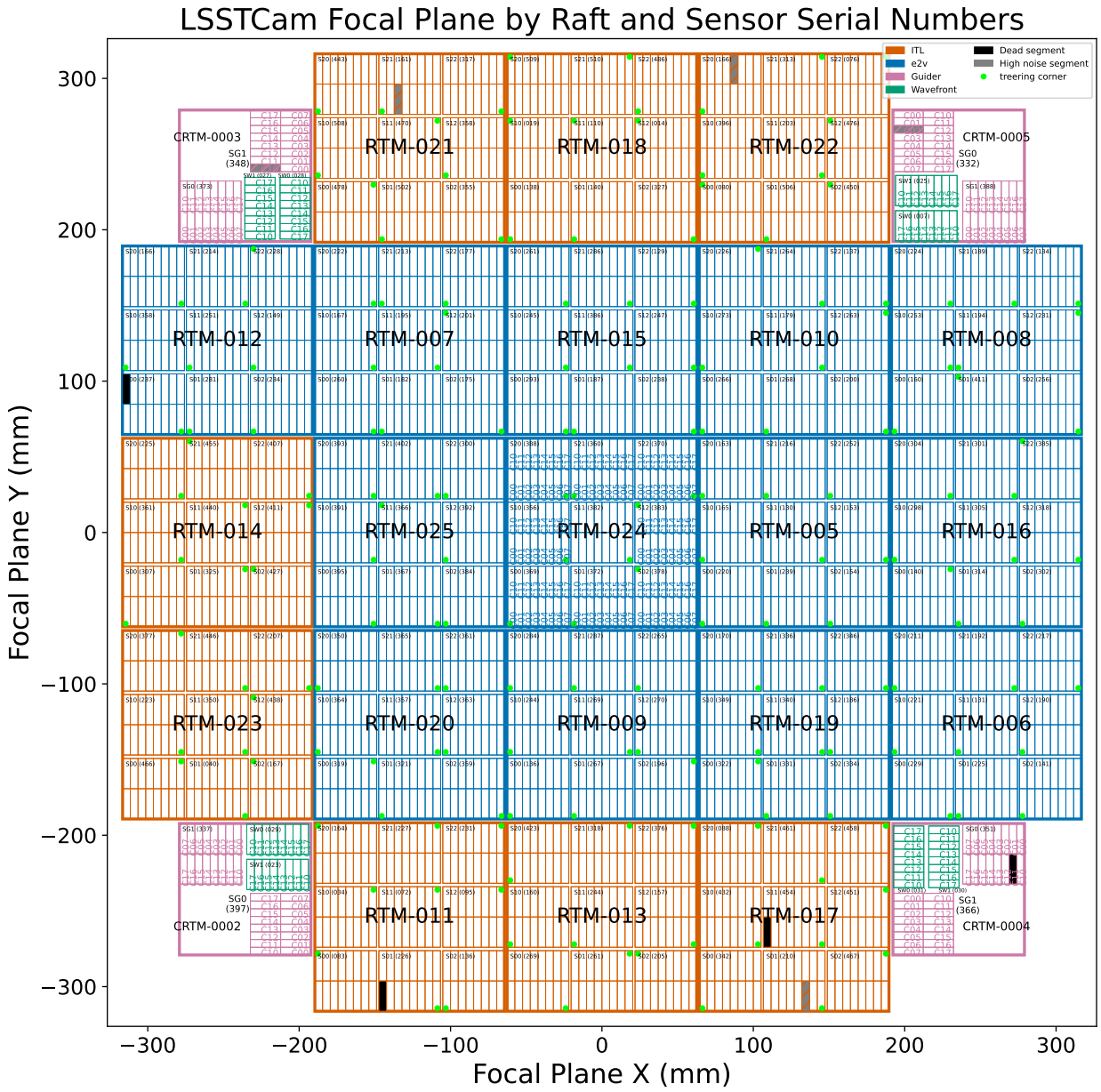


FIGURE 2: LSSTCam focal plane layout including raft and CCD serial numbers (see text). The raft and CCD serial numbers come from the *eTraveler* database accessed using `datacat-utilities` (`https://github.com/lsst-camera-dh/datacat-utilities`). The bad segment list is as in 1.

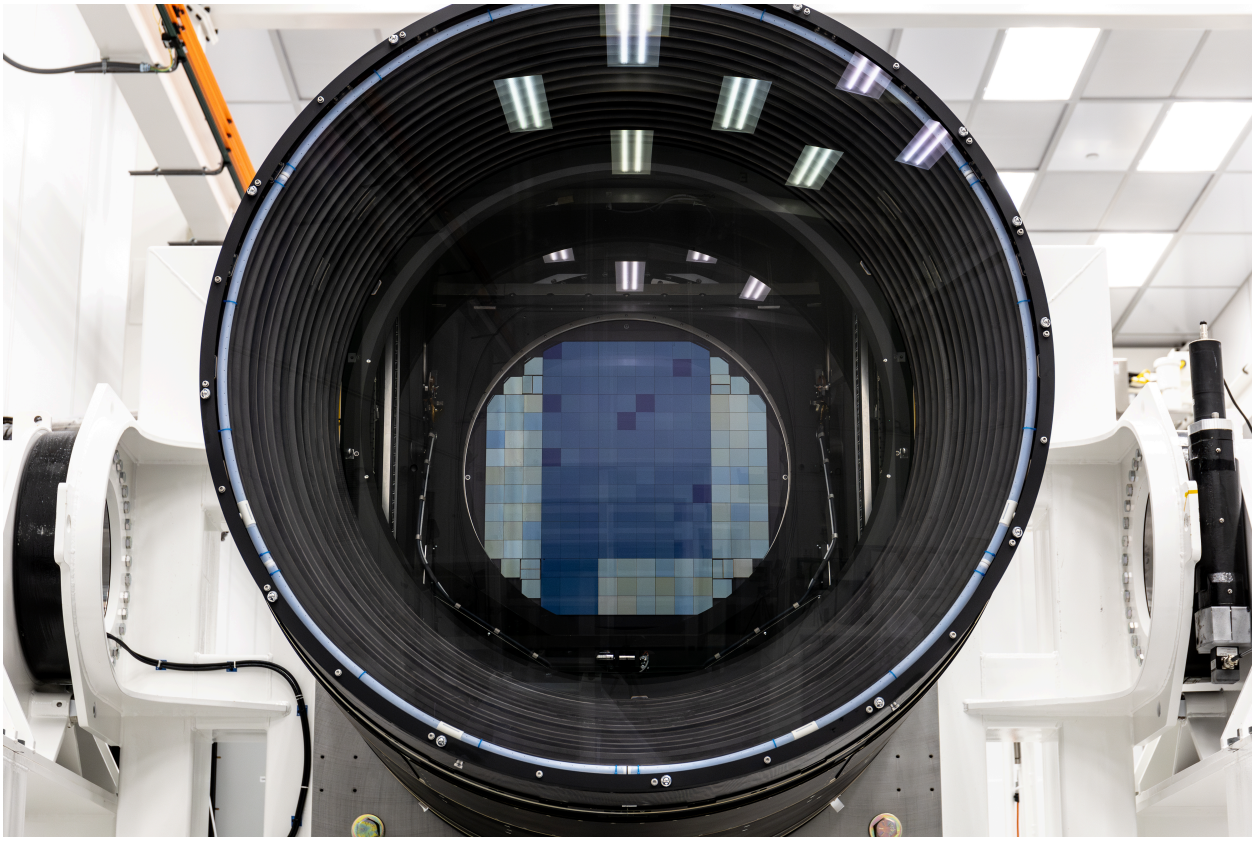


FIGURE 3: LSSTCam photographed in the LSST clean room on January 16, 2024. (Jacqueline Ramseyer Orrell/SLAC National Accelerator Laboratory). The camera is rotated 90 deg counter-clockwise with respect to the diagrams in Figures 1 and 2. Image and caption source: `https://rubinobservatory.org/gallery/`

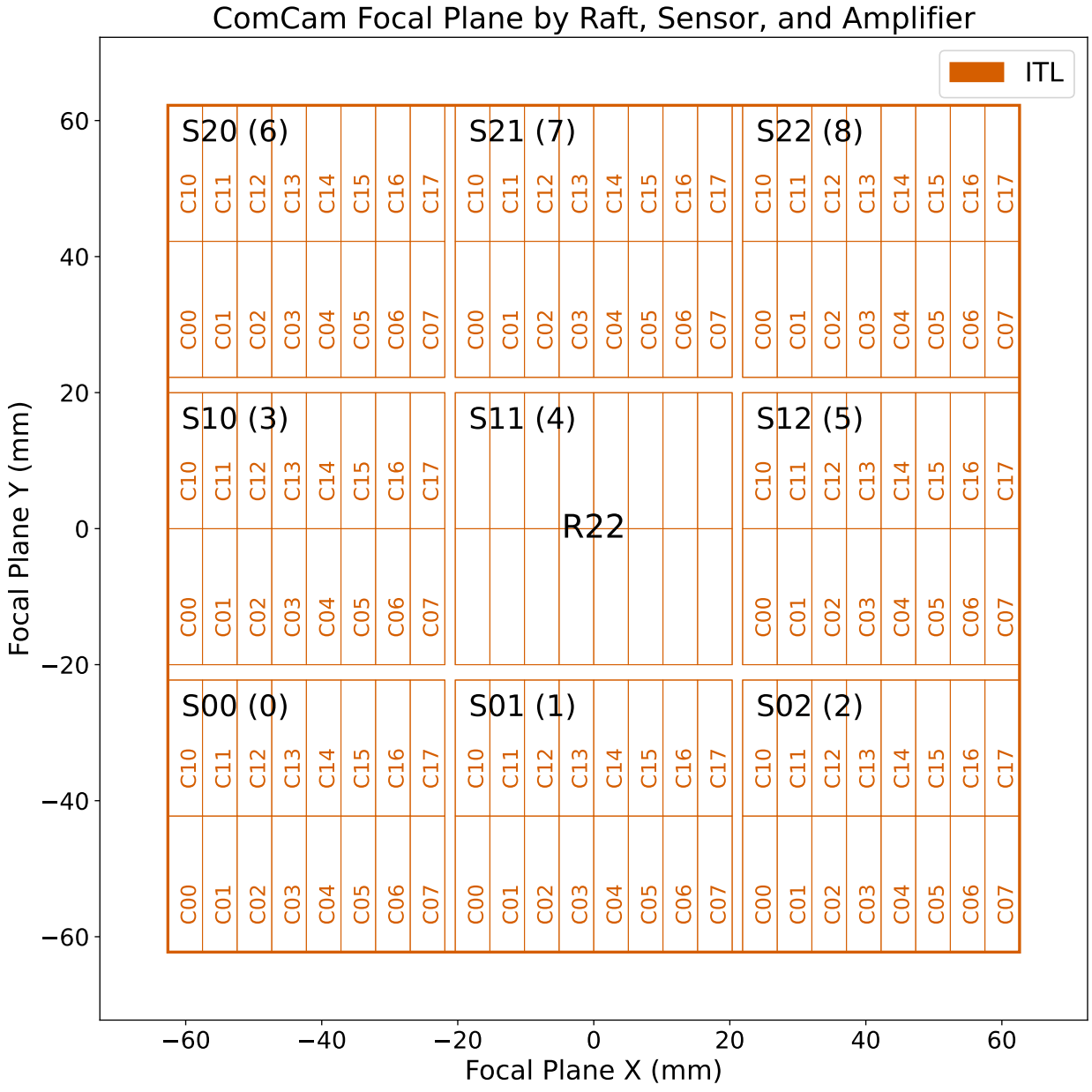


FIGURE 4: ComCam focal plane layout. Code source: `https://github.com/lsst/ctn-001`

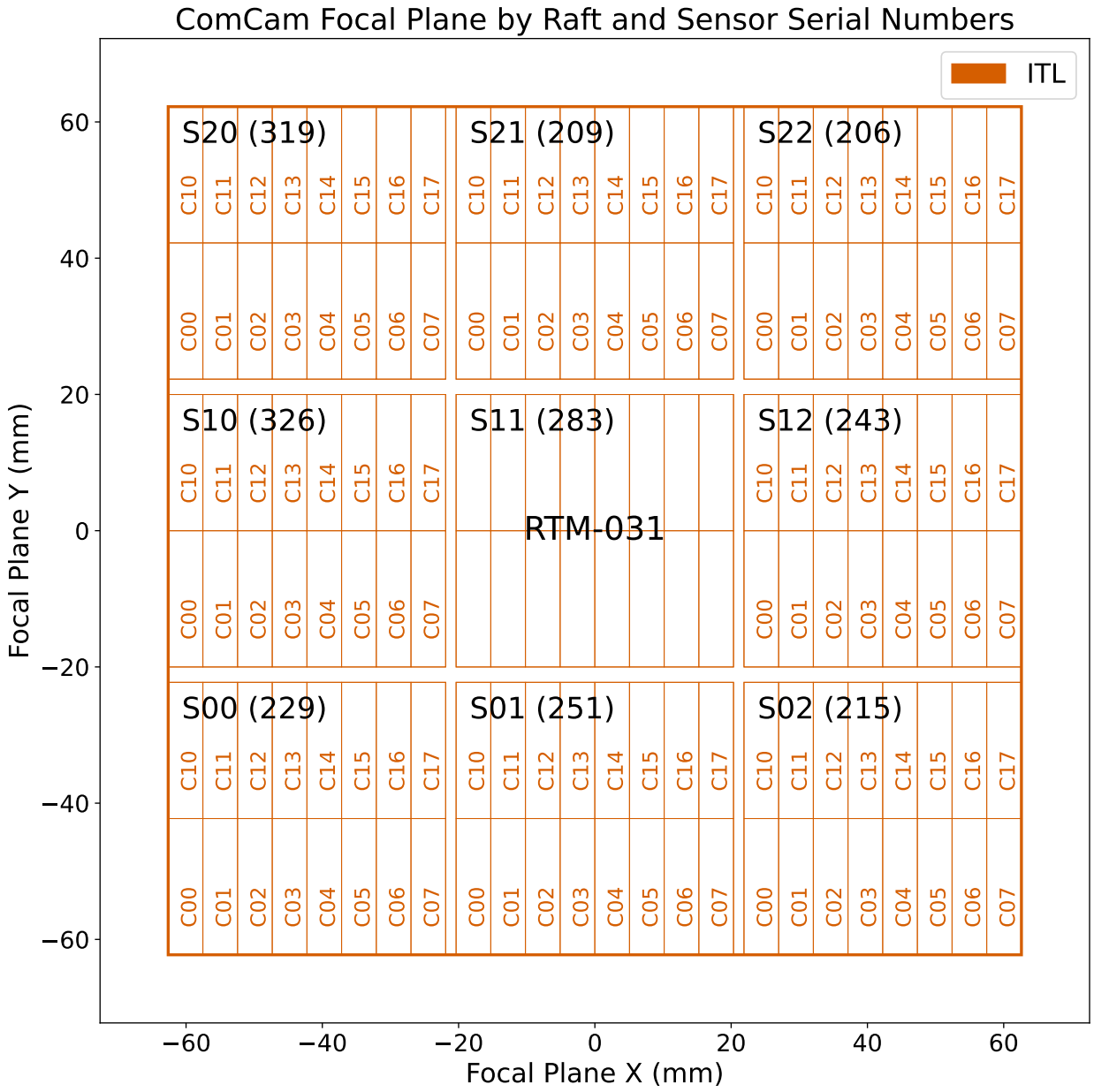


FIGURE 5: ComCam focal plane layout including raft and CCD serial numbers (see text). The raft and CCD serial numbers come from the *eTraveler* database accessed using `datacat-utilities` (`https://github.com/lsst-camera-dh/datacat-utilities`).

FIGURE 6: In one of the early images taken with Rubin's 144-megapixel test camera, Rubin staff gathered for a group photo inside the observatory dome, with the Simonyi Survey Telescope pointed at horizon. This "pinhole" image was created using the camera's sensors but without using lenses or mirrors to focus light. Instead of forming a detailed, zoomed-in picture, this technique gives a soft, unfocused image. The visible grid pattern of the camera's sensor array overlays the image. Image and caption source: `https://rubinobservatory.org/gallery/`

A Raft and Sensor Serial Numbers

Table 1 provides the mapping between the rafts, corner rafts, sensors, and their respective serial numbers for LSSTCam. See the caption of the table for details. The information for the table was extracted from the eTraveler database using the datacat-utilities[2].

Table 2 provides the sensor serial numbers for the ComCam raft.

R00 CRTM-0002 ITL		
SG0	189	ITL-CCD-397
SG1	190	ITL-CCD-337
SW0	191	ITL-CCD-029
SW1	192	ITL-CCD-023

R01 RTM-011 ITL		
S00	000	ITL-CCD-083
S01	001	ITL-CCD-226
S02	002	ITL-CCD-136
S10	003	ITL-CCD-034
S11	004	ITL-CCD-072
S12	005	ITL-CCD-095
S20	006	ITL-CCD-164
S21	007	ITL-CCD-227
S22	008	ITL-CCD-231

R02 RTM-013 ITL		
S00	009	ITL-CCD-269
S01	010	ITL-CCD-261
S02	011	ITL-CCD-205
S10	012	ITL-CCD-160
S11	013	ITL-CCD-244
S12	014	ITL-CCD-157
S20	015	ITL-CCD-423
S21	016	ITL-CCD-318
S22	017	ITL-CCD-376

[2] https://github.com/lsst-camera-dh/datacat-utilities

R03 RTM-017 ITL		
S00	018	ITL-CCD-342
S01	019	ITL-CCD-210
S02	020	ITL-CCD-467
S10	021	ITL-CCD-432
S11	022	ITL-CCD-454
S12	023	ITL-CCD-451
S20	024	ITL-CCD-088
S21	025	ITL-CCD-461
S22	026	ITL-CCD-458

R04 CRTM-0004 ITL		
SG0	193	ITL-CCD-351
SG1	194	ITL-CCD-366
SW0	195	ITL-CCD-031
SW1	196	ITL-CCD-030

R10 RTM-023 ITL		
S00	027	ITL-CCD-466
S01	028	ITL-CCD-040
S02	029	ITL-CCD-167
S10	030	ITL-CCD-223
S11	031	ITL-CCD-350
S12	032	ITL-CCD-438
S20	033	ITL-CCD-377
S21	034	ITL-CCD-446
S22	035	ITL-CCD-207

R11 RTM-020 E2V		
S00	036	E2V-CCD-319
S01	037	E2V-CCD-321
S02	038	E2V-CCD-359
S10	039	E2V-CCD-364
S11	040	E2V-CCD-357
S12	041	E2V-CCD-363

S20	042	E2V-CCD-350
S21	043	E2V-CCD-365
S22	044	E2V-CCD-361

R12 RTM-009 E2V

S00	045	E2V-CCD-136
S01	046	E2V-CCD-267
S02	047	E2V-CCD-196
S10	048	E2V-CCD-244
S11	049	E2V-CCD-269
S12	050	E2V-CCD-270
S20	051	E2V-CCD-284
S21	052	E2V-CCD-287
S22	053	E2V-CCD-265

R13 RTM-019 E2V

S00	054	E2V-CCD-322
S01	055	E2V-CCD-331
S02	056	E2V-CCD-334
S10	057	E2V-CCD-349
S11	058	E2V-CCD-340
S12	059	E2V-CCD-186
S20	060	E2V-CCD-170
S21	061	E2V-CCD-336
S22	062	E2V-CCD-346

R14 RTM-006 E2V

S00	063	E2V-CCD-229
S01	064	E2V-CCD-225
S02	065	E2V-CCD-141
S10	066	E2V-CCD-221
S11	067	E2V-CCD-131
S12	068	E2V-CCD-190
S20	069	E2V-CCD-211
S21	070	E2V-CCD-192
S22	071	E2V-CCD-217

R20 RTM-014 ITL		
S00	072	ITL-CCD-307
S01	073	ITL-CCD-325
S02	074	ITL-CCD-427
S10	075	ITL-CCD-361
S11	076	ITL-CCD-440
S12	077	ITL-CCD-411
S20	078	ITL-CCD-225
S21	079	ITL-CCD-455
S22	080	ITL-CCD-407

R21 RTM-025 E2V		
S00	081	E2V-CCD-395
S01	082	E2V-CCD-367
S02	083	E2V-CCD-384
S10	084	E2V-CCD-391
S11	085	E2V-CCD-366
S12	086	E2V-CCD-392
S20	087	E2V-CCD-393
S21	088	E2V-CCD-402
S22	089	E2V-CCD-300

R22 RTM-024 E2V		
S00	090	E2V-CCD-369
S01	091	E2V-CCD-372
S02	092	E2V-CCD-378
S10	093	E2V-CCD-356
S11	094	E2V-CCD-382
S12	095	E2V-CCD-383
S20	096	E2V-CCD-388
S21	097	E2V-CCD-360
S22	098	E2V-CCD-370

R23 RTM-005 E2V		
S00	099	E2V-CCD-220

S01	100	E2V-CCD-239
S02	101	E2V-CCD-154
S10	102	E2V-CCD-165
S11	103	E2V-CCD-130
S12	104	E2V-CCD-153
S20	105	E2V-CCD-163
S21	106	E2V-CCD-216
S22	107	E2V-CCD-252

R24 RTM-016 E2V

S00	108	E2V-CCD-140
S01	109	E2V-CCD-314
S02	110	E2V-CCD-302
S10	111	E2V-CCD-298
S11	112	E2V-CCD-305
S12	113	E2V-CCD-318
S20	114	E2V-CCD-304
S21	115	E2V-CCD-301
S22	116	E2V-CCD-385

R30 RTM-012 E2V

S00	117	E2V-CCD-237
S01	118	E2V-CCD-281
S02	119	E2V-CCD-234
S10	120	E2V-CCD-358
S11	121	E2V-CCD-251
S12	122	E2V-CCD-149
S20	123	E2V-CCD-166
S21	124	E2V-CCD-214
S22	125	E2V-CCD-228

R31 RTM-007 E2V

S00	126	E2V-CCD-260
S01	127	E2V-CCD-182
S02	128	E2V-CCD-175
S10	129	E2V-CCD-167

S11	130	E2V-CCD-195
S12	131	E2V-CCD-201
S20	132	E2V-CCD-222
S21	133	E2V-CCD-213
S22	134	E2V-CCD-177

R32 RTM-015 E2V

S00	135	E2V-CCD-293
S01	136	E2V-CCD-187
S02	137	E2V-CCD-238
S10	138	E2V-CCD-245
S11	139	E2V-CCD-386
S12	140	E2V-CCD-247
S20	141	E2V-CCD-261
S21	142	E2V-CCD-286
S22	143	E2V-CCD-129

R33 RTM-010 E2V

S00	144	E2V-CCD-266
S01	145	E2V-CCD-268
S02	146	E2V-CCD-200
S10	147	E2V-CCD-273
S11	148	E2V-CCD-179
S12	149	E2V-CCD-263
S20	150	E2V-CCD-226
S21	151	E2V-CCD-264
S22	152	E2V-CCD-137

R34 RTM-008 E2V

S00	153	E2V-CCD-160
S01	154	E2V-CCD-411
S02	155	E2V-CCD-256
S10	156	E2V-CCD-253
S11	157	E2V-CCD-194
S12	158	E2V-CCD-231
S20	159	E2V-CCD-224

S21	160	E2V-CCD-189
S22	161	E2V-CCD-134

R40 CRTM-0003 ITL

SG0	197	ITL-CCD-373
SG1	198	ITL-CCD-348
SW0	199	ITL-CCD-028
SW1	200	ITL-CCD-027

R41 RTM-021 ITL

S00	162	ITL-CCD-478
S01	163	ITL-CCD-502
S02	164	ITL-CCD-355
S10	165	ITL-CCD-508
S11	166	ITL-CCD-470
S12	167	ITL-CCD-358
S20	168	ITL-CCD-443
S21	169	ITL-CCD-161
S22	170	ITL-CCD-317

R42 RTM-018 ITL

S00	171	ITL-CCD-138
S01	172	ITL-CCD-140
S02	173	ITL-CCD-327
S10	174	ITL-CCD-019
S11	175	ITL-CCD-110
S12	176	ITL-CCD-014
S20	177	ITL-CCD-509
S21	178	ITL-CCD-510
S22	179	ITL-CCD-486

R43 RTM-022 ITL

S00	180	ITL-CCD-080
S01	181	ITL-CCD-506
S02	182	ITL-CCD-450
S10	183	ITL-CCD-396

S11	184	ITL-CCD-203
S12	185	ITL-CCD-476
S20	186	ITL-CCD-166
S21	187	ITL-CCD-313
S22	188	ITL-CCD-076

R44 CRTM-0005 ITL

SG0	201	ITL-CCD-332
SG1	202	ITL-CCD-388
SW0	203	ITL-CCD-007
SW1	204	ITL-CCD-025

Table 1: Each table lists the raft serial number (CRTM-### or RTM-###, and the CCD content of each raft. For each CCD the slot S## and DM index are listed along with the vendor's serial number.

ComCam RTM-031 ITL

S00	000	ITL-3800C-229
S01	001	ITL-3800C-251
S02	002	ITL-3800C-215
S10	003	ITL-3800C-326
S11	004	ITL-3800C-283
S12	005	ITL-3800C-243
S20	006	ITL-3800C-319
S21	007	ITL-3800C-209
S22	008	ITL-3800C-206

Table 2: This table lists the raft serial number and the CCD content ComCam. For each CCD the slot S## and DM index are listed along with the vendor's serial number.

B References

LSSTCam, 2020, *LCA-13381 - LSST Camera Focal Plane Layout*, URL https://docushare.lsst.org/docushare/dsweb/Get/LCA-13381

Utsumi, Y., et al., 2025, *SITCOMTN-148 - LSST Camera Electro-Optical Test (Run 7) Results*, URL https://sitcomtn-148.lsst.io/

C Acronyms

Acronym	Description
CCD	Charge-Coupled Device
CTN	Camera Technical Note
DM	Data Management
ITL	Imaging Technology Laboratory (UA)
LCA	Document handle LSST camera subsystem controlled documents
LSST	Legacy Survey of Space and Time (formerly Large Synoptic Survey Telescope)
OPS	Operations
RTM	Raft Tower Module
SLAC	SLAC National Accelerator Laboratory