WFPC2 Acceptance Testing

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Summary

A detailed acceptance test for the WFPC2 has been performed. A regression test shows that BOT is giving the correct answers. The new features (exposure expansion, pointing adjustments, actual duration usage, and visualization) are all functioning properly, and for the most part, BOT can handle error conditions gracefully and provides meaningful feedback to the users.

There is one aperture (F160AN15) that should not be processed by BOT (it is unsupported) but are, and there is one configuration (use of polarizers) that, while supported, should be unsupported in BOT; both of these have PRs filed.

Three issues with the Aladin display have been found – a slight misalignment of the BOT overlay with the DSS image, a failure to display all sub-exposures, and a broken link in the Aladin spreadsheet; all of these are known issues with PRs previously filed.

The unsupported mode (use of polarizers) issue, as well as the failure to display all sub-exposures, should be corrected prior to the release of the tool for WFPC2 usage.

Introduction

For this test, the following target and exposure was used:

Target: FY Com – 12h 49m 4.6s, +27^{o} 27’ 57.11”

Exposure: WFPC2, IMAGE, F555W, WF2, 700s, CR-SPLIT=NO, GAIN=7

When appropriate, modifications to the exposure (e.g. POS TARG) are detailed below.

This target/exposure was used to perform the following:

Test	Definition
Regression	Comparison with old VTT/BOT
New features	Exposure expansion, pointing adjustment, actual duration, visualization
Exception Handling	Unsupported exposure (network query and cancel operations were performed with the ACS/SBC, Bad Exposure with the ACS/HRC)

For certain tests, both the tabular and graphic output products are included for ease of comparison with future test results.

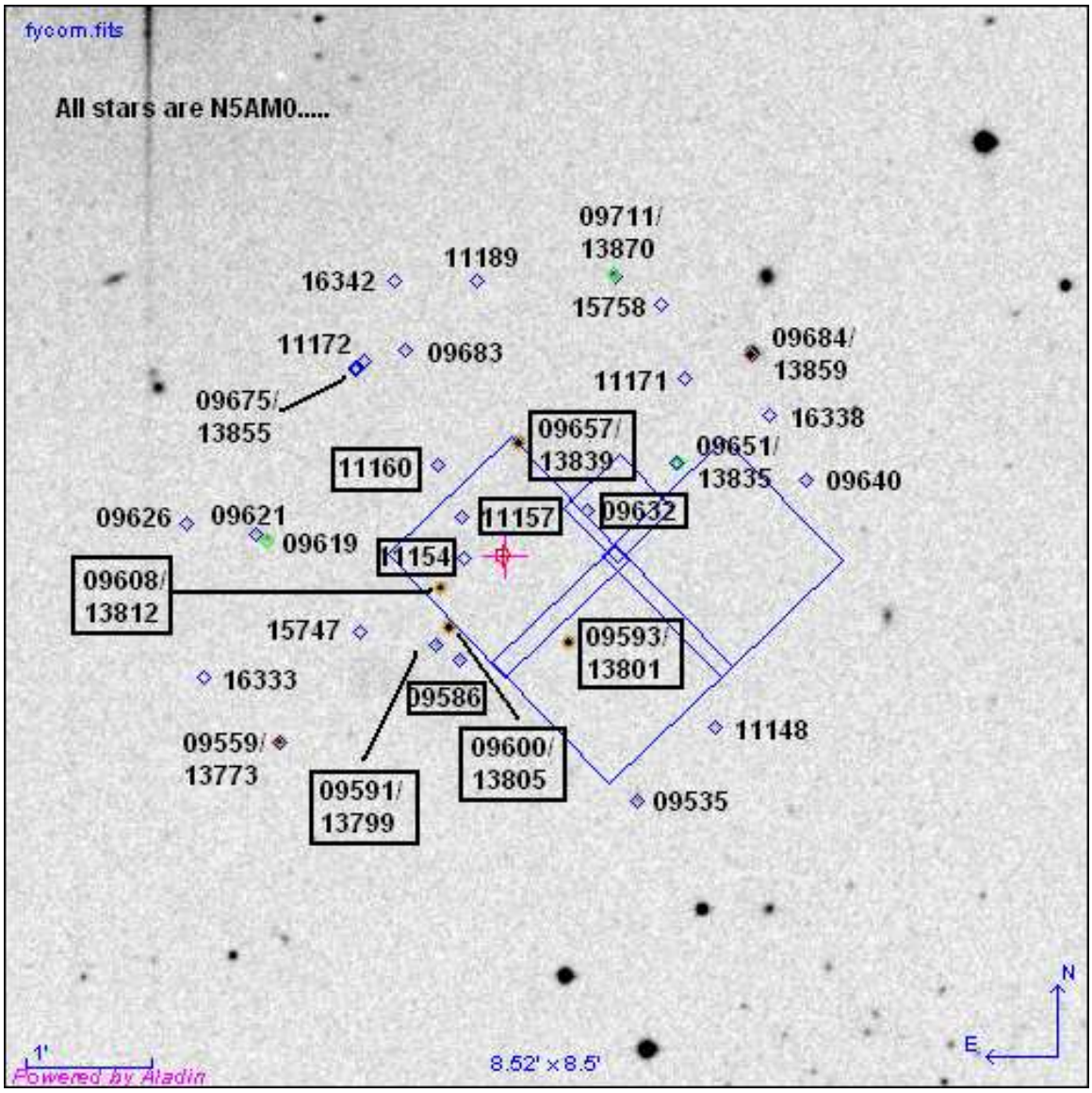
Regression Test

The test exposure was run through both the VTT/BOT and the new BOT/Aladin interface. The VTT/BOT used a search radius of 57.5", while the BOT/Aladin used 159.7". This resulted in 25 additional stars being found with the new BOT interface; the magnitudes and derived count rates were identical (after correcting the VTT/BOT for CR-SPLIT) for the objects detected by both methods. The 40 objects detected (6 science, 3 safe, and 31 unknown) were:

GSC2 ID	RA	Dec	F	J	V	B-V	Type	VTT	NEW
N5AM009640	12 48 53.9293	+27 28 34.75	20.2	---	---	---	not a star	N	Y
N5AM016338	12 48 55.2609	+27 29 4.91	---	---	---	---	no color info	N	Y
N5AM013859	12 48 55.9472	+27 29 33.57	15.51	---	---	---	no color info	N	Y
N5AM009684	12 48 55.9571	+27 29 33.88	15.61	16.31	15.94	0.13	A0V	N	Y
N5AM011148	12 48 57.0647	+27 26 38.50	---	20.94	---	---	not a star	N	Y
N5AM011171	12 48 58.2578	+27 29 22.39	---	21.6	---	---	not a star	N	Y
N5AM009651	12 48 58.4882	+27 28 42.03	20.19	20.9	20.52	0	B0V	N	Y
N5AM013835	12 48 58.5050	+27 28 42.04	19.85	---	---	---	not a star	N	Y
N5AM015758	12 48 59.1852	+27 29 56.36	---	---	---	---	no color info	N	Y
N5AM009535	12 48 59.7828	+27 26 2.75	19.64	20.72	---	---	not a star	N	Y
N5AM013870	12 49 0.7921	+27 30 9.44	19.01	---	---	---	not a star	N	Y
N5AM009711	12 49 0.8730	+27 30 9.93	19.12	20.21	19.62	0.37	F0V	N	Y
N5AM009632	12 49 1.6194	+27 28 18.77	20.2	---	---	---	not a star	Y	Y
N5AM013773	12 49 12.4439	+27 26 27.60	18.21	---	---	---	no color info	N	Y
N5AM009559	12 49 12.4544	+27 26 27.95	18.29	20.52	19.37	1.17	K0III	N	Y
N5AM009619	12 49 12.9793	+27 28 2.66	19.11	21.16	20.09	0.93	K0III	N	Y
N5AM009621	12 49 13.3312	+27 28 5.55	20.29	---	---	---	not a star	N	Y
N5AM016333	12 49 15.1485	+27 26 58.10	---	---	---	---	no color info	N	Y
N5AM009626	12 49 15.8143	+27 28 10.35	20.41	---	---	---	not a star	N	Y
N5AM013801	12 49 2.2684	+27 27 16.49	17.2	---	---	---	no color info	Y	Y
N5AM009593	12 49 2.2880	+27 27 16.76	17.24	19.38	18.27	1.13	K0III	Y	Y
N5AM013839	12 49 4.1678	+27 28 49.98	16.92	---	---	---	no color info	Y	Y
N5AM009657	12 49 4.1752	+27 28 50.41	16.87	19.27	18.06	1.31	K0III	Y	Y
N5AM011189	12 49 5.6610	+27 30 6.11	---	21.68	---	---	not a star	N	Y
N5AM011154	12 49 5.9726	+27 27 55.77	---	21.2	---	---	not a star	Y	Y
N5AM009586	12 49 6.1054	+27 27 7.67	19.97	---	---	---	not a star	Y	Y
N5AM011157	12 49 6.1068	+27 28 15.44	---	21.32	---	---	no color info	Y	Y
N5AM013805	12 49 6.5213	+27 27 22.63	17.11	---	---	---	no color info	Y	Y
N5AM009600	12 49 6.5297	+27 27 22.88	17.12	18.39	17.7	0.54	F0V	Y	Y
N5AM013812	12 49 6.8269	+27 27 41.25	18.02	---	---	---	not a star	Y	Y
N5AM009608	12 49 6.8527	+27 27 41.53	17.85	19.23	18.48	0.6	G0V	Y	Y
N5AM013799	12 49 6.9263	+27 27 14.48	19.07	---	---	---	not a star	Y	Y
N5AM009591	12 49 6.9386	+27 27 14.81	19.36	20.42	---	---	not a star	Y	Y
N5AM011160	12 49 6.9884	+27 28 39.25	---	21.17	---	---	no color info	Y	Y
N5AM009683	12 49 8.1457	+27 29 33.26	20.22	---	---	---	not a star	N	Y
N5AM016342	12 49 8.5607	+27 30 6.14	---	---	---	---	no color info	N	Y
N5AM015747	12 49 9.6096	+27 27 20.60	---	---	---	---	not a star	N	Y
N5AM011172	12 49 9.6405	+27 29 27.54	---	21.13	---	---	not a star	N	Y
N5AM013855	12 49 9.8925	+27 29 23.91	19.71	---	---	---	not a star	N	Y
N5AM009675	12 49 9.8943	+27 29 24.69	20.04	21.12	---	---	not a star	N	Y

All the stars that were only found by the new BOT were located more than 57.6” from the center of the aperture, and is therefore due to the increase in the search radius.

The field map, showing the objects found, is given below.



In the figure, all objects found by the VTT/BOT are in the boxes.

Issue

There appears to be a slight misalignment between the BOT overlay and the DSS image, which is 0.2” in both RA and Dec. The RA offset is consistent (the BOT overlay is always east of the star), while the Dec offset is sometimes north and sometimes south.

This discrepancy is small enough (0.2 pixels) to be of no concern, but is covered under APT-VTT PR 56217.

New Features

Exposure Expansion

For the WFPC2, there are three ways for exposures to be expanded – use of the CR-SPLIT optional parameter, number of iterations greater than 1, and the use of a pattern; it is also possible to combine these methods (i.e. CR-SPLIT and pattern). The following cases were tested:

CR-SPLIT	Num. of Iter.	Pattern	Number of sub-exposures	Original Exposure Time (s)	Exposure Time Perdicted (s)	Exposure Time Used by BOT (s)
NO	1	no	1	700	700	700
DEF (=0.5)	1	No	2	700	350	350
0.25	1	No	2	700	175/525	175/525
NO	3	No	3	700	700	700
DEF (-0.5)	1	Yes	3x1	700	350	350

In each case, BOT created the correct number of sub-exposures, and modified the given exposure time correctly. As with the SBC, Aladin did display the BOT overlays, although there was only 1 image plane shown for the CR-SPLIT and number of iterations cases, unlike the Pattern case where each sub-exposure was its own plane. Since the CR-SPLIT and number of iterations planes would all be, by definition, identical, showing only 1 plane is acceptable (however, if the actual duration field was used, a problem could result).

Pointing Adjustment

There are 3 different types of pointing adjustments valid for the WFPC2 – POS TARG, PATTERN, and use as a PARALLEL instrument.

POS TARG

For this test, the standard exposure was modified by adding a POS TARG of X=-40” and Y=-40”. The direction of the POS TARG is important in this test, and in order to be able to simply predict the size of the POS TARG motion, the motion must be in the same direction as the "Search Radius Vector" which is defined as the point from the fiducial to the outermost corner of the Aperture. A selection in a different direction makes the calculation of the motion vector more complicated.

The test exposure was run through both the VTT/BOT and the new BOT/Aladin interface. The VTT/BOT used a search radius of 57.5", and only did analysis at the exact pointing (i.e. it assumed ORIENT=0). The new BOT increased the standard search radius (159.7) by 10.5" to 170.2", which resulted in a circle being analyzed to support any possible ORIENT value. Because the WFPC2 search radius is not just for the chip selected, but is for the entire detector, predicting the size of the search radius is not straightforward. Therefore, I ran a series of POS TARGs from 10"-70" in steps of 10", and measured the separation between the (non POS TARGed) aperture fiducial and the furthest point on the (POS TARGed) aperture, and compared to the value determined by BOT. The following table shows the results:

POS TARG	BOT Radius	Measured Radius
-10", -10"	160.5"	160.2"
-20", -20"	162.6"	163.2"
-30", -30"	165.9"	166.2"
-40", -40"	170.2"	168.6"
-50", -50"	175.6"	174.0"
-60", -60"	182.0"	181.8"
-70", -70'	189.2"	188.4"

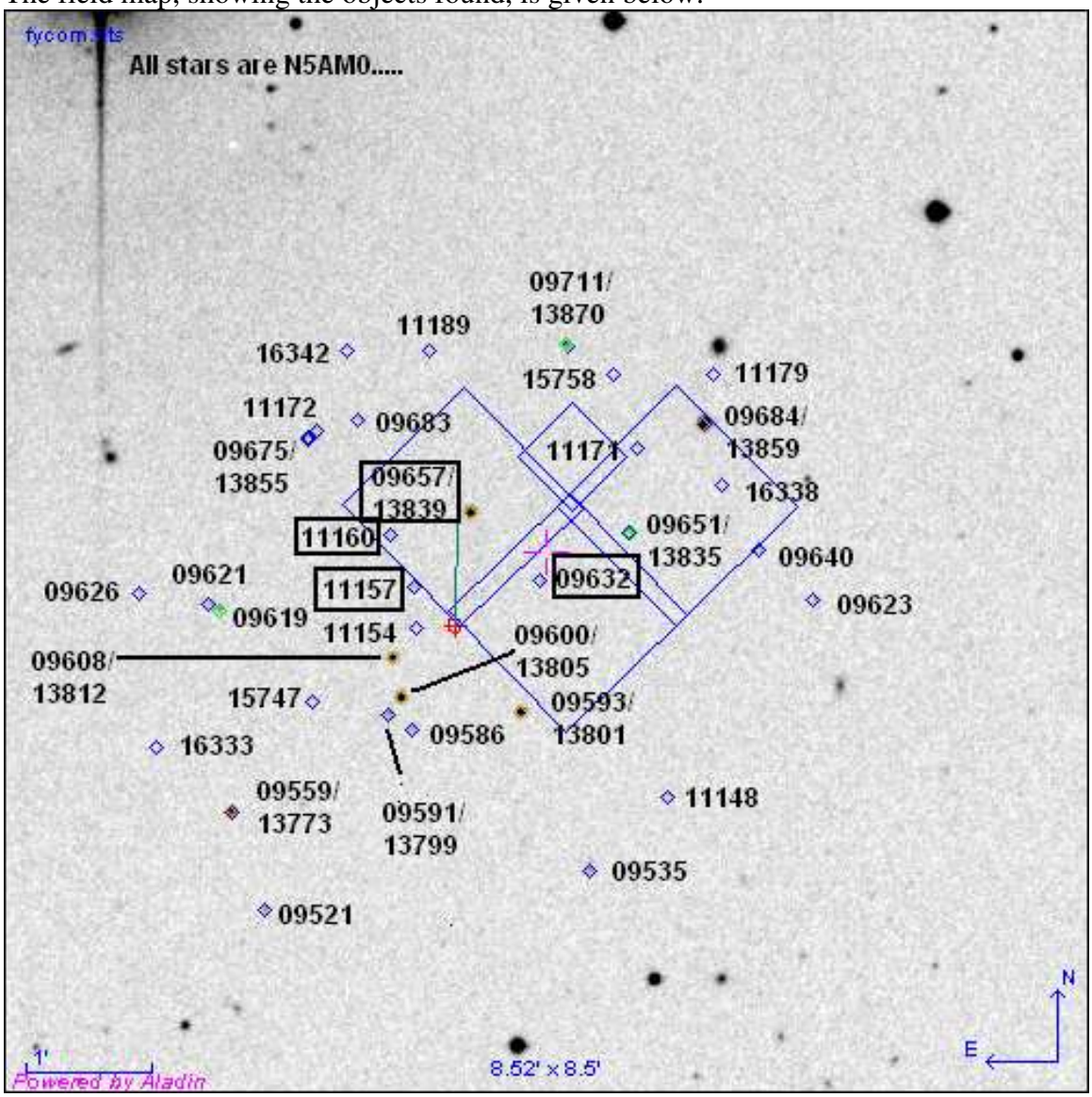
The measured values agree to within the measurement error with the BOT values, so it appears that POS TARGs are being properly handled.

With the increased search radius, the new BOT analyzed more objects than the VTT/BOT, but all objects in the VTT/BOT were detected, and for those objects, the magnitudes and derived count rates were identical.

The 43 objects detected (6 science, 3 safe, and 34 unknown) were:

GSC2 ID	RA	Dec	F	J	V	B-V	Type
N5AM009623	12 48 51.9732	+27 28 11.35	19.86	---	---	---	not a star
N5AM009640	12 48 53.9293	+27 28 34.75	20.2	---	---	---	not a star
N5AM016338	12 48 55.2609	+27 29 4.91	---	---	---	---	no color info
N5AM011179	12 48 55.6193	+27 29 56.82	---	21.59	---	---	not a star
N5AM013859	12 48 55.9472	+27 29 33.57	15.51	---	---	---	no color info
N5AM009684	12 48 55.9571	+27 29 33.88	15.61	16.31	15.94	0.13	A0V
N5AM011148	12 48 57.0647	+27 26 38.50	---	20.94	---	---	not a star
N5AM011171	12 48 58.2578	+27 29 22.39	---	21.6	---	---	not a star
N5AM009651	12 48 58.4882	+27 28 42.03	20.19	20.9	20.52	0	B0V
N5AM013835	12 48 58.5050	+27 28 42.04	19.85	---	---	---	not a star
N5AM015758	12 48 59.1852	+27 29 56.36	---	---	---	---	no color info
N5AM009535	12 48 59.7828	+27 26 2.75	19.64	20.72	---	---	not a star
N5AM013870	12 49 0.7921	+27 30 9.44	19.01	---	---	---	not a star
N5AM009711	12 49 0.8730	+27 30 9.93	19.12	20.21	19.62	0.37	F0V
N5AM009632	12 49 1.6194	+27 28 18.77	20.2	---	---	---	not a star
N5AM009521	12 49 11.1827	+27 25 41.84	20	---	---	---	no color info
N5AM013773	12 49 12.4439	+27 26 27.60	18.21	---	---	---	no color info
N5AM009559	12 49 12.4544	+27 26 27.95	18.29	20.52	19.37	1.17	K0III
N5AM009619	12 49 12.9793	+27 28 2.66	19.11	21.16	20.09	0.93	K0III
N5AM009621	12 49 13.3312	+27 28 5.55	20.29	---	---	---	not a star
N5AM016333	12 49 15.1485	+27 26 58.10	---	---	---	---	no color info
N5AM009626	12 49 15.8143	+27 28 10.35	20.41	---	---	---	not a star
N5AM013801	12 49 2.2684	+27 27 16.49	17.2	---	---	---	no color info
N5AM009593	12 49 2.2880	+27 27 16.76	17.24	19.38	18.27	1.13	K0III
N5AM013839	12 49 4.1678	+27 28 49.98	16.92	---	---	---	no color info
N5AM009657	12 49 4.1752	+27 28 50.41	16.87	19.27	18.06	1.31	K0III
N5AM011189	12 49 5.6610	+27 30 6.11	---	21.68	---	---	not a star
N5AM011154	12 49 5.9726	+27 27 55.77	---	21.2	---	---	not a star
N5AM009586	12 49 6.1054	+27 27 7.67	19.97	---	---	---	not a star
N5AM011157	12 49 6.1068	+27 28 15.44	---	21.32	---	---	no color info
N5AM013805	12 49 6.5213	+27 27 22.63	17.11	---	---	---	no color info
N5AM009600	12 49 6.5297	+27 27 22.88	17.12	18.39	17.7	0.54	F0V
N5AM013812	12 49 6.8269	+27 27 41.25	18.02	---	---	---	not a star
N5AM009608	12 49 6.8527	+27 27 41.53	17.85	19.23	18.48	0.6	G0V
N5AM013799	12 49 6.9263	+27 27 14.48	19.07	---	---	---	not a star
N5AM009591	12 49 6.9386	+27 27 14.81	19.36	20.42	---	---	not a star
N5AM011160	12 49 6.9884	+27 28 39.25	---	21.17	---	---	no color info
N5AM009683	12 49 8.1457	+27 29 33.26	20.22	---	---	---	not a star
N5AM016342	12 49 8.5607	+27 30 6.14	---	---	---	---	no color info
N5AM015747	12 49 9.6096	+27 27 20.60	---	---	---	---	not a star
N5AM011172	12 49 9.6405	+27 29 27.54	---	21.13	---	---	not a star
N5AM013855	12 49 9.8925	+27 29 23.91	19.71	---	---	---	not a star
N5AM009675	12 49 9.8943	+27 29 24.69	20.04	21.12	---	---	not a star

The field map, showing the objects found, is given below.



In the figure, the objects in boxes were found by the VTT/BOT. The new objects are all in the area that is expected.

Pattern

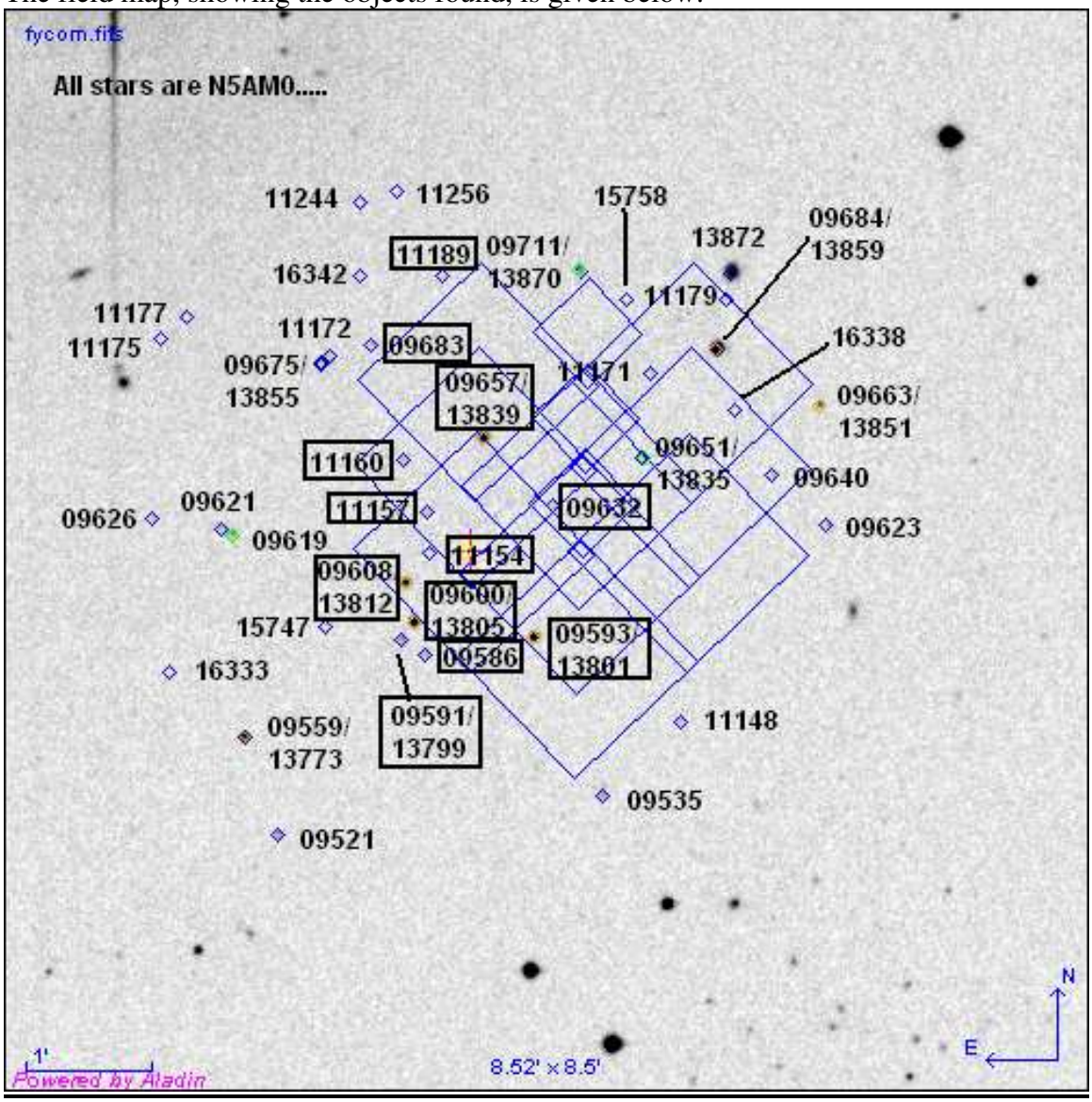
For this test, the standard exposure was modified by putting it in a PATTERN (a LINE with 3 points with a 40" spacing at an orientation of 225^{o}). The orientation of the pattern is important in this test, since in order to be able to simply predict the size of the PATTERN motion, the motion must be in the same direction as the "Search Radius Vector" which is defined as the point from the fiducial to the outermost corner of the Aperture. A selection in a different orientation makes the calculation of the motion vector more complicated.

The test exposure was run through both the VTT/BOT and the new BOT/Aladin interface. The VTT/BOT used a search radius of 57.5", and used the same radius for each pattern position. The new BOT also did 3 searches – one for the initial pointing (with the standard 159.7" search radius) and one for each of the two pattern points (with the search radius increased to 165.2" and 179.7"); all objects in the initial pointing were included in the larger pattern pointing report, as expected. The expanded search radius size was tested by measuring the separation between the aperture fiducial and the furthest point on the aperture in Aladin, and comparing to the BOT value (in a similar procedure used in testing POS TARG). The BOT search radii all agreed with the measured values to within the measurement error. With the increased search radius, the new BOT analyzed more objects than the VTT/BOT, but all objects in the VTT/BOT were detected, and for those objects, the magnitudes and derived count rates were identical.

The 50 objects detected (6 science, 4 safe, and 40 unknown) were:

GSC2 ID	RA	Dec	F	J	V	B-V	Type	VTT	NEW
N5AM009623	12 48 51.9732	+27 28 11.35	19.86	---	---	---	not a star	N	Y
N5AM013851	12 48 52.2763	+27 29 7.97	18.63	---	---	---	no color info	N	Y
N5AM009663	12 48 52.2855	+27 29 8.18	18.88	19.67	19.25	0.18	A0V	N	Y
N5AM009640	12 48 53.9293	+27 28 34.75	20.2	---	---	---	not a star	N	Y
N5AM016338	12 48 55.2609	+27 29 4.91	---	---	---	---	no color info	N	Y
N5AM013872	12 48 55.4738	+27 30 9.70	16.09	---	---	---	not a star	N	Y
N5AM011179	12 48 55.6193	+27 29 56.82	---	21.59	---	---	not a star	N	Y
N5AM013859	12 48 55.9472	+27 29 33.57	15.51	---	---	---	no color info	N	Y
N5AM009684	12 48 55.9571	+27 29 33.88	15.61	16.31	15.94	0.13	A0V	N	Y
N5AM011148	12 48 57.0647	+27 26 38.50	---	20.94	---	---	not a star	N	Y
N5AM011171	12 48 58.2578	+27 29 22.39	---	21.6	---	---	not a star	N	Y
N5AM009651	12 48 58.4882	+27 28 42.03	20.19	20.9	20.52	0	B0V	N	Y
N5AM013835	12 48 58.5050	+27 28 42.04	19.85	---	---	---	not a star	N	Y
N5AM015758	12 48 59.1852	+27 29 56.36	---	---	---	---	no color info	N	Y
N5AM009535	12 48 59.7828	+27 26 2.75	19.64	20.72	---	---	not a star	N	Y
N5AM013870	12 49 0.7921	+27 30 9.44	19.01	---	---	---	not a star	N	Y
N5AM009711	12 49 0.8730	+27 30 9.93	19.12	20.21	19.62	0.37	F0V	N	Y
N5AM009632	12 49 1.6194	+27 28 18.77	20.2	---	---	---	not a star	Y	Y
N5AM009521	12 49 11.1827	+27 25 41.84	20	---	---	---	no color info	N	Y
N5AM013773	12 49 12.4439	+27 26 27.60	18.21	---	---	---	no color info	N	Y
N5AM009559	12 49 12.4544	+27 26 27.95	18.29	20.52	19.37	1.17	K0III	N	Y
N5AM009619	12 49 12.9793	+27 28 2.66	19.11	21.16	20.09	0.93	K0III	N	Y
N5AM009621	12 49 13.3312	+27 28 5.55	20.29	---	---	---	not a star	N	Y
N5AM011177	12 49 14.6819	+27 29 45.65	---	20.96	---	---	not a star	N	Y
N5AM016333	12 49 15.1485	+27 26 58.10	---	---	---	---	no color info	N	Y
N5AM011175	12 49 15.5911	+27 29 34.94	---	21.11	---	---	not a star	N	Y
N5AM009626	12 49 15.8143	+27 28 10.35	20.41	---	---	---	not a star	N	Y
N5AM013801	12 49 2.2684	+27 27 16.49	17.2	---	---	---	no color info	Y	Y
N5AM009593	12 49 2.2880	+27 27 16.76	17.24	19.38	18.27	1.13	K0III	Y	Y
N5AM013839	12 49 4.1678	+27 28 49.98	16.92	---	---	---	no color info	Y	Y
N5AM009657	12 49 4.1752	+27 28 50.41	16.87	19.27	18.06	1.31	K0III	Y	Y
N5AM011189	12 49 5.6610	+27 30 6.11	---	21.68	---	---	not a star	Y	Y
N5AM011154	12 49 5.9726	+27 27 55.77	---	21.2	---	---	not a star	Y	Y
N5AM009586	12 49 6.1054	+27 27 7.67	19.97	---	---	---	not a star	Y	Y
N5AM011157	12 49 6.1068	+27 28 15.44	---	21.32	---	---	no color info	Y	Y
N5AM013805	12 49 6.5213	+27 27 22.63	17.11	---	---	---	no color info	Y	Y
N5AM009600	12 49 6.5297	+27 27 22.88	17.12	18.39	17.7	0.54	F0V	Y	Y
N5AM013812	12 49 6.8269	+27 27 41.25	18.02	---	---	---	not a star	Y	Y
N5AM009608	12 49 6.8527	+27 27 41.53	17.85	19.23	18.48	0.6	G0V	Y	Y
N5AM013799	12 49 6.9263	+27 27 14.48	19.07	---	---	---	not a star	Y	Y
N5AM009591	12 49 6.9386	+27 27 14.81	19.36	20.42	---	---	not a star	Y	Y
N5AM011160	12 49 6.9884	+27 28 39.25	---	21.17	---	---	no color info	Y	Y
N5AM011256	12 49 7.3714	+27 30 45.76	---	21.69	---	---	not a star	N	Y
N5AM009683	12 49 8.1457	+27 29 33.26	20.22	---	---	---	not a star	Y	Y
N5AM016342	12 49 8.5607	+27 30 6.14	---	---	---	---	no color info	N	Y
N5AM011244	12 49 8.6507	+27 30 40.01	---	21.5	---	---	not a star	N	Y
N5AM015747	12 49 9.6096	+27 27 20.60	---	---	---	---	not a star	N	Y
N5AM011172	12 49 9.6405	+27 29 27.54	---	21.13	---	---	not a star	N	Y
N5AM013855	12 49 9.8925	+27 29 23.91	19.71	---	---	---	not a star	N	Y
N5AM009675	12 49 9.8943	+27 29 24.69	20.04	21.12	---	---	not a star	N	Y

The field map, showing the objects found, is given below.



In the figure, the objects in boxes were found by the VTT/BOT. The new objects are all in the area that is expected.

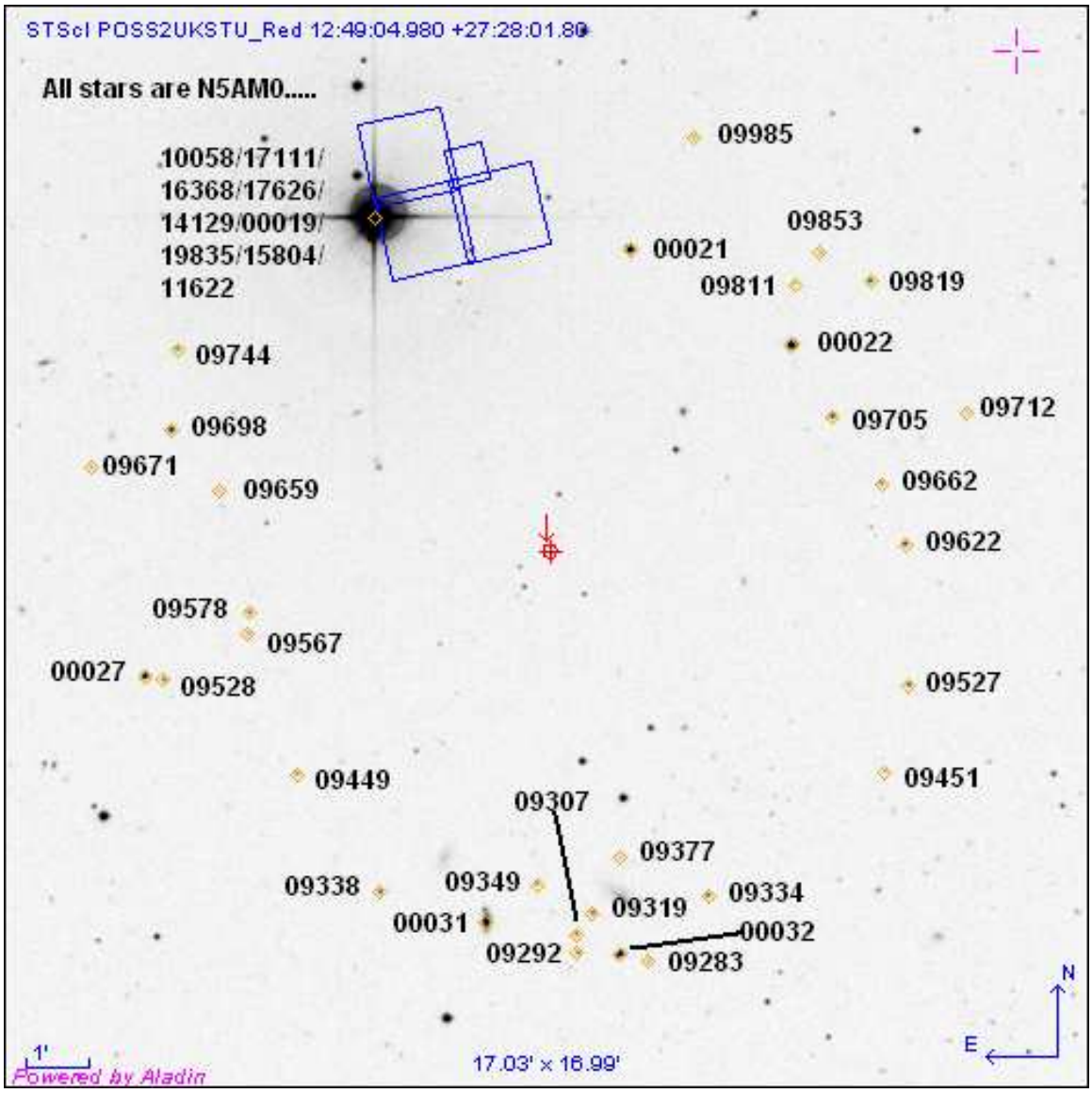
Parallel

For this test, the standard exposure was modified making it be a coordinated parallel observation with a ACS/WFC prime exposure. The test exposure was run through the new BOT/Aladin interface only; the old VTT/BOT did not take the position of the parallel aperture into account when performing its checking. The search radius used by BOT was 7.34', which is in agreement with that measured on the Aladin image.

A total of 572 stars were found in the new BOT, so the table below only lists the science concerns (40). The objects detected were:

GSC2 ID	RA	Dec	F	J	V	B-V	Type
N5AM000019	12 49 17.4519	+27 33 8.57	---	---	5.75	0.05	A0V
N5AM000021	12 48 59.3865	+27 32 42.11	13.3	14.07	13.66	0.18	A0V
N5AM000022	12 48 47.8406	+27 31 14.41	---	---	12.33	0.43	F0V
N5AM000027	12 49 33.2508	+27 25 53.34	14.16	16.01	15.03	0.93	K0III
N5AM000031	12 49 8.8427	+27 22 6.85	12.53	13.24	12.86	0.14	A0V
N5AM000032	12 48 59.3501	+27 21 38.92	13.76	14.54	14.13	0.19	A0V
N5AM009283	12 48 57.3667	+27 21 32.35	18.16	20.49	19.31	1.24	K0III
N5AM009292	12 49 2.3690	+27 21 39.69	17.25	19.56	18.38	1.24	K0III
N5AM009307	12 49 2.4803	+27 21 56.93	17.27	18.94	18.04	0.81	G5V
N5AM009319	12 49 1.3461	+27 22 17.51	16.89	17.74	17.29	0.24	A0V
N5AM009334	12 48 53.2414	+27 22 35.38	16.74	17.79	17.22	0.38	F0V
N5AM009338	12 49 16.4023	+27 22 34.09	16.63	17.28	16.94	0.1	A0V
N5AM009349	12 49 5.3166	+27 22 43.82	17.56	19.93	18.73	1.29	K0III
N5AM009377	12 48 59.4980	+27 23 10.21	18.79	19.92	19.31	0.42	F0V
N5AM009449	12 49 22.3785	+27 24 23.88	17.62	18.95	18.23	0.58	F0V
N5AM009451	12 48 40.8225	+27 24 34.27	18.39	19.09	18.72	0.14	A0V
N5AM009527	12 48 39.2504	+27 25 56.39	16.62	17.99	17.25	0.6	G0V
N5AM009528	12 49 31.8947	+27 25 50.34	17.01	19.41	18.2	1.31	K0III
N5AM009567	12 49 25.9866	+27 26 34.76	18.17	18.8	18.47	0.09	A0V
N5AM009578	12 49 25.9172	+27 26 54.79	17.11	18.13	17.58	0.35	F0V
N5AM009622	12 48 39.6490	+27 28 8.58	16.32	17.79	17	0.66	G5V
N5AM009659	12 49 28.1989	+27 28 48.58	18.71	20.31	19.45	0.74	G5V
N5AM009662	12 48 41.4039	+27 29 5.37	17.37	18.65	17.96	0.54	F0V
N5AM009671	12 49 37.2352	+27 29 9.08	18.39	20.56	19.44	1.12	K0III
N5AM009698	12 49 31.6534	+27 29 45.58	15.38	16.09	15.71	0.15	A0V
N5AM009705	12 48 44.9123	+27 30 7.71	16.16	16.99	16.55	0.22	A0V
N5AM009712	12 48 35.4078	+27 30 13.11	18.63	20.2	19.35	0.71	G5V
N5AM009744	12 49 31.3019	+27 31 1.76	17.27	19.26	18.21	1.02	K0III
N5AM009811	12 48 47.7199	+27 32 11.64	18.46	19.53	18.95	0.38	F0V
N5AM009819	12 48 42.3606	+27 32 15.52	16.41	18.01	17.15	0.76	G5V
N5AM009853	12 48 45.9332	+27 32 41.20	18.24	19.83	18.97	0.74	G5V
N5AM009985	12 48 54.9913	+27 34 27.99	18.24	19.41	18.77	0.45	F0V
N5AM010058	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info
N5AM011622	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info
N5AM014129	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info
N5AM015804	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info
N5AM016368	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info
N5AM017111	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info
N5AM017626	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info
N5AM019835	12 49 17.4512	+27 33 8.56	---	---	5.76	---	no color info

The field map, showing the objects found, is given below.



Actual Duration

There are three ways in which the WFPC2 can use actual durations – a CR-SPLIT exposure, a pattern exposure, and a number of iterations greater than 1 exposure. For this test, the second piece of a CR-SPLIT, the third piece of the pattern, and the third piece of a number of iterations=3 exposure will have the actual duration set to 100s.

CR-SPLIT

An examination of the BOT details shows that the revised exposure time for the second piece of the CR-SPLIT was detected by the tool, and that value was used in the determination of the total counts from the stars; for the other pieces of the CR-SPLIT, the correct exposure time was used.

Pattern
An examination of the BOT details shows that the revised exposure time for the third piece of the pattern was detected by the tool, and that value was used in the determination of the total counts for the stars; for the other pieces of the pattern, the correct exposure time was used.

Number of iterations
An examination of the BOT details shows that the revised exposure time for the third piece of the pattern was detected by the tool, and that value was used in the determination of the total counts for the stars; for the other pieces of the number of iterations, the correct exposure time was used.

Issue
For CR-SPLIT and number of iterations, only the first sub-exposure is shown in Aladin. If there were different actual durations, both sub-exposures would need to be display, as they could have different answers. This is a problem is covered in APT-BOT OPR 56136, and *should be corrected prior to the release of the tool for WFPC2 usage.*

Visualization

- There are many aspects to this test, all of which have already been verified by the previous SBC and HRC testing.

Issue
Aladin spreadsheet name link to an external html page with more details fails for the GSC2; this is covered with APT-VTT PR 56234.

Existing Proposals

I ran BOT on 9 cycle 15 operational proposals - 5 with prime WFPC2 observations, and 4 with parallel WFPC2 observations. The prime observations utilized POS TARGs (albiet very small), patterns, and ORIENTs, and all worked properly. The parallel observations also worked well, including exposures with 1500-2000 objects, which all ran and displayed (both in Aladin and in the details summary) quickly; there was also an exposure that used the actual duration field. There was one proposal with 144 exposures (prime and parallel), and after 20 minutes, only 100 exposures had processed. The memory monitor indicated that I was at my limit on memory, which explains that slow processing time. Note that my computer has the minimum memory necessary for APT (384 MB), so this is not a problem.

Exception Handling

There are four types of exception handling to be tested; Network Query Error and Cancel Ongoing Operations have been verified in the SBC testing, and Bad Exposures has been verified in the HRC testing.

Unsupported Exposures

There is 1 unsupported aperture (F160AN15) for the WFPC2.

Issue – Unsupported mode incorrectly supported in BOT

When this is used, the appropriate error message is not given, but instead you get the pop-up about no GSC2 stars found, and the status field says completed. This is covered in APT-BOT PR 56559, but does not need to be corrected prior to the release of the tool for WFPC2 usage.

Issue – Supported modes that should be unsupported in BOT

Use of polarizers are fully supported configurations. However, the polarizers impact the count rate (reduce it substantially). These spectral elements should be considered UNSUPPORTED in BOT; this is covered in APT-BOT PR 56559, and *should be corrected prior to the release of the tool for WFPC2 usage.*