Measurements of 121 New Visual Binary Stars Suggested by the Gaia Data Release 2

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Abstract: This paper reports the observation and measurement of 121 new potential visual binary stars, with magnitudes and separation ranging from 9.1 to 13.5 and 0.7 to 1.5 arcsec respectively, obtained from a mining of the data provided by the GAIA Data Release 2 in April 2018. Data mining has been carried out by a dedicated software, GDS, briefly described in this paper. Observations and measurements have been carried out between Sep 2018 and Feb 2019 by the author using a 11" reflector telescope, an ASI 290MM CMOS-based camera and bispectrum-based reduction techniques. The measurements are in very good agreement with the astrometric parameters derived from the individual positions reported in the GAIA DR2. Individual proper motions, parallaxes and radial velocities data available from the DR2 show a high probability that the discovered pairs are physical.

1. Introduction

The GAIA satellite [1], launched in late 2013, has completed a large portion of its planned observations. The second of the four planned data releases, DR2, became available to the public in April 2018. Although DR2 is a preliminary release, it contains a great deal of useful information having unprecedented accuracy [2].

In particular, the availability of very high precision astrometric solutions — with uncertainties < 0.7 mas for parallaxes and < 1.2 mas.yr^{-1} for proper motions — for more than 1.3 billion of stars up to magnitude 20 allows for the search of potentially binary systems which could have been overlooked in the existing catalogs of visual binary stars.

This was the motivation for the work described in this paper, which can be viewed as a preliminary assessment of the impact of the GAIA current and future Data Releases on the activity of visual double star observers.

2. DR2 Data Mining: the GDS Software

The work actually started when D. Rowe† wrote some code to download the GAIA DR2 database and search for potential binary stars by looking for pairs of "bright" DR2 sources whose separation — computed from their coordinates — stay under a given threshold.

Two sets of of thresholds were actually used:

- $mag_1 < 15$, $mag_2 < 18$ and 0.5" < separation < 5"
- $mag_1 < 12$, $mag_2 < 17$ and 5" < separation < 10"

The first set extracted 6,312,818 pairs, the second 507,741. The generated catalog, that was called the GDS catalog, therefore contains 6,820,559 potential pairs, for an overall size of approximately 825 MB††.

Each entry in the GDS catalog is a record giving the following information:

- The J2000 Right Ascension of the "primary" star, epoch 2015.5
- The J2000 declination of the "primary" star, epoch 2015.5
- The position angle of the pair calculated from Gaia DR2 coordinates
- The separation of the pair calculated from Gaia DR2 coordinates
- The Gaia G-magnitude of the "primary"
- The Gaia G-magnitude of the "secondary"
- The so-called Gravitationally Bound Index (see below).
- A flag indicating whether none, one or both of the two stars has Gaia 3-band photometry (Gmag, BPmag and RBmag)

† *Rowe is at Planewave Instruments, Rancho Domingez, California*

†† *The complete DR2 database is 1.3 TB.*

- A flag indicating whether a matching pair was found in the WDS catalog
- The color indices of the "primary" and the "secondary"

Of course, not all these entries will correspond to double stars, and there will be double stars that should be in the catalog but are not present. Also note that the minimum separation is 0.5 arcsec so that potential pairs with separation less than this value are not listed in the GDS catalog.

Gravitationally Bound Index

The Gravitationally Bound Index (GBI, GBIndex) is a rough measure of the likelihood that the pair is gravitationally bound†. It is based on the similarity of the proper motions (in RA and Dec), parallaxes and radial velocities, where these data are available. A lower value of GBI means that the pair is more likely to be physical. Although this indicator should be used with caution, since it can produce both false negatives and false positives, when it is less than 2.0 there is a high probability that the pair is gravitationally bound since the two stars have similar location and/or velocity.

The GB index is computed out as follows:

$$GBI = \begin{Bmatrix} MaxV & \text{if there's no available data on proper motions} \\ GBI_{PM} & \text{if data on proper motions is available} \\ GBI_{PLX} & \text{if data on parallaxes is also available} \\ GBI_{RV} & \text{if data on radial velocities is also available} \end{Bmatrix}$$

where

$$GBI_{PM} = \frac{1}{2}\left(\frac{|PMRA_0 - PMRA_1|}{PMRAErr_0 + PMRAErr_1} + \frac{|PMDec_0 - PMDec_1|}{PMDecErr_0 + PMDecErr_1} \right)$$

$$GBI_{PLX} = \frac{1}{3}\left(2GBI_{PM} + \frac{|Parallax_0 - Parallax_1|}{ParallaxErr_0 + ParallaxErr_1} \right)$$

$$GBI_{RV} = \frac{1}{4}\left(3GPI_{PLX} + \frac{|RV_0 - RV_1|}{RVErr_0 + RVErr_1} \right)$$

and

- *MaxV* is a high, arbitrary value
- $PMRA_0$ and $PMRA_1$ are the proper motions in cos(Dec)*RA of the primary star and secondary star, respectively (mas.yr^{-1}).
- $PMDec_0$ and $PMDec_1$ are the proper motions in declination of the primary star and secondary star, respectively (mas/ yr^{-1}).
- $PMRAErr_0$ and $PMRAErr_1$ are the standard errors in proper motion in cos(Dec)*RA of the primary star and secondary star, respectively (mas/ yr^{-1}).
- $PMDecErr_0$ and $PMDecErr_1$ are the standard errors in proper motion in declination of the primary star and secondary star, respectively (mas/ yr^{-1}).
- $Parallax_0$ and $Parallax_1$ are the parallaxes of the primary star and secondary star, respectively (mas).
- $ParallaxErr_0$ and $ParallaxErr_1$ are the standard errors in parallax of the primary star and secondary star, respectively (mas).
- RV_0 and RV_1 are the radial velocities of the primary star and secondary star, respectively (km.sec^{-1}).
- $RVErr_0$ and $RVErr_1$ are the standard errors in radial velocity of the primary star and secondary star, respectively (km/ sec^{-1}).

The GDS Program

The GDS catalog described in the previous section was used, in conjunction with the WDS Catalog [7], by a dedicated application, also written by D. Rowe. A preliminary†† version (1.00) of this application is illustrated in Figure 1. Selection filters used to search the catalog are set in the section marked (1). The resulting list is displayed in section (3), sorted according to the parameter specified in section (2). The first three columns give internal sequential identifiers. The other columns correspond to the catalog data described in Section 2. In particular, a "*" in column WDS indicates that a matching pair has been found in the WDS catalog. It is possible to select entries in the displayed list and save the resulting set as a CSV file for subsequent use, with the controls available in section (4).

Our targets were selected using the following criteria:

- 20h < RA < 0h and 4h < RA < 10h
- 10° < Dec < 55°
- 0.5" < Sep < 1.5"
- 8 < Cmag1 < 11.5
- 8 < Cmag2 < 13.5
- DeltaMag < 4
- GBI < 3

The maximum value for *Dec* results from physical limitations in our observatory (roof of the rolling shed), the minimum value from the ADC full correction range.

†The description of the GBIndex given in this section comes from the preliminary documentation of the GDS software written by D. Rowe. Further details should be given in a forthcoming paper.

††The GDS application will be described more in detail in a separate paper.

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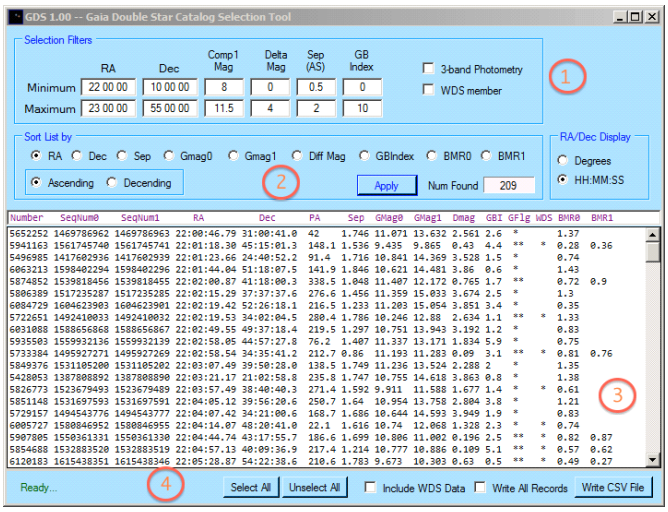

Figure 1 – Snapshot of the GDS 1.0 application

The minimum value for *Sep* results both from the GDS catalog and from our instrumentation (0.4" in theory for an 11" telescope, 0.5" in practice). The maximum value was chosen to target in priority the closest pairs, *i.e.* those for which orbital motion can be detected with the minimal span of time. The magnitude ranges have been derived from our previous experience with the used telescope and camera and the actual seeing conditions when the images where recorded. The value chosen for the GB Index is for maximizing the probability of observing physical pairs.

3. Instrumental Setup and Measurement Protocol

The instrumental setup is the same as that described in [3]. The telescope is a 280 mm Schmidt-Cassegrain reflector (Celestron C11) and the camera an ZWO ASI 290MM. With a 2x Barlow and an Atmospheric Dispersion Corrector (ADC), the resulting plate scale is 0.095 arcsec/pixel. The ADC allows us to use a broadpass L-type filter (400-700 nm), which is of critical importance for imaging faint stars (up to magnitude 13.5 in our case) with exposure times compatible with speckle analysis (typically, less than 80 ms in our average seeing conditions).

Acquisition is carried out with the Genika Astro software [4] with the camera gain setting set at 400. Exposure time for individual images range from 40 to 80 ms typically. For each target one to four sequences of 1000 images are acquired and latter converted to FITS cubes for analysis.

Calibration is carried out using the sideral drift method using the dedicated module of the Speckle-ToolBox software† as described in [5] for example.

Data reduction is performed using bispectrum analysis (BSA), also using SpeckleToolBox software as described in [5]. Although involving a significantly higher computational cost†† than lucky or simple auto-correlation based methods, BSA has the advantage of providing a non-ambiguous PA value and an estimation of the difference in magnitude between the two components.

4. Results

The reported measurements were obtained during 12 nights: six between September 10 and September 25, 2018 and six between February 13 and February 21, 2019.

Table 1 gives the list of the 121 observed stars with the associated data retrieved from the GAIA DR2. Columns 1-19 respectively gives

- the identification of the "primary" star in the UCAC4 catalog‡ [6]
- the identification of the star in the GDS catalog‡‡
- the precise coordinates of the "primary" and "secondary" stars (epoch 2015.5, equinox J2000)
- the G magnitude of the "primary" and "secondary" stars
- the proper motions of the "primary" and "secondary" stars (in mas/yr)
- the parallaxes of the "primary" and "secondary" stars (in mas)
- the radial velocities of the "primary" and "secondary" stars (in km/s)
- the computed *Gravitationally Bound Index* of the pair (as defined in Sec. 2)
- the separation (in arcsec) and position angle (in degree) of the pair, computed from their coordinates.

For the sake of readability, the magnitudes, proper motions, parallaxes and radial velocities are displayed in Table 1 with two decimals only (all computations have been carried out, of course, with the full precision values provided in DR2). When the values are not available the corresponding cell has been left blank.

The measures themselves are listed in Table 2. In

(Text continues on page 296)

†*Also developed by D. Rowe.*

†† *Which is not a real problem since most of the processing can be carried out in batch mode, without user intervention.*

‡ *We did not have access to the DR2 catalog on the computer controling the mount of the telescope, only to the UCAC4 catalog. We therefore made a previous search using the SkyChart software to correlate the coordinates given in the former to a star listed in the latter.*

‡‡ *This is the number reported in the first column in Fig. 1.*

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Table 1. Observed Stars

UCAC4	GDS	RA0	Decl0	RA1	Decl1	Gmag0	Gmag1	PMRA0	PMDec0	PMRA1	PMDec1	Plx0	Plx1	RV0	RV1	GBI	PA	Sep
501-037577	5154834	07:03:59.52	10:10:43.4	07:03:59.58	10:10:42.2	10.07	12.24	-4.97	-4.54	-6.37	-5.44	2.27	1.66	41.89		1.24	144	1.438
502-032372	5159755	06:52:51.28	10:19:29.1	06:52:51.35	10:19:29.1	10.90	10.95	-9.31	-5.74	-9.08	-5.89	1.70	1.75			0.38	91.17	1.114
504-047820	5167352	08:30:49.08	10:36:10.7	08:30:49.02	10:36:11.8	9.82	12.23	-44.37	3.67	-47.05	3.35	4.16	3.44	20.41		1.37	325.23	1.4
508-137021	5190019	20:30:53.79	11:26:10.2	20:30:53.82	11:26:09.6	10.02	10.54	21.77	17.84	20.50	12.06	4.61	6.83	-26.63		2.71	140.11	0.882
510-014543	5198704	05:45:09.11	11:50:30.6	05:45:09.19	11:50:31.1	11.37	12.61	3.04	-13.30	4.88	-14.98	1.55	0.95	-10.26		2.85	68.1	1.236
513-028065	5218233	06:36:54.11	12:27:57.0	06:36:54.16	12:27:58.0	10.78	11.81	-9.15	-41.42	-10.14	-41.49	5.41	5.16	-13.84		1.05	38.44	1.219
520-047616	5254941	08:33:27.27	13:48:18.1	08:33:27.24	13:48:17.4	11.28	11.99	218.52	-127.27	218.10	-123.56	14.88	15.73			2.08	211.39	0.838
520-048249	5254943	08:46:04.61	13:51:10.7	08:46:04.56	13:51:10.0	11.45	12.29	-7.16	-36.98	-5.32	-37.33	2.90	3.87			1.39	229.43	1.031
522-029027	5267398	06:39:41.32	14:19:20.7	06:39:41.25	14:19:20.2	10.42	12.55	-0.27	-2.05	1.58	-3.38	1.02	1.87			2.34	241.52	1.24
522-136397	5267041	21:13:00.77	14:12:09.2	21:13:00.87	14:12:09.7	9.12	11.01	5.40	-12.88	5.12	-12.40	2.41	2.71			1.61	71.31	1.507
525-043014	5280034	07:30:41.86	14:48:08.8	07:30:41.84	14:48:07.4	10.47	13.26	-1.20	-29.13	1.70	-33.31	3.36	3.33			2.94	195.18	1.388
528-039250	5294426	07:10:11.26	15:26:36.0	07:10:11.21	15:26:35.1	11.37	12.91	-1.89	10.62	-1.40	9.02	2.49	2.34	62.80		1.61	222.34	1.209
528-146334	5296346	21:21:49.41	15:24:19.4	21:21:49.48	15:24:19.2	11.26	12.26	5.70	0.07	8.05	3.29	1.02		-27.70		1.89	104.63	1.063
529-039966	5301950	07:21:21.06	15:44:47.6	07:21:21.08	15:44:46.6	11.35	11.51	-23.30	-7.92	-18.65	-11.32	2.65	2.66		35.00	2.15	163.76	1.091
530-034689	5304482	06:51:52.67	15:51:53.2	06:51:52.74	15:51:53.5	11.27	12.50	0.24	-4.64	-0.11	-4.72	0.67				0.63	72.49	1.127
531-012456	5309205	05:14:54.55	16:05:11.8	05:14:54.62	16:05:11.0	9.82	12.42	5.58	-5.00	1.18	-8.90	2.41	2.64			2.05	128.99	1.35
531-038132	5309542	07:09:50.19	16:02:33.9	07:09:50.27	16:02:34.3	10.86	12.60	7.54	-8.72	9.24	-9.36	2.04	3.20		-0.76	1.46	72.13	1.257
532-043579	5316942	07:54:33.98	16:20:08.8	07:54:34.07	16:20:08.8	11.40	12.38	-3.14	-5.98	-1.37	-7.65	2.74	2.28	-8.75		0.84	91.87	1.28
533-048175	5321819	08:51:26.72	16:32:47.4	08:51:26.70	16:32:46.0	10.78	12.33	-1.60	-9.43	-0.56	-9.63	3.25	3.35	3.69		2.27	188.2	1.363
536-045446	5336249	07:58:06.67	17:10:53.6	07:58:06.64	17:10:52.6	11.25	12.67	1.88	-4.79	-0.68	-2.41	1.30		8.55		1.75	202.97	0.998
540-041788	5355169	07:29:08.38	17:58:24.2	07:29:08.43	17:58:25.5	11.13	12.33	1.78	-13.01	0.80	-11.94	2.08	2.30	2.47		2.12	28.04	1.459
543-039864	5370209	07:10:32.37	18:33:30.3	07:10:32.28	18:33:30.4	11.36	13.23	-0.65	-2.43	0.32	-3.54	1.33	1.35	2.37		2.48	274.87	1.316
544-023390	5374928	06:12:10.56	18:45:03.9	06:12:10.63	18:45:05.0	10.78	11.94	-0.14	-5.20	-0.36	-4.83	1.10	0.74			0.76	39.98	1.355
545-105404	5381262	19:48:05.16	18:55:25.3	19:48:05.23	18:55:25.5	11.47	11.78	-0.04	-7.68	-1.93	-9.01	3.17	2.26		30.03	0.75	81.7	0.893
546-117797	5386333	20:06:28.00	19:08:00.2	20:06:27.94	19:08:00.4	11.45	11.61	-5.89	-9.80	-7.38	-11.07		4.26		11.43	1.97	277.15	0.954
549-009553	5398198	04:25:32.47	19:45:59.5	04:25:32.44	19:46:00.9	9.26	12.56	68.59	83.60	71.44	84.50	9.36	9.48	49.36		2.79	343.3	1.475
550-037553	5400803	07:06:30.30	19:49:53.0	07:06:30.40	19:49:53.1	11.27	12.47	18.90	-17.52	18.34	-15.19	3.99	3.93	-49.49	-50.99	1.04	87.82	1.422
553-018908	5413773	05:47:23.53	20:24:48.8	05:47:23.56	20:24:50.2	11.33	12.01	-1.55	-3.45	-1.42	-3.51	0.96	0.93			0.39	20.82	1.43
554-037934	5418022	07:24:42.71	20:36:08.3	07:24:42.76	20:36:07.4	11.04	11.74	0.82	-11.77	0.44	-13.19	1.52	3.82			1.23	145.06	1.099
554-041847	5418050	08:13:46.46	20:40:56.0	08:13:46.36	20:40:55.7	11.42	12.30	-22.61	15.55	-22.30	14.32	2.97	3.34	17.95		1.58	260.11	1.463
554-043925	5418070	08:56:18.94	20:41:40.0	08:56:18.99	20:41:39.2	11.50	11.58	4.28	-4.72	2.11	-5.71	3.47	2.61		40.25	2.21	136.25	1.147
555-023110	5422091	06:04:19.78	20:53:41.6	06:04:19.87	20:53:41.7	11.40	12.07	-2.11	-3.99	-1.28	-4.97	1.34	2.05			0.9	81.26	1.164
558-046251	5434767	08:28:19.69	21:29:44.5	08:28:19.76	21:29:45.4	11.46	11.88	-13.11	-31.75	-13.01	-32.56	4.07	4.19			1.82	47.25	1.345
559-025453	5440547	06:16:25.95	21:45:38.3	06:16:25.90	21:45:39.3	11.23	11.35	-9.09	-10.87	-6.94	-10.11			8.10		1.69	326.97	1.208
560-043758	5444618	07:49:09.64	21:57:11.6	07:49:09.59	21:57:10.8	11.26	12.48	-1.04	-5.37	0.94	-6.86	1.60	1.33			1.64	225.8	1.081
560-109791	5445609	20:06:20.28	21:59:30.7	20:06:20.25	21:59:29.4	11.10	11.46	16.02	-4.78	15.12	-4.87	3	2.75			1.59	197.92	1.378
563-110395	5456849	20:15:55.47	22:32:10.3	20:15:55.47	22:32:11.1	11.18	11.81	-5.90	-18.53	-15.01	-19.47	2.74				2.73	0.52	0.869
563-118326	5455149	20:35:29.00	22:24:42.9	20:35:28.91	22:24:42.4	11.13	12.35	12.05	8.16	13.65	7.19	3.57	3.47	-14.28		1.78	246.95	1.228
565-034117	5461201	06:55:09.65	22:48:27.0	06:55:09.74	22:48:27.7	10.46	12.24	-89.43	-43.17	-87.11	-48.82	5.34	4.99			2.8	56.62	1.354
566-022985	5466876	06:07:47.75	23:11:59.5	06:07:47.81	23:11:58.7	11.20	12.73	-5.33	-6.50	-3.00	-4.98	3.50	0.37			2.53	128.33	1.188
566-130865	5468496	23:18:45.36	23:08:37.8	23:18:45.37	23:08:38.5	11.36	11.48	-6.00	-15.43	-1.49	-14.27	3.5	1.06			1.32	13.44	0.734
569-019923	5478281	05:48:29.03	23:42:14.8	05:48:29.12	23:42:15.5	10.75	13.32	3.35	-10.93	-0.06	-9.14	2.90	2.97			2.71	62.85	1.484
572-024874	5487735	06:09:14.16	24:14:38.3	06:09:14.19	24:14:39.3	11.23	11.37	2.49	-3.94	2.43	-2.90	0.80	1.63			0.89	22.06	1.078
572-024930	5489562	06:09:20.56	24:23:35.8	06:09:20.65	24:23:35.6	11.39	12.43	2.60	-2.72	6.01	-11.30	1.26	0.94			2.89	100.55	1.222
572-025528	5489579	06:10:58.13	24:20:16.3	06:10:58.15	24:20:17.6	10.83	11.36	9.29	-1.38	10.40	-1.41	2.38	2.58			2.23	13.04	1.243
578-023649	5511272	06:05:44.51	25:28:59.6	06:05:44.45	25:29:00.4	11.36	12.17	-0.21	-1.48	3.08	1.46	2.30				2.69	315.06	1.124
578-023649	5511272	06:05:44.51	25:28:59.6	06:05:44.45	25:29:00.4	11.36	12.17	-0.21	-1.48	3.08	1.46	2.30				2.69	315.06	1.124

Table 1 continues on the next page.

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Table 1 (continued). Observed Stars

UCAC4	GDS	RA0	Decl0	RA1	Decl1	Gmag0	Gmag1	PMRA0	PMDec0	PMRA1	PMDec1	Plx0	Plx1	RV0	RV1	GBI	PA	Sep
579-098024	5516342	20:22:00.85	25:36:09.2	20:22:00.78	25:36:08.3	9.20	12.94	-5.13	-6.06	-3.94	-8.30	0.81	1.56			1.82	223.88	1.295
581-043221	5522841	08:58:22.20	26:01:47.4	08:58:22.27	26:01:48.2	11.41	12.05	-43.71	5.82	-42.07	4.40	3.35	3.44	-5.19		2.79	47.94	1.228
581-043221	5522841	08:58:22.20	26:01:47.4	08:58:22.27	26:01:48.2	11.41	12.05	-43.71	5.82	-42.07	4.40	3.35	3.44	-5.19		2.79	47.94	1.228
581-104282	5524095	20:23:04.73	26:05:32.2	20:23:04.82	26:05:32.5	9.70	13.03	1.29	2.76	-0.39	-3.66	1.76	1.69			1.68	76.81	1.234
581-115336	5526328	20:58:16.99	26:09:10.2	20:58:16.93	26:09:11.1	11.47	12.75	-3.47	3.77	-2.96	3.47	1.84	2.12		-19.42	0.77	314.28	1.231
583-011127	5532698	04:12:29.94	26:34:18.6	04:12:30.01	26:34:19.6	11.29	13.21	72.86	-120.04	68.35	-119.99	6.63	6.79	-56.20		2.83	43.04	1.445
583-040010	5532990	07:40:20.81	26:32:16.0	07:40:20.82	26:32:17.1	11.41	12.21	-11.98	2.01	-12.39	0.46	2.46	5.86	1.23	-0.30	2.34	4.67	1.156
584-040353	5535022	07:51:21.47	26:36:58.6	07:51:21.46	26:37:00.0	10.88	13.12	-0.11	-105.83	-0.17	-105.20	7.34	7.21	-5.76		1.82	350.87	1.365
584-076038	5535451	19:14:22.46	26:37:47.2	19:14:22.41	26:37:47.6	11.40	12.15	0.39	-16.76	2.01	-8.77	2.37	8.57	-12.30		2.74	296.97	0.785
584-110924	5536496	20:44:54.37	26:39:45.7	20:44:54.31	26:39:45.4	11.37	11.45	17.21	7.90	22.45	-1.13	8.6	8.92	2.19		1.68	250.85	0.772
592-043498	5573658	08:22:11.88	28:21:47.0	08:22:11.78	28:21:47.1	11.26	12.93	-26.27	-11.61	-27.27	-10.75	3.04	2.64	29.79		2.03	272.49	1.324
598-132616	5611324	21:47:20.55	29:32:04.9	21:47:20.52	29:32:03.1	10.95	12.57	5.60	6.94	5.67	6.45	1.67	1.71			0.55	192.8	1.838
603-114143	5636572	20:30:02.20	30:28:49.6	20:30:02.15	30:28:48.6	11.05	12.98	3.16	0.19	2.69	0.04	1.52	1.4			1.54	216.54	1.273
610-033903	5671783	06:33:58.70	31:54:57.4	06:33:58.65	31:54:58.4	10.71	11.74	6.50	-20.18	5.59	-20.82	2.70	2.60			1	325.86	1.17
610-043660	5671862	08:23:46.80	31:59:20.0	08:23:46.82	31:59:21.3	11.26	13.42	-5.10	-8.29	-4.45	-8.72	0.83	0.89	51.76		2.4	11.98	1.277
610-117005	5673506	21:00:57.90	31:55:42.4	21:00:57.98	31:55:41.4	9.92	12.57	-3.64	-8.91	-4.04	-10.38	1.97	2.7			1.15	135.74	1.495
610-129295	5671379	22:07:27.74	31:53:05.2	22:07:27.74	31:53:06.5	11.25	12.46	-1.60	-9.00	3.98	-4.67	2.53	3.63	13.08	10.33	2.62	0.31	1.319
617-039371	5701231	07:05:19.75	33:14:43.0	07:05:19.82	33:14:43.7	11.49	11.79	-16.39	-3.13	-16.61	-6.51	6.74	6.14			1.13	49.87	1.089
622-024222	5725149	05:31:40.23	34:14:26.1	05:31:40.32	34:14:26.8	11.23	12.98	1.49	-4.18	-2.45	-1.80	0.35	0.32			2.7	57.03	1.227
624-038643	5735987	07:25:07.00	34:46:26.2	07:25:06.97	34:46:25.1	11.19	11.64	8.80	-15.88	8.07	-15.74	3.36	3.22		5.35	1.51	195.62	1.201
624-118752	5735500	21:49:35.84	34:39:25.8	21:49:35.73	34:39:26.1	9.92	12.33	-13.92	-25.99	-13.54	-27.86	1.86	1.85	-22.20		1.86	282.65	1.394
626-034798	5742103	06:30:22.01	35:00:30.9	06:30:21.94	35:00:32.0	11.42	12.76	-15.68	-20.25	-17.34	-21.21	1.95				2.83	320.56	1.434
627-037471	5748409	06:58:08.98	35:23:28.3	06:58:09.08	35:23:28.1	11.33	11.92	-0.68	-0.89	-0.29	-3.16	1.38	4.64			2.3	99.59	1.208
628-021808	5752586	05:10:19.56	35:31:47.6	05:10:19.56	35:31:49.1	11.16	13.21	-0.41	-4.47	0.67	-4.81	0.79	0.53			2.86	359.01	1.441
628-033482	5750539	06:25:04.98	35:27:57.2	06:25:05.01	35:27:58.6	11.31	13.50	-0.85	-5.44	-0.71	-5.05	1.02	1.28			2.18	15.13	1.425
632-095200	5772481	20:12:13.88	36:20:50.4	20:12:13.97	36:20:50.0	11.41	12.69	0.08	-1.84	-0.29	-0.80	1.07	0.36			1.73	107.47	1.168
633-030637	5773527	05:58:54.88	36:28:03.7	05:58:54.81	36:28:03.1	11.30	11.31	-19.71	1.52	-14.92	3.70	12.97	15.46			1.71	233.41	0.99
634-098847	5785754	20:46:46.23	36:47:44.3	20:46:46.17	36:47:43.7	11.35	12.00	-6.00	-2.05	-3.99	-1.85	1.17				1.07	231.24	0.925
635-130935	5788610	23:54:41.03	36:52:40.6	23:54:41.04	36:52:41.6	11.36	13.09	-4.51	-3.28	-4.87	-3.68	1.34	1.28			0.42	8.69	0.97
636-027723	5791179	05:37:27.77	37:05:11.7	05:37:27.84	37:05:12.7	11.03	12.92	12.69	-13.03	14.29	-14.07	2.06	1.81	-14.47		1.41	40.4	1.274
637-043218	5798225	08:25:04.21	37:22:34.2	08:25:04.25	37:22:33.1	10.45	11.47	-4.98	5.70	-10.34	2.64	2.44	1.36			2.61	153.63	1.222
639-039377	5804825	07:22:15.12	37:38:03.6	07:22:15.20	37:38:04.3	11.29	12.55	-14.00	-43.85	-16.53	-43.79	3.36	2.84			1.2	55.06	1.204
641-026536	5815036	05:26:41.20	38:10:24.7	05:26:41.16	38:10:23.8	11.40	11.60	-0.41	-0.31	0.24	-1.65	0.51	0.14	-29.84		1.32	203.69	1
643-126683	5824811	23:54:43.62	38:33:43.3	23:54:43.60	38:33:43.9	11.42	13.07	-7.80	-2.39	-9.15	-4.15	2.4	3.27	1.51		1.82	340.09	0.691
646-022868	5835035	04:56:28.91	39:06:58.9	04:56:28.93	39:07:00.2	10.64	13.30	1.87	-4.00	4.12	-4.48	1.24	1.07	18.54		2.95	8.15	1.371
647-110853	5840261	22:35:55.57	39:19:09.2	22:35:55.67	39:19:08.8	10.23	12.58	-3.83	-10.53	-3.95	-11.28	1.81	1.58	-23.41		1.2	110.07	1.233
650-078863	5850432	19:52:21.48	39:59:16.3	19:52:21.41	39:59:15.9	11.13	11.56	-2.79	16.63	0.59	13.14	3.86	3.56			1.42	238.03	0.864
650-086057	5848946	20:07:55.14	39:48:33.3	20:07:55.08	39:48:33.8	11.28	11.39	-0.44	-3.06	1.10	1.33	1.74	3.1		0.16	0.97	306.85	0.887
652-091009	5856055	20:30:33.13	40:14:47.7	20:30:33.19	40:14:48.7	11.36	12.32	-2.61	0.57	1.66	1.99	1.54	1.86	5.37	11.79	1.13	34.49	1.188
653-051856	5858785	09:20:03.40	40:29:56.0	09:20:03.34	40:29:54.9	11.30	11.96	-4.84	2.00	-4.63	1.83	2.79	2.68	-12.84	-10.45	1.13	209.14	1.261
654-049141	5862330	08:10:42.03	40:41:41.5	08:10:42.10	40:41:42.6	10.60	13.16	-25.37	-13.90	-24.51	-15.69	3.15	3.17	63.57		1.26	36.16	1.315
657-103242	5874852	22:02:00.87	41:18:00.3	22:02:00.84	41:18:01.3	11.41	12.17	-14.05	-13.07	-10.15	-16.74	1.88		-10.61	-11.10	1.74	338.54	1.048
659-112855	5881290	23:27:43.35	41:46:18.8	23:27:43.33	41:46:17.9	11.44	13.15	9.59	3.14	9.80	3.53	2.45	2.52	-12.20		0.97	192.71	0.99
661-116828	5887522	23:29:20.50	42:11:17.8	23:29:20.58	42:11:17.5	11.34	11.82	7.68	-5.08	9.98	-9.94	3.9				3.18	111.66	0.953
663-024366	5892398	04:22:37.43	42:32:09.9	04:22:37.52	42:32:10.7	11.20	12.06	30.01	-23.62	27.30	-22.03	2.78	2.84			2.13	52.63	1.254
665-095928	5899734	21:11:50.92	42:59:18.1	21:11:50.82	42:59:18.1	11.45	11.88	-4.00	-9.34	-4.41	-10.65	1.18	0.48			1.01	271.12	1.038
666-044431	5902252	06:07:46.78	43:09:37.3	06:07:46.79	43:09:36.3	11.49	11.71	0.27	-19.71	-0.19	-19.85	2.67	1.91	22.34		1.29	174.33	1.02
667-106319	5907811	22:06:24.32	43:14:58.1	22:06:24.41	43:14:58.0	11.31	13.29	-4.05	2.12	-3.97	2.13	3.42	3.19	-42.51		0.31	93.72	0.955

Table 1 concludes on the next page.

Table 1 (continued). Observed Stars

UCAC4	GDS	RA0	Decl0	RA1	Decl1	Gmag0	Gmag1	PMRA0	PMDec0	PMRA1	PMDec1	Plx0	Plx1	RV0	RV1	GBI	PA	Sep
668-086512	5912009	20:07:56.47	43:30:17.1	20:07:56.50	43:30:16.0	11.14	12.76	6.58	2.61	6.54	2.88	1.79	1.54			0.89	163.7	1.163
669-028818	5914553	04:43:36.70	43:43:50.2	04:43:36.70	43:43:51.4	10.98	12.62	2.67	-1.94	2.94	-1.39	2.83	2.66	-47.21		1.64	359.42	1.232
669-036212	5914672	05:18:28.90	43:46:30.5	05:18:28.79	43:46:29.8	10.64	12.72	-4.81	-3.55	-6.64	-2.09	1.55				2.66	239.36	1.4
669-052025	5914848	08:02:34.36	43:42:29.4	08:02:34.43	43:42:28.8	11.33	11.66	-1.30	3.61	3.82	-4.58	3.53	2.58	-3.79	-7.24	1.93	127.36	0.991
672-050081	5922759	07:37:41.55	44:17:20.0	07:37:41.57	44:17:18.8	10.42	11.50	-3.77	-18.78	-4.25	-17.91	2.65	1.12			2.36	166.62	1.22
673-115114	5928553	22:29:09.26	44:30:55.0	22:29:09.32	44:30:55.8	11.14	12.90	0.24	-3.64	0.00	-3.36	1.27	1.43	-1.32	2.38	0.68	38.55	1.086
675-042663	5932549	05:57:04.30	44:52:44.4	05:57:04.40	44:52:45.3	10.82	12.94	8.00	-17.54	6.65	-16.74	2.48	2.50	2.58		1.75	49.17	1.498
678-033045	5945648	05:00:53.96	45:31:42.6	05:00:53.91	45:31:41.6	11.19	11.31	28.48	-28.74	26.80	-31.30	6.15	5.84			2.19	208.42	1.123
679-034536	5949722	05:13:35.38	45:43:49.4	05:13:35.52	45:43:49.7	11.44	12.30	10.04	15.65	10.70	14.00	3.08	2.66	-26.83	-25.99	2.67	75.27	1.447
680-085239	5954567	20:35:57.26	45:55:25.9	20:35:57.21	45:55:27.1	11.38	11.99	-16.87	-17.81	-16.94	-16.36	2.27	1.94	13.44		1.18	337.38	1.272
681-079773	5956497	20:16:04.62	46:04:38.2	20:16:04.53	46:04:39.2	11.23	12.87	0.28	13.84	1.55	13.74	3.02	2.92	-23.28		1.09	316.99	1.384
686-028195	5977782	04:09:36.30	47:01:27.1	04:09:36.20	47:01:27.9	11.24	12.29	1.56	-8.95	2.83	-6.60	1.26	1.08	0.25		2.75	309.1	1.36
686-028794	5977788	04:14:12.66	47:04:00.2	04:14:12.66	47:03:58.9	11.31	13.36	0.81	-1.97	0.84	-1.81	0.43	0.71			1.15	180.99	1.249
688-081285	5989362	20:24:36.10	47:31:41.7	20:24:36.20	47:31:42.2	11.27	12.95	-15.07	-19.65	-16.37	-20.48	2.15	2.36			1.74	64.81	1.07
688-107997	5990014	21:54:41.77	47:30:03.9	21:54:41.65	47:30:03.0	10.48	12.35	10.86	-1.53	10.83	-1.57	2.72	2.78			0.32	236.37	1.506
693-050538	6006656	09:24:32.16	48:26:37.3	09:24:32.07	48:26:36.3	10.66	12.88	5.55	-5.02	6.37	-4.25	4.04	4.09	-8.75		2.23	221.13	1.297
693-113124	6009644	22:17:24.52	48:32:01.0	22:17:24.41	48:32:01.1	11.48	12.29	-7.81	-5.88	-5.89	-5.61	1.51	1.77	-0.29		2.25	271.68	1.145
694-088583	6012986	21:11:53.50	48:44:47.4	21:11:53.62	48:44:46.8	10.83	12.34	1.46	-4.76	2.15	-5.75	3.11	3.15	13.21		0.93	114.24	1.283
697-080825	6024539	20:43:24.91	49:23:21.3	20:43:24.98	49:23:21.7	11.06	11.45	-1.06	-0.13	1.58	-1.97					0.56	63.39	0.826
700-051491	6033972	09:26:52.08	49:53:11.3	09:26:52.07	49:53:12.4	11.09	11.30	-29.53	1.31	-28.08	4.46	2.87	6.19			1.47	358.03	1.067
703-048330	6047347	08:30:09.01	50:33:38.8	08:30:08.96	50:33:37.7	11.36	11.62	-29.23	-12.93	-29.47	-12.89	3.69	3.40	24.99		1.13	203.45	1.212
705-087810	6055524	21:37:52.39	50:56:16.1	21:37:52.35	50:56:15.2	11.47	11.56	0.35	2.35	6.05	-4.16	3.52	2.33			3.38	206.78	0.953
709-045021	6068142	07:04:37.44	51:40:35.8	07:04:37.38	51:40:37.0	9.77	12.45	-11.33	-16.01	-12.48	-17.11	4.21	4.63	-65.43		1.46	332.17	1.324
710-082633	6072602	21:19:53.63	51:49:47.1	21:19:53.75	51:49:47.9	11.38	12.71	4.58	1.04	4.38	1.02	1.57	1.81			1.19	53.49	1.396
714-033708	6089781	04:40:33.94	52:45:45.6	04:40:34.04	52:45:45.1	11.24	12.24	1.93	-13.99	11.31	-6.45	3.43	1.27			2.62	119.61	0.995
716-048820	6097532	09:24:06.56	53:06:56.1	09:24:06.64	53:06:57.3	11.37	12.63	-0.07	-0.86	-0.34	-0.55	2.34	2.61			1.73	29.63	1.429

Measurements of 121 New Visual Binary Stars Suggested by the Gaia Data Release 2

Table 2. Measurements

UCAC4	DATE	N	PA	SEP	DM	δPA	δSEP
501-037577	2019.133	1	143.9	1.446	2.7	0.11	-0.008
502-032372	2019.122	1	90.7	1.115		0.45	-0.001
504-047820	2019.119	1	326	1.427		-0.77	-0.027
508-137021	2018.694	3	140.2 (0.1)	0.881 (0.003)	0.8 (0.02)	0.06	-0.001
510-014543	2019.119	1	66.9	1.273		1.23	-0.037
513-028065	2019.122	1	38.4	1.228		0.04	-0.009
520-047616	2019.128	1	210	0.884		1.35	-0.046
520-048249	2019.133	1	230.1	1.048		-0.66	-0.017
522-029027	2019.122	1	242.1	1.253	2.5	-0.6	-0.013
522-136397	2018.692	4	70.9 (0.1)	1.509 (0.005)	2.2 (0.05)	-0.39	0.002
525-043014	2019.139	1	195.5	1.451		-0.28	-0.063
528-039250	2019.139	1	219.6	1.28		2.79	-0.071
528-146334	2018.719	3	104.7 (1.4)	1.064 (0.016)		0.12	0.001
529-039966	2019.119	1	163.2	1.091		0.54	0
530-034689	2019.133	1	72.4	1.142	1.5	0.13	-0.015
531-012456	2019.122	1	129	1.378	3	-0.05	-0.028
531-038132	2019.139	1	73.2	1.278	2.2	-1.04	-0.021
532-043579	2019.117	1	91.6	1.27		0.29	0.01
533-048175	2019.128	1	188.3	1.372		-0.1	-0.009
536-045446	2019.117	1	203	0.995		0	0.003
540-041788	2019.139	1	29	1.478		-0.97	-0.019
543-039864	2019.139	1	276.2	1.416		-1.36	-0.1
544-023390	2019.133	1	39.7	1.394		0.25	-0.039
545-105404	2018.694	4	78 (1.2)	0.866 (0.017)		-3.67	-0.027
546-117797	2018.692	4	276.3 (0.2)	0.959 (0.006)		-0.87	0.005
549-009553	2019.128	1	343.8	1.477	4	-0.45	-0.002
550-037553	2019.139	1	87.7	1.447		0.13	-0.025
553-018908	2019.122	1	21	1.453		-0.17	-0.023
554-037934	2019.119	1	145.1	1.073		0.01	0.026
554-041847	2019.119	1	258.9	1.498		1.24	-0.035
554-043925	2019.122	1	136.1	1.158		0.12	-0.011
555-023110	2019.122	1	80.3	1.157		1.01	0.007
558-046251	2019.122	1	46.5	1.354		0.79	-0.009
559-025453	2019.133	1	327.3	1.22		-0.31	-0.012
560-043758	2019.117	1	226.6	1.082		-0.8	-0.001
560-109791	2018.719	3	197.8 (0)	1.392 (0.014)		-0.15	0.014
563-110395	2018.694	4	1.5 (0.5)	0.878 (0.009)		1.02	0.009
563-118326	2018.733	3	246.3 (0.6)	1.206 (0.001)		-0.61	-0.022
565-034117	2019.119	1	56.6	1.38	2.3	0.07	-0.026
566-022985	2019.122	1	126.8	1.207		1.53	-0.019
566-130865	2018.717	3	14 (0.2)	0.753 (0.008)		0.51	0.019
569-019923	2019.128	1	61.1	1.469	3.5	1.74	0.015
572-024874	2019.122	1	22.1	1.085		-0.08	-0.007
572-024930	2019.122	1	99.1	1.18		1.48	0.042
572-025528	2019.133	1	13.3	1.238		-0.29	0.005
578-023649	2019.119	1	313.2	1.104		1.88	0.02
578-023649	2019.133	1	313.9	1.11		1.18	0.014
579-098024	2018.731	2	222.5 (2.6)	1.39 (0.006)		-1.39	0.095
581-043221	2019.119	1	48.1	1.235		-0.14	-0.007
581-043221	2019.122	1	47.5	1.243		0.44	-0.015
581-104282	2018.731	3	73.4 (1.1)	1.275 (0.013)	4 (0.17)	-3.42	0.041
581-115336	2018.733	3	314.5 (0.1)	1.239 (0.022)		0.18	0.008
583-011127	2019.133	1	43.2	1.498		-0.18	-0.053
583-040010	2019.117	1	5.1	1.169		-0.44	-0.013
584-040353	2019.117	1	351.7	1.377	3	-0.86	-0.012
584-076038	2018.694	4	296.6 (0.8)	0.817 (0.006)		-0.35	0.032
584-110924	2018.692	4	250.7 (0.9)	0.79 (0.003)		-0.19	0.018
592-043498	2019.122	1	273	1.349		-0.51	-0.025
598-132616	2018.692	4	192.9 (0.3)	1.847 (0.012)		0.10	0.009
603-114143	2018.719	3	219.2 (1.7)	1.393 (0.067)		2.69	0.120

Table 2 concludes on the next page.

Measurements of 121 New Visual Binary Stars Suggested by the Gaia Data Release 2

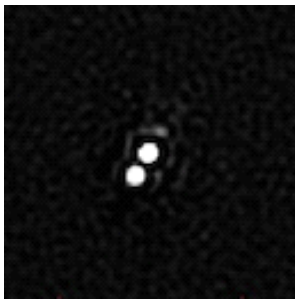
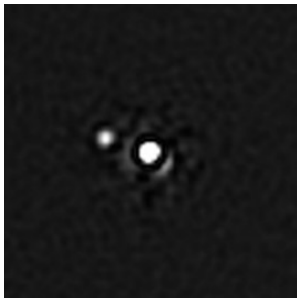
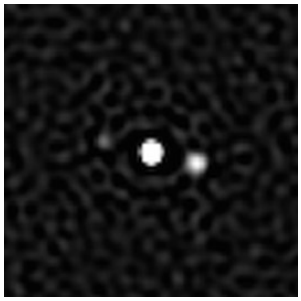
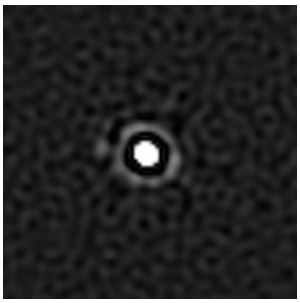
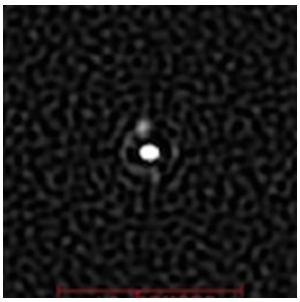
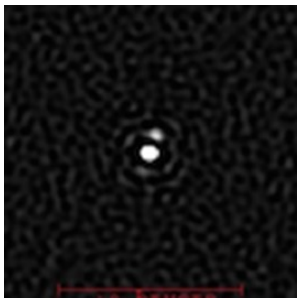
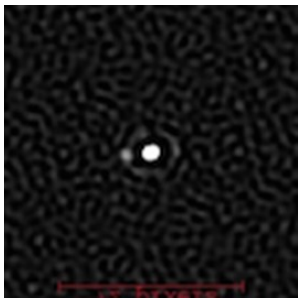
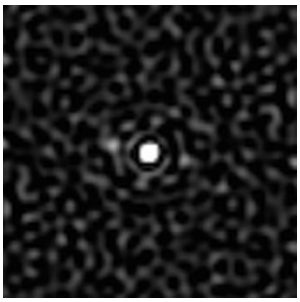
Table 2 (conclusion). Measurements

UCAC4	DATE	N	PA	SEP	DM	δPA	δSEP
610-033903	2019.133	1	326.9	1.165		-1.02	0.005
610-043660	2019.128	1	10.3	1.257		1.66	0.02
610-117005	2018.719	3	135.7 (0.5)	1.516 (0.008)	3.3 (0.03)	-0.07	0.021
610-129295	2018.733	3	-0.2 (0.8)	1.339 (0.009)	1.8 (0.02)	-0.47	0.020
617-039371	2019.119	1	49.8	1.092		0.05	-0.003
622-024222	2019.122	1	56.9	1.245	2.1	0.11	-0.018
624-038643	2019.117	1	196	1.192		-0.33	0.009
624-118752	2018.717	3	282.5 (0.2)	1.418 (0.016)	2.8 (0.07)	-0.17	0.024
626-034798	2019.133	1	320.8	1.432		-0.24	0.002
627-037471	2019.139	1	100.2	1.215		-0.58	-0.007
628-021808	2019.128	1	0.1	1.474		-1.09	-0.033
628-033482	2019.133	1	17.7	1.407		-2.55	0.018
632-095200	2018.731	3	105 (1.7)	1.092 (0.021)		-2.43	-0.076
633-030637	2019.119	1	233.6	0.977		-0.16	0.013
634-098847	2018.692	3	231.1 (0.2)	0.938 (0.003)		-0.14	0.013
635-130935	2018.717	3	11.6 (1.2)	0.943 (0.003)		2.91	-0.027
636-027723	2019.119	1	38.6	1.305		1.78	-0.031
637-043218	2019.119	1	153.7	1.231		-0.02	-0.009
639-039377	2019.139	1	54.6	1.177		0.5	0.027
641-026536	2019.119	1	203.3	0.984		0.39	0.016
643-126683	2018.717	2	336.9 (0.4)	0.716 (0.009)	2.1 (0.11)	-3.19	0.025
646-022868	2019.133	1	7.6	1.419	3.1	0.53	-0.048
647-110853	2018.733	3	109.6 (0.1)	1.245 (0.012)	2.9 (0.13)	-0.47	0.012
650-078863	2018.694	4	237.1 (0.8)	0.877 (0.012)		-0.91	0.013
650-086057	2018.694	4	307 (1.1)	0.916 (0.02)		0.19	0.029
652-091009	2018.733	3	34.1 (0.6)	1.201 (0.003)		-0.42	0.013
653-051856	2019.122	1	209.1	1.271		0.07	-0.01
654-049141	2019.122	1	37.1	1.314		-0.97	0.001
657-103242	2018.733	3	337.3 (0.9)	1.067 (0.013)		-1.28	0.019
659-112855	2018.717	3	193.2 (0.5)	0.976 (0.013)		0.45	-0.014
661-116828	2018.717	3	111.4 (0.2)	0.961 (0.008)		-0.28	0.008
663-024366	2019.122	1	53.3	1.264		-0.67	-0.01
665-095928	2018.733	3	271.1 (0.4)	1.039 (0.006)		0.00	0.001
666-044431	2019.128	1	174.8	1.009		-0.48	0.011
667-106319	2018.717	3	94.9 (1)	0.945 (0.001)	2.5 (0.06)	1.14	-0.010
668-086512	2018.719	2	162.3 (0.3)	1.152 (0.009)		-1.36	-0.012
669-028818	2019.122	1	0	1.252	2	-0.58	-0.02
669-036212	2019.119	1	238.8	1.401	2.5	0.61	-0.001
669-052025	2019.119	1	127.2	1.002		0.2	-0.011
672-050081	2019.117	1	167.3	1.231		-0.67	-0.011
673-115114	2018.733	3	38.3 (0.2)	1.064 (0.021)		-0.24	-0.022
675-042663	2019.122	1	50.1	1.511	2.5	-0.97	-0.013
678-033045	2019.119	1	208.4	1.131		0.05	-0.008
679-034536	2019.119	1	75.4	1.473		-0.1	-0.026
680-085239	2018.719	3	337.5 (0.9)	1.258 (0.024)		0.07	-0.014
681-079773	2018.733	3	315.7 (0.6)	1.418 (0.013)		-1.31	0.034
686-028195	2019.128	1	311	1.355		-1.91	0.005
686-028794	2019.133	1	181.1	1.274		-0.07	-0.025
688-081285	2018.733	3	66.8 (1.2)	1.074 (0.03)		1.99	0.004
688-107997	2018.692	3	235.6 (0.1)	1.49 (0.002)	2.2 (0.02)	-0.75	-0.016
693-050538	2019.122	1	220.1	1.349	2.7	0.99	-0.052
693-113124	2018.733	3	270.9 (0.8)	1.119 (0.004)		-0.74	-0.026
694-088583	2018.733	3	113.5 (0.2)	1.307 (0.004)		-0.72	0.024
697-080825	2018.692	4	63.7 (0.3)	0.852 (0.006)		0.34	0.026
700-051491	2019.122	1	358.3	1.08		-0.28	-0.013
703-048330	2019.119	1	203.4	1.204		0.06	0.008
705-087810	2018.694	3	206.2 (0.2)	0.943 (0.004)		-0.55	-0.010
709-045021	2019.139	1	332.6	1.35	3	-0.47	-0.026
710-082633	2018.733	3	52.6 (0.2)	1.425 (0.011)	2 (0.08)	-0.90	0.029
714-033708	2019.122	1	117.5	0.99		2.09	0.005
716-048820	2019.122	1	29.9	1.457		-0.25	-0.028

Table 2 continues on the next page.

Measurements of 121 New Visual Binary Stars Suggested by the Gaia Data Release 2

Plate 1 – Examples of bispectrum-reconstructed images (N up, E left)

			
ucac4-508-137021	**ucac4-522-136397**	**ucac4-563-118326**	**ucac4-581-104282**
			
ucac4-635-130935	**ucac4-643-126683**	**ucac4-667-106319**	**ucac4-688-081285**

(Continued from page 289)

this table, columns 1-8 respectively give

- the UCAC4 identifier for the primary
- the date of the measurement (Julian epoch)
- the number N of individual measurements
- the final PA and SEP measurement (in degree and arcsec, resp.) with estimated standard error (when when N > 1)
- the estimated difference of magnitude, when this value could be reliably measured† (also with the attached standard error)
- the differences between the reported PA and SEP values and those computed from the GAIA coordinates (and listed in Table 1)

The last two columns show a very good agreement between our measurements and the astrometric values deduced from GAIA DR2 with an average and standard deviation of the difference of -0.009° / 1.08° and 4 mas / 28 mas for the position angle (δPA) and separation (δSEP) respectively

A selection of reduced images from which the measures were obtained in given in Plate 1.

5. Conclusion

The results presented in this paper seems to indicate that the GAIA mission has opened a new era for double star observers. The discovering, by a an amateur with a modest equipment, of more than 120 new potential visual binary stars – with a high probability for them of being physical – in a dozen nights of observation would simply not have been possible without the availability of the very high accuracy astrometric data produced by this mission. Processed by smart data mining systems, such as the GDS software introduced in this paper, this data will allow to focus on targets with the highest observational interest. Recently published results, also obtained from GAIA DR2 [8] indicate that a large part (> 58 %) of the pairs listed in the WDS catalog are not physical and hence do not deserve further measurements as long as orbit computation is concerned. Observing time should probably and rather be devoted to pairs with a high probability of being physical, this probability being inferred from indicators such as the GB index used by the GDS software. For such pairs – including of course those which were *not* listed in the WDS, such as those described in this paper –, subsequent measurements will of course still be of interest for orbit (re)calculation since the GAIA mission will end in late 2019. Last, but not least, availability of photometric and astrophysical data (effective temperature for example) for a large subset of the DR2 database should allow specific observation programs based on the nature of system components (for example, systems with late M-type secondaries, such as those targeted in [9]).

† *Sometimes, and for reasons that remain to be investigated, the bispectrum reconstruction process does not fully eliminate the secondary peak, precluding any reliable estimation of the difference in flux between the two components. See for example images of ucac4-563-118326 or ucac4-688-081285 on Plate 1.*

6. Acknowledgments

This work has made use of data from the European Space Agency (ESA) mission Gaia (www.cosmos.esa.int/gaia), processed by the Gaia Data Processing and Analysis Consortium (www.cosmos.esa.int/web/gaia/dpac/consortium), and of the Washington Double Star and UCAC4 catalogs, both maintained by the U.S. Naval Observatory. It also relies on the availability of the invaluable SpeckleToolBox and GDS software, kindly developed and maintained by D. Rowe. Pre-processing of images has been carried out using the Reduc software (v 5.3) developed and maintained by F. Losse

This paper is dedicated to the memory of the great double star observer René Gili (2018).

7. References

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