

Speckle Interferometry Observation Report — RFO, 7/22/2026

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1 Observation List

WDS Identifier	PA (deg)	Sep. (arcsec)	Primary Mag.	Secondary Mag.
15510+4228 BU 810	84.2	1.615	9.13	10.85
17178+4535 STF 2152	237.4	1.967	9.79	9.89
15287+4215 HJ 1274	310.5	6.904	10.61	10.8

The values listed in this table are the most recent measurements from the WDS.

2 Plate Calibration

Before using SpeckleToolBox (STB) to determine the separation and position angle for the observed pairs, I ran Platesolve2 (PS2) on the 10 second shot of each observation, specifically to confirm that the plate calibration was correct for each pair.

3 Observations

3.1 15510+4228 BU 810

Primary: Gaia DR3 1384185878382428672
Secondary: Gaia DR3 1384185878381012480

	Position Angle (deg)	Separation (arcsec)
WDS	84.2	1.615
Gaia DR3	N/A	1.606
Our measurement	192.05	1.546

In the WDS, this pair has a total of 22 observations between 1881 and 2016. We can request the history of the separations and PAs from the USNO to compare against our measurements, since the 84.2 PA is a measurement from 2016.

At base, there is a position angle discrepancy of 107.85 degrees. In speckle bispectrum reduction, there is a known 180 degree position angle ambiguity. If we adjust either measurement by 180, the difference becomes 72.15 degrees.

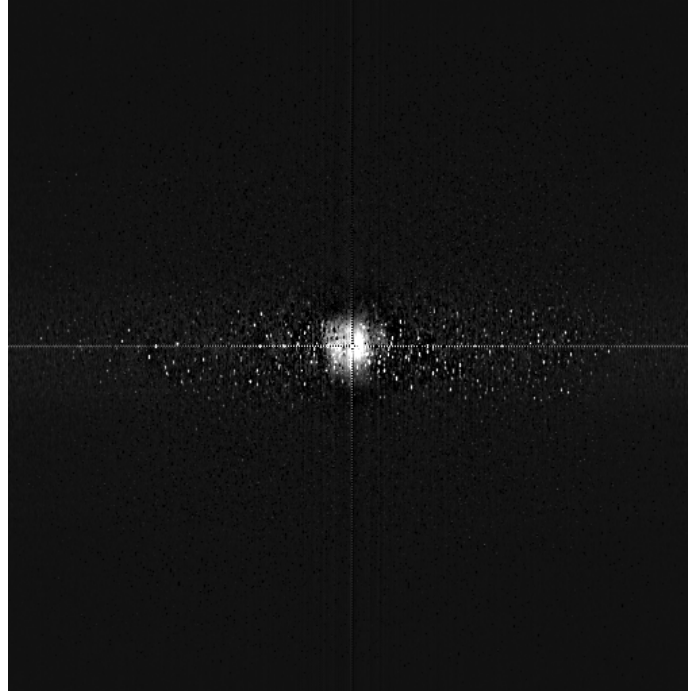


Figure 1: STB bispectrum reduction for 15510+4228 BU 810.

3.2 17178+4535 STF 2152

Primary: Gaia DR3 1361711237938850816

Secondary: Gaia DR3 1361711242233976576

	Position Angle (deg)	Separation (arcsec)
WDS	237.4	1.967
Gaia DR3	N/A	1.961
Our measurement	199.9	2.184

In the WDS, this pair has a total of 39 observations between 1830 and 2017. We can request the

history of the separations and PAs from the USNO to compare against our measurements, since the 237.4 PA is a measurement from 2017.

At base, there is a position angle discrepancy of 37.5 degrees. In speckle bispectrum reduction, there is a known 180 degree position angle ambiguity. Adjusting either the WDS measurement or our measurement by 180 only increases the discrepancy. I'd be curious to see what the observation history reveals about these position angle measurements.

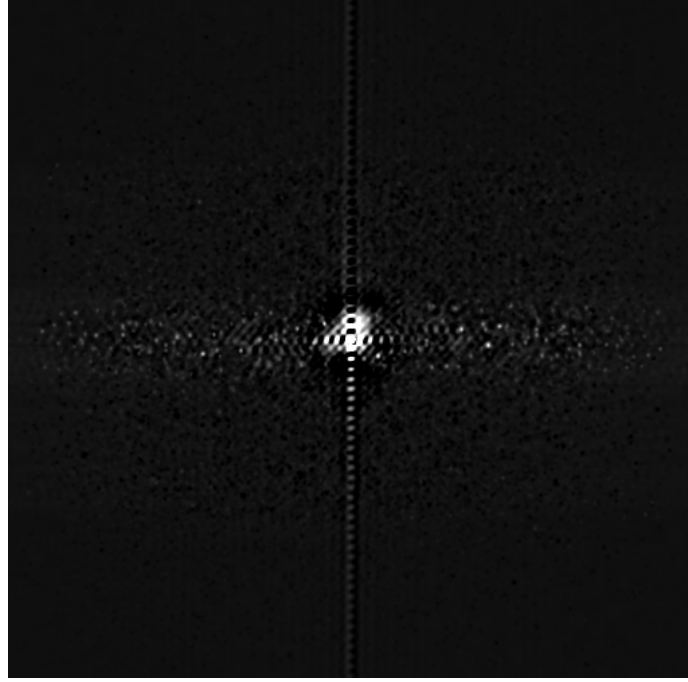


Figure 2: STB bispectrum reduction for 17178+4535 STF 2152.

3.3 15287+4215 HJ 1274

Primary: Gaia DR3 1390923513838318208

Secondary: Gaia DR3 1390923715700755456

	Position Angle (deg)	Separation (arcsec)
WDS	310.5	6.904
Gaia DR3	N/A	6.912
Our measurement	299.78	2.139

In the WDS, this pair has a total of 17 observations between 1828 and 2015. There is a significant difference between our measurement of the separation and the WDS's last measurement (from 2015). The original measurement of the separation, from 1828, was 3 arcseconds.

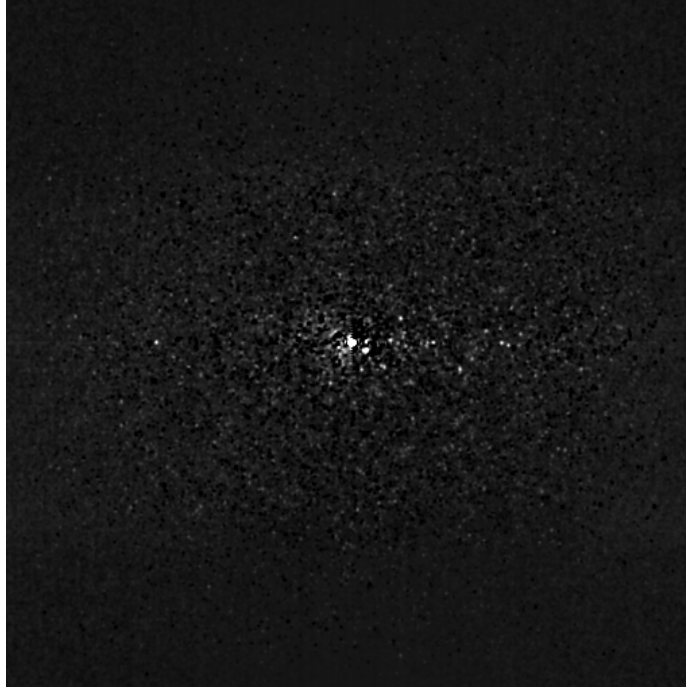


Figure 3: STB bispectrum reduction for 15287+4215 HJ 1274.

Because of this large variation, I emailed Dr. Rachel Matson requesting the measurement history for this pair. While there were 17 total observations listed, there are 18 different data points. 1893.3 is one observation with two data entries. The data she sent me is as follows:

Observation year	Position Angle (deg)	Separation (arcsec)
1828.	310.	3.
1893.29	309.8	7.023
1893.3	316.1	5.829
1893.3	304.5	5.649
1908.45	311.0	6.07
1912.5	309.4	6.9
1969.277	309.93	6.972
1969.279	309.9 ± 0.019	6.898 ± 0.005
1998.41	310.4	6.87
2002.351	310.3 ± 0.1	6.917 ± 0.017
2008.423	310.1	6.95
2010.5	310.3 ± 1.5	6.8 ± 0.17
2012.407	310.15 ± 0.21	6.896 ± 0.024
2012.258	$310. \pm 3.9$	6.9 ± 0.33
2013.354	310.33 ± 0.12	6.884 ± 0.014
2014.31	310.36 ± 0.1	6.902 ± 0.012
2015.0	310.418	6.91
2015.245	310.5 ± 0.15	6.904 ± 0.018

The observation history suggests that something strange happened while processing the data, or in the observation itself. So, out of curiosity, I ran the Bispectrum Photometry/Astrometry tool in SpeckleToolBox on a ten second exposure of the pair, and I got a separation that made much more sense.

	Position Angle (deg)	Separation (arcsec)
WDS	310.5	6.904
Gaia DR3	N/A	6.912
RFO 10s shot	130.66	6.309

I want to explicitly note that this measurement (which aligns with previous measurements) was not obtained using the speckle method of stacking multiple short exposures; it is simply a single 10-second exposure.

The WDS vs RFO difference in position angle here (310.5 vs. 130.66) is consistent with the known 180 degree position angle ambiguity in speckle bispectrum reduction. This is expected, not an error in reduction.

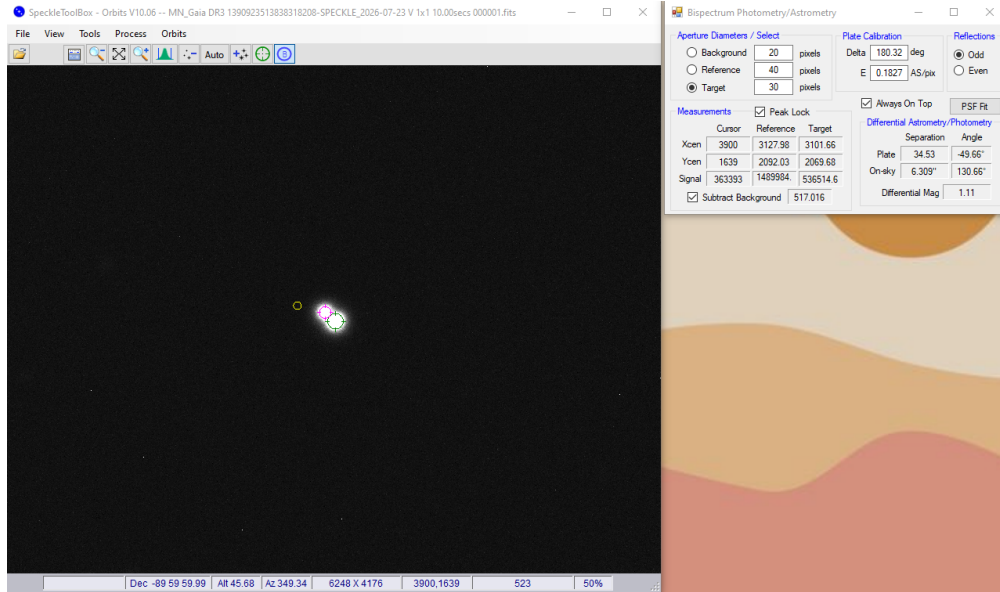


Figure 4: Ten second exposure of 15287+4215 HJ 1274, including the Bispectrum Photometry/Astrometry analysis.

I still want to get another observation of this pair, because the separation of approximately 7 arcseconds shouldn't cause the bispectrum reconstruction method to fail. An idea to fix this issue is maybe taking longer speckle exposures (40-50 ms).

4 Next Steps

- Re-observe 15287+4215 HJ 1274 to rule out issues specific to the night of observation, given the large discrepancy between our separation measurement and the WDS's most recent value.

- Request the observation history from the USNO for 15510+4228 BU 810 and 17178+4535 STF 2152 to compare against our PA measurements.

5 SpeckleToolBox Screenshots

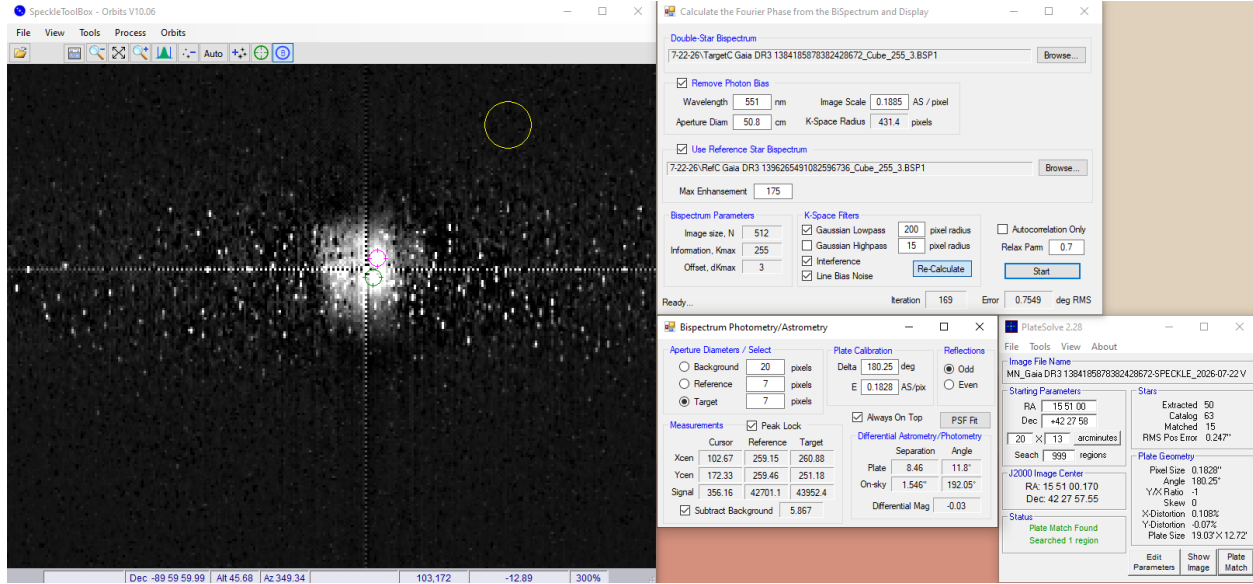


Figure 5: SpeckleToolBox reduction workflow, target 1.

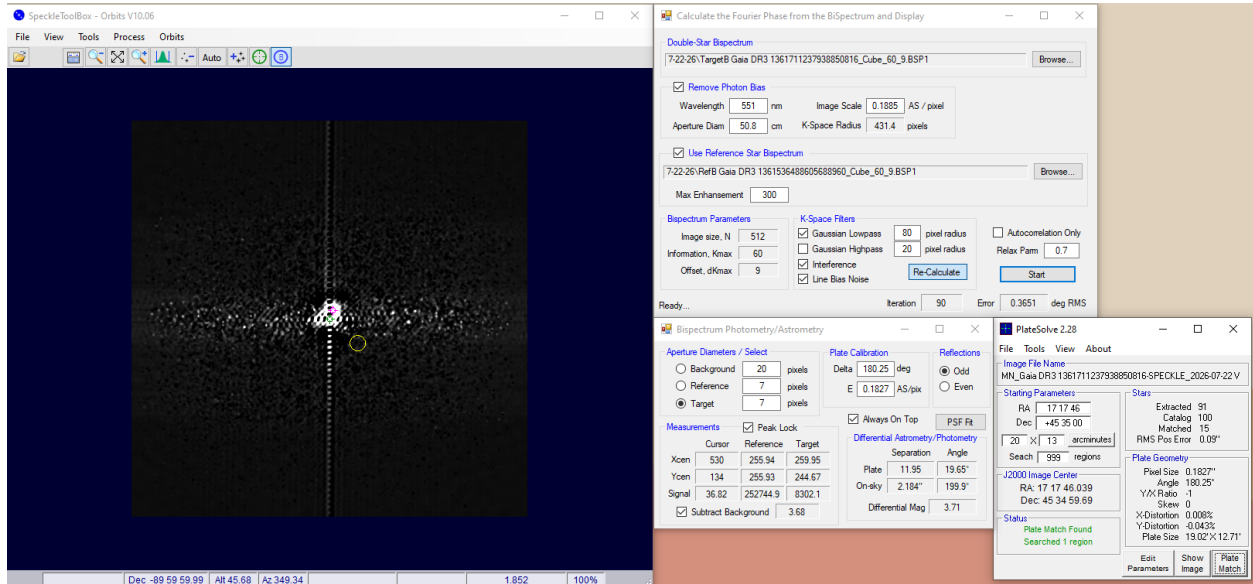


Figure 6: SpeckleToolBox reduction workflow, target 2.

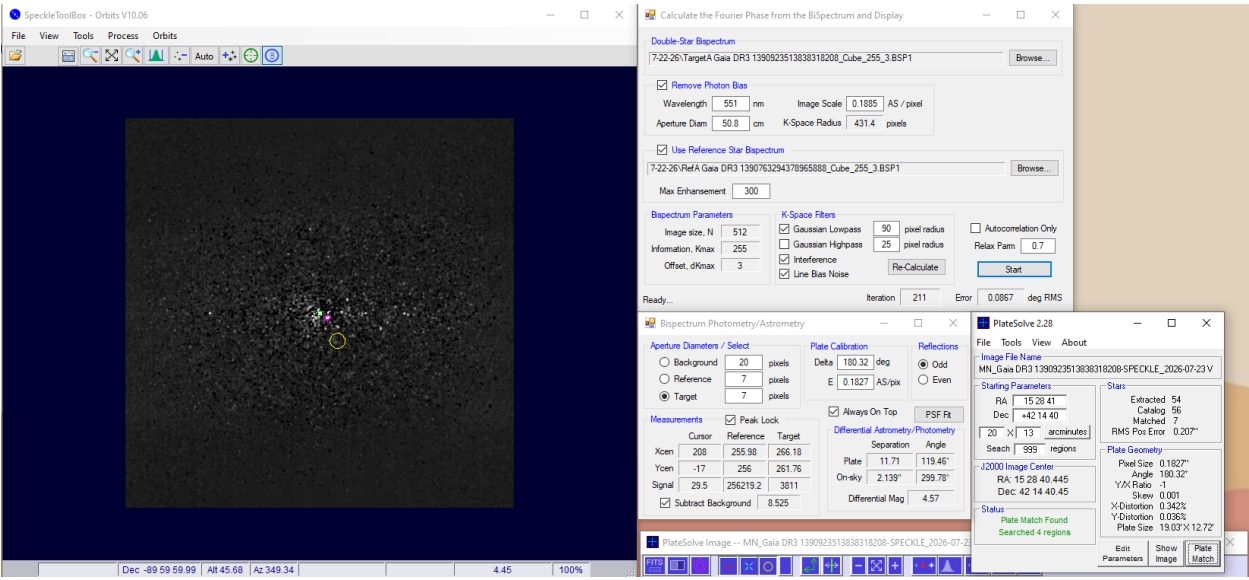


Figure 7: SpeckleToolBox reduction workflow, target 3.