

# An Interesting Stein Double-Double Pairing

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**Abstract:** Report on the observation of the double double pairing of two Stein discoveries in Cygnus. Each of the component pairs (STI9001 and STI2471) were discovered by Johan Stein in 1903 and 1909 respectively.

## Introduction

While collecting data on neglected double star systems in Cygnus, I encountered what initially appeared to be a duplicate reading for STI2471 on my Cartes du Ciel sky chart. The chart indicated that STI2471 and STI9001 occupied the same location and extremely close theta and rho values. Upon imaging the area I was delighted to discover that both pairs did exist and formed a very nice parallelogram (See Figure 1). My

first thought was that I was seeing some type of imaging ghosting as the relative alignments and separations were so close to each other. Repeated images provided the same view so I left the comfort of my computer and headed outside to examine the telescope and camera.

On arriving at the telescope, I noted it was close to zenith and the sky was clear and steady. The optics were free of any condensation or frost so it was time to confirm my image visually. I removed the camera and replaced it with a 15mm WA

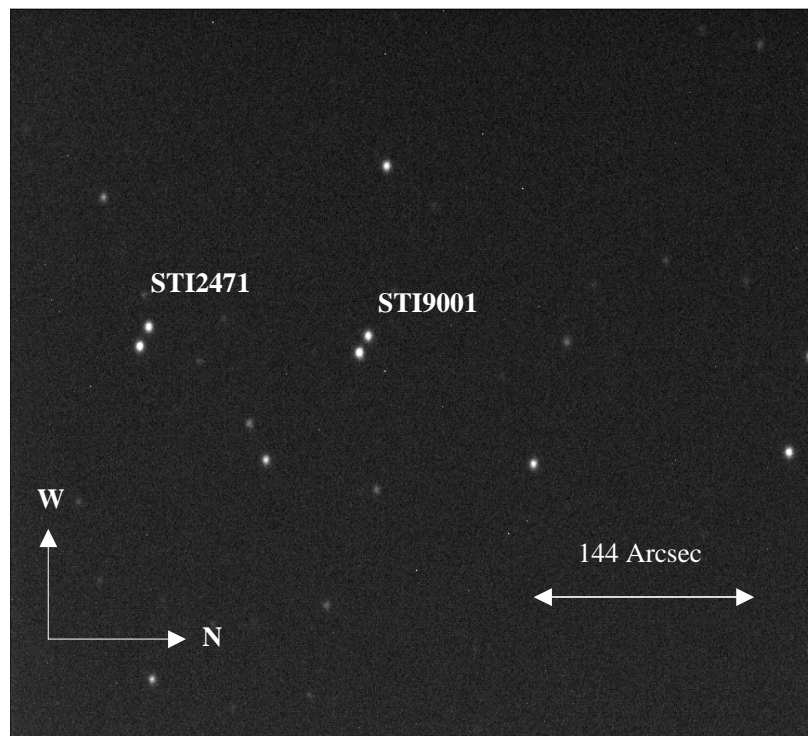


Figure 1: Image of the double-double, STI2471 and STI9001.

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providing 163X magnification. It is important to note that my skies are dominated by light pollution (the reason why I selected double stars as my main subject of observations). Given that and my recent emergence from a well-lit house, my visual limiting magnitude was rather limited (at zenith I could just make out 4.5 magnitude stars). As a result my first view through the eyepiece provided a starless field. It always amazes me how much more the camera can grasp with only an 2 second exposure. After taking this into account I used averted vision and spied an intermit-

tent glimpse of the two pairs. Bumping the magnification up to 246X with a 9.9mm orthoscopic eyepiece along with my steadily improving night vision afforded me a solid view of the two binary systems. My camera had not lied as they appeared clearly as four blue points of light of close to the same magnitude aligned in a beautiful parallelogram shape.

### Methodology

Using data from the WDS, the Two Micron All Sky Survey, and my observations utilizing an RCX400 12" telescope in concert with a DSI Pro II (providing

WDS ID	Disc ID	Yr Disc	Yr Ob	# Ob	Theta	Rho	Mag 1	Mag 2	Notes
19531+5432	STI9001	1903	1903.6300	1	136.20	14.289	11.8	12.4	Note 1 PA 180 deg off (316.20)
19531+5432	STI9001	1903	1909.7500	2	131.70	13.800	11.8	12.4	PA 180 deg off (311.70)
19531+5432	STI9001	1903	1909.7600	3	131.60	13.725	11.8	12.4	PA 180 deg off (311.60)
19531+5432	STI9001	1903	1999.9000	4	117.00	11.870	11.8	12.4	Note 2 PA 180 deg off (297.00)
19531+5432	STI9001	1903	1999.9030	5	298.40	10.377	11.8	12.4	2MASS
19531+5432	STI9001	1903	2006.6816	6	299.04	10.881	11.8	12.4	
19531+5430	STI2471	1909	1909.7500	1	331.00	10.900	11.4	11.8	
19531+5430	STI2471	1909	1999.9030	2	296.20	11.929	11.4	11.8	2MASS
19531+5430	STI2471	1909	2006.6816	3	295.53	12.053	11.4	11.8	
19531+5431	STI9001/ STI2471	2006	1999.9030	1	357.40	155.000	11.4	11.8	2MASS
19531+5431	STI9001/ STI2471	2006	2006.6816	2	357.95	142.148	11.4	11.8	Waverly Observatory

**Table 1:** Historic data and new measurements of STI9001 and STI2471.

### Notes

1. STI9001 is a renaming of STI2471a. This information taken with the readings of its corresponding pair STI2471 on 1909.7500 by Stein would lead me to conclude that he was aware of the double double nature of these stars. Such a view is in keeping with Stein's use of photographic plates to collect images of double stars for reduction. Despite this apparent awareness he did not take any theta or rho readings between the two pairs.
2. This reading looks like it may have been mistakenly taken of STI2471. The values appear to be closer to those obtained from the Two Micron All Sky Survey data taken in the same year for STI2471. Theta is 1.40 degrees and rho 1.493 arcsec less than the 2MASS readings for STI9001. By comparison, theta is 0.80 degrees and rho 0.059 arcsec from the 2MASS readings for STI2471.

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0.71 arcsec per pixel) I have prepared a table (Table 1) of all the known readings for STI2471, STI9001, and the discovery SOO 12. The Two Micron All Sky Survey data was reduced using the online Aladin software, while my images were reduced using Reduc software.

#### References

- I. The Washington Double Star Catalog
- II. "This publication makes use of data products from the Two Micron All Sky Survey, which is a joint project of the University of Massachusetts and the Infrared Processing and Analysis Center/ California Institute of Technology, funded by the National Aeronautics and Space Administration and the National Science Foundation."
- III. James A. Daley, "Notes on the Double Stars of Father John W. Stein, S.J." *Journal of Double Star Observations* Vol.2, No.4, Fall 2006.

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