Spectroscopy and Photometry of Gaia20eld (Nova Cas 2020)

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Follow-up observations of Gaia alerts

We have done follow-up observations of Gaia alerts. We carry out the photometric and spectroscopic identification of Gaia sources and especially astrophysical research of cataclysmic variables with 150, 100, and 60 cm telescopes.

Follow-up observations of Gaia alerts

We have performed spectroscopic Gaia follow-up observations by taking one spectrum with Grism 15, slit 100, and exposure between 1200 and 1800 s as a standard for the identification of each source. We use the RTT150 telescope for this job.

Follow-up observations of Gaia alerts

Similarly, we carry out photometric Gaia monitoring observations without a filter, with 10-60 s exposures, binning 2, and duration of 2-3 hours. We spend the observational time for more than 3 hours if there are priority sources. We use the T100 telescope for this job. Photometric observations of very bright Gaia sources are made by using T60 robotic telescope like the T100 but with B, V, R filters.



Gaia20eld (Nova Cas 2020, V1391 Cas) is one of the latest nova alerts of Gaia satellite.

Nova has been observed in its various stages since it was first noticed.

The brightness variation range of the nova is 10.8V - 21.3i and the discovery and outburst dates are July 27th and Aug. 10th, in 2000, respectively (AAVSO).

Gaia20eld



The difference between the maximum and minimum brightness from the light curve on the Gaia page within about 3 months reached approximately **7 mag**.

Observations in the Atels performed after the outburst are marked with lines on the light curve.

The green ones are TUG RTT150 spectroscopic observations.



Spectroscopy of Gaia20eld

We preferred the Gaia20eld source as a newly outburst nova (Nova Cas 2020, V1391 Cas).

Firstly, we have taken spectroscopic observations of the object with the TUG-RTT150 telescope especially in the nebular phase in order to study the atmosphere model and follow the process. We reported the first results of this study in Atel 13998 (2000).



From these observations immediately after the outburst, the change in the H-alpha profile in the two spectra taken with a difference of 2 days on 10 and 12 August is noticed.

Spectroscopy of Gaia20eld

FWHM values of H-alpha were measured in the range of 4.8-19 Å in 5 spectra taken on August 10, 11 and 12 with on Grism15.

H α line profile





This change was enormous in the Nova



In addition, observations of the Nova were carried out on September 8th, November 15th and December 17th, 2020.

These rather big changes of the H-alpha profiles in the new observations with the August ones are given in the figure together with the second minor picture in detail.

The 6 spectra in the figure were taken with Grism 8.



Spectroscopy of Gaia20eld



The changes in other lines and continuum with H-alpha are also shown in the spectra taken with **Grism 7** (figure). 3 minor pictures present the profiles of Halpha, H-beta and O I in order from top to bottom in detail.





Spectroscopy of Gaia20eld



A great change was observed in the continuum levels in the blue regions of the spectra in the data of the August 10th, 11th, and 12th close to the outburst.

Day and day the continuum level of the star has fallen.

The changes of the star in these 2 days are shown in spectra taken with Grism 15.



Photometry of Gaia20eld

In the meantime, we carried out photometric observations of the object with the TUG-T100 telescope, one-second exposures, binning 2, and without filter for about 9.5 hours since the source is very bright. We present these new photometric preliminary results in the Gaia workshop.

Photometry of Gaia20eld



The Nova's 1653 images were taken with the TUG T100 telescope on October 12, 2020, for 9.47 hours from evening to morning.

By taking advantage of its brightness, the observations were made with 1 s exposure without filter and with binning 2.

The data reduction was made using Iraf and phyton.

The comparison and check stars with the Nova are shown in the picture.



Photometry of Gaia20eld

Light curves have been obtained from the reduced data for various comparison stars.

One of them is given in the figure.





Period of Gaia20eld

Period analysis has been done.

The observations were made with short poses and frequent intervals and belonging to a night.

Therefore there were some difficulties in determining the period.

Period of Gaia20eld

The period of the Nova has been calculated by some people before to be 0.15442 d (3.706 h) (AAVSO).

The closest to this value from our period measurements is 0.1312 d (3.15 h).

The difference between the two values is about 33 minutes.

Result and Conclusion

- Immediately after the outburst and advanced stages of the system were examined spectroscopically.
- The orbital period of the system was found to be roughly
 3.15 h.
- We will plan to make additional observations to determine the exact period of the system.
- In addition, we are continuing the atmospheric model study of the nebular phase of the Nova.

References

Hamed, G.M., Esenoglu, H.H., Galeev, A.I., ATel #13998, 2020

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