The 11-th magnitude star EE Cep is a rare class of binary systems in which the eclipses are caused by a dark, dusty disk surrounding the orbiting companion. The precursor of this group is the extremely long-period (27 yr) A star A activated in 1952 (E = 10) by Romano (1956) and soon confirmed by Weber (1956). The eclipsing nature of these minima was established after observations of three subsequent eclipses in 1958, 1964, and 1969 (Meininger 1973). So far all eclipses have been observed on numerous nights by the AAVSO International Database, a collection of data contributed by observers worldwide, and used in this research.

The total duration times estimated from the old photometric data seem underestimated (see Fig. 1 and Table 1). The analysis of the depth-duration relation for the eclipses up to 1997 (E = 8) was performed by Graczyk et al. (2003) and it is reproduced here in Fig. 2. We do not observe significant changes in the Hα lines in the spectra obtained on Dec 23, 2015 also show absorption component – this is the orbital phase ~0.24 during the shallow eclipse. The depth-duration relation (each eclipse is signed by its epoch number). Right: Time dependence relation for the depth of the eclipses.

The AAVSO Database is a rich source of data on the behavior of the visual minima of EE Cep. The most striking feature of the EE Cep minima are large changes of their depth across a wide range of about 0.5 to 2.0 magnitudes. We do not observe significant changes in the Hα lines in the spectra obtained on Dec 23, 2015 also show absorption component – this is the orbital phase ~0.24 during the shallow eclipse. The depth-duration relation (each eclipse is signed by its epoch number). Right: Time dependence relation for the depth of the eclipses.

CHARACTERISTICS of THE ECLIPSES. The most striking feature of the EE Cep minima is large changes of their depth across a wide range of about 0.5 to 2.0 magnitudes. The variability of EE Cep was discovered in 1952 (E=0) by Romano (1956) and soon confirmed by Weber (1956). The eclipsing nature of these minima was established after observations of three subsequent eclipses in 1958, 1964, and 1969 (Meininger 1973). So far all eclipses have been observed on numerous nights by the AAVSO International Database, a collection of data contributed by observers worldwide, and used in this research.

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OBSERVATIONAL CAMPBACH. Good enough data can be obtained only through a collective effort in extensive campaigns, like those from the recent years. Galan et al. (2014) invited for observations of the event in 2014, and obtained widespread response from observers using more than 30 telescopes located in Europe and North America. More than 2000 individual photometric measurements were obtained with 27 instruments – most using U(BVRI), pass-bands of Johnson-Cousins photometric system and in several cases RI filters more close to Johnson's realizations of these bands. The photometric data – covering 243 days from 22-Mar to 20-Nov 2014 – were processed to correct for small differences among photometric systems of individual observers and the points obtained during the same nights were averaged in single points with the procedure described in details by Pietkowiak et al. in preparation. The final light curves and color indices are shown in Fig. 4.

High-resolution spectra were collected with two spectrograph operating on 2-m Ritchey-Chretien-Coude (RCC) telescope of the Rothenberg Observatory, Bulgaria. Two spectra (R ~50000) in the range ~4000–9000 Å were obtained with Echelle spectrograph (Buness et al. in preparation). Ten spectra (R ~16000) covering narrow ranges (~200 Å) were obtained with Coude spectrograph during ~50 nights from Apr to Aug 2014. Balmer Hα, Hβ and Hγ and sodium Na I doublet line profiles from these spectra are shown in Fig. 5.

Also low-resolution (R ~10000) spectra were collected with several instruments, like the historical light curves (Graczyk et al. 2003) were used to test the predictions of the model. The analysis of the Balmer lines Hα ~ Hβ in respect to continuum in flux calibrated, low resolution spectra was discussed here.

PRELIMINARY RESULTS. The obtained light curves show minimum of the eclipse on JD = 2456894, which coincides with the minimum calculated with respect to Mikolajewski & Graczyk (1999) and have been observed on all bands and are similar to those from 2003 and 2008/9. In particular there is clear “bump” about ~9 days before minimum in photometric light curve and color indices, and small dip at or around BB in 2015. The eclipse depth is estimated from ~0.81 in U to 0.61 in I, which is shallower than expected according to the Galan’s et al. (2012) model. The reason can be too simple. The models’ assumptions. In particular: i) circularity of the orbit, and ii) very simple the disk density profile. Moreover there was no reason to estimate reliable the disk diameter, and it was adopted quite arbitrarily as 250 R⊙. There are indications that the orbit can be eccentric that comes from variations out of the eclipses noted in I-band light curve (Galan et al. 2012). Fig. 1 shows repeatable brightening in infrared domain with maximum at phase 0.2. The tentative interpretation can be presented as follows: When components are approaching each other close to periastron passage. In that case, the acceleration in the orbital motion may be an additional reason for the observed eclipse asymmetry and this complication have to be taken into account in the model.

We do not observe significant changes in the Hα line up to 2014, and 2015, when the signs of absorption components begin to appear on the blue wings of this emission (Fig. 4 and 6 - Top). It falls at the time when small dip starts to develop in the light curve, which mean the beginning of the photometric eclipse. The new, precise photometric data with dense time coverage enable noticing more subtle changes, and more detailed determination of the eclipse times and their total durations. The sharp eclipses last up to ~5.5 and 3.5 months and in now much less difference with results obtained from spectroscopic observations. The total duration times estimated from the old photometric data seem underestimated (see Fig. 2 - Left). The Balmer Hα, Hβ and Hγ profiles in the spectra obtained in the eclipse (Aug 8, 2014) show deep absorption component on their blue wings. Interestingly Hγ and Hβ lines in the spectra obtained on Dec 23, 2015 also show absorption component – this is the orbital phase ~0.24 during the shallow eclipse.