**BULK DENSITY OF THE METEOROIDS ON COMBINED PHOTO-RADAR AND TV-RADAR OBSERVATIONS.** M. Narziev[1], N.A. Konovalova[1] [1]Institute of Astrophysics of the Academy of Sciences of the Republic of Tajikistan, Bukhoro, str. 22, Dushanbe 734042, Tajikistan, mirhusseyn_narzi@mail.ru.

**Introduction:** Here we present an analysis of a light curve of sporadic meteors and meteors from several meteor showers which were recorded on combined photo-radar and TV-radar observations [1-4]. It is well known that the ablation behavior of meteors in the Earth's atmosphere shows photometric light curves that are reflecting important physical properties of the meteoroids. In order to study the structure and composition of meteoroids, it is necessary to analyze the data obtained from meteor observations what along with applying various models describe the interaction of meteoroids with the Earth's atmosphere. The fragmentation of the meteoroid in the Earth's atmosphere are observed both optically [5-9] and with radar [10] as well as visually. Particularly valuable information both about physical-dynamic characteristics of meteoroids and about mechanism of their fragmentation in the Earth's atmosphere can be obtained as a result of combined radar-optical observations.

**Methods:** On the base of the observed data of meteors derived from radar and combined radar-optical methods the research of fragmentation and physical properties of small meteoroids was made. The Hissar Astronomical Observatory (HisAO) radar and TV meteor observations presented here were obtained during 1978 and 1980 years. The radar and TV observations allows us to take records of meteors +7.5 ÷ -7.0 absolute magnitude [2-4]. In this work we made the analysis of the observed light curves that are reflecting important physical properties of the sporadic meteoroids and meteoroids from the several meteor showers. The aim of this analysis is to determine the bulk density and the mass of smallest separating fragments of that meteoroids. The density of each meteoroid is estimate by simultaneously fitting the observed light curve using both a model based on the theory of "single body" [11] and a model based on quasi-continuous fragmentation [12]. By comparing the simulated and the observed light curves we obtain the density of the studied meteoroids.

**Results and discussion:** To receive the data on the bulk densities of the sporadic and several streams meteoroids we have analysed the smooth light curves of several meteors from that streams. A wide range of modeled bulk density from 0.5 g/cm$^3$ up to 3.6 g/cm$^3$ and mass of small separating fragments (Table 1) was obtained as a result. For 60% of studied combined radar-optical meteors the observed light curves have a good agreement with simulated light curves which have been calculated in the framework of the quasi-continuous fragmentation model. This result is consistent with work [13] which suggest bulk density of meteoroids with orbits belonging to Jupiter family comets (JFCs) have an average bulk density of 3.1± 0.3 g cm$^{-3}$.

**Conclusions:** As a result we concluded that approximately 60% of all analyzed meteor light curves are accessible to the quasi-continuous fragmentation model, while only one light curve can be accessible via the classical simple ablation model. Thus the fragmentation is a dominant process for most of the meteoroids. On the basis of bulk density derived values we can conclude that the Geminid and Quadrantid meteoroids are more dense than other shower's meteoroids. In contrast to this Leonid and Orionid meteoroids could be considered structurally fragile bodies that belong to the "dustball" type.

| Shower | n | $\delta_0$ g/cm$^3$ | $m_0$ g |
|---|---|---|---|
| δ-Aqua rid | 9 | 3.5 ± 0.3 | $10^{-5}$ - $5\cdot10^{-6}$ |
| Parsed | 17 | 1.0 ± 0.2 | $10^{-6}$ - $5\cdot10^{-8}$ |
| Orion | 2 | 0.5 ± 0.2 | $10^{-6}$ |
| Gemini | 1 | 3.6 | $10^{-6}$ |
| Leonid | 2 | 0.6 ± 0.2 | $10^{-6}$ |
| Guarantied | 4 | 2.1 ± 0.6 | $10^{-5}$ - $10^{-6}$ |
| α-Capricornia | 1 | 1.4 | $5\cdot10^{-6}$ |
| N. Virginia | 1 | 5.0 | - |
| S. Toured | 1 | 1.8 | $5\cdot10^{-6}$ |
| Sporadic | 18 | 1.3 ± 0.2 | $10^{-5}$ - $10^{-7}$ |

Table 1. Bulk density average values of the studied meteors and the mass $m_0$ of smallest fragments.

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