

Recent fireballs registered by the Polish Fireball Network

Przemysław Żołądek¹, Mariusz Wiśniewski¹, Arkadiusz Olech^{1,3},
Zbigniew Tymiński^{1,2} and Marcin Stolarz¹

¹ Polish Fireball Network, Comets and Meteors Workshop, ul. Bartycka 18, 00-716 Warszawa, Poland
pkim.inbox@gmail.com

² National Centre for Nuclear Research RC POLATOM, ul. Soltana 7, 05-400 Otwock, Poland
Zbyszek.tyminski@gmail.com

³ Copernicus Astronomical Center, Polish Academy of Sciences, ul. Bartycka 18, 00-716 Warszawa, Poland
olech@camk.edu.pl

This is a preliminary overview of the most interesting fireballs and meteors registered by the Polish Fireball Network in the years 2014 and 2015. Some of the fireballs have calculated trajectories and orbital elements, other have been observed as a single station event or as a very distant one, however also these fireballs are shortly described as a very bright, possibly meteorite dropping event.

1 Introduction

The Polish Fireball Network has been founded in 2004 as a system of numerous CCTV cameras located at various locations in Poland (Olech et al., 2006). The PFN consists mostly of PAL video cameras like Tayama, Mintron and Watec but also a few photographic units have been used in the past to determine the trajectories and orbits. Presently 36 stations work regularly every night and some other stations are used during the meteor shower maxima. This year we started with the modernization of the network, old low sensitivity CCTV cameras are replaced by new digital units (mostly Imaging Source DMK cameras), there is also a plan to use the new Mintron 12V6 analog cameras instead of some old Tayamas. (Żołądek, 2014) In 2014 and 2015 only two digital cameras were used as a high resolution spectrograph. Most of the fireballs described below have been observed using typical PAL CCTV cameras.

2 Recent fireballs

Multiple fireball 2014-06-09

A very unusual fireball has been registered by numerous stations of the Polish Fireball Network on 2014-06-09 22^h38^m UT. All stations observed the fireball not brighter than -6m accompanied by three faint fragments laterally separated from the main body. The observed distance between the main body and the fragments was larger than ten degrees and the real distance from the main fragment is of the order of 10km. It is obvious that these fragments separated from each other somewhere on the orbit, far ahead of the atmospheric entry.

Fireball 2014-10-11

This fireball has been found in the PFN data recently and is not precisely calculated yet. This Fireball occurred on 2014-10-11 at 01^h44^m UT. This long and very bright fireball has been registered by the PFN20 Urzędów station very low over the southern horizon. The

significant terminal flare is visible on the PFN20 recordings. The same fireball has been registered by the PFN32 Chełm station but the image is strongly overexposed. This fireball has been also registered by the all sky CCD camera at Mount Suhora Observatory.

Fireball 2014-11-11 "Rozdrażew"

A fireball with a huge terminal flare has been observed on 2014-11-11 at 16^h51^m40^s UT, shortly after sunset. It has been registered by only two stations – PFN03 and PFN53. The PFN03 image shows only the initial part of the trajectory, the second station was located much closer to the terminal point and registered a huge terminal flare probably brighter than the brightness of Full Moon. The trajectory has been calculated and, the Fireball entered the atmosphere between Wrocław and Konin in the western part of Poland. The trajectory was quite steep and terminated at a height of 32km. The terminal velocity was 14.5km/s, the probability of a meteorite fall is very small. The calculated orbit has a significant eccentricity, with an aphelion close to the Jupiter orbit and a perihelion inside the Earth orbit.

Fireball 2014-12-09 Zdar nad Sazavou

This fireball designated also as EN091214 has been observed by numerous central European stations including EN and EDMOND. The trajectory was located over the eastern part of the Czech Republic. This was a meteorite dropping fireball and two meteorites have been found in the Czech Republic by a local search group. This fireball was only partially visible on the PFN40, PFN41 and PFN38 cameras. All video data from the PFN network covers only the initial part of the trajectory however multiple very bright sky flashes have been registered when the fireball left the field of view.

Fireball 2015-01-02

This fireball has been registered at 04^h14^m24^s UT at only one fireball station during bad weather conditions. It is worth to mention because the fireball brightness was

strong, probably comparable with full moon. It is visible on the recording from the PFN32 Chelm station through the thin cloud cover.

Fireball over Romania 2015-01-07

A huge and very distant fireball caused a significant flash at the sky observed from the southern and central part of Poland. The flash was observed in several stations at 01^h05^m58^s UT, there is one direct observation of the fireball from the PFN49 Helenów station located close to Siedlce in eastern Poland. This distant fireball was visible almost on the southern horizon and illuminated the thin clouds low at the sky. This fireball was later identified with a huge superbolide observed over Romania that night.

Earthgrazing fireball "Platerów"

A very long meteor with a 340km long visible trajectory has been observed on 2015-01-13 at 16^h50^m48^s UT over eastern and central Poland. The trajectory of the Platerów fireball began over Belorussia, close to the city Pinsk. After numerous light flares the fireball ended just few kilometers east of Warsaw. During its atmospheric flight the fireball slowed down from 28 km/s to 23 km/s. The trajectory was shallow, with an inclination of only 7°.

Faint meteorite dropper 2015-04-04

One of the most interesting meteors has been registered by four fireball stations located mostly in the northern part of Poland. This was just a very long -1 magnitude

meteor which looks like a typical almost earthgrazing event. The real nature of this meteor was much more interesting. After the trajectory calculations we found that this fireball started its luminous trajectory at the height of 85 km and terminated its luminous path at the height of 43 km. The terminal part of the trajectory was well visible on the PFN37 Nowe Miasto Lubawskie station from a straight line distance of less than 50 km. The meteor terminated its light at a speed of only 4.8 km/s and it is very probable that some very little meteorite survived and fell on the ground. This is probably an example of a body with an extremely low ablation coefficient. The calculated orbit lies in the ecliptic plane and looks typical for a main belt originating body.

The "Stanisławów" fireball

A bright and slow fireball occurred on 2015-05-31 at 21^h25^m59^s over the central part of Poland. It was registered by numerous fireball stations, especially good recordings came from the PFN52 and PFN40 stations where the multiple fragmentation has been observed at the terminal part of the trajectory. The fireball began 82 km above the Earth surface and entered the atmosphere with $V_{\infty} = 14.6$ km/s. The first fragmentation was observed at a height of 40.5 km, the next respectively at the 39.9 km, 38.7 km, 34.9 km. The main fragment terminated its light just above 28 km with a terminal velocity of 5.2 km/s. A few small fragments should have survived and landed on the ground as meteorites. The biggest one should have a mass larger than 100g.

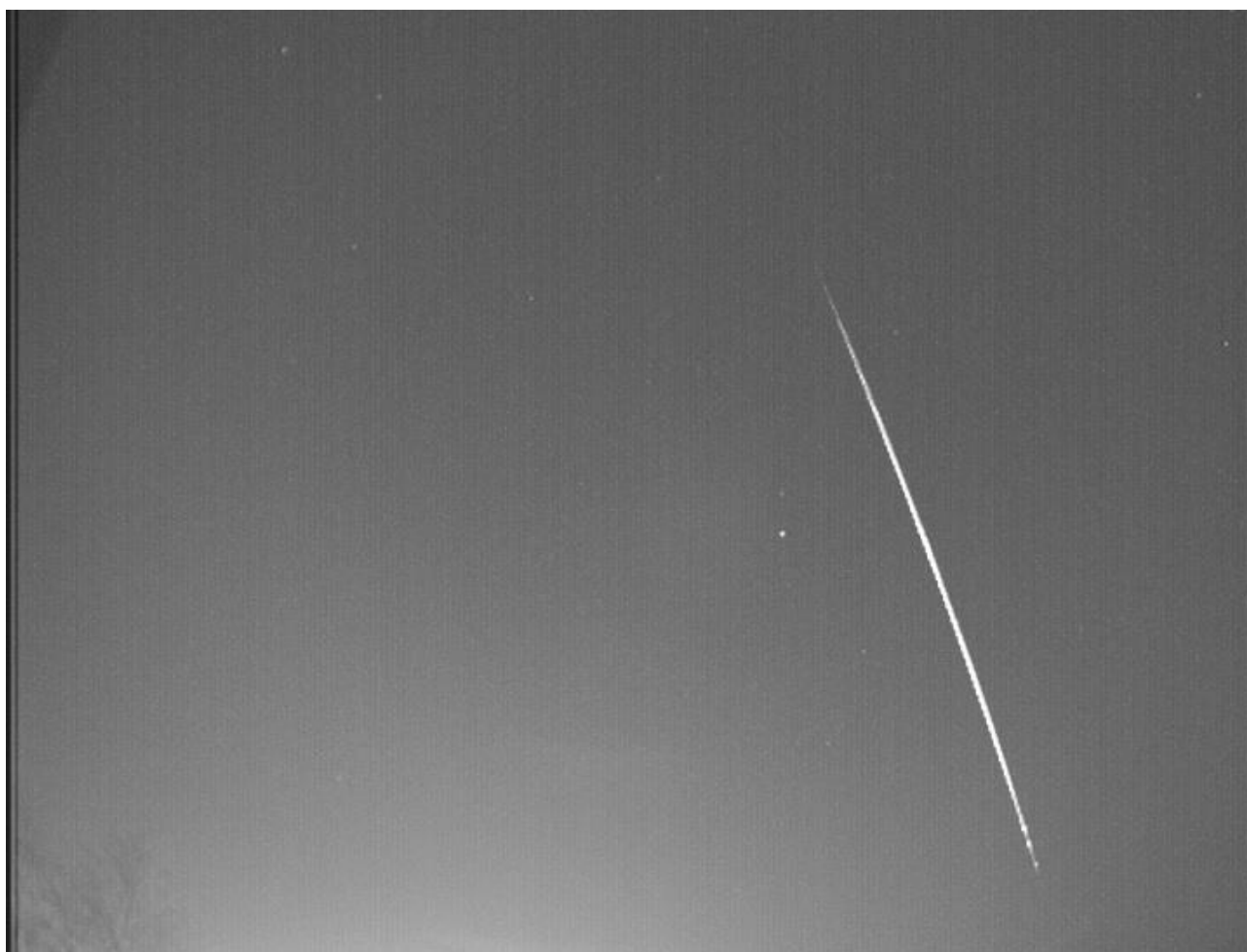


Figure 1 – Meteor observed on 2015-04-04 which can be a source of a very small meteorite fall. The bright star in the center is Altair.

3 Conclusion

The fireballs mentioned above were the brightest and most interesting events recorded in the second part of 2014 and the first part of 2015. In most cases measurements and calculations are preliminary and will be improved. Some fireballs were observed only from one camera and cannot be calculated without additional data. Any additional data from outside the Polish Fireball Network will be very helpful to improve these results.

Acknowledgment

This work was supported by the National Science Center (decision no. DEC-2013/09/B/ST9/02168).

References

- Olech A., Żołądek P., Wiśniewski M., Kransowski M., Kwinta M., Fajfer T., Fietkiewicz K., Dorosz D., Kowalski Ł., Olejnik J., Mularczyk K., Złoczewski K. (2006). "Polish Fireball Network", In Bastiaens L., Verbert J., Wislez J.-M. and Verbeeck C., editors, *Proceedings of the International Meteor Conference*, Oostmalle, Belgium, 15-18 September 2005. IMO, pages 53–62.
- Zoladek P. (2014). "Future plans of the Polish Fireball Network". In Rault J.-L. and Roggemans P., editors, *Proceedings of the International Meteor Conference*, Giron, France, 18–21 September 2014. IMO, pages 87–88.



The author, *Przemysław Żołądek* during his lecture (Photo by *Axel Haas*).