Answers on comments to problem No 4 (2010) GEORGIA

Dear Ilya,

First of all I want to thank all the reviewers for very useful remarks.
Please see my answers below. We revised our article respectively.

Answers to Review 1:

Q1. *Firstly, the scale of graphs (at least, Fig. 1 and Fig. 5) should be changed. Now it's difficult to read the captions under the axes even on a laptop screen; one should notice that hard-copy printing always decreases the image quality further.*
The same concerns the photos which may become unclear for the reader, especially Figs. 7, 8, 10. Cf. http://www.savvyminds.org/alg2images/parabola.jpg as a graph that would remain clear independent of the printer quality.
Maybe a schematic image, placed near a real photo, would clarify the shape of the surface.
A1. I agree. So we changed the graphs to more clear.

Q2. *Experimental graph: why theoretical curve overestimates the "**h**" value? That seems to be regular*.
A2. Yes, you are right. However the result depends on several parameters which were taken approximately. But even with these approximate values theoretical and experimental values are quite near to each other and the curve shape fits the experimental behavior (does not exceed two standard deviation).

Q3. *As I understand, there is only one diameter of the ring? I guess that the author will not now design another one of different size, but in any case it's worth to be mentioned and explained*.
A3. We used the optimal size of frame. Too small frames were not convenient for making observations and measurements, while too large – to get stable films and to avoid influence of even small air flows. We wrote these considerations in revised version.

Q4. *In my personal opinion, the discharge effect could have been described in more detail. Again, the poor quality of photos (9, 10) may hinder the reader to understand the mechanism of the discharge. By the way, it is interesting whether the soap film was destroyed with discharge, or not*.
A4. We added some clarifications to the discharge description. Of course the film was destroyed with discharge. Unfortunately the format of IYPT paper restricts photos to grey-scale, so for good quality color photos we added reference to our presentation [3].

Answers to Reviewer 2:

Q1. *"Soap molecules … form the surface of the film": they form the volume too; consider a more accurate wording on how surfactants stabilize the surface.*
A1. Here a very important feature is that negative ions of soap molecules tend to gather ***on the surface*** on the film (p. 6,7 of ref [1]) and they form ***the surface*** structure of the film. For clarification I added the reference to [1] in this paragraph.

Q2. *No explanation of the film stability*
A2. Due to restrictions on the size of article we did not focus on the detailed description of soap film properties. However in the revised version we added references on the relevant books and articles.

Q3. *Dependence **h(d)** was obtained and measured but linearization was not provided. So we can't make any conclusions about the correctness of the theory.*

A3. We used the approximation $h << a; h << d$ when formulae got quite simple and comprehensive form. In this approximation we made analysis of the film behavior and it fitted experiment quite well, so I don't think there was the need in making linearization.

Q4. *"$h<<a; h=a=R$": conditions are inconsistent*
A4. I agree. It was a printing mistake. The correct condition is $h << a; h << d$. As we wrote: "We will use the approximation, when the deformation is much less than the loop radius and the distance to the charged sphere". We corrected this printing mistake in revised version.

Q5. *"n/m": "N/m" is more common*
A5. We corrected this in the revised version.

Q6. *Assumptions of the theory are not clear – it should be described clearer*
A6. We added some assumptions for clarification in the revised paper.

Q7. *No numerical estimations in the theory*
A7. In our paper we made numerical estimations and compared them with experiment. We plotted the graph of dependence of film stretch height h on the distance to the charged body.

Q8. *No numerical descriptions for the majority of the experiments*
A8. Many experiments we made for ***qualitative*** descriptions of different interesting phenomena, such as ionic wind, different colors of discharge, asymmetry in soap film behavior in accordance to the sign of body charge. I think these are very interesting results. Numerical descriptions of these experiments are quite complicated but we think to return to them in future.

Editorial request

Q1. *Figure 1: Is the image of own work? If not, please reference rigorously and provide the source for the image.*
A1. We added the reference on fig. 1.

Q2. *Figures 3, 6, 9, 10: consider adding a scale bar.*
A2. We added the scale.

Q3. *Parameters: consider typing all physical parameters in italics, not in bold italics. Consistency of units and spelling: please check whether short notations (e.g. C or V) or full notations (e.g. Coulombs or Volts) are used throughout the text. Note that the short notations are clearly preferred.*
A3. We changed notations of Volt to the short variant in the revised paper however we left "***Coulomb***" in order not to mix it with capacitance C.

Once more I want to express my thanks for all remarks which were very useful.

With the best regards

Alexander Barnaveli.