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To whom it may concern,

I am writing to provide my assessment of the PhD thesis of of Mr. **Jiří Veselý**.

Mr. Veselý's thesis is very well-written. In my reading of the document, I did not encounter any grammatical or spelling errors of substance. The contents are well-organized in their presentation, with an introduction that concisely presents the relevant background material.

The thesis draws from research conducted in four published journal articles that Mr. Veselý co-authored with his supervisor. The thesis contains additional new results and commentary not present in the papers, and the organization and style of presentation is different as well. This gives the thesis additional value over the papers, and demonstrates that Mr. Veselý has a functional understanding of the material presented. Moreover, the fact that the thesis is rooted in published work is an indication that the thesis contains new scientific results. In my view, this is a good indication that Mr. Veselý has potential for creative scientific work.

The research is concerned with solutions of the Einstein-Maxwell equations that exhibit cylindrical symmetry and are sourced by magnetic fields. A number of solutions and generalizations are presented, and physical properties such as (electro) geodesics, causal structure, and shell sources are discussed. While most of the work is concerned with analytical solutions, there is also some consideration of numerically obtained solutions. In some cases, the analytical solutions obtained are not novel, and the connection to known solutions is discussed.

It my view, the thesis is of sufficient quality to merit the degree under consideration. I have questions/comments that arose in my reading of the thesis, and these appear below.

Questions/Comments:

1. Great care is taken throughout the thesis to understand the circumstances under which the derived cylindrically symmetric geometries may be physi-

cally relevant. A related topic may be their stability under perturbations. Are any results in this direction known, perhaps for the named-solutions? (This is very briefly commented upon in the conclusion, but without discussion of what is known).

2. If I am not mistaken, the metric appearing in (2.132), for negative cosmological constant, appears to be a charged generalization of the AdS soliton of Myers & Horowitz. A simple means to generate the solution would be to take the charged AdS black brane and perform a double Wick rotation of the time coordinate and one of the transverse directions. I point this out simply because the physical properties may be particularly relevant in the AdS/CFT correspondence.

3. There may be interesting connections between metric (2.250) and extremal/Nariai limits of magnetically charged black branes that could be explored. The (t, R) sector of the spacetime is a manifold of constant curvature determined by Λ: $R_{ab} = -2\Lambda$. If the value of Λ is positive, then this two-dimensional sector has constant negative curvature, and so represents an AdS_2 factor. The space transverse to this is just $\mathbb{R}^2$. An $\mathrm{AdS}_2 \times \mathbb{R}^2$ geometry is exactly what would be expected for the near horizon geometry of extremal black brane. Therefore, such a limit may provide an alternate way of obtaining the metric, and the connections to the black brane geometry could be explored.

   A similar comment applies in the case where the two-dimensional manifold is a dS_2 factor, in which case it may be obtainable as the Nariai limit of four-dimensional magnetically charged black branes with positive cosmological constant.

4. Below (2.288) there is a discussion of the electro-geodesics in this particular space-time. It is explicitly stated there, "Like in the non-cosmological spacetime of Sec. 2.4, we consider this to be another example of repulsive gravity, which is usually studied in the context of naked- singularity spacetimes."

   I agree with the assessment of this effect being due to repulsive gravity, but am somewhat confused about the comment pertaining to naked singularities. Such configurations surely do have repulsive gravity, but repulsive gravity appears too in many other less severe circumstances. For example, in the case of the electrically charged Reissner-Nordstrom black hole. In this case, radial geodesics do not research the singularity except for in the null case. Similarly, the radial electro-geodesics do not reach the singularity (even if the test particle is oppositely charged) unless their charge-to-mass ratio exceeds unity. In this case, there is no naked singularity and the repulsive effects originate from the electromagnetic contributions to the gravitational field.

Sincerely,

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