Department of Physics
Princeton University
Princeton, NJ 08544

January 26, 2015

To whom it may concern,

I have read Maciej Maliborski's thesis (though just paged through the appendices, and unfortunately did not have enough time to double check any expressions or calculations, however based on the presented results I do not have any reason to doubt the correctness of the work). In all I think it's an excellent thesis — in terms of the techniques and computation it should serve as an invaluable guide to anyone wanting to pursue solutions to similar problems, and in terms of the results contains many important advances, relevant to physics and mathematics, in understanding of this set of non-linear equations on bounded domains. So I am happy to sign off on it. Here are a few minor typo's and questions that he could address:

- Following Eqn (2.12) it says $v = S - u$, which has a different sign than (2.4).
- At the bottom of pg. 26, it specifically mentions $d = 28$ and $d = 2014$. What are special or meaningful about these cases, in particular since they aren't discussed later in the thesis?
- In (3.25) and similar calculations later, it states that the higher order terms are uniquely determined by the low order term. I presume this does not simply follow from smoothness requirements, but also applying the relevant equations, and it would be useful if this is explicitly stated, at least the first time these boundary conditions are discussed.
- The statements about Kreiss-Oliger dissipation on pg. 49 are a bit incongruous — it's first stated that $0 \leq \epsilon < 1$ is needed for stability, but later it says if $\epsilon > 0.1$ is needed to stabilize the evolution (implying the scheme *is* stable), the scheme is unstable.
- The caption of Fig. 5.24 says $\epsilon = 10^{-2}$, but the text on the previous page it says 10^{-4}.

In summary, I believe Maliborksi has fulfilled the thesis requirements for a PhD, and recommend it for the defense presentation.

Yours sincerely,

Frans Pretorius
(fpretori@princeton.edu)