Magnetic Modelling
21/05/2013

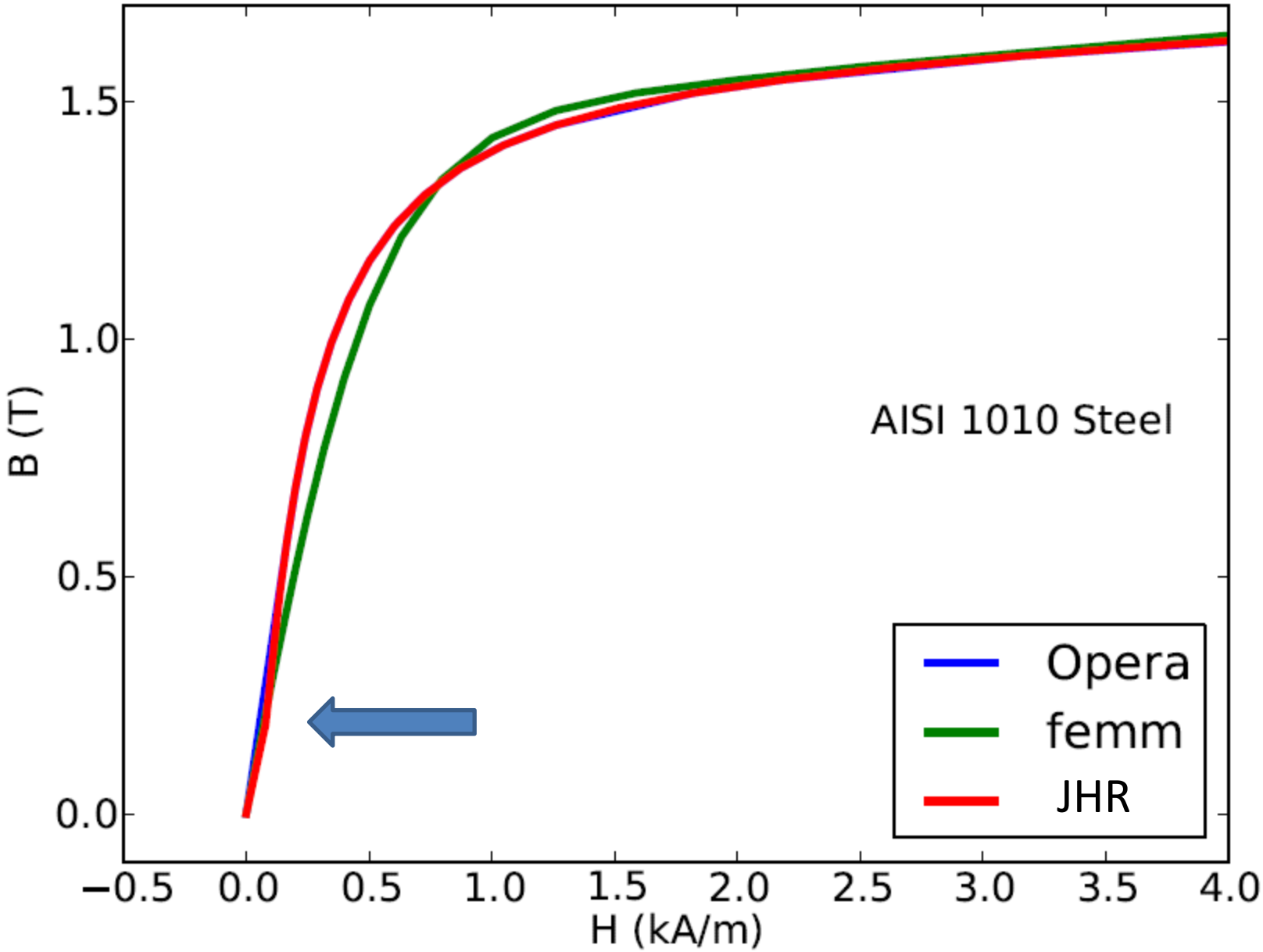
After reporting last week that I had found the problem with the Hall model (volume meshing errors) and fixed it the problem duly returned within the next day. However this time the Hall model got stuck in the solver in a much later iteration, namely iteration 5 rather than 2.

I discussed this with Klaus at VF, and as he hadn't been able to find any further specific problems with the hall model he kindly started to run multiple copies of the model in parallel with some small tweaks to each model. In one case we also tried running identical models for comparison purposes as the mesher on his version of OPERA (15R3/16) behaves slightly differently to the one on my version of OPERA (15R2).

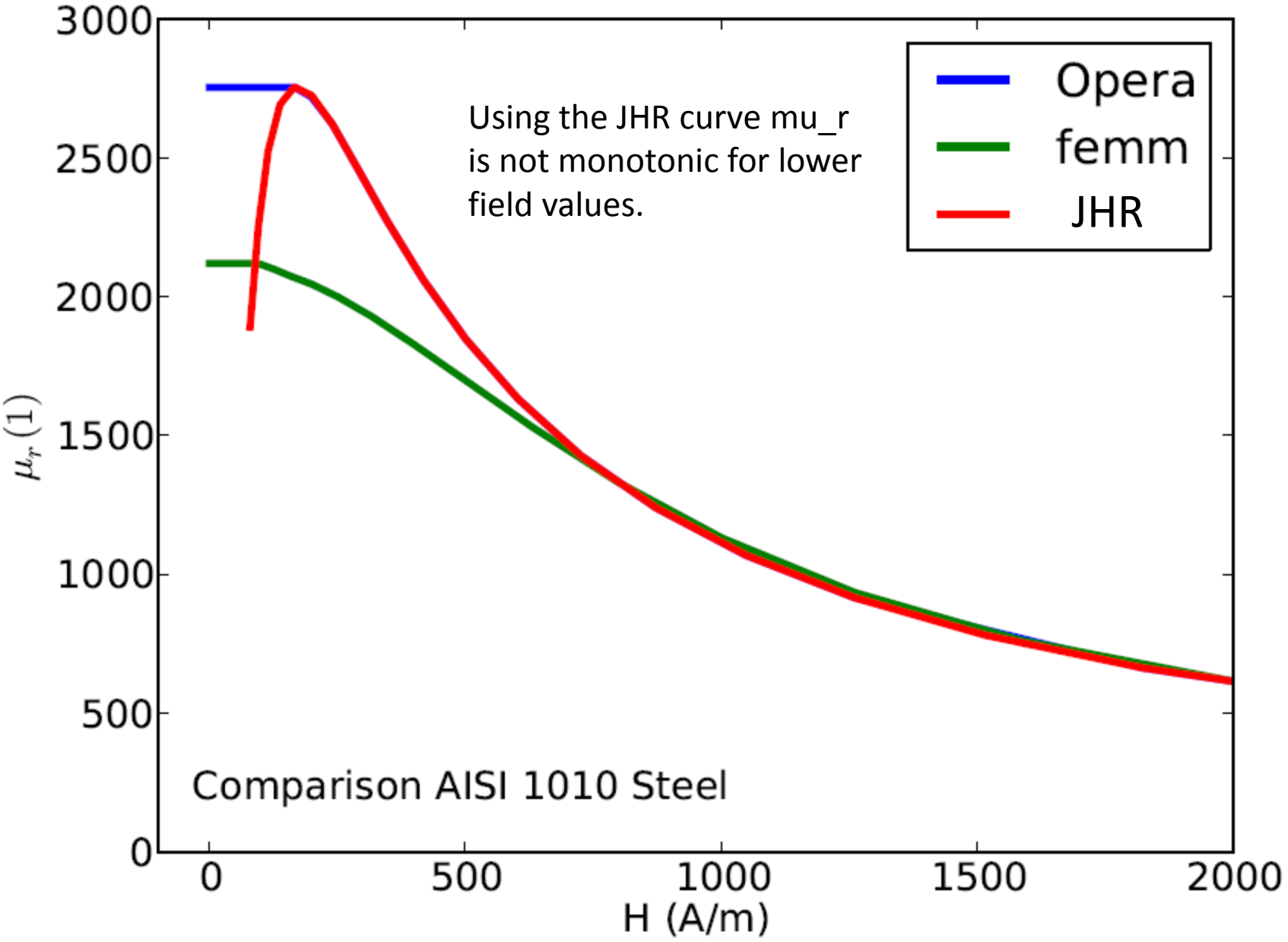
Further to advice from Holger a couple of weeks ago we got to the point where we started to try changing out the material properties to see what effect that this would have on the solution. In the end it turned out that changing the BH curve for the AISI1010 back to the default OPERA BH curve seemed to solve the problem. Not only that but it was also giving significant improvements to the solve time? This has now been demonstrated by both Klaus and myself.

So what was wrong with the BH curve we were using?

Plot kindly produced by Holger Witte



Plot kindly produced by Holger Witte



So with hindsight I wished I'd tried this sooner… In my defence I wanted to understand the cause of the problem and there were several small problem (and one large one) with the Hall model that needed addressing first.

The biggest problem has been due to the long solve time of the Hall model, so it was just unfortunate that this problem has reared it's head so far down the development cycle where the model is sufficiently complex that it can take several days to solve.

Interesting comparisons: (From what I understand Klaus machine is not as fast as the machine I'm using)

Model 84 (Simplified Hall Model)		
(JHR BH)	my system (15R2):	Would not solve. (Well gave up)
(JHR BH)	Klaus' system (16):	69 hours solve.
(OPERA BH)	Klaus' system (16):	43 hours solve.
Model 86 (Simplified Hall Model) – older comi code – much poorer mesh		
(OPERA BH)	my system (15R2):	36 hours solve,
(OPERA BH)	Klaus' system (16):	8h40 solve.
Model 85(Full Hall Model – Latest Mesh)		
(OPERA BH)	my system(15R2)	51 hours solve
Model 78(Full Hall Model – ~nearly latest Mesh)		
(JHR BH)	my system(15R2)	113 hours solve

Opera 16 is released tomorrow. I'm looking forward to getting my hands upon it!

Addressing the Fry List

I had commented last week that I'd started looking at the items on the Fry list above the North Mezzanine and comparing them to predicted field levels in my model.

I also looked at the items on the list beneath the mezzanine and compared that to the Hall model.

The results of this comparison are in two .ppts that I've not yet circulated.

I think this was a useful first pass but it has highlighted a problem.

The components on the Fry list have been put in drawings, but the drawings are not dimensioned. This has meant that there has been some guesswork as to the location of some of these items. For some items this guesswork is not important but for other items it is.

I want Craig to look at these .ppts so I can get an opinion whether we need to formulate a plan for improving the comparison. Does our information on the location on some of these items need improving.? Do we need to ask Luke to dimension every item in these drawings? When I'm happier with the methodology for doing the comparison I will start circulating the results from this and looking at other areas.

Plan

To get hold of OPERA 16 and to see if I can get it working. I accept there may be a few areas of meshing that need to be addressed but we now have evidence that the hall model will work with the latest version of OPERA and that significant performance gains can be realised. I think it is worth spending a bit of time spent trying to transition.

We haven't had a full set of models put through the solver for some time and I want to do this to take account of all the changes that have been made in the model over the last couple of months.

To formulate a plan to tackle the Fry list. I have done one iteration of this down the North Wall but in my opinion I think we need more information on the location of some of the items. I will discuss this with Craig tomorrow.

Mike and myself are trying to arrange a trip to see VF but I haven't yet been given a date by Klaus.