



FloWave TT and the University of Edinburgh

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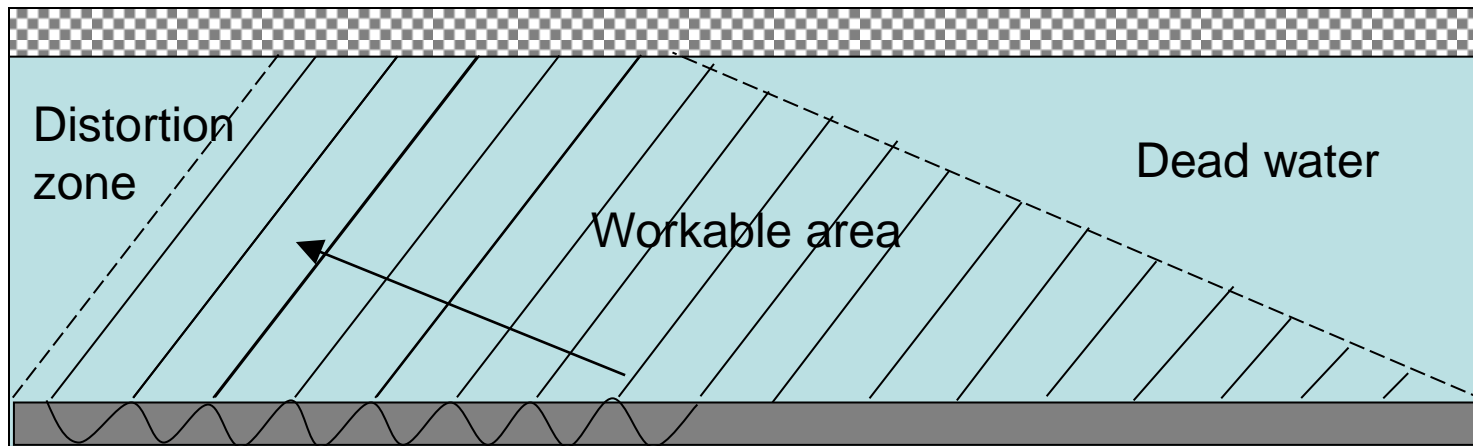
History: 1970s

The Edinburgh wide wave tank



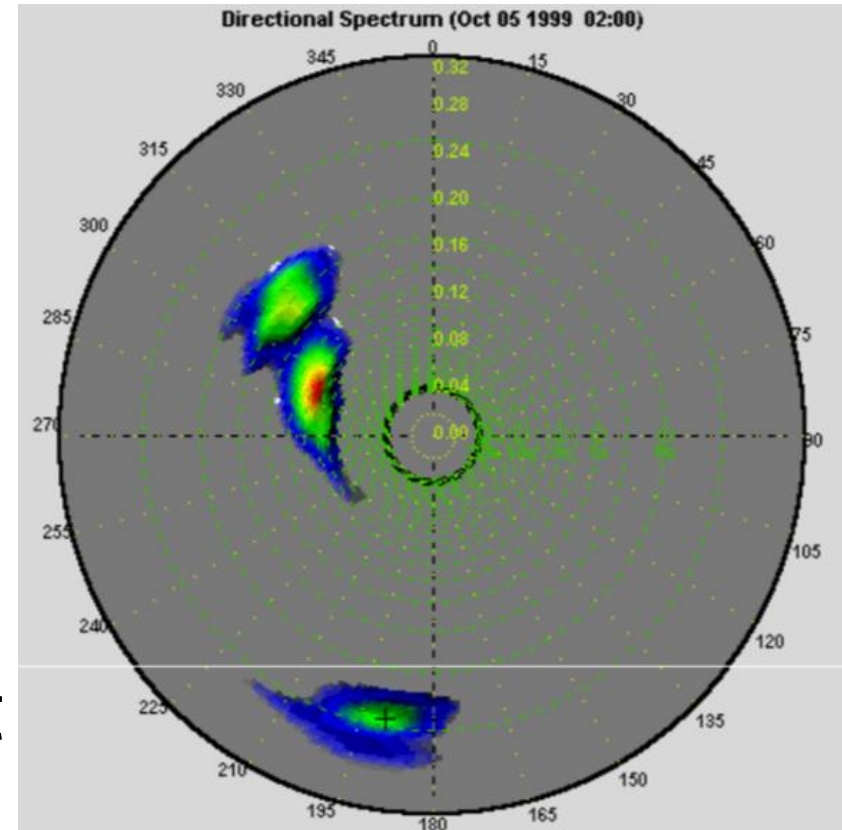
The Wide Tank and Direction

- The aspect ratio of the wide tank, with side walls far shorter than its width, gave it very good directional characteristics
- And, maximised the useable area



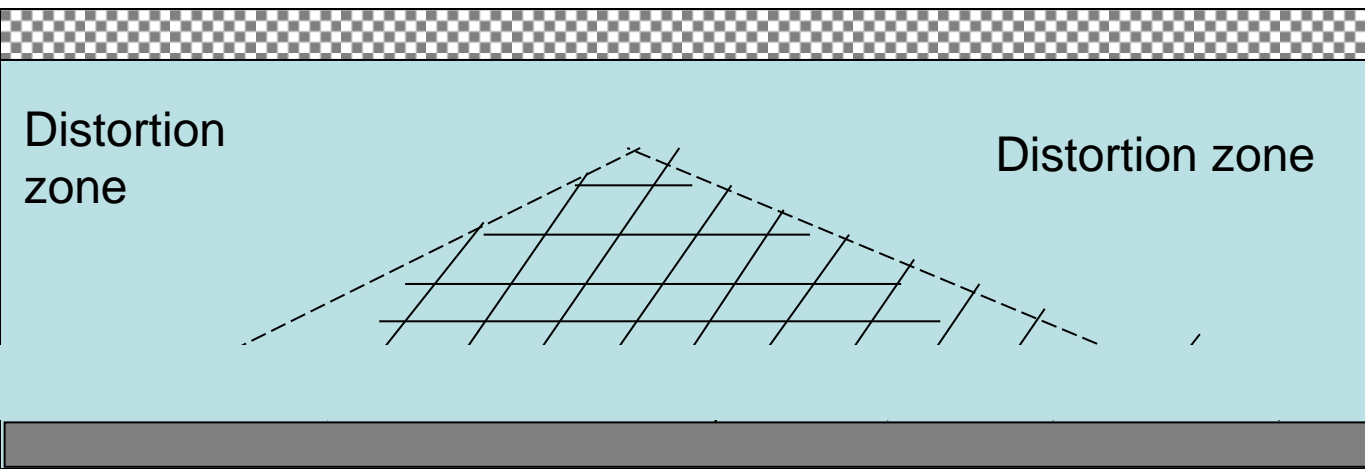
The Importance of Direction!

- Real ocean waves do not necessarily have a well defined direction
- Storm seas can be distributed over a wide range of directions
- There may be swell present with very different directional and frequency characteristics



Directionality and the Design of Wave Tanks

- Side walls, either reflecting or absorbing will have a detrimental effect on the reproduction of multi-directional wave fields
- This led us to the next stage in the philosophy of directional facilities- elimination of side walls!



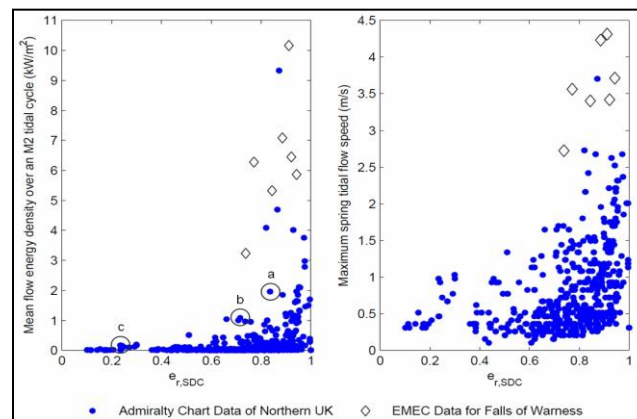
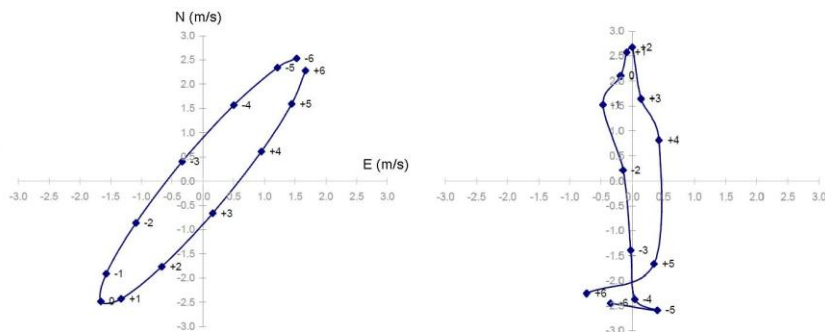
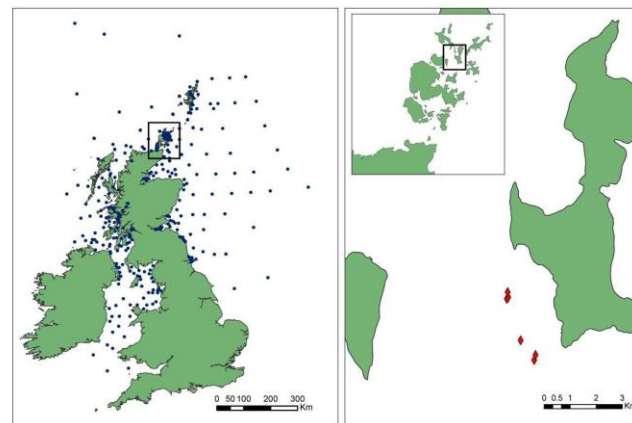
The Curved Tank

- This facility has only one side wall
- The wave-making array is a 90deg arc of absorbing wave flaps



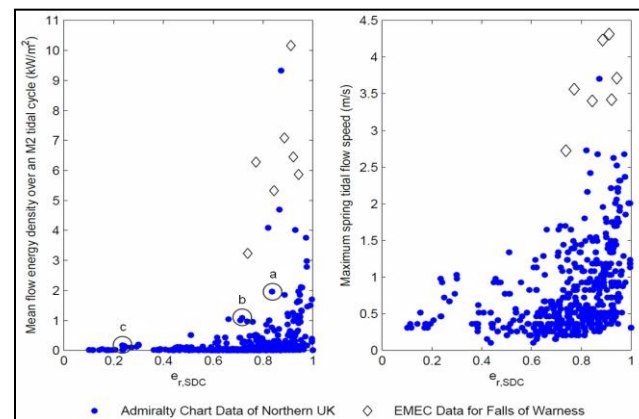
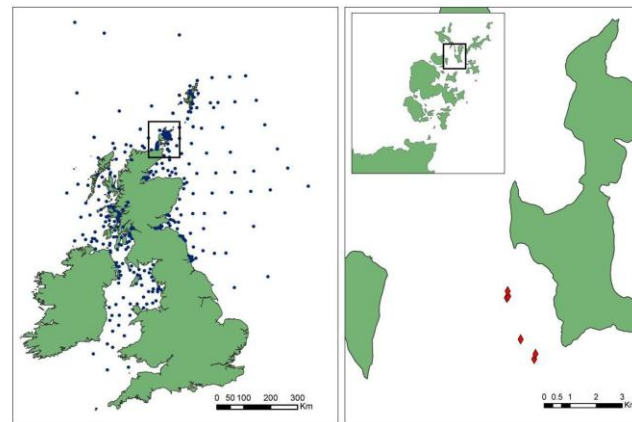
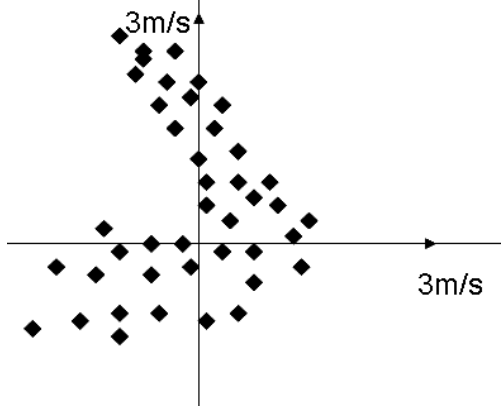
Current Directionality

- Tidal currents, just like waves, are not simple unidirectional, or even bidirectional effects
- 360° capability will be significant



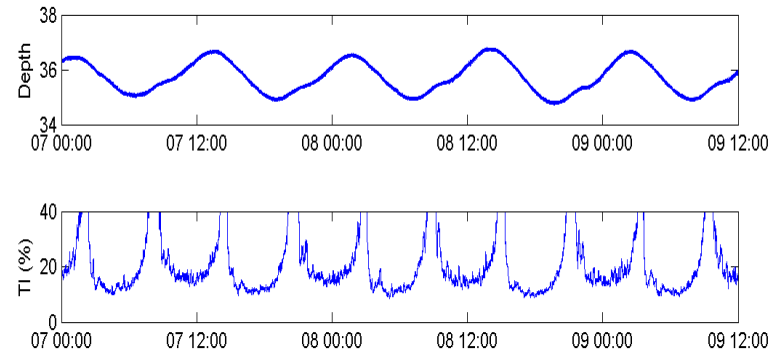
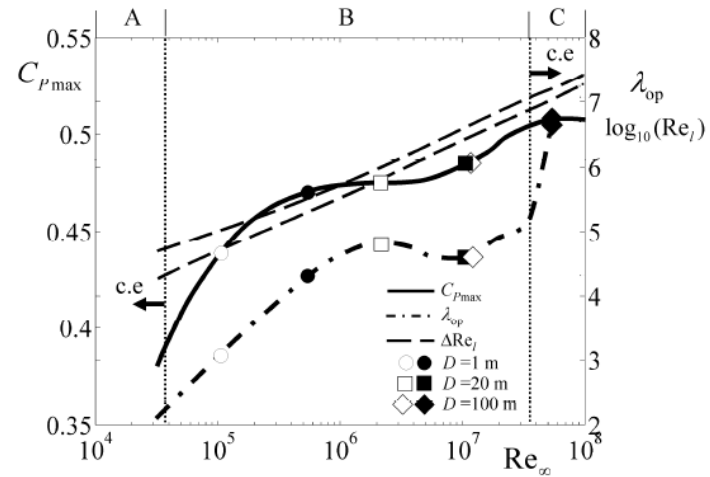
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Further Facility Design Issues

- Scaling analysis of tidal energy effects, suggests that $1/20^{\text{th}}$ is the smallest totally robust option
 - otherwise Reynolds effects will prevent robust interpretation!
- Turbulence in coastal flows is likely to exceed 12%, with eddy sizes comparable with the dimensions of tidal devices





The FloWave Brief

- Totally circular, with no side walls for an uncompromising directional capability
- 2m working depth to allow robust simulation of all conceivable development environments at 1/20th to 1/40th scale.
- Multidirectional waves with heights of up to 700mm
- Multi-directional currents with depth averaged speeds of up to 850mm/s at turbulence levels below 7%
 - allowing synthetic addition of “designer turbulence” up to and beyond realistic levels
 - Higher speeds available with higher turbulence levels

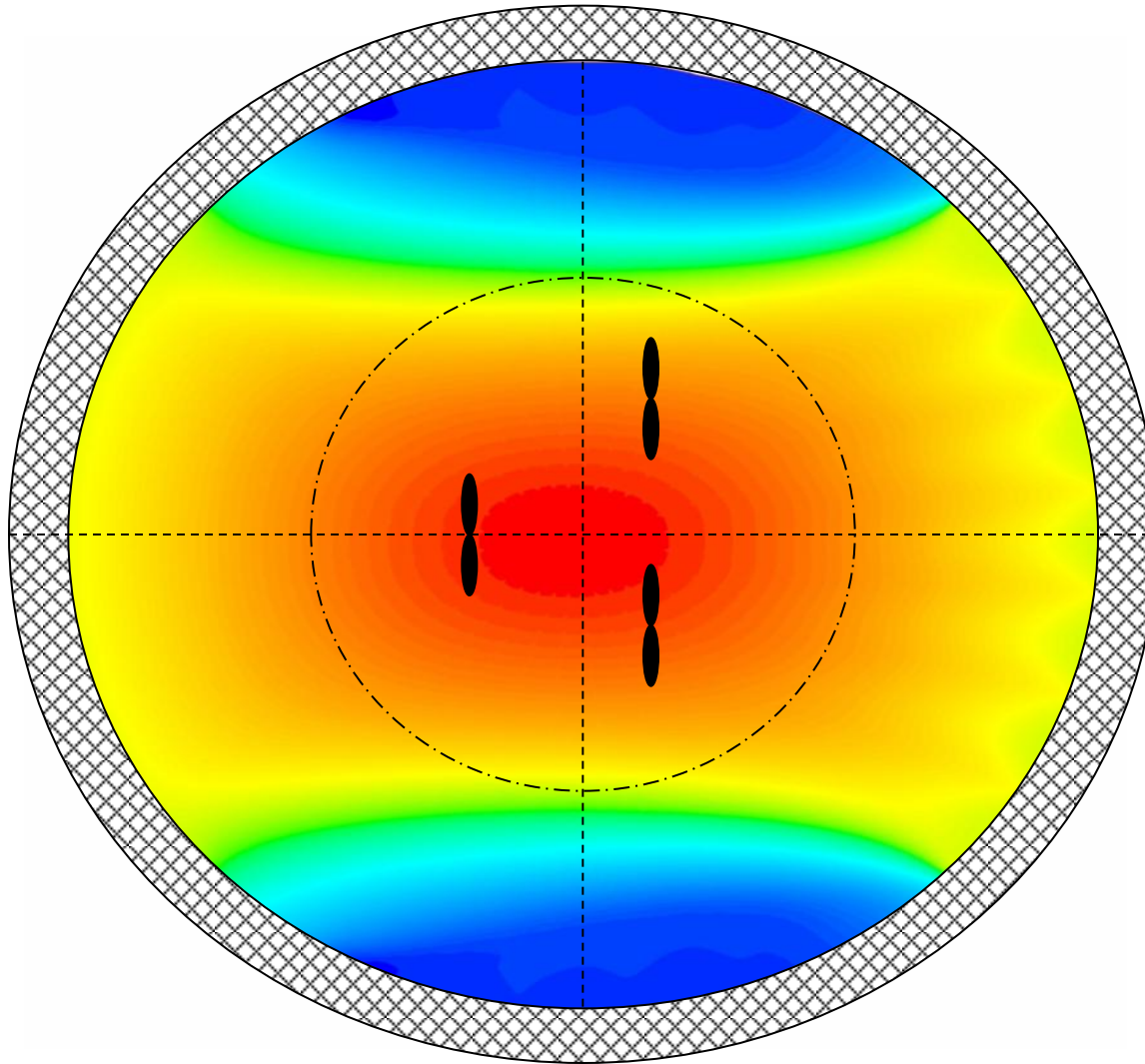
FloWave in 2013



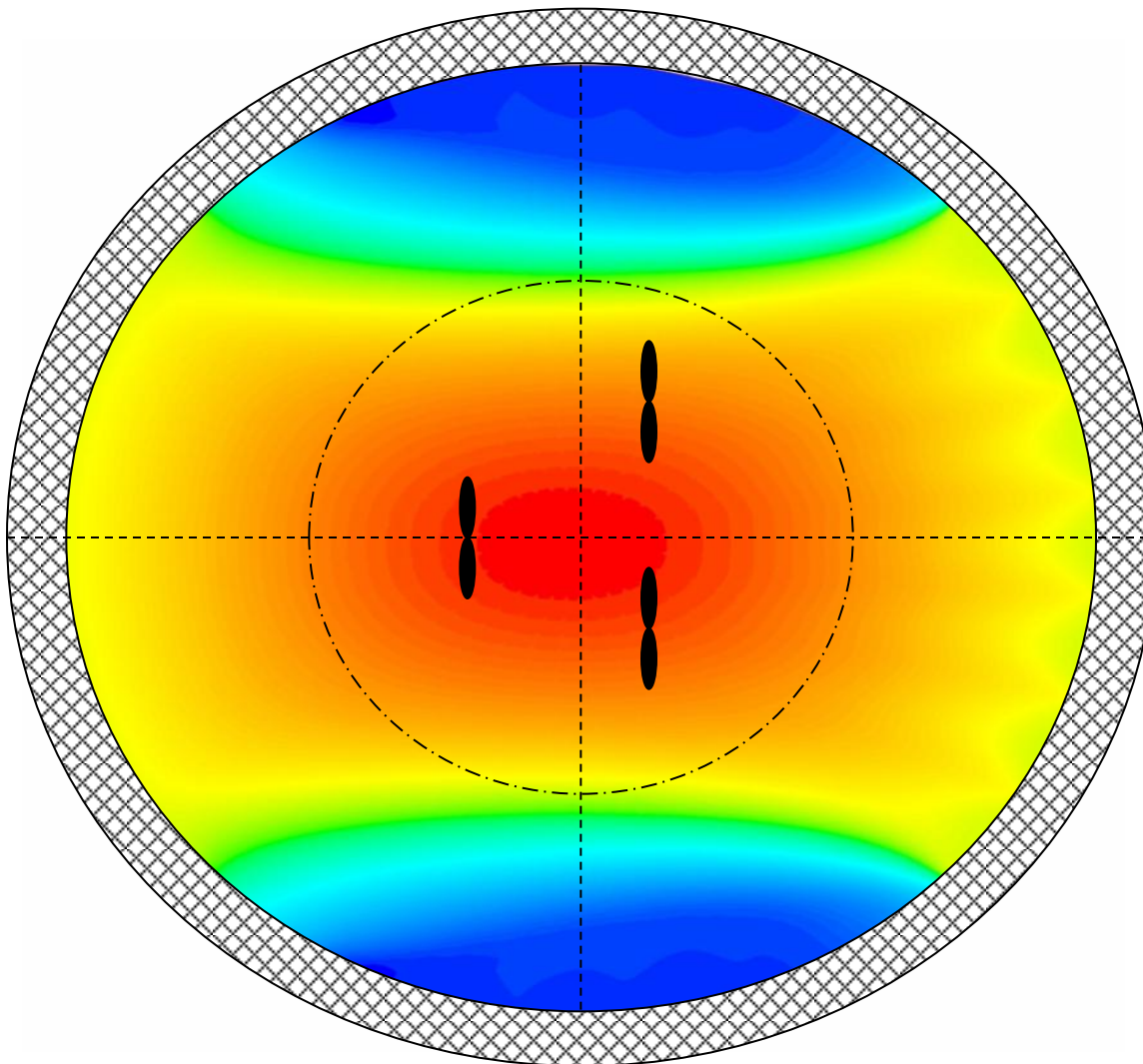
Cutaway



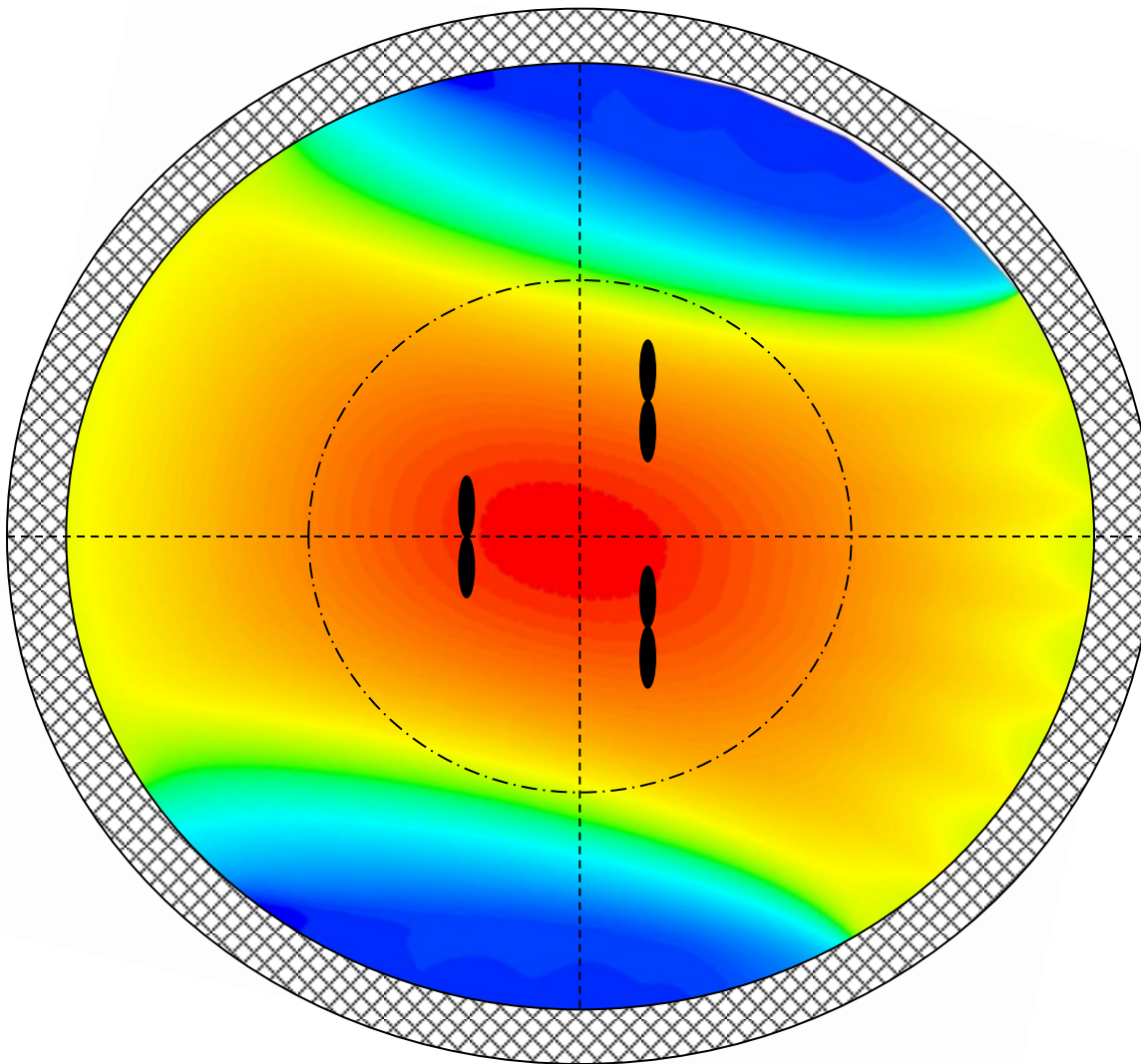
360° Tidal Array Testing



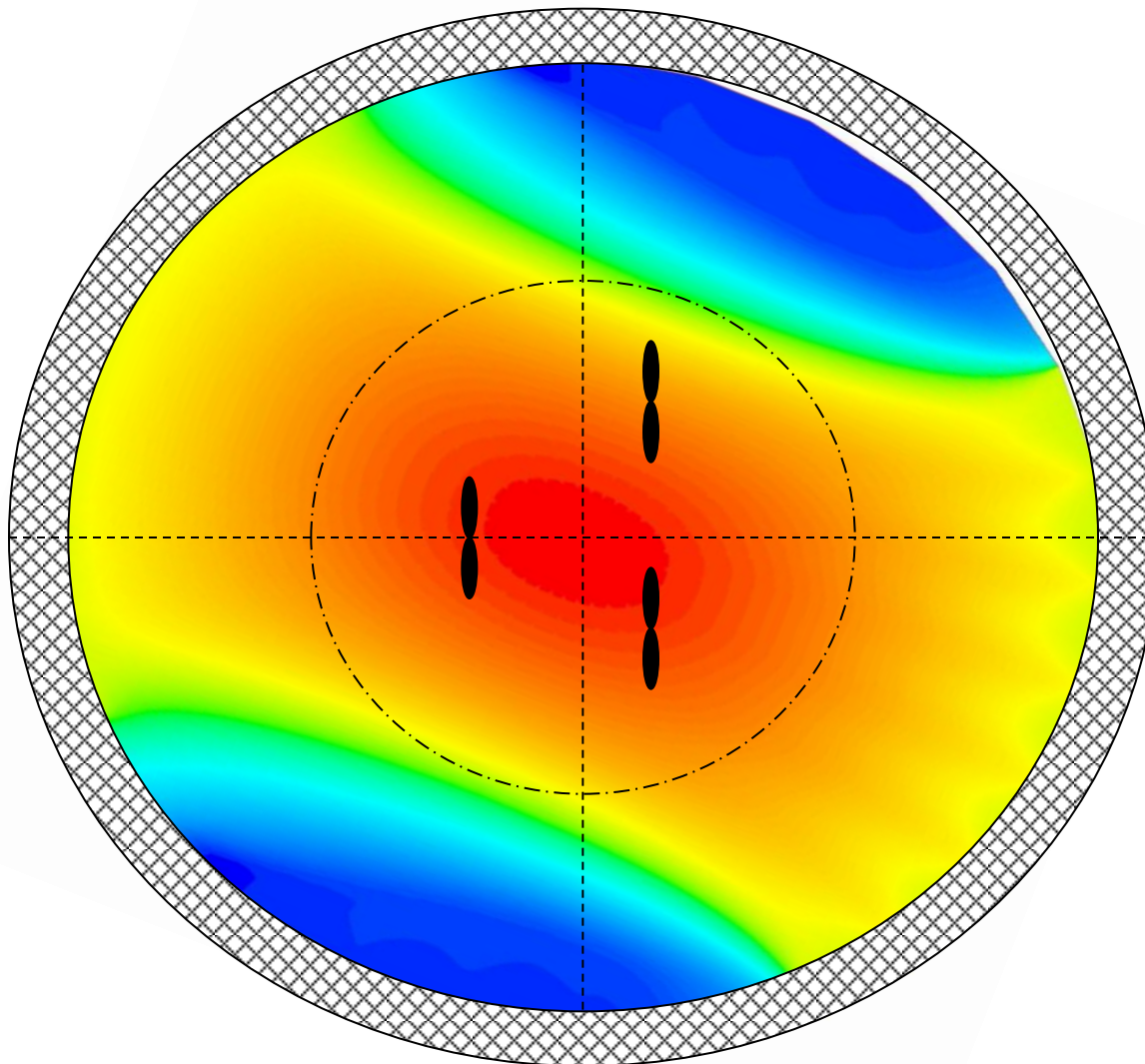
A Tidal Array Simulated in Multidirectional Currents



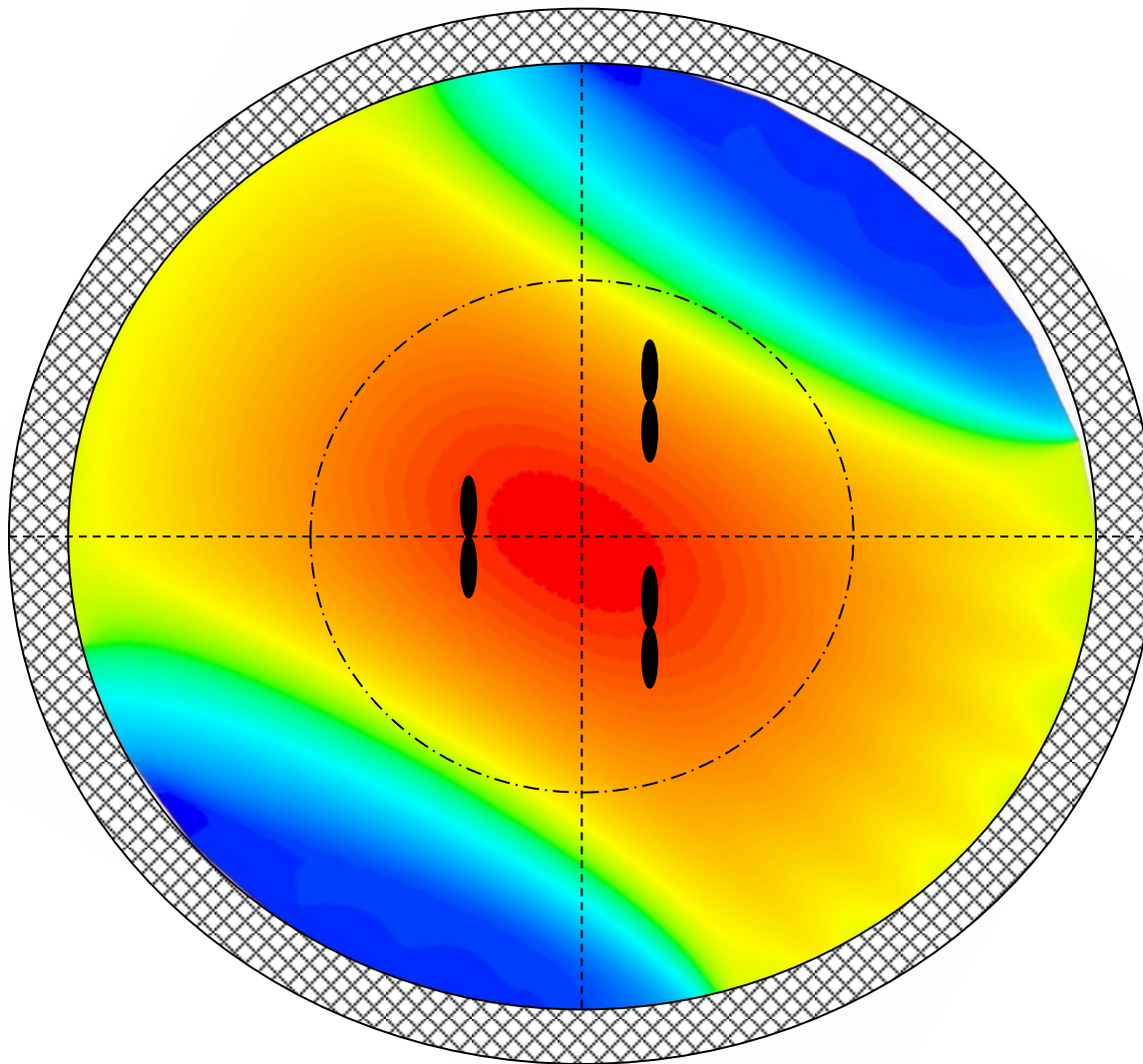
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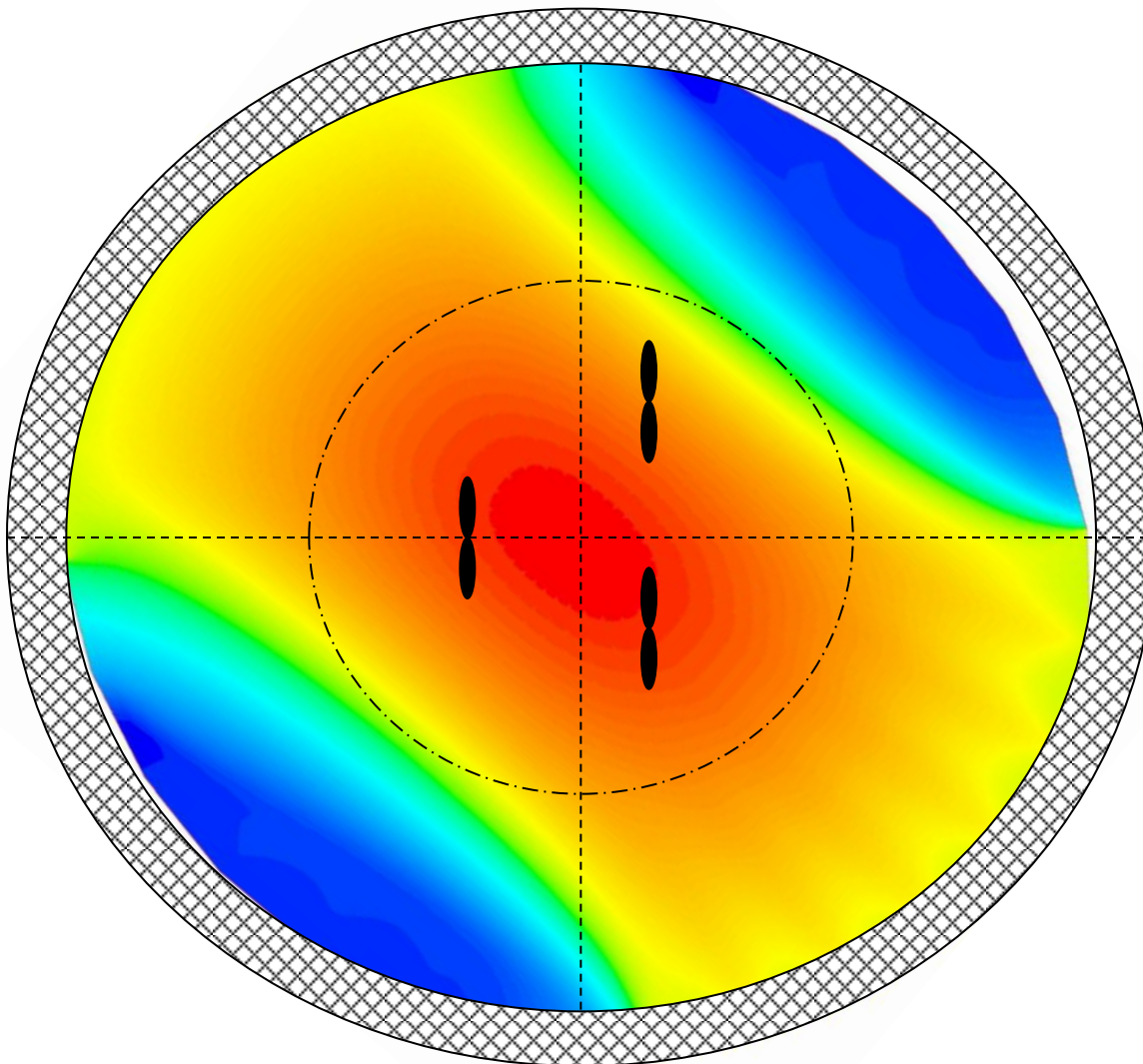
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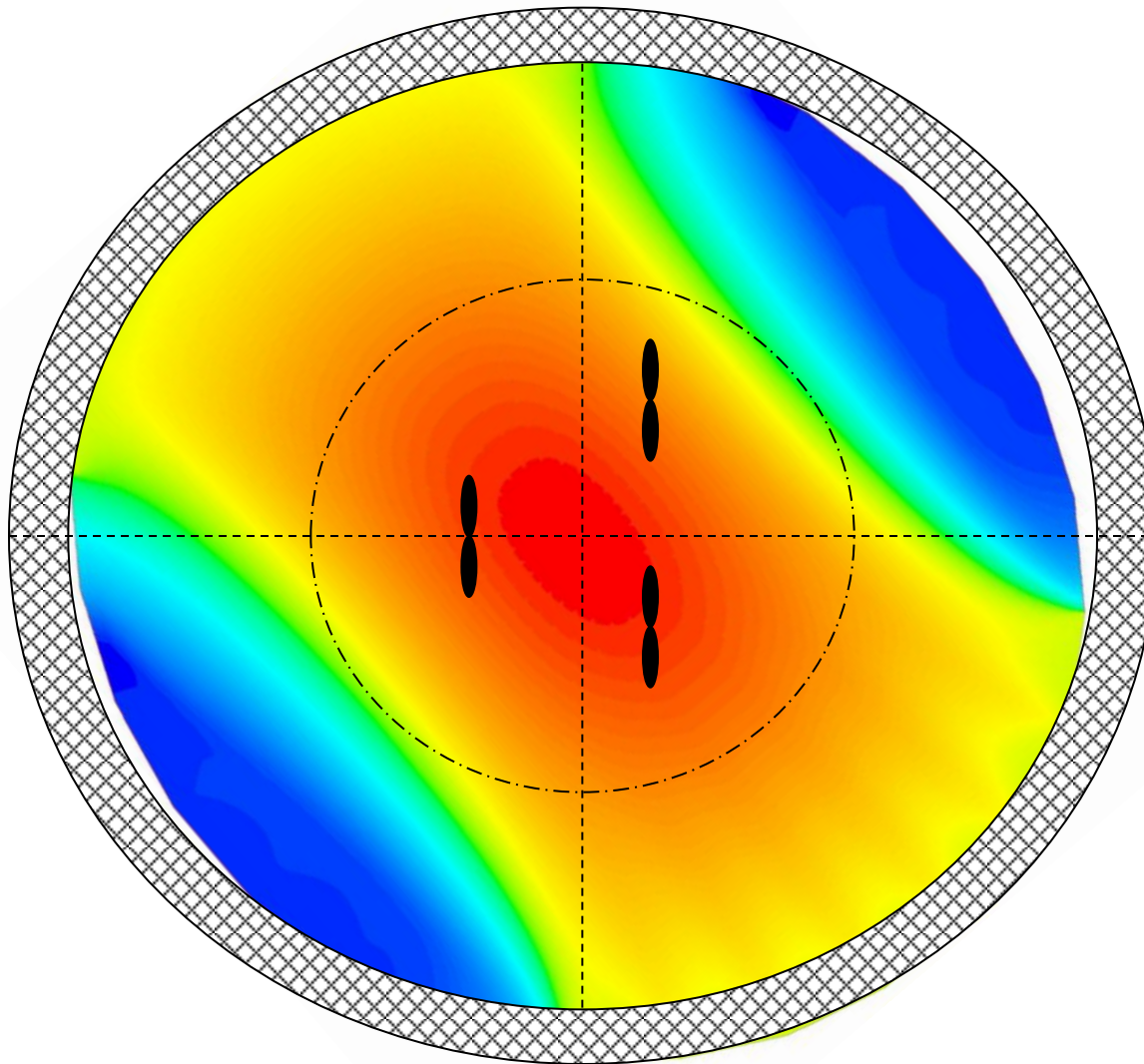
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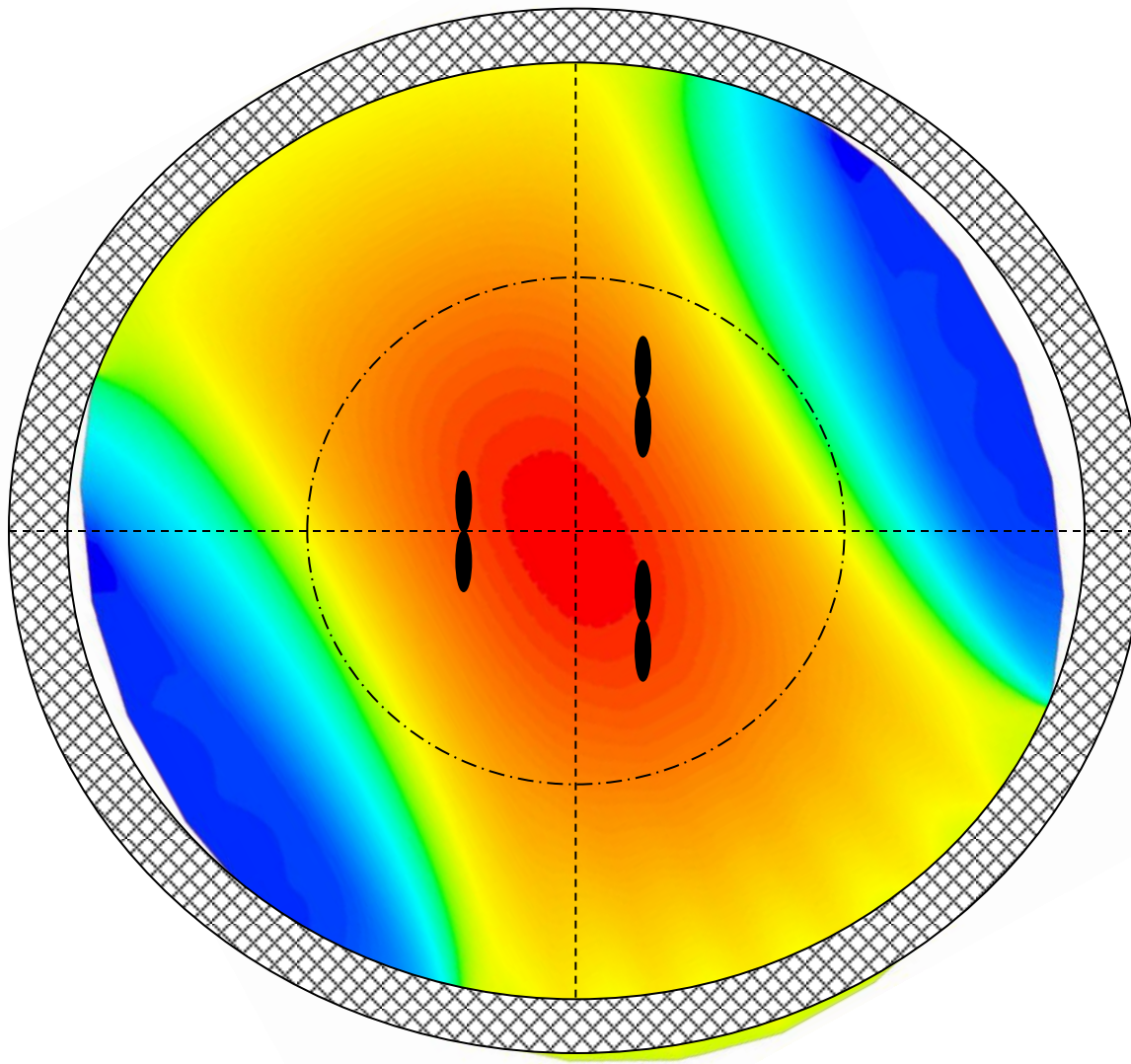
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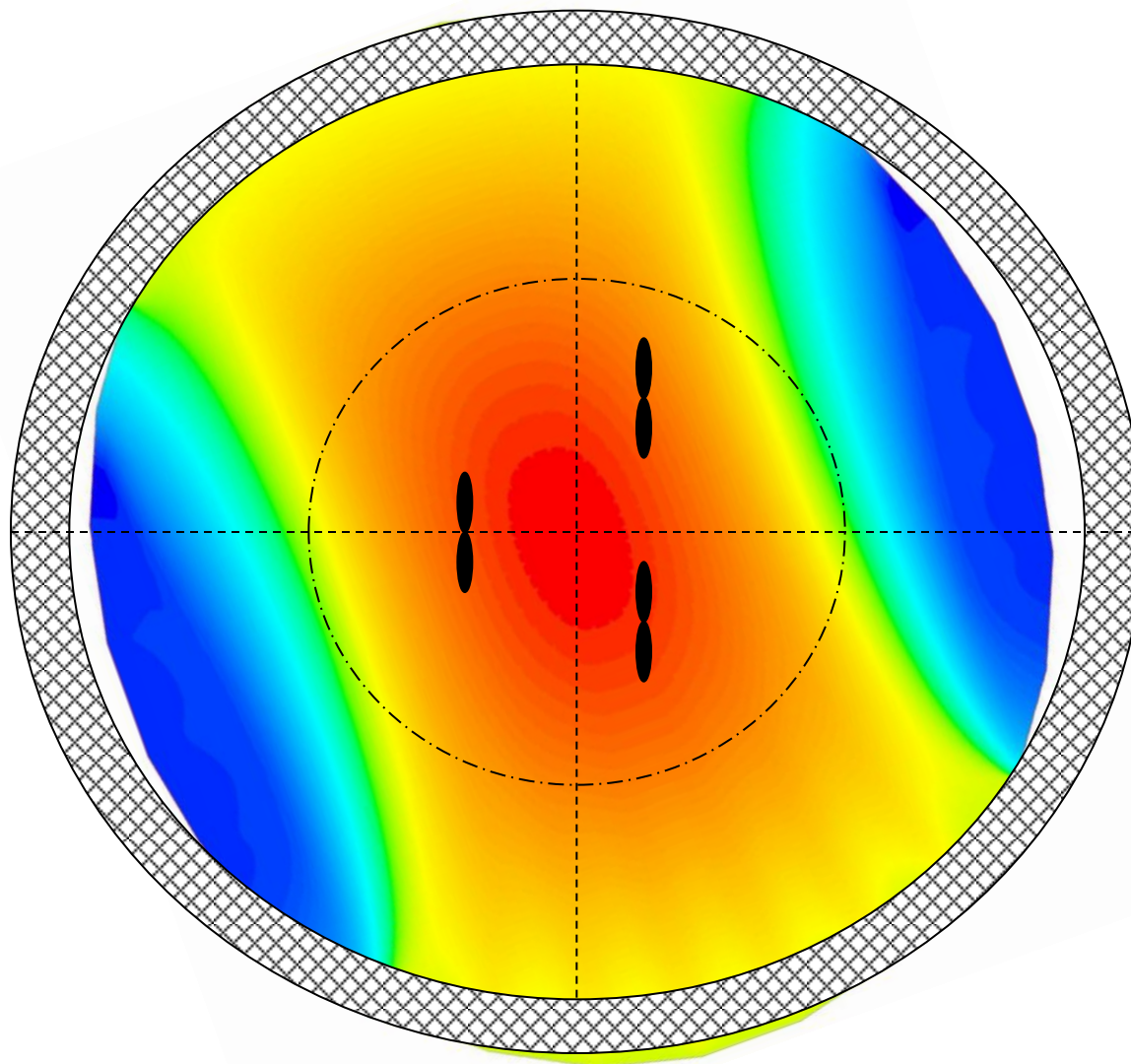
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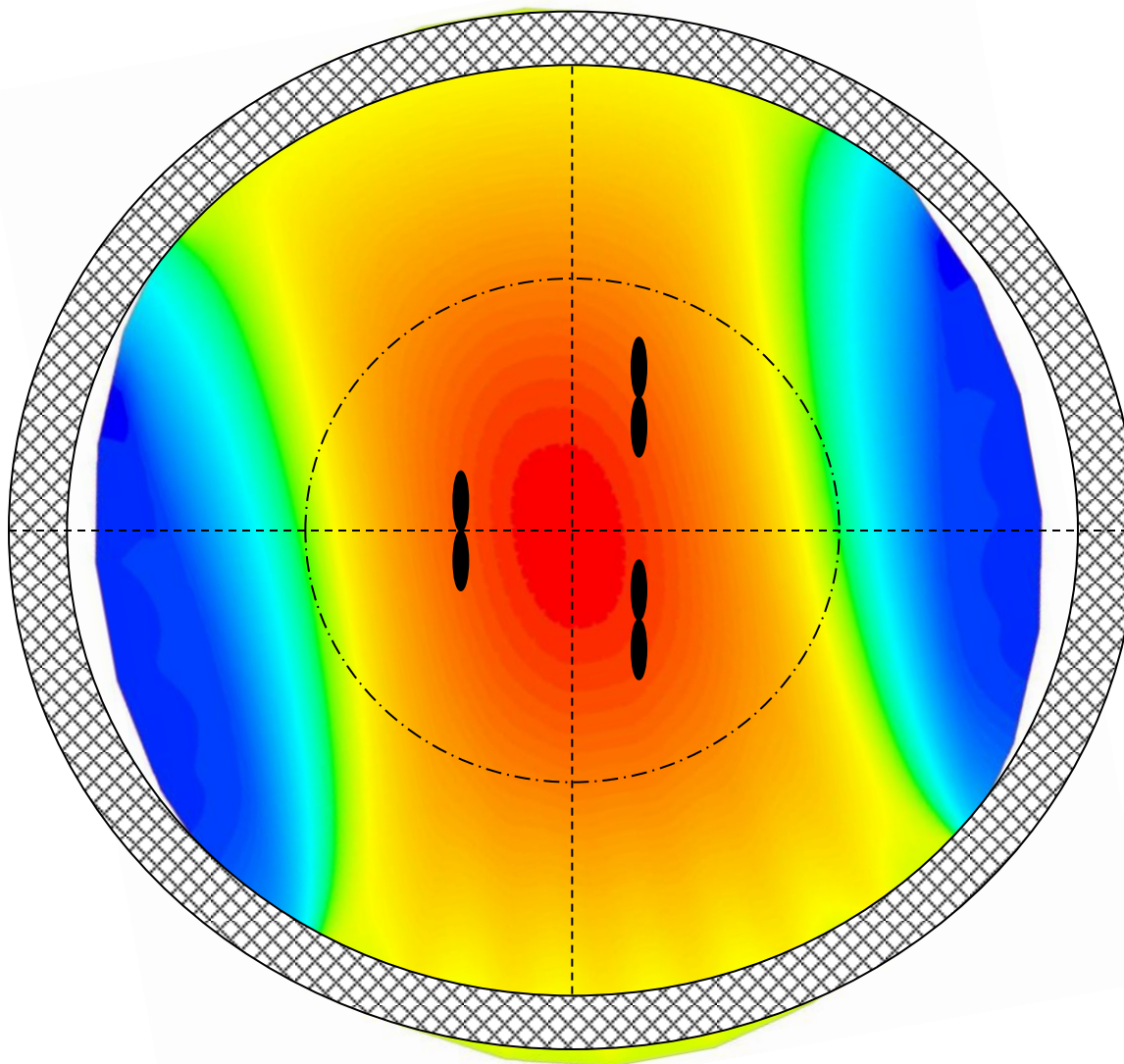
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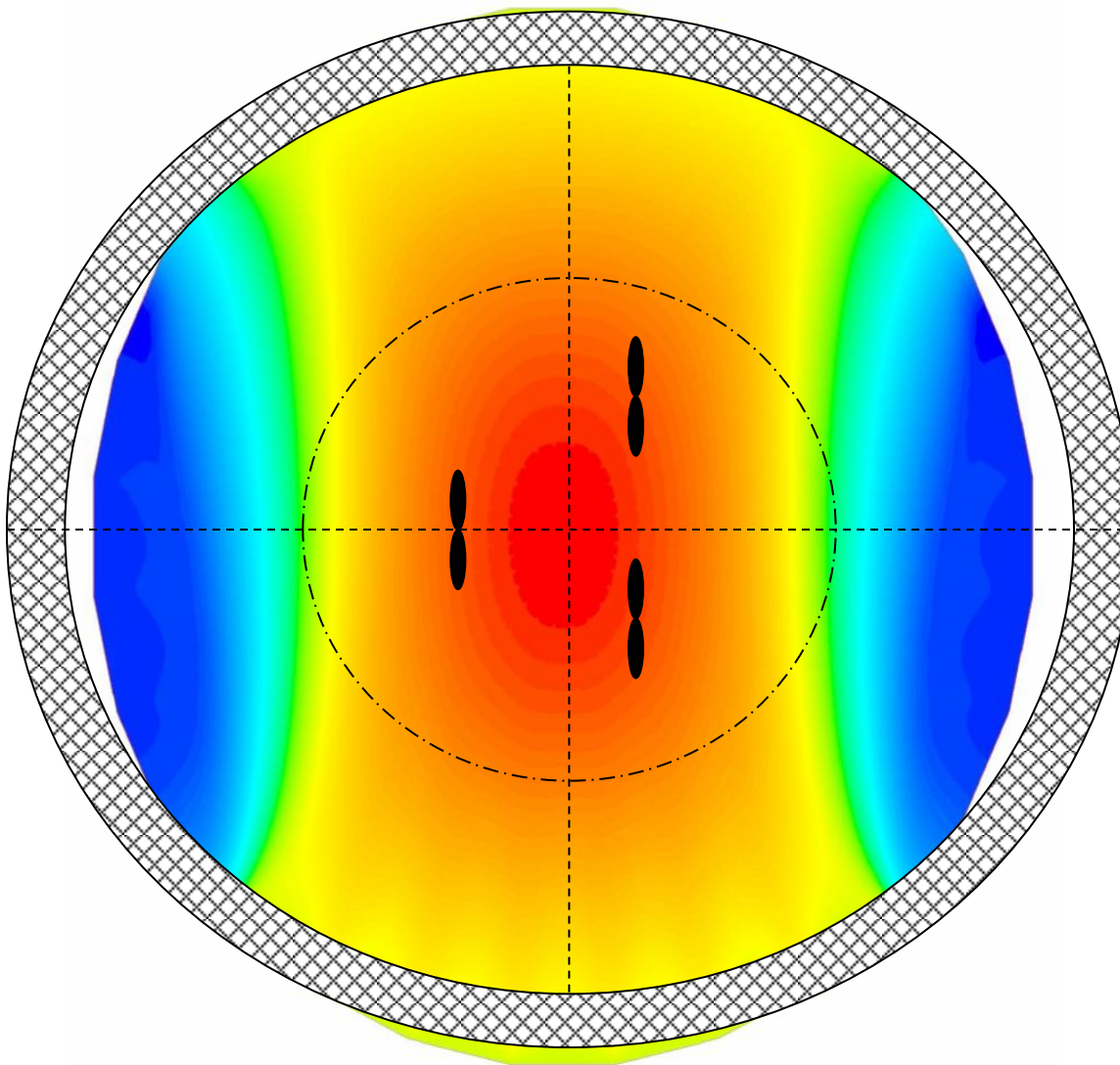
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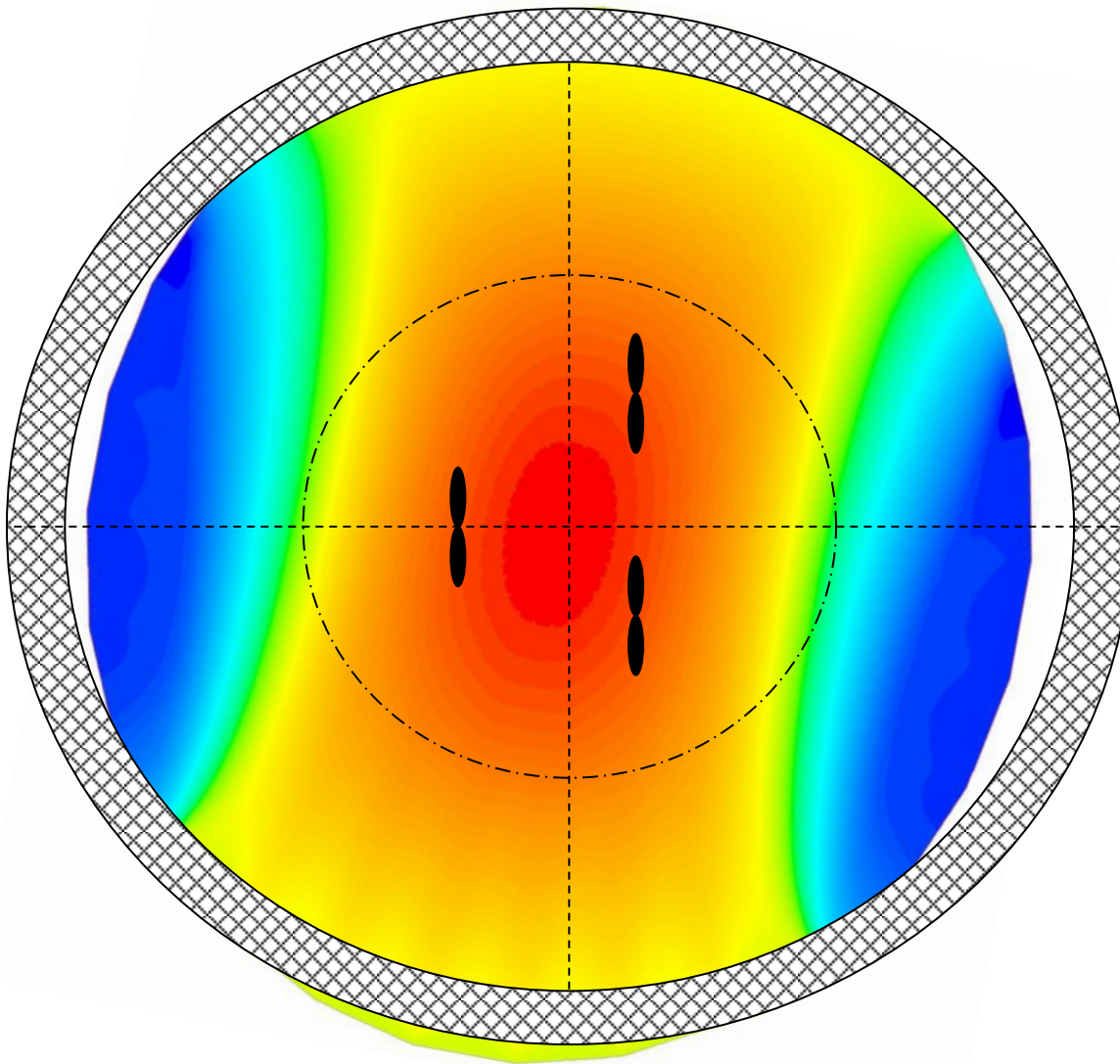
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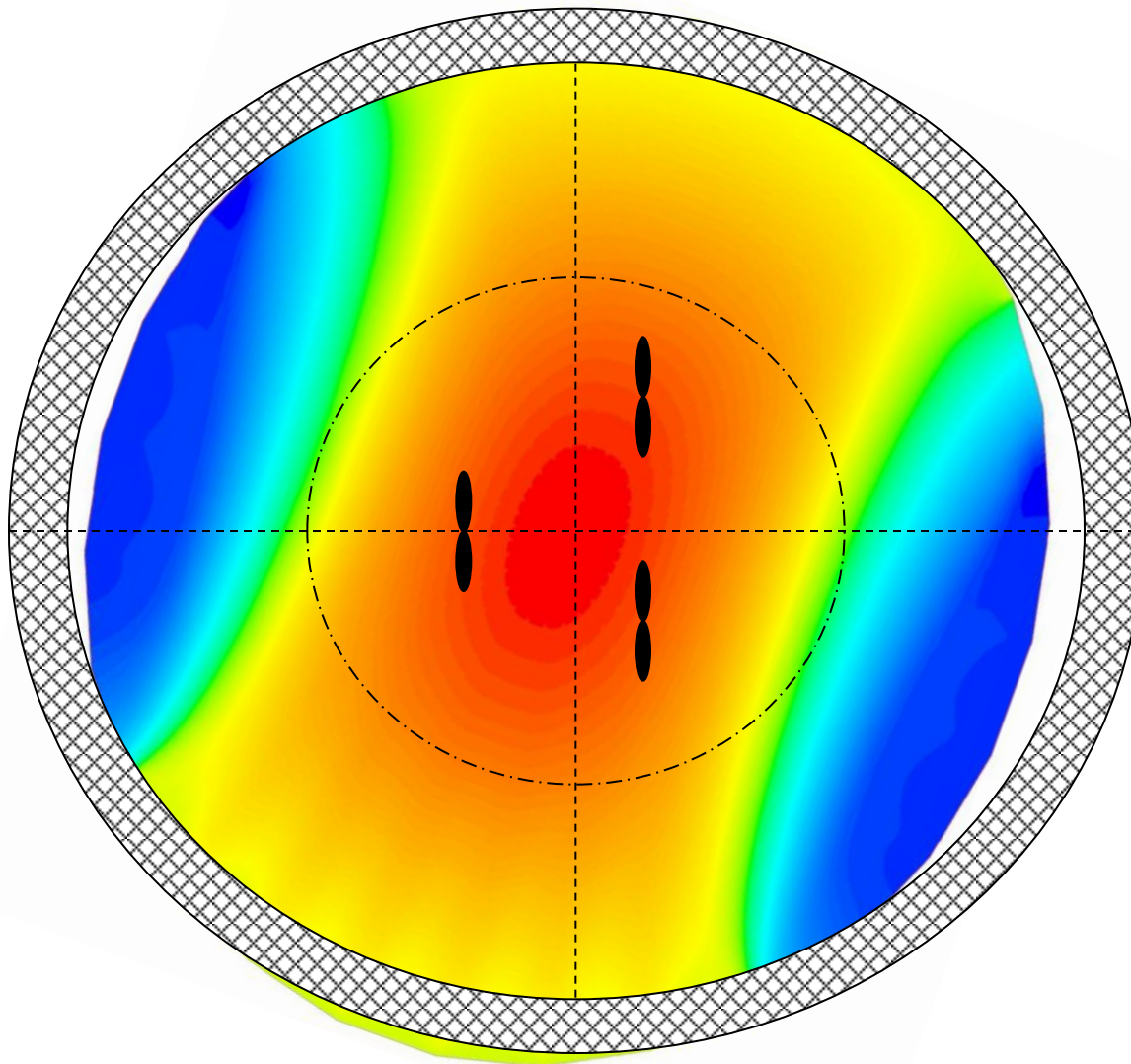
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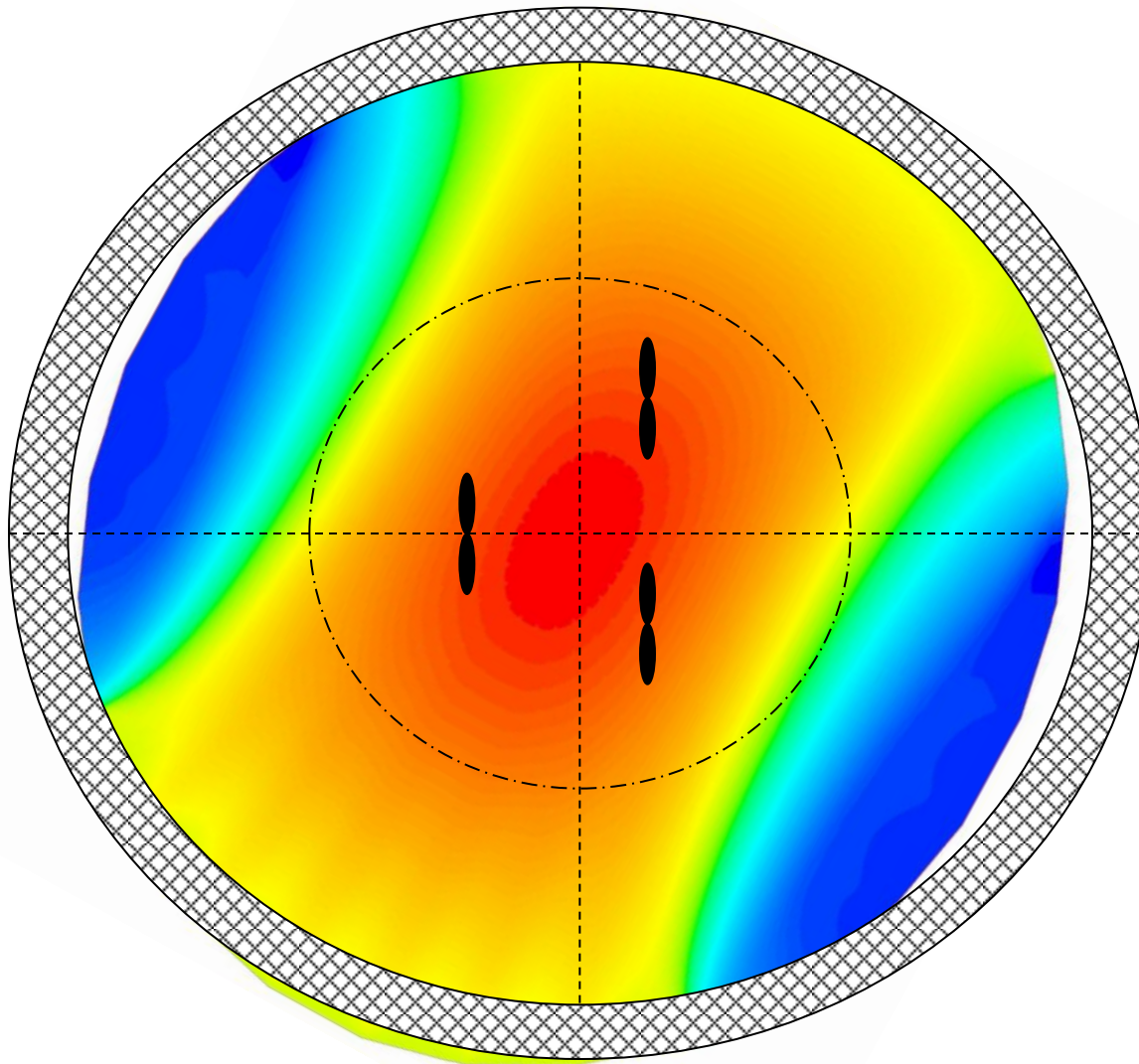
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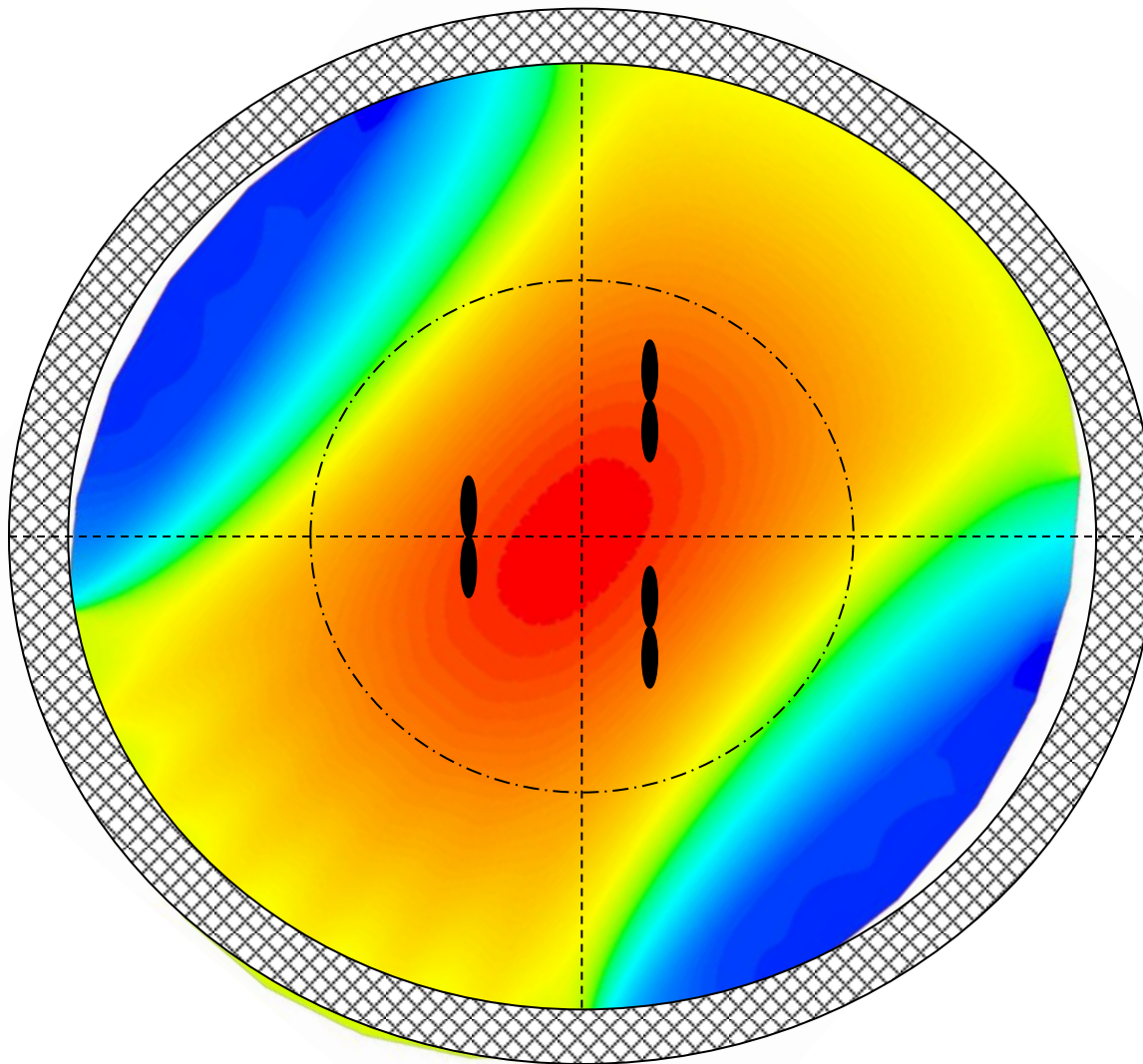
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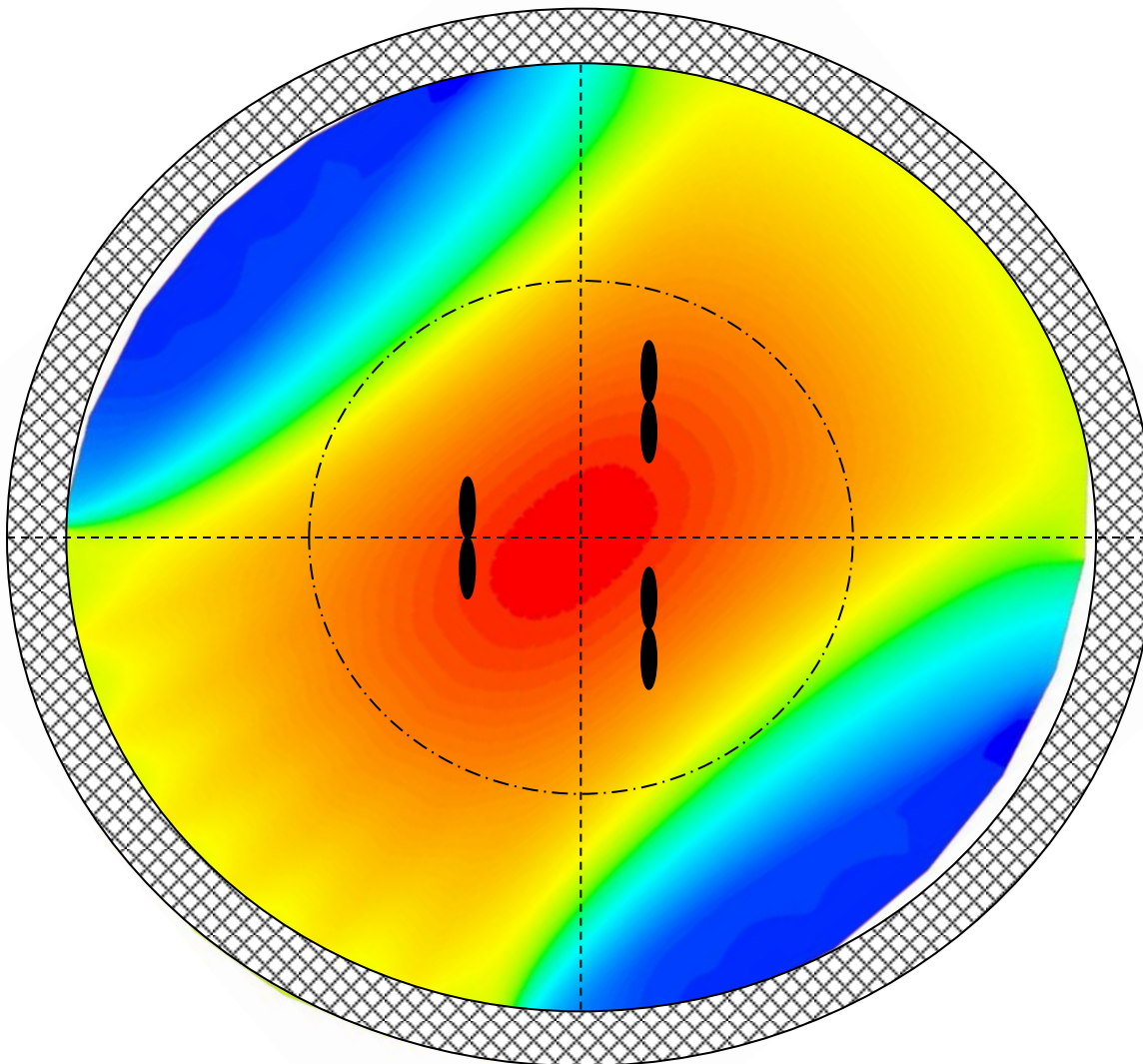
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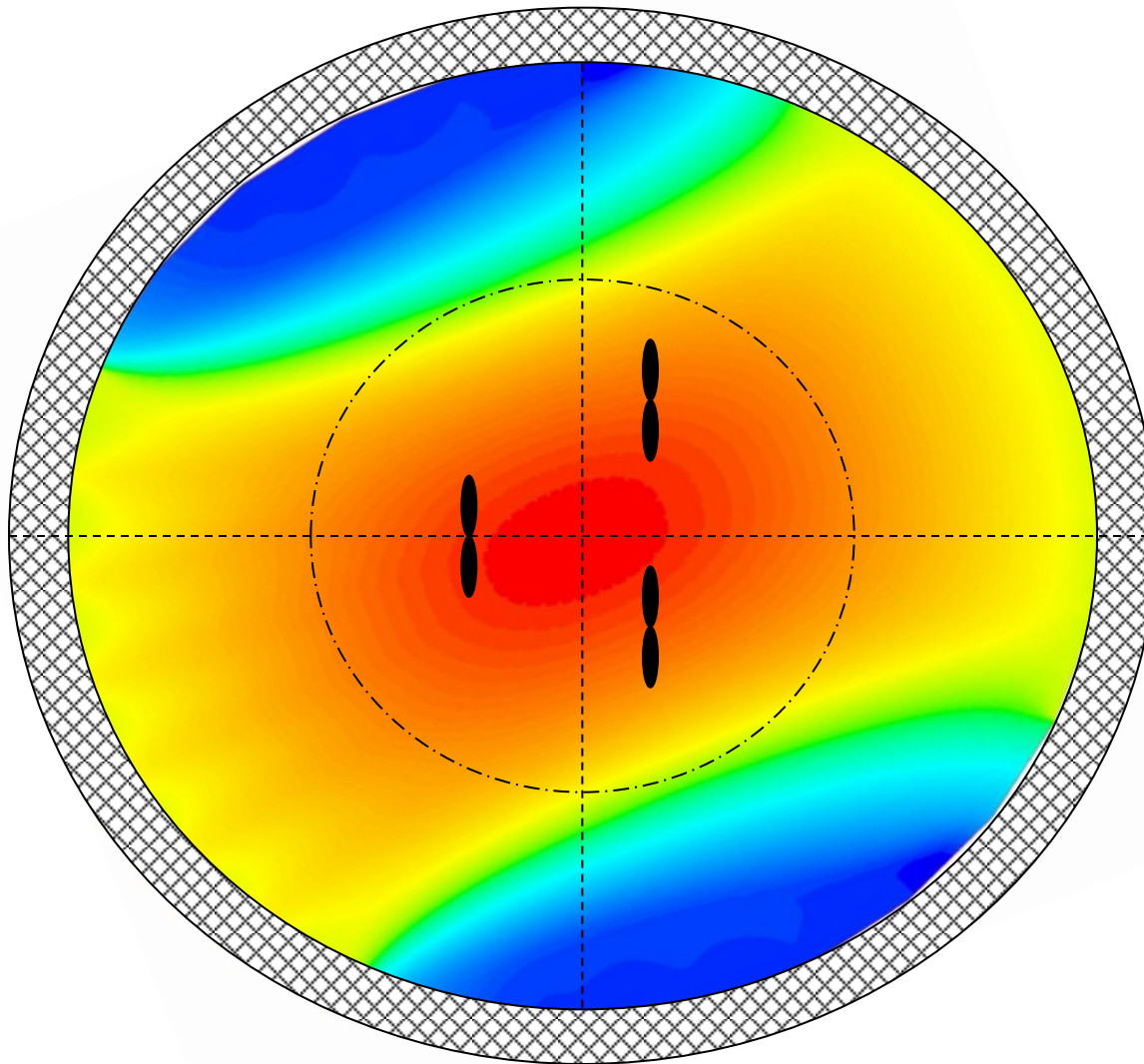
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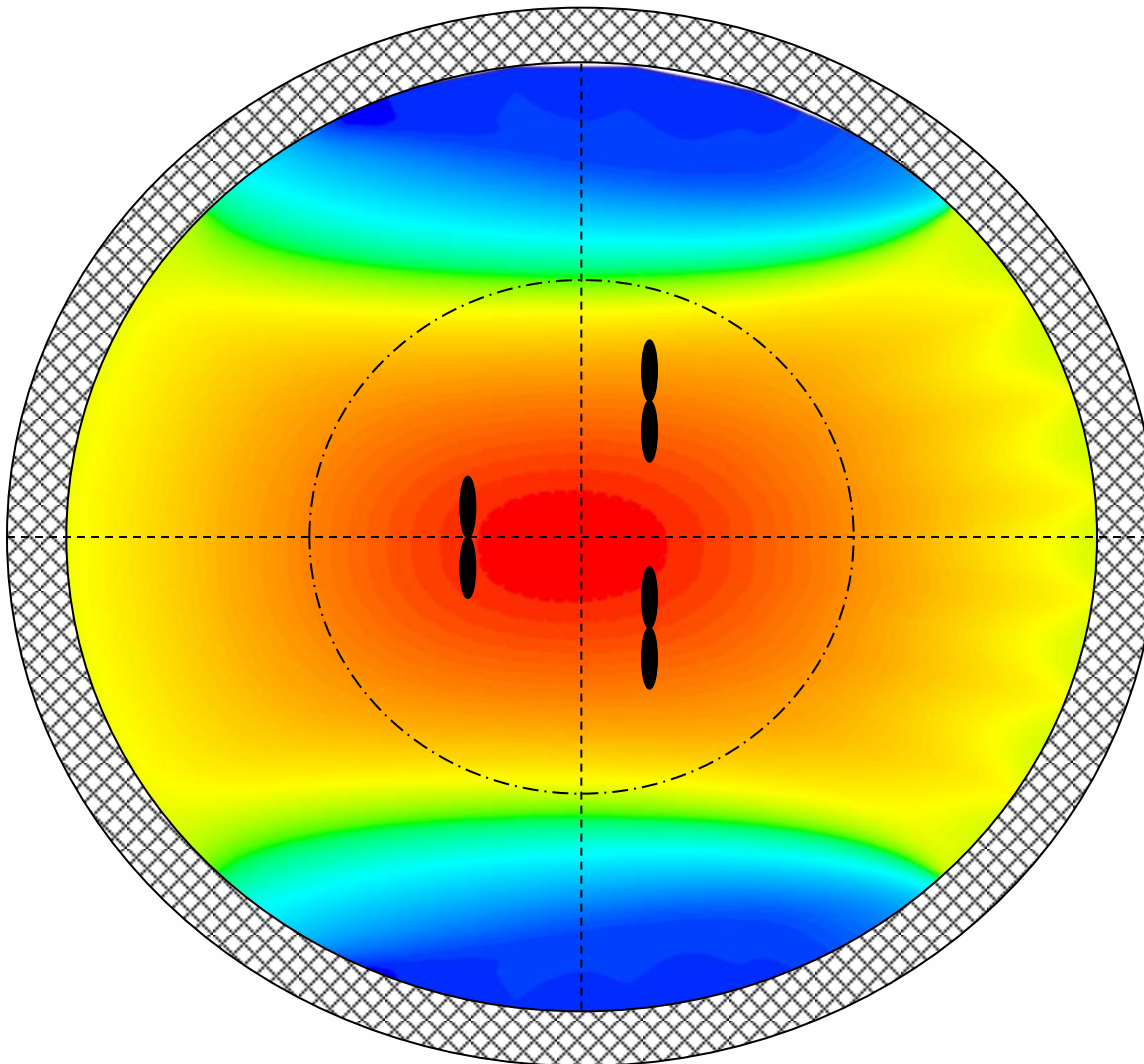
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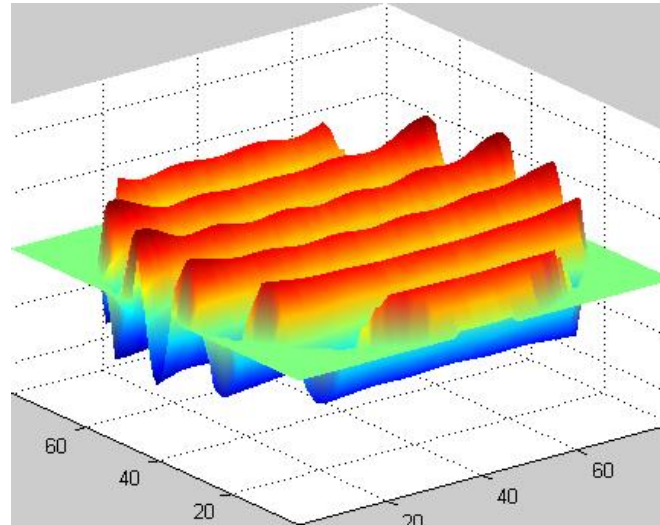
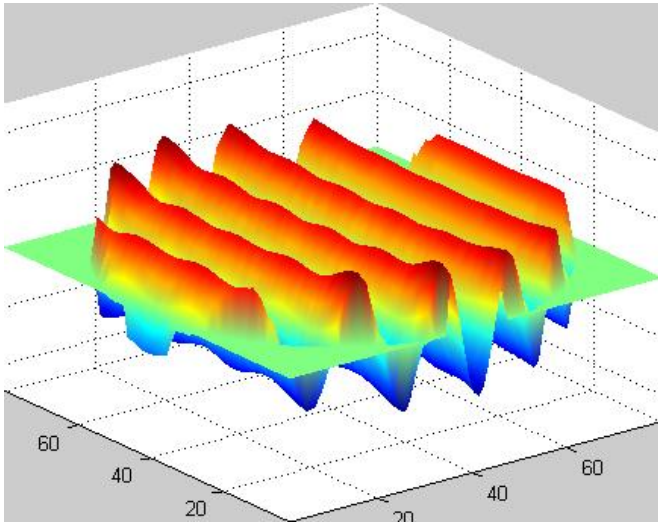
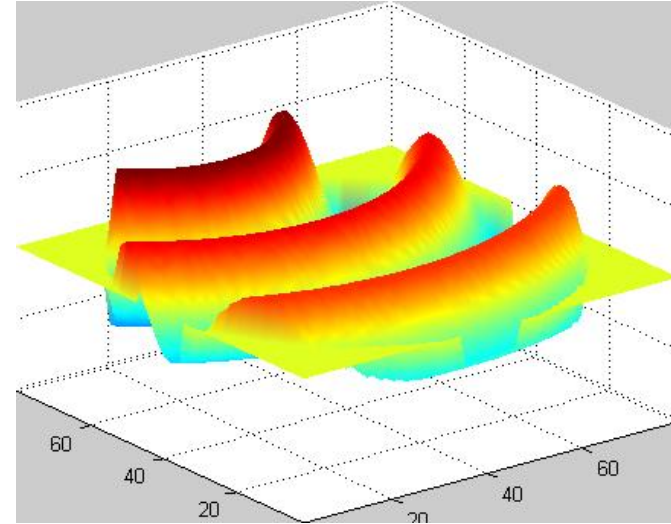


A Tidal Array Simulated in Multidirectional Currents



360° Wave Simulation

- The basic building blocks are the spreading waves from a carefully designed wavemaker
- However, regular unidirectional waves for a vital intermediate step in the building of pseudo random seas
- Once, of course, we have full control of direction and frequency



Support Capabilities



- Comprehensive instrumentation and data processing capability
- 5 tonne overhead crane
- Fully specified dedicated workshop
- Local/remote control of instrumentation
- Working space for commercial clients
- Commercial meeting room and all usual facilities

26/10/2012



QUESTIONS

