

# Vlasiator test cases technical information

## KelvinHelmholtz

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This document gives technical information on the KelvinHelmholtz test case.

### 1 Purpose

Try to produce the Kelvin-Helmholtz instability in Vlasiator.

### 2 Implementation

Code originally copied from Riemann1, there is here an `enum` for the TOP/BOTTOM states. One region centred on  $z = 0$  (TOP) gets a distinct velocity and density state (*e. g.* high velocity, low density), separated by a boundary which can be straight or have sinusoidal perturbations. The offset of the boundary from the  $x$ -axis is user-set.

### 3 Options

The options available in the `cfg` file are:

<code>rho[12]</code>	Number density ( $\text{m}^{-3}$ )
<code>T[12]</code>	Temperature (K)
<code>V[xyz][12]</code>	Velocity (m/s)
<code>B[xyz][12]</code>	Magnetic field (T)
<code>lambda</code>	Boundary perturbation wavelength (m)
<code>amp</code>	Boundary perturbation amplitude (m)
<code>offset</code>	Boundary offset from the $x$ -axis (m)
<code>nSpaceSamples</code>	Number of sampling points along spatial dimensions within a spatial cell, includes the corners (minimum 2)
<code>nVelocitySamples</code>	Number of sampling points along velocity dimensions within a velocity cell, includes the corners (minimum 2)