Waveguide Problem : Presentation

The interior problem

$$
(\mathcal{P}^i) \left|
\begin{aligned}
-\triangle u^i - \rho(\mathbf{x})\,\omega^2 u^i &= f(\mathbf{x}), \quad \text{in } \Omega^i \\
\nabla u^i \cdot \mathbf{n} &= 0 \quad \text{on } \partial\Omega^i \cap \partial\Omega \\
+\frac{\partial u^i}{\partial \mathbf{x}} + T^+\, u^i &= 0 \quad \text{on } \Gamma^+ \\
-\frac{\partial u^i}{\partial \mathbf{x}} + T^-\, u^i &= 0 \quad \text{on } \Gamma^-
\end{aligned}
\right.
$$

The interior problem is of **Fredholm type** (if ρ_{per} is constant near the transverse section).

Conjecture : *the DtN operators depends analytically of the frequency (except for a countable set of frequencies)*

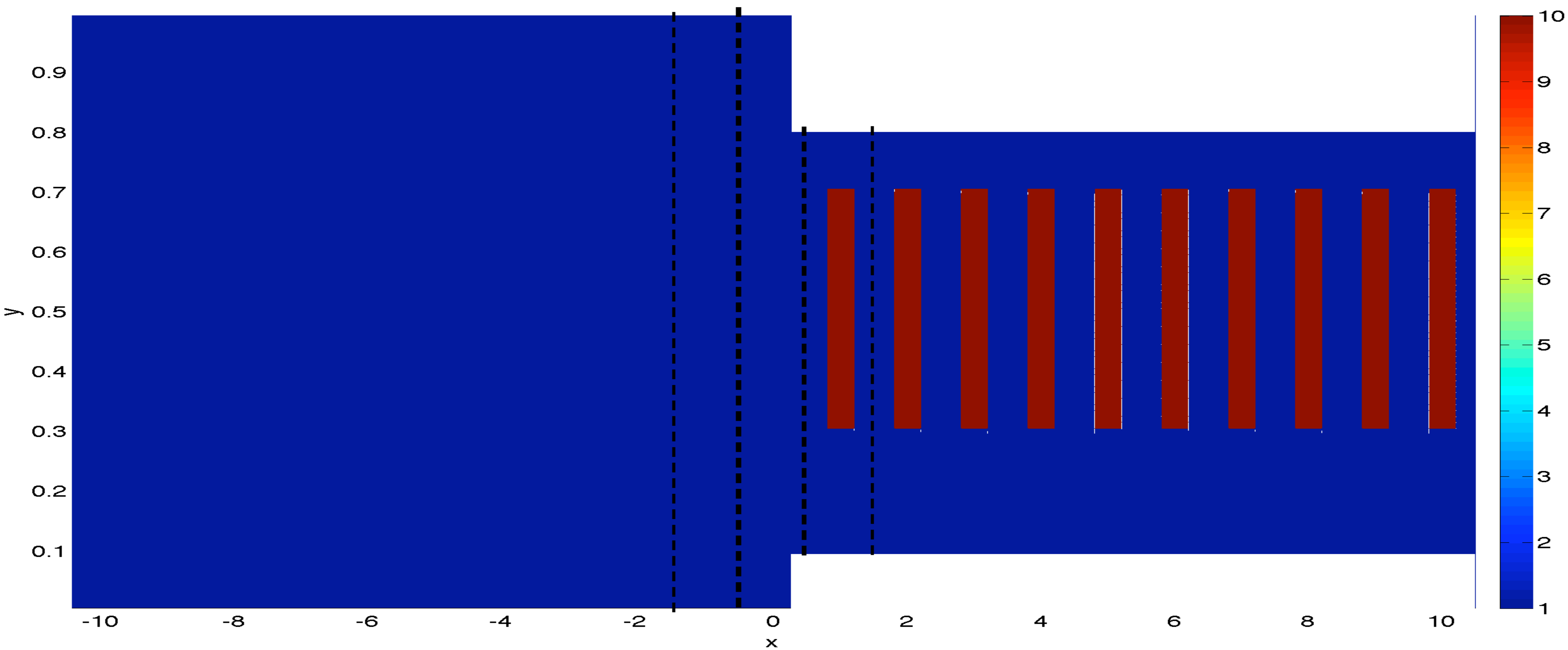
Theorem

The interior problem is **well posed** except for a countable set of frequencies.

Definition of the physical solution of the problem without absorption

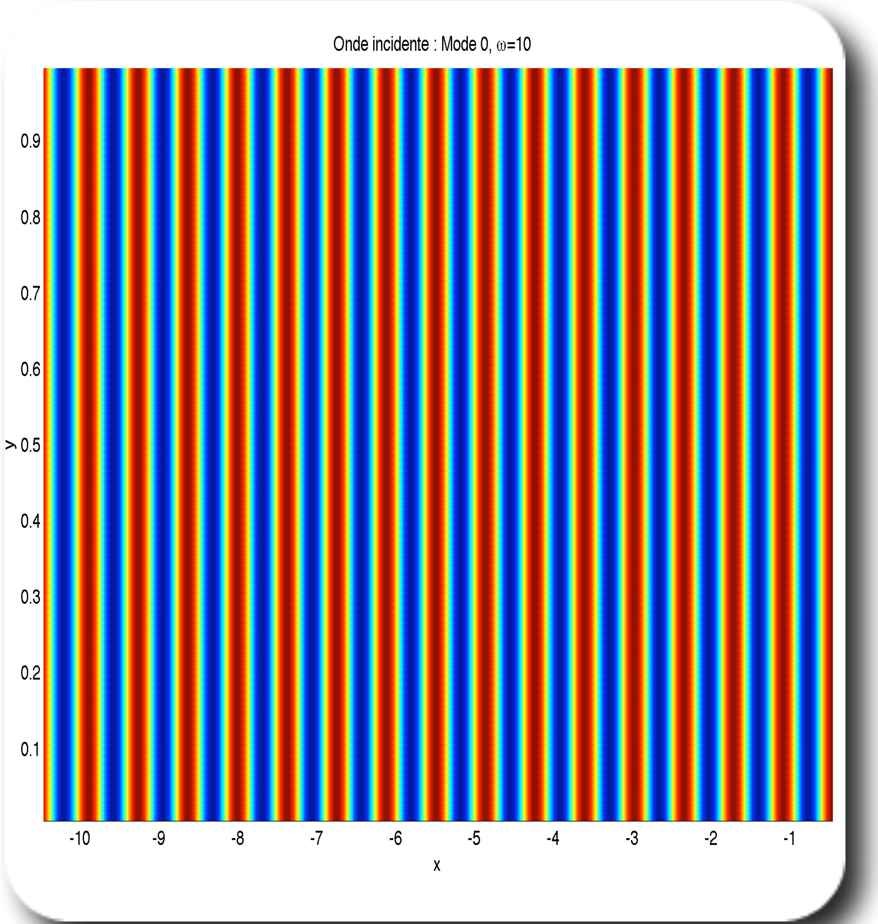
$$
\left|
\begin{array}{lll}
u = u^i & \text{in } \Omega^i & \\
u = u^+(\varphi_i^+) & \text{in } \Omega^+ & \text{with } \ \varphi_i^+ = u^i|_{\Gamma^+} \\
u = u^-(\varphi_i^-) & \text{in } \Omega^- & \text{with } \ \varphi_i^- = u^i|_{\Gamma^-}
\end{array}
\right.
$$

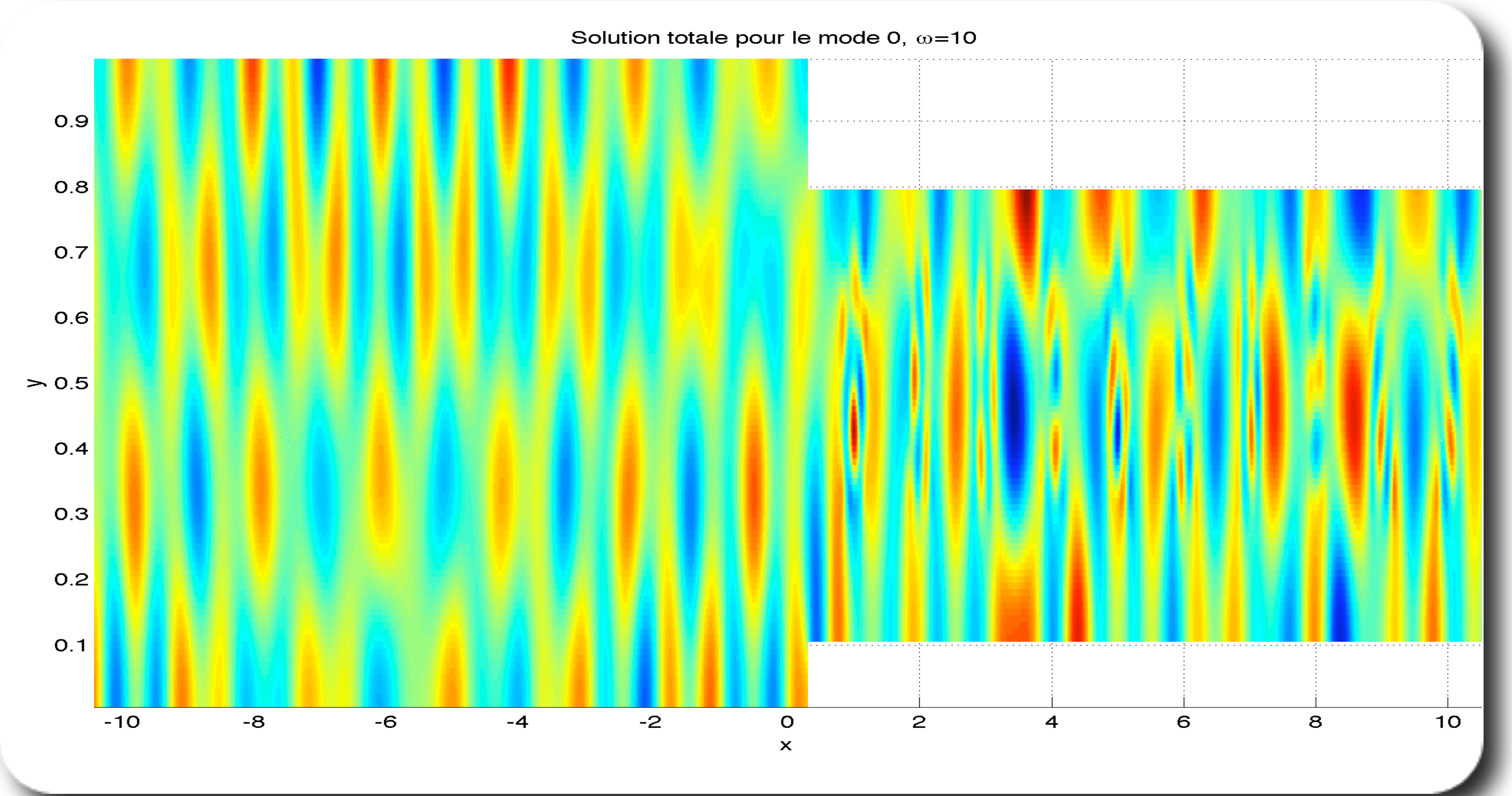
Waveguide Problem : Results



Refraction index

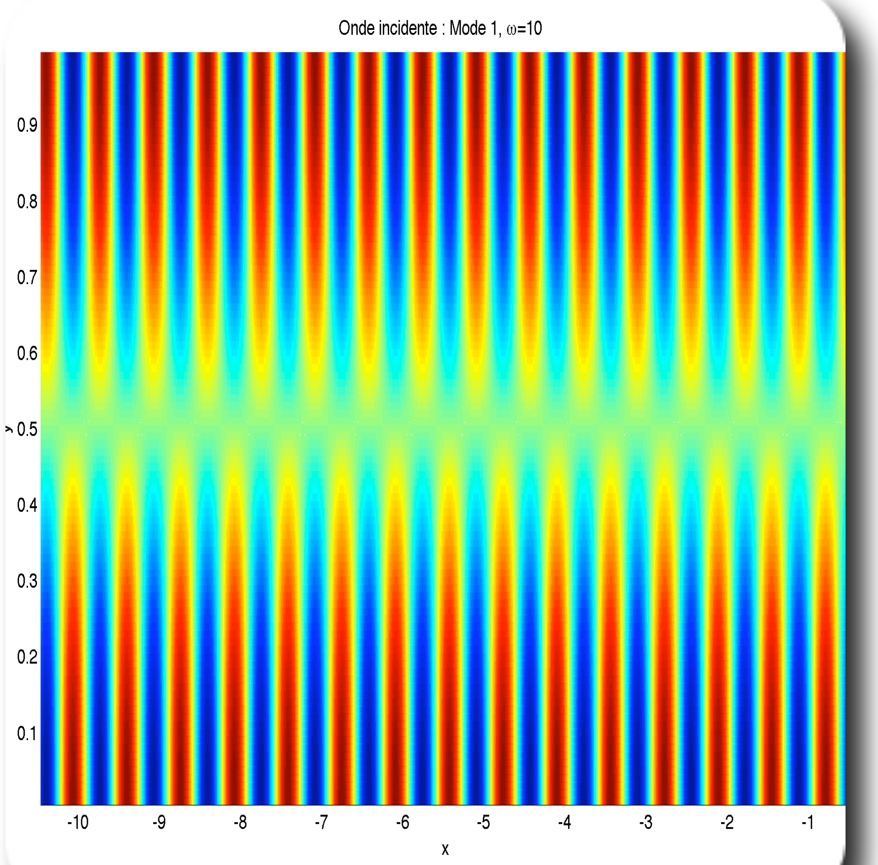
Waveguide Problem : Results

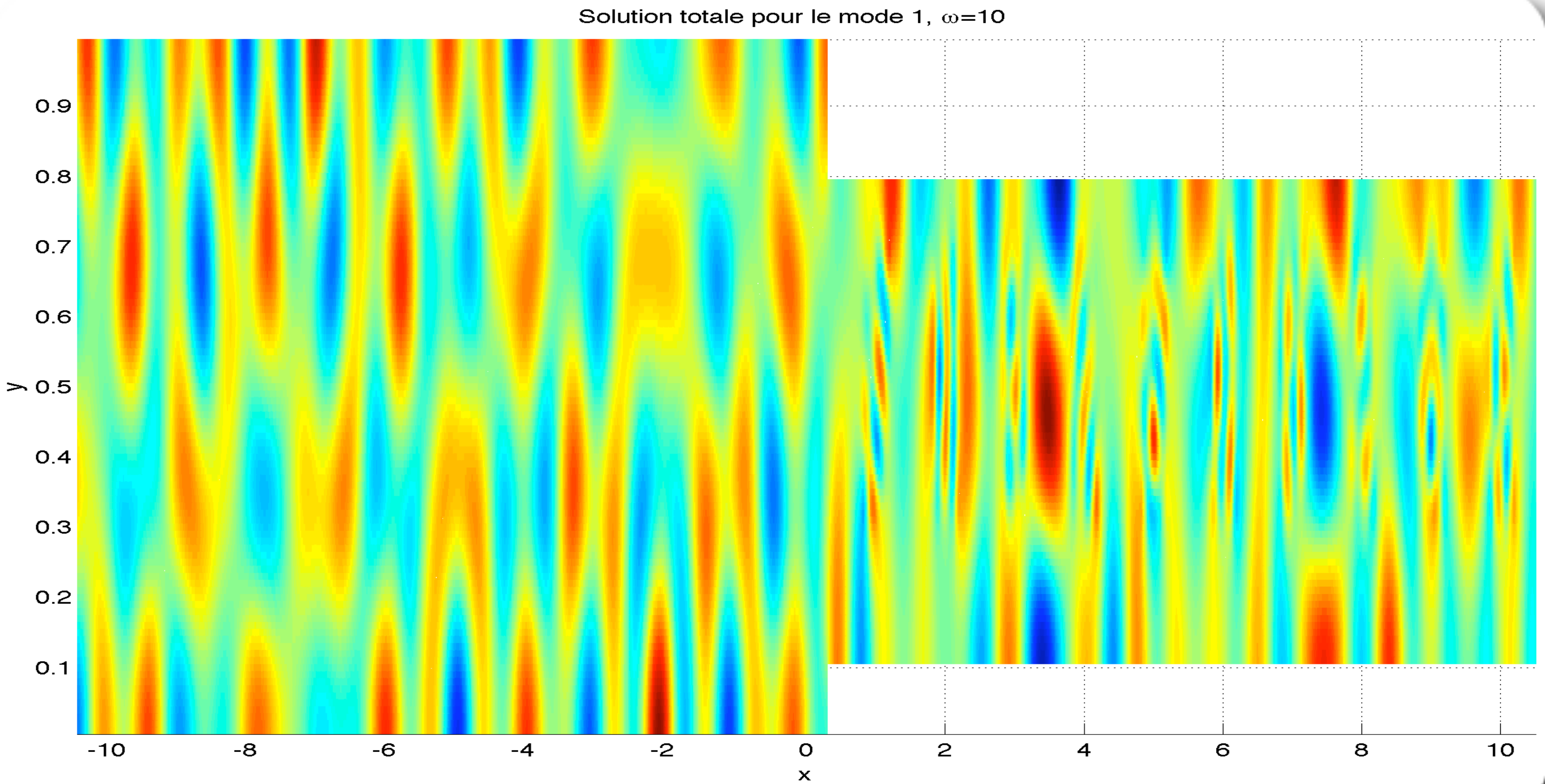




Incident field

Total field





Incident field

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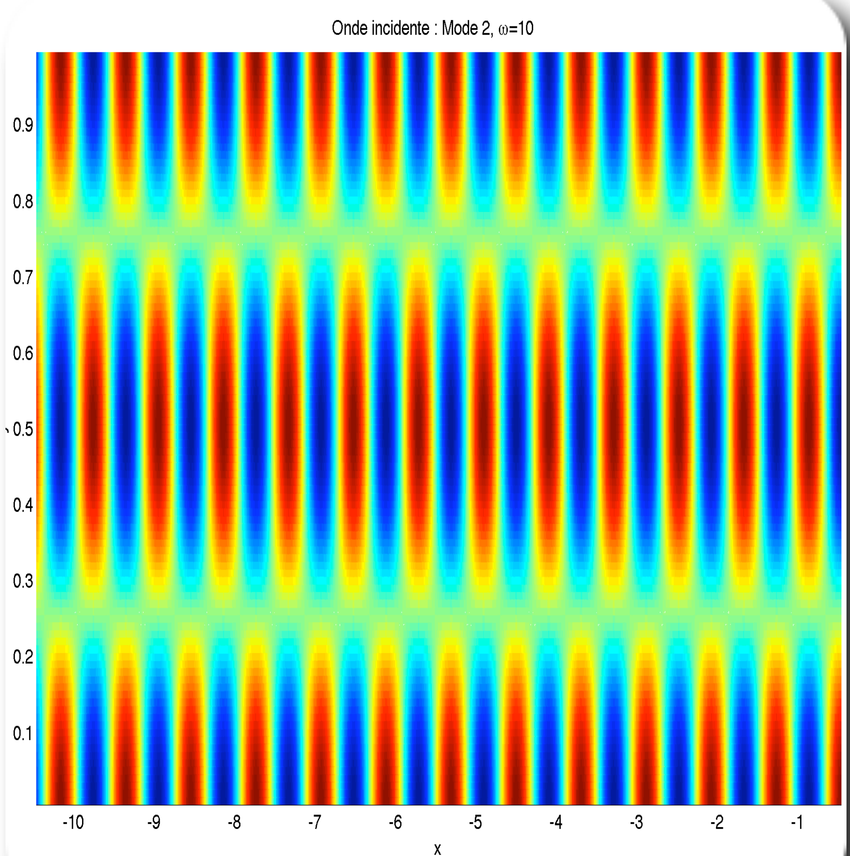

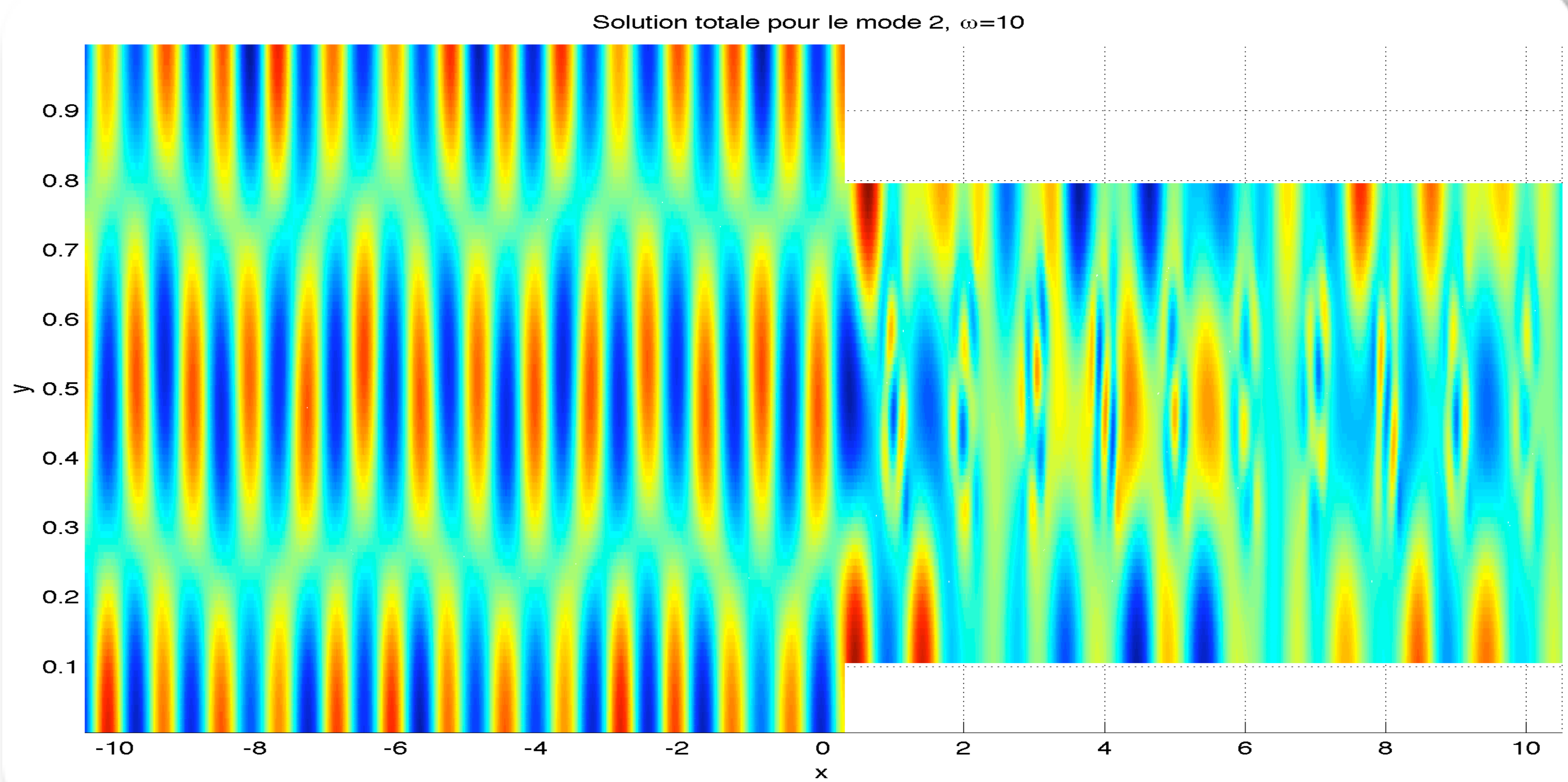

Incident field

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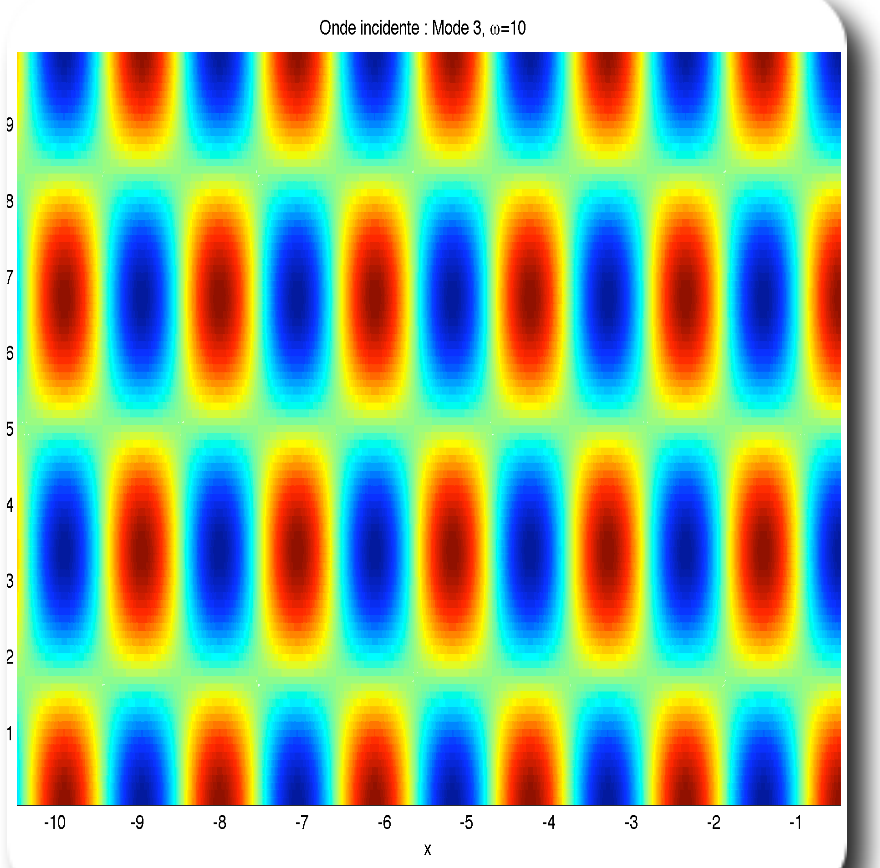

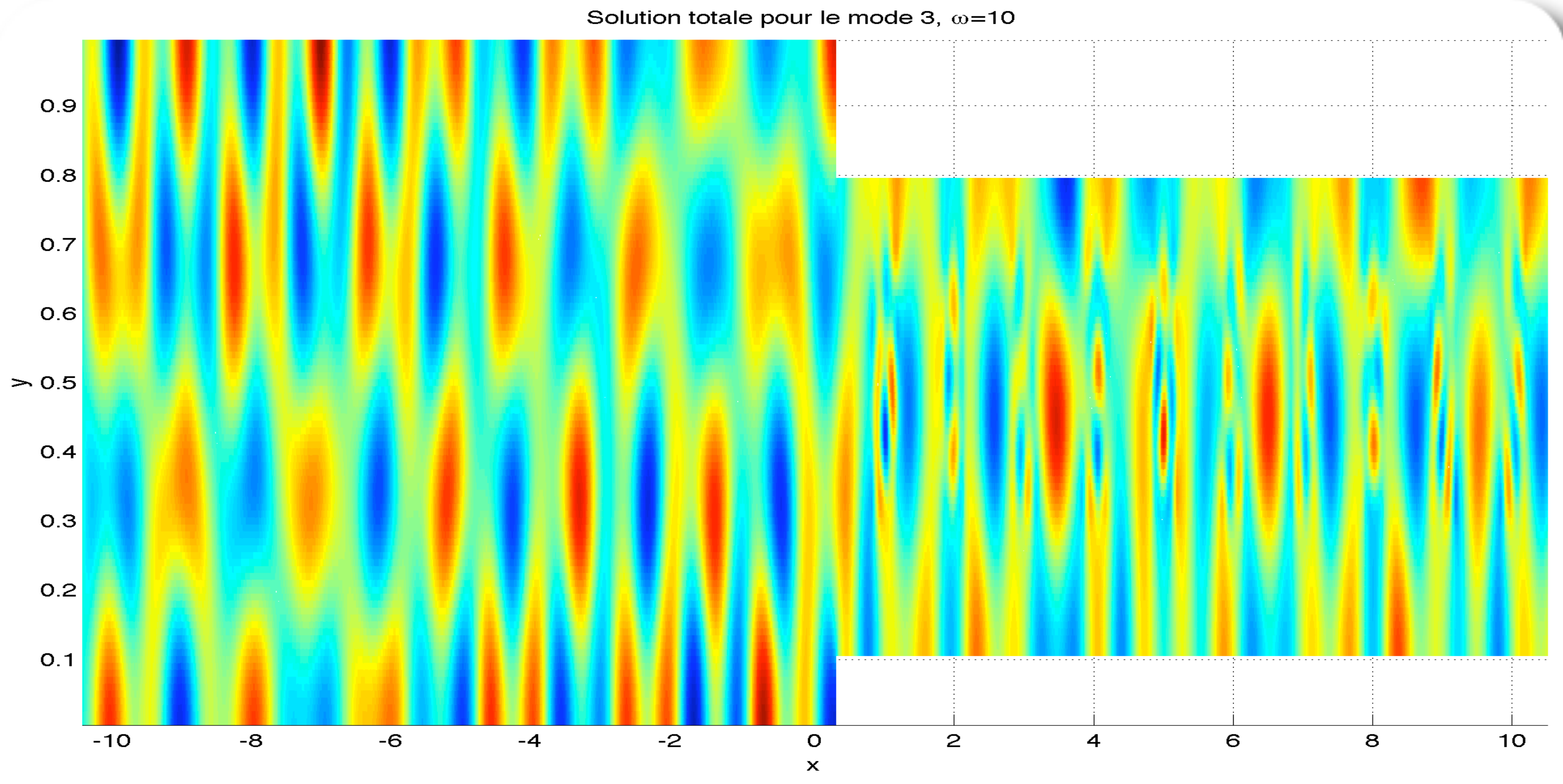

Incident field

Total field