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«Metrological Support of Innovative Technologies» ICMSIT-2020

«Elastic bend of twisted waveguide»

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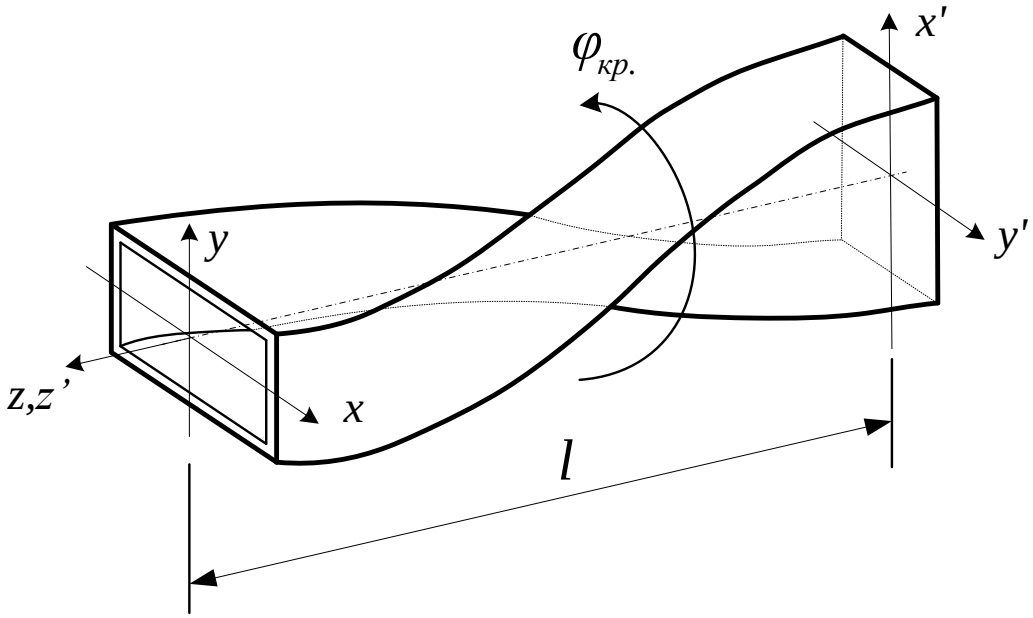
Problem statement

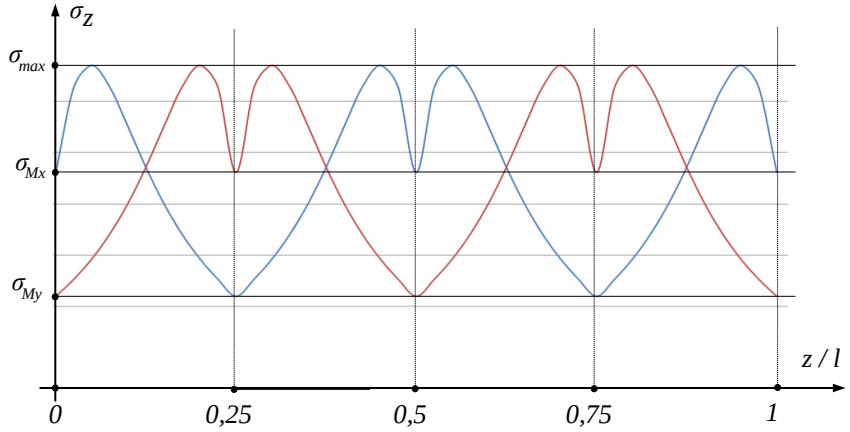
- Until recently, waveguides in antenna-feeder systems did not count for strength and rigidity, as it had overly large wall thickness of 3-4 mm.
- This paper considers the stress and deflection of a twisted waveguide at bending as the most common and dangerous type of loading.



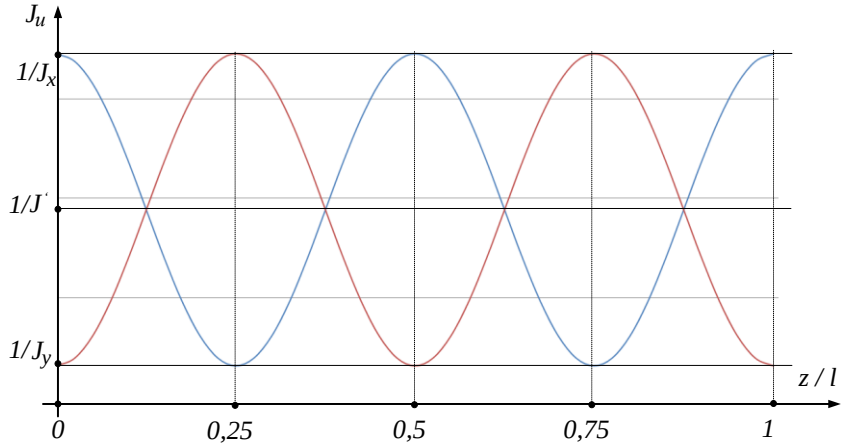
Twisted waveguide

Solution methods

- We examine the bending of twisted waveguides on the basis of the Euler–Bernoulli beam theory;
- According to the Euler–Bernoulli beam theory, the stress and bending deflections of the twisted waveguide are inversely proportional to the integral characteristics of the cross section.



Maximum bending stress of twisted waveguide along its longitudinal axis



Twisted waveguide deflection along its longitudinal axis

Conclusions

Results, implementation

- In this paper, the Euler–Bernoulli beam theory has been chosen to evaluate the general distribution of stress and deflection, in a twisted waveguides at bend.
- The ratio of maximum to minimum values for moments of inertia and the section modulus are equal to:

$$k_J = \frac{I_{MAX}}{I_{MIN}} \approx \frac{B}{H} \qquad k_W = \frac{W_{MAX}}{W_{MIN}} \approx \left(\frac{B}{H}\right)^2$$

- It is rational to use in solve the worst combination of geometric parameters relative to a load direction

$$I_u = \min\left(I_x, I_y\right) \qquad W_u = \min\left(W_x, W_y\right)$$

- The shell model of a twisted waveguide is expected to be developed in further research and allow to obtain a more accurate assessment of stresses and deflections.

Contacts

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