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And Magnetic Field Structure A  
Guide To A Fundamental Tool  
Of Plasma Theory

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## **Flux Coordinates And Magnetic Field**

Flux Coordinates and Magnetic Field Structure gives a systematic and rigorous presentation of the mathematical framework and principles underlying the description of magnetically confined fusion plasmas. After a brief treatment of vector algebra in curvilinear coordinate systems the book introduces concepts such as flux surfaces, rotational transforms, and magnetic differential equations.

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magnetic differential equations.

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ty of the special types of coordinate systems in which the magnetic field lines appear as straight lines. These so-called flux coordinates sweep, so to speak, the complexity of the magnetic-field structure "under the rug", and permit the user to concentrate on the (other) physical issues.

## **~p~ger Senes in Computational Physics W D. W.N. G. Hitchon ...**

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## **9783642755972 - Flux Coordinates and Magnetic Field ...**

Due to strong anisotropy associated with the magnetic field, the magnetic surface label  $\psi$  is a convenient radial coordinate for computations. The corresponding commonly used magnetic flux coordinates  $(\psi, \theta, \zeta)$  are the magnetic flux, the generalized poloidal and toroidal angles.

## **Canonical straight field line**

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## **magnetic flux coordinates ...**

**Key Takeaways** Key Points. It is a change in the magnetic field flux that results in an electromotive force (or voltage). The magnetic flux (often denoted  $\Phi$  or  $\Phi_B$ ) through a surface is the component of the magnetic field passing through that surface.; In the most general form, magnetic flux is defined as

$$\Phi_{\text{B}} = \iint_{\text{A}} \mathbf{B} \cdot d\mathbf{A}$$

## **Magnetic Flux, Induction, and Faraday's Law | Boundless ...**

Learn what magnetic flux means and how to calculate it. If you're seeing this message, it means we're having trouble loading external resources on our website. If you're behind a web filter, please make sure that the domains \*.kastatic.org and \*.kasandbox.org are unblocked.

## **What is magnetic flux? (article) | Khan Academy**

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along the direction of the magnetic field produced by the magnet, as depicted in Figure 8.1.1. Figure 8.1.1 Magnetic field produced by a bar magnet Notice that the bar magnet consists of two poles, which are designated as the north (N) and the south (S). Magnetic fields are strongest at the poles. The magnetic field lines

## **Chapter 8 Introduction to Magnetic Fields**

A magnetic field is a vector field that describes the magnetic influence on moving electric charges, electric currents, and magnetized materials. A charge that is moving in a magnetic field experiences a force perpendicular to its own velocity and to the magnetic field. The effects of magnetic fields are commonly seen in permanent magnets, which pull on magnetic materials such as ...

### **Magnetic field - Wikipedia**

A flux-independent coordinate system

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(FCI) is used in the direction parallel to the magnetic field, thus allowing one to decouple the grid of the numerical problem from the magnetic field geometry where the description in the poloidal plane do not employ magnetic coordinates.

## **A flux-coordinate independent field-aligned approach to ...**

Magnetic flux coordinates  $(\psi, \theta, \phi)$  and replace  $F$  where  $dF$  We then get:  $\nabla \cdot \mathbf{f} = \frac{1}{R} \frac{d}{dR} (R f_{\parallel}) + \frac{1}{R^2} \frac{d}{d\theta} (R^2 f_{\theta}) + \frac{1}{R^2 \sin^2 \theta} \frac{d}{d\phi} (R^2 \sin^2 \theta f_{\phi})$ , where  $f_{\parallel}$  is the parallel component of the vector  $\mathbf{f}$ . Assume particle is moving on a flux surface with magnetic field magnitude between  $B_{\min}$  and  $B_{\max}$ . Define:  $\mathbf{v} = v_{\parallel} \mathbf{e}_{\parallel} + v_{\theta} \mathbf{e}_{\theta} + v_{\phi} \mathbf{e}_{\phi}$

## **Working in toroidal geometry: \* magnetic flux coordinates ...**

Flux coordinates in the context of magnetic confinement fusion (MCF) is a set of coordinate functions adapted to the shape of the flux surfaces of the confining magnetic trap. They consist of one flux label, often termed  $\psi$  and two angle-like variables  $\theta, \phi$



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whose constant contours on the flux  $\psi(\mathbf{x}) = \text{constant}$  surfaces close either poloidally ( $\phi$  ...

## **Flux coordinates - FusionWiki**

Computing the spatial derivative of the magnetic field or magnetic flux density is useful in areas such as radiology, magnetophoresis, particle accelerators, and geophysics. One of the most important use cases is the design of magnetic resonance imaging (MRI) machines, where it is necessary to analyze not only the field strength but also the spatial variation of the field.

## **Plotting Spatial Derivatives of the Magnetic Field ...**

To construct the flux coordinates explicitly for a specified configuration of the magnetic field, the following algorithm can be carried out: First, a smooth base curve  $C_0$  in the domain  $M$  is selected that is nowhere parallel to a field line, see Fig. 2.

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## **Axisymmetric magnetically enhanced discharges described in**

...

Magnetic coordinates are a particular type of flux coordinates in which the magnetic field lines are straight lines. Magnetic coordinates adapt to the magnetic field, and therefore to the MHD equilibrium (also see Flux surface). Magnetic coordinates simplify the description of the magnetic field. In 3 dimensions (not assuming axisymmetry), the ...

## **Toroidal coordinates - FusionWiki**

Another magnetic coordinate system, the magnetospheric geomagnetic latitude, was defined by Papitashvili et al. (1997a,b). This system takes into account also the external, highly time varying magnetospheric field by means of the Tsyganenko model. The terminology associated with magnetic coordinates can be confusing and sometimes ambiguous.

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## **Magnetic Coordinate Systems | SpringerLink**

introducing a magnetic flux coordinate system, for which the metric tensor can be analytically or numerically determined once the magnetic field configuration is specified [D'haeseleer et al., 1991]. [6] Geomagnetic flux coordinates include a magnetic field-aligned coordinate, a radial-like, flux coordinate that

## **Ultralow-frequency magnetohydrodynamics in boundary**

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