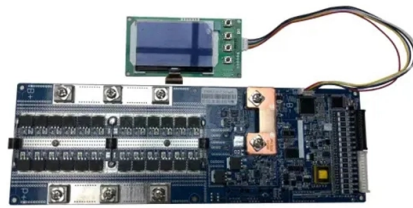


Working principle of tomographic spectrometer



Article Overview

A tomographic spectrometer captures spatial and spectral information simultaneously by projecting a scene through a dispersive element and reconstructing a 3D hyperspectral datacube from multiple projections.

Basic Concept

A tomographic spectrometer, such as a Computed Tomography Imaging Spectrometer (CTIS), combines the principles of tomography and spectroscopy to obtain a three-dimensional hyperspectral datacube of a scene, where two dimensions represent spatial information and the third represents spectral information. Unlike conventional spectrometers that scan sequentially, CTIS captures all spectral and spatial data in a single snapshot, enabling fast imaging of dynamic scenes.

Optical Layout

The optical system typically consists of:

- Objective lens: Forms an image of the scene.
- Field stop: Limits the field of view to reduce overlapping spectral information.
- Collimating lens: Converts the diverging light from the field stop into parallel rays.
- Dispersive element (grating or prism): Diffracts light into multiple spectral orders, creating projections of the scene at different wavelengths on the detector. The detector records a superimposed pattern of spatial and spectral projections, which...

Article Content

Basic Principles of Tomography | Springer Nature Link

This is an introductory chapter, which presents the fundamental concepts in tomography. It first defines what the tomography is, and

X-Ray Computed Tomography

X-ray computed tomography (X-ray CT) is a nondestructive testing method used to analyze the internal structure of objects by X

Tomography

Tomography This procedure is known by many names (e.g., "tomo," " tomography," " body-section radiography," "laminography," and

Basic principles of computed tomography

History 1924 - mathematical theory of tomographic image reconstructions (Johann Radon) 1930 - conventional tomography (A.

What is Tomographic Imaging?

But the relevance of tomography isn't exclusive to the clinic. Researchers also make extensive use of tomographic imaging

Single-photon emission computed tomography

The underlying principle is that under conditions of stress, diseased myocardium receives less blood flow than normal myocardium.

Optical spectrometer

Grating spectrometer schematic Internal structure of a grating spectrometer: Light comes from left side and diffracts on the upper

Tomography

Tomography Fig.1: Basic principle of tomography: superposition free tomographic cross sections S 1 and S 2 compared with the (not

Optical coherence tomography (OCT)

The working principle of optical coherence tomography (OCT) OCT, as a non-invasive, tomographic method, makes it possible to

Tomography — X-ray imaging: Physics, Instrumentation & Applications

The principle of computed tomography (CT) is to acquire a large number of x-rays all around the object, such so as to measure for

Tomography Explained: Theory and Applications | Academic Block

Tomography is a medical imaging technique that creates detailed cross-sectional images of the body's internal structures, allowing

Spectrometer

A spectrometer is any instrument used to view and analyze a range (or a spectrum) of a given characteristic for a substance (e.g., a

Spectrometer

Spectrometer An XPS spectrometer A spectrometer (/ spɛk'trɒmɪtər /) is a scientific instrument used to separate and measure

Computed tomography imaging spectrometer

The computed tomography imaging spectrometer (CTIS) is a snapshot imaging spectrometer which can produce in fine the three

Chapter 1 Introduction to Atom-Probe Tomography

Introduction to Atom-Probe Tomography The atomic-level materials characterization technique now usually called atom-probe

3 Optical spectrometry: principles and instrumentation

3.1 Principles Optical spectrometry is the technique of measuring the intensity of absorption or emission of radiation in the ultraviolet

Electron tomography

Electron tomography Basic principle of tomography: superposition free tomographic cross sections S 1 and S 2 compared with the

Tomography

Tomographic absorption spectroscopy: chemical state of a catalyst inside a reactor capillary. Tomographic small-angle scattering:

Tomography

Most algorithms fall into one of two categories: filtered back projection (FBP) and iterative reconstruction (IR). These procedures give

Chapter 4: Single Photon Emission Computed Tomography (SPECT)

Chapter 4: Single Photon Emission Computed Tomography (SPECT) NPRE 435, Principles of Imaging with Ionizing Radiation, Fall

How Do Spectrometers Work? Spectrometer vs. Spectrophotometer

Spectrometers can be designed and built using a number of different configurations. An alternative configuration is a standalone

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