

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 can be mathematically interpreted as multiple “mechanical projections” of the theoretical datacube....

Article Content

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

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

Spectrometer

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

Microsoft PowerPoint

The principal characteristics of this radionuclide are high skeletal uptake with long-term retention, minimal uptake in normal organs

Principles of OCT Whitepaper 2

The spectrometer is typically matched to the wavelength range of the source and has from 512 up to 4096 pixels across the

Computed tomography imaging spectrometer

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

Analysis of computed tomographic imaging spectrometers. I. Spatial

Computed tomographic imaging spectrometers measure the spectrally resolved image of an object scene in an entirely different

Optical coherence tomography (OCT)

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

Working Principle of OCT

Working Principle of OCT Basic OCT setup, with a beam splitter (BS) separating the light into the sample arm towards the tissue,

Tomography

In all tomographic imaging techniques, the maximum allowable sample size and the attainable resolution are important practical

Optical coherence tomography

Abstract | Optical coherence tomography (OCT) is a non-contact method for imaging the topological and internal microstructure of

Tomography

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

Computed Tomography: Physics, Principle of Operation, Quality

This chapter offers a comprehensive reference for Computed Tomography (CT), encompassing its historical, technical, clinical, and

Physics:Tomography

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

Tomography

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

Chapter 1 Introduction to Atom-Probe Tomography

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

doi: 10.1007/978-3-030-35326-1_2

Basic Principles of Tomographic Reconstruction Synopsis: In this chapter the reader is introduced to the basic principles and tools of

What Is Spectral Domain OCT? Uses and applications

Focused 100% on OEM business, Ibsen Photonics is the preferred partner for leading industrial companies in volume supply of high

Tomography

ODT, also known as Doppler OCT, combines the Doppler principle with OCT to obtain high-resolution tomographic images of tissue

Raman Spectroscopy

Raman spectroscopy provides information regarding the vibrational energy levels of molecules. Chemical structure, bonding,

OCT | 3D Imaging | Scattering Media

OCT is a 3D Imaging technique that can provide high resolution and deep penetration in Scattering Media. Click here to access the

Tomography

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

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