

Dual-Grid Multi-Source X-ray Tube

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ABSTRACT

Researchers at the University of California, Davis have developed an advanced multi x-ray source array system employing dual cathode designs that enhance computed tomography ("CT") imaging by enabling pulsed, spatially multiplexed x-ray emission with reduced artifacts.

FULL DESCRIPTION

This technology introduces a multi x-ray source array system featuring multiple rotating anodes arranged on a single shaft, each paired with dual thermionic cathode assemblies capable of rapid pulsed operation. By electronically modulating charged particle beams with dual grids, x-rays are selectively generated from discrete anode focal spots, creating a two-dimensional array of individually controllable x-ray sources. The system rotates in unison with a detector array around the patient, enabling full tomographic data acquisition with minimal cone beam artifacts. Switching x-ray emission between odd and even anode sets eliminates beam overlap and improves image quality. Additionally, the technology offers flexible spatial control of x-ray focal spots and enhanced field-of-view coverage compared to traditional single-source CT systems.

APPLICATIONS

- ▶ Whole body and general-purpose computed tomography scanners in clinical radiology.
- ▶ Cone beam computed tomography for dental, orthopedic, and interventional imaging.
- Security scanning systems such as airline baggage and package inspection.
- ▶ Stereoscopic and multi-angle x-ray imaging requiring rapid source switching.
- ▶ Industrial non-destructive testing and material analysis using computed tomography.

FEATURES/BENEFITS

- ▶ Reduces cone beam artifacts through multiplexed source geometry and pulsed x-ray emission.
- ▶ Improves image quality and ensures complete sampling with large field-of-view coverage.
- ▶ Allows rapid switching and precise control of x-ray focal spots with dual grid cathode design.
- ► Enables complex x-ray source sequencing through a two-dimensional planar array arrangement.
- ▶ Shares filaments between cathodes for efficient use of filament resources.
- ▶ Supports both medical and non-medical computed tomography applications.
- ▶ Provides sub-millisecond temporal precision of pulsed x-ray beams for flexible imaging protocols.
- ▶ Mitigates beam overlap on large area detectors during simultaneous multi-source operation.

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INVENTORS

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OTHER INFORMATION

KEYWORDS

anode, cathode,
computed tomography,
dual grid, filament,
rotating shaft, thermionic
cathode, x-ray focal
spots, enhanced imaging,
medical imaging

CATEGORIZED AS

- Engineering
 - Engineering
- **▶** Imaging
 - ▶ Medical
- Medical
 - Imaging

▶ Sensors &

Instrumentation

Medical

RELATED CASES

▶ Simplifies mechanical design challenges through multiplexing and dual cathode architecture.

PATENT STATUS

Patent Pending

Davis, CA 95616

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Device and Method for Measuring Beam Quality in CT

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