CASE STUDY

Medical Technology Firm Reduces Medical Imaging Test Investment Cost by 50%

KEYSIGHT

Organization

- A leading company that provides healthcare solutions and services in the US.

Challenges

- Upgrade from DDR3 to DDR4 and PCIe® Gen 3 to Gen 4 for signal integrity.
- Manual testing DDR and PCIe compliance efforts take weeks.
- Implement next-generation DDR and PCIe to meet the growing demand for faster data processing speeds, better image quality, and improved user experience.

Solutions

- UXR0254B Infiniium UXR-Series Oscilloscope
- D9020JITA Jitter, Vertical And Phase Noise Analysis Software For Infiniium UXR-Series Oscilloscopes
- D9020ASIA Advanced Signal Integrity Software
- D9040DDRC DDR4 and LPDDR4 Compliance Test Software

Results

- Reduces test investment cost by 50% over three years
- Speed up DDR4, PCIe 3, and USB 2.0 compliance tests by 2X
- Future-test ready:
  - enables 2x faster testing for PAM4 applications (eye diagram) for DDR and PCIe needs
  - provides 10X faster testing for USB4 v2

Introduction

In the rapidly evolving field of medical imaging, advances in next-generation CT scans, PET scans, and MRI technology are leading a paradigm shift toward faster, more accurate diagnostic results. The integration of artificial intelligence (AI) technologies has become central to enhancing the capabilities of these imaging modalities. A key aspect of this shift lies in the need for real-time imaging that requires advanced algorithms and a high degree of computational power and data transfer rates.

Whether implemented through programmable gate arrays (FPGAs), central processing units (CPUs), or graphics processing units (GPUs), the overarching quest is for higher processing power. The convergence of AI and medical imaging promises to revolutionize diagnostic accuracy and requires a robust infrastructure with high computational intensity and data throughput to handle real-time imaging applications.

A leading American multinational medical technology company aims to offer intelligent imaging systems designed to improve clinical decisions, imaging operations, and workflow efficiency. They strive to provide advanced clinical products with transformative digital and AI technologies. The company's growing demand for high-fidelity images drives the adoption of next-generation DDR and PCIe technologies to enhance image rendering and reconstruction speed.

Challenges: Testing the Next Generation of DDR and PCIe® Technology

The escalating demand for higher-fidelity images pushes medical technology companies to embrace the next generation of DDR and PCIe® technology for more efficient processing. The head of engineering within the medical technology company's R&D department faced several test challenges.

Signal integrity issues

Ensuring signal integrity for control and communication boards during the upgrade from DDR3 to DDR4 and PCIe Gen 3 to PCIe Gen 4 poses a substantial hurdle. The acceleration in speed, coupled with the need to accommodate more components on the same printed circuit board (PCB) to support increased processing power, exacerbates the likelihood of signal integrity issues. PCBs in medical systems have many layers, vias, fine pitch traces, and power rails at various voltages, so maintaining signal integrity throughout the test process is challenging.

Long test time

Customers also face long testing times. Today, the test engineers manually perform DDR and PCIe compliance testing, which takes weeks to complete. The prolonged test time raises the risk of oversight, potentially leading to non-compliance with standards or functionality issues in the upgraded components.

The need to process more data faster than before means medical imaging systems must support higher data rates and more densely packed parallel data lines. These challenges underscore the critical need for efficient solutions to optimize design processes, reduce manual efforts, and ensure seamless technology integration for sustained success for the customer.

Capital investment optimization

It is crucial for medical companies to remain informed of the latest technological trends and to innovate strategically to maximize capital investment effectively. The customer needs robust, high-quality test instruments that provide accurate and reliable measurements and support forthcoming technologies.

Solution: Keysight 4-Channel Real-Time Oscilloscope and Software

The head of engineering turned to Keysight for help in solving the firm's challenges. The Keysight sales team recommended the 4-channel Infiniium UXR-series oscilloscope, signal integrity software, jitter analysis software, and DDR compliance test software. The solution has low-noise analog front ends for precise signal acquisition and 10-bit vertical resolution for the most accurate representation of the signal.

UXR0254B Infiniium UXR-Series Oscilloscope

D9020ASIA Advanced Signal Integrity Software

With the advanced signal integrity software, test engineers can identify and measure the crosstalk presence and pinpoint the primary aggressors responsible for signal degradation. The software can further eliminate the crosstalk, enabling a direct visual comparison between the original and clean waveforms. Test engineers can quantify the improvements achieved by mitigating diverse crosstalk sources.

The sales team also recommended the DDR4 and LPDDR4 compliance test software to test, debug and characterize the DDR4 and LPDDR4 designs. The software automatically configures the oscilloscope for each test and generates an informative HTML report at the end of the test. The software helps test engineers save time and effort versus making the measurements manually.

Results: Enhanced Testing Speed and Future-Ready

After implementing the solutions recommended by Keysight on the R&D and manufacturing floor, the customer performed signal integrity tests and DDR4 compliance tests accurately and quickly. The solution, which includes the DDR4 and LPDDR4 compliance software with the real-time oscilloscopes, is two times faster than the initial plan of running the tests manually. In addition, the solution is expandable and includes testing for PAM4 and USB4 applications.

The Keysight UXR-B real-time oscilloscopes feature higher bandwidth, enabling customers to optimize their capital investment. By deploying the UXR across multiple engineering teams, the customer effectively meets current (DDR4 and PCIe 3) and future (upcoming DDR and PCIe standards) testing needs. The Keysight solutions maximize the customer's capital investment, resulting in a substantial 50% improvement in test investment cost over 3 years.

The measurable results highlight the tangible benefits realized by the customer, ranging from significant cost savings to enhanced testing speed and future readiness for evolving technologies.