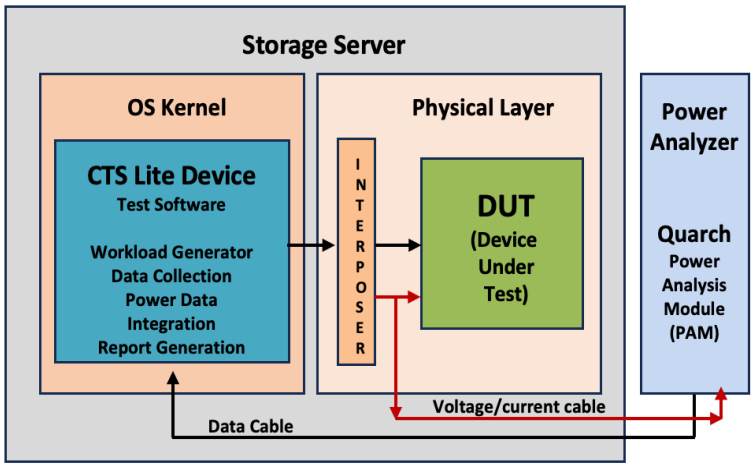
Power Efficiency Measurement

CTS Lite™ Device Test Software for Data Center Storage

Power Efficiency Measurement for Data Center Storage Devices

CTS Lite™ Device is the standard test software for **SNIA Emerald™ Power Efficiency Measurement Specification for Data Center Storage Devices** Version 1.0 (SNIA Emerald Device). See www.sniaemerald.com. CTS Lite Device is an automated, self-executing benchmark tool that applies standard SNIA Emerald Device workloads to target storage while measuring power consumption of the storage device. CTS Lite Device provides SNIA Emerald Device standard compliant results that are accurate, reliable and repeatable.

CTS Lite Device is the required test software under **SNIA Emerald™ Power Efficiency Measurement Specification for Data Center Storage Devices** Version 1.0. This tool is used to test HDD and SSD block storage devices commonly used in enterprise storage systems.



CTS Lite Device benchmark testing for individual storage device level power efficiency measurement shown with **Quarch Device Power Analysis Module**.

Product Overview

CTS Lite Device is a software tool for the automated measurement of **storage power efficiency** under SNIA Emerald Device workloads. CTS Lite Device contains the required workload generator, IO command set, device test software, database and report generator. **This data sheet applies only to storage device testing; a separate data sheet addresses storage system testing.

Key Features & Capabilities

Feature	Description
Power efficiency metrics	Reports performance versus power usage in IOPS/W, MiB/s/W, and GB/W during SNIA Emerald Device workloads.
Workloads	SNIA Emerald Device Complex multi-stream and multi-block workload; corner case Random 8KiB Read and 8KiB Write; and corner case Sequential 256KiB Read and 256KiB Write.
Automated test software	CTS Lite Device is an auto-executable, command line interface, benchmark tool that runs on most common Linux distributions and Microsoft Windows servers. CTS Lite Device software contains the CTS workload generator, test software, database and report generation. **CTS Lite Device has dependencies upon Java and Python versions.
Standard methodologies	Self-executing storage conditioning, steady state determination and self-optimizing demand intensity algorithms ensure accuracy and repeatability for standard Emerald workloads.
Power data aggregation	Device power measurement integration with Quarch or CTS Lite Device software.
Automated HTML report and results plot generation	Generates HTML reports with dynamic playback of test, pre-defined plots, source data, and test results as required under the SNIA Emerald Device specification.
Excel results file	Microsoft Excel file (.xlsx) with required reports and plots, full source data, IO commands and logs.
License model	Individual, air gapped single-seat or Corporate license for the CTS Lite Device software. Past versions are archived and available during valid license term for re-test and comparison.

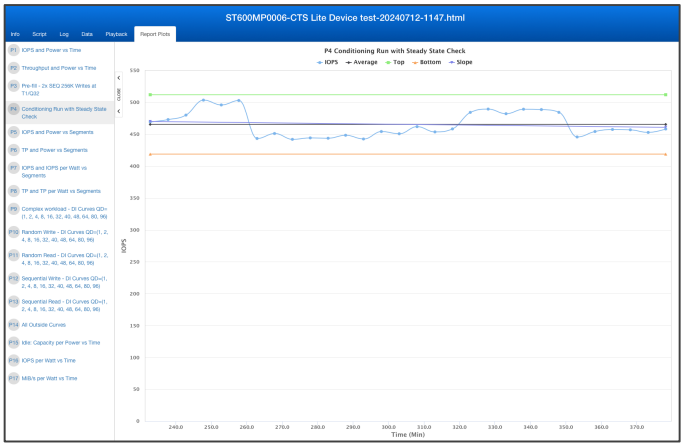
Publication CTS Lite Device 12.10.0 01

CTS Lite Device Software

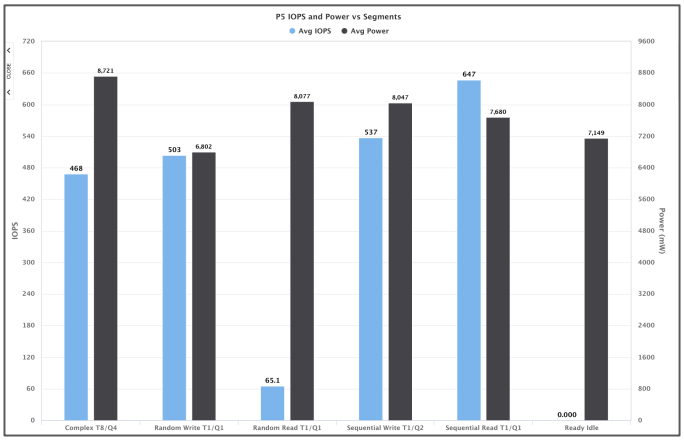
Individual Device Block Testing

CALYPSO Systems

CTS Lite Device Software. CTS Lite Device Software is a stand-alone, command line interface test for Linux and Windows. User selectable variables identify storage, power analyzers and parameters before auto test execution.



SNIA 5-Round Steady State Determination. CTS Lite Device Software automatically generates results plots (P1-P17). Plot P4 above shows Conditioning run with Steady State Check.



Test Reports. Required test results are automatically generated in Excel and HTML formats. Above shows workloads, IOPS and Power.

CTS Lite Device & License Seats

The **CTS Lite Device Software** is a stand-alone, single test for evaluating individual storage devices at the block level.

- **License Seats**: The CTS Lite Device Software annual seat license provides unlimited downloads of the CTS Lite Device Software at a single physical lab or company site (see CTS Lite Device seat license terms).
- **Environment**: Runs at a command line interface in Windows or Linux server environments. Binaries can be compiled, upon request, for operating systems such as Ubuntu, CentOS, Redhat, and FreeBSD.
- **Automation**: Integrates IO performance data with power measurement data from Quarch or csv output to report **Power Efficiency Measurements** in IOPS/W, MiB/s/W, and GB/W.
- **Reports**: Generates Excel and HTML results files.
- **Dynamic HTML audit file: I**ncludes workload playback, raw performance metrics, IO commands and logs.

Test Workflow

- **Purge:** Optional.
- **Pre-Fill:** Applies SEQ 256K Writes for twice the User Capacity
- **Steady State**: Steady State (SS) uses the SNIA 5-Round SS algorithm.
- **Workload Measurement Steps** (five total): Complex, Random 8K Writes, Random 8K Reads, Sequential 256K Writes, Sequential 256K Reads.
- **Active Idle Step**: Measures device efficiency at idle with no host IO.

Self-Optimization Loop

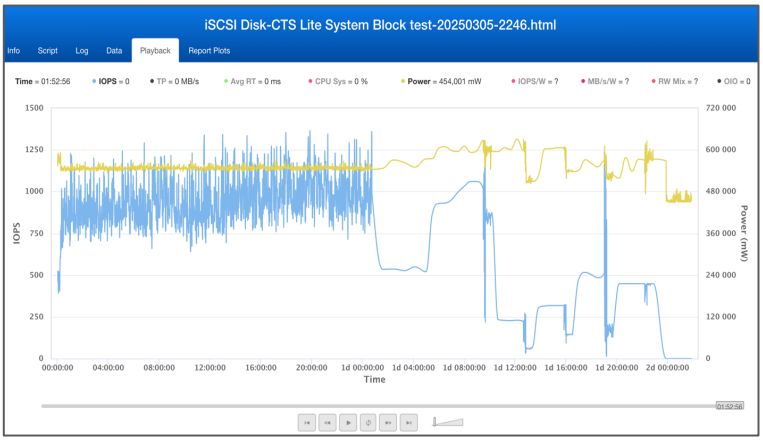
- Each workload step includes a self-optimization loop that adjusts Thread Count and Queue Depth to achieve maximum IOPS under a **20 mSec average response time ceiling**.
- Enables optimal power efficiency measurement in a **single test run**, eliminating the need for multiple runs.

Results Management

- CTS Lite results can be viewed as stand-alone files or imported into the **CTS Lite Enterprise Dashboard** for comparison, analytics, automated plotting, CTS Lite Device test reporting, and archiving. See CTS Lite Enterprise Dashboard.

What you need to run CTS Lite Device

- **CTS Lite Device test software** - go to www.ctslight.com
- **Quarch Power Analysis Monitor, Quarchpy** - go to www.quarch.com
- **Java 21+ and Python 3.8+** - go to www.java.com and www.python.com



Dynamic HTML audit file. HTML results is a read only audit file with dynamic playback, required report plots, raw performance metrics, script and logs.

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