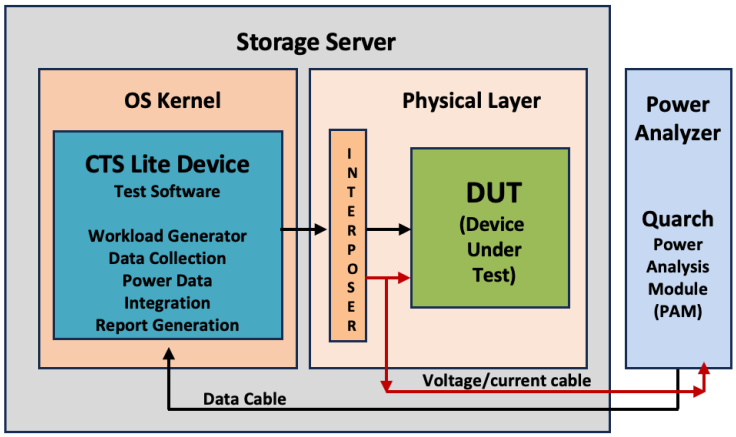
Power Efficiency Measurement

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 **Emerald power efficiency measurement of data center storage devices** (SSD, HDD). CTS Lite Device is an automated, self-executing benchmark tool that applies standard Emerald workloads to target storage while measuring power consumption of the storage device. CTS Lite Device provides Emerald Green standard compliant results that are accurate, reliable and repeatable.

CTS Lite Device is the required test software under **SNIA Emerald Data Center Device specification 1.0**. SNIA Emerald 4.0 specification has been adopted by ISO/IEC 24091:2019 and by the US EPA, Japan TopRunner and EU Lot 9.



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 standard Emerald workloads. **CTS Lite Device** for individual storage devices is the test tool required by the **SNIA Emerald Device 1.0** specification. CTS Lite Device contains the required workload generator, IO command set, device test software, database and report generator.

Key Features & Capabilities

Feature	Description
Power efficiency metrics	Measures performance vs. power usage, reported in IOPS/W, MiB/s/W, and GB/W during standard Emerald Green Storage workloads.
Workloads	Standard SNIA Emerald Complex (Hotbands) 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, air-gapped benchmark tool that runs on Linux and Windows servers. CTS Lite Device software contains the CTS workload generator, test software, database and report generation.
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 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 specifications.
Excel results file	Editable Excel file 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 test. Past versions are archived and available during valid license term for re-test & comparison

Publication CTS Lite Device 12.02.0

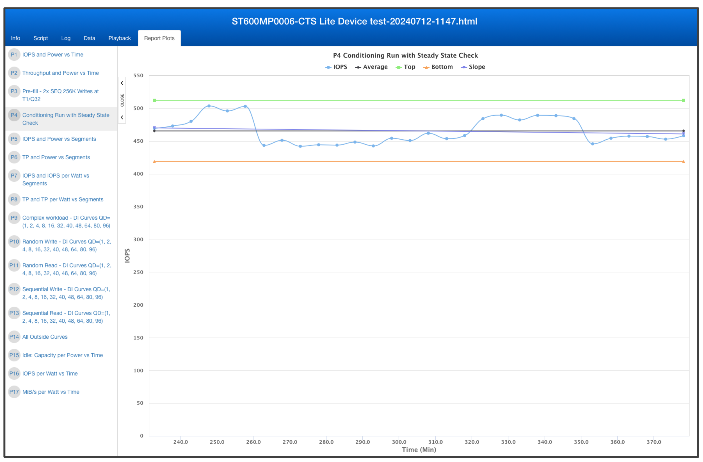
CTS Lite Device Test Software

Individual Device Block Testing

CTS Lite

Calypso Systems

CTS Lite Device Test. CTS Lite Device is an air-gapped, 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 automatically generates results plots (P1-P17). Plot P4 above shows Conditioning run with Steady State Check.

CTS Lite Device & License Seats

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

- **License Seats**: The CTS Lite Device annual seat license provides unlimited downloads of the CTS Lite Device Test 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.
- **HTML audit file:** Dynamic playback mode, source data, IO commands and logs.

Test Workflow

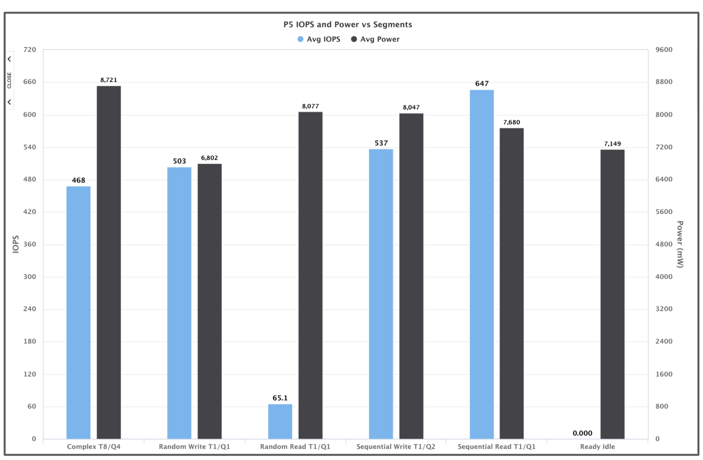
- **Purge:** Optional
- **Pre-Fill:** Applies SEQ 256K Writes for twice the User Capacity
- **Complex Workload Step**: Determines Steady State (SS) using the SNIA 5-Round SS algorithm, based on SNIA Emerald 4.0 Hotbands workload.
- **Workload Measurement Steps** (five total): Complex (Hotbands), Random 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

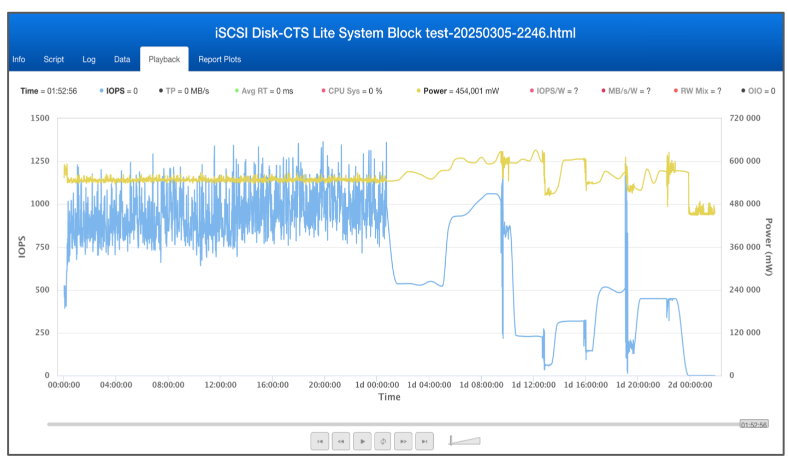
- Each workload step includes a self-optimization loop that adjusts Thread Count and Queue Depth to achieve maximum IOPS under a **20 mSec average response time ceiling**.
- Enables optimal power efficiency measurement in a **single test run**, eliminating the need for multiple runs.

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, SNIA reporting, and archiving. See CTS Lite Enterprise Dashboard.
- CTS Lite Device downloads: www.ctslite.com; info@calypsotesters.com
- Quarch Power Analysis Module: www.quarch.com; info@quarch.com



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



HTML Replay & Audit file. HTML results is a read only audit file with dynamic replay, required report plots, source data, script, logs and administrative data.

Publication CTS Lite Device 12.02.0