

## TrueMURA™

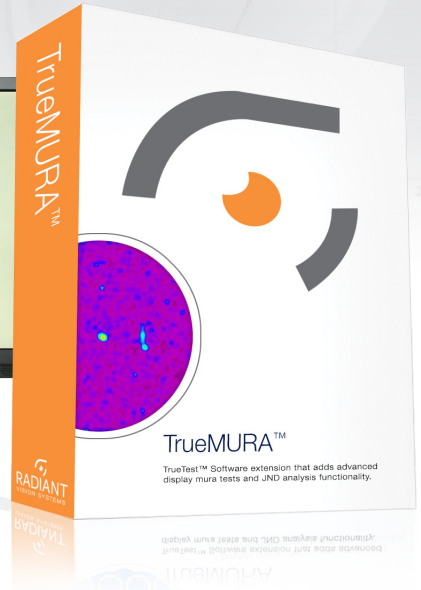
Display Test Extension for TrueTest™ Software

### Applications

- Display mura characterization
- Technology evaluation for mura detection, categorization, and grading
- Production quality control
- General defect detection
- Testing to German Flat Panel Display Forum (DFF) standards for Black Mura Gradient

### Benefits

- Correlated to human visual perception of light and color
- Reduces cost and variability in display image quality assessment
- Objective, numerical evaluation of display mura based on JND



Software extension that adds advanced display mura tests and JND analysis functionality

The Radiant Vision Systems TrueMURA™ software is the first commercial system available to provide advanced image analysis algorithms for computing JND (“Just Noticeable Differences”) in displays. These tests augment the defect analysis functions already available in Radiant’s TrueTest™ Automated Visual Inspection Software, including a complete test suite for luminance, chromaticity, and defect detection. The JND detection algorithm incorporated in TrueMURA is based on U. S. patent 7,783,130, “Spatial Standard Observer” (SSO) technology, licensed by Radiant Vision Systems from the National Aeronautics and Space Administration (NASA).

Automating human judgment of display defects or blemishes (referred to as “mura”) is difficult because human visual recognition of uniformity variations and other defects is dependent on many factors including brightness, color, and spatial relationships. To accurately discriminate JND—artifacts just noticeable by a human observer—TrueMURA is based on a model of human perception which allows grading of display mura in a way designed to match a human observer’s perception of defect severity. These algorithms ignore mura that cannot be seen by humans and rank the different varieties of mura that are distinguished by humans into categories matching those assigned by human observers.



## Key Features

- Matches human visual perception of defect type and severity.
- Fully integrated into standard TrueTest™ display test functionality.

The TrueMURA™ software license includes a range of mura tests, in addition to what is offered in standard TrueTest Software:

- Black Mura
- Blob Analysis
- Butterfly Mura
- Corner Light
- Diagonal Line Mura
- Edge Mura
- LED Mura
- Line Mura
- Spot Mura
- TrueMURATest

## Examples of TrueMURA Analyses:

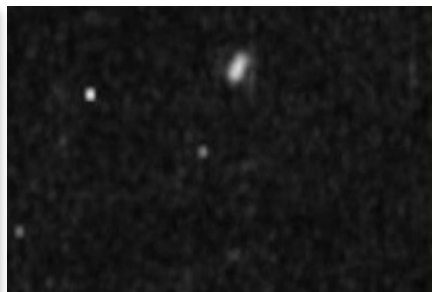
TrueMURA analysis provides the following outputs:

### JND Map of Display Screen Image

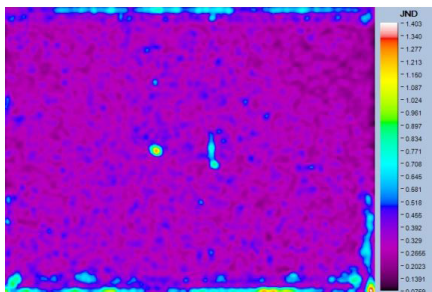
Maximum JND: Maximum JND value anywhere in the JND image  
 Total JND: Calculated by non-linear "pooling" across the JND image  
 Single JND: Applied to large extended artifacts in the JND image



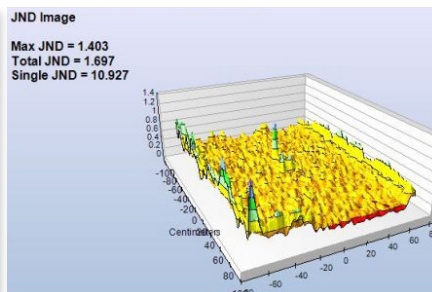
Original Screen Image



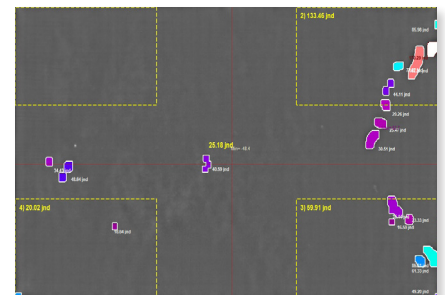
JND Image for Same Screen



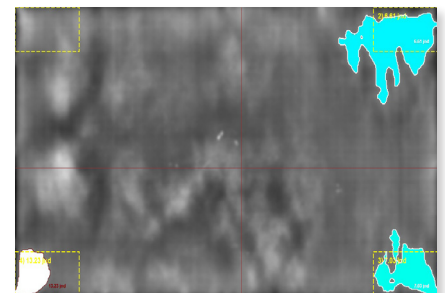
JND Image with Scale



JND Image with Metrics



Black Mura



Corner Light

## TrueMURA™ System Requirements

- ProMetric® Imaging Colorimeter or Photometer
- TrueTest™ Software
- Windows® 10, 64 bit
- 16-32 GB RAM
- Additional system requirements vary by camera. See hardware specification sheet for more information.