

Unisyn Engineering Analysis

Wyle Project Number T58073.01

Introduction

This report presents the results of the engineering analysis for Engineering Change Orders (ECO) and Engineering Approval Change (EAC) submitted by Unisyn Voting Solutions, Inc. to be implemented into the OpenElect Voting System (OVS), Version 1.0. The primary purpose of the engineering analysis was to determine if the changes submitted for the OVS are “De Minimis” changes according to the U.S. EAC Testing and Certification Manual, or are considered a modification.

Scope

Unisyn has two methods for making changes to the OVS. The engineering change order is used when a part is no longer used. The part can be “end of life”, updated by a third party, or changed to a better performing part. The engineering approval change is used when a part can be used interchangeably with an existing part. An example of this is either Part A or Part B can be used. Two units can be equivalent, but do not contain the exact same part.

The following are the ECO’s and EAC’s that have been evaluated as part of the engineering analysis:

- EAC 1001 – Three new parts have been upgraded to parts with more capacity or better performing parts. The DDR memory module was upgraded from a 512 MB 533MHz to a 1 GB 533 MHz memory module. The hard drive was updated from an 80GB SATA drive to a 320GB SATA drive. The USB flash drive was update to a more ESD resistant case with higher error bit correction.
- ECO 16844 – The OVI motherboard and BIOS have become “end-of-life” parts. The existing motherboard is a Jetway 1GHz Rev 3.1 (model number J7F2WE1GS-OC-LF). The replacement motherboard is a Jetway 1GHz Rev 4.0 (model number J7F2WE1GS-OC-LF). The BIOS is updated from Jetway I14 to Jetway I18.
- ECO 16855 – A change in the flash ROM supplier for the Star TSP743II-24 printer forced a change to the printer’s mainboard and a revision of the printer’s firmware from TSP700II 090406a - b1.0 to TSP700II 100304a - b2.0.
- ECO 16857 – Changes to the OVI chassis have been made to facilitate a better fit for components, and for ease of assembly.

Overview

Background

Wyle performed the original U.S. EAC certification testing for the Unisyn OVS, Version 1.0. After test completion, Wyle retained all the units for this certification effort. Wyle utilized two of the OVI units (serial numbers UNI150003 and UNI150006) for this evaluation. An Electromagnetic Radiation Quick Scan was performed on these units to create a baseline for comparison. The components from ECO 16844, ECO 16855, ECO 16857, and EAC 1001 were installed into a new chassis with serial number UNI150032 using components from the ECO’s and EAC’s as well as from the OVI donor unit with serial number UNI150003. These components included the following:

Unisyn Engineering Analysis
Wyle Project Number T58073.01

- Jetway motherboard model number J7F2WE1GS-OC-LF rev 4.0
- Jetway BIOS I18
- Super Talent DDR memory module 1 GB model number T533UB1GV
- Western Digital 320GB SATA hard drive model number WD32AAJS
- STEC 1GB industrial flash drive model number SLUFD1GU2U
- Revised OVI Chassis

Strategy for Evaluation

Although some of these ECO's can be determined to be "De Minimis" independently, Wyle determined the best approach would be to gather more data before making a determination. The data was gathered from four sources. First, Wyle compared the documented changes for each replacement component to the originally certified component. Next, Wyle ran a "Quick Scan" for electromagnetic radiation to determine what effect the changes had on the unit's electronic signature. Then, a functional exercise of all diagnostic features for the OVI was performed. Finally, attempts were made on the new BIOS to defeat the BIOS password.

Documentation Comparison

The documentation submitted for the ECO evaluations consisted of either manufacturer-supplied or publically-available test reports and data sheets. Each component is a COTS component that has been tested by the manufacturers. Because all replacement components except for the revised OVI chassis were COTS, most documentation was readily available for download at the manufacturers' web site. Through the documentation review, the following observations were noted:

- ECO – 16844 - It was determined that the replacement motherboard had been granted a CE Declaration of Conformity to the following tests/standards:
 - EN 55022 (Conducted and Radiated Emissions)
 - EN 61000-3-2 & EN 61000-3-3 (Power Harmonics & Voltage Fluctuation/Flicker)
 - IEC 61000-4-2 (Electrostatic Discharge)
 - IEC 61000-4-3 (Radiated Electromagnetic Field)
 - IEC 61000-4-4 (Fast Transient/Burst)
 - IEC 61000-4-5 (Surge Immunity)
 - IEC 61000-4-6 (Conducted Disturbance/Induced by Radio Frequency Field)
 - IEC 61000-4-11 (Voltage Dips & Interruptions)
- ECO 16855 – It was determined that a revision of the printer mainboard as a result of a change in flash ROM suppliers, as well as a revision of the printer's firmware from TSP700II 090406a - b1.0 to TSP700II 100304a - b2.0, did not negatively affect the test results.
- ECO 16857 – Changes to the OVI chassis made to better facilitate assembly of OVI units did not adversely affect the test results.
- EAC – 1001 - The 1GB DDR Memory Module can be added to the approved list for part number 3120-21237 because it is compatible with the current 512MB module. Both modules are manufactured by Super Talent Electronics, are of Type DDR2, have a speed of PC4200 533 MHz, and are 64x8 in size and bit. Therefore, changing this part would not negatively impact

Unisyn Engineering Analysis Wyle Project Number T58073.01

current test results. The 320GB capacity Hard Drive can be added to the approved list for part number 2000-60458 because it is compatible with the current 80GB drive. Both hard drives are manufactured by Western Digital, have an 8MB cache buffer, a spindle speed of 7200 rpm, and are Serial ATA (SATA) hard drives. Therefore, changing this part would not negatively impact current test results. The change in the USB flash drive is to a more ESD-resistant case and additional enhancements were added. Therefore, changing this part would not negatively impact current test results. The manufacturer part number changed from P/N SLUFD1GU1U-A to SLUFD1GU2U.

Quick Scan

Wyle needed more data to make a determination for the combination of all hardware changes applied to a single unit. Wyle performed a “Quick Scan” of electromagnetic radiation to provide the data needed. The “Quick Scan” was performed in a semi-anechoic chamber. Wyle utilized both biconical and horn antennas in both vertical and horizontal orientations at a distance of one meter from the test specimen.

For the first scan, OVI unit UNI150003 was loaded with the firmware and election data from the U.S. EAC certification testing. No hardware updates were made to this unit to create a baseline for comparison. A “Pre-Operational Status Check” was performed, after which the unit was placed in the chamber and set to play audio. Electromagnetic radiation scans were performed while the unit was in operation. At the conclusion of the electromagnetic radiation scans, the unit was subjected to a “Post-Operational Status Check”.

For the second scan, OVI unit UNI150006 was loaded with the firmware and election data from the U.S. EAC certification testing. No hardware updates were made to this unit to create a baseline for comparison. A “Pre-Operational Status Check” was performed, after which the unit was placed in the chamber and set to play audio. Electromagnetic radiation scans were performed while the unit was in operation. At the conclusion of the electromagnetic radiation scans, the unit was subjected to a “Post-Operational Status Check”.

For the third scan, OVI unit UNI150003 was updated with the components from all the ECO’s as well as the firmware and election data from the U.S. EAC certification testing. The new components and the existing components were placed into a new OVI chassis with serial number UNI150032. Unit UNI150032 then became the EUT because the chassis contains the serial number. A “Pre-Operational Status Check” was performed, after which the unit was placed in the chamber and set to play audio. Electromagnetic radiation scans were performed while the unit was in operation. At the conclusion of the electromagnetic radiation scans, the unit was subjected to a “Post-Operational Status Check”.

These three scans provided Wyle with enough data to make the assessment that the hardware updates are not significant and to suggest these changes be considered minor. The scans revealed there is a greater difference between units than the difference of a single unit with the different hardware components. The results of this scan are presented in Appendix A.

Internal Diagnostics Exercise

Wyle exercised the diagnostic features of the OVI with ECO’s applied. The Test Printer, Test Display, Test Audio, Test Headphones, Test Touchscreen, Test Keypad, and Test Binary Input diagnostics were performed from both poll worker diagnostics (except Test Printer, as it is unavailable in pollworker diagnostics mode) and in maintenance mode. Poll worker diagnostics were performed with both voting open and closed. The following is a list of diagnostic test features with a description that were performed:

Unisyn Engineering Analysis
Wyle Project Number T58073.01

- Test Printer – Prints a receipt with characters presented in varying font sizes.
- Test Display – A series of colored boxes are displayed to verify system colors are visually correct.
- Test Audio – A sound is played periodically over the headphones plugged into the Audio Tactile Interface (ATI).
- Test Headphones – Verifies that the headphones are connected to the ATI handset.
- Test Touchscreen – Blank screen that places an X on the screen for touch screen functionality.
- Test Keypad – Buttons on screen turn green as the corresponding keys are pressed on the ATI Handset.
- Test Binary Input – Buttons labeled Sip and Puff turn green when the corresponding test button is pressed on the Sip and Puff device.

All diagnostic test features performed without issue.

Defeat BIOS Password

The new Jetway motherboard uses an updated BIOS, version I18. Wyle felt more data was needed for this change because the original BIOS, version I14 was an OEM BIOS with a hardcoded password supplied by Unisyn. The following is a partial list of passwords used in original U.S. EAC certification of the OVI. All passwords listed failed to defeat the BIOS password.

| | | |
|-----------|-------------|----------|
| AWARD SW | AWARD_SW | Award SW |
| AWARD PW | _award | award |
| awkward | AWKWARD | AWARD?SW |
| j64 | j256 | j262 |
| j332 | J322 | 01322222 |
| 589589 | 589721 | 595595 |
| 598598 | IILT | SER |
| SKY_FOX | aLLy | aLLY |
| Condo | CONCAT | CONDO |
| aPaf | HLT | KDD |
| ZBAAADA | Djonet | CONDO |
| d8on | LWKPETER | BIOSTAR |
| Lwkpeter | PINT | pint |
| SYXZ | syxz | TTPATHA |
| ZBAAACA | ZJAAADC | A.M.I. |
| AAAMMMIII | AMI?SW | AMI_SW |
| BIOS | HEWITT RAND | MI |
| PASSWORD | phoenix | PHOENIX |

Recommendation

Wyle evaluated all submitted documentation, installed all components, functionally exercised the changes, and performed a “Quick Scan” of the electronic signature as part of our review for the submitted changes. Wyle believes these changes maintain and do not alter the reliability, functionality, capability and operability of the system. The review demonstrated the replacement hardware is electronically and mechanically interchangeable and has identical functionality and equal or better tolerances.

Unisyn Engineering Analysis
Wyle Project Number T58073.01

Wyle endorses each engineering change as 'De Minimis' and all engineering changes combined are 'De Minimis'. The following is a list of engineering changes that have been evaluated and endorsed as "De Minimis":

- ECO 16844
- ECO 16855
- ECO 16857
- EAC 1001

Approved: Wendy Owens 11/8/10
Project Engineer

Approved: Jack Cole 11/8/10
Project Engineer

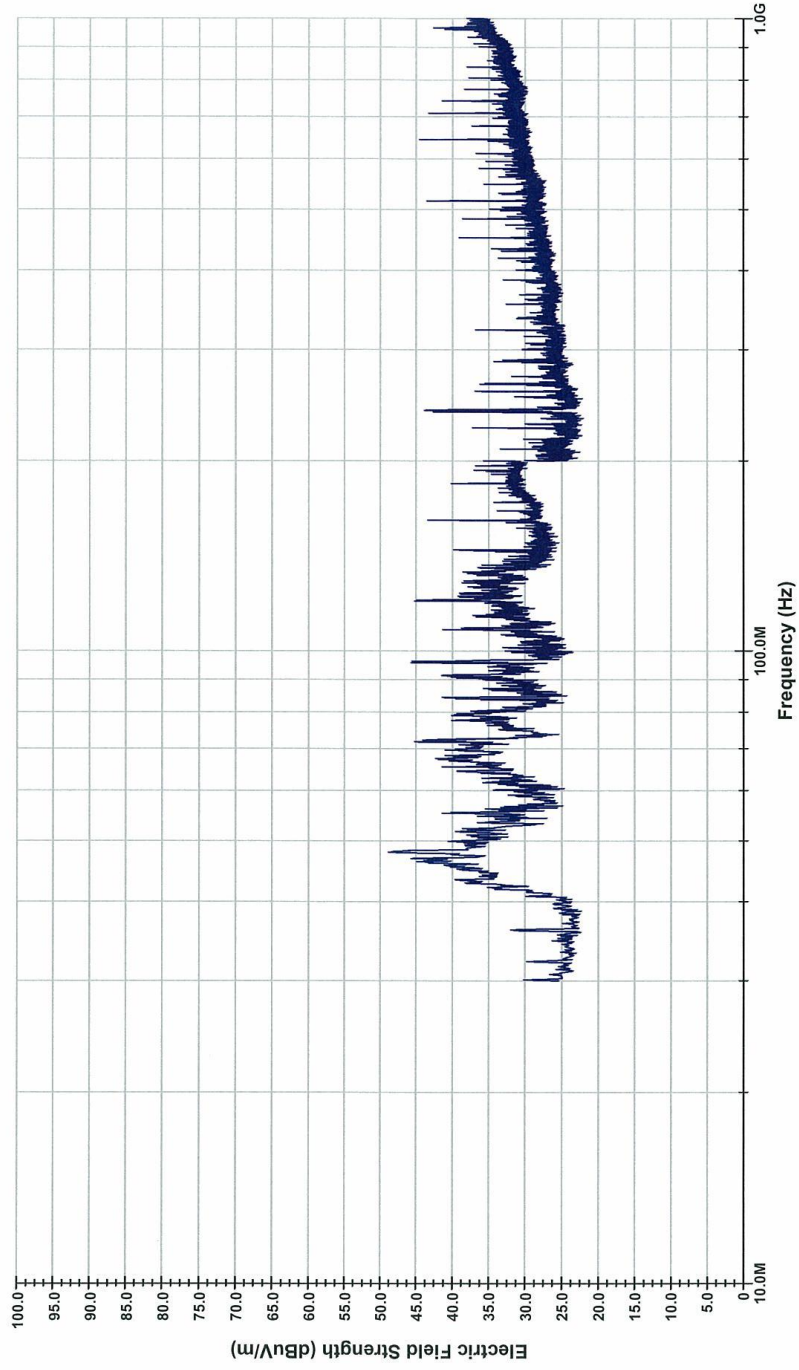
Approved: Frank Padella 11/9/10
Engineering Supervisor

APPENDIX A

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ITLS Comparison S/N UNI150003

EUT Active Results - Horizontal Antenna Polarization



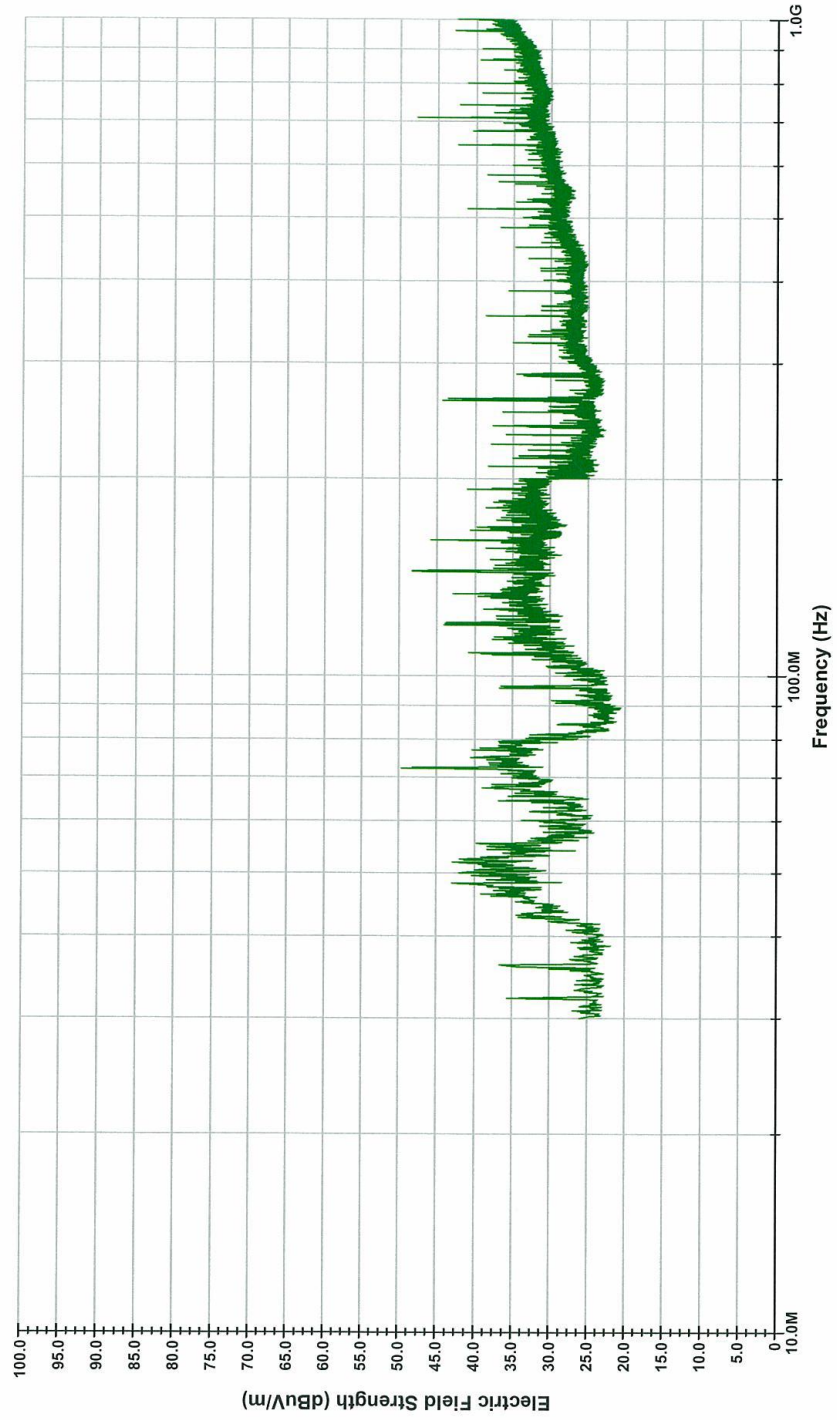
Operator: J. Galeone

11:10:47 AM, Thursday, October 28, 2010

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ITLS Comparison S/N150006

EUT Active Results - Horizontal Antenna Polarization



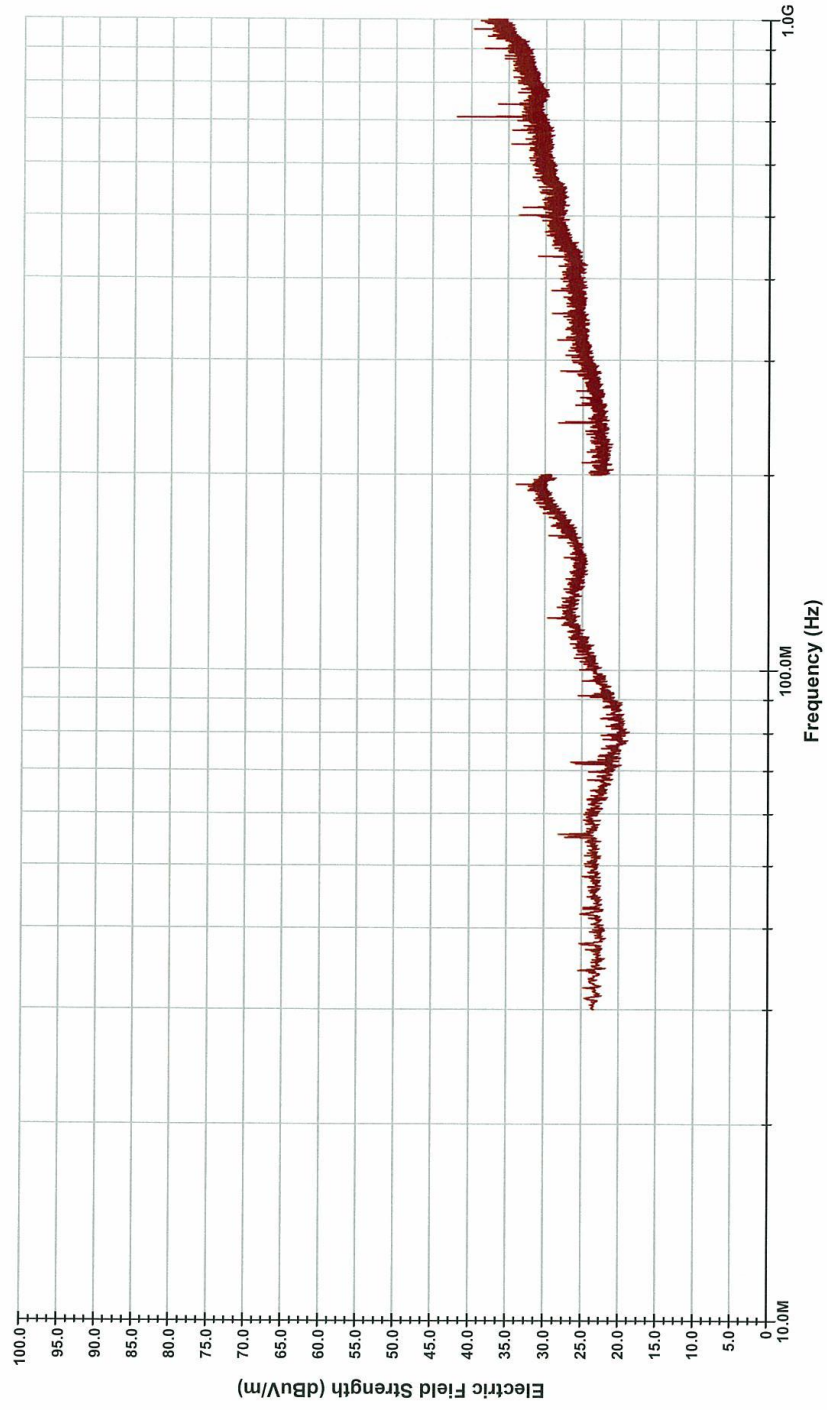
Operator: J. McFadden

11:00:13 AM, Thursday, October 28, 2010

Wyle Laboratories

ITLS Comparison S/N150032

EUT Active Results - Horizontal Antenna Polarization



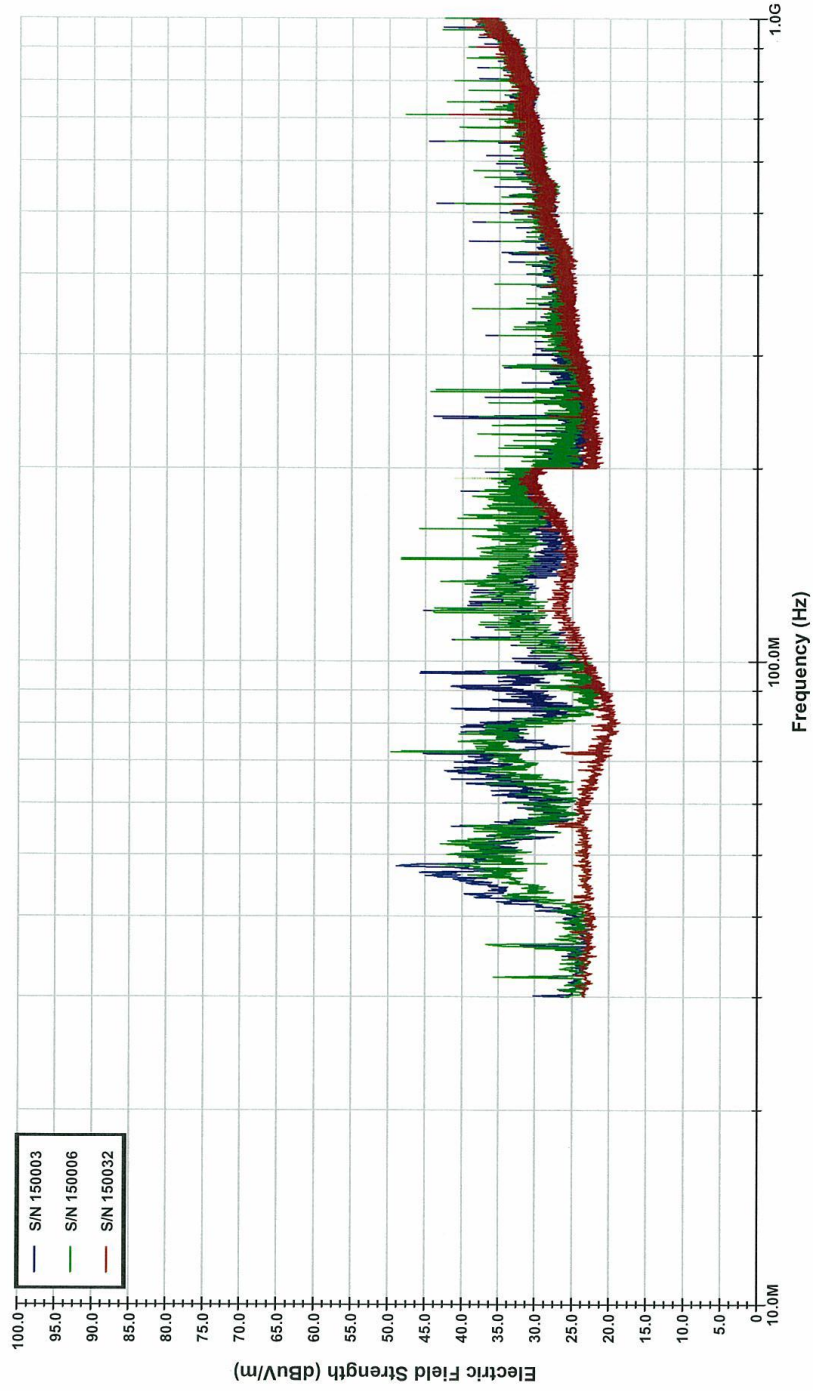
Operator: J. Galeone

02:57:11 PM, Monday, November 01, 2010

Wyle Laboratories

ITLS Comparison All

EUT Active Results - Horizontal Antenna Polarization1



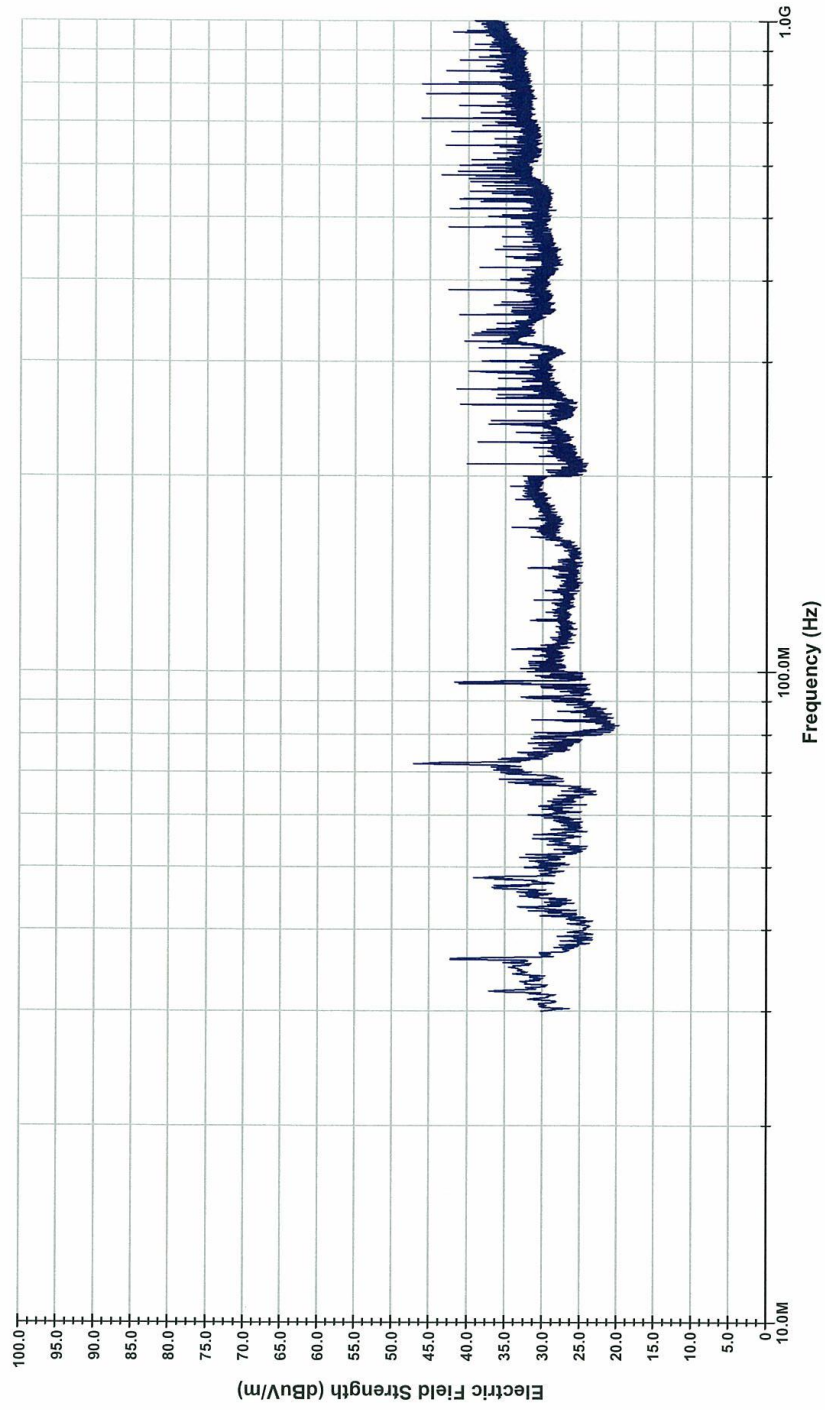
Operator: J. Galeone

01:23:29 PM, Wednesday, November 03, 2010

Wyle Laboratories

ITLS Comparison S/N 150003

EUT Active Results - Vertical Antenna Polarization



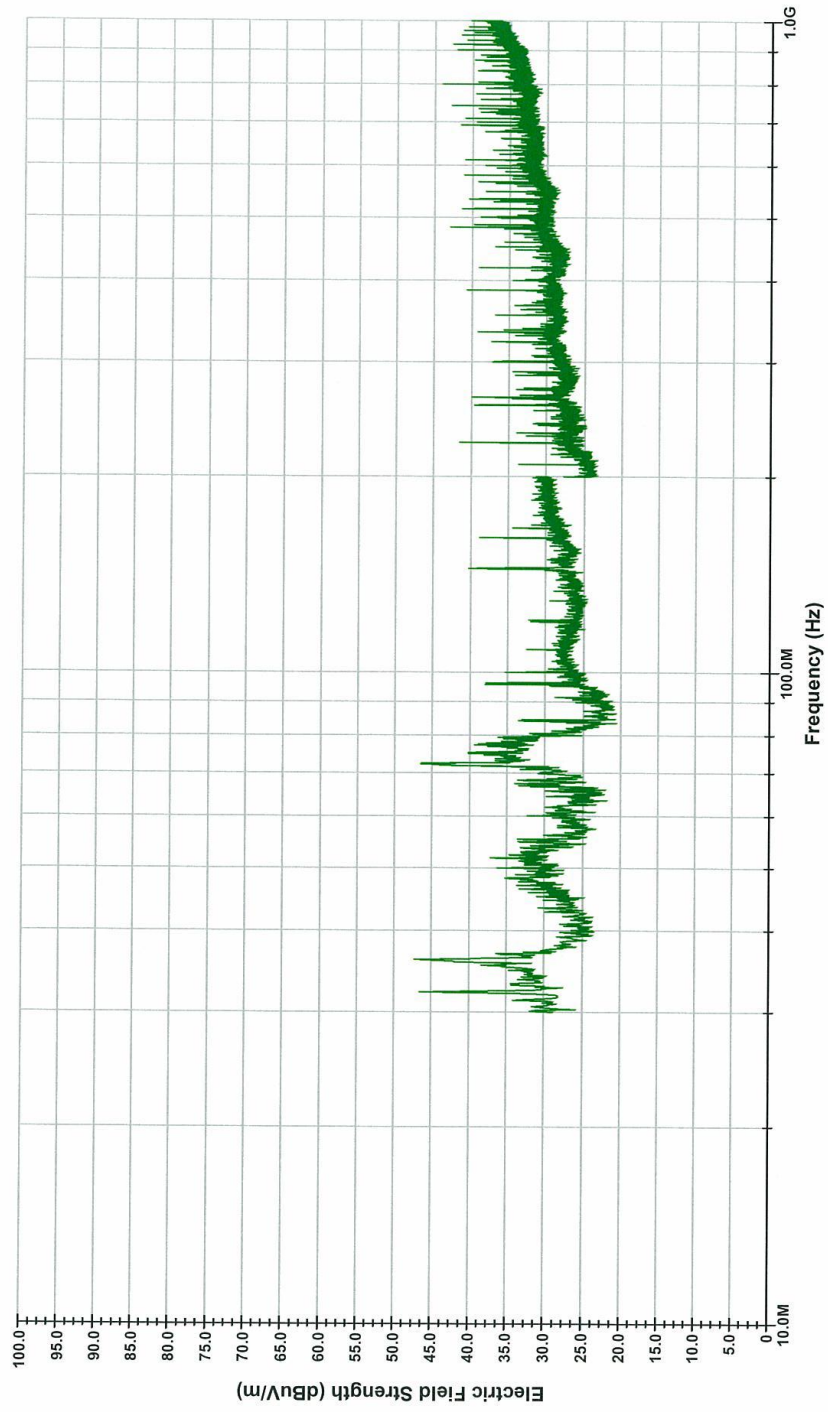
Operator: J. Galeone

11:16:08 AM, Thursday, October 28, 2010

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ITLS Comparison S/N150006

EUT Active Results - Vertical Antenna Polarization



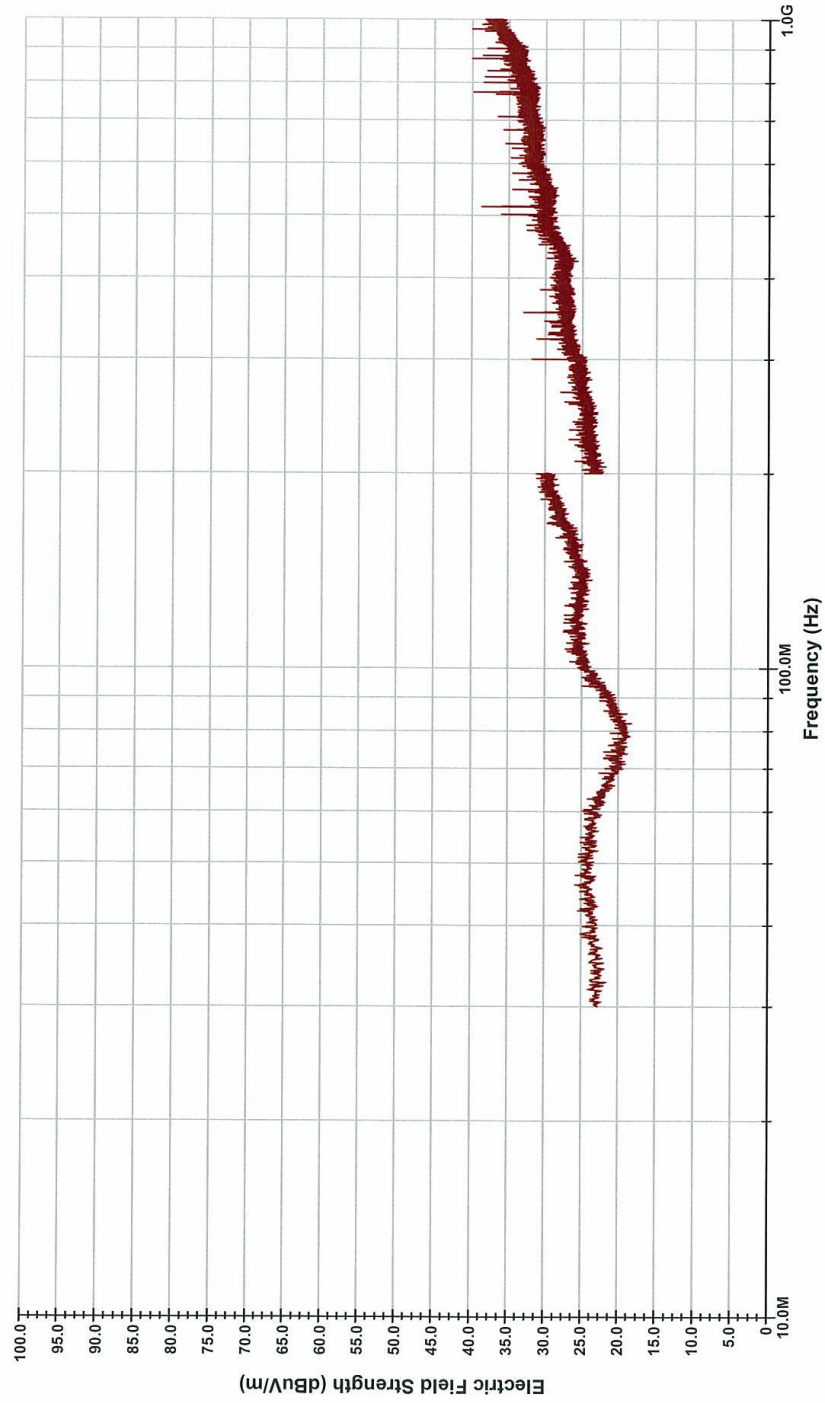
Operator: J. McFadden

10:54:53 AM, Thursday, October 28, 2010

Wyle Laboratories

ITLS Comparison S/N150032

EUT Active Results - Vertical Antenna Polarization



Operator: J. Galeone

02:53:17 PM, Monday, November 01, 2010