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INTELLIGENT PHOTON DELIVERY SYSTEMS POWERED BY IoT

RadTech USA, May 2018, Mike Gharagozloo

AGENDA

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- INTELLIGENT IRRADIATOR

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- IoT

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- AIMS CLOUD PREDICTIVE

BACKGROUND - MICROWAVE (MW) POWERED UV SYSTEMS

- Until now,…
  - › only power supply parameters were measured/reported
  - › no irradiator parameters were measured/reported

    (photodetector & air pressure switch were considered interlocks)

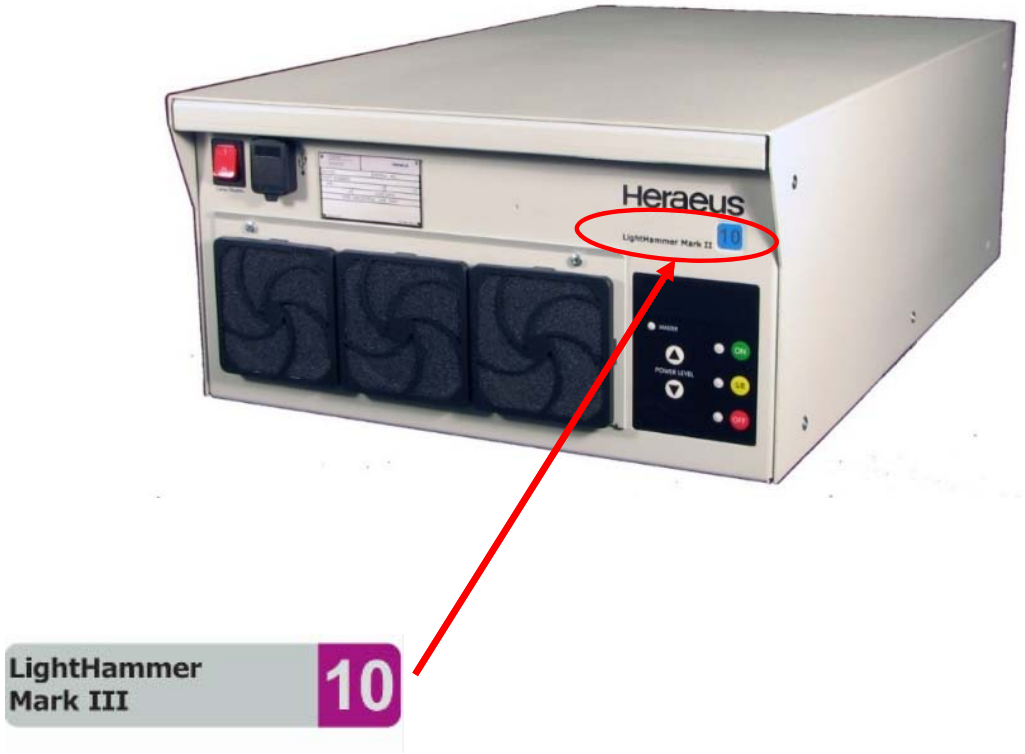
- Further building upon our latest, most technologically advanced MW powered system, the ***LightHammer® 10 Mark II***, a number of sensors have been integrated into the irradiator to make the ***Intelligent Irradiator***.

- These new irradiator parameters can then be provided to our optional ***Advanced Integrated Monitoring System (AIMS).***
  - › for enhanced system diagnostic, preventative maintenance, predictive analytics, and much, much more…

OVERVIEW - LIGHTHAMMER MKIII SYSTEMS

- Starting with the *LightHammer Mark II* power supply as the foundation
- **PLUS** the new ***Intelligent Irradiator***
- To enable…

  LOWER COST OF OWNERSHIP
- Heraeus Noblelight's new ***LightHammer Mark III*** is now here to provide reliable UV technologies for efficient processes.

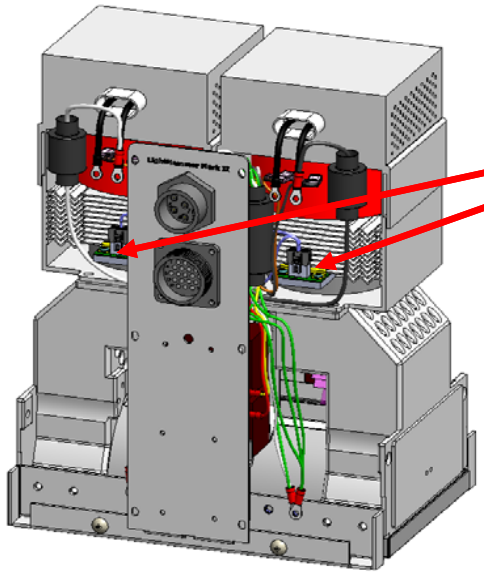


BENEFITS - LIGHTHAMMER MARK III POWER SUPPLY

- **Lower Cost of Ownership**
  - 20+% Energy Savings compared to legacy MW powered systems
  - ~99% Power Factor Correction (PFC) under full load
  - Higher reliability
  - Minimum Total Harmonic Distortion (THD)
  - 100% Balanced 3-Phase Power Loading
- **Scalable, modular system**
- **Utilizing today's latest state-of-the-art power electronics technology**
  - Up to 75% Lighter than ferro-resonant power supplies
- **DC output with essentially no output ripple**
- **Universal Industrial Input Power, auto ranging 200 - 480VAC, 50/60Hz**
- **Standard Industrial Communication Protocols**
  - DeviceNet™, ProfiBus®, ProfiNet®, EtherNet/IP™
  - Dry Contact (standard)
- **IoT Enabled**
- **Optional solid-state blower power module integrated into power supply**
- **Backward compatible with legacy Light Hammer & LightHammer Mark II power supplies**
- **Green Technology (RoHS)**

THE INTELLIGENT IRRADIATOR

Front View



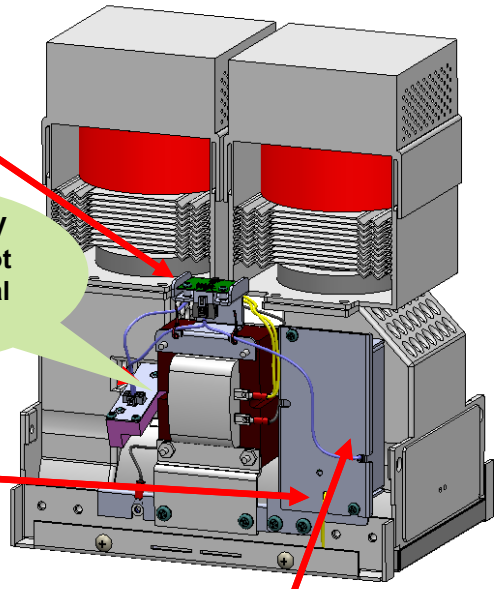
- Magnetron Temp Sensors

Back View

- Inlet Air Temp/Humidity Sensor
- **UV Sensor**
  Enables relative UV measurements
- **Thermopile**
  Enables bulb temperature measurements

The Internal UV sensor does not replace external radiometry

- **Analog Air Pressure sensor**
  Enables variable cooling function



- Main Module

Includes:

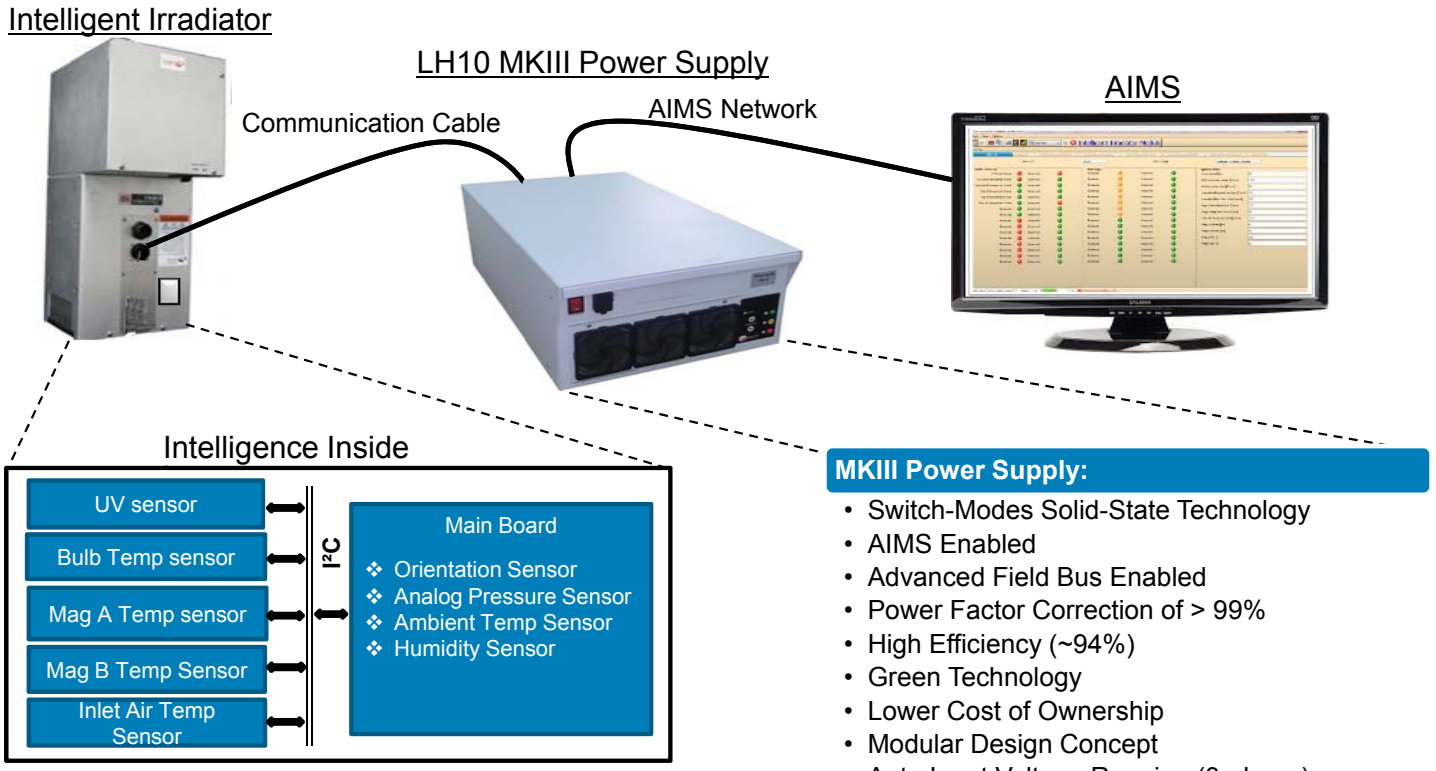
- Orientation Sensor
- Analog Air Pressure Sensor
- Temp Sensor

All new sensor boards designed, tested & qualified for:

- RF interference
- UV exposure
- Internal operational environment

SMART UV SYSTEM

LightHammer Mark III System with AIMS

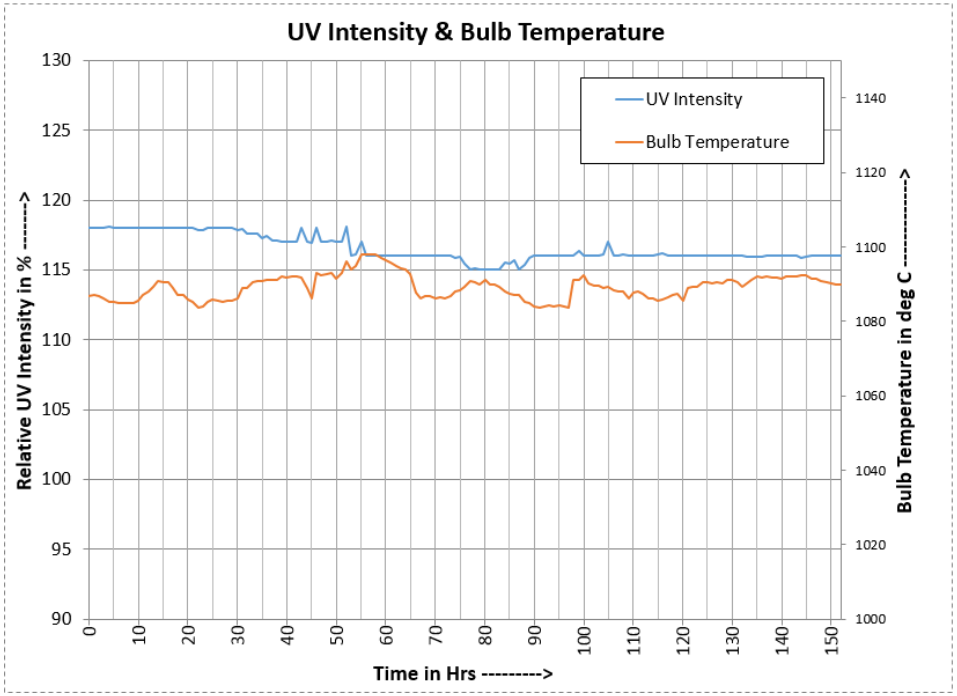


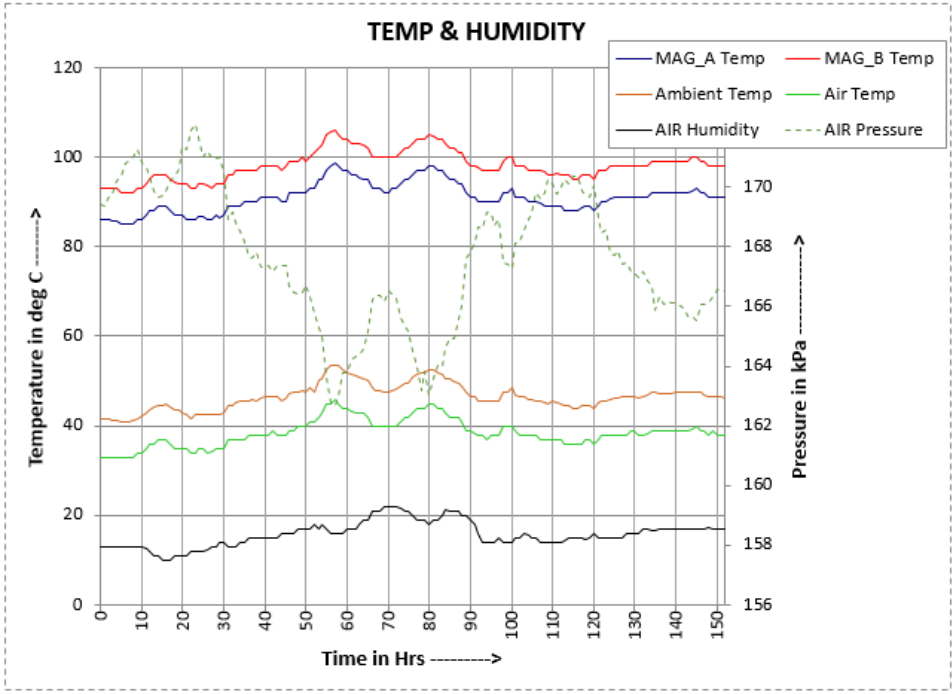
MKIII Power Supply:

- Switch-Modes Solid-State Technology
- AIMS Enabled
- Advanced Field Bus Enabled
- Power Factor Correction of > 99%
- High Efficiency (~94%)
- Green Technology
- Lower Cost of Ownership
- Modular Design Concept
- Auto Input Voltage Ranging (3-phase)

PARAMETER DATA - INTELLIGENT IRRADIATOR

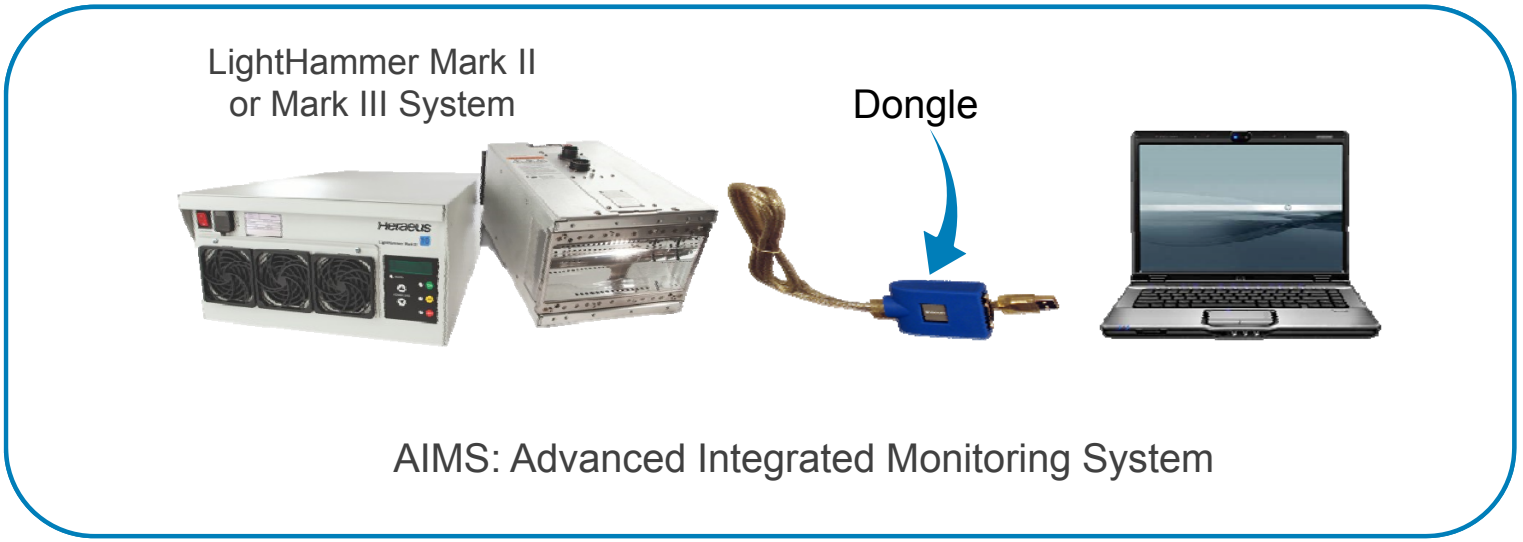
Measurement Data



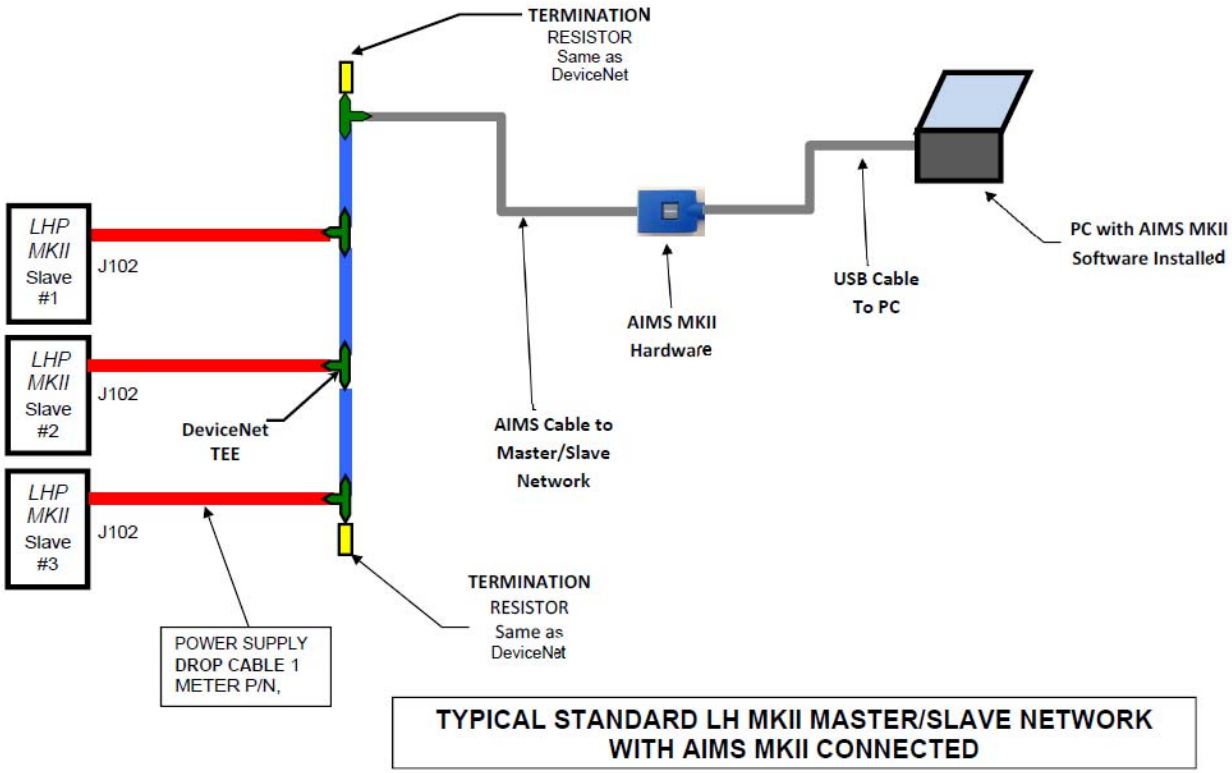


WHAT IS **AIMS?...A**dvanced **I**ntegrated **M**onitoring **S**ystem

- AIMS software application in conjunction with hardware (dongle) is used to monitor the system parameters during real-time operation.
  - Capable of monitoring up to **30** Light Hammer Systems.



AIMS: INTEGRATION & REAL-TIME PERFORMANCE MONITORING



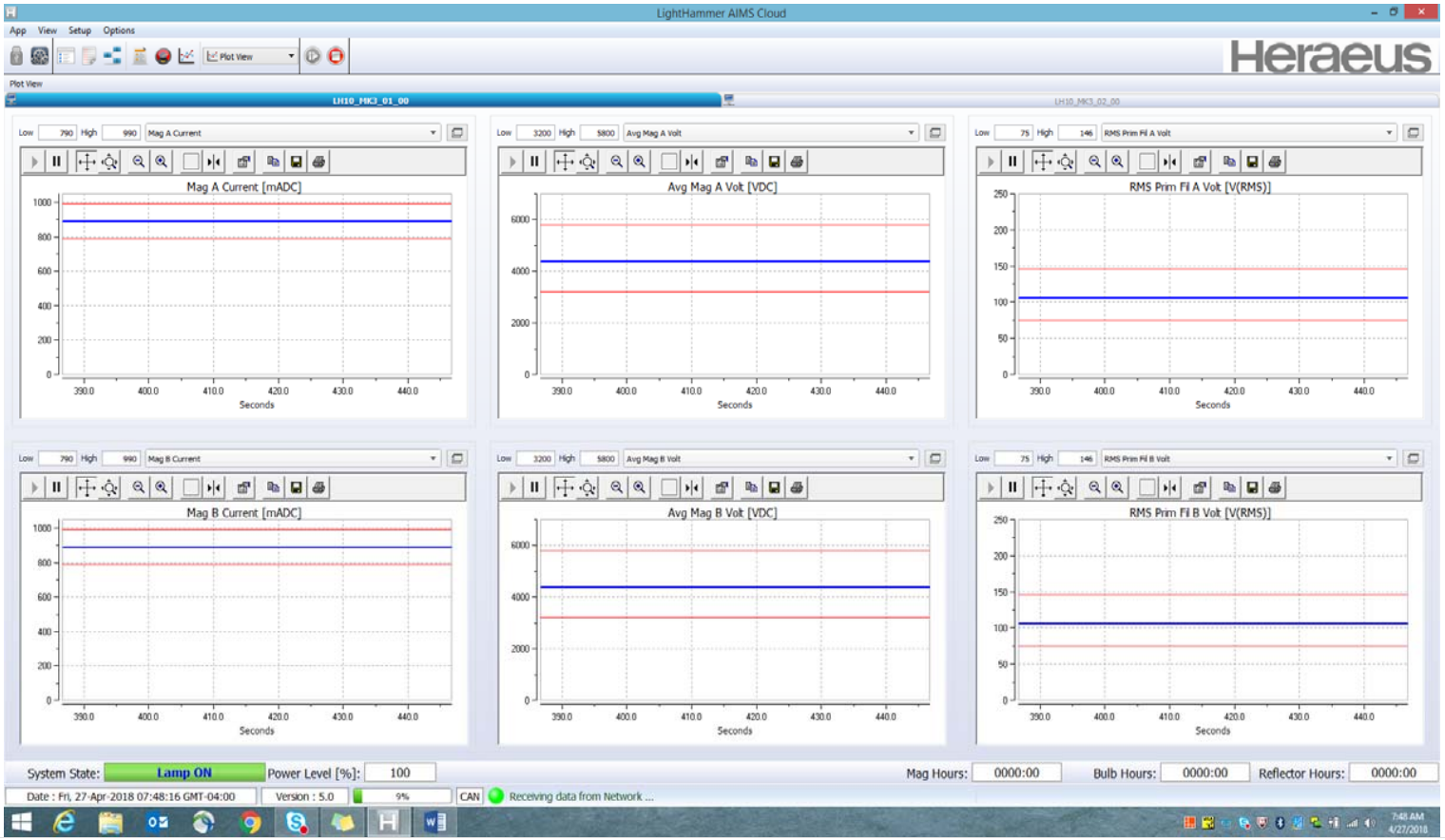
** LH Mark II shown for illustrative purposes only; LH Mark III would be the same.*

AIMS – FEATURES & BENEFITS

- **Improves system uptime and maintenance.**

- **Displays & Monitors performance parameters of *LightHammer Mark II* & *Mark III* Systems.**
  - Minimizes unscheduled system shut down
  - Central location to collect, display and email all critical system information/data.
  - Displays a high level status of all *LightHammer Mark II's* or *Mark III's* connected.
  - Monitors system parameters and sends email notification when critical predefined thresholds are reached.
  - Sends e-mail notification (when configured) when a warning/fault is detected or set control limits are exceeded.
  - Automatically creates a data file for each day of operation.
  - Emails periodic system summary report for all connected units when configured.
  - On Board "hour meters tool" to track the maintenance schedule of key consumables (magnetrons, bulbs, reflectors)
    - Sends reminder notification to the user(s) for timely replacement
    - User resettable
  - Able to log data in 15, 30, or 60 second intervals.

AIMS FOR LIGHTHAMMER MKIII – MONITORING DASHBOARD VIEWS



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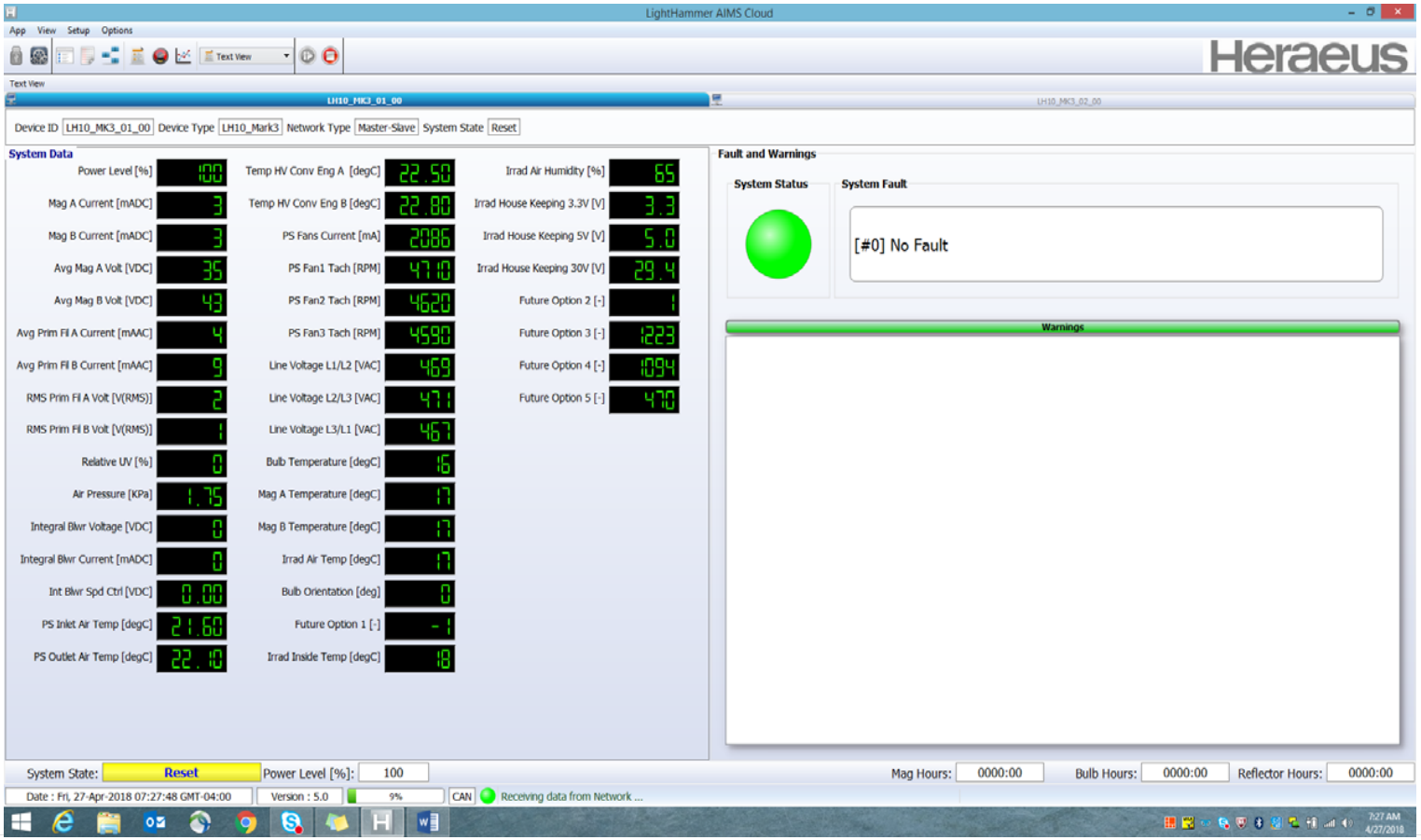

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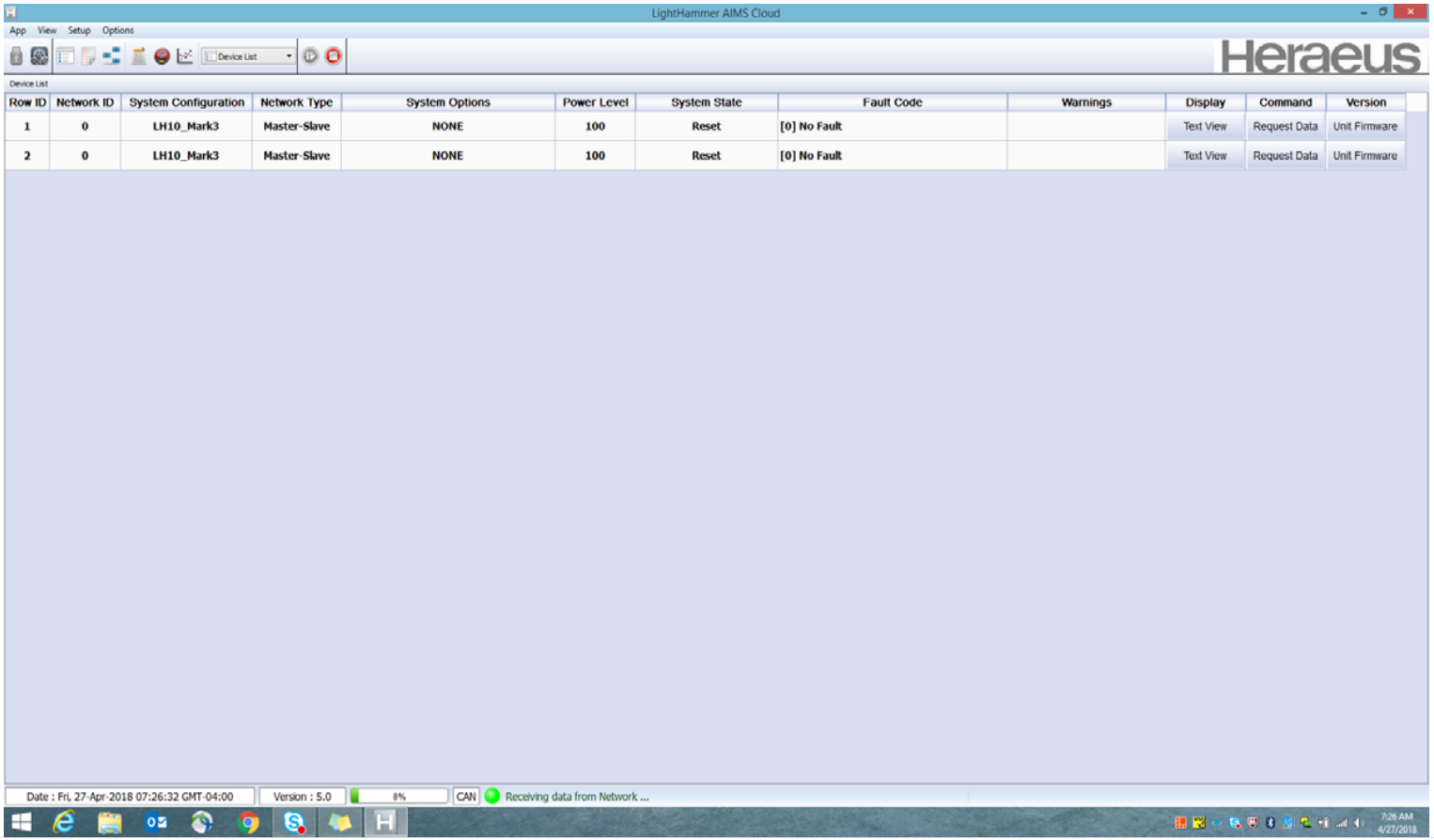
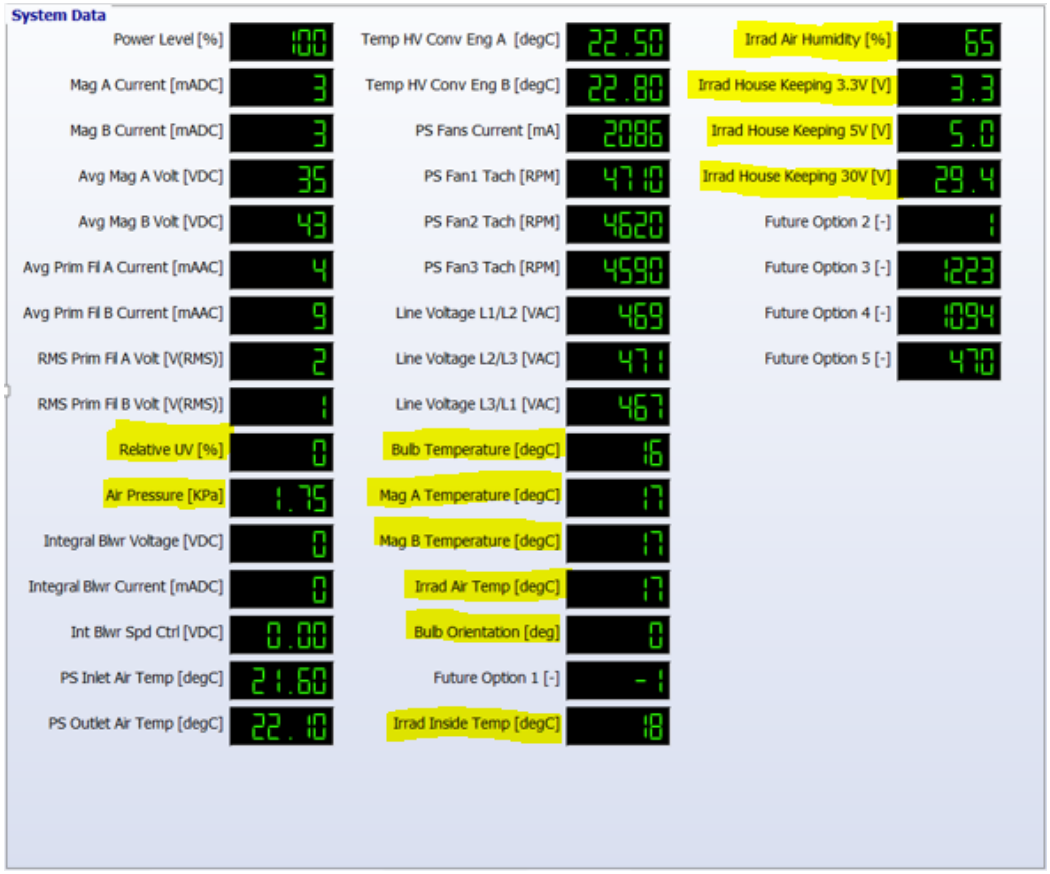
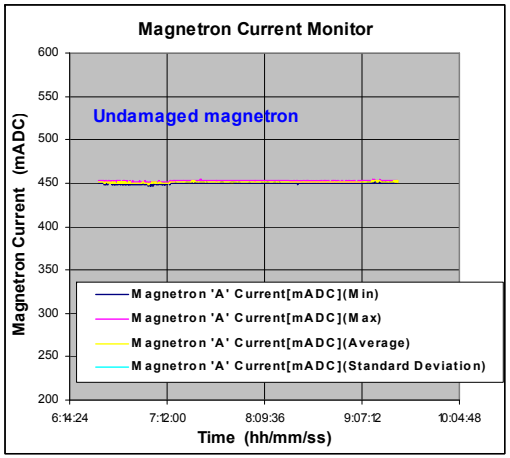


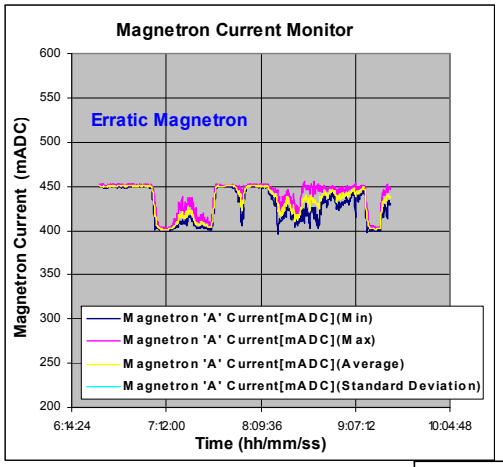
AIMS FOR LH10 MKIII (W/ INTELLIGENT IRRADIATOR) – NEW PARAMETERS

- The NEW Intelligent Irradiator allows for an additional 12 new parameters to be monitored
- Total of 80 measured and calculated parameters per system



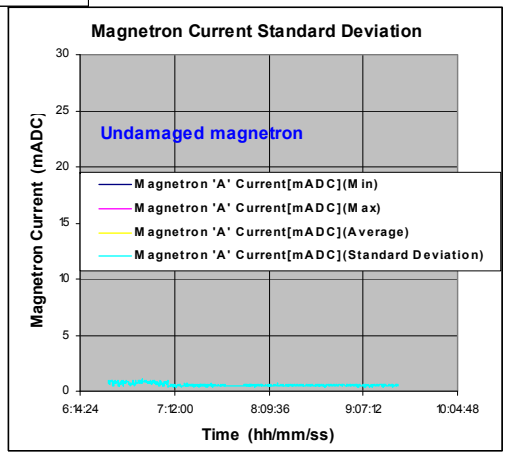
AIMS - EXAMPLES OF DIAGNOSTIC CAPABILITY

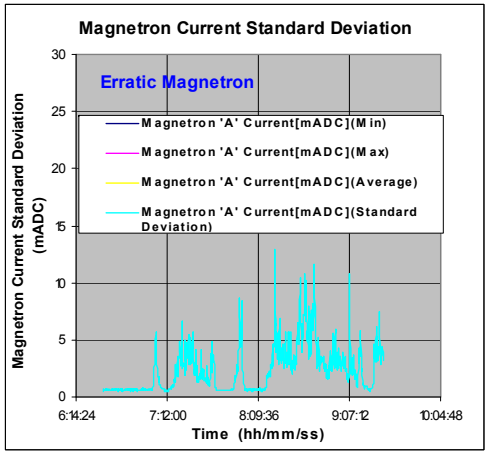




Magnetron Current Monitoring

Magnetron Current Standard Deviation





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IoT

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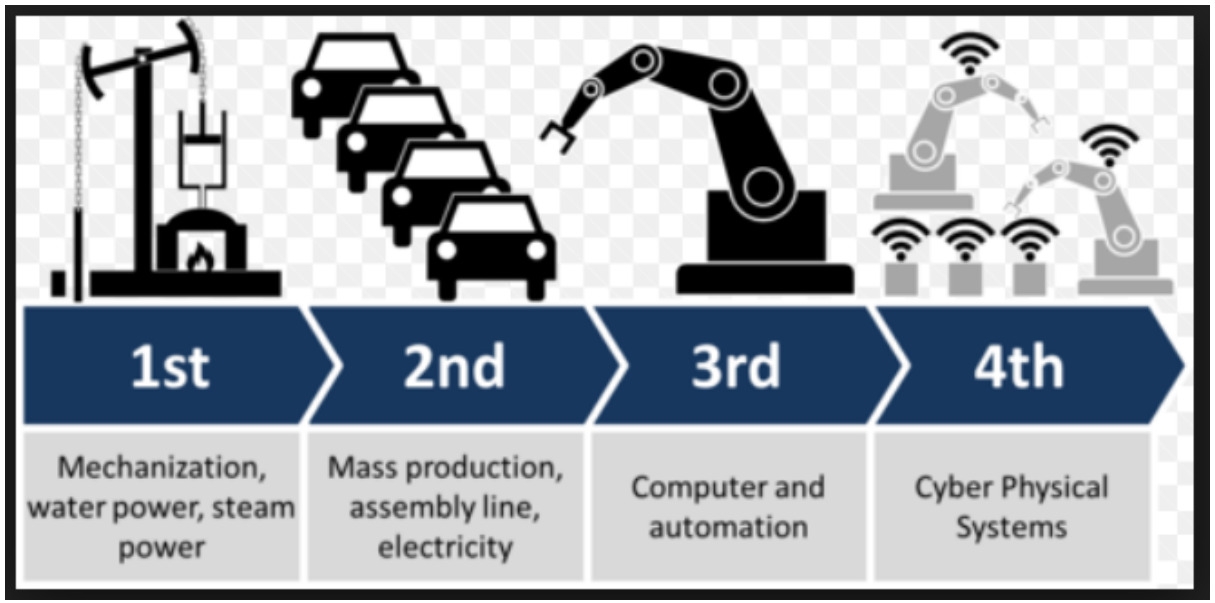
What is IoT?

- The "***Internet of Things***" (IoT) refers to the ever-growing network of physical objects that feature an IP address for internet connectivity and the communication that occurs between these objects and other Internet-enabled devices and systems which also encompasses technologies such as: *smart grids, smart homes, smart factories*

  intelligent transportation, smart cities ……..
- Also known as "***Big Data***" and "***Industry 4.0***"
- Also for Industrial use is call the "***Industrial Internet of Things***" (IIoT)
- The IoT (IIoT) is blurring the boundaries between virtual and physical objects, *enabling entirely new market segments and business models.*

INDUSTRY 4.0

- One of the largest global transformations is occurring in history right now…***digitalization***.
- The fourth industrial revolution (Industry 4.0) holds the promise of integrated digital and physical technologies that improve organizational operations, productivity, growth, and innovation.



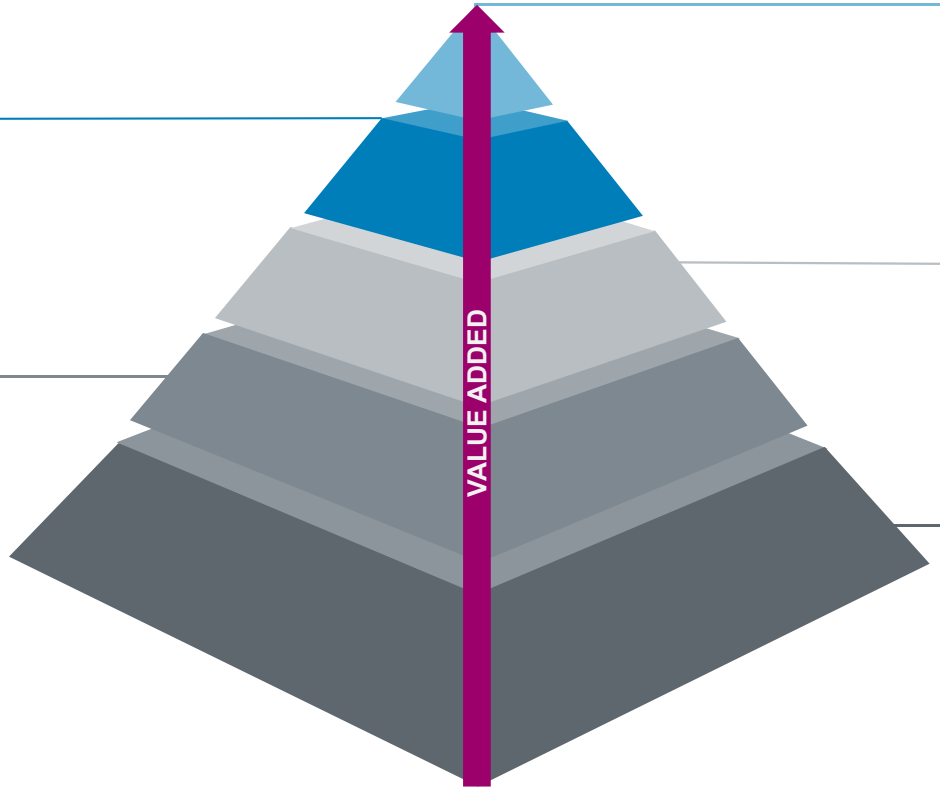
DIGITALIZATION STRUCTURE

Digital interfaces

- Customer understanding
- Cross-department interfaces

Manage Data

- Cloud
- Big data
- Cyber security



Business Impact

- Reconfigure for value delivery
- Business models and strategy

Advanced Analytics

- Data Science
- Data Analytics
- Machine learning

Build connectivity

- Data acquisition
- IoT
- Cyber-physical systems
- Technology

Source: Leading Digital: Turning Technology into Business Transformation, George Westerman, Didier bonnet, Andrew McAfee, October 14 2014

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What does this mean to UV Industry?

- Will IoT impact our Industry?
- The correct question is:

How will IoT impact our Industry?

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AIMS CLOUD

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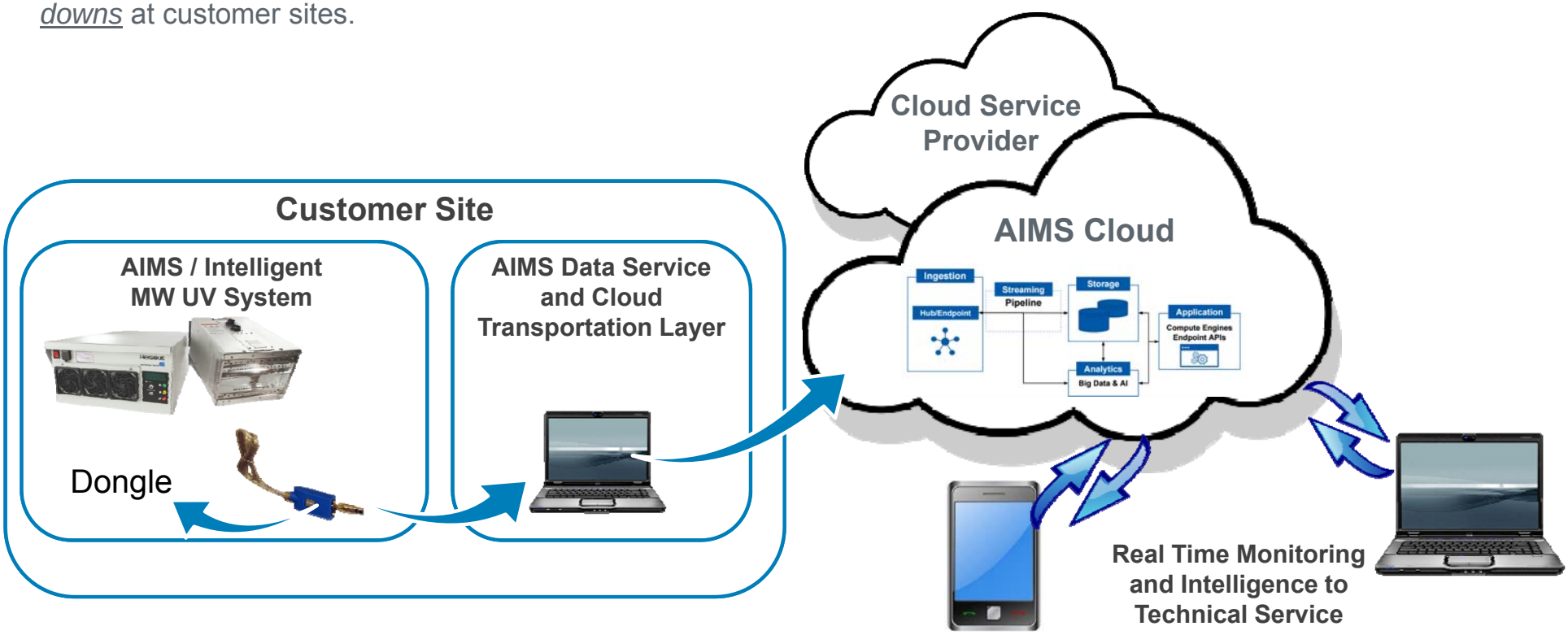
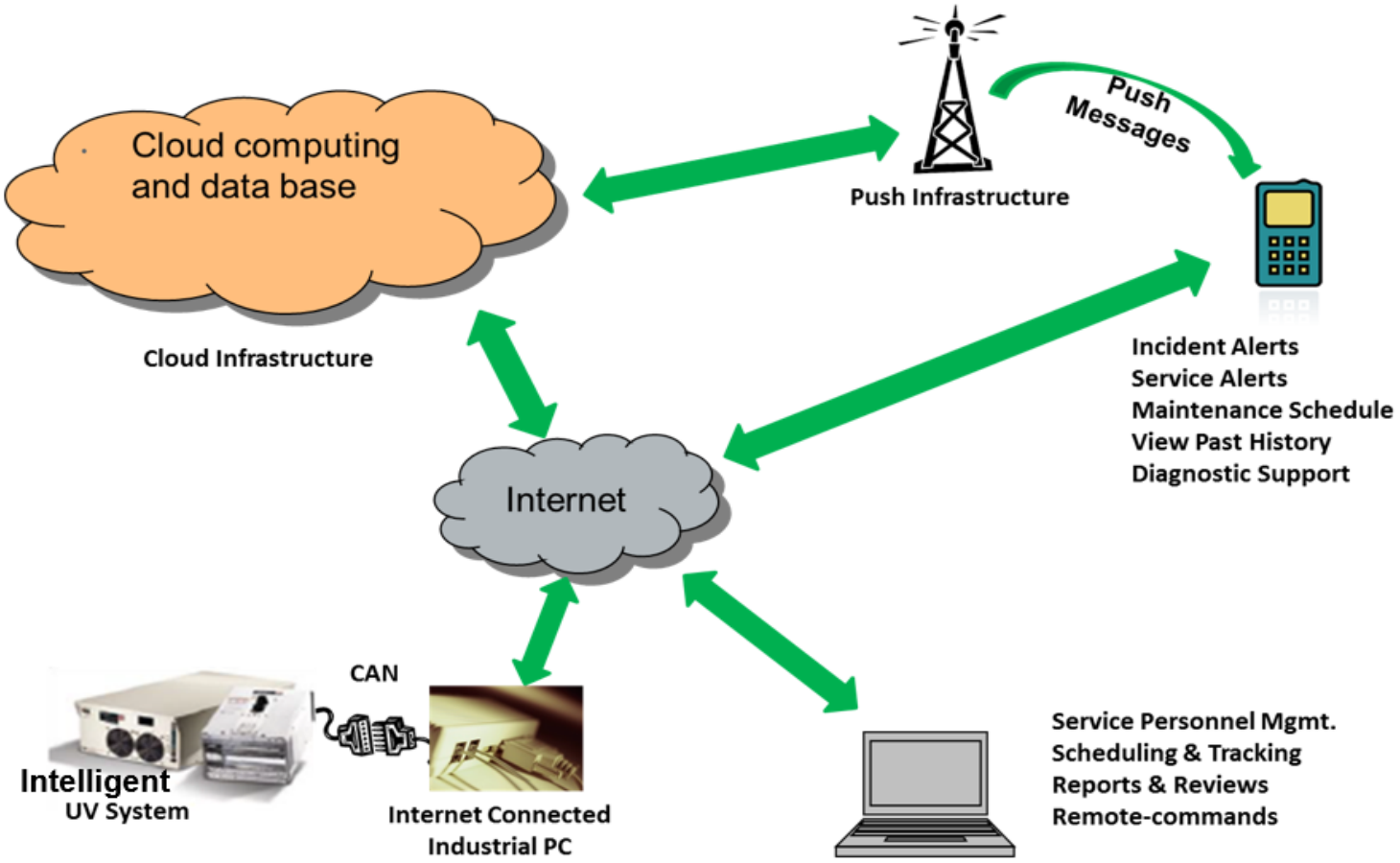
What is AIMS CLOUD?...

- Real-time transfer and storage of AIMS data to a server in the **Cloud**.
  - Ultimately, this data can be used for predictive maintenance/analytics to *avoid unscheduled and often costly system shut downs* at customer sites.



AIMS Cloud, System Architecture



AIMS Cloud, Benefits

- **The AIMS Cloud platform will revolutionize the way we are providing our customer service support.**
  - ***Real time data***
  - ***Advanced warning and predictive maintenance***
  - ***Minimize unscheduled shutdown for customers***
  - ***Can monitor customer operation***
  - ***Eventually data can be used for spare parts order via ERP if user enables***
  - ***New service models can be offered to our customers***
  - ***Service to customers can be proactive instead of reactive***

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AIMS CLOUD PREDICTIVE

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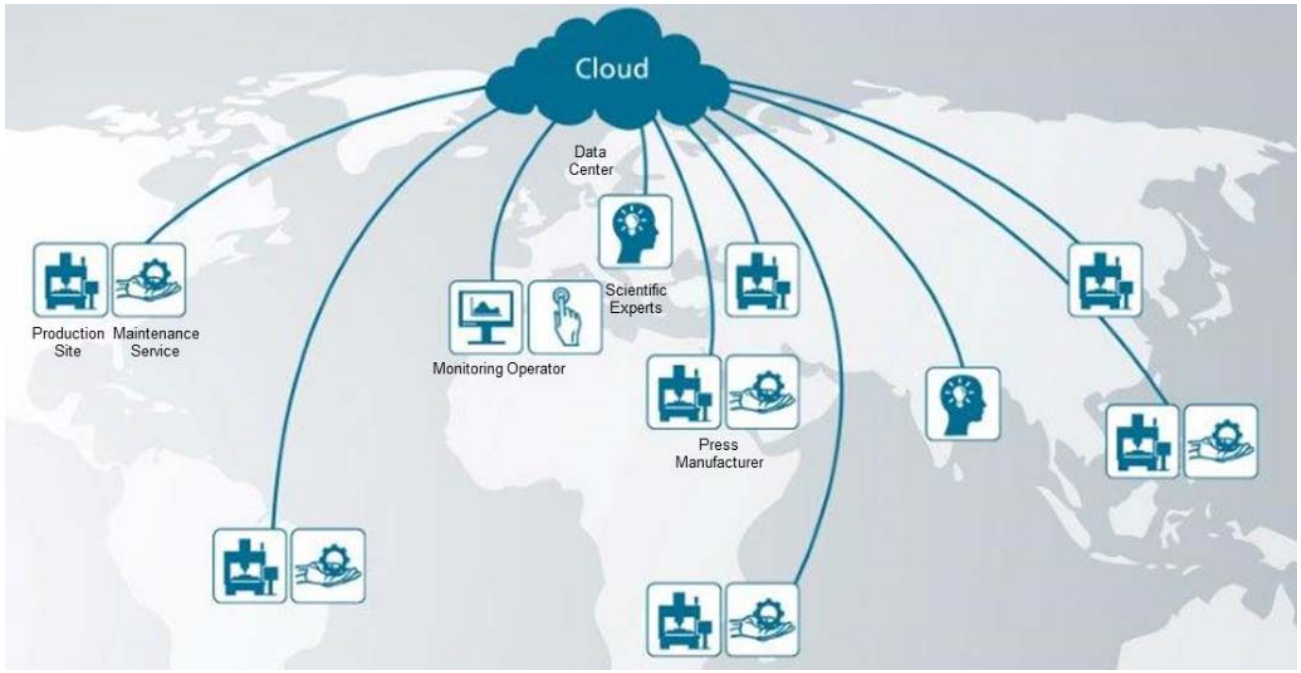
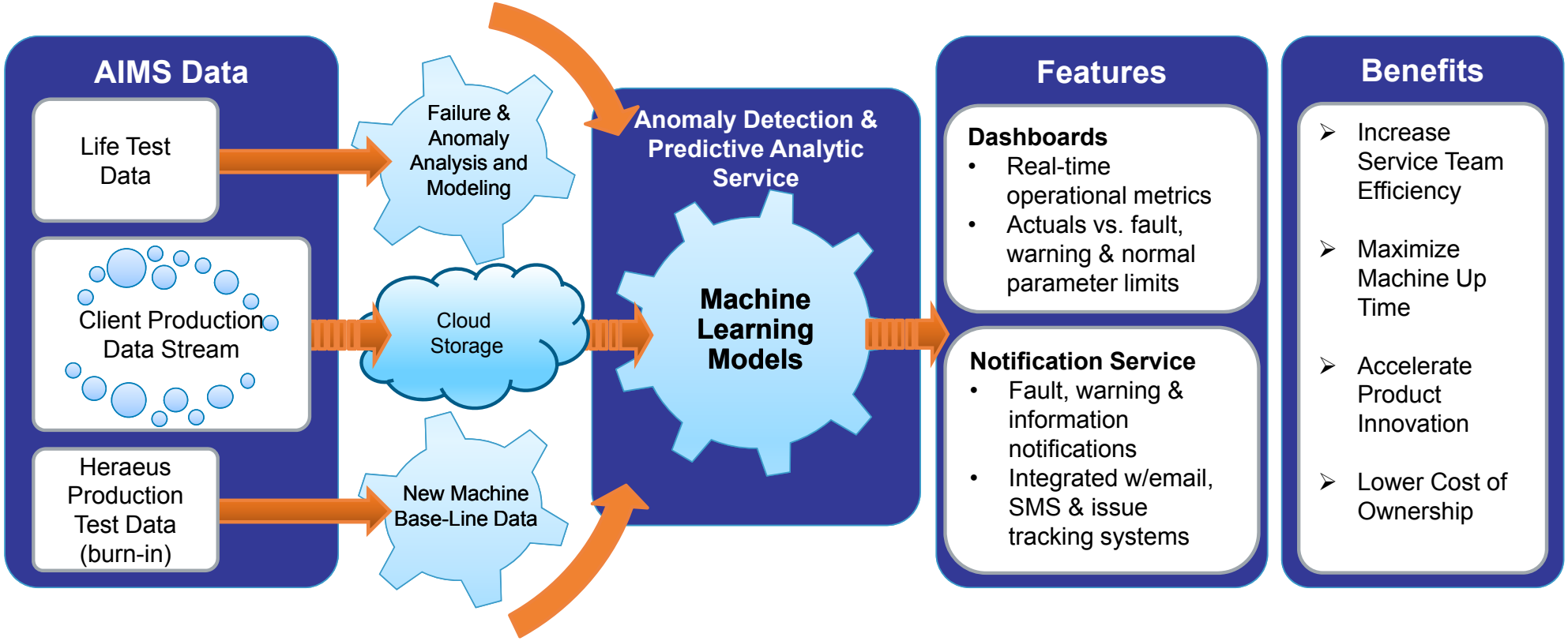
AIMS CLOUD PREDICTIVE – GLOBALLY INTERCONNECTED REACH

To further build upon this tool, and, to not only prepare but, to become a part of the age of digitization, Industry 4.0, and the "smart factory," ***AIMS CLOUD*** will be transformed into something even greater!…using predictive algorithms/analytics, it will provide ***Predictive & Actionable Intelligence****!*



WHAT IS NEXT?

AIMS CLOUD PREDICTIVE / ANALYTICS PLATFORM – HOW IT WILL WORK



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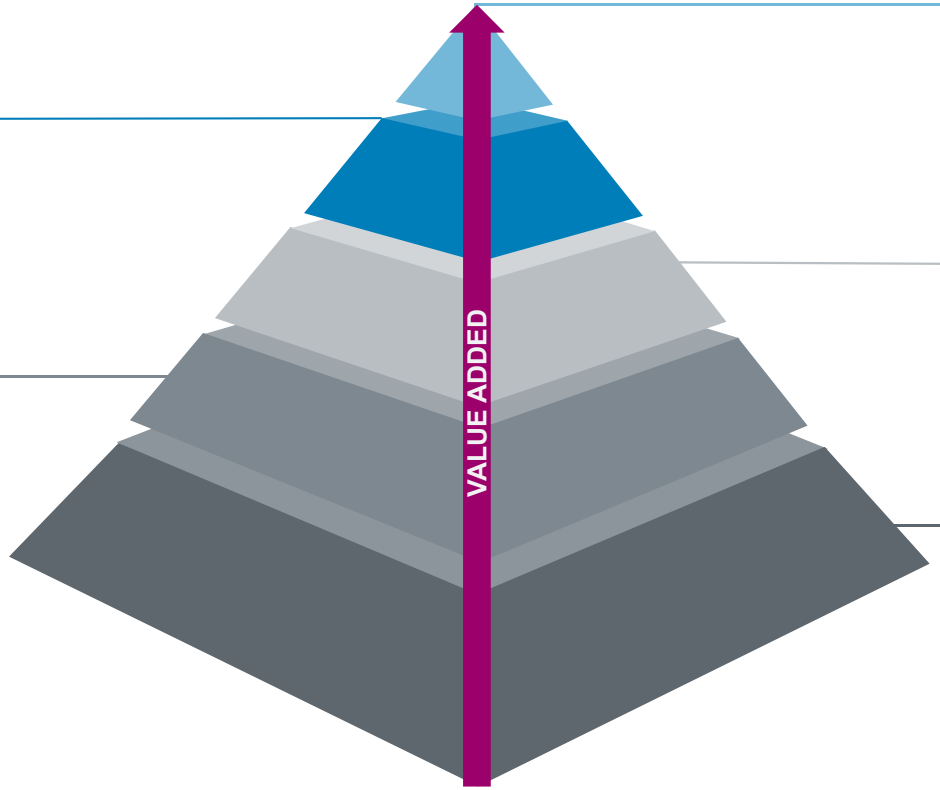

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“THE NEXT GENERATION OF UV CURING SOLUTIONS”