

MDT Gas System Monitoring

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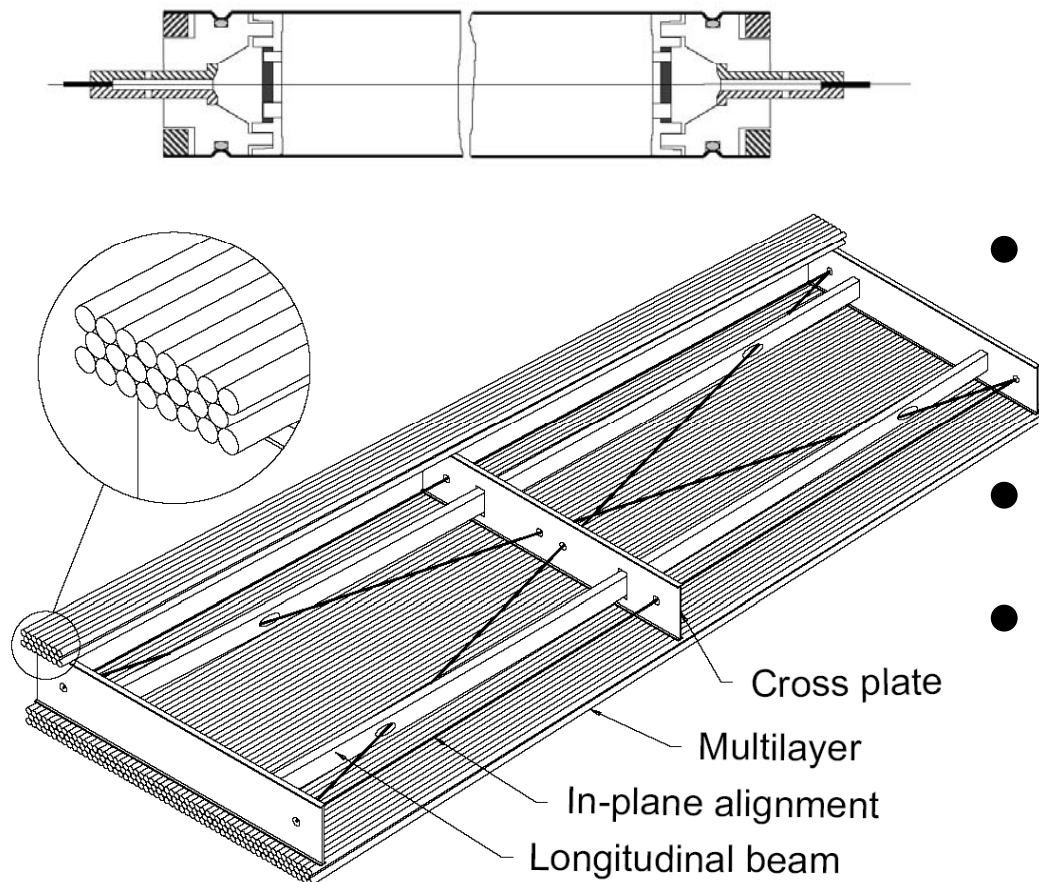
UM/CERN REU Summer 2007



Introduction

- Monitored Drift Tube (MDT) Control Systems Group
- Develop control systems to operate MDT chambers in the ATLAS experiment
 - Gas System
 - Voltage
 - Temperature
 - Magnetic Field Sensors
 - etc.

MDT Chambers



- Hollow tube filled with Argon gas and a wire at HV
- Muons ionize the Argon gas
- 1,200 Chambers
- Many tubes in a chamber

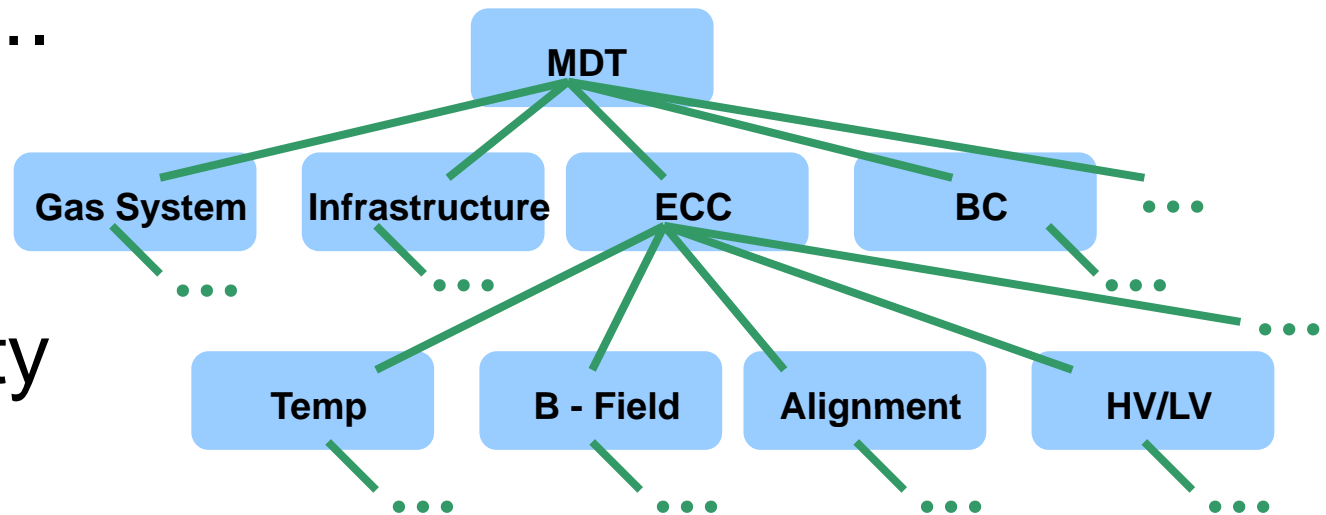
Definitions

- Gas Mapping – Physical setup of the gas system for MDT chambers
- Chamber Status – The functionality of a chamber
- Gas Flow – The flow rate and pressure of the gas

Finite State Machine (FSM)

- Framework built for a hierarchy of items that monitor overall health of the detector
- Each item is assigned a flag – On, Off, Unknown....

- Based on the type and quantity of errors detector is deemed operational

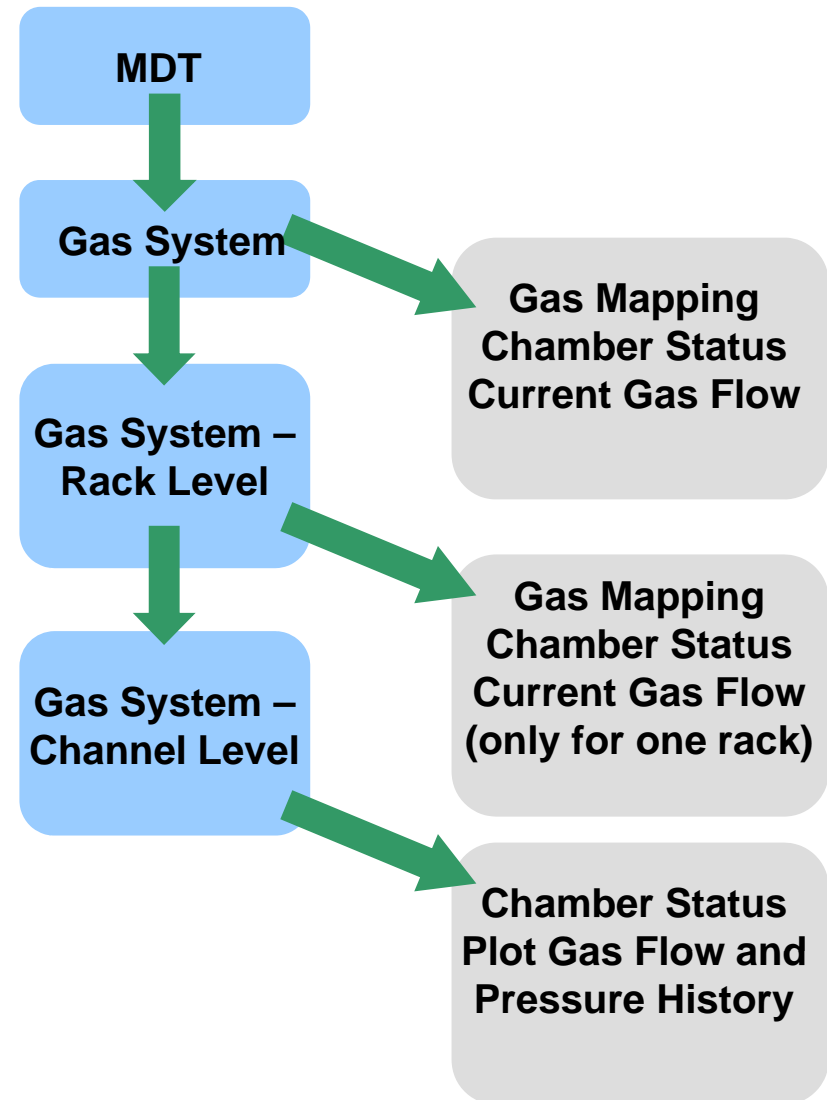


Problems with FSM

- Displays very little information – only current state
- Does not provide device history
- Cannot edit information about devices
- Cannot alter device states

FSM and Panels

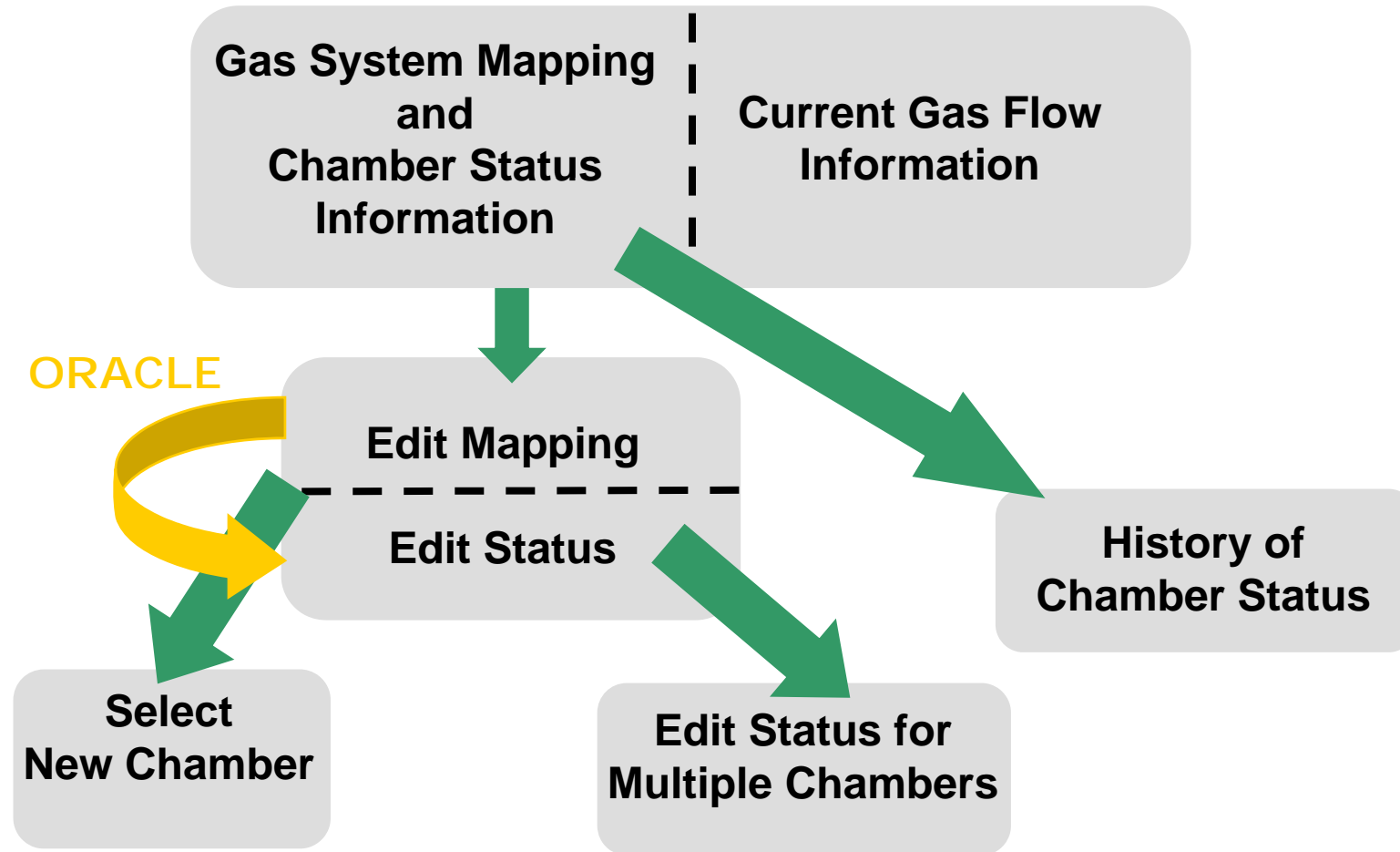
- As the operator navigates through the framework more specific information is accessed
- Panels display useful information for that level



Objectives

- Graphical interface for gas system monitoring of specific chambers
- Gas Mapping management
- Chamber Status management
- Gas Flow monitoring

Gas System Level



Gas System Level

QuickTest: MDT_GAS_DISTRIBUTION.pnl (System1 - ATLMDTSCS; #1)

Module Panel Scale Help

en_US.iso88591

Available Chambers:

Filter By: **ML1:** **ML2:**

| Chamber | Atlas Part ID | Rack | Channels | HV OK | HV Ctrl | Gas In | Gas Out | HV OK | HV Ctrl | Gas In | Gas Out |
|---------|----------------|------|----------|-------|---------|--------|---------|-------|---------|--------|---------|
| BOS1A02 | 20MMMPIC000001 | 69 | 01 02 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |
| BOS1A04 | 20MMMPIC000002 | 70 | 05 06 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |
| BOS1A06 | 20MMMPIC000030 | 70 | 17 18 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |
| BOS1A08 | 20MMMPIC000097 | 69 | 19 20 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |
| BOS1A10 | 20MMMPIC000005 | 67 | 01 02 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |
| BOS1A16 | 20MMMPIC000006 | 67 | 19 20 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |
| BOS1C02 | 20MMMPIC000071 | 69 | 01 02 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |
| BOS1C04 | 20MMMPIC000046 | 70 | 05 06 | YES | ON | ON | ON | YES | ON | ON | ON |
| BOS1C06 | 20MMMPIC000047 | 70 | 17 18 | NO | OFF | OFF | OFF | NO | OFF | OFF | OFF |

Chamber: BOS1A08 Atlas Part ID: 20MMMPIC000097 Rack: 69 Chamber History

Gas Mapping:

| | Rack | Channel | Rack Level | Gas Volume | Gas Flow HV Side | Manifold Location | Gas Flow RD Side | Manifold Location |
|------|------|---------|------------|------------|------------------|-------------------|------------------|-------------------|
| ML1: | 69 | 19 | L7 | 0 | OUT | S8/9 | IN | S8/7 |
| ML2: | 69 | 20 | L7 | 0 | IN | S8/9 | OUT | S8/7 |

Measurements and Status:

| | Rack | Channel | Pressure | Isolation Valve | In Flow | Out Flow | DIP Bad | DIP Invalid |
|------|------|---------|----------|-----------------|---------|----------|---------|-------------|
| ML1: | 69 | 19 | 964 mb | FALSE | 0.2 L/h | 1 L/h | FALSE | FALSE |
| ML2: | 69 | 20 | 1045 mb | FALSE | 0.6 L/h | 0.3 L/h | FALSE | FALSE |

Edit

Gas System Level

MDT Update (System1 - ATLMDTSCS; #1)

Chamber Name: **Atlas Part ID:** **Viewing From:**

Gas Mapping:

| ML1: | | | ML2: | | |
|---------------------------------|----------------------------------|-------------------------------------|----------------------------------|------------------------------------|-------------------------------------|
| Rack Level | Rack Number | Channel | Rack Level | Rack Number | Channel |
| <input type="text" value="37"/> | <input type="text" value="67"/> | <input type="text" value="3"/> | <input type="text" value="L1"/> | <input type="text" value="67"/> | <input type="text" value="4"/> |
| Gas Volume | Gas Flow HV Side | Manifold Location | Gas Volume | Gas Flow HV Side | Manifold Location |
| <input type="text" value="0"/> | <input type="text" value="OUT"/> | <input type="text" value="S10/12"/> | <input type="text" value="0"/> | <input type="text" value="IN"/> | <input type="text" value="S10/11"/> |
| | Gas Flow RD Side | Manifold Location | Gas Flow RD Side | Manifold Location | |
| | <input type="text" value="IN"/> | <input type="text" value="S10/9"/> | <input type="text" value="OUT"/> | <input type="text" value="S10/9"/> | |

Log Window
Running Synchronization Test...
No need to update.

Chamber Status:

| ML1: | | ML2: | |
|---|---|---|---|
| High Voltage OK | Gas In Valve | High Voltage OK | Gas In Valve |
| <input checked="" type="radio"/> Yes <input type="radio"/> No | <input checked="" type="radio"/> On <input type="radio"/> Off | <input checked="" type="radio"/> Yes <input type="radio"/> No | <input checked="" type="radio"/> On <input type="radio"/> Off |
| High Voltage Control | Gas Out Valve | High Voltage Control | Gas Out Valve |
| <input checked="" type="radio"/> On <input type="radio"/> Off | <input checked="" type="radio"/> On <input type="radio"/> Off | <input checked="" type="radio"/> On <input type="radio"/> Off | <input checked="" type="radio"/> On <input type="radio"/> Off |

Available Chambers (System1 - ATLMD...)

Filter By:

Chamber Name: **Atlas Part ID:**

| Chamber | Atlas Part ID |
|---------|----------------|
| BIS8A02 | 20MMEPBC000041 |
| BIS8A04 | 20MMEPBC000045 |
| BIS8A06 | 20MMEPBC000043 |
| BIS8A08 | 20MMEPBC000044 |
| BIS8A10 | 20MMEPBC000042 |
| BIS8A12 | 20MMEPBC000046 |
| BIS8A14 | 20MMEPBC000047 |
| BIS8A16 | 20MMEPBC000048 |
| BIS8C02 | 20MMEPBC000033 |
| BIS8C04 | 20MMEPBC000034 |
| BIS8C06 | 20MMEPBC000035 |
| BIS8C08 | 20MMEPBC000036 |
| BIS8C10 | 20MMEPBC000037 |
| BIS8C12 | 20MMEPBC000038 |
| BIS8C14 | 20MMEPBC000039 |
| BIS8C16 | 20MMEPBC000040 |
| | |
| | |
| | |
| | |

Gas System Level

Multiple Chamber Status Update (System1 - ATLMDTSCS; #1) [?] [X]

Available Chambers:

Filter By: **ML1:** **ML2:**

Chamber Atlas Part ID HV OK HV Control Gas In Gas Out HV OK HV Control Gas In Gas Out

YES NO

| Chamber | Atlas Part ID | HV OK | HV Control | Gas In | Gas Out | HV OK | HV Control | Gas In | Gas Out |
|---------|----------------|-------|------------|--------|---------|-------|------------|--------|---------|
| BEE1A08 | 20MMEPBC000004 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| BOG4C12 | 20MMALUC000009 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| BOL2A03 | 20MMFIAC000010 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| EIL1A11 | 20MMBMCC000006 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| EML5A03 | 20MMMICC000067 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| EMS4C04 | 20MMMICC000027 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| | | | | | | | | | |
| | | | | | | | | | |

Selected Chambers:

| Chamber | Atlas Part ID | HV OK | HV Control | Gas In | Gas Out | HV OK | HV Control | Gas In | Gas Out |
|---------|----------------|-------|------------|--------|---------|-------|------------|--------|---------|
| BOG4C12 | 20MMALUC000009 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| BOL2A03 | 20MMFIAC000010 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| EIL1A11 | 20MMBMCC000006 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| EML5A03 | 20MMMICC000067 | YES | OFF | OFF | OFF | NO | ON | OFF | OFF |
| | | | | | | | | | |
| | | | | | | | | | |

Chamber Status:

| ML1: | | ML2: | |
|---|---|---|---|
| High Voltage OK | Gas In Valve | High Voltage OK | Gas In Valve |
| <input checked="" type="radio"/> Yes <input type="radio"/> No | <input type="radio"/> On <input checked="" type="radio"/> Off | <input type="radio"/> Yes <input checked="" type="radio"/> No | <input type="radio"/> On <input checked="" type="radio"/> Off |
| High Voltage Control | Gas Out Valve | High Voltage Control | Gas Out Valve |
| <input type="radio"/> On <input checked="" type="radio"/> Off | <input type="radio"/> On <input checked="" type="radio"/> Off | <input checked="" type="radio"/> On <input type="radio"/> Off | <input type="radio"/> On <input checked="" type="radio"/> Off |

Gas System Level

Activity Filter (System1 - ATLMDTSCS; #1) ? x

Chamber: BEE1A02

Activity of:
ML1 - HV OK

Start Date: Stop Date:

Year: 2007 2007

Month: 7 8

Day: 31 6

Hour: 16 23

Minute: 0 19

Cancel Select Clear Log Window

Log Window

This is the history for chamber BEE1A02 for the state of ML1 - HV OK

On: 7/31/2007 at 16:7:20
The status of ML1 - HV OK changed to 999.

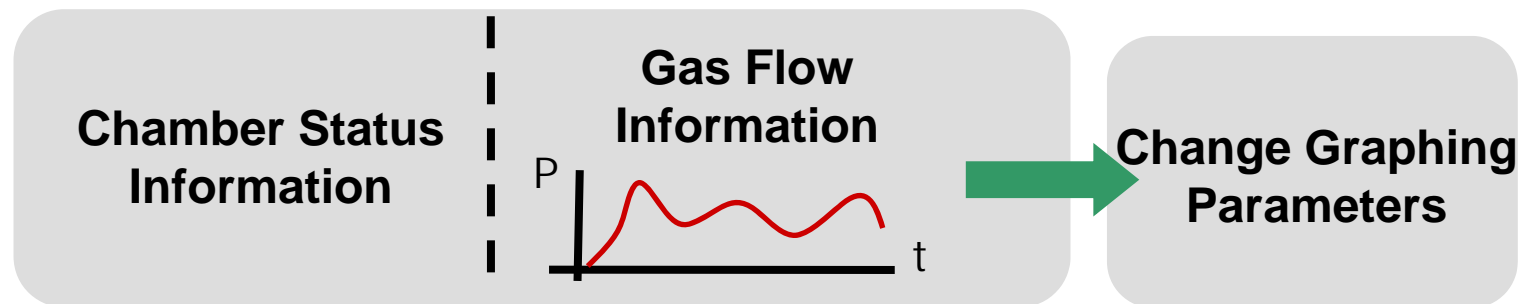
On: 7/31/2007 at 16:8:38
The status of ML1 - HV OK changed to 456.

On: 7/31/2007 at 16:8:48
The status of ML1 - HV OK changed to 876.

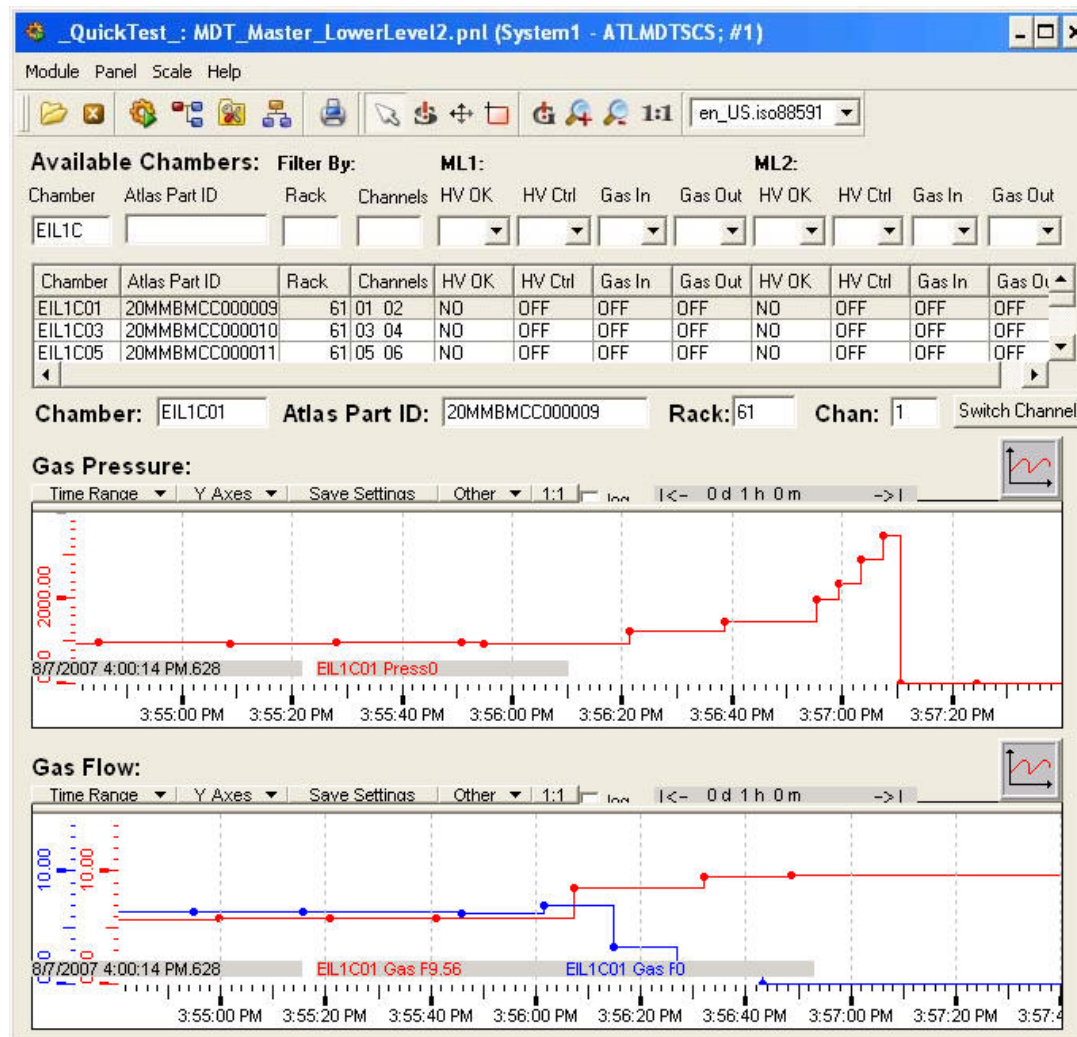
On: 7/31/2007 at 16:8:51
The status of ML1 - HV OK changed to 876.

On: 8/6/2007 at 16:36:41
The status of ML1 - HV OK changed to 876.

Gas System – Channel Level



Gas System – Channel Level



Conclusion

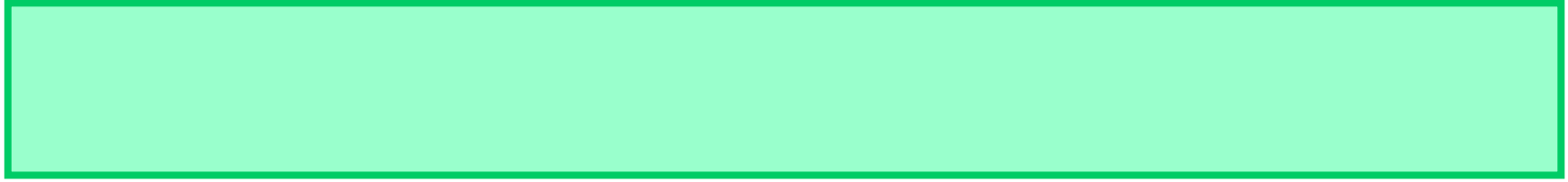
- Developed a graphical interface that can edit and manage Gas Mapping, Chamber Status and Gas Flow information
- Finish documentation for panels
- Further testing during Milestone 4 run in late August

Thanks

- Stepan Kovar
- Dr. Joerg Wotschack
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Questions







- Screen Shot FSM with Panel