

# caQtDM Tutorial

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- Based on 2004 “Medm” lecture by Kenneth Evans Jr.
- 2013 Abridged version by Tim Mooney for SSG class

# caQtDM Tutorial Introduction

## Introduction:

caQtDM “Channel Access Qt Display Manager”

- A graphical user interface (GUI) for creating control screens
- Similar to MEDM (Motif Editor Display Manager)
- Based on Qt, a cross-platform application framework
- Qt started as a widget toolkit, expanded to run non-GUI programs
- Runs on Linux & Windows (no X11 server required)
- Qt is distributed with an open source license
- caQtDM “look & feel” similar to medm; includes medm file converter
- Primary tool used to monitor & control devices using EPICS software



# caQtDM Swiss Light Source Display

proscan\_overview.ui& PROSCAN Status 20-08-2012 14:56:32

MMAC3  15 nA Vdef.  1.00 kV  
 SOL  15 nA Degr.  137.3 MeV

Regelung:   
 Ref\_Extern  
 Kontrolliert von: ControlSys  
 MMAP5X/6Y

Kicker  
 -0.0 A  
 HF  
 120.3 kW  
 8.40 V  
 Extractor  
 47.0 kV  
 50.0 kV  
 Hauptmagnet  
 158.90 A  
 Phase  
 99 Grad  
 Ionenquelle  
 1.78 kV  
 249.6 mA  
 1.5 cc/min

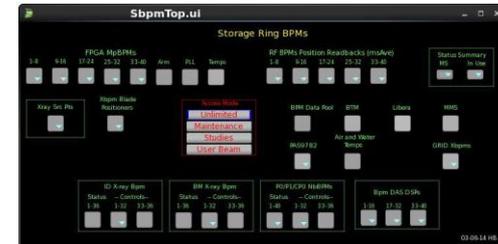
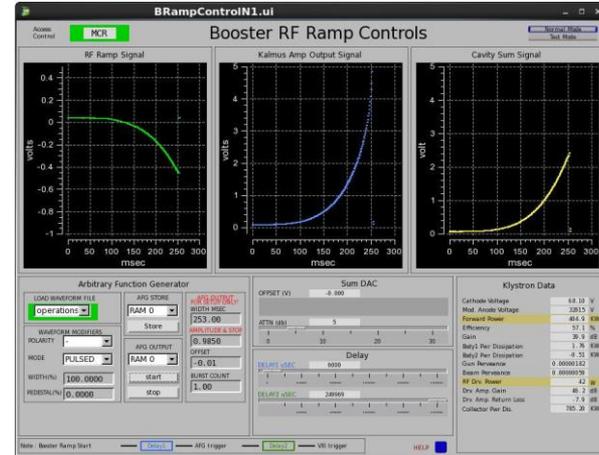
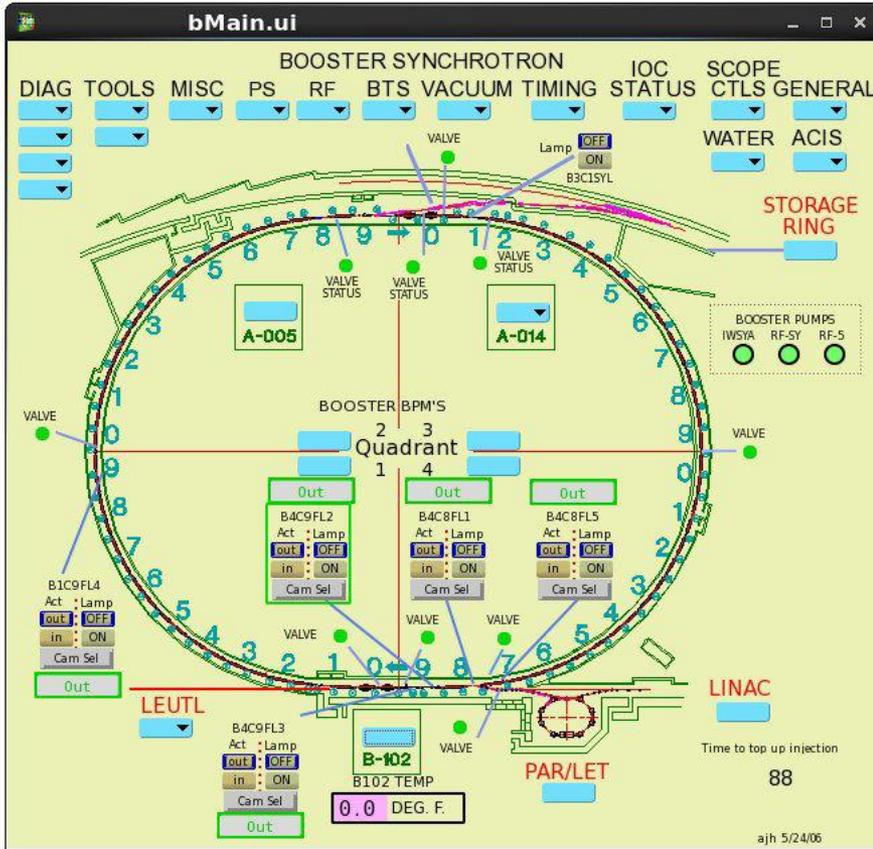
QMA1/2/3  
 -92.47 A  
 101.85 A  
 -97.97 A  
 SMJ1x/2y  
 -0.95 A  
 0.28 A  
 SMA1x/1y  
 -17.60 A  
 1.04 A  
 Ph.Spalt  
 -31 nA  
 96 nA  
 BMA1  
 Geschlossen  
 RPS Bew. OK  
 PaSS Bew. OK

MMAC3 Deflector HF  
  
 0.09 mm  
 -0.41 mm  
 Kollimatoren  
 2.5 mm  
 6.2 mm  
 RPS/Safety switch box  
 Ionenquelle  
 HF reduziert  
 HF  
 Ablenplatte

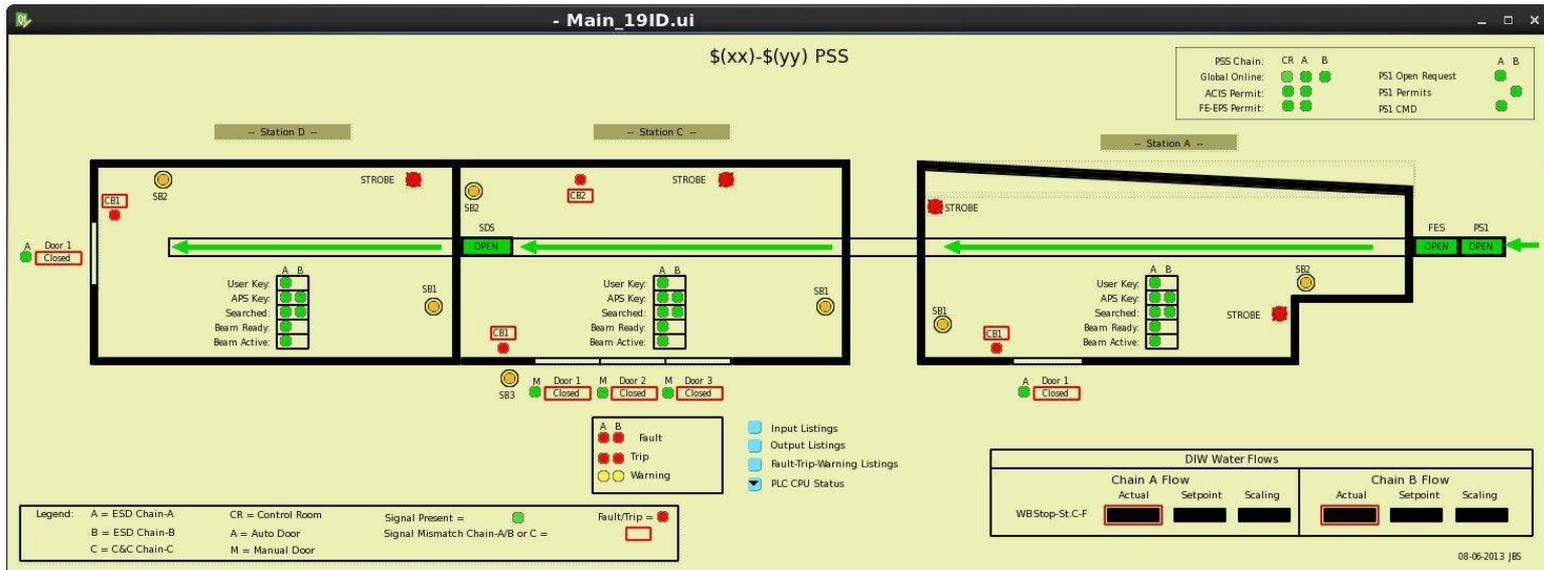
BME1 Gantry1  
 Geschlossen  
 RPS Bew. OK  
 PaSS Bew. NOK  
 BMB1 Gantry2  
 Geschlossen  
 RPS Bew. OK  
 PaSS Bew. NOK  
 BMC1 Optis  
 Geschlossen  
 RPS Bew. OK  
 PaSS Bew. NOK  
 BMD1 Exp.  
 Geschlossen  
 RPS Bew. OK  
 PaSS Bew. NOK  
 Bunker-Temperatur: 30.2 Grad C  
 Helium-Level: 515 mm  
 Mastership: Wartungsmodus



# caQtDM Examples



# caQtDM Beamline Display



# caQtDM Background

- Released February 2012 Paul Scherrer Institute (Swiss Light Source)
- MEDM (Swiss Light Source Control System) GUI
- Anton Mezger, PSI
  - MOTIF & X11 systems/libraries dated, difficult to add new features
  - Qt is a modern GUI widget toolkit based on C++
  - Incorporate all existing MEDM widgets into caQtDM
  - Convert existing MEDM adl files into XML based \*.ui format
- Qt Designer
  - Editor called “Designer”
  - Tool For Creating Displays
- caQtDM
  - Viewer
  - Used to run a display in execute mode



# caQtDM Environment Variables

## Environment Variables

- CAQTDM\_DISPLAY\_PATH
  - Set path to \*.ui files, ~caQtDM/parser, ~caQtDM-3.6.4/caQtDM\_Tests
- QT\_PLUGIN\_PATH
  - ~caQtDM/caQtDM-3.6.4/caQtDM\_Binaries
- EPICS\_CA\_MAX\_ARRAY\_BYTES
  - The maximum number of **bytes** transferred for an array.
  - This should be  $\geq$  the definition in the IOC.
- /APSshare/caqtdm
  - HowToUse.txt
  - Shell Scripts



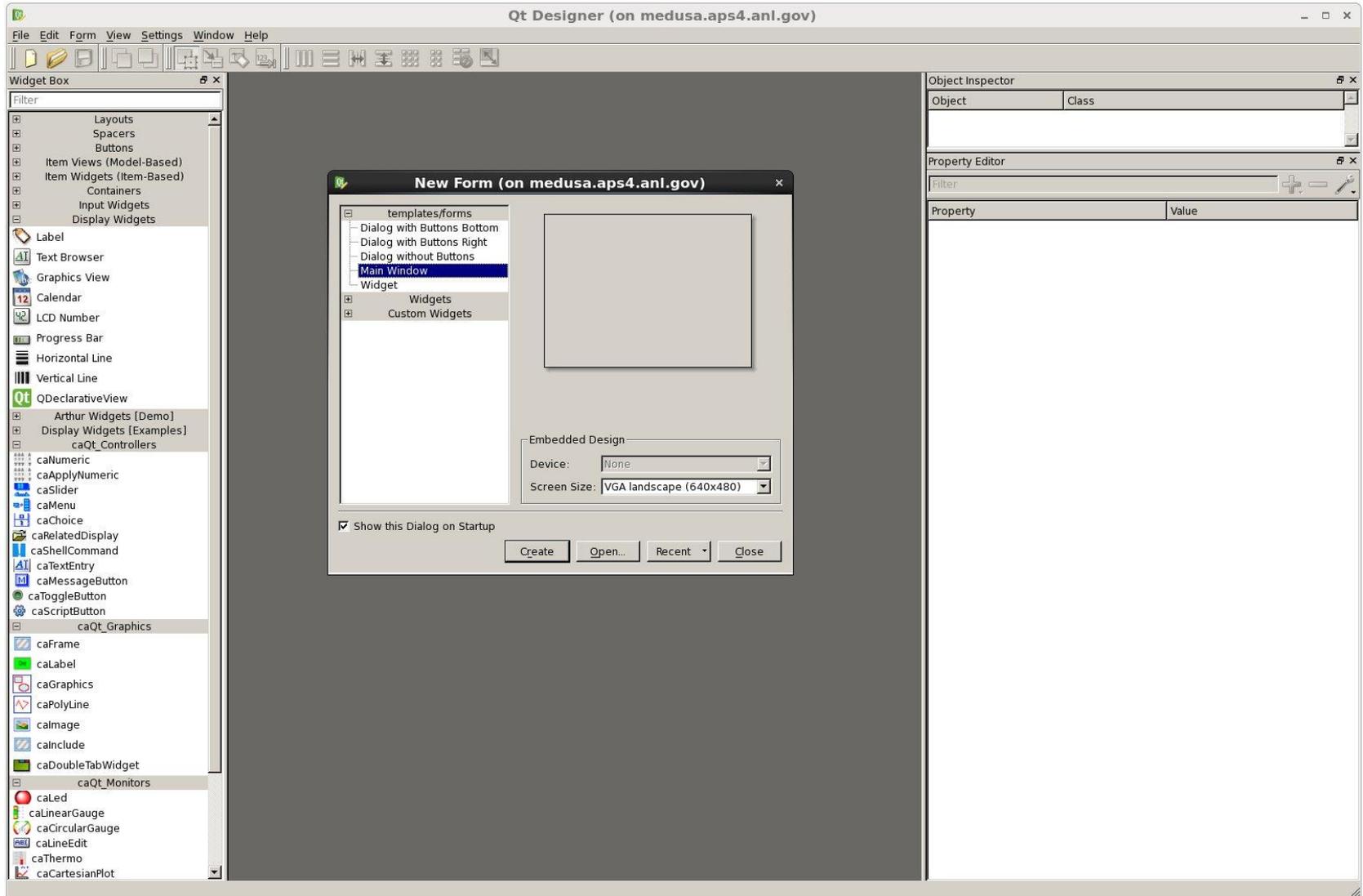
# Creating caQtDM Displays

## Convert, Create, & Run

- Create MEDM Display
- Convert MEDM adl file to caQtDm ui file
  - `~caQtDM-3.6.4/caQtDM_Binaries/adl2ui *.adl`
- Edit caQtDM \*.ui Display
  - `~caQtDM/packages/qt-everywhere-opensource-src-4.8.5/bin/designer`
- Run caQtDM Display
  - `~caQtDM/caQtDM-3.6.4/caQtDM_Binaries/caQtDM`



# caQtDM Designer



# caQtDM Designer

Qt Designer (on medusa.aps4.anl.gov)

File Edit Form View Settings Window Help

Widget Box

Filter

- Layouts
- Spacers
- Buttons
- Item Views (Model-Based)
- Item Widgets (Item-Based)
- Containers
- Input Widgets
- Display Widgets

Label

Text Browser

Graphics View

Calendar

LCD Number

Progress Bar

Horizontal Line

Vertical Line

QDeclarativeView

Arthur Widgets [Demo]

Display Widgets [Examples]

- caQt\_Controllers
  - caNumeric
  - caApplyNumeric
  - caSlider
  - caMenu
  - caChoice
  - caRelatedDisplay
  - caShellCommand
  - caTextEntry
  - caMessageButton
  - caToggleButton
  - caScriptButton
- caQt\_Graphics
  - caFrame
  - caLabel
  - caGraphics
  - caPolyLine
  - calmage
  - calnclude
  - caDoubleTabWidget
- caQt\_Monitors
  - caLed
  - caLinearGauge
  - caCircularGauge
  - caLineEdit
  - caThermo
  - caCartesianPlot

- newDisplayui

Object Inspector

Object	Class
MainWindow	QMainWindow
centralWidget	QWidget

Property Editor

Filter

MainWindow : QMainWindow

Property	Value
- QObject	
objectName	MainWindow
- QWidget	
windowModality	NonModal
enabled	<input checked="" type="checkbox"/>
geometry	[(0, 0), 400 x 400]
- X	0
- Y	0
- Width	400
- Height	400
sizePolicy	[Preferred, Preferred, 0, 0]
minimumSize	0 x 0
maximumSize	16777215 x 16777215
sizeIncrement	0 x 0
baseSize	0 x 0
palette	Inherited
font	A [Sans Serif, 9]
cursor	Arrow
mouseTracking	<input type="checkbox"/>
focusPolicy	NoFocus
contextMenuPolicy	DefaultContextMenu
acceptDrops	<input type="checkbox"/>
windowTitle	
- translatable	<input checked="" type="checkbox"/>
- disambiguation	
- comment	
windowIcon	
windowOpacity	1.000000
toolTip	
statusTip	
whatsThis	
- layoutDirection	LeftToRight
- autoFillBackground	<input type="checkbox"/>
stylesheet	\n\nQWidget#centralWidget {b...
- locale	English, UnitedStates
windowFilePath	
- translatable	<input checked="" type="checkbox"/>
- disambiguation	
- comment	
inputMethodHints	ImhNone

Settings / Preferences

Appearance : Toolwindow Font

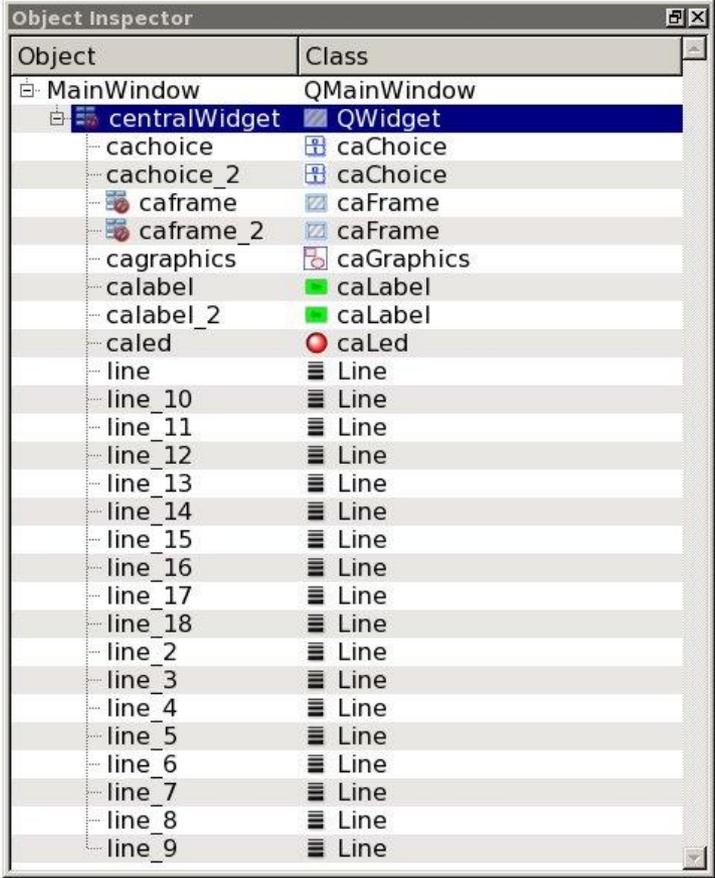
Forms : Grid X = 2, Grid Y = 2

Object Inspector

Property Editor

# caQtDM Object Inspector

- Shows Hierarchical List of Objects
- MainWindow
  - Parent Class of the Control Display
- centralWidget
  - Define Main Window Background Color
- Widgets
  - Object Assigned Number
  - Class Defined by Type

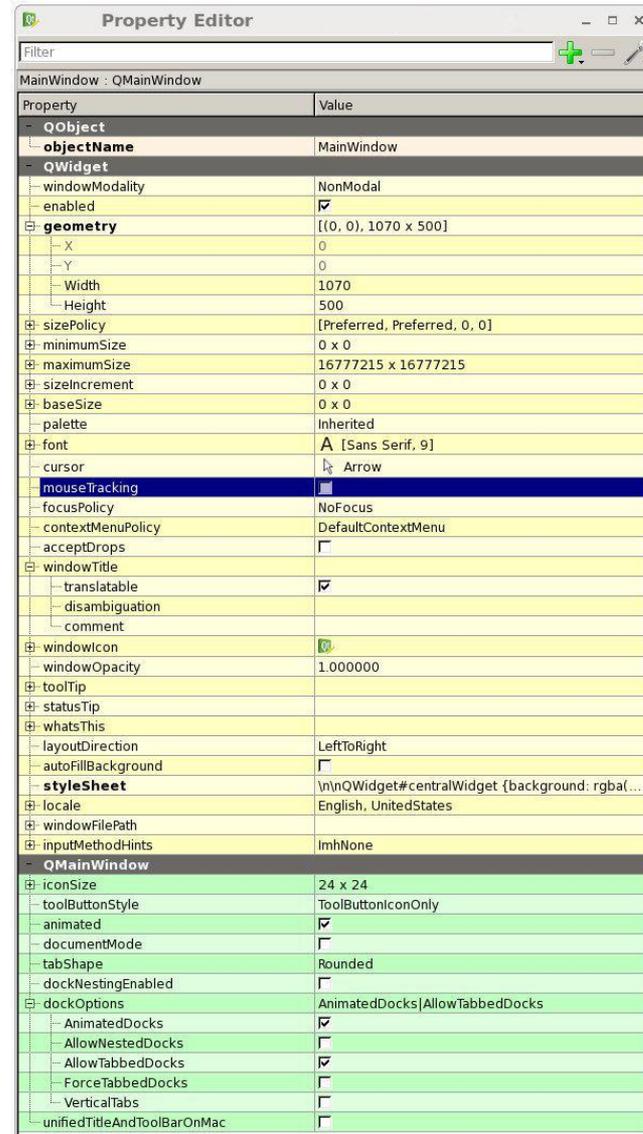


The screenshot shows the 'Object Inspector' window with a table of objects and their classes. The 'centralWidget' object is selected and highlighted in blue.

Object	Class
MainWindow	QMainWindow
centralWidget	QWidget
cachoice	caChoice
cachoice_2	caChoice
caframe	caFrame
caframe_2	caFrame
cagraphics	caGraphics
calabel	caLabel
calabel_2	caLabel
caled	caLed
line	Line
line_10	Line
line_11	Line
line_12	Line
line_13	Line
line_14	Line
line_15	Line
line_16	Line
line_17	Line
line_18	Line
line_2	Line
line_3	Line
line_4	Line
line_5	Line
line_6	Line
line_7	Line
line_8	Line
line_9	Line

# caQtDM Designer Property Editor

- Each widget has a set of properties
- The properties are chosen via the Property Editor
- All widgets have
  - X and Y Position
  - Height and Width
- Others vary depending on the object
- Assign Property Values
  - Channel (PV name)
  - Color Mode (static/alarm)
  - Visibility
  - Max/Min Range
  - Direction

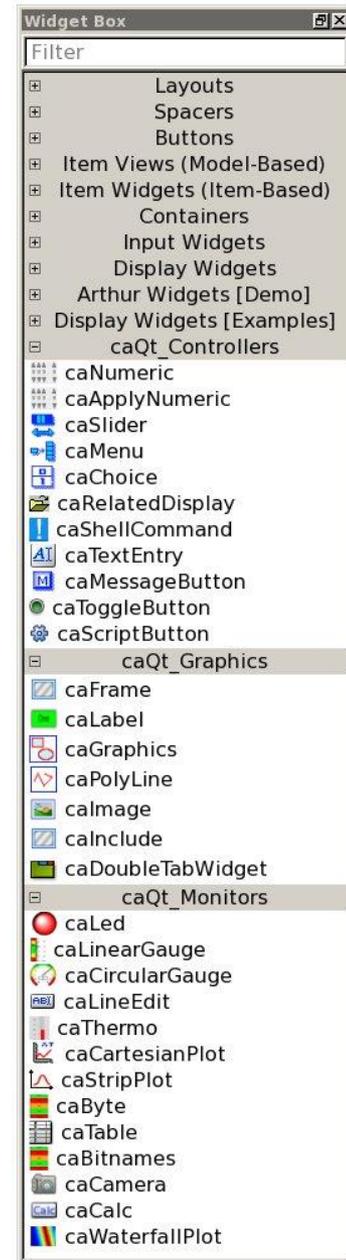


The screenshot shows the 'Property Editor' window for a 'MainWindow : QMainWindow'. The window contains a table with two columns: 'Property' and 'Value'. The properties are organized into a tree structure with expandable sections. The 'mouseTracking' property is currently selected and highlighted in blue.

Property	Value
<b>QObject</b>	
objectName	MainWindow
<b>QWidget</b>	
windowModality	NonModal
enabled	<input checked="" type="checkbox"/>
<b>geometry</b>	[(0, 0), 1070 x 500]
X	0
Y	0
Width	1070
Height	500
sizePolicy	[Preferred, Preferred, 0, 0]
minimumSize	0 x 0
maximumSize	16777215 x 16777215
sizeIncrement	0 x 0
baseSize	0 x 0
palette	Inherited
font	A [Sans Serif, 9]
cursor	Arrow
<b>mouseTracking</b>	<input checked="" type="checkbox"/>
focusPolicy	NoFocus
contextMenuPolicy	DefaultContextMenu
acceptDrops	<input type="checkbox"/>
<b>windowTitle</b>	
translatable	<input checked="" type="checkbox"/>
disambiguation	
comment	
windowIcon	
windowOpacity	1.000000
toolTip	
statusTip	
whatsThis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
<b>styleSheet</b>	\n\nQWidget#centralWidget {background: rgba(...
locale	English, UnitedStates
windowFilePath	
inputMethodHints	imhNone
<b>QMainWindow</b>	
iconSize	24 x 24
toolButtonStyle	ToolButtonIconOnly
animated	<input checked="" type="checkbox"/>
documentMode	<input type="checkbox"/>
tabShape	Rounded
dockNestingEnabled	<input type="checkbox"/>
<b>dockOptions</b>	AnimatedDocks AllowTabbedDocks
AnimatedDocks	<input checked="" type="checkbox"/>
AllowNestedDocks	<input type="checkbox"/>
AllowTabbedDocks	<input checked="" type="checkbox"/>
ForceTabbedDocks	<input type="checkbox"/>
VerticalTabs	<input type="checkbox"/>
unifiedTitleAndToolBarOnMac	<input type="checkbox"/>

# caQtDM Designer Widget Box

- CA Widgets Divided Into Three Categories
- Controllers
  - Send a value (caPut)
- Monitors
  - Read a value (caGet)
- Graphics
  - Circle, Square, Triangle
  - Polyline
  - Visibility based on Value, CALC, Alarm
- Display Widgets (Fourth Widget Type)
  - Passive (No Channel Access)
  - Horizontal Line
  - Vertical Line

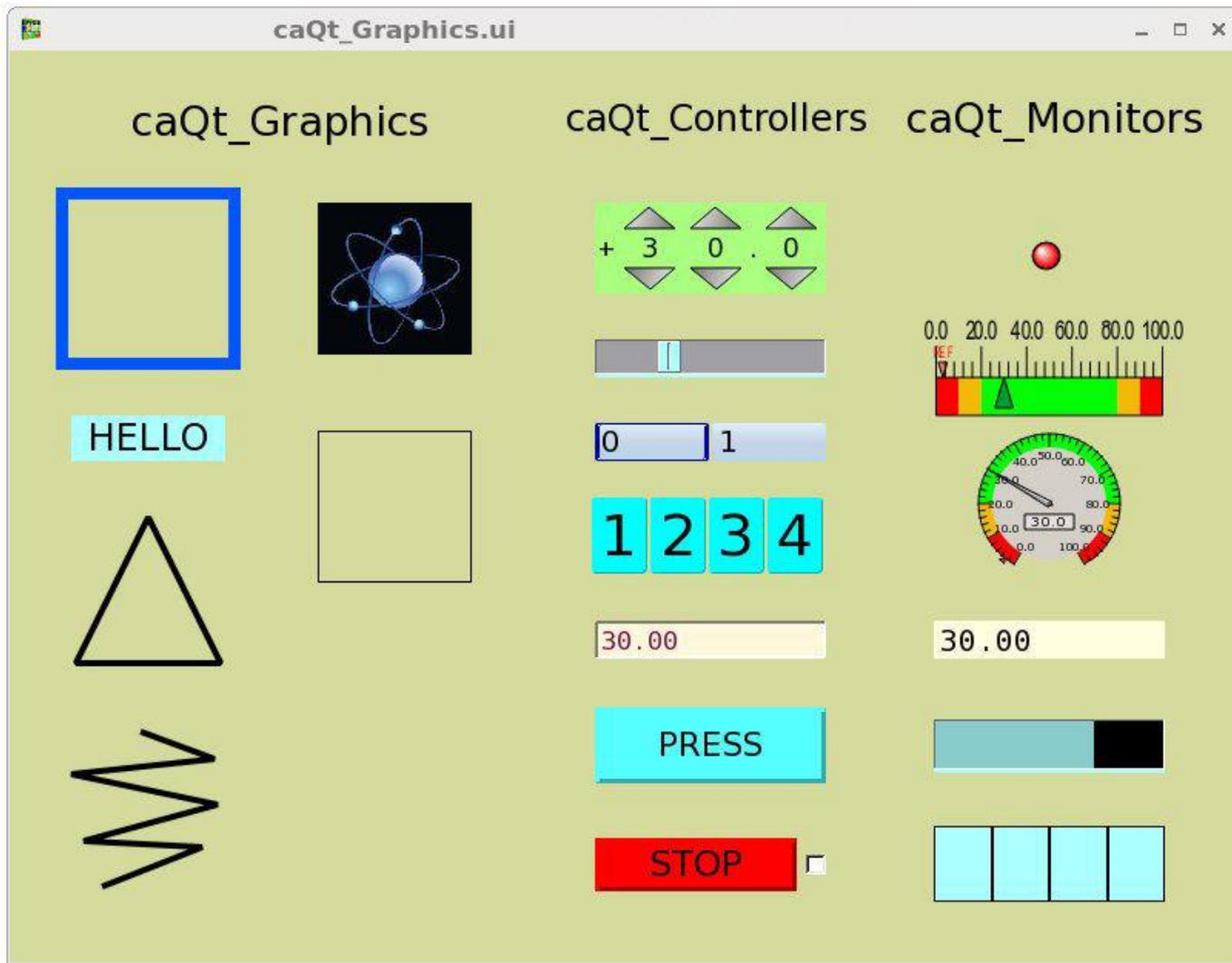


# caQtDM Widgets

Graphics	Monitors	Controllers	Display
caFrame	caLed	caNumeric	Horz. Line
caLabel	caLinearGage	caApplyNumeric	Vert. Line
caGraphics	caCircularGage	caSlider	Label
caPolyline	caThermo	caChoice	Calendar
calmage	caCartesianPlot	caRelatedDisplay	Progress Bar
caInclude	caStripPlot	csShellCommand	
caDoubleTabWidget	caByte	caTextEntry	
	caTable	caMessageButton	
	caBitnames	caToggleButton	
	caCamera	caScriptButton	



# caQtDM Widgets



# caQtDM Style Sheet

## Designing Custom Widgets

- Used To Define Attributes of Widgets
- Foreground Color, Background Color, Font Size, etc.
- Style Sheet based on HTML Cascading Style Sheets (CSS)
- Default Style Sheet Assigned to “parentobject” of the control display
- Define Standard Attributes of EPICS “Channel Access” Widgets
- Can Load Style Sheet From A Local Directory Defined by caQtDM Path
- Some Attributes of Widgets Overwritten



# caQtDM Style Sheet

The screenshot displays the Qt Designer application window titled "Qt Designer (on medusa.aps4.anl.gov)". The main window shows a "newDisplayui" project. A "Widget Box" is visible on the left, listing various widget classes. The "Object Inspector" on the right shows the hierarchy: MainWindow (QMainWindow) containing centralWidget (QWidget). The "Property Editor" shows the properties of the selected object, with "styleSheet" highlighted.

The "Edit Style Sheet" dialog box is open, showing the following CSS rules:

```
QWidget#centralWidget {background: rgba(187, 187, 187, 255);}

caTable {
    font: 10pt;
    background: cornsilk;
    alternate-background-color: wheat;
}

caLineEdit {
    border-radius: 1px;
    background: lightyellow;
    color: black;
}

caTextEntry {
    color: rgb(127, 0, 63);
    background-color: cornsilk;
    selection-color: #0a214c;
    selection-background-color: wheat;
    border: 1px groove black;
    border-radius: 1px;
    padding: 1px;
}

caTextEntry:focus {
    padding: 0px;
    border: 2px groove darkred;
    border-radius: 1px;
}

QPushButton {
    border-color: #00b;
    border-radius: 2px;
    padding: 3px;
    border-width: 1px;
}
```

The "Property Editor" shows the following properties for the selected object:

Property	Value
disambiguation	
comment	
windowIcon	
windowOpacity	1.000000
toolTip	
statusTip	
whatsThis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
<b>styleSheet</b>	dius: 2px;\n}\n\n\n\n ...
locale	English, UnitedStates
windowFilePath	
translatable	<input checked="" type="checkbox"/>
disambiguation	
comment	
inputMethodHints	ImhNone
<b>QMainWindow</b>	
iconSize	24 x 24



# caQtDM Style Sheet

The screenshot displays the Qt Designer interface for editing a style sheet. The main window is titled "Qt Designer (on medusa.aps4.anl.gov)". The "Edit Style Sheet" dialog is open, showing the following CSS rules:

```
QWidget#centralWidget {background: rgba(187, 187, 187, 255);}

caTable {
    font: 10pt;
    background: consilk;
    alternate-background-color: wheat;
}

caLineEdit {
    border-radius: 1px;
    background: lightyellow;
    color: black;
}

caTextEntry {
    color: rgb(127, 0, 63);
    background-color: consilk;
    selection-color: #0a214c;
    selection-background-color: wheat;
    border: 1px groove black;
    border-radius: 1px;
    padding: 1px;
}

caTextEntry:focus {
    padding: 0px;
    border: 2px groove darkred;
    border-radius: 1px;
}

QPushButton {
    border-color: #00b;
    border-radius: 2px;
    padding: 3px;
    border-width: 1px;
}
```

A "Select Color" dialog is also open, showing a color selection interface with a color wheel and a color palette. The "Basic colors" section is visible, and the "Alpha channel" is set to 255.

The "Object Inspector" on the right shows the following hierarchy:

- MainWindow (Class: QMainWindow)
- centralWidget (Class: QWidget)

The "Property Editor" on the right shows the following properties for the selected object:

Property	Value
disambiguation	
comment	
windowIcon	
windowOpacity	1.000000
tooltip	
statusTip	
whatsThis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
stylesheet	font-size: 2px;\n\n\n\n\n
locale	English, UnitedStates
windowFilePath	
translatable	<input checked="" type="checkbox"/>
disambiguation	
comment	
inputMethodHints	ImhNone
QMainWindow	
iconSize	24 x 24





# caQtDM Designer Editing

- Drag & Drop Widgets
- Left Click To Select Widget
  - Widget “objectName “ Property Editor
- Right Click On Widget For Edit Menu Functions
  - Cut, Copy, & Paste
- Tiled Widgets
  - Send To Back, Bring To Front
- Use Arrow Keys To Move Widget
- Standard File Functions
  - Open, Close, & Save
- Edit Undo/Redo Buffer



# caQtDM Designer Editing

The screenshot displays the Qt Designer interface for editing a UI file named 'Main\_X.ui'. The central canvas shows a light green background with two main sections labeled 'Station B' and 'Station A'. Station B is on the left, and Station A is on the right. A horizontal bar connects the two stations. Below Station B, there are two sets of buttons, each with two buttons labeled '1' and '2'. To the right of Station A, there is a green button labeled 'CLOSED'. The left sidebar contains a 'Widget Box' with a filter and a list of widget classes, including 'caQt\_Controllers' and 'caQt\_Graphics'. The right sidebar contains an 'Object Inspector' showing a tree view of the UI hierarchy, with 'caChoice\_8' selected. Below the Object Inspector is a 'Property Editor' for the selected 'caChoice\_8' widget, showing various properties and their values.

Property	Value
contextMenuPolicy	DefaultContextMenu
acceptDrops	<input type="checkbox"/>
toolTip	
statusTip	
whatsThis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
styleSheet	QPushButton { bor...
locale	English, UnitedStates
inputMethodHints	ImhNone
<b>caChoice</b>	
channel	\$(xx):A_SHUTTER...
foreground	■ [0, 0, 0] (255)
background	■ [153, 255, 255] ...
bordercolor	■ [0, 0, 176] (255)
alignment	center
colorMode	Static
stackingMode	Column
startBit	0
endBit	1
fontScaleMode	WidthAndHeight

# caQtDM Designer Editing

The screenshot displays the Qt Designer interface for editing a user interface. The main canvas shows a design with two stations, 'Station B' and 'Station A', connected by a horizontal line. Below the stations is a data table with two columns and four rows. A green 'CLOSED' button is located on the right side of the design.

An 'Edit text' dialog box is open, showing the text: `$(xx):A_SHUTTER_CLOSEDBO`. The dialog has 'Cancel' and 'OK' buttons.

The Object Inspector on the right shows the hierarchy of objects in the design. The selected object is 'caChoice\_8', which is a 'caChoice' widget. The Property Editor shows the properties for 'caChoice\_8', including 'channel', 'foreground', 'background', 'bordercolor', 'alignment', 'colorMode', 'stackingMode', 'startBit', 'endBit', and 'fontScaleMode'.

Property	Value
contextMenuPolicy	DefaultContextMenu
acceptDrops	<input type="checkbox"/>
tooltip	
statusTip	
whatsThis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
styleSheet	QPushButton { bor...
locale	English, UnitedStates
inputMethodHints	ImhNone
channel	TER_CLOSEDBO
foreground	[0, 0, 0] (255)
background	[153, 255, 255] ...
bordercolor	[0, 0, 176] (255)
alignment	center
colorMode	Static
stackingMode	Column
startBit	0
endBit	1
fontScaleMode	WidthAndHeight

# caQtDM Designer Editing

The screenshot displays the Qt Designer interface for editing a user interface. The main canvas shows two stations, 'Station B' and 'Station A', connected by a central horizontal bar. A 'CLOSED' button is visible on the right. A 'Select Color' dialog box is open, showing a color selection tool with a color wheel and sliders for Hue (180), Sat (102), Val (255), Red (153), Green (255), Blue (255), and Alpha channel (255). The dialog also includes a 'Basic colors' palette and a 'Custom colors' section.

The interface includes several toolbars and panels:

- Widget Box:** A sidebar on the left containing a filter and a list of widget classes such as `caNumeric`, `caSlider`, `caChoice`, and `caLabel`.
- Object Inspector:** A panel on the right showing a tree view of the UI hierarchy, with `caChoice_8` selected.
- Property Editor:** A panel on the right showing the properties of the selected `caChoice_8` widget, including `channel`, `foreground`, `background`, and `bordercolor`.

# caQtDM Fonts

- **caQtDM Uses Scalable Fonts**
- **caLabel & caLineEdit Widgets**
  - caLabel = Text Widget
  - caLineEdit = Text Monitor (readback)
- **fontScaleMode**
  - “None” = No Scaling
  - “Height” = Text Scaled to Height
  - “Width & Height” = Used For Correct Resizing of Display
  - Default Setting = “Width & Height”
- **The font size is determined by the **height** of the text box**
  - The text cannot extend beyond the box horizontally
  - In practice you vary it until it looks right



# caQtDM Font Selection

The screenshot displays the Qt Designer interface with a 'fontTest.ui' window. A 'Select Font' dialog is open, showing 'Verdana' selected as the font, 'Bold Italic' as the style, and '26' as the size. The dialog also includes options for 'Effects' (Strikeout, Underline), 'Writing System' (Any), and a 'Sample' area displaying 'AaBbYyZz'. The background window shows several labels with different font styles: 'Font Type: A', 'Font Type: C', 'Font Type: I', 'Font Type: R', 'Font Type: U', 'Font Type: V', 'Font Type: Utopia', and 'Font Type: Verdana'. The 'Object Inspector' on the right shows a list of objects (calabel\_2 to calabel\_7) all of class 'caLabel'. The 'Property Editor' on the right shows the properties for 'calabel\_6 : caLabel', with the 'font' property set to 'A [Verdana, 25]'.

Object	Class
calabel_2	caLabel
calabel_3	caLabel
calabel_4	caLabel
calabel_5	caLabel
calabel_6	caLabel
calabel_7	caLabel

Property	Value
enabled	<input checked="" type="checkbox"/>
geometry	[(25, 510), 338 x 50]
X	25
Y	510
Width	338
Height	50
sizePolicy	[Preferred, Preferred, 0, 0]
minimumSize	0 x 0
Width	0
Height	0
maximumSize	16777215 x 16777215
sizeIncrement	0 x 0
baseSize	0 x 0
palette	Customized (6 roles)
font	A [Verdana, 25]
cursor	Arrow
mouseTracking	<input type="checkbox"/>
focusPolicy	NoFocus
contextMenuPolicy	DefaultContextMenu
acceptDrops	<input type="checkbox"/>
toolTip	
statusTip	
whatsThis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
styleSheet	background-color: rgb(185...
locale	English, UnitedStates
inputMethodHints	ImhNone
QFrame	
frameShape	NoFrame
frameShadow	Plain

# caQtDM Font Alignment

The screenshot displays the Qt Designer interface for a widget named 'fontTest.ui'. The central canvas shows a list of text labels with various font styles and alignments. The 'Object Inspector' on the right shows a list of 'caLabel' objects, with 'calabel\_6' selected. The 'Property Editor' for 'calabel\_6' shows the 'alignment' property set to 'AlignLeft, AlignVCenter', with the 'Horizontal' sub-property set to 'AlignLeft'.

**Font Test**

Font Type: Arial

Font Type: Cambria

Font Type: Candara

**Font Type: Impact**

Font Type: Monospace

Font Type: OpenSymbol

Font Type: Sans

Font Type: Times New Roman

Font Type: Utopia

Font Type: Verdana

**Object Inspector**

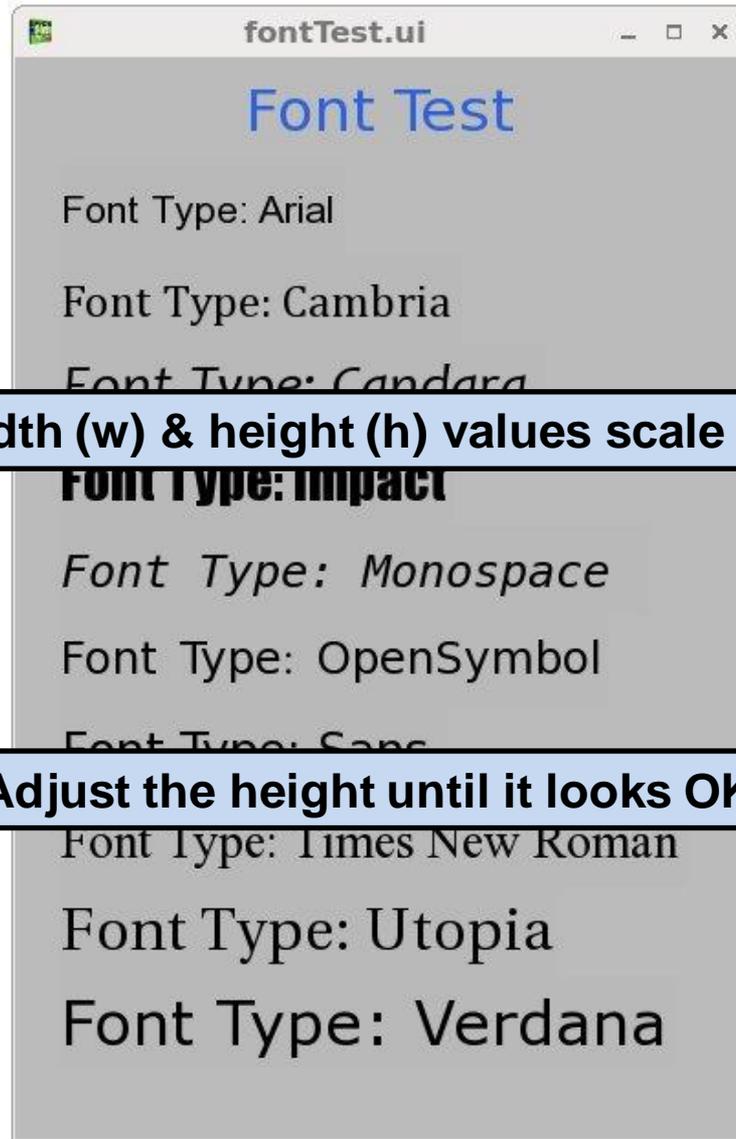
Object	Class
calabel_2	caLabel
calabel_3	caLabel
calabel_4	caLabel
calabel_5	caLabel
calabel_6	caLabel
calabel_7	caLabel

**Property Editor**

calabel\_6 : caLabel

Property	Value
lineWidth	1
midLineWidth	0
- QLabel	
text	Font Type: Verdana
textFormat	AutoText
pixmap	
scaledContents	<input type="checkbox"/>
alignment	AlignLeft, AlignVCenter
Horizontal	AlignLeft
Vertical	AlignVCenter
wordWrap	<input type="checkbox"/>
margin	0
indent	-1
openExternalLinks	<input type="checkbox"/>
textInteractionFlags	LinksAccessibleByMouse
- ESimpleLabel	
botTopBorderWidth	2.000000
lateralBorderWidth	2.000000
fontScaleMode	WidthAndHeight
- caLabel	
foreground	■ [0, 0, 0] (255)
background	■ [185, 185, 185] (255)
colorMode	Static
visibility	StaticV
visibilityCalc	
channel	
channelB	
channelC	
channelD	
buddy	

# caQtDM Scalable Fonts

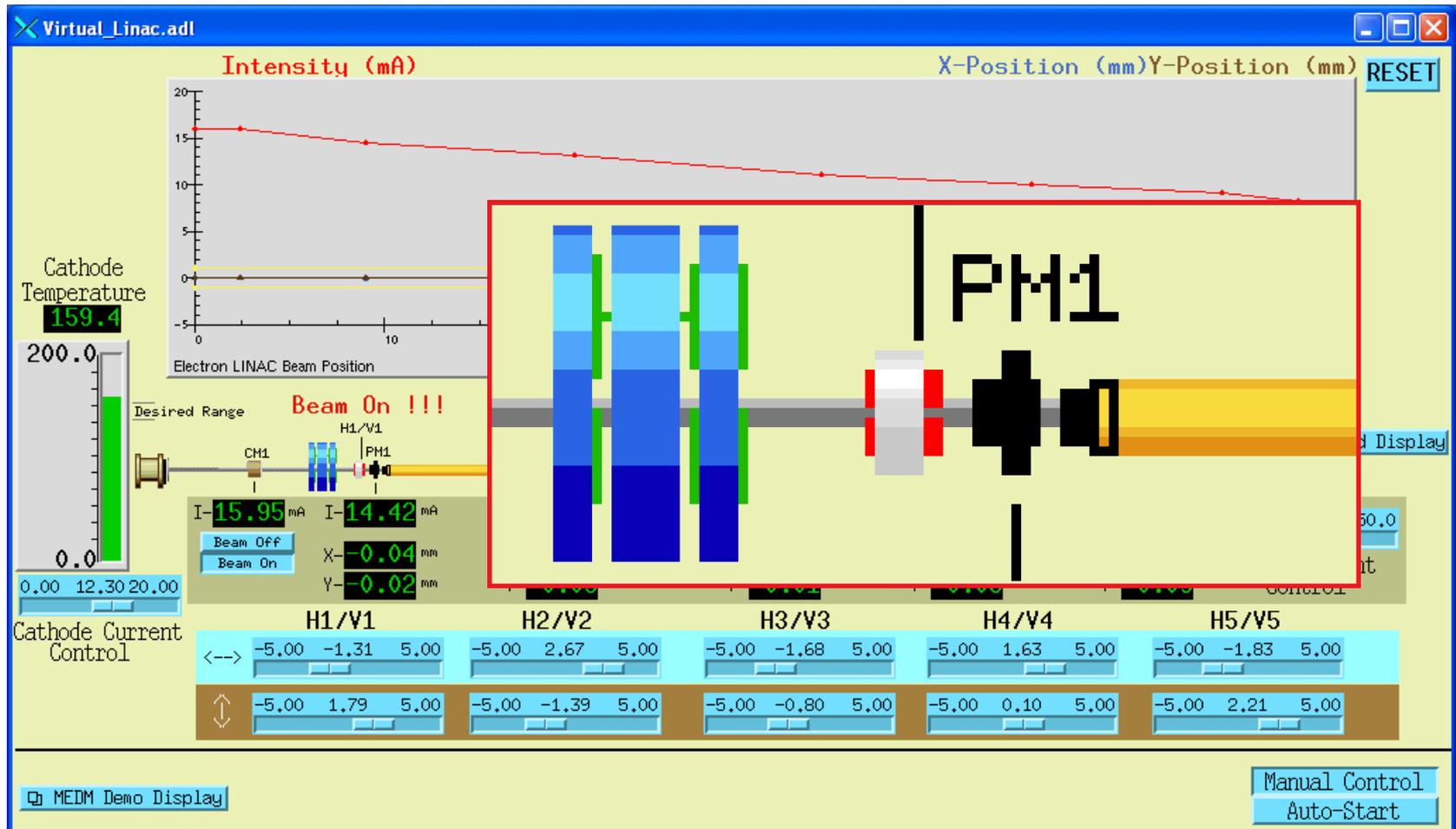


The width (w) & height (h) values scale uniformly

Adjust the height until it looks OK

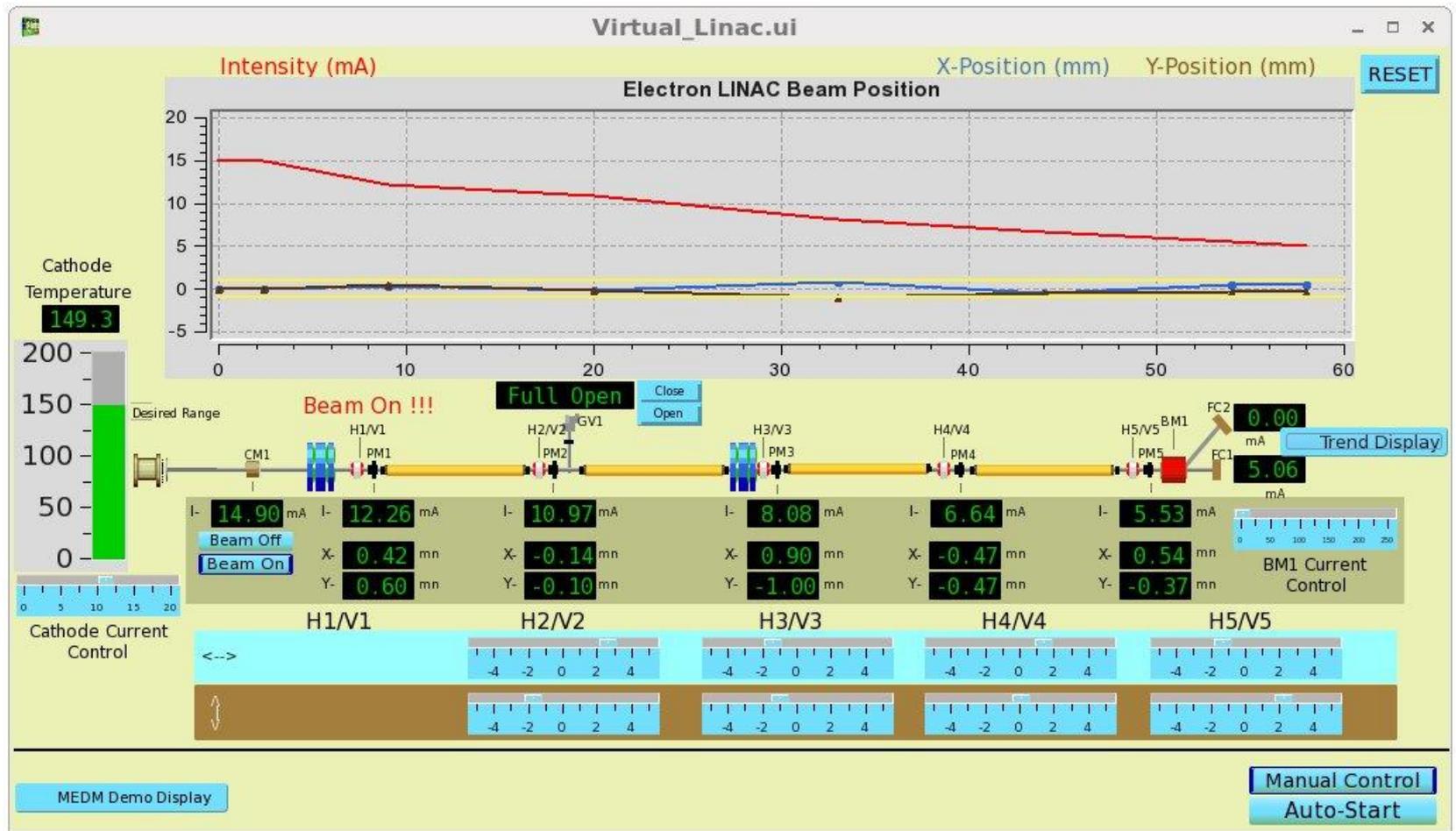
# medm Graphics Objects

- Many effects are created with Graphics objects



# caQtDm Virtual Linac Display

- Same effects are created with Graphics Widgets



# caQtDM Dynamic Attribute

- **Applies Primarily to Graphics Widgets**
- **Objects with a Dynamic Attribute can have their color or visibility change based on process variables or conditions**
- **Color Mode (Static/Alarm)**
  - Object has alarm colors (Green, Yellow, Red)
- **Visibility Mode**
  - Visible only if the process variable is zero or only if not zero
- **Visibility Calc Mode**
  - Visibility is based on a CALC expression involving up to 4 process variables plus HOPR, LOPR, STAT, SEVR, etc.



# caQtDM Calc Expression

- Expression involving 16 variables
  - A The value of Channel A
  - B The value of Channel B
  - C The value of Channel C
  - D The value of Channel D
  - E Reserved
  - F Reserved
  - G The COUNT of Channel A
  - H The HOPR of Channel A
  - I The STATUS of Channel A
  - J The SEVERITY of Channel A
  - K The PRECISION of Channel A
  - L The LOPR of Channel A

**Channel A** →

Property Editor

Filter

calabel : caLabel

Property	Value
acceptDrops	<input type="checkbox"/>
toolTip	
statusTip	
whatsthis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
styleSheet	background-color: rgb(0, 255,...
locale	English, UnitedStates
inputMethodHints	ImhNone
<b>QFrame</b>	
frameShape	NoFrame
frameShadow	Plain
lineWidth	1
midLineWidth	0
<b>QLabel</b>	
<b>text</b>	CLOSED
textFormat	AutoText
pixmap	
scaledContents	<input type="checkbox"/>
alignment	AlignRight, AlignVCenter
wordWrap	<input type="checkbox"/>
margin	0
indent	-1
openExternalLinks	<input type="checkbox"/>
textInteractionFlags	LinksAccessibleByMouse
<b>ESimpleLabel</b>	
botTopBorderWidth	2.000000
lateralBorderWidth	2.000000
fontScaleMode	WidthAndHeight
<b>caLabel</b>	
foreground	■ [0, 0, 0] (255)
background	■ [0, 255, 0] (255)
colorMode	Static
visibility	Calc
visibilityCalc	A>1
channel	js:TestThisBI
channelB	
channelC	
channelD	
buddy	

**calc**

**A>1**



# caQtDM Calc Expression

- Expression
  - A The value of Channel A
  - B The value of Channel B
  - C The value of Channel C
  - D The value of Channel D

Property Editor

Filter

calabel : caLabel

Property	Value
acceptDrops	<input type="checkbox"/>
toolTip	
statusTip	
whatsThis	
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
stylesheet	background-color: rgb(0, 255,...
locale	English, UnitedStates
inputMethodHints	ImhNone
<b>QFrame</b>	
frameShape	NoFrame
frameShadow	Plain
lineWidth	1
midLineWidth	0
<b>QLabel</b>	
<b>text</b>	CLOSED
textFormat	AutoText
pixmap	
scaledContents	<input type="checkbox"/>
alignment	AlignRight, AlignVCenter
wordWrap	<input type="checkbox"/>
margin	0
indent	-1
openExternalLinks	<input type="checkbox"/>
textInteractionFlags	LinksAccessibleByMouse
<b>ESimpleLabel</b>	
botTopBorderWidth	2.000000
lateralBorderWidth	2.000000
fontScaleMode	WidthAndHeight
<b>caLabel</b>	
foreground	■ [0, 0, 0] (255)
background	■ [0, 255, 0] (255)
colorMode	Static
visibility	Calc
visibilityCalc	A>1
channel	js:TestThisBI
channelB	
channelC	
channelD	
buddy	

Channel A

calc

A>1

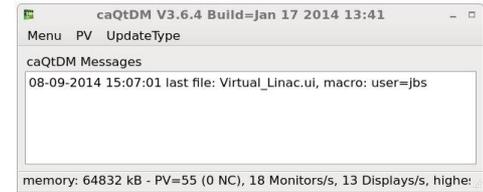


# caQtDM Calc Expressions

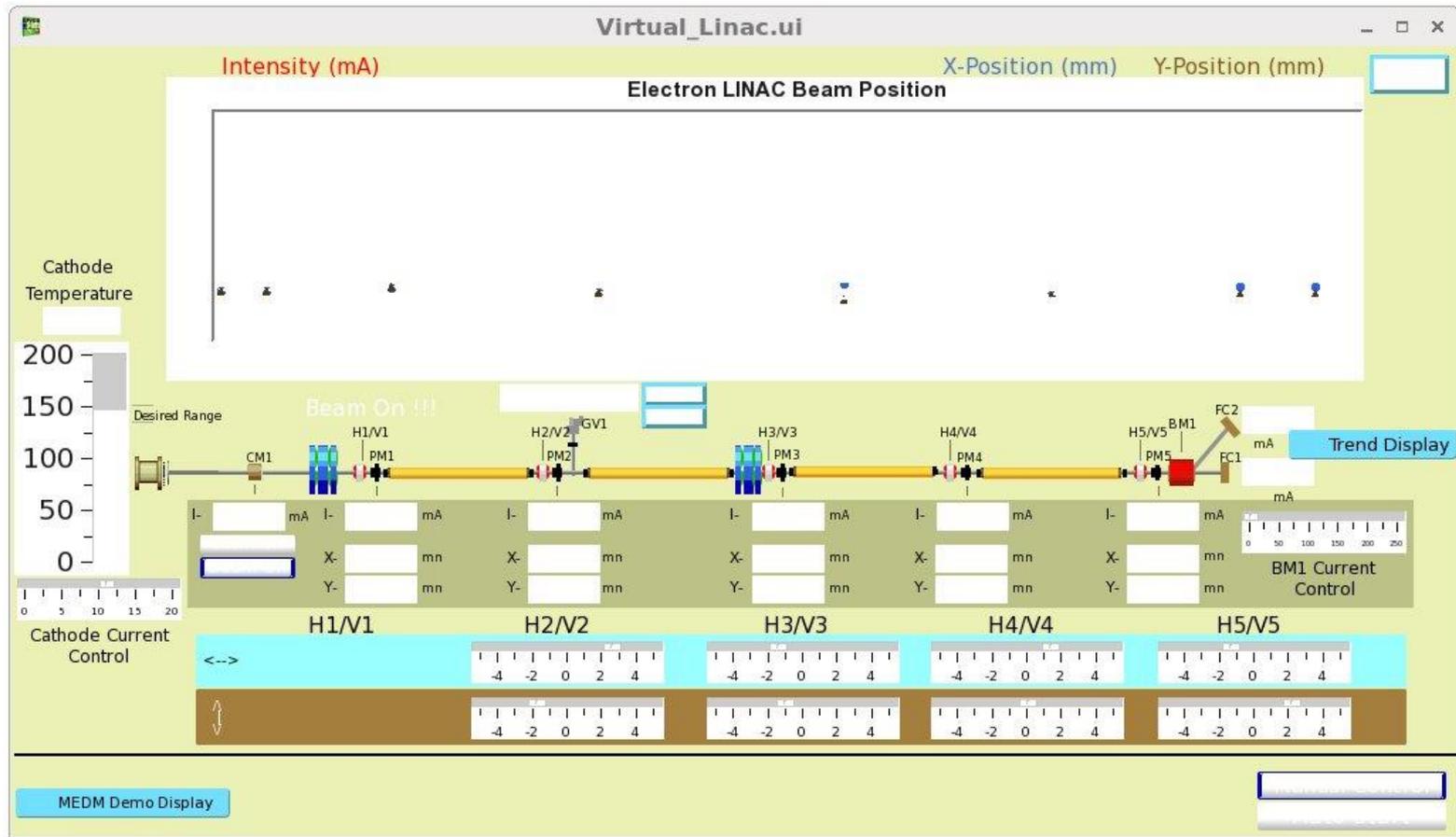
- **Syntax is the same as for the EPICS CALC record**
  - See the Record Reference Manual
- **Some True/False Examples (for Visibility)**
  - !A Value is zero (Same as "if zero")
  - A Value not zero (Same as "if not zero")
  - A=12 (or A==12) Value is 12
  - A#12 (or A!=12) Value is not 12
  - A<0&&B<0&&C<0 All are negative
  - A>.9\*H Beyond 90% of upper limit
  - !J SEVERITY is not zero



# caQtDM Execute Mode



- What's wrong with this screen?



- caQtDM objects turn white when the connection is lost !

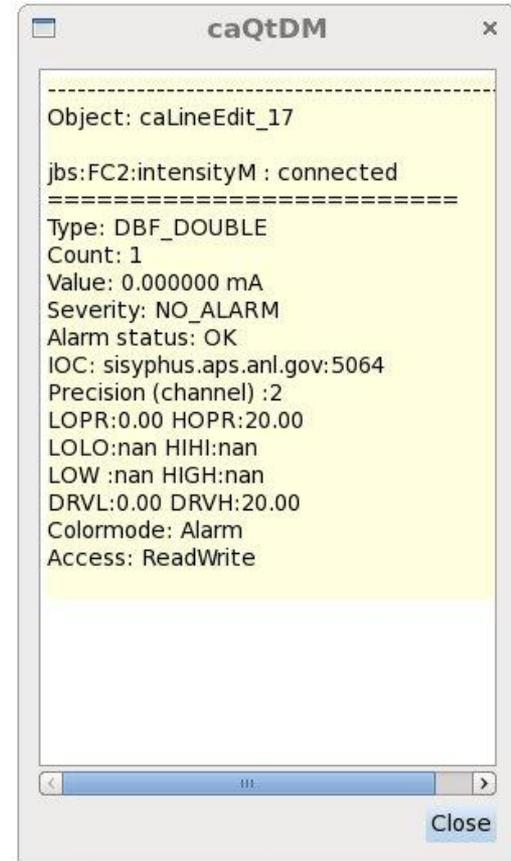
# caQtDM Drag & Drop

- **You can drag the process variable names from an object**
  - Use Mouse Button 2 (the middle button)
- **The Process variable name appears in its alarm color on black**
- **Cannot be dragged to any Motif Drop Site**
  - This includes Probe, StripTool, HistTool, and others
- **Names can be dragged into a Linux text editor**
  - Can paste them in the usual places without even dragging
- **Mouse Button 2 is a fast way to see the process variable name**
- **Doesn't work on a Mac**



# caQtDM PV Info

- **PV Info**
  - Gives extensive information about the process variable
- **Hover Mouse Pointer Over Widget**
  - Process Variable Name Appears
  - Right click “Get Info” Icon
  - Left Click



# caQtDM PV Limits

- **PV Limits**
  - Allows you to set the limits for Meters, Sliders, etc
- **The user can:**
  - Use the values from Channel Access (HOPR, LOPR, PREC)
  - Use the defaults set by the screen designer
- **The screen designer can:**
  - Set it to use Channel Access values
  - Define the limits
- **Settings Found On Property Editor**



# caQtDM PV Limits

The screenshot shows the Qt Designer interface for a window titled "AnalogTest.ui". The window contains a "Test Display" with a circular gauge, a slider, and a plot titled "Slider Analog Output". The Object Inspector on the right shows the hierarchy of objects, and the Property Editor shows the properties of the selected `caTextEntry_0` object.

**Object Inspector**

Object	Class
MainWindow	QMainWindow
centralWidget	QWidget
caCircularGauge_0	caCircularGauge
caLabel_0	caLabel
caSlider_0	caSlider
caStripPlot_0	caStripPlot
caTextEntry_0	caTextEntry

**Property Editor**

caTextEntry\_0 : caTextEntry

Property	Value
layoutDirection	LeftToRight
autoFillBackground	<input type="checkbox"/>
styleSheet	caTextEntry, caLineEdit {bac...
locale	English, UnitedStates
inputMethodHints	ImhNone
<b>QLineEdit</b>	
inputMask	
text	
maxLength	32767
frame	<input type="checkbox"/>
echoMode	Normal
cursorPosition	0
alignment	AlignLeft, AlignVCenter
Horizontal	AlignLeft
Vertical	AlignVCenter
dragEnabled	<input type="checkbox"/> AlignLeft, AlignVCenter
readOnly	<input type="checkbox"/>
placeholderText	
cursorMoveStyle	LogicalMoveStyle
<b>caLineEdit</b>	
channel	\$(xx):SliderAO
foreground	■ [0, 0, 0] (255)
background	■ [218, 218, 218] (255)
colorMode	Static
precision	0
precisionMode	Channel
limitsMode	Channel
maxValue	1.000000
minValue	0.000000
fontScaleMode	WidthAndHeight
formatType	decimal

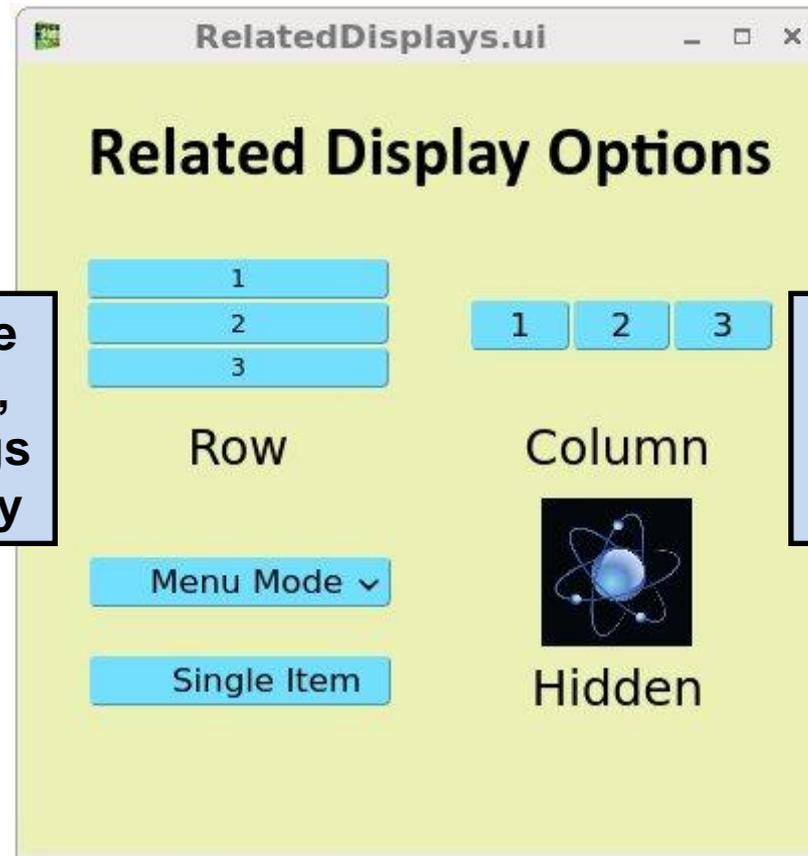
# caQtDM Macros

- **Strings of the form \$(name) in an ADL file can be replaced by some other string**
  - For example, enter \$(sector):\$(corrector) as part of a PV name
- **Replacement is specified:**
  - 1. On command line:  
**caQtDM –macro "sector=S1A,corrector=H2"**
  - 2. In Related Display configuration:  
Property Editor select **args xx=\$(xx)**
- **Allows you to design one screen and use it for many similar items**
- **The Main\_XXXX.ui display uses \$(xx) in front of PV names**
  - So different users have their own PV names
  - **caQtDM –macro "xx=user00" Main\_XXXX.ui &**



# caQtDM Related Display

- Brings up a menu of other displays
- As with most caQtDM widgets there are many options



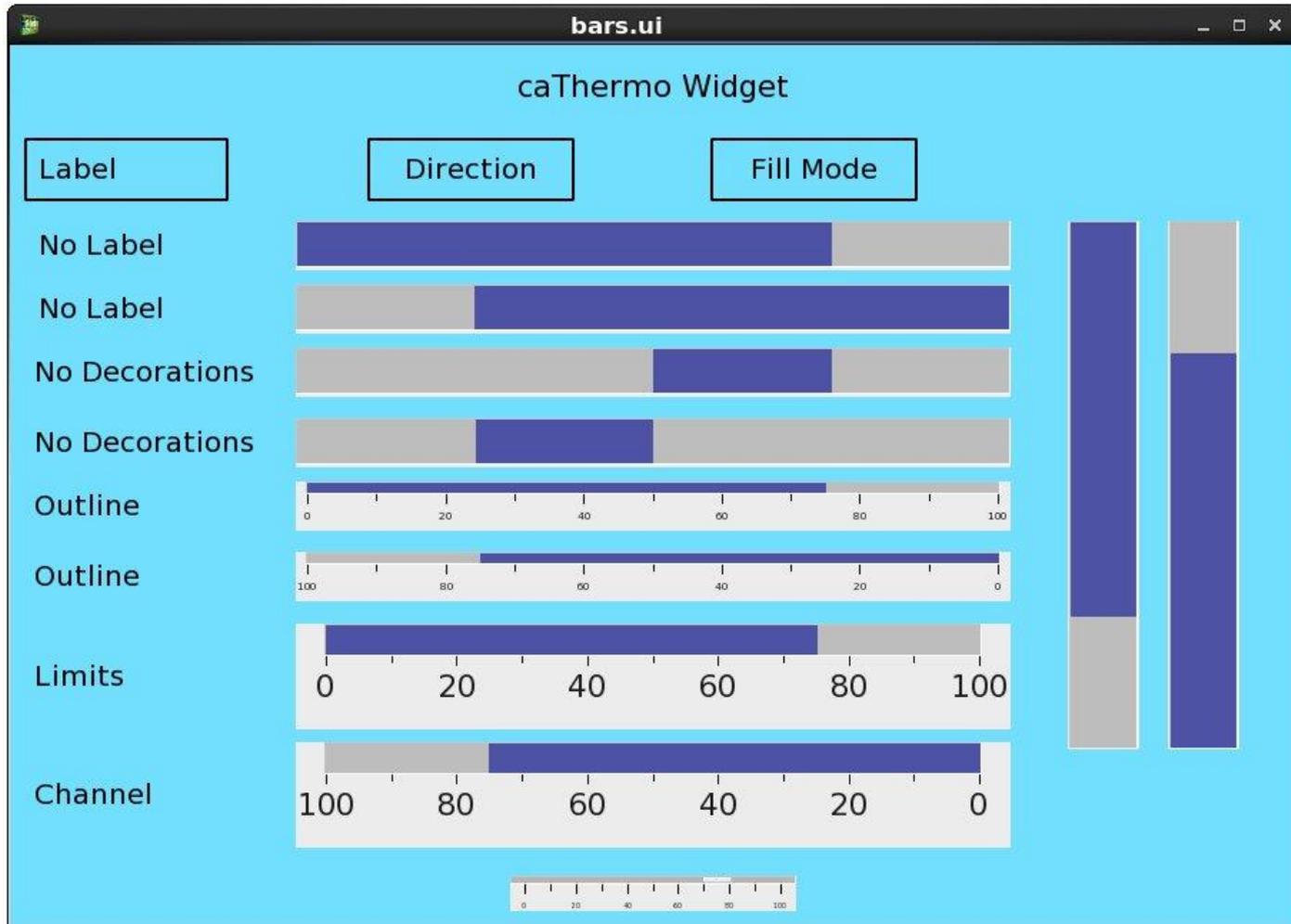
If there is only one item on the menu, clicking on it brings up that one display

If there is more than one item in the menu, a down arrow appears



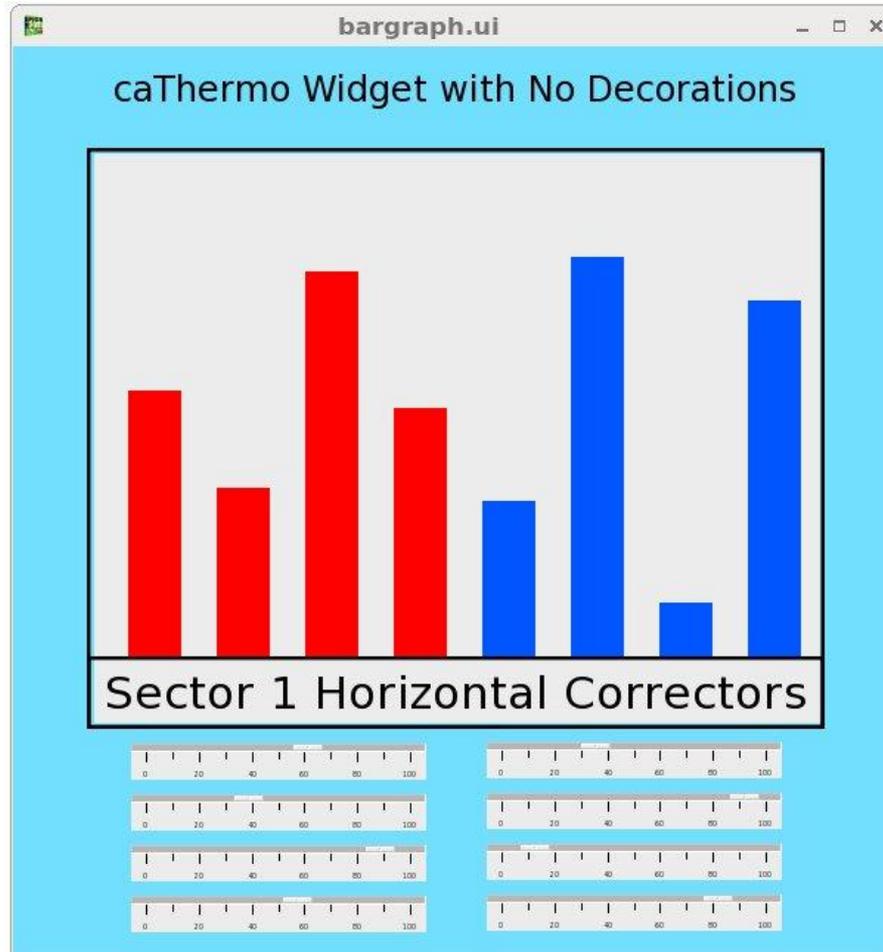
# caQtDM caThermo

- Here are some options for the caThermo Widget



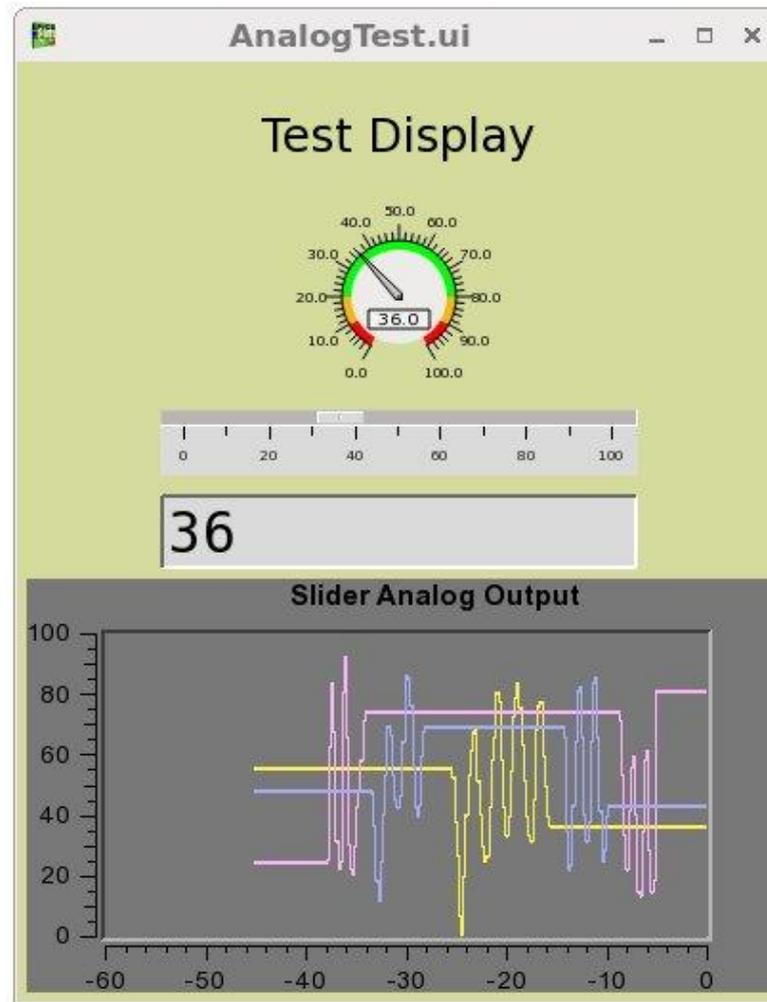
# CaQTDM caThermo Widget

- The no decorations mode, useful for bar graphs and effects



# caQtDM Strip Chart

- The caStripPlot Widget Plots Up to Seven Output Values



# caQtDM Strip Chart

The screenshot shows the Qt Designer interface for a project named 'AnalogTest.ui'. The central canvas displays a window titled 'AnalogTest.ui' with a yellow background. At the top center, there is a 'Test Display' containing a circular gauge with a needle pointing to approximately 0.5. Below the gauge is a horizontal slider with a range from 0 to 1.0. At the bottom of the window is a 'Slider Analog Output' plot area with a vertical axis from 0 to 1,000 and a horizontal axis from -60 to 0. The plot area is currently empty.

On the left side, the 'Widget Box' is open, showing a list of widgets. The 'caQt\_Graphics' category is expanded, showing various graphics-related widgets like 'caFrame', 'caLabel', 'caGraphics', 'caPolyLine', 'calmage', 'caInclude', 'caDoubleTabWidget', and 'caQt\_Monitors'. The 'caStripPlot' widget is highlighted.

On the right side, the 'Object Inspector' shows the hierarchy of objects in the design. The 'caStripPlot\_0' object is selected, and its properties are shown in the 'Property Editor'. The 'Property Editor' is open to the 'Edit text' dialog, which contains the following text:

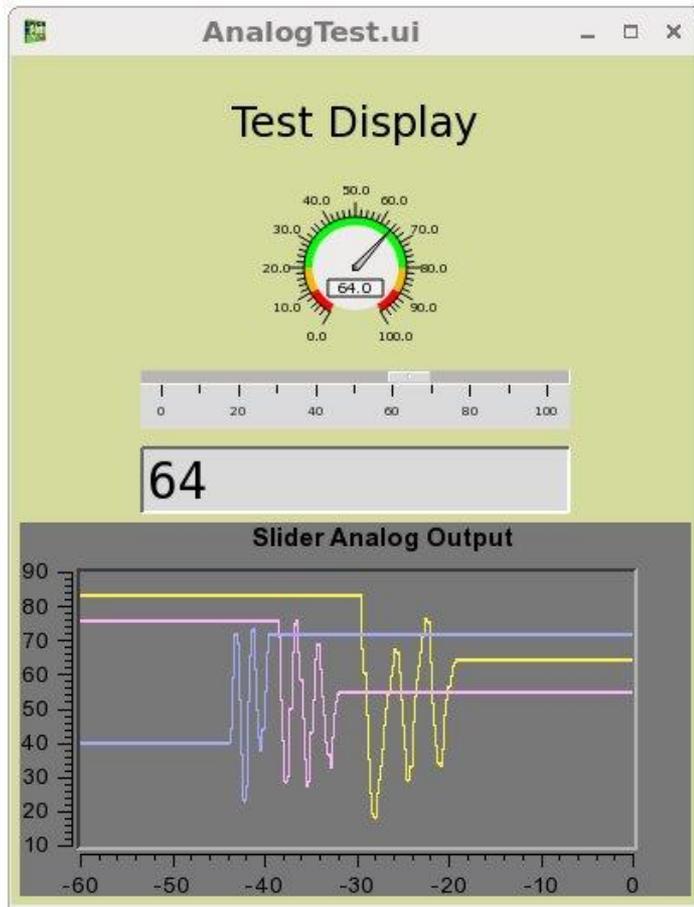
```
$(xx):MeterAI;$(xx):AirTemp1AI;  
$(xx):AirTemp2AI
```

The 'Property Editor' also shows the following properties for the 'caStripPlot\_0' object:

Property	Value
Slider Analog Output	
Second	60.000000
ValueScale	linear
1.000000	
0.000000	
Channel	Channel
Channel	Channel
Lines	[ 251, 243, 74] (255)
YaxisLimitsMax_2	1.000000
YaxisLimitsMin_2	0.000000
YaxisScalingMax_2	Channel
YaxisScalingMin_2	Channel
Style_2	Lines
color_2	[ 255, 176, 255] (255)
YaxisLimitsMax_3	1.000000
YaxisLimitsMin_3	0.000000
YaxisScalingMax_3	Channel
YaxisScalingMin_3	Channel
Style_3	Lines
color_3	[ 164, 170, 255] (255)
YaxisLimitsMax_4	100.000000
YaxisLimitsMin_4	0.000000
YaxisScalingMax_4	Channel
YaxisScalingMin_4	Channel
Style_4	Lines

# caQtDM Strip Chart

- Right Click On Active Display To Modify Strip Chart



The 'stripplot modifications' dialog box contains the following settings:

99:MeterAI	user	10	user	90
99:AirTemp1AI	channel	0	channel	100
99:AirTemp2AI	channel	0	channel	100

Buttons: Apply, Return

Y axis : linear



# caQtDM Plot Widgets

- Strip Plot (Strip Chart)
- The Cartesian Plot is the most complicated caQtDM widget
  - caQtDM uses the Qwt package
  - Plots Up To 6 Curves
  - Plot Arrays Using Waveform Records
  - Plot Scalar Using A Single Process Variable
- Waterfall Plot
  - Also Plots Waveforms & Scalars



# caQtDM Documentation

- There is a caQtDM web page
  - <http://epics.web.psi/software/caqtdm>
  - [http://epics.web.psi/software/caqtdm/caQtDM\\_Manual](http://epics.web.psi/software/caqtdm/caQtDM_Manual)
  - <http://epics.web.psi.ch/software/caqtdm/TUPPC121.pdf>
- Qt Project Homepage
  - <http://qt-project.org/>



# caQtDM Tutorial

## ‘Hands On’ Demonstration

- How To Create A Display
  - Mode Button, File Edit & Palette Menus
- File Operations
  - New Display, New, Open, Save, Close & Print
- Palettes
  - Object Types (Graphic, Monitors, Controllers)
  - Resource, Color, & Object Palettes
  - Dimensions, Colors, Objects
- Macros & Dynamic Attributes
  - String Substitutions, Calc Expressions



# caQtDM Tutorial

## VNC Instructions For A Mac Laptop

1. In Apple Finder, Press Command-K, or in the menu, select “Go Connect to Server...”. This brings up the Connect to Server dialog box.
2. In the Server Address box type "vnc://crackle-vm:5962" and press the Connect button. The Screen Sharing application should start and prompt you "Enter your password to share the screen of crackle-vm:5962".
3. Type "epics!" into the the password box (without the quotes) and press Connect.
4. You should now see the redhat Linux login screen where you can enter the username and password given to you.

