

Axel-probe

2.1.0.23

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| | |
|--|-----------|
| 1 Axel-probe Introduction | 1 |
| 2 Namespace Index | 3 |
| 2.1 Packages | 3 |
| 3 Hierarchical Index | 5 |
| 3.1 Class Hierarchy | 5 |
| 4 Class Index | 7 |
| 4.1 Class List | 7 |
| 5 File Index | 9 |
| 5.1 File List | 9 |
| 6 Namespace Documentation | 11 |
| 6.1 Axel_probe Namespace Reference | 11 |
| 6.1.1 Enumeration Type Documentation | 11 |
| 6.1.1.1 RemoteMode | 11 |
| 6.2 Axel_probe::Properties Namespace Reference | 12 |
| 7 Class Documentation | 13 |
| 7.1 Axel_probe::App Class Reference | 13 |
| 7.1.1 Detailed Description | 13 |
| 7.2 Axel_probe.Kalman Class Reference | 13 |
| 7.2.1 Detailed Description | 14 |
| 7.3 Axel_probe::MainWindow Class Reference | 14 |
| 7.3.1 Detailed Description | 14 |
| 7.4 Axel_probe.PID Class Reference | 14 |
| 7.4.1 Detailed Description | 15 |
| 7.5 Axel_probe.ProbeEngine Class Reference | 15 |
| 7.5.1 Detailed Description | 16 |
| 7.5.2 Constructor & Destructor Documentation | 17 |
| 7.5.2.1 ProbeEngine() | 17 |
| 7.5.3 Member Function Documentation | 17 |
| 7.5.3.1 acceleration() | 17 |
| 7.5.3.2 breathing() | 17 |
| 7.5.3.3 CancelRepeat() | 18 |
| 7.5.3.4 CancelScan() | 18 |
| 7.5.3.5 ChangeEvent() | 18 |
| 7.5.3.6 ChangeHandler() | 18 |
| 7.5.3.7 DoScan() | 18 |
| 7.5.3.8 fringes() | 19 |
| 7.5.3.9 fringesPoint() | 19 |
| 7.5.3.10 Gauss() | 19 |

| | |
|---|-----------|
| 7.5.3.11 getlfringe() | 20 |
| 7.5.3.12 LoadParams() | 20 |
| 7.5.3.13 LogEvent() | 20 |
| 7.5.3.14 LogHandler() | 20 |
| 7.5.3.15 pauseSingle() | 21 |
| 7.5.3.16 SaveParams() | 21 |
| 7.5.3.17 SimpleRepeat() | 21 |
| 7.5.3.18 SingleShot() | 21 |
| 7.5.3.19 Start() | 22 |
| 7.5.3.20 Stop() | 22 |
| 7.5.4 Member Data Documentation | 22 |
| 7.5.4.1 b4ConstrID | 22 |
| 7.5.4.2 bpps | 23 |
| 7.5.4.3 contrPhase | 23 |
| 7.5.4.4 dps | 23 |
| 7.5.4.5 lboxNB | 23 |
| 7.5.4.6 LockParams | 23 |
| 7.5.4.7 remote | 24 |
| 7.5.4.8 remoteMode | 24 |
| 7.5.4.9 srsFringes | 24 |
| 7.5.4.10 srsSignalB | 24 |
| 7.5.4.11 srsSignalN | 24 |
| 7.5.4.12 stopWatch | 24 |
| 7.5.5 Property Documentation | 25 |
| 7.5.5.1 axis | 25 |
| 7.5.5.2 Enabled | 25 |
| 7.5.5.3 Pause | 25 |
| 7.5.5.4 period | 25 |
| 7.5.6 Event Documentation | 25 |
| 7.5.6.1 OnChange | 26 |
| 7.5.6.2 OnLog | 26 |
| 7.6 Axel_probe::Properties::Resources Class Reference | 26 |
| 7.6.1 Detailed Description | 26 |
| 7.7 Axel_probe::Properties::Settings Class Reference | 26 |
| 7.7.1 Detailed Description | 26 |
| 8 File Documentation | 27 |
| 8.1 App.g.cs File Reference | 27 |
| 8.2 App.g.i.cs File Reference | 27 |
| 8.3 App.xaml.cs File Reference | 27 |
| 8.4 AssemblyInfo.cs File Reference | 28 |
| 8.5 Axel-probe_Content.g.i.cs File Reference | 28 |

| | |
|---|-----------|
| 8.6 Kalman.cs File Reference | 28 |
| 8.7 MainWindow.g.cs File Reference | 28 |
| 8.8 MainWindow.g.i.cs File Reference | 28 |
| 8.9 MainWindow.xaml.cs File Reference | 29 |
| 8.10 ProbeEngine.cs File Reference | 29 |
| 8.11 README.md File Reference | 29 |
| 8.12 Resources.Designer.cs File Reference | 29 |
| 8.13 Settings.Designer.cs File Reference | 30 |
| Index | 31 |

Chapter 1

Axel-probe Introduction

Axel Probe is designed as simulator of MotMaster2 application including the quantum (MOT) accelerometer. The main purpose is to test Axel Hub for communication, logging, visualizing and data processing abilities. The software provides:

- The simulation starts with generation of an acceleration pattern (repeatable). Then Axel Probe would simulate a signal which would come out of MotMaster2 and the MOT experiment and send that signal to Axel Hub
- A number behavioural patterns are available, as well as adding Gaussian noise and variety of simulated signal disturbances as amplitude variation, etc.
- In case of active feedback of Raman phase in order to follow the position of a fringe (from the atomic interferometer), Axel Probe will take into account the fed back Raman phase when the signal is simulated. For example: the PID algorithm (with pi flip) could be tested and optimized that way.
- Most of the intermediate and resulting value of calculation (simulation) are visible in charts and some of them in the communication log.

Chapter 2

Namespace Index

2.1 Packages

Here are the packages with brief descriptions (if available):

| | |
|--|----|
| Axel_probe | 11 |
| Axel_probe::Properties | 12 |

Chapter 3

Hierarchical Index

3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

| | |
|---|----|
| Application | |
| Axel_probe::App | 13 |
| Axel_probe::App | 13 |
| Axel_probe::App | 13 |
| ApplicationSettingsBase | |
| Axel_probe::Properties::Settings | 26 |
| IComponentConnector | |
| Axel_probe::MainWindow | 14 |
| Axel_probe::MainWindow | 14 |
| Axel_probe.Kalman | 13 |
| Axel_probe.PID | 14 |
| Axel_probe.ProbeEngine | 15 |
| Axel_probe::Properties::Resources | 26 |
| Window | |
| Axel_probe::MainWindow | 14 |
| Axel_probe::MainWindow | 14 |
| Axel_probe::MainWindow | 14 |

Chapter 4

Class Index

4.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

| | |
|---|----|
| Axel_probe::App | |
| Interaction logic for App.xaml | 13 |
| Axel_probe.Kalman | |
| Under development | 13 |
| Axel_probe::MainWindow | |
| Axel-probe is replacement simulator for MotMaster2 generating signal according to a settings corresponding to some experimental conditions | 14 |
| Axel_probe.PID | |
| Under development | 14 |
| Axel_probe.ProbeEngine | |
| An calculating engine for generating a fringes patterns according simulated experimental condi- tions the engine runs by its timer and behaives similar to Axel-tilt its state evolve according to the set parameters (accel.; disturbances) and axel-probe queries the engine for its state OnChange event fires when the state is recalculated | 15 |
| Axel_probe::Properties::Resources | |
| A strongly-typed resource class, for looking up localized strings, etc | 26 |
| Axel_probe::Properties::Settings | 26 |

Chapter 5

File Index

5.1 File List

Here is a list of all files with brief descriptions:

| | |
|---|----|
| App.g.cs | 27 |
| App.g.i.cs | 27 |
| App.xaml.cs | 27 |
| AssemblyInfo.cs | 28 |
| Axel-probe_Content.g.i.cs | 28 |
| Kalman.cs | 28 |
| MainWindow.g.cs | 28 |
| MainWindow.g.i.cs | 28 |
| MainWindow.xaml.cs | 29 |
| ProbeEngine.cs | 29 |
| Resources.Designer.cs | 29 |
| Settings.Designer.cs | 30 |

Chapter 6

Namespace Documentation

6.1 Axel_probe Namespace Reference

Namespaces

- [Properties](#)

Classes

- class [App](#)
Interaction logic for App.xaml
- class [Kalman](#)
Under development
- class [MainWindow](#)
Axel-probe is replacement simulator for MotMaster2 generating signal according to a settings corresponding to some experimental conditions
- class [PID](#)
Under development
- class [ProbeEngine](#)
An calculating engine for generating a fringes patterns according simulated experimental conditions the engine runs by its timer and behaves similar to Axel-tilt its state evolve according to the set parameters (accel.; disturbances) and axel-probe queries the engine for its state OnChange event fires when the state is recalculated

Enumerations

- enum [RemoteMode](#) {
[RemoteMode.Disconnected](#), [RemoteMode.Jumbo_Scan](#), [RemoteMode.Jumbo_Repeat](#), [RemoteMode.Simple_Scan](#),
[RemoteMode.Simple_Repeat](#), [RemoteMode.Ready_To_Remote](#) }
The current mode (group command) of incomming shots

6.1.1 Enumeration Type Documentation

6.1.1.1 RemoteMode

enum [Axel_probe.RemoteMode](#) [strong]

The current mode (group command) of incomming shots

Enumerator

| | |
|-----------------|--|
| Disconnected | |
| Jumbo_Scan | |
| Jumbo_Repeat | |
| Simple_Scan | |
| Simple_Repeat | |
| Ready_To_Remote | |

Definition at line 22 of file ProbeEngine.cs.

6.2 Axel_probe::Properties Namespace Reference

Classes

- class [Resources](#)
A strongly-typed resource class, for looking up localized strings, etc.
- class [Settings](#)

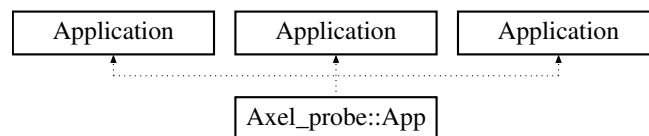
Chapter 7

Class Documentation

7.1 Axel_probe::App Class Reference

Interaction logic for App.xaml

Inheritance diagram for Axel_probe::App:



7.1.1 Detailed Description

Interaction logic for App.xaml

[App](#)

Definition at line 14 of file App.xaml.cs.

The documentation for this class was generated from the following files:

- [App.xaml.cs](#)
- [App.g.cs](#)
- [App.g.i.cs](#)

7.2 Axel_probe.Kalman Class Reference

Under development

7.2.1 Detailed Description

Under development

Definition at line 19 of file Kalman.cs.

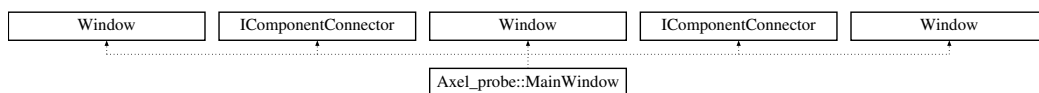
The documentation for this class was generated from the following file:

- [Kalman.cs](#)

7.3 Axel_probe::MainWindow Class Reference

Axel-probe is replacement simulator for MotMaster2 generating signal according to a settings corresponding to some experimental conditions

Inheritance diagram for Axel_probe::MainWindow:



7.3.1 Detailed Description

Axel-probe is replacement simulator for MotMaster2 generating signal according to a settings corresponding to some experimental conditions

[MainWindow](#)

Interaction logic for MainWindow.xaml

Definition at line 32 of file MainWindow.xaml.cs.

The documentation for this class was generated from the following files:

- [MainWindow.xaml.cs](#)
- [MainWindow.g.cs](#)
- [MainWindow.g.i.cs](#)

7.4 Axel_probe.PID Class Reference

Under development

7.4.1 Detailed Description

Under development

Definition at line 12 of file Kalman.cs.

The documentation for this class was generated from the following file:

- [Kalman.cs](#)

7.5 Axel_probe.ProbeEngine Class Reference

An calculating engine for generating a fringes patterns according simulated experimental conditions the engine runs by its timer and behaves similar to Axel-tilt its state evolve according to the set parameters (accel.; disturbances) and axel-probe queries the engine for its state OnChange event fires when the state is recalculated

Public Member Functions

- void [SaveParams](#) ()
Save Params in json file (params.cfg)
- void [LoadParams](#) ()
Load Params from json file (params.cfg)
- [ProbeEngine](#) ()
Class constructor
- void [Start](#) (int dur=500)
Start simulation
- void [Stop](#) ()
Stop simulation
- void [pauseSingle](#) ()
While in pause mode, shoot a single shot by calling this
- delegate void [ChangeHandler](#) (Point newAccel)
- delegate void [LogHandler](#) (string txt, Color? clr=null)
- void [LogEvent](#) (string txt, Color? clr=null)
- Point [Gauss](#) ()
New acceleration point with optional noise by X and Y
- double [acceleration](#) (double pos)
Generates specific pattern with set params
- double [breathing](#) ()
Simulates signal loosing contrast (various reassons) factor to multiply the fringes with
- Point [fringesPoint](#) (double scanPhase, double curAccel)
Individual for each point from the fringe
- double [fringes](#) (double curAccel)
(re)Generates the fringes series
- int [getlfringe](#) (double x)
Get index from phase in fringes series
- bool [SingleShot](#) (double A, int toAxis, ref MMexec mme)
Generates the simulated to photo diode signal to be send to Axel-hub
- void [CancelScan](#) ()
- void [DoScan](#) (MMscan mms)
Generates scan series of shots by group MMexec envelope
- void [CancelRepeat](#) ()
- void [SimpleRepeat](#) (int cycles, string groupID)
Generate simple (initialted from here) repeat series of shots

Public Attributes

- Dictionary< string, double > [bpps](#)
behaviour patterns parameters pattern => 0 -> constant; 1 -> trapeze; 2 -> sine ampl [mg] - accel. amplitude factor [mg/rad] step [%] percent from the pattern period time gap
- Dictionary< string, object > [dps](#)
disturbances - fringe noise and Y breathing simulating experimental conditions Xnoise - [mg] noise in accel. (fringe shifting) Ynoise - [%] Y noise in fringe signal XnoiseIO - (bool) Xnoise switch YnoiseIO - (bool) Ynoise switch Brth↔ Pattern - (int) Breathing pattern BrthAmpI - Breathing amplitude BrthPeriod - Breathing period BrthIO - (bool) Breathing switch
- Boolean [LockParams](#) = false
- RemoteMessaging [remote](#) = null
- ChartCollection< Point > [srsFringes](#) = null
- ListBox [lboxNB](#) = null
- ChartCollection< double > [srsSignalN](#) = null
- ChartCollection< double > [srsSignalB](#) = null
- RemoteMode [remoteMode](#) = RemoteMode.Disconnected
- Stopwatch [stopWatch](#)
- double [contrPhase](#) = -11
- int [b4ConstrID](#) = 0

Protected Member Functions

- void [ChangeEvent](#) (Point newAccel)

Properties

- int [axis](#) [get, set]
Axis mode -1 - old style; 0 - X; 1 - Y; 2 - X/Y
- double [period](#) [get]
Time period of generated
- Boolean [Enabled](#) [get, set]
One way to start/stop a simulation
- Boolean [Pause](#) [get, set]
Temporary pause the simulation

Events

- [ChangeHandler](#) OnChange
- [LogHandler](#) OnLog

7.5.1 Detailed Description

An calculating engine for generating a fringes patterns according simulated experimental conditions the engine runs by its timer and behaves similar to Axel-tilt its state evolve according to the set parameters (accel.; disturbances) and axel-probe queries the engine for its state OnChange event fires when the state is recalculated

Definition at line 39 of file ProbeEngine.cs.

7.5.2 Constructor & Destructor Documentation

7.5.2.1 ProbeEngine()

```
Axel_probe.ProbeEngine.ProbeEngine ( )
```

Class constructor

Definition at line 146 of file ProbeEngine.cs.

7.5.3 Member Function Documentation

7.5.3.1 acceleration()

```
double Axel_probe.ProbeEngine.acceleration (
    double pos )
```

Generates specific pattern with set params

Parameters

| | |
|------------|------------------------------|
| <i>pos</i> | pos in current pattern [sec] |
|------------|------------------------------|

Returns

Definition at line 265 of file ProbeEngine.cs.

7.5.3.2 breathing()

```
double Axel_probe.ProbeEngine.breathing ( )
```

Simulates signal loosing contrast (various reassons) factor to multiply the fringes with

Returns

Definition at line 303 of file ProbeEngine.cs.

7.5.3.3 CancelRepeat()

```
void Axel_probe.ProbeEngine.CancelRepeat ( )
```

Definition at line 501 of file ProbeEngine.cs.

7.5.3.4 CancelScan()

```
void Axel_probe.ProbeEngine.CancelScan ( )
```

Definition at line 463 of file ProbeEngine.cs.

7.5.3.5 ChangeEvent()

```
void Axel_probe.ProbeEngine.ChangeEvent (
    Point newAccel ) [protected]
```

Definition at line 214 of file ProbeEngine.cs.

7.5.3.6 ChangeHandler()

```
delegate void Axel_probe.ProbeEngine.ChangeHandler (
    Point newAccel )
```

7.5.3.7 DoScan()

```
void Axel_probe.ProbeEngine.DoScan (
    MMscan mms )
```

Generates scan series of shots by group MMexec envelope

Parameters

| | |
|------------|--------------|
| <i>mms</i> | group MMexec |
|------------|--------------|

Definition at line 468 of file ProbeEngine.cs.

7.5.3.8 fringes()

```
double Axel_probe.ProbeEngine.fringes (
    double curAccel )
```

(re)Generates the fringes series

Parameters

| | |
|-----------------|--------------------------------|
| <i>curAccel</i> | curAccel [mg] for illustration |
|-----------------|--------------------------------|

Returns

accel with noise

Definition at line 331 of file ProbeEngine.cs.

7.5.3.9 fringesPoint()

```
Point Axel_probe.ProbeEngine.fringesPoint (
    double scanPhase,
    double curAccel )
```

Individual for each point from the fringe

Parameters

| | |
|------------------|-------|
| <i>scanPhase</i> | [rad] |
| <i>curAccel</i> | [mg] |

Returns

result point

Definition at line 319 of file ProbeEngine.cs.

7.5.3.10 Gauss()

```
Point Axel_probe.ProbeEngine.Gauss ( )
```

New acceleration point with optional noise by X and Y

Returns

Definition at line 234 of file ProbeEngine.cs.

7.5.3.11 getIfringe()

```
int Axel_probe.ProbeEngine.getIfringe (
    double x )
```

Get index from phase in fringes series

Parameters

| | |
|---|-------|
| x | [rad] |
|---|-------|

Returns

Definition at line 351 of file ProbeEngine.cs.

7.5.3.12 LoadParams()

```
void Axel_probe.ProbeEngine.LoadParams ( )
```

Load Params from json file (params.cfg)

Definition at line 95 of file ProbeEngine.cs.

7.5.3.13 LogEvent()

```
void Axel_probe.ProbeEngine.LogEvent (
    string txt,
    Color? clr = null )
```

Definition at line 224 of file ProbeEngine.cs.

7.5.3.14 LogHandler()

```
delegate void Axel_probe.ProbeEngine.LogHandler (
    string txt,
    Color? clr = null )
```

7.5.3.15 pauseSingle()

```
void Axel_probe.ProbeEngine.pauseSingle ( )
```

While in pause mode, shoot a single shot by calling this

Definition at line 204 of file ProbeEngine.cs.

7.5.3.16 SaveParams()

```
void Axel_probe.ProbeEngine.SaveParams ( )
```

Save Params in json file (params.cfg)

Definition at line 83 of file ProbeEngine.cs.

7.5.3.17 SimpleRepeat()

```
void Axel_probe.ProbeEngine.SimpleRepeat (
    int cycles,
    string groupID )
```

Generate simple (initialted from here) repeat series of shots

Parameters

| | |
|----------------|------------------------------------|
| <i>cycles</i> | Number of shots (-1 if continious) |
| <i>groupID</i> | |

Definition at line 507 of file ProbeEngine.cs.

7.5.3.18 SingleShot()

```
bool Axel_probe.ProbeEngine.SingleShot (
    double A,
    int toAxis,
    ref MMexec mme )
```

Generates the simulated to photo diode signal to be send to Axel-hub

Example base data + some noise N2 Ntot B2 Btot Bg N2 Ntot B2 Btot Bg 1 5 1 3 0 3 5 1 3 0 NB2 NBtot NB2 NBtot
 0 2 2 2
 A A
 1 -1

Parameters

| | |
|-----------------|--|
| <i>curAccel</i> | |
|-----------------|--|

Returns

Definition at line 384 of file ProbeEngine.cs.

7.5.3.19 Start()

```
void Axel_probe.ProbeEngine.Start (
    int dur = 500 )
```

Start simulation

Parameters

| | |
|------------|--|
| <i>dur</i> | |
|------------|--|

Definition at line 167 of file ProbeEngine.cs.

7.5.3.20 Stop()

```
void Axel_probe.ProbeEngine.Stop ( )
```

Stop simulation

Definition at line 178 of file ProbeEngine.cs.

7.5.4 Member Data Documentation**7.5.4.1 b4ConstrID**

```
int Axel_probe.ProbeEngine.b4ConstrID = 0
```

Definition at line 369 of file ProbeEngine.cs.

7.5.4.2 bpps

```
Dictionary<string, double> Axel_probe.ProbeEngine.bpps
```

behaviour patterns parameters pattern => 0 -> constant; 1 -> trapeze; 2 -> sine ampl [mg] - accel. amplitude factor [mg/rad] step [%] percent from the pattern period time gap

Definition at line 49 of file ProbeEngine.cs.

7.5.4.3 contrPhase

```
double Axel_probe.ProbeEngine.contrPhase = -11
```

Definition at line 369 of file ProbeEngine.cs.

7.5.4.4 dps

```
Dictionary<string, object> Axel_probe.ProbeEngine.dps
```

disturbances - fringe noise and Y breathing simulating experimental conditions Xnoise - [mg] noise in accel. (fringe shifting) Ynoise - [%] Y noise in fringe signal XnoiseIO - (bool) Xnoise switch YnoiseIO - (bool) Ynoise switch BrthPattern - (int) Breathing pattern BrthApmpl - Breathing amplitude BrthPeriod - Breathing period BrthIO - (bool) Breathing switch

Definition at line 62 of file ProbeEngine.cs.

7.5.4.5 lboxNB

```
ListBox Axel_probe.ProbeEngine.lboxNB = null
```

Definition at line 106 of file ProbeEngine.cs.

7.5.4.6 LockParams

```
Boolean Axel_probe.ProbeEngine.LockParams = false
```

Definition at line 70 of file ProbeEngine.cs.

7.5.4.7 remote

```
RemoteMessaging Axel_probe.ProbeEngine.remote = null
```

Definition at line 103 of file ProbeEngine.cs.

7.5.4.8 remoteMode

```
RemoteMode Axel_probe.ProbeEngine.remoteMode = RemoteMode.Disconnected
```

Definition at line 112 of file ProbeEngine.cs.

7.5.4.9 srsFringes

```
ChartCollection<Point> Axel_probe.ProbeEngine.srsFringes = null
```

Definition at line 105 of file ProbeEngine.cs.

7.5.4.10 srsSignalB

```
ChartCollection<double> Axel_probe.ProbeEngine.srsSignalB = null
```

Definition at line 108 of file ProbeEngine.cs.

7.5.4.11 srsSignalN

```
ChartCollection<double> Axel_probe.ProbeEngine.srsSignalN = null
```

Definition at line 107 of file ProbeEngine.cs.

7.5.4.12 stopWatch

```
Stopwatch Axel_probe.ProbeEngine.stopWatch
```

Definition at line 142 of file ProbeEngine.cs.

7.5.5 Property Documentation

7.5.5.1 axis

```
int Axel_probe.ProbeEngine.axis [get], [set]
```

Axis mode -1 - old style; 0 - X; 1 - Y; 2 - X/Y

Definition at line 68 of file ProbeEngine.cs.

7.5.5.2 Enabled

```
Boolean Axel_probe.ProbeEngine.Enabled [get], [set]
```

One way to start/stop a simulation

Definition at line 127 of file ProbeEngine.cs.

7.5.5.3 Pause

```
Boolean Axel_probe.ProbeEngine.Pause [get], [set]
```

Temporary pause the simulation

Definition at line 190 of file ProbeEngine.cs.

7.5.5.4 period

```
double Axel_probe.ProbeEngine.period [get]
```

Time period of generated

Definition at line 118 of file ProbeEngine.cs.

7.5.6 Event Documentation

7.5.6.1 OnChange

[ChangeHandler](#) `Axel_probe.ProbeEngine.OnChange`

Definition at line 212 of file ProbeEngine.cs.

7.5.6.2 OnLog

[LogHandler](#) `Axel_probe.ProbeEngine.OnLog`

Definition at line 223 of file ProbeEngine.cs.

The documentation for this class was generated from the following file:

- [ProbeEngine.cs](#)

7.6 Axel_probe::Properties::Resources Class Reference

A strongly-typed resource class, for looking up localized strings, etc.

7.6.1 Detailed Description

A strongly-typed resource class, for looking up localized strings, etc.

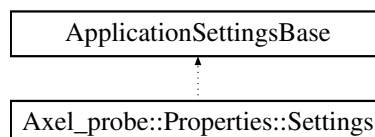
Definition at line 25 of file Resources.Designer.cs.

The documentation for this class was generated from the following file:

- [Resources.Designer.cs](#)

7.7 Axel_probe::Properties::Settings Class Reference

Inheritance diagram for Axel_probe::Properties::Settings:



7.7.1 Detailed Description

Definition at line 17 of file Settings.Designer.cs.

The documentation for this class was generated from the following file:

- [Settings.Designer.cs](#)

Chapter 8

File Documentation

8.1 App.g.cs File Reference

Classes

- class [Axel_probe::App](#)
Interaction logic for App.xaml

Namespaces

- [Axel_probe](#)

8.2 App.g.i.cs File Reference

Classes

- class [Axel_probe::App](#)
Interaction logic for App.xaml

Namespaces

- [Axel_probe](#)

8.3 App.xaml.cs File Reference

Classes

- class [Axel_probe::App](#)
Interaction logic for App.xaml

Namespaces

- [Axel_probe](#)

8.4 AssemblyInfo.cs File Reference

8.5 Axel_probe_Content.g.i.cs File Reference

8.6 Kalman.cs File Reference

Classes

- class [Axel_probe.PID](#)
Under development
- class [Axel_probe.Kalman](#)
Under development

Namespaces

- [Axel_probe](#)

8.7 MainWindow.g.cs File Reference

Classes

- class [Axel_probe::MainWindow](#)
Axel-probe is replacement simulator for MotMaster2 generating signal according to a settings corresponding to some experimental conditions

Namespaces

- [Axel_probe](#)

8.8 MainWindow.g.i.cs File Reference

Classes

- class [Axel_probe::MainWindow](#)
Axel-probe is replacement simulator for MotMaster2 generating signal according to a settings corresponding to some experimental conditions

Namespaces

- [Axel_probe](#)

8.9 MainWindow.xaml.cs File Reference

Classes

- class [Axel_probe::MainWindow](#)

Axel-probe is replacement simulator for MotMaster2 generating signal according to a settings corresponding to some experimental conditions

Namespaces

- [Axel_probe](#)

8.10 ProbeEngine.cs File Reference

Classes

- class [Axel_probe.ProbeEngine](#)

An calculating engine for generating a fringes patterns according simulated experimental conditions the engine runs by its timer and behaves similar to Axel-tilt its state evolve according to the set parameters (accel.; disturbances) and axel-probe queries the engine for its state OnChange event fires when the state is recalculated

Namespaces

- [Axel_probe](#)

Enumerations

- enum [Axel_probe.RemoteMode](#) {
 [Axel_probe.RemoteMode.Disconnected](#), [Axel_probe.RemoteMode.Jumbo_Scan](#), [Axel_probe.RemoteMode.Jumbo_Repeat](#),
 [Axel_probe.RemoteMode.Simple_Scan](#),
 [Axel_probe.RemoteMode.Simple_Repeat](#), [Axel_probe.RemoteMode.Ready_To_Remote](#) }

The current mode (group command) of incomming shots

8.11 README.md File Reference

8.12 Resources.Designer.cs File Reference

Classes

- class [Axel_probe::Properties::Resources](#)

A strongly-typed resource class, for looking up localized strings, etc.

Namespaces

- [Axel_probe](#)
- [Axel_probe::Properties](#)

8.13 Settings.Designer.cs File Reference

Classes

- class [Axel_probe::Properties::Settings](#)

Namespaces

- [Axel_probe](#)
- [Axel_probe::Properties](#)

Index

- acceleration
 - Axel_probe.ProbeEngine, 17
- App.g.cs, 27
- App.g.i.cs, 27
- App.xaml.cs, 27
- AssemblyInfo.cs, 28
- Axel-probe_Content.g.i.cs, 28
- Axel_probe, 11
 - Disconnected, 12
 - Jumbo_Repeat, 12
 - Jumbo_Scan, 12
 - Ready_To_Remote, 12
 - RemoteMode, 11
 - Simple_Repeat, 12
 - Simple_Scan, 12
- Axel_probe.Kalman, 13
- Axel_probe.PID, 14
- Axel_probe.ProbeEngine, 15
 - acceleration, 17
 - axis, 25
 - b4ConstrID, 22
 - bpps, 22
 - breathing, 17
 - CancelRepeat, 17
 - CancelScan, 18
 - ChangeEvent, 18
 - ChangeHandler, 18
 - contrPhase, 23
 - DoScan, 18
 - dps, 23
 - Enabled, 25
 - fringes, 18
 - fringesPoint, 19
 - Gauss, 19
 - getIfringe, 19
 - IboxNB, 23
 - LoadParams, 20
 - LockParams, 23
 - LogEvent, 20
 - LogHandler, 20
 - OnChange, 25
 - OnLog, 26
 - Pause, 25
 - pauseSingle, 20
 - period, 25
 - ProbeEngine, 17
 - remote, 23
 - remoteMode, 24
 - SaveParams, 21
 - SimpleRepeat, 21
 - SingleShot, 21
 - srsFringes, 24
 - srsSignalB, 24
 - srsSignalN, 24
 - Start, 22
 - Stop, 22
 - stopWatch, 24
- Axel_probe::App, 13
- Axel_probe::MainWindow, 14
- Axel_probe::Properties, 12
- Axel_probe::Properties::Resources, 26
- Axel_probe::Properties::Settings, 26
- axis
 - Axel_probe.ProbeEngine, 25
- b4ConstrID
 - Axel_probe.ProbeEngine, 22
- bpps
 - Axel_probe.ProbeEngine, 22
- breathing
 - Axel_probe.ProbeEngine, 17
- CancelRepeat
 - Axel_probe.ProbeEngine, 17
- CancelScan
 - Axel_probe.ProbeEngine, 18
- ChangeEvent
 - Axel_probe.ProbeEngine, 18
- ChangeHandler
 - Axel_probe.ProbeEngine, 18
- contrPhase
 - Axel_probe.ProbeEngine, 23
- Disconnected
 - Axel_probe, 12
- DoScan
 - Axel_probe.ProbeEngine, 18
- dps
 - Axel_probe.ProbeEngine, 23
- Enabled
 - Axel_probe.ProbeEngine, 25
- fringes
 - Axel_probe.ProbeEngine, 18
- fringesPoint
 - Axel_probe.ProbeEngine, 19
- Gauss
 - Axel_probe.ProbeEngine, 19

getIfringe
 Axel_probe.ProbeEngine, 19

Jumbo_Repeat
 Axel_probe, 12

Jumbo_Scan
 Axel_probe, 12

Kalman.cs, 28

IboxNB
 Axel_probe.ProbeEngine, 23

LoadParams
 Axel_probe.ProbeEngine, 20

LockParams
 Axel_probe.ProbeEngine, 23

LogEvent
 Axel_probe.ProbeEngine, 20

LogHandler
 Axel_probe.ProbeEngine, 20

MainWindow.g.cs, 28

MainWindow.g.i.cs, 28

MainWindow.xaml.cs, 29

OnChange
 Axel_probe.ProbeEngine, 25

OnLog
 Axel_probe.ProbeEngine, 26

Pause
 Axel_probe.ProbeEngine, 25

pauseSingle
 Axel_probe.ProbeEngine, 20

period
 Axel_probe.ProbeEngine, 25

ProbeEngine
 Axel_probe.ProbeEngine, 17

ProbeEngine.cs, 29

README.md, 29

Ready_To_Remote
 Axel_probe, 12

remote
 Axel_probe.ProbeEngine, 23

RemoteMode
 Axel_probe, 11

remoteMode
 Axel_probe.ProbeEngine, 24

Resources.Designer.cs, 29

SaveParams
 Axel_probe.ProbeEngine, 21

Settings.Designer.cs, 30

Simple_Repeat
 Axel_probe, 12

Simple_Scan
 Axel_probe, 12

SimpleRepeat
 Axel_probe.ProbeEngine, 21

SingleShot
 Axel_probe.ProbeEngine, 21

srsFringes
 Axel_probe.ProbeEngine, 24

srsSignalB
 Axel_probe.ProbeEngine, 24

srsSignalN
 Axel_probe.ProbeEngine, 24

Start
 Axel_probe.ProbeEngine, 22

Stop
 Axel_probe.ProbeEngine, 22

stopWatch
 Axel_probe.ProbeEngine, 24