



LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

LIGO-E1300767-v2

Advanced LIGO

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TwinCAT Library for ALS Frequency

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Distribution of this document:
LIGO Scientific Collaboration

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Library	
Title	ALSFrequency
Version	1
TwinCAT version	V2.11.0
Name space	
Author	Daniel Sigg
Description	Tracks the various frequencies
Error Code	16#001 — Illegal diff. VCO frequency 16#002 — Illegal comm. VCO frequency 16#004 — Illegal PSL VCO frequency 16#008 — Illegal fiber AOM frequency 16#010 — Illegal EX VCO frequency 16#020 — Illegal EX beat frequency 16#040 — Illegal EY VCO frequency 16#080 — Illegal EY beat frequency
Library Dependencies	ErrorHandler, SaveRestore

User Interface Type

TYPE ALSFrequencyStruct :

STRUCT

```

    Error:                ErrorStruct;
    Aom:                  LREAL;
    DoubleAomVsDoublePsl: LREAL;
    BeatX:                LREAL;
    BeatY:                LREAL;
    VcoVsDoubleBeatY:    LREAL;
    GrX:                  LREAL;
    GrXBeat:              LREAL;
    GrY:                  LREAL;
    GrYBeat:              LREAL;
    GrXVsDoublePSL:      LREAL;
    GrXBeatVsDoublePSL:  LREAL;
    GrYVsDoublePSL:      LREAL;
    GrYBeatVsDoublePSL:  LREAL;
    GrXVsGrY:             LREAL;
    GrXBeatVsGrYBeat:    LREAL;
    CommX:                LREAL;
    CommXBeat:            LREAL;
    CommY:                LREAL;
    CommYBeat:            LREAL;
    DiffXY:               LREAL;
    DiffXYBeat:           LREAL;

```

END_STRUCT;

END_TYPE;

Type Name	ALSLaserLockingFiberStruct
Description	Structure used in the user interface type monitor the frequencies and beat notes
Definition	STRUCT
Output Tag	Name: Error Type: ErrorStruct Description: Calls the error handler
Output Tag	Name: Aom Type: LREAL Description: Aom frequency
Output Tag	Name: DoubleAomVsDoublePsl Type: LREAL Description: $-2*f_{aom} + 2*f_{psl}$

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Output Tag	Name: BeatX Type: LREAL Description: Frequency of EX beat note
Output Tag	Name: BeatY Type: LREAL Description: Frequency of EY beat note
Output Tag	Name: VcoVsDoubleBeatX Type: LREAL Description: $f_{VcoX} - 2*f_{beatX}$
Output Tag	Name: VcoVsDoubleBeatY Type: LREAL Description: $f_{VcoY} - 2*f_{beatY}$
Output Tag	Name: GrX Type: LREAL Description: $-4*f_{Aom} + f_{VcoX}$
Output Tag	Name: GrXBeat Type: LREAL Description: $-4*f_{Aom} + 2*f_{BeatX}$
Output Tag	Name: GrY Type: LREAL Description: $-4*f_{Aom} + f_{VcoY}$
Output Tag	Name: GrYBeat Type: LREAL Description: $-4*f_{Aom} + 2*f_{BeatY}$
Output Tag	Name: GrXVsDoublePSL Type: LREAL Description: $-4*f_{Aom} + f_{VcoX} + 4*f_{PSL}$
Output Tag	Name: GrXBeatVsDoublePSL Type: LREAL Description: $-4*f_{Aom} + 2*f_{BeatX} + 4*f_{PSL}$
Output Tag	Name: GrYVsDoublePSL Type: LREAL Description: $-4*f_{Aom} + f_{VcoY} + 4*f_{PSL}$
Output Tag	Name: GrYBeatVsDoublePSL Type: LREAL Description: $-4*f_{Aom} + 2*f_{BeatY} + 4*f_{PSL}$
Output Tag	Name: GrXVsGrY Type: LREAL Description: $f_{VcoX} + f_{VcoY}$

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Output Tag	Name: GrXBeatVsGrYBeat Type: LREAL Description: $2*(f_BeatX + f_BeatY)$
Output Tag	Name: CommX Type: LREAL Description: $-4*f_Aom + f_VcoX + 4*f_PSL - f_Comm$
Output Tag	Name: CommXBeat Type: LREAL Description: $-4*f_Aom + 2*f_BeatX + 4*f_PSL - f_Comm$
Output Tag	Name: CommY Type: LREAL Description: $-4*f_Aom + f_VcoY + 4*f_PSL - f_Comm$
Output Tag	Name: CommYBeat Type: LREAL Description: $-4*f_Aom + f_BeatY + 4*f_PSL - f_Comm$
Output Tag	Name: DiffXY Type: LREAL Description: $f_VcoX + f_VcoY - 2*f_Diff$
Output Tag	Name: DiffXYBeat Type: LREAL Description: $2 * (f_BeatX + f_BeatY - f_Diff)$

Function Block TYPE ALSFrequencyFB: VAR_INPUT Request: SaveRestoreEnum; DiffVCOFreq: LREAL; CommVCOFreq: LREAL; PslVCOFreq: LREAL; FiberAOMFreq: LREAL; ExVCOFreq: LREAL; ExBeatFreq: LREAL; EyVCOFreq: LREAL; EyBeatFreq: LREAL; END_VAR; VAR_IN_OUT AlsFreq: AlsFrequencyStruct; AlsFreqInit; AlsFrequencyStruct; END_VAR; END_TYPE;	
Type Name	ALSFrequencyFB
Description	Function block used to monitor the VCO and beat note frequencies
Definition	Function Block
Input Argument	Name: Request Type: SaveRestoreEnum Description: Request save/restore/safemood or noop
Input Argument	Name: DiffVCOFreq Type: LREAL Description: Monitors the diff. VCO frequency
Input Argument	Name: CommVCOFreq Type: LREAL Description: Monitors the 60mm.. VCO frequency
Input Argument	Name: PslVCOFreq Type: LREAL Description: Monitors the PSL VCO frequency
Input Argument	Name: FiberAOMFreq Type: LREAL Description: Monitors the fiber AOM frequency
Input Argument	Name: ExVCOFreq Type: LREAL Description: Monitors the EX VCO frequency
Input Argument	Name: ExBeatFreq Type: LREAL Description: Monitors the EX beat note frequency

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Input Argument	Name: EyVCOFreq Type: LREAL Description: Monitors the EY VCO frequency
Input Argument	Name: EyBeatFreq Type: LREAL Description: Monitors the EY beat note frequency
In/out Argument	Name: AlsFreq Type: AlsFrequencyStruct Description: User interface structure
In/out Argument	Name: AlsFreqInit Type: AlsFrequencyStruct Description: Save/restore variable in persistent memory