LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

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TwinCAT Library for ALS Frequency

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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;
    GrY:                    LREAL;
    GrXVsDoublePSL:         LREAL;
    GrYVsDoublePSL:         LREAL;
    GrXVsGrY:               LREAL;
    CommX:                  LREAL:
    CommY:                  LREAL;
    DiffXY:                 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 freuquency
Output Tag	Name: DoubleAomVsDoublePsl Type: LREAL Description: -2*f_aom + 2*f_psl
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: GrY Type: LREAL Description: -4*f_Aom + f_VcoY
Output Tag	Name: GrXVsDoublePSL Type: LREAL Description: -4*f_Aom + f_VcoX + 4*f_PSL
Output Tag	Name: GrYVsDoublePSL Type: LREAL Description: -4*f_Aom + f_VcoY + 4*f_PSL
Output Tag	Name: GrXVsGrY Type: LREAL Description: f_VcoX + f_VcoY
Output Tag	Name: CommX Type: LREAL Description: -4*f_Aom + f_VcoX + 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: DIffXY Type: LREAL Description: f_VcoX + f_VcoY – 2*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 □omm.. 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
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