*LIGO Laboratory / LIGO Scientific Collaboration*

LIGO-T1600605-v8 Advanced LIGO April 22, 2022

Monitor Photodiodes for SQZ

Rich Abbott, Lisa Barsotti, Daniel Sigg

Distribution of this document:

LIGO Scientific Collaboration

This is an internal working note

of the LIGO Laboratory.

|  |  |
| --- | --- |
| **California Institute of Technology**  **LIGO Project – MS 18-34**  **1200 E. California Blvd.**  **Pasadena, CA 91125**  Phone (626) 395-2129  Fax (626) 304-9834  E-mail: info@ligo.caltech.edu | **Massachusetts Institute of Technology**  **LIGO Project – NW22-295**  **185 Albany St**  **Cambridge, MA 02139**  Phone (617) 253-4824  Fax (617) 253-7014  E-mail: info@ligo.mit.edu |
| **LIGO Hanford Observatory**  **P.O. Box 159**  **Richland WA 99352**  Phone 509-372-8106  Fax 509-372-8137 | **LIGO Livingston Observatory**  **P.O. Box 940**  **Livingston, LA 70754**  Phone 225-686-3100  Fax 225-686-7189 |

http://www.ligo.caltech.edu/

List of RF Photodiodes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Location | Type | RF Chain | Comment |
| Newport 1611FS-AC: | | [Commercial](https://www.newport.com/p/1611FS-AC) | | |
| FIBR\_MIXER | SQZT0/FSS1 | 1611 | TTFSS | Laser/fiber locking PD |
| Broadband Photodetectors: | | [E1200428](https://dcc.ligo.org/LIGO-E1200428) | | |
| SHG\_TRANS\_RF35 | SQZT0/SHG | BBPD | 2ch demod | SHG locking (IR) |
| OPO\_REFL\_RF80 | SQZT7/OPO | BBPD | 2ch demod | OPO locking (GR) |
| LSC RF Photodetectors: | | [E1400099](https://dcc.ligo.org/LIGO-E1400099) | | |
| CLF\_REFL\_RF6 | SQZT7/CLF | ALIGO | 2ch demod | CLF phase. locking |
| FC\_REFL\_RF40 | SQZT7/FC | ALIGO | 2ch demod | FC locking |
| Existing OMC DCPD: | | [E1300521](https://dcc.ligo.org/LIGO-E1300521) | | |
| OMC\_TRANS\_RF3 | In-vac | ALIGO | 2ch demod | Squeeze angle locking |
| Thorlabs PDA100A: | | [Commercial](https://www.thorlabs.us/thorproduct.cfm?partnumber=PDA100A2) | | |
| FC\_BEAT\_RF1 | SQZT7/FC | PDA100A | TBD | FC beat note |
| Homodyne Photodetector: | | [E1700135](https://dcc.ligo.org/LIGO-E1700135) | | |
| HD\_DIFF\_RF3 | SQZT7/HD | ALIGO | 2ch demod | LO locking/diagnostics |

List of Quad Detectors

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Location | Type | Chain | Comment |
| New 105 kHz Quads: | | [E2000502](https://dcc.ligo.org/LIGO-E2000502) | | |
| RLF\_REFL\_A | In-vac | ALIGO | RLF | FC locking/alignment |
| RLF\_REFL\_B | In-vac | ALIGO | RLF | FC locking/alignment |
| Green Quad: | | TBD | | |
| FC\_TRANS\_A | SQZT8/green | ALIGO | QPD | FC alignment |
| FC\_TRANS\_B | SQZT8/green | ALIGO | QPD | FC alignment |

List of DC monitor photodiodes

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Name** | **Location** | **Type** | **S** | **F** | **W** | **Comment** |
| **4-chn Generic PD interface (SQZT0):** | | | | | | |
| FIBR\_PD\_DC/LF | SQZT0/FSS1 | 1611 | × | × | × | DC of laser/fiber locking PD |
| SHG\_TRANS\_ DC/LF | SQZT0/SHG | BBPD | × | × | × | DC of SHG locking (IR) |
| LASER\_IR\_ DC/LF | SQZT0/PD1 | PDA100A | × | × | × | Power of SQZ laser |
| SHG\_GR\_ DC/LF | SQZT0/PD2 | PDA100A | × | × | × | SHG green power (GR) |
| **4-chn Generic PD interface (SQZT7):** | | | | | | |
| CLF\_TRIG\_DC | SQZT7/PD3 | PDA100A | × | × |  | Trigger PD CLF path |
| OPO\_IR\_PD\_LF | SQZT7/IR | PDA100A | × | × |  | DC of OPO transmitted (IR) |
| CLF\_REFL\_DC | SQZT7/CLF | ALIGO | × |  |  | DC of CLF refl. Locking |
| OPO\_REFL\_DC | SQZT7/OPO | ALIGO | × |  |  | DC of OPO refl. Locking (GR) |
| **DC Outputs of LSC RF PD interface:** | | | | | | |
| CLF\_REFL\_LF | SQZT7/CLF | ALIGO |  | × | + | DC of CLF refl. locking |
| OPO\_REFL\_LF | SQZT7/OPO | ALIGO |  | × | + | DC of OPO refl. locking (GR) |
| FC\_REFL\_LF | SQZT7/FC | ALIGO |  | × | + | DC of FC refl. locking (GR) |
| FC\_BEAT\_LF | SQZT7/FC | ALIGO |  | × | + | DC of FC/OPO beat note (GR) |
| **Homodyne interface:** | | | | | | |
| HD\_B\_DC | SQZT7/HD | ALIGO |  | × | + | PD B of homodyne |
| HD\_DIFF\_DC | SQZT7/HD | ALIGO |  | × | + | Difference of homodyne PDs |
| HD\_A\_DC | SQZT7/HD | ALIGO |  | × | + | PD A of homodyne |
| **Unamplified DC Monitors:** | | | | | | |
| SHG\_FIBR\_REJECTED\_DC | In-vac | PD | × |  |  | Rejected pump power |
| CLF\_FIBR\_ REJECTED \_DC | In-vac | PD | × |  |  | Rejected CLF power |
| FC\_FIBR\_REJECTED\_DC | In-vac | PD | × |  |  | Rejected green FC power |
| OFI\_A\_REJECTED\_DC | In-vac | PD | × |  |  | OFI monitor HAM7 |
| OFI\_B\_REJECTED\_DC | In-vac | PD | × |  |  | OFI monitor HAM5 |
|  |  |  |  |  |  |  |
| FIBR\_TRANS \_ DC/LF | SQZT0/DC1 | SM1PD1A | × | × | × | Transmitted by laser fiber |
| FIBR\_REJECTED\_DC | SQZT0/DC2 | SM1PD1A | × |  |  | Rejected after laser fiber |
| CLF\_LAUNCH\_DC | SQZT0/DC4 | SM1PD1A | × |  |  | Injected into CLF fiber |
| CLF\_REJECTED\_DC | SQZT0/DC3 | SM1PD1A | × |  |  | Rejected before injection |
| SHG\_LAUNCH\_DC | SQZT0/DC7 | SM1PD1A | × |  |  | Injected into pump fiber |
| SHG\_REJECTED\_DC | SQZT0/DC6 | SM1PD1A | × |  |  | Rejected before injection |
| SEED\_LAUNCH\_DC | SQZT0/DC5 | SM1PD1A | × |  |  | Seed beam injection |
| LO\_LAUNCH\_DC | SQZT0/DC8 | SM1PD1A | × |  |  | LO beam injection |
| FC\_FIBR\_LAUNCH\_DC | SQZT0/DC11 | SM1PD1A | × |  |  | Injected into FC green fiber |
|  |  |  |  |  |  |  |
| OPO\_REFL\_REJECTED\_ DC | SQZT7/DC9 | SM1PD1A | × | × | × | Rejected OPO refl. power |
| OPO\_ TRANS\_ DC/LF | SQZT7/DC10 | PDA100A | × | × | × | Trans. green OPO power (GR) |
| FC\_REFL\_REJECTED\_DC | SQZT7/DC12 | SM1PD1A | × | × | × | Reject. FC REFL power (GR) |
| FC\_BEAT\_REJECTED\_DC | SQZT7/DC13 | SM1PD1A | × |  |  | Reject. FC BEAT power (GR) |
|  |  |  |  |  |  |  |
| SPARE\_A\_DC | TBD | TBD | × |  |  | Spare (SQZT0) |
| SPARE\_B\_DC | TBD | TBD | × |  |  | Spare (SQZT7) |
| **Trigger PD:** | | | | | | |
| SYS-MOTION\_C\_ SHUTTER\_H\_TRIGGER | SQZT7/PD3 | PDA100A | × |  |  | Trigger PD CLF path |

S: Slow controls readback; F: Fast DAQ readback; W: Whitened readback (×: standard whitening, +: custom whitening)