WS powered up at Yend at 8:10AM 8:20 2.590V -> 11.75°C
10:30 2.603V

LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -
CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Note Rx side power imbalance ~ 2%!

Technical Note	LIGO-T1500062-v7	2019/02/26

Pcal End Station Power Sensors Responsivity Ratio Measurements Log

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END STATION: LHO Yend DATE: 2/26/19

PEOPLE DOING THE WORK: Rick S., Niko L.

Calibration Log

Before (or after) going to the End Station

- Check the calibration of the Keithley Model 2100 voltmeter using the Martel Calibrated Voltage source (the same one that will be taken to the end station.
  - – 4 V with Martel = -4.0000 V on Keithley 2100 DVM
  - – 2 V with Martel = -2.0000 V on Keithley 2100 DVM
  - 0 V with Martel = 0.00001 V on Keithley 2100 DVM

Items to take to the end station for the measurements:

- Working Standard
- PD Satellite Box (blue box), D1300368
- Long (25') and short (6'-10' 9-pin D-sub cables)
- BNC cable
- Martel calibrated voltage source and charger
- IR-only laser glasses

Before recording time series:

- Disable excitations on the Pcal MEDM screen.
- Check that ETM is pointed properly. Check Pcal beam locations at the Rx sensor (photograph spot locations on white card).
- Open **gpsclock**
- Open **StripTool** and display the following sensor outputs. Always verify that signals are stable before recording time series.
  - **(IFO):CAL-PCAL(END)_TX_PD_VOLTS_OUTMON**
  - **(IFO):CAL-PCAL(END)_RX_PD_VOLTS_OUTMON**
  - **(IFO):CAL-PCAL(END)_WS_PD_OUTMON**
  - **(IFO):CAL-PCAL(END)_OFS_PD_OUTMON**

note: switch polarity to neg by connecting red to -

- Calibrate the Working standard channel using a **Martel Calibrated Voltage** source. Connect Martel to INPUT 1 on the ***BNC to DB9*** module. Record 15 seconds of data for each input voltage.
  - - 4 V = -3.9987 volts and GPS Start Time 241 740
  - - 2 V = -1.9995 volts and GPS Start Time 241 712
  - 0 V = 0.0003 volts and GPS Start Time 1235 241 645

- Record OFS settings:
  - Offset: 3.75 volts
  - Gain: 38.2 dB
  - OFS PD: -3.733 volts

- Record Working Standard temperature sensor voltage at Interface Module **WS PD MON** BNC output
  - WS PD MON: 2.603 volts
  - Convert to degrees Celsius by dividing by 0.90909 and subtracting 273.15.

    WS PD temperature: 13.18 deg. Celsius. 55.72°F

record time? GPS or local?

multiply by 100, and

Time Series Measurements

- Connect Pcal Blue Box PD MON output to INPUT 1 on the ***BNC to DB9*** module.

Measurement 1:

- Block the OUTER beam with a razor blade dump in the Tx module.
- Place the WS in the INNER beam in the Tx module.

WS in the INNER beam in the Tx module.				
GPS Times		Readings from MEDM screen		
Start Time #1	1235 242 150	TxPD	3.079	volt
Duration	240 seconds	WSPD	-3.151	volt
End Time #1	390	OFSPD	-3.732	volt

Measurement 2:

- Move the block to the INNER beam in the Tx module.

- Move the WS to the OUTER beam in the Tx module.

WS in the OUTER beam in the Tx module.			
GPS Times		Readings from MEDM screen	
Start Time #2	242473	TxPD	3.079
Duration	240 seconds	WSPD	-3.232
End Time #2	242713	OFSPD	-3.732

Measurement 3:

- Leave the WS in the OUTER beam in the Tx module with the INNER beam blocked.
- Close the shutter in the Tx module.

WS in the OUTER beam in the Tx module. Shutter CLOSED.			
GPS Times		Readings from MEDM screen	
Start Time #3	242755	TxPD	0.011
Duration	60 seconds	WSPD	-0.0005
End Time #3	242815	OFSPD	-0.011

Measurement 4:

- Leave the block in the INNER beam in the Tx module.
- Open the shutter in the Tx module.
- Replace the Rx sensor with the WS in the Rx module.

WS in the Rx module. INNER beam blocked in the Tx module.			
GPS Times		Readings from MEDM screen	
Start Time #4	243130	TxPD	3.080
Duration	240 seconds	WSPD	-3.194
End Time #4	243370	OFSPD	-3.732

Measurement 5:

- Move the block to the OUTER beam in the Tx module.

WS in the Rx module. OUTER beam blocked in the Tx module.			
GPS Times		Readings from MEDM screen	
Start Time #5	243 425	TxPD	3.079
Duration	240 seconds	WSPD	-3.127
End Time #5	423 665	OFSPD	-3.732

Measurement 6:

- CLOSE the shutter in the Tx module.

WS in the Rx module. Shutter CLOSED in the Tx module.			
GPS Times		Readings from MEDM screen	
Start Time #6	243 675	TxPD	0.010
Duration	60 seconds	WSPD	0.0002
End Time #6	243 735	OFSPD	-0.011

Measurement 7:

- OPEN the shutter in the Tx module.
- Leave the beam block in the OUTER beam in the Tx module.
- Replace the WS with the Rx sensor in the Rx module.

OUTER beam blocked in the Tx module. Rx sensor in the Rx module.			
GPS Times		Readings from MEDM screen	
Start Time #7	244 162	TxPD	3.079
Duration	240 seconds	RX WSPD	+2.236
End Time #7	244 402	OFSPD	-3.733.

*

Measurement 8:

- Move the beam block to the INNER beam in the Tx module.

INNER beam blocked in the Tx module. Rx sensor in the Rx module.			
GPS Times		Readings from MEDM screen	
Start Time #8	244 460	TxPD	3.079
Duration	240 seconds	Rx WSPD	2.284
End Time #8	244 700	OFSPD	-3.732

← *

Measurement 9:

- CLOSE the shutter in the Tx module.

Shutter CLOSED in the Tx module. Inner beam blocked.			
GPS Times		Readings from MEDM screen	
Start Time #9	244 730	TxPD	0.011
Duration	60 seconds	Rx WSPD	-0.0004
End Time #9	244 790	OFSPD	-0.011

← *

When measurements are finished.

- Remove the beam block from the INNER beam in the Tx module.
- OPEN shutter in the Tx module.
- Re-enable excitations on the Pcal MEDM screen (if applicable).
- Check that ETM is pointed properly. Check Pcal beam locations at the Rx sensor (photograph spot locations on white card).
- Analyze the data and upload results to the SVN.
- Make aLog entry, append image of beam spots at the Rx module, add pointer to measurements results in the SVN.

set shutter control to REMOTE on interface module.