Aerosols Chamber

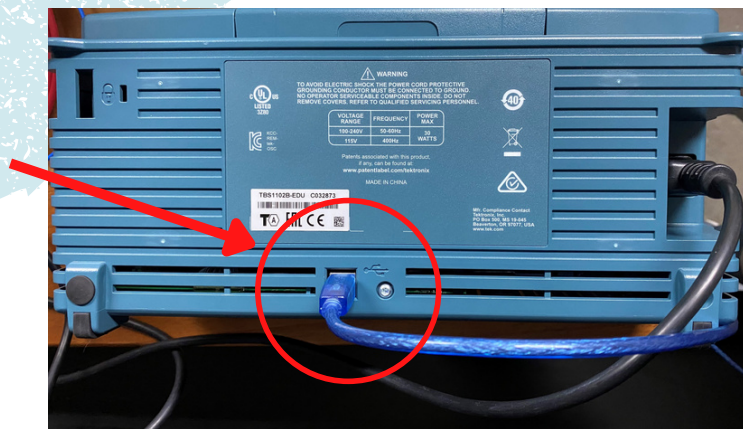
User Manual

1. Getting ready

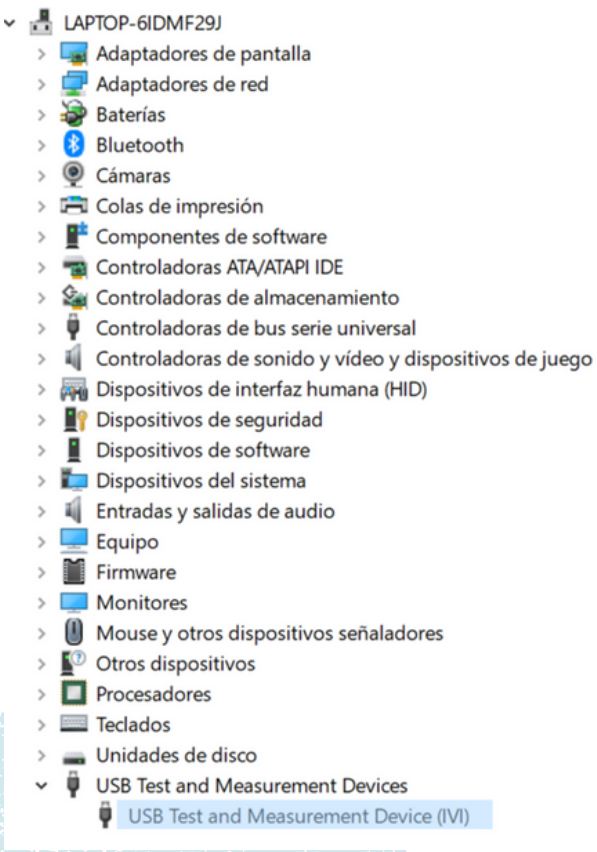
1. Make sure every mechanical and electronical connection is correct, the compressor and vacuum pump are set and the OPC is communicating with your computer.
2. Guarantee the chamber is clean and aerosols or dust free.
3. Verify the laser beam is going out the chamber through the exit hole in the left side.
4. Asure the cleaning door is well sealed.
5. Check the signal that the PMTs will receive BEFORE REMOVING THEIR COVER.

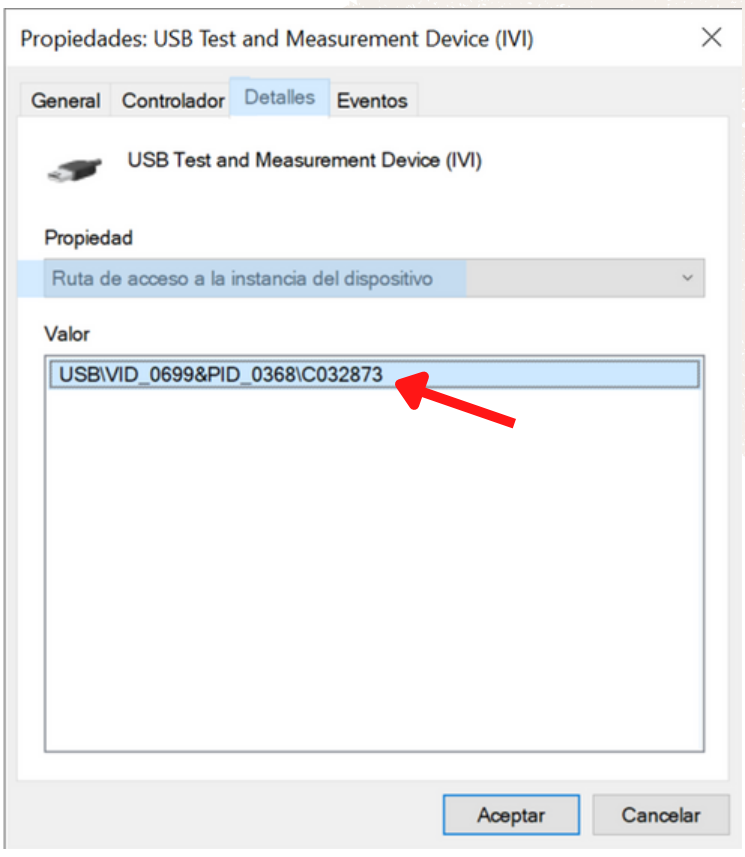
2. Oscilloscope connection

1. Go to Github Repository and select branch 'Taking-data'.
2. Download all the .m files and open them in MATLAB.
3. Download 'Instrument Control Toolbox' for MATLAB.
4. Connect the oscilloscope to you computer, through a USB type A to type B cable. Insert the type A side to your computer port and the type B side to the oscilloscope back.



5. In your PC, go to Device Administrator and look for 'USB Test and Measurement Device (IVI)'





6. Go to 'configFgen' code and insert that device ID in the blue highlight parts in the image, in section 'Instrument Connection' :

```
%% Instrument Connection

% Find a VISA-USB object.
obj1 = instrfind('Type', 'visa-usb', 'RsrcName', 'USB0::0x0699::0x0368::C032873::0::INSTR', 'Tag', '');

% Create the VISA-USB object if it does not exist
% otherwise use the object that was found.
if isempty(obj1)
    obj1 = visa('NI', 'USB0::0x0699::0x0368::C032873::0::INSTR');
else
    fclose(obj1);
    obj1 = obj1(1);
end
```

3. Start reading data

1. In same branch 'Taking-data' go to 'OscilloscopeAdq' code, the 'Read waveform and save graph' section. There you should specify the folder path where you want to save the data in the D variable and write in F variable the date your realizing your test to create a folder with that name.

```
%% Read waveform and save graph

D = 'C:\Users\mjrg0\OneDrive - Universidad EAFIT\Escritorio\Aerosols Chamber\PMT\Ensayo';
F = 'Mayo_25';
```

2. Run 'SaveGraphs' code and insert in the command window the number of the test your taking, i.e. if it is your first try write 1, for the second one write 2 and so on. The code will display *'Test number already exist'* when you try to overwrite the folder, e.g. if I have already taken test number 3 and in the next run I write again in the command window the number 3, the code will stop running and show the message described.

3. Once the message *'Data saved'* is displayed, verify in your folder the data acquired and you can also have a look on the filtered signal plotted.

4. You should save all your the data recollected in a folder with the test name, for example '0_degree' for the signals taken with a polarizer at 0°.

4. Filter and process data

1. Go to Github Repository and select branch 'filter-process-data'.
2. Download all the .m files and open them in MATLAB.
3. Go to 'Graphs' code and specify the folder path where you want to save the data, in the D variable.
4. You should write the folders name where your noise data is saved, in the highlights parts in the image below. You can have multiple noise folders, just make sure you include all of them in the 'Se guarda la señal de ruido de fondo' section. Then, in section 'Se resta la señal de ruido de fondo para...' you should match the CH1 and CH2 names with the signal noise you want to subtract. For example, in the image below, there were two folders with noise signal data: 'Ruido de fondo' and 'Ruido de fondo_con nylon'. In this case, it was the selected the 'Ruido de fondo' data to subtract it from the other signals taken, so in CH1 and CH2 it was written 'CH1_Ruido de fondo.mat' and the same for CH2. If it is wanted to subtract now the 'Ruido de fondo_con nylon' data, it should be written 'CH1_Ruido de fondo_con nylon.mat' and the same for CH2.

```
% Se guarda la señal de ruido de fondo
if strcmp(A,'Ruido de fondo')||strcmp(A,'Ruido de fondo_con nylon')
```

```
% Se resta la señal de ruido de fondo para el cálculo del delta*
if strcmp(A,'aerosoles_seco')||strcmp(A,'humedad')
    disp('Restando ruido')
    importfile('CH1_Ruido de fondo.mat')
    importfile('CH2_Ruido de fondo.mat')
```

5. In section 'Cálculo de eta y delta*=reflejada(CH1)/transmitida(CH2)' you should follow the same logic in the previous step, inserting the folders name where aerosols tests were taken (under the multiple temperature and RH conditions you chose) in the following parts:

```
%% Cálculo de eta y delta*=reflejada(CH1)/transmitida(CH2)
if strcmp(A,'aerosoles_seco')||strcmp(A,'humedad')
```

```
%Calcula eta
...
if strcmp(A,'aerosoles_seco')||strcmp(A,'humedad')
        delta{1,k}=ch1_join{1,k}./ch2_join{1,k};    % Señal Reflejada(CH1)/transmitida(CH2)
...
if strcmp(A,'aerosoles_seco')||strcmp(A,'humedad')
    save('delta_'+string(A),'delta');
    a=delta;
```

5. Run the code and insert in the command window the date you took the data (this is the name of the F variable of section 3), the folder name where you saved it (e.g. '0_degree') and the number of tests you made.

6. You should run this code for every measurement taken, in order to obtain the calibration parameters and the apparent LDR.

7. The filtered signals and the $\eta*$ or $\delta*$ will be plotted and automatically saved to the folder selected. You can change the tile layout by modifying 51 and 103 lines and write between brackets the number of rows and columns you desire.

```
figure(1)
tiledlayout(2,4)
```

```
figure(2)
de=tiledlayout(2,4);
```

5. Calculate VLDR and PLDR

1. Go to Github Repository and select branch 'eta90-LDR'.
2. Download all the .m files and open them in MATLAB.
3. Make sure the data exported in section 4 of this document is on the same path as this .m files, otherwise, add it right before the 'importfile2' commands.
4. In 'Plot delta final' section include the folders name that you included in step 5 of the previous section, making the distinction between different temperature and RH conditions. In the image below, there were two different conditions: case 1 for ambient temperature and RH and case 2 for higher RH level.

```
switch cases
    case 1
        importfile2('delta_aerosoles_seco');
        a=delta_aerosoles_seco;
    case 2
        importfile2('delta_humedad');
        a=delta_humedad;
end
```

5. Run 'deltas_etas' code and insert in the command windows the information that is requested: number of calibration tests taken, number of aerosols tests taken (under the conditions you select) and choose between two types of temperature and RH conditions.

6. Verify the information plotted and save it manually in the format and the path that you prefer.

Cautions

- Pay attention to the PMTs cables and make your they are kept in a good position.
- DON'T open the PMTs with the lights on or before checking the light that is coming from the chamber.
- Always close the PMTs when the is finalized, BEFORE turning the room lights on.
- Make sure that the compressor stay in the loading state to prevent running out of clean air.
- Be careful when adjusting the compressor flow, since it is a hot surface after some time of continuous work.
- Check all the flows stay around 12 L/min to keep a good air circulation.