Version 1.1

TECHNICAL NOTE

BeanDevice® Wilow - Using MQTT with LabVIEW

www.beanair.com

DOCUMENT			
Document number		**Version**	V1.1
External Reference	TN-RF-27	**Publication date**	13/09/2022
Author	Seddik ATTIG		
Internal Reference		**Project Code**	N.A.
Document Name	***BeanDevice® Wilow - Using MQTT with LabVIEW***		

VALIDATION			
Function	**Recipients**	**For Validation**	**For information**
Reader	Nadine AMMAR		X
Author	Seddik ATTIG	X	

MAILING LIST			
Function	**Recipients**	**For action**	**For Info**
Staffer 1	Nadine AMMAR	X	
Staffer 2	Damon PARSY		X

Updates			
Version	**Date**	**Author**	**Evolution & Status**
1.0	13/07/2022	Seddik ATTIG	First version of document
1.1	13/09/2022	Seddik ATTIG	Add sending OTAC via MQTT (Publish)

Contents

1. TECHNICAL SUPPORT 4

2. VISUAL SYMBOLS DEFINITION 5

3. AIM OF THE DOCUMENT 6

1. OVERVIEW 7

2. INSTALATION AND ENVIRONMENT CONFIGURATION 9
   2.1 Network 9
   2.2 BeanDevice® MQTT Configuration 9
   2.3 LabVIEW MQTT Configuration 15
      2.3.1 Getting started 15
      2.3.2 Setup the environment 15
      2.3.3 MQTT Configuration on LabVIEW toolkit 16
      2.3.4 Subscription Options (Read the measurements) 17
      2.3.5 Publish Options (Read the measurements) 27

3. RELATED DOCUMENTS & VIDEOS 39

Disclaimer

- The information contained in this document is the proprietary information of Beanair.
- The contents are confidential and any disclosure to persons other than the officers, employees, agents or subcontractors of the owner or licensee of this document, without the prior written consent of Beanair Ltd, is strictly prohibited.
- Beanair makes every effort to ensure the quality of the information it makes available. Notwithstanding the foregoing, Beanair does not make any warranty as to the information contained herein, and does not accept any liability for any injury, loss or damage of any kind incurred by use of or reliance upon the information.
- Beanair disclaims any and all responsibility for the application of the devices characterized in this document, and notes that the application of the device must comply with the safety standards of the applicable country, and where applicable, with the relevant wiring rules.
- Beanair reserves the right to make modifications, additions and deletions to this document due to typographical errors, inaccurate information, or improvements to programs and/or equipment at any time and without notice.
- Such changes will, nevertheless be incorporated into new editions of this document.

Copyright: Transmittal, reproduction, dissemination and/or editing of this document as well as utilization of its contents and communication thereof to others without express authorization are prohibited. Offenders will be held liable for payment of damages. All rights are reserved.

Copyright © Beanair GmbH. 2022

1. TECHNICAL SUPPORT

For general contact, technical support, to report documentation errors and to order manuals, contact ***BEANAIR® Technical Support Center*** (BTSC) at:

tech-support@Beanair.com

For detailed information about where you can buy the Beanair equipment/software or for recommendations on accessories and components visit:

www.Beanair.com

To register for product news and announcements or for product questions contact BEANAIR®'s Technical Support Center (BTSC).

Our aim is to make this user manual as helpful as possible. Please keep us informed of your comments and suggestions for improvements. Beanair appreciates feedback from the users.

2. VISUAL SYMBOLS DEFINITION

Visual	*Definition*
	***Caution or Warning** – Alerts the user with important information about Beanair wireless sensor networks (WSN), if this information is not followed, the equipment /software may fail or malfunction.*
	***Danger** – This information MUST be followed if not you may damage the equipment permanently or bodily injury may occur.*
	***Tip or Information** – Provides advice and suggestions that may be useful when installing Beanair Wireless Sensor Networks.*

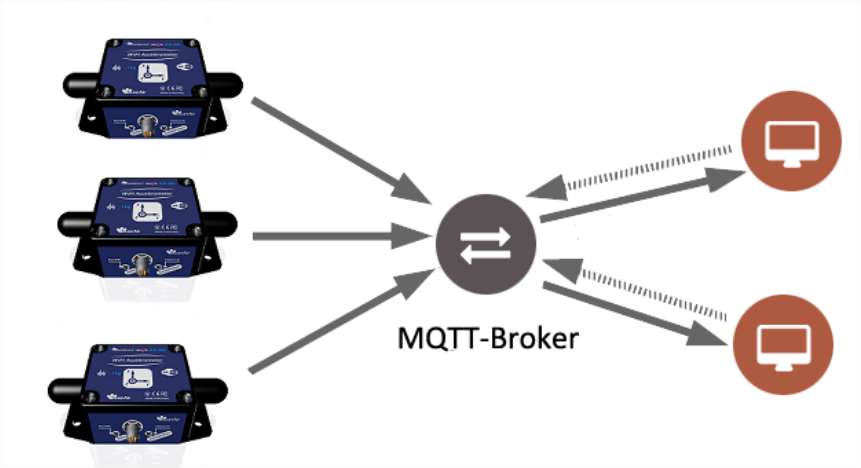
3. AIM OF THE DOCUMENT

The aim of this document is to demonstrate a simple integration of the BeanDevice® Wilow in the Internet of things ecosystem using cutting-edge technology, this will be very important for a countless possibility of measurements, collecting, analyzing and processing the data.

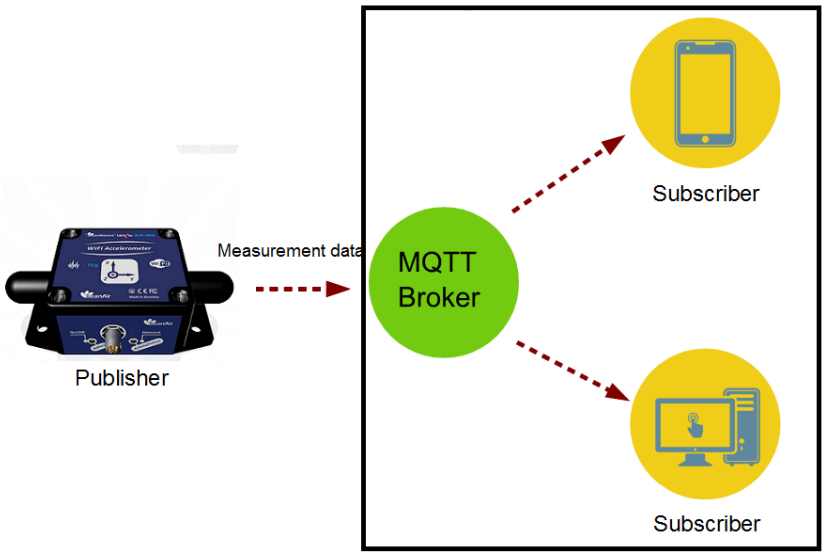
This document is aimed to give you a step by step tutorial how to use the LabVIEW toolkit.

1. OVERVIEW

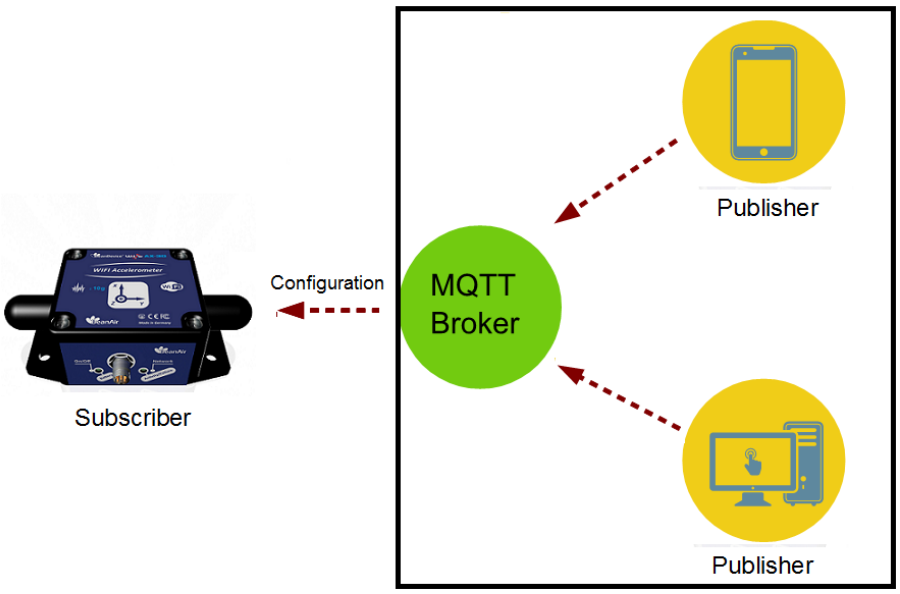
The idea is to introduce the BeanDevice to the internet of things using the MQTT protocol and the LabVIEW software.



We can install and use local MQTT broker or use a free of cost online broker (cloud-based broker) (limited usage). The BeanDevice will publish data to all subscribed devices on its topic, and you can publish configuration (change acquisition mode, restart BeanDevice ...set sleep mode) to a subscribed BeanDevice.



Data collection

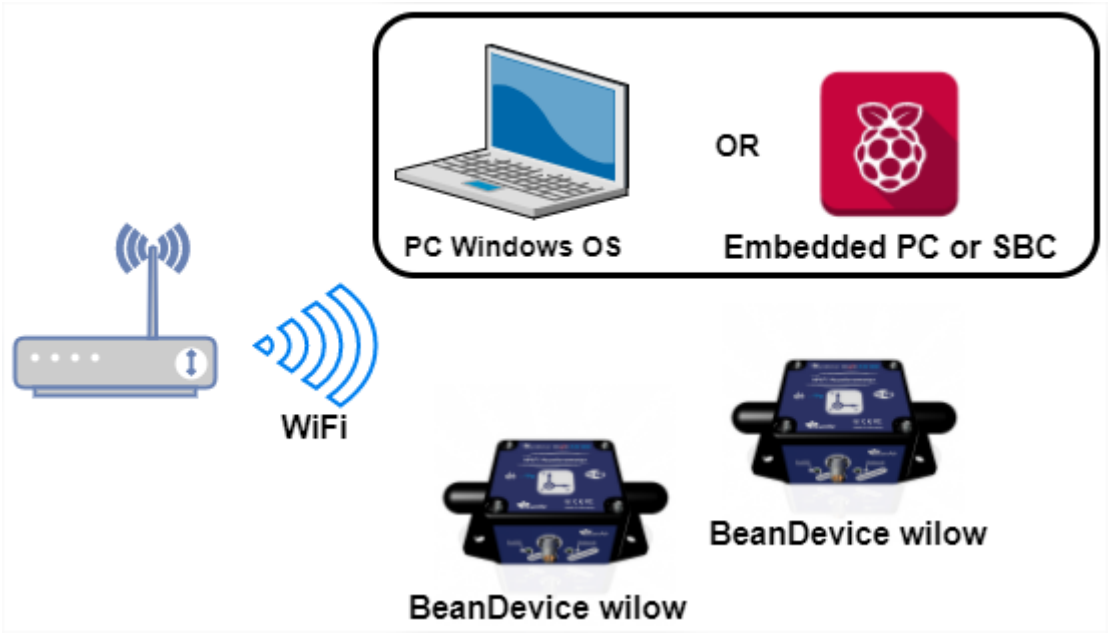


BeanDevice Configuration over MQTT

2. INSTALATION AND ENVIRONMENT CONFIGURATION

2.1 NETWORK

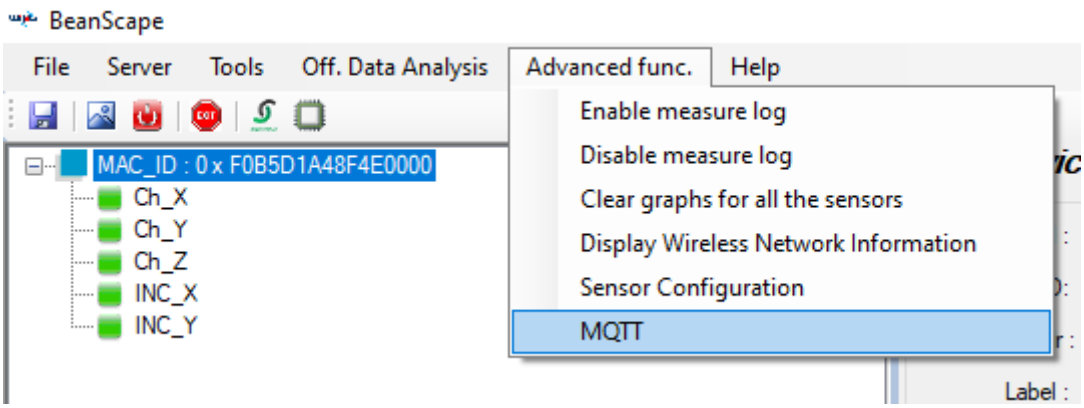
To get started using your BeanDevice Wilow over MQTT and before starting the configuration you need to install an MQTT broker on any embedded computer or SBC of your choice (Raspberry PI, Beagle bone black,) Alternatively, even use a windows system (like in this example), also you can simply use an online broker (free with limits) or you can use the MQTT broker hosted on the Teltonika router if you have one, next build your Wi-Fi network and make sure you follow the network architecture shown in the figure below.



2.2 BEANDEVICE® MQTT CONFIGURATION

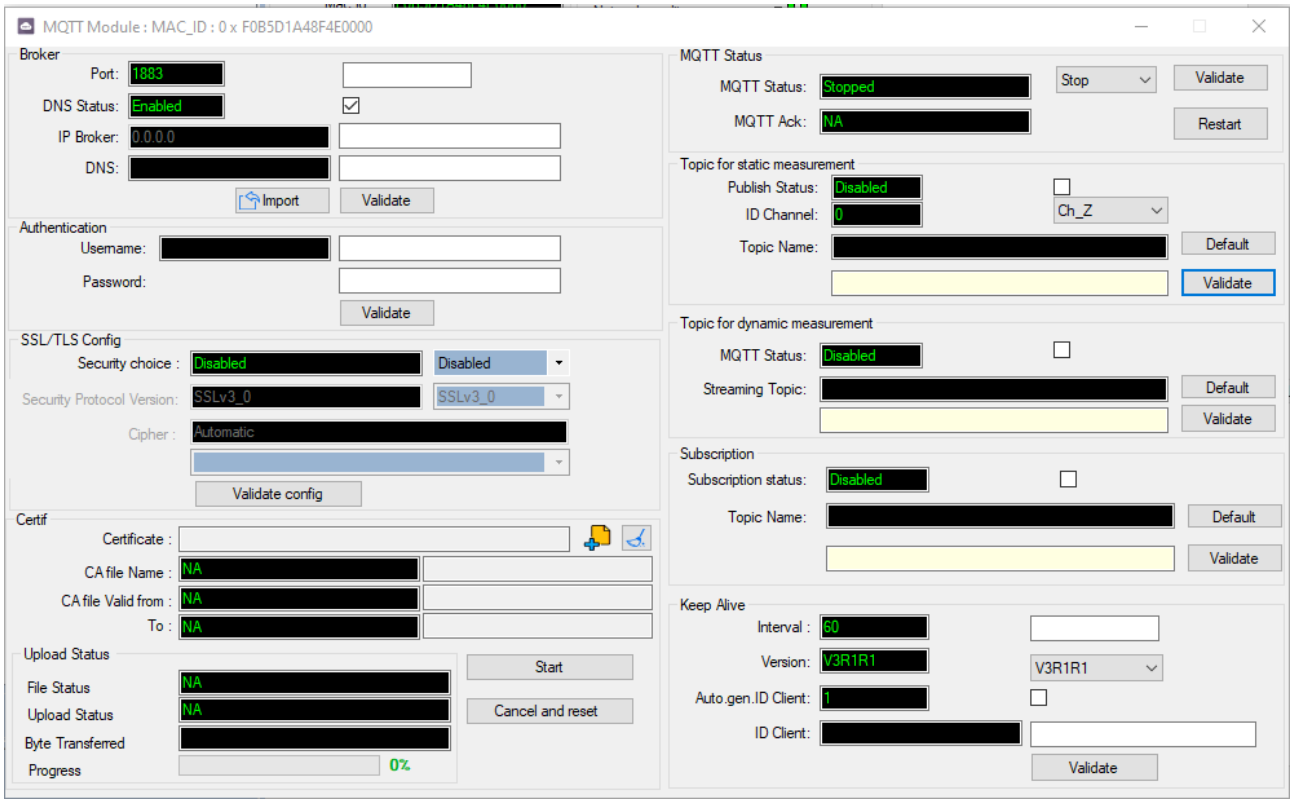
In order to start the MQTT communication you have to setup the MQTT configuration using BeanScape, after connecting the BeanDevice to the network.

Select your BeanDevice and scroll down to MQTT in the BeanDevice tab.

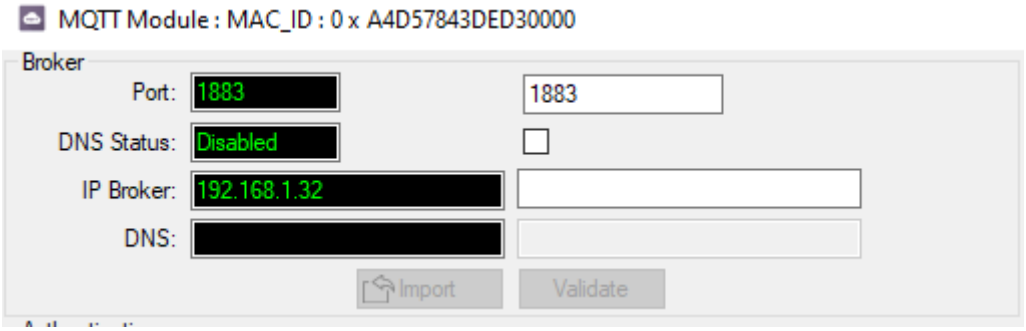


A new window will pop up from which you will configure the BeanDevice MQTT module.

To make things simple we will not use the security feature in this example (SSL/TLS and Certif options).



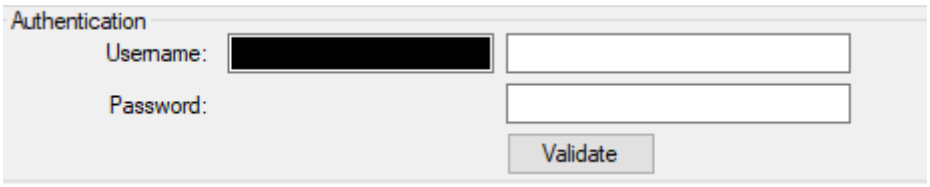
Broker



- ***Port***: TCP/IP port to use with MQTT .1883 and 8883(secured port, over SSL/TLS) are the reserved (default) ports for MQTT.
- ***DNS Status***: check it if you want to use your broker DNS otherwise uncheck it if you want to use your broker ip address.
- ***IP Broker***: enter your broker Ip address (make sure to uncheck the DNS Status).
- ***DNS***: enter the DNS (domain name server) of your Broker (make sure to check the DNS Status)
- ***Import button***: Import saved configuration (last used configuration).
- ***Validate***: confirm and save your broker configuration.

Authentication

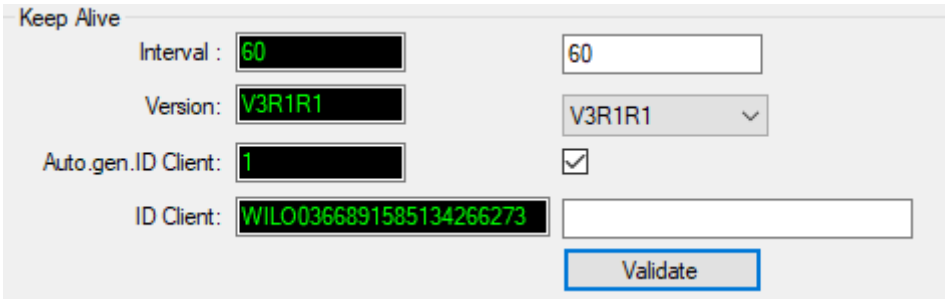
MQTT broker can be configured to require client authentication using a valid username and password before a connection is permitted.



- ***Username:*** specify your user name
- ***Password:*** enter your password
- ***Validate***: save your configuration.

Keep alive

The keep alive functionality assures that the connection is still open and both broker and client are connected to one another



- ***Interval***: The interval is the longest possible period of time, within the broker and the client can endure without exchanging a message.
- ***Version***: MQTT Protocol version
- ***Auto.gen.ID Client***: check for auto generate a Client ID
- ***Client ID***: Enter your client ID manually (make sure to uncheck Auto_gen.ID Client)
- ***Validate***: save your configuration.

Topic for static measurement

The topic is a string used by the broker to filter messages for each connected client.

"Topics for static measurement" section is related only to LowDutyCycle and Alarm modes.

In static mode (LDC or Alarm) each sensor in the BeanDevice will publish its measurements to a specific and well reserved topic.

In our case we will subscribe to those Topics to receive the static measurements from each sensor.

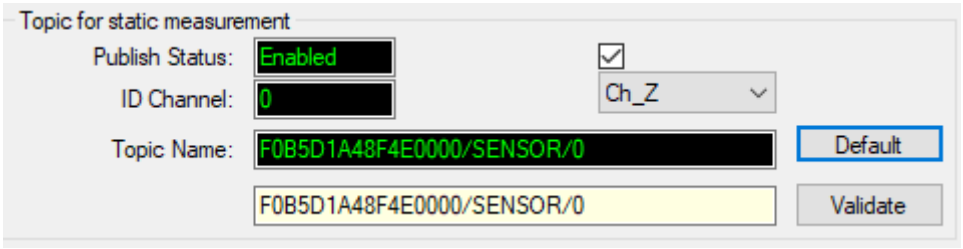
For better and easy use, Topic names are not configurable and they are as follow:

[BeanDevice MAC-ID]/SENSOR/[sensor-ID]

For Example: F0B5D1A48F4E0000/SENSOR/0

F0B5D1A48F4E0000: BeanDevice mac id

0: channel Z



- ***Publish Status:*** check it to enable publishing.
- ***ID Channel:*** channel identification, select sensor from the list.
- ***Topic Name:*** display the used Topic name to publish measurement to (not configurable).
- ***Default:*** to set a default configuration. You need to click this button to set the Topic name.
- ***Validate:*** save your configuration.

Topic for dynamic measurement

Here you enable the Topic for dynamic measurements and it works only for the streaming, S.E.T and Shock Detection modes.

The BeanDevice will publish all measurement for all sensors to a single Topic.

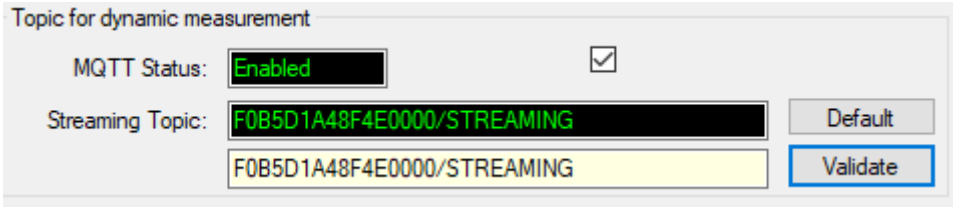
Again, the topic name is not configurable and you can only enable or disable this option.

The topic format is as follow:

[BeanDevice_MAC-ID]/STREAMING

For Example: F0B5D1A48F4E0000/STREAMING

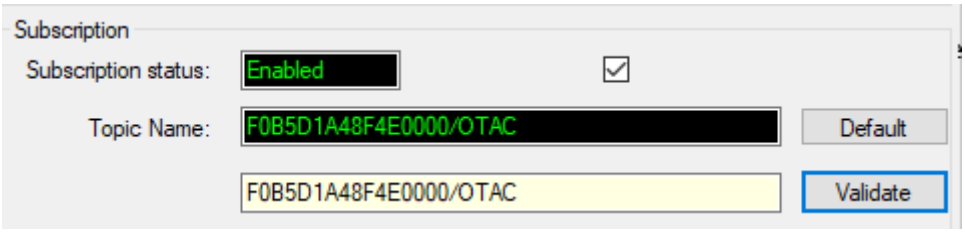
F0B5D1A48F4E0000: BeanDevice ID



- ***MQTT_status:*** check it to enable publishing
- ***Streaming Topic:*** display the used Topic name to publish measurement to (not configurable).
- ***Default:*** to set the default configuration. You need to click this button to set the Topic name.
- ***Validate:*** save your configuration.

Subscribe

The BeanDevice will subscribe to a another MQTT client which will publish configuration messages,



- ***Subscription status:*** check it to enable subscribing.
- ***Topic Name:*** Field to enter your topic's name to subscribe to.
- ***Default:*** to set the default configuration. You need to click this button to set the Topic name.
- ***Validate:*** save your configuration.

MQTT STATUS

Here you can check your MQTT different status, connected, stopped, connecting or disconnecting and can start/restart your connection from here.

- ***MQTT Status:*** shows the current status of the MQTT module:
  - **Connecting:** trying to establish a connection
  - **Connected:** connection established
  - **Disconnecting:** disconnecting the Client
  - **Stopped:** the connection is stopped
- ***Start/Stop:*** select to start or to stop your MQTT Client connection
- ***Restart:*** restart your connection

2.3 LABVIEW MQTT CONFIGURATION

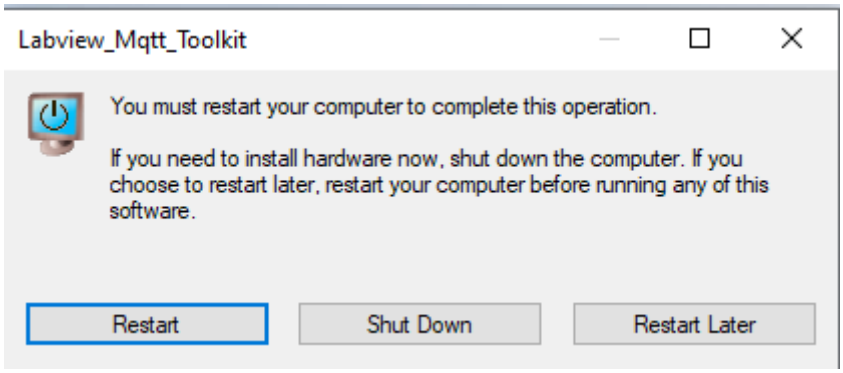
2.3.1 Getting started

For anyone who wants to start using LabVIEW to collect data from a BeanAir Wilow WSN we provide you examples for both, static and dynamic modes with real time graph results.

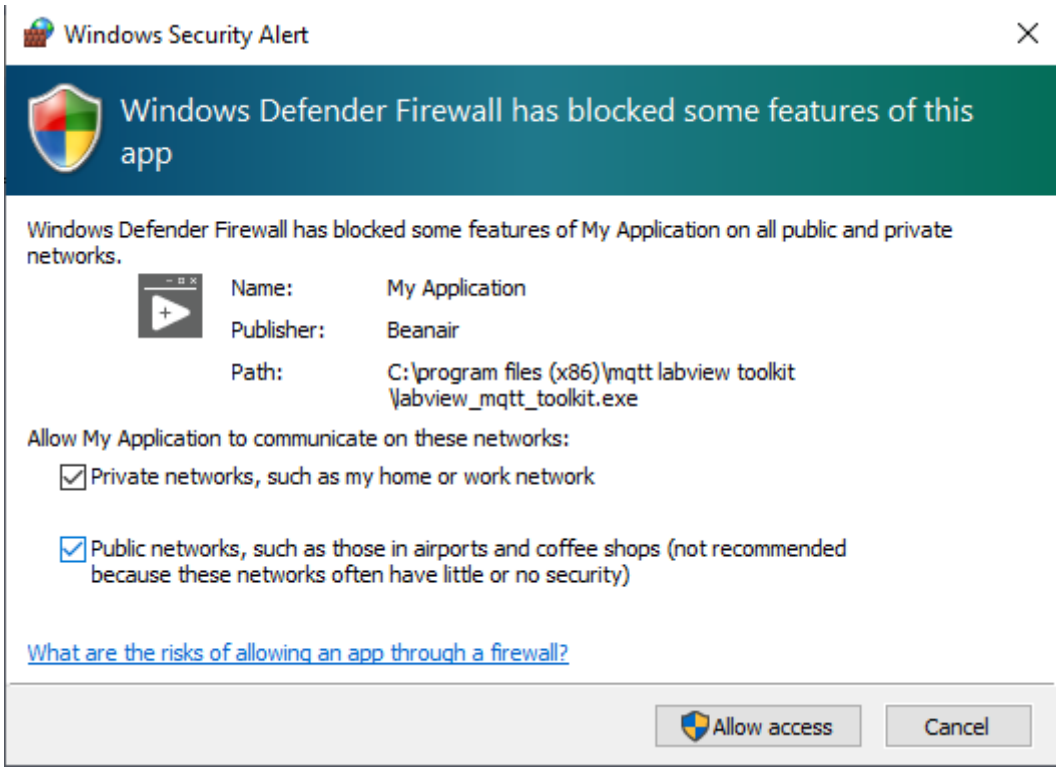
2.3.2 Setup the environment

After installing the executable setup, don't forget to check install the related installer package.

Then you have to restart your computer.



Then allow the application though firewall for both Public and Private.

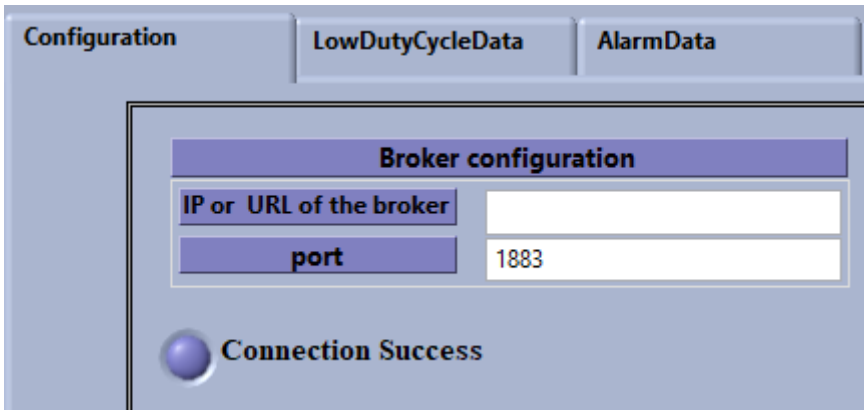


2.3.3 MQTT Configuration on LabVIEW toolkit

2.3.3.1 Broker configuration

After launching the LabVIEW application navigate to **configuration** tab where you will enter the broker configuration.

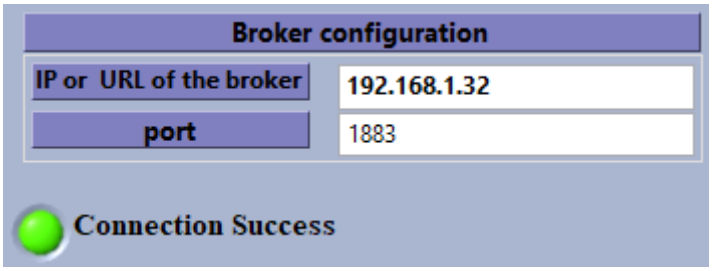
Under Broker configuration section, you have to enter the right broker settings



- ***IP or URL of the broker:*** Enter the broker IP address or its URL
- ***Port:*** Enter the MQTT port number (1883 default MQTT port number).

Then click on **connect button**

if all the settings are correct the connection LED will turn to green color.

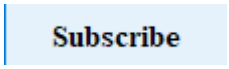


2.3.4 Subscription Options (Read the measurements)

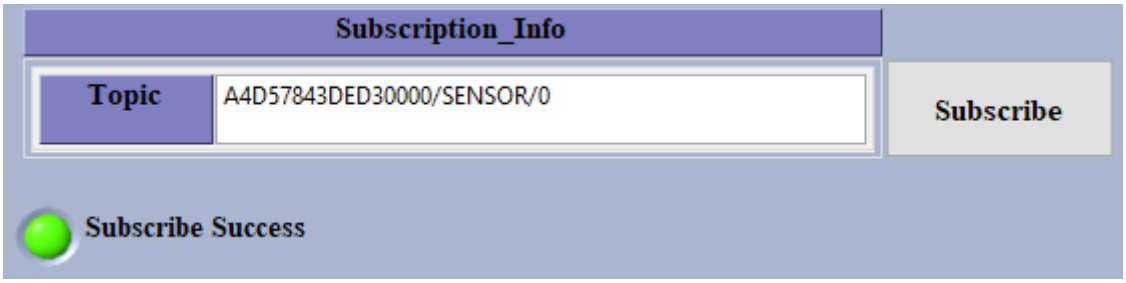
2.3.4.1 Example with Static DAQ mode

2.3.4.1.1 Topic Name configuration

From the same **configuration** tab, navigate to Subscription_Info section, and enter the topic name for static measurement mode (LowDutyCycle & Alarm).

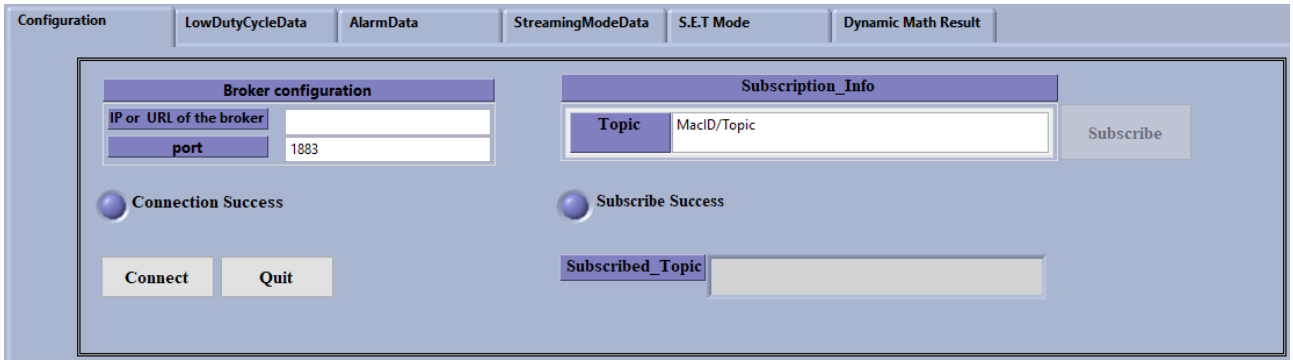
Then click on **Subscribe** button. 

The subscription LED will turn to green.



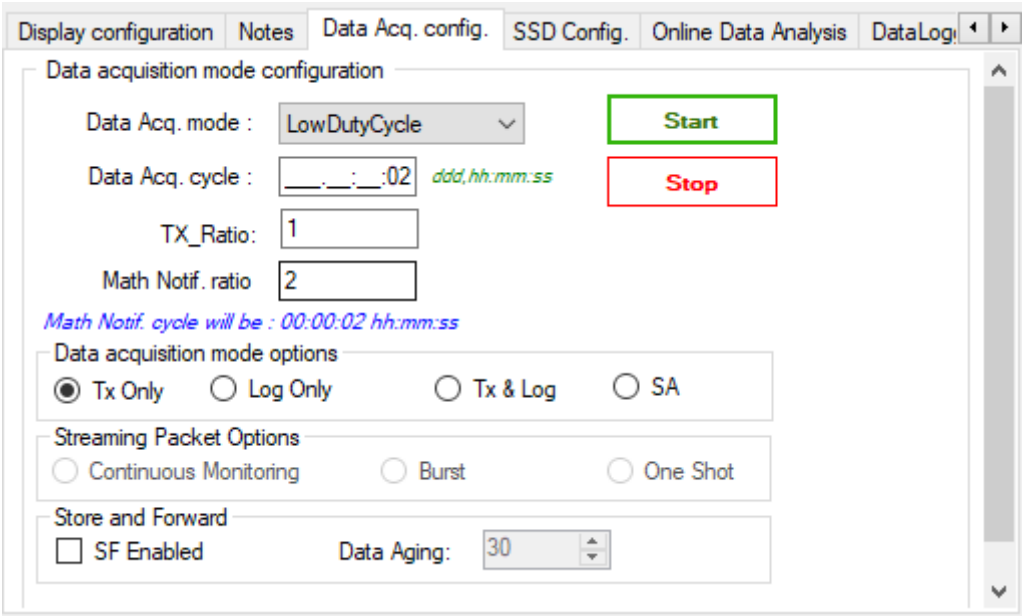
Do not exceed 30s, between the broker configuration and the topic name configuration otherwise there will be a time out issue and the operation will not be valid and you have to reconfigure everything again.

If you face a time out issue during the configuration, just Click on Quit button Quit, then click on the arrow icon to start again from the scratch.



2.3.4.1.2 Data acquisition configuration on the BeanScape software

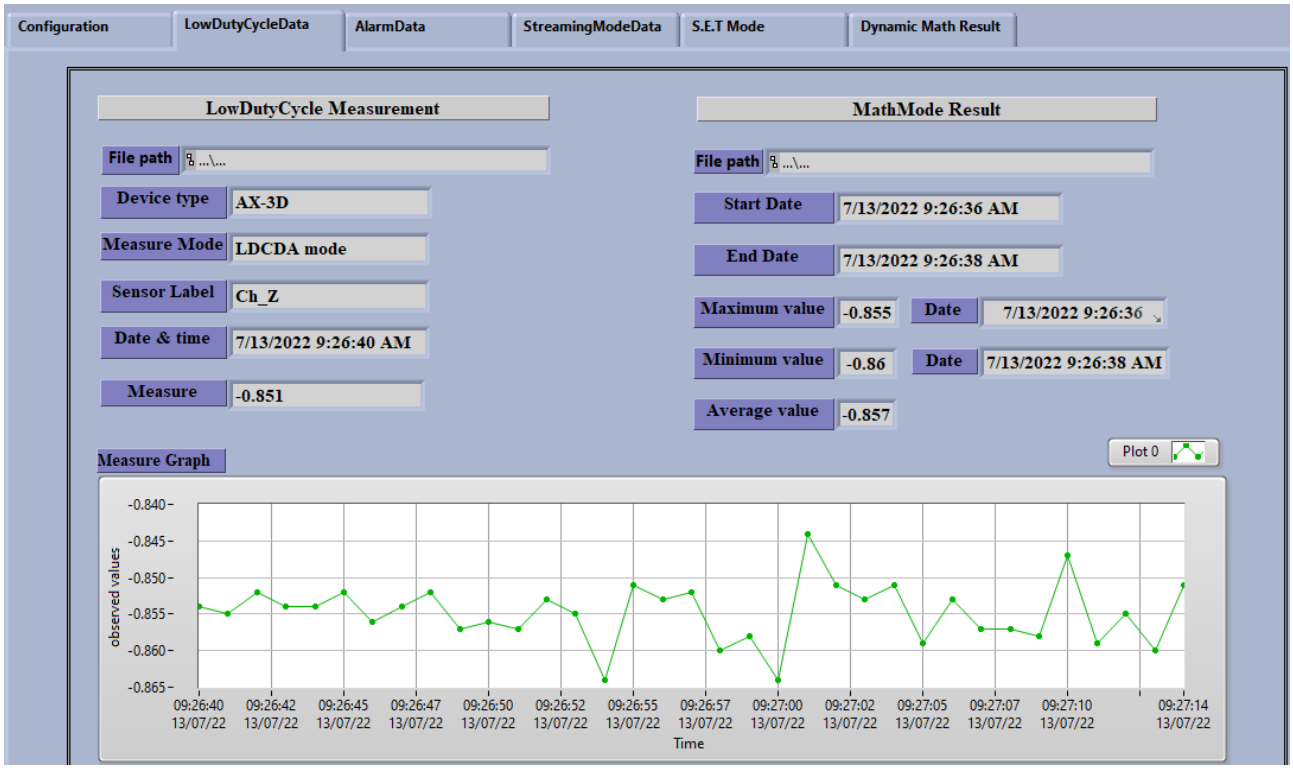
Once you validate the configuration successfully, go back to the BeanScape® software and start new Low Duty Cycle DAQ mode.



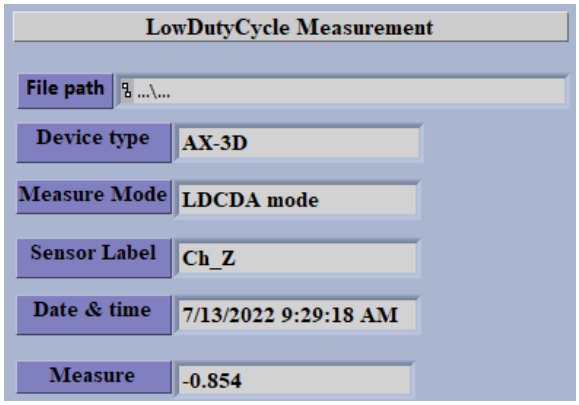
Once you start the data acquisition you can close the BeanScape software, it's only needed for the BeanDevice configuration.

2.3.4.1.3 Measurement and graph display

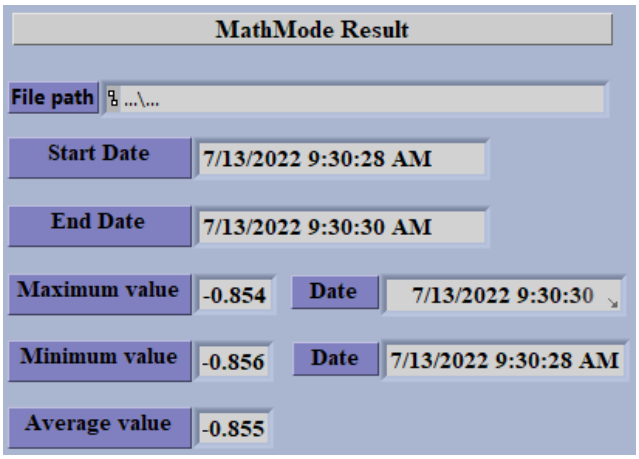
Now from the LabVIEW interface navigate to Low Duty Cycle tab to see the graph and the measurement results.



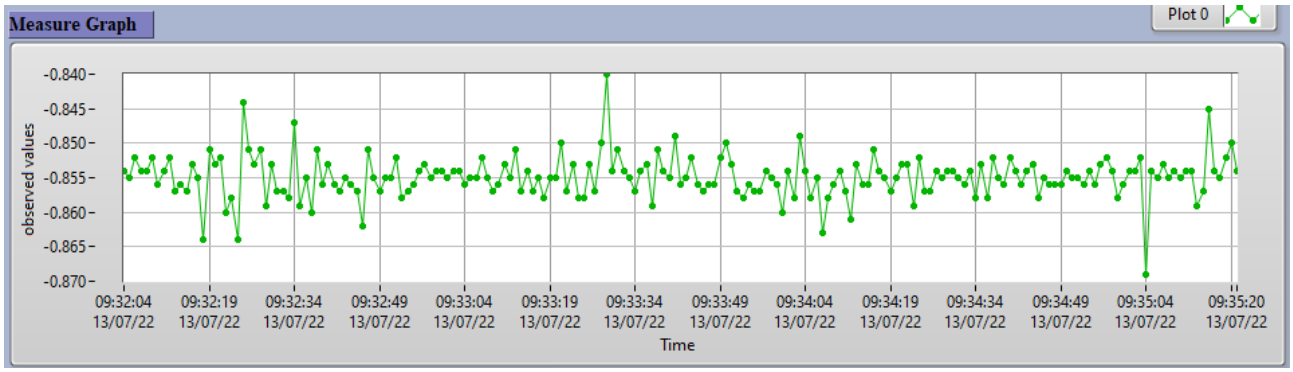
The BeanDevice identity and related information will be displayed on the left-hand screen.



And the Math mode results for static measurements will be displayed on the right-hand screen.

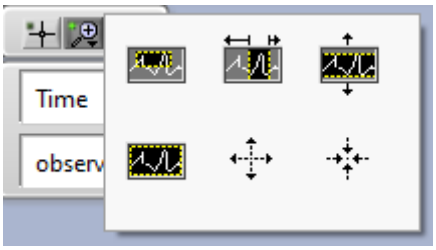


The graph will be displayed below with the measurements time and value.



Several options are available to play with the graph and zoom in & zoom out.

Click on the icon in the middle of the icons, a bunch of option will be displayed.



Zooms in an area of the graph or chart.

Zooms in an area of the graph or chart on the X-axis.

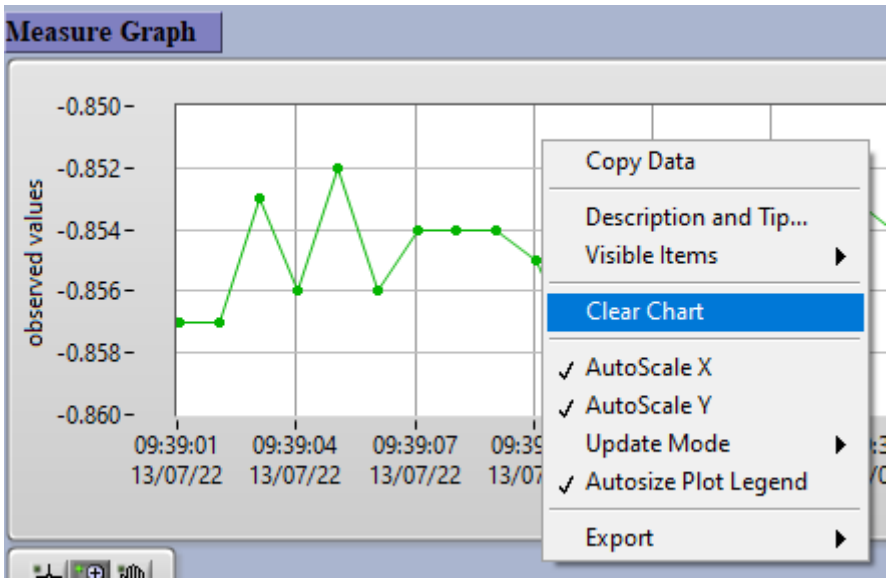
Zooms in an area of the graph or chart on the Y-axis.

Zooms in or out to auto scale the graph or chart.

Zooms in. Hold <shift> to zoom out while you are zooming in, and release <shift> to zoom in again.

Zooms out. Hold <shift> to zoom in while you are zooming out, and release <shift> to zoom out again.

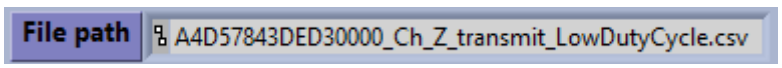
If you want to clear the graph just right click on the chart then click on clear chart.



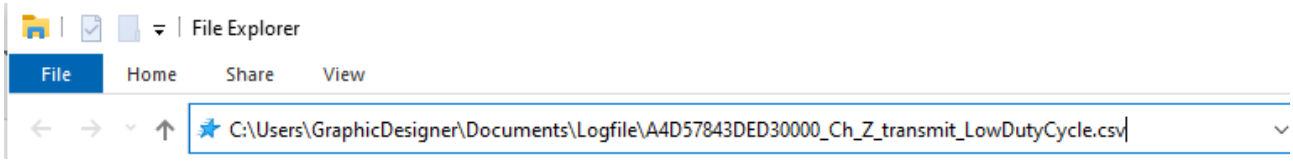
2.3.4.1.4 Logfiles

To check the logfiles, just click on the File path area.

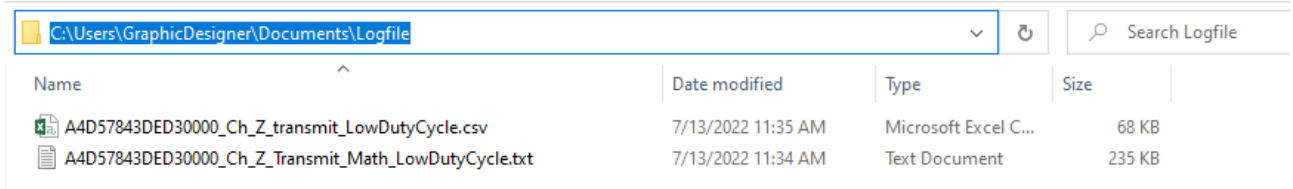
Then copy the path.



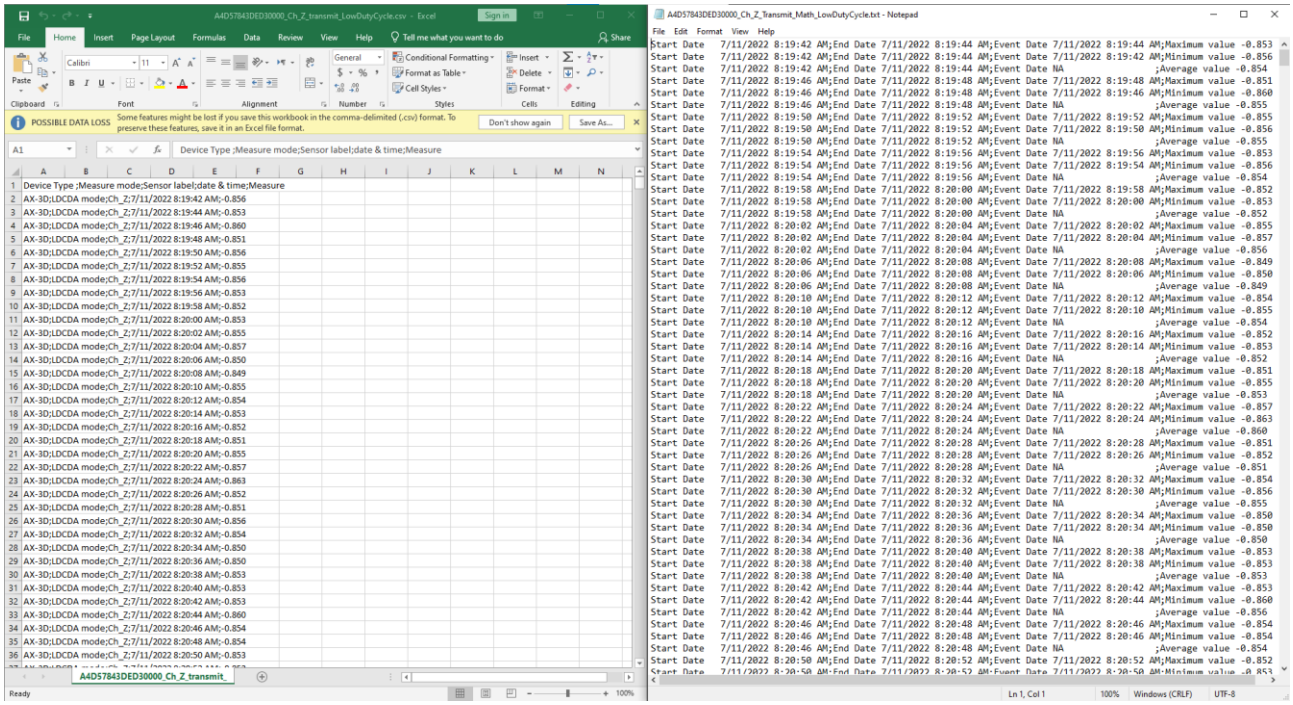
And paste it in the search bar of windows file explorer.



By default, all the logfiles will be saved under C:\Users\your_profile_name\Documents\Logfile



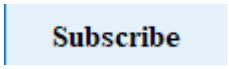
All the measurement data will be saved in a CSV file while the Math results will be backed up in a Txt file.



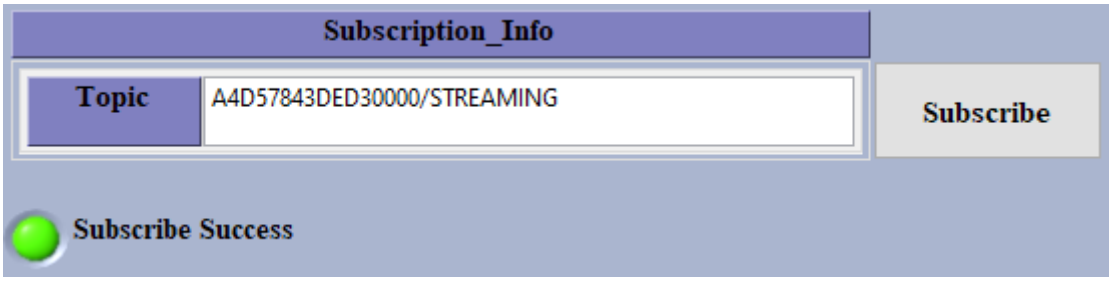
2.3.4.2 Example with Dynamic DAQ mode

2.3.4.2.1 Topic Name configuration

From the same **configuration** tab, navigate to Subscription_Info section, and enter the topic name for dynamic measurement mode (Streaming & S.E.T).

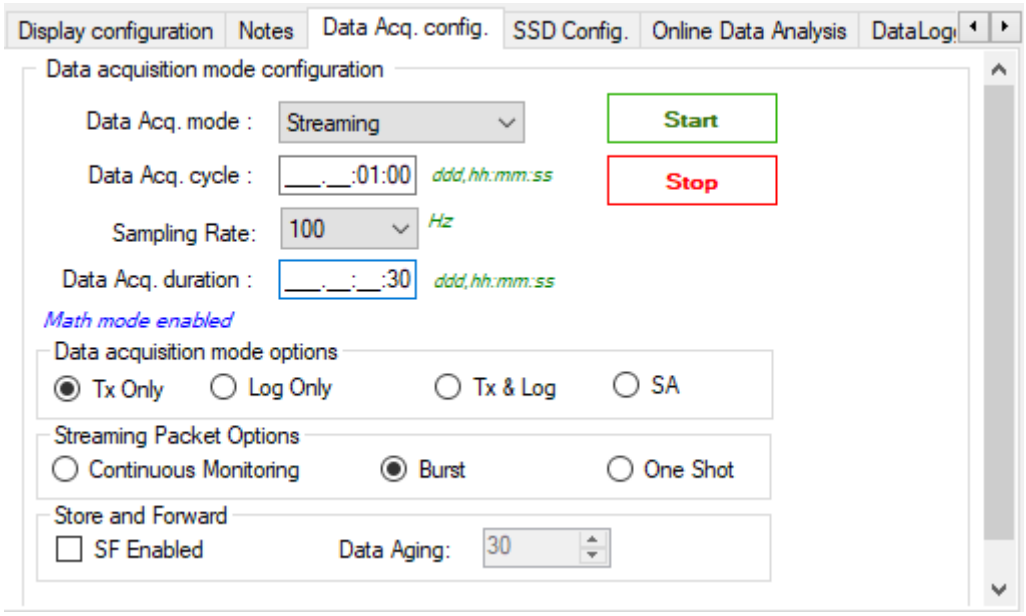
Then click on **Subscribe** button. 

The subscription LED will turn to green.



2.3.4.2.2 Data acquisition configuration on the BeanScape software

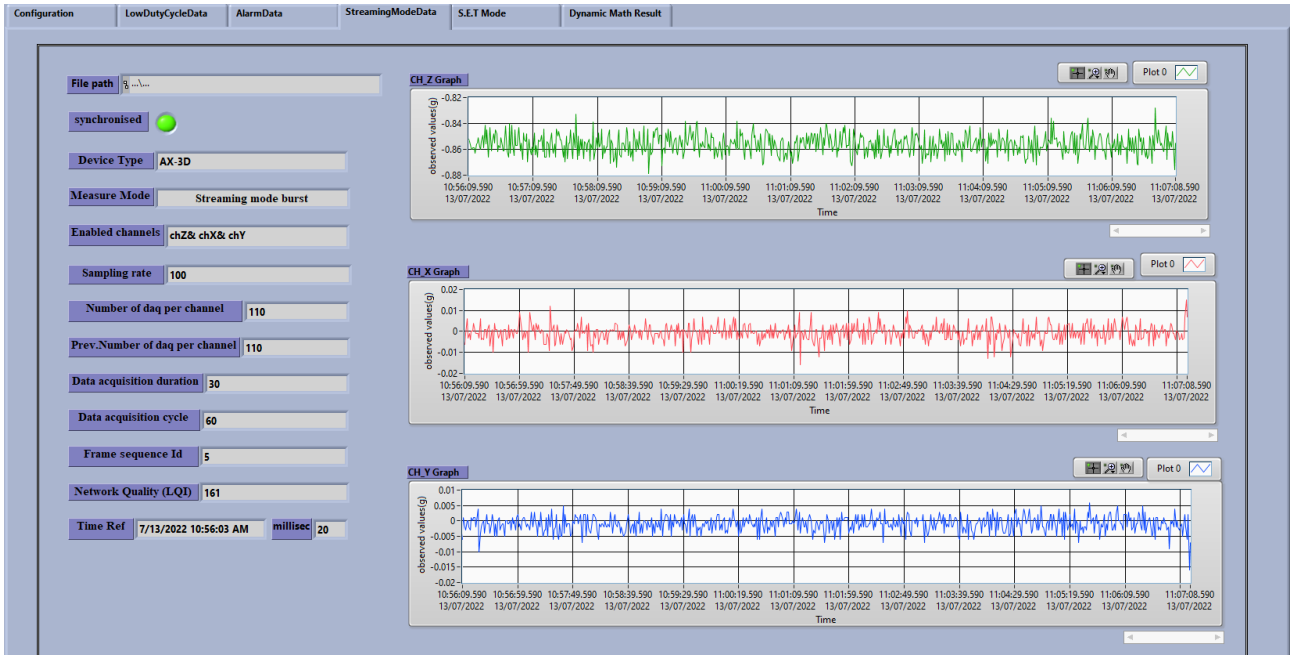
Once you validate the configuration successfully, go back to the BeanScape® software and start new Low Duty Cycle DAQ mode.



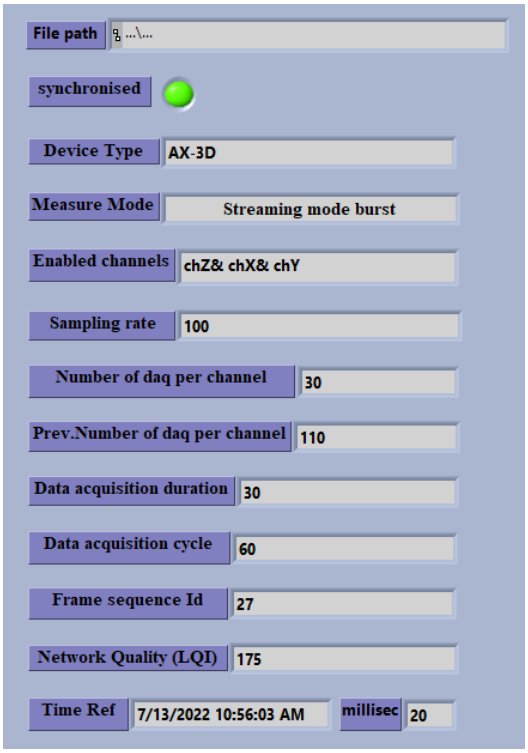
Once you start the data acquisition you can close the BeanScape software, it's only needed for the BeanDevice configuration.

2.3.4.2.3 Measurement and graph display

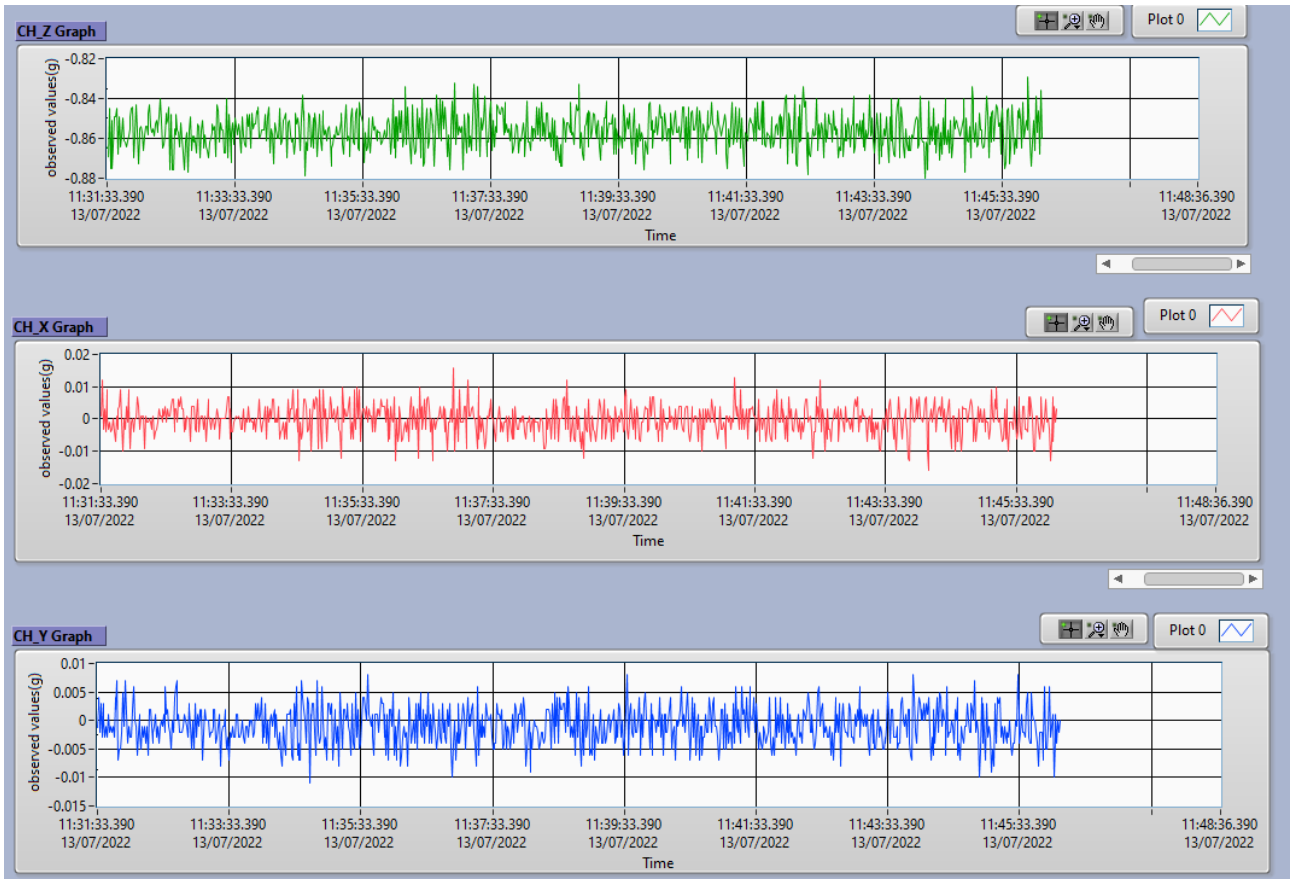
Now from the LabVIEW interface navigate to StreamingModeData tab to see the graph and the measurement results.



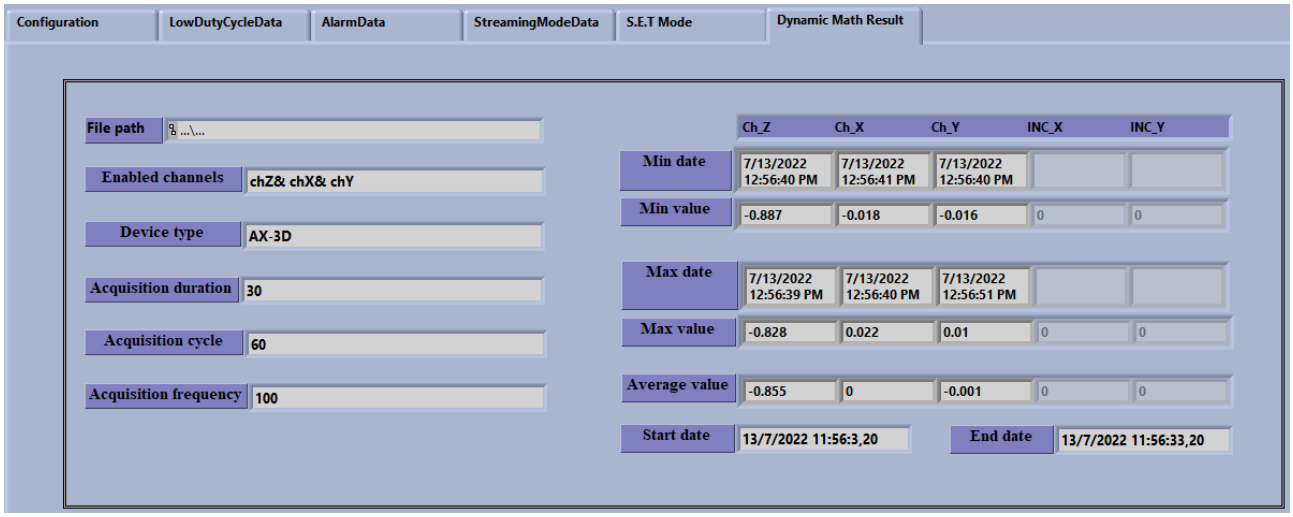
The BeanDevice identity and related information will be displayed on the left-hand screen.



The graph will be displayed at the right-hand of the screen.



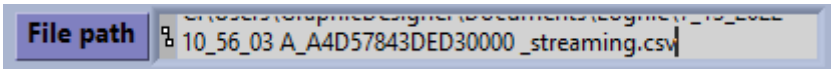
Navigate to Dynamic Math Results tab to see the Math mode values.



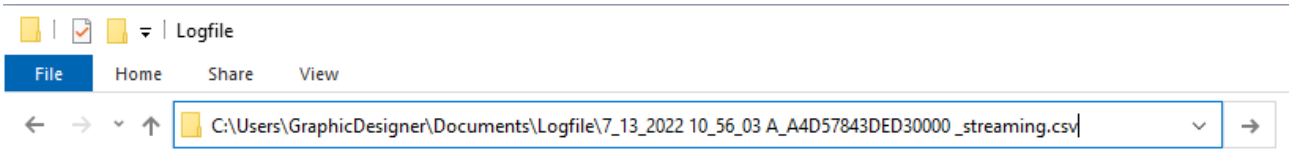
2.3.4.2.4 Logfiles

To check the logfiles, just click on the File path area.

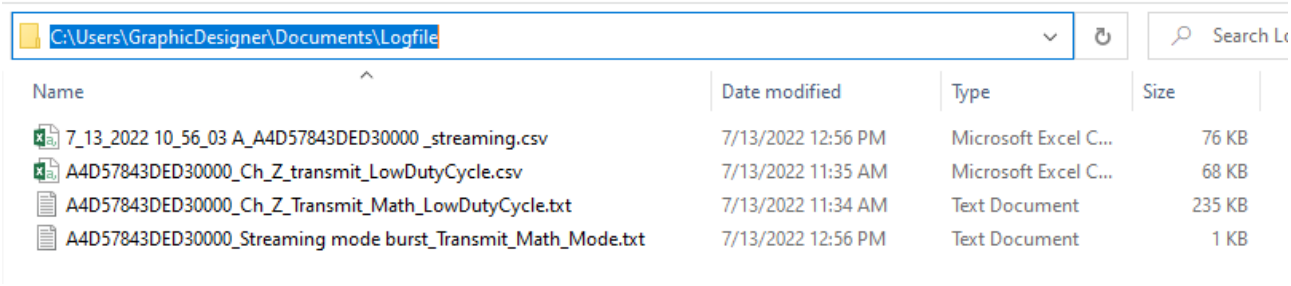
Then copy the path.



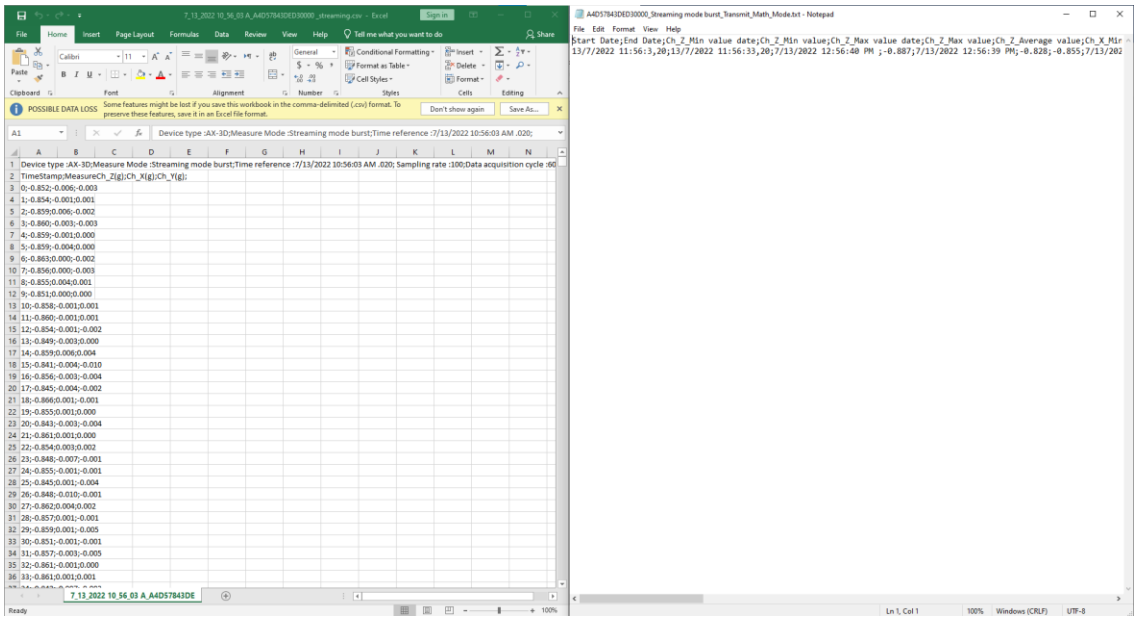
And paste it in the search bar of windows file explorer.



By default, all the logfiles will be saved under C:\Users\your_profile_name\Documents\Logfile



All the measurement data will be saved in a CSV file while the Math results will be backed up in a Txt file.

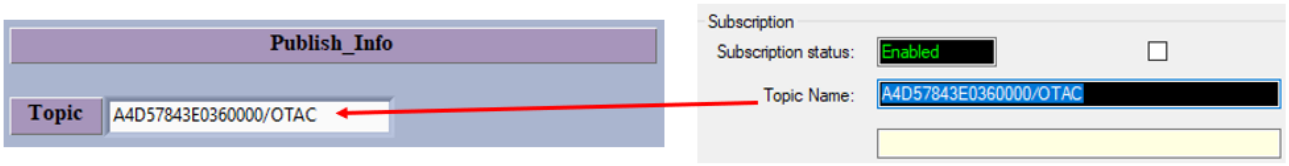


2.3.5 Publish Options (Read the measurements)

2.3.5.1 Example with Static DAQ mode

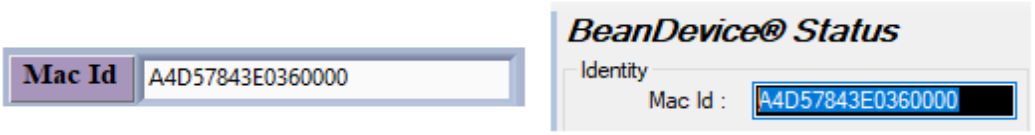
2.3.5.1.1 Topic Name configuration

From the same **configuration** tab, navigate to **Publish_Info** section, and enter the topic name for static measurement mode (LowDutyCycle & Alarm).



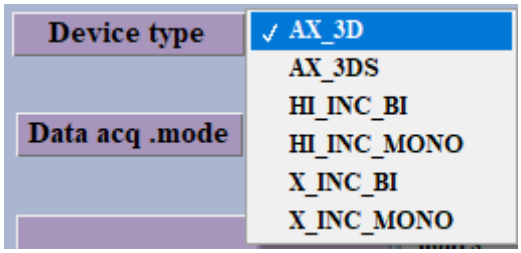
2.3.5.1.2 MAC ID Configuration

Then Enter the BeanDevice MAC-ID, you can copy it from the BeanScape software



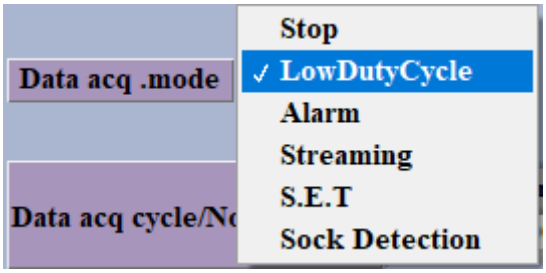
2.3.5.1.3 BeanDevice Platform Selection

Select the corresponding BeanDevice platform.

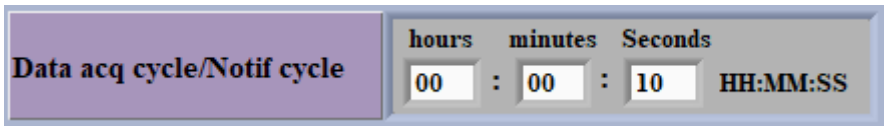


2.3.5.1.4 Data Acquisition Configuration

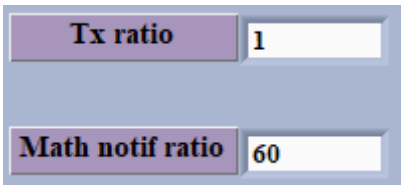
Then select the data acquisition mode. (Low Duty Cycle in this case)



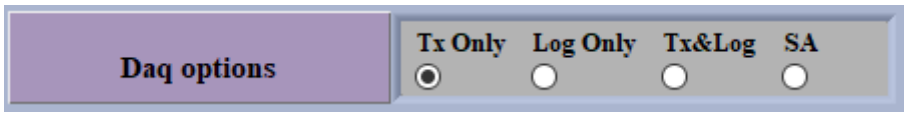
Enter the DAQ cycle



Then enter the transmit ratio and Math notification ratio



Choose the DAQ option

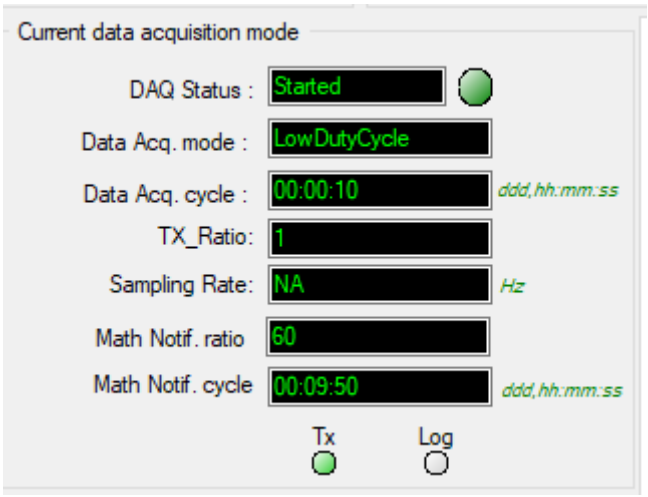


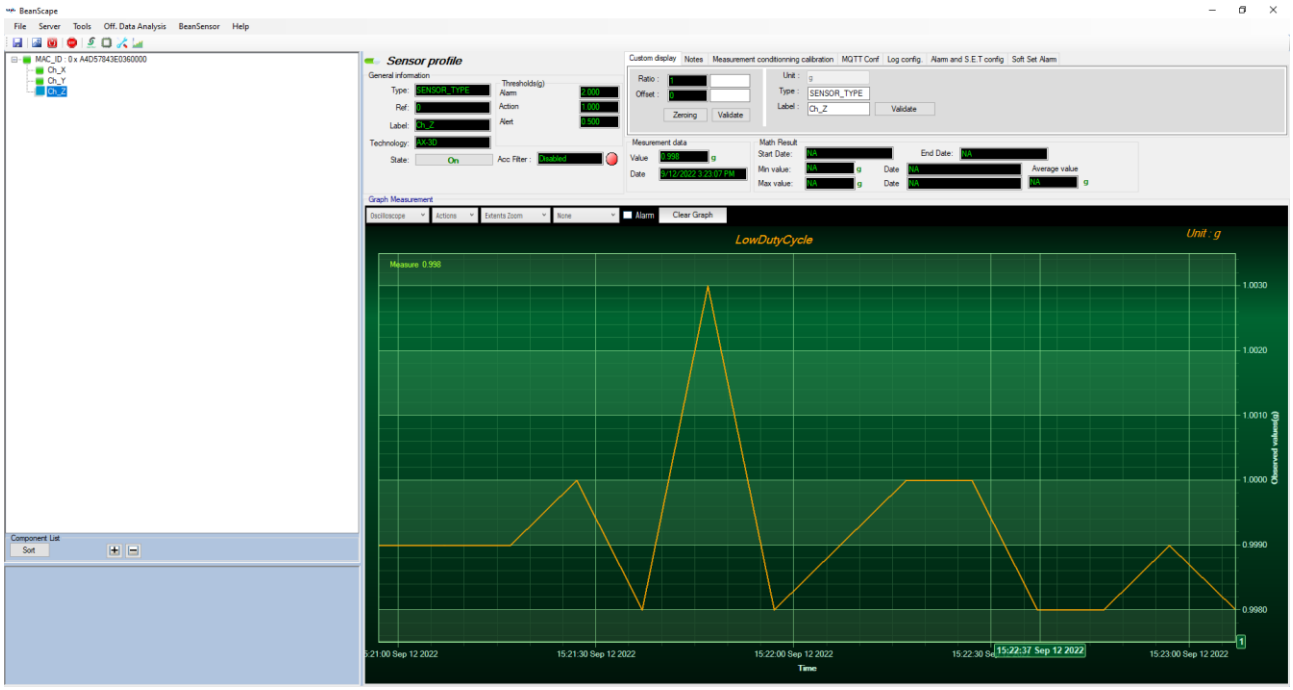
Don't forget to click on Validate

Once you validate the Publish success LED turn to green.

2.3.5.1.5 Current Configuration on the BeanScape Software

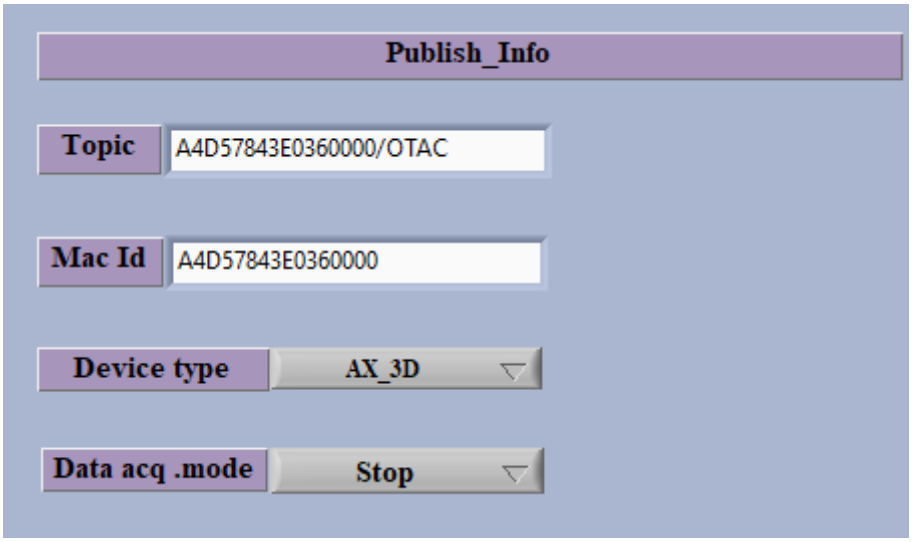
Go to the BeanScape software and check the current acquisition, you must have the exact same configuration entered from the LabView toolkit.

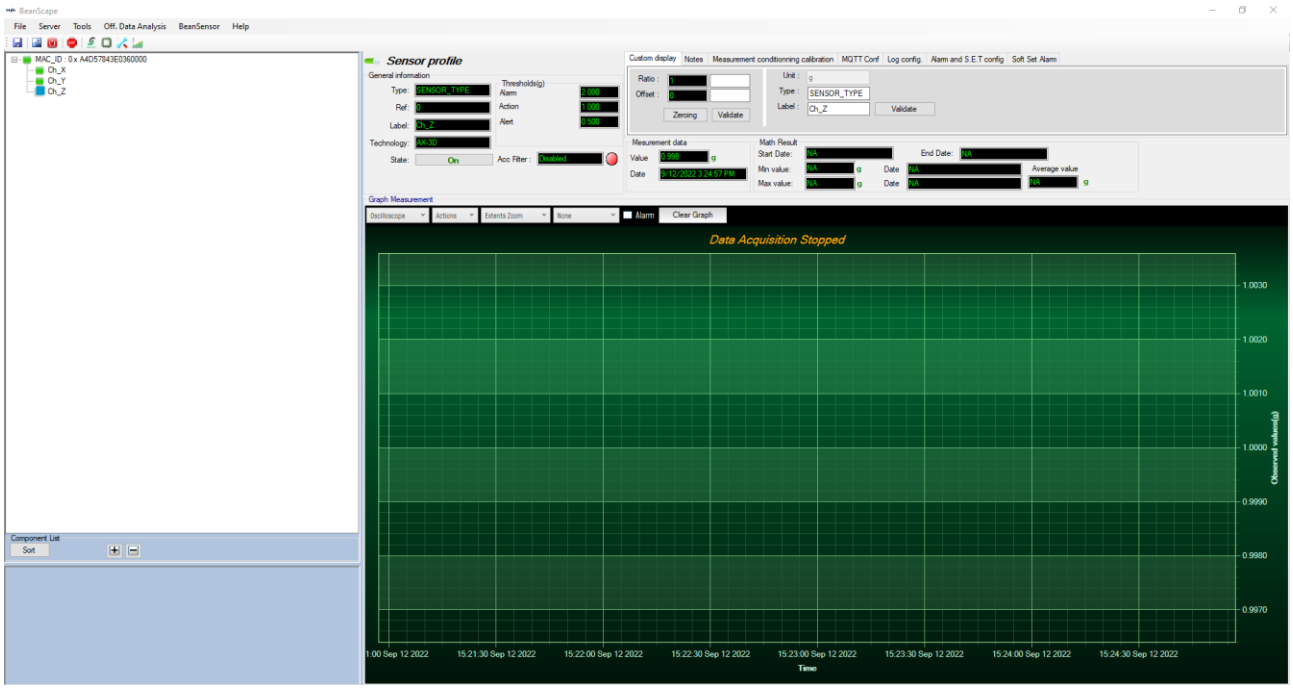




2.3.5.1.6 Stop Data Acquisition

If you want to stop the Data Acquisition just go back to the toolkit interface and change the data acquisition mode to stop, Then the BeanDevice will be stopped.

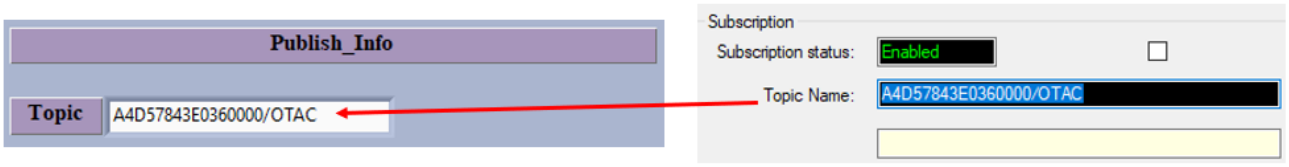




2.3.5.2 Example with Dynamic Measurement Mode (Streaming)

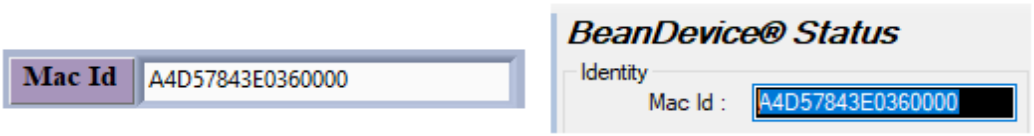
2.3.5.2.1 Topic Name configuration

From the same **configuration** tab, navigate to **Publish_Info** section, and enter the topic name for dynamic measurement mode (Streaming/SET/Shock detection).



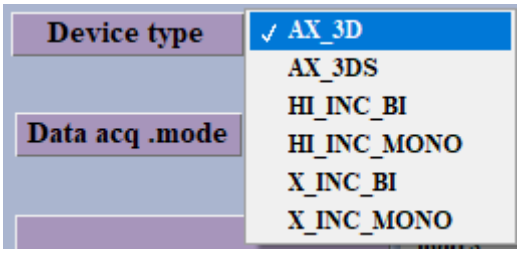
2.3.5.2.2 MAC ID Configuration

Then Enter the BeanDevice MAC-ID, you can copy it from the BeanScape software



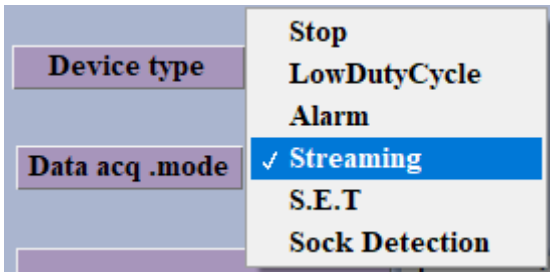
2.3.5.2.3 BeanDevice Platform Selection

Select the corresponding BeanDevice platform.

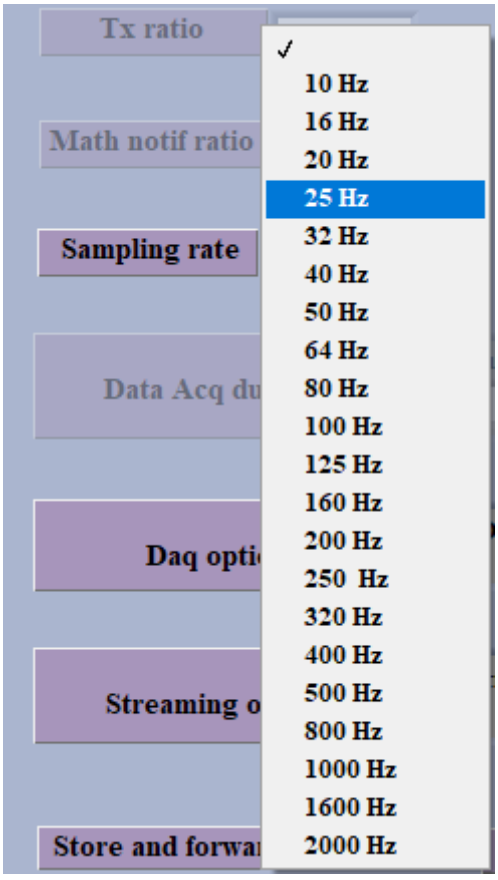


2.3.5.2.4 Data Acquisition Configuration

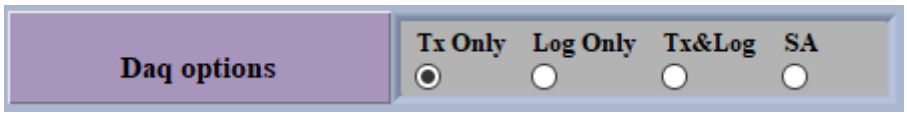
Then select the data acquisition mode. (Streaming in this case)



Choose a sampling rate from the list



Choose the DAQ option



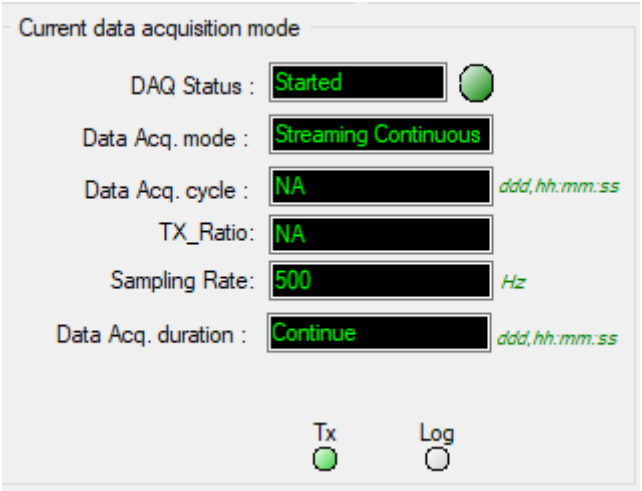
Select the Streaming option

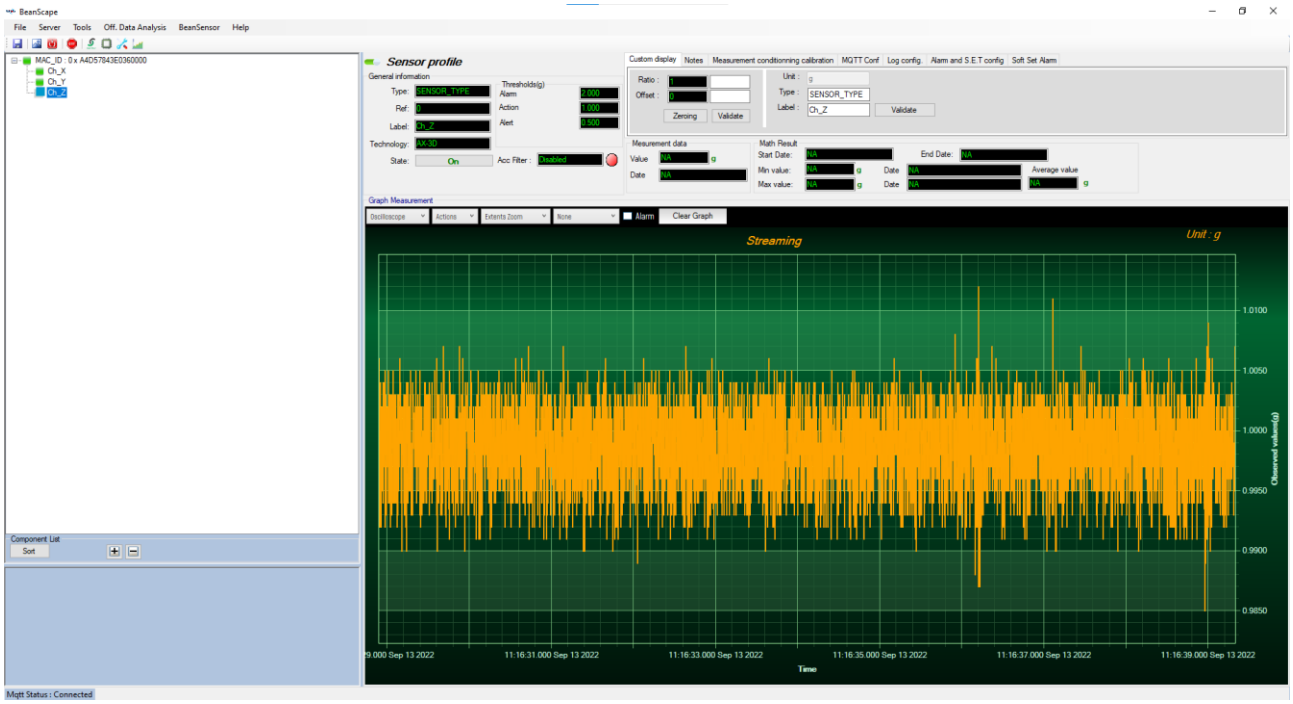
Don't forget to click on Validate

Once you validate the Publish success LED turn to green.

2.3.5.2.5 Current Configuration on the BeanScape Software

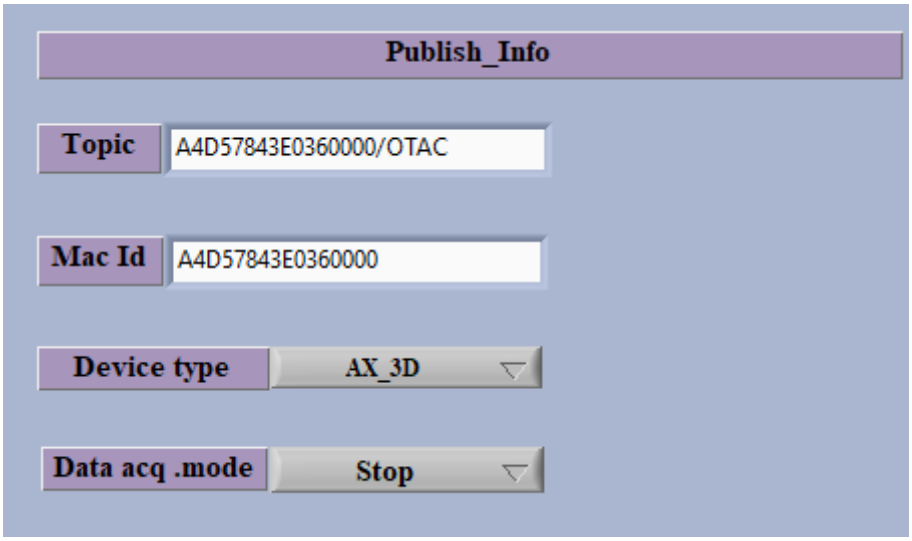
Go to the BeanScape software and check the current acquisition, you must have the exact same configuration entered from the LabView toolkit.

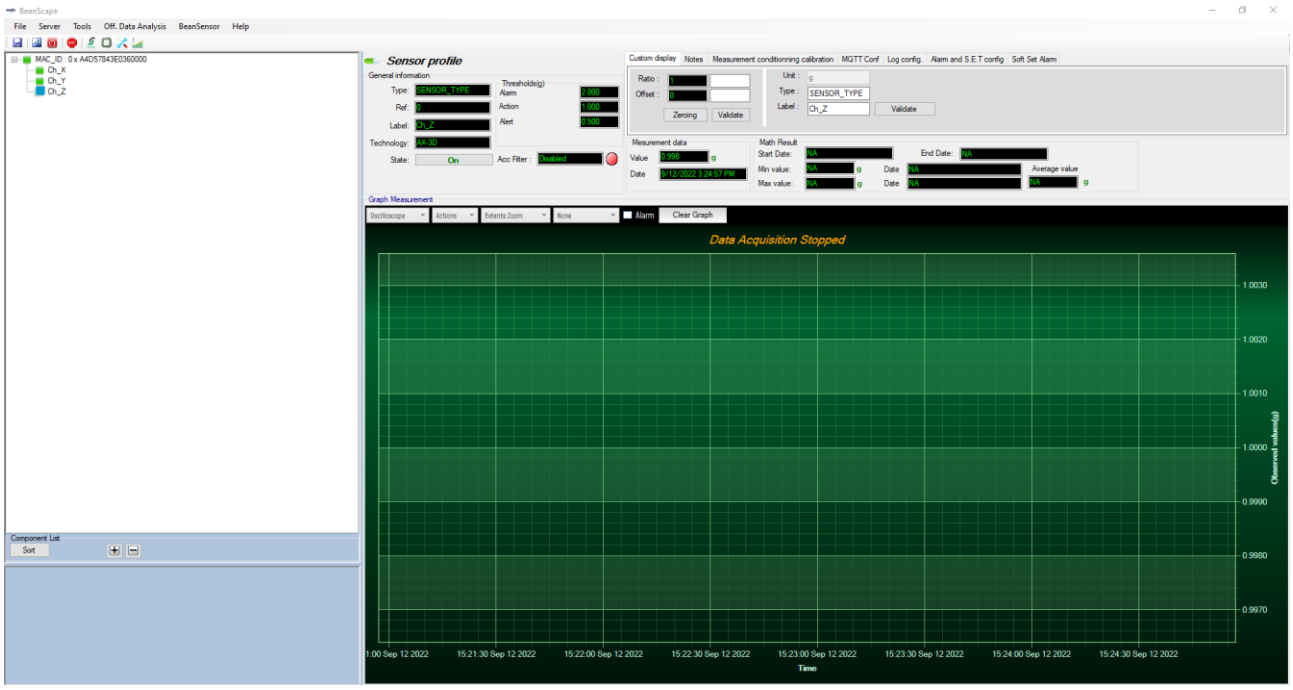




2.3.5.2.6 Stop Data Acquisition

If you want to stop the Data Acquisition just go back to the toolkit interface and change the data acquisition mode to stop, Then the BeanDevice will be stopped.

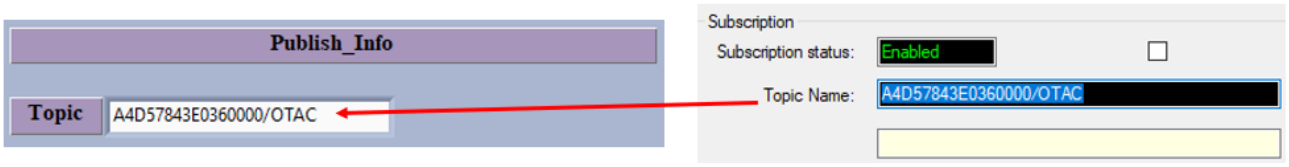




2.3.5.3 Example with Dynamic Measurement Mode (SET)

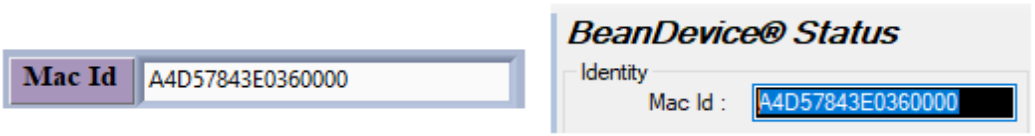
2.3.5.3.1 Topic Name configuration

From the same **configuration** tab, navigate to **Publish_Info** section, and enter the topic name for dynamic measurement mode (Streaming/SET/Shock detection).



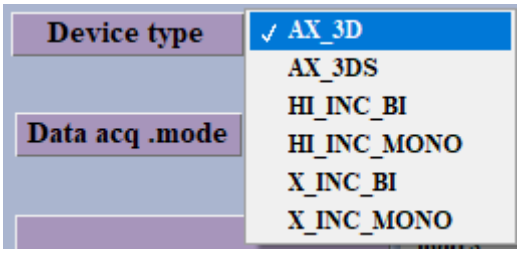
2.3.5.3.2 MAC ID Configuration

Then Enter the BeanDevice MAC-ID, you can copy it from the BeanScape software



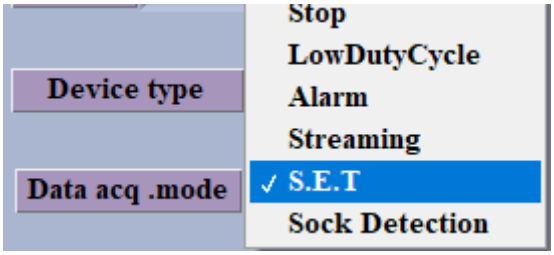
2.3.5.3.3 BeanDevice Platform Selection

Select the corresponding BeanDevice platform.

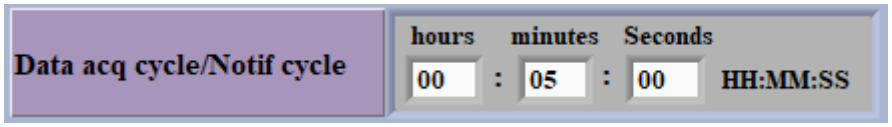


2.3.5.3.4 Data Acquisition Configuration

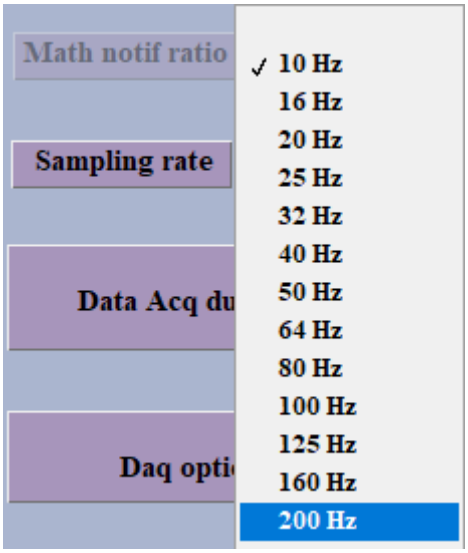
Then select the data acquisition mode. (Streaming in this case)



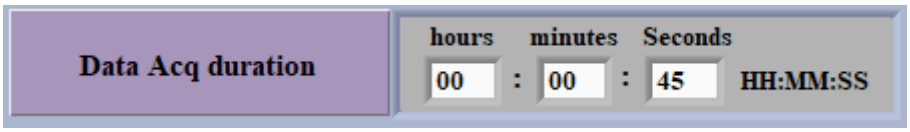
Enter the data acquisition cycle



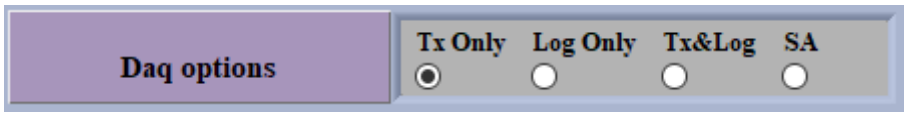
Choose a sampling rate from the list



Enter the data acquisition duration



Select the data acquisition option

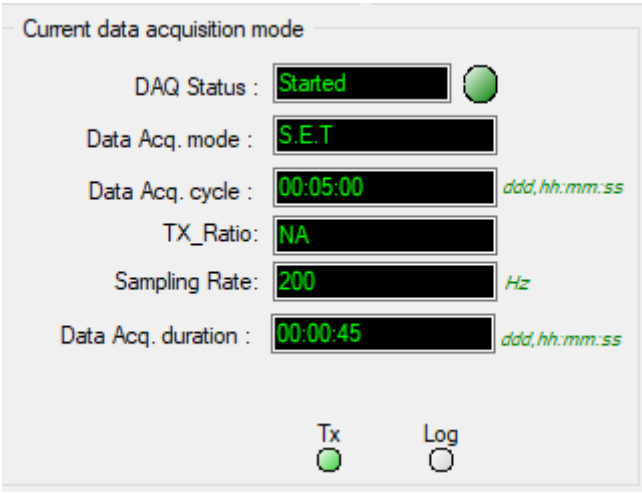


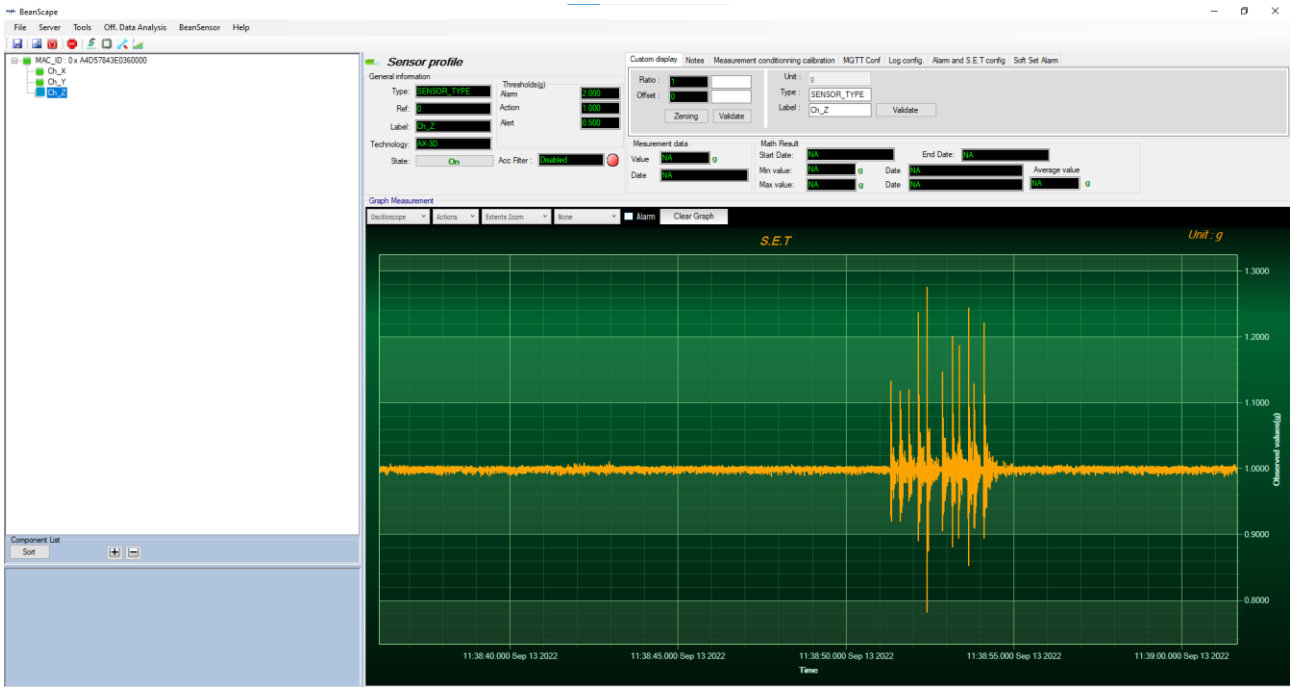
Don't forget to click on Validate

Once you validate the Publish success LED turn to green.

2.3.5.3.5 Current Configuration on the BeanScape Software

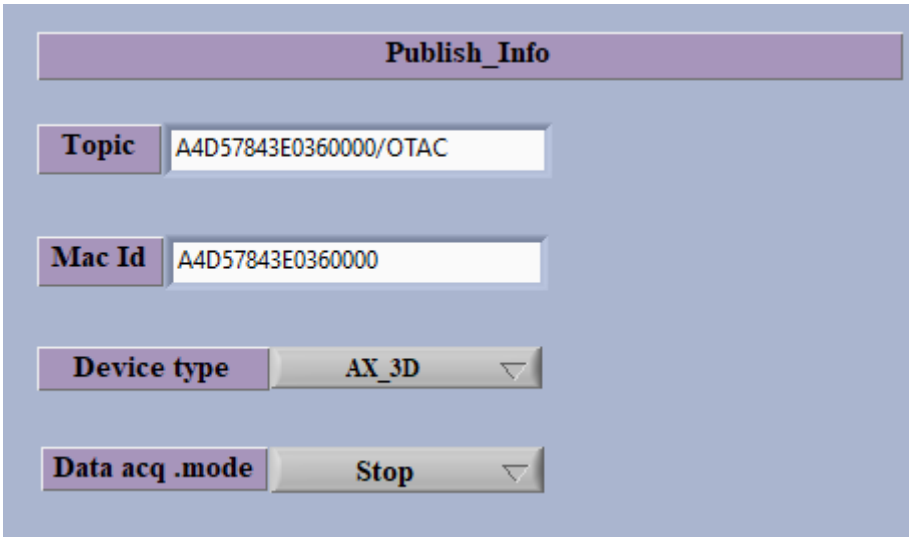
Go to the BeanScape software and check the current acquisition, you must have the exact same configuration entered from the LabView toolkit.

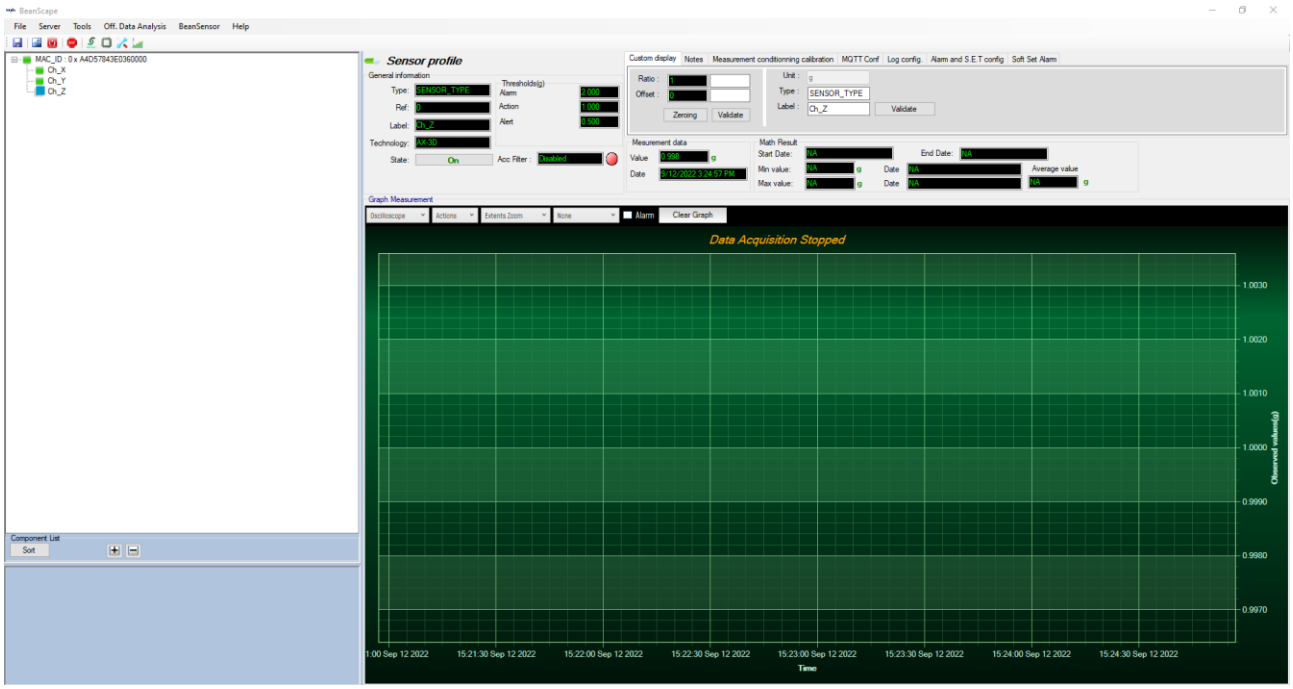




2.3.5.3.6 Stop Data Acquisition

If you want to stop the Data Acquisition just go back to the toolkit interface and change the data acquisition mode to stop, Then the BeanDevice will be stopped.




File
Server
Tools
Off. Data Analysis
BeanSensor
Help
Sensor profile
Data Acquisition Stopped
Time

3. RELATED DOCUMENTS & VIDEOS

In addition to this technical note, please consult the related User guide, technical notes and videos:

Document name (Click on the web link)	Related product	Description
TN_RF_004 «MQTT_Communication Protocol »	Wilow® products line	MQTT Communication Protocol for a seamless integration into a third-party IOT software
TN RF 005 «Building a reliable Wi-Fi network with Wilow sensors»	Wilow® products line	The aim of this document is to describe the autonomy performance of the BeanDevice® SmartSensor® and ProcessSensor® product line in streaming and streaming packet mode.
UM_RF_007 «UM-RF-07-ENG-Wilow-Wifi-Sensor»	Wilow® products line	BeanDevice® Wilow® user manual

How to use the LabVIEW MQTT toolkit