Radar level sensor LNR06V4 user guide
December 2022

1) Necessary Equipment

A LNR06V4 logger, a connection kit and the software Avelour 7(minimum)

The lastest version of Avelour is available to download from the Ijinus website, it features many changes compared to the previous version (version 6.9.5), the most notable of are
1° a new interface
2° the Radar Height Measurement application and some other functions to be used with it

2) General informations

- Wireless setting and data download by radio (Wiji protocol) on-site
- Lithium battery powered, ultra low-power consumption
- Communication : locally by radio + option 2G / 4G (LTE-M / NB-IoT)
- Memory : 500 000 data
- Inputs : 1 external power supply (5Vcc...30Vcc), 2 Contacts 100Hz, 1 Modbus
- Outputs : 1 power supply (int. battery or switch), 1 open drain, 1 Modbus
- Rugged housing with IP68 rating (1 bar / 30 days)
- Integrated conversion tables and formulas (water height, Flow, volume)

The LNR06V4 is a logger with an integrated radar level sensor and several communication options. Particularly adapted for outdoor measurements (river, storm storage...).
Fully autonomous with its long-life battery, its logger and its integrated modem. Easy to install and to use, configuration is done safety by direct radio connection.

3) Radar Vs Ultrasonic level transmitter

Ultrason vs Radar pour la mesure de distance : la théorie...


Transmitter - receiver
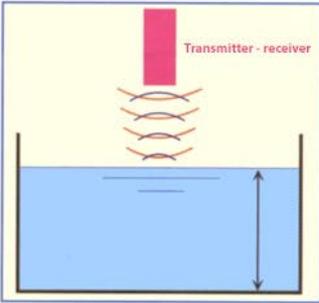
Principles :
The sensor sends a wave into the air which rebounds against the obstacles (in this case the water) and allows to measure the distance, and therefore the water height.

Waves are reflected by the aircraft and return to the radar
Emitted waves
Reflected waves
Transmitter/receiver radar

ULTRASONIC

• **The wave is mechanical** (in this case sound)

• Propagation speed of sound in the air: **346m/s à 25°C** and is temperature dependent. A variation of 1°C in the air over a distance of 1m from the sensor must be compensated by 2mm.

• The frequencies used vary from **30KHz up to 200KHz** (depending on the distance)

RADAR

• **The wave is electromagnetic** (like light or radio)

• Propagation speed: **300,000,000m/s** (1 million times faster than sound!) and is independent of air temperature. These waves have the particularity of being able to penetrate or even pass through certain (non-conductive) materials and substances such as foam.

• The frequencies used vary between **5GHz and 120GHz** (depending on the distance)
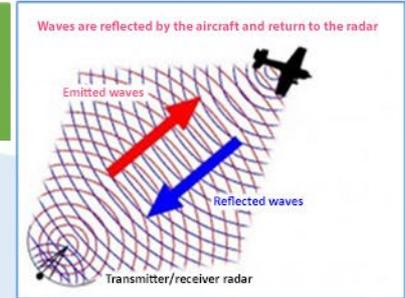
4. Quelques éléments techniques

Choice of a frequency of 60 GHz (minimum resolution of 1mm and discretisation of the maximum measurement range of 2000 points...)

Choice and validation of a "**Fresnel**" **lens** because of its better performances compared to the "famous drops" formed by condensation

Watertightness: 1 bar (10m) during 1 month

Beam angle ("full"): 4°*2=8° (-3dB amplitude attenuation or half power)

Energy autonomy: up to 10 years depending on use (measurement and communication)

5. Some elements of the data sheet

The LNR06V4 is capable of measuring a distance of up to 6 metres. The distance between the sensor and the water is therefore a maximum of 6 m, so the maximum water heights are also 6 m. The resolution of the radar sensor (2,000 points) has been optimised compared to the ultrasonic sensor (1,000 pts for the LNU).

| Features	LNR06V4-82-LTE (868 MHz) LNR06V4-92-LTE (915 MHz)
Measuring distance	0,15 … 6m
Resolution	2 000 samples available for the measured distance, 1mm minimum (Example : ± 4 mm for a distance of 6m)
Accuracy	± 0,2% of measured distance with a minimum of ± 2mm*
Communication	Radio HF (868 MHz or 915 MHz) 2G / 3G / LTE M / NB IoT (depending on your chosen options)
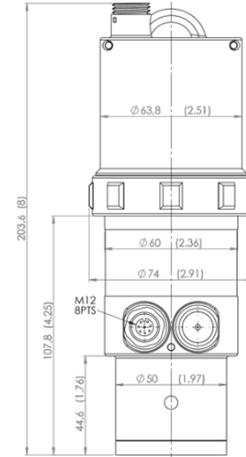
Note: Radar technology is based on the emission of electro-magnetic waves, so these waves can penetrate or be partially absorbed by certain materials. A radar echo will be similar to an ultrasound echo on water or metal. However, a radar echo on plastic, foam or other porous materials is very different from ultrasound.

# 6. Presentation of the main steps of Avelour 7.0.0

- Launch the Avelour software (version 7.0.0 or higher)
- Connect to the desired logger
- Choose one of the applications available on the radar ("add a measure" button)
- Define the measurement frequency and the different options (thresholds, acceleration...)
- Calibrate the water level measurement (see next page)
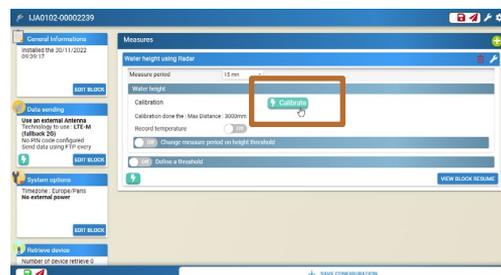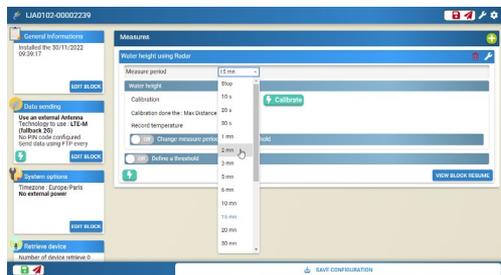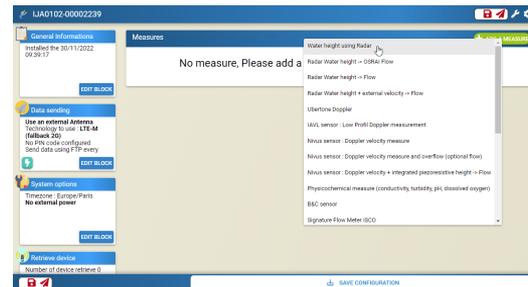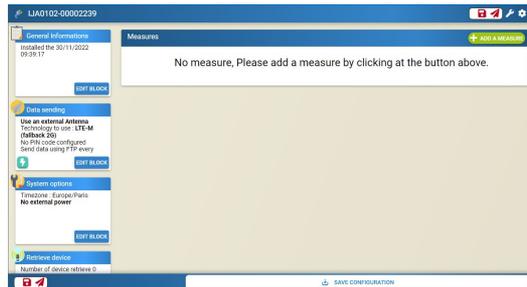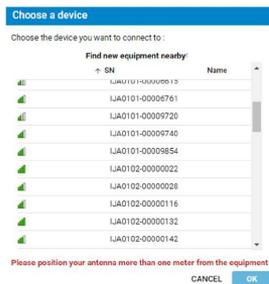
# 7. « Simple » and « Advanced » water height calibration
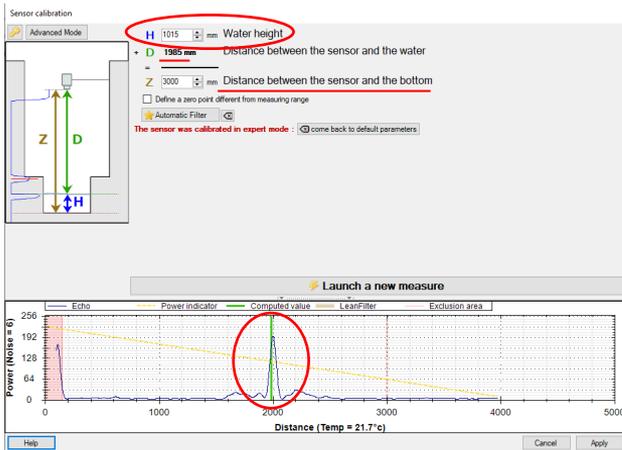
Simple" mode: If only one "clean" peak, enter the Z and adjust the water level
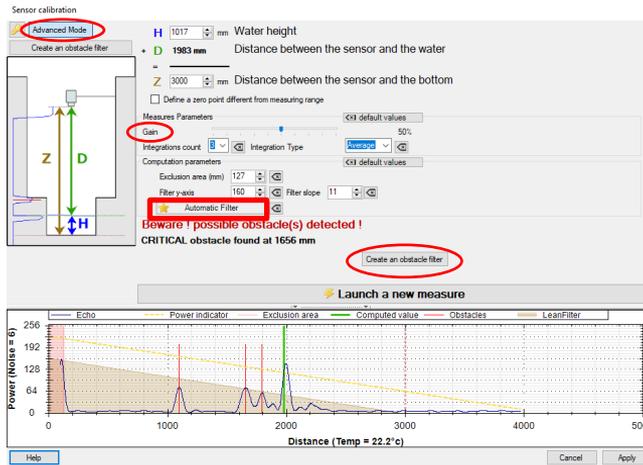
Advanced mode: If several peaks are present, the tools for the LNU are always available (filters, ...) and for the Radar the Gain is the equivalent of the ultrasonic power.
The gain is the most important parameter to set. Changing the "Integration Type" from average to maximum can be useful for measurements at distances > 4m and on a disturbed surface (e.g. presence of ripples).
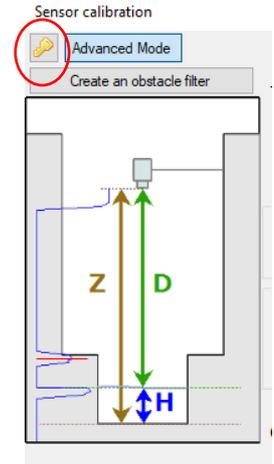

The « Expert mode » Is always available. Please contact us if necessary.

7. Other available applications with the level radar sensor

After connecting to an Ijinus radar and choosing to add a measurement, different possibilities are offered :
- Water height using radar level sensor
- Radar water height with the Osrai'Flow device to obtain the flow rate
- Radar water height with a convertion law to obtain the flow rate
- Finally, water level by radar with an external velocity sensor to obtain the flow rate after having entered the conversion table height to wetted surface
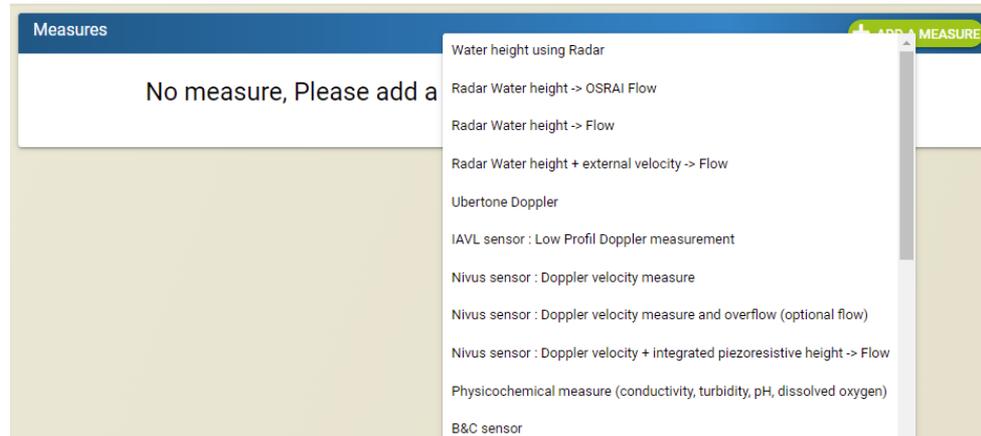
7. Examples of graphical measurement and echo data

The same data visualisation features as in previous Avelour versions are available:
- In graphical form after data download
- In list form
- Radar Echoes
- In the form of instantaneous values, after having activated
  the "see Direct measurements visualization using radio
- Data exports,
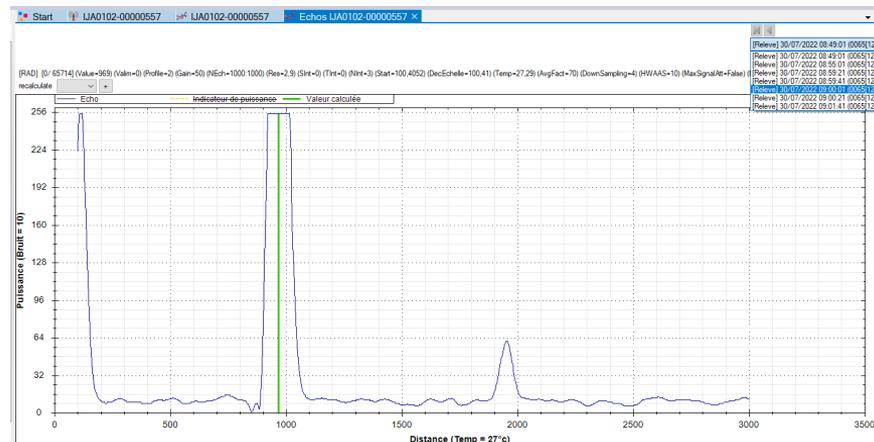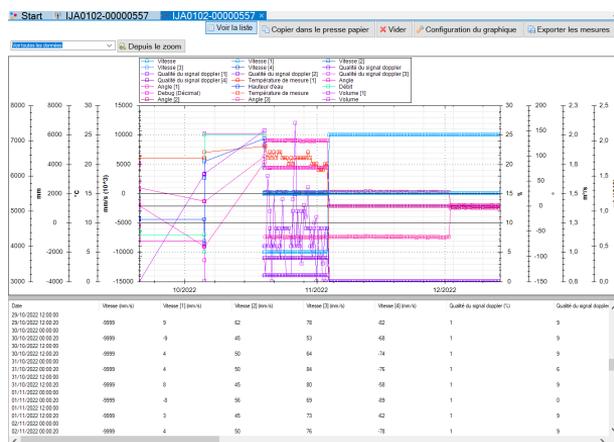
10. Force Measure & Angles

Installation aid with product verticality indicators
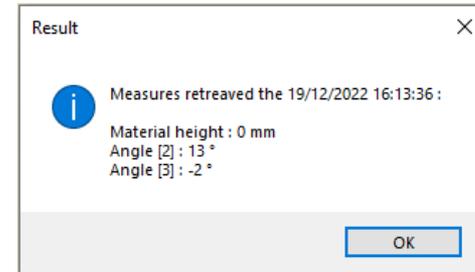

Example of sensor inclination:
Angle [2] to the vertical +20° on the left image and -20° on the right image
Angle [3]: 0° on the three images

NB: these angles are indicative, they do not correct the measurement !

Force a measure

In the connector axis: angle [3] of -2° and perpendicularly angle [2] of -13

IJINUS Head Office:

25 ZA de Kervidanou 3
29300 MELLAC – FRANCE
Tel: +33 2 98 09 03 30
info@ijinus.fr

After sales service
Ijinus and Teledyne Isco products
Baptiste Tabaric & Didier Gérard
Tel : +33 2 98 09 03 32
sav@ijinus.fr