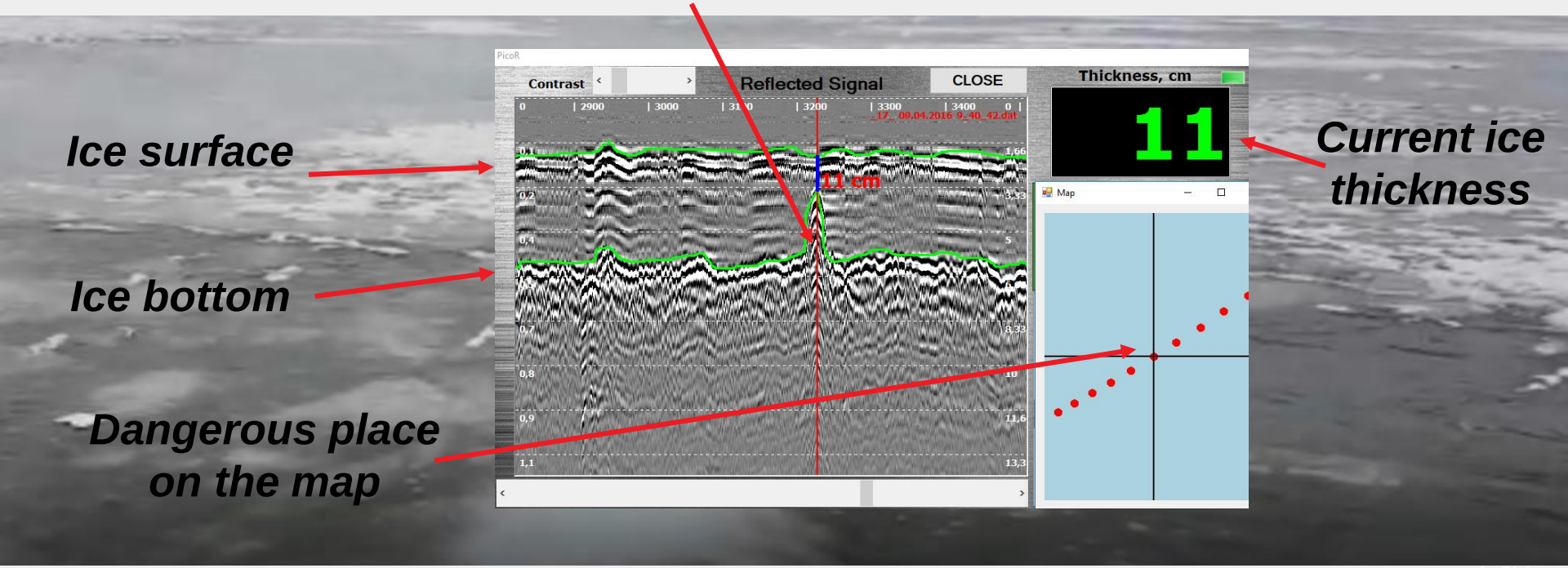
Don’t miss that critical ice crack!



PicoR-Ice GPR Ice and Snow Measuring System

By ESTRA company, Moscow, Russia
+7 903 735 9720, a@ledomer.ru, ledomer.ru/en

PicoR-Ice Measures Ice and Snow Thicknesses

- Ground Penetrating Radar (GPR) technology
- Continuous profile of ice thickness without constant ice drilling
- Real-time sensing, data processing, and display
- Saving measurement records, preparing reports
- Linking measurements to terrain: setting labels, GPS coordinates

Entire system fits in a single compact carrying bag with a folding shelf

PicoR-Ice Components

Transforms a Personal Computer into a Personal GPR

Hand-held operation

GPS (positioning) receiver can be attached to shoulder and plugged into computer USB port.

Antenna module plugs into computer USB port.

Entire system is powered from the computer's battery.

The laptop computer is placed in a breast bag with a folding shelf

Antenna module is carried ~50 cm above the surface.

Transport mode operation

Antenna is attached forward on a car, hovercraft, snowmobile, or other vehicle.

Antenna module plugs into computer inside the vehicle, using a 4.5 m cable.

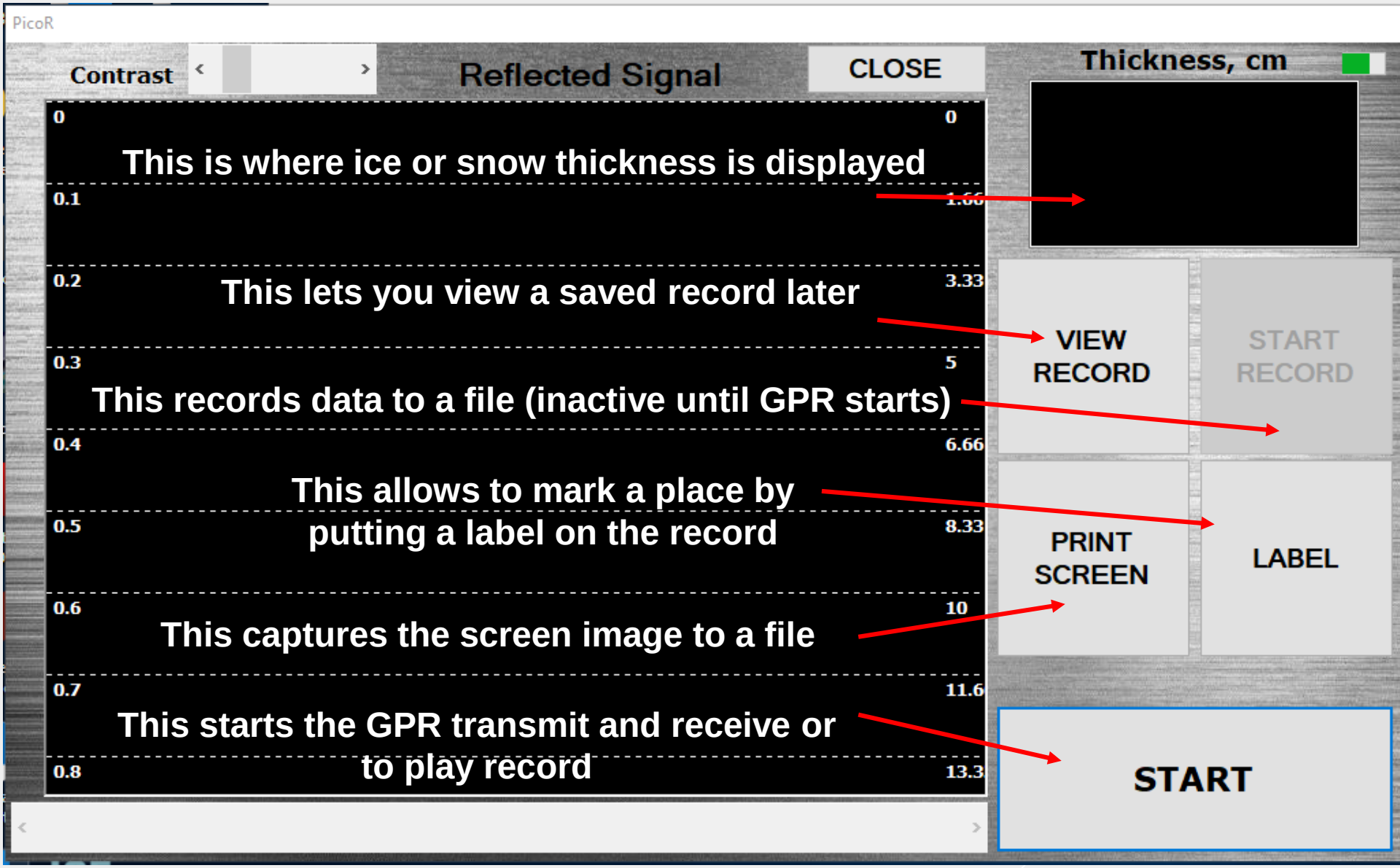
GPS receiver can be attached under the car glass or outside of vehicle.

Vehicle maintains a steady speed (less than 40 km/h) over the ice.

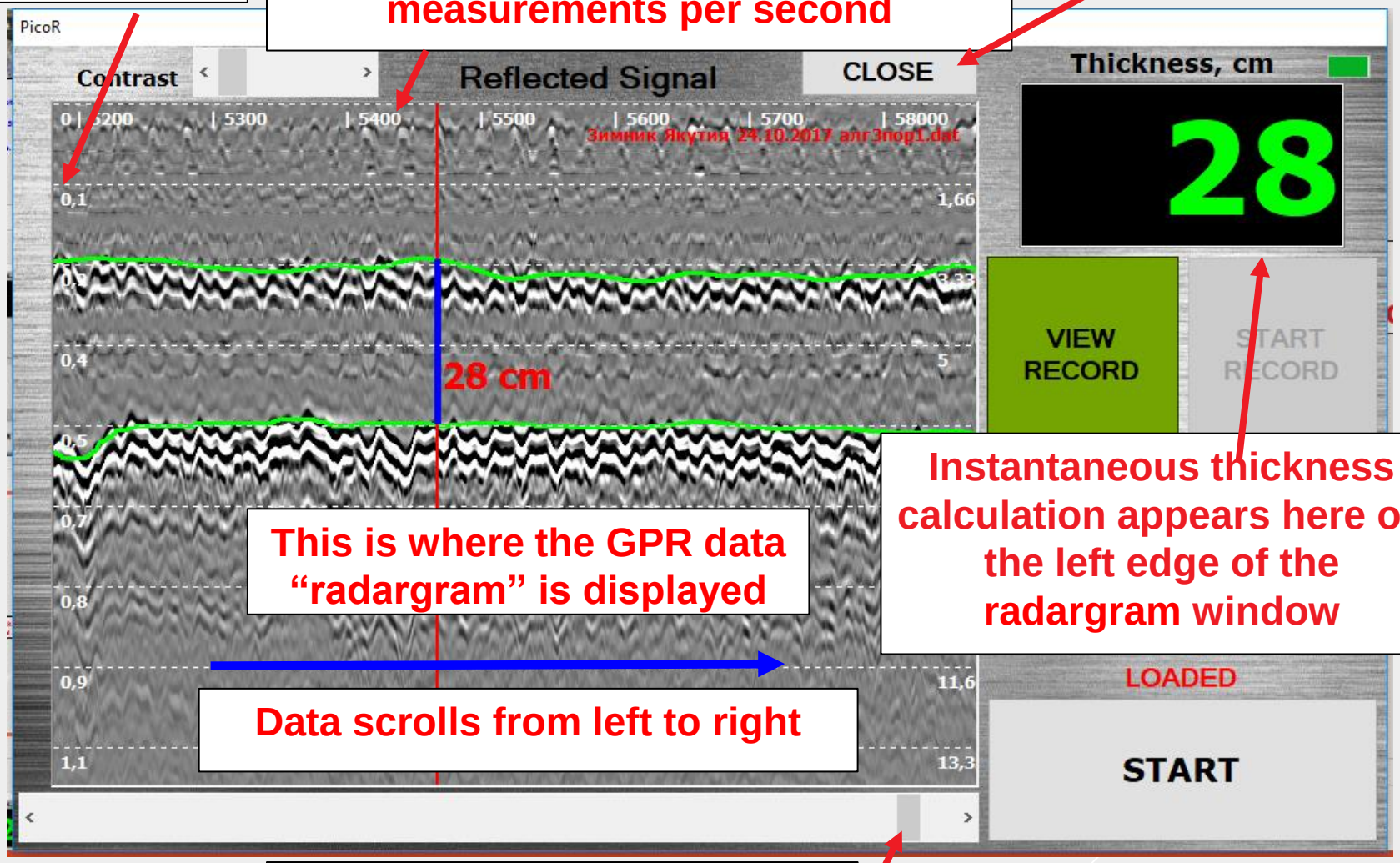
Antenna module remains ~20-50 cm above the surface.

Entire system is powered from the computer's battery.

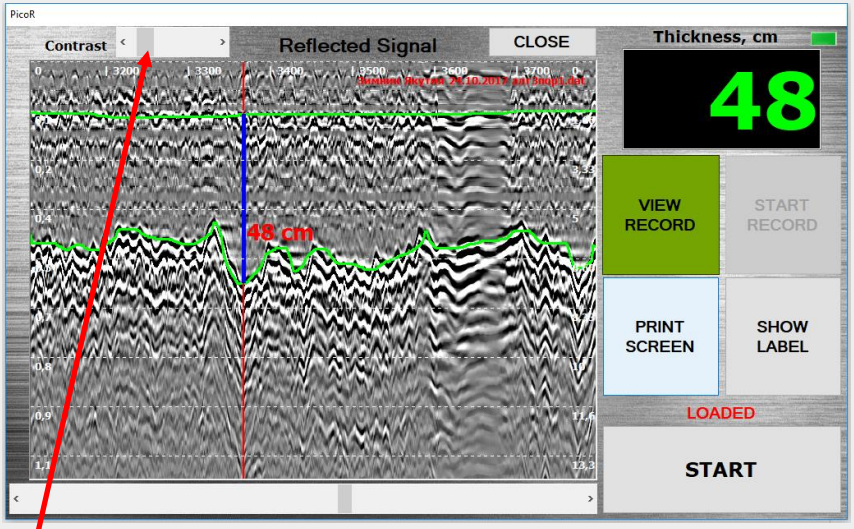
PicoR software. Main functions. Screen Display



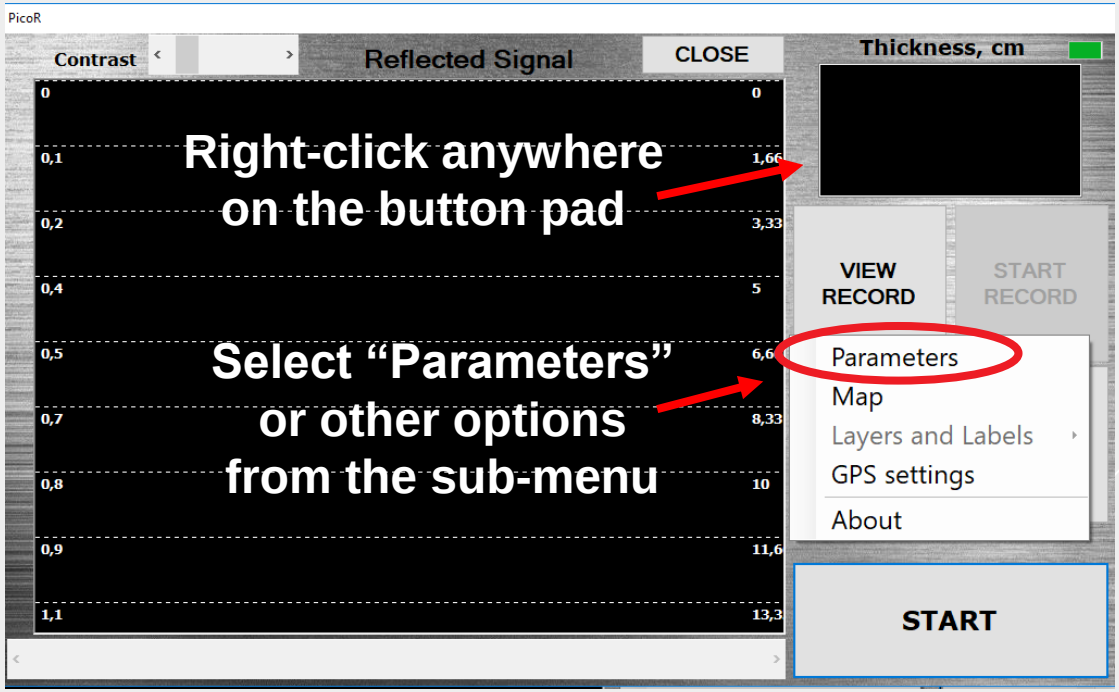
Screen Display



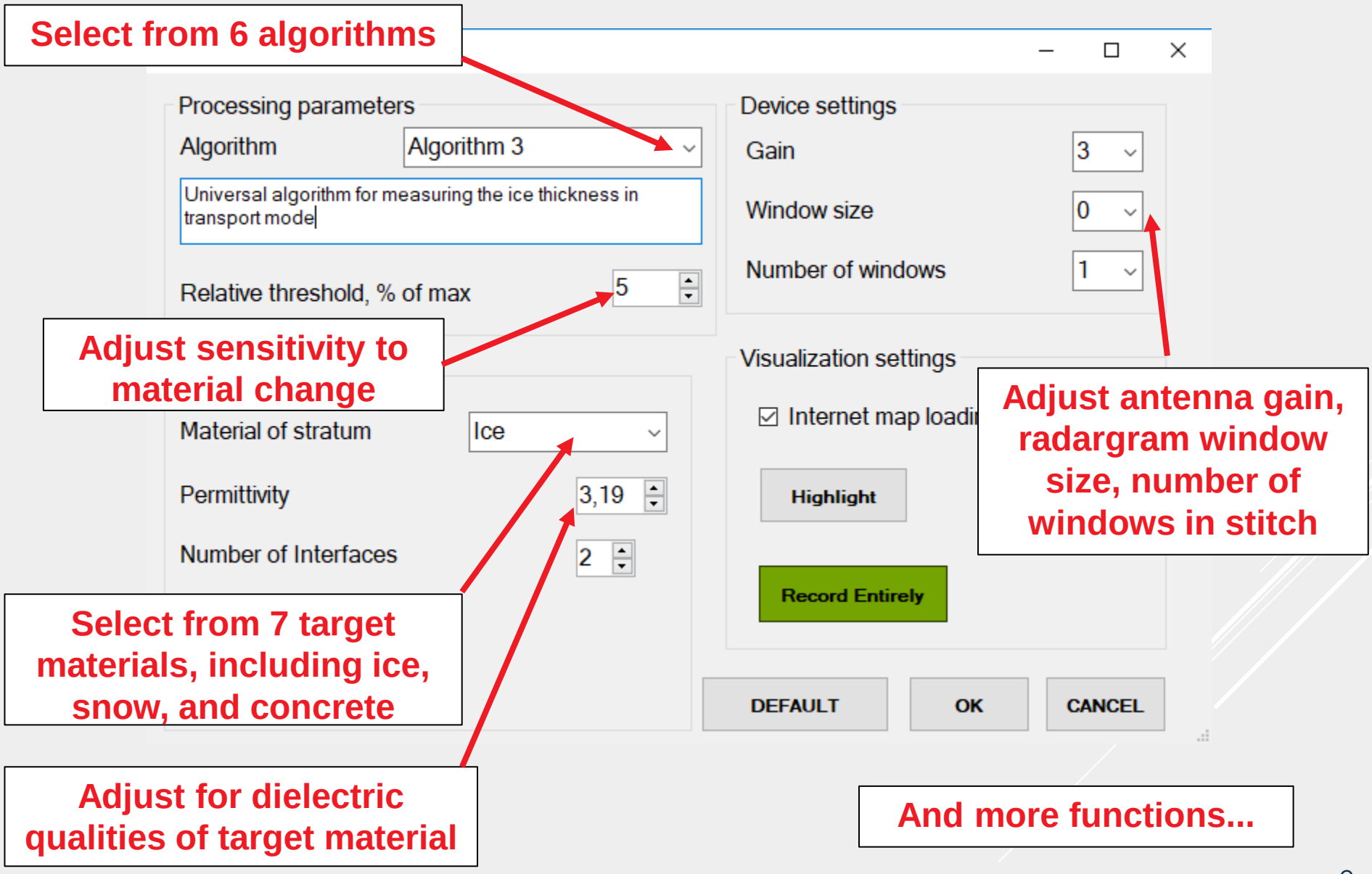
Display Contrast. Alter the Settings



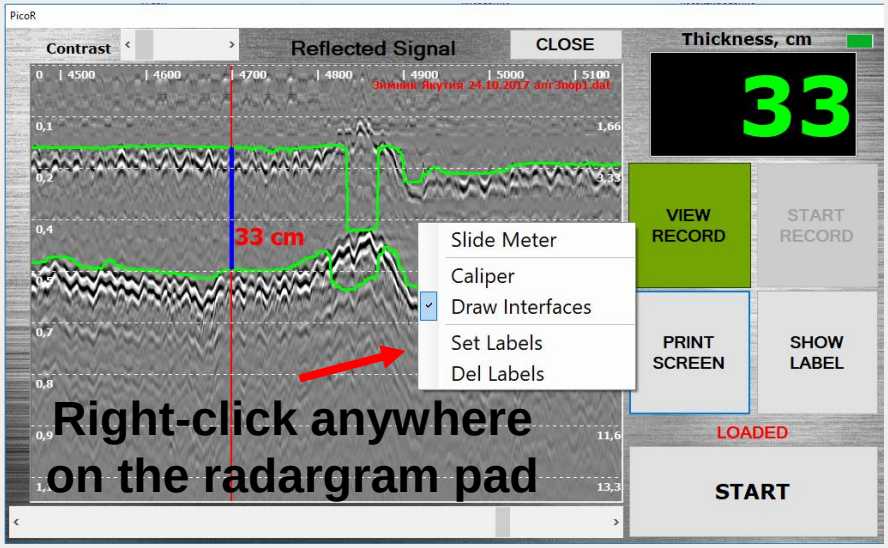
Control display contrast with the slider bar. On the right - too much contrast, you can see a lot of noise

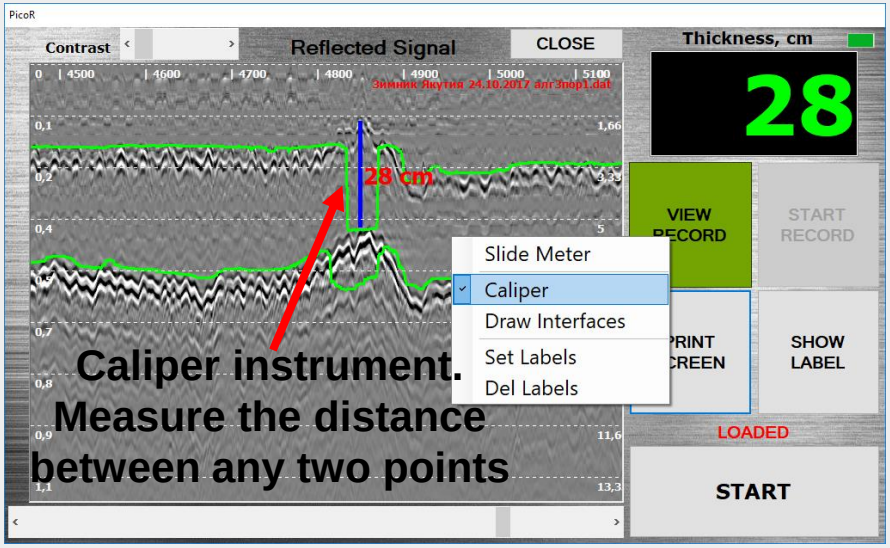


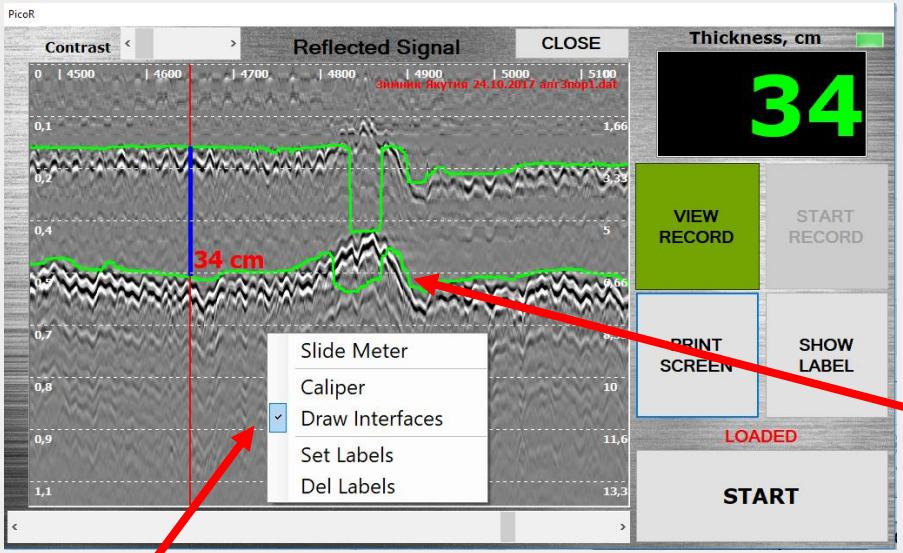
Screen Display – Alter the Settings

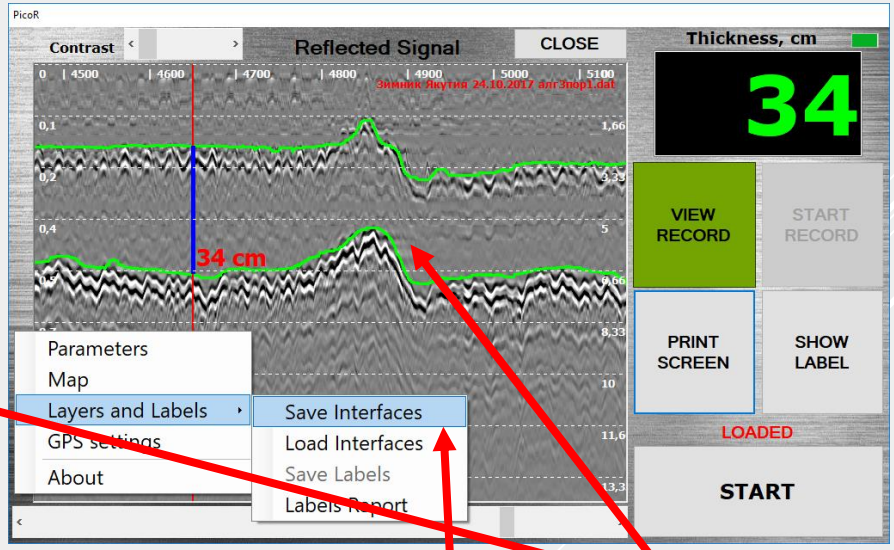


Screen Display – Alter the Settings in record mode



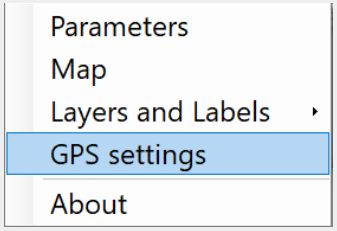


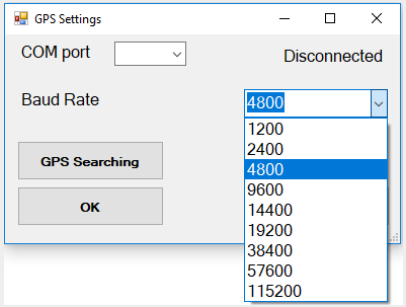


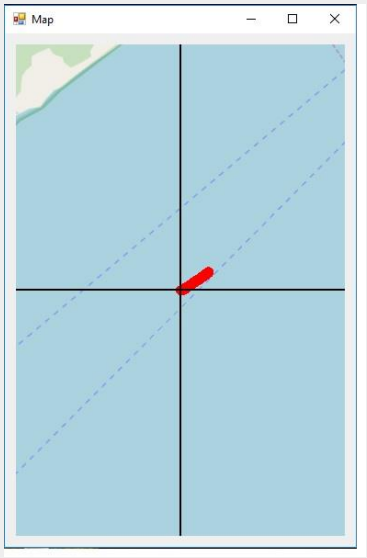


Draw Interfaces – very important and useful instrument! **It allows to manually correct all errors of the automatic algorithm on the record and store the correct boundaries in a separate file. Just left-click near green line, hold and draw. Then correct boundaries can be loaded by function “Load interfaces”**

Binding to GPS coordinates. Calibration



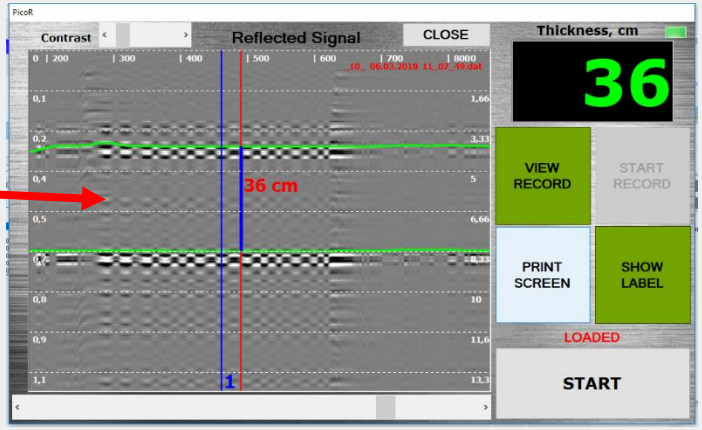




Connect the included GPS receiver to the USB port, install the driver and use GPS settings Then open map (loaded with internet available). After the start of the device, GPS coordinates (which are recorded in a text file) correspond to each ice thickness measurement.
All record are saved in C:\!UWB_logs folder:
Filename.dat is a main data file
Filename.lab is a file of labels,
Filename.gps is a GPS track,
Filename.del is a file of the selected borders.

Before performing work it is very important to calibrate the device!

1. **It is necessary to measure the thickness by the device at a point.**
2. **Then drill a hole at this point and measure the thickness with a ruler.**



If the values differ, you need to set the dielectric constant in the program so that the values match, using the formula:

$$\varepsilon = 3.19 \times \left(\frac{D_{device}}{D_{ruler}}\right)^2$$

Field Experience

Calgary, Canada

Ozhiski Lake, Canada

Lena River, Russia

Severnaya Zemlya, Russia

Moscow region, Russia

Gulf of Ob, Russia

Ob River, Russia

Ural River, Kazakhstan

Sakhalin Island, Russia

Songhua River, China

Lake Baikal, Russia

Expedition in Antarctica

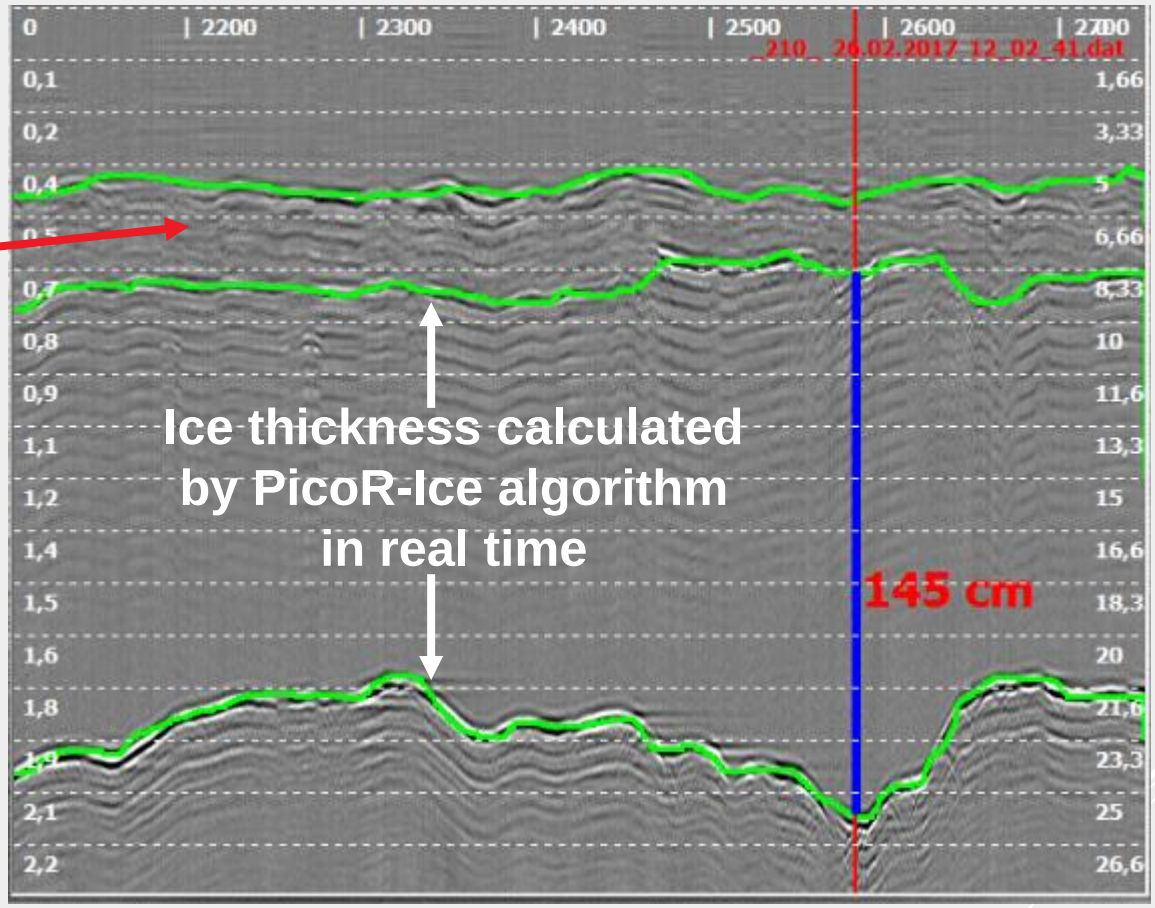
Wikipedia orthographic map projection

Manufacturer's Specifications

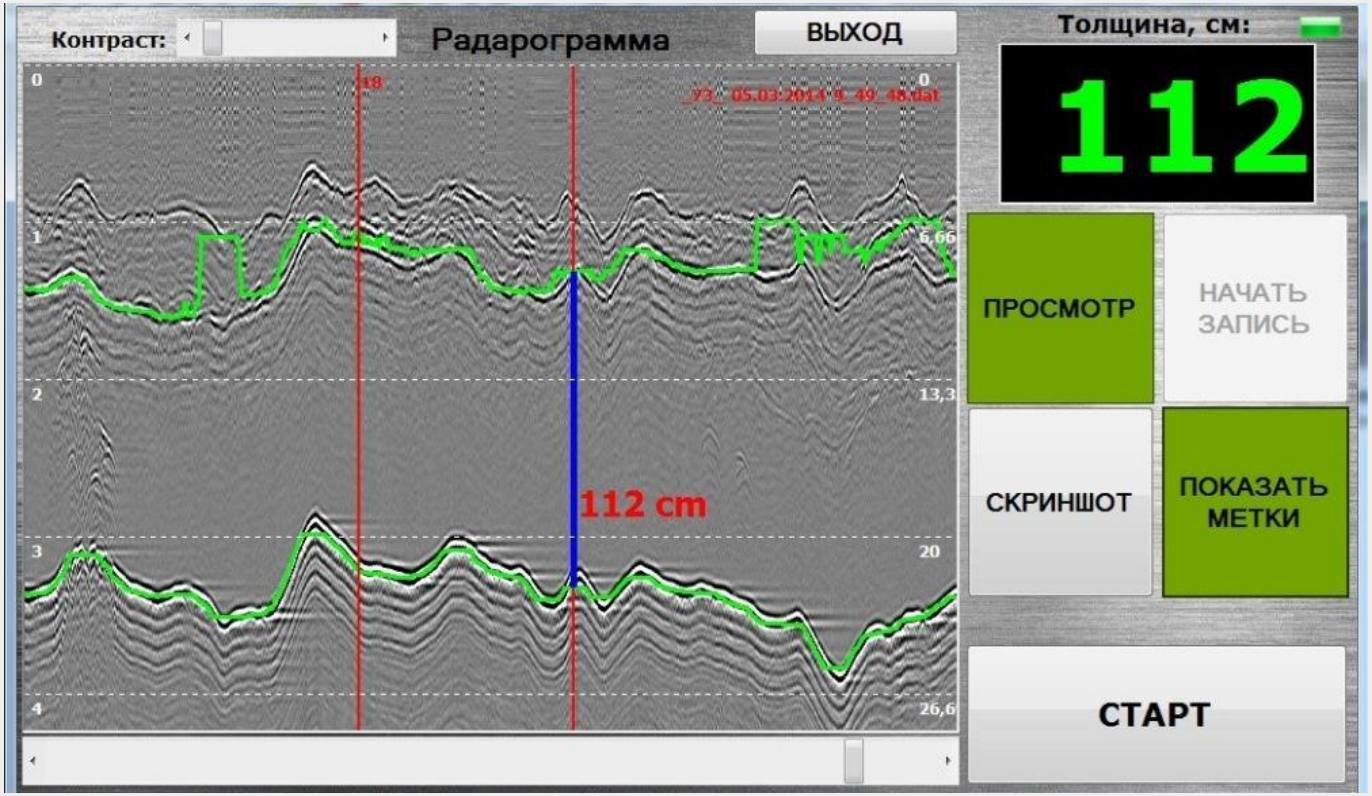
DESCRIPTION	SI	US/UK
Measured thickness for:		
Snow	5 to 200 cm	2 to 80 in.
Ice	5 to 300 cm	2 to 120 in.
Pavement	5 to 70 cm	2 to 28 in.
Ground (sand, loam)	5 to 100 cm	2 to 39 in.
Measurement accuracy	1 to 2 cm	0.5 to 1.0 in.
Transmit frequency	1700 MHz	
Measurements/second	30 to 60	
Max. Vehicle speed for measurement	40 km/h	25 mph
Antenna height above surface	20 to 50 cm	8 to 20 in.
GPS/GLONASS positioning support	Yes	
Antenna module dimensions	41 x 27 x 7 cm	16 x 11 x 3 in.
Antenna module weight	1.8 kg	4 lb.
Antenna module external interface	mini-USB	
Computer operating systems	Windows 7, 8, 10	

Gulf of Ob – Ice thickness measured during heavy equipment convoy

Additionally, the sensor picked up this observed snow layer

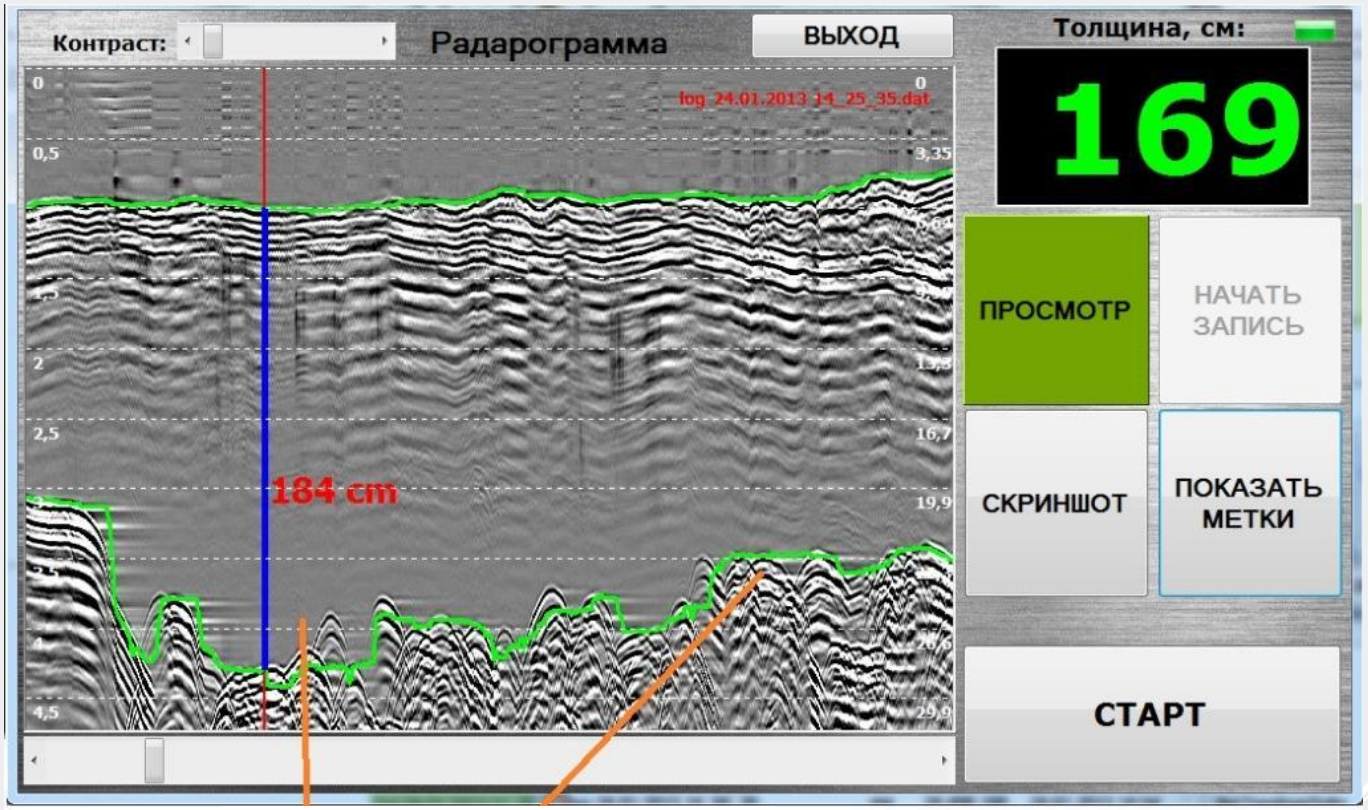


Ob River – Ice thickness profile from car-mounted antenna



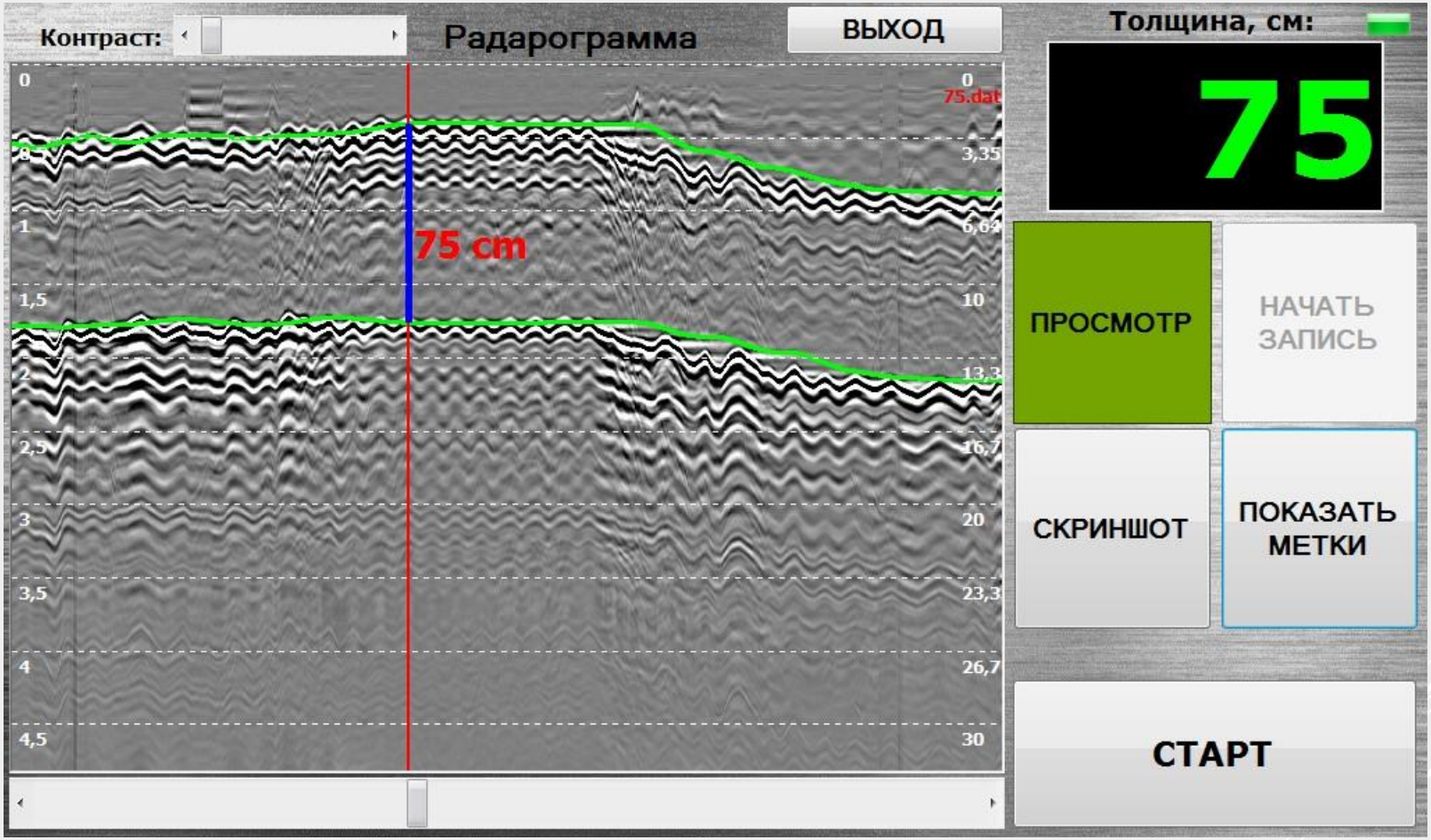
Ice thickness is 112 cm, a layer of snow up to 40 cm thick is clearly visible from above. Shaking along the road does not interfere with the operation.

Gulf of Ob – Ice thickness profile from ATV-mounted antenna



Frozen to bottom

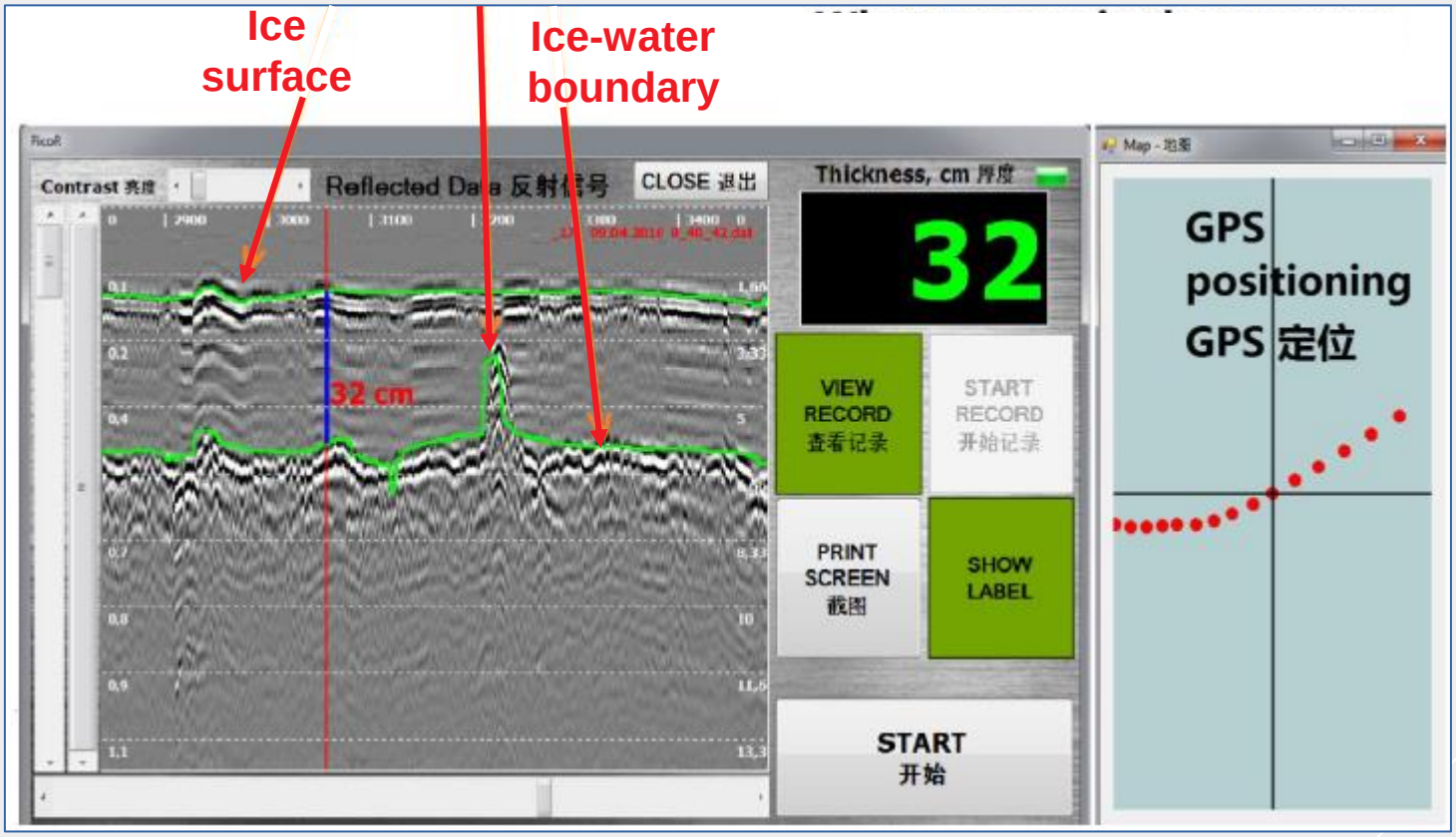
Lena River, Yakutia, profiled from automobile



Ice thickness of 75 cm; boundaries clearly defined by the algorithm. Depression at right may be due to snow layer.

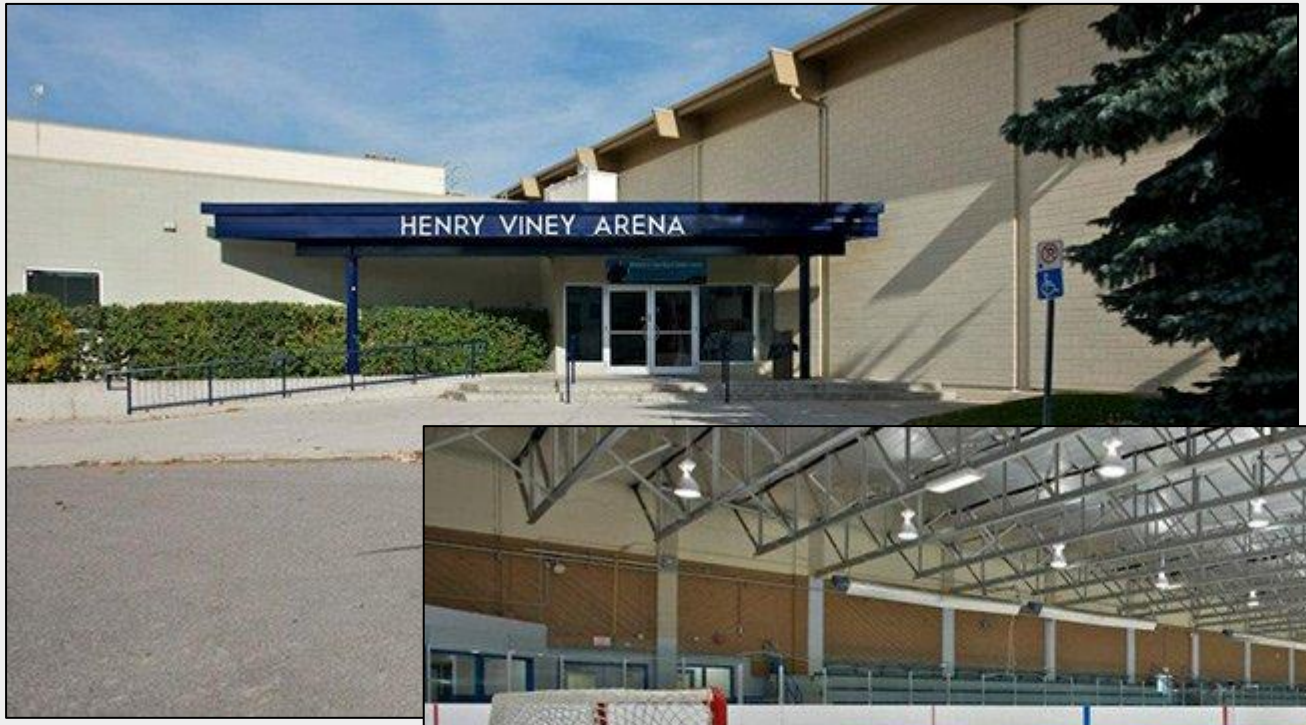
Songhua River, Heilongjiang, profiled from hovercraft

A significant crack in the lower part of the ice cover was detected.



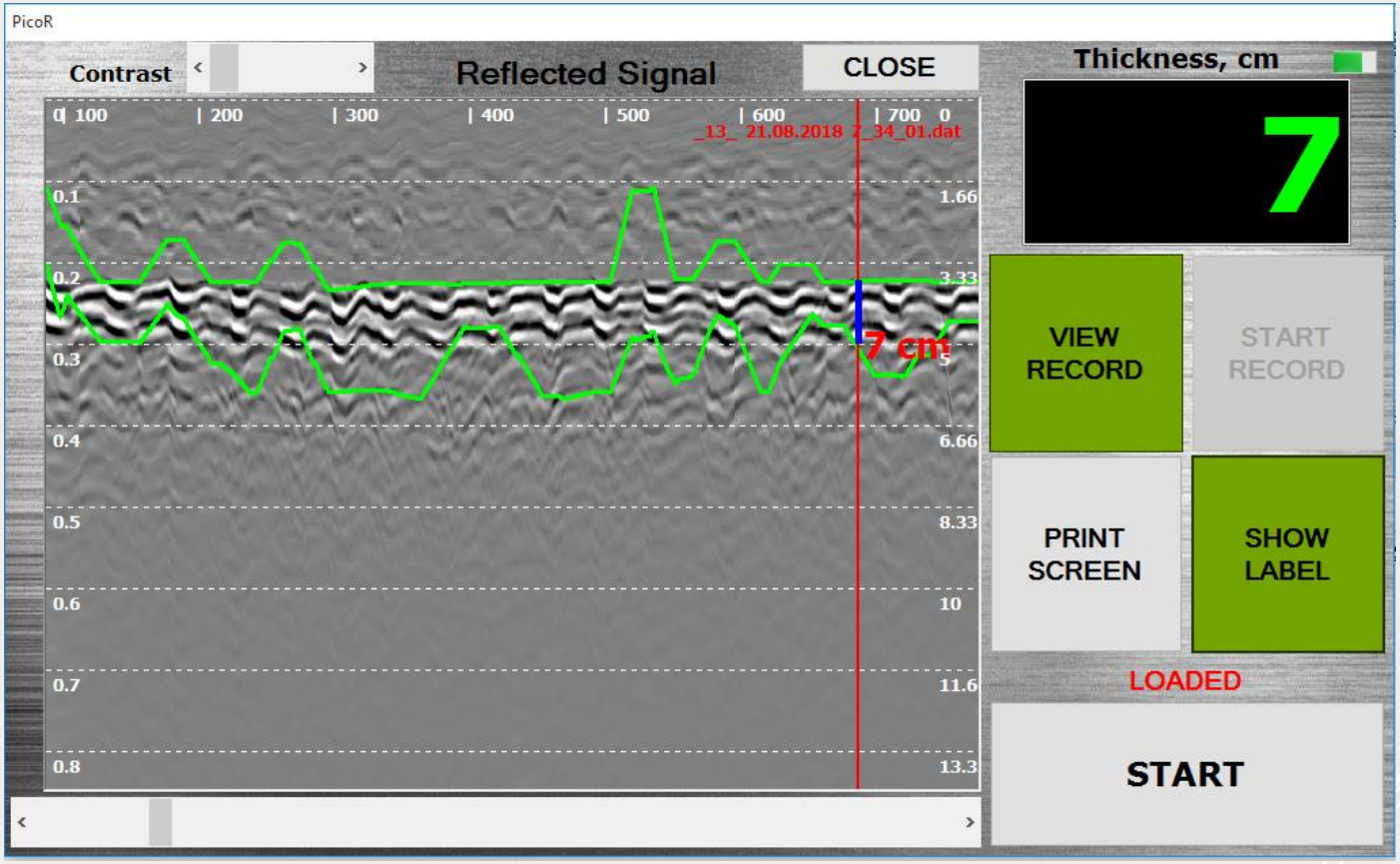
GPS receiver was attached and position map was displayed in this example.

Henry Viney Ice Arena, Calgary, 21 August 2018



Ice – 12 months per year at a community hockey arena.

Henry Viney Ice Arena, Calgary
21 August 2018



Exactly what one expects at a carefully maintained ice rink – 7 cm (3 in.) thick ice toward centre ice (15 cm/6 in. along boards).

PicoR-Ice in Summary

Compact!!

Low Cost

Connectivity with personal computers

A “Personal GPR”

No hazardous batteries

NEW!!

The PicoR-3 antenna module

1200 MHz frequency for deeper sub-surface penetration

For measurement of thick snow covers (over 2 m)