

## WORK AND ECONOMY



# Infrasound from wind turbines is a new signal in the environment

**Finland. Aunio Group Oy from Oulu has developed a device for measuring and recording infrasound produced by wind turbines. The measurement equipment can be used to produce research data for investigating the characteristics of infrasound and where it spreads, and to analyze any health problems it may cause. The infrasound produced by wind turbines differs from infrasounds occurring in nature; according to measurements the infrasound produced by wind turbines is a clear signal — distinguishable from ambient noise in the environment.**

Text: Reetta Reinman

**A**unio Group Oy from Oulu, Finland, has developed a measurement device capable of measuring and recording the infrasound produced by wind turbines at a distance of up to 50 kilometers and over from the turbines, according to owner and Managing Director of Aunio Group Oy, **Antti Aunio**. A prototype of the measurement instrument was made in autumn of 2016. At the moment Aunio Group has about 30 devices available for rent. The devices can also be used together as a measurement network, which makes it possible to monitor how far an infrasound spreads under different weather conditions, for instance.

"Humans cannot hear infrasounds because they are very low frequency. Their frequency is less than 20 Hertz", says Mr. Aunio.

**ACCORDING TO AUNIO**, his measurement device is capable of distinguishing nature's infrasounds from the infrasound produced by wind turbines. The infrasound from wind turbines stands out as clear, repeating signals that are distinct from natural infrasound, which is a steady type of noise.

**"Never before has there been this kind of continuous, regular infrasound signal covering entire regions."**

"It's an interesting situation because never before has there been this kind of continuous, regular infrasound signal covering entire regions. This is an entirely new environmental factor and its long-term effects on people and animals are not yet known."

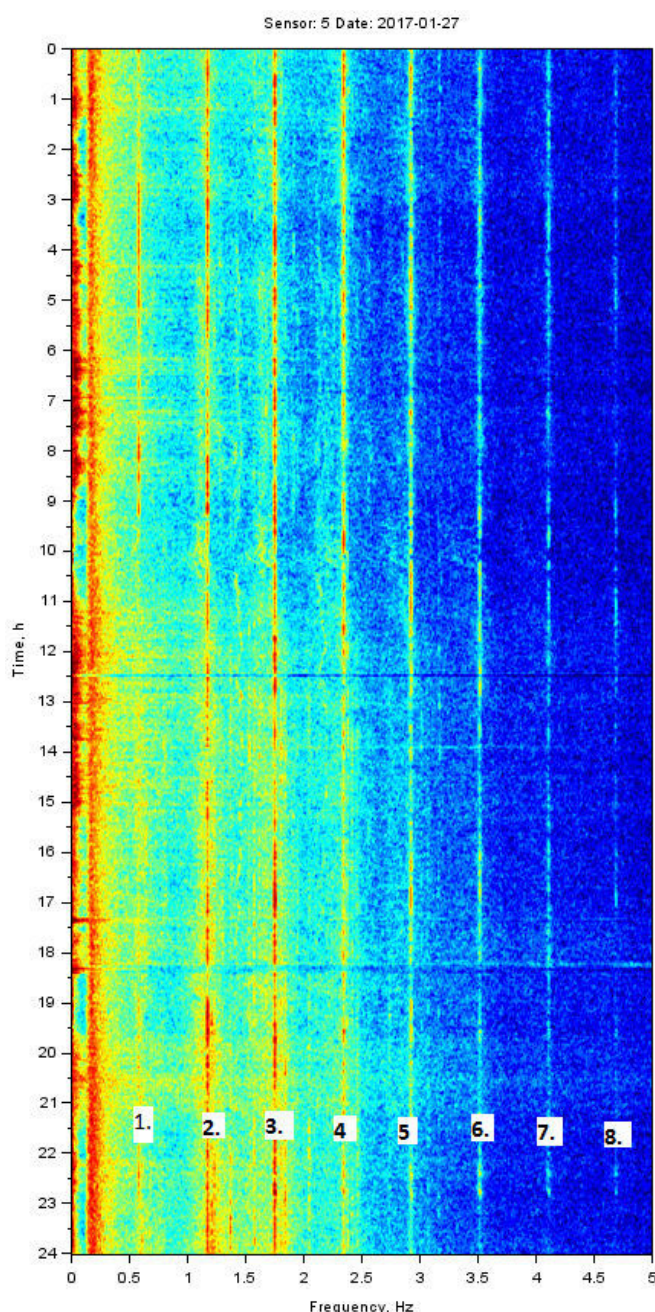
**AUNIO'S COMPANY** placed about 20 measurement devices in homes of people who

had complained of symptoms caused by wind turbines in a self-funded pilot project to collect data in different parts of Finland. At the same time, the inhabitants wrote down their feelings of symptoms. The measurement data was not shown to the inhabitants. Measurements were carried out in several different locali-

ties in Finland, including Oulu, Siikajoki, Kalajoki, Ylivieska, Kurikka, Pori and Merikarvia. Aunio does not take a position on how infrasound affects humans. He believes the matter should be studied and measured properly, and any effect of wind turbines on health should be analyzed based on the measurements. "Because this kind of environmental factor has never existed before, we don't yet have any experience of its long-term effects. It is known that short-term exposure to infrasound at a strong signal level is harmful to health. But nobody knows how harmful long-term exposure to infrasound produced by wind turbines is. There is no detailed scientific research and analysis on the long-term effects of infrasound. Research data would bring clarity to the question of whether a clear causal link between infrasound of wind turbines and people's health problems can be established", says Aunio.

"Our measurement devices are able to produce research data for analysis. They are able to record infrasound continuously for long periods of time and the results can be compared with symptoms experienced by a person," he emphasizes.

"In any case, we have in Finland a new signal in the environment, which is infrasound caused by wind tur-



## How does the infrasound from wind turbines differ from infrasound from nature?

**T**he image shows a typical spectrogram of infrasound produced by wind turbines. The horizontal axis shows the frequency from 0-

5 Hertz. The vertical axis shows time of day from 00:00–24:00 from top to bottom. The strength of the infrasound is depicted with colors from blue to red. Red

is a strong signal. The measurement was conducted from residential premises. The nearest wind turbine is located at a distance of approximately 1.37 km. The

infrasound originating from the wind turbine is shown in the spectrogram as clear streaks in the frequencies numbered 0.6 Hz, 1.2 Hz, 1.8 Hz, etc. •

Questions on coloured background answered by Antti Aunio.



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bines. The measurement images produced by our equipment show clearly the continuous infrasound produced by wind turbines, as the spectrum peaks in the spectrograms disappear when the turbines are stopped. We have noticed that infrasound is partly masked or covered by ambient noise during heavy ground winds,” says Aunio.

“We have observed through our measurements that the infrasound of wind turbines spreads very far from the turbines. As a result of modern development, the infrasound produced by wind turbines will be a new signal in our environment that will have an effect all over Finland”.

ACCORDING TO ANTTI AUNIO the device developed by Aunio Group Oy for measuring the infrasound produced by wind turbines is the first instrument suitable for continuous non-interrupted measurement that is inexpensive enough to enable an extensive measurement network.

“External funding is needed to continue the research; the role of our company is as device developer.”

According to Aunio the research project has been offered to the Ministry of Social Affairs and Health as well as the Ministry of

Employment and the Economy in Finland. No response has been received from the ministries.

“We absolutely are not looking for any kind of confrontation; no ‘he said – she said’ debate on the possible health hazards of wind power, but our company offers measurement equipment for investigating the matter. Thanks to the measurement device, there is a way to investigate the correlation between infrasound and health effects in the long-term,” emphasizes Aunio.

ANTTI AUNIO has previously worked at Nokia in mobile phone technology and product development projects and at Valkee Oy. He first heard about the infrasound produced by wind turbines about six years ago.

“At that time, I was told that large wind turbines produce infrasound that can travel dozens of kilometers from the turbines. There were people in the world claiming that infrasound is dangerous to the health of people and animals and long-term exposure causes permanent physiological changes.”

IN HIS PREVIOUS jobs Aunio had to consider the placebo effect and how it can be re-

duced in medical device trials.

“The placebo effect is known to be extremely high and presumably the nocebo effect is equally challenging. In placebo, the person being treated is healed even though the medicine is just a calcium tablet, whereas the nocebo effect means a person gets symptoms from an external factor for which a physiological causal relationship to the symptoms has not been scientifically demonstrated.”

The possible health effects of the infrasound caused by wind turbines continued to bother Aunio.

“I heard through a friend that people living near wind turbines in several localities in Finland had begun to develop symptoms that were similar to what researchers in different countries had reported. People had developed a.o. arrhythmias, hypertension, unexplained awakening at night, ringing in the ears and tinnitus at a low frequency.”

“My friend had also obtained an infrasound measurement device with which he had been able to measure the infrasound from wind turbines. At the same time, he had monitored his own symptoms and written them in a diary. He had recorded the infrasound for one month at a time and

compared the infrasound from wind turbines with the dates when symptoms appeared. He found that there was a connection between the symptoms and infrasound. We often talked about how to investigate the matter more extensively. We concluded that there should be an infrasound measurement kit that is affordable enough so that it could be used to measure and record in multiple locations simultaneously and collect data of people’s experiences of health hazards at the same time. Finally we decided to develop our own measurement device for carrying out the research if necessary, and meet the needs of people concerned about the possible health hazards of wind turbines.

SINCE JANUARY 2017 in the pilot project more than 20 of Aunio Group’s infrasound measurement devices have been placed in different parts of Finland in an approximately 1-10 kilometer radius from the wind turbines in homes where inhabitants have experienced health problems that developed after the wind turbines came. The measurement devices have been in one place at a time for a month. At the same time the people in the homes have filled in a symptom diary every day.

“Thanks to the measurement equipment and pilot project, Finland now has unique technology and know-how for studying the connection between infrasound and people’s health problems experienced”, says Aunio.

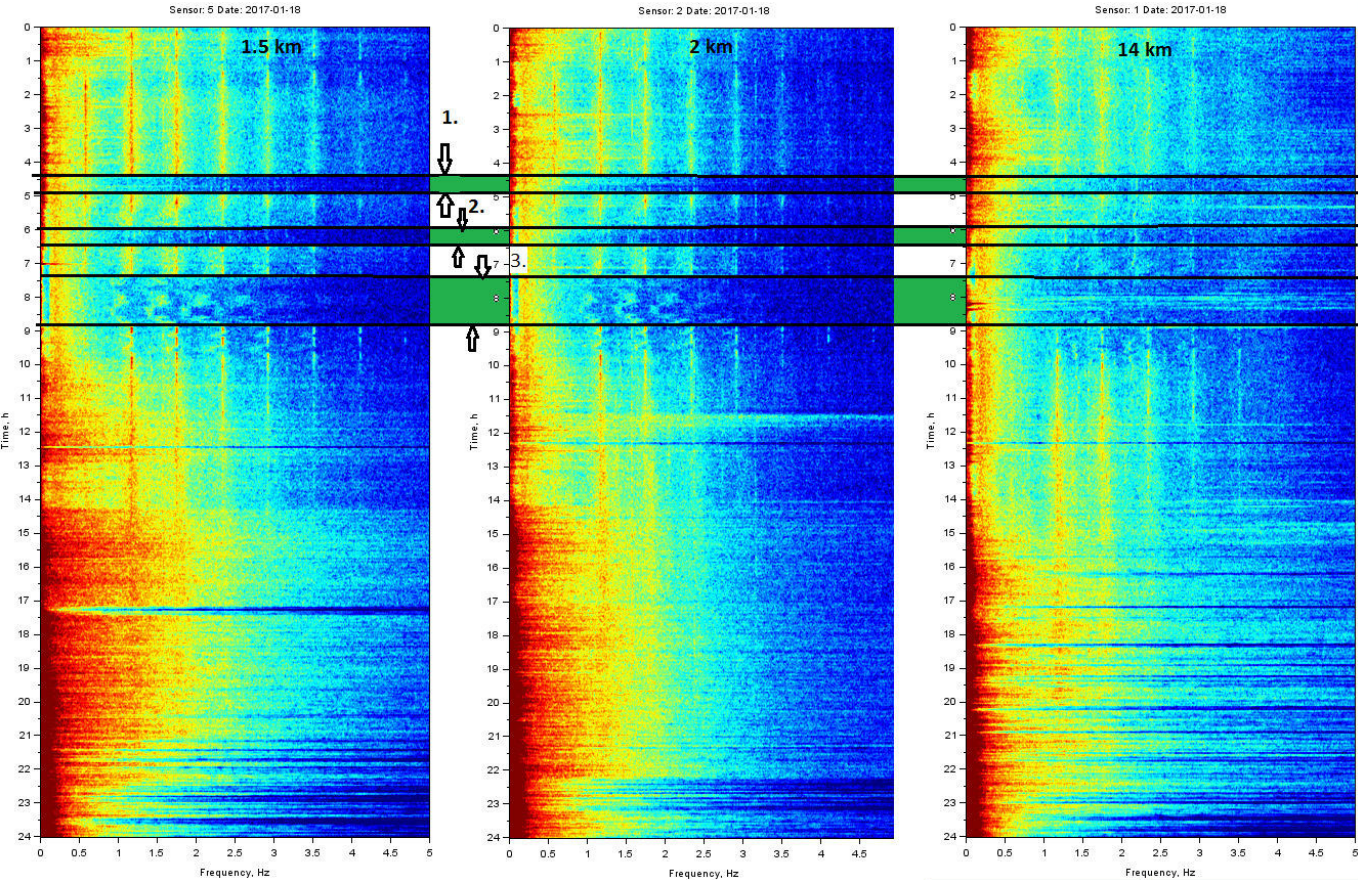
Aunio Group rents infrasound measurement devices around Finland.

“At the same time, our customers have the option of taking part in the research by filling in a symptom diary during the measuring period. At the end of the measurement period the

customer receives spectrograms of the incidence of infrasound and copies of the symptom diary. We combine the incidence of infrasound with data of the symptom diary without any personal data in the research data.

The measurement equipment is also used to measure other low-frequency sounds occurring in environment, such as disturbances caused by pumping stations in living spaces,” says Aunio.

For more information check out [www.auniogroup.com](http://www.auniogroup.com).



Can we be absolutely sure that the infrasound shown on the spectrogram is caused by wind turbines?

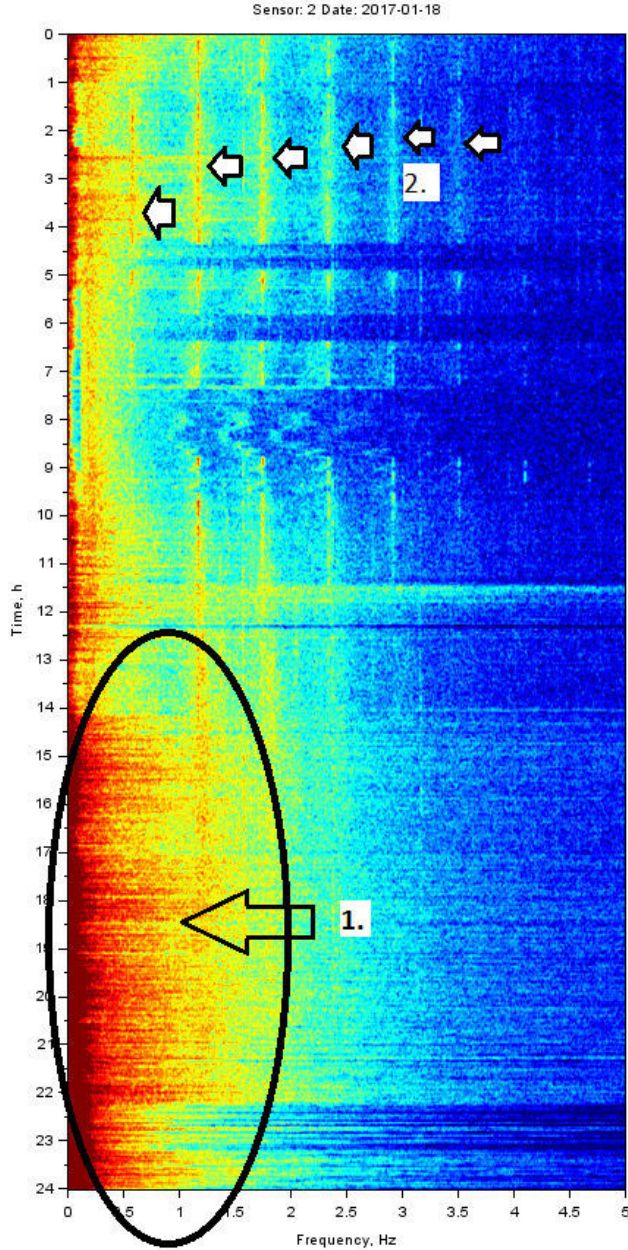
The image shows infrasound spectrograms side-by-side measured from three different distances on the same day. The distances of the measuring sites from the nearest wind turbines are

about 1.5 km, 2 km and 14 km from left to right.

During the periods indicated by arrows, the nearest turbines have been stopped (space colored in green). The stoppages of wind turbines are clearly dis-

tinguished in the spectrograms even at a distance of 14 km. This demonstrates that the spectrum peaks that are visible in the spectrograms (vertical stripes), which disappear when the wind turbines are stopped, originate

from the wind turbines in question. There are weaker infrasound signals present, too, coming from turbine areas located farther away in the spectrograms.



Infrasound also occurs in nature, mainly caused by wind. How is the infrasound from wind different?

In this image a strong ground wind causes ambient noise at low frequency bands. There is especially strong fluctuation at the very low frequencies, which is best detected from measures of time level. There is no noticeable periodicity in the infrasound produced by wind. The image below has a circle (1) at a point of infrasound caused by a strong ground wind. The infrasound caused by wind turbines is seen very specifically in the points indicated by the white arrows

(2). Ground wind here refers to wind moving at low altitudes. It is worth noting that even when there is wind higher up and wind turbines are operating, it isn’t always windy on land. It can be seen from the above image that there is not much wind on the ground between 0:00–14:00 hours, but there is a strong wind between 14:00 and 22:20 also on the ground. The infrasound from wind turbines is partly masked by ambient noise during a strong ground wind.