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"WOLF" complex can detect the following activities:

- crossing border by a foot-slogger and / or a vehicle
- digging tools operation
- excavation equipment operation
- movement and / or operation of heavy vehicles

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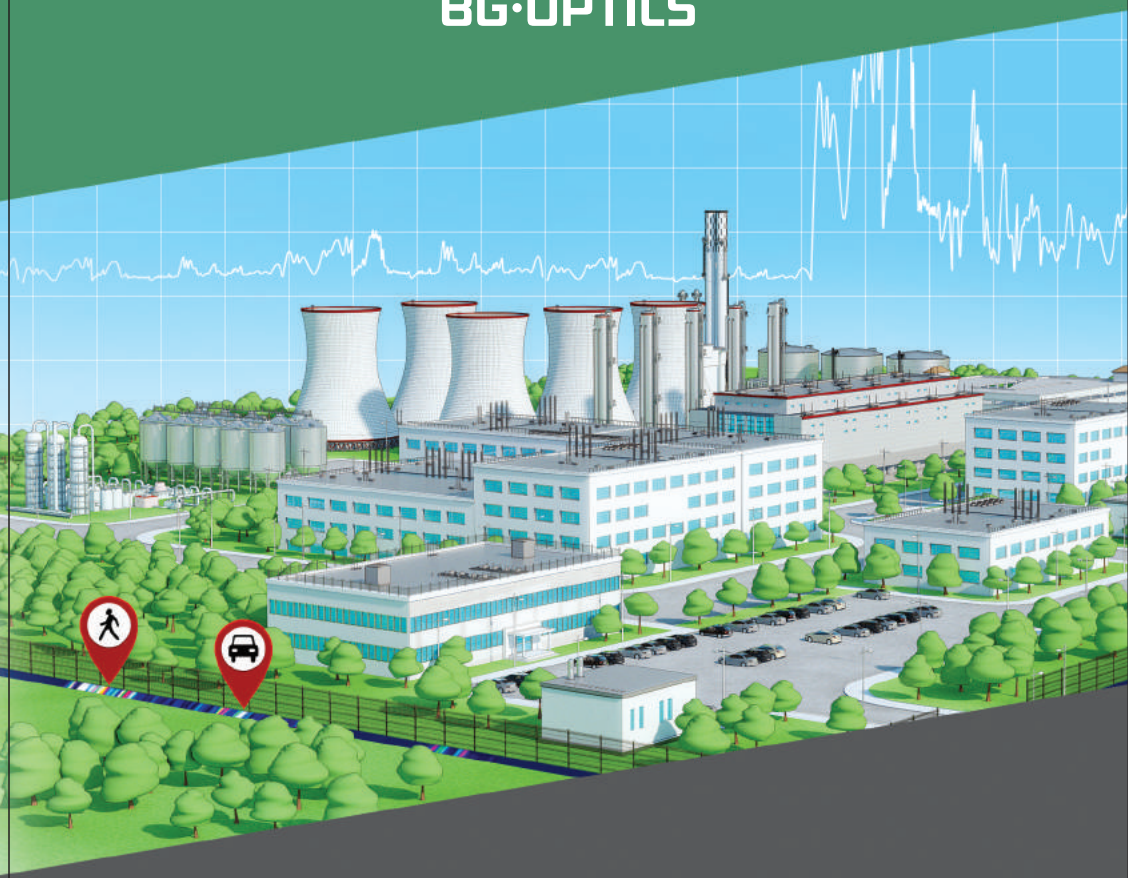

WOLF COMPLEX

Warning Optic-fiber Line Facility

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WOLF COMPLEX

Warning Optic-fiber Line Facility

2016

Distributed Optic Fiber Acoustic Sensing Security Complex “WOLF” can provide monitoring and guarding for outlines of extensive objects.

The Complex allows detection of approaching to the protected area and crossing of its borders. In case of a footslogger and / or a vehicle, approaching or in case of any earthworks being carried out in the area adjacent to / near the guarded object the incident location data is transmitted by “WOLF” to the subscriber / operator terminal in a real-time mode.

“WOLF” complex / system is based on the distributed optical fiber vibration acoustic sensor. Its key element is coherent optical reflectometer.
Ordinary telecom single mode optical fiber (SMF 28 e+) is used as the sensitive element of the cable-sensor. That is how the electrical inactivity of the sensitive element is provided.

The Complex allows detection of any types of activities, which induce acoustical vibration in the area physically connected to the cable-sensor. Usage of the reflectometry principle allows determining place, time and character of such activity. One “WOLF” Complex can replace large number of point sensors. It allows detecting and tracking any number of objects simultaneously.

STANDARD “WOLF” CONFIGURATION

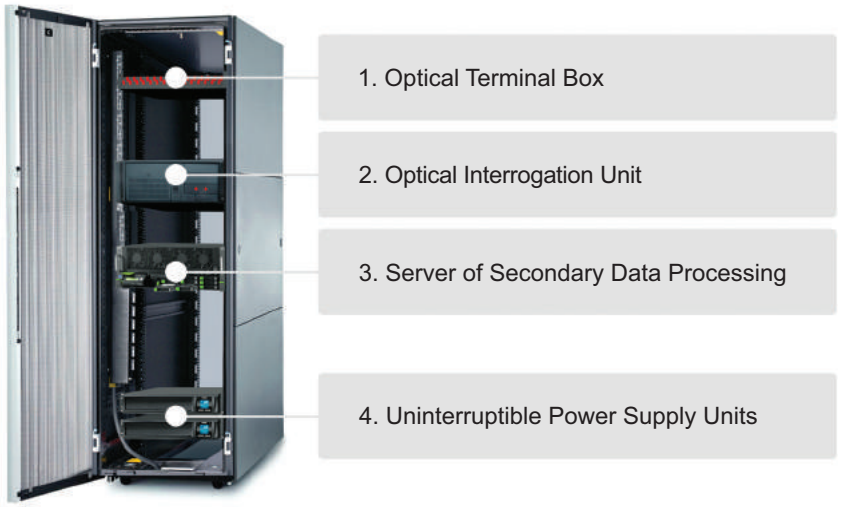

Fig.1 *A typical Server Rack, equipped with “WOLF” system.*

Standard "WOLF" configuration:

1. Optical Terminal Box for optical fiber commutation;
2. Four-channel Optical Interrogation Unit, allowing to connect four optical lines 40 km. each;
3. Software Server of Secondary Data Processing, allowing interaction with external systems and complexes by standard protocols;
4. Uninterruptable Power Supply Unit allowing 2 hours of autonomous operation.

"WOLF" Complex allows detection of the following activity types:

digging using manual tools / spading;

invasion and / or approaching to the protected area by a foot-slogger, vehicles and machinery;

digging using excavation machinery;

caterpillar machine moving;

determining direction of crossing the protected perimeter using several sensor lines;

object tracking at the protected territory in case of using special scheme of cable-sensor installation.

Standard "WOLF" configuration has the following parameters and qualities:

the position defining accuracy along the cable-sensor is 10 m.;

maximum length of the sensitive element is 40 km.;

complex reaction time is 0.5 s.;

security alarm forming time is 5 – 10 s.;

the false intrusion alarms generated due to occurrences other than sensor cable motions are less than once per month;

the system shall be adapted to minimize the rate of alarms induced by environmental and technogenic factors (false alarms) during installation and checkout phase period.

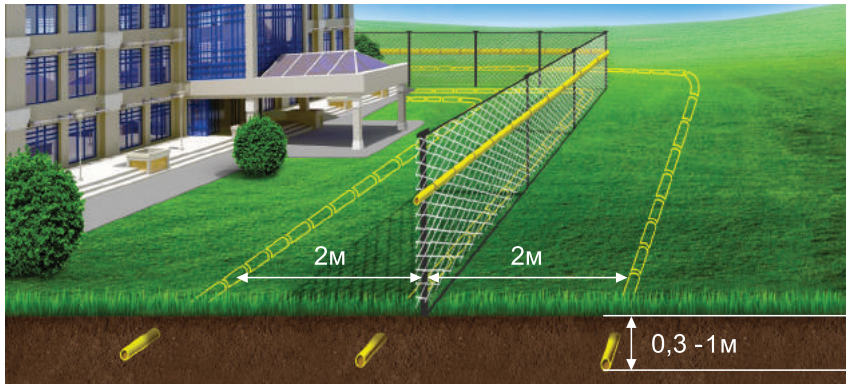

Fig.2 *Example of cable-sensor installation.*

Requirements to the Sensor cable routing and installation:

1м — cable installation depth – less than 1 m.;

40 — less than 40 splices on 40 km length cable-sensor;

cable-sensor could be mounted on fence;

GPS GLONASS — cable-sensor should be geo-referenced by using GPS or Glonass after installation.

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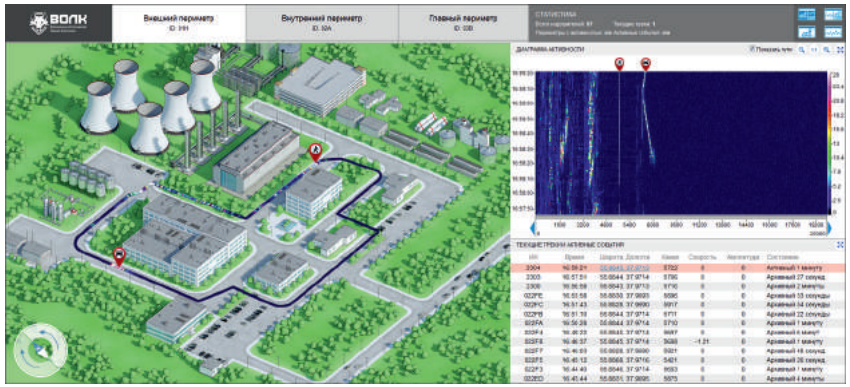

Fig.3 *shows an example of the user's interface, with information mapping about detected activities (a man on foot and / or a vehicle).*

Remote detection characteristics of typical impacts:

2 м — A footslogger – 2 m.

10 м — Heavy machinery moving – 10 m.

20 м — Digging using excavation machinery – 20 m.

2 м — Digging using manual tools / spading – 2 m.

5 м — Light vehicle moving – 5 m.

50 м — Caterpillar machine moving – 20 m.

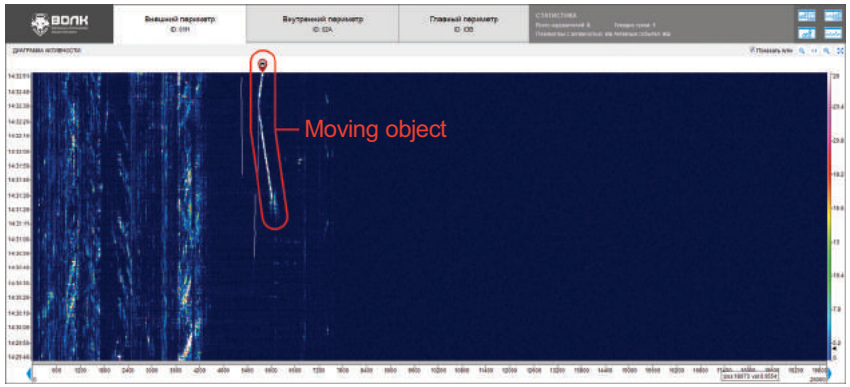

Fig.4 *"Waterfall" is the display method of primary activity. Oblique track corresponds to vehicle movement.*

The alarm event is formed resulting from the secondary data processing. It contains information about location figures (coordinates), time and character of the activity. This information is sent to the operator terminal or to the external system by using standard protocols.

Complex "WOLF" guaranties stable operation and detection reliability. Maximum outline-area extension under one module control is 80 km. Modules can be combined at the logical level for controlling extended outline areas. Thus, the extension of the controlled object is not limited. The position determining accuracy along the cable-sensor is 10 m.

Geo-referencing of cable-sensor could be carried out by using the following mapping projects: Google, Yandex or OpenStreetMap also BG-3Dmaps is available.

Guarded outline area control is permanently performed along the full length. In case of activity, detecting "WOLF" instantly informs the user about the event. Security alarm forming time is 5 – 10 s.

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VIBRO-ACOUSTIC MONITORING COMPLEX "WOLF"

Vibro-acoustic monitoring complex "WOLF" has scalable structure able to control object state permanently.

"WOLF" software supports interaction with external systems through web-interface. That allows receiving information about the object state by using mobile devices. Unlike most of other, out-line monitoring systems "WOLF" is very easily installed and constructed. Depth of cable laying should be 0.3 – 1 m. Cable-sensor is based on ordinary telecom single mode optical fiber (SMF 28 e+), it doesn't contain any current conductors and does not require any special conditions for its placement.

Drum length of the cable-sensor usually corresponds to 4 – 6 km. Cable sections splices by using splice closure. Cable-sensor splicing and / or repairing in case of its breaking is carried out by standard welding equipment.

Vibro-acoustic monitoring complex "WOLF" is the self-sufficient complex, which meets all possible specified requirements for security systems. "WOLF" does not require application of other systems, but it can efficiently operate jointly with them.

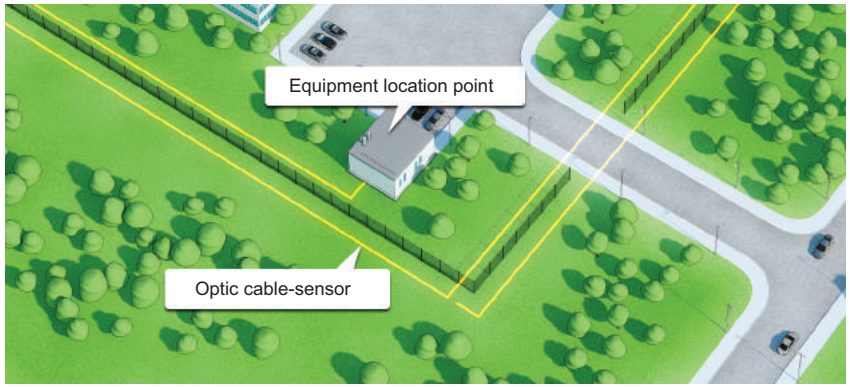

Fig.5 *shows a part of a 3D map of an area with the layout chart of the cable-sensor and equipment positioning.*

The provided software allows minimizing of the adjustment while running-in test period. Major stages of the assembling and installation:

the server rack assembling, mounting, connecting of modules and the control board;

installation and connection of the fiber optic cable-sensor;

geo-referencing of cable-sensor;

in case of technological or willful damage of a cable-sensor, the break can be eliminated by welding the ends of the sensor by standard welding equipment, also its length can be spliced if required.

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ADVANTAGES OF “WOLF” SYSTEM:

- reliable system based on optical fiber, which does not require electrical power supply throughout its entire length, resistant to electromagnetic influences and capable to provide wide-range monitoring;
- SMF 28e+ fiber is applied;
- it allows using a previously laid cable;
- only one fiber-optic cable core is required;
- one “WOLF” control unit for 80 kilometer line;
- EMI / RFI and lightning immunity;
- can be used jointly with other security systems by standard protocols: video surveillance, informing the emergency services, etc.;
- the possibility of blanking the distance channels in case of strong noise;
- detecting guard boundary crossings by an intruder in winter, summer and in the off-season periods in any direction;
- system functioning saving control with a duplicate cable-sensor for a single cable break;
- defining the location of the cable break with accuracy up to 10 m;
- high reliability of the system;
- high sensitivity of the system in various environments;
- easy installation of the system;
- universality of the system.

PHOENIX

aerial monitoring complex

SOS

Can be integrates to other security systems.

Interaction with the “PHOENIX” system allows applying of integrated approach to the protection of the objects.

Combined appliance of “WOLF” complex and “PHOENIX” system of the air-response is possible in the following versions:

- **manual mode** (the operator, reacting the alarm signal of “WOLF” complex, directs the copter to the given point of the protected area);
- **auto-manual mode** (complex automatically builds a route to the fixed point of the violation, the operator is required to confirm the flight task);
- **automatic mode** (copter in standby mode performs independent flight-around by the instructions of the “WOLF” complex, sending the recorded video to the server).

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Address

build. 12, 1, 8 Marta,
Moscow, 127083

phone: 8 (800) 775-25-00
ext.: 1543
e-mail: info@bg-optics.ru
bg-optics.ru