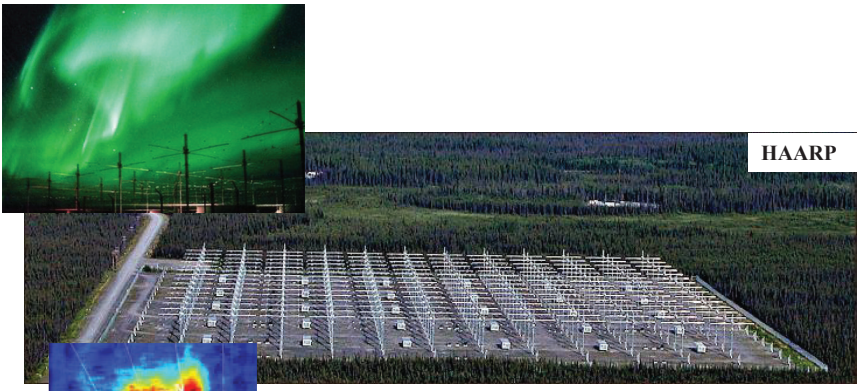
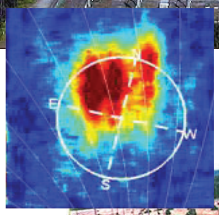
Research (What is it about?)	**High Frequency induced ionospheric turbulence**
UNN authors	*Grach S M., Sergeev E.N., Shindin A.V.*
We find (The result)	New components of ionospheric turbulence induced by high frequency heating facilities at increase power has been observed
Abstract	The impact of high-power radio waves on the near-Earth environment was first described in the 1930s with the discovery of the Luxemburg-Gorky effect, in which a powerful wave, transfers part of its amplitude modulation to a weaker wave as they propagate in the lower ionospheric layers. The onset of systematic investigations into the interaction of high-power electromagnetic waves with the ionosphere dates to the early 1970s. The pump wave at frequencies from 2.8 up to 10 MHz induces artificial ionospheric turbulence (AIT) in plasma resonance regions (where plasma electrostatic waves can be excited) at altitudes of 200±300 km. Today, this investigations are carried out at specialized installations (heating facilities) located in near polar regions: European Incoherent SCATter scientific association (EISCAT), Tromso, Norway, and High Frequency Active Auroral Research Program (HAARP), Alaska, USA, or in the mid latitudes: Sura, Nizhni Novgorod region, Russia. A meaningful AIT manifestation consists in the generation of high-frequency stimulated electromagnetic emission with frequencies varies from 0.9 to 1.45 MHz, depending on the altitude at which the pump wave interacts with the ionospheric plasma and the geographic location of the heating facility. At the effective radiation power of the HAARP facility 3600 MW and the Sura facility reached 270 MW we discovered new components in AIT stimulated spectrum with the frequency shift (4÷6) kHz and (40÷220) kHz down pump frequency.

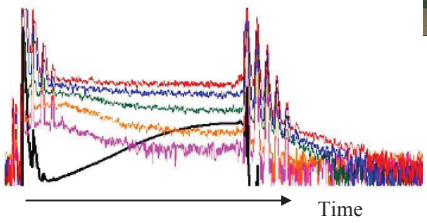
Representative articles 2016-2017, quartiles	1. *Sergeev E.N., Shindin A.V., Grach S M., Milikh G.M., Mishin E.V., Bernhardt P.A., Siefring C.L., Briczinski S.J., McCarrick M.J.* Exploring HF-induced ionospheric turbulence by Doppler sounding and stimulated electromagnetic emissions at the High Frequency Active Auroral Research Program heating facility. Radio Sci. **51**(7), 1118–1130 (2016).	Q3
	2. *Grach S.M.; Sergeev E.N.; Mishin E.V., Shindin A.V.* Dynamic properties of ionospheric plasma turbulence driven by high-power high-frequency radiowaves. Physics-Uspekhi. **59**(11), 1091-1128 (2016).	Q1
	Q-index (Qi) of the result	**3**

In collaboration	Univ Maryland, Dept Astron, College Pk, MD 20742 USA Air Force Res Lab, Space Vehicles Directorate, Kirtland AFB, NM USA Naval Res Lab, Plasma Phys Div, Washington, DC 20375 USA Naval Res Lab, Div Informat Technol, Washington, DC 20375 USA





Heating facilities and night sky glowing under AIT stimulation



Stimulated electromagnetic emission at different frequencies (from -7 kHz to -45 кГц – color lines) down pump wave (black line)

AIT stimulated electromagnetic spectra near pump frequency (black arrow)

New components which were observed

The dynamic spectrum