

Advanced Communication and Surveillance using Ionosphere

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Abstract-- In order to develop the communication and surveillance with help of ionosphere we use cross dipole antenna which reduces the cost of setting up communication or surveillance facilities. In this antenna the signal is focused in particular area of ionosphere turning that particular region into an ionosphere mirror. The ionosphere reflects the signals sent by the cross dipole antenna.

Index Terms-- Ionosphere lens, Electro jet, Electromagnetic Waves, Extremely Low Frequency Waves, Cross Dipole Antenna, feed point, ionosphere

1 INTRODUCTION

Turnstile antenna is often referred to as *Crossed Dipoles* with help of crossed dipoles by directing a 3.6mW signal in the 2.8-10 MHz [1] region of HF band and can be transmitted continuously or pulsed and the effect of transmission and recovery is examined using radars like VHF and UHF. Hence by using Crossed Dipoles we can improve the performance of communication and navigation systems which is used for both domestic and defence purposes. Modifying the length and shape of the dipoles, the combined terminal impedance presented to a single feed point. One can achieve pure resistance and yield quadrature currents in each dipole. Here we choose ionosphere and magnetosphere, the regions of earth's atmosphere in which the number of ions and electrons, charged particles are created due to action of extraterrestrial radiation of molecules in air and on neutral atoms.

2 WORKING

The crossed dipole antenna which has a set of antennas produces High Frequency Phased Array Radio Waves. Setting up this antenna in large area can energize a small portion of ionosphere temporarily. [5][1] The antenna focuses its energies in particular section of ionosphere and turning into the Ionosphere Mirror which acts as reflecting surface of the signals. Schematic illustration of the use of an imaging Riometer to measure the conductivity modification within a heated region.

While observing the layer of ionosphere, the generated signal is delivered to the antenna which is transmitted in upward direction with a distance of 70 to 350 km [1] depending on the operating frequency. The ionosphere intensity of HF signal is less than 3 micro watt/sq.cm. The ionosphere is created because of tens of thousands of times less than a sun's natural electromagnetic radiation reaching the earth and hundreds of times less than even the normal variations in intensity of sun's natural ultra violet energy. The region is thin enough to allow sun's x-rays and UV rays and it is thick

enough to observe the rays from the crossed dipole antenna [1][5].

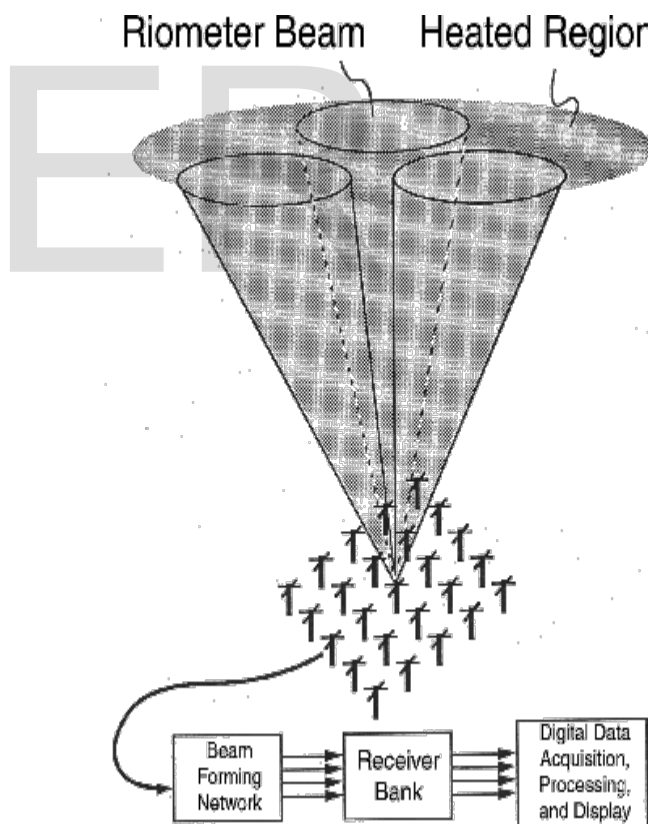


Figure 1: Schematic illustration of the use of an imaging Riometer

The antenna used here consists of a crossed dipole which can be linearly polarized or X-mode transmission and reception.

This IRI transmitter is capable of transmitting frequency range from 2.7 to 10 MHz which ranges between citizen's normal band frequencies allocations and the AM broadcast band. This antenna can transmit continuous waves or in pulses ranging below 10 microseconds. For modification of ionosphere continuous waves transmission is used when transmitted signals reaches the ionosphere it turns ionosphere into a mirror reflecting the signals back to earth without any satellite connection.

Here the EM radiated waves is in low frequency when compared to plasma frequency, the electrons observes the energy transmitted by the EM waves from antenna causing them to vibrate at that frequency which lead to generation of new EM waves that are in opposite direction of the original transmitted signal.

3 Applications

It is capable of generating Low Frequency waves such as in 0.1 HZ range which is almost impossible to generate by any other Transmitting antenna, it also includes Observation of plasma lines, Thermal research by gyro frequency, high velocity of trace runs, Meteors can be observed by using radio waves[2].

Polar mesospheric summer, Echoes (PMSE) have been studied, Echoes of Extra-terrestrial High Frequency Research (Lunar Echo experiment), Meteor impacts on the ionosphere can be realized, Ionosphere response and recovery from Solar flares and Geomagnetic storms is studied, Disturbances in GPS signal quality due to effect of ionosphere disturbance is studied.

We can use this setup to protect earth from meteoroid shower, by focusing its energy signal in particular direction thereby destroying the meteoroid.

It can be used to detect the minerals and petroleum content in the earth crust by its ability in producing effective Low Frequency signals that can penetrate the earth's surface.

It can be used for defence purposes like tracking down missiles, fighter jets which cannot be detected by normal radars. Since the fighter jets uses radar signal observant paint it will observe the signals from the radars which cannot be detected.

The black lines represent the geomagnetic field lines. The gray scale colors represent cold plasma density inside.

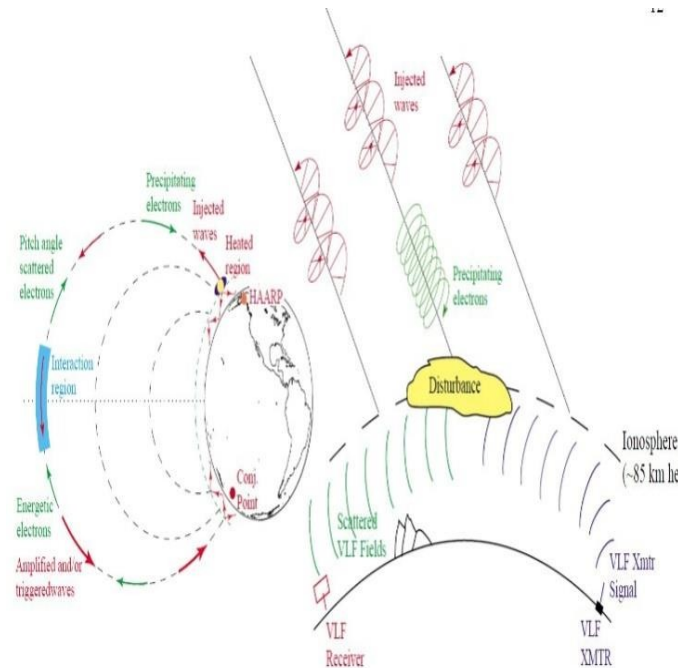


Figure 2: Representation of the inner magnetosphere.

The red lines represent trajectories of trapped energetic electrons that make up the hot plasma of the radiation belts. It is Used to communicate with space stations in effective way and can also communicate with remote planets, or with space stations located outside the earth's orbit[2].

4 RESULT

Since communication with submarines in underwater is difficult with help of this Cross Dipole antenna in mid-1980s Physicist Dennis Papadopoulos was successful in communicating with the submarine by using ELF technology in this they used electro jets, currents of charged particles that flow through ionosphere which acts as virtual antennas which transmit messages to submarines.

When electrons in the magnetosphere collide with the uncharged particles of the atmosphere, creating the optical emissions often seen as brilliantly coloured lights in the night sky. One of HAARP's (High Frequency Active Aurora Research Program) most cited accomplishments is the creation of the first artificial aurora visible to the naked eye. On zapping the Ionosphere, HAARP created a green aurora about 100 and 150 kilometres high — in the middle of a natural aurora.

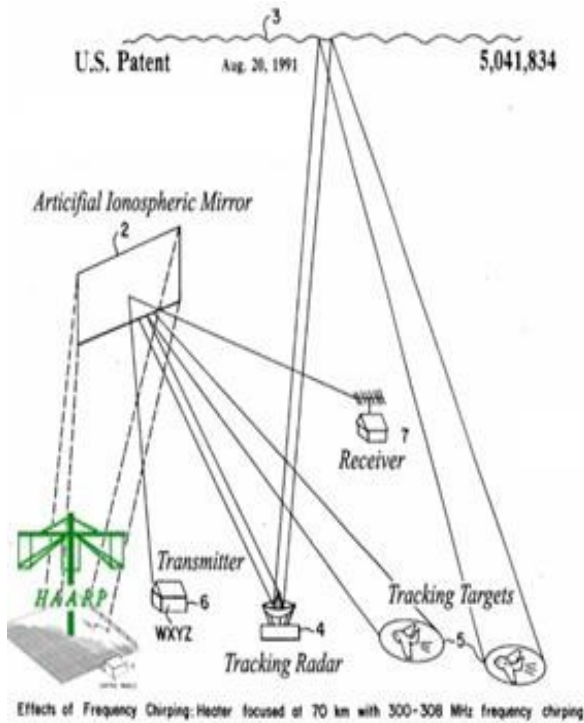


Figure 3 -Super Small Size Field-Aligned Scattering (SSS FAS) mirrors

Injecting high-frequency radio energy into the ionosphere to create huge, Extremely Low Frequency (ELF) virtual antennas used for earth-penetrating tomography peering deep beneath the surface of the ground by collecting and analysing reflected ELF waves beamed down from above.[3][8].

By heating the regions of the lower and upper Ionosphere to form virtual "lens" and "mirrors" that can reflect a broad range of radio frequencies far over the horizon to detect stealthy cruise missiles and aircraft. Communication with deeply submerged submarines over long distances are achieved. And, patent documents filed during an earlier research effort that evolved into the HAARP outline further military applications of Ionosphere-Heating technology:[6][8].

Creating a "Full Global Shield" that would destroy ballistic missiles by overheating their electronic guidance systems as they fly through a powerful radio-energy field. It can distinguish nuclear warheads from decoys by sensing their elemental composition.

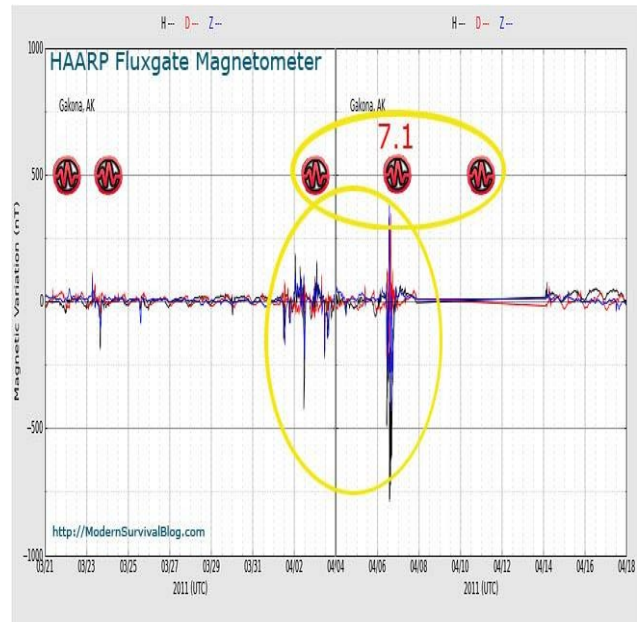


Figure 4 Chart reveals a period of active magnetic change followed by several magnitudes.

5 CONCLUSION

It can be concluded by saying that the use of Crossed Dipole Antenna is an effective way for communication over long distances under and above the Earth's Surface [3].

In the Near future it can be made more Effective and efficient by reducing the Cost of Installation. It can also be used to predict the weather conditions which give us a distinct advantage to overcome large scale calamities and prevent loss of life [3][6].

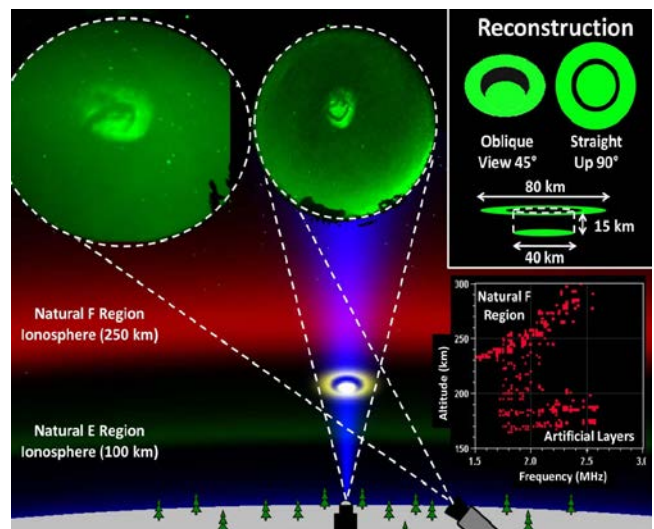


Fig 5-Observation geometry and image data from two low light imaging system

Observation geometry and image data from two low light imaging system capturing 557.7nm emission from eye shaped artificial ionosphere plasma over the facility, a reconstruction based on the image data shows the central spot and the ring to form two distinct artificial layers separated in altitude by ~15 km, which matches closely the multiple layers seen in ionosonde echoes.

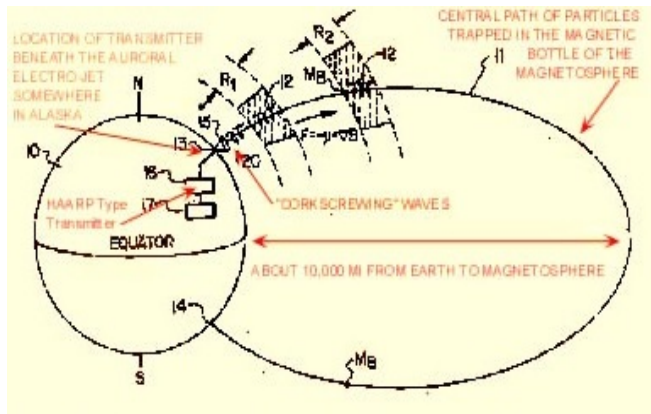


Fig6- Schematic diagram of haarp concept.

Showing the concept of the “corkscrewing” of the waves as

they leave the transmitter, the position of the transmitter near the polar region and the path of the particles in the magnetosphere. [7].

6 REFERENCES

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