

The Universe: Search for Neutrino on Earth

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Abstract: *The Universe is so wide and big search Neutrino in earth is so difficult task, Astronomy play Vital role to search Neutrino instead looking up into deep sky, search photon in deep space under water. Neutrino are nearly mass less particle that interact with very weak with matter. The detection of neutrino emitted by sun and nearby supernova. Solar neutrino provides new information about fundamental properties of matter. Our planet is bombarded with trillion of particles, from Space from all direction called "Cosmic Rays". The cosmic rays are made of tiny 'elementary' particles such as photon, He, Neutrinos, Hydrogen and atomic nuclei have wide range of energies. Cosmic rays high energies suggest that they must be produced in the most energetic processes in the universe. As the cosmic rays particles have net electric charges they get deflected due to presence of geomagnetic fields during their travel and therefore do not travel in straight line. Cosmic rays particles can interact with matter and radiates at the sources to produced extremely particles called neutrino. Gamma rays radio Bursts of Electromagnetic energy in the form of gamma rays are the absolute, most energetic sources of energy known in the universe. The amount of energy that gamma ray bursts puts out in a few seconds is more than the Sun. every will in its entire life time. The neutrino, a fundamental elementary particle of nature, was born out of necessity to keep the conversation of energy principle. In observed alpha,beta,and gamma decay. Although neutrinos are not massless like photon of light, they have very special property. Neutrino are omnipresent in nature pass through every square centimeter of bodies without ever notice. Neutrino originate from events in the Universe such as Colliding of Black Holes, Gamma Ray Bursts from exploding stars and or violent event at core of distant Galaxies. A high energy of particles neutrino transform in to its particles lepton(electron,muon,or tauon).most accelerated Neutrino beam can also called muons , and few can create tauons. A detector which distinguished among these leptons can reveal the flavor of neutrino incident to charged particle current interaction because interaction involves the exchange of Boson the 'target' particle also change(e.g. neutron-proton). Neutrinos detectors is a physics apparatus which is designed to study neutrinos, because neutrinos only weakly interact with other particles of matter, neutrino detector must very large to detect significant number of neutrinos. Confirmed extraterrestrial sources such as Sun, Super Nova1987A, with discovery of High energy Solar Neutrino Flux in the range of 0.1 PeV to PeV range. Ice Cube detector, Neutrino Astronomy play Vital role in exploration of High energy Universe.*

Keyword: high energy neutrino, neutrino astronomy, gamma ray burst, CR

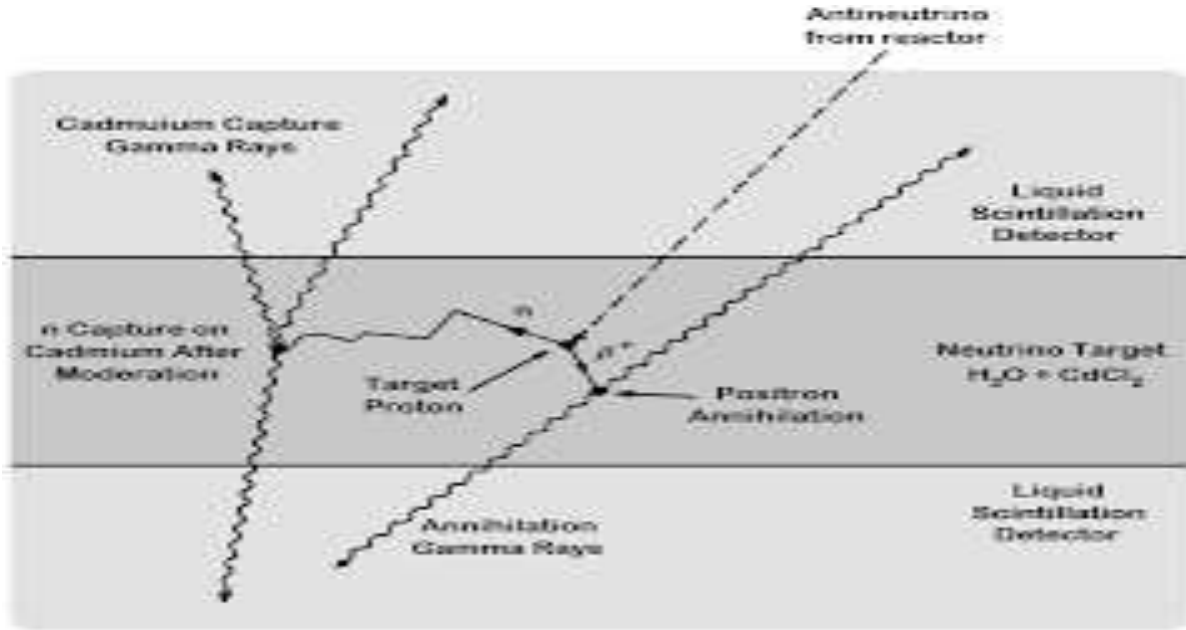
INTRODUCTION

Cosmic rays (CR) are High energy charged particles:

Cosmic rays (CR) are High energy charged particles that arrive at earth from all direction from space Gamma rays Bursts (GRBs) where main source of Cosmic Ray produced where High energy Neutrinos are charged less particles that can also be produced during the same process .CRs.Since Neutrinos travel in straight back to know if GRBs produce Neutrinos and there for Cosmic Rays.Cosmic rays and Neutrinos as our planet is bombarded from space from all direction called “Cosmic Rays.The cosmic rays are made up of tiny elementary particles such as photons, He, Neutrinos, Hydrogen and atomic Nuclei. Have wide energy.Cosmic ray particles can interact with Matter and radiated at source to produced extremely tiny particles called neutrino such as photons, Muons, neutrinos, CR Galactic particles, atom Nuclei, and positrons. The cosmic rays particles have net electric Charges they get deflected due to the presence of magnetic fields during their travel and therefore do not travel in straight line.

Cosmic rays’

Where exactly Cosmic rays’ come from cosmic rays High energies suggest that they must be produced in the most energetic processes in the Universe. Usual aspect of Cosmic rays are where they come from SUN TeV,AGNs-Tev,GRBs-Pev, TDEs-PeV super Nova-TeV energy. Neutrinos have neutral Character and are almost massless they also interact very rarely with matter and radiation due to this, their travel is not affected by magnetic Field, and they do not get absorbed by gases or dust in the paths. As a result of their unique properties of Neutrinos can travel Vast Cosmic Distances in straight Paths; Pointing back to where they produced. Neutrinos can therefore the ideal Messenger Particles allowing us find sites of Cosmic ray production in the Universe.



Behavior of Neutrino

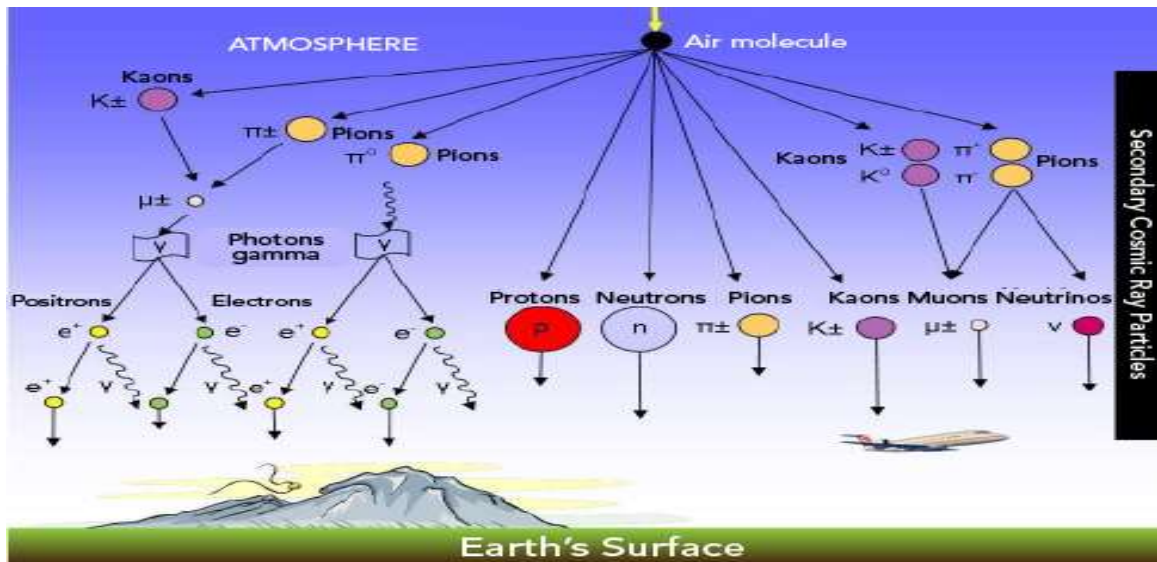


Figure 1(a) Cosmic Ray shower in earth atmosphere

Gamma Rays Bursts

Gamma rays Bursts (GRBs) can be produced by high energy cosmic rays. GRBs are short bursts of high energy radiation of cosmic rays in beam line manner, they typically last for few seconds in duration, and can outshine entire galaxies in that period. There are two classes of GRBs: Long GRBs, with burst duration greater than 2 seconds, and short GRBs, with duration less than 2 seconds.

Each class of GRBs is understood to be created due to different processes.

Figure Long GRBs and Short GRBs similar Process

A strong evidence for cosmic ray production at GRBs will be produced if we observe neutrinos from GRBs.

We can detect neutrinos coming from such direction of GRBs and at the same time as the gamma rays from GRBs were observed.



Figure 1(b) shows Origin of Neutrino through Solar Radio Bursts or Galactic Cosmic Rays

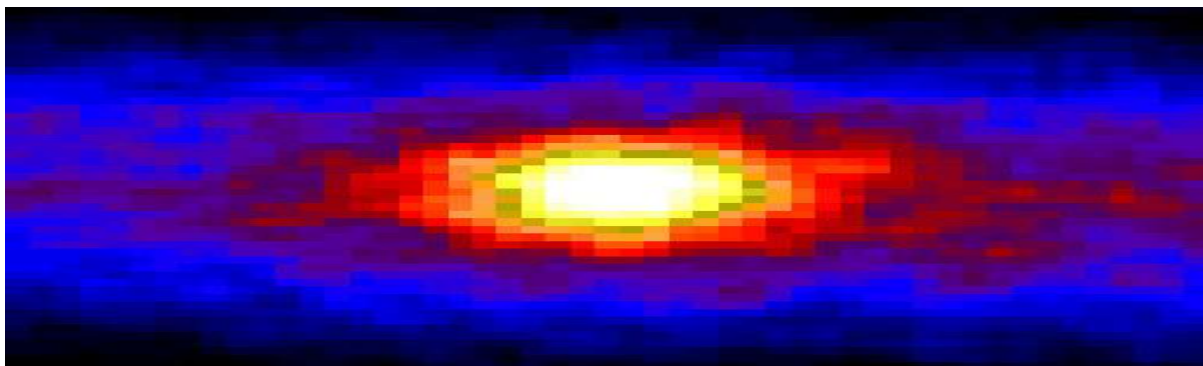


Figure 1(c) Solar Radio bursts

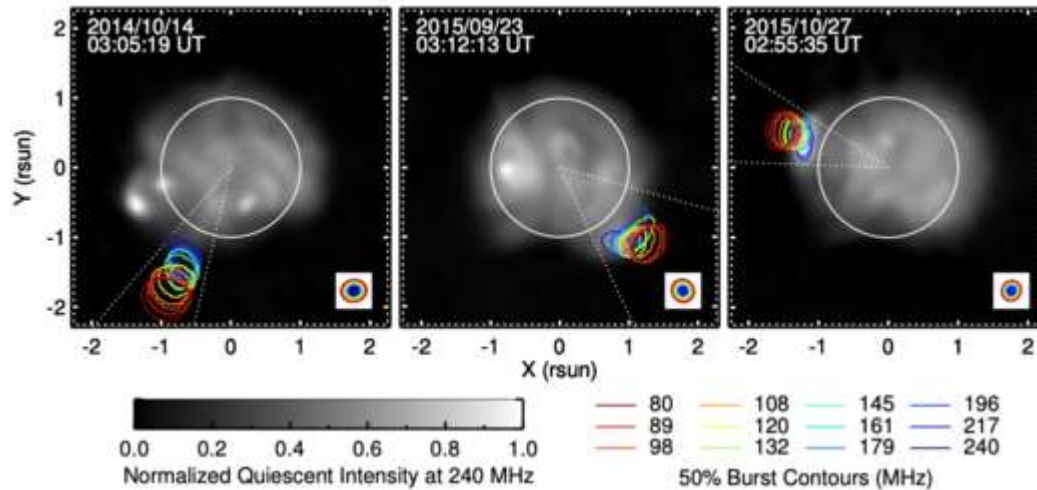


Figure1 (d) Searching Galaxy through Radio wave

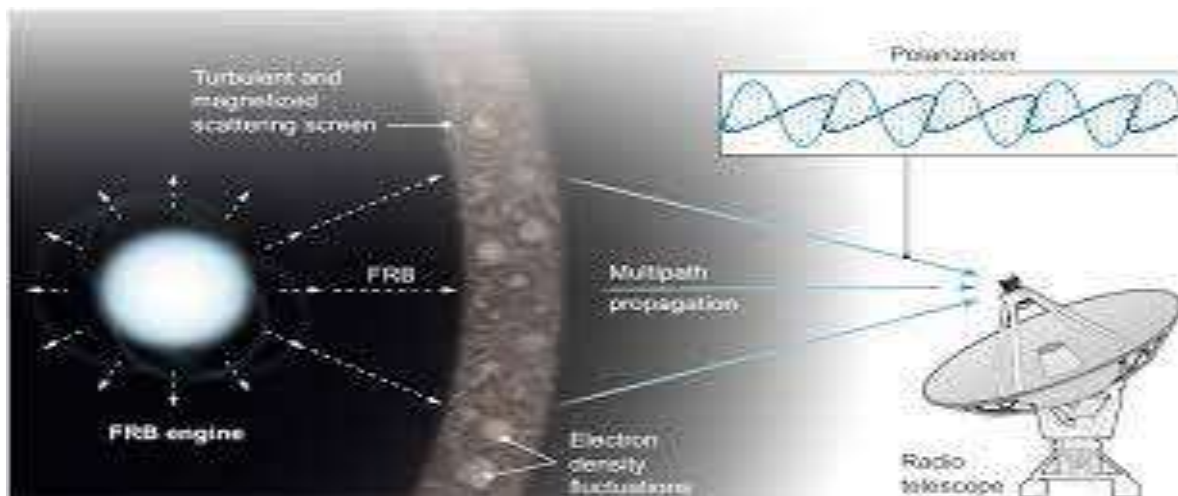


Figure1 (e) Ground Based Radio Observatory search Galaxy

“Neutrino”: it’s Future Challenge and Application

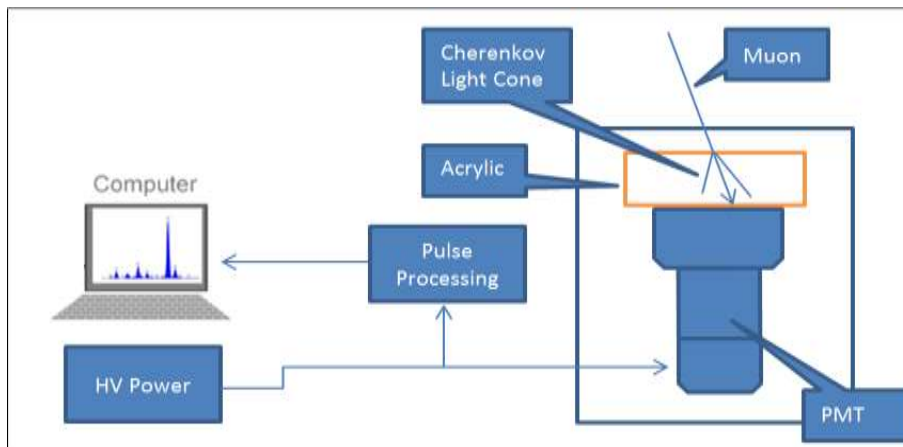
The Ice Cube Neutrinos Observatory

In this articles we correlation of Gamma radiation signals from GRBs and Neutrino observations. In investigated but if neutrinos are not affected by anything when travel through space how we can observe it.

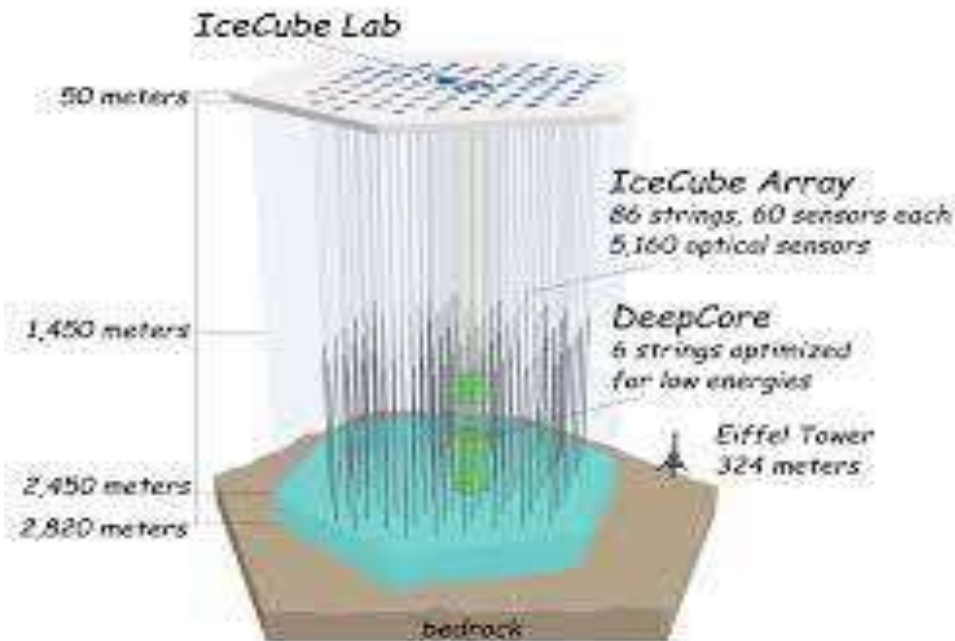
Under special circumstances; this processes eventually can result in light emission in special ‘conical’ pattern called “Cherenkov emission “. Detector can observed effectively Cherenkov Light emission and their infer the properties, if present Neutrinos responsible for it. Detector making use of Cherenkov emission to detect Neutrinos at Highest energies



From 1(f) Shown In figure The Ice Cube Neutrinos Observatory

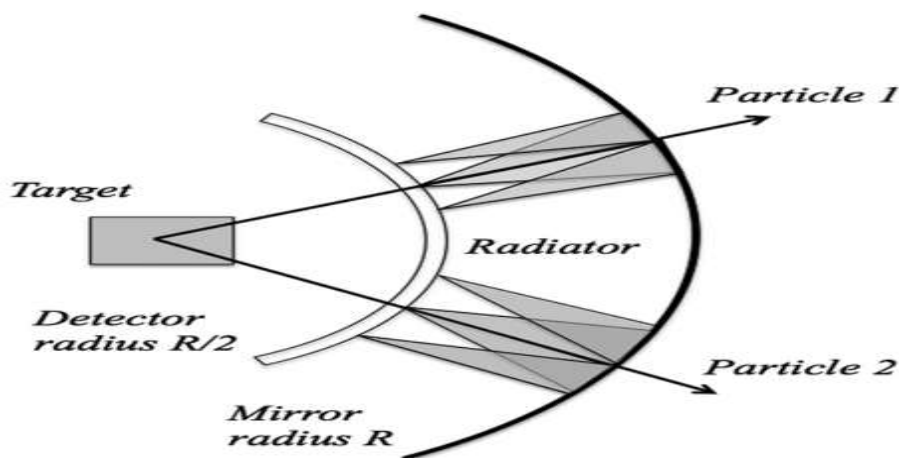


.Figure1 (g) of detector working and detect Neutrino through Computer simulation



Detector at geomagnetic south poles in Antarctica ; the Ice Cube detector make up sensors spreads over 1 k.m.³ of ice to detect the Cherenkov light resulting from neutrino interaction each light sensor unit in Ice cube is called a digital optical Modules(DOM) and there are about 5000 of the altogether in detector.

The amount of light observed by each sensor and the timing of each observation is used to 'Constant' the pattern of the Cone, which tell us the energy and direction of the coming neutrino.



Working diagram of Neutrino detector (How Light Scattered in Ice)

Figure and working ICE Cube Detector.

Cosmic rays particles interact with particles of earth’s atmosphere to produce atmospheric neutrinos and other particles which can act as unwanted signal called “Noise” in the detector. These Noise ‘Background’ to detect our neutrino data using computer algorithms involving of mathematical calculation.

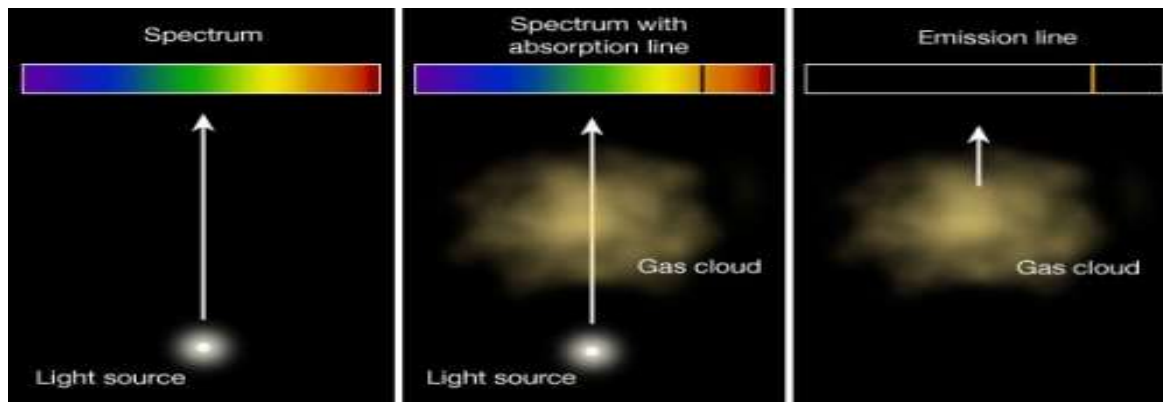


Figure 2(a) Searching ET through Spectrum analysis

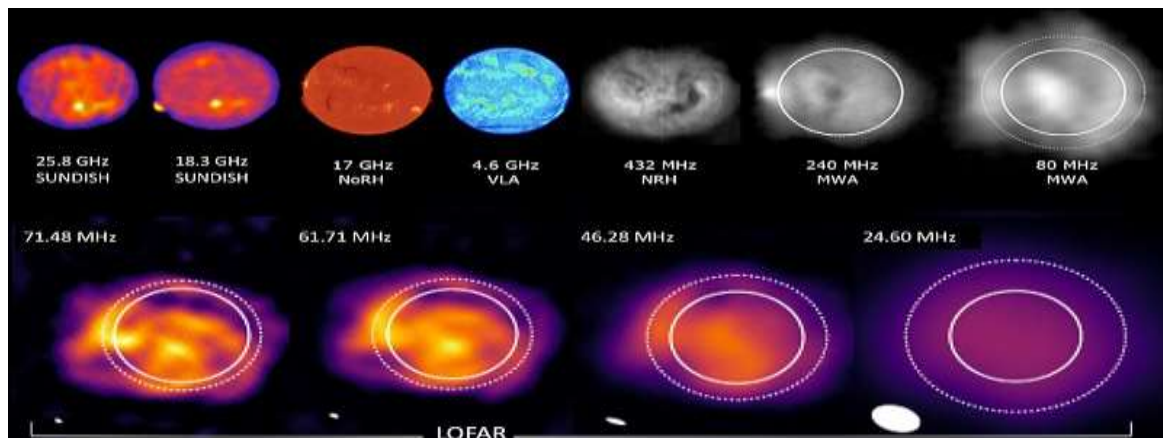


Figure2(b) Searching Galaxy through LOFAR radiowave Observatory

How Neutrino Born?

Neutrino are born during the processes of nuclear fusion in the Sun Core in fusion proton (then Nucleus from the simplest element hydrogen) fuse together to form heavier element, helium. This release neutrino and elementary particles will eventually reaches earth as in form of Light and Heat.

Solar Neutrino oscillation:

Ray Davis Homestake experiment 1960’s observed a defect in the flux prediction of standard

Solar modal using chlorine –based detector this gave rise to the Solar neutrino problem. May subsequent radio,chemical and water, Cherenkov detector's confirmed the deflect, but neutrino oscillation was not conclusively identified as the source of deflect until the Sudbury neutrino observatory provided clear evidence of neutrino flavor. Solar Neutrino energy below 20 Mev at energies but 5MeV above. Solar Neutrino oscillation actually take place in time Sun trough known as MSW effect a different resonance process from the Vacuum tube oscillation describe. reference (Davis R,Harmer; Hoffman ,Don (1968).

Cosmic Radiation

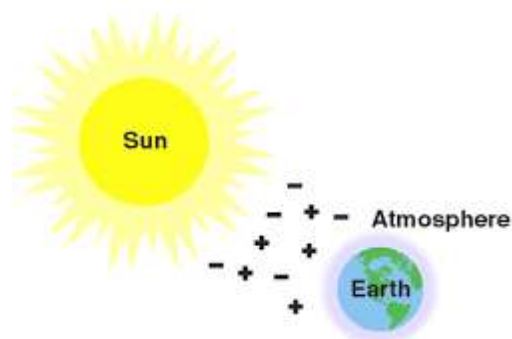


Figure2(c) of Solar Neutrino

Solar Neutrino

a major Back through happened that when the second time in history a neutrino was tracked back to source from outside of Solar System. It come from an immense Galaxy four billion light years away with supermassive black hole at its hear. The neutrino happened to be lineup on the perfect trajectory towards detector planted within Antarctica Ice sheet, at the Ice Cube Neutrino observatory near the south pole, only **20 to 30 Neutrino** are detected here each year. But actually tracing them back to their origins requires an additional lucky combination of events in both time and space. The detection last September yield a wealth of information Astronomical event's the neutrino are accompanied by sequential wave of x rays and wave of extremely height- energy photons called Gamma rays , was emitted by the Black Hole.

The basic that neutrinos almost never interact with matter make them difficult to study directly but if a neutrino pass through by Ice crystal, at just right angle, the charged interaction releases subatomic particle called muons.

Because Ice slow down light the travels through it, the muon is emitted at speed greater than the surrounding light within Ice sheet. This cause a blue light flash of light called Cerenkov radiation Cherenkov radiation detected by sensors.

A muon can travel many kilometer through Ice; and Cherenkov radiation several hundred meter, until it reached an Ice cube sensor.

Atmospheric Neutrino Atmospheric Neutrino Oscillation

Electromagnetic ,weak and strong forces , a few experiment on proton decay followed in large

detector such as IBM, MACRO, Kamiokande have observed deflect in the ratio of flux of muon to electron Flavor atmospheric neutrinos (Muon decay).

The Super kamiokande experiment provided a very precise measurement of neutrino oscillation in energy range from Hundreds of MeV to few TeV. Many experiment have researched by oscillation of electron anti- neutrino produced in nuclear reactor, no oscillation were found until a detector was installed at distance 1-2 k.m. such oscillation given value the parameter.

Beam Neutrino oscillation

Neutrino Beam Produced at particles accelerator offers the greatest control over neutrinos study. The study the same oscillation as in atmosphere neutrinos oscillating using neutrino with few GeV of energy and several Hundred k.m. baselines the Minos K2K and Super-K experiment have all independently observed muon, neutrino disappearance overlong base Line.

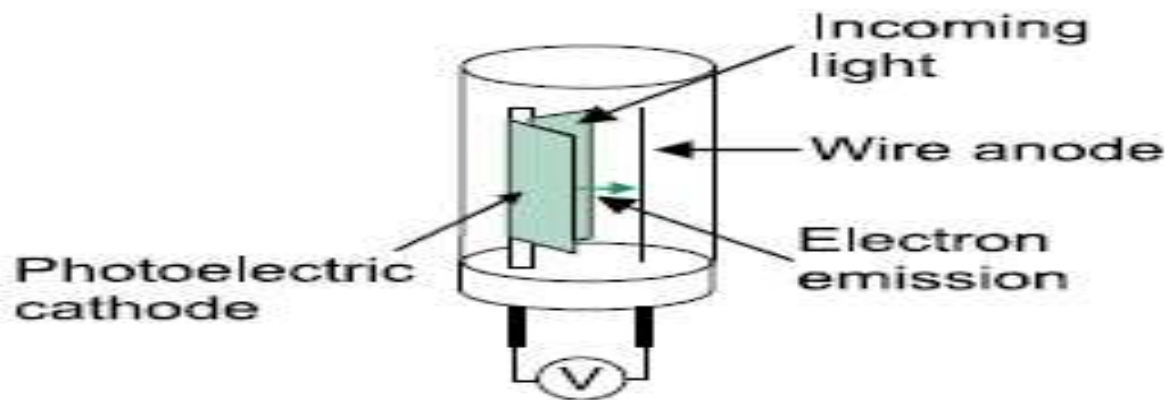
Neutrino oscillation a quantum mechanical phenomenon in which a neutrino a created with specific lepton family number (Lepton Flavor) electron, muon or tau) the probability of measure of a particular flavor for neutrino varies between three known states as it propagate through space. Neutrino have the proportional to do amazing things like speedup communication detect Nuclear weapon and even confirm the presence of of elusive dark matter.



Neutrino detector



Kamiokande water detector use to detects Muon Particle



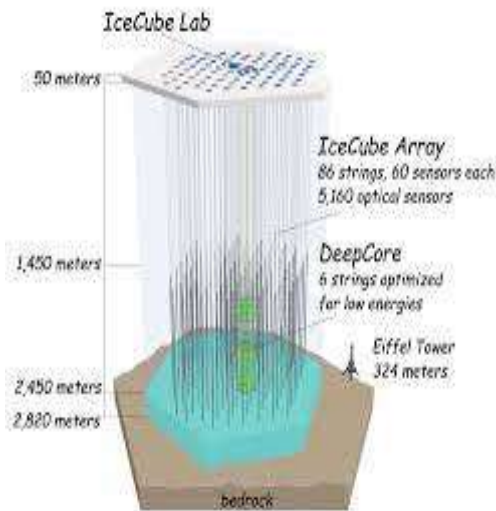
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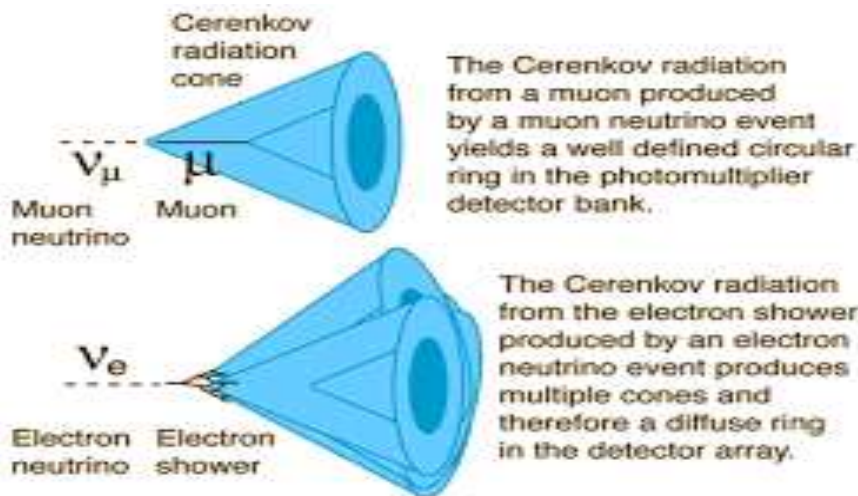
Ice Cube Lab to detect Neutrino through Cherenkov Effect Image: Ice Cube /NSF

Ice Cube Sensor:

Ice cube system involves more than 5,000 sensor that measure the angle of light that's emitted when a neutrino strikes the bend of Antarctic Ice Sheet, creating a subatomic particles called muon. Scientist us angle to calculate the direction from which the neutrino came AMAND, The Antarctic Muon and neutrino detector Array, served as a proof or concept for Ice cube was turned off in may 2009. Together, these immense bodies of water and ice on our World are the best for exploring how neutrinos from the far-flung comes that How Universe are made?. Probe the properties of neutrino get our understanding clear that these neutrino particles is really beginning to reach new research.



Ice cube working procedure image



“Neutrino”: From Historical perspective and its Future Challenge

The neutrino, a fundamental elementary particles of nature, was born out of necessity to keep the conversation of energy principle. In observed alpha,beta,and gamma decay. Although neutrinos are not massless like photon of light, they have very special property. Neutrino are omnipresent in nature pass through every square centimeter of bodies without ever notice. Neutrino originate from events in the Universe such as Colliding of Black Holes, Gamma Ray Bursts from exploding stars and or violent event at core of distant Galaxies. A high energy of particles neutrino transform in to its particles lepton (electron,muon,or tauon).most accelerated Neutrino beam can also called muons , and few can create tauons. A detector which distinguished among these leptons can reveal the flavor of neutrino incident to charged particle current interaction because interaction involves the exchange of Boson the ‘target’ particle also change (e.g. neutron-proton o. Neutrinos detectors is a physics apparatus which is designed to study neutrinos, because neutrinos only weakly interact with other particles of matter, neutrino detector must very large to detect significant number of neutrinos. Confirmed extraterrestrial sources such as Sun, Supernova 1987A,

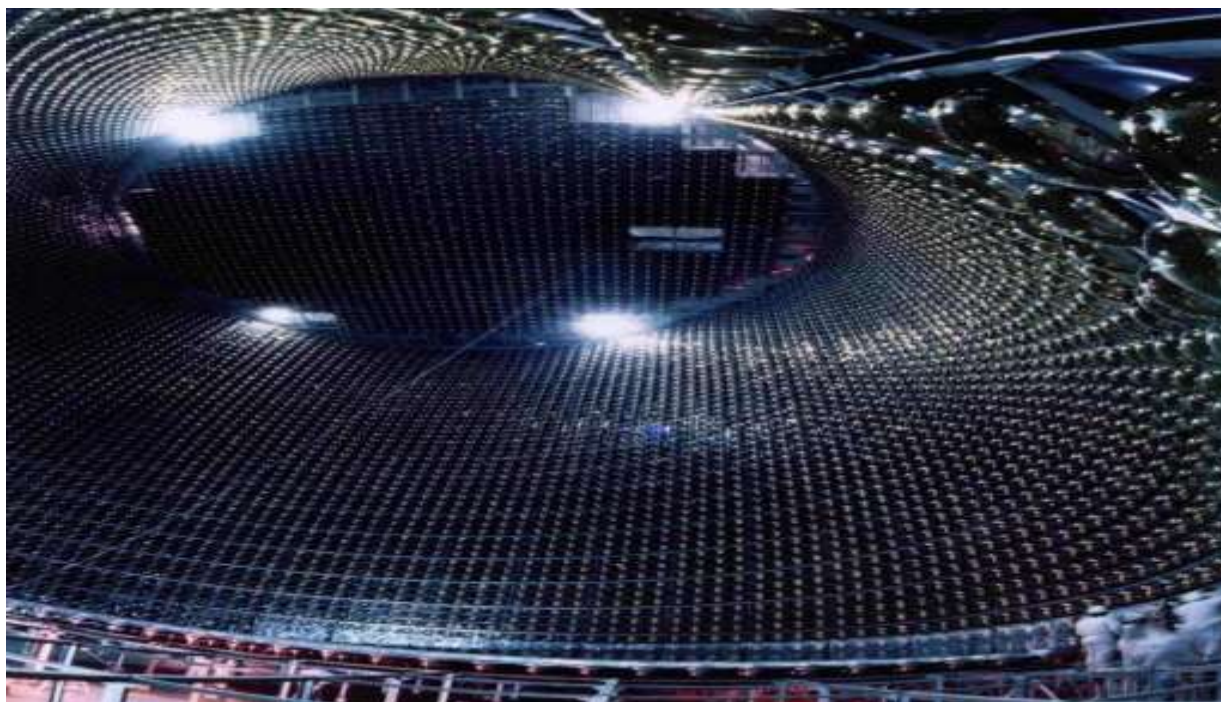


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a large Volume of Water. Water surrounded by phototubes that watch for Cherenkov radiation emitted in coming neutrino creates when an incoming neutrino creates when an incoming neutrino creates an electron or muon in the water. The Sudbury Neutrino observatory is similar; but use

heavy Water as the detecting medium.



Figure neutrino detectors Kamiokande water detector use to detects Muon Particle

Application of Neutrino in Technology

Neutrinos have potential to do amazing things like speed up global communication, detect the presence of Nuclear weapons and even confirm the presence of elusive Dark matter.

Application Neutrino technology

Invisible and almost massless particles could be building blocks for some incredible new technology.

Neutrinos have potential to do amazing things like speed up global communication, detect and presence of Nuclear Weapons. Neutrinos are produced from various sources and used in neutrino detectors to monitor which countries are following the treaty on non-proliferation of Nuclear weapons. It detects neutrinos emitted from the decay in nuclear reactors and has proposed using neutrino detectors to locate undocumented Nuclear reactors or reactors that secretly harvest plutonium. Neutrinos can be used to find cavities of mineral oil deposits. Fastest global communication is an easy way to communicate with submarines submerged far below the sea surface. Detect Dark matter: certain types of neutrinos might come from decaying dark matter. The IceCube lab has built to detect Neutrinos through a detector in Antarctica that has detected extremely high energy neutrinos. Communication with extraterrestrial life: beams of Neutrinos have the ability to detect alien life and the receiving end would be able to decode messages.

Neutrino-anti neutrino annihilation can also be used as a tactical weapon to target hidden targets that are unreachable by conventional means.

Neutrino counter Nuclear Weapon

Radiation annihilation at zero distance can be used to heat up the primary stage of a thermonuclear warhead and can, in principle, detonate the device remotely. Neutrino-anti-Neutrino annihilation can also be used as a tactical assault weapon to target hidden targets that are unreachable by conventional means.

At the highest energies, neutrinos will be absorbed by Earth and will never make it to IceCube.

image via Ice Cube Collaboration.

In Human Bodies 100 trillion Neutrino pass through our bodies in every second. The problem of the physicist is that neutrinos are impossible to see and difficult to detect.

Solid –state Neutron detections application

Neutron detector application Neutron detector application include those for homeland security (e.g.) Border screening) fundamental research such as water content in soil .Solid state neutron monitor detectors provide an alternative to ^3He based, a high thermal –neutrons detection affecting, at fraction of the Volume, Mass, Voltage and power requires from gas, liquid or crystal detectors, recommended AC coupling to electronic readout circuit.

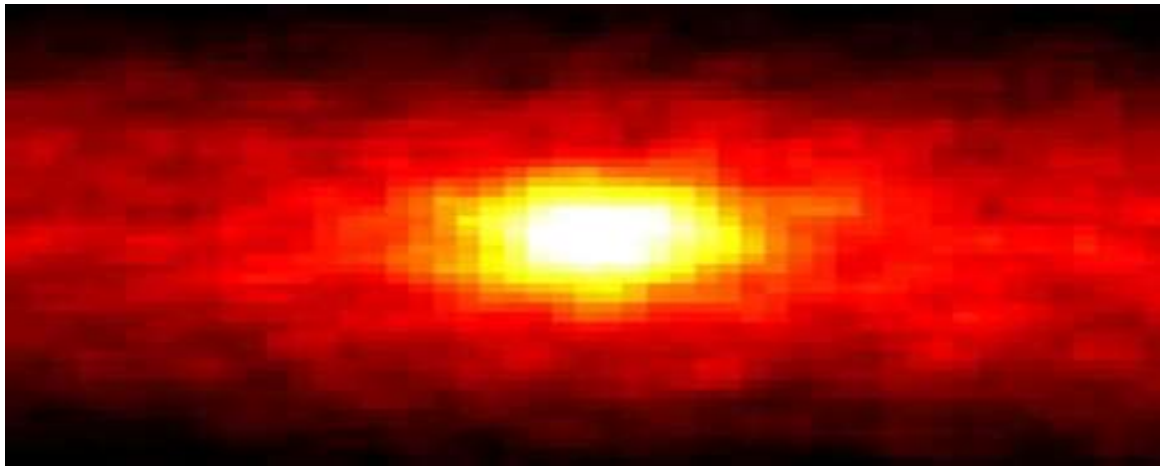
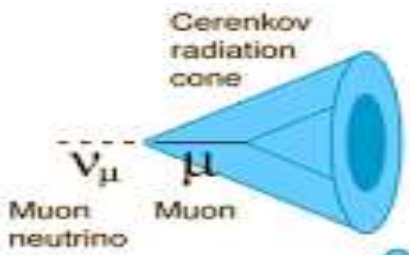
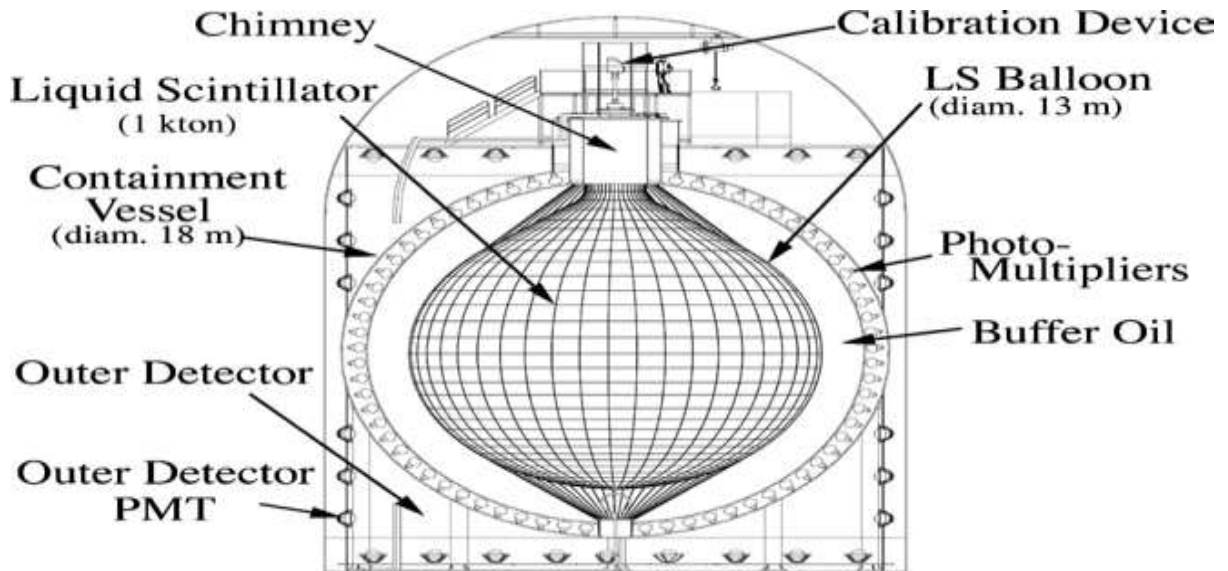


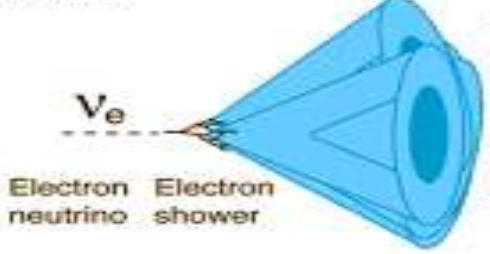
Figure 1(b) a Picture of the Sun made from looking at direction of Solar Neutrinos courtesy of (NASA APOD).



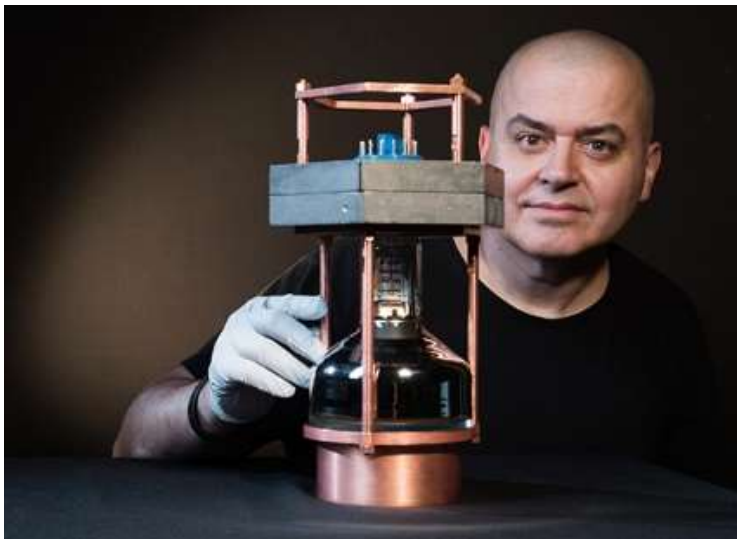
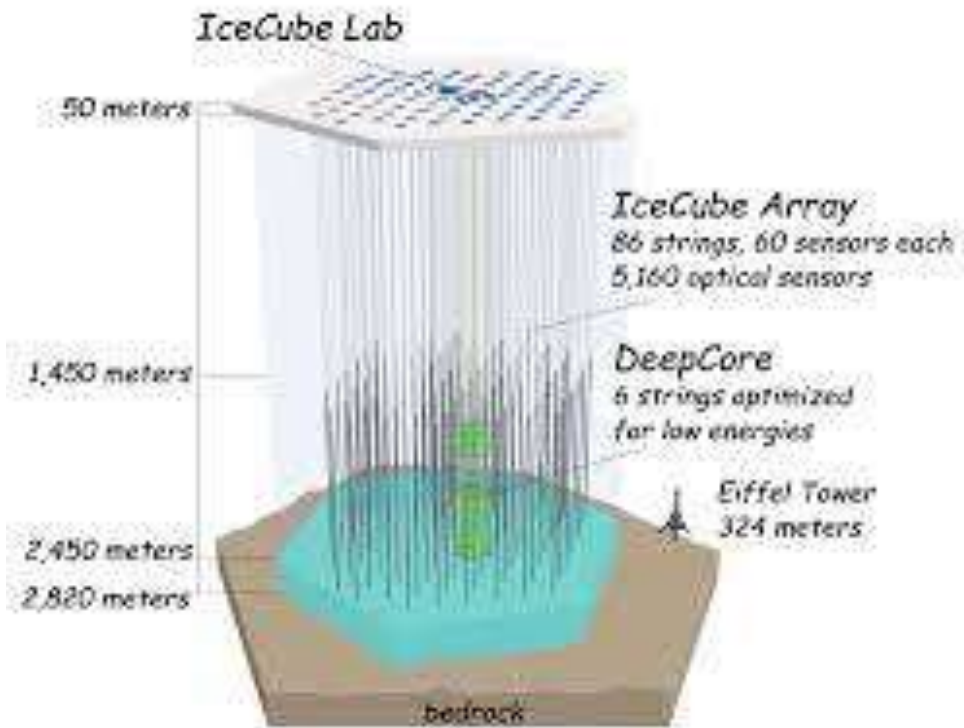
Neutrino comes from Galaxy



The Cerenkov radiation from a muon produced by a muon neutrino event yields a well defined circular ring in the photomultiplier detector bank.



The Cerenkov radiation from the electron shower produced by an electron neutrino event produces multiple cones and therefore a diffuse ring in the detector array.



Neutrino detector

ANALYSIS AND RESULT

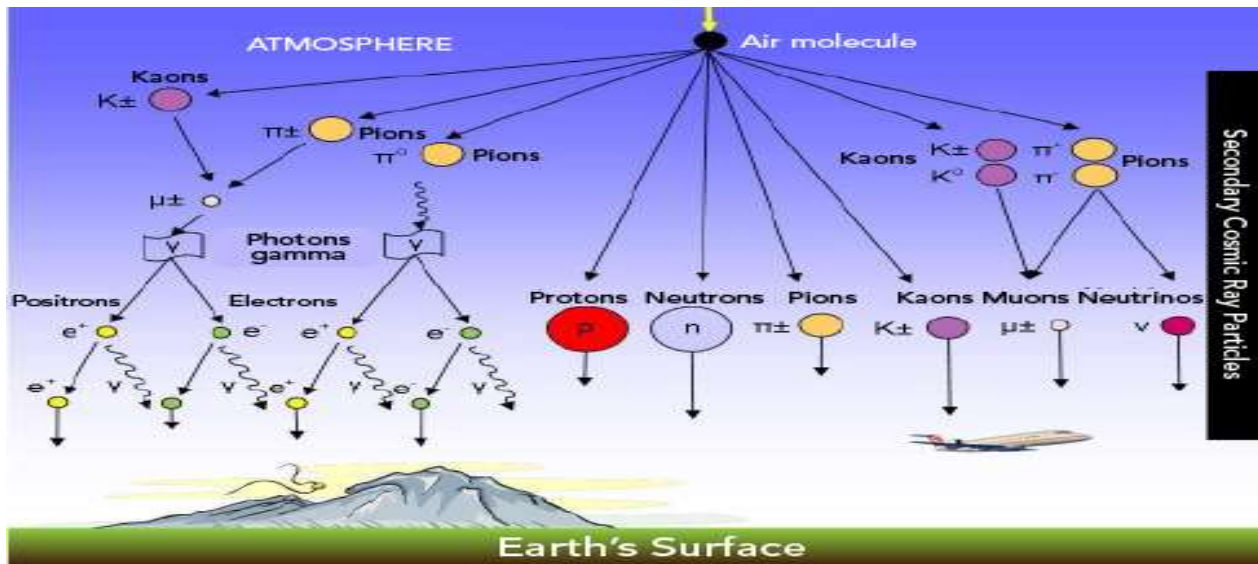
The neutrinos detected; ICE CUBE and GRBs observed as Space based Telescope are checked to see if there are any coincidence in direction and detections GRBs.

GAMMA RAY'S SATELITE

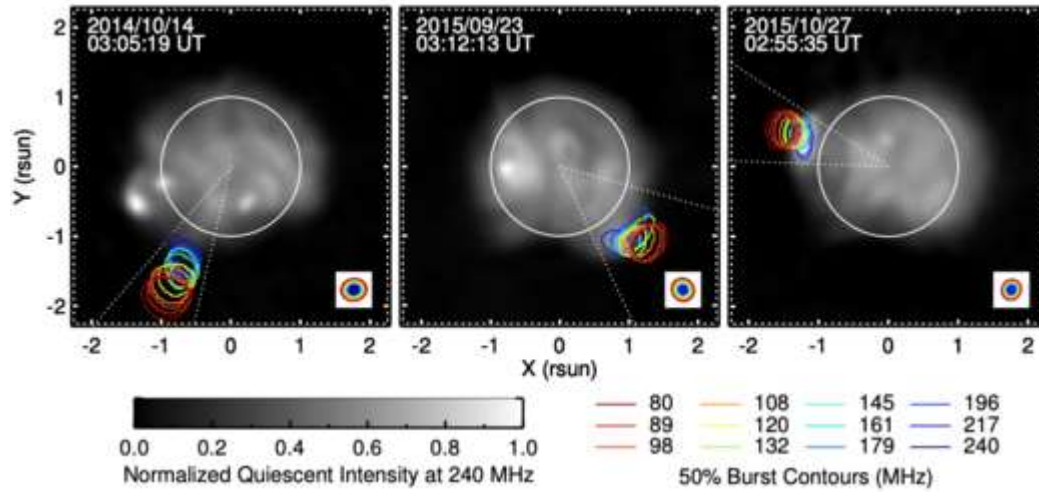
If the neutrinos is observed coming from the direction GRBs at same time the gamma-rays from GRB where observed, however an atmospheric neutrinos can also aligned with detections and time of observation of GRBs as a chance of Occurance.To properly distinguished between these two scenario 1.mathematical calculation we use "P value" Voice recorder to resolve through Voice and frequency The Voice in form of Noise so we identify Voice of difference animals and birds recording.

Conclusion

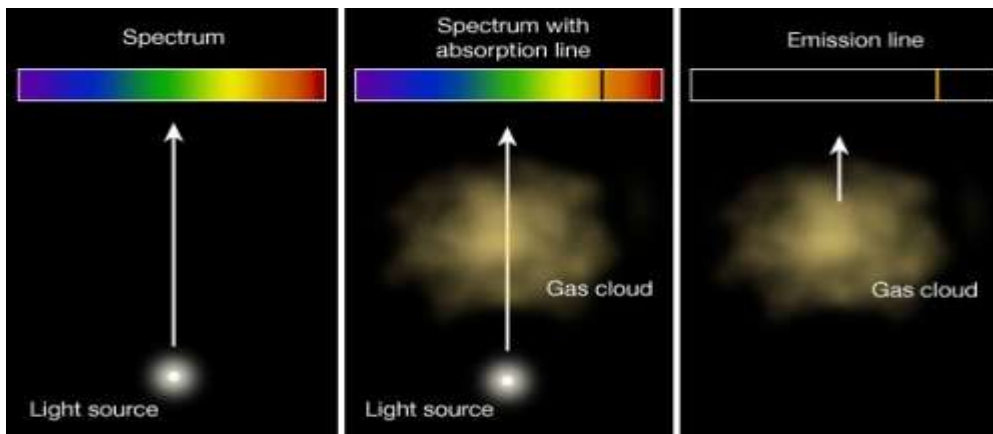
Evidence to produce GRBs produced Neutrinos or CR ray's and detect by Ice Cube detector. Gamma rays produced from Cosmic rays and Neutrinos???? What difference between Galactic energetic particles and Neutrinos or radio Bursts particles??



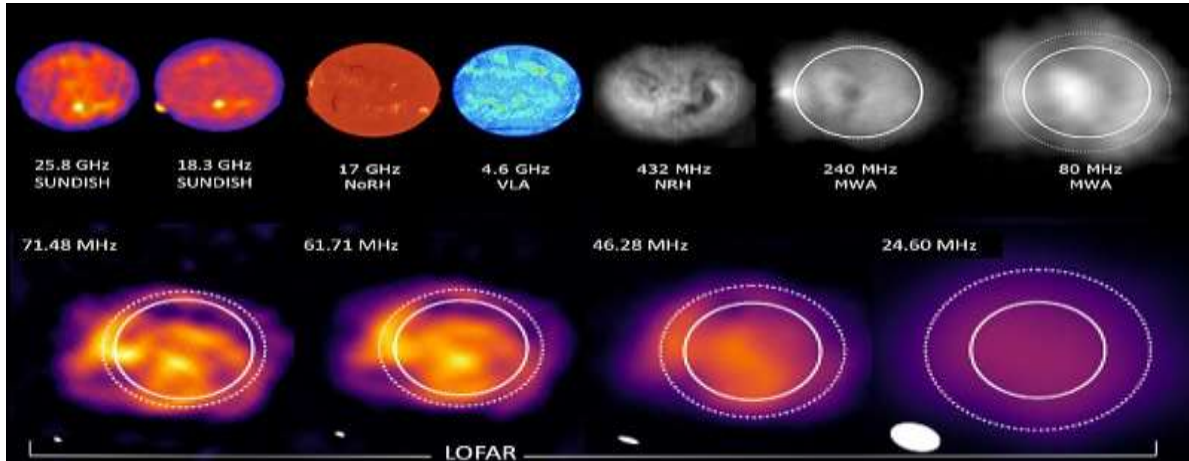
Cosmic Ray shower in earth atmosphere



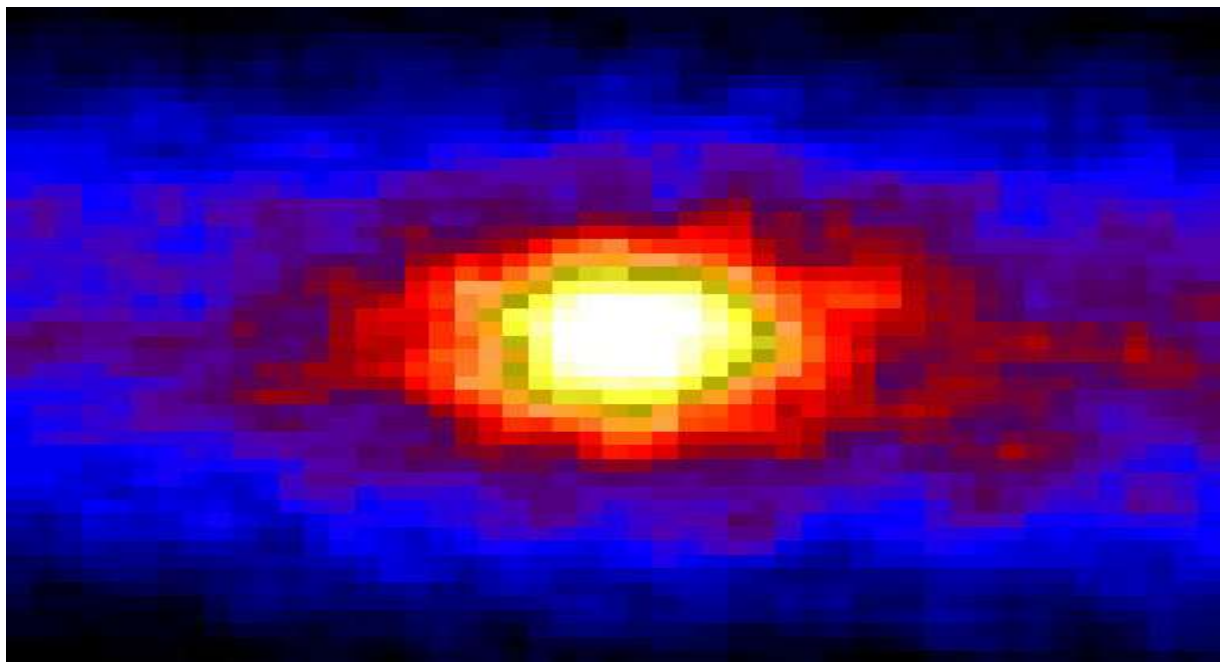
Searching Galaxy



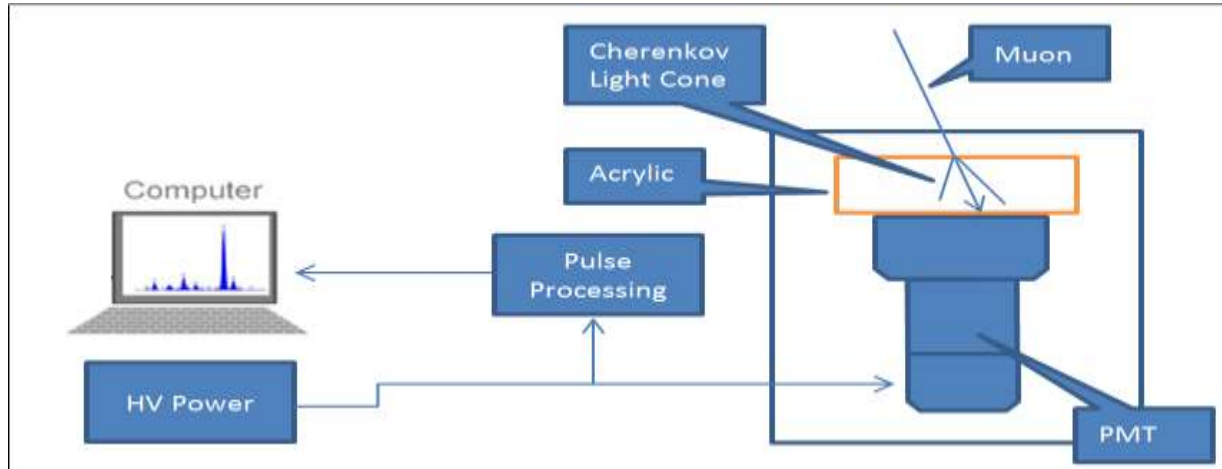
Searching ET through Spectrum analysis



Searching Galaxy with LOFAR



Solar Radio bursts



Instrument procedure of Cerenkov Effect in Ice cube Detector

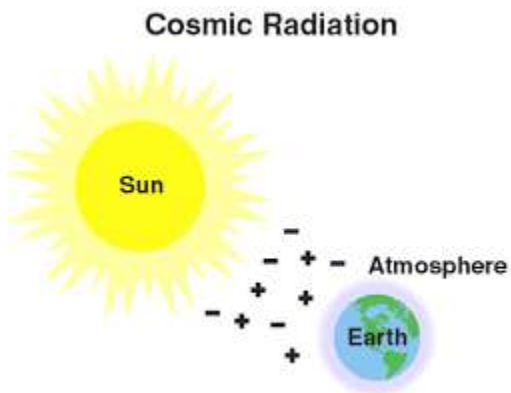


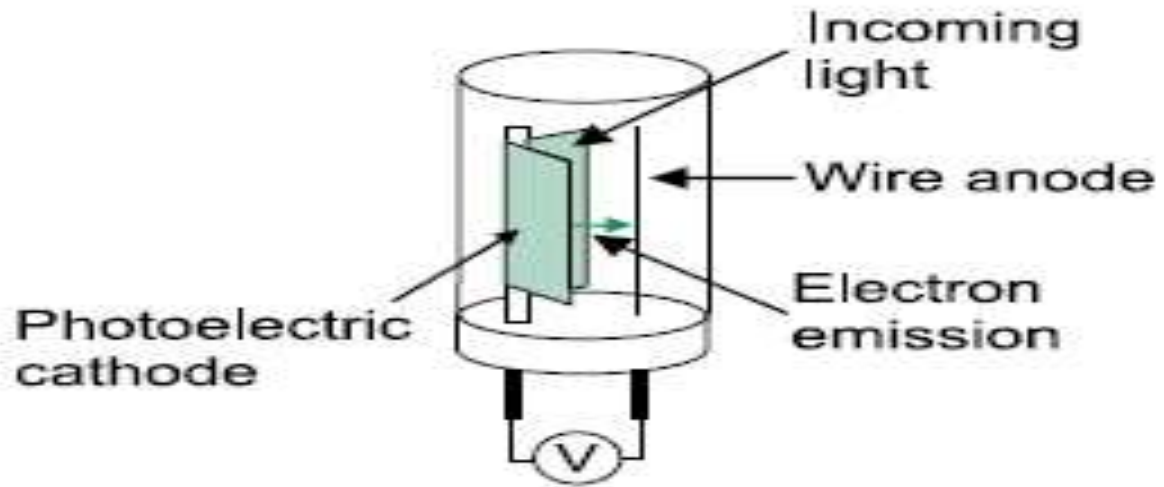
Figure of Solar Neutrino



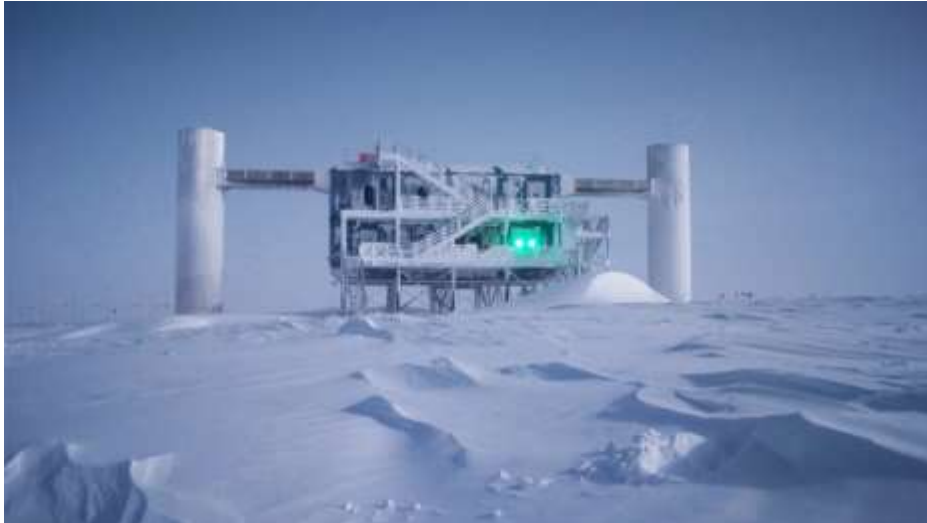
Neutrino detector



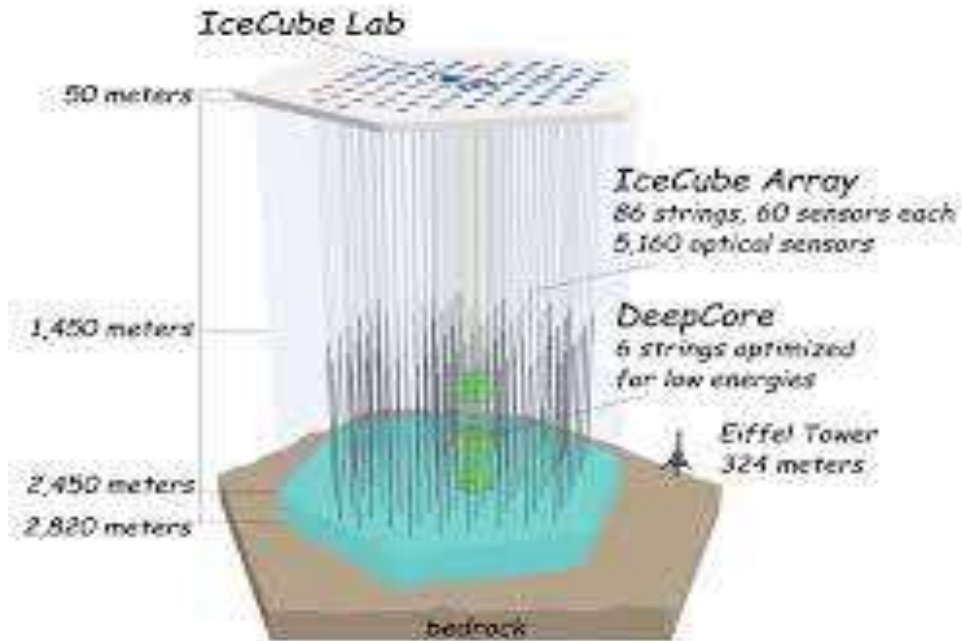
Kamiokande water detector use to detects Muon Particle



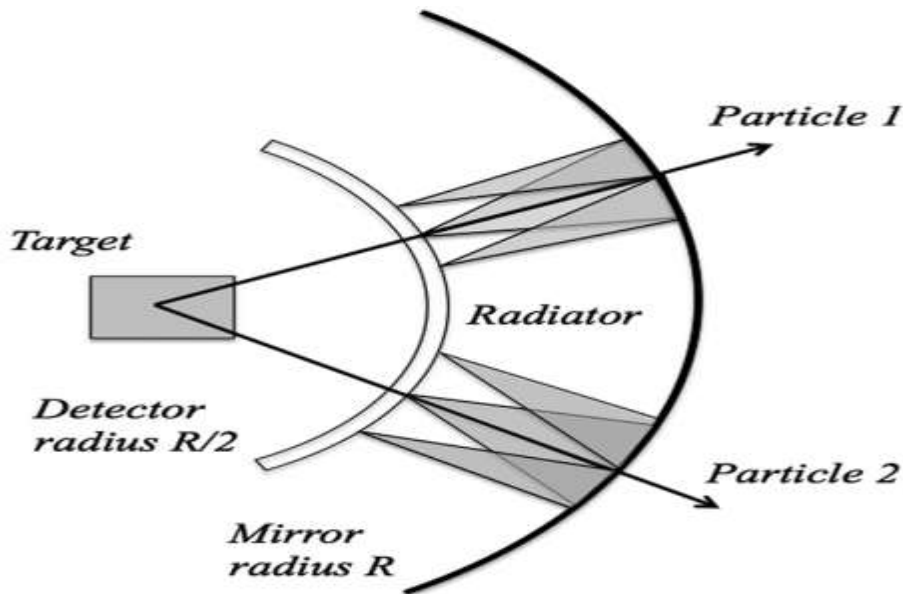
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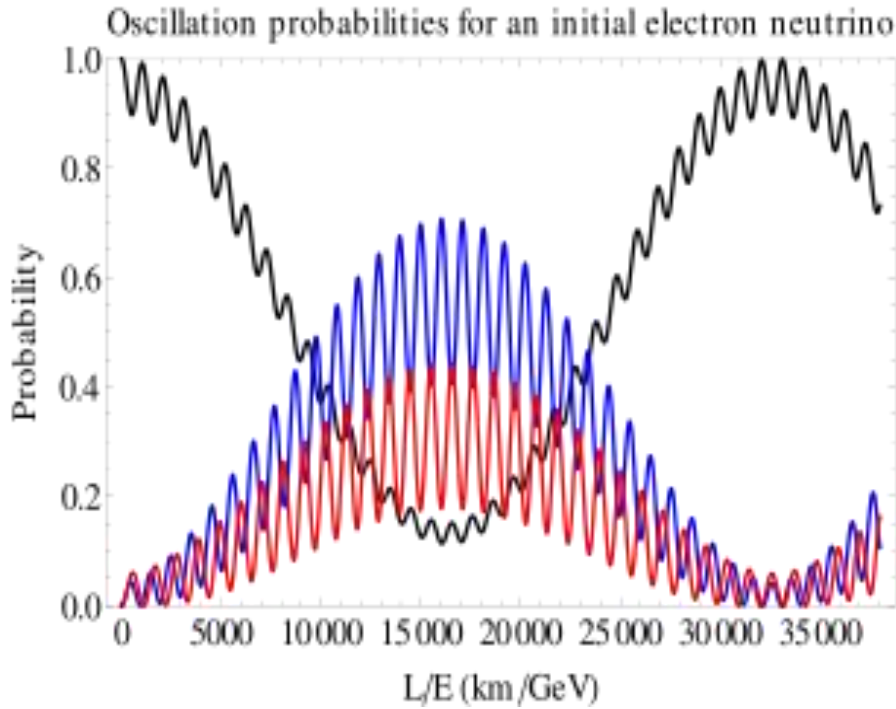
Ice Cube Lab to detect Neutrino through Cherenkov Effect



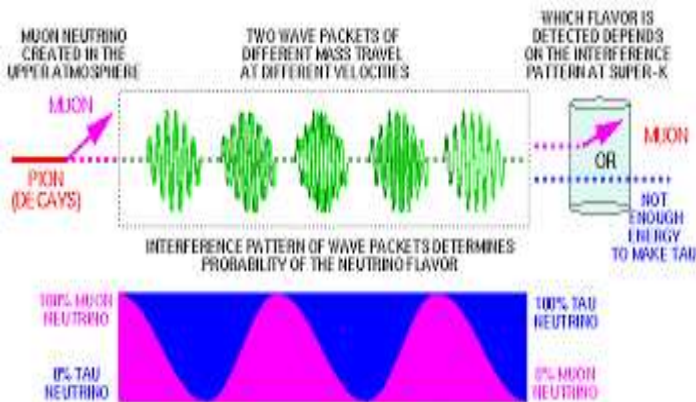
Ice cube Working procedure image



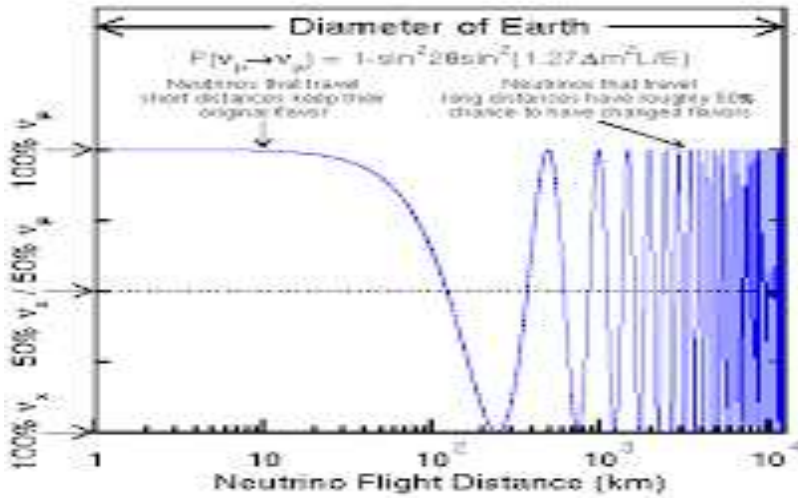
Working diagram of Neutrino detector



Neutrino oscillation through oscillation Neutrino particle change flavor or change Behavior



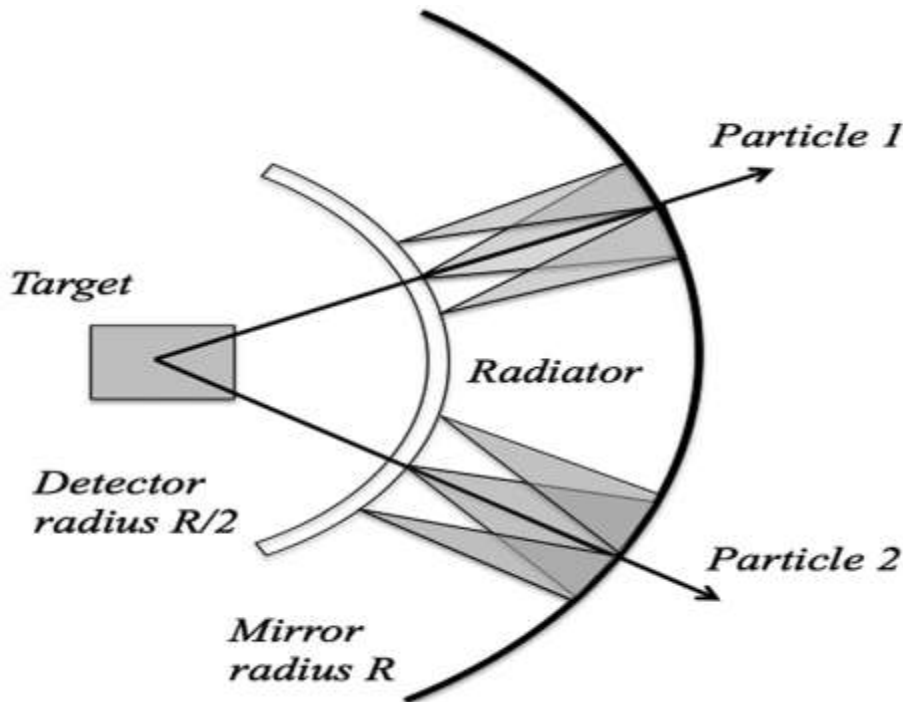
Ray Diagram Of Chrenkov effect



Neutrino flight changes in Flavor



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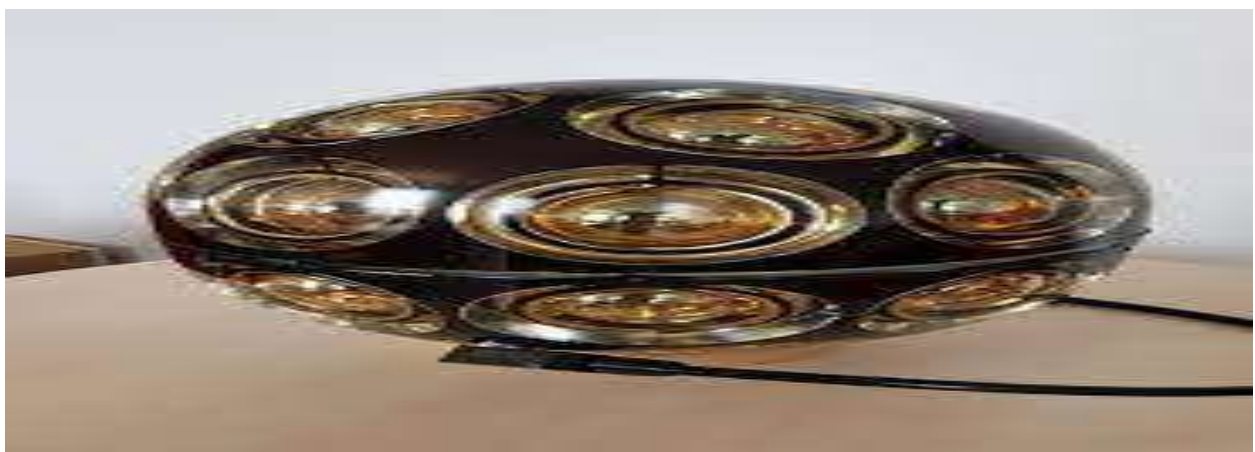


Figure neutrino detectors

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‘X-ray’ the earth to find cavities of mineral oil deposits. Fastest global communication it easy way to communicate with submarines submerges far below the sea surface. Detect Dark matter certain type of neutrino might come from decaying dark matter. The Ice Cube lab has built to detect Neutrino through detector in Antarctica that has detect extremely beginning energy neutrinos.

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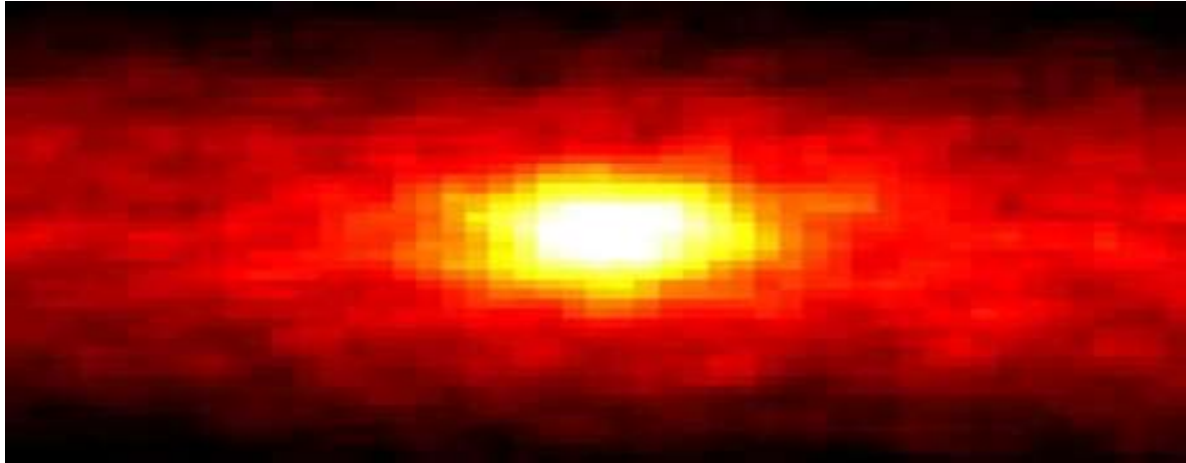


Figure 1(b) picture of the Sun made from looking at direction of Solar Neutrinos courtesy of (NASA APOD).



Neutrino

Conclusion

Evidence to produce GRBs produced Neutrinos or CR ray's and detect by Ice Cube detector. Together, these immense bodies of water and Ice on our Water and Ice on our World are the best for exploring. How Neutrinos from Far-flung comes that How Universe are made? All aspect Neutrino search for it. Probe the properties of Neutrino get to our understanding clear that these Neutrino particle is really beginning to reach through New Research on behavior of Neutrino. IS it Gamma rays produced from Cosmic rays and Neutrinos????

What difference between Galactic energetic particles and Neutrinos or radio Bursts particles??
How they effect in Earth environment still answerable.

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