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# Space based Solar Power: Feasibility Microwave based wireless power system

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## Abstract

Electricity is Part of Life. Electricity is extremely essential to all need it is flexible form of energy, and has been adapt to huge, and growing number of uses. The concentration on the use of fossil fuel for energy supply is the main threat for stability of the global Climate system. To converse our Globe, the Scientific Community gave evidence that mankind has decreases the green House gas emission.

***Keywords:*** *Space based Solar Power Application, Wireless Power transmission (WPT), Space Solar Power (SSP), Renewable Sources, UNSDG*

## Introduction

Space based solar power every hour moves solar energy reach the earth the use about 30%.

Space satellite based Solar panels would be able to capture and transmit substantially more energy than terrestrial panel. Microwave transmitting solar satellite.

### *How does it work*

Solar panel equipped, energy transmitting satellite collect high intensity, uninterrupted solar radiation by using giant mirrors solar radiation by using giant mirrors reflects huge number of solar rays on to smaller.

Solar ray's collectors this radiation in then wireless beamed to earth in safe and controlled way as either by microwave of Laser Beam.

Microwave transmitting solar satellite Sunlight reflect off these large mirrors in to the center of satellite.

Solar Photovoltaic Panel

Solar Energy work by converted the Sun's energy in to electricity, A Solar cell which is also known as Photovoltaic (PV) cell converts Sunlight in to electricity. The process by which Voltage is generated in Solar Cell is known "Photovoltaic effect".

Solar Cell is Known as "Photovoltaic effect" Solar Cell were fabricated using Silicon- Silicon is the dominant material in first discovery of doping effects in hydrogenated as Si(G-Si:H) alloy (Spears and Lecomber 1975).

Thin films have received a great deal of attention as candidate for low cost and large area of Solar Cell.

The second-generation thin film technology has potential to reduced materials and disposition cost. Thus, however the photo degradation of a Si-iH is serious problem for practical application, today Nano crystalline and microcrystalline silicon films have been extensively investigated a solar cell materials (Lewis 2007).

Hydrogenated micro crystalline silicon (Uc-Si:H) has been used extensively to thin – film Solar Cell owing better stability and Higher efficiency as compared with Si- H solar Cell.

The concept of the third-generation solar cell increases of efficiency and reduction of the production thin film technologies, we anticipate the new generation quantum phenomena of silicon nanostructure for device (Nozik; 2008).

### *Space Back Ground*

The concept of large SPS that would be placed in geostationaryorbit was invented by peter Glaser, 1968. The SPS concept was examined extensively during the late 1970s by the US department of energy

(DOE) and national aeronautics and space Administration (NASA) the DOE- NASA put forward the SPS concept in year 1979. The center feature of this concept was creation of large-Scale power infrastructure in Space consisting 60 SPS. Delivering a total of about 300GW but, as result of huge price tag. Lack of evolution many concept and subsiding energy crisis in 1980-81. SPS efforts were terminated with a view to re-asses the concept after about ten years during recent time international community take interest in SPS emerged which led to WPT (WIRELESS POWER Technology TRANSMISSION) experiment in Japan.

**Concept of SPS development and evaluation programmed**

NASA USA department of Energy (DOE) is jointly investigating the SPS concept they organized the satellite power concept development and evaluation to engineering feasibility of such project.

Resources requirement (critical material Energy and Land).

Financial/ Management Scenario

Public acceptance

State and local regulation as applied to satellite power system Microwave receiving Antenna

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Student participation through New Wireless technology system.

Potential of LASER for SBSP.

International agreement

Centralization/decentralization

Mapping exclusive Area for rectenna sites

Economic of exclusion Areas for rectenna sites.

Meenna sites.

Meteorological effect on LASER Beam Propagation and Direct Solar Pumped LASERS

Public Outreach experiment

Power transmission and reception technical summary and assessment

In years 1997 Nasa Conducted its fresh outlook study and examine to modern feasibility to assessing “What has changed”.

Peter Worden of NASA claimed that Space Based Solar is about five order of magnitude more expensive that Solar Power from Arizona Desert, with major cost being the transportation of materials to orbit. Worden referred to make possible solution as speculative. 2 Nov 2012 china proposed Space collaboration with India that mentioned SBSP.

**Exoplanetary Research and technology Program**

Space Based power explanatory research and technology program

SERT developing a solar power satellite concept for future Giga Watt Space Power system, provide electrical power by converting the Sun’s Energy and beaming it’s to earth’s surface and provided a conceptual development.

SERT proposed inflatable photovoltaic gossamers structure with concentrates lenses of Solar Heat engine to convert Sunlight in to electricity.

The programme looked both systems in Sun synchronous orbit and geosynchronous orbit.

Space debris is major Hazards to large object in Space, particularly for large structure such as SBSP systems in transit through the Debris below 2000 k.m. Collision risk is much reduced in GEO since all satellite are Moving in the same direction. At very close to same Speed.

The large Size at corresponding cost receiving station on the ground. The Cost has been estimated at billion dollar for 5GW produced by SBSP researcher Keith heson predict.

Energy loss during several phases of conversion from Photons to electron stop Photon back to electrons.

West heat disposal in space Power system difficult to begin with become intractable when entire space Craft in designed to absorb Such Solar radon is possible.

Traditional space craft thermal control system such as radiative varies may interfere with Solar Panel.

The space-based portion will not need to support itself against gravity (other than relatively weak tidal stresses).

It is need no protection from terrestrial Wind or weather, but will have to cope with space Hazards, such as Micrometeorites and Solar Flares. Two basic conversion methods of conversion have been studied through photovoltaic cell (PV) and solar dynamics (SD). Most analyses of SBSP have focused on

Photovoltaic conversion using Space Cells that directly convert Sunlight in to Electricity, Solar Dynamics uses mirrors to concentrate Solar Light or Boilers. This use of Solar Dynamics could reduce mass per Watt.

Wireless power transmission was proposed eating on as means to transfer energy from collection to the earth Surface, using Microwave or laser radiation at variety of frequencies.

**Orbital location of satellite**

The main advantage of locating a space power station in geostationary orbit is that antenna geometry stay constant, so keeping the antenna lined up in smaller. Another advantage is that nearly continuously power transmission is immediately availability soon as the first Space power station is placed in orbit.

LEO requires several satellites before them producing nearly continuous power. Power beaming from geostationary orbit by microwave carries the difficulty that require “optical aperture sizes are very large NASA SPS study requires 1 k.m diameter transmitting antenna, and 10 kilometer diameter receiving rectenna , for microwave beam at 2.45 GHz . These Blockage by rain or water droplets because thinned array curse. It is not possible to make a narrower beam a several high, small SPS systems will be possible, but uneconomic a collection of LEO (Lower Earth Orbit) Space Power station has been proposed as Precursor to GEO (Geostationary Orbit) through space based Solar **Panel.**

**Space –based Solar Power (SBPS, SSP)**

Is that concept of collecting Solar Power in Outer Space by Solar Power satellite (SPS) and distributing it to earth? It advantages include a Higher collection of energy due to lack of reflection and absorption by atmosphere, the possibility of very little Night, and better ability to orient to face odd of the Sun. Space based Solar power system convert Sunlight to some other form of energy (such as Microwaves) which can be transmitted through atmosphere to receives on earth.

The Solar energy collected by satellite would be converted into High Frequency radio waves and beamed for rectifying antenna on earth, which would convert the radio waves in to electricity. Each satellite could delivers aground 2 GW of Power in to grids, making each satellite comparable in power output to Nuclear Power station.

**In space;** there is no atmosphere, so the Sunlight is undiluted; and as the aerospace engineers at the beginning of Space race found, put a solar panel in orbit and it will automatically generate about twice as much as the equivalent Panel on earth. Space-based Solar panels can generate2,000 Giga Watts of power constantly. This is 40 times more energy than Solar Panel would generate on earth annually this is also several fold higher than the efficiency of Solar panels todays.

IBSP, SSP Space based Solar Power in outer space by solar power satellite (SPS) and distributing it to earth. It’s advantage include a higher collection of energy due to the lack of reflection and absorption by the atmosphere, the possibility of very little night and better Ability to orient to face the Sun. space based Solar Power system convert Sunlight to some other form of energy

it’s advantages include a higher collection of energy due to lack of reflection and absorption by atmosphere

the possibility of very little night, and better ability to orient face toward the sun

Space based solar power system convert Sunlight to some other forms of energy Such as Microwaves which can be transmitted through atmosphere to receive on earth surface.

Wireless power transmission with its concomitant conversion in efficient as, as well as land use concerns for antenna station to receive the energy at earth surface.

The collecting satellite could convert solar energy in to electrical energy powered microwave transmitter or laser emitter and transmit this energy to collectors or microwave rectenna on earth’s surface.

Then necessarily vast size of receiving antennas would still requires large blocks of land near the end users.

The services vast size of receiving antennas would still requires large block of land would still requires large Block of land near end users. The services life’s space-based collectors in the face of long-term exposure to the space environment including degradation from radiation and micrometeoroids damage could also become a concern for SBPS.

**Space based Solar power consist of three elements**

Collecting Solar energy in space with refer or inflammable mirrors on to Solar Cells or Heater for thermal system

Wireless power transmission to earth via microwaves or Laser.

Receiving Power on earth via a rectenna a microwave antenna.

Space based Solar Power essentially consists the space-based portion will not need to support itself against gravity (other than relatively weak tridal stresses). It is need no protection from tress trial wind and weather, but will have to cope with space hazards. Such as micrometers and Solar Flares.

Two basic methods of conversion have been studied photo voltaic (PV) and Solar Dynamics (SD).

Most analyses of SBPSP have focused on Photovoltaic conversion using Solar cells that directly convert sunlight in to electricity, solar dynamics uses mirrors to concentrate light or boiled. This use of solar dynamics would reduce mass per watt.

Wireless power transmission was proposed eating on as means to transfer energy from collections to earth's surface, using microwave or laser radiation at variety of frequencies.

**Laser Power Beaming**

Laser Power Beaming was emission by NASA as stepping some further industerlization of space in 1980s. NASA worked on the potential use of LASER for Space power beaming focusing primarily on development of Solar –powered LASER in 1989.

It was suggested that power could also be usefully beamed by LASER from earth to space. 1991 the SELENE Project (SPACE LASER ENERGY) had begun less power beaming for supplying power to lunar base.

SELENE Programmed was two-year research effort, but the cost of taking the concept to operational status was too high.

Bill Brown technical JPL Raytheon programme that beamed 50 KW of power over distance 1 Miles (1.6 k.m.) at 9.6

***Feasibility Wireless Power technology***

The new millennium has introduced increased power demand for finding new renewable energy sources. The exponential increases in population has led to the global crisis such as global warming, Climate change, Environment pollution, and change in rapid decreases of fossil reservoir.

So, this lead for great demand of electric power increases at a much higher prices at a much higher pace than energy needs. Under these circumstances, research and development carried out to look possibility of building Power station in Space to transmit electricity to earth by Microwaves through use of radio wave through Solar Power satellite.

One of key technologies needed to enable the future feasibility of SPS is that microwave wireless power transmission WPT is based on the energy transfer capacity of microwave beam i.e., energy can be transmitted by well-focused Microwave Beam. Advanced in phased array antenna and rectennas have provided the building Block for negligible WPT system.

**Why SPS need of time?**

Increasing Global energy demand is likely to continue for many decades, renewable energy is compelling approach

Renewable energy is compelling approach – both philosophically and engineering terms. However, many renewable energy sources are limited in their ability to affordably provide the based load power requires for global industrial development and prosperity. An abrupt decrease in their availability of fresh water, water shortage, and electricity make situation worst.

Abrupt decreases in their availability make led to the green House effect and many environmental problems.

Nuclear power station seems to be answer for global warming due to tsunami nuclear power station plant damaged have intensified nuclear radiation hazards and **environmentalproblems.**

***Why use Micro wave?***

Where solar energy is collected and converted in to an electricity which is collected and converted through Solar Powered satellite converted to highly directed microwave beam for transmission. This microwave transmission through Beam which directed to any desired location in earth surface can be collected and converted back to electricity.

This concept more advantage then conventional methods also the microwave energy chosen for transmission can pass unimposed through Clouds and precipitations.

***Why SPS is So important to fill needs***

Space Based Solar Power essentially consists of three elements

1.collecting Solar energy in Space with reflect or inflatable mirrors on to Solar Cell or Heat taken for thermal system

2.Wireless power transmission to earth via Microwave or Laser

Receiving Power on earth Via a rectenna a microwave antenna

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Wireless, using Microwave or LASER radiation at variety of frequencies.

***Wireless Power transmission why need?***

*Wireless power transmission or distribution 50 &60 Hz electrical energy from the generation point to consumer end without any physical wire has yet to mature as familiar and vible technology the 50Hz AC power tapped from the grid line stepped down to a suitable Voltage level for rectification in to D.C.*

*This is supplied to an Oscillator fed magnetron. The microwave power output of magnetron is channel up into an array of parabolic reflector antenna for transmission to the receiving end to antenna for transmission to receiving end to antennas. To compensate for large loss in free space. space propagation and Boost at receiving end the signal strength as well as conversion efficiency. the antennas are connected in arrays a signal radio control feedback system operating in FM based provides appropriate control signal to the magnetron for adjacent its output level with fluctuation in the consumer demand at receiving side. The overall efficiency of WPT system can be improved by-increasing directivity of the antenna array using DC to AC investor with high conversion efficiency with Scotty diode with higher rating.*

*Microwave Power Transmission in SPS*

*The microwave transmission system have three aspect*

*The conversion of direct power from Photovoltaic Cells to Microwave power on satellite on geosynchronous* orbit above earth.

The formation and control of microwave beam aimed precisely at fixed location on earth's surface.

The collection of microwave energy and it's conversion into electrical energy at earth surface.

The key microwave componentsion a WPT system are the transmitter beam control and receiving antenna called rectennas.

At transmitting antenna, microwave power tubes such as magnetrons and Klystron are used as RF power sources in rectenna, is component is unique to WPT system. The following sections describes each of these component details.

Transmitter they key transmitter's it stability to convert DC power to RF power efficiently and radiate power in control manner with low loss.

The microwave power density at transmitting array will be 1 kw/m2 for typical 1GW SPS with transmitting antenna aperture of 1 k.m. diameter. Its use 2.45 GHz for MPT, the number of antenna element per square meter on the order of 100.

Know about Klystron Amplifier

A klystron amplifier is specific liner beam vacuum tube, which used as an amplifier for higher resonant frequencies.

In this amplifies an electron Beam releases to radio waves as its passes via metal boxes, resonant cavities along the length of tube. The signal of amplifiers can be amplified by energy of electron Beam. And the amplified signal received from cavity at other end of tube

Application of Klystron Amplifier

A klystron is vacuum tube that can be used as oscillator, at microwave frequencies the klystron is linear beam device; that is electron flow is in straight line in straight line focused by an axial magnetic field. A power of amplifier tube used to amplify weak microwave energy (provided by radio-frequency exciter) to higher power level for radar transmitter. A Klystron is characterized by high power level for radar transmitter a klystron is characterized by high power, large Size, high stability, high gain and high operating Voltage. Electron are formed in to beam that velocity is modulated by input waveform to produced microwave energy.

1 these amplifiers can generate for higher microwave power O/P solid state Microwave power/P solid state microwave device like Gunn diode

Klystron are used modern system TeV used for Hundreds of MHZ (VHF) through Hundreds of GHZ.

This amplitude can be found in satellite, radar, wide spread high-power communication, medicine, high energy physics.

SLAC, these amplifiers are normally employed which operating in range of 50MW& 50 kW time average at 2856 megahertz.

The radar use two klystron that offer a total power of 1 MW at 2380 megahertz.

Global resources corporation (GRC) currently using Klystron amplifier to convert Hydrocarbons in daily material coal, automotive Waste oil, sand, diesel fuel, oil shale and oil sands in to natural Gas.

Figure Shows Klystron convert RF signal (Solar Electrical Signal) to Microwave

**Two types of amplifiers are**

1. Two cavity klystron Amplifiers
2. Reflex Klystron Amplifiers

**1. *Two cavity Amplifiers***

Here the catches cavity is used to absorbs energy from the electron Beam, the catcher grid is located when a beam, at place where the bunches are totally formed, the place is determined by transits time of the bursts at natural RF cavity. The collector receives the energy from electron Beam and alter it in to heat as well as Xray radiation. The addition to an intermediate cavity b/n the i/p send o/p cavity is basic klystron amplification. Extra cavities serve to velocity modulates the electron beam increase in the energy available out O/P.

2.***Reflex klystron Amplifiers****:* the refix klystron is called invented by Roberts sutten. It is a low power tube with single and work as an oscillator. the reflex klystron amplifiers is used as an oscillator is modulated in microwave transmitter and radar receiver, but these devices are replaced by semiconductor microwaves devices. In this electron Beam flows through a single resonant Cavity. The electron in this amplifier is excited by electron Gun in to end of tube. After permitting through the resonant cavity, they replicated by negatively charged reflector electrode for alternative pass-through cavity.

When electron beam flowing through cavity, the its velocity is modulated, making of electron bunches take place in drift Space between the cavity and reflector. The voltage on the reflector must be attuned so that bunching will as maximum at electron beam return the cavity therefore confirming a max of energy is moved from the electron beam to RF Oscillator in cavity

In most application the reflex klystron is effectively replaced by the modern semiconductor technology.

**Rectenna**

Rectenna is device that convert radio waves in to electrical signals rectifying bridge Circuit which directly connected to normal antenna. Rectenna is device that converts radio signal in to electrical signal by utilizing of rectifying circuit which is directly connected to normal antenna. The common purpose of antenna is received RF energy from atmosphere and transmit through Circuit. This provides High efficiency while conversion of microwave in to electrical energy. Rectenna research carried out for different application, Viz., Wireless Sensor Network (WSNs), Solar Sensor network (SPT), medical in plant, and wireless energy-harvesting (WEH)system.28GHz rectenna used for Harvesting wireless transmission.

Rectenna is microwave to DC power conversion device and mainly composed of receiving antenna and rectifying circuit. Schottkey Barrier diode utilizing silicon and gallium arsenide are employed. Diode selection is dependent on the input power levels the break down voltage limits the power handling capacity and directly related to series rectinna. the diode selection depend upon input power level,

Advantage and disadvantage of Solar Power energy to Space.

Idea of collecting solar energy in space and returning to earth using microwave beam has many attractions. The full Solar irradiation would be available at all times. At time of Solar eclipsed by earth five times energy could collected, compared to best terrestrial sites.

The power could be directed to any point on earth surface. The zero gravity and high vacuum condition in space would be allow much higher, low maintains structure and collectors.

The power density would be uninterrupted by darkness, clouds or precipitations, which problems encountered with earth based Solar Arrays.

The realization of SPS concepts holds Great concepts for solving energy crisis. The concept of generating electricity from Solar Energy in the space itself has it's inherent dis advantage are

The main drawback of solar energy transfer from orbit is the storage of electricity during off peak demand hour.

The frequency of beamed radiation in planned to be at 2.45 GHz and this frequency is used by communication satellite also. The entire structure is massive high cost and require much time of construction. Radiation Hazards associated with system risks involved with malfunction. High power microwave source and high gain antenna can –used to deliver an intense burst of energy to target and used as weapon.

Space satellite using Solar Energy and Microwave transmission technology Solar power satellite (SPS) converts Solar energy in to microwaves and send microwave in to beam to receiving antenna on the earth for conversion to ordinary electricity SPS Clean, Large scale, stable electric power Sources for SPS wireless Power transmission is essential. WPT contain microwave beam which can be directed to any desired location on earth surface.

**Space**

Solar Power satellites would be Located in geosynchronous Orbit. The difference between existing satellites and SPS is that and SPS would generate micro power- much more power than its own operation. The solar energy collected by SPS would be converted in to electricity. Then into microwaves, the microwaves would be beamed to earth's surface, where they would be received and converted back in to electricity by large arrays of devices Known as rectifying antenna or rectennas. Each SPS would have ground rectenna size been massive; measuring 10.5 k.m long 5.3 k.m long wide of with average are 56 Square k.m. the surface or of satellite covered with 400 million Solar Cells. The transmitting antenna on satellite would have been 1 k.m. diameter and receiving antenna on earth's surface have been about 10 k.m.

In order to obtain a sufficiently concentrated Beam; a great deal of power must be collected and fed in to a large transmitter array. The power would be beamed to earth in the form of microwave at frequency of 2.45 GHz.

Are consider optimal for the transmission from SPS to the the ground rectenna site.

The amount of power available to the consumed from one SPS in 5 GW. The peak intensity of microwave beam would by 23 mW/cm3. SPS has all the advantage of ground Solar, it generates power during cloudy weather at height in otherward SPS receives operates Just like Solar Arrays. It receives power from Space and convert in to electricity.

The reduce the size and complexity of satellite.

Design SBSP through figure shown in 1,2, 3

Effective suggestion about wireless technology

Researcher should work in R&D on some sort of Wireless technology to transmit the trapped Solar energy stored in satellite back to earth in form of Microwave

The whole working process of the wireless system must be Cost effective.

Project and cost make So difficult to implemented, if launch facility through whole idea of scale of the problem, assuming that Solar panel mass of 20 k.g per kilowatt without considering mass supporting structure of, antenna or significantly mass reduction of any focusing mirrors. At 4GW power station would weigh 80,000meter tons? All of which would in current circumstance be launched from earth. These however possible through origami deigned of solar cell array used through part of satellite based solar power project that's However far from the state of art for flown space craft. Very light payloads could likely achieve 1 kg/kw.

1. Solar Electromagnetic Radiation
2. SPS background
3. Transmitter through Klystron
4. Klystron transmitter
5. Advantage and disadvantage of Solar Power energy to Space

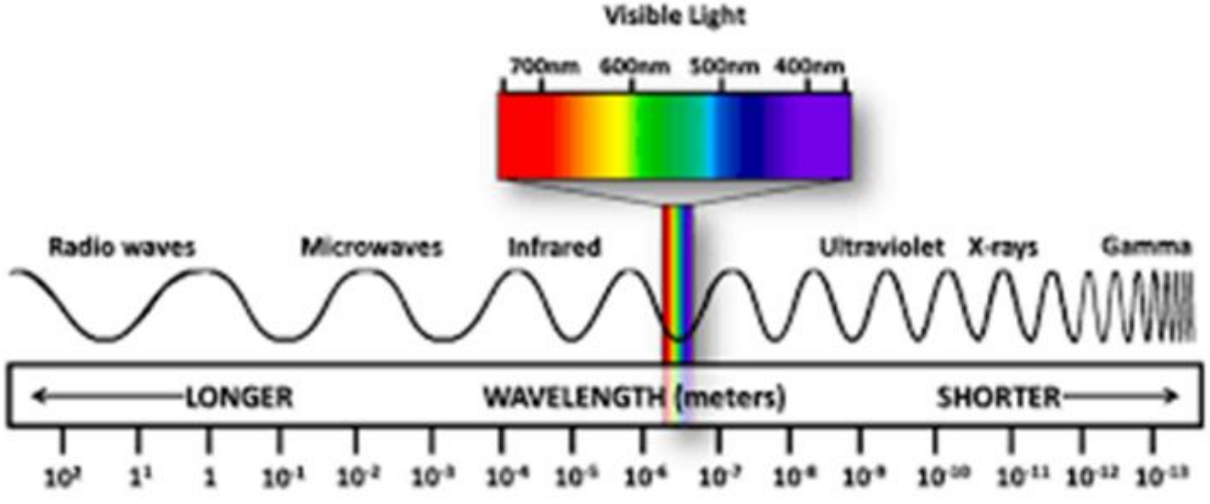


***Fig 1(a):*** Solar Energy In form Electromagnetic radiation

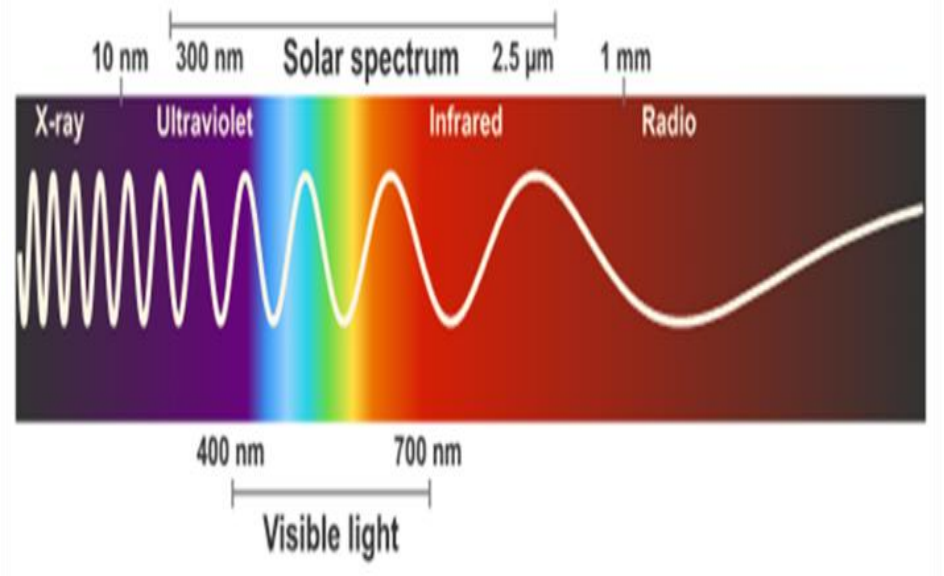


***Fig 1 (b):*** Electromagnetic radiation

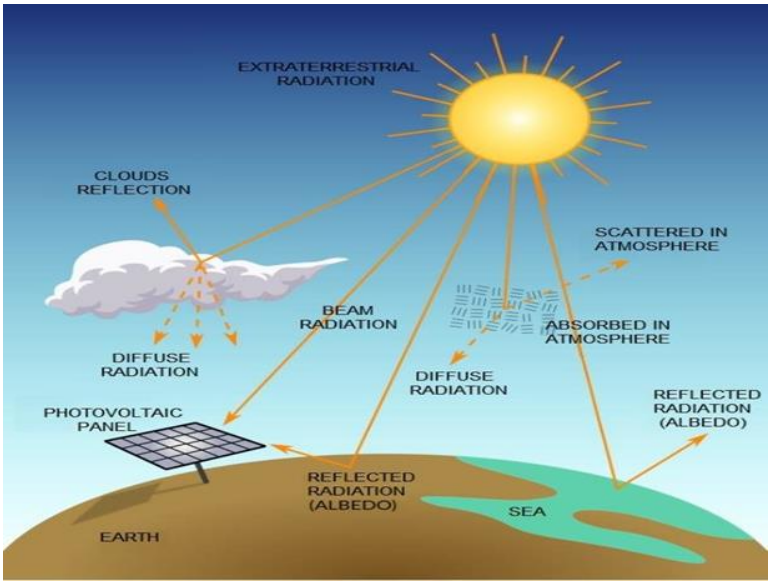


***Fig 1(c):*** Solar Energy radiation in the form of Solar radiation Energy

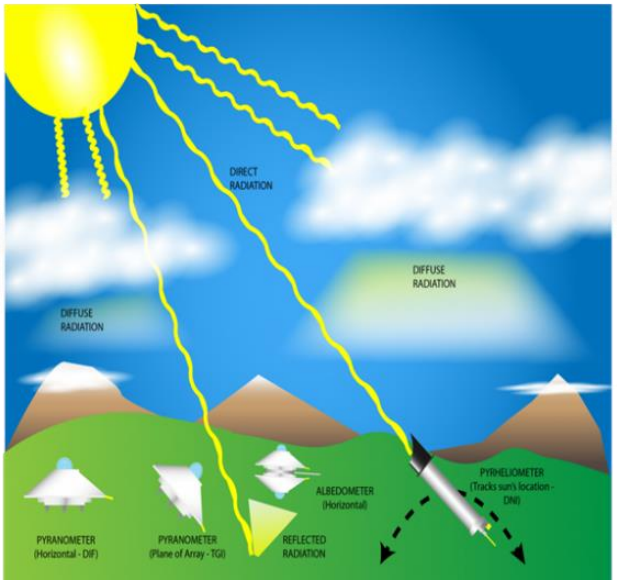


***Fig 1(d):*** Solar radiation in earth environment

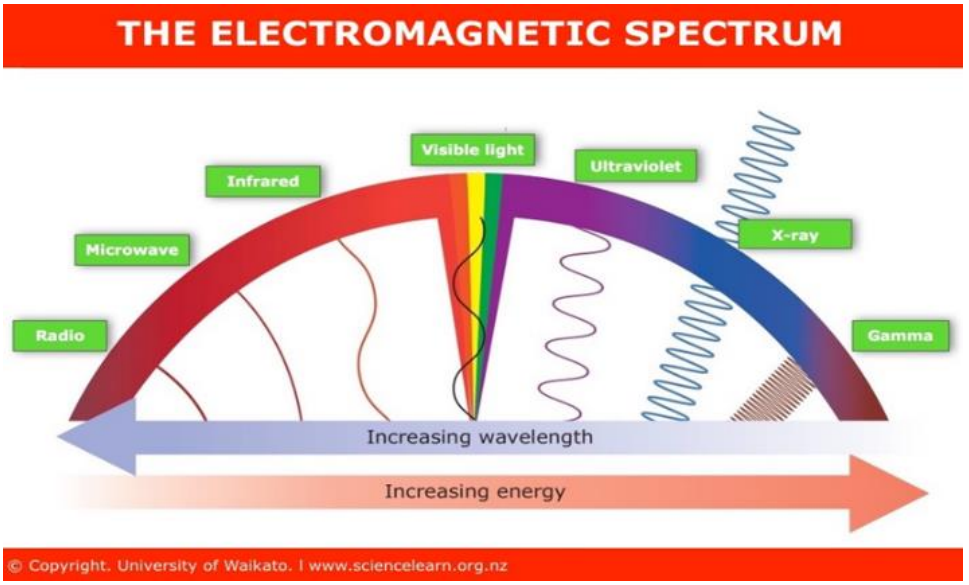


***Fig 1(e):*** Solar radiation In the form of Electromagnetic radiation

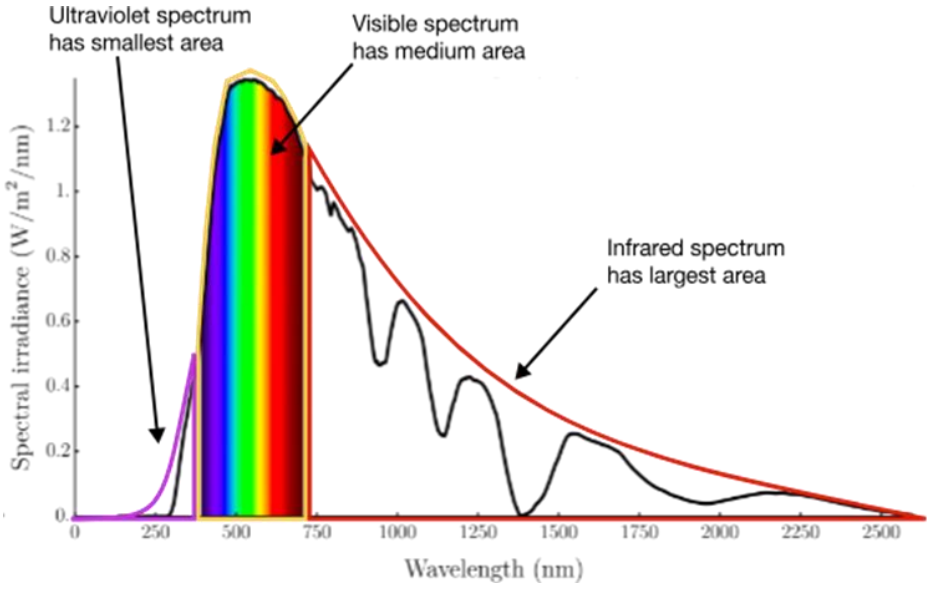


***Fig 1(f):*** Electromagnetic radiation range

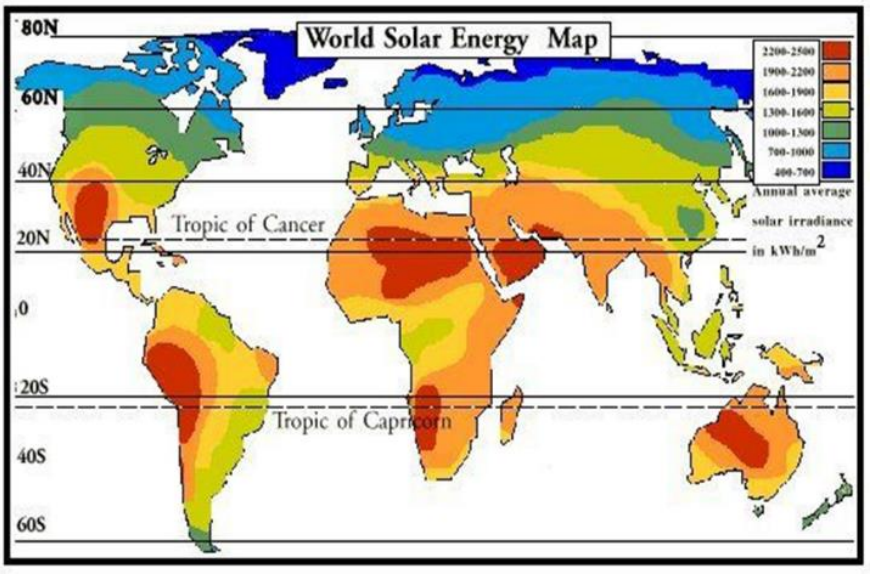


***Fig 1(g):*** Global Solar Energy Potential of World

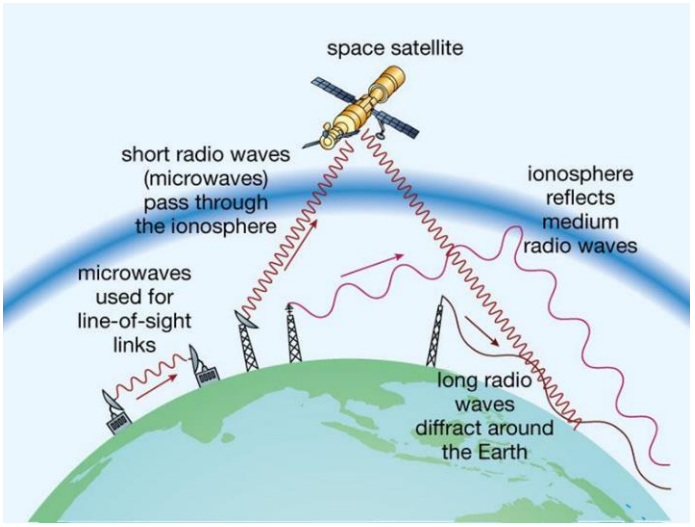


***Fig 2(a):*** Radio wave propagation passes through Ionosphere

## SPS background Satellite Solar Pannell

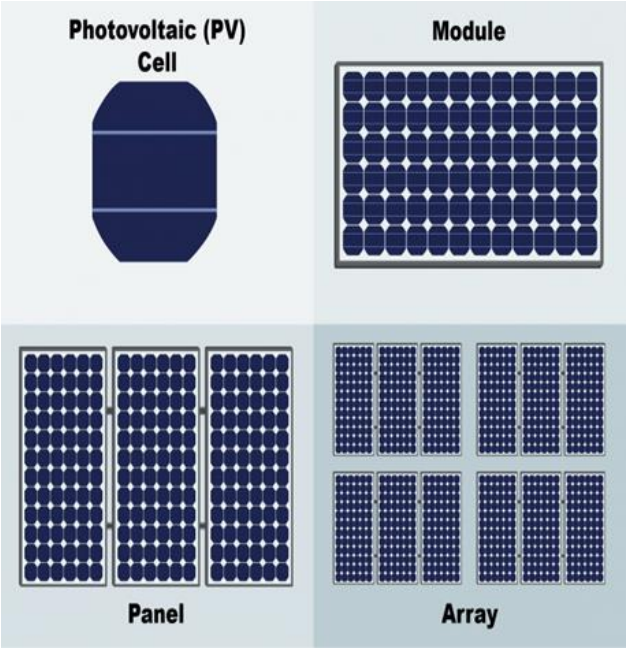


***Fig 2(b):*** Photovoltaic (PV) Cell wafer working use in Solar Panel of satellite

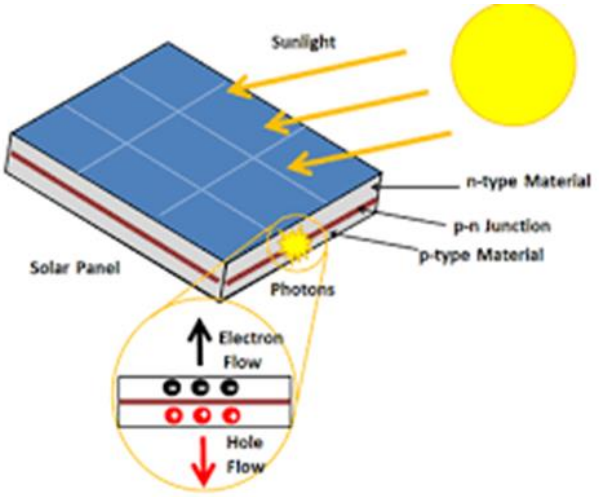


***Fig 2(c):*** Photovoltaic Panel

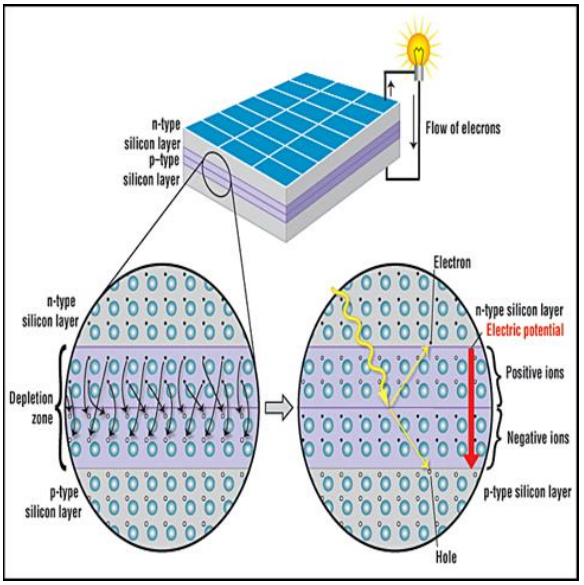


***Fig 2(e):*** How a Solar Cell works

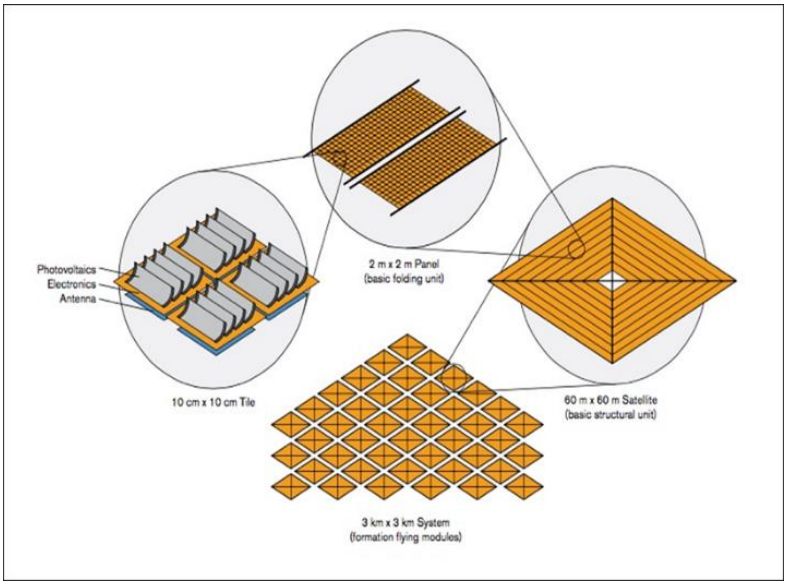


***Fig 2(f):*** Origami Solar Pannel to power the space station through Solar Cell Array

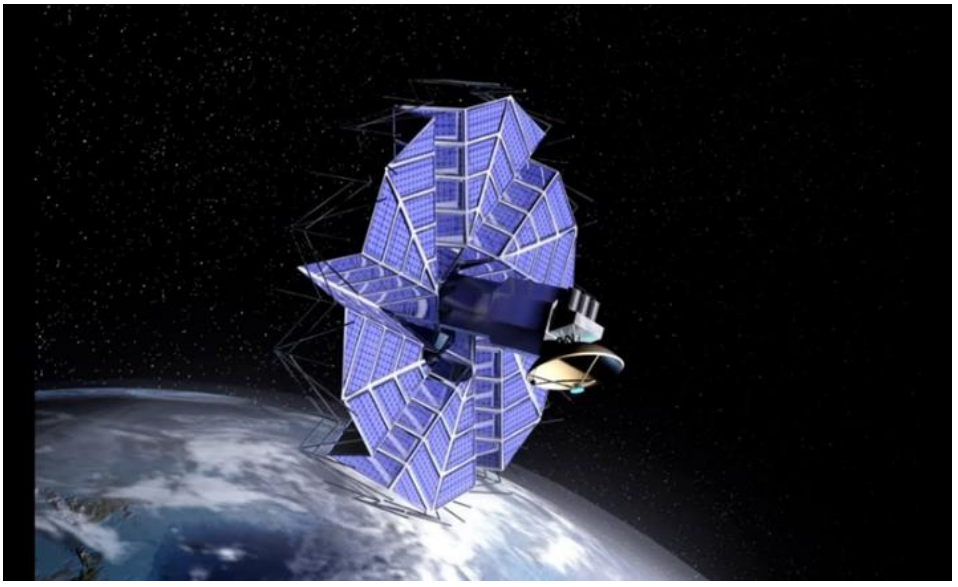

***Fig 2(g):*** Origami Solar Panel to power the space station through Solar Cell Array

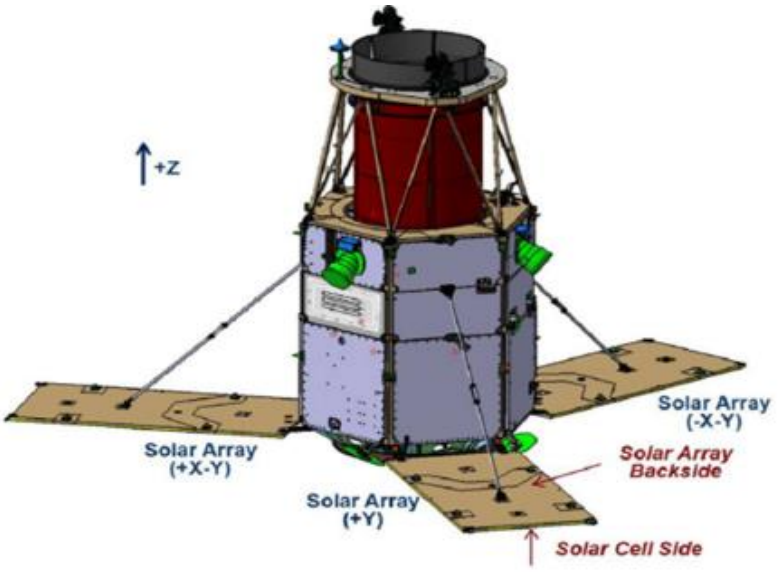


***Fig 2(h):*** Satellite by Solar Pannell

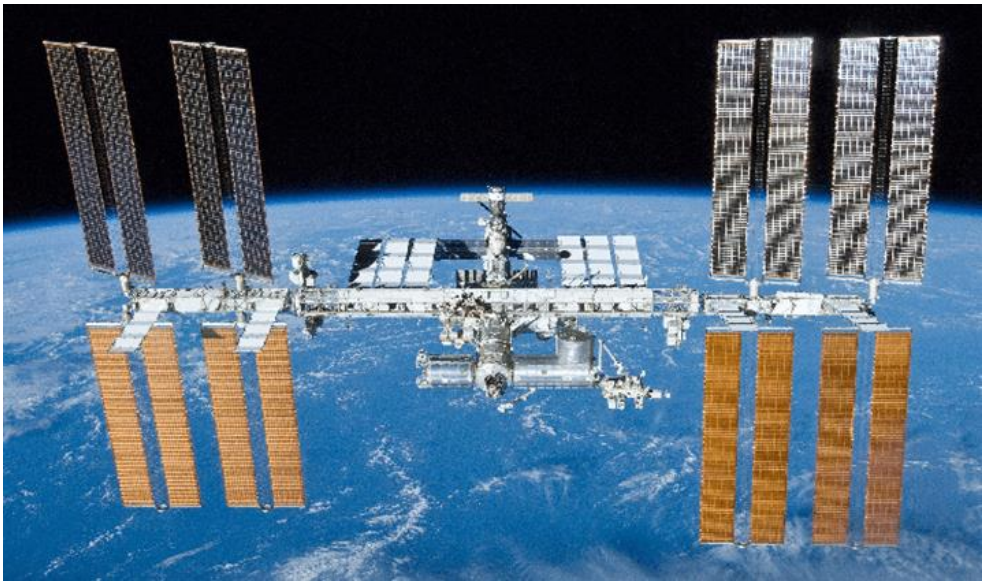

***Fig 3(a):*** International Space station

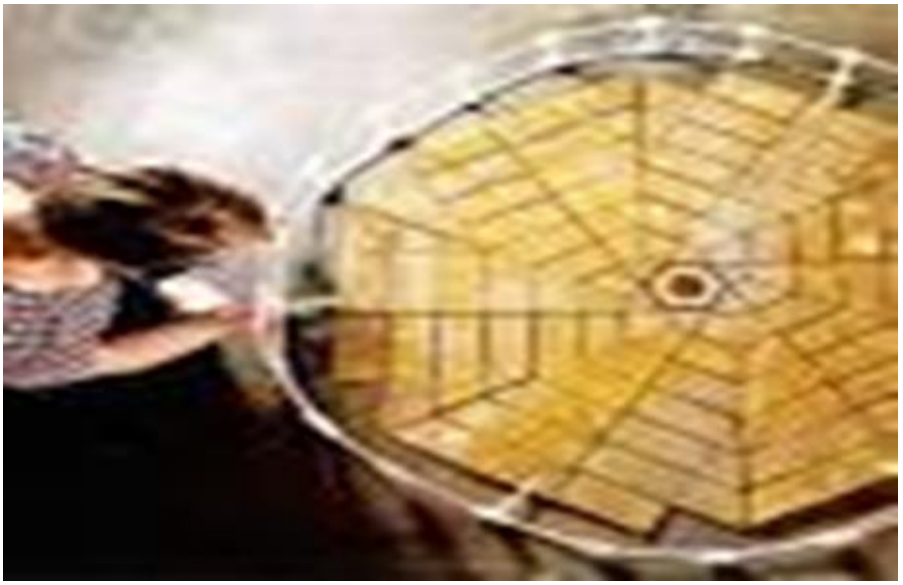

***Fig 3(b):*** Solar power deployed as like umbrella shape package Pattern use of Solar cell array panel in Spacecraft

***Fig 3(c):*** Satellite use Solar cell arrays panel

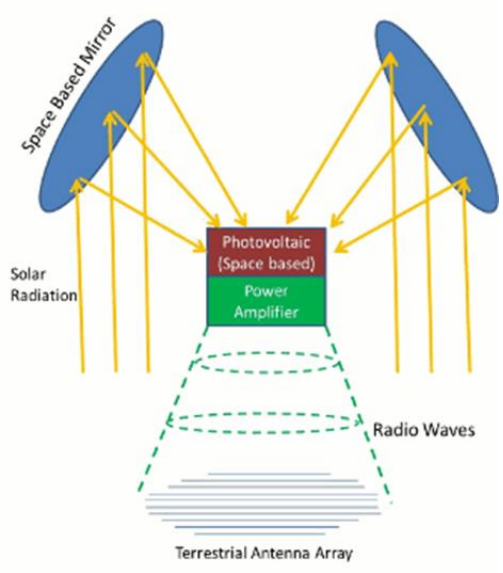


***Fig 3(d):*** Terrestrial Antenna Array

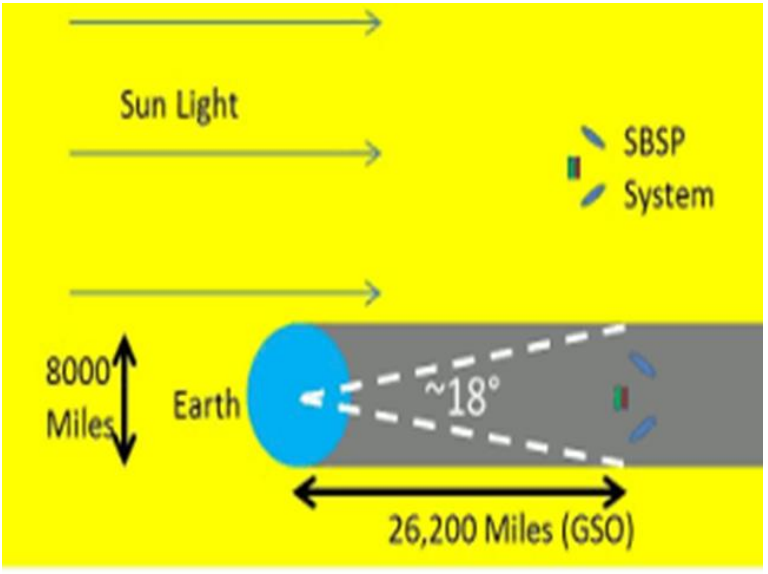


***Fig 3(e):*** SBSP deployed in LEO and GEO

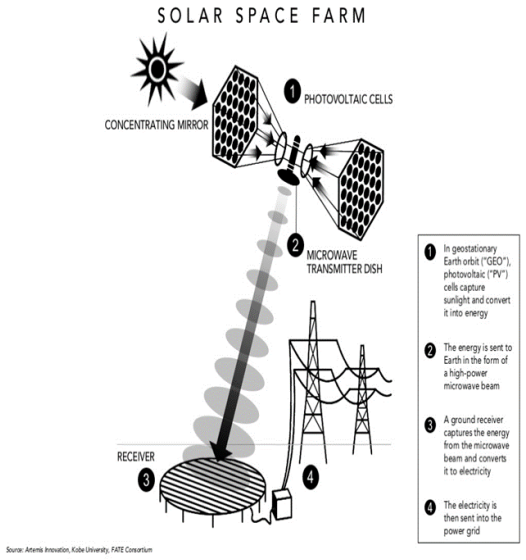


***Fig 3(f):*** Conceptual Diagram of SPS is So important to fill needs, through Wireless Power transmission

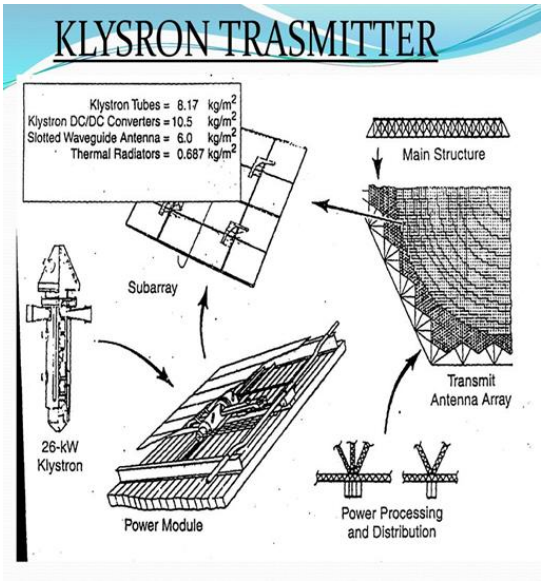


***Fig 4(a):*** Klystron

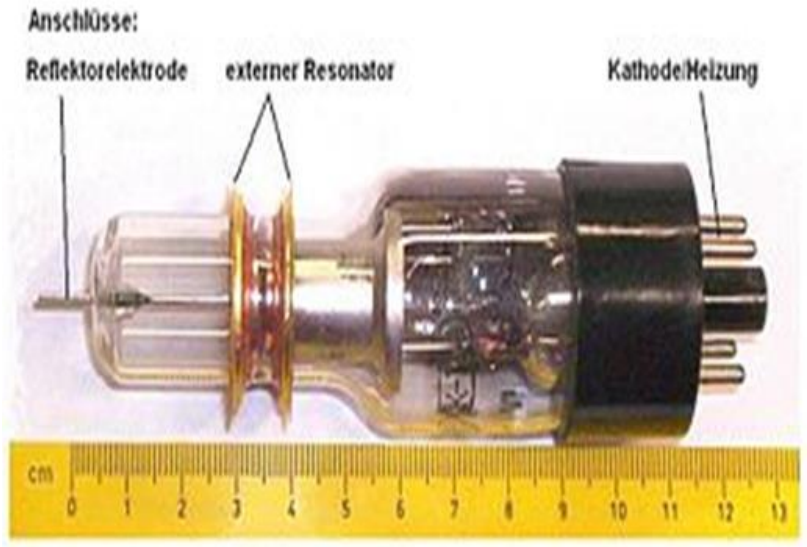


***Fig 4(b):*** Microwave Transmitter through Klystron

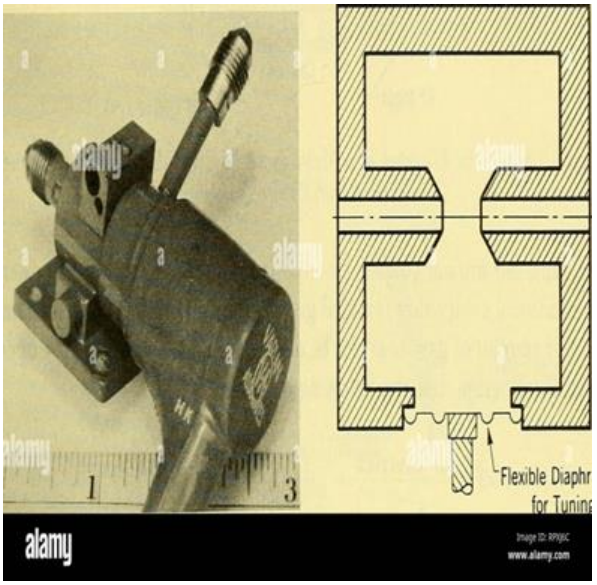


***Fig 4(c):*** Reflex Klystron Used as Oscillator and amplifier of microwave

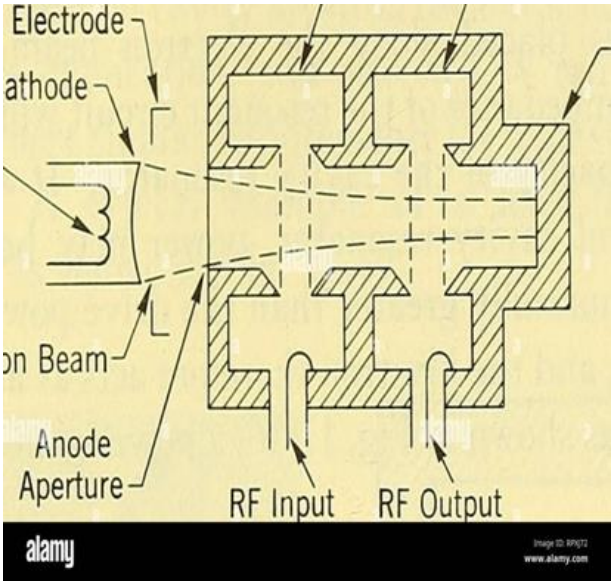


***Fig 4(d):*** Two Cavity Klystron transmitter

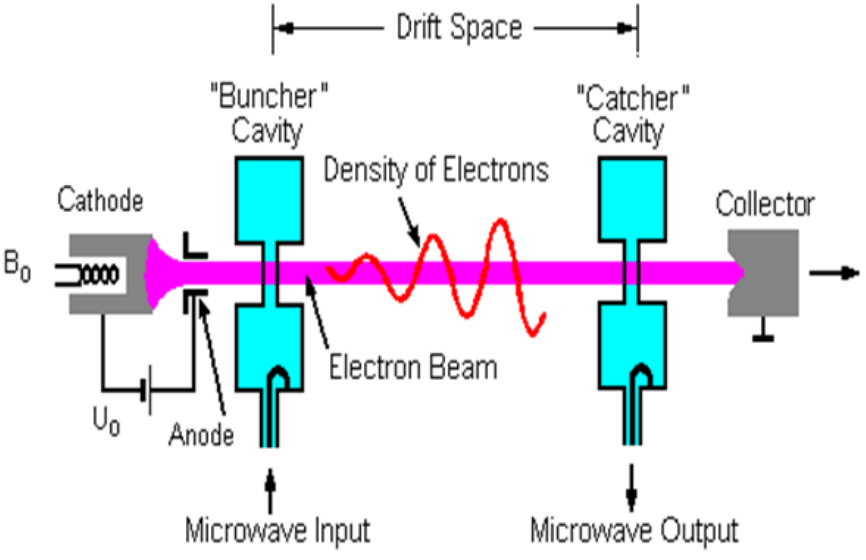


***Fig 4(e):*** Klystron transmitter BLOCK Diagram

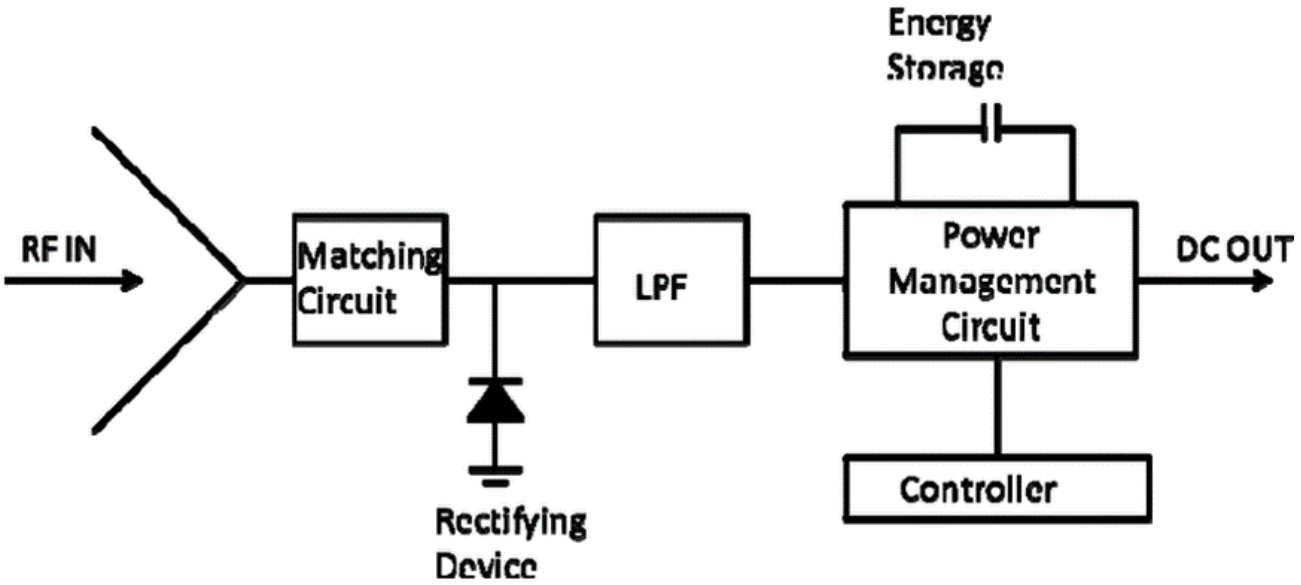


***Fig 4(f):*** Rectenna working diagram

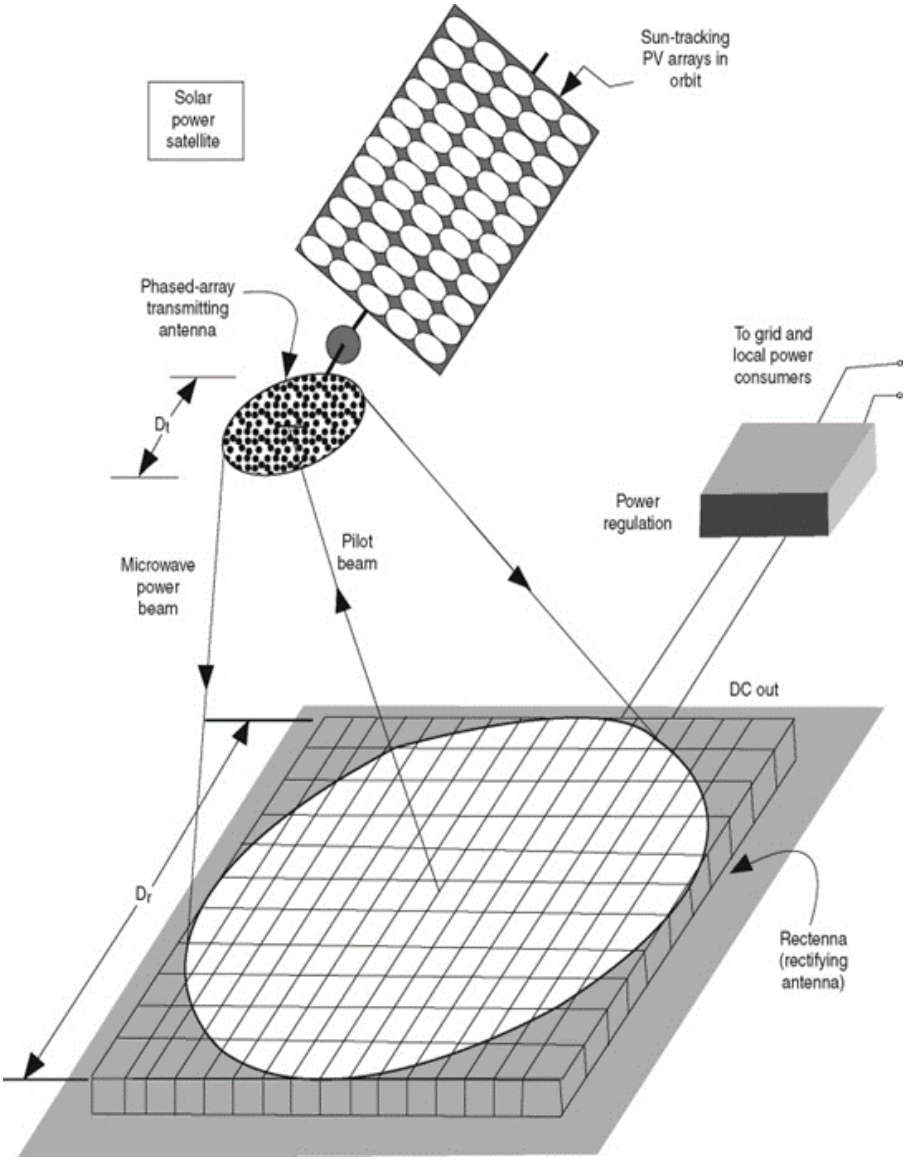


***Fig 5(a):*** Geo space Solar Power system Concept Showing Solar Space Power. Rectenna is devices that convert radio waves into electrical signal rectifying bridge circuit which directly connected to Normal Antenna

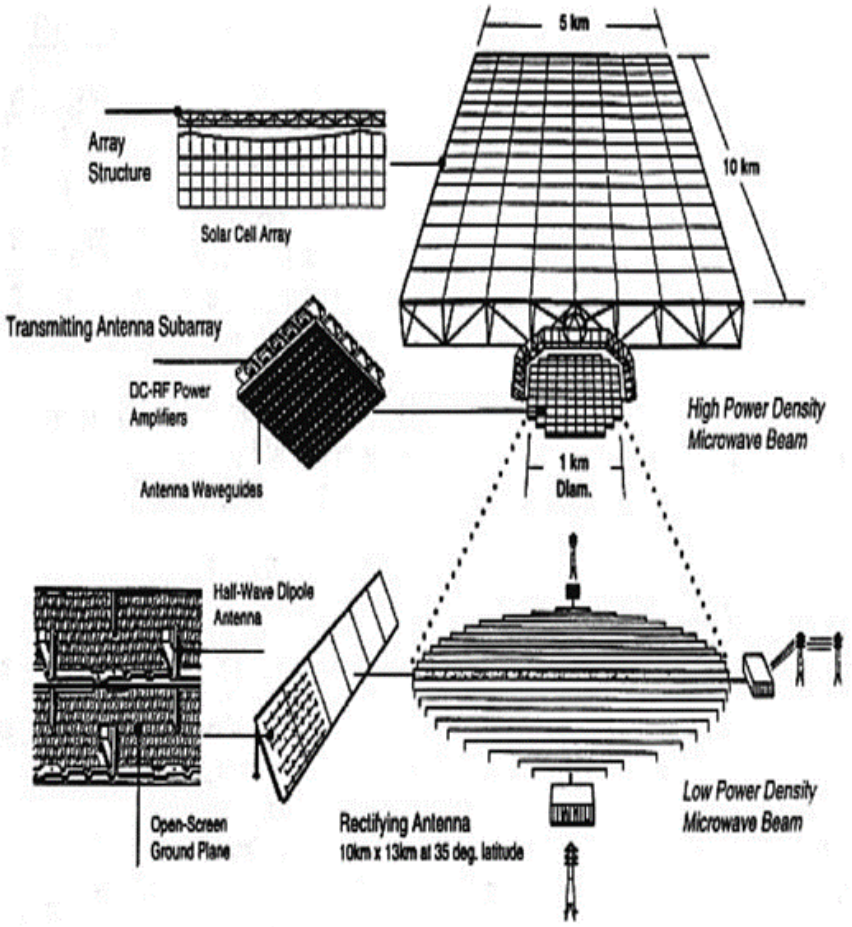


***Fig 5(b):*** Conceptual Diagram of 1980 Solar Power with Microwave Power transmission in SPS

### *Launch Cost*

One programmed for SBSP concept is the cost of space launch and amount of material that would needed to be launched, much of the materials launched need to be delivered to its eventual orbits. Immediately which raises the possibility that high efficiency (But slower) engine could move SPS Material from LEO to GEO at acceptable Cost. Example include Ion thruster or nuclear propulsion can used in Rocket technology.

**LEO Satellite** needs to be adequately placed in the corresponding orbit since once it leave for Space. It will receives in a particular direction and serve it commercial, military or scientific purpose. The orbits assigned to such machines that are closest to the earth are known as earth orbit. The technology is deployed orbit **knowns as LEO satellite**

**A LEO SPS** satellite, or Low earth Orbit satellite is typically placed between 500 to 2,000k.m. These device has limited of view. If a need of a high number of them for complete earth coverage unlike GEO device are staisanory LEO ones, at altitudes of 1000k.m can maintain an orbital velocity 7.3 k.m./s. its mean that two or three antenna as on with ground for charge over tracking. May reduced gain requirement, these antenna are smaller than GEO antennas, at most , the diameter needs to be 2.4 m and can utilize both cu and ka bands.

A collection of LEO (Low earth orbit) space based power has been proposed as precursor to GEO geostationary orbit) space based Solar Power, (Komearth N.M.; Beechler N,2006)

### GEO

Is most typical because of it's advantage of nearness to earth simplified pointing and tracking very small Radio occultation, and scalability to meet all global demand several times over, other locations have been proposed.

### *Sun Earth L1*

Robert Kennedy III kenroyand devoid fields have proposed a variant of L1 Sun shade called "Dyson dots" whose multi-Terra watt primarily collector would beam energy back to series of LEO, Sun-synchronous receiver satellite that much further distance to earth, require a correspondingly larger transmission aperture.

Origami is developed by yosizokawa 1797 Japanese

paper folding in Art form, code of dots, mean transmitting information.

Origami application use in medicine, engineer, space exploration tool, such use in Solar array flows in 1995, James Webb space telescope rocket, small how make folded one origami 100 meter make few in 3 meters by use origami techniques. Origami is use as problem solving method in very aesthetic way. Origami turns around have application.

**Origami** is art of paper model to make Application to make solar array cell panel use to make zero thickness. Which use in advance exploration project such as Hen flex are origami solar panel solar array collected solar energy from Sun and converted microwave radiation to earth surface change electricity. Technology of space exploration benefit life on earth. Space exploration use origami in many missions such as Apollo moon mission, ISS space, sending Mars limitation of power 8-month Journey Flight. Is bigger concern yoager 1, 2launch in 1977 these take 32 years in space to search solar system. Hold recording mission use nuclear energy in space craft solar array designed with nuclear exploration, use principle in Hola flex of origami.

Origami makes solar cell radiation pressure large in cell infinite portion set using solar pressure so large in array. Solar radiation pressure constant acceleration solar birthday balloon, small in size in tissue box shape Solar cell is clean energy make reality in earth.

Origami Solar panel to power the space station packing and deployed Solar panel through Space craft it also uses in aircraft satellite Solar panel use origami

Origami can deploy very large by using origami solar array compact in space craft. Origami expanding Solar array very unique ancient craft, inspiration designed anything origami

In SPSP, Since Clouds atmosphere and nighttime are absent in space, satellite-based Solar Pannel would able to capture and transmit substantially more energy than terrestrial Solar panel.

## Conclusion

A SBPs system is principle of very simple and vastly neat idea, an array of solar mirror and or photovoltaic cell assembled in geo-synchronous orbit (GSO).

Solar energy collected by array is reflected down to earth's surface or more typically proposed scheme converted by power amplifier in to radio wave. Which can easily penetrate the atmosphere. The radio wave is collected by a large terrestrial rectenna array converted electricity.

Satellite based Solar Power will centrally issue of attraction of Space Technology However Large Scale proven and needs further research and development which reduction of Size, Cost and weight of individual element in Space station of SPS. Large Scale-transportation and AI based robotic of Technologies require further research development. The electromagnetic energy is tool to improve the quality of life for mankind. It is mot pollutant but more aptly., a man-made extension of the naturally generated electromagnetic spectrum that provides Heat and Light for our Substances, from this point the SPS (Satellite based Solar Power) merely a down frequency converter from Visible spectrum to microwave. Since cloud atmosphere and night time are absent in space, satellite-based Solar panel would able to capture and transmit more energy than terrestrial Solar Panel.

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Disclosure of conflict interest

Authors disclosed that there is no conflict interest in carrying out this research study.

## Future challenge

A demonstrate Power Plant to Capture Solar Radiation in Geostationary Earth's Orbit("GEO") and Beaming Solar Power Via Wireless Power Transmission on earth. This will include an enabling Global technology platform ecosystem to be developed via collaborative research Work.

Main Contributor of project who make it so easy and more emerged and Vible Technology with Low-cost use Smart Artificial Technology. To make it Possible Vible and Non vible SPS wireless project.

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