Design for a Gravitational Wave Generator

Preprint · May 2021

DOI: 10.13140/RG.2.2.30238.87366

1 author:

Peter Hahn
Northern Alberta Institute of Technology
11 PUBLICATIONS **0** CITATIONS

SEE PROFILE

Design for a Gravitational Wave Generator

By Peter CM Hahn

May 26, 2021

Abstract

This invention is a device that generates gravitational waves which can be configured as a thruster or a communication device. The device is comprised of a linear antenna array that is injected with a Radio Frequency (RF) signal. The antennas are configured in such a way that the electromagnetic (EM) waves are converted into gravitational waves.

When the antennas are arranged in a linear phased array configuration, a thrust is produced that allows the device to be used as a method of propulsion.

If the injected RF signal is modulated with an Intermediate Frequency (IF) signal, the gravitational waves produced are also modulated. This enables the invention to be used as a communication device by using the gravitational waves as a carrier instead of electromagnetic waves. A gravitational wave detector at the receiving end can then demodulate the gravitational waves, thereby extracting the original signal.

Table of Contents

Background Theory

Foamy Ether Theory describes electromagnetic waves as distortions in the foam that are transverse to the direction of propagation. This is explained in detail at site: https://www.peterhahn.ca/the-photon. When two electromagnetic waves, traveling in opposite directions meet, a compression of foamy ether (space) takes place between the waves. Screen

captures of a simulation (using ThreeDimSim) of this compression is illustrated in Figure 1. Figure1a shows the initial wave where the red wave on top is traveling from right to left and the green wave on the bottom is traveling from left to right. When the two waves are aligned, as shown in Figure 1b, a compression of foamy ether takes place momentarily (see the blue cell in the center of Figure1b). As the waves leave each other (Figure 1c), a momentary stretching of the foam occurs. This compressing and stretching is equivalent to a gravitational wave which will propagate into the surrounding space.

The full simulation can be viewed at: https://www.peterhahn.ca/gravitational-wave-generator.

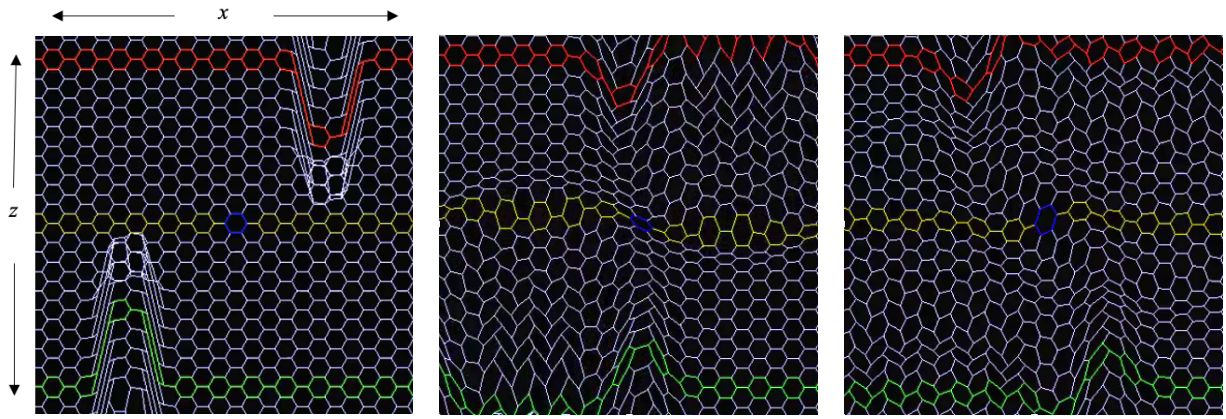

Figure 1a Figure 1b Figure 1c

Figure 2 below is a plot of the distortions in the foamy ether that take place as the EM waves (from Figure 1) pass by each other. The green and red lines show a maximum distortion of +40 and -40 units respectively in the z direction. The blue line plots the changes in height (z direction) of the blue cell in the middle as it goes through the compression and stretching. It compresses by a maximum of 12 units at time 19 and then stretches by 7 units at time 24. This process of using EM waves to generate gravitational waves is the basis of this invention.

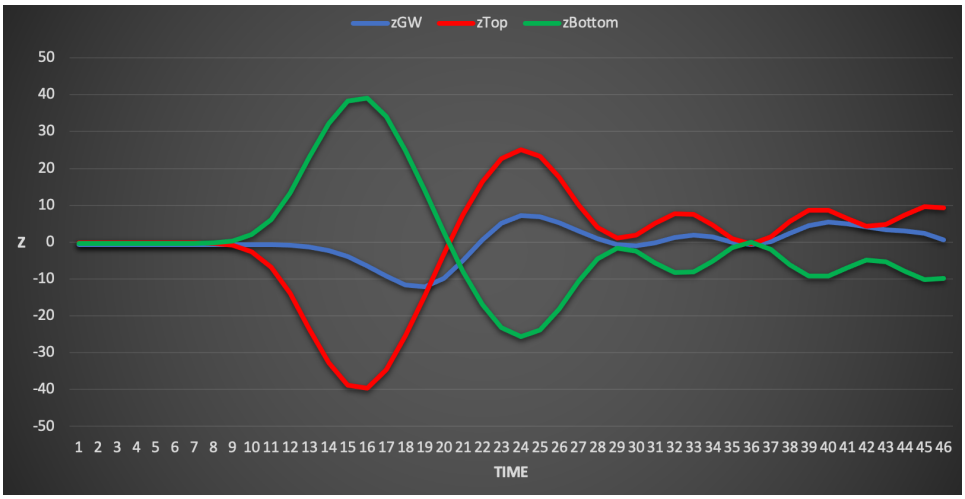

Figure 2
EM waves and G waves

Background of the Invention

Radio waves have been used for decades for wireless communication purposes. Various modulation techniques are used to encode information onto a high frequency carrier and then transmit that signal through space via electromagnetic (EM) waves. A device on the receiving end is designed to capture the radio waves, demodulate the signal and extract the original information.

Gravitational waves travel through space at the same speed as EM waves. This allows for the opportunity to use gravitational waves as a means of communication. Gravitational waves can also be modulated with an information signal, using this invention.

Using gravitational waves as a method of communication has the following advantages over radio waves:

- Unlike EM waves, gravitational waves travel unimpeded through bodies of matter. This would enable underwater or underground facilities to communicate more easily and spacecraft to communicate with earth-based facilities while on the far side of planetary objects.
- The planet is saturated with EM waves causing a significant amount of interference. Currently, there are no known sources of high frequency gravitational waves, so communication can be done virtually interference free.

The invention can also be configured to utilize gravitational waves as a method of propulsion which has the following advantages over current propulsion technologies:

- EM Drives that claim to use high frequency radio waves as a source of thrust have been found not to work.
- This invention uses radio waves to generate gravitational waves so thrust ***is*** generated. This means that no propellant is required, thus spacecraft can operate indefinitely as long as they have continuous sources of electricity (i.e. solar).

Applications of the Invention

1. The invention can be used as a wireless communication device by modulating the gravitational waves with a signal similar to how radio waves are modulated.
2. The gravitational waves generated from this device can be used to send signals to current gravitational wave detectors (i.e. LIGO and Virgo) for test and validation purposes.
3. When the invention is configured as a thruster, it can be used as a source of propulsion to maneuver various objects, such as:
    a. Aircraft
    b. Spacecraft
    c. Space-based telescopes (i.e. James Webb, LISA, Hubble)
    d. Satellites
4. The invention can be used as a device that reduces the gravitational pull on an object when the invention is placed between earth and the object. The effect could potentially

be strong enough to make the object essentially weightless, while still located on the surface of a planet.

Description of How the Device Works

An alternating current (AC) that is fed through an unshielded conductor will generate EM waves that propagate away from the conductor at the speed of light. However, if two conductors are placed adjacent to each other and fed an AC signal in opposing directions, a rhythmic compression and stretching of empty space will occur between the conductors. This compression of space is similar to what occurs in a gravitational wave. The EM waves created by the two opposing signals will cancel each other out, but the gravitational wave will propagate into the surrounding space. The frequency of the gravitational wave will be twice that of the frequency of the AC signal because a compression will take place each time the current flow changes direction and reaches a maximum.

Description of the Invention Configured as a Thruster

The current prototype was built with a configuration as illustrated in Figure 3. Oscillator 1 from Silicon Labs was used to generate a 466MHz continuous sinewave, however, any frequency will work. The output of the oscillator is connected to the input of a UHF pre-amplifier 2a and RF power amplifier 2b, using a coaxial cable. The RF power amplifier is connected to a six-way RF power divider 3. The six outputs of the power divider are connected to coaxial cables 4 which are cut to various lengths. Referring to Figure 3, the length of each coaxial cable is increased by 1/24th of the wavelength produced by the oscillator. This creates an incremental delay in the arrival time of the RF signal to each antenna array element 6. This incremental delay sends a phase shifted signal to each element. The antenna array element on the far left receives the signal first, followed by the next element to the right, until array element on the far right receives the signal last. Each of the array elements are separated by 1/24th of a wavelength. So, a phase shift of 1/24th wavelength feeding the array elements, separated by 1/24th wavelength, creates a gravitational wave pulse that travels from element on the far left through to element on the far right. This gravitational pulse travels in the direction of arrow 9, exiting the device on the right, thereby creating a thrust that pushes the device from right to left as indicated by arrow 8.

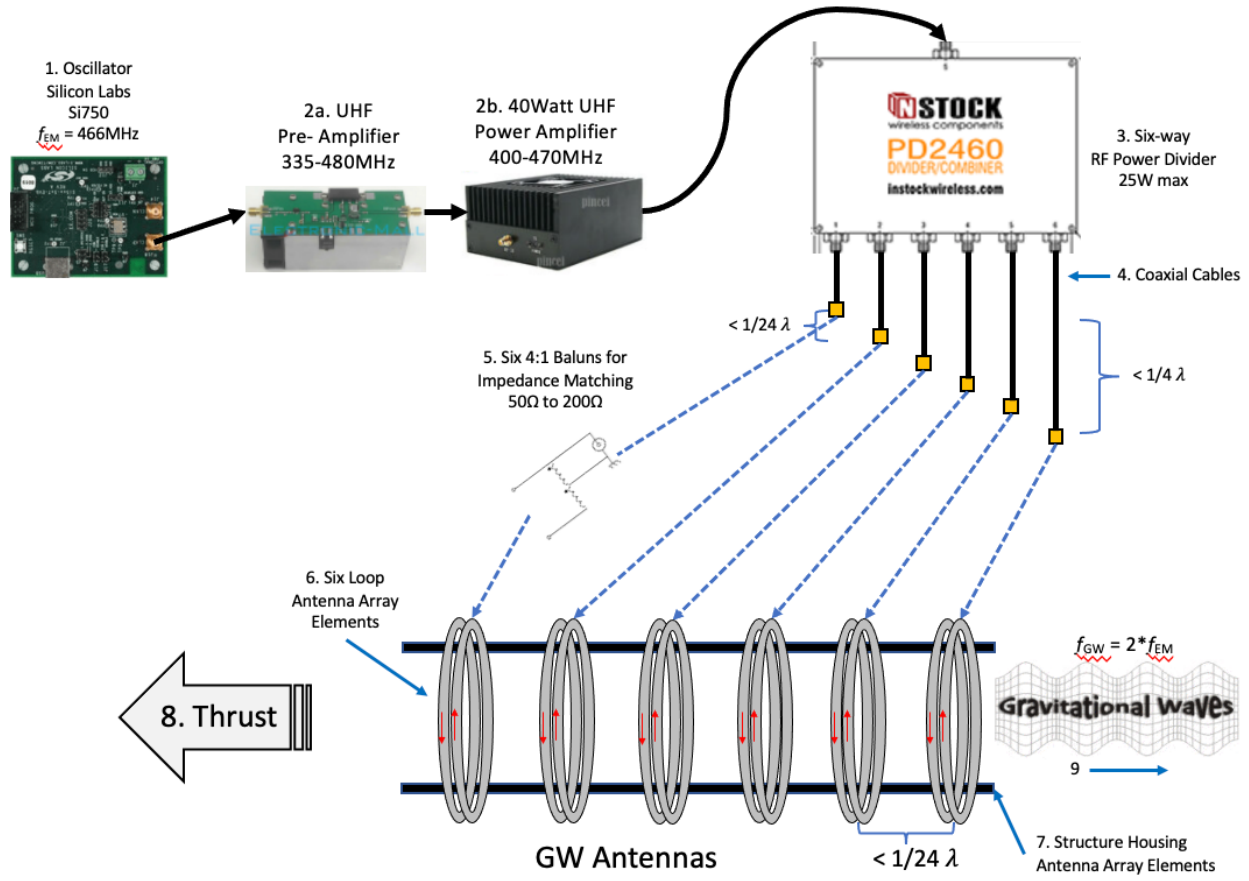

Figure 3
General Configuration of Prototype

The current prototype uses a pair of loop antennas that are placed adjacent to each other to form one antenna array element. Figure 4 shows a cutaway view of the internal components of one antenna array element. It is composed of two parallel, insulated conductors surrounded by an exterior insulator. (An optional braided shield to ground can be used to minimize the escape of EM radiation). The two conductors are fed opposing AC currents which are 180 degrees out of phase. Each loop antenna is constructed so its circumference is equal to one wavelength of the oscillator (wavelength of a 466MHz signal equals 64.3cm). (Any antenna shape has the potential to generate gravitational waves, provided that it is configured such that at least two antennas are place adjacent to each other and are fed opposing AC currents or AC signals that are out of phase).

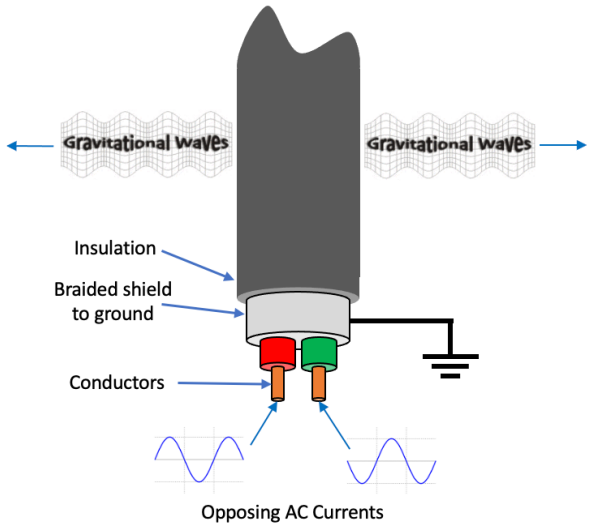

Figure 4
Cutaway of a Loop Antenna Element

Figures 5a and 5b show a circuit drawing of a front and side view of the loop antennas. Referring to Figures 3, 5a and 5b, baluns 5 are used for impedance matching and for converting/adapting the single-ended coaxial cable feed to a twin lead. Each of the two output leads of the baluns are connected to the loop antenna pairs in such a way that the currents in the loops are travelling in opposite directions (as shown in Figure 5a). Figure 5b shows the direction of propagation of the gravitational waves that emanate from a single antenna element.

The current prototype used a six-way RF Power Divider connected to six antenna array elements, which are each separated by 1/24th wavelength, however, two or more antenna elements with separations of any distance will work, as long as the signals entering each antenna array element are out of phase.

The patent of this invention has been filed at the Canadian Intellectual Property Office:
http://www.ic.gc.ca/eic/site/cipointernet-internetopic.nsf/eng/h_wr00001.html

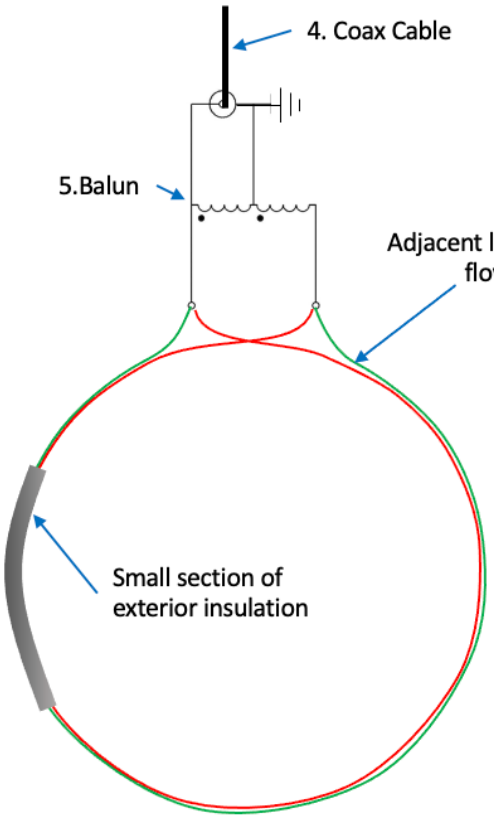

Figure 5a
Loop Antennas Front View

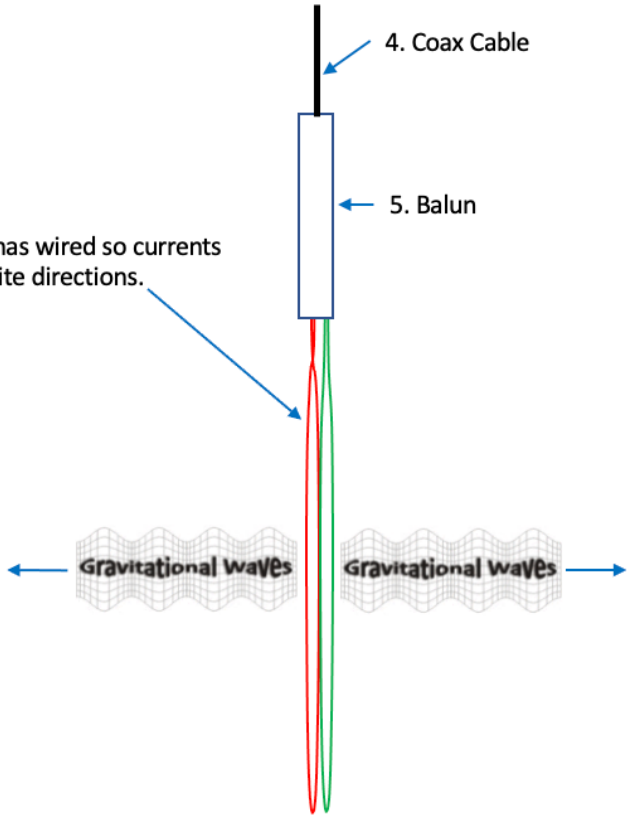

Figure 5b
Loop Antennas Side View

Plots of a simulation of loop antenna properties are shown in the following figures:

- Figure 6a plots the current distribution within the loop antenna.
- Figure 6b shows a 3D radiation pattern emitted by the loop at 466MHz
- Figure 6c plots the VSWR (Voltage Standing Wave Ratio) of the loop with frequencies ranging from 350MHz to 600MHz.
- Figure 6d plots the Impedance of the loop with frequencies ranging from 440MHz to 500MHz.

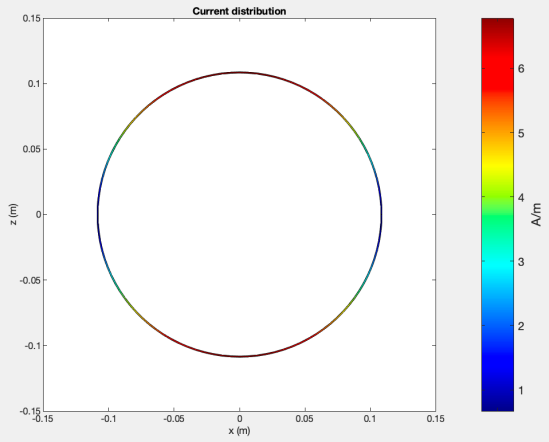

Figure 6a
Current Distribution

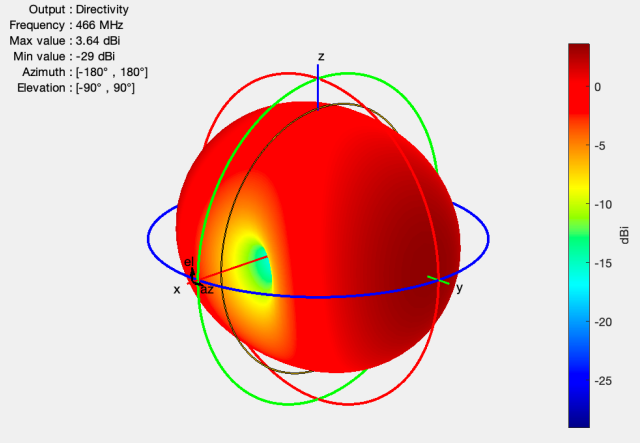

Figure 6b
3D Radiation Pattern

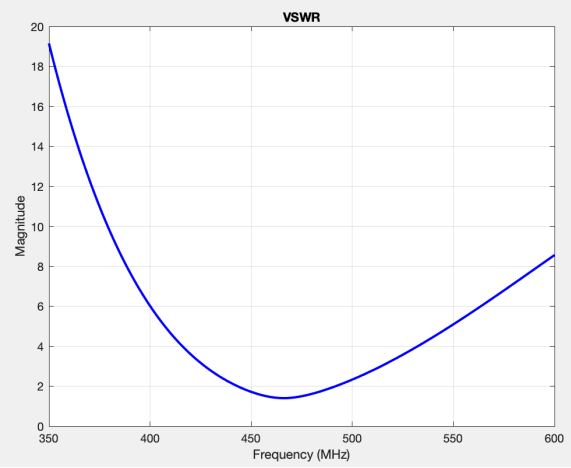

Figure 6c
Voltage Standing Wave Ratio

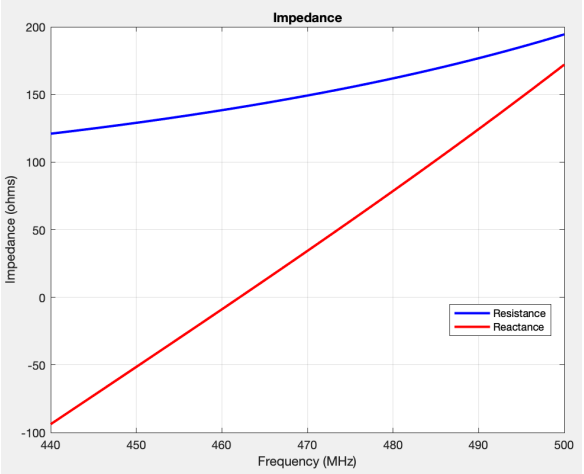

Figure 6d
Impedance

A NanoVNA (Vector Network Analyser) was used to measure the properties of one of the antenna array element prototypes. Plots of the results are as follows:

- Figure 7a is Smith Chart plotting the actual reactance values of one of the antenna array elements.
- Figure 7b is a Return Loss plot of one of the antenna array elements.
- Figure 7c is a screen capture displaying antenna property values at 466MHz.

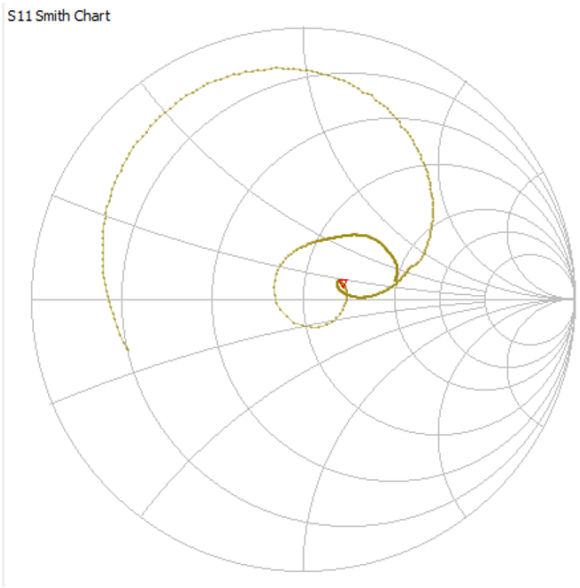

Figure 7a

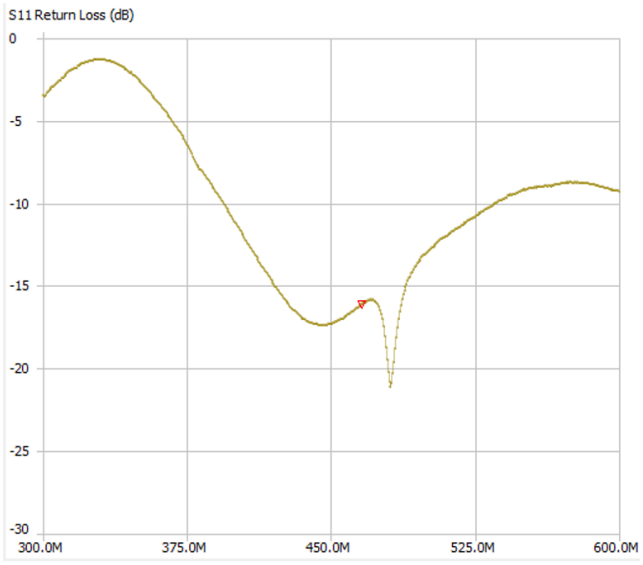

Figure 7b

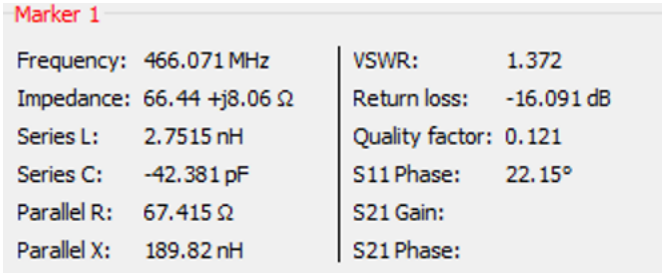

Figure 7c

Description Of The Invention Configured As a Communication Device

The invention can also be used as a communication device. Since the device is using radio waves to create gravitational waves, a modulated RF signal fed into the device will cause the generated gravitational wave to be modulated as well.

Referring to Figure 8, an electrical AC signal is generated at 15. This signal can originate from various sources, such as audio, video or data. A local oscillator 16 is set to the desired carrier frequency. An RF modulator 17 is used to combine the two output signals of 15 and 16.

Components of 15, 16 or 17 can be any off-the-shelf radio transmitter that is capable of outputting a modulated RF signal.

An RF Power Amplifier 2 amplifies the signal from modulator 17 and feeds it to an RF Power Divider 3. The RF Power Divider splits the signal into two or more outputs which feed coaxial cables 4. The coaxial cables are connected to impedance matching baluns 5. The baluns also serve the function of converting the signal from a single unbalanced feed to a balanced twin lead that is connected to loop antennas (as shown in Figure 5a and 5b). The red loop antenna is wired in reverse so that the current coming out of the balun flows in the direction opposite to the current in the green loop antenna. This AC current that flows through adjacent loop antennas in opposite directions is what causes a gravitational wave to be generated. The frequency of the gravitational wave will be twice that of the modulated signal from 17, because a gravitational pulse will be generated at both the positive and negative peak of the AC signal from modulator 17.

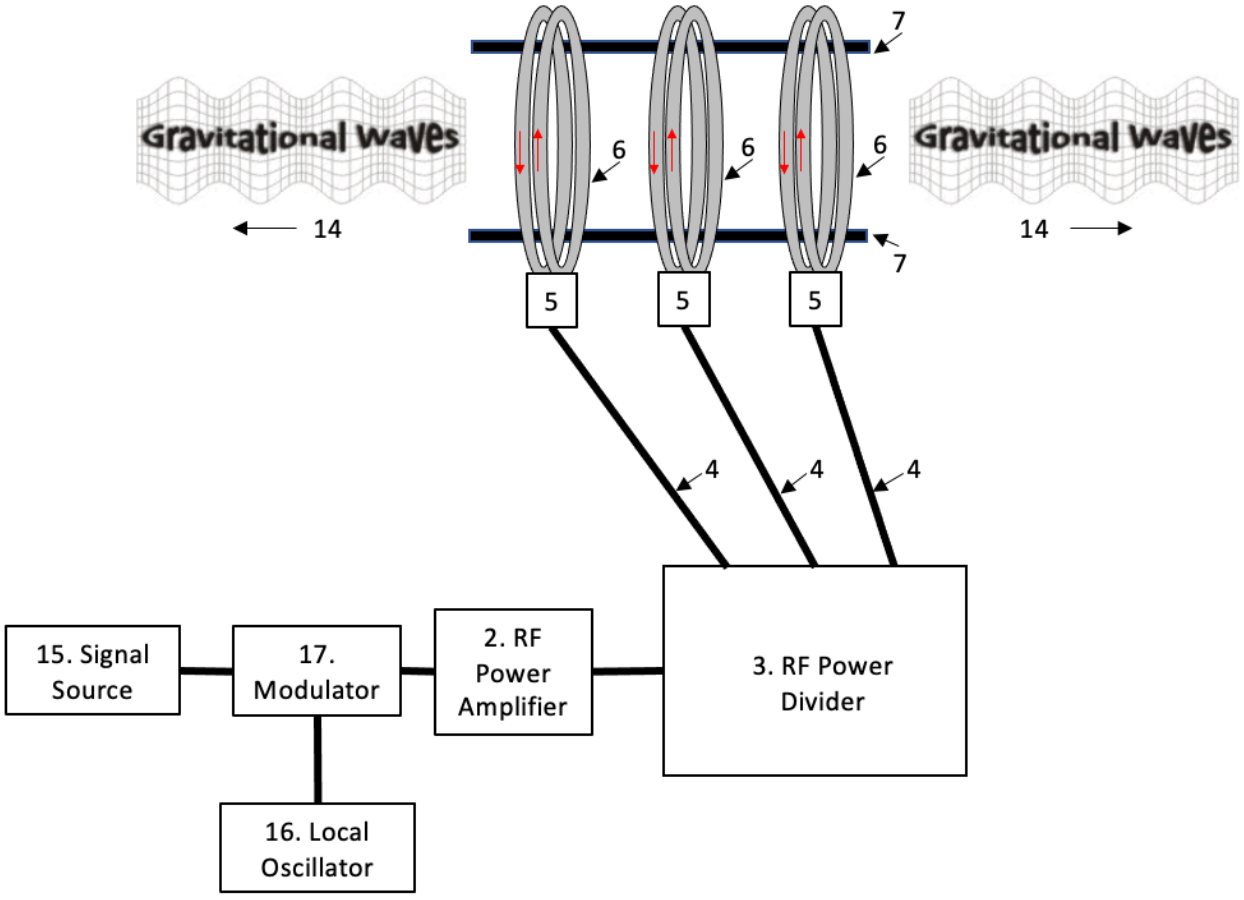

Figure 8

A minimum of one antenna element is required for gravitational waves to be produced. The gravitational waves will exit the antenna elements in the direction of arrows 14 as shown in Figure 8. Implementing an array of more than one antenna element will allow the gravitational beam pattern to be more directional. For example, the strength of the gravitational waves exiting

the device may be stronger on the left than on the right. The beam strength and directivity may be modified by adjusting the length of coaxial cables and/or the distance between antenna elements. Antenna elements are fastened in place by a non-metallic structure 7.

The modulated gravitational wave generated by the invention can be received and processed by a device such as a 'Time Variance-Gravitational Wave Detector' described at https://vixra.org/abs/1506.0137 and https://www.researchgate.net/project/Version-6-Build-of-a-Time-Variance-Gravitational-Wave-Detector.

Test Results of the Device When Configured as a Thruster

Measuring the movement of the device was accomplished by using the test configuration as shown in Figure 9 and Photo 1. The antenna array and RF Power Divider were suspended from the ceiling. A laser diode module projected the laser light onto a mirror which was fixed on the device at a 45^{O} angle. The laser beam reflected off of the mirror and was picked up by a line scan camera. The output of the line scan camera was fed into a computer which recorded the movement of the device.

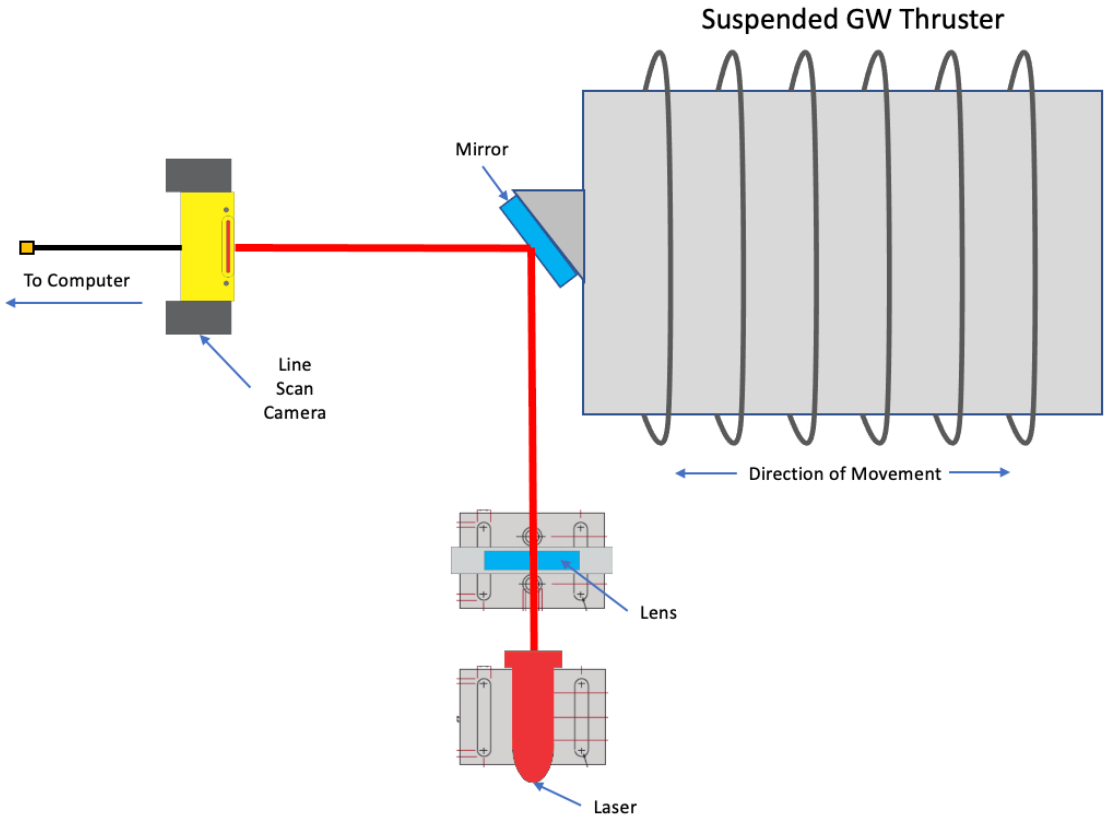

Figure 9
Top View of Test Configuration

A total capture time of 60 seconds was used for testing. No power was applied to the antenna array for the first 20 seconds; power was then applied for 20 seconds and then shut off for the remaining 20 seconds. Figure 10a is an example of a plot of the results, clearly showing that the antenna array moved in a direction that was away from the line scan camera, while the power was applied to the device.

The natural pendulum motion of the suspended device caused the laser beam to oscillate between pixel numbers 1028 and 1032 for the first 20 seconds. It then moved up to pixel numbers 1032 to 1036 during the next 20 seconds, as a result of the power being applied to the antenna array. The last 20 seconds showed the device slowly returning to its original position after the power was removed. The plot shows that the total movement of the device was equal to four pixels of the line scan camera. Each pixel is 7.04μm in width. Using the pendulum force equation of $F = mg \sin\theta$, the thrust generated by the invention was calculated be 198 micro Newtons of force when 29 Watts of RF power was applied to the antenna array.

The direction of the thruster was set to four different directions (north, east, west and south) in order to eliminate any possibility of the device being affected by the earth's magnetic field. Figures 10a and 10c are plots of the device moving towards the line scan camera; Figures 10b and 10d are plots of the device moving away from the camera. This was done to eliminate the possibility of the device simply being an electromagnet that is attracted to the metallic parts of the camera or its support platform.

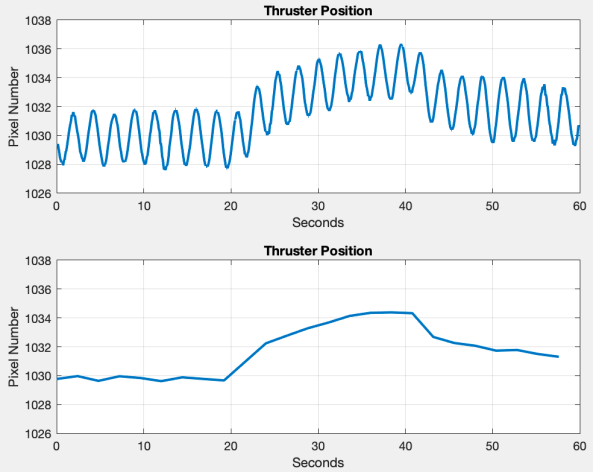

Figure 10a South

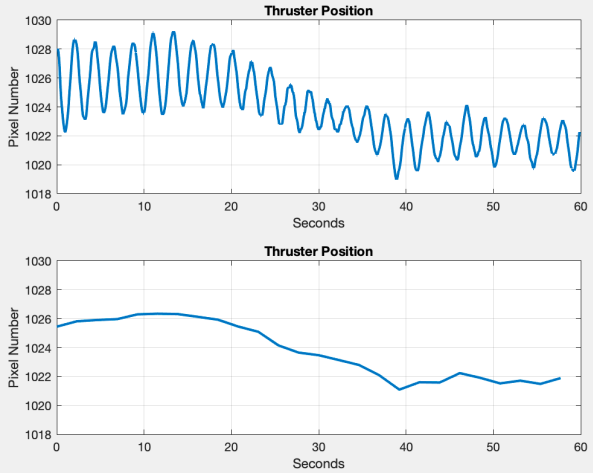

Figure 10b North

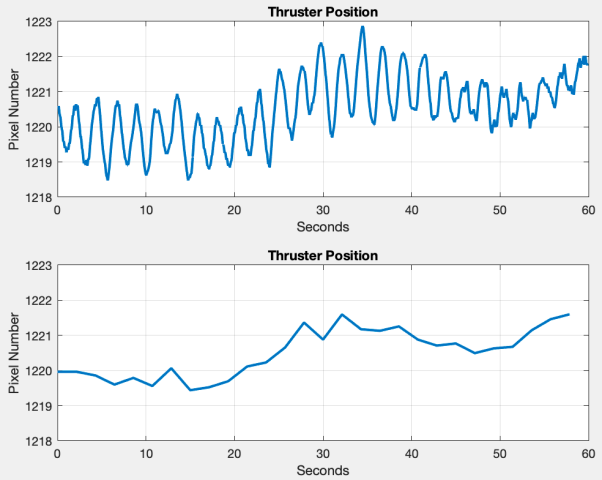

Figure 10c West

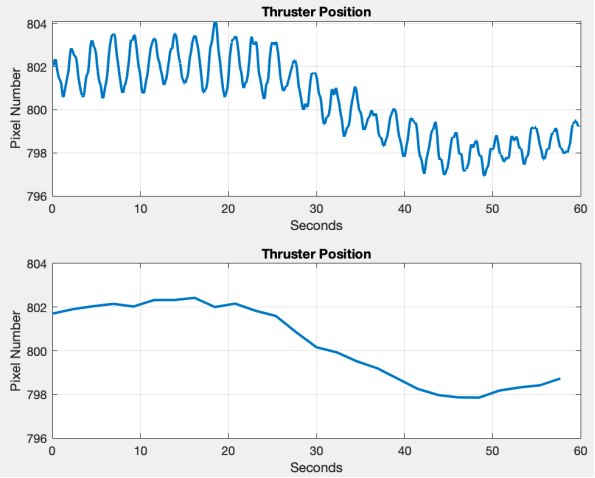

Figure 10d East

List of Figures

Figures 1a,1b and 1c are screen captures of a simulation of foamy ether.
Figure 2 is a plot of the distortions of the foamy ether showing how opposing EM waves cause compression and stretching to take place.
Figure 3 is a general drawing of the gravitational wave generator configured as a thruster.
Figure 4 is a cutaway view showing a section of the internal components of a loop antenna element.
Figure 5a is a front view of a loop antenna pair connected to a balun.
Figure 5b is a side view of a loop antenna pair connected to a balun.
Figure 6a is a simulation plot showing the current distribution in a loop antenna.
Figure 6b is a simulation plot showing the 3D radiation pattern of a loop antenna.
Figure 6c plots the VSWR (Voltage Standing Wave Ratio) of the loop with frequencies ranging from 350MHz to 600MHz.
Figure 6d plots the Impedance of the loop with frequencies ranging from 440MHz to 500MHz.
Figure 7a is Smith Chart plotting the actual reactance values of one of the antenna array elements.
Figure 7b is a Return Loss plot of one of the antenna array elements.
Figure 7c is a screen capture displaying antenna property values at 466MHz.
Figure 8 is a general drawing of the gravitational wave generator configured as a transmitter.
Figures 10a to 10d are plots of the test results revealing the movement of the device therefore validating the existence of a thrust.

List of Photos

Photo 1 shows the suspended prototype thruster along with the test apparatus.
Photo 2 shows how the thruster is connected to the RF Power Divider using coaxial cables cut to various lengths.
Photo 3 is a closeup of the baluns connected to the antenna array.

Photos

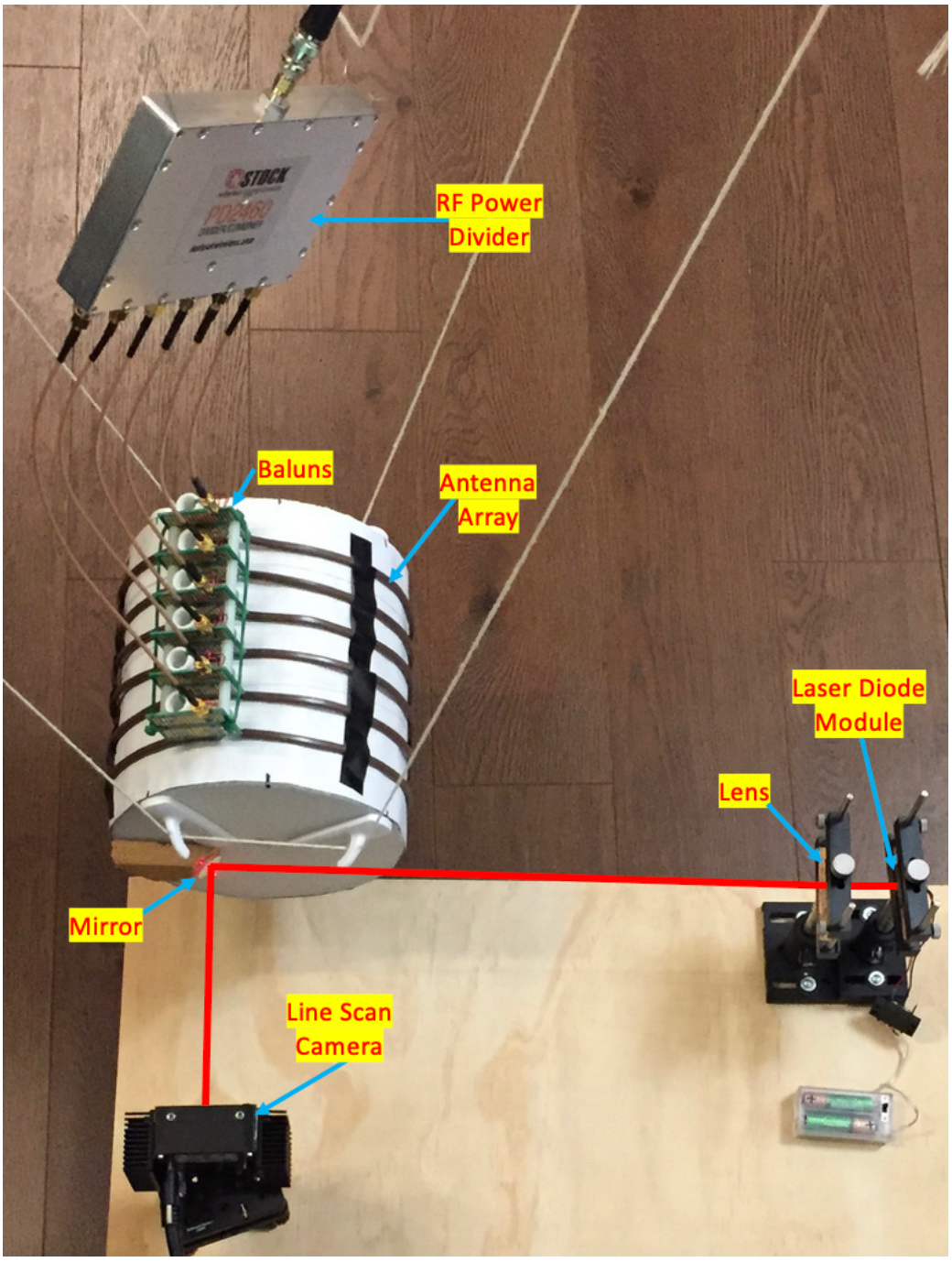

Photo 1
Testing the Thruster

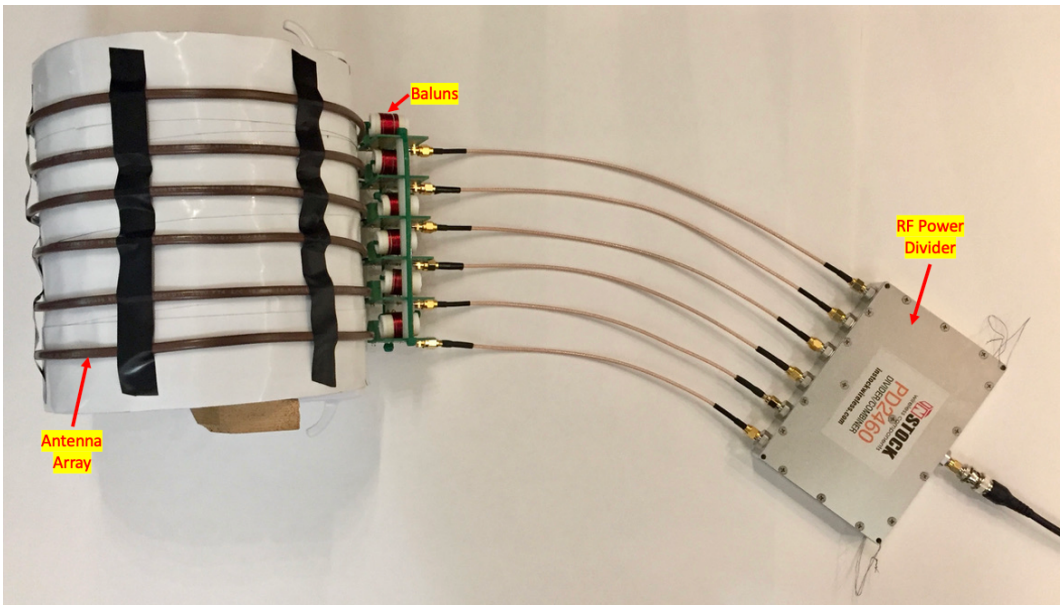

Photo 2
Thruster Connected to RF Power Divider

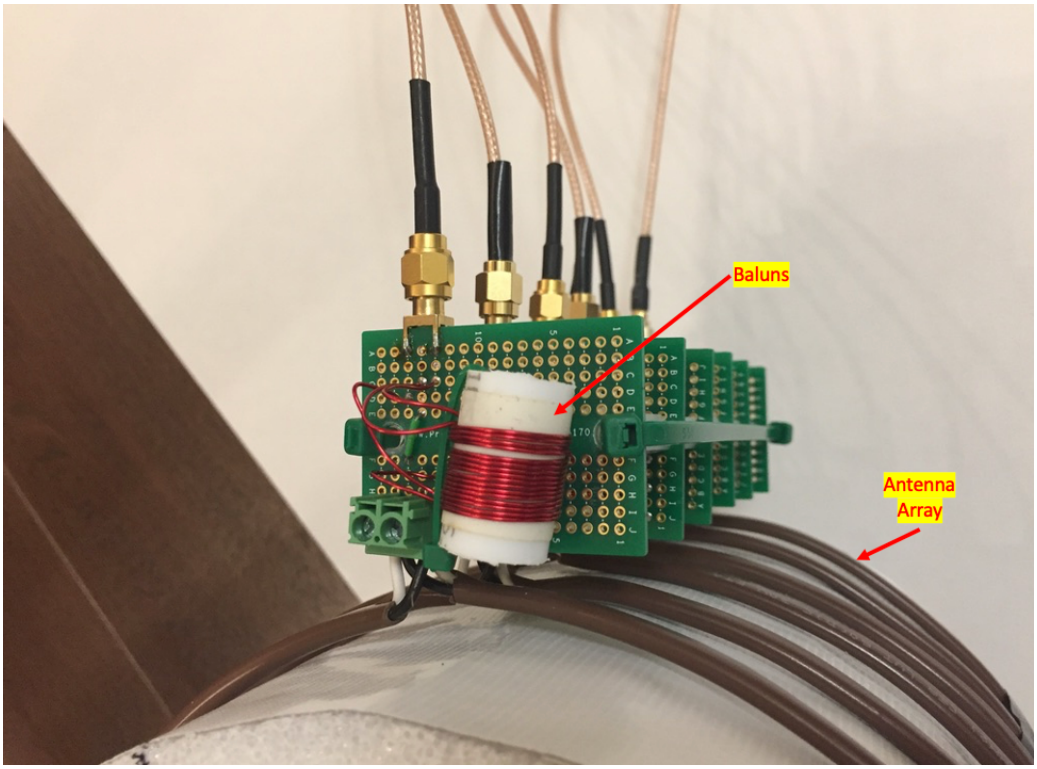

Photo 3
Baluns Connected to the Antenna Array