Odd, Even & Whole Number Schumann Point Triads of a Relativistic Radiation Pattern

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Abstract

There are different numerical models, such as the transmission-line matrix model or partially uniform knee model used to predict Schumann radiation. This report introduces a new method build on the previously stated idea of locating Schumann resonances on a single particle's radiation pattern using a Golden ratio and their Octave relationship. In addition, this different prediction method for Schumann resonances derived from the first principle fundamental physics combining both particle radiation patterns and the mathematical concept of the Golden ratio spiral that expands at the rate of Golden ratio. Previous idea of octaves allows us to predict the magnitude of other Schumann resonances on the radiation pattern of a single accelerated charged particle conveniently by knowing the value of initial Schumann resonant frequency. In addition, it also allows us to find and match Schumann resonances that are on the same radiation lobe. Furthermore, it is important to find Schumann octaves as they propagate in the same direction and have a higher likelihood of wave interference. This contribution, introduces another property of Schumann resonant points on a relativistic radiation pattern that enables to predict the direction of the remaining Schumann resonant frequency points that are not Octave pairs. Previously, Schumann Octaves were introduced as a method to predict which Schumann resonant points exist on same radiation lobe, hence propagate in the same direction. This method of Triads is an additional method to Octaves in order to predict propagation direction of all Schumann points besides Octave pairs. Count of Schumann resonant frequency points starts with one as the first and minimum frequency Schumann point on a Golden ratio spiral. Count of Schumann resonant frequency points goes up to seven with increasing radius of Golden ratio spiral. Hence, the odd triad consists of Schumann resonant points 1, 3 and 5. Whereas, even triad consists of Schumann resonant points 2,4 and 6. First point in the triad is called "root" and final point is called "third". Root and the third are always Octave apart from each other. Hence, exist on same radiation lobe and propagate in the same direction. Odd number triads distribute vertically and even number triads distribute horizontally on a relativistic radiation pattern plot. Hence, this causes Octave value of an odd triad to be bigger than the Octave value of even triad. There are three Octave pairs and odd triad is the one with the highest Octave value. Triads together with Octaves helps to predict magnitude and direction of Schumann resonant points without needing to refer to a radiation pattern plot.

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Key Points:

- There are up to seven Schumann Resonant points on a radiation pattern. Schumann pairs only exist on the two lowest intensity lobes.
- Schumann Resonant frequency points on a relativistic radiation pattern form an odd (1 3 5), even (2 4 6), and whole number (3 4 7) triads.
- In a triad, the root is the first, the third is the last number. Root and third always propagate in the same direction and are Octave apart.

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1 Introduction

Schumann resonances are extremely low-frequency waves that bounce back and forth between the ground and the ionosphere of the earth. Schumann resonances originate mostly from lightning discharges. However, a contribution can also be from outer space. Schumann resonances first predicted by Schumann in 1952 (Schumann, 01 Feb. 1952) and experimentally observed in 1960 (Balser & Wagner, 1960). In addition, Schumann resonances can be predicted, with numerical methods such as the partially uniform knee model (Pechony & Price, 2004) or with the Transmission Line Matrix model (Morente et al., 2003). Recently, Golden ratio, Golden ratio spiral, and rectangle all were combined and introduced to be capable of finding the magnitudes and locating Schumann resonances on a single particle radiation pattern (Yucemoz, 2020a). The Golden ratio spiral is quite an important method, as it enables to know the location of Schumann resonant frequencies on a radiation pattern of a single charged particle that is consists of many frequencies from low to ionizing part of the spectrum. Furthermore, as an expansion to the idea of locating Schumann resonances using the Golden ratio spiral, the method of electromagnetic octaves are introduced. Octaves exist in standing transverse waves and sound waves in the form of music discovered by the Pythagoras using the Pythagorean ratios (Crocker, 1964). One octave between the two waves is double frequency apart from each other, but they sound the same (Schellenberg & Trehub, 1994). In terms of an accelerated relativistic particle, radiation is emitted in the form of a forward-backward radiation pattern. This radiation pattern consists of lobes that are different from each other due to physical Bremsstrahlung and Doppler asymmetries (Yucemoz & Füllekrug, 2020). These lobes are closed loops, and they are bound to the charged particle. Hence, Schumann points on a radiation pattern of a particle can be modeled with the standing transverse octave waves. This method cannot provide any information about the location of the Schumann resonant frequencies as the Golden ratio spiral method. However, as an extension, the standing transverse octave waves method provides more meaning and information about the Schumann points that are predicted by the Golden ratio spiral. The standing transverse octave waves method predicts only the values of Schumann resonant frequencies that are located on the same radiation lobe as the input Schumann frequency point. These Schumann points are known as octaves of the input Schumann values. In summary, knowing a Schumann resonant frequency value on a radiation pattern, the equation of standing transverse octave waves method predicts another Schumann frequency point that only exists on the same radiation lobe as the original input Schumann resonant point. Octaves are important as Schumann points on the same radiation lobe propagate in the same direction and, they have a higher likely hood of undergoing wave interference. Triads are extension to octaves. They help predict and understand Schumann resonant pairs and where they are located on a relativistic radiation pattern without having to calculate Octave values.

2 Even, Odd, and Whole Number Schumann Triads

In this section, a new method of the electromagnetic Schumann triads will be used to relate seven Schumann notes in pairs that specifically exist on the same radiation lobe. As can be seen in figure 1, the forward-backward peaking relativistic radiation pattern has four radiation lobes. Each lobe is different from the other due to 2 physical effects of the Bremsstrahlung and the Doppler asymmetries.

The relativistic forward-backward radiation pattern displayed in figure 1 is specific to the Bremsstrahlung process as it incorporates the Bremsstrahlung asymmetry (Yucemoz & Füllekrug, 2020). Schumann resonance notes from A to G on the radiation pattern are located using the Golden ratio spiral (Yucemoz, 2020a).

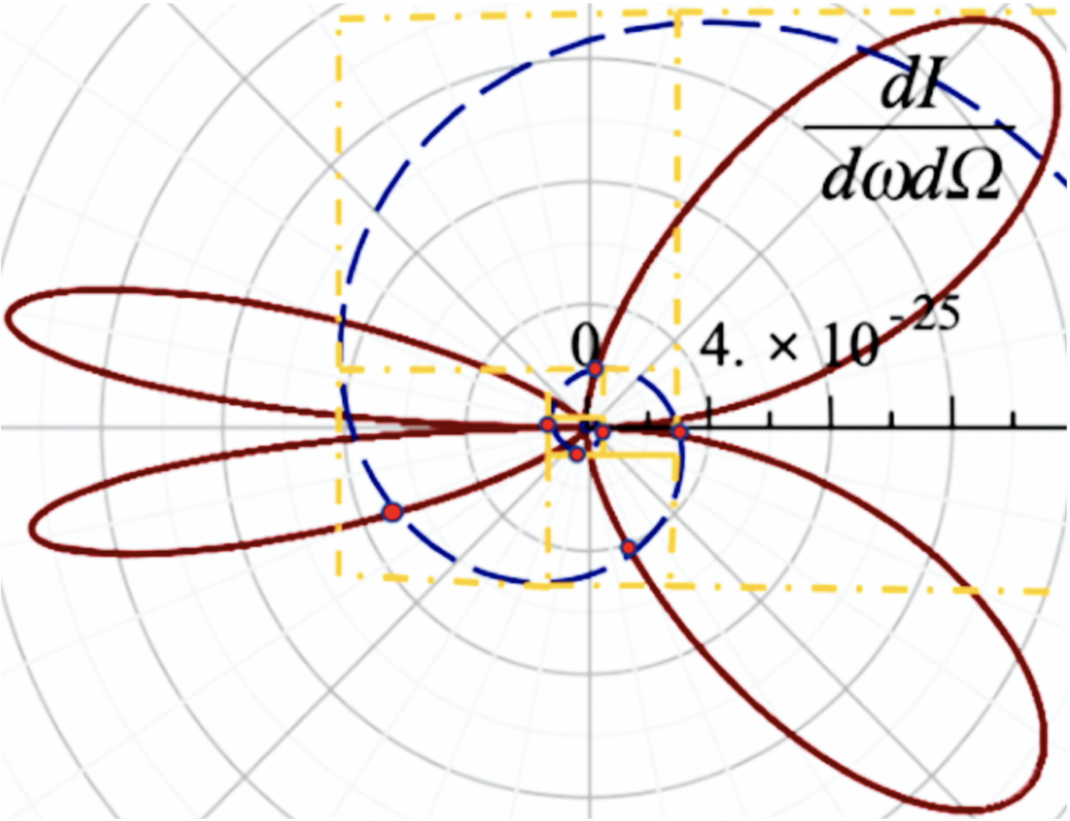

Figure 1. Figure 1 displays a Zoomed relativistic forward-backward peaking radiation pattern. This radiation pattern is chosen for the octave study as it is the radiation pattern with most Schumann resonant points. Each point on the graphs is named A, B, C, D... starting from the origin and expanding with the spiral. Each named point from A to G is called a Schumann note or a Schumann point.

The numbering of Schumann resonant points starts with one and increases with each point on expanding the Golden ratio spiral.

Odd Triad is made up of points 1, 3, and 5. Even triad is made up of Schumann points of 2, 4, and 6. Point 1 is labeled A and point 2 is labeled B. point 3 is C and so on. The first point in a triad is called the root and the final number in the triad is called third. The property of triads is that their root and the third are always Octave apart. Hence, point 1 (A) should exist on the same radiation lobe as point 5 (E) as this is what Octave means. This is shown in figure 1 and given in table 2.

The second number in odd and even triads is not defined. There are seven Schumann points and only 1 and 5 and 2 and 6 are related Octave pairs. Hence, this leaves three Schumann points to be defined. This means another triad can be formed with these Schumann points. These points are 3, 4, and 7. As this triad consists of even and odd numbers, this triad is called the Whole number triad. With the same rule, root and the third Schumann points in the new whole number triad should be Octave apart and should exist in the same radiation lobe. This can be seen in figure 1 and table 2 that, again Schumann point 3 (C) and Schumann point 7 (G) exist on the same radiation lobe and are Octave apart.

All the Schumann pairs were found to be only on the lowest radiation intensity lobe in each forward and backward direction.

Energy values of each Schumann point and their relation to each other in Figure 1c.	
Schumann Resonance Point (Schumann Note)	Radiation intensity ”I” $[Js^{-1}]$ per emitted angular wave frequency ”ω” $[rads^{-1}]$ per Solid angle ”Ω” $[rad]$ $\frac{dI}{d\omega d\Omega}$
A	$\sim 2.15 \times 10^{-26}$
B	$\sim 3.54 \times 10^{-26}$
C	$\sim 5.632 \times 10^{-26}$
D	$\sim 9.483 \times 10^{-26}$
E	$\sim 1.454 \times 10^{-25}$
F	$\sim 2.217 \times 10^{-25}$
G	$\sim 3.390 \times 10^{-25}$

Table 1. Values of Schumann points A, B, C, D, E and F. Golden ratio of B to A, C to B, D to C, F to E and G to F in figure 1c.

Predicted and Paired Schumann Octave Wave Energies			
The Schumann Octave Pairs	Octave, O value	Number of Golden Ratio, n	Radiation intensity ”I_O” $[Js^{-1}]$ per emitted angular wave frequency ”ω” $[rads^{-1}]$ per Solid angle ”Ω” $[rad]$ $\frac{dI}{d\omega d\Omega}$ of Upper Octave
A $\Rightarrow$ E	3.279	6	$\sim 1.410 \times 10^{-25}$
B $\Rightarrow$ F	3.016	5	$\sim 2.135 \times 10^{-25}$
C $\Rightarrow$ G	2.694	4	$\sim 3.035 \times 10^{-25}$
D $\Rightarrow$ Diminished	2.279	3	$\sim 4.322 \times 10^{-25}$

Table 2. The table displays Schumann resonances and their octave Schumann resonances. The first column of the table gives a pair of Schumann resonances that are octave pairs of each other. The left of the arrow is named as a lower octave, and the right of the arrow is named a higher octave between the octave pairs. To calculate the Schumann resonance octave point, that is on the same radiation lobe as Schumann resonance point A, the first Octave has to be calculated between the Schumann point A and Final Schumann point G. This is known as an octave. Octave is calculated using (Yucemoz, 2020b, equation 2) with n of 6 as there is six times the Golden ratio between points A and G displayed in figure 1. Finally, the octave Schumann resonance pair of a Schumann resonances point A, where both share the same radiation lobe, is calculated using (Yucemoz, 2020b, equation 4), which is the double of radiation intensity, I of Schumann point A that scales with the number of octaves. The resultant Schumann higher octave radiation intensity, $I_O = 1.410 \times 10^{-25} J$ of A is compared with all radiation intensities determined from the Golden ratio spiral in figure 1, and presented in table 1, it can be seen that Schumann higher octave radiation intensity, I_O is approximately equal to the Schumann radiation intensity of point E in table 1 $I_O \approx I$. This relates point A and E as Schumann octave pairs and means that they should exist on the same radiation lobe, which can be observed in figure 1.

3 Discussion & Conclusion

All the Schumann octave pairs predicted by the method of triads are as expected and matches with the predictions of Schumann Octaves presented in table 2 and plot in figure 1.

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