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Experimental Detection of Advanced Waves

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ABSTRACT

On 3 December 2016 to 5 January 2017, Bajlo appears to have been the first person to successfully detect advanced waves. To repeat his findings, I conducted an experiment from 6 July to 31 August 2026, with horizontally polarized antennas, a transmitter $\lambda/4$, and a receiver $\lambda/20$, and confirmed the detection of advanced waves at a frequency of 174 - 174.6 MHz, appearing before retarded pulse, with statistically significant results.

Keywords: advanced waves; retarded waves; transmitter; antenna

INTRODUCTION

Maxwell's equations have two solutions, retarded (radio waves propagating from the present to the future) and advanced (radio waves propagating into the past), suggesting that time is symmetrical. The advanced solutions are usually ignored as unphysical. The issue weather advanced waves exist was first debated between Ritz and Einstein during 1908 and 1909, known as the Ritz - Einstein debate.

During 1908 and 1909, Ritz and Einstein battled over what we now call the time arrows of electrodynamics and entropy. Ritz argued that electrodynamic irreversibility was one of the roots of the second law of thermodynamics, while Einstein defended Maxwell-Lorentz electromagnetic time symmetry. Microscopic reversibility remains a cornerstone of our current paradigm. In 1921, Einstein stated, 'The space-time theory and the kinetics of the special theory of relativity were modelled on the Maxwell-Lorentz theory of the electromagnetic field.

Ritz claimed that the ultraviolet catastrophe in the classical Rayleigh-Jeans law had as its fundamental reason the implicit and improper use of advanced potential. Ritz argued that the solution of the wave equation in terms of the retarded (versus advanced) potential established a genuine difference between past and future and may be the real source of the irreversibility of the radiation phenomenoa and the second law of thermodynamics.

Einstein disagreed. Einstein maintains that instead of solving the wave equation in terms of initial state, one can, in principle, equally as well use the end state and operate with the help of the advanced potential.

Another source for this dispute is Wheeler's account of a conversation that he and Richard Feynman had with Einstein in 1939. Wheeler and Feynman had become dissatisfied with the conventional practice of simply ignoring the advanced solutions of Maxwell's equations and working exclusively with the retarded solutions. Their field-free electrodynamics was, therefore, designed to be time-symmetric. In a spirit of temporal even-handedness, Wheeler and Feynman restricted themselves to using solutions that had the form of equally weighted sums of retarded and advanced solutions. They claimed, moreover, that this approach generated exactly the same predictions as did the conventional practice of using retarded solutions alone. In particular, they contended, it continued to predict the phenomenon of radiative damping. This, then, is the context of the meeting (with Einstein) that Wheeler recounts:

In 1939 - 1945, Richard Feynman and I explored the idea of sweeping out the electromagnetic field from all the world's charged particles. We knew that Tetrode and Fokker had postulated instead that every charge acts directly on every other charge with a force governed by half the sum of the retarded and advanced potentials. Their considerations and ours lead to the thesis that the force of radiative reaction arises from the direct interaction between the accelerated source charged particles of the absorber. In this work we encountered so many interesting issues of principle that we went to 112 Mercer Street (in Princeton) to consult Einstein about them. He told us of his dialogue with W. Ritz. Ritz had taken the phenomenon of radiative damping to argue that, at bottom, the electrodynamic force between particle and particle must itself be time - asymmetric. Einstein, in contrast, had maintained that electrodynamics is fundamentally time-symmetric, and that any observed asymmetry must, like the flow of heat from hot to cold, follow from the statistics of large numbers of interactions.

Einstein's words made us appreciate one of our findings anew: that the half-advanced, plus half-retarded action of particles of the absorber on the radiating source only then added up to the well-known and observationally tested force of radiative reaction when the absorber contained enough particles completely to absorb the radiation from the source. By this route, Feynman and I learned that the physics of radiation can indeed be regarded as, at bottom, time-symmetric with only the statistics of large numbers giving it the appearance of asymmetry.

It appears then that Einstein favoured advanced waves in Maxwell's equations. There have been attempts by others to try to detect advanced waves [1] Heron, [2] Davies, [3] Pegg, [4] Schmidt, [5] Niknejad, all unsuccessful with negative results. In fact, John Madey [6] of the University of Hawaii privately detected advanced waves but never published. Luis Elias spoke of Madey [6]: To continue with the magic scientific predicitions, prepared an experimental proposal aimed at demonstrating that advanced solutions of Maxwell's equation do exist. Before he passed away, he explained to me how he and his brother Jules were ready to demonstrate instantaneous EM communication between two points in space through the detection of near-field advanced waves. As proof of the seriousness of such an experiment, they prepared a patent disclosure describing the invention. If they are right, one cannot imagine the technological impact that their discovery will have on our human society. It is up to the University of Hawaii to request a patent.

I have a reference to his patent [7]. Darko Bajlo also detected advanced waves [8][9], it reads in his abstract: For the purpose of detecting advanced electromagnetic radiation predicted by Wheeler-Feynman absorber theory for the case of incomplete absorption of retarded electromagnetic radiation, pulses in duration of 6 ns to 24 ns, wavelength from 91 cm to 200 cm were supplied to three different transmitting antennas. Detection was done with a λ/20 monopole antenna in the advanced time window at a time of 2r/c before the arrival of the centre of the retarded pulse. At distances ranging from 430 cm to 18 m, advanced signals were measured in the SNR (μ/σ) range from 15.4 to 30.9. How is it that Bajlo successfully detected advanced waves, while other researchers got negative results.

According to Bajlo, the advanced signals usually cancel out. Bajlo explains how he overcame this problem in his experiment [9]: Is there any way to detect advanced electromagnetic waves that the transmitting antenna radiates into free space? The solution to this measurement problem is to minimize the influence of the measuring instrument on the phenomenon being measured. This can be easily achieved with the meter and decimeter radio waves by using a small enough receiving antenna for detection, where its advanced waves cannot completely cancel advanced waves from the transmitting antenna. If the results of the recent experiments represent the real signal and not some systematic error, then the advanced radiation can actually be detected with a receiving antenna twenty times smaller than the wavelength of the emitted electromagnetic pulses. For this, Bajlo used λ/20 as a receiving antenna. So, in deciding to repeat Bajlo's experiment to detect advanced waves, one used for one's experiment a λ/4 transmitter and a λ/20 receiver.

EXPERIMENT

So, one set up the experiment to confirm the existence of advanced waves from 6th July to 31st August 2026. Figure 1 shows the experimental equipment setup.

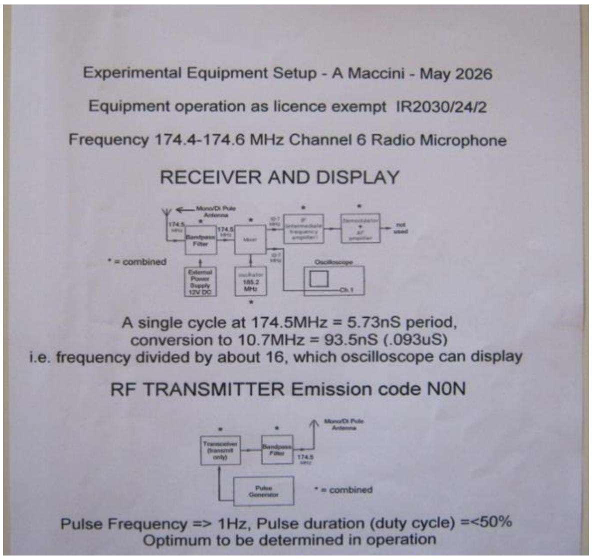

FIGURE 1: Experimental Equipment Setup.

Here, the illustrations are not that clear, so I will name them. In the receiver and display is the block diagram from left to right: A Mono/Di pole Antenna 174.5 MHz to a Bandpass filter with an external power supply of 12 V DC. The 174.5 MHz to Oscillator 185.2 MHz is combined to a mixer. From this 10.7 MHz goes to an oscilloscope. For the RF Transmitter on has a Pulse generator to a Transceiver (transmit only) combined with a Bandpass filter to 174.5 MHz pluse to a Mono/Di Pole antenna.

The experimental set up, one used a Baofeng UV-5RC Plus transmitter. The transceiver is used in transmit mode only. The transmit control cable is already connected to the 2.5mm and 3.5 mm sockets. This cable is fitted with a 2-pin DIN plug that connects to the waveform generator. Use a non-radiating 50-ohm terminating load. It is good practice to initially test a transmitter in the laboratory using a non-radiating (dummy) load in place of an actual aerial. This will limit the range to a short distance. A 50Ω BNC load is supplied with a BNC-BNC adaptor and a short BNC plug-plug cable. This is connected to the BNC socket on the top of the transmitter. If the system is tested and is functional, the dummy load can be disconnected and replaced by the cable to the actual aerial. The power handling of the load is 1W maximum. The load can also be used to simulate the receiver aerial. This is used to check the level of noise when no signal is being received.

One used a Waveform Generator, set to square waveform. The wireless receiver was a Chiayo R-1001, and one used a Hameg 203-6 Oscillosocope. One set the waveform generator frequency control to 0.5 (slowest pulse). If there is any signal in between the pulse gaps it should be visible. If the signal is of a short duration, then it is possible to examine only 10% of the trace width using 18. button pushed IN, and select which portion of this scan one wish to examine.

Practical interpretation and implementation of Bajlo 2016 experiments.

1. There are ambiguities in the published description, but it can be assumed;
   a) available equipment was used and not critical with the exception of the $\lambda/2$ dipoles, $\lambda/4$ monopoles, with $\lambda/10$ and $\lambda/20$ variants. Any or all of these can be used for receiving or transmitting. Theory indicates half and quarter wave antennas are polarised and therefore most efficient, and the shorter variations can only function as isotropic radiators with no gain and unpredictable polar patterns.

   b) apart from initial set up, the transmitter can be activated by regular pulses with adjustable on/off timings of 1:1 - 1:3 ratio, and the synchronised oscillosocope with the receiver will show any signals not transmitted in the ''off'' periods. The pulses produced by a generator which has variable timing settings.

   c) Some method can be used to record the data from the oscilloscope display, here I used a notebook and pen and took readings.

   d) Although transmitted power is low and spectrum occupancy is also low the experiment(s) should be/is compliant with existing IR2030 legislation.

Frequency normal 174.5MHz (Actual 174.55 to limit local range). Transmitter - Baofeng UV-5RC Plus (frequency synthesiser). RF Power=low setting 1W erp x antenna losses. Internal battery (battery charger for mains supplied; unit will fully charge in <60mins).

Receiver - Chaiyo (crystal fixed frequency). Used as a frequency converter (10.7 MHz output). Range 174.3-174.7 MHz, Audio output not used. 12V DC with external mains power supply.

Antenna Design. Self supporting 0.86m plastic tubing, sockets for single or twin rods, coaxial cable with fitted connectors, for vertical or horizontal use. Antenna dimensions. $\lambda = 1.72$ metres (normal dipole=0.86 m) so $\lambda/10$ = 17.2cm, $\lambda/20$ = 8.6 cm, adjustable for vertical or horizontal polarisation.

Antenna 1 - 1/2 λ dipole (adjustable) - for transmitter (can also be used as a vertical monopole if the lower element set to 30-45 degree angle relatove to vertical).

Antenna 2 - dipole centre to accept $\lambda/10$ and $\lambda/20$ elements (can also be used as a monopole using the red terminal only) any cut length can be used.

Antenna cables - RG58CU negligible loss, velocity factor 0.66. Length <2.2 m, Connectors BNC 50Ω. It should be noted that equipment is not modified from original and therefore is still compliant with the original specifications.

Pulse generator - Modified Maplin kit waveform generator using 8038 IC - the pulse output socket is used to activate the transmitter. Controls to set frequency, waveform, duty cycle, and output levels. Powered by 2 internal 6F22 batteries.

Oscilloscope - Hameg 203-6 Dual trace 20MHz, mains powered. Used in single trace mode as signal indicator.

FREQUENCIES FOR EXPERIMENT

Original 2m (150MHz) and 91cm (330 MHz) - these can not be used for free radiation in UK. Choices available from IR2030.
Alternatives: 169.5MHz (1.77m)
173.775-175.075 (CHANNEL CHOSEN 174.550 MHz) (1.72m)
27.2 MHz (11.03m)
40.8 MHz (7.35m)
47.4 MHz (6.33m)
459 MHz (0.65m)
erp <100mW free radiation ref; EN300 422

Note: the transmission time of 10% is recommended, e.g. 10 minutes per 100 minutes (1 hour 40 min) period.; 1/2 wave dipole = 86cm, 1/4 wave monopole = 43cm, $\lambda/10$ = 17.2cm, $\lambda/20$ = 8.6cm.

Also used for experiment - 10.7 MHz pre-amplifer, to examine very weak RF displayed on the oscilloscope, (to detect possible weak advanced pluses) and an external 10.7 MHz preamplifer is used. Battery consumption is small. Battery = 9V 6F22.

For the experiment I used a dipole antenna, sseparated from10 feet (269cm), from each other. Transmitter $\lambda/4$, and receiver $\lambda/20$, both horizontally polarized, from 6th July to 31st August 2026, and had 11,068 runs. The qualified technician explained that all advanced pulses will show up on the left side of the oscilloscope screen, and all retarded pulses on the right of the screen, to which one could recognize the advanced pulses. Table 1 presents the advanced and retarded pulse counts for July and August.

TABLE 1: Advanced and retarded pulse counts in July and August 2026.

Month	Advanced	Retarded
July	4,016	997
August	4,765	1,290
Total	**8,781**	**2,287**

Table 1 shows a majority of advanced pulses relative to retarded pulses. Figure 2 presents a bar chart of these data.

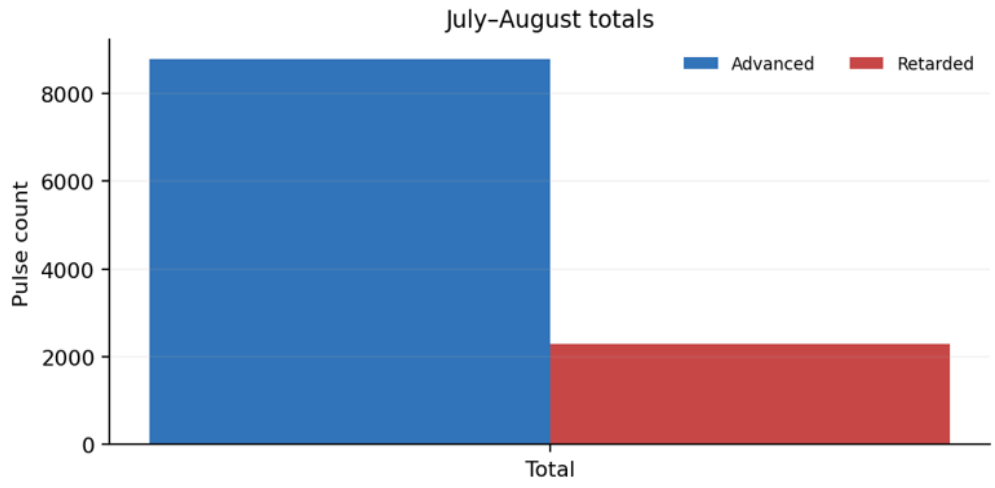

FIGURE 2: Total advanced and retarded pulse counts.

Figure 2 shows that the blue series 1 (advanced pulses) is considerably larger than the red series 2 (retarded pulses). I entered these data into a statistical difference calculator, which confirmed that the difference is significant. The percentage difference required at the 99% confidence level is 2.4%.

Figure 3 presents a bar chart of the July and August data.

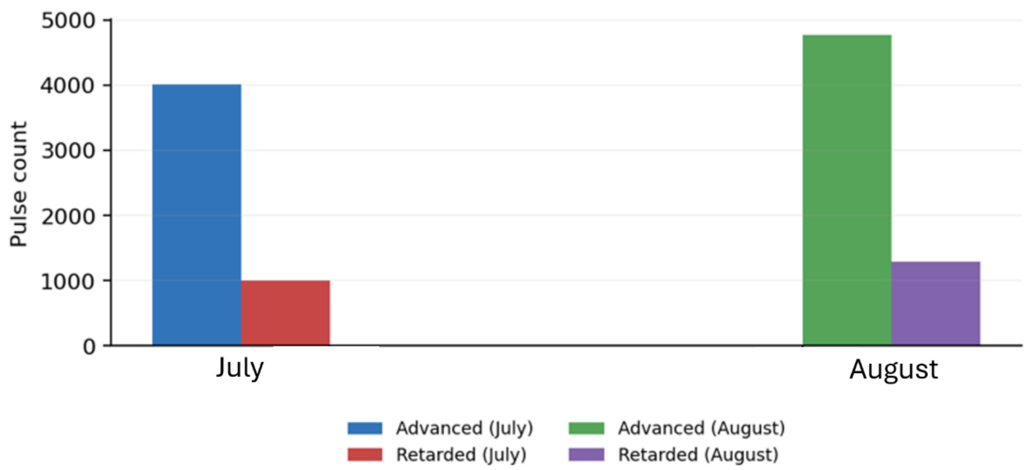

FIGURE 3: Advanced and retarded pulse counts by month.

In Figure 3, we have the data for July and August. The Blue series 1, and green series 3 are advanced pulses for July and August. Red series 2 and purple series 4 are retarded pulses for July and August. One can see from this that there is still more significant data for advanced over retarded pulses. The above data of pulses is as shown in Table 1, Advanced pulses in July 4,016, Retarded pulses 997, and August, advanced pulses 4,765, Retarded pulses 2,287, but without the total as shown in Figure 2.

At the beginning of the experiment, I used the 10.7 MHz pre-amplifier to detect weak advanced signals. On 13 July 2026, however, the pre-amplifier signals became distorted, making further readings unreliable. I therefore continued without the pre-amplifier and still observed strong signals.

After the main indoor experiment, I conducted two additional experiments with the transmitter outdoors at 20 feet, 5,380 cm, and 50 feet, 13,450 cm, on 1 September 2026. See Table 2.

TABLE 2: Advanced and retarded pulse counts at 20 and 50 feet on 1 September 2026.

Distance	Advanced	Retarded
20 feet	156	41
50 feet	162	44

Table 2 again shows a majority of advanced pulses relative to retarded pulses; see Figure 4.

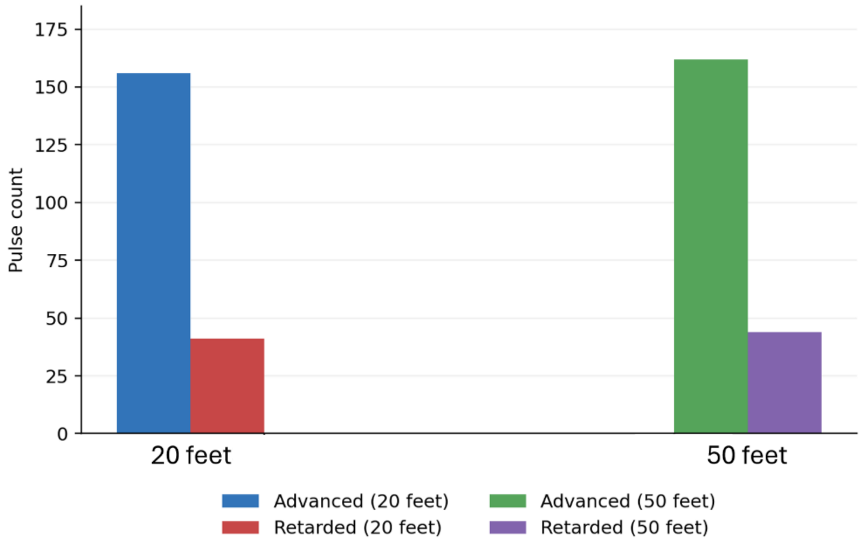

FIGURE 4: Advanced and retarded pulse counts at 20 and 50 feet.

The blue and green series show the advanced pulse data, while the red and purple series show the retarded pulse data. The difference between the advanced and retarded pulse counts is significant. The data in Table 2 and Figure 4 from the two experiments on 1 September, with the outdoor transmitter separated by 20 and 50 feet, suggest that the main indoor results from July and August were not an illusory effect caused by the antennas being only 10 feet apart. These outdoor experiments give me confidence that an experiment with the transmitter 50 feet away would show results similar to those in Table 2 and Figure 4, with clear, strong signals comparable to the July and August data.

With the pre-amplifier, both advanced and retarded pulses lasted 600 ms, with a 200 ms delay between them. Without the pre-amplifier, advanced pulses lasted 400 ms and retarded pulses lasted 600 ms; the delay between them remained 200 ms.

INTERPRETATION AND CONCLUSIONS

The positive results of this experiment appear to confirm Bajlo's findings. On the basis of the detected advanced waves, which propagate into the past, one may conclude that time can be considered symmetrical and that the advanced solutions of Maxwell's equations cannot simply be ignored, as physicists normally do.

These positive results suggest that other scientists could repeat this experiment to confirm the existence of advanced waves. According to Bajlo, advanced waves usually cancel each other out, which may explain why they are not normally detected. Bajlo's findings, supported by this experiment using a $\lambda/20$ receiver, suggest that the advanced waves do not cancel out in this arrangement. The results also support the view that radio transmissions and the wider electromagnetic spectrum produce advanced waves, although these waves are not normally detected. This work also supports Wheeler–Feynman absorber theory, under which excited particles normally emit advanced and retarded signals simultaneously.

This work supports the notion that electromagnetic phenomena produce advanced waves and that time is symmetrical, although it cannot yet explain why or how advanced energy propagates into the past. It points to the existence of negative energy in nature that is hidden and not normally detected. Wheeler–Feynman absorber theory also implies that matter and energy extend partly into the past and partly into the future.

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