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# ATTEMPT AT REMOTE DETECTION OF A NUCLEAR EXPLOSION

Work done by:

R. K. Beauchamp

J. F. Kalbach

Report written by:

J. F. Kalbach

## Abstract

This report supplements Mr. H. T. Gittings' report (LAMS-731) which describes the construction and operational results of photoelectric recording equipment for attempting to detect a sudden change of sky illumination due to a nuclear explosion over 5,000 miles away.

In order to support any positive indications which Mr. Gittings' equipment might produce here in New Mexico during the third nuclear explosion at Operation Sandstone, similar equipment was set-up and operated by Messrs. J. F. Kalbach and R. K. Beauchamp. This additional set-up included means to record changes in intensity of sky illumination simultaneously with standard time signals received directly from radio station WWV.

As with Mr. Gittings' equipment, this additional equipment did not indicate any change in sky illumination at the time of the nuclear explosion. Since the sensitivity of the equipment was such as to give a significant record for a change in sky brightness of one part in ten thousand, any effects of the flash in this general area must have been below this level.

A careful study of the WWV time signals, however, indicated that duplicate timing signals were received here in New Mexico from about ten minutes before the nuclear explosion until about four minutes after the explosion. The nature of these additional signals was such as to make us

suspect that they originated in connection with Operation Sandstone. A striking shift in pulse rate coincided with the time at which an atomic bomb was supposedly detonated, and although the explanation for this effect has not been found, it is hoped that the answer may be indicated by correlation of these data with other information which is not available to us at this time.

## Attempt at Remote Detection of A Nuclear Explosion

### Introduction

As a result of speculation as to whether or not a nuclear explosion would produce a flash in the Pacific brilliant enough to be detected here in New Mexico, Mr. H. T. Gittings assembled and operated equipment for recording sudden changes in sky illumination. Near the time of the second nuclear explosion at Operation Sandstone, Mr. Gittings' equipment indicated an apparent rise in illumination. The time of the indication was not close enough to the time of the explosion to show definite coincidence, but was close enough to justify a repeat of the test during the third nuclear explosion.

The authors constructed equipment more or less duplicating the sky illumination recording equipment of Mr. Gittings, but providing the additional feature of recording standard time signals from radio station WWV on the same record chart with the illumination record. This equipment was taken along with the rest of Mr. Gittings' equipment to a site near Taos Junction, New Mexico, and put into operation to obtain supplementary data.

### Description of Equipment

The equipment for recording changes in illumination intensity of the western sky was similar to that described fully by Mr. Gittings in his report LAMS-731. Mounted upon a tripod was a 15 inch telephoto FS.6 lens focused upon the sensitive

portion of a 929 photoelectric tube. The output of the phototube was used to operate a cathode follower which in turn operated a 100 volt voltmeter and a d-c amplifier coupled through a resistance capacitance network. The network was adjustable to give time constants from 3 to 48 seconds. The d-c amplifier operated one pen of a Brush two-element BL-202 oscillograph. Besides the iris on the telephoto lens, controls included the time constant adjustment already mentioned, an attenuator, and ambient current adjustment and a maximum current limiting adjustment for the d-c amplifier, and finally a zero adjustment and an on-off switch on the Brush oscillographic recorder. The record roll was run at approximately 25 millimeters per second.

For recording time signals on the record roll using the second element of the recorder, a directional "V" antenna of four wavelengths at 20 mc was erected for receiving WWV signals. A Hallicrafters SX-28 (battery operated) was used, and a tone filter was connected in the output circuit to remove the 440 cps tone and leave only the one second time markers for producing the record on the oscillograph. A neon bulb limiter was provided to prevent static bursts from overdriving the oscillograph pen through a BL-905 amplifier. Schematic diagrams of the circuits used are given in the appendix.

Results and Conclusions

All equipment was set up and put into operation by 9:30 a.m., May 14, 1948 near Taos Junction. The less was

directed just above the horizon 9° north of west (265° magnetic bearing), while the "V" antenna was directed approximately 13° north of east (63° magnetic bearing). Although the antenna had bi-directional characteristics, that is, had considerable sensitivity in a westerly direction as well as the desired easterly direction, the reception of WWV was excellent as indicated by the record chart. The sky was cloudless in the west.

Sensitivity of the photoelectric apparatus was checked by momentarily turning the iris from F:8 to F:5.6 and return. As this operation increased the light reaching the phototube by 100 per cent, it was necessary to set the attenuator at 0.4 per cent full gain to give a reasonable oscillograph pen deflection. Under these conditions, an upward pen deflection of 15 millimeters was obtained. From the calibration, it may be deduced that a one-third millimeter deflection on the chart with the amplifier at full gain would correspond to a change in ambient phototube illumination of less than one part in ten thousand. Since the actual running record of illumination was very smooth during the test, it was felt that a 1/3 mm sudden deflection upward would have been easily noticed, and therefore significant. A change in illumination of 0.4 per cent would have given a deflection of 15 millimeters on the oscillograph record.

The sensitivity of the equipment was demonstrated

by small gnats and other insects in the air which produced sudden momentary downward deflections in the record early in the morning. A small stone thrown across the field of vision of the phototube would deflect the trace off scale as did a large black bird some 500 to 1000 yards away. These deflections, however, were in a downward direction, and would have been readily distinguishable from any upward deflection indicating an increase in illumination. Fortunately, at about 10 a.m. the wind came up sufficiently to clear away the insects; yet the wind did not become strong enough to create problems due to dust.

Since no upward deflections were noticed between 10:45 and 11:15 a.m., it may be concluded that any sudden increase in sky brightness here in this area due to the nuclear explosion at Operation Sandstone would have had to be less than one part in ten thousand. After viewing the smoothness of the record, the absence of microphonics, and the lack of trouble due to wind blowing on the equipment, it was felt that additional amplification of at least 100 times could have been used under these very favorable climatic conditions without obtaining an unstable record. However, there is no basis for believing that even this additional amplification would have permitted detection of the nuclear flash.

Reception of WWV time signals was excellent, and except for an effect to be described later, and except for a

few short intervals of familiar fading, the time signals sounded normal and appeared to give a very regular record on the oscillograph trace. Signals were strong on either 15 or 20 mc as received by either the Hallicrafters SX-28 or Hallicrafters S-39 receivers on the large "V" antenna. The doublet antenna gave unsatisfactory performance on 15 mc. However, since the signals on 20 mc appeared to be a bit steadier than those on 15 mc, the receivers were both tuned to 20 mc and left there from about 10:30 a.m. until tests were completed at about 12:00 noon. The selectivity of the SX-28 was adjusted to the "Sharp I.F." position.

An abnormal series of time signals was first noted approximately ten minutes before the explosion and, with a few interruptions, continued until about four minutes after the explosion. These abnormal signals were in the form of additional pulses almost identical in sound and in appearance on the record chart to those from WWV. At first, these additional pulse signals preceded the stronger steady signals by approximately a half second, a phenomenon which was readily observable at the 59th second of each minute when one pulse is omitted. At approximately 11:04 a.m., MST, the additional pulses decrease slightly in pulse rate so that 21 seconds later they lag the strong pulses instead of leading them. The pulse rate continues to drift in a lagging direction for a while, then slowly starts to recover and drift slowly toward the

leading direction until the additional signals disappeared abruptly. The following table outlines the sequence of events as shown on the oscillograph record chart, using the strong time signals as reference. A chronometer had been synchronized with WWV signals at 9:30 a.m., and the time by this instrument indicated the strong signals to be the regular ones while the weaker signals drifted in time interval.

| Time on May 14, 1948 (Mountain Standard Time) | | | Description of Event |
|---|---|---|---|
| Hour | Minute | Second | |
| 9 | 30 | | Normal reception of WWV signals established on 20mc with directional East-West "V" antenna. |
| 10 | 54 | 49.52 | First abnormal extra time "pip", with other extra pips following at one second intervals. |
| 10 | 56 | 14 | Extra signals fade out slowly for 18 seconds, then reappear. |
| 10 | 57 | 16.52 | Extra "pips" disappear abruptly after the pip at this time. |
| 11 | 02 | 15.57 | Extra "pips" fade in with low amplitude and fade out after 10 seconds. |
| 11 | 03 | 15.63 | Extra "pips" reappear strongly for three consecutive seconds, disappear abruptly for three consecutive seconds, then reappear. |
| 11 | 03 | 45 | Extra "pips" disappear. |
| 11 | 03 | 55.65 | Extra "pips" reappear. |
| 11 | 04 | 06.66 | Extra "pips" show noticeable lag. |
| 11 | 04 | 14.675 | Extra "pip" lag rate becomes more rapid. |

| Time on May 14, 1948 (Mountain Standard Time) Hour | Minute | Second | Description of Event |
|---|---|---|---|
| 11 : | 04 : | 57.83 | Extra "pip" rate still slipping. |
| 11 : | 04 : | 21.07 | Extra "pips" have slipped past main pips. |
| 11 : | 05 : | 26.22 | Maximum lag of extra pips. |
| 11 : | 07 : | 45.05 | Last extra pip recorded. |



As long as the equipment was run afterward (until about 12 noon), no extra pips were noticed. Signals monitored from WWV for several days afterward did not give any further indication of this type of signal. Since the time of the nuclear explosion was supposed to have been 11:04 a.m., Los Alamos time, the presence of these extra time signals, together with the striking shift in pulse rate immediately following 11:04 a.m., leads us to suspect that these signals originated in connection with Operation Sandstone. The directional characteristics of the antenna were at least favorable for receiving signals in the Pacific.

At this writing, no satisfactory explanation has been found for these extra time signals. It is hoped that the recording of these data in this report may help in finding someone who knows the answer.

A sample of the record chart is included in the appendix together with a copy of a portion of the record which shows the additional abnormal "pips".

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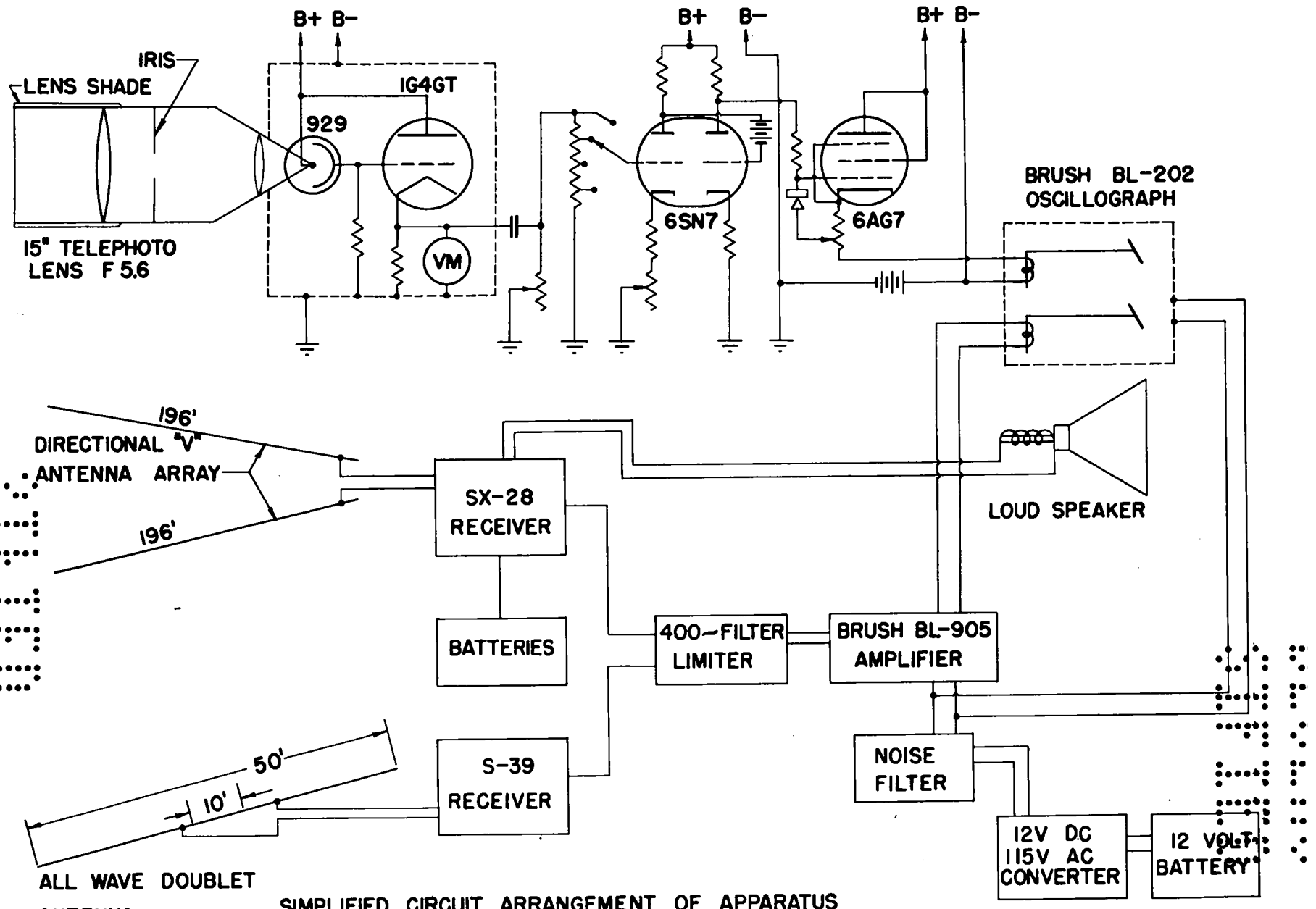


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