in received frequency due to the Doppler effect, under conditions of uniform rectilinear motion, uniformly accelerated rectilinear motion and motion on a curved trajectory. The methods of determining the instant of nearest approach, the distance of the satellite at this point and its velocity are discussed. Sputniks I and II carried a 40 megacycle transmitter, the signals from which were mixed at the receiving station with a standard frequency from a quartz oscillator, to produce beats for recording on magnetic tape. Good readings were obtained at distances up to 1000 km. The time of nearest approach was determined to within $\pm$ 1 sec at this range, the orbital velocity to within $\pm$3 per cent and the distance at nearest approach to about the same accuracy. From these first experiments, improvements have been possible in the equipment to improve the timing of the frequency variation curves and to include automatic frequency metering gear. These will reduce the errors to some hundredths of a second.

K. I. GRINGAUZ: **Rocket measurements of electron concentration in the ionosphere, using an ultra-shortwave dispersion interferometer** (pp. 62–66).

After a brief discussion of the shortcomings of reflected-signal radio-sounding of the ionosphere, a description is given of Soviet rocket experiments, culminating in the ascent of 21 February 1958, which attained an altitude of 473 km. The rockets carried two VHF transmitters operating on two different frequencies, one a multiple of the other. The phase and amplitude differences of the signals received at two different points were continuously recorded; simultaneously, the rockets were tracked optically and by radar and ionospheric radio-sounding records were made at nearby stations for comparison with the transmitted signals. It is concluded, in agreement with published American findings, that there is no sharply defined E layer below the maximum of the F layer. In contrast to the American work, however, it is found that ionization does not fall rapidly above the F layer maximum, but is still pronounced up to the highest altitude reached. Comparison of the rocket results with those of radio-sounding is useful in interpreting the latter. Thus it was found that the height within the F layer from which the radar waves are actually reflected is some 50–150 km lower than the apparent altitude recorded at the station, depending on the state of the ionosphere.

L. A. ZHEKULIN: **The altitude distribution of electron concentration from experiments with rockets and artificial earth satellites, and its influence on the propagation of radio waves** (pp. 67–79).

A mathematical study is made of the propagation of electromagnetic waves through the ionosphere, using the latest experimental data on ionization distribution. The solutions are expressed in the form of Airey functions. According to earlier hypotheses based on the existence of sharply defined ionized layers, reflection jumped from the E layer to the F layer on reaching a certain critical frequency. It is now known that the E layer corresponds to a sharp change in ionization gradient, and the critical factor is the frequency at which the dielectric permeability, corresponding to the ionization density at the level where the gradient changes suddenly, reverts to zero. On passing through this frequency, the signal delay suddenly increases so that the apparent reflection altitude thus increases suddenly. It is shown that when absorption in the ionized medium is small, the results obtained by the present solution approximate to those derived from the principles of geometrical optics, ionization gradient being equivalent to refractive index.

V. N. CHERNOV and V. I. IAKOVLEV: **Scientific experiments on the flight of an animal in an artificial earth satellite** (pp. 80–94).

A detailed account is given of the series of experiments culminating in the flight of the dog Laika in Sputnik II. The dogs must be systematically trained to endure the various conditions of long-period confinement, first under normal terrestrial conditions prior to take-off, secondly under the noise and acceleration of launching and finally under prolonged weightlessness in orbit. All these conditions, except the last, were reproduced singly and in combination in the laboratory and the training continued until the animals quickly reverted to the normal physiological state on cessation of the special conditions. The sealed container, its heating and ventilation system and the various pieces of experimental gear are described and illustrated, but not in great detail. Laika was fed on a mixture of rusk, dried meat and beef fat, ground up and mixed to a jelly-like consistency with water and agar-agar and was free to move in its harness over a short distance, so that measurements could be made of its locomotive activity under the various sets of stimuli. The signals transmitted to earth covered breathing and heart action, body temperature, movement and maximum pressure in the carotid artery, removed for the purpose into a special skin graft and constricted by a manometric sleeve. No substantial changes were recorded in the physiological state of Laika during seven days orbital flight. The satellite passed through a meteorite zone, but the cabin remained sealed and functioned normally throughout. There was no evidence of any effects due to cosmic radiation, but a final judgement on this would necessitate prolonged post-flight investigations.

No. 2 (1958)

*L. I. SEDOV: **Dynamic effects in the motion of artificial earth satellites** (pp. 3–9).

After a review of the various influences causing perturbations in the orbital and rotary motion of artificial earth satellites, due to atmospheric resistance the oblateness of the earth, the earth's magnetic field,, meteorite collisions and solar and lunar gravitation, the results are given of the full computation of observational data on the first three Soviet satellites. Graphs are given of the secular variations in period and in altitude at perigee and apogee, and the main data are summarised in