TABLE II. g values calculated by $\nu=(\gamma/2\pi)(H_z+H_i)$.

Material	Frequency (Mc/sec)	g
$NiOFe_2O_3$	9450	2.05
	18,400	2.04
	23,500	2.06
	47,000	2.05
$MnOFe_2O_3$	9450	1.99
	18,400	1.99
	23,500	1.98
	47,000	1.99

in Kittel's formula as follows:

$$\nu=(\gamma/2\pi)(H_z+H_i), \tag{2}$$

where $\gamma=ge/2mc$, and H_i denote the internal field in the material, which must be independent of frequency.

By use of the resonance data in Table I, the most probable values of H_i were calculated by the method of least squares to be 507 oersteds for Ni ferrite and 278 oersteds for Mn ferrite. Substituting these values in Eq. (2), we obtained for both ferrites the g values shown in the last column of Table II. These g values are independent of the frequency within the limits of experimental error. It should be noted that the g factor of Mn ferrite calculated from Eq. (2) agrees with the theoretical value of 2, showing good evidence for quenching of the orbital contribution of the Mn^{++} ion.

H_i may be the internal field[3-5] caused by the magnetocrystalline anisotropic energy, and seems to be equal to the internal field discussed by Rado et al.;[4] they reported that the internal field in Ferramic A would contribute to the resonance by domain rotation in the material.

This work will be reported in detail in the near future.

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[3] L. Landau and E. Lifshitz, Physik. Z. Sowjetunion 8, 158 (1935).

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Ferroelectricity in Oxides of Fluorite Structure

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A HIGH dielectric constant with a strong negative temperature coefficient recently has been reported for the new cadmium niobate composition $Cd_2Nb_2O_7$ by Bousky[1] and by Wainer and Wentworth.[2] These authors do not describe the crystal structure of this compound, but their discussion implies it to be a perovskite.

We have made powder x-ray diffraction patterns of this compound, prepared at 1150°C and found, not a perovskite structure, but a face-centered cubic structure of lattice constant 5.185 ±0.003A. The pattern is very sharp and shows no evidence of splitting in the back reflection lines, nor any indication of a superlattice. The relative intensities of the diffraction lines are very similar to those of cerium dioxide, which has the calcium fluoride structure.

This pattern can be accounted for by an arrangement of one molecule of $Cd_2Nb_2O_7$, with oxygens occupying statistically seven out of the eight anionic positions, and niobium and cadmium distributed statistically over the cationic positions of the fluorite structure. Periodic alternation of cadmium and niobium, or oxygen and vacant positions, are not compatible with the face-centered cubic structure. The O—O distance, 2.59A, is unusually small, probably because of the absence of $\frac{1}{8}$ of the oxygen atoms. The density calculated from the lattice constant is 6.24. Direct measurement on a ceramic body gave 5.89.

The high dielectric constant reported by Bousky[1] and by Wainer and Wentworth[2] was confirmed. A disk of the material fired to 1300°C shows a relative dielectric constant of 450 at room temperature. This rises to a peak of 2850 at −103°C, the Curie point. Hysteresis loops taken at −196°C show it to be ferroelectric below its Curie point.

We have also studied the analogous compound $Pb_2Nb_2O_7$, not previously described in the literature. We find a dielectric constant of 110 and a dielectric loss factor of 0.004 at 100 kc/sec, measured at room temperature. The dielectric constant rises with falling temperature from a value of 80 at 400°C to 245 at −196°C, the limit of measurement, with indications of a Curie point at somewhat lower temperatures.

The x-ray diffraction pattern of $Pb_2Nb_2O_7$ shows a distorted fluorite structure of rhombohedral symmetry. The lattice parameters are $a_0=5.285\pm0.003$A and $\alpha=89°15'$. Again there is no indication of any superstructure.

These results are significant in that they show ferroelectricity in a simple structure type where it was previously not suspected.

We thank E. J. Brajer for preparation of the samples and G. N. Cotton for the dielectric measurements which established the Curie point of $Cd_2Nb_2O_7$.

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[2] E. Wainer and C. Wentworth, J. Am. Ceram. Soc. 35, 207 (1952).

The Ratio of Positive to Negative π-Meson Production from Deuterium

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THE ratio of positive to negative π-meson production from deuterium at 0° to the 340-Mev proton beam of the Berkeley cyclotron has been measured by a method which permits a direct comparison of the positive and negative production. The mesons were separated from the proton background by using a double magnet arrangement as shown in Fig. 1. Double coincidences were made between photomultiplier signals 1 and 2, and 3 and 4 in diode bridge type coincidence circuits which had resolving times of about 5×10^{-9} second. The outputs of the two bridges were combined in a slow mixer (about 10^{-6} second resolving time), and the resulting triple coincidences were taken as being due to particles that had traveled the trajectory laid out. Several checks were made to assure that this was so. Turning off either magnet reduced the triples counting rate to about one percent of the rate with the fields on. This was the same as the accidental rate measured by inserting a time delay equal to one rf cycle ($\sim6\times10^{-8}$ sec) in the signal lines from photomultipliers 1 and 3. The number of negative particles counted when the target was filled with hydrogen was the same as that from the empty target. Range curves

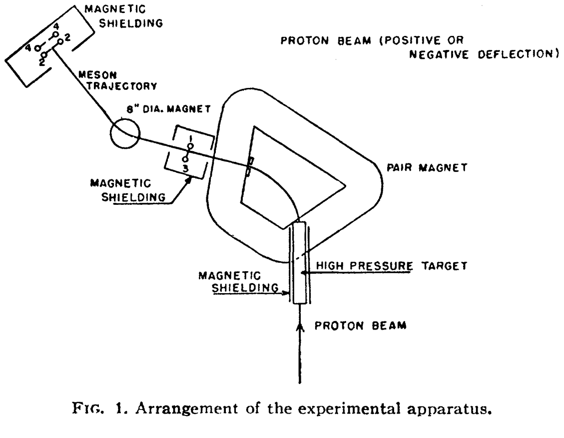

FIG. 1. Arrangement of the experimental apparatus.