

**substance: Fe<sub>3</sub>O<sub>4</sub>**

**property: magnetic properties**

Fe<sub>3</sub>O<sub>4</sub> is ferrimagnetic. Real and imaginary parts of the permeability are given in Fig. 1.

**Curie temperature**

$T_C$	848.5 K	74G
	850 K	69S
	848.41 K	56S
$(1/T_C)dT_C/dp$	$2.42 \cdot 10^{-3} \text{ kbar}^{-1}$	69S

At 300 K, the magnetic structure [48N, 51S] has a-site Fe<sub>tetr</sub><sup>3+</sup> spins along [001] coupled antiferromagnetically to spins on d-site Fe<sub>oct</sub><sup>3+</sup> (spins along  $[00\bar{1}]$ ). The d-site Fe<sub>oct</sub><sup>2+</sup> ions are coupled ferromagnetically to the d-site Fe<sub>oct</sub><sup>3+</sup> ions and their spins hence also point along  $[00\bar{1}]$ .

**spin wave spectrum** in the acoustic branch: Fig. 2.

**spin-spin coupling constants**

$J_{AB}$	– 0.44 meV	$T = 1.8...4.2 \text{ K}$	heat capacity	56K
	– 1.10 meV	$T = 1.8...4.2 \text{ K}$		65D
	– 2.4 meV	$T > T_V$	neutron scattering	63G,
				62W
	– 2.5 meV	$T > T_V$		66M
	– 1.0 meV	$T < T_V$		66M
	– 2.55 meV	$T > T_V$		62W
	– 2.35 meV	$T > T_V, < T_V$		67A
	– 2.32 meV	$T > T_V, < T_V$		67T
$J_{BB}$	0.25 meV	$T > T_V$		66M
	0.68 meV	$T > T_V, < T_V$		67T

**magnetic moments**

(in units of  $\mu_B$ , at RT(?))

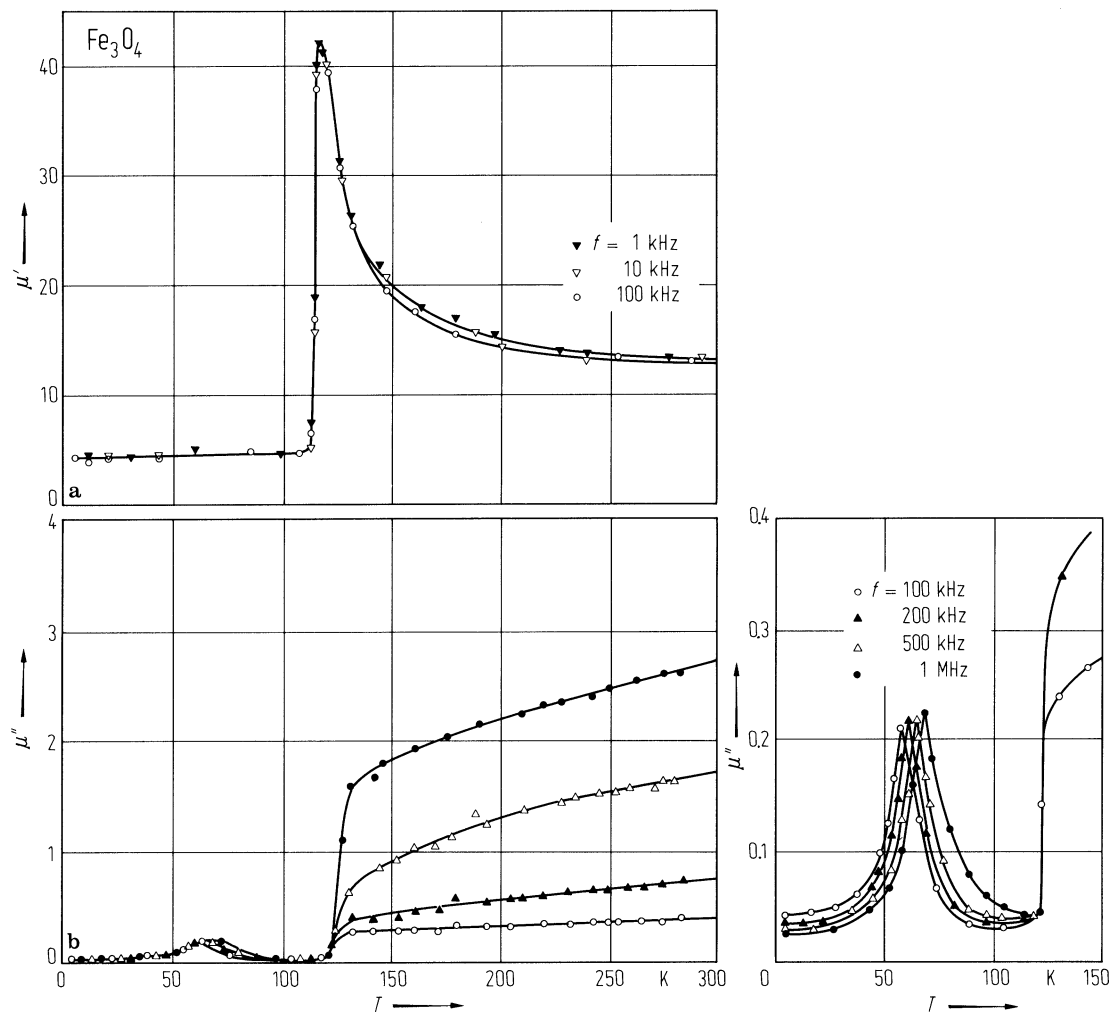
$p_m$	3.47	single crystal	mean magnetic moment per	78R,
		powder	formula unit	77R,
				77M
$p_A(A)$	3.82	single crystal	A-site moment; 1.2% Ti	77R,
	4.0	powder		78R
$p_A(B)$	3.6	single crystal	B-site moment	
	3.7	powder		

## References:

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**Fig. 1.**

$\text{Fe}_3\text{O}_4$ . Real ( $\mu'$ ) and imaginary ( $\mu''$ ) parts of the relative permeability vs. temperature at various frequencies [80I]. Lower right band figure shows low-temperature range on an enlarged scale.



**Fig. 2.**

$\text{Fe}_3\text{O}_4$ . Acoustic spin-wave spectrum. Energy transfer vs. reduced wave vector. Open circles: data of [67T] at 77 K. Full circles: data of [62W] at 297 K.

