

LETTERS TO THE EDITOR

OPTIMUM NOISE CONDITIONS IN A FET

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Received 1 August 1966

Lately some papers have been published about pre-amplifiers for solid state detectors and even commercial equipments exist in which these FET's are used as an input element¹⁻³).

In all of these papers excepted in the one by Nybakken and Vali⁴) the possibility of changing the operating point has not been taken into account. Even in the article just mentioned, there is hardly a possibility of changing the FET current without changing the operating conditions of the rest of the circuit.

Even though in a FET both the transconductance as well as the input capacity decrease with the drain current, the relation G/C_{in} (that can be considered as a merit factor with regards to noise) has no reason to be a decreasing function with the drain current. This relation can perfectly have a maximum for a current that does not correspond to zero gate-source voltage.

With the possibility of an optimum condition for the drain current we constructed a preamplifier in which the FET was connected as indicated in the diagram of fig. 1. Through the potentiometer we can change the gate-source bias and with this the drain current.

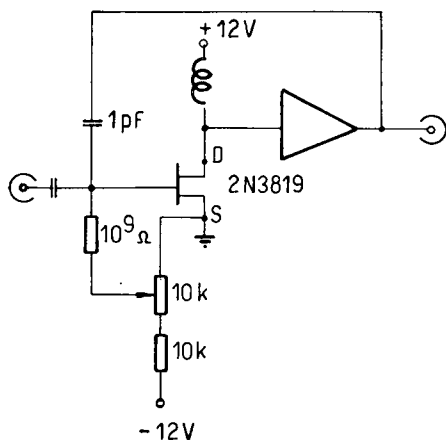


Fig. 1. Diagram, containing FET.

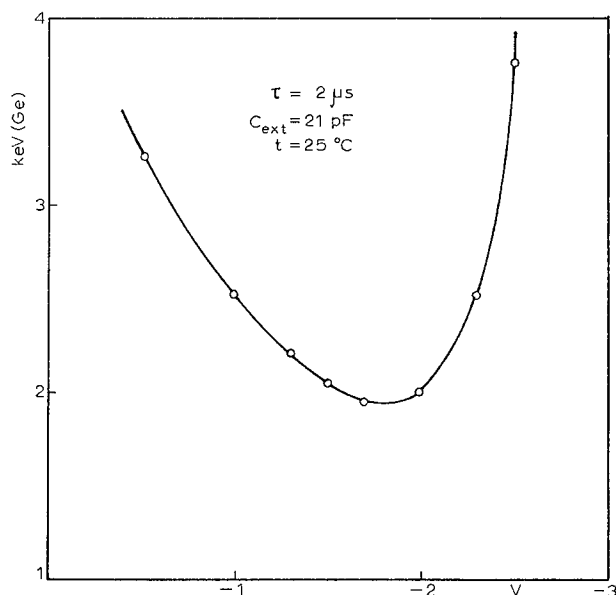


Fig. 2. Noise vs gate-source bias.

The drawing of fig. 2 indicates the values of the noise in keV(Ge) as a function of the gate-source bias.

From the foregoing it can clearly be observed that there exists an optimum condition strongly dependent on the gate-source bias.

Measured resolution with the optimum condition at room temperature for $\tau = 2 \mu\text{sec}$ was $0.64 \text{ keV(Ge)} + 0.062 \text{ keV/pF}$.

References

- 1) K. A. Smith and J. E. Chain, IEEE Trans. Nucl. Sci. (June, 1966) to be published.
- 2) T. V. Blalock, IEEE Trans. Nucl. Sci. (June, 1966) to be published.
- 3) FET preamplifier, Model TC 130. Tennelec.
- 4) T. W. Nybakken and V. Vali, Nucl. Instr. and Meth. 32 (1965) 121.