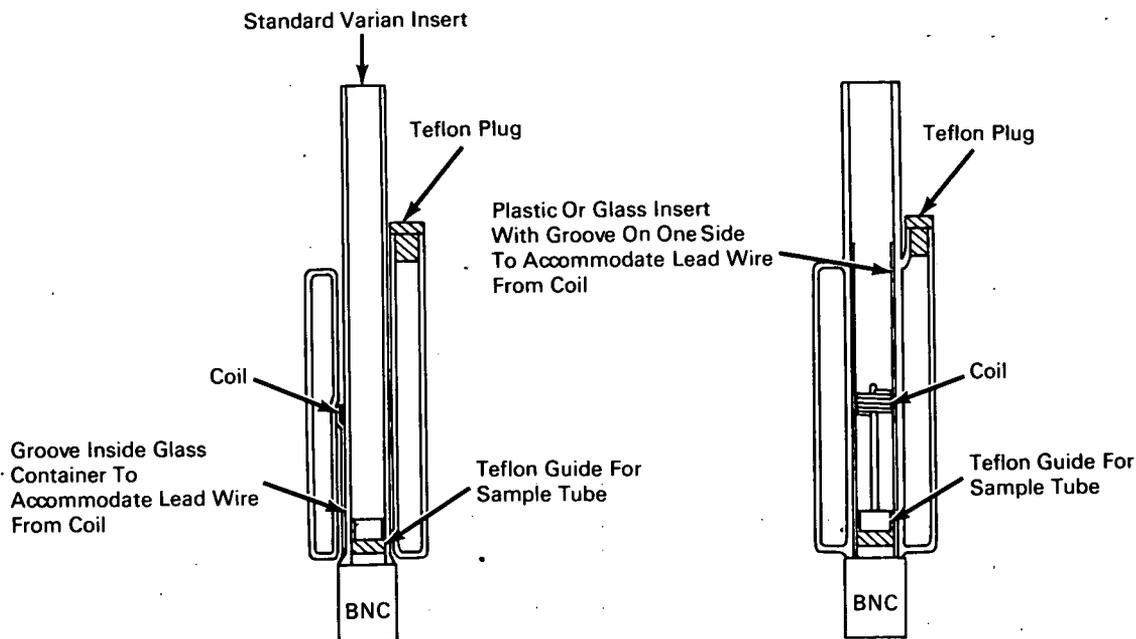


NASA TECH BRIEF



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An Improved Nuclear Magnetic Resonance Spectrometer



The problem:

To accomplish a high degree of nuclear stabilization of a nuclear magnetic resonance (nmr) spectrometer for low gyromagnetic ratio nuclei in a simple, straight-forward manner. Such stabilization has previously been possible only through a complicated nmr system employing frequency synthesis.

The solution:

A device in which a sample of a reference substance is placed in a container that is slipped over presently used nmr receiver inserts. The transmitter excites the nuclei in this container external to the coil windings and the nuclei induce a signal in the signal coil of

opposite phase to that of nuclei in a sample container inside the receiver coil winding.

How it's done:

A cylindrical sample container is placed coaxially about the common nmr insert as shown in the left figure. A reference sample in such a container has a sufficiently homogeneous field to give a signal suitable for locking the field and frequency of an nmr spectrometer with a simple audio modulation system of a type widely in use. Spectra of N^{14} , C^{13} , B^{11} , P^{31} , F^{19} , and H^1 are successfully recorded when the spectrometer is stabilized on a sample of the corresponding nucleus in such a sample container external to the

(continued overleaf)

receiver coil. Resolution of the order of 0.2 to 0.4 cps is achieved for N¹⁴, C¹³, B¹¹, and P³¹.

Notes:

1. The ultimate in design to increase the field homogeneity at the sample and reference would be a one-piece insert with the receiver coil wound inside as shown in the right figure. The problems concerning such a design are under study, the winding and placement of the coil being the greatest at present.

2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B67-10234

Patent status:

No patent action is contemplated by NASA.

Source: Stanley L. Manatt and Daniel D. Elleman
(JPL-762)