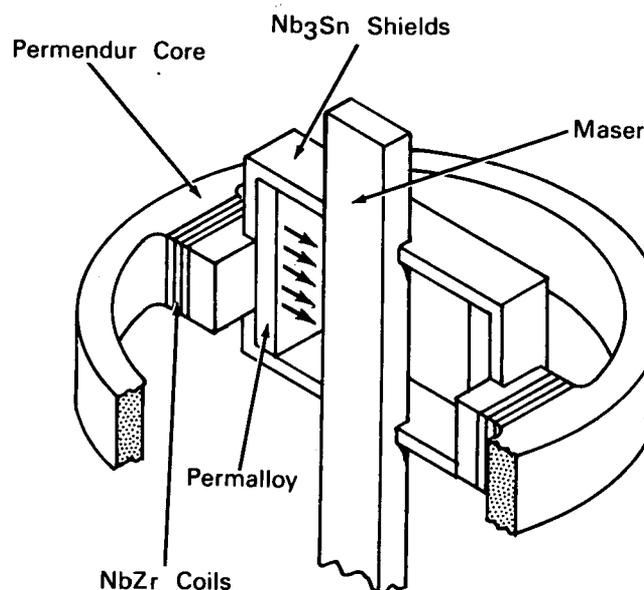


NASA TECH BRIEF



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Superconductor Magnets Used for Stagger-Tuning Traveling-Wave Maser



The problem: The bandwidth of a traveling-wave maser can be increased by stagger-tuning the individual maser crystals. Since the operating frequency of a crystal depends on the strength of the applied magnetic field, a stagger-tuned maser requires a series of magnetic fields, each having a different field strength. A large, heavy multipole magnet, with a power supply and a method of removing heat, has been required to produce these fields. Such an arrangement also introduces the problem of flux leakage, field fringing, and nonuniformity of the magnetic field.

The solution: The use of superconducting materials to reduce the size and weight of the magnet. Flux leakage, fringing, and nonuniformity of the field are eliminated by placing superconducting shields around the individual fields.

How it's done: The magnet uses "hard" superconductors, which can tolerate high current density and intense magnetic fields before going resistive. The magnet can be brought up to full power very easily, and requires no power source once the field is established. The core of the magnet uses high-flux-saturation, low-permeability material. The superconductor coils are wound with the proper number of turns to produce the required magnetic field. The superconductor shields force the individual magnetic fields to be uniform along each individual crystal.

Notes:

1. The superconductor shields consist of a ceramic material coated on both sides with vapor-deposited Nb_3Sn .
2. This invention is applicable to any microwave

(continued overleaf)

communications system that requires a high information rate.

3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland, 20771
Reference: B65-10165

Patent status: NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C. 20546.

Source: Radio Corporation of America
under contract to Goddard Space
Flight Center
(GSFC-292)