

NEW PRODUCTS

The descriptions of the new products listed in this section are based on information supplied to us by the manufacturers. PHYSICS TODAY can assume no responsibility for their accuracy. To facilitate inquiries about a particular product, a Reader Service Card is attached inside the back cover of the magazine.

LAWRENCE G. RUBIN

FOCUS ON MAGNETISM

Top-Loading AC Susceptibility Insert for Cryogenic System

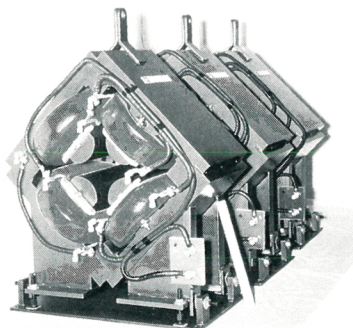
CRYO Industries of America has developed a versatile low-temperature cryogenic system that not only eliminates the need for liquid cryogenics, but can be configured to perform a multitude of low-temperature experiments. Refrigeration is provided by a two-stage Gifford-McMahon helium closed-cycle refrigerator that can obtain base temperatures of 10 K. The top-loading exchange gas configuration means that experimental stages and samples can be easily and rapidly transferred into the cold stage without interrupting the operation of the refrigerator.

The ac susceptibility top-load probe assembly is constructed from a non-magnetic composite material to minimize induced eddy current noise and magnetic contamination. The primary excitation coil can generate an ac magnetic field of up to 10 gauss, and the high-turns-density counter-wound secondary pickup coils provide high sensitivity with an equivalent level of 10^{-7} emu. This setup is ideally suited for determining the critical transition temperature and other characteristics of high-temperature ceramic superconducting materials. CRYO Industries of America, 11 Industrial Way, Atkinson, New Hampshire 03811

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Beam Electromagnet Systems

A new line of standard and custom electromagnets used to focus, deflect and analyze all types of beams is being introduced by Walker Scientific. The line includes analyzing, deflecting, switching, quadrupole, octupole, corkscrew, Chicane, steering and custom beam magnets. Engineered to customer requirements, dipole magnets for beam handling systems with fields above 5 kilogauss have their pole edges



contoured to approximate a Rogowski profile, to minimize edge saturation. Analyzing magnets can be supplied with homogenizing gaps and field clamps. Quadrupole magnets can be produced with yokes and pole roots that operate at flux densities below 12 kG, to provide a near-linear response to excitation currents; magnetic and geometric centerlines coincide within 0.003 inches, and pole-to-pole symmetry and gap uniformity are held to within 0.003 inches. Walker Scientific's Beam Electromagnet Systems are available with power supplies having 0.001% current regulation. Walker Scientific, Rockdale Street, Worcester, Massachusetts 01606

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Permanent- and Superconducting-Magnet-Based VSM Systems

Lake Shore Cryotronics is offering what is said to be a first in vibrating sample magnetometry (VSM): a variable field, permanent-magnet-based system. Unlike conventional electromagnet-based VSMs, a power supply and cooling system are not required, which significantly reduces the unit's size and weight.

Variable fields to 1 tesla are available. An option for vector magnetometer measurements uses mutually or-

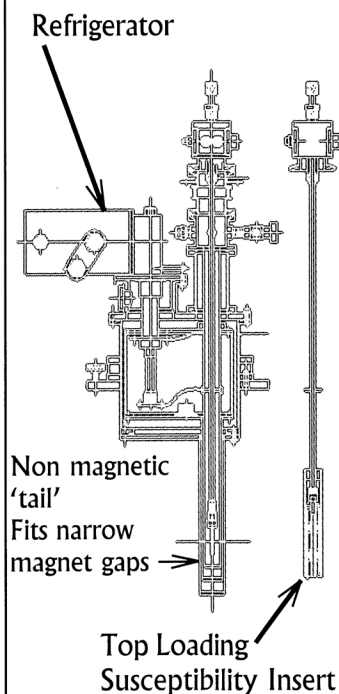
CRYO

What's New?

1. Cryogen free magnet systems to 14 tesla with sample variable temperature down to 4 K.

2. Cryogen free optical systems with sample temperatures down to less than 1.5 K.

Now, Cryogen free A.C. Susceptibility

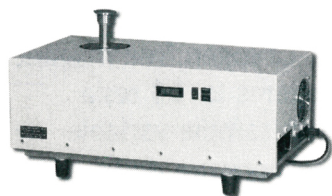


CRYO Industries of America, Inc.

11 Industrial Way
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thogonal sensing coils to measure magnetic moment both in the field direction and at right angles to the field direction. These vector measurements are taken in combination with the angular variation of the magnetic field relative to the sample. This capability is particularly useful for the measurement of anisotropy, rotational hysteresis and torque in anisotropic magnetic materials. The vector magnetometer option can also be used with a 7-tesla transverse field superconducting magnet, one of several superconducting-magnet-based VSM configurations being introduced.

The Lake Shore VSM features variable temperatures from 1.5 to 350 K and moment sensitivities approaching 10^{-7} emu. *Lake Shore Cryotronics, 575 McCorkle Boulevard, Westerville, Ohio 43082*

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Torque and Force Magnetometer Probe

Oxford Instruments's MagLab CMP is a torque and force magnetometer probe that uses a novel microcantilever sensing device. The cantilever is micromachined from single-crystal silicon; to measure magnetic moment, its deflection is measured by the change in capacitance between the beam and the substrate. That deflection is caused by the interaction of the applied magnetic field and the magnetized sample, which can be in the form of small single crystals.

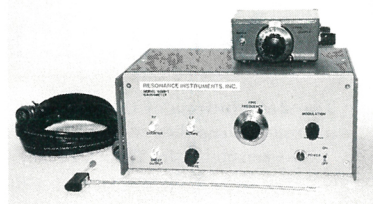
The technique is very sensitive in high fields: Magnetic moments in the range of 10^{-10} to 10^{-1} emu G can be detected. The probe is used to measure anisotropic moments in torque mode and isotropic moments in force mode; the latter requires the presence of a magnetic field gradient.

The MagLab CMP comes with its own control electronics unit and has an automated sample rotation stage, driven by the controller over a 360° range. The probe, which fits any 30 mm sample space insert, is supplied with the company's ObjectBench applications software. *Oxford Instruments, Tubney Woods, Abingdon Oxon OX13 5QX, England*

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Economical Gaussmeter for NMR Measurements

Easy to use and versatile, the Model 515B gaussmeter from Resonance Instruments is designed for measuring



magnetic fields in nuclear magnetic resonance (NMR) applications and other uses, such as calibrating less accurate fluxmeters or as a classroom demonstrator of NMR principles. At low fields, electron paramagnetic resonance can also be demonstrated. The manufacturer claims that the instrument is much less expensive than other resonance gaussmeters.

The Model 515B employs a regenerative marginal oscillator covering the 4–33 MHz frequency range. With three interchangeable probes incorporating appropriate samples (^1H , ^7Li and ^2D), the gaussmeter can measure fields from 1 to 52 kilogauss. Its fast response time permits the accurate measurement of rapidly, as well as slowly changing fields. The probes are designed for transverse magnetic fields only. *Resonance Instruments, 9054 Terminal Avenue, Skokie, Illinois 60076*

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New Generation of NMR Measuring Systems

Virginia Scientific Instruments has announced a series of high-precision magnetometers based on a flowing water nuclear magnetic resonance (NMR) technique. Each instrument consists of five devices: a flowing water probe; a water pump system; a magnetic field polarizer (to produce a necessary level of proton longitudinal polarization prior to the water's passage through the field to be measured); a synthesized frequency source, which scans the frequency to enable the gyromagnetic resonance condition to be satisfied; and a magnetic polarization analyzer, which detects the resulting electronic signal.

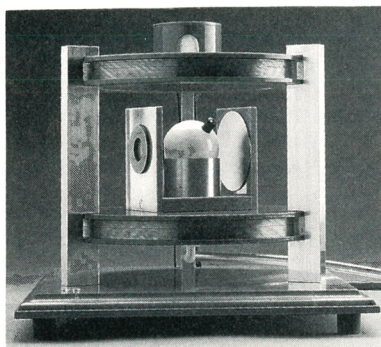
Only a single probe is needed to measure a broad range of fields: 1.4 microtesla to 2.1 tesla for the Model FW101 magnetometer, and 0.7 to 23 T for the FW201. The frequency corresponding to the highest field is ~1000 MHz. The probe incorporates a sample size of 2 mm diameter by 3 mm long, over which a field volume-average measurement is made. That technique relaxes the requirement on the field

uniformity needed for resonance to be seen. The field can be in either a transverse or axial direction with respect to the probe. *Virginia Scientific Instruments, 10466 Dumfries Road, Manassas, Virginia 20110*

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Magnetic Instruments Designed for Teaching

Teachspin claims that its Magnetic Torque M71-A is the first instrument designed to provide science and engineering students with hands-on experiments that demonstrate the various effects of a magnetic field on a magnetic dipole. Torque measurements are done on a cue ball in which a



magnetic disk is imbedded. The ball floats on an ultralow-friction air bearing located at the center of Helmholtz-like coils, and a frequency counter measures the rotational frequency of the spinning ball with the aid of a strobe light. Force measurements are carried out on a magnetized disk supported in a gimbal, which is in turn suspended from a calibrated spring; a field gradient is produced at the coils' center.

The spinning cue ball can also be used to demonstrate a classical spin-flip model of magnetic resonance. This is done by adding a millitesla uniform horizontal field, created by permanent magnets and iron shims, and then rotating the unit at the Larmor precession frequency of the spinning sphere. *Teachspin, 45 Penhurst Park, Buffalo, New York 14222-1013*

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Magnetoresistive Current Sensor

F. W. Bell, a division of Bell Technologies, has introduced its magnetoresistive NT series current sensor, claimed

to be roughly half the size and weight of conventional Hall-effect current sensors, an advantage that can lead to shrinking sensor-product packaging.

Instead of employing a sensor core, the NT series features a coreless busbar conductor. Current passes through the busbar and is sensed by a geometric network, which then measures the absolute magnetic field strengths and field gradients. These devices make use of a patented feedback technique that cancels out errors caused by temperature drifts—a problem that is often encountered in Hall-effect current sensor designs. The sensor also features high linearity performance, low insertion loss and a dc to 50 kHz frequency range for fast short-circuit protection.

The NT series is said to be ideally suited for applications such as robotics, ac motor control, power supplies, shunt replacements, battery management, motion control, power failure and overload, as well as safety protection, solar technology and traffic-control systems. *Bell Technologies, 6120 Hanging Moss Road, Orlando, Florida 32807*

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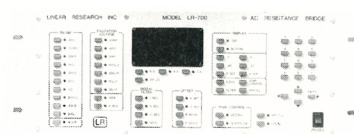
RF Amplifiers for NMR and MRI Testing

Two new special-purpose radio-frequency amplifiers from Amplifier Research, the 75AP250 (75 W minimum power) and the 250AP250 (250 W minimum power), offer features ideal for nuclear magnetic resonance (NMR) and magnetic resonance imaging (MRI) pulse applications. Fast blanking circuitry is said to all but eliminate noise at the conclusion of an rf pulse or series of pulses, so that the effects of the applied rf can be detected and measured. That is a feature critical in NMR applications.

Class A operation with gating keeps the amplifiers' waveforms square, and rf pulse rise and fall times rapid. Class A operation also implies the highest degree of linearity—the greatest freedom from harmonic and phase distortion. Broad bandwidth (5 to 250 MHz for each amplifier) facilitates rise and fall times and sharp resolution. The 75AP and 250AP amplifiers continue to operate in both pulse and continuous-wave modes at full rated power without damage or shutdown, even in a worst-case load mismatch. *Amplifier Research, 160 School House Road, Souderston, Pennsylvania 18964-9990*

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LR-700



ULTRA LOW NOISE AC RESISTANCE BRIDGE

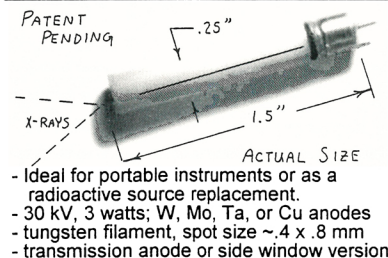
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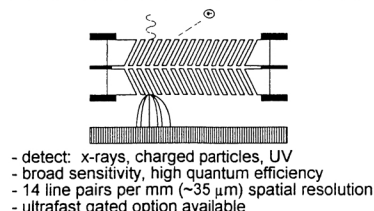
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