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PULSE RF SOURCES

2.4-30	MHz	100 KW	.02 DC
80-160	MHz	500 W	2-5 μ S
160-240	MHz	500 W	4-7 μ S
175-225	MHz	300 KW	1, 4, 20, μ S
210-225	MHz	1 MW	5 μ S
400-420	MHz	14 KW	.0002 DC
420-460	MHz	5 KW	.5 μ S/1.5-9K PPS
950-1150	MHz	1 KW	.005 DC
950-1550	MHz	1 KW	1 DC
900-1040	MHz	5, 10 or 20 KW	1 μ S
1.2-1.35	GHz	500 KW	2 μ S
1.25-1.35	GHz	4 MW	4 μ S
2.1-3.8	GHz	100 W	1.5-7 μ S
3.2-3.3	MHz	10 KW	.001 DC
2.7-2.9	GHz	250 KW	0.8 μ S
2.7-2.9	GHz	1 MW	1 μ S
3.1-3.5	GHz	1 MW	1.3 μ S
2.7-2.9	GHz	5 MW	2-3 μ S
5.4-5.8	GHz	175 KW	.001 DC
5.4-5.9	GHz	500 W	.002 DC
5.4-5.8	GHz	5 MW	.001 DC
6	GHz	1 MW	1 μ S
6.2-6.6	GHz	200 KW	.37 μ S
8.7-8.9	GHz	1.2 KW	0.9 μ S/50K PPS
9.2-9.5	GHz	100 W	0.5 μ S
8.9-9.4	GHz	400 W	.001 DC
9.375	GHz	40 KW	5-12 μ S
8.5-9.6	GHz	250 KW	.0013 DC
9.375	GHz	100 KW	5-12 μ S
9.1	GHz	400 KW	1.8 μ S
15.5-17.5	GHz	135 KW	.33-1.5 μ S
24	GHz	40 KW	.15 μ S
35	GHz	40 KW	.1 μ S
35	GHz	80 KW	.001 DC

CW RF SOURCES

17-27	KHz	200 W
125-450	KHz	4 KW
350-500	KHz	250 W
2-30	MHz	3 KW
4-21	MHz	40 KW
20-170	MHz	100 W
160-350	MHz	100 W
200-2000	MHz	40 W
385-575	MHz	1.5 KW
750-985	MHz	1 KW
950-1550	MHz	150 W
1.5-5.0	GHz	150 W
1.7-2.4	GHz	1 KW
1.7-2.4	GHz	10 KW
4.4-5.0	GHz	1 KW
7.25-8.8	GHz	150 W
7.4	GHz	2 KW
8.5-9.6	GHz	1 mw
8.7-10	GHz	150 W
16-17	GHz	40 mw

MODULATORS

2 KW Line Type	4.2 KV	5 A	.25 μ S
5 KW Hard Tube	3 KV	2 A	1.1 μ S
25 KW Line Type	5.5 KV	4.5 A	.0025 DC
25 KW Hard Tube	5 KV	6 A	.012 DC
144 KW Hard Tube	12 KV	12 A	.001 DC
250 KW Hard Tube	16 KV	16 A	.002 DC
405 KW Float's Dk	20 KV	20 A	.1 DC
500 KW Line Type	22 KV	28 A	.001 DC
1 MW Hard Tube	25 KV	40 A	.002 DC
3 MW Line Type	50 KV	60 A	.30 μ S
10 MW Line Type	76 KV	135 A	.001 DC
13 MW Line Type	135 KV	112 A	.3 μ S
17 MW Line Type	17 KV	1000 A	.5 μ S
66 MW Line Type	160 KV	312 A	.12 μ S

PULSE TRANSFORMERS

120 KW	3KV-64A	12.5KV-9.5A
225 KW	3.3KV-70A	15KV-15A
600 KW	5.5KV-100A	22KV-28A
1.5 MW	8KV-187A	35KV-50A
3.5 MW	7.1KV-500A	55KV-65A
30 MW	17.2KV-1740A	100KV-300A

HIGH VOLTAGE POWER SUPPLIES

6.3	KV	5.25 A
0-20	KV	1.35 A
0-6/2/1.5	KV	500/50/50 Ma
0-35	KV	1.5 A
28	KV	70 Ma
17.5	KV	1.8 A
12	KV	800 Ma
30	KV	230 Ma
15	KV	2 A
18	KV	2.25 A
16.8	KV	10 A
20	KV	50 A
60	KV	1 Ma

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A few years later Thouless began working on the phase transitions of the two-dimensional "x-y model," a planar array of magnetic vectors free to rotate only in their plane. (This model represents such systems as thin superconducting films and liquid helium films.) He identified spin vortices as the objects whose interactions would very likely determine the phase transitions.

Thouless suspected that the x-y model might admit the same sort of renormalization-group techniques that Philip Anderson, Gideon Yuval and Donald Hamann had used recently in their work on Kondo alloys. The three had shown that a Kondo alloy was, for certain purposes, equivalent to a one-dimensional strip of "charges" whose interaction energy varies as the logarithm of their separation distance. Having found that a vortex pair in the x-y model also behaves logarithmically, Thouless wished to further explore the analogy between the two problems; for this project he enlisted the help of J. Michael Kosterlitz, a postdoctoral fellow in high-energy physics. The renormalization-group analysis yielded some of the first specific predictions about the phase transition in the x-y model—in particular, the prediction that the transition would be accompanied by a discrete drop in superfluid density (see PHYSICS TODAY, August 1978, page 19). Later, Kosterlitz applied a somewhat more sophisticated renormalization argument, which gave a number of more quantitative predictions. (V. L. Berezinskii of the Soviet Union had made considerable progress on the same problem roughly a year earlier.)

Much of Thouless's work in the 1970s was directed toward the problem of electron localization in disordered systems, a phenomenon that had been predicted much earlier by Anderson, Nevill Mott and Rolf Landauer but was still poorly understood. Today, Thouless's ideas on the topic underlie the whole field of mesoscopic systems. His work emphasized the key roles played by the conductance measured as a multiple of e^2/h and by the suppression of inelastic scattering at very low temperatures. One of the most dramatic predictions was that the resistance of a very thin wire would increase exponentially with its length at sufficiently low temperatures.

While working on spin glasses, Thouless, together with Jairo de Almeida, arrived at the conclusion that the mean-field-theory model of spin glasses would exhibit a phase transition at a certain curve in the magnetic

field-temperature plane—the so-called Almeida-Thouless line. An earlier paper, by Thouless, Anderson and Richard Palmer, has also been the basis for some significant recent developments.

When he left Birmingham in 1978, Thouless became a professor of applied science at Yale. He left Yale in 1980 to become a physics professor at the University of Washington. Much of Thouless's work at Washington has centered on topological quantum numbers, particularly those found in the quantum Hall effect.

—MATT SIEGEL

AUSTON WINS AWARD FOR WORK IN ULTRAFAST OPTICS

David H. Auston of Columbia University has won this year's Quantum Electronics Award of the IEEE/Lasers and Electro-Optics Society. The award, presented on 21 May at a joint session of the Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference, was made in recognition of Auston's "pioneering and fundamental contributions to the field of picosecond optoelectronics and ultrafast optical phenomena."

In 1975 Auston demonstrated that picosecond light pulses could be used to activate photoconductive switches and gates in electrical circuits; this work helped lay the foundations of the now-rich research area of picosecond optoelectronics. In 1984 he introduced pulses as short as a few femtoseconds into electro-optic materials to induce in the crystal a conical electromagnetic shock wave (electro-optic Čerenkov radiation), which Aus-

David H. Auston



ton used to probe the electronic structure of semiconductors (see **PHYSICS TODAY**, February, page 46). More recently Auston has been working on a different means of transforming optical pulses into electronic signals, namely, photoconducting antennas.

Auston received both his BASc (1962) and his MASc (1963) from the University of Toronto, and got his PhD (1969) in electrical engineering from the University of California at Berkeley. After graduate school, he joined the technical staff at AT&T Bell Laboratories, where he eventually became head of the high-speed materials and phenomena research department. Since 1987 Auston has been a professor of electrical engineering and of applied physics at Columbia.

IN BRIEF

Jack Crow, a condensed matter experimenter, has left his professorship at Temple University in Philadelphia to become a professor of physics and director of the Center for Materials Research and Technology at Florida State University in Tallahassee.

OBITUARIES

Stephen B. Fels

Stephen B. Fels, a senior research physicist at the National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory, died on 22 October 1989 after a courageous struggle against cancer. As one of the world's pioneers in the mathematical modeling of atmospheric radiative-transfer processes, Fels had contributed to more accurate weather forecasting and better modeling of the impact of the greenhouse gases on Earth's climate. His published papers span particle physics, geophysics, planetary atmospheres, atmospheric dynamics and radiative transfer.

Fels completed both undergraduate and graduate work at Harvard University, earning his PhD in physics in 1967. After spending four years doing high-energy theory at the University of California, Los Angeles, Fels received a fellowship to switch to atmospheric physics. In 1971 he split his time between the department of geophysical sciences of the University of Chicago and the National Center for Atmospheric Research in Boulder, Colorado. In 1972, he became a visiting scientist in Princeton University's Geophysical Fluid Dynamics Program (now called the Program in

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