

C O N T E N T SSESSION A - Magnets for high energy physics

Invited papers :

DEVELOPMENTS IN MAGNET TECHNOLOGY R. Billinge	3
SUPERCONDUCTING MAGNETS FOR HIGH ENERGY PHYSICS W. Heinz	14

Contributions :

MULTIPOLE MAGNETS FOR THE DARESBUY SYNCHROTRON RADIATION SOURCE N. Marks	22
MAGNETS FOR THE BOOSTER SYNCHROTRON AND STORAGE RING OF THE DARESBUY SYNCHROTRON RADIATION SOURCE M.W. Poole, N. Marks and A.G. Wardle	25
PROGRAMMED QUADRUPOLE POWER SUPPLIES FOR NINA J.B. Lyall	30
DESIGN AND CONSTRUCTION OF THE PROGRAMMED QUADRUPOLE MAGNETS FOR THE DARESBUY ELECTRON SYNCHROTRON M.W. Poole	33
AN ACHROMATIC ISOCHRONOUS REFLECTING MAGNET E.A. Heighway	37
SUPERCONDUCTING 6 T MAGNET FOR THE SHORT LIVED PARTICLES BEAMS AT ITEP I.A. Vetlitsky, A.V. Belonogov, M.V. Gritsuk, V.M. Guzavin, G.K. Kliger, V.Z. Kolganov, V.L. Krilov, A.V. Lebedev, G.S. Lomkatsy, A.F. Nilov, Ju.I. Povarov, O.I. Pogorelko, V.T. Smolyankin, D.D. Tokarev, I.V. Chuvilo, V.A. Gluhih, O.A. Gusev, N.I. Doynikov, N.I. Emelyanov, V.A. Carnauh, N.A. Monoszon, V.V. Nesterov, Yu.H. Ostroumov, B.V. Bogdestvensky, I.I. Sabansky, G.B. Sydorovich, A.S. Simakov, V.F. Tihomirov, V.D. Fedorov and G.F. Churakov	42
DESIGN PROCEDURES FOR THE JÜLICH QQDDQ HIGH RESOLUTION SPECTROMETER A. Abdel-Gawad, A. Hardt, S. Martin, J. Reich, K.L. Brown and K. Halbach	45
DESIGN OF THE HIGH RESOLUTION SPECTROMETER QQDDQ AT THE JÜLICH CYCLOTRON H. Haas, J. Wimmer, H. Fey, A. Retz and M. Köhler	52
CORRECTING MAGNET SYSTEM FOR THE KEK-PS MAIN RING A. Ando, K. Endo, M. Kihara, T. Kasuga, E. Takasaki and T. Igarashi	63
THE BOOSTER SYNCHROTRON MAGNET FOR KEK 12 GeV PROTON SYNCHROTRON H. Sasaki, K. Takikawa, M. Kumada, Y. Miyahara, T. Kurosawa and H. Someya	68
MAGNETIC FIELD MEASUREMENTS OF THE MAIN RING BENDING MAGNETS OF KEK PROTON ACCELERATOR T. Kasuga, E. Takasaki, T. Igarashi, A. Araki, A. Ando, K. Endo and M. Kihara	74
DC POWER SUPPLIES FOR THE DORIS STORAGE RINGS W. Bothe	81

THE OPERATION OF A THREE COIL 5 MEGAJOULE SUPERCONDUCTING MAGNET SYSTEM AT THE ELECTRON POSITRON STORAGE RING DORIS	85
W. Eschricht, H. J. Fiebig, G. Horlitz, U. Knopf, G. Knust, K. D. Nowakowski, O. Peters, W. Stahlschmidt and S. Wolff	
THE COMMISSIONING AND PERFORMANCE OF THE TRIUMF CYCLOTRON MAGNET	93
E. G. Auld, R. E. Marek and A. J. Otter	
A HIGH HOMOGENEOUS FIELD SUPERCONDUCTING MAGNET FOR ARGONNE POLARIZED PROTON TARGET	106
S. T. Wang, H. Desportes and F. Onesto	
THE SUPERCONDUCTING MUON CHANNELS	110
G. Vécsey, J. Horvath and J. Zellweger	
SUPERCritical COOLING OF SUPERCONDUCTING MAGNETS	120
G. Vecsey	
PULSED MAGNET SYSTEMS FOR HIGH ENERGY PHYSICS BEAM LINES	125
W. F. Praeg	
THE NEW CERN MUON STORAGE RING	133
K. Borer, H. Drumm, C. Eck, G. Petrucci and O. Runolfsson	
THE MAGNETIC ELEMENTS OF DCI, THE ORSAY'S 1.8 GeV e^+e^- COLLIDING RINGS	136
C. Bazin, A. Dael, G. Le Meur, M. Ohayon, J. Pagot, M. Renard and M. Ribes	

SESSION B - Field computations and measurements

Invited paper :

COMPUTATION OF MAGNETIC FIELDS AND EDDY CURRENTS	147
C. J. Carpenter	

Contributions :

LIMA - AN IBM 370/165 CODE FOR CALCULATING MAGNETIC FIELD LINES OF A FINITE-DIMENSIONS COIL WITH AXIAL SYMMETRY. APPLICATION TO THE EXPERIMENT OF MAGNETIC SCATTERING IN NUCLEAR REACTOR	159
F. Franco and E. Pedretti	
NEW DEVELOPMENTS IN THE MAGNET DESIGN COMPUTER PROGRAM GFUN3D	168
A. G. A. M. Armstrong, C. J. Collie, N. J. Diserens, M. J. Newman, J. Simkin and C. W. Trowbridge	
COMPUTATIONAL STUDY OF THE MAGNETIC FIELD OF THE MARYLAND COLLECTIVE ACCELERATOR	183
A. U. Luccio	
CALCULATION OF THREE-DIMENSIONAL MAGNETIC FIELDS WITH A TWO-DIMENSIONAL COMPUTER PROGRAM	187
B. Berkes and D. Brombach	
MAGNETIC FIELD CORRECTION WITH POLE-SIDE SHIMS	192
B. Berkes and M. Ianovici	
A MAGNETIC FIELD CODE FOR HANDLING GENERAL CURRENT CARRYING CONDUCTORS IN THREE DIMENSIONS - MAFCO-W	203
T. F. Yang	
THE SNAKE, A DEVICE FOR CORRECTION OF THE FIELD BOUNDARY	210
H. A. Enge, S. B. Kowalski, A. G. Drentje, R. J. De Meijer, B. Anderberg and J. Rohlin	

HIGH SPEED FIELD MAPPING DEVICE AT FERMILAB R. Yamada, J. Dinkel, R. J. Wojslaw, C. D. Buchanan and P. F. Shepard	214
THE FIELD MEASUREMENTS AND TESTING OF ARGONNE ZERO GRADIENT SYNCHROTRON SUPERCONDUCTING STRETCHER RING MAGNETS S. T. Wang, J. R. Purcell, H. Ludwig and K. F. Mataya	219
COMPUTER CALCULATIONS OF THE THREE DIMENSIONAL MAGNETIC FIELDS PRODUCED BY CONVENTIONAL QUADRUPOLE MAGNETS D. E. Lobb	223
THE CALCULATION AND MEASUREMENT OF THE EFFECTIVE LENGTH OF TWO INTERACTING MAGNETS W. Faust, B. Langenbeck, H. Ewald, K. Güttner, P. Hinckel and G. Münzenberg	227
A MEASURING SYSTEM FOR MAGNETS WITH CYLINDRICAL SYMMETRY C. Wyss	231
A STEPPING COIL SETUP FOR A QUICK DETERMINATION OF MULTIPOLE COEFFICIENTS OF QUADRUPOLE MAGNETS B. Langenbeck	237
GRAPHIC, TIME-SHARING MAGNET DESIGN COMPUTER PROGRAMS AT ARGONNE R. J. Lari	244
ON THE HYSTERESIS EFFECT OF RELATIVE DISTRIBUTION OF MAGNETIC FIELDS IN ELECTROMAGNETS H. Kumagai	252

SESSION C - Pulsed magnets

Contributions :

EDDY CURRENT SCREENS FOR FAST PULSED MAGNETS H. O'Hanlon	259
PULSED MAGNETIC FIELDS UP TO 50 T WITH MULTITURN COILS J. A. Lira, W. Boon, F. Herlach, L. Janssens and J. Kuppens	264
A PULSED FERRITE MAGNET SYSTEM WITH RISE AND FALL TIME BELOW 100 ns P. Bossard and F. Völker	268
GENERATION OF MAGNETIC FIELD IN REPETITIVE PULSE FORM AND ITS APPLICATION TO MAGNETO-OPTICAL MEASUREMENTS Y. Nishina and N. Kuroda	274

SESSION D - Magnets for plasma research and for fusion reactors

Contributions :

THE PRINCETON FUSION POWER PLANT SUPERCONDUCTING MAGNET SYSTEM AND COSTS J. File	281
THE TOROIDAL FIELD COILS FOR THE PRINCETON DIVERTOR EXPERIMENT J. C. Citrolo and C. W. Bushnell	290
SUPERCONDUCTING MAGNET DEVELOPMENT PROGRAM FOR FUSION POWER APPLICATIONS E. J. Ziurys	296

MULTIFILAMENTARY Nb ₃ Sn CONDUCTORS FOR LARGE FUSION MAGNETS E. Gregory, W.G. Marancik, F.T. Ormand and J.P. Zbasnik	301
CONSTRUCTION TECHNIQUES AND STRESS ANALYSIS OF TOROIDAL FIELD MAGNETS FOR TOKAMAK FUSION REACTORS W.C. Young and I.N. Sviatoslavsky	305
INVESTIGATIONS ON SUPERCONDUCTING ENERGY STORAGE SYSTEMS CONCERNING FUSION TECHNOLOGY P. Komarek and A. Ulbricht	313
A PULSED 300 kJ SUPERCONDUCTIVE ENERGY STORAGE MAGNET R.L. Rhodenizer, R.A. Ackermann and C.D. Henning	320
SHAPE, FIELD AND MECHANICAL ANALYSIS OF THE JET TOROIDAL FIELD COILS R. Pöhlchen and M. Huguet	325
THE TOROIDAL MAGNETIC FIELD COILS FOR THE ASDEX-TOKAMAK E. Broser, M. Keilhacker, M. Kornherr, H. Niedermeyer, H. Preis and F. Wesner	332
TECHNOLOGICAL ASPECTS OF THE CRYOGENIC MAGNET FOR THE FRASCATI TOKAMAK L. Anzidei, L. Bettinali, G. Celentano, G.B. Malavasi, G.B. Righetti, B. Rumi, E. Salpietro and R. Toschi	337
AIR CORE TRANSFORMER FOR THE FRASCATI TOKAMAK R. Andreani, L. Lovisetto and G.B. Righetti	344

SESSION E - Special applications magnets

Invited papers :

MEDICAL APPLICATIONS AND BIOLOGICAL EFFECTS OF MAGNETIC FIELDS H. Brechna	351
SUPERCONDUCTIVITY AND ELECTRON MICROSCOPY U. Valdrè	367
EVERYDAY APPLICATIONS FOR SUPERCONDUCTING MAGNETS H.H. Kolm	385
SEPARATION OF SOLID PARTICLES IN MAGNETIC LIQUIDS POLARIZED IN NON- HOMOGENEOUS MAGNETIC FIELD U. Andres, I. Lin and I. Yaniv	389

Contributions :

MAGNETIC FIELDS IN SURGERY S.J. St. Laurant	393
HIGH-FIELD MAGNETS WITH CONSTANT STRESS H.J. Schneider-Muntau	398
THE NEW 20 T - 10 MW MAGNETS OF THE SERVICE NATIONAL DES CHAMPS INTENSES P. Rub, J.C. Picoche and H.J. Schneider-Muntau	402
ON THE MEASUREMENT OF H _{c1} IN THIN SUPERCONDUCTORS FOR ELECTRON MICROSCOPY EXPERIMENTS M. Vittori Antisari, U. Valdrè and G. Gallinaro	408
SOME REMARKS ABOUT A SIMPLE AND LOW COST BEAMSTEERER B. Langenbeck and H. Liesem	411

EXCEPTIONAL ASPECTS OF HIGH POWER RESISTIVE SOLENOIDS IN RELATION TO THEIR USE IN HYBRID MAGNET SYSTEMS	414
P. A. Hudson, P. E. Hanley and P. O. Carden	
A LARGE TOROIDAL COIL SYSTEM FOR THE STANFORD MEDICAL PION GENERATOR	419
Z. J. J. Stekly, E. J. Lucas and W. F. B. Punchard	
COMPARATIVE PERFORMANCE AND COST OF SUPERCONDUCTING AND CONVENTIONAL MAGNETS FOR HIGH GRADIENT MAGNETIC SEPARATION	424
P. G. Marston	
OPTIMIZATION OF DC COIL MAGNETS OPERATED AT ROOM TEMPERATURE	427
P. Blanchard and M. Jacobzone	

SESSION F - Magnets for industrial applications

Invited papers :

APPLICATION OF SUPERCONDUCTORS TO A.C. GENERATORS	431
J. L. Smith, Jr.	
SUPERCONDUCTING HOMOPOLAR MACHINES	439
A. J. Mailfert	

Contributions :

HIGH CURRENT D.C. HOMOPOLAR GENERATOR - USING CARBON FIBRE BRUSHES	447
A. D. Appleton	
CONSTRUCTION OF A SUPERCONDUCTING DIPOLE TO SERVE AS INDUCTOR OF A SYNCHRONOUS MACHINE WITH TORQUE COMPENSATION	452
C. Pinet	
MAGNETIC ATTRACTION WITH CONTROLLED ELECTROMAGNETS	462
D. R. Willis	
PROBLEMS ARISING IN CONNECTION WITH THE USE OF SUPERCONDUCTING COILS IN A PASSENGER TRANSPORT SYSTEM	468
H. Autruffe	
MAGNET DESIGN FOR SUPERCONDUCTIVE ENERGY STORAGE FOR POWER SYSTEMS	477
R. W. Boom, M. A. Hilal, R. W. Moses, G. E. McIntosh, H. A. Peterson, T. L. Willig and W. C. Young	
MAGNETIC ENERGY STORAGE FOR ELECTRIC UTILITY APPLICATIONS	485
W. Hassenzahl, L. Fuka, W. E. Keller, R. Schermer and R. Turner	
SUPERCONDUCTING MAGNETS FOR LEVITATED HIGH SPEED VEHICLES	493
R. G. Rhodes and B. E. Mulhall	

SESSION G - Superconducting and cryogenic magnets, refrigeration problems, power supply

Contributions :

THE WORK OF THE GESS COLLABORATION	499
D. B. Thomas	
A 6 T D.C. SUPERCONDUCTING DIPOLE	502
H. Desportes	

BEHAVIOUR OF SMALL COILS - CURRENT SHARING AND LOSSES WITH RESISTIVE BARRIERS	507
P. Genevey, H. Nithart and J. L. Noel	
A PRESSURE IMPREGNATED SUPERCONDUCTING DIPOLE	511
M. N. Wilson, R. B. Hopes and R. L. Roberts	
SUPERCritical-HELIUM COOLED "BUNDLE CONDUCTORS" AND THEIR APPLICATION TO LARGE SUPERCONDUCTING MAGNETS	519
M. O. Hoenig, Y. Iwasa and D. B. Montgomery	
THE SUPERCONDUCTING PULSED DIPOLE "ALEC"	525
G. Bronca, J. Perot, R. Boissier, J. Ferry, P. Dubois and J. Maldy	
EXPERIMENTAL AND HEAT TRANSFER STUDIES OF LIQUID HELIUM IN THE HIGH SPEED ROTATING FRAME FOR THE REFRIGERATION OF SUPERCONDUCTING AC MACHINERY	530
R. G. Scurlock and G. K. Thornton	
THE PULSED SUPERCONDUCTING MAGNET AC5	535
J. H. Coupland	
TRANSIENT PHENOMENA AND QUENCH PROPAGATION IN A PULSED DIPOLE MAGNET	541
P. Turowski	
INVESTIGATIONS ON QUENCH PROPAGATION AND INTERNAL VOLTAGE IN A SUPERCONDUCTING COIL	546
W. Eschricht, H. J. Fiebig, G. Horlitz, U. Knopf, G. Knust, K. D. Nowakowski, G. Peters, W. Stahschmidt and S. Wolff	
PREDICTION OF MAXIMUM QUENCHING CURRENTS IN COILS MADE OF HIGH CURRENT MULTIFILAMENTARY COMPOSITES OR MULTISTRAND CABLES	554
J. L. Duchateau and B. Turck	
MECHANICAL STABILITY OF SUPERCONDUCTING QUADRUPOLE COILS	559
R. Perin	
REFRIGERATION OF LARGE SUPERCONDUCTING MAGNETS	567
H. Quack and Ch. Trepp	
SUPERCONDUCTING DIPOLE MAGNET SPD-3	572
V. P. Alexeev, E. A. Galstajin, L. I. Greben, E. S. Mironov, L. A. Popokin and A. A. Vasiliev	
A UNIFORM FIELD SUPERCONDUCTING MAGNET WITH GOOD ACCESS	577
G. R. Court, R. Gamet, P. J. Hayman and D. Phillips	
A 15 T HYBRID SUPERCONDUCTING MAGNET WITH Nb-Ti AND Nb ₃ S _n	579
S. Shimamoto and H. Desportes	
HEAT TRANSFER TO LIQUID HELIUM. DESIGN DATA FOR BATH COOLED SUPERCONDUCTING MAGNETS	582
R. L. Bailey	
SUPERCONDUCTING MAGNET COOLED BY A FORCED CIRCULATION SYSTEM OF SUPERCritical HELIUM	590
K. Agatsuma, K. Koyama and I. Todoriki	
THE EFFECT OF RADIATION HEATING ON SUPERCONDUCTING COILS	594
C. Restat, H. Schönbacher and M. Van de Voorde	
MAGNETIC AND MECHANICAL DESIGN OF A LARGE CRYOGENIC 6 TESLA DIPOLE MAGNET	599
P. G. Marston, R. D. Hay, J. J. Nolan and W. G. Langton	

A SUPERCONDUCTING MAGNET FOR A POLARISED TARGET NUCLEAR PHYSICS
EXPERIMENT

M. Ball, P.T.M. Clee, N. Cunliffe and J. Simkin

606

SESSION H - Materials

Invited papers :

SUPERCONDUCTING MATERIALS : SOME RECENT DEVELOPMENTS

M. N. Wilson

615

CONDUCTOR MATERIALS FOR CRYOMAGNETS

W. Schauer

629

A REVIEW OF THE MAIN PROPERTIES OF ELECTRICAL INSULATING MATERIALS
USED AT CRYOGENIC TEMPERATURES

B. Fallou

644

PROPERTIES OF NONSUPERCONDUCTING TECHNICAL SOLIDS AT LOW
TEMPERATURES - AN UPDATE

F. R. Fickett

659

Contributions :

SUPERCONDUCTING PROPERTIES OF DIFFUSION Nb_3Sn LAYERS AS RELATED TO
THE Zr CONTENT AND TO THE COLD WORK AMOUNT OF THE Nb BASE RIBBONS

G. Pasotti, M. V. Ricci, N. Sacchetti, G. Sacerdoti and M. Spadoni

679

SUPERCONDUCTING PROPERTIES OF Nb_3Al FORMED AT TEMPERATURES LOWER
THAN 1000°C

S. Ceresara, M. V. Ricci, N. Sacchetti, G. Sacerdoti and M. Spadoni

685

RATE DEPENDENT MAGNETIZATION OF SUPERCONDUCTING MAGNET CONDUCTORS
IN TRANSVERSE AND LONGITUDINAL FIELDS

K. P. Jüngst

690

VARIOUS TYPES OF STRANDED SUPERCONDUCTING CABLE FOR MAGNET COILS

G. Meyer and N. Schaetti

695

THE PERFORMANCE OF Nb_3Sn MULTIFILAMENTARY SUPERCONDUCTORS IN
SOLENOIDAL MAGNETS

W. B. Sampson, M. Suenaga and K. E. Robins

699

PROPERTIES OF MULTIFILAMENT Nb_3Sn IN USEFUL CONDUCTOR CONFIGURATIONS
FOR SUPERCONDUCTING ROTATING MACHINES

C. E. Oberly, M. C. Ohmer and H. L. Gegel

704

SUPERCONDUCTING SOLENOIDS USING HIGH CURRENT DENSITY Nb_3Sn
FILAMENTARY COMPOSITES

I. L. McDougall

710

COIL CHARACTERISTICS OF MULTIFILAMENTARY COMPOUND SUPERCONDUCTING
WIRE ON 100-KG HYBRID MAGNET AND ITS COIL PROTECTION

M. Ikeda, Y. Furuto, Y. Tanaka, I. Inoue and J. Tanii

715

MAGNETS WITH MINERAL INSULATED COILS AT S. I. N.

D. George

719

TRANSVERSE FIELD LOSSES IN MULTIFILAMENT SUPERCONDUCTORS

M. S. Walker, J. H. Murphy and W. J. Carr, Jr.

724

CRITICAL PROPERTIES OF V_3Ga MULTIFILAMENT WIRE

J. D. Elen and C. A. M. van Beynen

730

A METHOD TO MEASURE THE I_c - B - CHARACTERISTIC OF SUPERCONDUCTORS WITHOUT POTENTIAL LEADS	735
P. Turowski, M. Scherer and W. Goll	
DEVELOPMENT OF SUPERCONDUCTING WIRES IN KEK	739
M. Kobayashi, K. Morimoto, H. Ishimoto and M. Wake	
CRITICAL CURRENT OF COMMERCIAL V_3Ga SUPERCONDUCTING TAPES IN THE TEMPERATURE RANGE FROM 4.2 K TO T_c . COMPARISON WITH Nb_3Sn AND POSSIBLE USE IN MAGNETS OPERATED IN EXCESS OF 4.2 K	743
A. P. Martinelli and W. Amenda	
LIST OF PARTICIPANTS	749