

Fermilab

PROPERTIES OF SUPERCONDUCTING MAGNETS*

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BIBLIOGRAPHY OF FERMILAB MATERIAL
RELATING TO SUPERCONDUCTING MAGNETS

Section 1 - Energy Doubler Division Publications - 1976, 1977, 1978, 1979

Section 2 - UPC Notes

Section 3 - List of Technical Memos Available at Fermilab (January 1979 to
Present)

ENERGY DOUBLER REPORTS BY UPC NUMBER Section 2

January 31, 1979

<u>Sent to Dupli- cating</u>	<u>UPC Number</u>	<u>Serial Number</u>	<u>Title</u>
	None		Doubler Design Report (DRAFT) dated October 21, 1978, by the Fermilab Staff
	0		Draft Outline for Energy Doubler Design Report, H. T. Edwards, October 27, 1978
D	1	51	The Abortable Beam, T. L. Collins, Rev. Nov. 14, 1978
D	2	62	Radiation on Magnet Coils from the Wire Septum, T. L. Collins, Rev. November 14, 1978
D	3	65	The Pressure Bump Instability in the Fermilab Doubler, P. Limon, November 6, 1978
	4 (Revised)	15 16	Dipole Acceptance Criteria, H. Edwards and P. Koehler, February, 1979
D	5	65	Comments on Pressure Bump Instability in the Energy Doubler, D. A. Edwards, November 6, 1978
	6		(Superceded by UPC No. 32)
D	7	6	Multipole Components of the Dipole Field, S. Ohnuma, October 23, 1978
D	8	7	Field Quality of Dipoles in the Tunnel, S. Ohnuma, September 11, 1978
D	9	8	Field Quality of Dipoles for the Doubler, S. Ohnuma, September 11, 1978
D	10	9	Harmonic Components of the Doubler Dipole Field Field in DC and AC Modes, S. Ohnuma, September 29, 1978
D	11	10	Doubler Dipole File, S. Ohnuma, October 6, 1978
D	12	11	Memo from S. Ohnuma to A. Tollestrup regarding Harmonic Components, October 12, 1978
D	13	12	Center Coordinates from DC and AC Data, S. Ohnuma, October 27, 1978

<u>Sent to Dupli- cating</u>	<u>UPC Number</u>	<u>Serial Number</u>	<u>Title</u>
D	14	41	High-Beta Straight Sections for the Doubler, T. L. Collins, November 14, 1978
	15		(Superceded by UPC No. 22)
D	16	57	Magnet Aperture and Extraction, Dated December 4, 1978. M. Harrison, REVISED January 17, 1979
D	17	39	Energy Doubler Circumference - pp colliding beams considerations, December 4, 1978, L. C. Teng
D	18	81	Layout of MR and ED Functions in Long Straight Sections, December 4, 1978, L. C. Teng
D	19	49	Beam Transfer - Normal and Reverse Directions, December 4, 1978, S. Ohnuma, REVISED Jan. 11, 1979
D	20	52	Energy Doubler Beam Abort System, December 7, 1978, F. Turkot, REVISED January 1, 1979
	21	40	Doubler Lattice, November 17, 1978, D. E. Johnson (Do Not Duplicate -- too long)
D	22	56	Effect of a High Beta Insertion on Resonant Extraction from the Energy Doubler, D. A. Edwards, REVISED December 13, 1978
D	23	38	High Eta for Stacking, T. Collins, December 13, 1978
D	24	37	Preliminary Doubler Low - Insertion, D. E. Johnson, December 13, 1978
D	25	42	Correction and Adjustment Magnet System Progress Report for Meeting of December 4, 1978, D. E. Edwards
D	26	66	Electron - Proton Instabilities in the Energy Doubler, P. Limon, December 13, 1978
D	27	58	Local Orbit Bumps, extracted beam phase space and an initial look at fast resonant extraction, M. Harrison, December 19, 1978, REVISED January 12, 1979
D	28	13	Multipole Fields in Doubler Dipoles - Review, S. Ohnuma, December 21, 1978

<u>Sent to Dupli- cating</u>	<u>UPC Number</u>	<u>Serial Number</u>	<u>Title</u>
D	29	14	Effects of Full Quenches and Warm-Cool Cycle on Multipole Contents, S. Ohnuma, December 26, 1978
D	30	63	Studies on Radiation Shielding of Energy Doubler Magnets (1), H. Edwards, S. Mori, and A. Van Ginneken, December 27, 1978
D	31	17	Study of Eddy Current Effects in Energy Doubler Dipole Magnets Introduction, January 2, 1979, R. Shafer
D	32	4	Status of Magnetic Measurements of Energy Doubler Magnets, F. T. Cole and D. R. Gross, December 20, 1978
D	33	67	Heat Loss by Wall Resistivity, S. Ohnuma, December 28, 1978
D	34	55	Comparison of Half Integer and Third Integer Extraction for the Energy Doubler: 1. Basic Processes, D. A. Edwards, December 1978
D	35	53	Energy Doubler Abort Kicker, Q. Kerns, and J. McCarthy, January 8, 1979
D	36	71	Transverse Active Dampers for the Tevatron, B. Miller, January 17, 1979
D	37	24	Transmission Line Characteristics of Energy Doubler Dipole Strings, R. Shafer, January 10, 1979
D	38	50	Main Ring Extraction and Doubler Injection Kicker, J. McCarthy, January 12, 1979
D	39	54	Pulses Magnet for the Doubler, J. McCarthy, January 16, 1979
D	40	64	Supplement to UPC 30, S. Mori, H. Edwards, and A. Van Ginneken, January 12, 1979. Supplement to UPC-40.
D	41		Design of the Energy Doubler by H. T. Edwards Appendix 1 - Design Status of the ED, March 1979
D	42	3	Quadrupoles, G. Kalbfleisch and R. Peters, Jan. 1979

<u>Sent to Dupli- cating</u>	<u>UPC Number</u>	<u>Serial Number</u>	<u>Title</u>
D	43	5	Studies of Some Energy Doubler Magnet Properties, D. Gross, January 15, 1979
Hold	44	18	Dipole Data Table, B. P. Strauss, January 16, 1979 (Must be updated)
D	45	19	Doubler Dipole and Quadrupole Design Field Specifications, S. C. Snowdon, January 16, 1979
D	46	20	Uniform Use of 4 Inch Bore Magnets in Doubler, S. C. Snowdon, January 17, 1979
D	47	21	Energy Doubler Magnet Power Supply and Quench Protection, R. Flora and G. Tool, October 18, 1978
D	48	22	Energy Doubler Power Supply Location, G. Tool, January 7, 1979
D	49	23	Return Bus Quench Protection, R. Flora, Jan. 12, 1979
D	50	25	Energy Doubler Ripple Reduction and Regulation G. Tool, January 10, 1979
D	51	26	Energy Doubler Refrigeration System, C. Rode, October 18, 1978 (Revised January, 1979)
D	52	28	Energy Doubler Tunnel Cryogenic Components, C. Rode, January 1979
D	53	30	Energy Doubler Vacuum System, P. Limon, October 20, 1978
D	54	31	Vacuum Requirements for $\bar{p}p$ Colliding Beams, S. Ecklund, January 11, 1979
D	55	32	B12 Doubler Magnet Operating Experience, K. Koepke, January 8, 1979 B12 Awning Program - Phase IV, R. Orr, Jan. 6, 1979
D	56	33	A1 Cryogenic Magnet Runs, C. Rode, January 17, 1979
D	57	34	Energy Doubler Magnet Installation, R. Orr, Oct. 12, 1978

<u>Sent to</u> <u>Dupli-</u> <u>cating</u>	<u>UPC</u> <u>Number</u>	<u>Serial</u> <u>Number</u>	<u>Title</u>
D	58	35	Doubler Lattice and Phase-Amplitude Functions T. Collins, June 7, 1978
D	59	36	Lattice for the Doubler, T. Collins, January 17, 1979
D	60	43	Notes on Excitation of Correction and Adjustment Elements, D. Edwards, December 20, 1978
D	61	44	A. Test of LCP2 inside QB6, Jan. 5, 1979 B. Parameters of the Long Tune Quadrupole, Jan. 5, 1979 C. Strength of the Long Correcting Coils, Nov. 21, 1978 D. Test of LQT-1, February 1979
D	62	45	QB Quadrupole/Spool Package, T. Nicol, January 8, 1979
	63	46	Beam Position Monitoring, E. Higgins, Jan. 31, 1979
D	64	47	Tevatron RF - Q. Kerns, and W. Miller, October 19, 1978
D	65	48	RF Requirements for Tevatron Use with $\bar{p}p$ Colliding Beams - J. Griffin, Jan. 1979
D	66	59	Good Field Region of the Design Bend Magnet and Expected Behavior of Extraction, H. Edwards and M. Harrison, October 19, 1978
D	67	60	Energy Doubler Multipole Field - Random Errors and Slow Extraction, L. C. Teng, October 21, 1978
D	68	61	Sensitivity of an Energy Doubler Dipole to Beam Induced Quenches, B. Cox, P. O. Mazur, and A. Van Ginneken, November 1978
D	69	68	Addendum to the Beam Pipe Heating Calculations, J. Griffin, January 12, 1979
D	70	69	Progress Report on the Study of the Effects Which Are Intensity Dependent in the Energy Doubler, A. G. Ruggiero, January 12, 1979

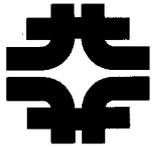
<u>Sent to Dupli- cating</u>	<u>UPC Number</u>	<u>Serial Number</u>	<u>Title</u>
D	71	70	Consideration - about the Bellow, A. G. Ruggiero, January 17, 1979
D	72	72	Individual Bunch Longitudinal Instabilities, A. G. Ruggiero, January 5, 1979
D	73	73	A Scenario to Achieve a Luminosity of Approximately $5 \times 10^{29} \text{ cm}^{-2} \text{ sec}^{-1}$ for $\bar{p}p$ Collisions in the Fermilab Energy Doubler, F. Mills and D. E. Young, November 11, 1978
D	74	74	Transparencies on $p\bar{p}$, F. E. Mills, November 1978
D	75	75	Doubler Requirements for Proton Antiproton Collisions, F. E. Mills, January 17, 1979
D	76	76	Kissing Magnet Design for the $p\bar{p}$ Collider, D. Ayres, J. A. Bywater, R. E. Diebold, M. H. Foss, R. J. Lari, Nov. 8, 1978, Rev. Dec. 21, 1978
D	77	77	Easy Low Beta for the Main Ring, T. Collins, March 11, 1976
D	78	78	$p\bar{p}$ Transparencies, R. E. Diebold, November 1978
D		79	Control System Facilities, M. Gormley, Oct. 20, 1978
D		80	1000 GeV Switchyard Upgrade, H. Dixon, Oct. 16, 1978
D		1	Progress Report - Fermilab Energy Doubler, A. Tollestrup, September 1978
D		2	Fermilab Doubler Magnet Design and Fabrication K. Koepke, et al., September 1978
D		27	The Central Helium Liquifier, R. Walker, Nov. 6, 1978
D		29	Refrigeration System for the Energy Doubler, P. C. Vander Arend, November 27, 1978
D	79		Taken from Talk of T. Collins, December 1978.
D	80		High Luminosity $p\bar{p}$ Colliding Beam Straight Section D. E. Johnson, January 18, 1979

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D	81		Bunch-to-Bunch Longitudinal Instabilities, A. G. Ruggiero, January 1979
D	82		Energy Doubler Refrigeration Load, M. Kuchnir, January 1979
D	83		An Effect of Full Quenches on the Field Quality of Dipoles Hysteresis. Dependence of the Dipole Field Quality at Injection on the Base Current of Ramping S. Ohnuma, February 1, 1979
	84		Notes for Energy Doubler Correction Element Power Supplies, R. Yarema, January 25, 1979
	85		Interpretation of Inductance Bridge Measurements of Energy Doubler Dipoles, R. Shafer, February 14, 1979
	86		The Amateur Magnet Builder's Handbook, A. V. Tollestrup, February 22, 1979
	87		Extraction III - Fast Resonant Extraction, M. Harrison, February 27, 1979
	88		Multikilogauss Fast Kickers, Q. Kerns, February 16, 1979
	89		Coil Size Scaling Laws for AC Losses in ED Dipoles, R. Shafer, March 29, 1979
	90		Beam Heating by Wall Resistivity, R. Shafer, March 5, 1979 Revised March 27, 1979
	91		Recommendation to Replace Existing Inductance Bridges for ED Dipole L and Q Measurements, R. Shafer, February 22, 1979 Proposal for Simple Reliable L and Q Measuring Circuit for ED Dipoles, R. Shafer, February 16, 1979

<u>UPC Number</u>	<u>Serial Number</u>	<u>Title</u>
92		The Longitudinal Coupling Impedance Associated to the Pick-Up Devices for the Energy Doubler, A. G. Ruggiero, January 1979
93		The Multiple Magnet Test Program, P. Brindza, R. Flora, G. Kalbfleisch, K. Koepke, M. Kuchnir, P. Limon, D. Richied, C. Rode, R. Stiening, S. Stoy, and G. Tool, March 1979
94		Energy Doubler Refrigeration System, P. Brindza, D. E. Richied, and C. H. Rode, March 1979
95		Recent Measurement Results of Energy Doubler Magnets, M. Wake, D. A. Gross, M. Kumada, D. Blatchley, and A. V. Tollestrup, March 1979
96		The Great Doubler Shift, T. L. Collins, April 1979
97		Normal Doubler Lattice, D. E. Johnson, March 23, 1979
98		B12 Quench Test Update, K. Koepke, May 10, 1979
99		AC Dependence of ED Dipole Transfer Ratio With and Without Damping Resistor, R. Shafer, May 11, 1979
100		The D0 Electrostatic Septum, M. Harrison, May 22, 1979
101		Sensitivity of Beam Position Detectors for the Tevatron, R. Shafer, May 18, 1979
102		The Effects of Power Supply Ripple on the Energy Doubler, R. Shafer, June 4, 1979
103		An estimate of the Vertical Dispersion Function, S. Ohnuma, June 22, 1979
104		Some Calculations About the Heaters Used in the EDS Dipoles, F. Kircher, June 1979.
105		Summary of the First Twelve "200" Series Magnets in Regards to Ramp Rate Dependence of Quench Current, D. Gross and G. Jordan, June 22, 1979
106		Large Amplitude Orbits, M. Harrison, June 28, 1979

<u>UPC Number</u>	<u>Serial Number</u>	<u>Title</u>
107		Effect of 10^{11} Proton Bunch on Cavity , L. Teng, July 20, 1979
108		Lower Order Dipole Harmonics, M. Harrison, August 20, 1979
109		Bend Magnet Quadrupole Component, M. Harrison, August 20, 1979
110		Dipole Skew Harmonics, M. Harrison, August 23, 1979
111		On Reducing the Coupling Impedance of Step Dis- continuities in Vacuum Chambers, R. Shafer, August 26, 1979
112		Proposal for Satellite Refrigeration Control Interface, H. Edwards, September 11, 1979
113		Studies on Radiation Shielding of Energy Doubler Magnets (II), H. Edwards, S. Mori, and A. Van Ginneken, June 1979 (Continuation of UPC-40 and UPC-30)
114		(Jostlein) The ED/S Vacuum Control System, November 21, 1979. (H. Jostlein and L. Bartelson)
115		Monte Carlo Studies on Tevatron Extraction, M. Harrison, October 26, 1979
116		Guidelines for the Field Quality of Doubler Quadrupoles, S. Ohnuma, November 19, 1979
117		Comments on the Beam-Beam Interaction in Storage Rings, S. Ohnuma, December 10, 1979
118		Field Flatness of Doubler Dipoles, S. Ohnuma, December 20, 1979; Addendum December 27, 1979
119		Vacuum and the Beam Lifetime in the Doubler, H. Mizuno, S. Ohnuma, A. Ruggiero, Dec. 21, 1979.
120		Energy Doubler Dipole String Electrical Impedance Measurements at B12, R. Shafer, November 26, 1979
121		Random Field Errors in the Tevatron Dipoles, A. V. Tollestrup, January 18, 1980
122		Vacuum Tests on a Sample Lambertson Magnet H. Jostlein, G. Lawrence, M. May and M. Raphael January 1980

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123		The Quadrupole Component in Dipoles and the Injection Mismatch, S. Ohnuma, March 6, 1980
124		Tevlat: A New Program for Computing Lattice functions for the Energy Saver/Doubler, A. D. Russell, March 17th, 1980.
125		Correction of Skew Quadrupole Field in the Doubler, S. Ohnuma, March 26, 1980
126		On the Inductance of the Doubler Magnet System, R. Shafer, April 2, 1980
127		Non-Linear Characteristics of the Doubler Magnet Yoke Inductance, R. Shafer, April 8, 1980
128		Longitudinal Instabilities Revisited, S. Ohnuma, April 8, 1980; Addendum April 22, 1980.
129		Notes on a Study Week on Beam Storage in the Tevatron, April 7-11, 1980, F. T. Cole, April 14, 1980
130		Vacuum Proposal for the Injection Straight Section (E0) H. Jostlein, April 29, 1980
131		Comments on Correction Package Test Procedure D. Edwards, June 16th, 1980
132		A Reply to the Question from HEPAP "Are the Doubler Magnets Good Enough for the Collider?", S. Ohnuma, June 26, 1980.
133		On The Longitudinal Coupling Impedance of the Energy Doubler Beam Position Detectors, Robert E. Shafer, July 15, 1980



LIST OF TECHNICAL MEMOS AVAILABLE AT FERMILAB

(January 1979 to Present)

TM-844, "Short Sample Tests and Tevatron Magnet Performance," R. H. Flora, January 22, 1979.

TM-845, "Application of Superconducting Technology to Big Accelerators," R. Yamada, January 1979.

TM-849, "Pump Down Time of Energy Doubler Magnets," M. Kuchnir and J. Tague, January 1979.

TM-860B, "Magnet Test Facility - Magnet Protection, Quench Circuit Tie-In", Cryogenic Consultants, January 8, 1979.

TM-863A, "Helium Cooling of the Shells of a Dipole Magnet in the Model 135 Cryostat," Cryogenic Consultants, January 30, 1979.

TM-863B, "Helium Cooling of the Shells of a Dipole Magnet in the Model 135 Cryostat," Cryogenic Consultants, January 30, 1979.

TM-866, "Quadrupole Torsional Rigidity Measurements," Mark Leininger and Dan Smith, March 1979.

TM-867, "Doubler-Tevatron μ P Quench Protection System," R. H. Flora and G. S. Tool, March 1979.

TM-874, "The Great Doubler Shift," T. L. Collins, April 1979.

TM-878, "A Four-Quadrant Magnet Trim Power Supply," R. Yarema, May 7, 1979.

TM-880, "Status of the Fermilab Tevatron Project," A. V. Tollestrup, April 1979.

TM-881A, "Evaluation of Various Options for the Compression and Distribution of Compressed Helium Gas to the Satellite Refrigeration System of the Energy Doubler," Cryogenic Consultants, March 1, 1979.

TM-881B, "Evaluation of Various Options for the Compression and Distribution of Compressed Helium Gas to the Satellite Refrigeration System of the Energy Doubler," Cryogenic Consultants, March 1, 1979.

TM-882, "Turbo Expander for Satellite Refrigerator," Cryogenic Consultants, April 1979.

TM-891, "Support Location for ED Dipole Magnet," W. B. Hanson, August 2, 1979.

TM-892, "Evaluation of Superconducting Dipoles," L. C. Teng, August 16, 1979.

TM-897, "Heat Removal from Beam Scraping of an Energy Doubler Magnet," Cryogenic Consultants, May 15, 1979.

TM-898, "Investigation of Means to Increase Refrigeration Capacity of the CH4 Satellite Refrigeration System of the Fermilab Energy Doubler," Cryogenic Consultants, August 30, 1979.

TM-899, "Design Evaluation of Valve Actuator Cams (Fermilab Reciprocating Design)," Cryogenic Consultants, August 6, 1979.

TM-900, "Evaluation of Wet and Gas Helium Expansion Engines (Fermilab Reciprocating Design)," Cryogenic Consultants, July 10, 1979.

TM-903, "Wet Expansion Engine for Helium Refrigerator Application," Cryogenic Consultants, September 6, 1979.

TM-907, "Mechanical Drive and Control System for High Efficiency Wet Helium Expansion Engine," Cryogenic Consultants, September 18, 1979.

TM-910, "Field Quality of Doubler Dipoles and Its Possible Implications," S. Ohnuma, October 15, 1979.

TM-910A, "Addendum to TM-910, Field Quality of Doubler Dipoles and Its Possible Implications," S. Ohnuma, November 6, 1979.

TM-916, "Method for Reducing Cryostat Pressure During a Heater Induced Magnet Quench," Cryogenic Consultants, October 25, 1979.

TM-917, "Satellite Vacuum Vessel Pressure Rating and Relief Port Size," Cryogenic Consultants, October 26, 1979.

TM-922, "Harmonic Fluctuations in Energy Doubler Dipoles from Azimuthal Wire Displacements Inside the Coils," J. Wolff, November 9, 1979.

TM-925, "Bellows Failure of Energy Doubler Magnet String," Cryogenic Consultants, November 29, 1979.

TM-927, "Magnetic Measurements on a Main Ring Trim Quadrupole," D. Krause, R. Mills, C. Moore, F. Turkot, December 1979.

TM-929, "The Abort Dump for the Energy Saver/Doubler and Main Ring," T. E. Toohig, December 6, 1979.

TM-935, "Sensitivity and Accuracy of the Measurement with the Yoke Coil of the Doubler Dipole," H. Kaiser, January 1980.

TM-943, "Mechanical Distortions in the Energy Doubler Dipoles During Cooldown. A Possible Mechanism to Induce Torques in the Cryostat Components," C. Hojvat, February 15, 1980.

TM-948, "Cryogenic Tests at Al," P. Brindza and T. Peterson, March 7, 1980.

TM-949, "Design Considerations for High Efficiency Wet Helium Expansion Engine," Cryogenic Consultants, March 5, 1980.

TM-951, "CHL Liquid Helium Dewar/Ring Interfaces and Operation," Cryogenic Consultants, March 18, 1980.

TM-956, "Quench Protection Circuit for Superconducting Magnets with Eddy Currents," M. Wake, April 1980.

TM-962, "Electrical Protection of a Low-Current Superconducting Magnet," A. Visser, April 25, 1980.

TM-967, "CENTRAL: A Computer Program to do Performance Calculations for a Helium Liquefier," H. Barton, May 19, 1980.

TM-968, "Evaluation of Crankshaft Designs Proposed for the Dry and Wet Helium Expansion Engines," Cryogenic Consultants, May 15, 1980.

TM-971, "An Analysis of the Cooldown of the Central Liquefier," H. Barton, June 1980.

TM-972, "The Bucking Coil - An Improvement for Dipole Room Temperature Measurements," S. Wolff, May 27, 1980.