

CONTENTS

Opening address	M. Kondo (RCNP)-----
<u>I. REVIEW TALK (invited)</u>	
27Aa. Chairman; Y. Hirao (INS)	
1. Report of International Conference on High Energy Accelerators	
T. Nishikawa (KEK)	
2. Application of Ion Beams for Solid States Studies	
N. Itoh (Nagoya Univ.)	1
3. Industrial Use of Electron Accelerators	
Y. Tabata (Univ. Tokyo)	5
4. Applications to Nuclear Medicine	
T. Ido (NIRS)	7
<u>II. STATUS REPORT (a) (invited)</u>	
27Ap. Chairman; T. Nishikawa (KEK)	
1. Present Status of the JAERI 20MV Tandem Accelerator	
M. Maruyama (JAERI)	11
2. Present Status of the KEK 12GeV Proton Synchrotron and Some Associated Projects	
H. Sasaki (KEK)	13
3a. Status of the Photon Factory 2.5GeV Linac	
J. Tanaka (KEK)	17
3b. Status of Photon Factory Storage Ring	
K. Huke (KEK)	19
4. RIKEN Variable Frequency Linac, RILAC	
M. Odera (IPCR)	23
5. Status of the RCNP AVF Cyclotron	
A. Shimizu, I. Miura, T. Yamazaki, K. Hosono, M. Inoue, T. Itahashi, N. Matsuoka, H. Sakai, T. Saito, K. Hatanaka, K. Nishimura*, H. Shimizu*, S. Nagamachi, and M. Kondo (RCNP & *Kyoto Univ.)	27
<u>III. INJECTION & BEAM LINE</u>	
27Bp. Chairman; H. Sasaki (KEK)	
1. Injection System of H ⁻ Beam in KEK Booster Synchrotron	
T. Kawakubo, H. Sasaki, I. Sakai and M. Suetake (KEK)	31

(ii)

2. 500MeV Proton Beam Line for KEK Booster Synchrotron Utilization Facility	
I. Sakai, H. Someya, T. Adachi, Y. Irie and H. Sasaki (KEK)	33
3. Beam Transport System from the INS-SF Cyclotron to TARN	
T. Hattori, K. Chida, T. Fujino, T. Honma, T. Hori*, A. Mizobuchi, T. Nakanishi, Y. Ohshiro, K. Sato, S. Yamada and N. Yamazaki (INS & *Sumitomo Heavy Industries, Ltd.)	35
4. Multiturn Injection to TARN	
T. Nakanishi, S. Yamada, A. Mizobuchi, H. Tsujikawa and T. Hattori (INS)	37
5. Injection System for the 1st Ring Cyclotron	
T. Itahashi, A. Shimizu and I. Miura (RCNP) ...	39
6. Design of the Beam Transport System for the IPCR SSC	
N. Kishida, Y. Yano, T. Wada, S. Motonaga, and H. Kamitsubo (IPCR)	41
7. Design of Injection System for the IRCR SSC (I)	
Y. Yano, A. Goto, T. Wada, H. Takebe, Y. Obana, N. Kishida, N. Nakanishi, S. Motonaga and H. Kamitsubo (IPCR)	43
8. Design of Injection System for the IPCR SSC (II)	
A. Goto, Y. Yano, T. Wada, H. Takebe, Y. Obana, N. Kishida, N. Nakanishi, S. Motonaga and H. Kamitsubo (IPCR)	45
<u>IV. STATUS REPORT (b)</u>	
27Cp. Chairman; T. Kamei (KEK)	
1. Construction of a 14-MeV Microtron of Nihon University	
T. Ozaki, M. Saito, N. Nakamura, K. Hayakawa, K. Sato, and K. Tsukada (Nihon Univ.)	47
2. The Osaka University Electron Linac	
K. Tsumori, N. Kimura, T. Yamamoto, T. Hori, S. Takeda, J. Okuma, T. Sawai, M. Kawanishi and K. Hayashi (ISIR)	49
3. Polarized H ⁻ Preinjector project at KEK	
Y. Mori, Z. Igarashi, K. Ito, T. Kakuyama, T. Kato, J. Kishiro, C. Kubota, E. Takasaki, A. Takagi, S. Hiramatsu, S. Fukumoto and K. Noda* (KEK and *Kyushu Univ.)	51
4. Osaka University 14MeV Intense Neutron Source for Fusion Studies (OKTAVIAN Program)	
K. Sumita, A. Takahashi, T. Iida, S. Imoto and K. Matsuda* (Osaka Univ. and *Nissin-High Voltage Co. Ltd.)	53

(iii)

5. JAERI Fusion Neutronics Source (FNS) T. Nakamura, H. Maekawa, J. Kusano, Y. Oyama, Y. Ikeda, C. Kutsukake and S. Tanaka (JAERI)	55
6. Status Report of the Tohoku Cyclotron T. Shinozuka, K. Sera, K. Ishii, H. Orihara, M. Fujioka and S. Morita (Tohoku Univ.)	57
7. Operation of TARM Y. Hirao and Study Group for NUMATRON Project (INS)	61
<u>V. ION SOURCE</u>	
27Dp. Chairman; T. Takagi (Kyoto Univ.)	
1. Gas Purification System M. Uraki and T. Itahashi (RCNP)	63
2. A Gas Feed System with Piezoelectric Valves Y. Sakurada, T. Yamazaki, T. Honma, H. Ogawa*, M. Sekiguchi, M. Fujita, T. Tanabe, K. Sato, Y. Ohshiro and N. Yamazaki (INS and *NIRS)	65
3. 1MHz Pulsed Duoplasmatron I. Abe, S. Iwasaki, K. Onodera, R. Sakamoto, M. Fujisawa, M. Baba and S. Itagaki (Tohoku Univ.)	67
4. Characteristics of an ECR-EB Hybrid-type Multiply-charged Ion Source K. Oda, Y. Moriguchi, T. Yamamoto and M. Kawanishi (ISIR)	69
5. Heavy Ion Source for the IPCR Cyclotron I. Kohno, K. Ikegami and T. Kageyama (IPCR)	71
6. Magnetron H ⁻ Ion Source at KEK A. Takagi, K. Ito, Y. Mori and S. Fukumoto (KEK)	73
7. Measurements of Electron-spin Oriented Sodium Atoms for KEK Polarized H ⁻ Ion Source K. Ito, Y. Mori, A. Takagi and S. Fukumoto (KEK)	75
8. Acceleration of Protons with the Spin Axis in the Horizontal Plane K. Hatanaka, T. Saito, N. Matsuoka, H. Sakai, K. Nishimura*, H. Shimizu*, K. Hosono and M. Kondo (RCNP and *Kyoto Univ.)	77
<u>VI. RADIATION SAFETY & MEASUREMENT</u>	
28Ba. Chairmen; T. Nakamura (INS) and S. Morinobu (RCNP)	
1. Problems of Neutron Personnel Dosimeter at KEK S. Ban and H. Hirayama (KEK)	79

2. Surface Contamination Measurements at KEK H. Hirayama, S. Miura, S. Ban, and K. Kondo (KEK)	81
3. Radiation Monitoring System at KEK M. Miyajima, H. Hirayama, and K. Hozumi (KEK) ...	83
4. Radiation Monitoring System at KEK (Software) H. Hirayama, M. Miyajima and K. Hozumi (KEK)	85
5. Beam and Radiation Security System of KEK PS K. Uchino, K. Ishii and T. Kamei (KEK)	87
6. Secondary Neutron and Photon Yield from Several Tens MeV Ions M. Fujii, K. Shin, T. Nakamura* and Y. Uwamino** (Kyoto Univ., *INS and **NIRS)	89
7. Analysis of the Secondary Particle Penetration Experiment Y. Uwamino, T. Nakamura*, T. Kosako* and K. Shin** (NIRS, *INS and **Kyoto Univ.)	91
8. Self Radiation Shielding on the Baby Cyclotron T. Karasawa, T. Tanaka* and H. Yoshida* (IPCR and *Japan Steel Works, Ltd.)	93
9. Shielding of External 12GeV Proton Beam Line at KEK S. Ban, and H. Hirayama (KEK)	95
10. Proton Beam Dosimetry Intercomparison with Ionization Chambers A. Ito, T. Nakamura*, T. Hiraoka**, and L.J. Verhey** (IMS, *INS, **NIRS and **Massachusetts General Hospital)	97
11. Intercomparison of Proton Dose with TLD T. Nakamura, T. Kosako, A. Itoh*, A. Maruhashi** (INS, *IMS and **Univ. Tsukuba)	99
12. Pulse Dosimetry of Mixed Radiation Field around an Electron Linear Accelerator T. Yamamoto, K. Oda and M. Kawanishi (ISIR)	101
<u>VII. MEDICAL APPLICATIONS & FUTURE PLAN (a)</u>	
28Bp. Chairmen; H. Tsunemoto (NIRS) and H. Takekoshi (ICR)	
1. An Application of PIXE-Microprobe in the Study of Galactosemic Cataract H. Koyama, E. Wada, T. Tsumita, A. Jahnke*, T. Yamazaki*, S. Sun**, I. Nishio**, T. Tanaka** and L. Grodzins** (IMS, *Univ. Tokyo and & **MIT) ...	105
2. NIRS Proton Therapy Facility T. Kanai, K. Kawachi, H. Matsuzawa and T. Inada* (NIRS and *Univ. Tsukuba)	107

3. Mouse Skin Reaction from 40MeV Helium Ions A. Akanuma, M. Tatagai*, K. Igarashi*, K. Usuba* and T. Irifune** (Univ. Tokyo, *IPCR and **Cancer Institute)	109
4. Clinical Usage of Krypton-81m Gas T. Koyama, S. Katsuta, Y. Yoshizawa, T. Horiguchi, H. Noma, Y. Kiso, H. Hasai and H. Takemi (Hiroshima Univ.)	111
5. Medical Electron Linear Accelerator for the Pion Generation K. Tsukada, K. Sato, K. Hayakawa, Y. Minowa* and I. Uetomi* (Nihon Univ. and *Mitsubishi Electric Co. Ltd.)	115
6. Heavy Ion Medical Synchrotron -HIMETRON- T. Hori*, T. Hattori and Y. Hirao (INS and *Sumitomo Heavy Industries, Ltd.)	117
7. Medical Dedicated Proton Synchrotron S. Fukumoto, T. Suzuki, E. Toyota* and T. Hori* (KEK and *Sumitomo Heavy Industries Ltd.)	119
8. Medical Proton Synchrocyclotron E. Toyota, T. Hori, Y. Hirao* and S. Fukumoto** (Sumitomo Heavy Industries, Ltd. *INS and **KEK)	121
9. Plan of Cyclotron Research Center, Hiroshima University Y. Yoshizawa, H. Inoue, T. Horiguchi, M. Nishi, Y. Kiso, H. Hasai, K. Iwatani, H. Nishiyama and H. Kumamaru (Hiroshima Univ.)	123
10. Status of the Construction of a Small Superconducting Cyclotron H. Takekoshi, S. Matsuki, T. Miyanaga, Y. Iwashita, T. Yanabu, Y. Nakayama* and Y. Saito* (ICR and *Toshiba Electric Co. Ltd.)	125
11. Injector Cyclotron Concepts M. Inoue, T. Itahashi and I. Miura (RCNP)	127

VIII. CONTROL & BEAM MONITOR

28Ca. Chairmen; K. Ishii (KEK) and T. Yamazaki (RCNP)	
1. Ion Source Control System with an Optical Fiber Link H. Sakamoto, H. Sakaguchi, F. Ohtani, and O. Cynshi (Kyoto Univ.)	129
2. Control System of RIKEN Linac T. Kambara, M. Odera and S. Takeda* (IPCR and *KEK)	131

3. Operation of the Electron Synchrotron with a Personal Computer S. Asaoka, A. Imanishi, K. Norimura, K. Shiino and M. Yoshioka (INS)	133
4. Computer Control of Measurement in TARN M. Takanaka, I. Honma, A. Noda, K. Omata, N. Tokuda, S. Watanabe and M. Yoshizawa (INS)	135
5. The Control Console for the KEK PS T. Takashima, E. Kadokura, M. Tejima, T. Katoh, K. Uchino, K. Ishii, H. Nakanishi and A. Takagi (KEK)	137
6. An Application of TSS for the KEK PS Control Computer System M. Tejima, T. Katoh, K. Uchino, T. Takashima, E. Kadokura and K. Ishii (KEK)	139
7. Control System of Beam Line Magnets in KEK H. Ikeda, S. Kurokawa and M. Takasaki (KEK)	141
8. Control System for Booster Synchrotron Utilization Facility Y. Irie, K. Ishii, S. Ninomiya, H. Ishimaru, S. Hiramatsu, Z. Igarashi, E. Kadokura, T. Adachi, I. Sakai and H. Sasaki (KEK)	143
9. Operation Statistics and Reliability of the KEK-PS H. Nakanishi, and A. Takagi (KEK)	145
10. Beam Buncher and Chopper of the RIKEN Variable Frequency Linac, RILAC M. Yanokura, I. Yokoyama, I. Takeshita and M. Odera (IPCR)	147
11. Beam Current Transformer with DC to 500Hz S. Shibata, T. Katsura, H. Kudo* and S. Shoji* (KEK and *Kudo Electric Co., Ltd.)	149
12. Beam Diagnostic Probes of the RILAC M. Kase, I. Yokoyama, M. Hemmi, M. Yanokura, J. Shimizu and M. Odera (IPCR)	151
13. Beam Profile Monitoring in Atmosphere S. Fukumoto, Z. Igarashi and C. Kubota (KEK)	153
28Cp. Chairmen; M. Yoshioka (INS) and S. Shibata (KEK)	
1. Non-destructive Emittance Measurement for the KEK 20MeV Line K. Ebihara, M. Tejima, T. Kawakubo, S. Takano Z. Igarashi and H. Ishimaru (KEK)	155
2. A Beam Profile Monitoring System for the Bio-medical Irradiation A. Ito (IMS)	157

3. Beam Monitors in TARN N. Tokuda, T. Hattori, T. Katayama, H. Tsujikawa, S. Watanabe and M. Yoshizawa (INS)	159
4. Measurement of the Bunch Length in an Electron Storage Ring by Means of the Single Photon Counting Method G. Isoyama, H. Kitamura*, A. Mikuni and T. Yamakawa* (ISSP and *KEK)	161
5. Measurement of Picosecond Single Beam of 35MeV Todai Linac T. Ueda, H. Kobayashi, T. Kobayashi, Y. Katsumura, M. Washio, S. Tagawa, Y. Tabata, K. Hasegawa, Y. Hosono, J. Tanaka*, and I. Sato* (Univ. Tokyo and *KEK)	163
6. Beam Position Monitor for the PF Storage Ring and Its Calibration System T. Katsura and S. Shibata (KEK)	165
7. Bunch Length Monitor Using an RF Detector T. Ieiri (KEK)	167
8. Progress of Beam Position Monitor in KEK Proton Synchrotron D. Arakawa, S. Hiramatsu, H. Ishii, J. Kishiro and K. Satoh (KEK)	169
9. Measurement of the Beam Matching for the Synchronized Transfer of the Booster to the Main Ring Y. Arakita and K. Uchino (KEK)	171
10. A Beam-loss Monitoring System at KEK H. Nakagawa, S. Shibata, S. Hiramatsu, K. Uchino and T. Takashima (KEK)	173
11. Slow Extracted Beam and the Beam Monitoring System at KEK H. Hirabayashi, A. Yamamoto, N. Takasaki, H. Ikeda, S. Kurokawa, K. Tsuchiya, M. Taino and Y. Suzuki (KEK)	175
12. Spill Monitor for Slow Extraction Y. Takeuchi, S. Ninomiya and K. Endo (KEK)	177
<u>IX. MAGNET, COOLING & VACUUM</u>	
28Da. Chairmen; K. Endo (KEK) and G. Horikoshi (KEK)	
1. Effects of the Leakage Flux in the Inhomogeneity of Magnetic Field in a Sectorial Electromagnet Y. Okuma (RCNP)	179
2. Baby Cyclotron Magnet and Magnetic Field Mapping Y. Toda, T. Hyakawa, and T. Karasawa* (The Japan Steel Works, Ltd. and *IPCR)	181

3. Design of the Sector Magnet for the IPCR SSC S. Motonaga, H. Takebe, T. Wada, Y. Yano, J. Fujita and H. Kamitsubo (IPCR)	183
4. Model Studies for the Magnets of the Ring Cyclotron Project in RCNP K. Hosono K. Enoki and I. Miura (RCNP)	185
5. Correction of Closed Orbit Distortion by Backleg Winding of Main Ring Magnet in KEK-PS N. Kumagai and K. Endo (KEK)	187
6. Improved Dynamic Filters for the Main Ring Magnet Power Supply of the KEK 12GeV PS H. Baba, H. Sato, S. Matsumoto, T. Kubo, K. Kitagawa, K. Asaji and A. Kabe (KEK)	189
7. Power Supplies of the Synchrotrons for NUMATRON Project M. Mutou, A. Noda, A. Mizobuchi and A. Miyahara* (INS and *IPP)	191
8. Cryogenic System for Vertical Wiggler T. Yamakawa, H. Kitamura, S. Sato and E. Takasaki (KEK)	193
9. Problems of 10^{-11} Torr Order K. Chida, H. Tsujikawa, A. Mizobuchi and A. Miyahara* (INS and *IPP)	195
10. Reconstruction of Main Ring Vacuum System in KEK Proton Synchrotron K. Narushima, H. Yamaguchi, T. Kubo, I. Komada, H. Watanabe and G. Horikoshi (KEK)	197
11. Sealing Characteristics of All Aluminum Vacuum System Using Elastic Metal Gasket I. Sakai, H. Ishimaru and G. Horikoshi (KEK) ...	199
12. Aluminum Alloy Vacuum Chamber with Conflat-type Seal to an Aluminum Alloy Flange for Ultra High Vacuum H. Ishimaru (KEK)	201
<u>X. RF & PULSE TECHNIQUE</u>	
28Dp. Chairman; I. Miura (RCNP)	
1. An MOPA RF System of INS SF Cyclotron K. Sato, M. Fujita, N. Yamazaki, T. Honma, Y. Ohshiro, T. Tanabe and M. Sekiguchi (INS) ...	203
2. RF System for the RCNP Cyclotron T. Saito and I. Miura (RCNP)	205

3. RF Structure of Superconducting Cyclotron for Therapy K. Mashiko, N. Shikazono, H. Takekoshi*, S. Matsuki* and T. Miyanaga* (JAERI and *ICR)	207
4. RF Cavity for IPCR SSC M. Hara, K. Ogiwara, and T. Fujisawa (IPCR)	209
5. RF System for the Ring Cyclotron Project in RCNP T. Saito, H. Tamura and I. Miura (RCNP)	211
6. RF Stacking System of TARN S. Watanabe, T. Katayama, M. Yoshizawa and K. Omata (INS)	213
7. Beam Spill Control with Frequency Modulation in Electron Synchrotron T. Fukushima, S. Arai, K. Yoshida and M. Yoshioka (INS)	215
8. 500MHz 200kW CW Klystron for Photon Factory Storage Ring T. Okamoto, K. Ohya and K. Takata* (Toshiba Corporation and *KEK)	217
9a. Phase Lock Loop and Associated Components for the Radio Frequency System of the PF Storage Ring Part-I H. Kobayakawa and A.K. Mitra (KEK)	219
9b. Phase Lock Loop and Associated Components for the Radio Frequency System of the PF Storage Ring Part-II A.K. Mitra and H. Kobayakawa (KEK)	221
9c. Phase Lock Loop and Associated Components for the Radio Frequency System of the PF Storage Ring Part-III A.K. Mitra and H. Kobayakawa (KEK)	223
10. RF Cavity of KEK-PF Storage Ring Y. Yamazaki and K. Takata (KEK)	225
11. Higher-order Modes of KEK-PF Cavity and Beam Instabilities Y. Yamazaki, K. Takata and S. Tokumoto (KEK) ...	227
12. Attenuator for Observation of Faser Rise-time High Voltage Pulses H. Yamazaki, A. Homma and S. Yamaki (Hokkaido Univ.)	229
<u>XI. LINAC, ELECTROSTATIC ACCELERATOR & HIGH VOLTAGE</u>	
29Ba. Chairmen; Y. Torizuka (Tohoku Univ.) and A. Isoya (Kyushu Univ.)	
1. Space Charge Effect in Proton Linac S. Inagaki (KEK)	231

2. Low Beta Structure in Linac S. Inagaki (KEK)	233
3. Heavy Ion Linear Accelerator in the NUMATRON Project T. Katayama, S. Arai, T. Hattori, T. Hori, T. Nakanishi, A. Noda, E. Tojo, N. Tokuda, N. Ueda, S. Yamada and K. Yoshida (INS)	235
4. Improvements of Linac for Picosecond Single Electron Pulse H. Kobayashi, T. Ueda, T. Kobayashi, S. Tagawa and Y. Tabata (Univ. Tokyo)	241
5. Status of the KEK Injector S. Fukumoto, S. Inagaki, K. Ito, T. Kakuyama, T. Kato, C. Kubota, Y. Mori, A. Takagi, E. Takasaki, T. Takenaka and Y. Terayama (KEK)	243
6. Injector Terminal of the RILAC M. Hemmi, Y. Miyazawa, M. Kase, T. Inoue and M. Odera (IPCR)	245
7. Remote Control System for Tandem Accelerator T. Nakashima and T. Maeda (Kyushu Univ.)	247
8. Baking Procedure of the Accelerator Tube by Means of Low Voltage Arc Discharge A. Isoya, Y. Miyake, K. Kobayashi, N. Kato, T. Nakashima, T. Maeda, T. Sugimitsu and Y. Nakajima (Kyushu Univ.)	249
9. Rotating-disk Type High Voltage Generator A. Isoya, K. Kobayashi, T. Nakashima and T. Maeda (Kyushu Univ.)	251
10. The New System of Negative Ion Sources and Injector of the RCNST Tandem Accelerator I. Yamane, H. Yamashita and Y. Hashimoto (Univ. Tokyo)	253
11. The New Evacuation Systems of the RCNST Tandem Accelerating Tube H. Yamashita, Y. Hashimoto and I. Yamane (Univ. Tokyo)	255
12. Production and Acceleration of Heavy Ions with TUNIS-12UD System at the University of Tsukuba M. Yamanouchi, Y. Higashi, H. Yamaguchi, K. Furuno, S. Seki, T. Ishihara, T. Kimura, T. Mikumo and J. Sanada (Univ. Tsukuba)	257
13. Status of Electrostatic Separators at KEK H. Ishii and A. Yamamoto (KEK)	259

XII. APPLICATIONS OF ACCELERATORS

29Ca. Chairmen; M. Kawanishi (ISIR) and K. Tsumori (ISIR)

1. Utilization of Natural Mica for Measuring High Radiation Doses
K. Fukuda, S. Nakamura, Y. Satoh, T. Tabata, S. Okamoto and S. Okuda (Radiation Center of Osaka Pref.) 261
2. Stopping Powers of Metallic Elements for 6.5MeV Protons
N. Shiomi, R. Ishiwari and N. Sakamoto (Nara Women's Univ.) 263
3. Angle Dependent Energy Losses of Amorphous Materials for MeV Protons
N. Sakamoto, N. Shiomi and R. Ishiwari (Nara Women's Univ.) 265
4. Analysis of Impurity Concentrations in a-Si Films Using a Low Energy Nuclear Reaction
T. Asano, H. Ishiwara and H. Matsumura (T.I.T.) 267
5. Emission of Electrons and Ions from Ar⁺-ion Bombarded Solid Surfaces
K. Furukawa and S. Ohno (JAERI) 269
6. Double Excitation Spectroscopy by Electron and Laser-light Pulses
K. Tanimura, K. Soda and N. Itoh (Nagoya Univ.) 271
7. Electron Transport and Electron-ion Recombination in Non-polar Liquids and Solids as Studied by X-ray Pulse Conductivity Method
Y. Hatano, K. Shinsaka, H. Namba, Y. Nakamura, M. Chiba, and T. Tezuka (T.I.T.) 273
8. Atomic and Molecular Processes in the Gas Phase as Studied by a Pulse Radiolysis Method
Y. Hatano, K. Shinsaka, A. Yokoyama, Y. Kokaku, N. Suzuki, M. Toriumi, A. Nishikawa and H. Koizumi (T.I.T.) 275
9. Picosecond Pulse Radiolysis Studies on Behavior of Scintillation Emission in Various Kinds of Solvents
Y. Katsumura, S. Tagawa and Y. Tabata (Univ. Tokyo) 277
10. Picosecond Pulse Radiolysis Studies on Mechanism of Liquid Scintillation
S. Tagawa, Y. Katsumura and Y. Tabata (Univ. Tokyo) 279
11. Radioactive Isotope Production with Baby Cyclotron and Radioactive Isotope Processing System
I. Suzukawa, H. Yoshida, T. Nozaki* and T. Ido** (The Japan Steel Works, Ltd., *IPCR and **NIRS) 281

(xii)

12. Behavior of Hydrogen Implanted in First Wall Materials
T. Tanabe and S. Imoto (Osaka Univ.) 283
13. Beam Injection and Accumulation Method in the Storage Ring for Heavy Ion Fusion
T. Katayama, S. Arai, A. Noda, N. Tokuda and Y. Hirao (INS) 285
14. ETL Ion-accelerator Facility
N. Kobayashi, I. Nashiyama and ETL ion-accelerator group (ETL) 287
15. Mechanical Property Evaluation of Reactor Materials by Ion Bombardment Simulation
M. Shimada (Toshiba Corporation) 289

XIII. BEAM DYNAMICS & SUPERCONDUCTING MAGNET

29Da. Chairmen; Y. Mizumachi (KEK) and K. Tsukada (Nihon Univ.)

1. Higher Harmonic Mode Operation in Baby Cyclotron
Y. Kaneda, H. Yoshida and T. Karasawa* (The Japan Steel Works, Ltd. and *IPCR) 291
2. Studies of the Internal and External Beam Properties of the INS SF Cyclotron
T. Honma, M. Sekiguchi, K. Sato, Y. Sakurada, T. Yamazaki, M. Fujita, N. Yamazaki, Y. Ohshiro and T. Tanabe (INS) 293
3. Orbit Calculations for the IPCR SSC
N. Nakanishi, K. Yamashita, T. Wada, A. Goto, Y. Yano, S. Motonaga and H. Kamitsubo (IPCR) 295
4. Orbit Calculations of TARN and Its Operation Characteristics
A. Noda, T. Hori*, T. Hattori, M. Mutou, T. Katayama, and H. Sasaki** (INS, *Sumitomo Heavy Industries Co. Ltd. and **KEK) 297
5. Possibility of Polarized Proton Acceleration in KEK PS
S. Hiramatsu and K. Muto (KEK) 299
6. Single Bunch Beam Loading Experiment on the Osaka University Electron Linac
S. Takeda, N. Kimura, K. Tsumori, M. Kawanishi, K. Hayashi and H. Sakurai (ISIR) 301
7. Head-tail Instability in KEK Booster Synchrotron
T. Kasuga, T. Kawakubo, S. Takeda, H. Someya and M. Suetake (KEK) 305
8. Beam Loading Observed during the Debunching Process in the KEK-PS
T. Ieiri and E. Ezura (KEK) 307

(xiii)

9. RF Phase Shake and RF Voltage Modulation at Phase Transition	
Y. Mizumachi and K. Muto (KEK)	309
10. Bunch Diffusion in a Storage Ring	
Y. Mizumachi (KEK)	311
11. Computer Calculations of a Solenoid Lens for Focussing MeV Proton Beams	
H. Koyama and L. Grodzins* (IMS and *MIT)	313
12. Design Consideration on Superconducting Magnets with High Current Densities	
H. Hirabayashi, K. Hosoyama, T. Mito, S. Mitsunobu, T. Shintomi, T. Tominaka, K. Tsuchiya and A. Yamamoto (KEK)	315
13. Superconducting Helmholtz Coil	
A. Shimizu, K. Enoki and J. Seki (RCNP)	317
14. Design and Operational Performance of Superconducting Coil for SSC Sector Magnet	
N. Yasumitsu, T. Minakuchi, E. Toyota and N. Kishida* (Sumitomo Heavy Industries, Ltd. and *IPCR)	319

XIV. FUTURE PLAN(b) (invited)

29Ap. Chairmen; J. Sanada (Univ. Tsukuba) and K. Huke (KEK)	
1. The RCNP Intermediate Energy Particle Accelerator Complex	
I. Miura, T. Yamazaki, A. Shimizu, M. Inoue, T. Saito, K. Hosono, T. Itahashi, M. Fujiwara and M. Kondo (RCNP)	321
2. The IPCR Separated Sector Cyclotron Project	
H. Kamitsubo (IPCR)	325
3. TRISTAN Project	
Y. Kimura (KEK)	331
4. NUMATRON Project	
Y. Hirao (INS)	335
5. Ultraviolet Synchrotron Orbital Radiation Project (UVSOR) of Institute for Molecular Science	
M. Watanabe and UVSOR Working Group (Institute for Molecular Science)	341
6. New Project of 1.5GeV Electron Linac and Pulse Stretcher	
T. Tamae (Tohoku Univ.)	343

Closing address M. Kawanishi (ISIR) -----