

1986 Linear Accelerator Conference at SLAC

1. Proton and Ion Linac Topics

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Abstract

Topics on proton and ion linacs of the 1986 Linear Accelerator Conference are briefly described with a list of all invited review talks. Presentations on the electron linac and related topics exceeded that on the proton and ion linac in number.

The 1986 Linear Accelerator Conference was held on June 2 - 6 at SLAC (Stanford Linear Accelerator Center). The Conference chairman was Dr. G.A. Loew. More than 300 attended it. Japanese participants were M. Oyamada of Tohoku U., I. Sato, J. Tanaka and S. Fukumoto of KEK, H. Takekoshi and Y. Iwashita of Kyoto U., H. Iyeki of MELCO, N. Terabayashi and F. Okubo of MHI and M. Odera and T. Hori of SHI. All review talks and invited papers were orally presented. Contributed papers were presented by posters although some of them were introduced orally in five minutes. All posters were exhibited outdoors.

Lists of the invited talks are:

- MO1-1 History of Proton Linear Accelerators, L.W. Alvarez, LBL
- MO1-2 Induction Linacs, R.J. Briggs, LLNL

- MO2-1 Control of Beam Dynamics in High Energy Induction Linacs, G.J. Caporaso, LLNL
- MO2-2 Linacs for Esoteric Applications, R.A. Jameson, LANL
- MO2-3 RF Power Sources for 1990 and Beyond, D.W. Reid, LANL
- MO2-4 Linacs for Medical and Industrial Applications, R.W. Hamm, AssSys Technology, Inc.

- TU1-1 Highlights of the Heavy Ion Fusion Symposium D. Keefe, LBL
- TU1-2 High-Current Beam Dynamics and Transport, Theory and Experiment, M. Reiser, Univ. of Maryland (1 hour)

- TU2-1 Emittance Growth, I. Hofmann, GSI, Darmstadt
- TU2-2 Recent Developments in RF Superconductivity for Linac Structures, H. Lengeler, CERN
- TU2-3 The CEBAF Superconducting Accelerator - An Overview, C.W. Leemann, CEBAF
- TU2-4 Comparison of Standing-Wave and Traveling-Wave Linacs, R.H. Miller, SLAC

- WE1-1 SLC Progress Report, J. Rees, SLAC
- WE1-2 Special SLC Linac Developments, J.T. Seeman, SLAC
- WE1-3 Advanced Technology Recently Developed at KEK for Future Linear Colliders, J. Tanaka, KEK

- WE2-1 RFQ's in Research and Industry, J. Staples, LBL
 WE2-2 Innovations in Ion Sources and Injectors, R. Keller, GSI, Darmstadt
 WE2-3 Progress in the Development of H^- Ion Sources, K. Prelec, BNL
 WE2-4 RF Cavity Design and Codes, T. Weiland, DESY
- TH1-1 The Two-beam Accelerator, A.M. Sessler, LBL
 TH1-2 Progress on Plasma Accelerator, P. Chen, SLAC
 TH1-3 Wake field Accelerators, G.A. Voss, DESY
 (Presented by T. Weiland)
- TH2-1 Magnet Innovations for Linacs, K. Halbach, LBL
 TH2-2 Electron Linac Injector Developments, J.S. Fraser, LANL
 TH2-3 Linacs for Microtrons and Pulse Stretchers, S. Penner, NBS
 TH2-4 Production of Intense Low Emittance Beams for Free Electron Lasers Using Electron Linear Accelerators, T.I. Smith, Stanford Univ.
- FR1-1 Future e^+e^- Linear Colliders and Beam-Beam Effects, P.B. Wilson, SLAC
 FR1-2 Factors Limiting the Operation of Structures under High Gradient, S.O. Schriber, LANL
- FR2-1 Collider Constraints in the Choices for Wavelength and Gradient Scaling, J.D. Lawson, RAL
 FR2-2 High Energy Physics and Future Very High Energy Accelerators, B. Richter, SLAC

Summary of the Conference, N. Angert

At the beginning of the Conference, L. Alvarez of LBL disclosed that the mechanical design of his first "Alvarez" linac started in 1945 and its first beam was accelerated in 1947. His new idea was so quickly proved.

At the end of the Conference, N. Angart of GSI, the chairman of the Darmstadt Conference, pointed out that although the Linac Conference started as the Proton Linac Conference in 1961, this Conference has following two distinct features:

- 1) more electrons than protons,
- 2) high energy accelerators are included.

Behavior of the induction linac is better understood. "Esoteric" means 1) mysterious, strange, 2) intended for or understood by only a small group, 3) difficult to understand, abstruse, 4) not publicly disclosed, confidential. The object is a 50 MeV proton (H^-) linac to produce neutral beam of SDI. A laser channel worked as a beam channel. There are about 2500 medical electron linac in the world. RF sources are becoming cheaper but more stable and new sources, such as lasertron and relativistic klystrons, are being developed.

A high energy induction linac is being built for the heavy ion fusion. High current beam transport is theoretically and experimentally treated. Distribution of the beam changes drastically along the

beam line. Estimation of emittance growth is presented. Superconducting RF cavity accelerates electrons with $5 \sim 10$ MV/m fields, and CEBAF (Continuous Electron Beam Accelerator Facility) will be equipped with superconducting RF cavities.

Design of RFQ's are becoming simpler. MEVVA (Metal Vapor Vacuum Arc) source can produce high intensity heavy ion beams. Magnetron, Penning, semi-planotron and multicusp sources are developed or used in routine operation for H^- beams. They are surface production sources with cesium. Several volume production sources are being developed in the world. Among them, the Nagoya sheet plasma source is unique and interesting.

Permanent quadrupole magnets are more compact than electric ones. Variable strength permanent quadrupole magnet is possible. Since last year, an Alvarez linac with permanent quadrupole magnets has worked in Japan. Plasma acceleration was demonstrated experimentally in Canada.

A microwave power of 1.8 GW was produced by FEL (Free Electron Laser) and 180 MV/m was attained by a small accelerating tube with a diameter of $1 \sim 2$ cm at LLNL. It was handed on to the audience.

The Conference includes more computer works, new and exotic schemes of acceleration such as FEL, induction linac or plasma acceleration, and less practical informations compared with this Meeting. There was neither presentation on the SSC injector nor that on the European Hardron Facility injector.

The next Conference will be held in 1988 at CEBAF in Virginia.