

## CONTENTS OF VOLUME II

### ELECTRON CYCLOTRON RESONANCE HEATING

#### INVITED PAPERS

<b>Consoli T.</b>	
<b>Review of possible applications of hot electron rings     or cylindrical shells produced by ECR</b>	<b>733</b>
<b>Parail V.V., Alikaev V.V.</b>	
<b>ECRH in T-10 tokamak</b>	<b>753</b>
<b>Prater R., Ejima S., Lin S.H. et al.</b>	
<b>Electron cyclotron heating experiments on Doublet III</b>	<b>763</b>
<b>Batchelor D.B., EBT Experimental Group et al.</b>	
<b>Comparison of electron cyclotron heating theory and     experiment in EBT</b>	<b>779</b>
<b>Riviere A.C., Ainsworth N.R., Alcock, M.W. et al.</b>	
<b>Toroidal confinement results with ECRH in Tosca and Cleo</b>	<b>795</b>
<b>Hsuan H., Bol K., Bowen N. et al.</b>	
<b>Major results of the electron cyclotron heating experiment     in the PDX tokamak</b>	<b>809</b>
<b>CONTRIBUTED PAPERS</b>	
<b>Fang Y.D., Chen S.X., Ren Z.X. et al.</b>	
<b>Electron cyclotron heating in HER device</b>	<b>834</b>
<b>Hansen F.R., Lynov J.P., Michelsen P.</b>	
<b>ECRH of a high density plasma</b>	<b>840</b>

Erckmann V., Janzen G., Müller G. et al.	
ECRH on the Wendelstein W VII-A stellarator with different kinds of wave launching	846
Cano R., Capes H., Dubois M. et al.	
Physics and technical aspects of the ECRH experiment on TFR	853
Motojima O., Kaneko H., Besshou S. et al.	
Experimental studies of currentless, high-beta plasma on heliotron E device	865
Giruzzi G., Fidone I., Granata G. et al.	
Optimizing current drive by the combined effects of electron cyclotron and Landau wave damping in tokamak plasmas	872
Giruzzi G., Fidone, I., Granata G. et al.	
Electron cyclotron emission in a RF current driven tokamak plasma	877
Owen J.A., Cairns R.A., Lashmore-Davies C.N.	
Wave propagation and electron cyclotron current drive at the second harmonic	882
O'Brien M.R., Ferreira A., Start D.F.H.	
Neoclassical corrections to the theory of ECRH current drive	888
Maroli C., Lampis G., Petrillo V. et al.	
Absorption of ordinary waves in a tokamak at the electron cyclotron frequency outside the WKB scheme for arbitrary meridian incidence	894
Bornatici M., Ruffina U.	
Wave propagation and absorption around the electron cyclotron and plasma frequencies for parallel and quasi-parallel propagation	901
Lontano M., Farina D., Pozzoli R.	
Electron cyclotron current drive in ohmic discharges	908
Buratti P., Lelli R., Tudisco O., et al.	
On the possibility of inferring the electron velocity distribution from cyclotron emission	915

Capes H., Mercier C., Morera J.P. et al.

Use of A1 - D transport code to study the transport  
modifications due to sawtooth oscillations in TFR

921

## GENERAL TOPICS

### INVITED PAPERS

Stallard B.W., Cummins W.F., Molvik A.W. et al.

ECRH and ICRH in the TMX-U tandem mirror

931

Uo K., Iiyoshi A., Obiki T., et al.

Neutral beam injection and RF heating experiments  
on the currentless plasma in heliotron E

947

Lebedev S.V., Bulyginsky D.G., Fedorov V.I. et al.

Experiments on plasma adiabatic compression and high  
frequency heating in tokamaks of A.F. Ioffe Physical-  
Technical Institute

961

Perkins F.W.

Confinement scaling in tokamaks: consequences of drift  
wave turbulence

977

## SPECIAL PAPERS

### INVITED PAPERS

Rebut P.H.

JET progress report

991

Hawryluk R.J., Bell M.G., Bitter M. et al.

Recent results from TFTR

1012

Greenwald M., Gwinn D., Milora S. et al.

Confinement results from pellet fueled discharges in  
Alcator C

1033

# TECHNOLOGY OF HEATING SYSTEMS

## CONTRIBUTED PAPERS

Feist J.H., Freudenberger K., Kolos J. et al.	
Long pulse injector design for ASDEX and Wendelstein VII-AS	1051
Becherer R., Bonnal J.F., Bottiglioni F.	
Conceptual design for the neutral beam injection system for Tore Supra	1057
Holmes A.J.T., Green T.S., Martin A.R. et al.	
Optimisation of the proton fraction in the JET ion sources	1065
Neutral Beam Development Group	
Measurement of beam transport for JET injectors	1073
Matsuda S., Itoh T., Matsuoka M. et al.	
Development of 200 keV 3.5 A helium beam injector	1081
Dammertz G. Piosczyk B.	
Development work on H <sup>-</sup> -ion sources	1087
Cole H.C.	
A neutral beam heating system for the Culham conceptual tokamak reactor MKIIC	1094
Wesner F., Braun F., Fritsch R. et al.	
ICRH components for ASDEX and W VII	1103
Noterdaeme J.M., Braun F., Söll M.	
Innovative designs for long pulse ICRH antennae	1109

Bannelier P., Adam J.	
Coupling properties of alternative designs for launching ICRF waves	1115
Sand F., Arbez, J., Jacquinot J. et al.	
RF properties of the JET antennae	1121
Kimura H., Fujii T., Ikeda Y. et al.	
Design study of an ICRF coupler for JT-60	1128
Perkins F.W.	
Reentrant waveguide antennas for ICRF heating of tokamaks	1136
Button J.R.	
Gridded power tubes for ICRF and neutral beam heating of plasmas	1141
Perkins F.W.	
Magnetic shielding by a Faraday shield	1148
Faulconer D.W.	
Electrostatic shield as current source for coupling calculations including magnetic shielding and shield feeder current effect	1157
Jory H., Felch K., Bier R. et al.	
Gyrotrons for plasma heating experiments	1165
Sassi M., Andreani R., Mirizzi F. et al.	
Technological problems of a high power lower hybrid additional heating system for FTU at 8 GHz	1171
Münich M.J., Brambilla M., Brinkschulte H. et al.	
The lower hybrid RF heating system for the ASDEX tokamak	1183
Bearzatto C., Auberdjac A., Faillon G.	
Klystrons for fusion-rated application	1191

Franconi E.

Multipacting and secondary electron emission of the FT  
RF waveguides system

1201

McCune E.W.,

Klystrons for present and future lower hybrid resonance  
applications

1208

Schminke W., Wyss J., Holm K.

Design and tests of a 1.5 MW generator and tube for ICRF  
heating

1214

## PANEL ON TECHNOLOGY OF NEUTRAL BEAM INJECTION

Matsuda S., Okumura Y., Akiba M. et al.

Experimental results on JET-60 neutral beam injection  
prototype unit

1225

## PANEL ON ANTENNA DESIGN FOR ION CYCLOTRON AND ALFVEN WAVE HEATING

Messiaen A.M.

Antenna design for ion cyclotron and Alfvén wave  
heating "Introduction and Summary"

1235

Jacquinot J., Arbez J., Beaumont B. et al.

The JET ICRF antenna system

1244

## PANEL ON RF COUPLING STRUCTURES FOR LOWER HYBRID RESONANCE HEATING

Gormezano C.

RF coupling structures for lower hybrid resonance heating

1255

Derfler H., Brinkschulte H., Leuterer F. et al.

The suppression of multipactors in lower hybrid antennae

1261

Ferro C., Alessandrini C., Orsini A.

Lower hybrid coupling structure development for FTU

1270

Tonon G., Bibet Ph., David C. et al.

High power transmission in L.H. wave couplers

1277

Briand P., Bibet Ph., Gormezano C. et al.

Grill conditioning techniques in the Petula-B tokamak

1286

Leuterer F., Brambilla M., Brinkschulte H. et al.

Teststand experiments for the lower hybrid heating in ASDEX

1293

## PANEL ON LOWER HYBRID HEATING AND CURRENT DRIVE THEORY

Santini F.

Lower hybrid heating and current drive theory  
"Progress and Results"

1303

Porkolab M., Bonoli P.T., Englade R.

Realistic modelling of lower hybrid current drive with multiple codes

1311

<b>Bernard M.</b>		
<b>Numerical simulation of lower hybrid heating and current drive in tokamaks</b>		1319
<b>Decyk V.K., Dawson J.M.</b>		
<b>Computer simulation of lower hybrid current drive</b>		1327
<b>Chan V.S., Liu C.S., Andrews P.L. et al.</b>		
<b>Nonlinear theory of lower hybrid current drive ??</b>		1334
<b>Tonon G., Moulin D.</b>		
<b>L.H. current drive and electron heating simulations with present experimental data</b>		1343
<b>Barbato E., Cardinalli A., Santini F.</b>		
<b>Ray focusing of lower hybrid waves in current drive and electron heating conditions</b>		1353
 <b>PANEL ON POWER HANDLING AND SURFACE EFFECTS</b>		
<b>Wolf G.H.</b>		
<b>Power handling and surface effects</b>		1363
<b>Neuhauser J., ASDEX Upgrade Design Team</b>		
<b>Power handling in the ASDEX upgrade divertor experiment</b>		1365
<b>Overskei D., Petrie T.W., Luxon J.L.</b>		
<b>Power flow measurements in beam-heated D-III plasmas</b>		1367
<b>Maddaluno G.</b>		
<b>Considerations on limiter performance in FT</b>		1369
<b>Engelhardt W.</b>		
<b>Power load and limiter considerations in JET</b>		1371

**Matsuda S.**

**JT-60**

**1372**

**Wolf G.H.**

**Considerations on limiter performance in Textor under full plasma heating**

**1373**

**Hawryluk R.J., Cecchi J.L., Dylla H.F. et al.**

**Power handling and particle control in TFTR**

**1374**

**Engelmann F., Net Team**

**Power exhaust and plasma-wall interaction in NET/INTOR**

**1376**

**Fois M.**

**Graphite dumps for non neutralised ions in T.F.R.  
neutral injectors**

**1378**

## PANEL ON HEATING IN FUTURE LARGE DEVICES

**Matsuda S., Nagashima T., Shimomura Y.**

**Plasma heating systems for JT-60**

**1385**

**Wesner F.**

**Ion cyclotron resonance heating for ASDEX-upgrade**

**1393**

**Segre S.E.**

**Plans for additional heating of FTU**

**1400**

**Engelmann F., NET Team**

**Heating to ignition in NET/INTOR**

**1408**

# PANEL ON ELECTRON CYCLOTRON RESONANCE HEATING POWER SOURCES AND APPLICATIONS

Cano R.

Introduction and summary of the panel on ECRH power sources and applications 1413

Nusinovich G.S., Fiks A.Sh., Flyagin V.A. et al.

Powerful gyrotrons for electron cyclotron resonance heating and active diagnostics of plasma 1416

Jory H.

Status of gyrotron developments at Varian associates 1424

Bensimhon A., Charbit P., Faillon G., et al.

Development of a 100 GHz gyrotron 1431

Tran M.Q., Bondeson A., Festeau-Barrioz M.C. et al.

Quasi-optical gyrokylystron development at the centre de recherches en physique des plasmas 1437

White T.L., Kimrey H.D., Bigelow T.S.

Mixed-mode distribution systems for high average power electron cyclotron heating 1444

Prater R., Moeller C.P., Lin S.H.

Components and transmission systems for ECH 1454

Thumm M., Eerckmann V., Janzen G. et al.

ECRH systems for linearly polarized plasma irradiation in the HE 11 mode at 28 and 70 GHz 1461

## APPENDIX

List of Authors 1471