Nov. 12th, 1999

Dear Authors:

We at the ITC-10 Editorial Office welcome all of your contributions to the conference proceedings. For your information, the instructions for manuscript preparation are attached here, together with a sample. If you have any questions, please contact us at procITC10@nifs.ac.jp.

Thank you and look forward to seeing you in Toki.

Editorial Office
Prof. A. Sagara, Chief Editor
Prof. Y. Hirooka, Secretary

Instructions for Proceedings Manuscript Preparation
(for Contributed Papers to ITC-10)

1. Introduction

All papers presented at ITC-10 will be considered, via peer review, for inclusion in the conference proceedings, a special issue of the Journal of Plasma and Fusion Research (JPFR) published by the Japan Society of Plasma Science and Nuclear Fusion Research. Details of this journal and society can be found at www.nifs.ac.jp/jspf/index-e.html. To make a timely publication of these proceedings, the Editorial Office has come up with the following instructions for manuscript preparation. Authors' cooperation will be greatly appreciated.

2. Manuscript preparation

Language and authors: Manuscripts should be written in clear English and should bear the name(s) and full affiliation(s) of the author(s), their mailing address(es) and corresponding author's name and e-mail address. The names of authors must appear in such a way that last name comes first in upper case and then first name follows in lower case, as shown in the attached example.

Length limit: The total length will be limited to 4 journal pages. The conference proceeding publication budget is extremely tight, so that this page limit must be observed. Authors are kindly advised to prepare 3.5-page long manuscripts, leaving room to grow in responding to reviewers' comments.

Format: As shown in the attached example (see www.nifs.ac.jp/~itc10/paper_format.PDF or below), it is recommended that approximately 0.5 page will be used for the authors and abstract. The margin for this "cover page" is limited to 142 mm. The rest of manuscript must be prepared in the following manner. Fit your manuscript in a 76 mm x 221 mm column each page, leaving ample room for reviewers' comments. Therefore, efforts must be made to fit figures in the column. If this is not possible, however, figures may be laid, using the whole margin of 161mm. Please note that the Editorial Office will not be able to handle any footnotes. This format will help the editorial staff to figure out easily the length of your paper upon receipt at the conference (see **Manuscript submission** section).

Word processor and font: Microsoft WORD version 8.0 or later is recommended. However, LaTex files can also be handled at the Editorial Office. Single space all text, which allows to fit 51lines in the column described above. Use Century-9pts font or equivalent, except for equations. Equations must be prepared using the software compatible with these word processors (see **Manuscript submission** section).

References: References should be included at the end of the manuscript, but within the page limit (see the attached example). They must be listed in order that they appear in the text in the following manner: [1] Y. Hirooka et al., Nucl. Fusion **32**, 2029(1992), where the number in bold letters indicates the volume number, followed by the pager number and the year of publication in round brackets.

Reproduction: If manuscripts contain any reproduction from other sources, authors are requested to furnish the Editorial Office with a document of the original publisher's agreement.

Units: Authors are requested to use the metric units in the SI form.

2. Manuscript submission

Submission for review: Bring with you to the conference and turn in your original manuscript and three copies at the publication desk. The original will be retained at the Editorial Office and the copies will be forwarded to reviewers. Upon receipt, manuscripts will be check in terms of length and format, etc. Please be advised that if these guidelines are severely violated, manuscripts will not be forwarded to reviewers, in which case these manuscripts can not be considered for inclusion in the proceedings. Again, authors' cooperation would be appreciated from the timely publication point of view. Reviewers' comments will be forwarded to authors as soon as they become available.

Submission for publication: Responding to reviewers' comments, authors are requested to revise and re-submit their manuscripts to the Editorial Office, whereby the acceptance for publication will be decided. For the proceedings publication, the Editorial Office need to collect from authors revised manuscripts and also their electronic files. In preparing electronic files, both PC and Mac are acceptable. Again, equations must be prepared using the software compatible with these platforms. If they wish for simplicity, authors can provide two separate files: one for the abstract page in single column format; and the other for the text pages in double column format.

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Sample Sheet. Type A for the first half-page.

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Font for the abstract : 9 pt century (standard pitch)

142 mm

Conceptual Design of a Quasi-Axisymmetric Stellarator (CHS-qa)

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Abstract

A new type of stellarator which has very small non-axisymmetric ripple has been designed. It has an aspect ratio 4.2 which is lower than any existing helical device. A rotational transform $\iota \sim 0.4$ is created without a net toroidal current for a tokamak-like axisymmetric magnetic field structure. A bootstrap current increases the rotational transform giving a reversed shear equilibrium. Twenty modular coils (ten per period) are designed and the effect of positioning error is estimated.

Keywords:

axisymmetric stellarator, low aspect ratio, bootstrap current, reversed shear, modular coil

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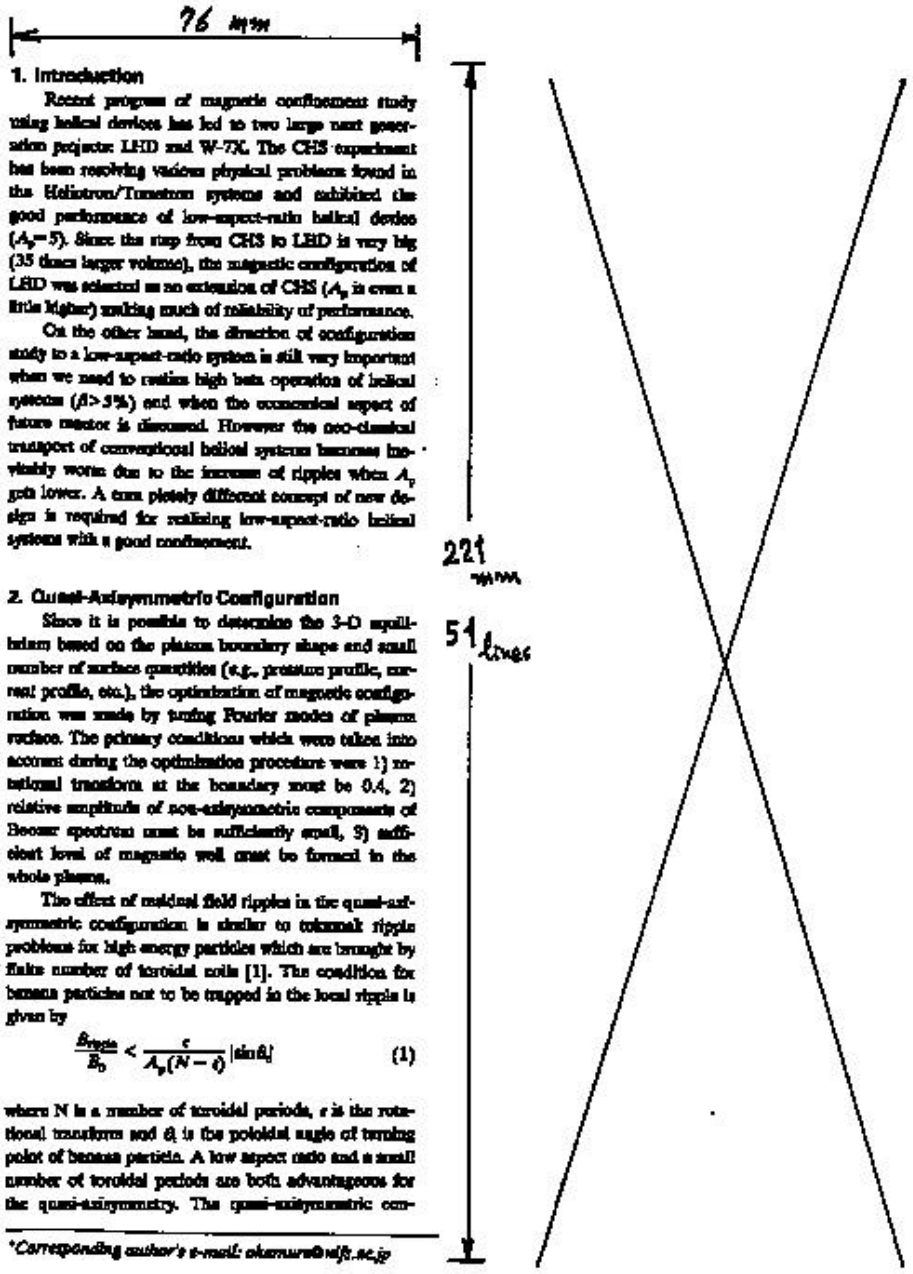
Sample Sheet. Type B for the main part, including Fig. Table, Ref., etc.

Width = 76 mm, Length = 221 mm, less than 51 lines

Font : 8 pt century (standard pitch)



1. Introduction

Recent progress of magnetic confinement study using helical devices has led to two large next generation projects: LHD and W-7X. The CHS experiment has been resolving various physical problems found in the Heliotron/Tranetron systems and exhibited the good performance of low-aspect-ratio helical device (A_p=5). Since the step from CHS to LHD is very big (35 times larger volume), the magnetic configuration of LHD was selected as an extension of CHS (A_p is even a little higher) making much of reliability of performance.

On the other hand, the direction of configuration study to a low-aspect-ratio system is still very important when we need to realize high beta operation of helical systems (β>5%) and when the economical aspect of future reactor is discussed. However the neo-classical transport of conventional helical systems becomes inevitably worse due to the increase of ripples when A_p gets lower. A completely different concept of new design is required for realizing low-aspect-ratio helical systems with a good confinement.

2. Quasi-Axisymmetric Configuration

Since it is possible to determine the 3-D equilibrium based on the plasma boundary shape and small number of surface quantities (e.g., pressure profile, current profile, etc.), the optimization of magnetic configuration was made by tuning Fourier modes of plasma surface. The primary conditions which were taken into account during the optimization procedure were 1) rotational transform at the boundary must be 0.4, 2) relative amplitude of non-axisymmetric components of Boozer spectrum must be sufficiently small, 3) sufficient level of magnetic well must be formed in the whole plasma.

The effect of residual field ripples in the quasi-axisymmetric configuration is similar to tokamak ripple problems for high energy particles which are brought by finite number of toroidal coils [1]. The condition for banana particles not to be trapped in the local ripple is given by

$$\frac{B_{ripple}}{B_0} < \frac{\epsilon}{A_p(N-\delta)}|\sin\delta| \qquad (1)$$

where N is a number of toroidal periods, ϵ is the rotational transform and δ is the poloidal angle of turning point of banana particle. A low aspect ratio and a small number of toroidal periods are both advantageous for the quasi-axisymmetry. The quasi-axisymmetric con-

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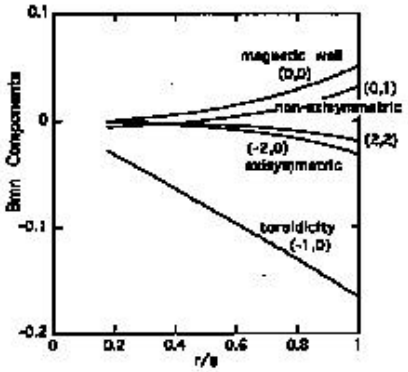

Fig. 3 Profile of Boozer spectrum for vacuum configuration.

6. Conclusion

A low-aspect-ratio helical device (A_p=4.2) is designed which has a quasi-axisymmetric magnetic field structure. Bootstrap current modifies significantly the vacuum rotational transform profile in the direction to the higher beta and better confinement. The experimental plan is prepared for the improved confinement study.

Acknowledgements

The authors are grateful to the people in the theory and data analysis division in NIFS, especially to Dr. N. Nakajima and Dr. M. Yokoyama, for useful discussions and help.

References

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Sample Sheet. Type C for large size Fig. or Table.

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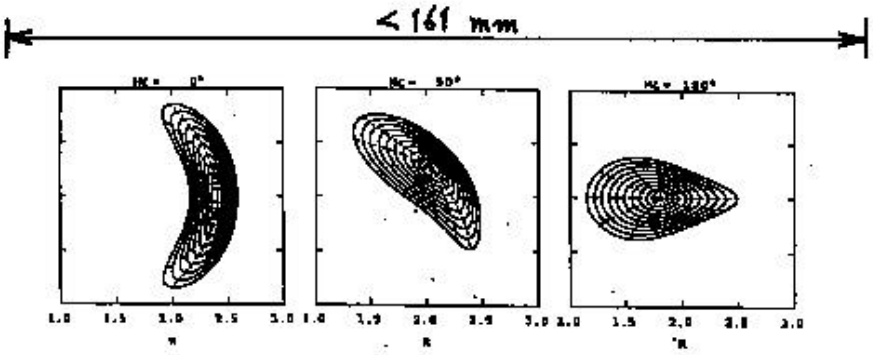

Fig. 1 Cross sections of magnetic surfaces for an equilibrium with bootstrap current.

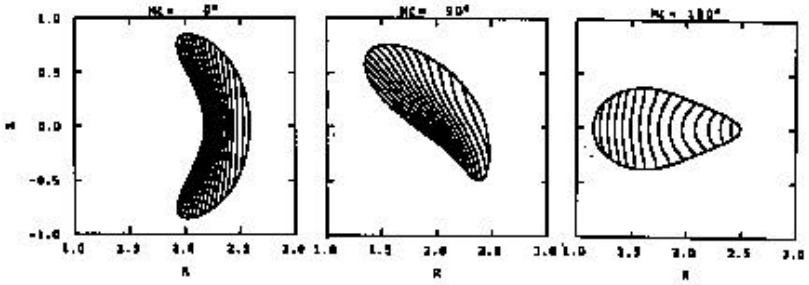

Fig. 2 Contour plots of magnetic field strength for an equilibrium with bootstrap current.