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Two-Dimensional Contact Stress Analysis of Composite Laminates with Pinned-Joint

By Yi XIAO Wen-Xue WANG and Yoshihiro TAKAO

The design of a pinned-joint of composite laminates requires a method how to obtain the stress distributions and a relevant failure criterion based on these stresses. The present paper contributes to its two-dimensional numerical calculation method by proposing a variable friction coefficient model around a circular hole of composite laminates. This model is based on an experimental result of anisotropic properties of friction coefficients of a composite lamina and a simplified relationship between the normal contact stress and strain. It is shown that the friction coefficient of a point along a circular hole of composite laminates is not just its volume average but the one with a weight of the Young's modulus of each lamina. Variable friction coefficients are presented along the hole for two representative stacking sequences of laminates. These results are applied to the practical joint problems using the finite element technique with the classical lamination theory and the effects of the present model is obtained in contact stress distributions.

Estimation of Poloidal Beta by Magnetic Analysis in TRIAM-1M

By Hiroshi KATAINO, Kazuo NAKAMURA, Takashi YAMAGAJO, Hisatoshi NAKASHIMA, Shoji KAWASAKI, Eriko JOTAKI, Ken-ichi MAKINO, Mizuki SAKAMOTO and Satoshi ITOH

A magentic analysis method for estimating poloidal beta β_p at real-time during plasma discharge is proposed. The method based on filament current model is well known as the one which estimate β_p by magnetic analysis. But since the method takes order of seconds, it is difficult to estimate β_p on real-time during plasma discharge. In this paper, correlations of β_p with poloidal fields, elongation, plasma current

and current of SP coil which is one of poloidal field coils are prepared to simplify the analysis. And it is presented that an iteration about those correlations makes it possible to estimate β_p without filament current model for a very short time. Results of comparison with equilibrium code and sensitivity study are also described.

Image Processing System for Plasma Position Control on TRIAM-1M

By Masaya OHSAWA, Mizuki SAKAMOTO, Takashi YAMAGAJO, Hisatoshi NAKASHIMA, Shoji KAWASAKI, Eriko JOTAKI, Ken-ichi MAKINO, Kazuo NAKAMURA and Satoshi ITOH

In a long duration discharge, there appears a hot spot, where heat flux concentrates, on a poloidal limiter. The interacting position (i.e. the hot spot) between the plasma and the limiter becomes bright. The concentration of the heat flux must be avoided since it causes the increase of the density and the impurity in the plasma and it damages the limiter. In TRIAM-1M, an image processing system has been developed for the position control of the long duration discharges. The image processing system can detect the bright spot on the limiter and move the plasma to reduce the heat flux on the hot spot. Preliminary experiments with light sources were carried out before applying to plasma experiments and the reliability of the image processing circuit was confirmed.

Measurements of Plasma Position and Shape in Divertor Configuration on TRIAM-1M

By Michihide NAKAMURE, Kazuo NAKAMURA, Takashi YAMAGAJO, Hisatoshi NAKASHIMA, Shoji KAWASAKI, Eriko JOTAKI, Ken-ichi MAKINO, Mizuki SAKAMOTO and Satoshi ITOH

We can carry out divertor plasma experiments on TRIAM-1M since 1994. We changed coefficients of plasma position and shape control equations in limiter configuration to use them in divertor configuration. And using plasma equilibrium code, we corrected the

plasma position and shape estimation equation in divertor configuration.

SOL Plasma Measurements during High Density and Long-Duration Current Drive on TRIAM-1M

By Takeharu TAKEMURA, Shoji KAWASAKI, Eriko JOTAKI, Ken-ichi MAKINO, Mizuki SAKAMOTO, Kazuo NAKAMURA, Yukio NAKAMURA, Sanae-I. ITOH and Satoshi ITOH

SOL (scrape-off-layer) plasma properties of 8.2 GH_Z lower hybrid current drive (LHCD) discharges as well as ohmic heating (OH) discharges in the TRIAM-1M tokamak have been investigated. SOL plasma density n_{SOL} and SOL plasma electron temperature T_{SOL} are measured by double probe which is located at deep inside the limiter shadow. The typical values of n_{SOL} and T_{SOL} were about 6×10^{15} m^{-3}, 8eV, respectively. Radial density profiles of the SOL of LHCD discharge and that of OH discharge were found to be similar, though the density of LHCD plasma was smaller than that of OH plasma. The e-folding lengths of SOL plasma were 10mm in both cases.

In LHCD and OH discharges, the ratio $n_{SOL}/\bar{n}_e$, where $\bar{n}_e$ was the line averaged density, was found to decrease with B_T in the range $6T\leqq B_T\leqq 8T$. The dependencies were $n_{SOL}/\bar{n}_e\sim(1.9/B_T(T)^2)\times10^{-2}$ in OH discharges and $n_{SOL}/\bar{n}_e\sim(1.2/B_T(T)^2)\times10^{-2}$ in LHCD discharges, respectively.

The parameter scan of the phase difference between adjacent wave guides, $\Delta\phi$, (70°, 90°, 110°, 130°, 150°), showed that the n_{SOL} had the maximum value of $6.0\times10^{15}m^{-3}$ when $\Delta\phi=90°$. The current drive efficiency η_{CD} had the maximum value of $0.7\times10^{19}m^{-2}A/W$ and also $\bar{n}_e$ had the maximum value of $2.0\times10^{19}m^{-3}$, when $\Delta\Phi=90°$. The observed edge plasma density n_0 corresponds to the value of $2.7n_c$, where $n_c=(\varepsilon_0 m_e/e^2)(2\pi f)^2=8.3\times10^{17}m^{-3}$. The result approximately agrees with the analytical formula of optimum coupling condition, $n_0/n_c=N_{/\!/}^2$ ($N_{/\!/}^2\sim3$ when $\Delta\Phi=90°$).