MAGNETIC FIELD ERROR MEASUREMENT IN THE REVERSED FIELD PINCH

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MAGNETIC FIELD ERROR MEASUREMENT IN THE MST REVERSED FIELD PINCH*

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MST(Madison Symmetric Torus) has been in operation since June 1988. The vacuum vessel is 5-cm-thick aluminum, 1.5 meters major radius and 0.52 meters minor radius. MST was designed with minimal field errors. The toroidal field system produces an error field with dominant n=4,m=0 fourier component of magnitude of order 0.1% of the toroidal field, as was expected. With the present temporary ohmic winding the maximum radial magnetic field at the poloidal gap for a typical plasma is about 30% of the poloidal field at the wall (a=0.52m). The distribution between m=1 and m=4 is measured, and the phases of the modes are as expected from the winding positions. Detailed structure of these radial fields as well as the radial fields at the toroidal gap will be presented.

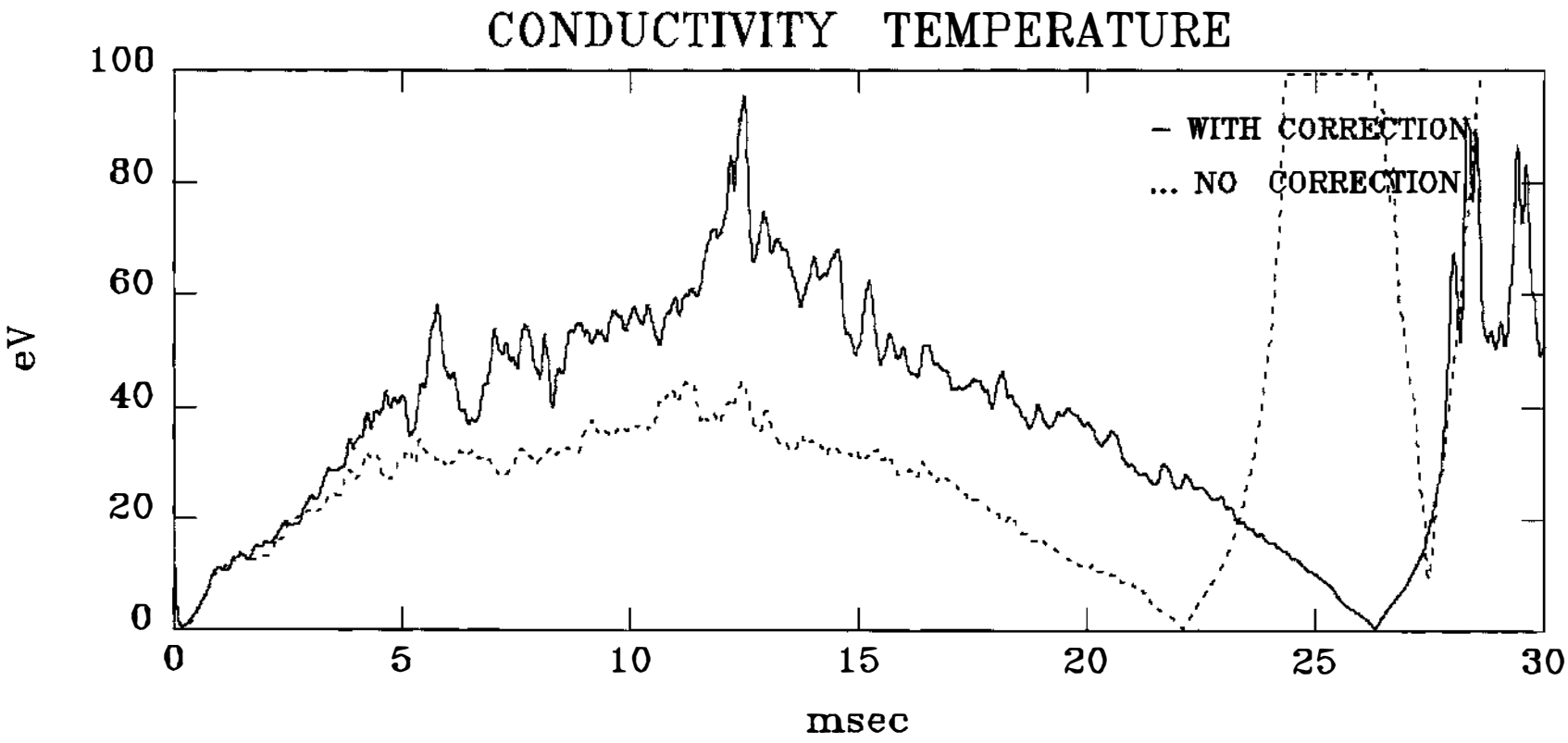
*Work supported by U.S.D.O.E

INTRODUCTION

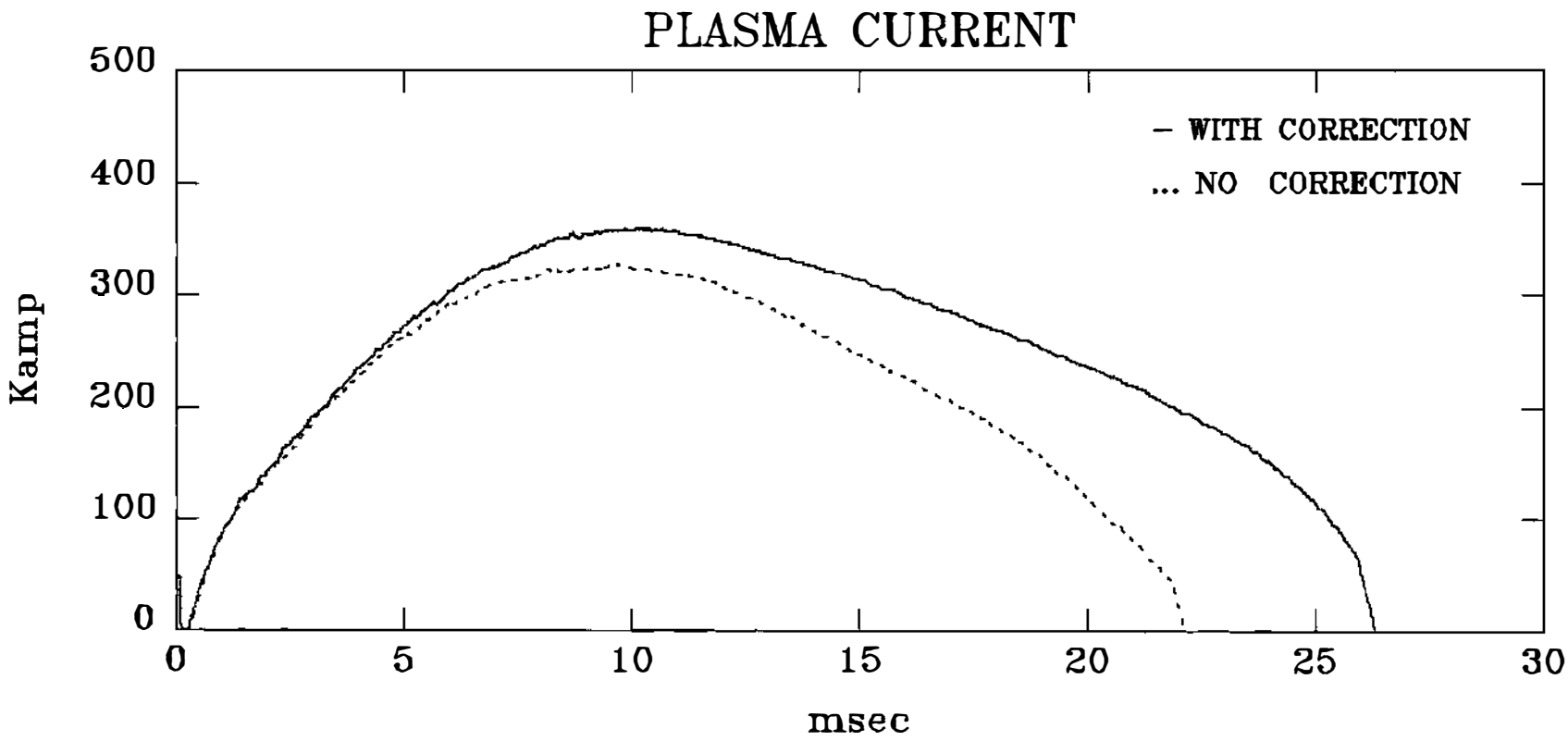
.PLASMA CONFINEMENT IS IMPROVED WITH THE REDUCTION OF RADIAL MAGNETIC FIELD AT THE POLOIDAL GAP WHICH ARE RATHER LARGE WITHOUT THE POLOIDAL FIELD SYSTEM

.SAWTEETH LIKE JUMPS IN THE AVERAGE TOROIDAL MAGNETIC FIELD AND SOFT X-RAY SIGNAL ARE OBSERVED IN MST PLASMA.

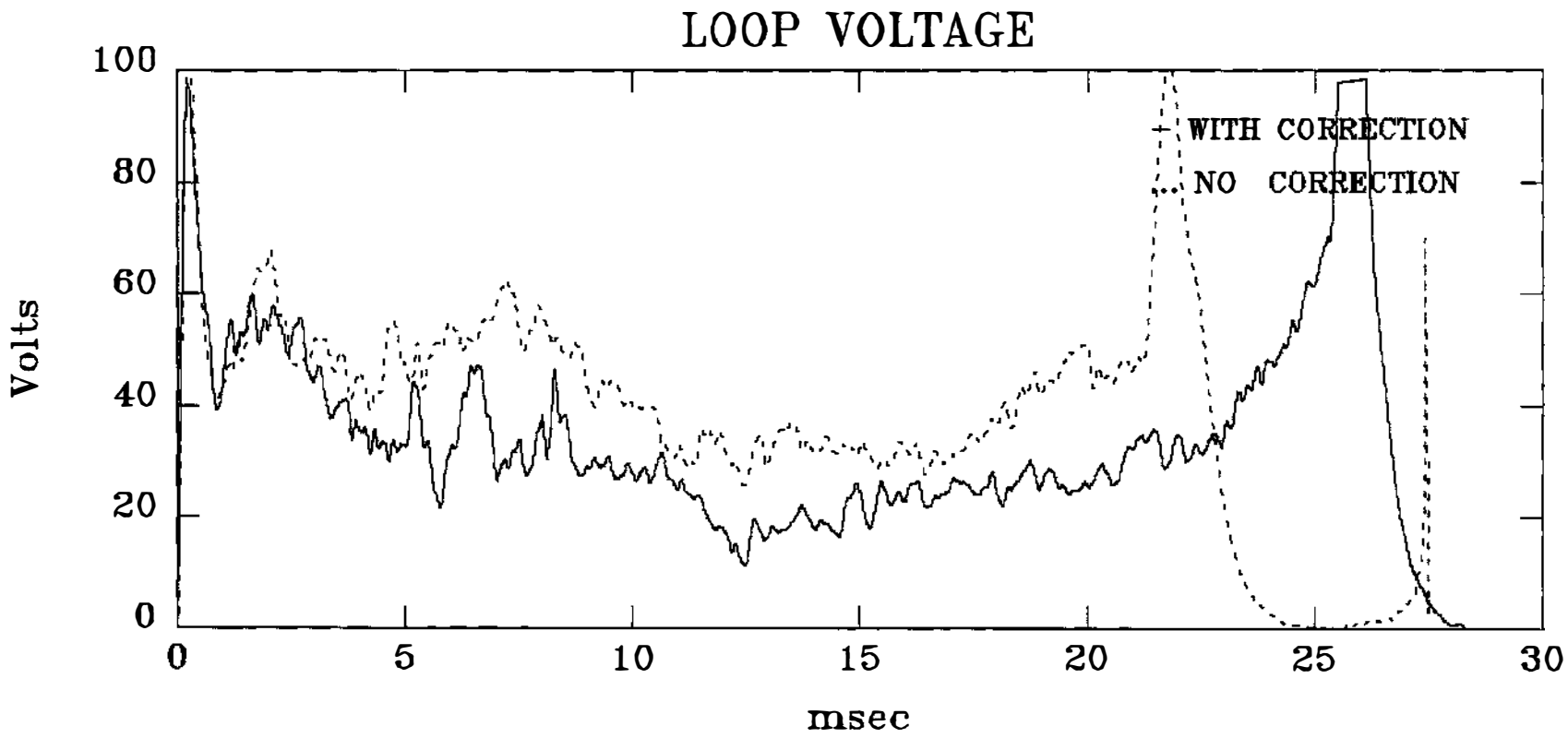
CONDUCTIVITY TEMPERATURE IS DOUBLED WITH REDUCED MAGNETIC FIELD ERRORS



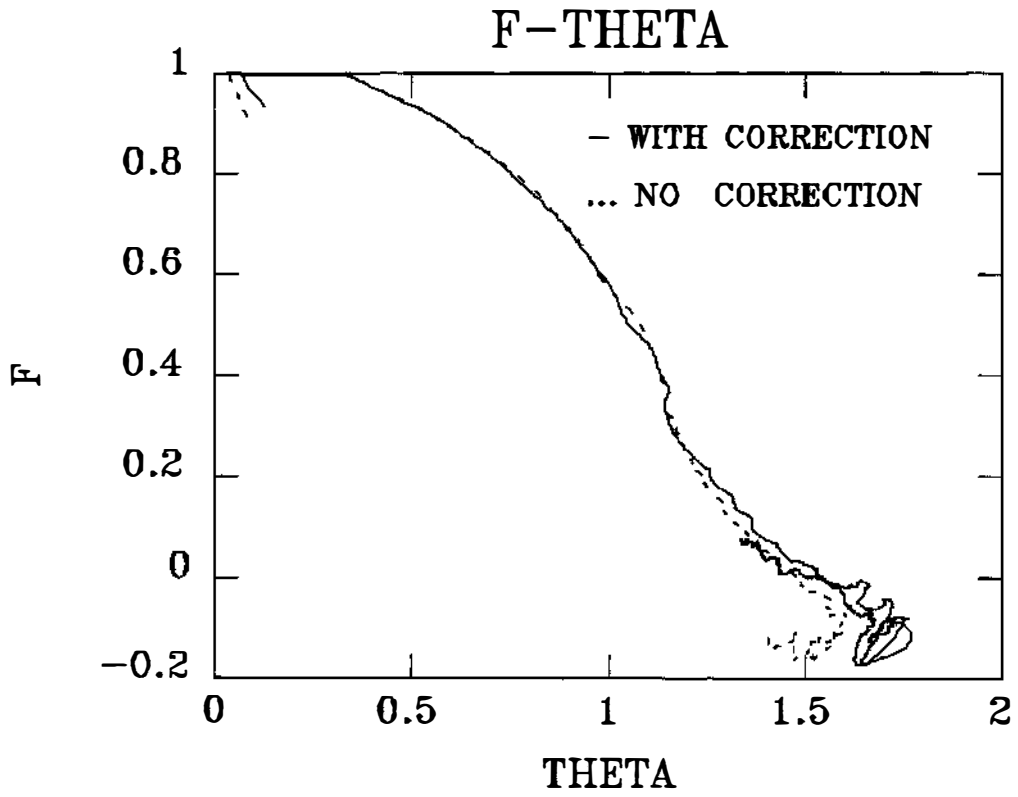
PLASMA CURRENT INCREASES AND LASTS LONGER WITH REDUCED MAGNETIC FIELD ERRORS



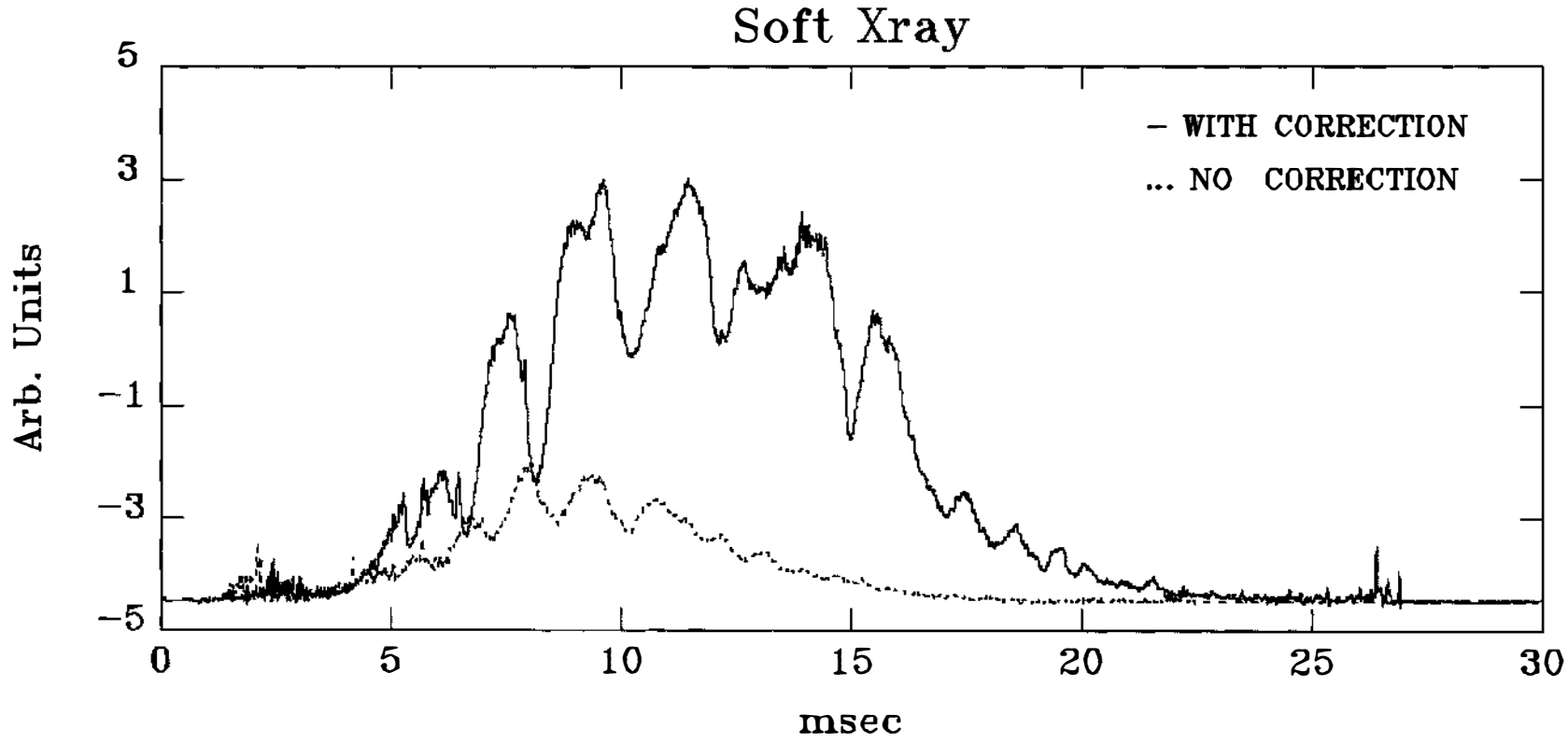
LOOP VOLTAGE IS LOWERED TO 20.0 VOLTS WITH REDUCED MAGNETIC FIELD ERRORS



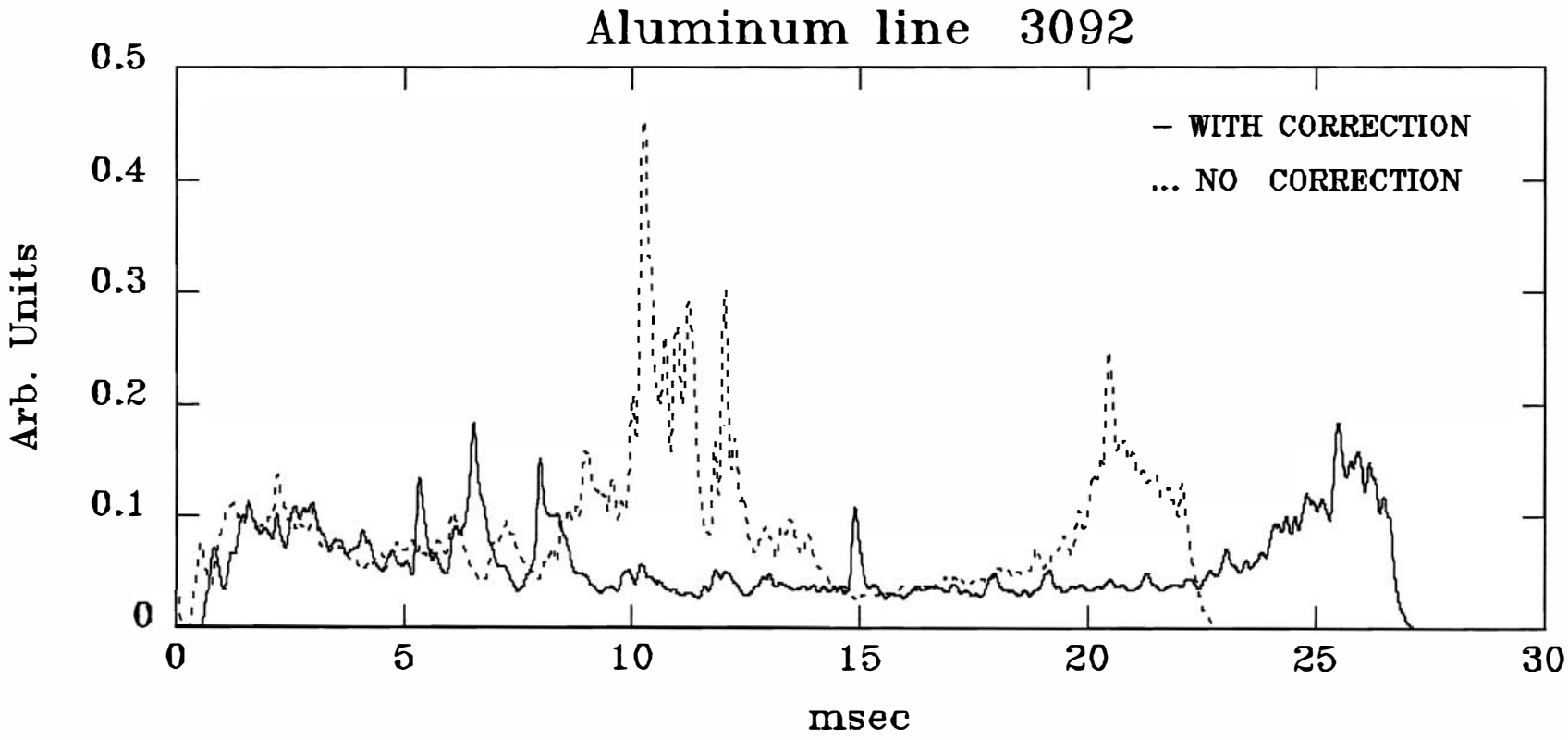
PLASMA OPERATES AT A HIGHER VALUE OF Θ WITH REDUCED MAGNETIC FIELD ERRORS

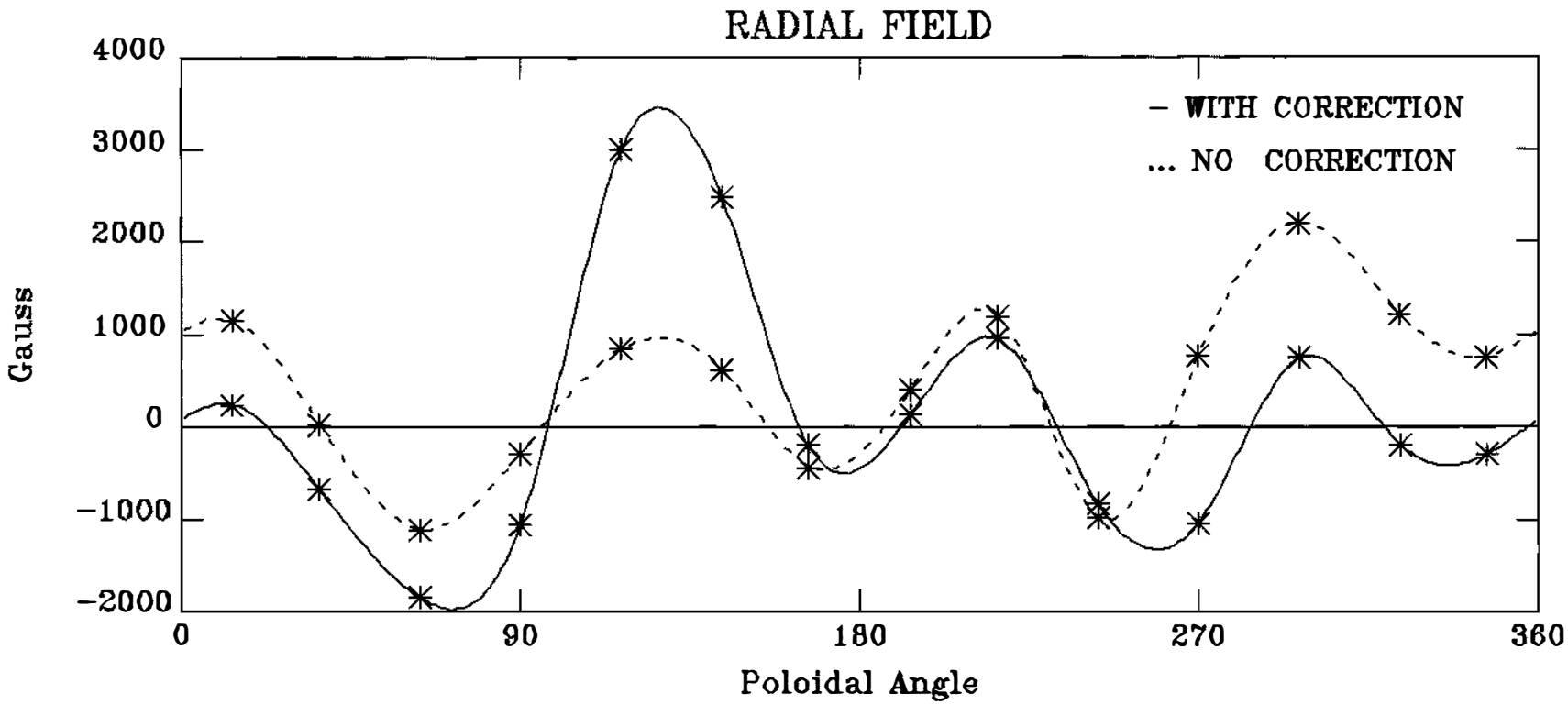


SOFT X-RAY SIGNAL INCREASES WITH REDUCED MAGNETIC FIELD ERRORS IMPLYING HOTTER PLASMA

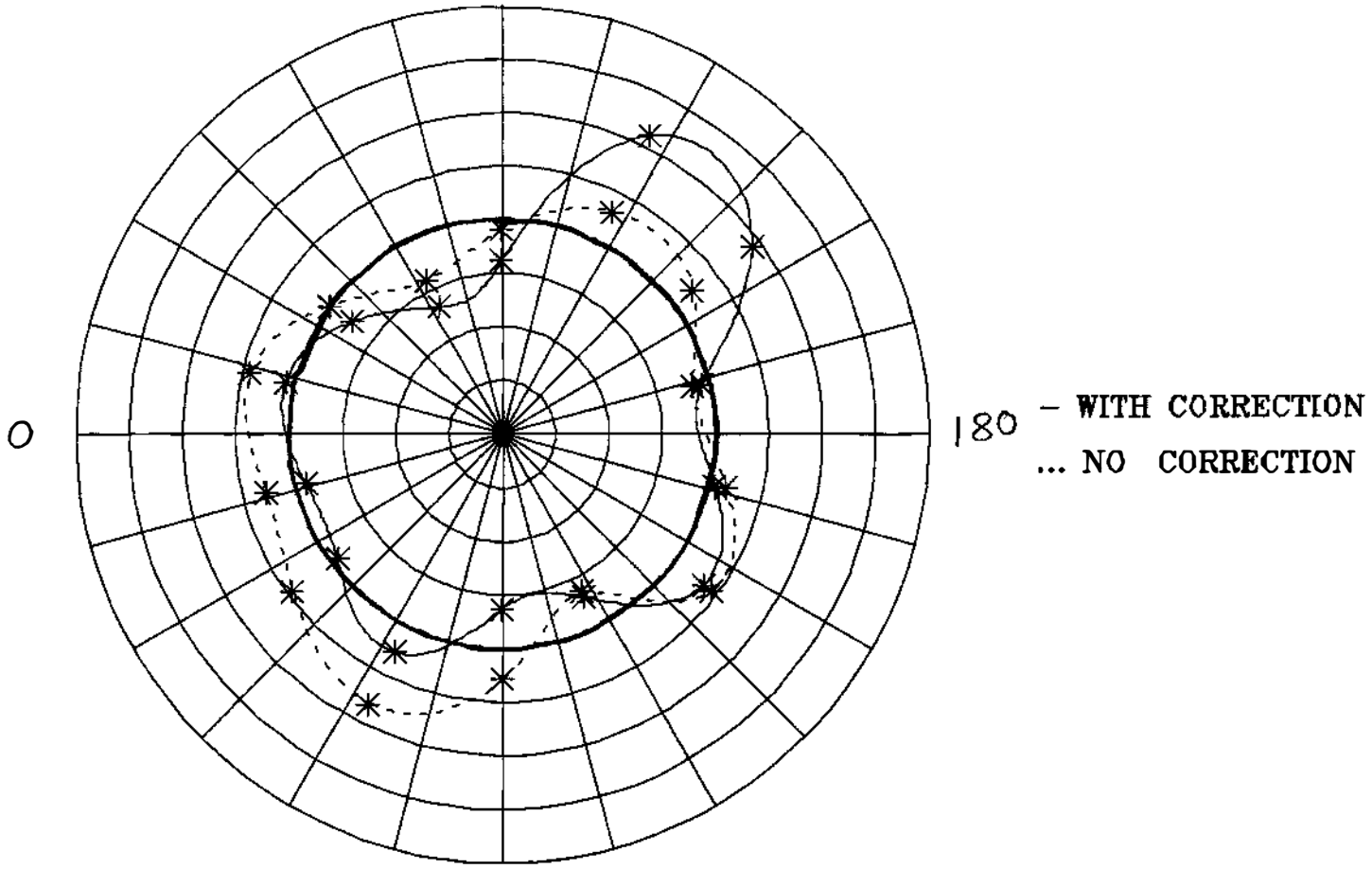


ALUMINUM SIGNAL DECREASES WITH REDUCED MAGNETIC FIELD ERRORS IMPLYING A DECREASED PLASMA–WALL INTERACTION



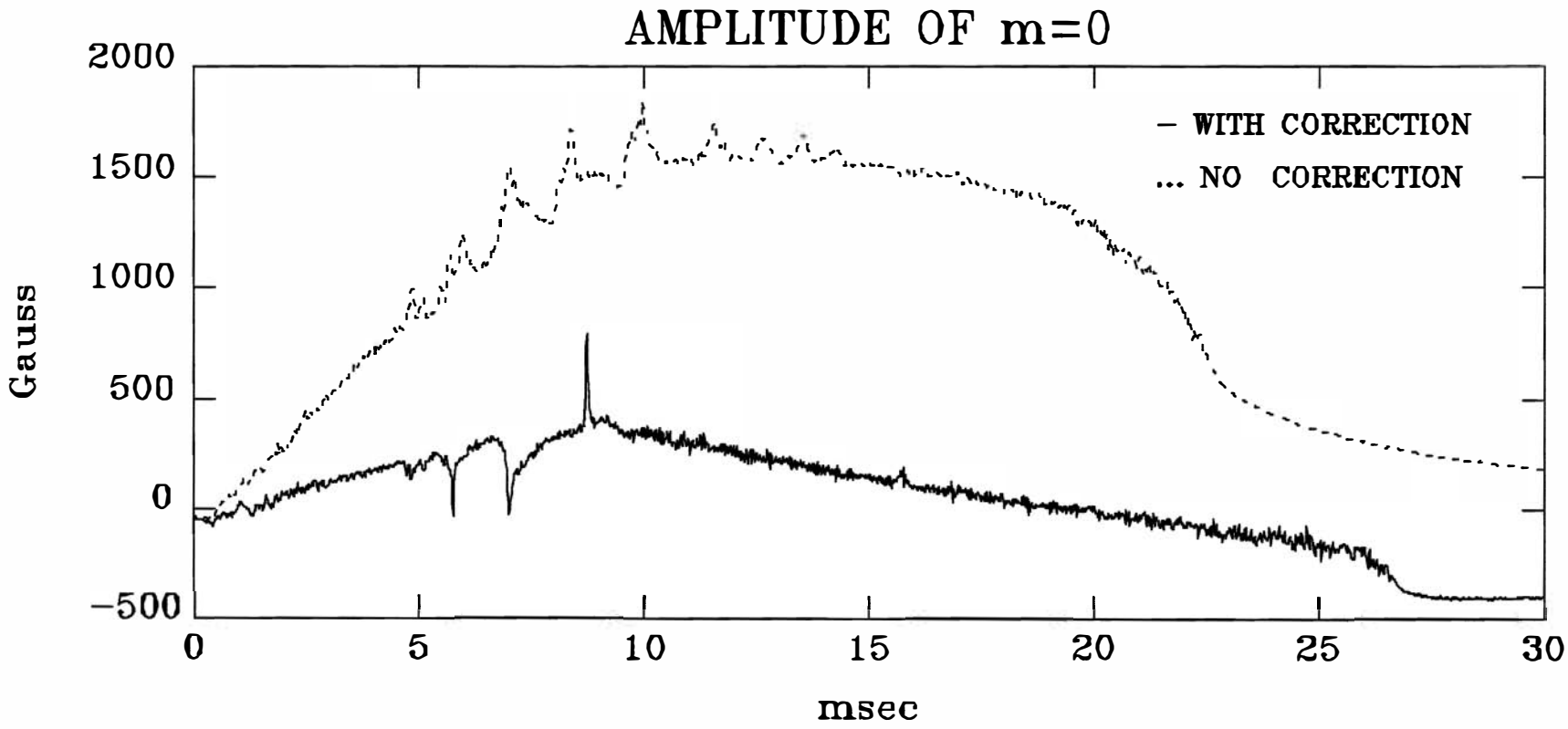


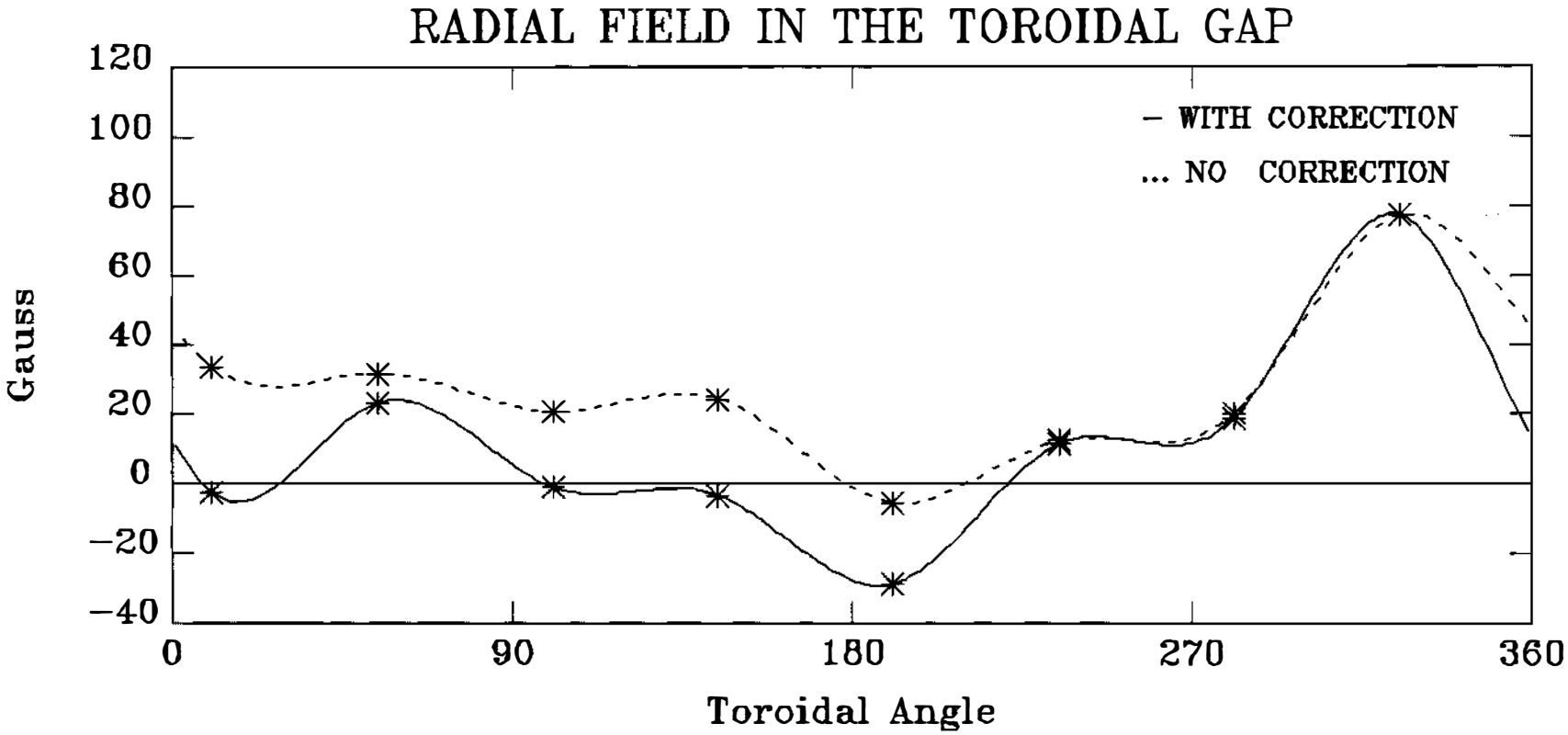
THE RADIAL MAGNETIC FIELD IS REDUCED OVER A LARGE POLOIDAL EXTENT OF GAP



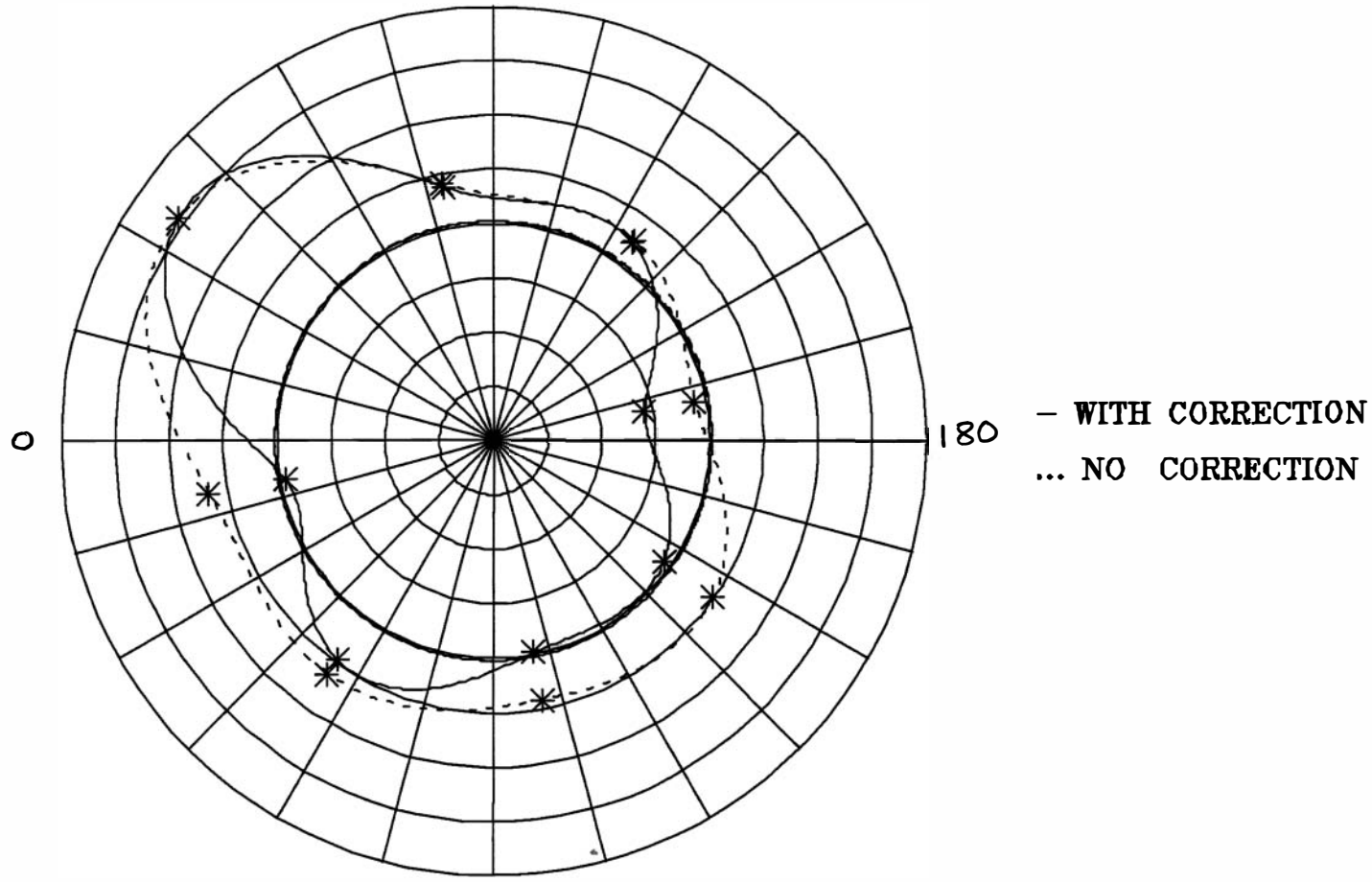
THE RADIAL MAGNETIC FIELD IS REDUCED OVER A LARGE POLOIDAL EXTENT OF GAP

THE AMPLITUDE OF m=0 IS REDUCED BY A FACTOR OF 3



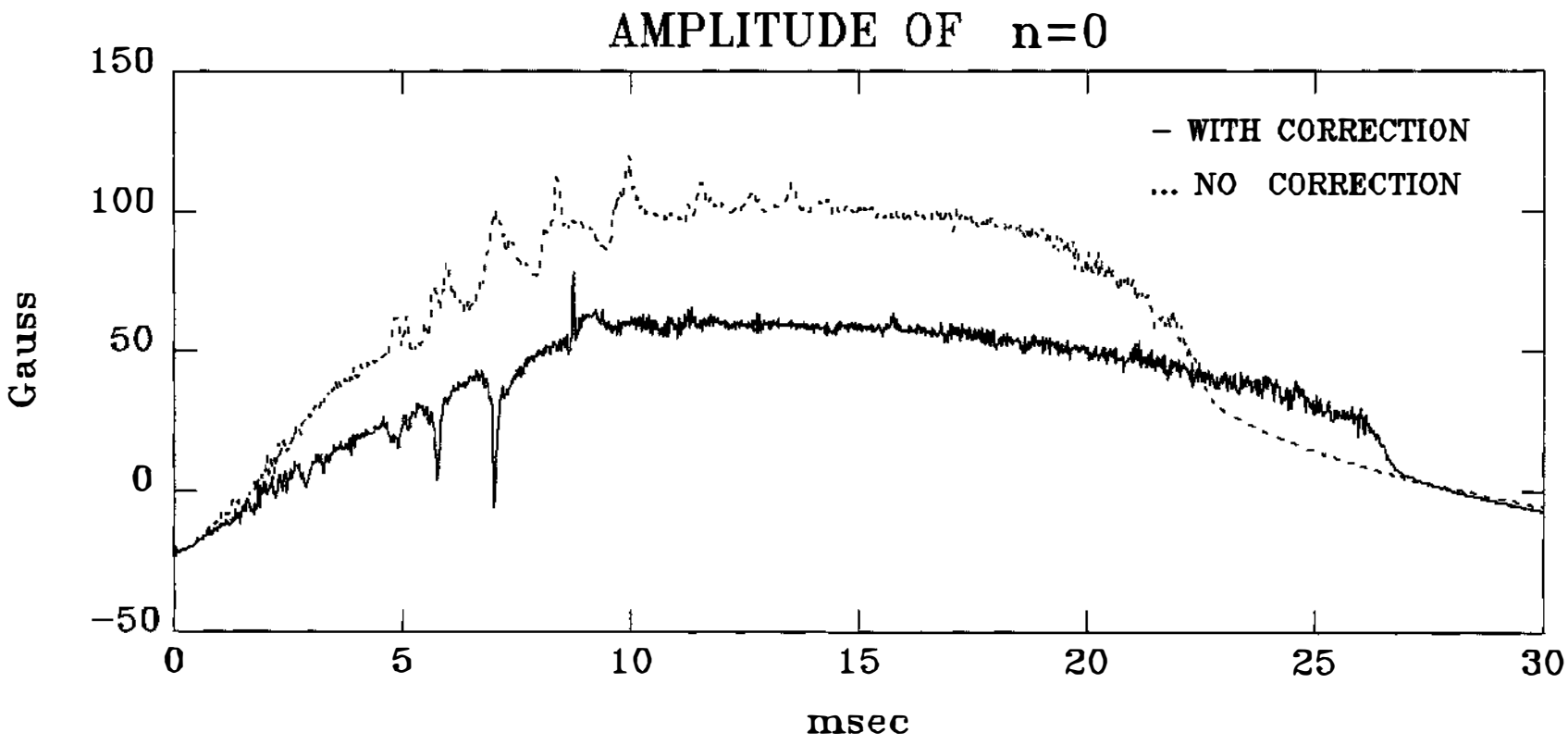


THE RADIAL MAGNETIC FIELD AT THE TOROIDAL GAP IS REDUCED AS A RESULT OF REDUCING THE RADIAL MAGNETIC FIELD AT THE POLOIDAL GAP

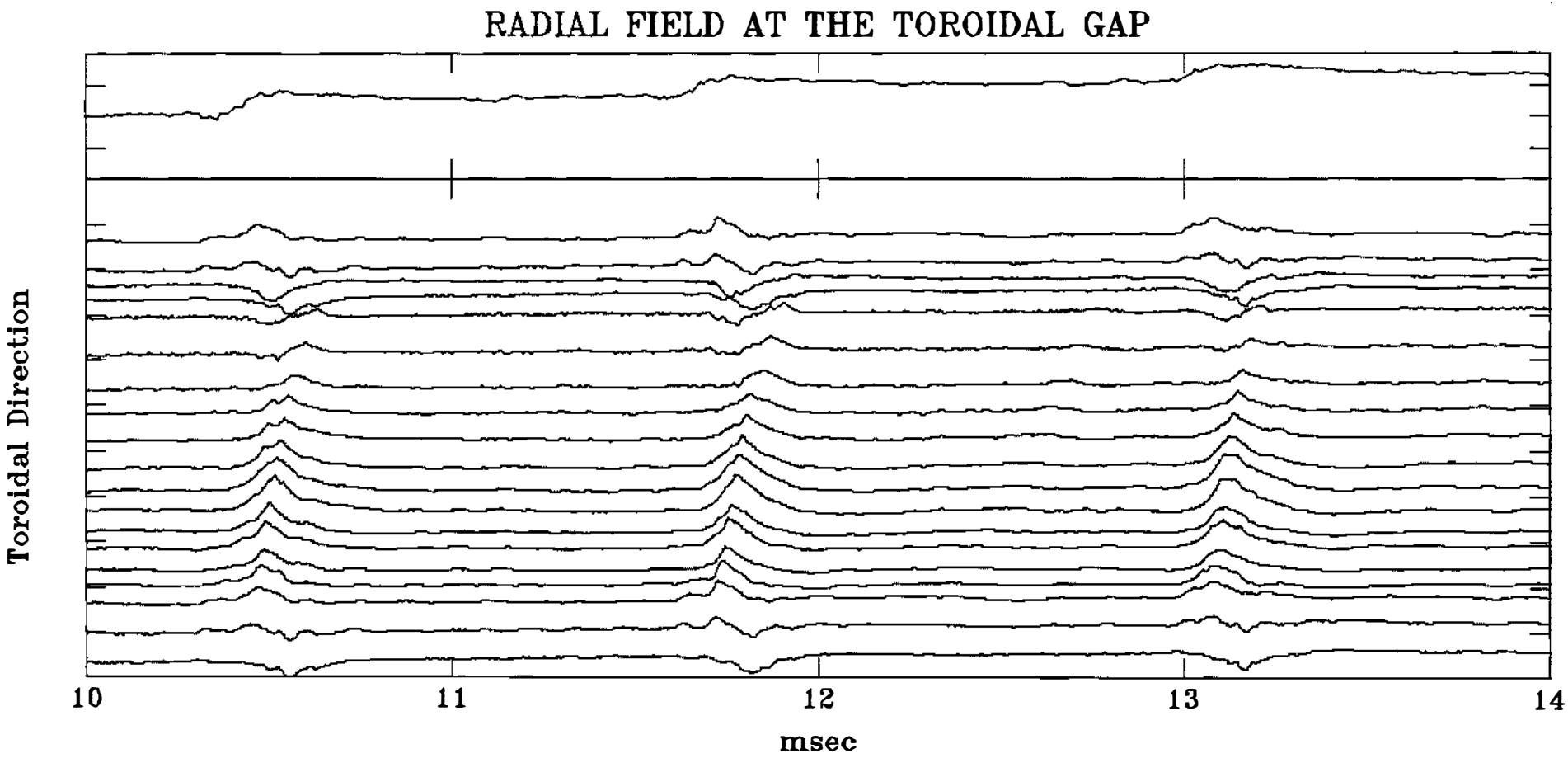


THE RADIAL MAGNETIC FIELD AT THE TOROIDAL GAP IS REDUCED AS A RESULT OF REDUCING THE RADIAL MAGNETIC FIELD AT THE POLOIDAL GAP

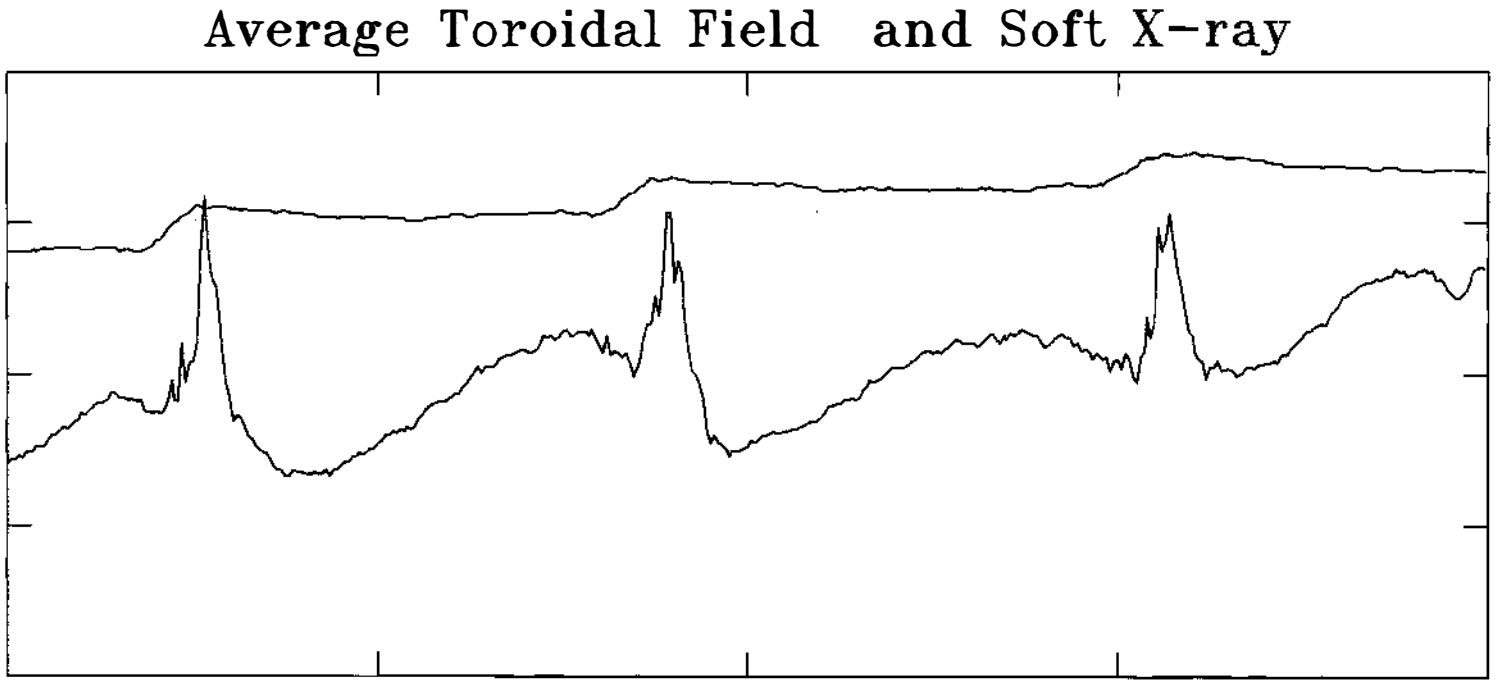
THE AMPLITUDE OF n=0 IS REDUCED BY A FACTOR OF 2



THE RADIAL COILS AT THE BT GAP SHOWING THE TOROIDAL MOTION OF THESE FLUX JUMPS



FLUX JUMPS IN THE TOROIDAL FIELD ARE CORRELETED WITH SAWTEETH IN SOFT X-RAY



CONCLUSION

MST PLASMA HAS IMPROVED IN QUALITY TO THE LEVEL THAT IT CAN BE ENHANCED BY FIELD ERROR REDUCTION.

A PROPER POLOIDAL FIELD SYSTEM WILL PRODUCE A LONGER , HOTTER AND BETTER CONFINED PLASMA.

THE TOROIDAL FIELD SYSTEM GENERATES A DOMINANT MODE OF $B_r^{n=4,m=0} \approx 0.2$ % RADIAL FIELD AT THE WALL.

AN INWARD SHIFT OF THE PLASMA COLUMN IS OBSERVED TO BE ASSOCIATED WITH THE FLUX JUMPS.