Table 3**:** Comparison with POD controller and MFFN controller for control signal α_2

Control signal α_2	With POD	With MFFN
-11.1351 ± 26.1331i	-14.4546 +27.1546i	-10.3873± 25.8504i
0.0000	-4.6185	-4.8569
-0.0022	-0.7128 + 3.7544i	-0.7128 ± 3.7544i
-0.7128 ± 3.7544i	-0.0767	-0.1058

The comparative performance of Fig. 6,7,8,9 justified that MFFN based IPFC with pulse width modulation index of voltage series converter 1 and 2 (m_{i2} and α_2) are damps the oscillations more effectively. This inference has been checked by obtaining eigen value analysis which indicates that the system is stable.

5. CONCLUSION

In this paper, a systematic approach for determining relative effectiveness of Interline Power Flow Controller (IPFC) control signals (mi_1, α_1, mi_2, α_2) in damping low frequency oscillations has been presented. The linearized power system model of Single Machine Infinite Bus system for analyzing the performance of MFFN based IPFC for variation in system parameters has been studied. These control signals shows the significant improvement in damping of power system performance. Investigations have revealed that IPFC control signals m_{i2} and α_2 provide robust performance over other signals. The proposed MFFN Controller performance is comparatively better than PI based controller. The MFFN strategy have been designed to minimize transients swing, improvement in damping of oscillations. The controllers comparative performance in terms of small signal stability improvement and damping of oscillations is demonstrated. The MFFN demonstrates the robust performance and easy to coordinate with damping schemes. The proposed controller fulfills the main objective of this paper. Time domain analysis and eigen value analysis results demonstrated the IPFC performance.

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APPENDIX-A

A.1. Generator

$M=2H=0.1787, T_{do}^{1}=5.044$, $V_b=1$ p.u.

A.2. Excitation system

$K_a=50.0$, $T_a=0.05$

A.2. Constants

$K_1=0.3837$, $K_2=-0.1717$, $K_3=3.6667$, $K_4=-0.7350$, $K_5=-0.0237$, $K_6=1.0659$, $K_7=-0.0139$, $K_8=-0.6890$, $K_9=0.0023$

A.3. Interline Power Flow Controller Parameters

$K_{p\alpha1}=0.0376$, $K_{q\alpha1}=0.0010$, $K_{v\alpha1}=-0.0029$, $K_{c\alpha1}=0.0672$,

$K_{p\alpha2}=-0.0045$, $K_{q\alpha2}=0.0033$, $K_{v\alpha2}=-0.0021$, $K_{c\alpha2}=-0.01116$,

$K_{pmi1}=0.0552$, $K_{qmi1}=-0.0326$, $K_{vmi1}=-0.0360$, $K_{cmi1}=-0.000766$,

$K_{pmi2}=0.2530$, $K_{qmi2}=0.0056$, $K_{vmi2}=-0.0038$, $K_{cmi2=-0.0087}$, $K_{pp}=1$, $K_{pi}=0.5$