TABLE I

"SHIFTED" ROSENBROCK BANANA PROBLEM

Iteration	$\boldsymbol{x}_c^{(j)}$	$\boldsymbol{f}^{(j)}$	$\boldsymbol{B}^{(j)}$	$\boldsymbol{h}^{(j)}$	$\boldsymbol{x}_f^{(j)}$	$R_f^{(j)}$
0	$\begin{bmatrix}1.0\\1.0\end{bmatrix}$	---	---	---	$\begin{bmatrix}1.0\\1.0\end{bmatrix}$	31.4
1	$\begin{bmatrix}0.8\\1.2\end{bmatrix}$	$\begin{bmatrix}-0.2\\0.2\end{bmatrix}$	$\begin{bmatrix}1.0 & 0.0\\0.0 & 1.0\end{bmatrix}$	$\begin{bmatrix}0.2\\-0.2\end{bmatrix}$	$\begin{bmatrix}1.2\\0.8\end{bmatrix}$	0
	$\begin{bmatrix}1.0\\1.0\end{bmatrix}$	$\begin{bmatrix}0\\0\end{bmatrix}$				

TABLE II

"TRANSFORMED" ROSENBROCK BANANA PROBLEM

Iteration	$\boldsymbol{x}_c^{(j)}$	$\boldsymbol{f}^{(j)}$	$\boldsymbol{B}^{(j)}$	$\boldsymbol{h}^{(j)}$	$\boldsymbol{x}_f^{(j)}$	$R_f^{(j)}$
0	$\begin{bmatrix}1.0\\1.0\end{bmatrix}$	---	---	---	$\begin{bmatrix}1.0\\1.0\end{bmatrix}$	108.3
1	$\begin{bmatrix}0.526\\1.384\end{bmatrix}$	$\begin{bmatrix}-0.474\\0.384\end{bmatrix}$	$\begin{bmatrix}1.01 & -0.05\\0.01 & 1.01\end{bmatrix}$	$\begin{bmatrix}0.447\\-0.385\end{bmatrix}$	$\begin{bmatrix}1.447\\0.615\end{bmatrix}$	5.119
2	$\begin{bmatrix}1.185\\1.178\end{bmatrix}$	$\begin{bmatrix}0.185\\0.178\end{bmatrix}$	$\begin{bmatrix}0.96 & -0.12\\-0.096 & 1.06\end{bmatrix}$	$\begin{bmatrix}-0.218\\-0.187\end{bmatrix}$	$\begin{bmatrix}1.23\\0.427\end{bmatrix}$	4.4E–3
3	$\begin{bmatrix}0.967\\0.929\end{bmatrix}$	$\begin{bmatrix}-0.033\\-0.071\end{bmatrix}$	$\begin{bmatrix}1.09 & -0.19\\0.168 & 0.92\end{bmatrix}$	$\begin{bmatrix}0.0429\\0.0697\end{bmatrix}$	$\begin{bmatrix}1.273\\0.497\end{bmatrix}$	1.8E–6
4	$\begin{bmatrix}1.001\\1.001\end{bmatrix}$	$\begin{bmatrix}0.001\\0.001\end{bmatrix}$	$\begin{bmatrix}1.10001 & -0.1999\\0.1999 & 0.9001\end{bmatrix}$	$\begin{bmatrix}-0.001\\-0.002\end{bmatrix}$	$\begin{bmatrix}1.2719\\0.4952\end{bmatrix}$	5E–10
5	$\begin{bmatrix}1.00002\\1.00004\end{bmatrix}$	$\begin{bmatrix}0.2\mathrm{E}-4\\0.4\mathrm{E}-4\end{bmatrix}$	$\begin{bmatrix}1.1 & -0.2\\0.2 & 0.9\end{bmatrix}$	$\begin{bmatrix}0.3\mathrm{E}-4\\0.5\mathrm{E}-4\end{bmatrix}$	$\begin{bmatrix}1.2718\\0.4951\end{bmatrix}$	3E–17
6	$\begin{bmatrix}1.0\\1.0\end{bmatrix}$	$\begin{bmatrix}0.1\mathrm{E}-8\\0.3\mathrm{E}-8\end{bmatrix}$	$\begin{bmatrix}1.1 & -0.2\\0.2 & 0.9\end{bmatrix}$	$\begin{bmatrix}0.2\mathrm{E}-8\\0.3\mathrm{E}-8\end{bmatrix}$	$\boldsymbol{x}_f^*$	9E–29

TABLE III

COARSE MODEL SENSITIVITIES WITH RESPECT TO THE DESIGN PARAMETERS FOR THE CAPACITIVELY LOADED IMPEDANCE TRANSFORMER

Parameter	$\hat{S}_i$
L_1	0.98
L_2	1.00
Z_1	0.048
Z_2	0.048

TABLE IV

INITIAL AND FINAL DESIGNS FOR THE CAPACITIVELY LOADED IMPEDANCE TRANSFORMER

Parameter	$\boldsymbol{x}_f^{(0)}$	$\boldsymbol{x}_f^{(1)}$ (L_1 and L_2)	$\boldsymbol{x}_f^{(1)}$ (L_1)	$\boldsymbol{x}_f^{(1)}$ (L_2)
L_1	1.0	0.9105	0.8363	0.8644
L_2	1.0	0.8089	0.9007	0.8488
Z_1	2.23615	2.2371	2.2347	2.2364
Z_2	4.47230	4.4708	4.4716	4.4709

L_1 and L_2 are normalized lengths

Z_1 and Z_2 are in ohm

TABLE V

COARSE MODEL SENSITIVITIES WITH RESPECT TO DESIGN PARAMETERS FOR THE BANDSTOP MICROSTRIP FILTER

Parameter	$\hat{S}_i$
W_1	0.065
W_2	0.077
L_0	0.677
L_1	1.000
L_2	0.873

TABLE VI

INITIAL AND FINAL DESIGNS FOR
THE BANDSTOP MICROSTRIP FILTER USING L_1 AND L_2

Parameter	$\boldsymbol{x}_f^{(0)}$	$\boldsymbol{x}_f^{(5)}$
W_1	4.560	7.329
W_2	9.351	10.672
L_0	107.80	109.24
L_1	111.03	115.53
L_2	108.75	111.28
All values are in mils		

TABLE VII

INITIAL AND FINAL DESIGNS FOR
THE BANDSTOP MICROSTRIP FILTER USING A FULL MAPPING

Parameter	$\boldsymbol{x}_f^{(0)}$	$\boldsymbol{x}_f^{(5)}$
W_1	4.560	8.7464
W_2	9.351	19.623
L_0	107.80	97.206
L_1	111.03	116.13
L_2	108.75	113.99
All values are in mils		

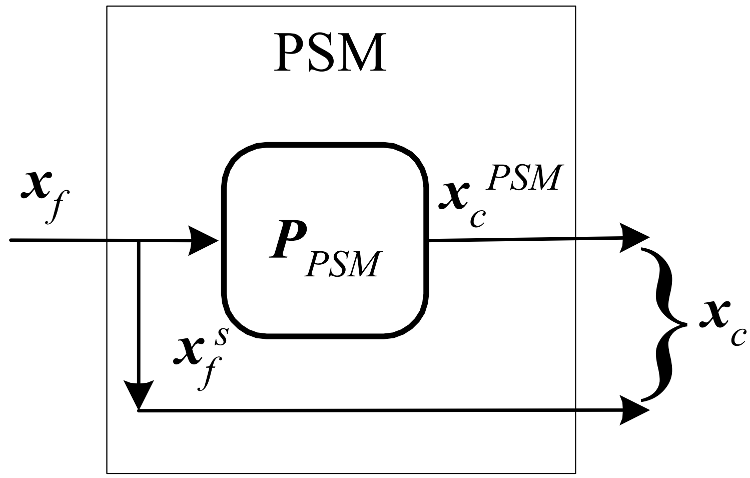

Fig. 1. Partial Space Mapping (PSM).

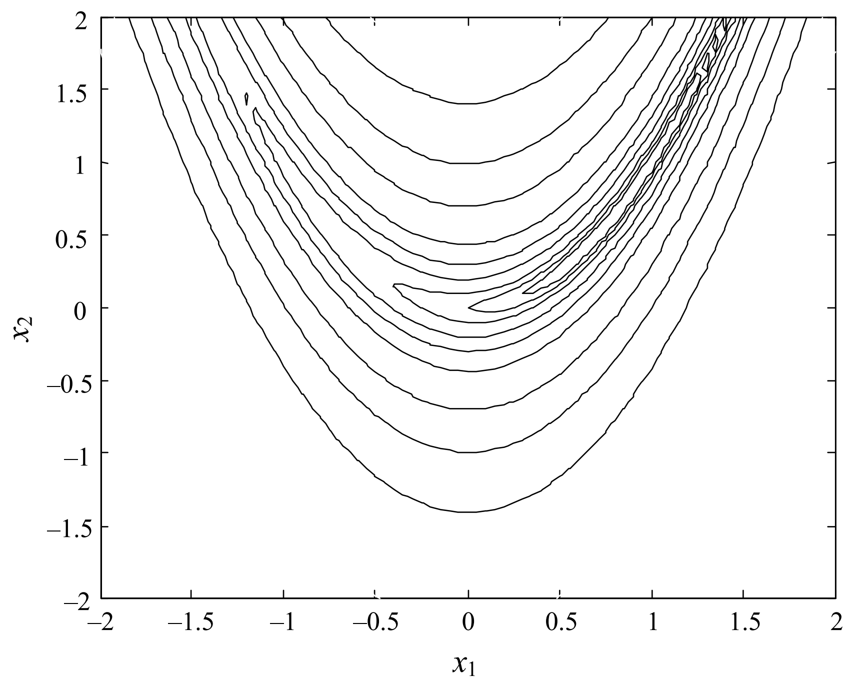

Fig. 2. Contour plot of the "coarse" original Rosenbrock banana function.

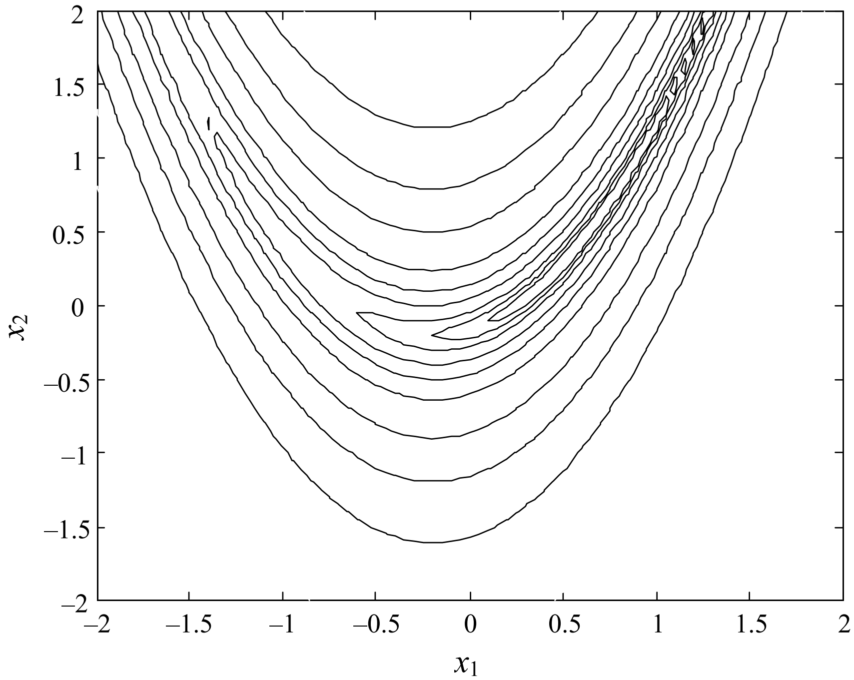

Fig. 3. Contour plot of the "fine" shifted Rosenbrock banana function.

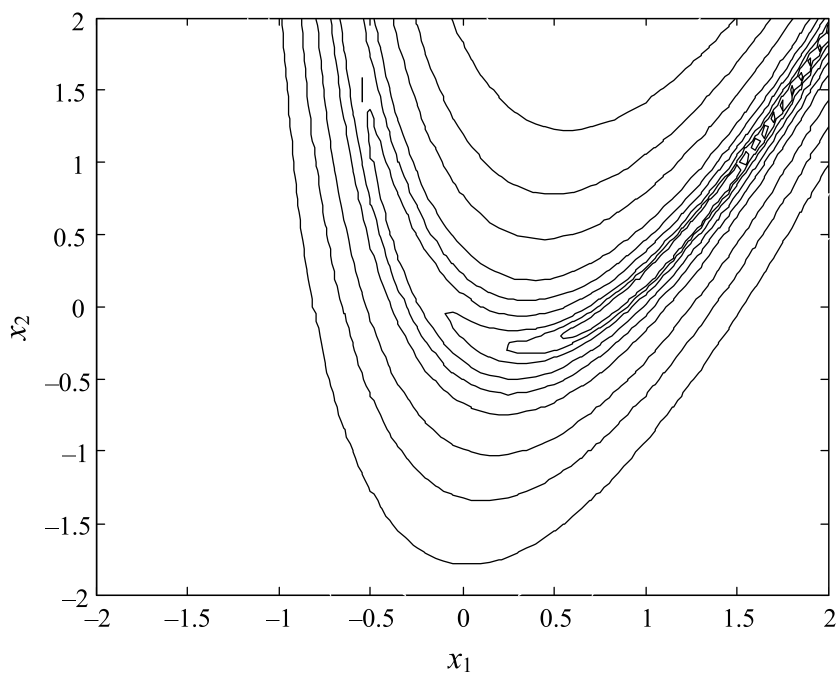

Fig. 4. Contour plot of the "fine" transformed Rosenbrock banana function.

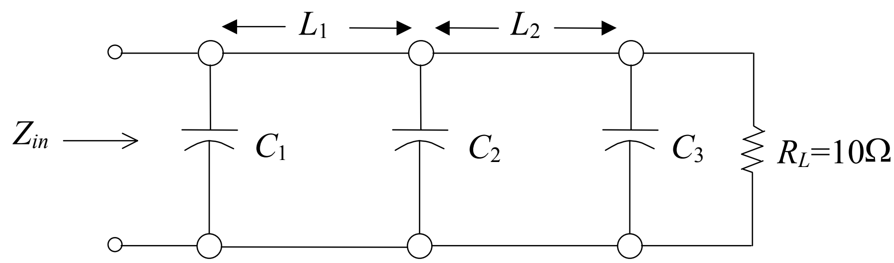

Fig. 5. Two-section impedance transformer: “fine” model.

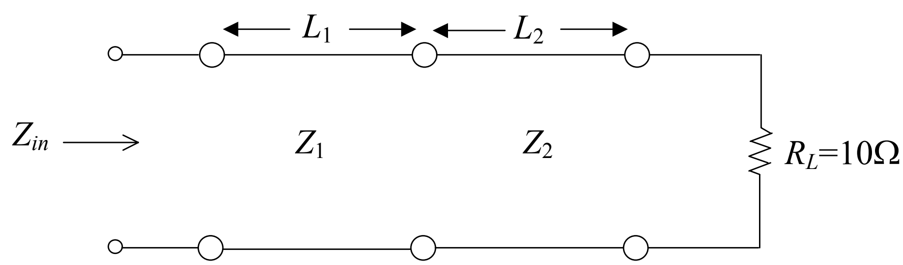

Fig. 6. Two-section impedance transformer: “coarse” model.

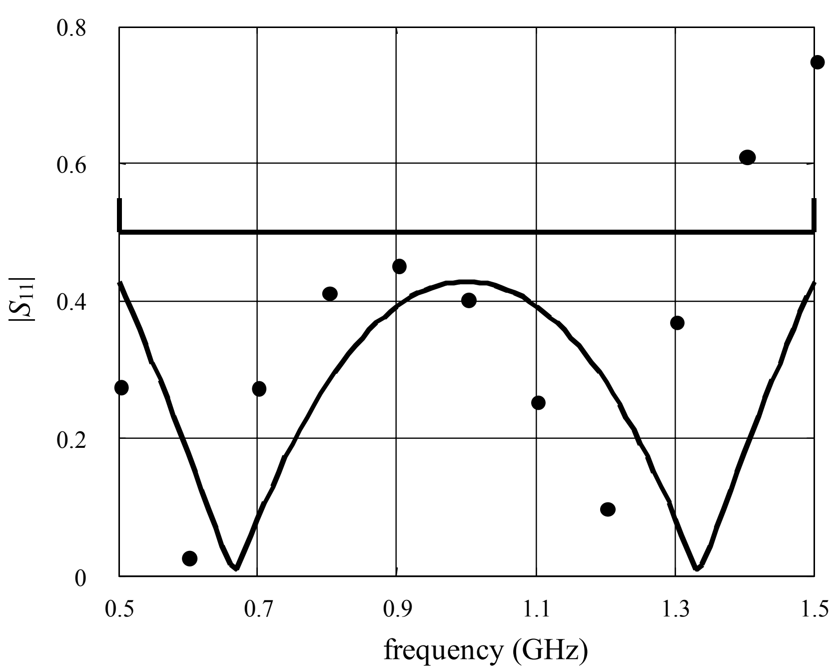

Fig. 7. Optimal coarse model target response (—), the fine model response at the starting point (•) for the capacitively loaded 10:1 transformer with L_1 and L_2 as the PSM coarse model parameters.

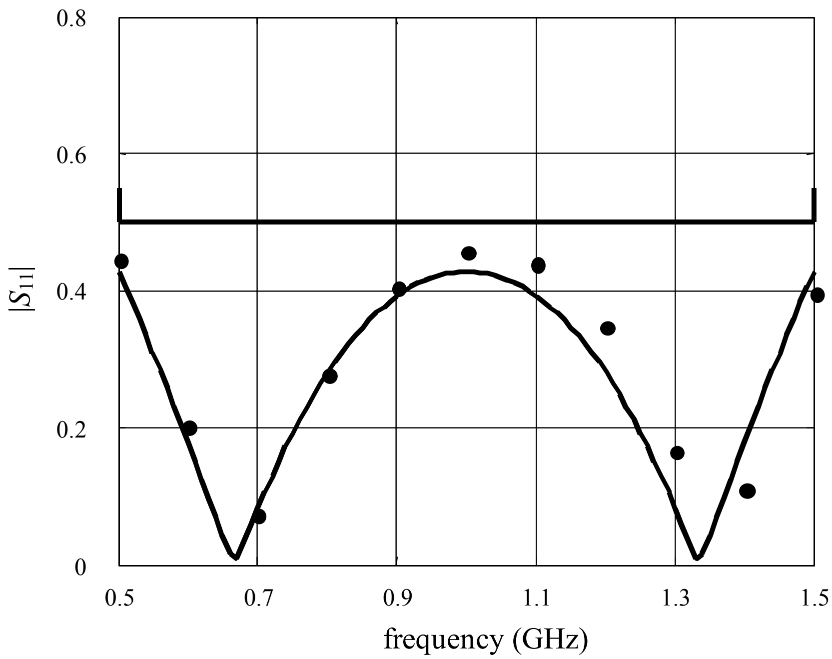

Fig. 8. Optimal coarse model target response (—), the fine model response at the final design (•) for the capacitively loaded 10:1 transformer with L_1 and L_2 as the PSM coarse model parameters.

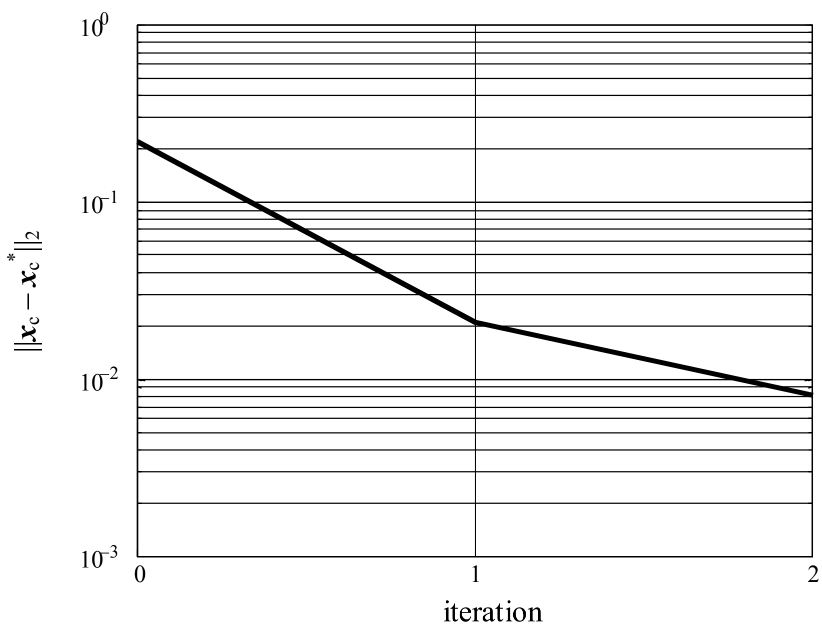

Fig. 9. $\|\boldsymbol{x}_c - \boldsymbol{x}_c^*\|_2$ versus iteration for the capacitively loaded 10:1 transformer with L_1 and L_2 as the PSM coarse model parameters.

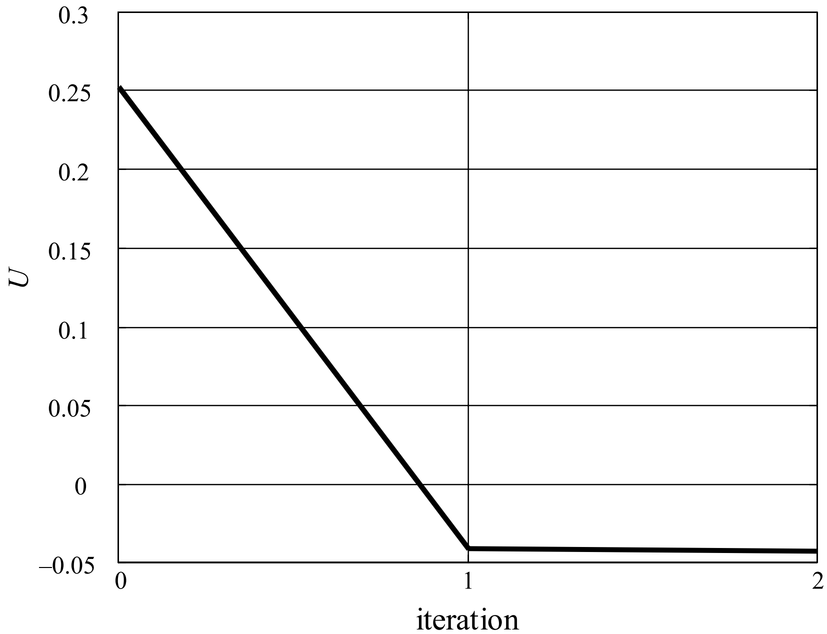

Fig. 10. U versus iteration for the capacitively loaded 10:1 transformer with L_1 and L_2 as the PSM coarse model parameters.

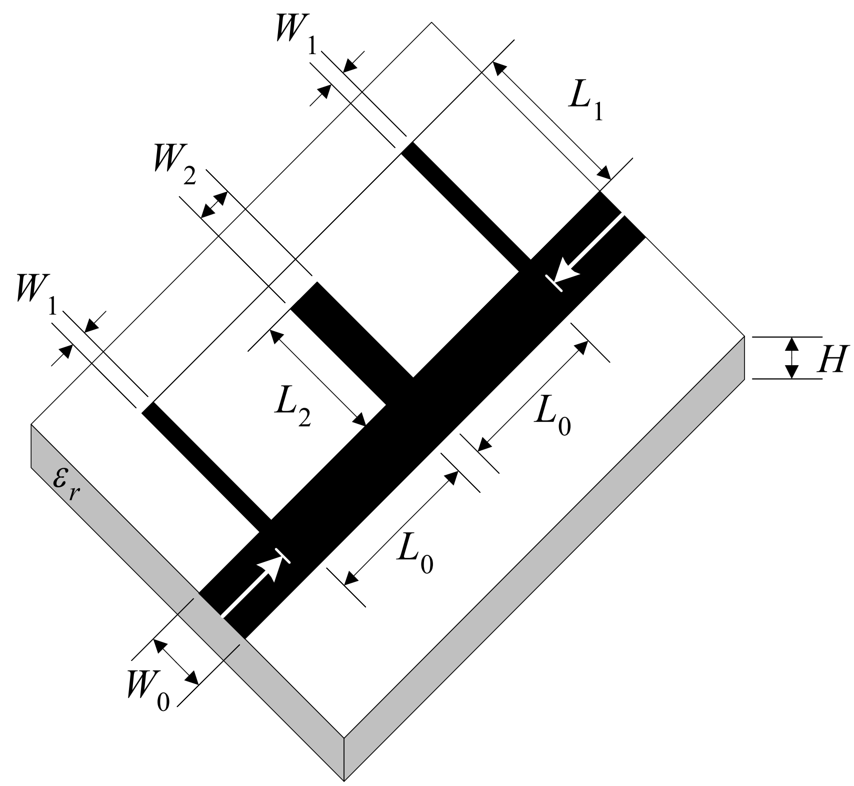

Fig. 11. "Fine" model for the bandstop microstrip filter with open stubs.

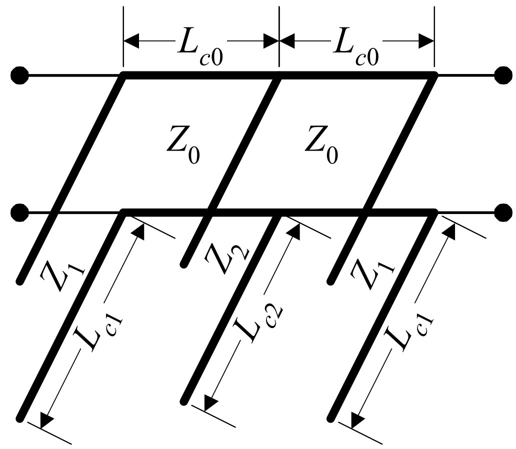

Fig. 12. "Coarse" model for the bandstop microstrip filter with open stubs.

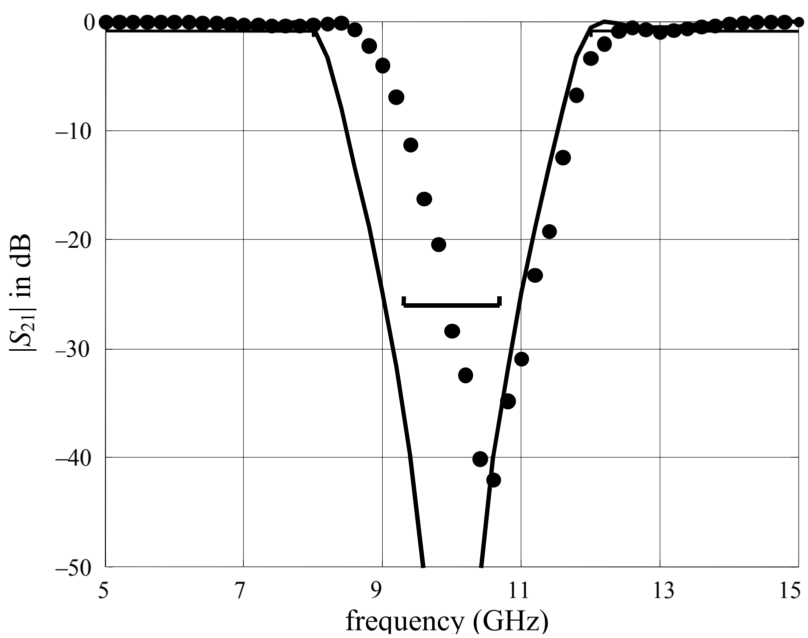

Fig. 13. Optimal OSA90/hope coarse target response (—) and ***em*** fine model response at the starting point (•) for the bandstop microstrip filter using a fine frequency sweep (51 points) with L_1 and L_2 as the PSM coarse model parameters.

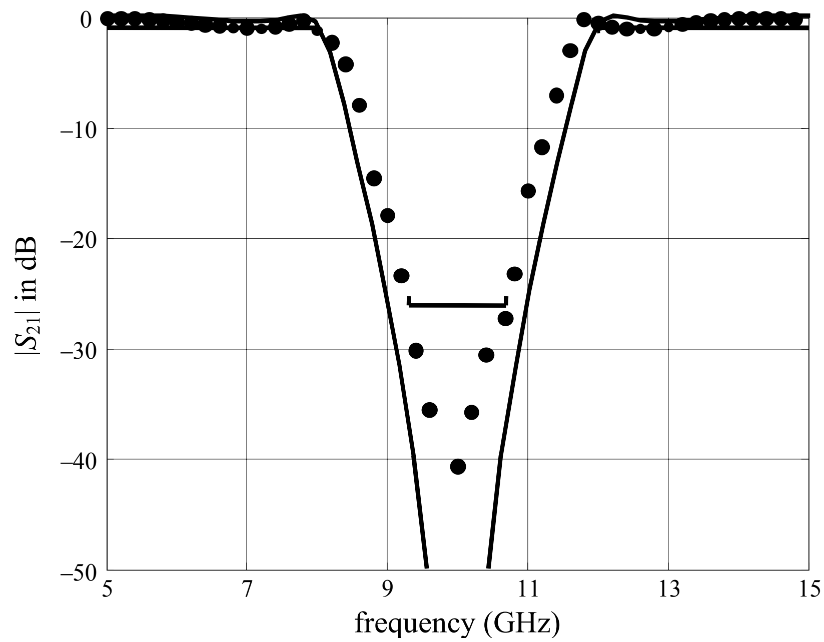

Fig. 14. Optimal OSA90/hope coarse target response (—) and ***em*** fine model response at the final design (•) for the bandstop microstrip filter using a fine frequency sweep (51 points) with L_1 and L_2 as the PSM coarse model parameters.

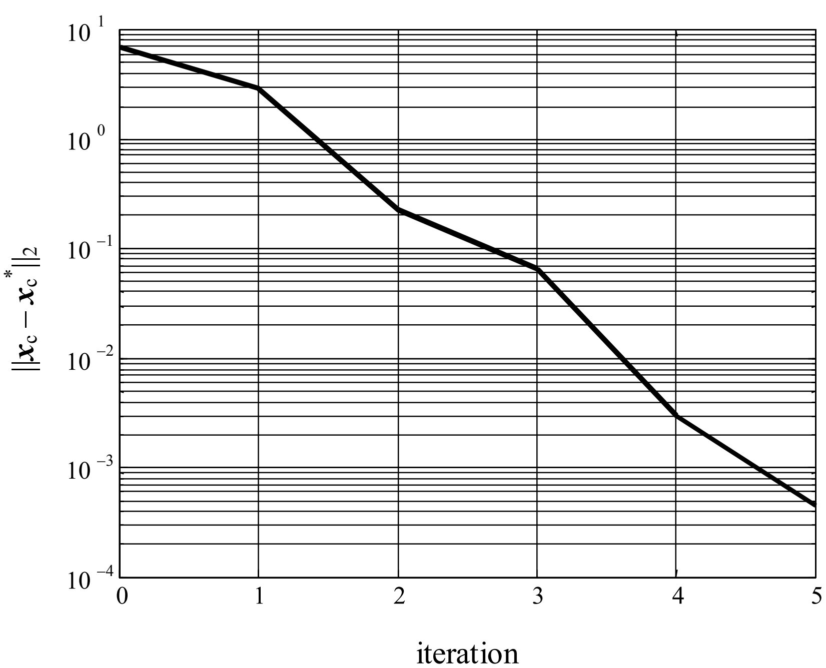

Fig. 15. $\|\boldsymbol{x}_c - \boldsymbol{x}_c^*\|_2$ versus iteration for the bandstop microstrip filter using L_1 and L_2 as the PSM coarse model parameters.

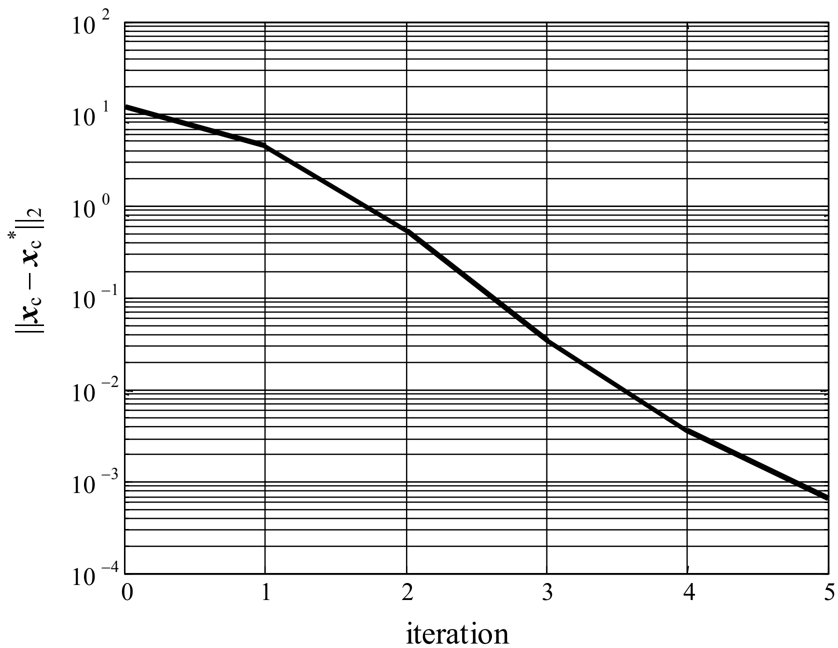

Fig. 16. $\|\boldsymbol{x}_c - \boldsymbol{x}_c^*\|_2$ versus iteration for the bandstop microstrip filter using a full mapping.