The only acceptable value of $|S_{14}|$ is then $1/\sqrt{2}$ which implies that $|S_{12}|=1/\sqrt{2}$. Substitution of $|S_{14}|=|S_{12}|=1/\sqrt{2}$ in (5) gives,

$$|s_{14'}| = \cos\frac{\psi}{2}$$

while the power transmission is:

$$|s_{14'}|^2 = \cos^2\frac{\psi}{2}$$

and $0\leq|s_{14'}|^2\leq 1$ for $0\leq\psi\leq\pi$.

For all other values of $0<|S_{14}|<1$

$$0 \leq |s_{14'}|^2 = 4|S_{14}|^2[1-|S_{14}|^2]\cos^2\frac{\psi}{2}$$

$< 1$ for $0\leq\psi\leq\pi$.

The phase angles of the scattering coefficients are given by

$$\measuredangle s_{14'} = \varphi_{12}+\varphi_{14}-\theta-\frac{\psi}{2} = \varphi_{12}+\varphi_{14}-\frac{(\theta+\phi)}{2}$$

$$\measuredangle s_{12'} = \tan^{-1}\frac{|S_{12}|^2\sin(2\varphi_{12}-\phi)+|S_{14}|^2\sin(2\varphi_{14}-\theta)}{|S_{12}|^2\cos(2\varphi_{12}-\phi)+|S_{14}|^2\cos(2\varphi_{14}-\theta)}$$

$$\measuredangle s_{34'} = \tan^{-1}\frac{|S_{12}|^2\sin(2\varphi_{12}-\theta)+|S_{14}|^2\sin(2\varphi_{14}-\phi)}{|S_{12}|^2\cos(2\varphi_{12}-\theta)+|S_{14}|^2\cos(2\varphi_{14}-\phi)}$$

and for $|S_{12}|=|S_{14}|=1/\sqrt{2}$ they reduce to

$$\measuredangle s_{14'}=\measuredangle s_{12'}\pm\pi=\measuredangle s_{34'}=\varphi_{12}+\varphi_{14}-\frac{(\theta+\phi)}{2}.$$

From a general viewpoint there are other possible interconnections of two directional couplers which still give a new directional coupler. These cases are being studied in a Master of Science thesis at Laval University, Quebec, Can., and will be publisher later.

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Authors wishing to present papers at the 1958 WESCON Convention to be held in Los Angeles, Calif., August 19–22, should send 100-word abstracts and either the complete text or a detailed summary to the Technical Program Committee Chairman:

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