with a uniform resistivity in space and with time.

The original impurity concentration in the substrate must be known; if two or more impurities are originally present they may be treated separately and the results superposed. The bulk resistivity of the deposited material near the final deposited surface must be known, either as inferred from knowledge of the behavior of the epitaxial deposition system or from direct measurement of the resistivity following deposition.[3] Lastly, the solutions must be used with some discretion and ingenuity in superposing the effects of more than one deposition or of several species of impurities.

Obviously, the end result is not an exact description of the structure but rather an engineering approximation to the actual impurity distributions, since drastic idealizations have been used in the analytical development. However, accounting for diffusion during epitaxy is informative as described here, and the accuracy of the accounting is consistent with the degree of control afforded by deposition systems and with available means of measurement of the properties of resulting devices.

ACKNOWLEDGMENT

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Correction

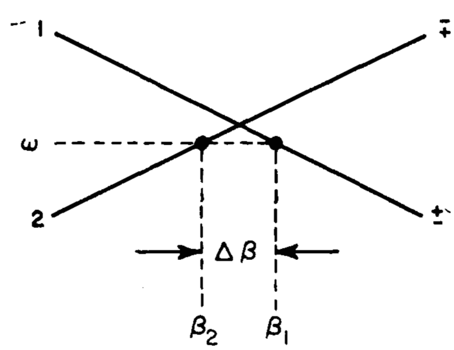
Casper W. Barnes, author of the paper "Conservative Coupling Between Modes of Propagation—a Tabular Summary," which appeared on pages 64–73, of the January, 1964, issue of PROCEEDINGS, has called the following to the attention of the Editor. Parts of the left-hand halves of Tables III, IV, VII, and VIII, were published incorrectly, and are reproduced on pages 296–299 as they should have appeared originally.

Table III

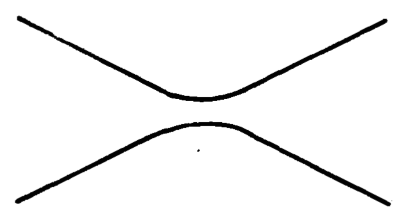
CONTRA-FLOW SKEW-HERMITIAN DIRECT COUPLING

Conditions $v_{g1}v_{g2} < 0$

$p_1 p_2 < 0$



ω-β Diagram (uncoupled)



ω-β Diagram (coupled)

Coupled Mode Equation

$$\frac{\partial}{\partial z}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega) \end{pmatrix} = -j\begin{pmatrix} \beta_1(\omega) & \kappa(\omega) \\ -\kappa^*(\omega) & \beta_2(\omega) \end{pmatrix}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega) \end{pmatrix}$$

General Solution (with + z-direction in direction of v_{g2})

$$a_1(z,\omega) = \left\{ a_1(L,\omega)\left[\frac{\cosh \gamma z - j(\Delta\beta/2\gamma)\sinh \gamma z}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right] e^{j(\beta_1 - \Delta\beta/2)L} + a_2(0,\omega)\left[\frac{j(\kappa/\gamma)\sinh \gamma(L-z)}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right]\right\} e^{-j(\beta_1 - \Delta\beta/2)z}$$

$$a_2(z,\omega) = \left\{ a_1(L,\omega)\left[\frac{i(\kappa^*/\gamma)\sinh \gamma z}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right] e^{j(\beta_2 + \Delta\beta/2)L} + a_2(0,\omega)\left[\frac{\cosh \gamma(L-z) - j(\Delta\beta/2\gamma)\sinh \gamma(L-z)}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right]\right\} e^{-j(\beta_2 + \Delta\beta/2)z}$$

where

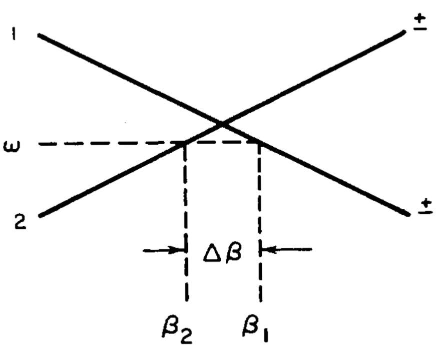
$$\gamma = [\kappa\kappa^* - (\Delta\beta/2)^2]^{1/2} \quad \text{and} \quad \Delta\beta = \beta_1 - \beta_2 .$$

Table IV

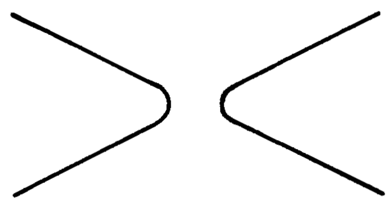
CONTRA-FLOW HERMITIAN DIRECT COUPLING

Conditions $v_{g1}v_{g2} < 0$

$p_1 p_2 > 0$



ω-β Diagram (uncoupled)



ω-β Diagram (coupled)

Coupled-Mode Equation

$$\frac{\partial}{\partial z}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega) \end{pmatrix} = -j\begin{pmatrix} \beta_1(\omega) & \kappa(\omega) \\ \kappa^*(\omega) & \beta_2(\omega) \end{pmatrix}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega) \end{pmatrix}$$

General Solution (with + z-direction in direction of v_{g2})

$$a_1(z,\omega) = \left\{ a_1(L,\omega)\left[\frac{\cos \xi z - j(\Delta\beta/2\xi)\sin \xi z}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right] e^{j(\beta_1-\Delta\beta/2)L} + a_2(0,\omega)\left[\frac{j(\kappa/\xi)\sin \xi(L-z)}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right]\right\} e^{-j(\beta_1-\Delta\beta/2)z}$$

$$a_2(z,\omega) = \left\{ a_1(L,\omega)\left[\frac{-j(\kappa^*/\xi)\sin \xi z}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right] e^{j(\beta_2+\Delta\beta/2)L} + a_2(0,\omega)\left[\frac{\cos \xi(L-z) - j(\Delta\beta/2\xi)\sin \xi(L-z)}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right]\right\} e^{-j(\beta_2+\Delta\beta/2)z}$$

where

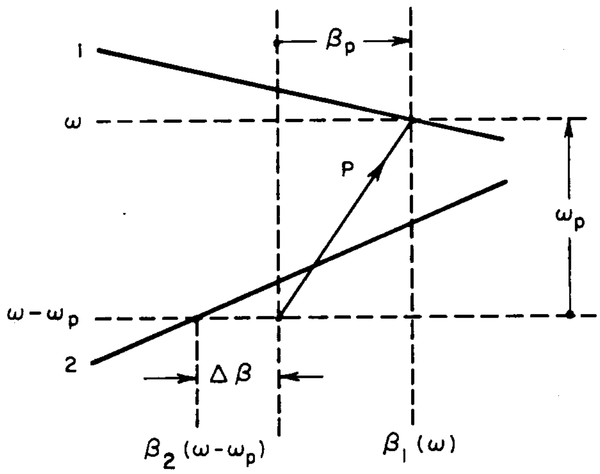
$$\xi = [\kappa\kappa^* + (\Delta\beta/2)^2]^{1/2} \quad \text{and} \quad \Delta\beta = \beta_1 - \beta_2 \quad .$$

Table VII

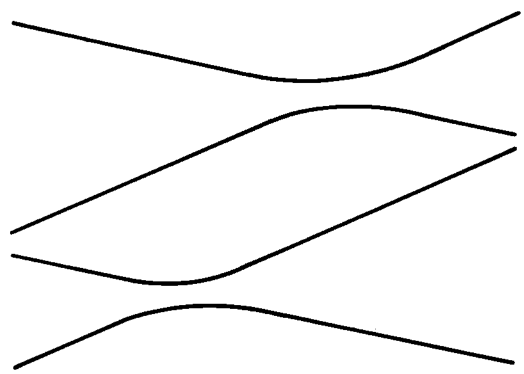
CONTRA-FLOW SKEW-HERMITIAN PARAMETRIC COUPLING

Conditions $v_{g1}v_{g2} < 0$

$p_1 p_2 \omega(\omega - \omega_p) < 0$



ω-β Diagram (uncoupled)



ω-β Diagram (coupled)

Coupled Mode Equation

$$\frac{\partial}{\partial z}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega-\omega_p) \end{pmatrix} = -j\begin{pmatrix} \beta_1(\omega) & \kappa(\omega)e^{-j\beta_p z} \\ -\kappa^*(\omega)e^{j\beta_p z} & \beta_2(\omega-\omega_p) \end{pmatrix}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega-\omega_p) \end{pmatrix}$$

General Solution (+ z-direction in direction of v_{g2})

$$a_1(z,\omega) = \left\{ a_1(L,\omega)\left[\frac{\cosh \gamma z - j(\Delta\beta/2\gamma)\sinh \gamma z}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right] e^{j(\beta_1-\Delta\beta/2)L} + a_2(0,\omega-\omega_p)\left[\frac{j(\kappa/\gamma)\sinh \gamma(L-z)}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right]\right\} e^{-j(\beta_1-\Delta\beta/2)z}$$

$$a_2(z,\omega-\omega_p) = \left\{ a_1(L,\omega)\left[\frac{j(\kappa^*/\gamma)\sinh \gamma z}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right] e^{j(\beta_2+\Delta\beta/2)L} + a_2(0,\omega-\omega_p)\left[\frac{\cosh \gamma(L-z) - j(\Delta\beta/2\gamma)\sinh \gamma(L-z)}{\cosh \gamma L - j(\Delta\beta/2\gamma)\sinh \gamma L}\right]\right\} e^{-j(\beta_2+\Delta\beta/2)z}$$

where

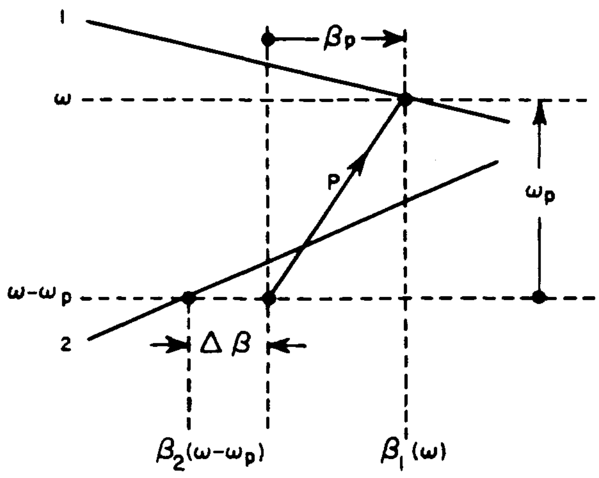
$$\gamma = [\kappa\kappa^* - (\Delta\beta/2)^2]^{1/2} \quad \text{and} \quad \Delta\beta = \beta_1(\omega) - \beta_2(\omega-\omega_p) - \beta_p \ .$$

Table VIII

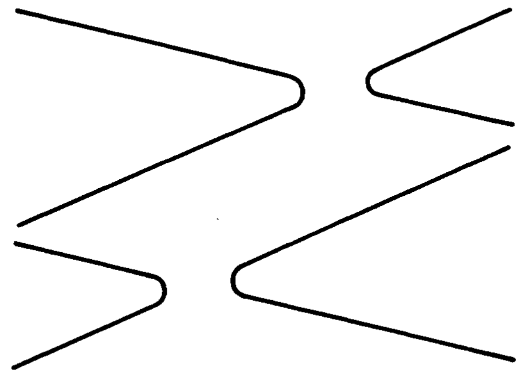
CONTRA-FLOW HERMITIAN PARAMETRIC COUPLING

Conditions $v_{g1}v_{g2} < 0$

$p_1 p_2 \omega(\omega - \omega_p) > 0$



ω-β Diagram (uncoupled)



ω-β Diagram (coupled)

Coupled Mode Equation

$$\frac{\partial}{\partial z}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega-\omega_p)\end{pmatrix} = -j\begin{pmatrix}\beta_1(\omega) & \kappa(\omega)e^{-j\beta_p z} \\ \kappa^*(\omega)e^{j\beta_p z} & \beta_2(\omega-\omega_p)\end{pmatrix}\begin{pmatrix} a_1(z,\omega) \\ a_2(z,\omega-\omega_p)\end{pmatrix}$$

General Solution (+ z-direction in direction of v_{g2})

$$a_1(z,\omega) = \left\{ a_1(L,\omega)\left[\frac{\cos \xi z - j(\Delta\beta/2\xi)\sin \xi z}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right] e^{j(\beta_1 - \Delta\beta/2)L} + a_2(0,\omega-\omega_p)\left[\frac{j(\kappa/\xi)\sin \xi(L-z)}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right]\right\} e^{-j(\beta_1-\Delta\beta/2)z}$$

$$a_2(z,\omega-\omega_p) = \left\{ a_1(L,\omega)\left[\frac{-j(\kappa^*/\xi)\sin \xi z}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right] e^{j(\beta_2 + \Delta\beta/2)L} + a_2(0,\omega-\omega_p)\left[\frac{\cos \xi(L-z) - j(\Delta\beta/2\xi)\sin \xi(L-z)}{\cos \xi L - j(\Delta\beta/2\xi)\sin \xi L}\right]\right\} e^{-j(\beta_2+\Delta\beta/2)z}$$

where

$\xi = [\kappa\kappa^* + (\Delta\beta/2)^2]^{1/2}$ and $\Delta\beta = \beta_1(\omega) - \beta_2(\omega - \omega_p) - \beta_p$.