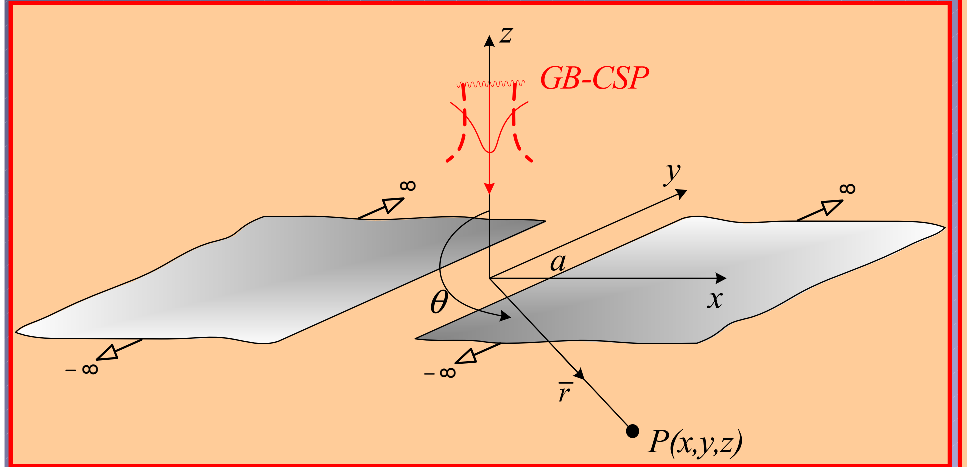
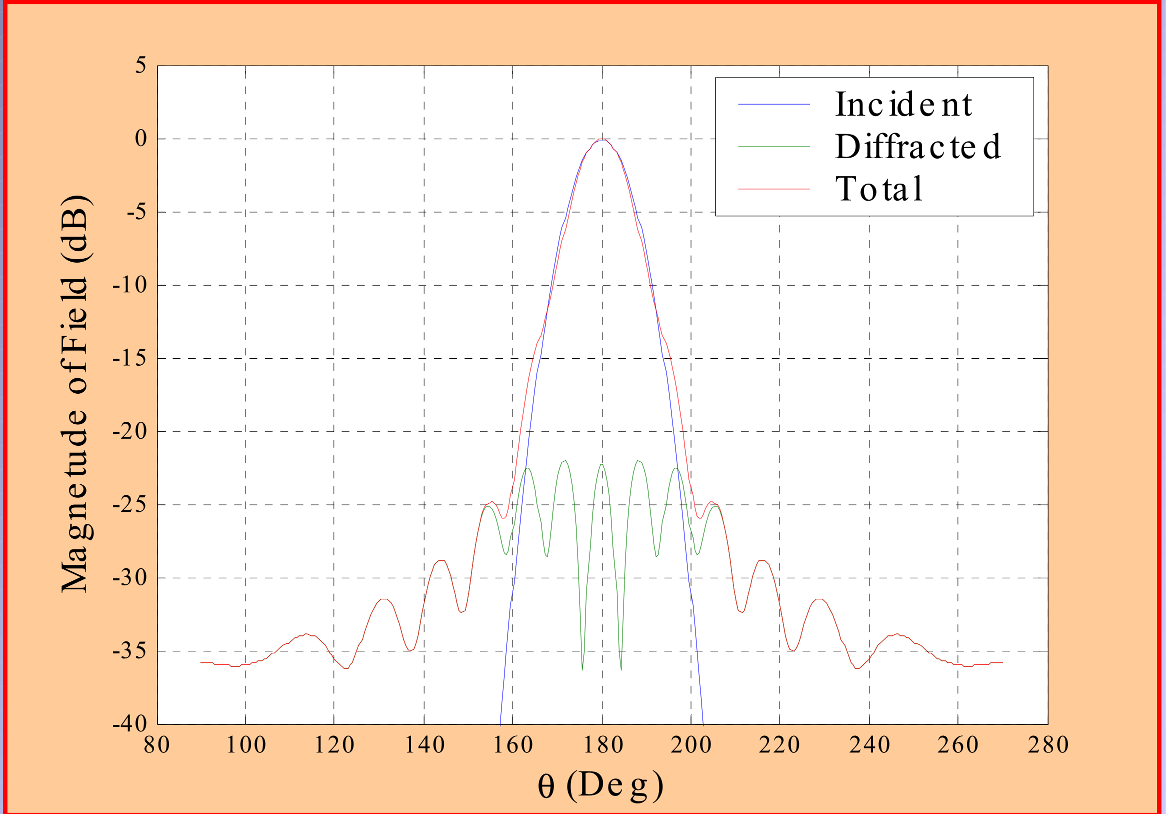
Infinite PEC slit excited by a 3D CSP-GB

- Hard acoustic field





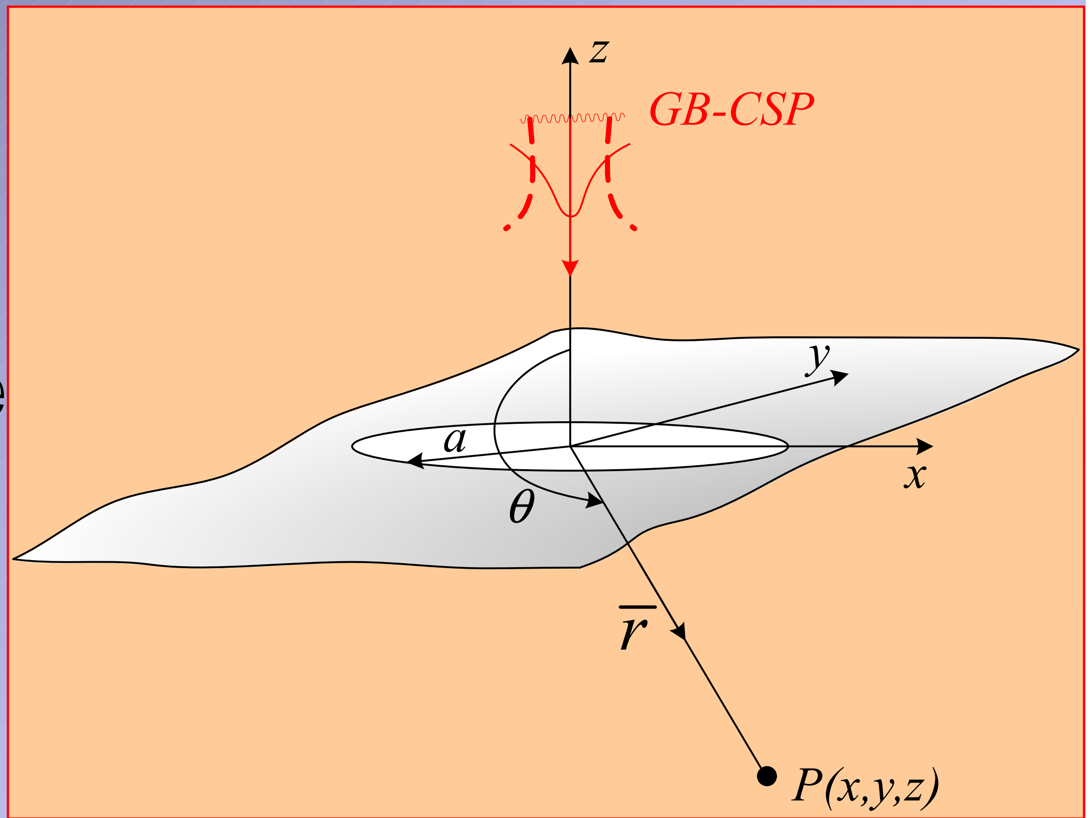
$x'=0,\ y'=0,\ z'=10\lambda,$

$b=60/k,\ w_0=0.87\lambda,\ a=3\lambda$

$\phi_b=0$ deg, and $\theta_b=180$ deg

Diffraction of a CSP-GB by a Circular Hole

- Hard Acoustic Field
- UTD solution fails at $\theta \rightarrow \pi$ the axial caustic
- Need the equivalent current solution to correct the UTD in the caustic region

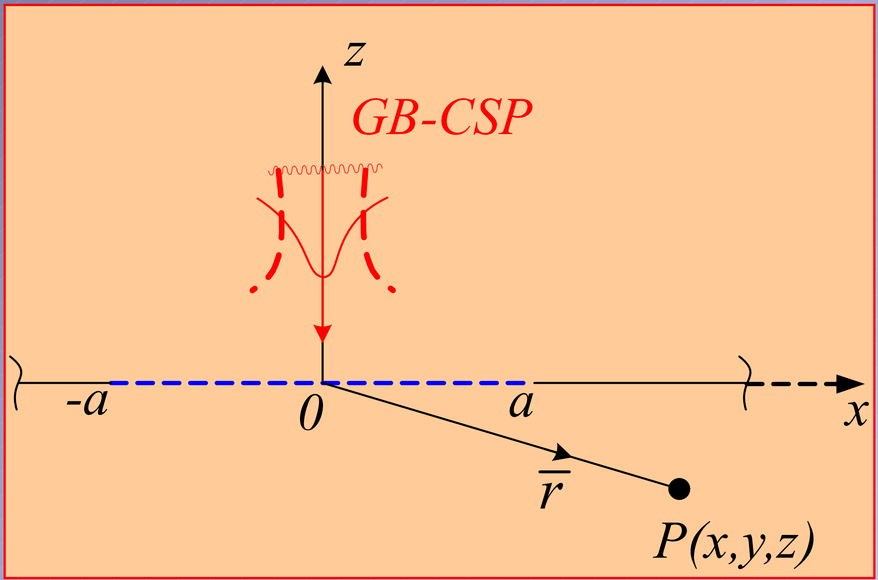


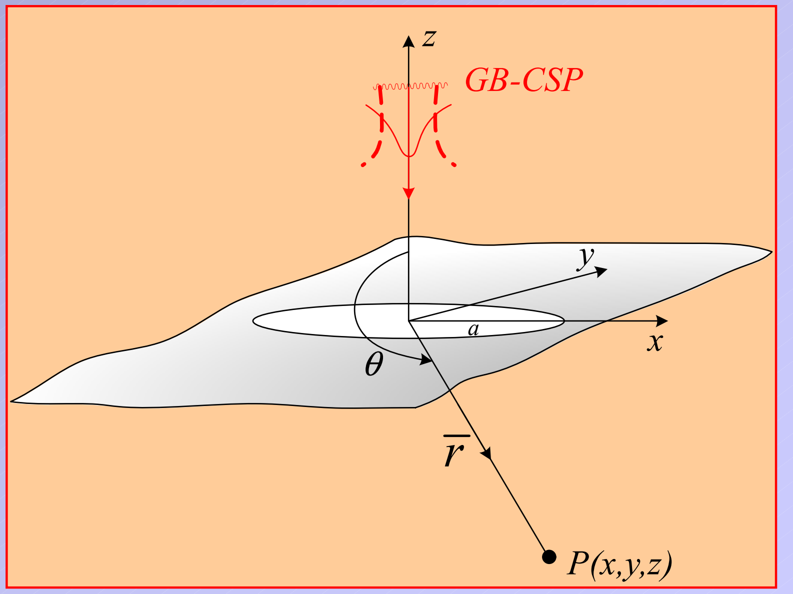
Diffraction of a CSP-GB by a Circular Hole (CONTD.)

$$\tilde{\bar{E}}_i(P) \approx j\frac{\omega\mu_0}{4\pi}\, p_e(\hat{R}\times\hat{R}\times\hat{p}_e)\frac{e^{-jk\tilde{R}_i}}{\tilde{R}_i}U_{si}(\phi_{si}-\phi)$$

$$\tilde{\bar{E}}_d(P)\approx j\frac{\omega\mu_0}{4\pi}\, p_e(\hat R\times\hat R\times\hat p_e)\cdot\bar{\bar{D}}(\tilde L,\tilde a^\pm,\tilde\beta_0)\sqrt{\frac{\rho_c}{\tilde s_d(\tilde s_d+\rho_c)}}\,\frac{e^{-jk(\tilde s_i+\tilde s_d)}}{\tilde s_i}$$

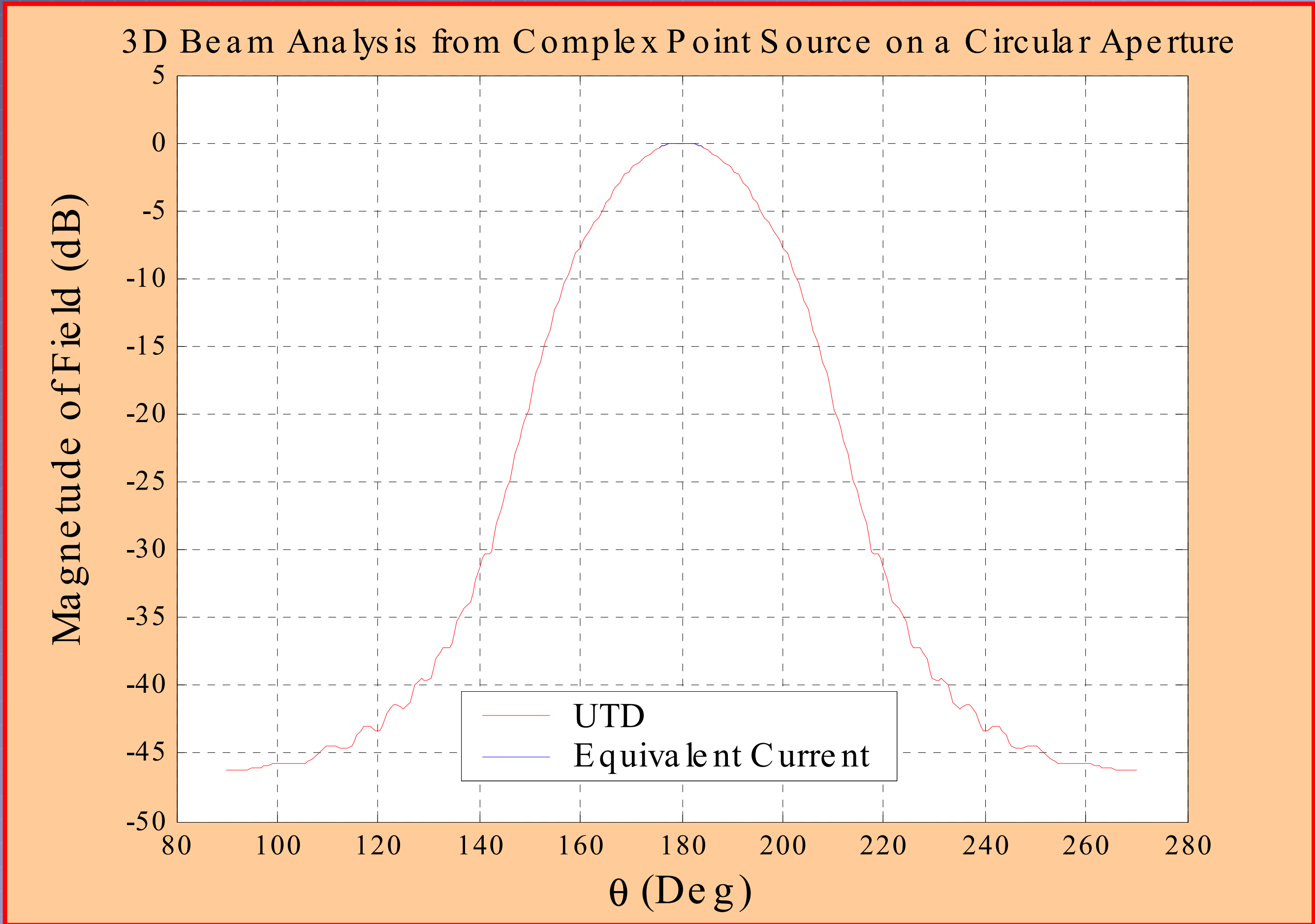
$$\tilde{\bar E}_d(P)=\tilde{\bar E}_e^d+\tilde{\bar E}_m^d=\frac{-jk}{4\pi}\int_0^{2\pi}\left\{Z_0\hat R\times\hat R\times\tilde I_e(\ell')\hat\ell'+\hat R\times\tilde I_m(\ell')\hat\ell'\right\}\frac{e^{-jk\tilde R}}{\tilde R}d\ell'$$

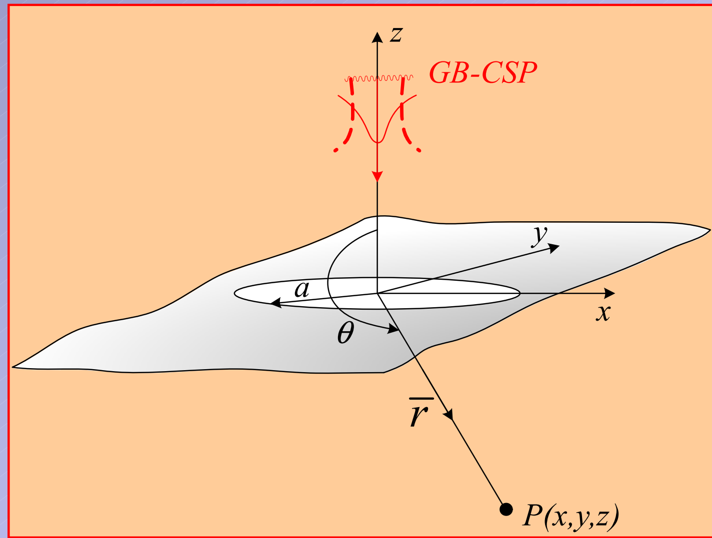




Numerical Results

- Scalar Acoustic 3D Total Field from CSP excited Circular Aperture in a Hard Screen



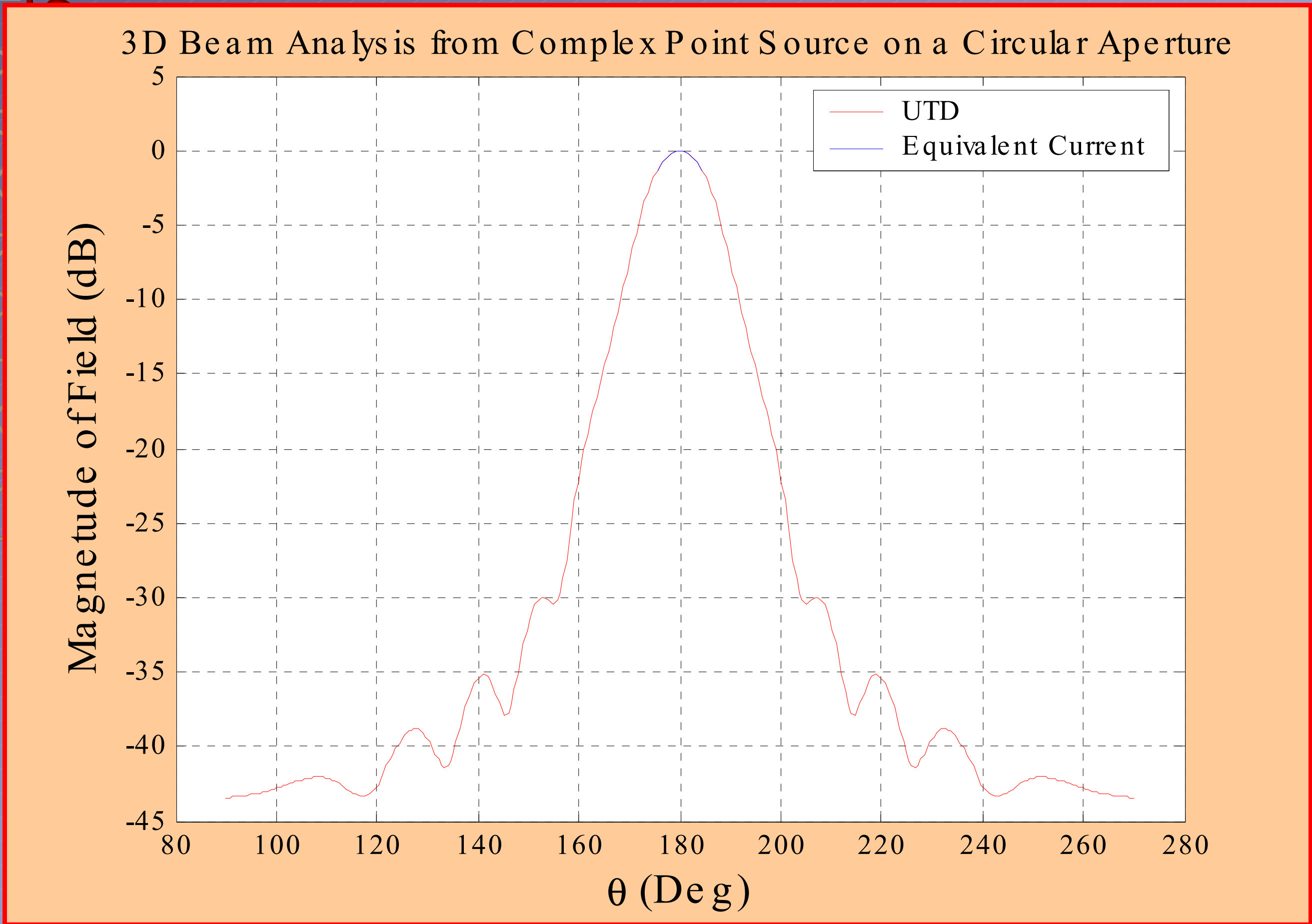


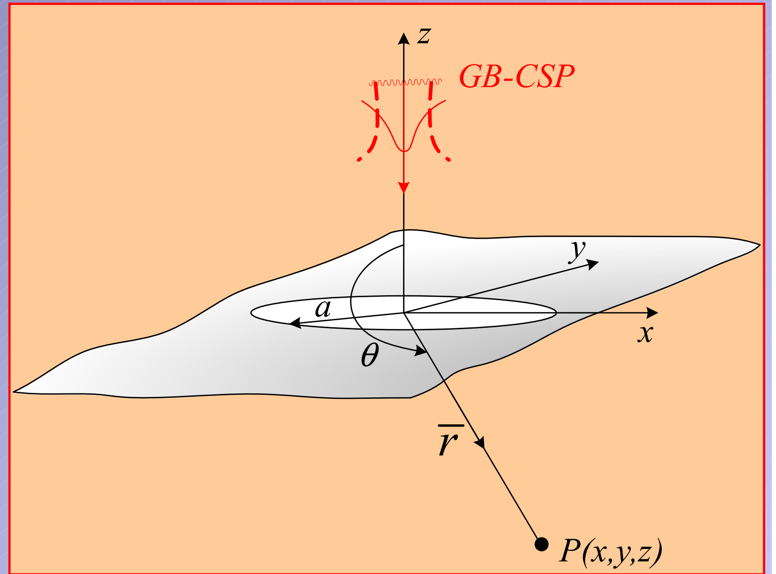
$a=10\lambda$, $z'=10\lambda$,
$b=15/k$, $2w_0=0.6\lambda$

Numerical Results

(CONTD.)

- Scalar Acoustic 3D Total Field from CSP excited Circular Aperture in a Hard Screen





$a=3\lambda$, $z'=8\lambda$, $b=50/k$, $2w_0=1.6\ \lambda$

Wider Beam Waist & Smaller Aperture

Conclusion

- Astigmatic GB is obtained by using an analytic continuation of an astigmatic GO field.
- 3D rotationally symmetric GB is obtained by a CSP method.
- Current work shows the preliminary results for UTD based rotationally symmetric GB diffraction by 3D edge.

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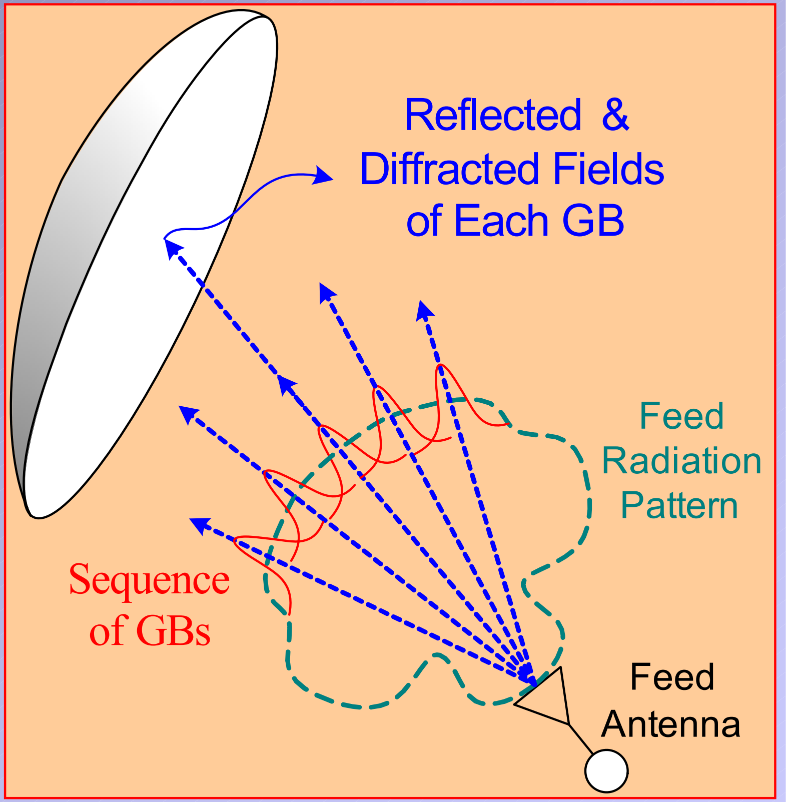
Future Work

- 3D Analysis of General Astigmatic GB for PEC edge is in progress.
- Work is in progress to provide additional improvement to PO based GB analysis of large reflectors*.
- Study applications to Millimeter Wave Components and Optics.
- Use of GBs to speed up MoM for large scale problems (Koray Tap).



[*] H.-T. Chou, P. H. Pathak, and R. J. Burkholder , "Novel Gaussian Beam Method for the Rapid Analysis Large Reflector Antennas," IEEE Trans. AP, June 2001