Çankaya University – ECE Department – ECE 635

2011 Autumn Term **29.11.2011**

Experiment 5 : Finding the receiver field for hyperbolic / sinusoidal Gaussian beams via HF integral and plotting intensity receiver intensity profiles against variations in source and medium parameters

1. By using the new copy of ECE 635_Eylul 2011.pdf and the derivation steps given there, derive the receiver field expression for fundamental sinusoidal/hyperbolic Gaussian beams both in cylindrical and Cartesian coordinates. Verify that your solution in cylindrical coordinates matches the following

$$u_r\left(r,\phi_r,z\right)=\sum_{\ell=1}^{2}\frac{A_\ell}{1+2j\alpha_\ell z}\exp\left[-\frac{k\alpha_\ell r^2-\left(\cos\phi_r+\sin\phi_r\right)rD_{s\ell}-jk^{-1}D_{s\ell}^2 z}{1+2j\alpha_\ell z}\right] \qquad (1)$$

   You can use above equation for conversion into Cartesian coordinates or undertake a separate derivation.
2. By replacing the source field expression in Beamtypes1.m file with (1) from above, plot the receiver field intensity profile for Gaussian, cos Gaussian, cosh Gaussian, sine Gaussian, sinh Gaussian and annular Gaussian beams for two different source and parameter settings.
3. Note the following settings for $A_1, A_2, D_{s1}, D_{s2}, \alpha_{s1}, \alpha_{s1}$ for different beam types.

	Beam type					
Parameter	Gaussian	Annular Gaussian	Cosh Gaussian	Cos Gaussian	Sine Gaussian	Sinh Gaussian
A_1	1	1	1	1	j	1
A_2	0	≥ -1	1	1	$-j$	-1
D_1	0	0	>0 real	>0 imaginary	>0 imaginary	>0 real
D_2	0	0	<0 real	<0 imaginary	<0 imaginary	<0 real
α_{s1}	α_{s1}	α_{s1}	α_{s1}	α_{s1}	α_{s1}	α_{s1}
α_{s2}		$<\alpha_{s1}$	α_{s1}	α_{s1}	α_{s1}	α_{s1}

4. Include your comments and graphs for the experiment in your notebook