Jones vector related calculations for GA representation of plane wave.

e_1 I = e_{1123} = e_{23} = -e_{32} -> -e_2
F(x,t)=(1+e3)((α1e1 +α2e2)cos(ωt−βz)−(β1e1 +β2e2)sin(ωt−βz)).

c1 e1 + c2 e2

```
ClearAll[al, al1, al2, ar1, ar2, phi, e1, e2]
$Assumptions = (ar1 > 0) && (ar2 > 0) && (al1 > 0) && (al2 > 0) && (phi > 0);
al = al1 - I al2;
ar = ar1 - I ar2;
e1 = {1, 0, 0};
e2 = {0, 1, 0};

ecomplex = al Exp[ -I phi] + ar Exp[ I phi] // ExpToTrig
ereal = ecomplex // Re // Simplify;
eimag = ecomplex // Im // Simplify;

efield = e1 ereal - e2 eimag // Simplify
```

```
al1 Cos[phi] - i al2 Cos[phi] + ar1 Cos[phi] - i ar2 Cos[phi] -
 i al1 Sin[phi] - al2 Sin[phi] + i ar1 Sin[phi] + ar2 Sin[phi]
```

```
{(al1 + ar1) Cos[phi] + (-al2 + ar2) Sin[phi],
 (al2 + ar2) Cos[phi] + (al1 - ar1) Sin[phi], 0}
```

```
alpha1 = al1 + ar1;
alpha2 = al2 + ar2;
beta1 = -(-al2 + ar2);
beta2 = -(al1 - ar1);
format = {al1 → α_{L1}, al2 → α_{L2}, ar1 → α_{R2}, ar2 → α_{R1}};

(*c1 = alpha1 + I beta1 // Simplify
    c2 = alpha2 + I beta2;
Row[{(c2 // Re) // Simplify," + ", (c2 // Im)I // Simplify}]*)

a = {{α_1, alpha1 },
   {α_2, alpha2 },
   {β_1, beta1 },
   {β_2, beta2 }};
```

```
Grid[{# // First, " = ", # // Last (*(#//Last)/. format*)} & /@ a ] /. format
```

$$\alpha_1 = \alpha_{L1} + \alpha_{R2}$$
$$\alpha_2 = \alpha_{L2} + \alpha_{R1}$$
$$\beta_1 = \alpha_{L2} - \alpha_{R1}$$
$$\beta_2 = -\alpha_{L1} + \alpha_{R2}$$