$$ {}^{0}\overbrace{\sharp F} = \int_{dy}^{-1|1} \frac{\left(1-y^2\right)^{\ell-2}}{\left(1+y^2\right)^{\ell/2-1}} \overbrace{-iy}^{n} \; {}^{0}\overbrace{\frac{\partial^n}{n!} \underbrace{\overbrace{1-x^2}^{n-\ell/2-1} \overbrace{1-ixy}^{-n} {}^{iy}\overbrace{\mathfrak{g}_x \ltimes F}}} $$

$$ = \int_{dy}^{-1|1} \frac{\left(1-y^2\right)^{\ell-2}}{\left(1+y^2\right)^{\ell/2-1}} \overbrace{-iy}^{m+n} \; {}^{0}\overbrace{\frac{\partial^n}{n!} \underbrace{\overbrace{1-x^2}^{m+n-\ell/2-1} \overbrace{1-ixy}^{-n} \overbrace{1+ixy}^{-m} {}^{x}\overbrace{\partial^m F}}} $$

$$ {}^{iy}\overbrace{\mathfrak{g}_x \ltimes H} = \frac{iy\overbrace{1-x^2}}{1+ixy}^{n} \frac{{}^{x}\overbrace{\partial_z^n H}}{n!} = \frac{y\overbrace{1-x^2}}{1+ixy}^{n} i^n \frac{{}^{x}\overbrace{\partial_z^n H}}{n!} = \frac{y^n\left(1-x^2\right)^n}{\left(1+ixy\right)^n} \frac{{}^{x}\overbrace{\partial_y^n H}}{n!} $$

$$ \frac{1+ixy}{1+x^2y^2} = \frac{1}{1-ixy} = \frac{1-\bar{z}x}{1-x^2} $$

$$ \int_{dx}^{\mathbb{R}B} \frac{\left(1-x^2\right)^{\ell/2}}{1-x^2} {}^{x}\bar{\Phi} \; {}^{x}\overbrace{\sharp F} = \int_{dz}^{\mathbb{C}B} \frac{\left(1-z\bar{z}\right)^{\ell}}{\left(1-z\bar{z}\right)^{2}} {}^{z}\bar{\Phi} \; \overbrace{1-z^2}^{-\ell/2} \; {}^{z}F $$

$$ = \int_{dx}^{B_{\mathbb{R}}} \overbrace{1-x^2}^{-1} \int_{dy}^{-1|1} \frac{1+y^2}{\left(1-y^2\right)^2} \; {}^{iy}\overbrace{\mathfrak{g}_x \ltimes \bar{\Phi} F} \; \frac{\left(1-x^2\right)^{\ell}\left(1-y^2\right)^{\ell}}{\left(1+x^2y^2\right)^{\ell}} \frac{\left(1+ixy\right)^{\ell}}{\left(1-x^2\right)^{\ell/2}\left(1+y^2\right)^{\ell/2}} $$

$$ = \int_{dx}^{B_{\mathbb{R}}} \overbrace{1-x^2}^{\ell/2-1} \int_{dy}^{-1|1} \frac{\left(1-y^2\right)^{\ell-2}}{\left(1+y^2\right)^{\ell/2-1}} \frac{\left(1-\bar{z}x\right)^{\ell}}{\left(1-x^2\right)^{\ell}} \; {}^{iy}\overbrace{\mathfrak{g}_x \ltimes \bar{\Phi} F} = \int_{dx}^{B_{\mathbb{R}}} \overbrace{1-x^2}^{-\ell/2-1} \int_{dy}^{-1|1} \frac{\left(1-y^2\right)^{\ell-2}}{\left(1+y^2\right)^{\ell/2-1}} \; {}^{iy}\overbrace{\mathfrak{g}_x \ltimes \overline{\Delta_x^{\ell}\Phi} F} $$

$$ = \int_{dx}^{B_{\mathbb{R}}} \overbrace{1-x^2}^{n-\ell/2-1} \frac{{}^{x}\overline{\partial^n \Delta_x^{\ell}\Phi}}{n!} \int_{dy}^{-1|1} \frac{\left(1-y^2\right)^{\ell-2}}{\left(1+y^2\right)^{\ell/2-1}} \overbrace{1-ixy}^{-n} \overbrace{-iy}^{n} \; {}^{iy}\overbrace{\mathfrak{g}_x \ltimes F} $$

$$ = \int_{dy}^{-1|1} \frac{\left(1-y^2\right)^{\ell-2}}{\left(1+y^2\right)^{\ell/2-1}} \overbrace{-iy}^{n} \int_{dx}^{B_{\mathbb{R}}} {}^{x}\Delta_x^{\ell} \; {}^{x}\bar{\Phi} \frac{1}{n!} \; {}^{x}\overbrace{\partial^n \underbrace{\overbrace{1-x^2}^{n-\ell/2-1} \overbrace{1-ixy}^{-n} {}^{iy}\overbrace{\mathfrak{g}_x \ltimes F}}} $$

$$ \Rightarrow {}^{x}\overbrace{\sharp F} = {}^{x}\Delta_x^{\ell} \int_{dy}^{-1|1} \frac{\left(1-y^2\right)^{\ell-2}}{\left(1+y^2\right)^{\ell/2-1}} \overbrace{-iy}^{n} \; {}^{x}\overbrace{\frac{\partial^n}{n!} \underbrace{\overbrace{1-x^2}^{n-\ell/2-1} \overbrace{1-ixy}^{-n} {}^{iy}\overbrace{\mathfrak{g}_x \ltimes F}}} $$

$$\underset{z=\zeta\mathfrak{g}_w}{=} \int_{dw}^{\mathbb{R}^D} {}^{w}_{\mathbb{C}}\Delta_w^{-p/2} \int_{d\mu_0(z)}^{\pi^{-1}(0)} {}^{\zeta\mathfrak{g}_w}_{\mathbb{C}}\Delta^{\ell}_{\zeta\mathfrak{g}_w} \, {}^{\zeta\mathfrak{g}_w}\bar{\Phi} \, {}^{\zeta\mathfrak{g}_w}_{\mathbb{C}}\Delta^{-\ell/2}_{\bar{\zeta}\mathfrak{g}_w} \, {}^{\zeta\mathfrak{g}_w}F = \int_{dw}^{\mathbb{R}^D} {}^{w}_{\mathbb{C}}\Delta_w^{-p/2} \int_{d\mu_0(\zeta)}^{\pi^{-1}(0)} {}^{\zeta\mathfrak{g}_w}_{\mathbb{C}}\Delta^{\ell}_{\zeta\mathfrak{g}_w} \, {}^{\zeta\mathfrak{g}_w}\bar{\Phi} \, {}^{\zeta\mathfrak{g}_w}_{\mathbb{C}}\Delta^{-\ell/2}_{\bar{\zeta}\mathfrak{g}_w} \, {}^{\zeta\mathfrak{g}_w}F$$

$$= \int_{dw}^{\mathbb{R}^D} {}^{w}_{\mathbb{C}}\Delta_w^{-\ell/2-p/2} \int_{d\mu_0(\zeta)}^{\pi^{-1}(0)} {}^{\zeta}_{\mathbb{C}}\Delta^{\ell}_{\zeta} \, {}^{\zeta}_{\mathbb{C}}\Delta^{-\ell/2}_{\bar{\zeta}} \, {}^{\bar{\zeta}\mathfrak{g}_w}_{\mathbb{C}}\Delta^{\ell}_{w} \, {}^{\zeta\mathfrak{g}_w}\bar{\Phi} \, {}^{\zeta\mathfrak{g}_w}F = \int_{dw}^{\mathbb{R}^D} {}^{w}_{\mathbb{C}}\Delta_w^{-\ell/2-p/2} \int_{d\mu_0(\zeta)}^{\pi^{-1}(0)} {}^{\zeta}_{\mathbb{C}}\Delta^{\ell}_{\zeta} \, {}^{\zeta}_{\mathbb{C}}\Delta^{-\ell/2}_{\bar{\zeta}} \, {}^{\zeta}\overbrace{\mathfrak{g}_w \ltimes \underbrace{\Delta_w^{\ell}\bar{\Phi}F}}$$