$$\frac{\Gamma_{n+1+ra/2}\Gamma_{n+1+d/r}}{\Gamma_{n+1+a/2}}\int\limits_{du}^{S_1}{}^a\mathcal{E}_u^m\,\underset{\sim}{u\overset{*}{u}w}\,{}^u\underset{-}{\mathcal{E}}_b^n=\frac{p}{2}\underset{\sim}{w\boldsymbol{\curlywedge}b}\,{}^a\mathcal{E}_b^n+a\boldsymbol{\curlywedge}\underset{\sim}{b\overset{*}{w}b}\,{}^a\mathcal{E}_b^{n-}$$

$$\underset{\sim}{u\overset{*}{u}w}\,{}^u\underset{-}{\mathcal{E}}_b^{n+}=\underset{\sim}{u\overset{*}{u}w}\boldsymbol{\curlywedge}b\,{}^u\mathcal{E}_b^n=u\boldsymbol{\curlywedge}\underset{\sim}{u\overset{*}{w}b}\,{}^u\mathcal{E}_b^n=\overbrace{u\boldsymbol{\curlywedge}e_i}\,\underset{\sim}{e_i\overset{*}{b}w}\boldsymbol{\curlywedge}u\,{}^u\mathcal{E}_b^n$$

$$\text{LHS}\;=\;\overbrace{{}^z\mathcal{E}_a^m z\boldsymbol{\curlywedge}\underset{\sim}{e_i\overset{*}{b}w}}\boldsymbol{\curlywedge}\overbrace{\underset{\sim}{z\boldsymbol{\curlywedge}e_i}\,{}^z\mathcal{E}_b^n}\;=\;{}^z\mathcal{E}_a^m\boldsymbol{\curlywedge}\overbrace{\underset{\sim}{e_i\overset{*}{b}w}\,\underset{\sim}{z\boldsymbol{\curlywedge}e_i}\,{}^z\mathcal{E}_b^n}$$

$$=\;{}^z\mathcal{E}_a^m\boldsymbol{\curlywedge}\overbrace{\underset{\sim}{e_i\overset{*}{b}w}\boldsymbol{\curlywedge}e_i\,{}^z\mathcal{E}_b^n+z\boldsymbol{\curlywedge}e_i\underset{\sim}{e_i\overset{*}{b}w}\boldsymbol{\curlywedge}b\,{}^z\mathcal{E}_b^{n-}}\;=\;\underset{\sim}{e_i\overset{*}{b}w}\boldsymbol{\curlywedge}e_i\,{}^a\mathcal{E}_b^n+a\boldsymbol{\curlywedge}e_i\,\underset{\sim}{e_i\overset{*}{b}w}\boldsymbol{\curlywedge}b\,{}^a\mathcal{E}_b^{n-}\;=\;\text{RHS}$$

$$\int\limits_{dx}{}^a\mathcal{E}_x^m\,\underset{\sim}{x\overset{*}{u}w}\,{}^x\underset{-}{\mathcal{E}}_b^{n+}=\int\limits_{dt}^{\mathbb{R}^>}\delta\left(t\right)\sqrt{t}^{m+n+}\int\limits_{du}^{S_1}{}^a\mathcal{E}_u^m\,\underset{\sim}{u\overset{*}{u}w}\,{}^u\underset{-}{\mathcal{E}}_b^n$$

$$=\frac{\Gamma_{n+1+a/2}}{\Gamma_{n+1+ra/2}\Gamma_{n+1+d/r}}\left(\frac{p}{2}\underset{\sim}{w\boldsymbol{\curlywedge}b}\,{}^a\mathcal{E}_b^n+a\boldsymbol{\curlywedge}\underset{\sim}{b\overset{*}{w}b}\,{}^a\mathcal{E}_b^{n-}\right)\int\limits_{dt}^{\mathbb{R}^>}\delta\left(t\right)t^{n+\,1/2}$$

$${}^a\overbrace{P\,\underset{\sim}{x\overset{*}{u}w}\,{}^x\underset{-}{\mathcal{E}}_b^{n+}}=\int\limits_{dx}\frac{{}^a\mathcal{E}_x^m}{\Gamma_{m+a/2}}\underset{\sim}{x\overset{*}{u}w}\,{}^x\underset{-}{\mathcal{E}}_b^{n+}=\frac{\Gamma_{n+1+a/2}}{\Gamma_{n+1+ra/2}\Gamma_{n+1+d/r}\Gamma_{n+a/2}}\left(\frac{p}{2}\underset{\sim}{w\boldsymbol{\curlywedge}b}\,{}^a\mathcal{E}_b^n+a\boldsymbol{\curlywedge}\underset{\sim}{b\overset{*}{w}b}\,{}^a\mathcal{E}_b^{n-}\right)\int\limits_{dt}^{\mathbb{R}^>}\delta\left(t\right)t^{n+\,1/2}$$

$$=\left(n+\frac{a}{2}\right)\frac{\Gamma_{n+1/2+ra/2}\Gamma_{n+1/2+d/r}}{\Gamma_{n+1+ra/2}\Gamma_{n+1+d/r}}\left(\frac{p}{2}\underset{\sim}{w\boldsymbol{\curlywedge}b}\,{}^a\mathcal{E}_b^n+a\boldsymbol{\curlywedge}\underset{\sim}{b\overset{*}{w}b}\,{}^a\mathcal{E}_b^{n-}\right)$$

$$\Delta_w = e_i \overset{*}{\boxtimes} \underbrace{w\overset{*}{e}_i x}\, {}^{x}\underline{\underline{\mathcal{E}^{n+}_b}} = \underbrace{w\overset{*}{e}_i x}\, \underline{e_i\, {}^{x}\mathcal{E}^{n+}_b} = \underbrace{w\overset{*}{e}_i x}\, \underline{\overbrace{e_i \overset{*}{\boxtimes} b}\, {}^{x}\mathcal{E}^{n}_b} = \overbrace{e_i \overset{*}{\boxtimes} b}\, \underbrace{w\overset{*}{e}_i x}\, \underline{{}^{x}\mathcal{E}^{n}_b}$$

$$= \overbrace{e_i \overset{*}{\boxtimes} b}\, \underbrace{\overbrace{w\overset{*}{e}_i x \overset{*}{\boxtimes} b}\, {}^{x}\mathcal{E}^{n-}_b} = \overbrace{x \overset{*}{\boxtimes} \underbrace{b\overset{*}{w}b}\, {}^{x}\mathcal{E}^{n-}_b}$$

$$\partial_w = w\, {}^{x}\underline{\mathcal{E}^{n+}_b} = \overbrace{w \overset{*}{\boxtimes} b}\, {}^{x}\mathcal{E}^{n}_b$$

$$P\overbrace{\partial_{x\overset{*}{u}w}\varphi} = \left(n + \frac{a}{2}\right) \frac{\Gamma_{n+1/2+ra/2}\Gamma_{n+1/2+d/r}}{\Gamma_{n+1+ra/2}\Gamma_{n+1+d/r}} \left(\frac{p}{2}\partial_w\varphi + \Delta_w\varphi\right)$$

$$P\overbrace{\partial_{x\overset{*}{u}w}\mathcal{J}_b} = \left(n + 1 + \frac{a}{2}\right) \frac{\Gamma_{n+1/2+ra/2}\Gamma_{n+1/2+d/r}}{\Gamma_{n+1+ra/2}\Gamma_{n+1+d/r}} \left(\frac{p}{2}\partial_w\mathcal{J}_b + \Delta_w\mathcal{J}_b\right)$$

$$\int_{du}^{S_1} {}^{u}\bar{p}\, \underbrace{u\overset{*}{u}w}\, {}^{u}\underline{q} = \frac{m + a/2}{m + ra/2} \int_{du}^{S_1} {}^{u}\bar{p}\, \partial_w\, {}^{u}q$$

$$u\overset{*}{u}w = u\overbrace{u\overset{*}{\boxtimes}e_i e_i}\, w = \underbrace{e_i \overset{*}{\boxtimes} u}\, \underbrace{u\overset{*}{e}_i w}$$

$${}^{u}\bar{p}\, \underbrace{u\overset{*}{u}w}\, {}^{u}\underline{q} = {}^{u}\bar{p}\, \underbrace{e_i \overset{*}{\boxtimes} u}\, \underbrace{u\overset{*}{e}_i w}\, {}^{u}\underline{q}$$