11.30. Following (11.149), $\vec{D}$ and $\vec{H}$ should transform similarly,

$$\vec{D} = \gamma(\vec{D}' - \vec{\beta}\times\vec{H}') - \frac{\gamma^2}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{D}'), \qquad \vec{H} = \gamma(\vec{H}' + \vec{\beta}\times\vec{D}') - \frac{\gamma^2}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{H}').$$

Using the constitutive relation $\vec{D}' = \varepsilon\vec{E}'$ and $\vec{H}' = \vec{B}'/\mu$, we have

$$\vec{D} = \gamma(\varepsilon\vec{E}' - \frac{1}{\mu}\vec{\beta}\times\vec{B}') - \frac{\varepsilon\gamma^2}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{E}'), \qquad \vec{H} = \gamma\left(\frac{\vec{B}'}{\mu} + \varepsilon\vec{\beta}\times\vec{E}'\right) - \frac{\gamma^2}{\mu(\gamma+1)}\vec{\beta}(\vec{\beta}\cdot\vec{B}').$$

Now using (11.149), for $\vec{D}$, we have

$$\begin{aligned}
\vec{D} = \gamma\Big\{ & \varepsilon\Big[\gamma(\vec{E} + \vec{\beta}\times\vec{B}) - \frac{\gamma^2}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{E})\Big] \\
& - \frac{1}{\mu}\vec{\beta}\times\Big[\gamma(\vec{B} - \vec{\beta}\times\vec{E}) - \frac{\gamma^2}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{B})\Big]\Big\} \\
& - \frac{\varepsilon\gamma^2}{\gamma+1}\vec{\beta}\Big(\vec{\beta}\cdot\Big[\gamma(\vec{E} + \vec{\beta}\times\vec{B}) - \frac{\gamma^2}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{E})\Big]\Big) \\
= {} & \gamma^2\varepsilon\vec{E} + \gamma^2\varepsilon\vec{\beta}\times\vec{B} - \frac{\varepsilon\gamma^3}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{E}) \\
& - \frac{\gamma^2}{\mu}\vec{\beta}\times\vec{B} + \frac{\gamma^2}{\mu}\vec{\beta}\times(\vec{\beta}\times\vec{E}) + \frac{\gamma^3}{\mu(\gamma+1)}(\vec{\beta}\times\vec{\beta})(\vec{\beta}\cdot\vec{B}) \\
& - \frac{\varepsilon\gamma^3}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{E}) - \frac{\varepsilon\gamma^3}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot(\vec{\beta}\times\vec{B})) + \frac{\varepsilon\gamma^4}{(\gamma+1)^2}\beta^2\vec{\beta}(\vec{\beta}\cdot\vec{E}) \\
= {} & \gamma^2\varepsilon\vec{E} + \gamma^2\left(\varepsilon - \frac{1}{\mu}\right)(\vec{\beta}\times\vec{B}) + \frac{\gamma^2}{\mu}\vec{\beta}\times(\vec{\beta}\times\vec{E}) - \frac{2\varepsilon\gamma^3}{\gamma+1}\vec{\beta}(\vec{\beta}\cdot\vec{E}) + \frac{\varepsilon\gamma^4}{(\gamma+1)^2}\beta^2\vec{\beta}(\vec{\beta}\cdot\vec{E})
\end{aligned}$$

Since $\vec{\beta}\times\vec{\beta} = 0$ and $\vec{\beta}\cdot(\vec{\beta}\times\vec{B}) = 0$. Notice that

$$\frac{\gamma^4}{(\gamma+1)^2}\beta^2 - \frac{2\gamma^3}{\gamma+1} = \frac{\gamma^2(\gamma^2-1) - 2\gamma^3}{\gamma+1} = -\gamma^2,$$

then

$$\begin{aligned}
\vec{D} &= \gamma^2\varepsilon\vec{E} + \gamma^2\left(\varepsilon - \frac{1}{\mu}\right)(\vec{\beta}\times\vec{B}) + \frac{\gamma^2}{\mu}\vec{\beta}\times(\vec{\beta}\times\vec{E}) - \varepsilon\gamma^2\vec{\beta}(\vec{\beta}\cdot\vec{E}) \\
&= \gamma^2\varepsilon\vec{E} + \gamma^2\left(\varepsilon - \frac{1}{\mu}\right)\vec{\beta}\times\vec{B} + \frac{\gamma^2}{\mu}\vec{\beta}\times(\vec{\beta}\times\vec{E}) - \varepsilon\gamma^2[\vec{\beta}\times(\vec{\beta}\times\vec{E}) + \beta^2\vec{E}] \\
&= \varepsilon\vec{E}\,\gamma^2(1-\beta^2) + \gamma^2\left(\varepsilon - \frac{1}{\mu}\right)\vec{\beta}\times\vec{B} - \gamma^2\left(\varepsilon - \frac{1}{\mu}\right)[\vec{\beta}\times(\vec{\beta}\times\vec{E})] \\
&= \varepsilon\vec{E} + \gamma^2\left(\varepsilon - \frac{1}{\mu}\right)[\beta^2\vec{E}_\perp + \vec{\beta}\times\vec{B}],
\end{aligned}$$

where we have used the fact that $\gamma^2 = (1-\beta^2)^{-1}$ and $\vec{\beta}\times(\vec{\beta}\times\vec{E}) \equiv \beta^2\vec{E}_\perp$.

Following the same manipulation, we will have the results for $\vec{H}$.