We accept that the electric and magnetic fields are

$$E_k = -\frac{I}{a^2}\left(\frac{V}{I}\right)', \qquad B_k = \pm\frac{k}{a^2}V$$

and their contributions to the energy density are

$$\begin{aligned}\rho_E &= \frac{4\pi}{a^4}I^2\int dk\,k^2\left|\left(\frac{V}{I}\right)'\right|^2\\ \rho_B &= \frac{4\pi}{a^4}I^2\int dk\,k^4\left|\frac{V}{I}\right|^2\end{aligned}$$

These are the formulas from your email.

Now let us suppose, as before, that

$$I \propto \tau^n, \qquad \text{and} \qquad V_\lambda \propto \tau^m,$$

where n and m are integers and of course m will depend on n, being a solution of the equations of motion. They can be positive or negative, does not matter now.

Now,

$$V/I = \tau^{m-n} \qquad \text{hence} \qquad (V/I)' = \tau^{m-n-1},$$

up to numerical coefficients.

The densities are, multiplied by the same (functional) proportionality coefficients,

$$\begin{aligned}\rho_E &\propto \int dk\,k^2\left(\tau^{m-n-1}\right)^2 = \int_{Ha_i}^{Ha_0} dk\,k^2\cdot\tau^{2m-2n-2}\\ \rho_B &\propto \int dk\,k^4\left(\tau^{m-n}\right)^2 = \int_{Ha_i}^{Ha_0} dk\,k^4\cdot\tau^{2m-2n}\end{aligned}$$

And hence,

$$\begin{aligned}\rho_E &\propto \left(Ha_0\right)^3\cdot\tau^{2m-2n-2} \propto \tau^{2m-2n-5}\\ \rho_B &\propto \left(Ha_0\right)^5\cdot\tau^{2m-2n} \propto \tau^{2m-2n-5}\end{aligned}$$

I don't see how one is growing much bigger than the other.

Mukhanov did not write the following. In the *strong coupling* case, he never mentioned that electric field becomes much bigger than the magnetic field. He did say that the coupling becomes strong — the known issue — but pretty much nothing else (now in the case of weak coupling — which I am not discussing — he did say that there is an excess of electromagnetic energy compared to the inflationary potential).

Imagine a regular electromagnetism where we do not have the restriction that e_0 is order one today, but can be accepted to be negligible. Let it be order one before the inflation and zero after the inflation (the same "strong coupling" scenario but now e is renormalized so it is weak at all times). Then there does not seem to be a problem that the electric field greatly exceeds the magnetic field, nor that their overall density disturbs the inflation. Do you agree?