1096-53-1965 **Lizhi Chen*** (lchen@math.okstate.edu), Department of Mathematics, Oklahoma State University, Mathematical Sciences 401, Stillwater, OK 74078. *$\mathbb{Z}_2-$Systolic $(1,2)-$Freedom of $\mathbb{R}P^3\#\mathbb{R}P^3$.*

We show that the $3-$manifold $\mathbb{R}P^3\#\mathbb{R}P^3$ has $\mathbb{Z}_2$ coefficient $(1,2)$ homologically systolic freedom. In other words, we can construct Riemannian metrics on $\mathbb{R}P^3\#\mathbb{R}P^3$ of arbitrarily small volume, such that $\text{length}(\gamma)\cdot\text{area}(\Sigma)\geqslant 1$, for every geodesic loop γ which is nontrivial in $H_1(\mathbb{R}P^3\#\mathbb{R}P^3;\mathbb{Z}_2)$ and every embedded smooth surface which is nontrivial in $H_2(\mathbb{R}P^3\#\mathbb{R}P^3;\mathbb{Z}_2)$. Previously M. Freedman has proved that the $3-$manifold $S^2\times S^1$ exhibits $(1,2)$ systolic freedom over $\mathbb{Z}_2$, which is the first example of systolic freedom over torsion coefficients. The $\mathbb{Z}_2$ systolic freedom of $\mathbb{R}P^3\#\mathbb{R}P^3$ is another systolic freedom example over torsion coefficients of $3-$manifolds after Freedman's example.In this work, Freedman's technique is used to construct metrics on $\mathbb{R}P^3\#\mathbb{R}P^3$. The $3-$manifold $\mathbb{R}P^3\#\mathbb{R}P^3$ is doubly covered by the surface bundle $S^2\times S^1$, so the arithmetic hyperbolic surface construction and the Dehn surgery technique can be employed. (Received September 16, 2013)