For a closed oriented 3-manifold $M$ with a preferred volume form $dvol$, let $\mathcal{X}_h$ denote the kernel of the natural surjective homomorphism from $\mathcal{X}_d$ to $H_1(M; \mathbb{R})$, where $\mathcal{X}_d$ is the Lie algebra of all smooth divergence free vector fields on $M$.

We can define so called asymptotic linking pairing between $X$ and $Y \in \mathcal{X}_h$ ([1], [2]), which is non-degenerate and symmetric. Consider the problem that whether if we can define the signature of this pairing. It is clear that the dimensions of maximal positive and maximal negative subspaces are infinite, so that defining the signature is to give a meaning to this $\infty - \infty$.

The results presented in this talk are as follows. First, in the presence of a foliation of codimension 1, we can ‘renormalize’ $\infty - \infty$ and in some cases we get finite number. Second, it is shown that this computation reduces to that of 1st foliated(leafwise) cohomology. Thirdly, using our previous results on the foliated cohomology [3], in the case of algebraic Anosov foliations, we get 0 for suspension type Anosov and 1 for geodesic flow type Anosov as the signature. Of course this process may depend on the choice of foliations and it does not imply that it gives rise to an invariant of the manifold itself.

A possible application of this framework to contact topology, namely an analytic definition of torsion invariant is also proposed and some analytical difficulties that have been confronted are discussed.

