

# The gluing formula for the analytic torsion - a new approach

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We give an analytic approach to the behavior of classical Ray-Singer analytic torsion in de Rham theory when a manifold is separated along a hypersurface. More precisely, we give a formula relating the analytic torsion of the full manifold, and the analytic torsion associated with relative or absolute boundary conditions along the hypersurface. This result can also be viewed as a consequence of the Cheeger-Müller Theorem that relates analytic torsion to combinatorial torsion. However, the point of our proof is to obtain a direct proof of this result, by introducing a cylinder transversal to the hypersurface whose length is made to tend to  $+\infty$ . The scattering matrix introduced by Müller in this geometric context plays an important role in establishing the final result.