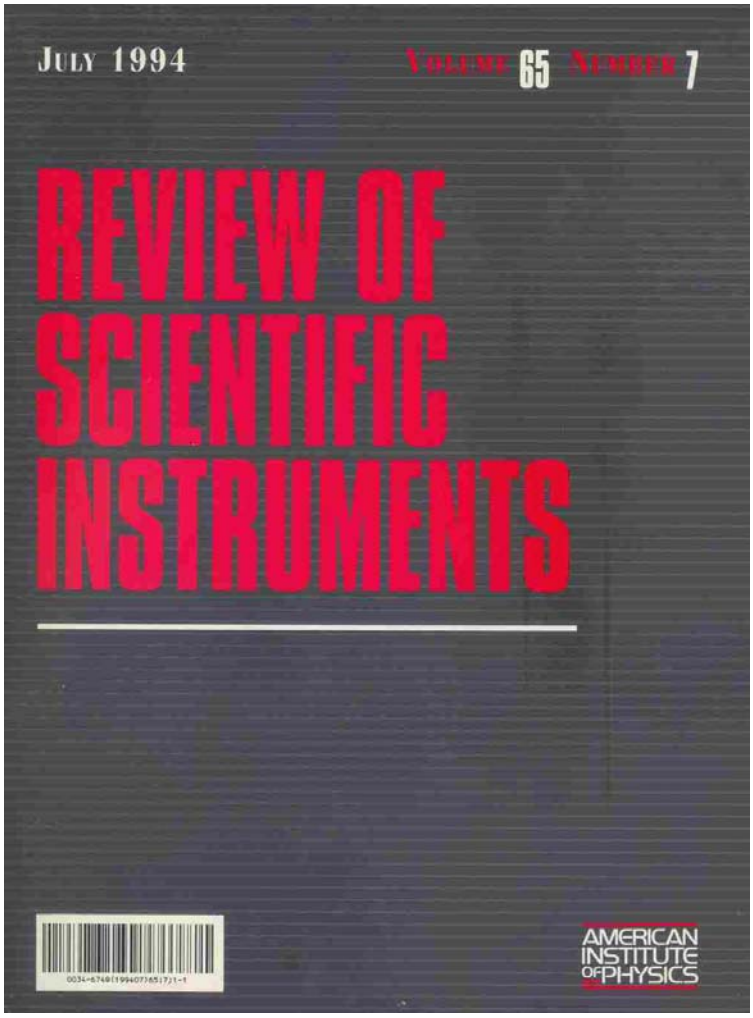


# Design and characterization of a shock wave generator using canalized electrical discharge: Application to lithotripsy

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During recent years, much work has focused on breaking urinary and biliary stones using extracorporeal shock wave devices. Up to now, in terms of fragmentation efficacy, the "electrohydraulic" principle is the gold standard. In an electrohydraulic shock wave generator, a plasma is created by a high-voltage electrical discharge between two underwater electrodes. This kind of shock wave generator has a significant drawback because of the large variations of pressure pulses. Moreover, the wear of the electrodes is considerable, leading to nonconstant electrical discharge conditions all along the treatment. A new method to canalize the plasma between the electrodes, using highly conductive liquid, was investigated. Based on this principle a new spark plug was designed. This paper deals with the description and the characterization of this new type of spark plug. The electrical and geometrical parameters are presented. Measurements of the focal point pressure amplitude, of the spatial pressure distribution using different voltage settings, are reported. The acoustic energy in the focal zone is computed. We show that using this principle, the wear of the electrodes has been tremendously reduced. A comparison of *in vitro* results with other shock wave technologies shows that this new spark plug represents a significant breakthrough in terms of stone fragmentation efficacy. This spark plug is not only useful in the medical field, but it should also be of great interest to laboratories.