AN ALTERNATIVE CTBT INFRASOUND SENSOR USING PVDF PIEZOCABLE

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Sponsored by the Defense Threat Reduction Agency
Arms Control Technology Division
Nuclear Treaties Branch

SBIR Contract

ABSTRACT

We are exploring the feasibility of a novel infrasound sensor array employing piezoelectric cable. Piezocable is a coaxial cable with a center conductor, an outer shield, and a "dielectric" consisting of radially poled polyvinylidene fluoride (PVDF) which can be manufactured in almost arbitrary lengths and which is continuously piezoelectric. The infrasound sensor array consists of several lines of length on the order of up to hundreds of meters of piezocable, each of which is coupled individually and electronically to an on-site central processor. This design has several advantages over the usual concept in which the in-air pressure enters the porous hoses and is carried to a manifold in which signals from all hoses are added and input to the microbarograph where transduction takes place. Direct electronic transduction eliminates the air paths and the microbarograph making for a much simpler system which should be more reliable and less sensitive to environmental factors. It would also be less visible. In addition, in the piezocable system the output from each subarray line can be recorded and processed independently. This can support several novel processing options including real-time selection of those sensors with the best signal, noise, or signal to noise ratio, identification of incidence direction by array steering (by selection of those lines with the greatest signal), exclusion of signals from lines which are overly noisy (which could be due to animal activity, for example), or formation of superdirective (e.g. dipole) patterns at the subarray level. Geometries other than the "octopus" concept may also be desirable. Work is now focussed on a characterization of sensor noise which is expected to be dominated by electronic noise, pyroelectric effects, and wind noise. Theoretically, line array rejection of wind turbulence noise will be comparable to or better than that of a porous hose if the length of the piezocable line is comparable to the characteristic length of the porous hose. Current efforts in this program are focused on characterizing peizocable line noise both in the laboratory and outdoors in various meteorological conditions.