Ultra-low Field MRI for the Detection of Liquid Explosives Using SQUIDs

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Abstract – Recently it has become both possible and practical to perform MR at magnetic fields from µT to mT, the so-called ultra-low field (ULF) regime. SQUID sensor technology allows for ultra-sensitive detection while pulsed pre-polarizing fields greatly enhance signal. The instrumentation allows for unprecedented flexibility in signal acquisition sequences and simplified MRI instrumentation. Here we present the results for a new application of ULF MRI and relaxometry for the detection and characterization of liquids. We briefly describe the motivation and advantages of the ULF MR approach. We then present recent results from a 7-channel ULF MRI/relaxometer system constructed to non-invasively inspect liquids at a security check-point for the presence of hazardous material. The instrument was fielded to the Albuquerque International Airport in December, 2008, and results from that endeavor are also presented.