A MICROWAVE ANALYSIS FOR THE PRE-SHOT DETECTION OF RIFLES

Scholarly Paper Presentation
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There is a pressing need in the U.S. military and law enforcement for early sniper detection systems. Snipers are particularly dangerous to troops because of their long range accuracy, causing them to be nearly impossible to predict and difficult to locate. Detection of sniper rifles has thus far been limited to post-shot identification using acoustic wave detection, shock wave detection, muzzle flash detection, and the fusion of the preceding to triangulate the location of the sniper. However, the limit of post-shot detection hinders the prevention loss of life from snipers.

This paper details an effort to identify unique properties of rifles which could be utilized for their pre-shot detection. After designing radar reflection experiments later conducted at Rhein Tech Laboratories on a SAKO Finnbear rifle and an AK-47 rifle, we analyzed the radar data and wrote a GUI to quickly visualize the data in MATLAB. We identified two physical phenomena characteristic of the rifles using microwaves between 26 and 40 GHz which could be used to identify these prior to any firing. We found a unique antenna radiation pattern consistent across the different rifles and different bullets. We propose a theory that describes the high signal return patterns looking down the barrel.