# ODAS 2021 Abstract Template


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| **TITLE:** REMOTE RAMAN DETECTION OF WARFARE GASSES |
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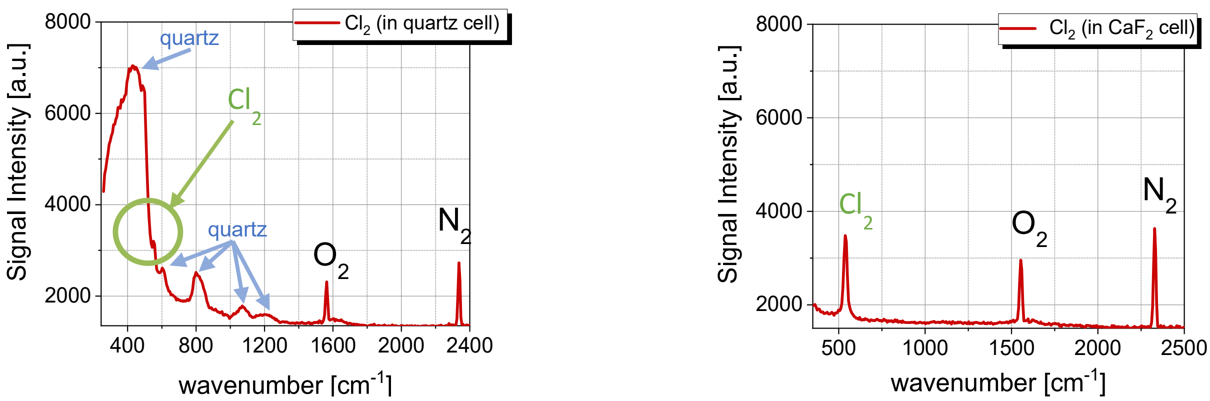
**Abstract**


Deep ultraviolet Raman spectroscopy measurements have been performed at the German Aerospace Center (DLR) to detect chlorine gas in a short range remote backscattering configuration. Chlorine gas causes death by asphyxiation at high concentrations (>1000 ppm mortality in few minutes [1]), so the need of a monitoring remote device is necessary to avoid a direct contact with the source of unknown danger [2,3,4]. Unwanted chlorine release into the atmosphere can occur as accidental industrial spill, domestic exposure, and warfare agent [5]. Industrially, chlorine gas is often used as an anti-mold agent in dry seeds production (like flour, meat disinfection, etc.); however due to its high commercially availability, its potential for misuse as warfare agent is high since it doesn't require any further manufacturing effort like mustard gas or phosgene.

The final goal of this study is to find the optimal laser excitation wavelength that would maximize the chlorine signal. The best wavelength will be then used to be a part of a first alert and monitoring remote Raman scattering sensor. In this study a remote Raman set up was optimized to detect chlorine gas at a distance of 60 cm [4]. Several ultraviolet laser wavelengths (224, 232, 235 nm respectively, 2.5 mJ/pulse at 10 Hz) were tuned to experimentally observe the highest possible signal to noise ratio. For each tested excitation wavelength, chlorine spectra were successfully detected. Detection limits in acquisition times for a 40% chlorine sample are discussed. In a realistic scenario, released chlorine gas would be simply detected in the atmosphere, so no material interference is expected. Although when performing a test in a closed environment, such a laboratory, any possible chlorine release is unwanted for safety reasons. Discriminating the acquired sample cell signal from the background was challenging since Raman spectral overlapping occurred. In this work a solution to avoid spectral overlapping of the background material with the sample is proposed.

## Figures




(a) (b)

Fig 1. (a) Quartz and chlorine Raman raw signal, (b) $CaF_2$ and chlorine Raman raw signal

## References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