FALCON 4G Field Test Report

The Estonian Rescue Board

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1. INTRODUCTION

Falcon 4G is a laser based chemical active stand-off detector that can detect, identify and quantify chemical warfare agents (CWA) and toxic industrial chemicals (TIC). The Falcon 4G uses eye safe lasers (CLASS 1) that are undetectable by laser warning devices.

2. TRIAL CONDITIONS

Date	December 16, 2020
Place	Tallinn, Estonia
Wind speed	5 m/s
Humidity	97 %
Temperature	3 °C
Simulants[1]	Ethanol (EtOH), Toluene (C_7H_8), Ammonia (NH_3)
Detection method	Measurements on a static target

[1] Please refer to the last page of the report for detailed information about the simulants.

3. METHODOLOGY

Trials took place in the open mine pit close to Tallinn, the capital city of Estonia. The conditions were very typical for the beginning of winter in the Baltics. The landscape was covered in light snow that had gradually disappeared during the trials due to constant rain. The detection distance was 580 meters, the longest identified in the mine pit. Mine trucks were working and regularly crossing the mine pit during the trials.

Fig. 1 · Open mine pit used for the stand-off detection demonstration

The Falcon 4G was placed on a tripod outside in the rain. Thanks to its rugged military design and IP68 protection, the weather did not pose any burden for the detector or its operation.

The Falcon 4G was operated remotely by an operator from inside a vehicle, with the standoff detector's operation being controlled from a standard PC.

Fig. 2 · The Falcon 4G was positioned on a tripod and remotely controlled by an operator inside the vehicle.

Plumes of various gases were released in an open tent with dimensions of 2x3x3 meters at a distance of 583 meters (the maximum possible distance in the mine pit).

A liquid solution of testing chemicals was dispersed one by one on trays at various time intervals over a period of 50 minutes. The trays were positioned on a table inside the tent (see Figure 3) and lined with multiple layers of soft paper tissue. The chemicals were spilled onto each tray by the customer's operative.

SEC Technologies had no control over the process or access to the release point during the release. Based on the information provided to SEC Technologies, this was an ordered release of chemicals:

- Ethanol was released as the first test agent
- A few minutes later, Toluene was released
- The third chemical released was Ammonia
- More Ethanol was released 15 minutes before the end of the trial

Fig. 3 · Trays for chemical dispersion · Measuring path · Open tent used for the release

4. RESULTS

4.1 MEASUREMENTS ON A STATIC TARGET

All measurement data from this trial are summarized and shown in the simplified graph depicting all detections (Figure 5). During the measurement every detection is presented to the operator in real time (Figure 4) Falcon 4G saves as well logfile that includes data points. Each data point includes:

- date and time stamp
- GPS position of the detector
- azimuth of the measurement
- distance and calculated position of the target used for the reflection
- measured average concentration of the agent
- chemical identification (name, code)

Despite low temperatures and slow evaporation has Falcon 4G successfully detected all three (3) chemicals released. Even almost 100% humidity and constant drizzle of rain has not placed any problem of detecting all chemicals singly as well mixed in the cloud.

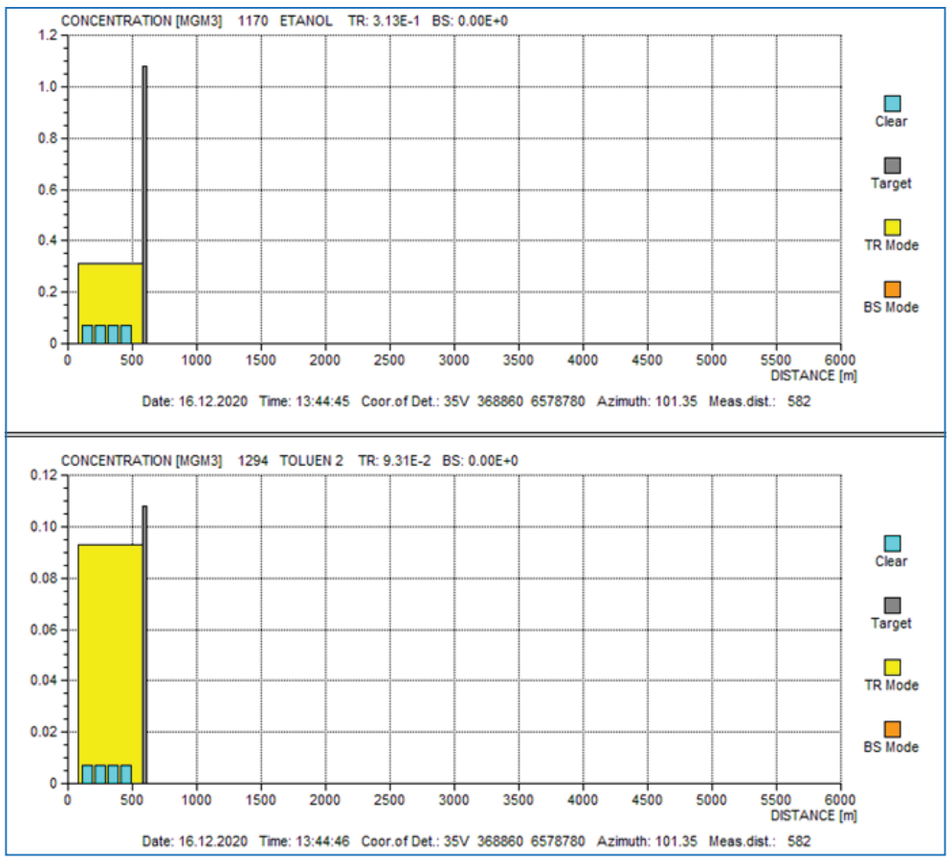


Fig. 4 · Information available to the operator at the time

of the detection for further tactical evaluation.

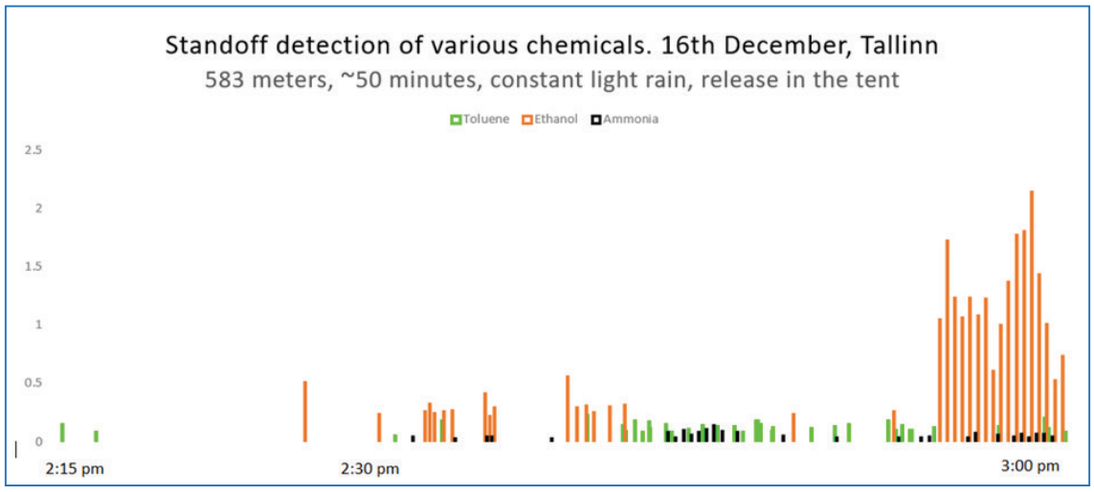


Fig. 5 · Simplified graph report from the trials

5. CONCLUSION

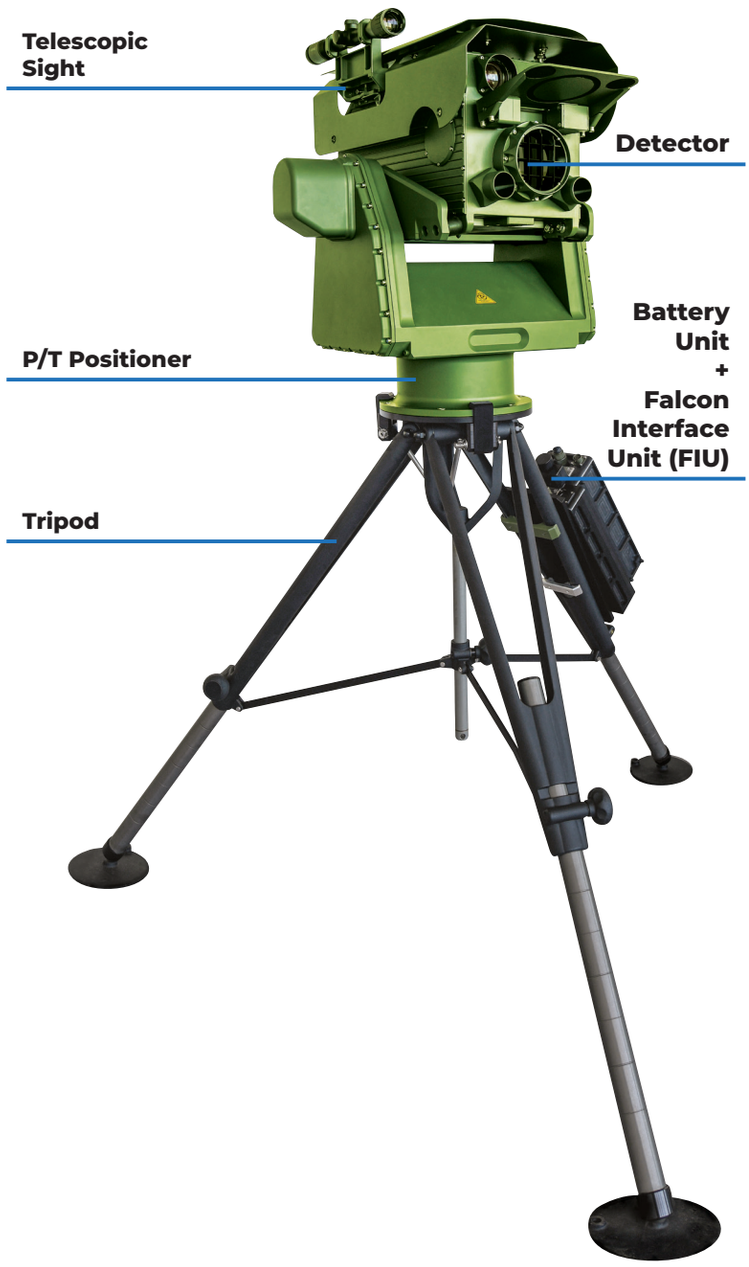
During the trials in Estonia, the Falcon 4G has reliably detected simulants during the releases and confirmed its unique performance and unmatched sensitivity.

FALCON 4G

Long-Range Reconnaissance Chemical Detector

The 4th generation active stand-off detector is based on eye-safe and undetectable laser technology.

- **Detection**
- **Identification**
- **Quantification**
- **Up to 6 km**
- **Best sensitivity on the market**
- **No calibration needed**
- Distance to the cloud without triangulation
- Refractors not required
- No need to scan background



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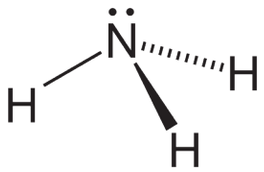
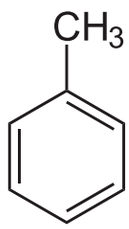


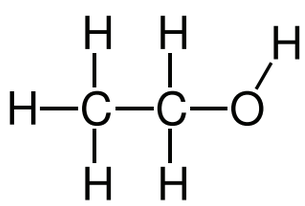
AMMONIA
(NH_3, Molecular weight: 17.031 g/mol)

Ammonia is a colourless inorganic compound of nitrogen and hydrogen, usually in gaseous form with a characteristic pungent odour. Ammonia is irritating to the skin, eyes, nose, throat, and lungs. It is essential for many biological processes and has various industrial applications. Relative Air Density is 0.597 (lighter than air).



TOLUENE
(C_7H_8, Molecular weight: 92.141 g/mol)

Toluene is a colorless, water-insoluble liquid with the smell associated with paint thinners. Its vapor is heavier than air and may accumulate in low-lying areas. Toluene is predominantly used in the production of industrial chemicals, fuels, plastics, and pharmaceutical goods and as a solvent. It is used as a solvent in some types of paint thinner, contact cement and model airplane glue. Toluene is toxic but is sometimes used as a recreational inhalant and has the potential of causing severe neurological harm.



ETHANOL
(C_2H_6O, Molecular weight: 46.069 g/mol)

Ethanol appears as a clear colorless flammable liquid with a characteristic vinous odor and pungent taste. Ethanol is used to dissolve other chemical substances and mixes readily with water and many organic liquids. Ethanol rapidly absorbs water from the air.

Source: www.worldofmolecules.com.

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