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FALCON 4G Field Test Report

Austrian Armed Forces

SEC TECHNOLOGIES

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CHEM

www.sec-technologies.com

1. INTRODUCTION

The Falcon 4G is a powerful long range reconnaissance detector that can detect, identify and measure chemical warfare agents and toxic industrial chemicals using two independent eye-safe pulsed tunable CO_2 lasers. Its patented laser technology is undetectable by laser warning devices, making it an effective tool for military and industrial applications.

2. TRIAL CONDITIONS

Date	February 2, 2019
Place	Korneuburg, Lower Austria, Austria
Wind speed	7 – 10 m/s
Humidity	75 – 83 %
Pressure	1015 – 1017 mbar
Simulants[1]	Ammonia (NH_3), Sulfur Hexafluoride (SF_6)
Detection method #1	Identifying hazardous substances while moving on unpaved roads at a speed of 20 km/h within a range of 1000 to 1625 meters, with the Falcon 4G mounted on top of the vehicle.
Detection method #2	Measurements on a static target were taken at distances of 230 m, 1000 m, and 1600 m.

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

3. METHODOLOGY

The Falcon 4G detector was installed atop the vehicle using a pan and tilt platform, and operated via a personal computer. The platform's stabilization mode allowed for smooth and precise movement during the measurements, which were conducted across various scenarios for thorough testing.

Fig. 1 · Falcon 4G mounted on a vehicle

- Detection method #1 – Measurement on the move
  - Release point at the distances between 1000 m and 1600 m
- Detection method #2 – Static measurement
  - Release point at the distance of 230 m
  - Release point at the distance of 1000 m
  - Release point at the distance of 1600 m

3.1 MEASUREMENTS ON THE MOVE

For this detection method, a pan and tilt platform equipped with stabilization modules was used. The Falcon 4G detector maintained its aiming direction independently of any movement. The trial began by aiming at the release site from the measuring position #1, while driving towards measuring position #2 at a variable speed. Throughout the experiment, the vehicle's speed was set at up to 20 km/h.

Fig. 2 · View from measuring point 2 through the binoculars

3.2 MEASUREMENTS ON A STATIC TARGET

The figure bellow shows the location of Falcon 4G and the release point.

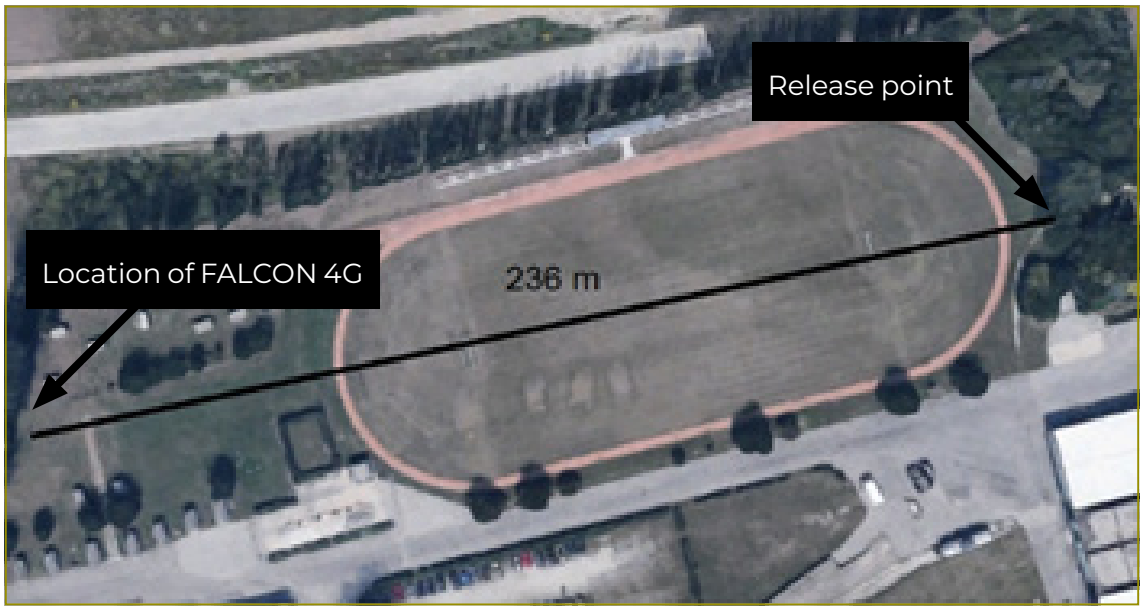


Fig. 3 · Location of the Falcon 4G and the location of the release point

We have used detection at 230 m, 1000 m and 1600 m. For the releases at distance of 1000 m and 1600 m a a different release point was utilized than on 230 m. Barracks, where the testing took place has a training facility with a setup of two training towers and the train tank. Towers and train are clearly visible from the two measuring points.

Figures bellow show the location of the release point and of the measurement points.

Fig. 4 · Measuring pos. #1 and measuring pos. #2

Fig. 5 · View from measuring pos. #1

4. RESULTS

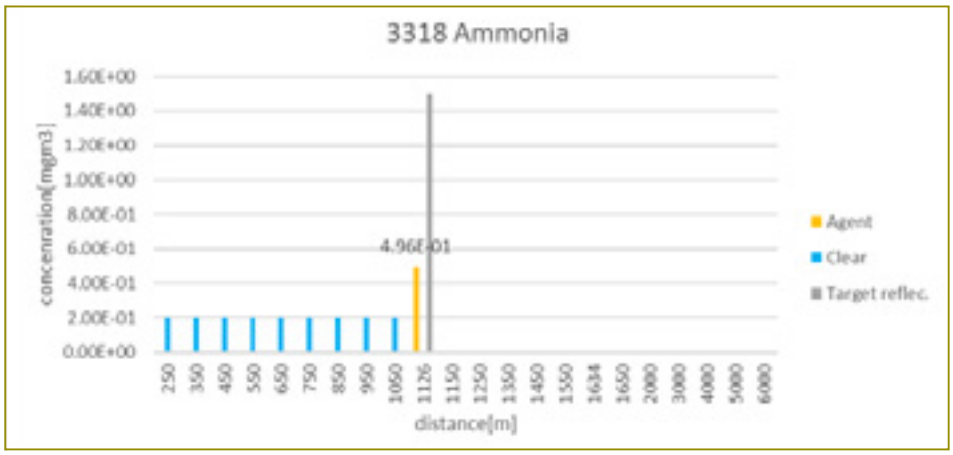
4.1 MEASUREMENTS ON THE MOVE

Trial #1A: Ammonia (NH_3), Sulfur Hexafluoride (SF_6), 2 distinct clouds
Wind speed: 9 – 10 m/s
Distance: 1126 m

Measurement results: DETECTION

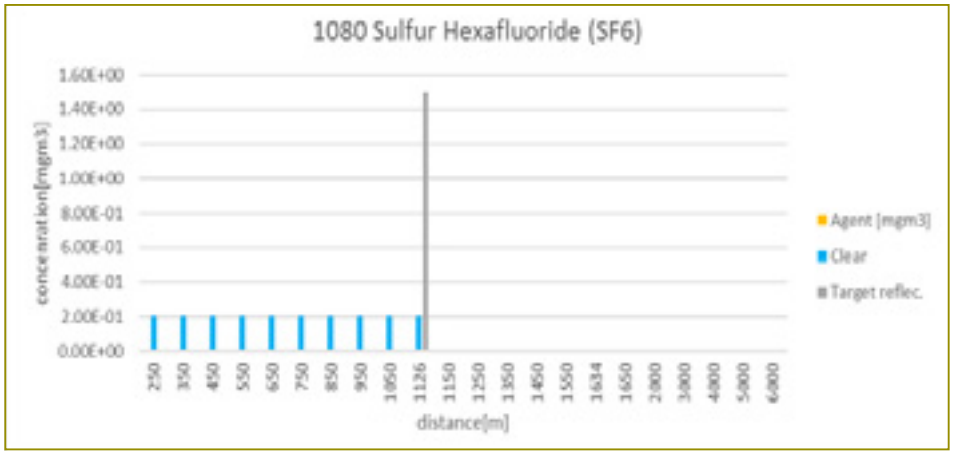
- Ammonia: 0.496 mg/m³
- Sulfur Hexafluoride: 0.0 mg/m³

```
13:34:20 --- RESULTS:[CHEM,Scan Mode for TIM,010/2018] -------------------------------
13:34:23 3318 (AMMONIA) ... 1126 [m]  4.962E-1 [MGM3] (TR)  Detected
13:34:24 1080 (SF6) ..... 1126 [m]  0.000E+0 [MGM3] (TR)  --------
13:34:24 Date: 24.04.2019; Time: 13:34:24; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 3140.3
```

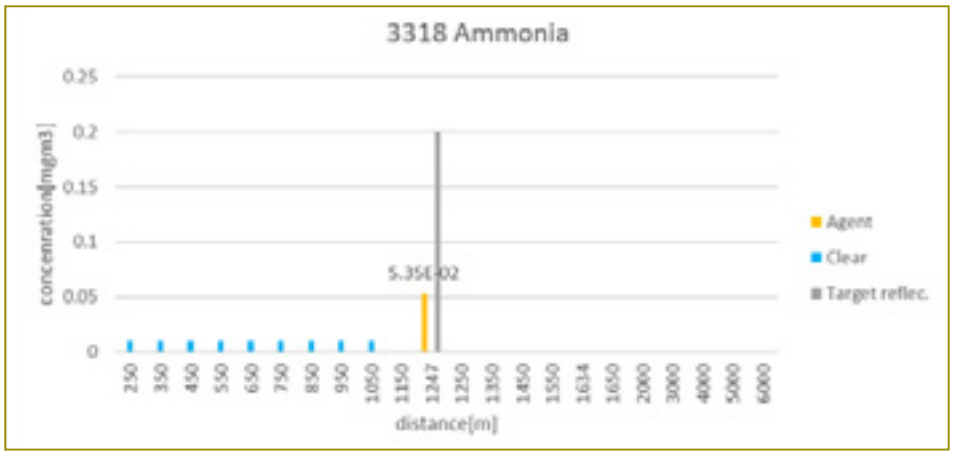


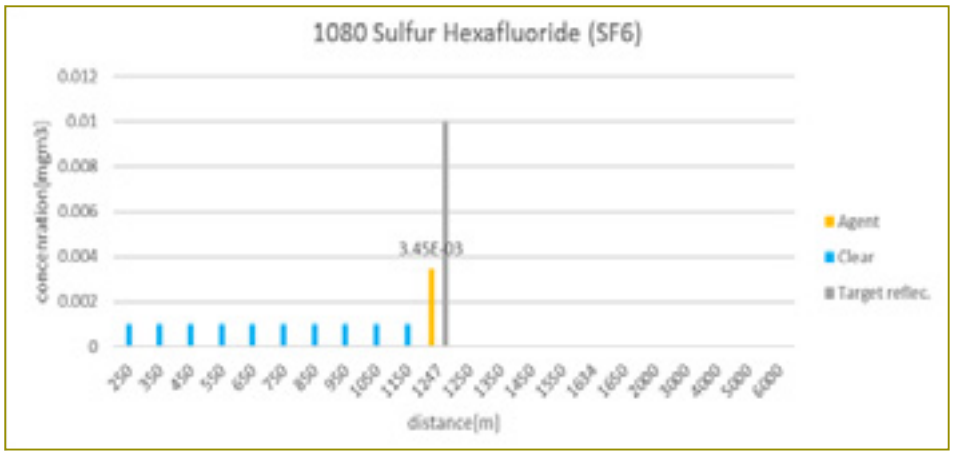
Trial #1B: Ammonia (NH_3), Sulfur Hexafluoride (SF_6), 2 distinct clouds
Wind speed: 9 – 10 m/s
Distance: 1247 m

- Measurement results: DETECTION
  - Ammonia: 0.053 mg/m³
  - Sulfur Hexafluoride: 0.0034 mg/m³




```
13:35:02 --- RESULTS:[CHEM,Scan Mode for TIM,010/2018] -------------------------------
13:35:05 3318 (AMMONIA) ... 1247 [m]  5.353E-2 [MGM3] (TR)  ------
13:35:06 1080 (SF6) ..... 1247 [m]  3.449E-3 [MGM3] (TR)  --------
13:35:06 Date: 24.04.2019; Time: 13:35:06; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 3230.4
```





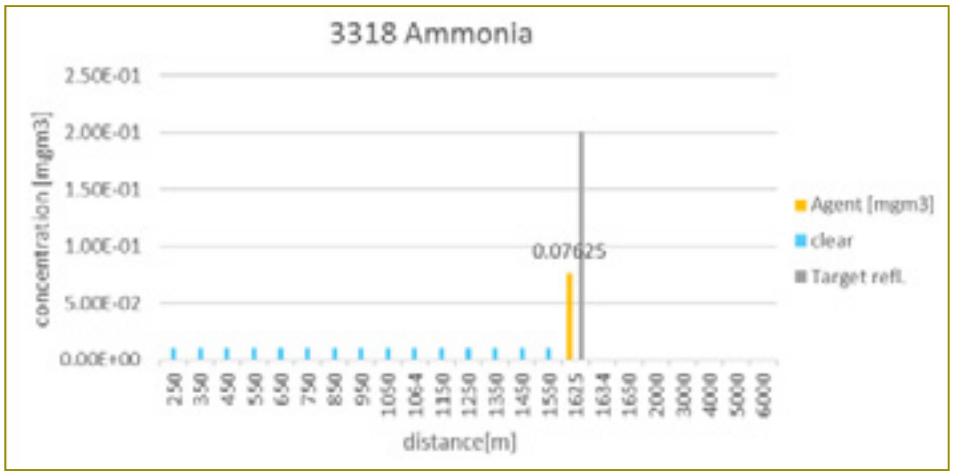
Trial #1C: Ammonia (NH_3), Sulfur Hexafluoride (SF_6), 2 distinct clouds

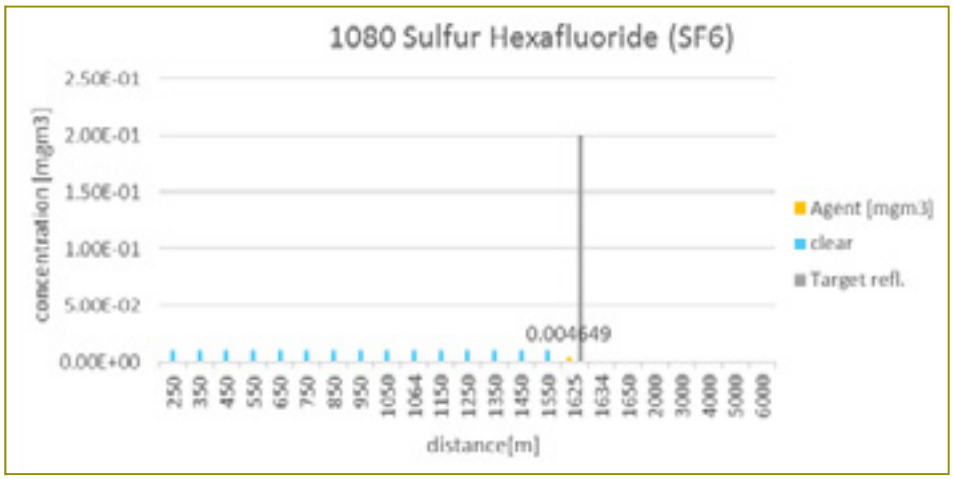
Wind speed 9 – 10 m/s

Distance: 1625 m

- Measurement results: DETECTION
  - Ammonia: 0.076 mg/m³
  - Sulfur Hexafluoride: 0.0046 mg/m³

```
13:39:08 --- RESULTS:[CHEM,Scan Mode for TIM,010/2018] -------------------------------
13:39:10 3318 (AMMONIA) ...  1625 [m]  7.625E-2 [MGM3] (TR)  Detected
13:39:11 1080 (SF6) .......  1625 [m]  4.649E-3 [MGM3] (TR)  Detected
13:39:11 Date: 24.04.2019; Time: 13:39:11; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 1217.5
```





4.2 MEASUREMENTS ON A STATIC TARGET

Trial #2: Ammonia (NH_3) in a bowl at a distance 230m

- 500 ml of Ammonia (32 % solution) was spilled in a metal cup to evaporate. Wind speed of 10 m/s.
- Measurement results: NO DETECTION

```
11:21:32 --- RESULTS:[CHEM,Single Mode for 3318 (AMMONIA),010/2018] ------------------
11:21:32 Settings: Start at [m]: 200 Zone width [m]: 100 Sensitivity: Expert Mode
11:21:35 3318 (AMMONIA) ... 229 [m]  0.000E+0 [MGM3] (TR)  ------
11:21:35 Date: 24.04.2019; Time: 11:21:35; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 5386.0
```

24.4.2019	11:21:35	3318 AMMONIA	250	0.00E+00	---	350	0.00E+00	---	450	0.00E+00	---

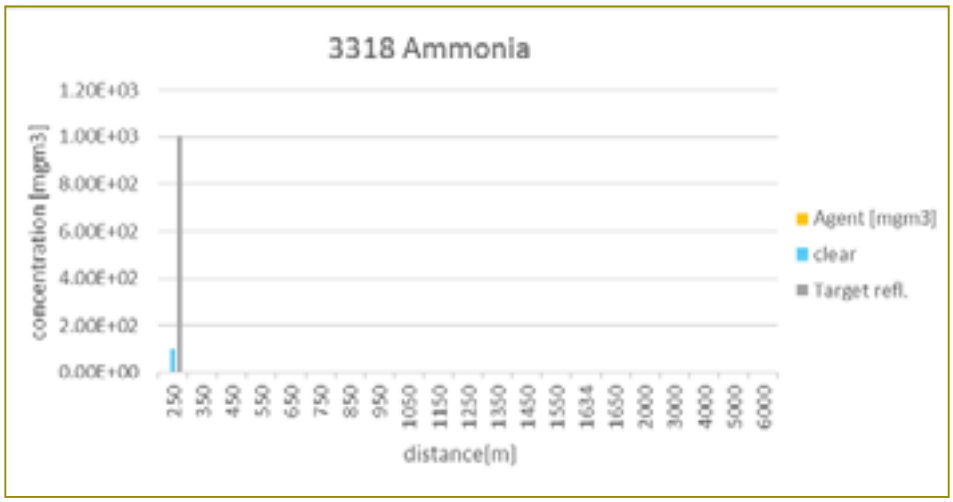
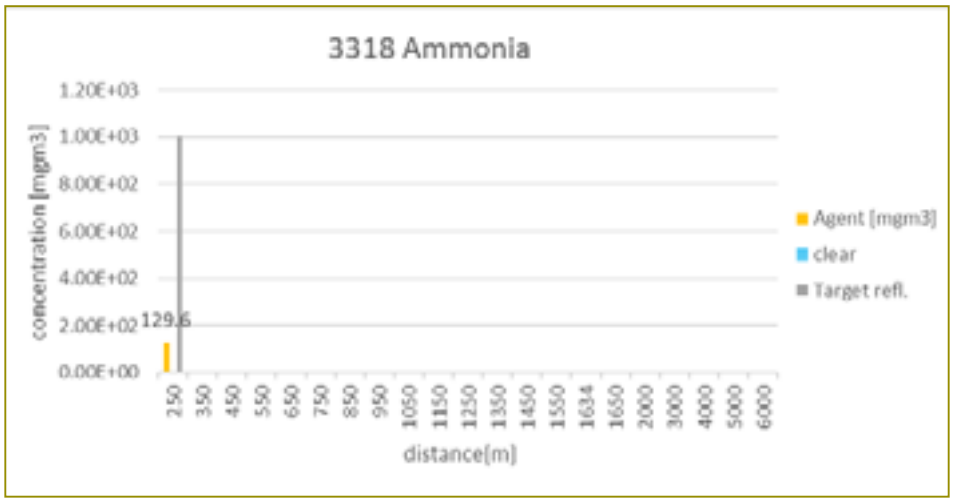


Fig. 6 · View of the release site

Trial #3: Ammonia (NH_3, 32 % solution) spray at a distance 230 m

- Measurement results: DETECTION
  - Ammonia: 129. 6 mg/m³

```
11:22:38 --- RESULTS:[CHEM,Single Mode for 3318 (AMMONIA),010/2018] ------------------
11:22:38 Settings: Start at [m]: 200  Zone width [m]: 100  Sensitivity: Expert Mode
11:22:40 3318 (AMMONIA) ... 231 [m]  0.000E+0 [MGM3] (TR)  --------
11:22:40                    250 [m]  1.296E+2 [MGM3] (BS)  Detected
```

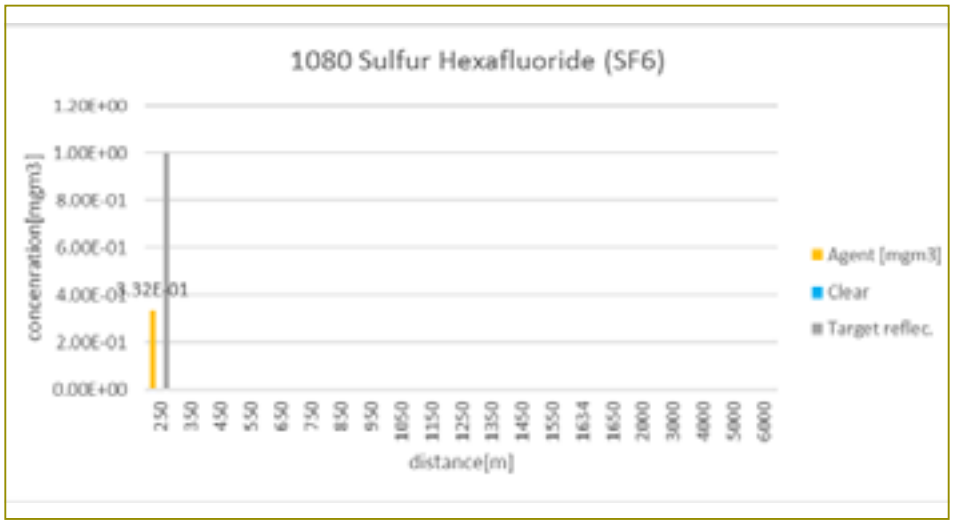
Trial #4: Sulfur Hexafluoride (SF_6) released at a distance 230 m, wind speed 8 m/s

- Measurement results: DETECTION
  - Sulfur Hexafluoride: 0.3315 mg/m³

```
11:26:25 --- RESULTS:[CHEM,Single Mode for 1080 (SF6),010/2018] ----------------------
11:26:25 Settings: Start at [m]: 200  Zone width [m]: 100  Sensitivity: Expert Mode
11:26:27 1080 (SF6) ... ----- [m]  0.000E+0 [MGM3] (TR)  --------
11:26:27                250 [m]  3.315E-1 [MGM3] (BS)  Detected
```

```
11:26:27 Date: 24.04.2019; Time: 11:26:27; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 5386.0
```

24.4.2019	11:26:27	1080 SF6	250	3.32E-01	DET.	350	0.00E+00	---	450 0.00E+00 ---



Trial #5A: Measurement (first 30 seconds), wind speed 9m/s

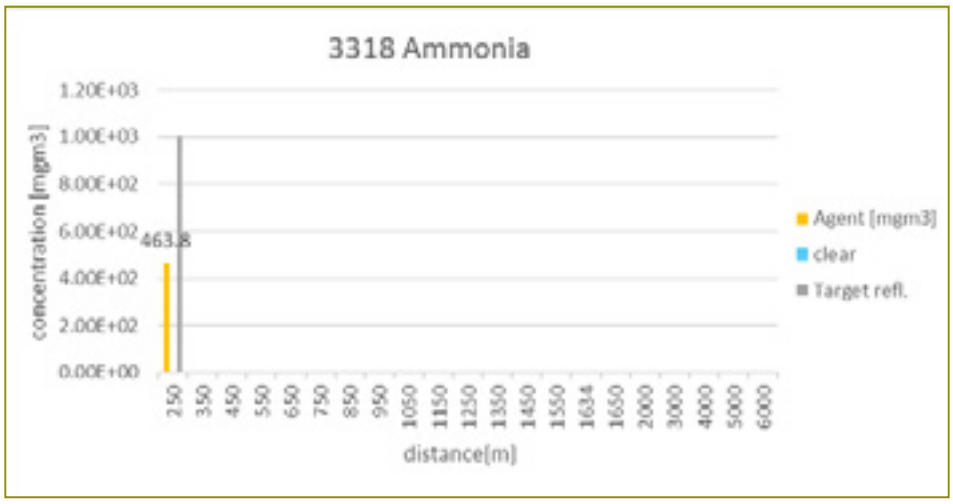
- Sulfur Hexafluoride (SF_6) and Ammonia (NH_3) released at the same time at a distance 230 m
- Measurement results: DETECTION of one agent
  - Ammonia: 463.8 mg/m³
  - Sulfur Hexafluoride: 0.0 mg/m³

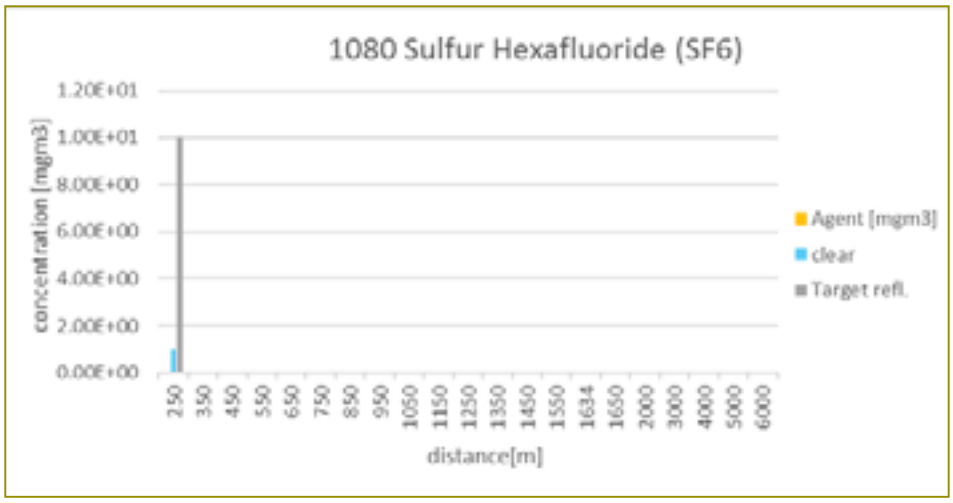
Trial #5B: Measurement (after 30 seconds)

- Results: DETECTION of both agents
  - Ammonia: 3.972 mg/m³
  - Sulfur Hexafluoride: 1.558 mg/m³

```
11:29:28 --- RESULTS:[CHEM,Scan Mode for TIM,010/2018] --------------------------------
11:29:30 3318 (AMMONIA) ... ----- [m]  0.000E+0 [MGM3] (TR)  -------
11:29:30                      250 [m]  4.638E+2 [MGM3] (BS)  Detected
11:29:32 1080 (SF6) ......... 250 [m]  0.000E+0 [MGM3] (TR)  --------
11:29:32 Date: 24.04.2019; Time: 11:29:32; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 5385.4
```

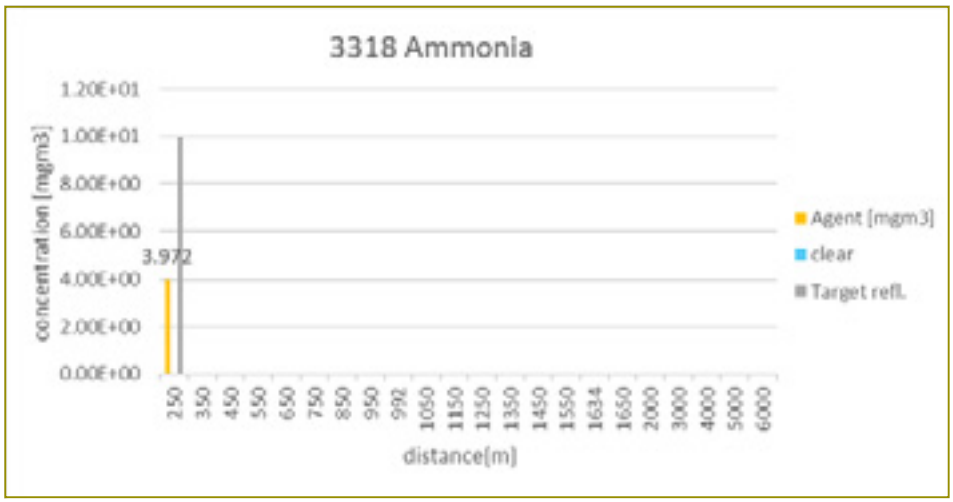
24.4.2019	11:29:30	3318 AMMONIA	250	4.64E+02	DET.	350	0.00E+00	DET.	450 0.00E+00 ---
24.4.2019	11:29:32	1080 SF6	250	0.00E+00	---	350	0.00E+00	---	450 0.00E+00 ---

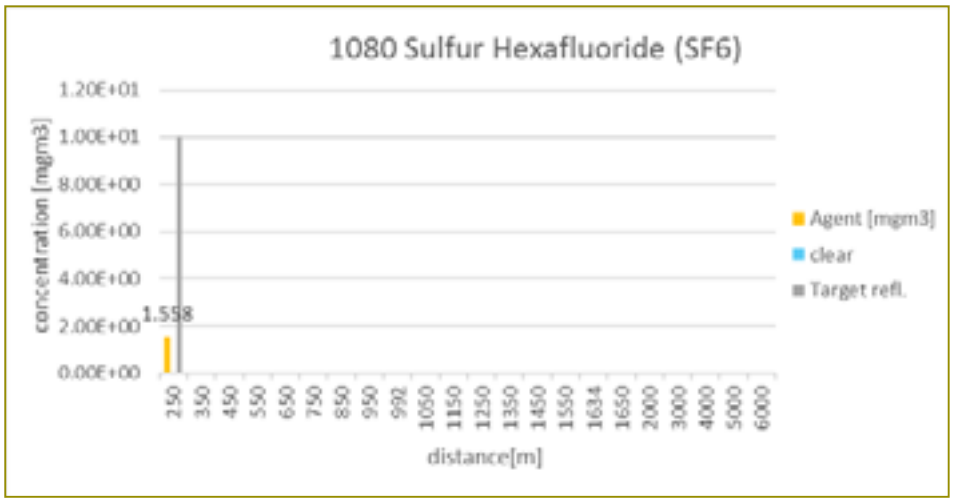





```
11:29:53 --- RESULTS:[CHEM,Scan Mode for TIM,010/2018] --------------------------------
11:29:55 3318 (AMMONIA) ... ----- [m]  0.000E+0 [MGM3] (TR)  -------
11:29:55                      250 [m]  3.972E+0 [MGM3] (BS)  Detected
11:29:56 1080 (SF6) ....... ----- [m]  0.000E+0 [MGM3] (TR)  --------
11:29:56                      250 [m]  1.558E+0 [MGM3] (BS)  Detected
11:29:56 Date: 24.04.2019; Time: 11:29:56; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 5385.4
```

24.4.2019	11:29:55	3318 AMMONIA	250 3.97E+00 DET.	350 0.00E+00 ---	450 0.00E+00 ---
24.4.2019	11:29:56	1080 SF6	250 1.56E+00 DET.	350 0.00E+00 ---	450 0.00E+00 ---

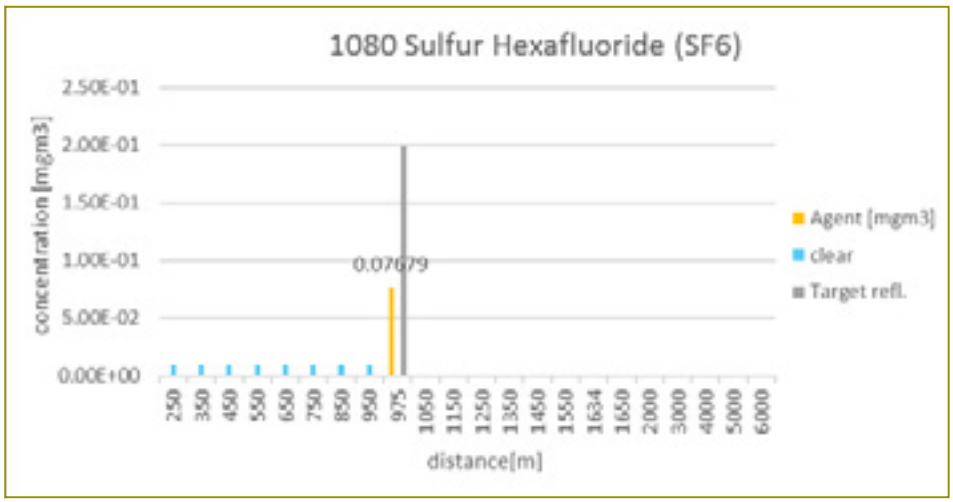




Trial #7: Sulfur Hexafluoride (SF_6) at distance of 1000 m, wind speed 7 m/s

- Measurement results: DETECTION
  - Sulfur Hexafluoride: 0.076 mg/m³

```
13:17:14 --- RESULTS:[CHEM,Single Mode for 1080 (SF6),010/2018] ----------------------
13:17:14 Settings: Start at [m]: 200  Zone width [m]: 100  Sensitivity: Expert Mode
13:17:18 1080 (SF6) ...   975 [m]  7.679E-2 [MGM3] (TR)  Detected
13:17:18 Date: 24.04.2019;Time: 13:17:18; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 4457.3
```



Trial #8: Ammonia (NH_3) at a distance 1000 m, wind speed 7 m/s

- Measurement results: DETECTION
  - Ammonia: 0.057 mg/m³

```
13:28:36 --- RESULTS:[CHEM,Single Mode for 3318 (AMMONIA),010/2018] ------------------
13:28:36 Settings: Start at [m]: 200  Zone width [m]: 100  Sensitivity: Expert Mode
13:28:38 3318 (AMMONIA) ...  1064 [m]  5.717E-2 [MGM3] (TR)  Detected
13:28:38 Date: 24.04.2019; Time: 13:28:38; Coor.of Det.: 33U 599831 5357037;
         Azimuth: 3306.0
```

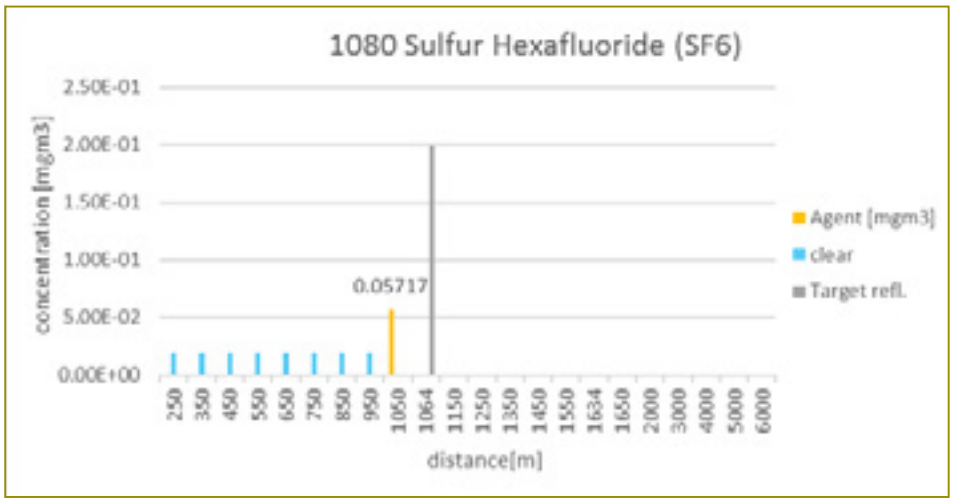


Fig. 7 · Participants of the trials

FALCON 4G

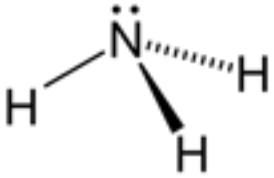
Long-Range Reconnaissance Chemical Detector

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

- **Detection**
- **Identification**
- **Quantification**

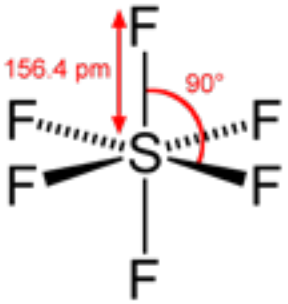
- **Up to 6 km**
- **Best sensitivity on the market**
- Distance to the cloud without triangulation
- Refractors not required
- No need to scan background

NOTES



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).



SULFUR HEXAFLUORIDE
(SF_6, Molecular weight: 146.06 g/mol)

Sulfur Hexafluoride is a colourless odourless gas. Relative Air Density is 5.10 (5 times heavier than air and very similar to CWA agents).

Source: www.worldofmolecules.com.

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Report about field tests with FALCON 4G CWA stand-off detector

Date	**24. April, 2019**
Author(s)	**Samuel Horváth, Michal Šimko**
Place	**Korneuburg, Austria**

All test results are confirmed by the Austrian Ministry of Defence

Austrian MoD, 09.05.2019

Friedrich AFLENZER, COL

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