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FALCON 4G Report
The Belgian Defense Forces

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☑ CHEM

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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 CO2 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	June 29, 2022
Place	AMAY, Belgium
Weather	sunny
Wind speed	5 – 7 m/s
Humidity	59 % (morning), 40 % (midday)
Pressure	1021 – 102 mbar
Simulants[1]	Sulphur Hexafluoride (SF_6) Ammonia (NH_3) liquid concentrate Methanol (CH_3OH)
Minimum distance	360 m
Maximum distance	999 m
Venue	Camp BRASSEUR[2]
Results	Scenarios/Success: 3/3

[1] Please refer to the last page of the report for detailed information about the simulants.
[2] Detecting in a camp area with busy driveways and ongoing construction works during the measurements.

3. METHODOLOGY

A vehicle version of Falcon 4G B was installed on a tripod with a stabilized Pan-and-Tilt platform. The Falcon 4G System was installed on the roof of the container to demonstrate that the system can be operated without the need for direct contact with the operator. The detector operation was conducted from a PC and joystick. Measurements were performed in three (3) scenarios using both manual and scanning modes.

Simulants used in trials:

- SF_6
- Methanol
- Ammonia (25% liquid concentrate). Simulants were released separately and jointly.

Simulants used in scenario No. 1

- 0.2 liters of liquid ammonia concentrate, combined with 0.5 liters of methanol

Simulants used in scenario No. 2

- Approximately 70 liters of SF_6

Simulants used in scenario No. 3

- None; automatic surveillance scanning mode conducted from panoramic pictures

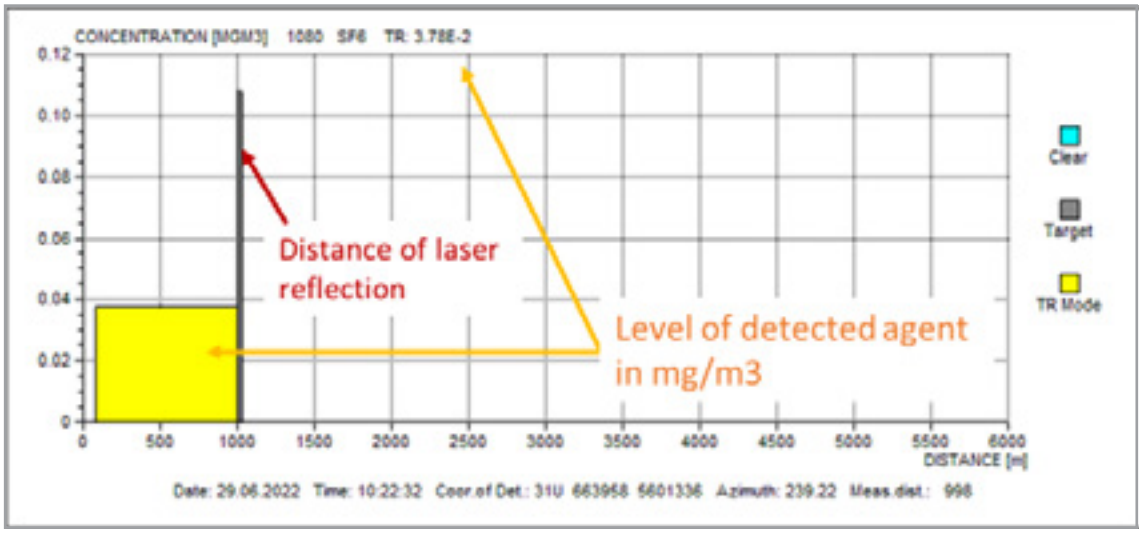


Fig. 1 · Result window description

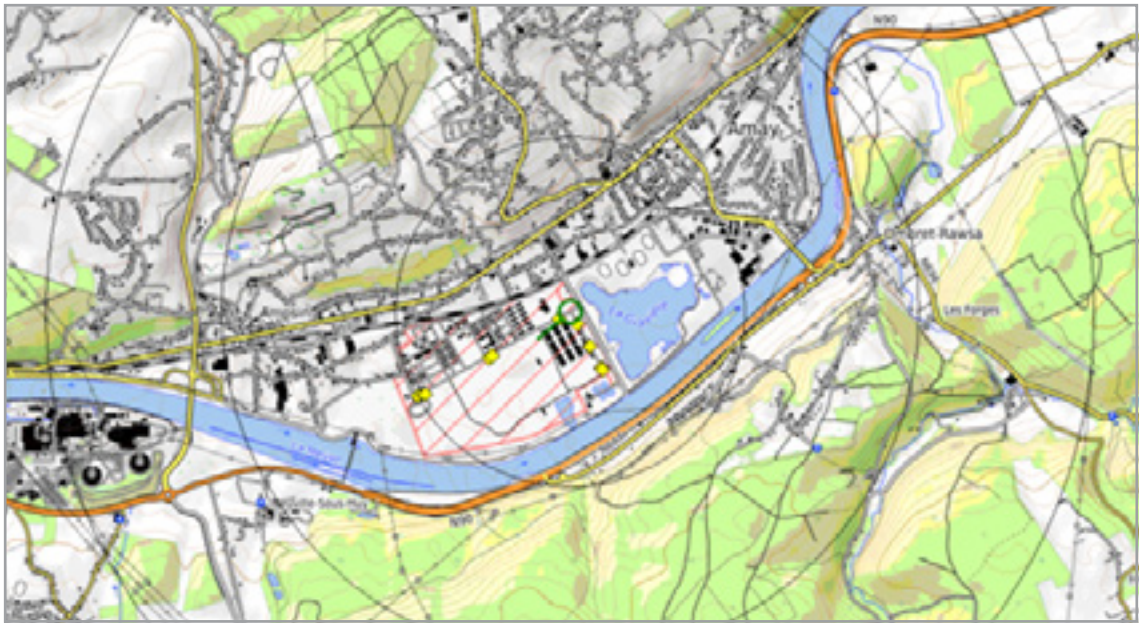


Fig. 2 · Results are displayed in Falcon 4G mapping software based on the CBRN 4 messages format

Fig. 3 · Picture of camera is saved automatically after every measurement

4. RESULTS

4.1 SCENARIO NO. 1 – AMMONIA AND METHANOL AT 366 M

Detection path was 366 meters long along an unpaved road in Camp BRASSEUR.

Fig. 4 · Description of Scenario 1

Fig. 5 · The position of releasing point for Scenario 1 with chemicals

The first scenario began with control measurements to confirm clean air on the detected path. The measurement was conducted at 10:12:35.

```
10:12:35 --- RESULTS:[CHEM,Scan Mode 3 Agent(s),022/2022] --------------------
10:12:35 Sensitivity: Normal Mode
10:12:40 3318 AMMONIA ..................... 364[m]  0.00E+0[MGM3]  TR  --------
10:12:41 1230 METHANOL .................... 364[m]  0.00E+0[MGM3]  TR  --------
10:12:42 1080 SF6 ......................... 364[m]  0.00E+0[MGM3]  TR  --------
```

After confirming clean air, liquid substances were spilled on the ground terrain to create a cloud through the evaporation of ammonia and methanol. After a few seconds, the first detection was recorded at 10:13:07 with a concentration of 0.375 mg/m³ of ammonia and 0.178 mg/m³ of methanol.

```
10:13:03 --- RESULTS:[CHEM,Scan Mode 3 Agent(s),022/2022] --------------------
10:13:03 100  Sensitivity: Normal Mode
10:13:07 3318 AMMONIA ..................... 366[m]  3.75E-1[MGM3]  TR  Detected
10:13:09 1230 METHANOL .................... 366[m]  1.78E-1[MGM3]  TR  Detected
10:13:10 1080 SF6 ......................... 366[m]  0.00E+0[MGM3]  TR  --------
```

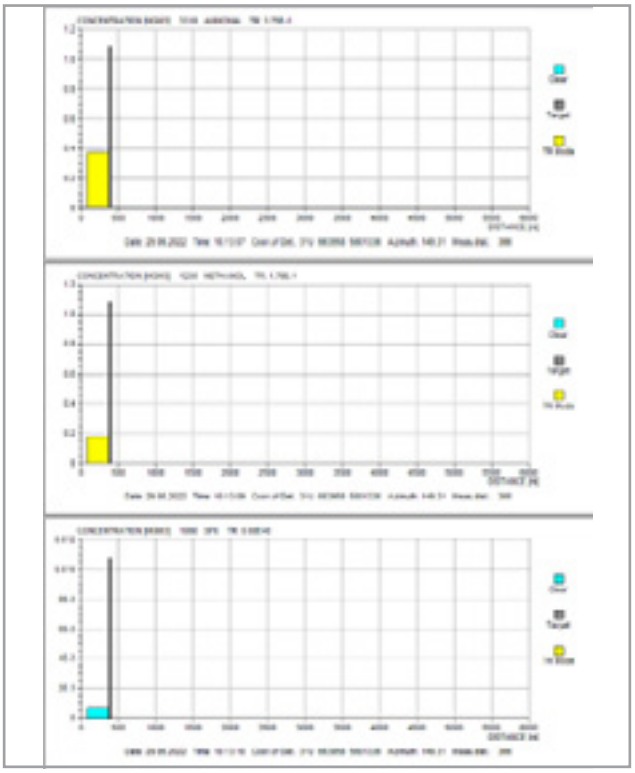


Fig. 6 · Window results of Ammonia and Methanol detection

The presence of each substance was confirmed even two minutes later, where decreasing concentrations were recorded.

At 10:15:16, concentrations of 0.066 mg/m³ of ammonia and 0.098 mg/m³ of methanol were observed.

```
10:15:12 --- RESULTS:[CHEM,Scan Mode 3 Agent(s),022/2022] --------------------
10:15:12 Settings: Sensitivity: Normal Mode
10:15:16 3318 AMMONIA ..................  374[m]  6.64E-2[MGM3]  TR  Detected
10:15:18 1230 METHANOL .................  374[m]  9.80E-2[MGM3]  TR  Detected
10:15:19 1080 SF6 ......................  374[m]  0.00E+0[MGM3]  TR  --------
```

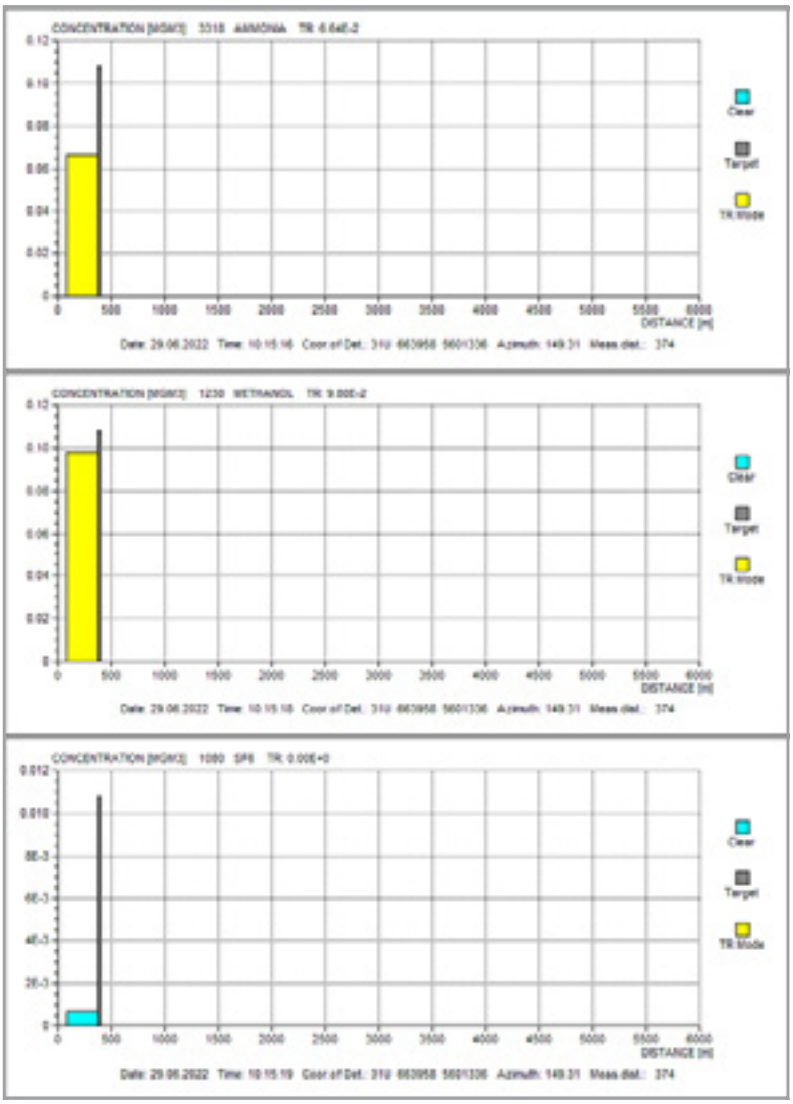


Fig. 7 · Window results that confirms detection of Ammonia and Methanol

4.2 SCENARIO NO. 2 – SULPHUR HEXAFLUORIDE AT 999 M

Second scenario started directly with released SF_6 in gas form into the tent.

Fig. 8 · Description of Scenario 2

Initially, the concentration of sulphur hexafluoride was low. The first detected concentration was recorded at a level of 0.022 mg/m³. After a few seconds, it was observed that Falcon 4G detected an increasing concentration up to 0.155 mg/m³ inside the tent.

```
10:22:19 --- RESULTS:[CHEM,Single Mode 1080 (SF6),022/2022] ------------------
10:22:19 Settings: Sensitivity: Normal Mode
10:22:23 1080 SF6 ......................  999[m]  2.24E-2[MGM3]  TR  Detected
```

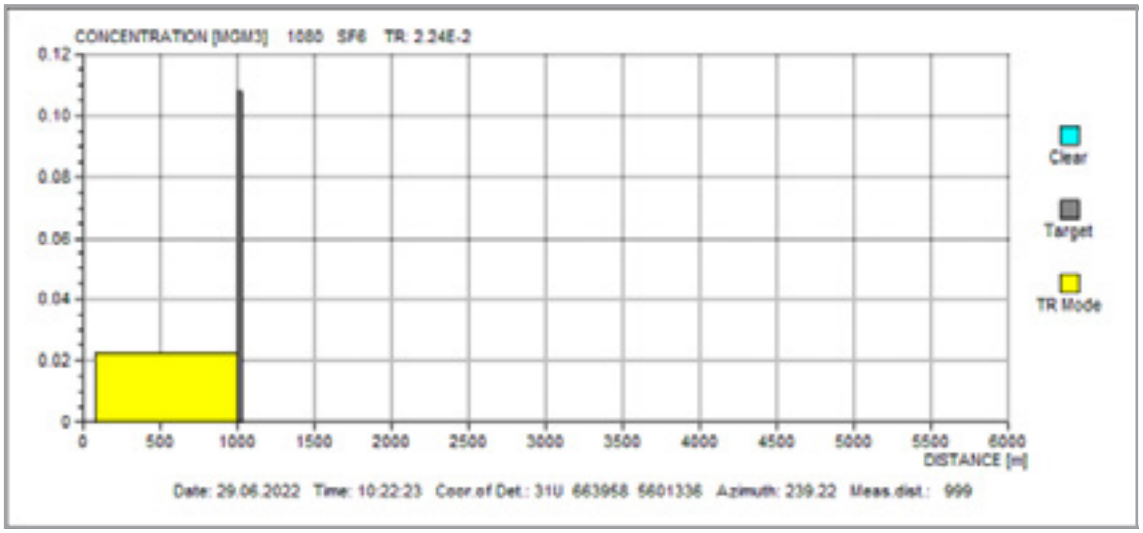


Fig. 9 · Window results of first SF_6 detection

```
10:22:27 --- RESULTS:[CHEM,Single Mode 1080 (SF6),022/2022] ------------------
10:22:27 Settings: Sensitivity: Normal Mode
10:22:32 1080 SF6 ........................ 998[m]  3.78E-2[MGM3]  TR  Detected
```

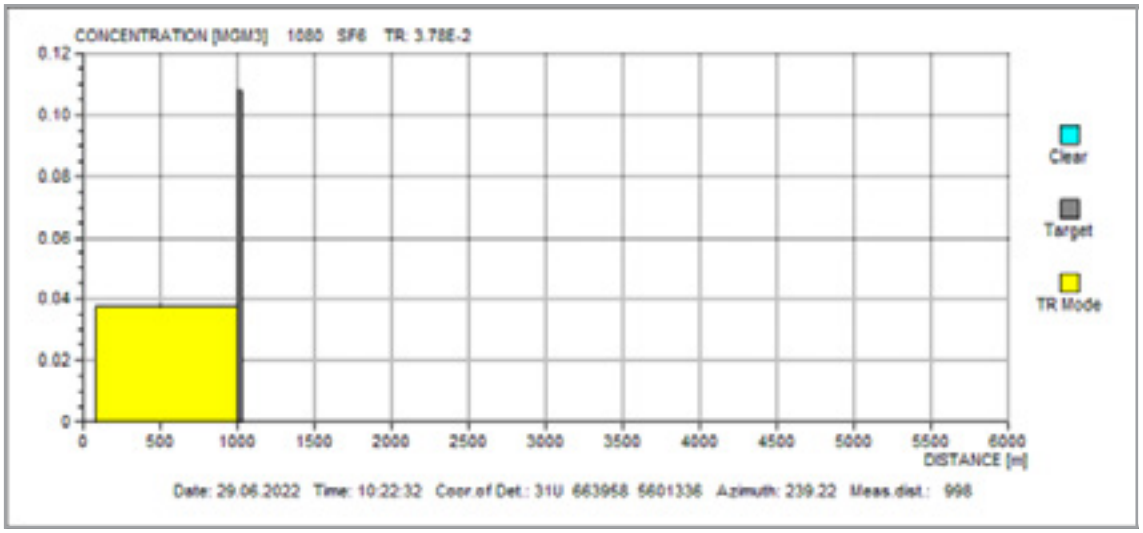


Fig. 10 · Window results of second SF_6 detection

```
10:22:39 --- RESULTS:[CHEM,Single Mode 1080 (SF6),022/2022] ------------------
10:22:39 Settings: Sensitivity: Normal Mode
10:22:44 1080 SF6 ........................  996[m]  1.01E-1[MGM3]  TR Detected
```

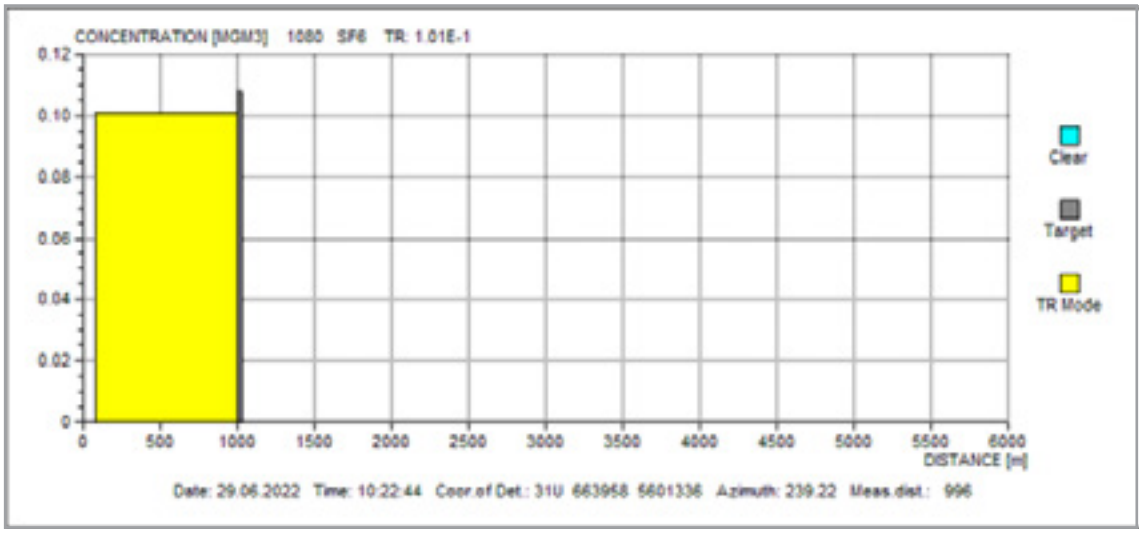


Fig. 11 · Window results of SF_6 detection with increasing concentration

```
10:22:49 --- RESULTS:[CHEM,Single Mode 1080 (SF6),022/2022] ------------------
10:22:49 Settings: Sensitivity: Normal Mode
10:22:55 1080 SF6 ........................  997[m]  1.55E-1[MGM3]  TR Detected
```

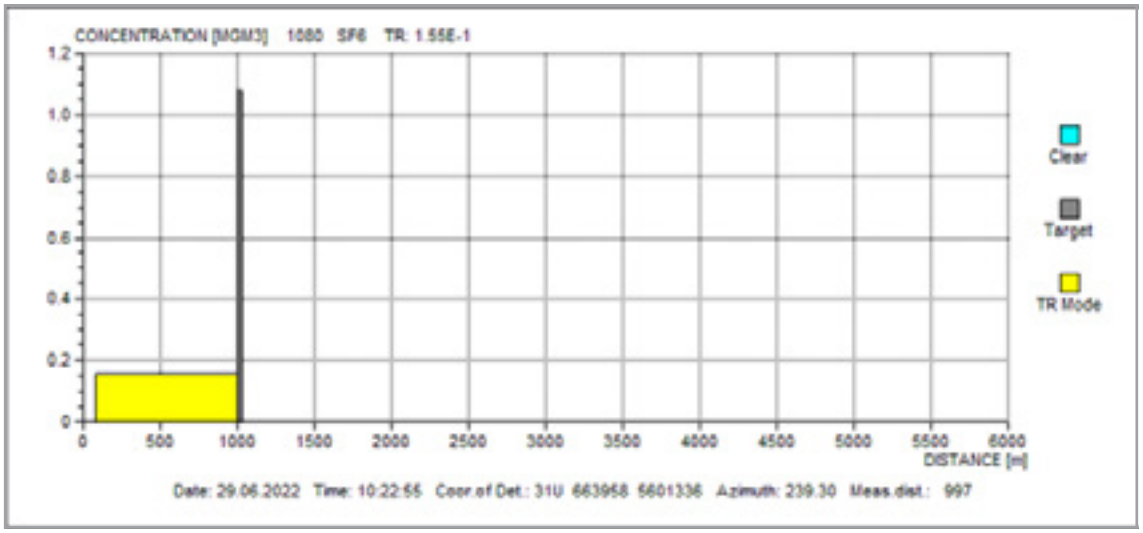


Fig. 12 · Window results of SF_6 detection with increasing concentration in time

4.3 SCENARIO NO. 3 – AUTOMATIC SURVEILLANCE SCANNING MORE FROM PANORAMA PICTURE

In the third scenario, Falcon 4G performed automatic surveillance using the scanning mode to target selected areas from the panorama picture. The panorama picture serves as a tool for the operator to quickly mark points of interest for detection surveillance. Falcon 4G software will automatically calculate these marked points and save them as targets for automatic surveillance.

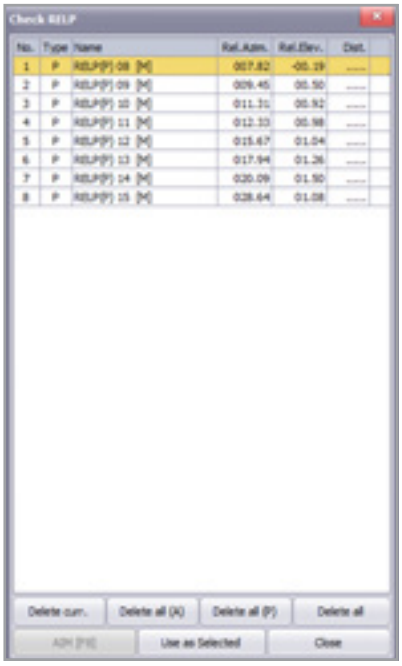


Fig. 13 · Automatically calculated relative positions based on selected points from the panorama picture

Fig. 14 · Selected points of interest are marked in the panorama picture

Fig. 15 · Selected points of interest are marked in the panorama picture

Fig. 16 · Selected points of interest are marked in the panorama picture

FALCON 4G

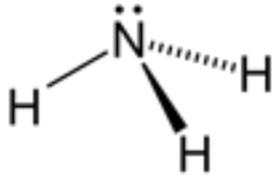
Long-Range Reconnaissance Chemical Detector

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**

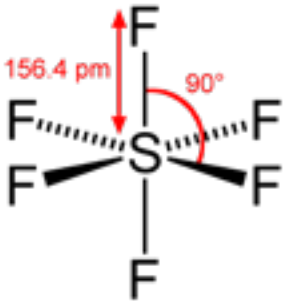
- Distance to the cloud without triangulation
- Refractors not required
- No need to scan background

NOTES



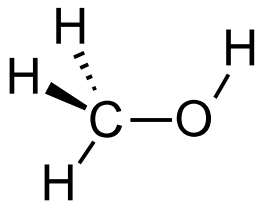
AMMONIA
(NH_3, Molecular weight: 17.031 g/mol)

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).



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

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



METHANOL
(CH_3OH, Molecular weight: 32.04 g/mol)

Methanol is a toxic alcohol that is used industrially as a solvent, pesticide, and alternative fuel source. It also occurs naturally in humans, animals, and plants.

Source: www.worldofmolecules.com.

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