

Summer Field Detection Trials in Singapore

SEC TECHNOLOGIES



1. INTRODUCTION

The **Falcon 4G** is a long-range active stand-off **chemical detector** that can detect, identify and measure chemical warfare agents (**CWA**) and toxic industrial chemicals (**TIC**) 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, homeland security and industrial applications**.

2. TRIAL CONDITIONS

Date	July 1, 2025, 12:00 AM – 3:00 PM
Place	Singapore
Weather	Sunny
Wind speed	2 m/s S – 4 m/s SW
Humidity	70 – 85 %
Temperature	33 – 38 °C
Simulants¹	SF ₆
Demonstration	1 st release: 5,0 kg SF ₆ – 5 min
	2 nd release: 5,0 kg SF ₆ – 5 min
	3 rd release: 6,6 kg SF ₆ – 3 min

3. METHODOLOGY

The demonstration (**“demo”**) conducting company was APAQ. Position of the active stand-off detector Falcon 4G is shown on Figure 1, point 1. Release point of the SF₆ was situated on the opposite shore of the bay (Figure 1). The length of the detection path was approx. 1300 m.

The Falcon 4G with MTU P&T Platform was set-up in under 10 minutes and was mounted on a tripod and positioned on the 1st floor of the small tower, where other sensors were placed as well. The active stand-off detector Falcon 4G's operation was controlled from a ruggedized Getac PC from the bottom level. Detector Falcon 4G was connected with laptop with 35 m LAN cable.

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

The team from Singapore released simulant at the designated location (Figure 1, 2-release point). Release of the SF_6 gas was done three times

- 1st release: 5,0 kg SF_6 – 5 min
- 2nd release: 5,0 kg SF_6 – 5 min
- 3rd release: 6,6 kg SF_6 – 3 min

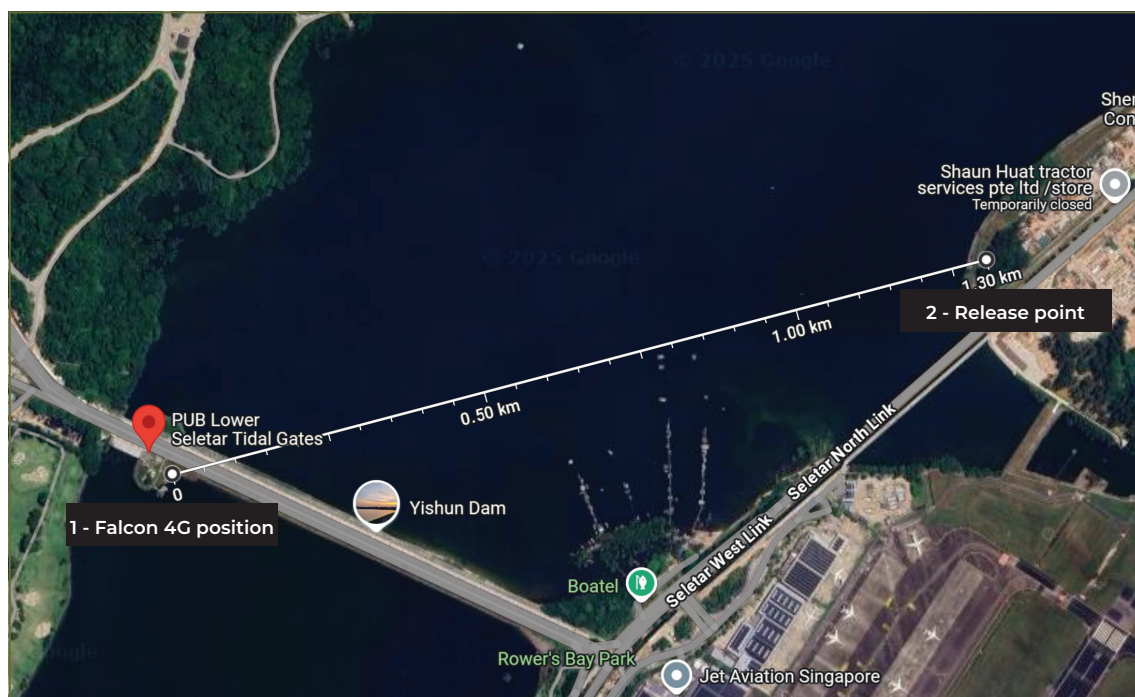


Figure 1 - Falcon 4G demo site Singapore

Position for every release was changed. This position change is visible from the Figure 2 (red box serves as orientation point).



Figure 2 - Release point position change

Communication between Falcon 4G and GETAC PC was established through 35 m LAN cable.

4. DEMONSTRATION

The map (Figure 1) shows the **distance** between **gas release site** and the **Falcon 4G detector** as **1300 m** which was the **maximum distance available at the test site**. During the actual measurement, the range varied from 1298 m to 1306 m.

4.1 RELEASE NO. 1

At 14:30 SGT (GTM+8) personal from APAQ Singapore started with releasing SF_6 gas from gas cylinder at the position marked on the Figure 1 (approx. 48N 374229 157855). First release took 5 minutes and 5 kg of SF_6 was used. Immediately after release started operator run the measurement.

First positive detection of the SF_6 was 14:30:21, it means 21 second after release was started (Figure 3 and Figure 4).



Figure 3 - Release point – 1st run

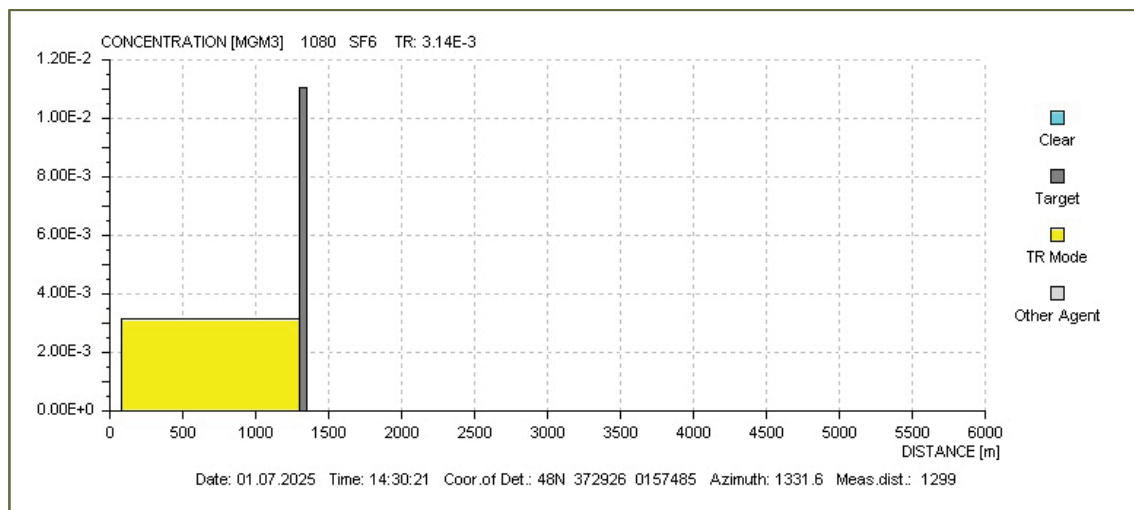


Figure 4 - Detection result – 1st run

Detection of the SF₆ gas continued with several tries which confirmed presence of the SF₆ gas and showed increasing concentration trend. After short time SF₆ gas expanded to the environment and concentration felt down (see Table 1 and Figure 5).

Table 1 Detection No. 1 - 5 kg SF₆ in 5 min

Time	Concentration x10-3 mg/m ³	Distance
14:30:06	0	1301
14:30:14	0	1303
14:30:21	3,1	1299
14:30:54	3,69	1301
14:31:22	3,64	1301
14:31:49	4,03	1298
14:32:41	3,55	1300
14:34:15	2,7	1302

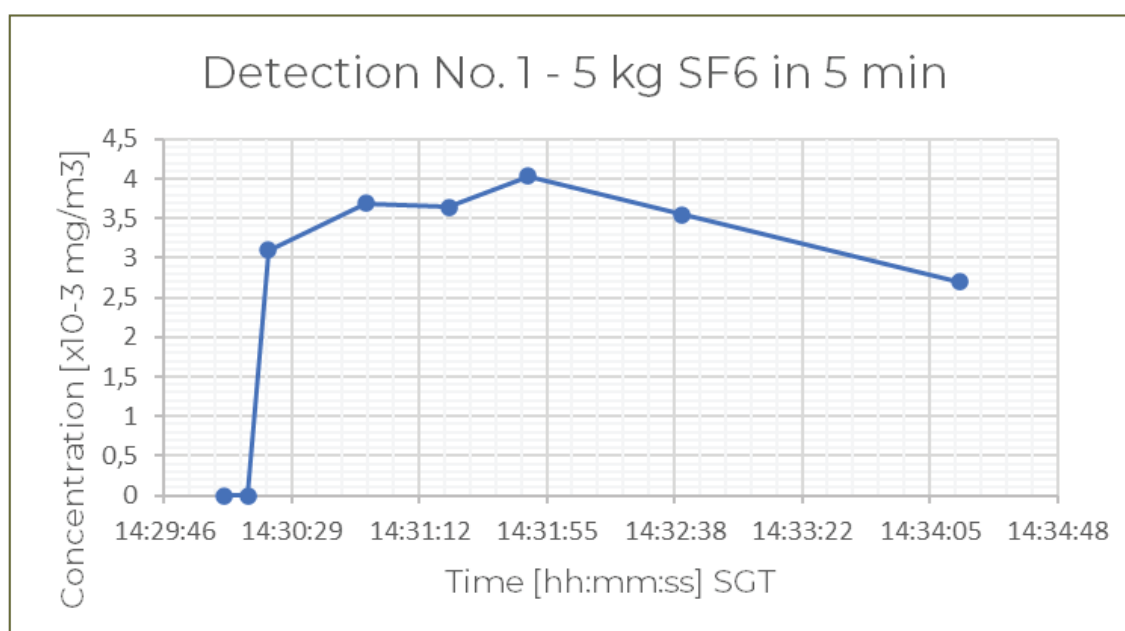


Figure 5 - Detection No. 1 - 5 kg SF₆ in 5 min

Conclusion of the 1st run

Despite relatively high temperature and humidity the Falcon 4G successfully detected the chemical within seconds of the release. **The 1st run of the test was successful** and confirmed the system's reliable performance even in challenging weather conditions.

4.2 RELEASE NO. 2

Second test started approx. at 14:53 SGT (GTM+8). Setup was exactly the same as 1st run. Personal from APAQ Singapore started with releasing SF₆ gas from gas cylinder at the position marked on the Figure 1 (approx. 48N 374229 157855). They slightly move few meters to the left side (from Falcon 4G view). Second release took 5 minutes and 5 kg of SF₆ was used. Immediately after release started operator run the measurement with goal to find the new release point.

First positive detection of the SF₆ was 14:53:41 (Figure 6 and Figure 7).



Figure 6 - Release point – 2nd run

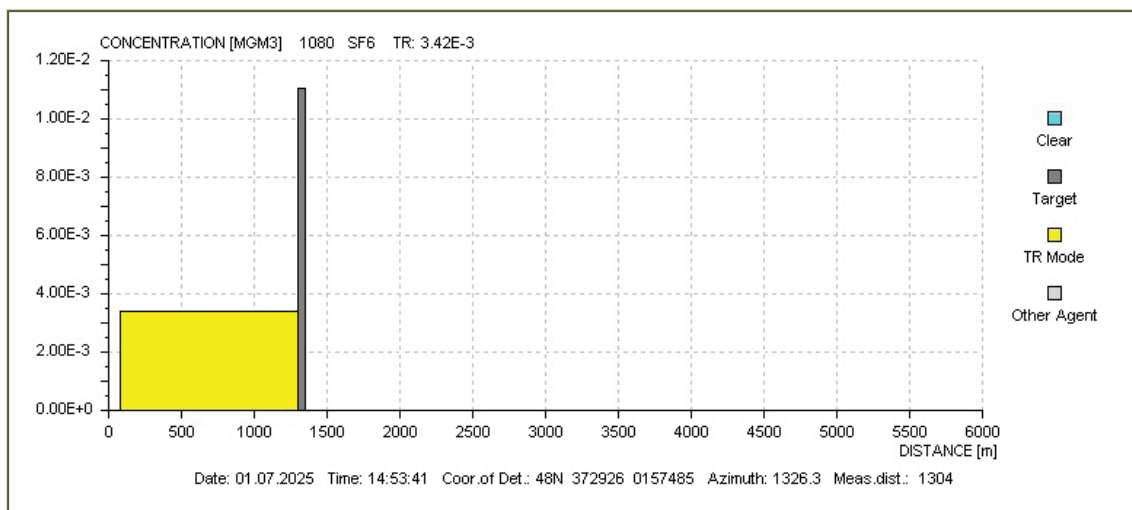
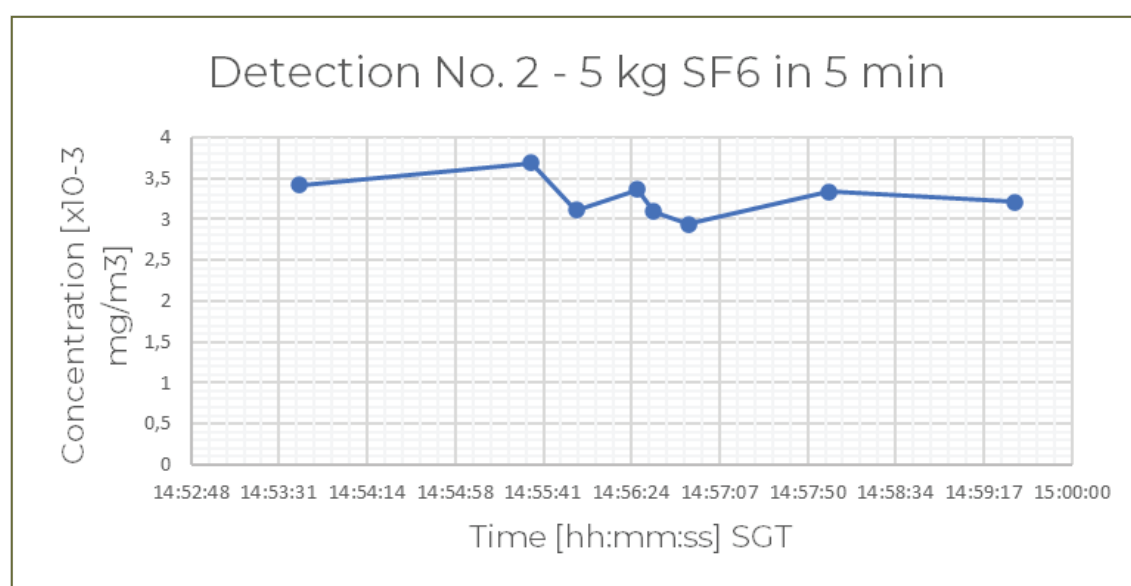


Figure 7 - Detection result – 2nd run

Same as during 1st run, detection of the SF₆ gas continued with several tries which confirmed presence of the SF₆ gas and showed increasing concentration trend. During the measurement of the SF₆ release concentration remains almost at the same level (see Table 2 and Figure 8).

Table 2 Detection No. 2 - 5 kg SF₆ in 5 min

Time	Concentration	Distance
14:53:41	3,42	1304
14:55:35	3,69	1303
14:55:57	3,11	1302
14:56:27	3,36	1305
14:56:35	3,09	1303
14:56:52	2,94	1303
14:58:01	3,34	1304
14:59:32	3,21	1306

Figure 8 - Detection No. 2 - 5 kg SF₆ in 5 min

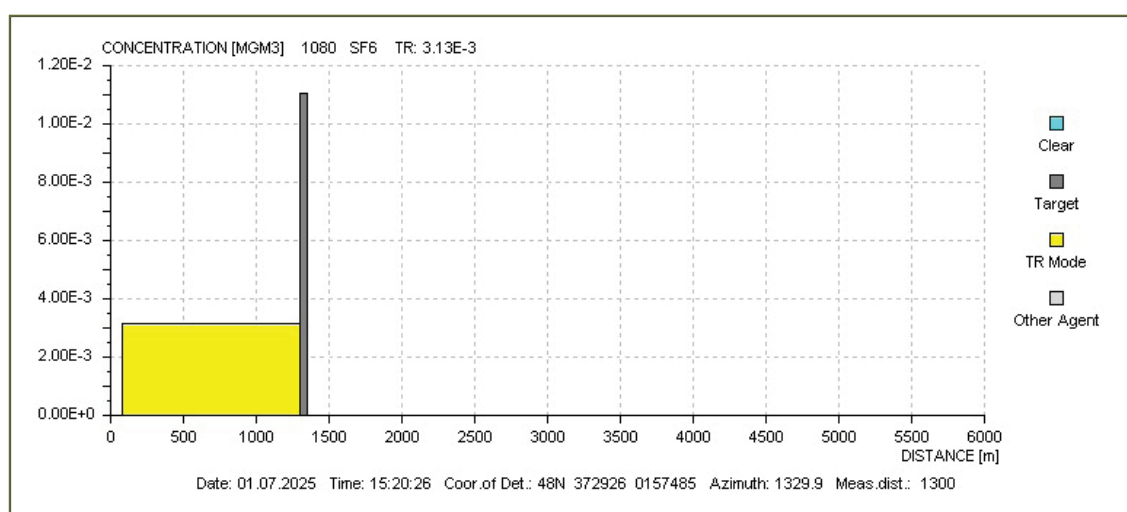
Conclusion of the 2nd run

The 2nd run of the test was successful again and confirmed the system's reliable performance with quick detectors response and ability to quickly find contaminated area.

4.3 RELEASE NO. 3

Third test started approx. at 15:20 SGT (GTM+8). Setup was slightly changed as the first two runs. Personal from APAQ Singapore started with releasing SF₆ gas from gas cylinder at the position marked on the Figure 1 (approx. 48N 374229 157855). They slightly move back few meters to the right side (from Falcon 4G view). Third release took only 3 minutes and 6.6 kg of SF₆ was used. Immediately after release started operator run the measurement with goal to find the new release point.

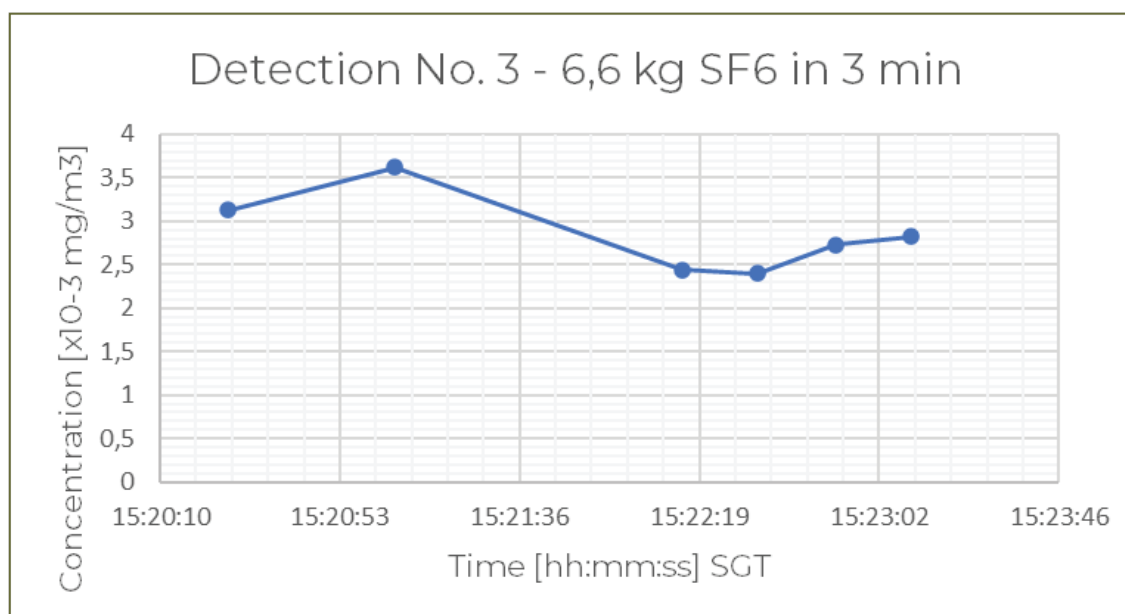
First positive detection of the SF₆ was 15:20:26 (Figure 9 and Figure 10).

Figure 9 - Release point – 3rd runFigure 10 - Detection result – 3rd run

Despite facts, that release 3rd run was realised during shorer time then previous two and amount of the SF₆ gas was higher, similar result were observed. Positive detection by the detector Falcon 4G after few seconds after release and concentration slightly varies during measurement (Table 3 and Figure 11).

Table 3 Detection No. 3 - 6.6 kg SF₆ in 3 min

Time	Concentration	Distance
15:20:26	3,13	1300
15:21:06	3,62	1301
15:22:15	2,44	1303
15:22:33	2,4	1303
15:22:52	2,73	1303
15:23:10	2,82	1303

Figure 11 - Detection No. 3 - 6.6 kg SF₆ in 3 min

Conclusion of the 3rd run

The 3rd run of the test was successful as previous test runs and confirmed the system's reliable performance with quick detectors response and ability to quickly find contaminated area.

5. RESULTS

The Falcon 4G detector was tested for its ability to detect SF₆ gas releases at a distance of approximately 1300 meters in Singapore. The demonstration included three separate gas releases, each from slightly different positions. In each trial, the detector successfully identified the presence of SF₆ within seconds of the release.

Concentration measurements showed a rapid increase after release, followed by a gradual decrease as the gas dispersed.

The system consistently detected the gas, even when the release point was shifted. Detection was reliable despite challenging weather conditions such as high

temperature and humidity. The detector's response was quick and allowed for fast identification of contaminated areas. Results were consistent across different release durations and gas quantities.

Communication between the detector and control PC was stable and effective throughout the tests. Overall, the Falcon 4G demonstrated robust and reliable performance for long-range chemical detection in field conditions.

6. CONCLUSION

The Falcon 4G detector demonstrated:

1. Rapid, reliable detection of SF₆ gas at long range under varying conditions.
2. Positive detection occurred within seconds of gas release in all trials.
3. The active stand-off detector Falcon 4G effectively identified the contaminated area even when the release point was changed between tests.
4. Detection remained consistent despite changes in release duration, gas quantity, and environmental factors (temperature & humidity).
5. This demonstration confirms the Falcon 4G's suitability for rapid, remote chemical detection in field scenarios.

Demo attendees commented that the **Falcon 4G offers "excellent detection speed and an impressive detection threshold."** They described it as **"a versatile active stand-off detector, ideal for early warning and monitoring of chemical clouds."**

Users also appreciated that the long battery life and the option to power the detector from the electric grid make it highly practical in the field. Furthermore, they noted that challenging weather conditions—such as high humidity and temperature—did not affect the detector's performance.

FALCON 4G

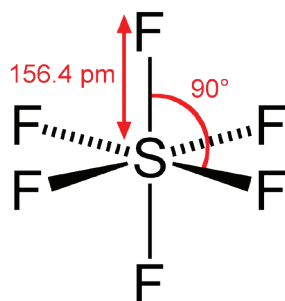
Long-Range Active Stand-off Chemical Detector

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



SIMULANTS



SULPHUR HEXAFLUORIDE

SF_6

CAS: 59109-69-2

Molecular weight: 146.06 g/mol)

Relative vapor density (air = 1): 5

Sulfur hexafluoride is an inorganic compound with the formula SF_6 . It is a colorless, odorless, non-flammable, and non-toxic gas. SF_6 has an octahedral geometry, consisting of six fluorine atoms attached to a central sulfur atom. It is a hypervalent molecule.

Sulfur hexafluoride (SF_6) is the electric power industry's preferred gas for electrical insulation and arc quenching/current interruption equipment used in the transmission and distribution of electrical energy.

Source: <https://pubchem.ncbi.nlm.nih.gov>.

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