



Insensitive Munitions Test on Artillery ammunition Vulcano 127 mm and 155 mm - Ballistic Extended Range (BER) version

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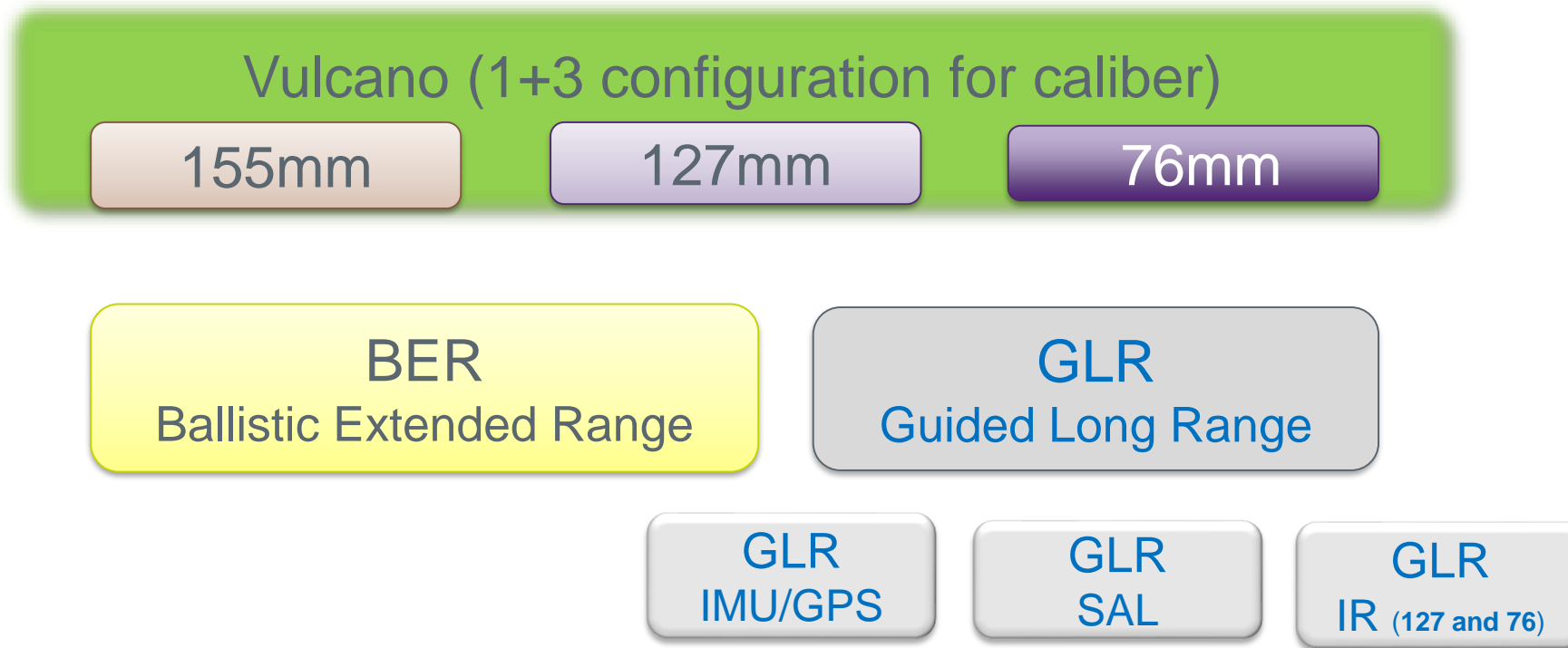
Insensitive Munitions & Energetic Material Technology Symposium

Seville Tuesday 22 October 2019





Vulcano Concept

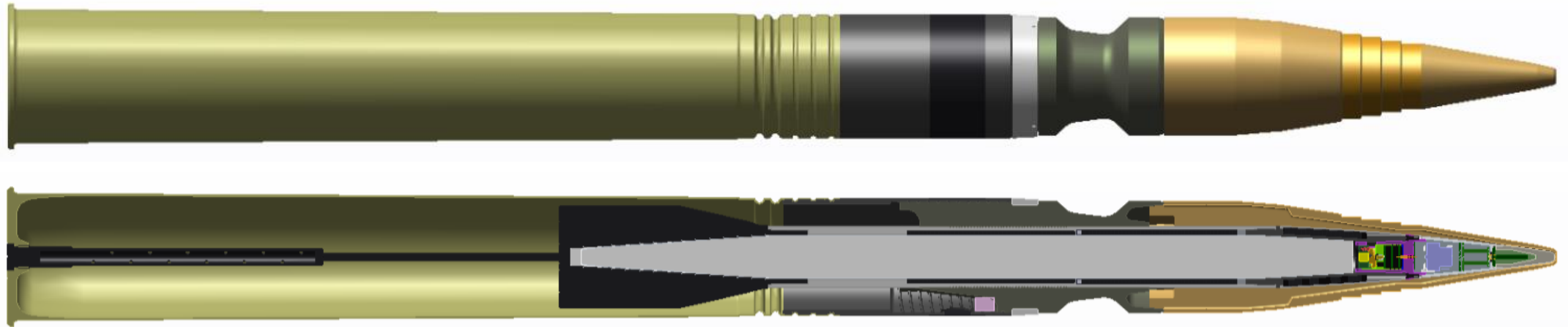


A family of new generation ammunition developed in the last 10-15 years

Vulcano 127 BER concept

Fixed-cartridge ammunition

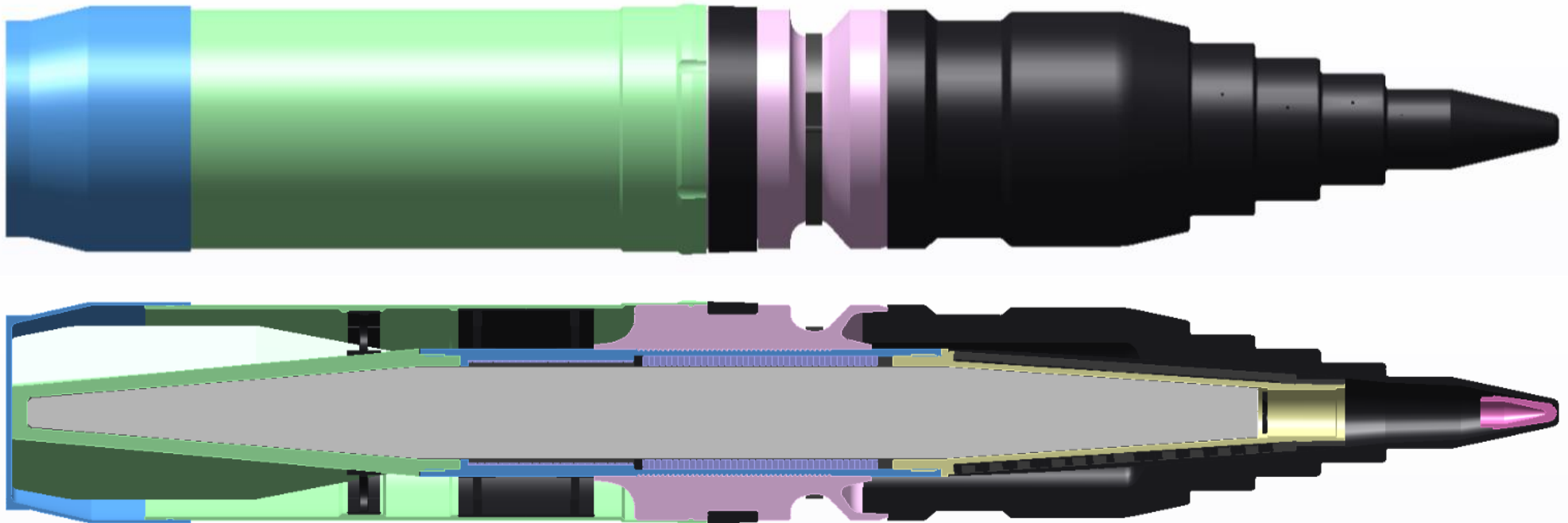
- propulsion in brass cartridge case
- HE in the projectile.
- Total weight of energetic material: 13 kg.



Vulcano 155 BER concept

Ammunition to be fired with the standard propulsion charge (modular charges),

- Contains about 4 kg of propellant around the tail.
- Total weight of energetic material: around 7,5 kg.

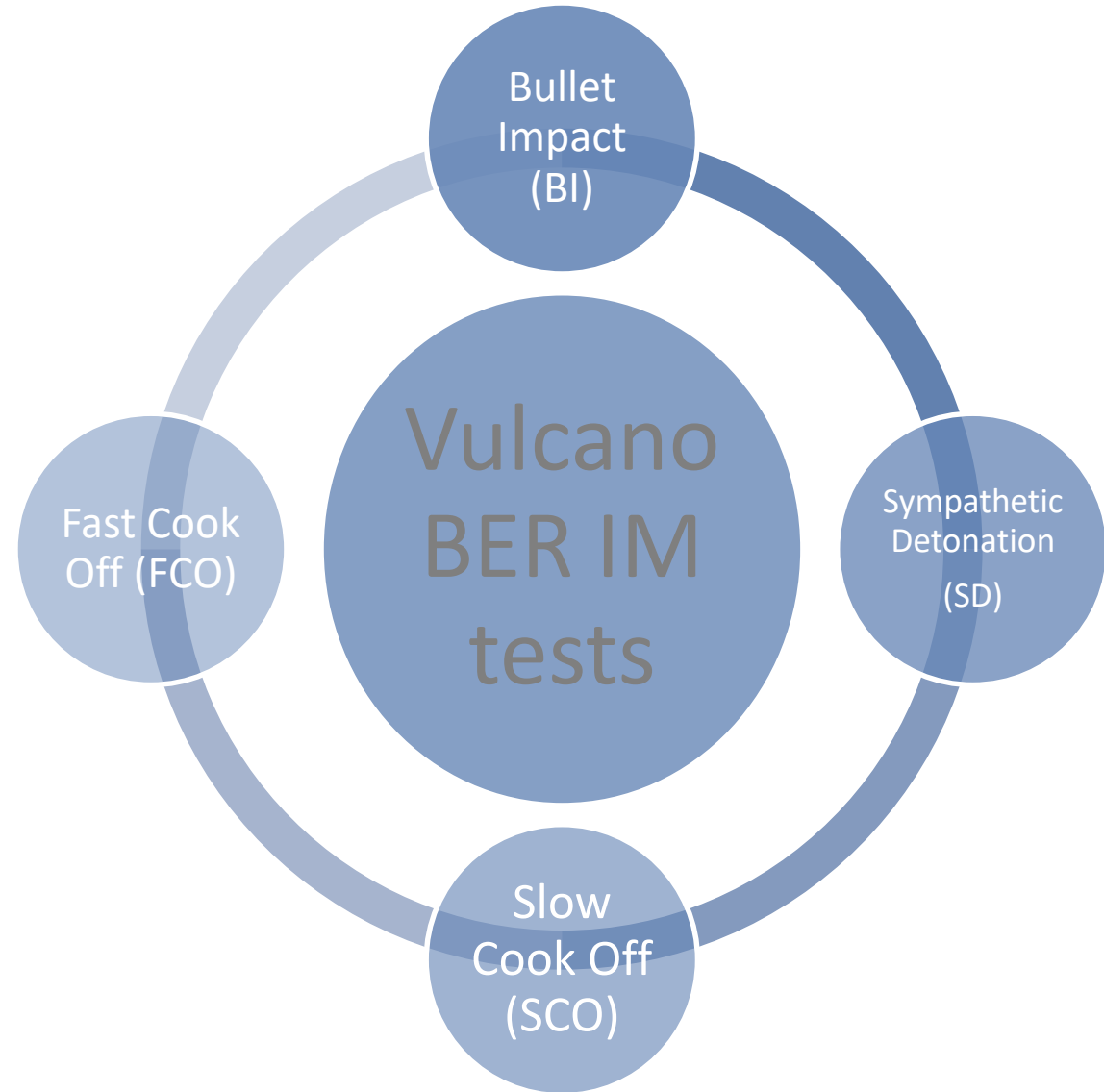




Vulcano IM qualification test

Threat Hazard Analysis performed by IT MoD:

- Bullet Impact,
 - Sympathetic Detonation,
 - Fast and Slow Cook Off.
- were chosen for both calibers



Bullett Impact

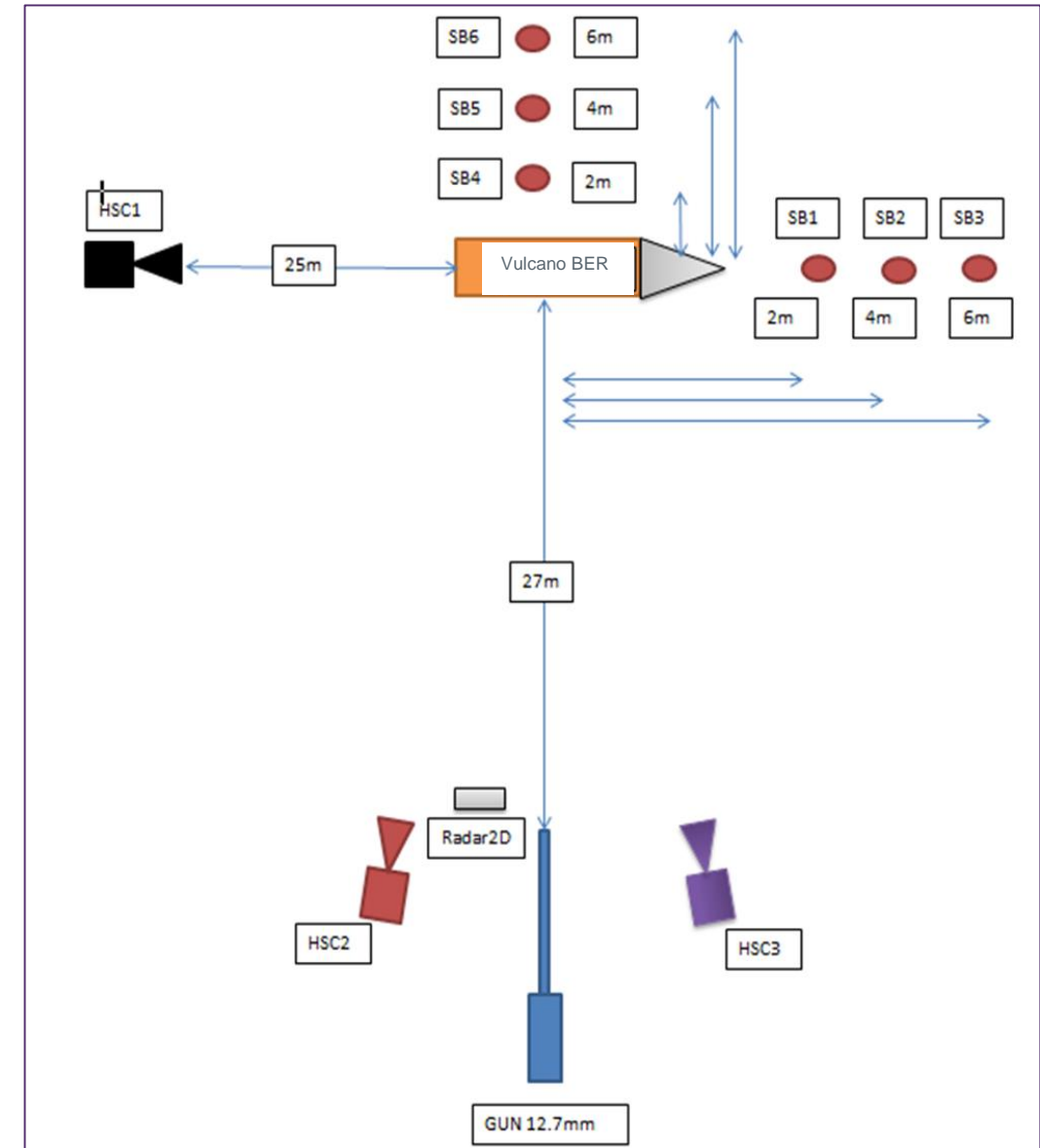
Vulcano BER

Tests: Nettuno proving ground.

A 12.7mm AP projectiles fired from a fixed gun placed at 27 m from the ammo under test.

Different aiming points were selected on the ammo related with the layout of the energetic material inside the ammo

→ A Type V reaction for both caliber

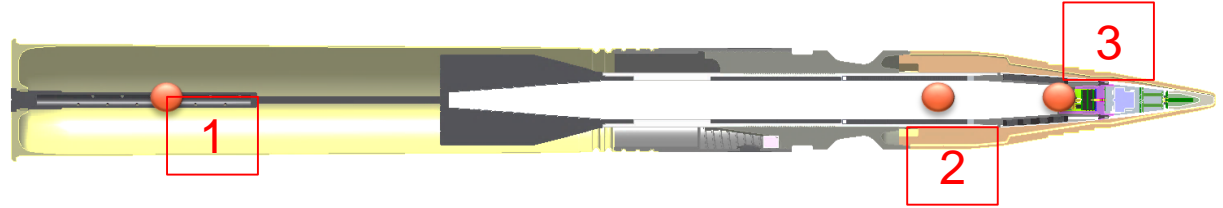




Bullet Impact - **Vulcano 127 BER**

Using three different ammo the shoots were aimed to three points:

1. propelling charge and its primer;
2. warhead section;
3. explosive fire train section.

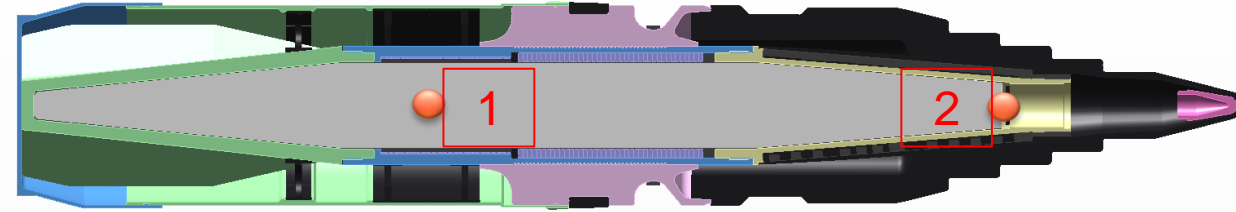




Bullet Impact - Vulcano 155 BER

For the Vulcano 155 BER ammo, shoot in two points, with two different V127BER:

1. warhead section;
2. explosive fire train section.





Sympathetic Detonation

Vulcano BER

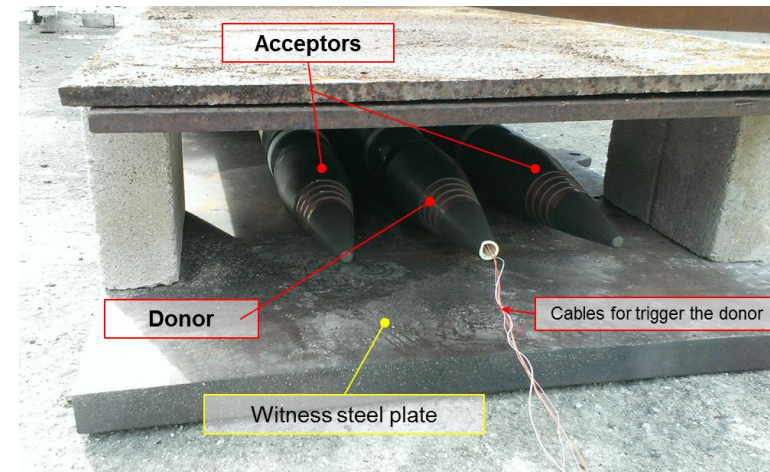
Tests: Nettuno proving ground.

V127 BER: two identical tests were performed with bare ammunition.

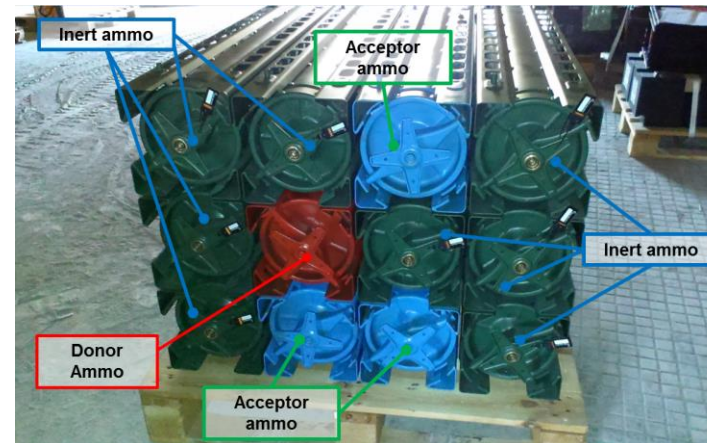
V155 BER: three tests in two different configurations:

- two with the ammo packaged
- one with ammo bare.

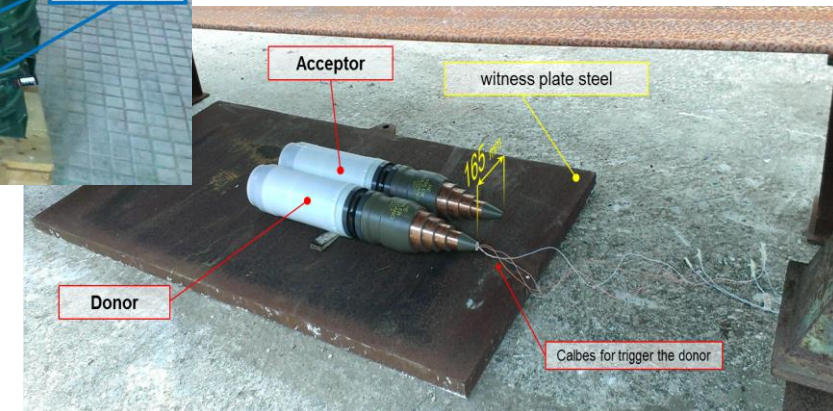
→ A type IV reaction for both calibers



V 127 BER



V 155BER



Sympathetic Detonation

Vulcano 127 BER

Big parts of the donors warhead and brass cartridge were found, as well as several grains of propellant.

All these parts were found several meters away from the test original position.



Sympathetic Detonation

Vulcano 155 BER

- Several pieces of unreacted explosive,
- Big parts of the donors warhead
- Pieces of explosive were found,
- Several grains of propellant.

The recovered parts were found several meters away from the test original position.



Fast Cook Off

Vulcano BER

Tests: Meppen proving ground (Germany).
Tests performed with gas fire.

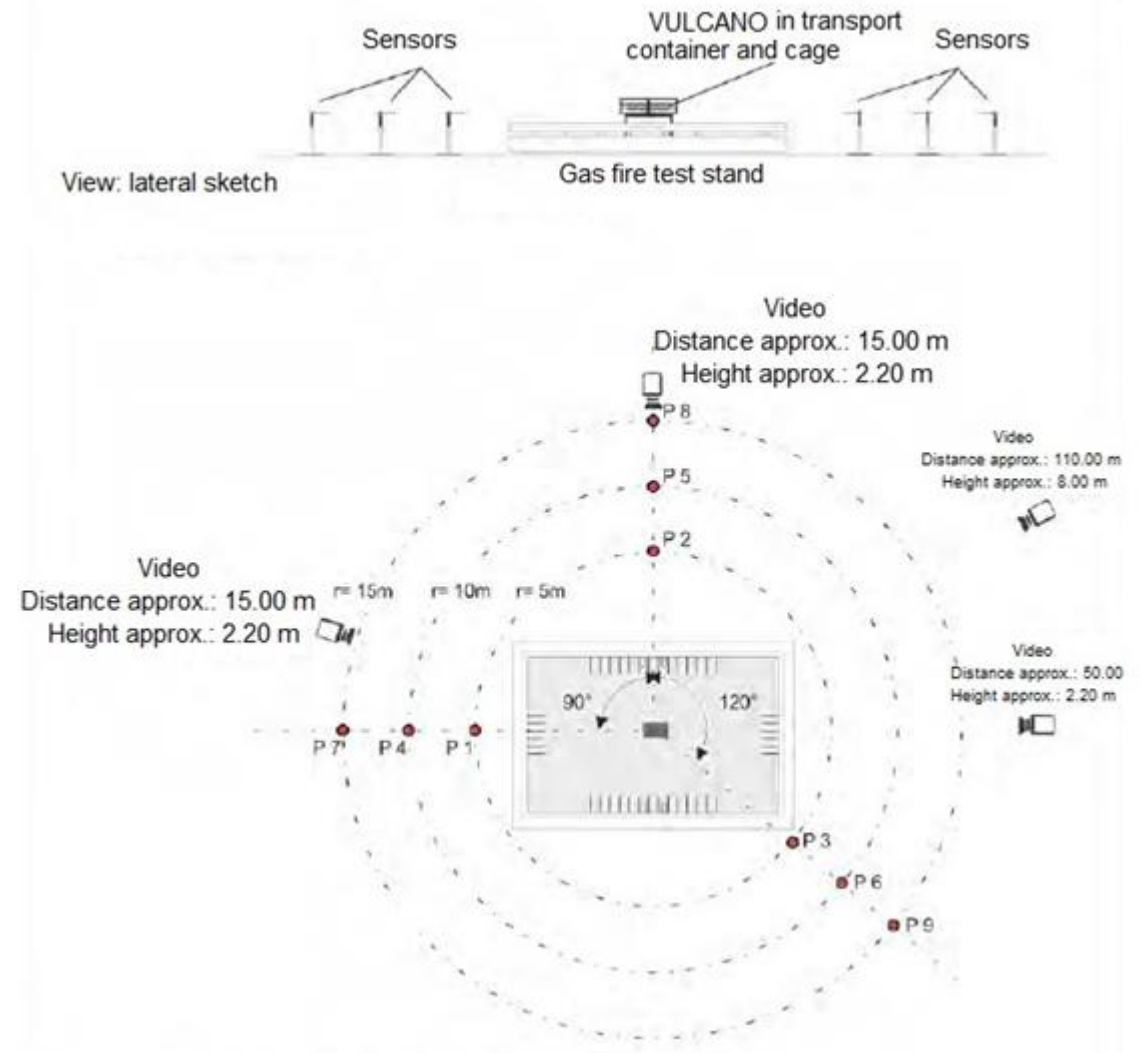
→ A type IV reaction for both calibers



V127BER packaged



V155BER packaged



Fast Cook Off

Vulcano 127 BER

Two identical tests were performed, both test gave similar results.
The first reaction occurred between 4 and 7 minutes from the start of the fire.



V127BER cage after the test



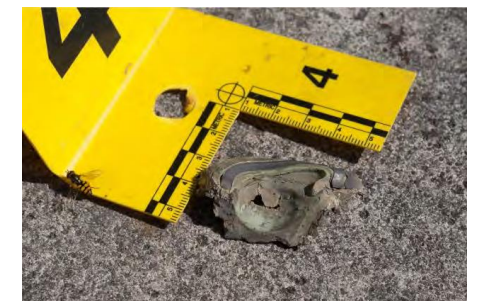
Fast Cook Off

Vulcano 155 BER

Two identical tests were performed, both test gave similar results.
The first reaction occurred between 5 and 6 minutes from the start of the fire.



V127BER cage after the test



Slow Cook Off

Vulcano BER

Tests: Nettuno proving ground (IT MoD).

- A special oven was designed.
- For both ammunition, the bare condition was considered as the worst threat.

→ A type IV reaction for V127BER

→ A type V reaction for V155BER



Slow Cook Off

Vulcano 127 BER

Reaction at a temperature of 132°C and 127°C,

- Reaction happened in the propelling charge and the brass cartridge was teared off in several big pieces.



Slow Cook Off

Vulcano 155BER

Reaction at a temperature of 118°C and 128°C,

- Reaction happened in the propelling charge.





Contacts

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THANK YOU
FOR YOUR ATTENTION

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