# Counter Stealth with Quantum Radar

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***Abstract—*** *The present extract refers to the stealth technologies and counter-effecting them with quantum radars. Stealth technology is based reflection and absorption which covers the object or the object's observability.Stealth technology is more prominent in military aircrafts. Certain Aircrafts like B-2 Bombers uses stealth technology which created a great dominance in defence. Recent Development in Anti Stealth reveals that these aircrafts can be countered. Quantum radar is one among them.*

***Keywords: Quantum Radar, Antistealth, Quantum Entanglement, RAM, RCS, ECM***

## I. INTRODUCTION

Stealth Aircrafts are the aircrafts that avoids its detection from radar. Heat signatures are the most important parameter to be concentrated while designing these aricrafts.Stealth Technology is a Low Observable Technology.

The Designer's top priority is

- Reducing thermal emission
- Reducing detection while in pursuit and Firing.
- Reducing Infra-red Detection.

Eg:F-117 Nighthawk,B-2 Spirit stealth Bomber

*Fig. 1.a*

*Fig. 1.b*

Fig1a shows the F-117 Nighthawk

Fig1b shows the B-2 Bomber

**Limitations of Stealth aircrafts:**

- Unstable Design
- Aerodynamic restrictions
- Electromagnetic Radiations
- Less Payload
- Subtle Skin
- Weak Armour
- VHF Radars can Detect

**RADAR CROSS SECTION:**

RCS is a degree of how noticeable an object is with radar.A larger RCS means the object is more easily detected.

$$\sigma^0 = \left\langle \frac{RCS_i}{A_i} \right\rangle$$

Where $RCS_i$ is the radar cross section of a particular object

$A_i$ is the area on the ground associated with that object

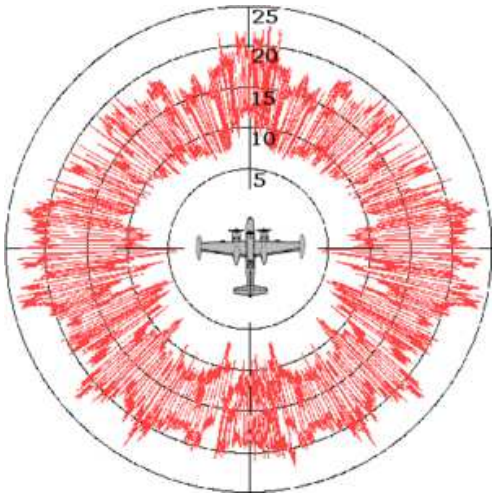



*Fig. 1.c*

**FACTORS DEPENDING ON RCS:**

1. Material of the target
2. Size of the target
3. Reflected angle
4. Polarisation of Transmitted and Received
5. Radar Absorbent Paint

Radar Absorbent Paint is a special type of paint in which radar energy is converted to heat rather than being reflected

## II. COUNTER STEALTH

All existing stealth airplanes were projected to counter X-band radars, but those forms are getting useless if radar works in s-band and even extra unusable after the radar works in L-band.

The cause for the stealth airplane to be discovered is the wavelength of the radar.

radar working in L-band produces wavelengths alongside size comparative to the airplane itself and ought to display dispersing in the resonance span rather than the optical region, so that most of the continuing stealth airplane will coil from sightless, to visible.

**ECM:**

Electronic countermeasure (ECM) is an electronic mechanism projected to mislead radar, sonar or supplementary detection arrangements, like infrared (IR) or lasers.

It could be utilized both offensively and defensively to repudiate targeting data to an enemy.

The arrangement could make countless distinct targets materialize to the enemy, or make the real target materialize to vanish or move concerning randomly. It is utilized efficiently to protect airplane from accompanied missiles.

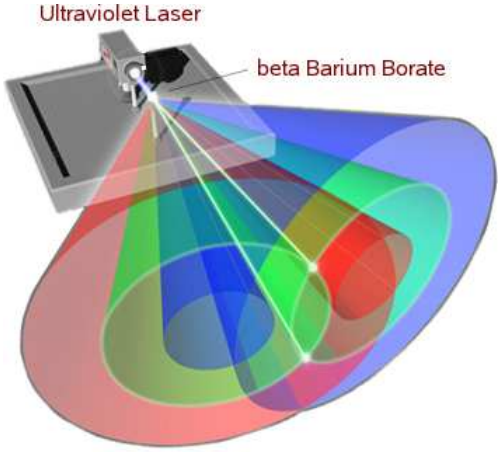
Most air powers use ECM to protect their airplane from attack. It has additionally been used by military ships and presently on advanced tanks to fool laser/IR accompanied missiles. It is commonly coupled with stealth developments so that the ECM systems have an easier job.Invasive ECM often takes the form of jamming. Defensive ECM includes using blip enhancement and jamming of missile terminal homers.

The above two images is an example of radar spoofing where the original image is an aircraft and compromised image is a bird.

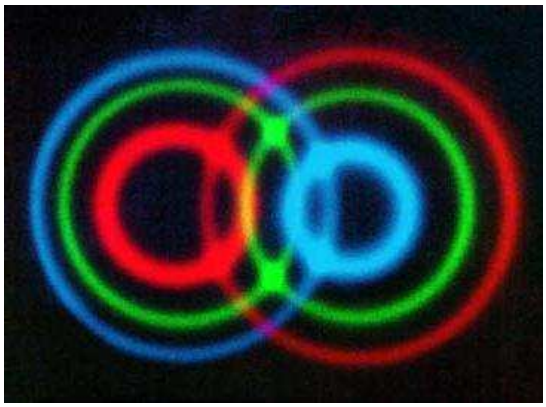
## III. QUANTUM RADAR

Quantum radar is a type of radar which is based on quantum entanglement.

Quantum entanglement:when the original photon splits into two photons,the resulting photon pair is considered to be entagled.




Photon entangler device



Entangled Photons

Quantum radaruses photon entanglement to allow more entangled photons to purpose as if a shorter wavelength was utilized to permit detection of tiny features as possessing a finished longer cluster wavelength that permits long distance transmission.

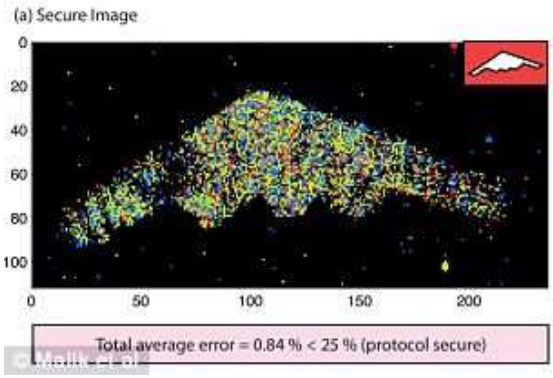



*Fig.1.d*

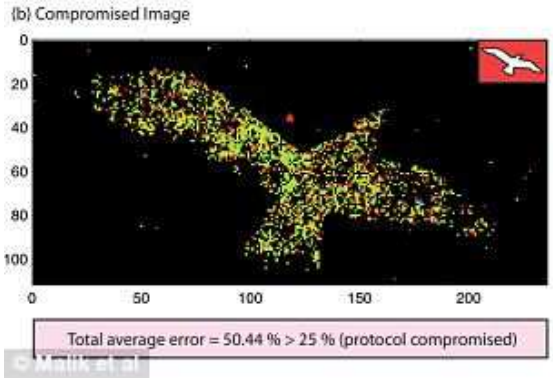



*Fig. 1.e*

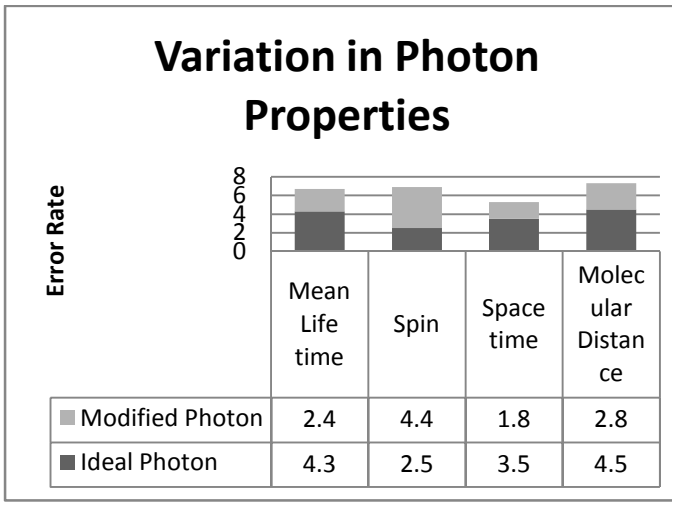
From the above two images we can see that the Target has spoofed the detected aircraft into a bird.

But the Quantum radar is able to identify that it is a fake signal.

Since the quantum radar uses photon entanglement, if a stealth aircrafts captures these photons and resend them in a manner that masks its position, it would definitely change the photon's quantum properties.

The Quantum Radar recordsthese properties and compares it with the original signal. Once it doesn't match, the quantum radar calculates the average error rate.

If we take a look at the Fig1D, E we can see that the properties of the photons are changed.




From the above statistics, the error rate is found so the radar spoofing is useless in the case of quantum radar.

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