Variable-Frequency pHased Array Laser [VFHAL]

OOC Note VFHAL is a *weapon technology*, not a distinct weapon system. As a result this article has no DR value. DR values for VFHAL systems on future submissions will need to be approved with that submission (or use the DR value for prior approved VFHAL systems).

Abstract

The Variable-Frequency Phased Array Laser (or VFHAL) is one of the most common weapon systems found on vehicles and armor within the Republic and can be seen in the hands of both the military and civilians. The VFHAL system is capable of generating and guiding multiple laser beams and has no moving parts, making it exceptionally durable. VFHAL weapon systems are commonly seen in conjunction with HECAC armor as the later is designed so that laser systems under it are able to fire through.

Detail

The Variable-Frequency Phased Array Laser (or VFHAL) is one of the most common weapon systems found on vehicles and armor within the Republic. They can be seen in use by both the military and (in a substantially less powerful version) civilians and are in fact the most common defensive weapons found on civilian starships due to their reliability, efficiency, and relative low cost.

The VFHAL system utilizes an array of quantum dot-based laser diodes to generate its beam. Like all phased array EM systems, the VFHAL utilizes the destructive and constructive interference of its constituent laser diodes to generate coherent laser beams. This method results in a number of bonuses to its operation

- Reliability: The VFHAL system has no moving parts and since its power-transfer systems utilize superconductors it has little to no wear-and-tear, allowing a unit to operate for years without any maintenance.
- Durability: Since the VFHAL system is composed of thousands (or far more in larger arrays) of independent diodes the array can suffer damage to a larger percentage of its surface without a serious drop in capability.
- Efficiency: The quantum-dot diodes used in the VFHAL are extremely efficient converting essentially all of its input power into the emitted laser.
- Versatility: VFHAL systems are able to generate and steer a multitude of different beams (even ones at differing frequencies) at any given time allowing the VFHAL to perform in multiple roles at once. The diodes are also able to act as receivers, allowing the vehicle or armor on which the VFHAL is installed to see through the weapon system.

The feature that distinguishes VFHAL systems from simpler phased array-type lasers is its ability to alter the quantum-dot structure through alterations of the applied current. This allows the array to change the

frequency of its emitted light over a wide range. In civilian systems this ranges the low radio-frequency range up to the high ultra-violet. Military units are able to reach in to the high x-ray range. Unfortunately, since gamma-rays can only be produced by nuclear processes the VFHAL system cannot create them (although the upper-end photon energies of military units overlap into the gamma-ray energy band).

Most vehicles and armors that utilize VFHAL systems use them in a multitude of roles, ranging from sensors to weapons to communications. On military vehicles and armors they are also a key component in their active camouflage systems.

VFHAL systems are assigned a designation with the following structure: [Prefix Descriptor][Application Class][Generation][Series Number]

- The Prefix Descriptor identifies the general application (civilian, C, or military, M). Systems using the related Layered VFHAL technology have a prefix descriptor of L.
- The Application Class shows what the intended purpose of the system is, ranging from 1 to 5 as shown on the following table.

Class	Application
1	Non-combat applications. These are generally systems used purely as sensors or communications as they are incapable of producing any serious damage.
2	Low Combat Risk. These are the systems usually found on civilian vessels. They are capable of causing damage to armored targets but are unlikely to cause any serious harm to military vehicles or armors unless the system array is very large.
3	Moderate Combat Risk. These systems are meant to provide good offensive power for applications where it is unlikely that the armor or vehicle will encounter military opponents.
4	High Combat Risk. Intended for high-intensity combat, these systems posses substantially higher offensive power than similarly sized arrays of class 1-3.
5	High Combat Risk. These systems are purely for military warships and heavy armors. Vehicles so equipped have full-coverage VFHAL systems (i.e. covering most if not all of the hull).

- Generation: VFHAL-type systems have been in use within the Republic (and the OCG before it) for centuries and have gone through several generations. The table that follows lists some important improvements in subsequent generations.

Generation	Improvements
1	The original version of the VFHAL system, produced in BR- 730
2	Improvements in production of quantum-dots lasers and their support structures greatly decreased the array size necessary to produce a given beam strength. Produced around BR-411
3	This generation introduced a the capability to produce a very wide range of frequencies through dynamic alteration of the quantum dots. Previous generations where limited to operation in a number of fixed frequency ranges. Produced from BR-245 to the present. They can still be found in some older applications.
4	Current generation. They incorporate a number of advances gained through combat use and technology acquired over the last several years. Military G4 VFHAL systems are capable of generating scalar effects at distance.

- Series Number. Simple as it sounds, the series number of that particular VFHAL system. It is usually a 2 or 3 digit number but can be longer so as to ensure a unique code.

Layered VFHAL

Layered VFHAL systems are quite simply weapons where multiple layers of the VFHAL network are placed on top of each other with a waveguide between the layers. These systems are intended purely as weapons and are capable of much higher power output than normal VFHAL systems. They could be deployed to cover the surface of a armor of vehicles as are normal VFHAL systems they are not quite as resilient in that configuration and because of this are almost always seen in compact applications, such as carried weapons or high-powered emplacements.