Hard Light (Technology)

Hard Light is a volumetric projection which resists things passing through it, the same way matter does. It has no mass but can replicate the texture, feel and appearance of a wide variety of forms of real matter. While it has no “advanced” chemical processes, it can to an extremely limited degree trigger chemical properties in OTHER materials the same way a catylist does since it has electrons or be fused with conventional matter. It can also surrender these electrons but its nucleus is composed of photons, not protons and neutrons as conventional matter is.

- At this time, the only industrial capacity hard-light projector is the Lazarus Consortium Iridescence-Resonance Inference hard-light Projector.
- While technically hard light can be considered a form of solid volumetrics, it forms real atoms using photons as a nucleus, not the use of plasma or electroreactive particles to emulate this property. Some hard light objects can be permanent structures though their repair and alteration involves the use of a projector.

Science

Hardlight tricks individual photons which make up light into slowing down and then traps them into bonding into a nucleus which supports an electron shell. This is achieved by resonance trapping. A resonance trap is similar to a Rydberg blockade found inside advanced gravitational control equipment, specifically the Lazarus gravitic centrifuge which was used to create the first hardlight objects.

Basic Mechanics

Specifically, it is the containment via electron shell which keeps the light stable and allows the light to be “chemically bonded” in a way which can be electronically controlled. In addition, matter won't pass through the hard-light object, since it replicates Pauli's Exclusion principle - the same principle which prevents matter from passing through itself - with resonance shifting the same way matter does.

In addition, controlled electrostatics along its length can command hard-light to re-organise itself differently in very very complex ways, even changing the pseudo-atomic order and electron shell count as well as the layout of these objects, essentially creating a form of programmable matter. Conventional atoms can be chemically bonded to this electrically programmable shell.

Unless designed otherwise, all hard-light objects are transparent. Most hard-light objects are “stuck” to their projectors. It is common to weigh them down with ballast, making them heavier than air using gas pockets.

Damage Resistance

The damage resistance of any projection is limited to how well the layout of the pseudo-atoms can distribute the force in question: either yielding and bending or by being stiff, just like matter. Unlike matter, a hard-light object can heal or “rectify”. Rectification is achieved in one of two ways:

1. The energy in the electron shell which causes strain (overwhelming the shell until it splits) is extracted, first electro-statically and then to other photons, making the hard-light object radiate when struck, twisted, bent or crushed.
2. By replacing photonic/pseudo-atoms, sealing gaps, holes or re-combining separated elements. This can only be achieved by a projector.

Hard-light can be physically harder or more yielding than conventional matter, provided it is rectified to make up for damage.

The effective damage hard-light can endure is directly linked to how well organised its structure is and the rectification-rate of its connected projector.

These processes can be interrupted with a very intense, directed and precise electromagnetic pulsed burst. This EMP at this time is far beyond anything short of the upper atmosphere of electromagnetically active gas-giants and stars - particularly pulsars, at the time of hard-light's discovery, surpassing even the capabilities of surface-to-orbit weapons and starbases. An output of this magnitude would easily induce total nuclear failure, collapsing any atomic structure of equal atomic-count made of conventional matter.

Long term structures

Hard-light objects continue to persist if disconnected from their projector long-term the same way matter does, depending on the chemical effectiveness of the arrangement. Generally this “chemical effectiveness” or how stable the arrangement is largely based on the amount of energy and precision invested, with more permanent structures taking weeks or even months to synthesize and taking much longer than less stable structures to rectify. Permanent structures are ideal for creating hull or construction supports or specialised components.

Very very few hard-light objects are long-term structures due to the extremely high tolerances involved during their “manufacture” and are almost never cost-effective and the means for forming long-term structures with a decent yield or rectifying long-term structures without damaging them is not public knowledge at this point.

Short term structures

Objects with low energy investments and simple arrangements can be rectified and transformed in arrangement and layout very quickly. These are the vast majority if not almost all hard-light objects. They are ideal for forming multi-purpose tools, for acting as a means of locomotion, for creating disposable circuitry, platforms, interfaces and physical protection.

When a projector shuts down, a short-term structure rapidly fails and flickers under strain.

As an electromagnet

The variable electromagnetic properties of hard-light allow it to act as an electromagnet which can change shape on demand. A conventional electromagnet destroys itself around 100 to 10,000 tesla, cracking, buckling, warping and crushing itself or overheating itself. While hard-light objects experience the same stresses, the rectification rate can surpass the destruction-rate if the projectors efficiency is high enough, creating a sustainable non-volatile non-self-destructive electromagnet.

While commonly to achieve these sorts of outputs many electromagnets are used redundantly (which is very heavy) a sustainable hard-light electromagnet can do it almost weightlessly.

Unfortunately the means to create a post-10,000 tesla rated hard-light antennae at this time are not public knowledge.

The projector

An assortment of different ways exist to create hard-light projectors but in all cases the design is a trade-off between four primary factors: 1) Programmability, mechanical response and controllability, 2) Rectification performance and projection scale, 3) electromagnetic output and 4) efficiency, size and weight.

As a direct result, projectors used for some applications are totally unsuitable in others with projectors available to the public being highly specialised, rather than generalised. Those which overstep their boundaries suffer in terms of energetic efficiency, the cost to manufacture and their mechanical fault tolerance. For this reason, it is not unusual for a device to use many projectors supporting the same object in different ways.

While at this time projectors are widely experimented with in academic settings on extremely small scales with limited results, the only effective projector at this time doing meaningful work is the Iridescence Projector privately used at this time by the Lazarus Consortium.