

 **TDK**



MADE AND PLAYED ON 

 **TDK**

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WHY OPT FOR A **BLU-RAY DISC**? EXAMPLES AND APPLICATIONS

HDTV

High Definition Television (HDTV) is expected to replace standard television in the coming years. Compared to the PAL and SECAM formats, HDTV offers up to five times more detail.

The common HDTV formats are 720p, 1080i and 1080p. The 1080p format with a resolution of 1920x1080 pixels/lines, delivers a picture with a resolution and picture size five times greater than the current PAL format with 720x576 pixels/lines.

HDTV offers the viewer more detail. However, as picture quality improves, the amount of storage required to record such a high-resolution television signal without loss of quality also increases.

Due to the large amount of television signal data, viewers can only record approximately 20 minutes of programming in HDTV quality on a conventional DVD. The Blu-ray Disc offers viewers sufficient storage capacity to record their favourite TV shows in HDTV quality without any loss of data.

Data Storage

More and more businesses are investing in backup systems capable of storing vast amounts of data. As a result of the ever-increasing amount of legal requirements concerning archiving and retention of business records, data storage and backup solutions are becoming more crucial for businesses.

Thanks to the Blu-ray Disc, future data backups can be performed with a throughput of 72 Mbps. In addition to the greater storage capacity (up to ten times greater than conventional DVDs), the Blu-ray Disc together with its high data transfer rates offers a genuine alternative to other types of backup systems.

Developers of Video Games

The next generation video game consoles are based upon HD technology and offer gamers a more intense gaming experience with more vivid visual effects. As a result of HDTV's higher-resolution picture quality, next generation video consoles will also require storage media with greater capacities.

SONY's Playstation 3 will be the first video game console to utilise the Blu-ray Disc as a storage medium. Thanks to its higher data transfer rates as well as its greater storage capacity, the Blu-ray Disc is the optimal storage medium for next generation games.

Game developers working on games for Playstation 3 require Blu-ray Discs for mastering and authoring. TDK's Blu-ray Disc media have been included in SONY's list of recommended storage media for the development of Playstation 3 games.



Film and TV Studios

In the future, film and television production companies will work with high-resolution HD videos and consequently will require dependable high-capacity storage media with high data transfer rates.

The Blu-ray Disc will be deployed here too, and it will be used with professional as well as semi-professional video editing systems. In addition to traditional video editing, the Blu-ray Disc will also be deployed for HD authoring.

Film studios will use Blu-ray Discs for their mass production masters. The Blu-ray Disc will be utilised for mastering and authoring purposes.

Home Computing

Beginning in the spring of 2006, the first manufacturers will start offering Blu-ray Disc drives for PCs, thereby enabling their customers to utilise the benefits of the Blu-ray Disc both professionally and privately.

Businesses can perform backups using Blu-ray Disc writers, and hobby moviemakers can save their high-resolution holiday video or camcorder footage to Blu-ray Discs. PC functions and home entertainment will increasingly merge.

By virtue of its features, such as high storage capacity and high data transfer rates, the Blu-ray Disc offers many application possibilities.

HDTV recordings.

Data backup/data storage.

Next generation video games.

Film and TV productions.

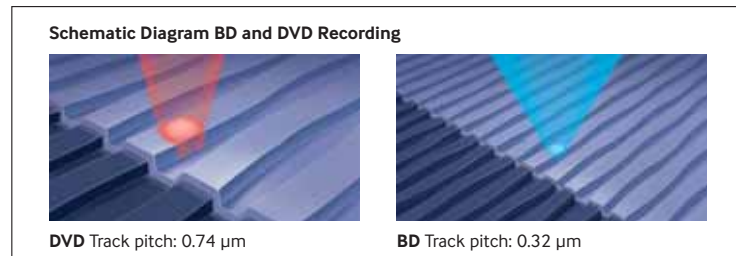
Home computing applications.

WHAT IS A **BLU-RAY DISC**?

Blue-violet laser

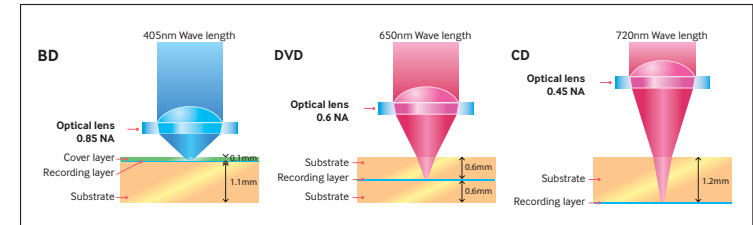
The Blu-ray Disc format utilises a blue-violet laser with a shorter wavelength to enable higher storage capacities. Compared to a CD with an infrared laser and a wavelength of 720nm or a DVD with a red laser and a wavelength of 650nm, the Blu-ray Disc format utilises a blue-violet laser with a wavelength of only 405nm. A nm is equal to a millionth of a millimetre.

Due to the blue-violet laser's shorter wavelength, it is possible to write smaller data pits and therefore to drastically increase the data density on the Blu-ray Disc compared to CDs and DVDs.

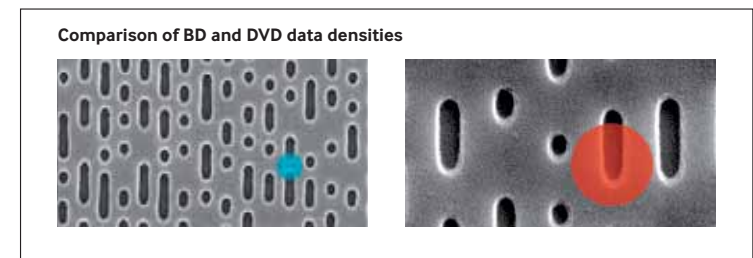


Structural Design of the Disc

The structure of a Blu-ray Disc differs fundamentally from the structure of a CD or DVD. The recording layer of the Blu-ray Disc is covered by a mere 0.1mm thin cover layer in order to achieve an optimal distance between the data track and the drive's optical system. After all, a CD's finishing layer is 1.2mm thick and a DVD is 0.6mm.



The combination of this special structure and the blue-violet laser allows for a very high data density. Compared to the DVD with a data track pitch of 0.74 μm , the Blu-ray Disc's data tracks are located extremely close together with a track pitch of 0.32 μm (1 μm =1/1000mm). The blue-violet laser beam is only about one-fifth the size of the red laser beam of a DVD and consequently achieves a 500% higher data density.



TDK'S **BLU-RAY DISC** TECHNOLOGIES

Research & Development

TDK operates its own research and development laboratory for the Blu-ray Disc, the Chikumagawa Technical Center.

TDK Research has developed three important technologies in the Chikumagawa Technical Center that make the TDK Blu-ray Disc unique: the high-precision Spin Coating technology, the DURABIS2 technology and TDK's special Recording Layer technology.

The high-precision Spin Coating technology enables TDK to furnish its Blu-ray Disc with an extremely smooth and precise cover layer. TDK's DURABIS2 technology makes TDK's Blu-ray Disc scratch-resistant, and TDK's special Recording Layer technology makes higher speeds and multiple recording layers possible.



TDK Research Centre, the Chikumagawa Technical Center

Ultra-Precise Cover Layer

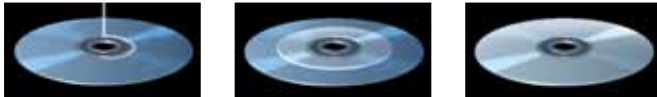
The recording layer of the Blu-ray Disc is located just under the cover layer and is thus especially susceptible to scratches. The cover layer is only 0.1mm thick and must therefore be applied precisely and smoothly to the Blu-ray Disc.

Even the tiniest protrusions in the surface of the Blu-ray Disc can deflect the sensitive laser beam and cause laser errors. Precision, smoothness and evenness are the three characteristics that distinguish the TDK cover layer.

TDK has optimised the Spin Coating technology in order to apply the cover layer smoothly and precisely to the Blu-ray Disc. The curing resin protective layer is applied in a liquid state to a rotating disc. The centrifugal force of the rotating disc spin-coats the liquid curing resin before it hardens. As a result of this coating process, a smooth cover layer with a precise thickness of 0.1mm can be applied to the disc's entire surface.

With conventional spin coating methods, differences in height of up to 60µm between the inner and outer area of the disc surface are possible. However, thanks to the TDK Spin Coating technology, the coating of the TDK Blu-ray Disc is absolutely smooth.

Continually inspecting, testing and innovating, TDK creates optimal conditions for the production of its Blu-ray Disc. Temperature, dampness, drafts, viscosity, the amount of resin and its coating point are continually monitored.



TDK's new Spin Coating technology

TDK's New Spin Coating Technology



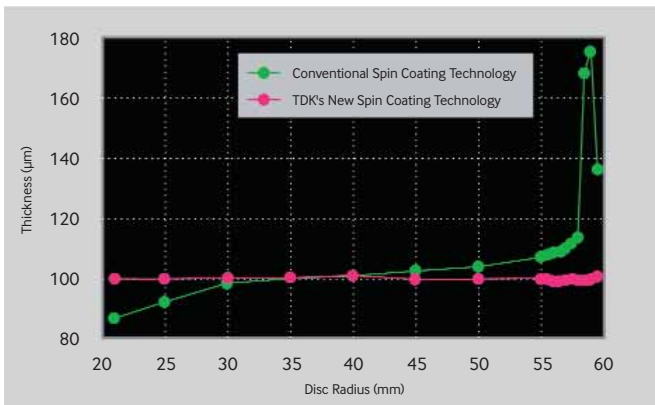
A uniform protective coating

Conventional Spin Coating Method



The outer section becomes uneven

Comparison: Cover Layer Thickness



DURABIS2 Technology

The Blu-ray Disc standard stipulates a scratch-free protective layer. With the DURABIS2 coating, TDK has developed a technology that far exceeds the standard requirements. The first generation of the TDK DURABIS coating has already been used with TDK's award-winning ScratchProof DVD recordable media. In order to meet the new challenges of the Blu-ray Disc, TDK has developed the DURABIS2 protective layer, which is an even more effective scratch-protection technology.

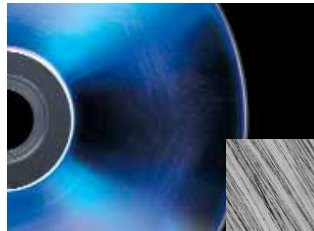
The scratch-free layer of the Blu-ray Disc is essential because of the high data density, where even the tiniest of scratches on the surface of the Blu-ray Disc can lead to recording or playback errors. In the worst case, all of the data on the disc could be lost.

Thanks to TDK's DURABIS2 technology, TDK Blu-ray Discs even withstand the steel wool test and are also dirt and dust repellent. Even fingerprint smudges can't interfere with the readability of the disc. With conventional discs, fingerprints can deposit a slight layer of grease that can redirect the laser and cause reading and writing errors.

DURABIS2 Technology

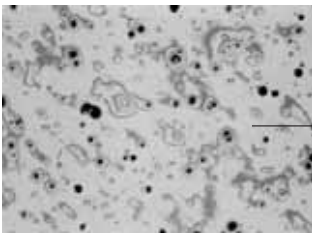


With DURABIS2 technology



Without DURABIS2 technology

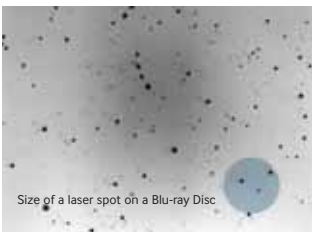
Fingerprint on a Conventional Disc



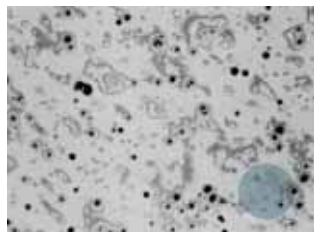
Enlargement



Fingerprint Comparison

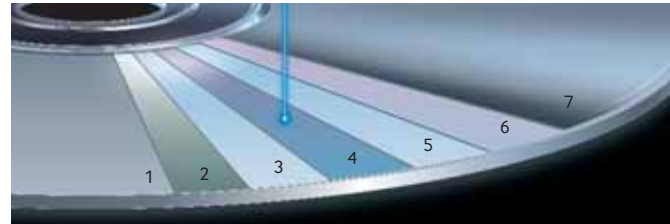


With DURABIS2 technology



Without DURABIS2 technology

DURABIS2 Technology

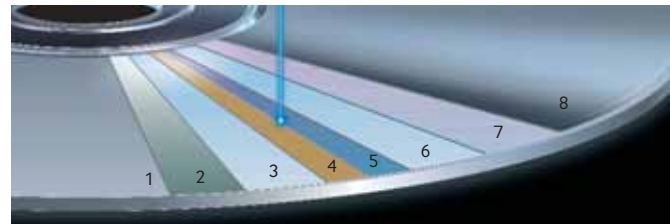


1 Disc substrate 2 Reflective layer 3 Dielectric layer 4 Recording layer
5 Dielectric layer 6 Cover layer 7 DURABIS 2 layer

Recording Layer Design Technology

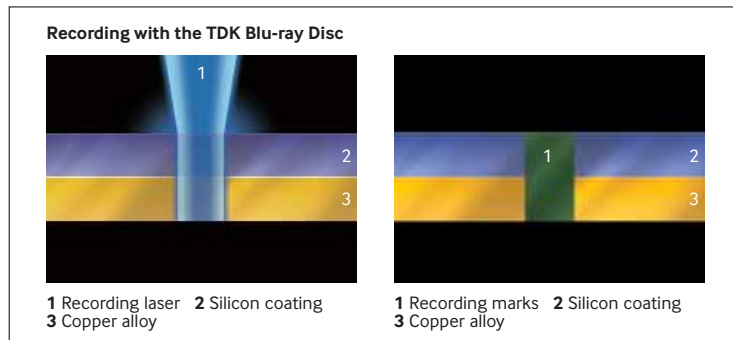
Thanks to its research efforts, TDK has been able to develop a new Recording Layer technology. The Recording Layer of the TDK Blu-ray Disc is made up of inorganic material. Whereas pigments are used for the recording layer of CDs and DVDs, TDK uses the exceptional characteristics of the new light-resistant material for its Blu-ray Disc.

Blu-ray Disc structure



1 Disc substrate 2 Reflective layer 3 Dielectric layer 4 Recording layer: Copper alloy
5 Recording layer: Silicon 6 Dielectric layer 7 Cover layer 8 DURABIS2 layer

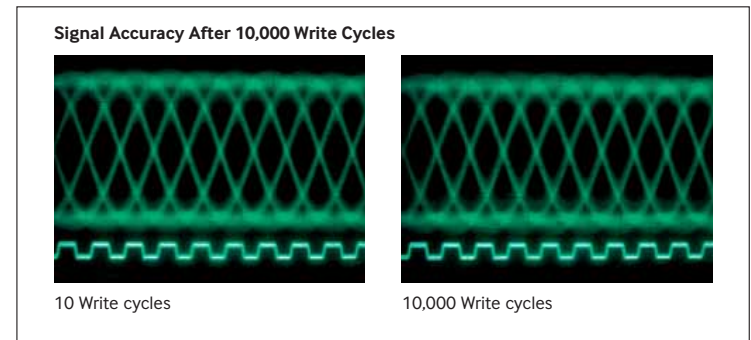
The recording layers of the TDK Blu-ray Disc consist of a silicon layer and a copper alloy. When heated by the Blu-ray Disc writer's recording laser beam, the silicon layer and the copper alloy melt to become a composite forming recording marks.



The new Recording Layer technology makes it possible for TDK to develop Multilayer Blu-ray Discs.

Furthermore, thanks to the new technology, the TDK Blu-ray Disc is less sensitive to sunlight (ultraviolet light) and offers outstandingly high reliability in terms of archiving.

The rewritable BD-RE media from TDK utilises a high-sensitivity phase-change material in the recording layer that achieves stabilised characteristics even after as many as 10,000 rewrites.



Outstandingly high reliability in terms of archiving and protection against ultraviolet light.

High write speeds are possible.

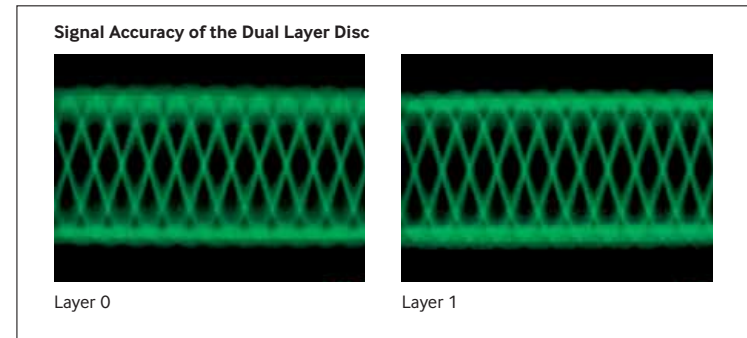
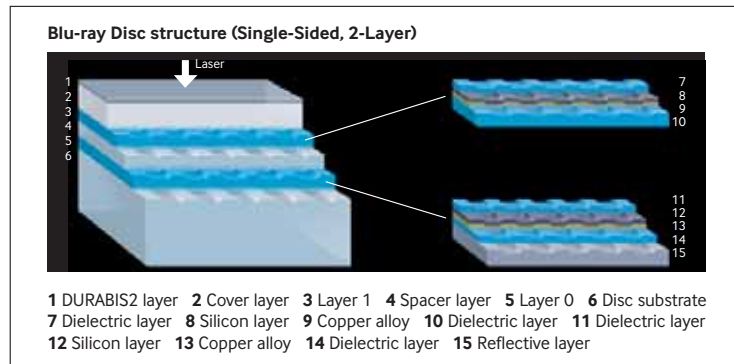
The use of multiple recording layers in one disc is possible.

More than 10,000 rewrites with BD-RE media.

Higher Capacity with Increased Reliability

TDK's new Recording Layer technology makes it possible to accommodate multiple recording layers in one disc. The first TDK Blu-ray Discs are already available as Dual Layer Discs with a capacity of 50GB and twice the recording speed.

Each of the two recording layers consists of two layers: the actual recording layer and a non-conducting layer. Between the two recording layers is a spacer layer. This design allows both recording layers to be read and written separately from one another. Both recording layers send a superior signal.



TDK Blu-ray Disc as a Reference Medium

The outstanding characteristics of the TDK Blu-ray Disc exceed the standards of the Blu-ray Disc format. From early on, hardware manufacturers could depend on TDK media for the development of their own products. This establishes the TDK Blu-ray Disc as the reference medium and guarantees a high compatibility with Blu-ray Disc hardware products from the moment they reach the marketplace.

TDK'S **BLU-RAY DISC** LINE-UP

TDK is the first manufacturer worldwide to market cartridge-less Blu-ray Discs. Both discs, the write-once BD-R and the rewritable BD-RE, are being offered as Single Layer and Dual Layer Discs with storage capacities of 25GB and 50GB respectively. The media are written with a speed of 72Mbps (2x). Thanks to the TDK DURABIS2 technology, TDK Blu-ray Discs are extremely scratch-resistant, dirt and fingerprint resilient and resistant to ultraviolet light.



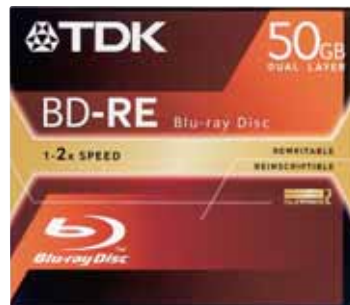
BD-R 25GB



BD-R 50GB



BD-RE 25GB



BD-RE 50GB

TDK DEVELOPMENT IN THE FUTURE

TDK has already been successful in the development of the TDK Blu-ray Disc. TDK is the first manufacturer worldwide to have developed Blu-ray Disc media with four recording layers that can be written with a phenomenal speed of 216Mbps.

Blue Laser Disc structure (single-sided, 4-layer)



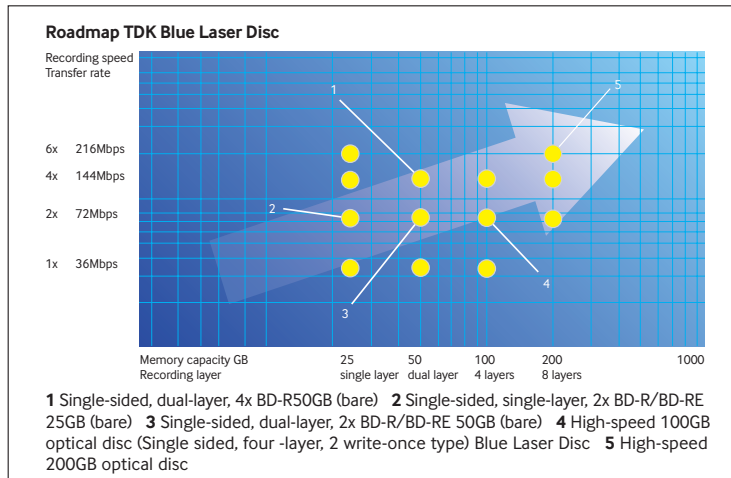
1 Cover layer 2 Recording layer (L3) 3 Spacer layer 4 Recording layer (L2) 5 Spacer layer 6 Recording layer (L1) 7 Spacer layer 8 Recording layer (L0) 9 Disc substrate

However, the Blu-ray Disc still offers a lot of potential for further development. TDK is already developing new technologies that will make it possible to accommodate up to eight recording layers on one Blu-ray Disc with a storage capacity of up to 200 GB.

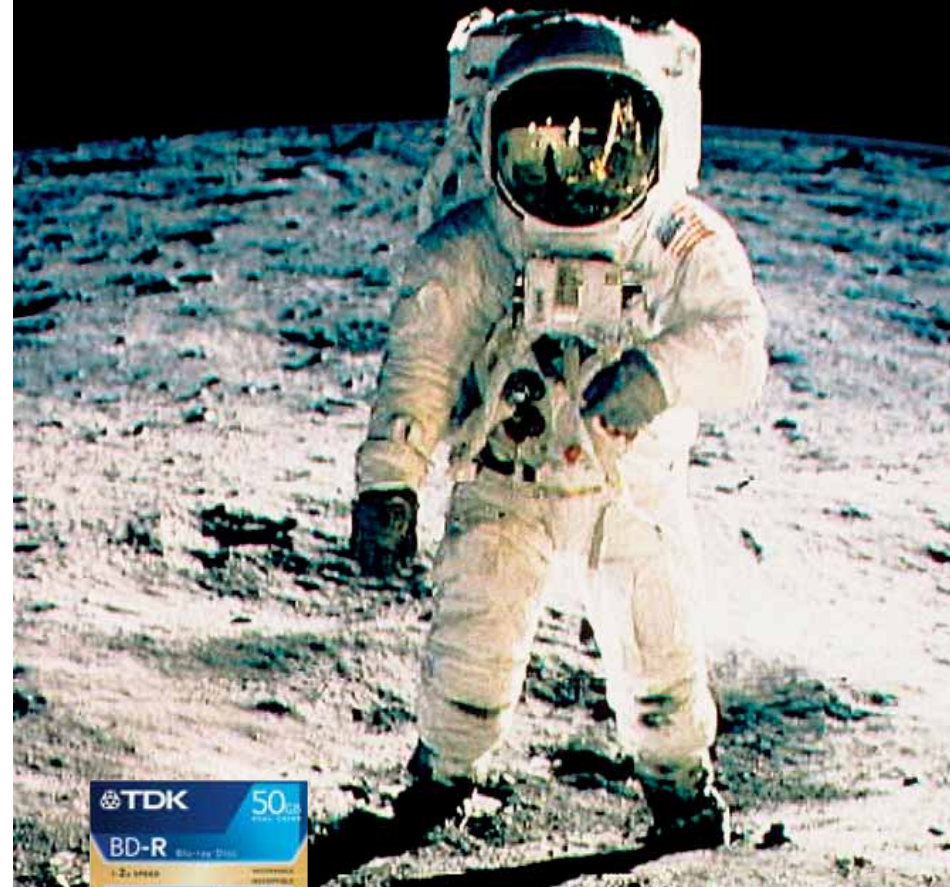


PossiBlu

1969. One small step. First words recorded from the moon on TDK tape.
2006. One giant leap. TDK launch the Blu-ray Disc.
Now disc space seems infinite too.



Thanks to its first-class research work as well as new technologies, TDK is the leader in the world of optical storage media. With its Blu-ray Disc, TDK introduces the storage medium of the future, providing the reliability and quality that have distinguished TDK products for years.



It's possible.



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