

HDCVI Broadcast-quality Audio Technology

Delivering High-quality Audio to
HD-over-Coax Surveillance

White Paper by Dahua Technology



Release 1.0

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1 Background

Within a complete surveillance system, audio provides various monitoring scenarios with important evidence such as capturing conversations, which can be used to resolve disputes. Although the transmission of video and audio within standard analog surveillance installations achieves a result of video with sound, the following user pain points still exist:

1. When not using a technology with the ability to transmit audio and video over the same coaxial cable, audio must be transmitted over an additional cable. This greatly increases system labor and maintenance costs. At the same time, the non-synchronous nature of the video and audio signals will cause discrepancies in the captured surveillance monitoring information.
2. Coaxial cable-based audio transmission solutions in traditional analog monitoring systems usually feature low signal reduction precision and high noise interference, making it hard to achieve high-quality audio. In addition, as the transmission distance is increased, the reduction in audio quality becomes increasingly evident.

HDCVI technology is the first on the HD-over-Coax market to realize audio transmission over coaxial cable. It is also the only technology to have achieved the commercialization of audio over coax. HDCVI's newly released broadcast-quality audio technology transmits a digital audio signal directly over coaxial cable. As a result, not only is installation much more convenient, but there is also a remarkable increase in audio transmission quality, achieving lossless "broadcast-level" audio quality, thus providing users with a multidimensional, high-quality video surveillance solution.

2 Key Technology

HDCVI broadcast-quality audio technology converts a captured audio signal into a digital signal and combines it with the analog video signal. Then, the signal is transmitted to the XVR via coaxial cable, where it is received and processed.



Figure 1 – HDCVI Broadcast-Quality Audio Technology Solution Diagram

High-Definition Sampling and Digital Signal Transmission

Previous audio transmission over coaxial cable was performed with the use of an analog signal. Within these configurations, it is easy for the signal to be affected by interference during the transmission process, making it difficult for the receiving end to precisely restore the sent audio signal. HDCVI broadcast-quality audio technology uses digital signal transmission technology to resolve this problem. It converts the analog audio signal collected from a sound pick-up or a built-mic into a digital audio signal via an AD module (Analog-Digital conversion module), whereby it then engages in processing and transmission. This results in the data on both the sending end and the receiving end being exactly the same, guaranteeing lossless transmission. At the same time, the AD sampling module uses 16 bit high precision sampling to divide the signal amplitude to 2^{16} . In comparison with previous 8 bit audio, this provides more precise sampling.

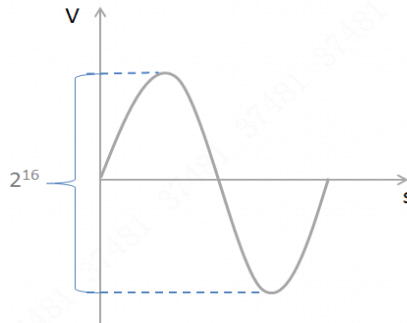


Figure 2 - Sampling Precision Graph

Noise Reduction via Software Filtering

Audio noise is often introduced during audio collection. No matter whether the user employs an external pickup or built-in mic, noise is unavoidable. With HDCVI broadcast-quality audio technology, after conversion from an analog to digital audio signal, the signal is processed by an ISP, which uses an algorithm to achieve filtering, resulting in a maximum reduction of pickup input related noise.

Note: Due to ISP performance limit, this technology is only adopted on some models.

Baseband Multilevel Modulation/Demodulation

HDCVI broadcast-quality audio technology uses baseband multilevel modulation. Baseband modulation allows for strong signal interference resistance and low signal degradation, allowing for longer range transmission. Multilevel modulation transforms the process from simple high-low levels into a number of levels, increasing the quantity of data transmission and reducing the audio data bit error rate.

When the composite video signal is transmitted to the XVR, HDCVI broadcast-quality audio

technology uses multilevel demodulation to completely extract and isolate the exact digital signal sent from the sending end, achieving lossless audio restoration.

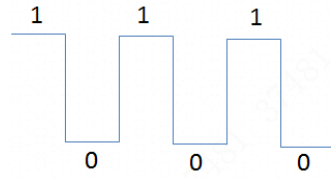


Figure 3 – Binary Modulation

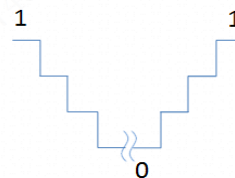


Figure 4 – Multilevel Modulation

Audio Signal Judgment and Extraction

HDCVI broadcast-quality audio technology adds audio flags to audio signals, preventing interference with the video signal. When the composite video signal passes through a coaxial cable and reaches the XVR device, the XVR will check for audio flags within the signal. If audio flags are not found, the device will not accept the audio signal, which reduces noise in the absence of audio input and further increases audio quality.

3 Application Scenarios

HDCVI broadcast-quality audio technology provides high quality audio for various monitoring scenarios, offering important supplementary evidence for traditional video surveillance.

In the shops and other business applications, high quality HDCVI video and audio provides useful evidence for disputes on behaviors or trading. Also, the synchronization of video and audio ensures high accuracy and reliability of the surveillance. Provided a customer and a cashier disagrees on some issue at the cashier desk. Besides restoring the scene of incident by video monitoring system, HDCVI broadcast-quality audio technology can be applied to provide audio evidence. Thus, the conflict can be mediated with a more reasonable and effective solution.

HDCVI system can also be used for some special applications, such as the synchronous video and audio recording system for interrogation, supervision system for prison, etc. In such occasions with audio forensics requirement, HDCVI surveillance system effectively replaces the combination of separate audio recording system and video monitoring system. Thereby it simplifies the construction and installation as well as saves time and cost of system building.

4 Conclusion

HDCVI broadcast-quality audio technology adopts the digital signal audio-over-coax transmission technology, which guarantees the lossless transmission of the audio signal. At the same time, HDCVI broadcast-quality audio technology realizes effective noise reduction in the whole audio transmission process, remarkably enhancing the audio quality. It satisfies the user's demand for auxiliary audio information in various monitoring applications with little increase on device or installation costs.

5 Products

Fighter Series HDCVI Camera

Optional Models:



HAC-2802 Series



HAC-2601 Series



HAC-2501 Series



HAC-2241 Series



HAC-2249 Series

Features:

- Dahua in-house Fighter ISP
- High resolution of 4K/6MP/5MP/4MP/1080P
- Broadcast-quality audio
- Audio-in interface (by default) & built-in mic (-A models)
- High image performance, 120dB true WDR, 3NDR
- Various motorized/fixed lens models optional

Cruiser Series HDCVI Camera

Optional Models:



HAC-1500 Series



HAC-1230 Series



HAC-1200-S4 Series

Features:

- Dahua in-house Cruiser ISP
- High resolution of 5MP/4MP/1080P
- Broadcast-quality audio
- Audio-in interface (available for customize) & built-in mic (-A models)
- High cost-efficiency and highly reliable quality
- Various motorized/fixed lens models optional

H.265 Series HDCVI Recorder

Optional Models:



XVR7000-4K/4KL-X Series



XVR5000-4KL-X Series



XVR5000-X Series



XVR4000-X Series

Features:

- Up to 4K ultra high definition preview and recording
- Smart H.265+ saves up to 90% bandwidth and storage while maintaining high image quality
- Full compatibility with HDCVI/AHD/TVI/CVBS/IP
- Powerful performance on video compression, decoding, network and intelligent functions
- New XVR 4.0 GUI with user-friendly appearance and concise functional modules

About Dahua Technology

Dahua Technology is a world-leading video surveillance solution provider. Our company enjoys the world's second largest market share according to the IMS 2015 report. We believe in investing and building strong R&D capabilities for new technology and innovation. The company invests more than 10% of sales revenue in R&D every year. Dahua technology has more than 4000 professionals in R&D team, who are dedicated to provide cutting edge products and solutions for our valuable customers. The company has 592 patents in total till end of 2005 and advocates opens to share or license its technical know-how with global partners.

Dahua's product portfolio includes: Advanced Video Surveillance Products/Solutions and related Software, Access Control, VDP, Alarm, Intelligent Building Management Systems and Intelligent Traffic Management System etc.

Dahua's products are widely used in banking, public security, energy infrastructure, telecommunication, intelligent-building and intelligent-transportation etc. Many significant projects have been installed with Dahua's solutions including: The Sanxia Hydropower Plant, Six-Country Summit, Beijing Olympic Venues, APEC, Shanghai World Expo, UNESCO site in Italy and London Underground Subway as well as many others.