Investigation of Signal Level Post-Print in Radio Broadcast Control Systems

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Abstract

In the development environment of media convergence, radio stations must comprehensively enhance signal stability and improve broadcast quality and effectiveness. Based on this, this paper analyzes the characteristics of signal levels in radio broadcast control systems, examines the necessity of signal level allocation, briefly integrates the key design priorities for signal level allocation, elaborates with emphasis on the broadcasting, connection, and output of signal levels, and proposes relevant recommendations for the specific allocation of signal levels in radio broadcast control systems.

Full Text

Investigating Signal Levels in Radio Broadcast Control Systems

Abstract: In the context of media convergence, radio stations must comprehensively enhance signal stability to strengthen broadcast effectiveness and quality. This paper analyzes the characteristics of signal levels in radio broadcast control systems, examines the necessity of signal level allocation, integrates key design considerations for signal level distribution, elaborates on the broadcasting, connection, and output of signal levels in radio broadcast control systems, and proposes relevant recommendations for specific signal level allocation.

Keywords: radio broadcast control system; signal level; recording level; output level

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In today' s media landscape, all-media platforms have emerged, encompassing full-process, holographic, 全员, and full-effect media, with information being omnipresent, pervasive, and universally accessible. As a major component of

China' s traditional media, radio broadcasting must comprehensively strengthen its capabilities within this converged media environment through rational signal level allocation in broadcast control systems. By applying advanced signal level control methods to signal distribution, reception, and feedback, radio stations can further expand their development potential.

Rational signal level allocation in radio broadcast control systems ensures optimal control performance, enables centralized and decentralized signal applications, and creates an effective information transmission environment. Moreover, proper allocation accommodates the diverse requirements of broadcast control system equipment across different functions and orientations, fully realizing diversified signal level applications and expanding the scope of radio media equipment utilization. This approach leverages scientific and technological advantages to advance broadcast media development while significantly reducing technical risks, maintaining system operational stability, and promoting long-term growth through enhanced broadcast quality.

1. Characteristics of Signal Levels in Radio Broadcast Control Systems

As global technology advances, media convergence has become imperative, driven by integrated development, process optimization, and platform restructuring to achieve effective integration of media resources and production elements. This convergence facilitates interoperability in content, technology, platforms, and management, catalyzing transformative integration and amplifying unified efficiency to establish influential and competitive new mainstream media. Consequently, strengthening traditional radio media is essential.

Signal levels directly impact transmission stability in broadcast control systems. Key characteristics include:

First, **signal stability**. Signal level in broadcast control systems refers to the logarithmic ratio (base-10, multiplied by a coefficient) of internal electrical signals to their respective reference values, effectively reflecting physical system properties. This stability characteristic safeguards broadcast quality.

Second, **extensive signal coverage**. Radio media maintains an irreplaceable position in China' s media landscape. As audience expectations rise, expanding signal coverage has become critical for development. The broad coverage capability of signal levels effectively meets the technical demands of modern broadcast control systems.

2. Necessity of Signal Level Allocation in Broadcast Control Systems

China currently faces a challenging media development environment, with all-media and converged media representing inevitable outcomes of technological advancement. Scientific signal level allocation in broadcast control systems ensures control effectiveness, enables centralized and decentralized signal utiliza-

tion, and constructs favorable information transmission environments. Simultaneously, rational allocation satisfies diverse equipment requirements across different functions and orientations, fully realizing diversified signal level applications and expanding equipment utilization scope. This integration of technological advantages further propels broadcast media development while significantly reducing technical risks, maintaining system stability, and promoting long-term broadcast 事业 growth.

3. Key Design Considerations for Signal Level Allocation

As China' s technology and society progress, radio and television media—as primary traditional media components—possess distinct characteristics and advantages, with credibility surpassing many emerging media platforms. Their public, authentic features attract broad audiences. In comprehensive new media development, the path of media convergence requires preserving traditional strengths while leveraging modern technology' s efficiency and convenience to comprehensively enhance radio station quality.

Signal level allocation represents an effective approach to expanding radio media development space. Key design considerations include:

First, technical requirements must be thoroughly understood, including standing wave ratio specifications, circularity, wave downtilt angle, null fill, main feeder cable standing wave ratio and loss, precise DC resistance, airtightness, connector requirements, and insulation resistance factors.

Second, the technical design process should analyze both main feeder cable standing wave ratio/loss and the standing wave ratio itself. To fully satisfy broadcast control system requirements, main feeder characteristic impedance must be controlled within 5Ω, with ambient temperature maintained around 40°C for optimal power values. Standing wave ratio design should incorporate hierarchical classification of input 端 standing wave ratios based on broadcast control system platform characteristics.

4. Broadcasting and Connection of Signal Levels

4.1 Live Studio Mixer Program Signal Level Broadcasting Signal level broadcasting primarily involves live studio mixer program signal levels, directly impacting control effectiveness and transmission quality. Personnel must strictly control broadcast data accuracy. Current practice employs audio signal generators with 1000Hz sine wave calibration at +4dBu, with line input/output faders set to 0dB. Line output gain potentiometers are adjusted until volume indicators display 0VU and peak meters show -8PPU or -18dBFS/-20dBFS.

Additionally, precise control of program signal average level standards is essential, with reasonable specifications for speech and music broadcasting average levels and instantaneous maximum values. This maximizes mixer control capabilities and ensures stable level output. Given today' s favorable global tech-

nological environment and continuously developing all-media landscape with significantly improved information transmission efficiency, controlling live studio mixer program signal level broadcasting is critical.

4.2 Signal Level Connection Between Live Studio and Master Control Signal levels directly affect broadcast quality and program integrity. In the converged media environment, traditional radio media must strengthen signal level connections to maintain stability and effectiveness. Establishing stable connections requires rational selection of connection methods. Current connections between live studios and master control primarily utilize analog and digital interfaces. Selection must consider connection requirements, characteristics, and functional differences between relevant equipment.

For live studio-master control connections, the mixer' s maximum output level should match the master control matrix' s maximum input level value. Signal level connections must strictly follow numerical equivalence principles to ensure connection stability.

4.3 Transmission System Signal Level Input Transmission system signal level input represents a critical, non-negligible component. Input level refers to the operating level at transmission equipment input ports. Current broadcast control systems primarily employ digital and analog interfaces. To ensure optimal input effectiveness, digital interface transmission equipment must maintain audio format consistency with the overall broadcast control system' s digital audio format.

5. Specific Recommendations for Signal Level Allocation

5.1 Mastering Digital and Analog Equipment Performance and Specifications Signal level allocation processes are complex and increasingly diversified. To enhance allocation capabilities and achieve stable transmission, personnel must thoroughly understand the allocation environment, clearly comprehend each digital and analog device' s performance and specifications, optimize relevant allocation equipment, and fully clear signal transmission pathways. This establishes foundations for subsequent allocation, promotes comprehensive improvement of signal level control capabilities, and maintains favorable information transmission environments.

5.2 Creating and Preserving Calibration Levels Radio media maintains strong development advantages and foundations in China' s media environment, retaining broad development space despite strong new media 冲击. Scientific signal level allocation enhances development momentum. Creating and preserving calibration points is crucial for effectively correcting allocation errors and ensuring real-time transmission. During preservation, personnel can comprehensively grasp system signal variations. Calibration points enable simultaneous

calibration across multiple broadcast systems, comprehensively maintaining the development environment and reducing allocation risks.

5.3 Adjusting Broadcast Station Output Levels China attaches great importance to radio media development. Adjusting broadcast station output levels is essential for ensuring output environments and stabilizing output signals. Proper adjustment significantly reduces system output signal-to-noise ratios, directly impacting transmission stability. The adjustment process involves opening the broadcast station, accessing the broadcast interface, retrieving preserved calibration signals, and playing them. The broadcast station interface should display -18dBFS output, with millivolt meters directly connected to output terminals for measurement. Analog output set at -25dBU will clearly exhibit insufficient output. Since broadcast station computer noise levels are fixed, inadequate input levels directly affect signal-to-noise ratios. Therefore, personnel should reasonably modify the machine.ini configuration file during output level adjustment.

5.4 Adjusting Broadcast Station Recording Levels To further enhance allocation rationality, broadcast station recording levels should be adjusted according to system structure and overall transmission effectiveness. Recording levels are critical in broadcast control systems. Personnel must clearly understand adjustment requirements, analyze current system control capabilities, verify manual and automatic recording methods, and use preserved calibration levels to check recording levels. After identifying differences between calibration and recording levels, feedback data should be used to adjust sound card settings, achieving effective recording level allocation and improving recording output quality.

5.5 Adjusting Slow Recording Station and Display Equipment Levels Although slow recording station and display equipment levels do not directly affect broadcast quality, they belong to the same system as other level control equipment. Improper levels reduce overall system signal-to-noise ratios, necessitating rational adjustment. Personnel must coordinate with transmission departments at radio receiver output terminals, access broadcast interfaces, apply preserved calibration files, precisely verify receiver output signals, obtain level differences, and reflect these differential data in relevant slow recording and display equipment systems.

5.6 Adjusting Online Broadcast Levels As technology advances, radio media has established online transmission pathways, generally employing digital equipment. This leverages digital devices' high signal-to-noise ratios and wide dynamic ranges. Online broadcast level adjustment should be based on actual transmission pathways, scientifically calibrating and configuring input/output levels. All adjusted equipment signal level transmissions should be recorded and preserved, with subsequent online broadcasts conducting fine comparisons

against preserved data to identify transmission differences and effectively adjust levels, completing real-time online broadcast signal transmission and comprehensively ensuring stability to expand radio media application scope.

Conclusion

China' s radio media currently faces a challenging development environment. In the all-media era, radio media must comprehensively strengthen broadcast quality to achieve favorable development prospects. Rational signal level allocation in broadcast control systems can comprehensively improve broadcasting, connection, and transmission effectiveness, ensure signal transmission stability, create favorable information transmission environments, and substantially enhance radio media development momentum.

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Note: Figure translations are in progress. See original paper for figures.