

广播与电视技术

2022 11



Radio & TV Broadcast Engineering

全国百种重点期刊 专业核心科技期刊

第49卷 第11期 VOL.49 NO.11



ISSN 1002-4522



9 771002 452227



11

国家广播电视总局 主管
国家广播电视总局广播电视规划院 主办



主管：国家广播电视总局
主办：国家广播电视总局广播电视规划院

邮发代号：82-464

编辑出版：《广播与电视技术》编辑部 通讯地址：北京2116信箱(100866)
电 话：010-86093619(作者服务) 010-86092040(读者服务)
主 编：何剑辉 投稿网址：tougao.lieku.cn
副主编：卢 群 国内总发行：北京报刊发行局
订 购 处：全国各地邮局
运营总代理：北京中广信通文化传媒有限公司
编 辑：房 磊 李 丹 市场专员：李聪 (18518221868) 邮箱：licong@tvoao.com
发 行：胡 南 国外总发行：中国出版对外贸易总公司(北京728信箱100011)
美 编：张云峰 广告经营许可证：京西市监广登字20170187号
国内定价：20.00元/本 国外定价：20美元/本
刊 号：ISSN 1002-4522
CN11-1659/TN

目次

全国百种重点期刊 专业核心科技期刊
投稿平台 tougao.lieku.cn



2022年 | 第49卷 | 第11期

中国视听大数据(CVB)专栏·应用

11 Kmeans++模型在电视节目分类分析中的应用 王祎, 黄瑞婷, 路静怡

热点·论点

智慧广电助力乡村振兴

- 16 乡村振兴背景下5G智慧电台在基层广播宣传阵地建设中的应用实践 徐蓉
22 基于智慧广电的数字乡村能力支撑平台的设计和应用 周芸, 王庆顺
27 网络电视/地面数字电视/模拟电视三前端方案在高速低成本实现广电乡村覆盖中的应用 徐军, 王立柱

网络视听

33 低轨卫星互联网研究与应用展望 袁浚

广电5G

36 广电5G室内覆盖网络建设研究 罗沛

内容制播

- 41 基于SMPTE ST 2110无压缩系列标准的4K超高清IP系统设计与实现 王炜, 赵兴刚
45 广播融媒生产网络安全设计与实现 杨阳, 罗清
50 县级融媒体移动端在新闻选题采访中的应用研究 燕宪文, 董文辉
56 基于制播分离架构的广播播出安全性设计与部署 高小清
61 IPTV播控平台轮播系统分析与改进 朱江
67 机器人摇臂及AI手语播报系统在新闻演播室中的应用 郭晓磊
71 演播室LED大屏设计思路和使用经验 范祥林



主管：国家广播电视总局
主办：国家广播电视总局广播电视规划院

《广播与电视技术》是由国家广播电视总局主管，国家广播电视总局广播电视规划院主办，《广播与电视技术》编辑部编辑出版的国家级技术期刊；是发布广播电视科技政策，反映事业建设成就，介绍高新技术，交流工作经验，传播各种信息的重要媒体。本刊主要面向各级广播电视行业主管部门、各级广播电台、电视台、网络公司、发射台、微波站、卫星站、节目制作单位及电教系统，同时对企业、工矿、学校、部队等具有公共广播电视设施的管理人员、技术人员也有参考价值。

为繁荣学术交流，本刊已加入《中国学术期刊网络出版总库》、“万方数据”和“维普中文科技期刊数据库”，有权选取部分论文在本刊关联平台（如广电猎酷网 www.lieku.cn、“广电猎酷”微信公众号等）发布，作者著作权使用费已随论文稿酬一次性给付。本刊充分尊重作者的原创成果并合理保护作者享有的权利，如作者不同意本刊之外其他形式的发布，请在来稿中声明，本刊将作适当处理。本刊及主办单位对本刊已发布作品的内容和观点不持有任何立场、不做出任何承诺或保证、不承担任何责任。

目次

全国百种重点期刊 专业核心科技期刊
 投稿平台 tougao.lieku.cn



中国邮政
微信订阅

2022年 | 第49卷 | 第11期

76 广播电视台智慧运维大数据平台建设方案及演进路线分析

赵宇，康大琦

传输覆盖

有线网络

82 广电网络全IP化融合播控平台的设计与实现

王伟，潘林

86 城区有线电视接入网改造方案的设计和实现

郑家松

92 广电主干网光缆线路健康状态评估研究

陈铭人

无线覆盖

96 调频同步广播网的设计原则及建设方案分析

郑亚明

102 采用极低码率在CDR信道中传输短消息的方法和实现

李璐门，盛国芳

106 调频广播新增频率的评估规划及办理流程解析

赵宏杰

109 中波天线调配网络的设计与仿真

刘珠明

114 中波广播发射台水冷设备防冻措施分析及改造

沈选刚

安全播出与监测监管

118 省级新媒体综合监管平台设计

周丽，冯俊昌

124 闽南语智能交互引擎开发和应用研究

郑晔，欧智坚，杨艇

128 广播电视微波天线位移监测系统的设计与实现

童衍材，朱仁超

132 提高短波广播识别效率的方法研究及应用

白亮

行业聚焦

136 佳能邀您一起沉浸式体验：新疆伊犁天马节

广告索引 P138



主管：国家广播电视总局

主办：国家广播电视总局广播电视规划院

邮发代号：82-464

全国百种重点期刊 专业核心科技期刊

导 读

tougao.lieku.cn

中国邮政
微信订阅



2022年 | 第49卷 | 第11期

〔36〕 广电5G室内覆盖网络建设研究

中国广电 700MHz 5G 网络具有信号覆盖广、穿透力强的特点，但是在楼宇深层覆盖的复杂环境下，仍需要采用室内分布式天线系统进行补充覆盖。本文分析了广电 5G 信号的室内传播特性，研究了提高室内覆盖效果的网络建设方案，并列出了两个典型覆盖案例，具有较高的借鉴价值。

〔56〕 基于制播分离架构的广播播出安全性设计与部署

为保障制播系统的安全播出，基于安全性考量，将制作和播出系统进行有效分离、全面升级，设计可靠的制作和播出系统势在必行。论文基于制播分离架构，开展广播播出安全性设计与部署，可资业界同仁参考。

〔82〕 广电网络全IP化融合播控平台的设计与实现

在全网终端 IP 化整改需求的催化下，江苏有线完成了广电网络全 IP 化融合播控平台建设。基于新平台架构，建成全省云化资源池，实现多信源的接入，多格式多封装多码率多分辨率的输出；利用具备自愈性保护的三级播控直播专网，保障直播重要节目不间断传输，并覆盖 DVB 和 IP 直播业务；通过加强全省 IP 推流能力建设，完成融合 CDN 系统建设，实现全省 IP 业务和 DVB 点播业务的支撑；利用智能终端技术，实现自适应内容播放；利用分步分区改造战略，实现平台稳步过渡。文中所述的广电网络全 IP 化融合播控平台的设计与建设实践可供广电网络运营商建设相关系统时参考借鉴。

〔118〕 省级新媒体综合监管平台设计

在媒体深度融合的背景下，广电系统需建立一套面向新媒体的智能化综合监管平台。本文设计了一套一体化、数字化、网络化、智能化的省级新媒体综合监管系统，可有效对接上下级监管平台，在各个子系统中实现数据横向共享，实现事件预警、舆情分析、内容违规报警等功能，为广电行业提供现代化、规范化的融合信息服务。



Competent Authority:
National Radio and Television Administration
Sponsor: Academy of Broadcasting Planning, NRTA

Publisher: Editorial Department of RTBE

Chief Editor: He Jianhui

Deputy Chief Editors: Lu Qun

Editors: Fang Lei Li Dan

Circulation Coordinator: Hu Nan

Art Editor: Zhang Yunfeng

Tel: (86-10) 86093619 (Author service) (86-10) 86092040 (Reader service)

Web Address: tougao.lieku.cn

Address: P.O.Box 2116, Beijing, P.R.China

Post Code: 100866

Postal Distributing: Code 82-464

General agent of operation: Beijing China Broadcasting Media Co., Ltd.

Marketing: Licong(18518221868) E-mail:licong@tvao.com

Journal Number: ISSN 1002-4522 / CN11-1659/TN

Prices: RMB 20 for one copy (in China)

USD 20 for one copy (outside China)

Contents

One of Hundred National Key Periodicals
A Core Professional Sci-Tech Periodical
tougao.lieku.cn

Nov 2022 No.11

CVB Column • Application

11 Application of Kmeans++ Model in TV Program Classification Analysis *By Wang Yi, Huang Ruiting, Lu Jingyi*

Intelligent Radio and Television Helps Rural Revitalization

- 16 Application and Practice of 5G Smart Radio in the Construction of Radio Propaganda Fronts at Grassroots Level in the Context of Rural Revitalization *By Xu Rong*
- 22 Design and Application of Digital Village Capability Support Platform Based on Intelligent Radio and Television *By Zhou Yun, Wang Qingshun*
- 27 Application of IPTV/DTMB/ATV Three Front End Scheme in High-speed and Low-cost Rural Coverage of Radio and Television *By Xu Jun, Wang Lizhu*

Internet Audio & Video

33 Research and Application Prospect of LEO Satellite Internet *By Yuan Jun*

5G for Radio and Television

36 Research on 5G Indoor Coverage Network Construction of Radio and Television *By Luo Pei*

Content Production & Broadcasting

- 41 Design and Implementation of 4K Ultra HD IP System Based on SMPTE ST 2110 Uncompressed Series Standard *By Wang Wei, Zhao Xinggang*
- 45 Design and Implementation of Network Security for Converged Media Production *By Yang Yang, Luo Qing*
- 50 Research on the Application of County-level Converged Media Mobile Terminal in News Topic Selection and Interview *By Yan Xianwen, Dong Wenhui*
- 56 Design and Deployment of Broadcast Security Based on Production and Broadcasting Separation Architecture *By Gao Xiaoqing*
- 61 Analysis and Improvement of IPTV Broadcast Control Platform *By Zhu Jiang*
- 67 Application of Robot Rocker Arm and AI Sign Language Broadcasting System in News Studio *By Guo Xiaolei*
- 71 Design Idea and Application Experience of LED Large Screen in TV Studio *By Fan Xianglin*
- 76 Analysis on Construction Plan and Evolution Route of Smart Operation and Maintenance Big Data Platform of Radio and Television Station *By Zhao Yu, Kang Daqi*

CATV

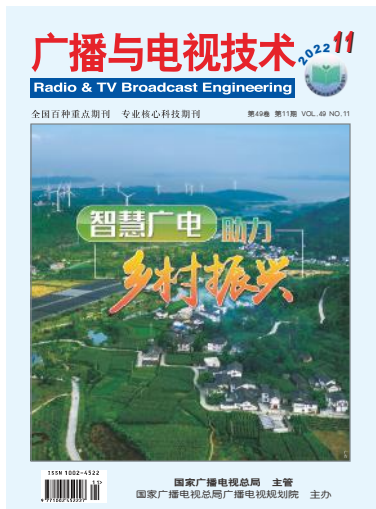
- 82 Design and Implementation of New All IP Integrated Broadcast Control Platform for Radio and Television Network *By Wang Wei, Pan Lin*
- 86 Design and Practice of Urban Cable TV Access Network Transformation Plan *By Zheng Jiasong*
- 92 Study on the Health State Assessment of Optical Fiber Line of Radio and Television Backbone Network *By Chen Mingren*

Wireless Coverage

- 96 Design Principle and Construction Scheme Analysis of FM Synchronous Broadcasting Network *By Zheng Yaming*
- 102 Methods and Practices of Transmitting Short Messages in CDR Channels at the Very Low Bit Rate *By Li Jumen, Sheng Guofang*
- 106 Evaluation Planning and Handling Process Analysis of New Frequency for FM Broadcasting *By Zhao Hongjie*
- 109 Design and Simulation of MW Antenna Matching Network *By Liu Zhuming*
- 114 Analysis and Modification of Anti-freezing Measures for Water Cooling Equipment of MW Radio Transmitting Station *By Shen Xuangang*

Safe Broadcasting & Monitoring and Supervision

- 118 Design of Provincial New Media Comprehensive Supervision Platform *By Zhou Li, Feng Junchang*
- 124 Research on Development and Application of Hokkien Intelligent Interaction Engine *By Zheng Ye, Ou Zhijian, Yang Ting*
- 128 Design and Implementation of Radio and Television Microwave Antenna Displacement Monitoring System *By Tong Yancai, Zhu Renchao*
- 132 Research and Application on Methods of Improving the Recognition Efficiency of Shortwave Broadcasting *By Bai Liang*



Competent Authority:
National Radio and Television Administration
Sponsor: Academy of Broadcasting Planning, NRTA

Radio & TV Broadcast Engineering (RTBE) is a state-class technical journal, approved by the General Administration of Press and Publication, PR of China, authorized by the National Radio and Television Administration (NRTA), PR of China, sponsored by Academy of Broadcasting Planning (ABP), NRTA, and published by Editorial Department of RTBE. RTBE is an important medium, that publishes scientific and technological policies in broadcasting, reports achievements in building broadcasting cause, introduces high and new technologies, exchanges work experience and spreads various information. RTBE is mainly geared to the needs of departments responsible for the work of radio & TV industry at all levels, radio & TV stations at all levels, network companies, transmitting stations, microwave stations, satellite stations, program production units and electrified education systems, as well as is of reference value to managerial and technical personnel for public radio & TV facilities in industrial and mining enterprises, educational institutions, troops and so on.

Index

One of Hundred National Key Periodicals
A Core Professional Sci-Tech Periodical
tougao.lieku.cn

Nov 2022 No.11

[36] Research on 5G Indoor Coverage Network Construction of Radio and Television

China Radio and Television 700MHz 5G network has the characteristics of wide signal coverage and strong penetration, but in the complex environment of deep building coverage, indoor distributed antenna system is still needed for supplementary coverage. This paper analyzes the indoor propagation characteristics of Radio and Television 5G signals, studies the network construction scheme to improve the indoor coverage effect, and lists two typical coverage cases, which have high reference value.

[56] Design and Deployment of Broadcast Security Based on Production and Broadcasting Separation Architecture

In order to ensure the safe broadcasting of the production and broadcasting system, it is imperative to effectively separate and comprehensively upgrade the production and broadcasting system based on security considerations, and design a reliable production and broadcasting system. Based on the separation architecture of production and broadcasting, the paper carries out the security design and deployment of broadcasting, which can be referred by colleagues in the industry.

[82] Design and Implementation of New All IP Integrated Broadcast Control Platform for Radio and Television Network

Under the catalysis of the demand for IP based rectification of the whole network terminals, Jiangsu Cable completed the construction of an all IP based integrated broadcast control platform for Radio and Television network. Based on the new platform architecture, the province's cloud resource pool will be built to realize the access of multiple sources, multi-format, multi-encapsulation, multi-rate and multi-resolution output; The three-level broadcast control live broadcast private network with self-healing protection is used to ensure the uninterrupted transmission of live important programs and cover DVB and IP live broadcast services; By strengthening the construction of the province's IP streaming capability, the construction of integrated CDN system has been completed to support the province's IP business and DVB on-demand business; Use intelligent terminal technology to realize adaptive content playback; Make use of the step-by-step and divisional transformation strategy to realize the steady transition of the platform. The design and construction practice of all IP integrated broadcast control platform of Radio and Television network described in this paper can be used for reference by Radio and Television network operators when building relevant systems.

[118] Design of Provincial New Media Comprehensive Supervision Platform

Under the background of deep media integration, the radio and television system needs to establish an intelligent comprehensive supervision platform for new media. This paper designs a set of integrated, digital, networked and intelligent provincial new media comprehensive supervision system, which can effectively interface with the superior and subordinate supervision platforms, realize horizontal data sharing in each subsystem, achieve event early warning, public opinion analysis, content violation alarm and other functions, and provide modern and standardized integrated information services for the radio and television industry.