

# 广播与电视技术



## Radio & TV Broadcast Engineering

全国百种重点期刊 专业核心科技期刊

第50卷 第1期 VOL.50 NO.1



### 中国广电认证

中国广播电视行业自愿性广播电视产品第三方认证机构

### 传递信任 服务发展

截至2022年12月1日以下企业入户型光接收机、

GPON/EPON /OTN 系统设备获“中国广电认证”



(企业排名不分先后)

电话: 010-86095645 电子邮件: rzzx@abp2003.cn

地址: 北京西城区复兴门外大街2号国家广播电视总局监管大楼408室 (100866)

ISSN 1002-4522



9 771002 452234

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

全国百种重点期刊 专业核心科技期刊

# 目次

tougao.lieku.cn



发行部直订 杂志铺订阅

2023年 | 第50卷 | 第1期

## 中国视听大数据 (CVB) 专栏·应用

11 中央广播电视总台央视频道收视大数据指标体系研究 杨质祺, 苏畅, 王欣悦

## 热点·论点

### 广电媒体融合应用实践

- 15 构建媒体融合多业务统一用户体系的探索与实践 彭祖胜
- 19 媒体融合下的智能媒资系统设计与应用 龚旭强
- 23 媒体融合场景下软件应用系统性能测试研究 沈文弢

## 网络视听

26 智能营销决策系统在IPTV业务运营中的应用 姜程甦, 刘长军

## 内容制播

- 30 基于泛工具化的全媒体新闻生产工具接入设计与实现 洪松虹
- 34 基于省级融媒体技术平台的“无人电台”技术系统建设 宋欣欣, 章剑, 朱恬逸
- 39 城市台全IP 4K超高清转播车系统的设计与实践 谭建明, 常飞, 赵一铭, 孙帅, 吴冀鲁
- 46 视频情感计算在广电视听领域的应用研究 刘文翰
- 50 电视直播中空地互联的技术实现 毛成坤, 李琦龙
- 56 大型应急演练无线传输方案设计及录制实践 王鹏钦

## 传输覆盖

### 有线网络

60 基于IP网络的智能机顶盒终端产品研制 张一哲, 庄崑, 姚辉军, 李蓓佳



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

# 目次

tougao.lieku.cn



2023年 | 第50卷 | 第1期

67 基于全IP化架构的有线电视云平台方案设计研究 范晔, 葛祥

72 基于环网带宽共享的融合传输平台设计与实现 冒昌银, 孙仲华

## 无线覆盖

76 中波发射台天线电磁环境改善方案研究 康晓乐

80 天线高度对中波发射效果的影响及适配改造实践 王一凡

84 广播发射机远程监控系统的设计与实现 乔晶鑫

89 大功率发射电子管节能提效的“黑灯丝”控制电路实现 蒲亮

93 发射机同轴倒换开关故障分析与处理 汪家祺, 沈斌, 王敏海, 吴星辰

96 应急广播微波传输覆盖方案设计 弓彦伟

## 安全播出与监测监管

100 电视台容灾备份系统设计中需注意的因素分析 莫鑫, 钟士奇

105 基于密文策略属性加密的广电监管数据共享系统 黄吉林

110 电视播出自动切换语音报警系统的设计与实现 郑伟, 吴艳, 刘路, 杨烁, 于涵迪

114 人脸识别技术在广播电视节目内容监管系统中的应用与实现 郭靖威, 李晓婷

广告索引 P118



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、各级广播电视台及融媒体中心、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、不做任何承诺或保证、不承担任何责任。

# 导 读

全国百种重点期刊 专业核心科技期刊  
投稿平台 [tougao.lieku.cn](http://tougao.lieku.cn)



2023年 | 第50卷 | 第1期

## 【15】构建媒体融合多业务统一用户体系的探索与实践

随着媒体融合业务的发展，不同业务之间的内容互通、用户互动的场景需求越来越普遍，如何从整体上解决各业务的用户、权益以及鉴权等问题变得日益迫切。论文结合不同业务的内容互通和用户互动、智能推荐、广告精准推送等潜在需求场景，提出了构建一个多业务统一的用户体系设计思路，既能满足不同业务的个性化需求以及灵活发展，又能实现各业务统一管理以及信息互通，相关思路和做法可资借鉴。

## 【34】基于省级融媒体技术平台的“无人电台”技术系统建设

为适应媒体融合发展，对广播制播技术系统进行升级改造势在必行。本文介绍的“无人电台”技术系统，充分利用省级融媒体技术平台的云计算、云存储等云服务能力和广播云媒资，可通过云端资源的上传和下载，灵活配置并定制全天节目单，可利用云计算、AI技术等进行新闻、天气、路况等节目内容的自动生成、自动播报，实现了全时段的无人自动播出，从而为电台的融合制播能力升级换代赋能。

## 【60】基于IP网络的智能机顶盒终端产品研制

为承载各类IP化新功能新业务，江苏有线配合有线网络全网IP化进程，决策构建面向IP网络化的系列终端产品体系。本文主要论述了研制IP机顶盒、电视棒等终端产品形态的技术设计方案，分别从软硬件原型设计角度讨论了IP型机顶盒的结构构成、如何与有线网络全业务融合IP电视播出平台以及运营支撑平台对接、如何全场景覆盖等内容。该设计方案已应用于通用型IP机顶盒、电视棒等多个形态的IP型终端产品上，取得了较好的实践效果，值得业界同行参考借鉴。

## 【76】中波发射台天线电磁环境改善方案研究

随着我国城市化进程的不断加快和居民健康意识的不断提升，广播电视发射设施尤其是大型中短波发射台站的电磁污染安全问题日渐得到关注。本文研究了某中短波发射台四塔中波天线的电磁辐射情况，通过增加反射幕的手段改善了其电磁环境，将背向电磁辐射超标范围控制在台区以内，减少了发射天线对周边区域的电磁辐射。

## 【100】电视台容灾备份系统设计中需注意的因素分析

电视台容灾备份系统关系到广播电视安全播出，其系统建设需要从项目预算、选址、技术方向等多个角度综合考虑，是一项复杂的系统性工程。本文分析了电视台容灾备份系统的规范性要求，并结合湖南卫视频道备播系统的设计，对电视台容灾备份播出系统在建设时需要考虑的因素进行分析，可为其他电视台建设备播系统时提供参考依据。



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

**Publisher:** Editorial Department of RTBE

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

**Chief Editor:** He Jianhui

**Web Address:** tougao.lieku.cn

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

**Deputy Chief Editors:** Lu Qun

**Post Code:** 100866

**Postal Distributing:** Code 82-464

**Editors:** Fang Lei Li Dan

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

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

**Circulation Coordinator:** Hu Nan

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

**Art Editor:** Zhang Yunfeng

**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**

Jan 2023 No.1

## CVB Column • Application

11 Research on CCTV Ratings Big Data Index System of CMG *By Yang Zhiqi, Su Chang, Wang Xinyue*

## Application and Practice of Radio and Television Media Convergence

15 Exploration and Practice of Establishing a Multi-service Unified User System in Media Convergence *By Peng Zusheng*

19 Design and Application of Intelligent Media Asset System under Media Convergence *By Gong Xuqiang*

23 Research on Software Application System Performance Testing in Media Convergence Scene *By Shen Wentao*

## Internet Audio & Video

26 Application of Intelligent Marketing Decision System in IPTV Business Operation *By Jiang Chengsu, Liu Changjun*

## Content Production & Broadcasting

30 Design and Implementation of Omnimedia News Production Tool Access Based on Pan Instrumentalization *By Hong Songhong*

34 Construction of "Unmanned Radio Station" Technology System Based on Provincial Convergence Media Technology Platform *By Song Xinxin, Zhang Jian, Zhu Tianyi*

39 Design and Practice of All-IP 4K UHD Relay Vehicle System at City Radio Station *By Tan Jianming, Chang Fei, Zhao Yiming, Sun Shuai, Wu Jilu*

46 Research on the Application of Video Affective Computing in the Field of Radio and Television Audio-visual *By Liu Wenhan*

50 Realization of Air-ground Information Interconnection Technology in Live Television Broadcasting *By Mao Chengkun, Li Qilong*

56 Wireless Transmission Scheme Design and Recording Practice of Large-scale Emergency Drill *By Wang Pengqin*

## CATV

60 Development of Intelligent STB Terminal Products Based on IP Network *By Zhang Yizhe, Zhuang Yin, Yao Huijun, Li Beijia*

67 Research on Design of CATV Cloud Platform Based on All-IP Architecture *By Fan Ye, Ge Yang*

72 Design and Implementation of Converged Transmission Platform Based on Shared Ring Network Bandwidth *By Mao Changyin, Sun Zhonghua*

## Wireless Coverage

76 Research on Improvement Scheme of Electromagnetic Environment of Medium Wave Transmitting Station Antenna *By Kang Xiaole*

80 The Influence of Antenna Height on Medium Wave Transmitting Effect and the Practice of Adaptation *By Wang Yifan*

84 Design and Implementation of Remote Monitoring System for Broadcasting Transmitter *By Qiao Jingxin*

89 Realization of "Black Filament" Control Circuit for Energy Saving and Efficiency Improvement of High-power Transmitting Electronic Tube *By Pu Liang*

93 Fault Analysis and Treatment of Transmitter Coaxial Switch *By Wang Jiaqi, Shen Bin, Wang Minhai, Wu Xingchen*

96 Design of Microwave Transmission Coverage Scheme for Emergency Broadcasting *By Gong Yanwei*

## Safe Broadcasting & Monitoring and Supervision

100 Analysis of Factors Needing Attention in the Design of Disaster Recovery Backup System of TV Station *By Mo Xin, Zhong Shiqi*

105 Supervision Data Sharing System of Radio and Television Based on Ciphertext-policy Attribute-based Encryption *By Huang Jilin*

110 Design and Implementation of Automatic Switching Voice Alarm System for TV Broadcasting *By Zheng Wei, Wu Yan, Liu Lu, Yang Shuo, Yu Handi*

114 Application and Implementation of Face Recognition Technology in Radio and Television Program Content Supervision System *By Guo Jingwei, Li Xiaoting*



**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](http://tougao.lieku.cn)

Jan 2023 No.1

## [ 15 ] Exploration and Practice of Establishing a Multi-service Unified User System in Media Convergence

With the development of media convergence services, the demand for content interoperability and user interaction scenarios among different services is becoming more and more common. How to solve the problems of users, rights, and authentication of various services as a whole has become increasingly urgent. In combination with potential demand scenarios such as content interoperability and user interaction of different businesses, intelligent recommendation, and accurate advertising push, the paper proposes a design idea of building a unified user system for multiple businesses, which can not only meet the personalized needs and flexible development of different businesses, but also achieve unified management and information interoperability of various businesses. Relevant ideas and practices can be used for reference.

## [ 34 ] Construction of "Unmanned Radio Station" Technology System Based on Provincial Convergence Media Technology Platform

In order to adapt to the development of media convergence, it is imperative to upgrade the broadcasting technology system. The "unmanned radio station" technology system introduced in this paper makes full use of the cloud computing, cloud storage and other cloud service capabilities of the provincial convergence media technology platform and the broadcast cloud media resources. It can flexibly configure and customize the all-day program list through the upload and download of cloud resources. It can use cloud computing, AI technology and other technologies to automatically generate and broadcast news, weather, road conditions and other program content, realizing the automatic broadcast of unmanned programs in full time, so as to enable the upgrading of integrated production and broadcasting capacity of the radio station.

## [ 60 ] Development of Intelligent STB Terminal Products Based on IP Network

In order to carry all kinds of new functions and new services of IP, Jiangsu Cable decided to build a series of terminal product systems oriented to IP networking in line with the IP process of the whole cable network. This paper mainly discusses the technical design scheme for the development of terminal products such as IP set-top boxes and TV sticks. From the perspective of software and hardware prototype design, it discusses the structure of IP set-top boxes, how to integrate with the cable network full-service IP TV broadcast platform, how to connect the operation support platform, how to cover the whole scene, etc. This design scheme has been applied to IP terminal products in multiple forms, such as general-purpose IP set-top boxes and TV sticks, and has achieved good practical results, which is worthy of reference for peers in the industry.

## [ 76 ] Research on Improvement Scheme of Electromagnetic Environment of Medium Wave Transmitting Station Antenna

With the accelerating process of urbanization in China and the continuous improvement of residents' health awareness, the electromagnetic pollution safety of radio and television transmitting facilities, especially large medium and short wave transmitting stations, has received increasing attention. In this paper, the electromagnetic radiation of the medium wave antenna in the four towers of a medium and short wave transmitting station is studied. The electromagnetic environment is improved by adding a reflector screen. The back electromagnetic radiation exceeds the standard within the station area, reducing the electromagnetic radiation of the transmitting antenna to the surrounding area.

## [ 100 ] Analysis of Factors Needing Attention in the Design of Disaster Recovery Backup System of TV Station

The disaster recovery backup system of TV station is related to the safe broadcasting of radio and television, and its system construction needs to be considered comprehensively from the project budget, site selection, technical direction and other aspects, which is a complex systematic project. This paper analyzes the normative requirements of the disaster recovery backup system of TV stations, and analyzes the factors that need to be considered in the construction of the disaster recovery backup broadcasting system of TV stations in combination with the design of the backup broadcasting system of Hunan Satellite TV channel, which can provide a reference for other TV stations when building the backup broadcasting system.