

研究论文

小型宽带GIS局放检测内置天线设计

郭宏福¹;许彩祥¹;唐金锋¹;付咪¹;白丽娜²

(1. 西安电子科技大学 理学院, 陕西 西安 710071;
2. 西安电子科技大学 机电工程学院, 陕西 西安 710071)

摘要:

针对用于气体绝缘封闭式组合电器(GIS)局部放电超高频检测天线应具有宽频带、高增益、小尺寸的性能要求, 基于对称振子天线阻抗与带宽关系, 对天线振子结构变形演变, 设计了一种新型的异型椭圆平面内置天线. 采用HFSS仿真软件对天线结构尺寸参数进行优化分析, 选取一组最优参数, 制作了天线实物. 实测结果为: 天线尺寸为90mm×45mm时, 实测频带为781MHz~2.00GHz, 驻波比小于2.5, 天线最大增益为3.55dB. 仿真和实测结果吻合. 放电试验验证该天线满足局部放电超高频检测的要求.

关键词: 宽带内置天线 HFSS 超高频(UHF) GIS 局部放电

Design of a miniature broadband internal antenna for PD detection in GIS

GUO Hongfu¹;XU Caixiang¹;TANG Jinfeng¹;FU Mi¹;BAI Li'na²

(1. School of Science, Xidian Univ., Xi'an 710071, China;
2. School of Mechano-electronic Engineering, Xidian Univ., Xi'an 710071, China)

Abstract:

According to the analysis of the relationship between the impedance and bandwidth of the dipole antenna, a novel elliptical plane internal antenna feeding by a coaxial line is presented. It consists of an elliptical monopole and a rectangular grounding piece and has the virtues of broad band, high gain and small size. The antenna can be used for ultrahigh frequency (UHF) partial discharge (PD) detection in the gas-insulated switchgear (GIS). The size is achieved by using the simulation software Ansoft HFSS and the optimum size of total antenna is 90mm×45mm. A prototype is constructed and studied, and then measured. The antenna covers a large band from 781MHz to 2.00GHz, with the VSWR less than 2.5 and a max gain of 3.55dB. Simulated and tested results are in good agreement and the radiation pattern and gain characteristics are given.

Keywords: broadband internal antenna HFSS UHF GIS partial discharge

收稿日期 2012-04-27 修回日期 网络版发布日期

DOI: 10.3969/j.issn.1001-2400.2013.02.026

基金项目:

陕西省科技攻关资助项目(2011K06-44);榆林市校地合作资助项目(55)

通讯作者: 郭宏福

作者简介: 郭宏福(1964-), 男, 高级工程师, E-mail: hfguo@xidian.edu.cn.

作者Email: hfguo@xidian.edu.cn

参考文献:

[1] 王平, 许琴, 王林泓, 等. 电力设备局部放电信号的在线检测系统研究 [J]. 电力系统保护与控制, 2010, 38(24): 190-194.

Wang Ping, Xu Qin, Wang Linhong, et al. Research of On-line Detection System for Partial Discharge signal of Power Equipments [J]. Power System Protection and Control, 2010, 38(24): 190-194.

[2] 郭宏福, 付咪, 许彩祥. 宽带超高频局放检测壳装天线设计方法研究 [J]. 电波科学学报, 2011, 26(6):

扩展功能

本文信息

▶ Supporting info

▶ PDF(1118KB)

▶ [HTML全文]

▶ 参考文献[PDF]

▶ 参考文献

服务与反馈

▶ 把本文推荐给朋友

▶ 加入我的书架

▶ 加入引用管理器

▶ 引用本文

▶ Email Alert

▶ 文章反馈

▶ 浏览反馈信息

本文关键词相关文章

▶ 宽带内置天线

▶ HFSS

▶ 超高频(UHF)

▶ GIS

▶ 局部放电

本文作者相关文章

▶ 郭宏福

▶ 许彩祥

▶ 唐金锋

▶ 付咪

PubMed

▶ Article by Guo,H.F

▶ Article by Xu,C.X

▶ Article by Tang,J.F

▶ Article by Fu,m

1212-1217.

Guo Hongfu, Fu Mi, Xu Caixiang. A Design of UHF Antenna with Metallic Shell for PD Detection [J].

Chinese Journal of Radio Science, 2011, 26(6): 1212-1217.

[3] 赵煦, 孟永鹏, 成永红, 等. 变压器现场超高频局部放电信号的时域特征分析 [J]. 西安交通大学学报, 2011, 45(12): 82-86.

Zhao Xu, Meng Yongpeng, Cheng Yonghong, et al. Time-Domain Characteristic Site Analysis for Ultra-High Frequency Partial Discharge in Power Transformer [J]. Journal of Xi'an Jiaotong University, 2011, 45(12): 82-86.

[4] 郭灿新, 张连宏, 姚林朋, 等. 局部放电HF/UHF联合分析方法的现场电缆终端检测应用 [J]. 电力自动化设备, 2010, 30(5): 92-94.

Guo Canxin, Zhang Lianhong, Yao Linpeng, et al. Application of HF/UHF Joint Partial Discharge Analysis to On-site Power Cable Terminal Detection [J]. Electric Power Automation Equipment, 2010, 30(5): 92-94.

[5] Guo Hongfu, Guo Jinxi, Mei Xiaoyun, et al. The Design of Sensitive and Wide Dynamic Range UHF PD Detection Sensor Circuit [C] //International conference on Electrical and Control Engineering.

Yichang: IEEE, 2011: 4128-4131.

[6] 王建生, 邱毓昌, 吴向华, 等. 用于GIS局部放电检测的超高频传感器频率响应特性 [J]. 中国电机工程学报, 2000, 20(8): 42-45.

Wang Jiansheng, Qiu Yuchang, Wu Xianghua, et al. Frequency Response Characteristics of the UHF Sensors for Partial Discharge Detection in GIS [J]. Proceedings of the CSEE, 2000, 20(8): 42-45.

[7] 唐炬, 侍海军, 孙才新, 等. 用于GIS局部放电检测的内置传感器超高频耦合特性研究 [J]. 电工技术学报, 2004, 19(5): 71-75.

Tang Ju, Shi Haijun, Sun Caixin, et al. Study of UHF Frequency Response Characteristics of the Inner Sensor for Partial Discharge Detection in GIS [J]. Trans of China Electrotechnical Society, 2004, 19(5): 71-75.

[8] 刘卫东, 金立军, 黄家旗, 等. 日本SF6电器局部放电监测技术研究近况 [J]. 高电压技术, 2001, 27(2): 76-77.

Liu Weidong, Jin Lijun, Huang Jiaqi, et al. Review of Recent Researches on PD Monitoring in Gas Insulated Equipment in Japan [J]. High Voltage Engineering, 2001, 27(2): 76-77.

[9] Kim D S, Hwang C M, Kim Y N, et al. Development of an Intelligent Spacer Built into the Internal Type UHF Partial Discharge Sensor [C] //IEEE International Symposium on Electrical Insulation.

Vancouver: IEEE, 2008: 396-399.

[10] 李亚峰, 王保保, 冯象初. 一种检测局部放电信号的新方法 [J]. 西安电子科技大学学报, 2010, 37(3): 529-533.

Li Yafeng, Wang Baobao, Feng Xiangchu. New Method for Partial Discharge Signals Detection [J]. Journal of Xidian University, 2010, 37(3): 529-533.

[11] 唐志国, 李成榕, 常文治, 等. 变压器局部放电定位技术及新兴UHF方法的关键问题 [J]. 南方电网技术, 2008, 2(1): 36-40.

Tang Zhiguo, Li Chengrong, Chang Wenzhi, et al. The Partial Discharge Location Technology of Power Transformer and the Key Issues of Newly Developed UHF Method [J]. Southern Power System Technology, 2008, 2(1): 36-40.

[12] 魏文元, 宫德明, 陈必森. 天线原理 [M]. 北京: 国防工业出版社, 1985: 40-43.

本刊中的类似文章

1. 李媛媛¹;许录平¹;2.用于矢量地图版权保护的数字水印[J]. 西安电子科技大学学报, 2004,31(5): 719-723
2. 郭宏福 许彩祥 唐金锋 付咪.小型宽带GIS局放检测内置天线设计[J]. 西安电子科技大学学报, 2013,40(2): 159-163
3. 李亚峰;王保保;冯象初.一种检测局部放电信号的新方法[J]. 西安电子科技大学学报, 2010,37(3): 529-533+569
4. 刘道华;原思聪;兰洋;马新建.混沌映射的粒子群优化方法[J]. 西安电子科技大学学报, 2010,37(4): 764-769