

Will there be an open voltage at a 10kV bus resonant line



AI Overview

Yes, a resonant transmission line can exhibit a significant open-circuit voltage at its open end due to standing wave formation and resonance effects.

Resonance and Standing Waves In a resonant line, the line length and system frequency can create standing waves, where voltage and current nodes and antinodes form along the line. At the open end of a transmission line, the current is zero (current node), while the voltage reaches a maximum (voltage antinode). This means that even if the line is not carrying current, the voltage at the open end can be as high as the source voltage or even higher under resonance conditions.

Over-Voltage in Shunt-Compensated Lines For shunt-compensated or lightly loaded lines, the distributed line capacitance can interact with shunt reactors, creating series or parallel resonance. This can lead to excessive over-voltage on the open or de-energized phases, especially if breaker poles fail to operate symmetrically. Such over-voltage can exceed the continuous voltage rating of the line and damage connected equipment.

Practical Implications

- Voltage Amplification:** At resonance, the voltage on the open phase can be significantly higher than the nominal 10 kV bus voltage due to the resonant amplification effect.
- Equipment Risk:** Instrument transformers, surge arresters, and other line-connected devices may be exposed to dangerous voltages if resonance is not mitigated.
- Mitigation:** Utilities often use shunt reactors, neutral reactors, and careful switching procedures to control resonance and limit over-voltage.

Conclusion A 10 kV bus resonant line can indeed have an open voltage at its open end, potentially reaching or exceeding the nominal voltage due to standing waves and resonance. Proper design, compensation, and operational precautions are essential to prevent equipment damage and ensure system stability.

Article Content

The Science Behind AC Resonant Frequency—And

Resonance plays a fundamental role in high voltage testing, allowing us to amplify voltage with minimal power input while ensuring precise test

Voltage Imbalance: Ground Fault, Open Line, or

Single-phase grounding, line break (open-phase), and resonance can all cause three-phase voltage unbalance. Correctly distinguishing among them is essential

Study on the optimum value of remanent magnetism for ...

In the 10 kV system, the proportion of all-cable lines is increasing, which will lead to an increase in the capacitance to ground in the system, providing the necessary conditions for the

Power Tips: Designing an LLC resonant half-bridge power converter

Unlike traditional pulse-width modulation (PWM) power converters, resonant converter output voltages are regulated by frequency modulation. Therefore, the design methodology of a resonant converter

Single line-to-ground fault current analysis for resonant grounded ...

Abstract In bushfire-prone regions, powerline faults, notably single line-to-ground (SLG) faults, are significant contributors to wildfires. In order to promptly mitigate conflagration risks and

7.4: TEM Resonances

A transmission line short-circuited at both ends also has a zero-frequency resonance corresponding to a steady current flowing around the line

Resonance management in long transmission lines

In a light-loaded or no-load long transmission line, due to the reactive power provided by the distributed capacitor along the line, the voltage at the receiving end of the line is higher than the

Harmonic Resonance in Power Systems – Voltage Disturbance

Voltage distortion: For resonant condition the distortion will be due to one or two closely spaced harmonic orders. By analyzing the current and voltage on a power quality analyzer the

Research on the mechanism and restraining measures of

The results show that when eliminating the single-phase ground fault, it is easy to cause the frequency division resonance of the system, and the use of these two measures can effectively

15.6: Resonance in an AC Circuit

In the RLC series circuit, there is a resonant frequency where the inductive reactance equals capacitive reactance. The average power versus

12.6: Standing Waves and Resonance

With the line's load end open-circuited, there can be no current, but there will be voltage. Therefore, the load-end of an open-circuited transmission line is a

The ferroresonance of 10kV distribution PT during live working ...

Abstract: When the lead wires of a inductive potential transformer (PT) of a distribution network are overlapped with electricity, ferro-resonance often occur, which will cause serious

Harmonic Resonance in Power Systems - Voltage

There are some key ideas to be understood while trying to delve in to understanding electrical power system harmonic resonance. They are: Non

Design example resonant LLC converter operation and design

While a resonant LLC converter has several desired features such as high efficiency, low EMI and high power density, the design of a resonant converter is an involved task, and requires more effort for

Series Resonance in a Series RLC Resonant Circuit

However, its high current and very high component voltage values can cause damage to the circuit. The most prominent feature of the frequency

Determining Series RLC Circuit Resonance Frequency

Learn how to determine the resonance frequency, the component voltages, and current levels at various frequencies in a series RLC circuit.

Measurement of insulation resistance (IR) - Part 2

Insulation Resistance (IR) This article goes into details of insulation resistance values measured by Megger tester on many different kinds of

What Is an AC Resonant Test System? A

When selecting an AC resonant test system, there are a few critical factors to consider to ensure you get the right system for your needs: 1. Voltage

Analysis and Measures of 10kV Bus PT Breakdown Accident

A 10kV bus PT breakdown accident caused by two-phase grounded is mainly introduced in this paper. Firstly, the bus voltage variation is analyzed when two-phase grounded occurs.

POWER FLOWS AND SHORT CIRCUIT CALCULATIONS FOR KV AND 20 KV

The paper deals with the analyses of power flows for 10 kV and 20 kV operating voltage, the analyses of three- phase short circuit for 10 kV and 20 kV operating voltage, the analyses of two-phase short

Resonance

Resonance phenomena occur with all types of vibrations or waves: there is mechanical resonance, orbital resonance, acoustic resonance, electromagnetic

Resonant Transmission Line Analysis

This document discusses the application of transmission lines as resonant circuits. It explains that a short or open circuited transmission line acts as a resonant circuit when its length is an integer

Study on the Requirements for the 10 kV Voltage Transformers

The electronic voltage transformer, typically integrated and sealed within the column-mounted intelligent switch, mainly consists of a capacitive voltage divider and a power supply sensor

Faulty feeder detection for single-phase-to-ground fault in resonant ...

Aiming at the weak fault characteristics and poor adaptability of existing methods during high-impedance faults in 10 kV resonant grounding distribution systems, this paper proposes a fault

PT 10kV high-voltage fuse bus causes and solutions

Neutral systems to 10kV high voltage fuse of Bus PT analyze the causes of possible causes for a variety of solutions were discussed. And Phoenix Zhengzhou 220KV substation power company actually

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