

# SMART CONTRACT AUDIT



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PREPARED FOR

**BIOKRIPT**



# INTRODUCTION

Auditing Firm	InterFi Network
Client Firm	BioKript
Methodology	Automated Analysis, Manual Code Review
Language	Solidity
Contract	0x6448Be0ca45a7581D9c4C9DD665e14ec60B25113
Blockchain	Binance Smart Chain
Centralization	Active ownership
Commit	c490c18d4fb45b2a2f4b7489bfba1766eabf4ed4
Website	<a href="https://www.biokript.com/">https://www.biokript.com/</a>
Telegram	<a href="https://t.me/biokript/">https://t.me/biokript/</a>
Twitter	<a href="https://twitter.com/biokript/">https://twitter.com/biokript/</a>
Instagram	<a href="https://www.instagram.com/biokript/">https://www.instagram.com/biokript/</a>
Report Date	July 05, 2023


 Verify the authenticity of this report on our website: <https://www.github.com/interfinetwork>




## EXECUTIVE SUMMARY

InterFi has performed the automated and manual analysis of solidity codes. Solidity codes were reviewed for common contract vulnerabilities and centralized exploits. Here's a quick audit summary:

Status	Critical <span style="color: red;">●</span>	Major <span style="color: orange;">●</span>	Medium <span style="color: yellow;">●</span>	Minor <span style="color: green;">●</span>	Unknown <span style="color: brown;">●</span>
Open	0	0	0	3	0
Acknowledged	0	1	0	2	1
Resolved	0	1	2*	0	0
Important Privileges	<b>Prevent Bots (Blacklist)</b> , Set Buy and Sell Tax, Set Liquidity Fee, Withdraw, Add Liquidity Pair, Set Router, Set Distributor				

 Please note that smart contracts deployed on blockchains aren't resistant to exploits, vulnerabilities and/or hacks. Blockchain and cryptography assets utilize new and emerging technologies. These technologies present a high level of ongoing risks. For a detailed understanding of risk severity, source code vulnerability, and audit limitations, kindly review the audit report thoroughly.

 Please note that centralization privileges regardless of their inherited risk status - constitute an elevated impact on smart contract safety and security.



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## SCOPE OF WORK

InterFi was consulted by BioKript to conduct the smart contract audit of their solidity source codes. The audit scope of work is strictly limited to mentioned solidity file(s) only:

- BioKript.sol

 If source codes are not deployed on the main net, they can be modified or altered before main-net deployment. Verify the contract's deployment status below:

Public Contract Link	
<a href="https://bscscan.com/address/0x6448Be0ca45a7581D9c4C9DD665e14ec60B25113#code">https://bscscan.com/address/0x6448Be0ca45a7581D9c4C9DD665e14ec60B25113#code</a>	
Contract Name	BioKript
Compiler Version	0.8.10
License	MIT



# AUDIT METHODOLOGY

Smart contract audits are conducted using a set of standards and procedures. Mutual collaboration is essential to performing an effective smart contract audit. Here's a brief overview of InterFi's auditing process and methodology:

## CONNECT

- The onboarding team gathers source codes, and specifications to make sure we understand the size, and scope of the smart contract audit.

## AUDIT

- Automated analysis is performed to identify common contract vulnerabilities. We may use the following third-party frameworks and dependencies to perform the automated analysis:
  - Remix IDE Developer Tool
  - Open Zeppelin Code Analyzer
  - SWC Vulnerabilities Registry
  - DEX Dependencies, e.g., Pancakeswap, Uniswap
- Simulations are performed to identify centralized exploits causing contract and/or trade locks.
- A manual line-by-line analysis is performed to identify contract issues and centralized privileges.

We may inspect below mentioned common contract vulnerabilities, and centralized exploits:

Centralized Exploits	<ul style="list-style-type: none"><li>○ Token Supply Manipulation</li><li>○ Access Control and Authorization</li><li>○ Assets Manipulation</li><li>○ Ownership Control</li><li>○ Liquidity Access</li><li>○ Stop and Pause Trading</li><li>○ Ownable Library Verification</li></ul>
----------------------	---



## Common Contract Vulnerabilities

- Integer Overflow
- Lack of Arbitrary limits
- Incorrect Inheritance Order
- Typographical Errors
- Requirement Violation
- Gas Optimization
- Coding Style Violations
- Re-entrancy
- Third-Party Dependencies
- Potential Sandwich Attacks
- Irrelevant Codes
- Divide before multiply
- Conformance to Solidity Naming Guides
- Compiler Specific Warnings
- Language Specific Warnings

**REPORT**

- The auditing team provides a preliminary report specifying all the checks which have been performed and the findings thereof.
- The client's development team reviews the report and makes amendments to solidity codes.
- The auditing team provides the final comprehensive report with open and unresolved issues.

**PUBLISH**

- The client may use the audit report internally or disclose it publicly.

 It is important to note that there is no pass or fail in the audit, it is recommended to view the audit as an unbiased assessment of the safety of solidity codes.



## RISK CATEGORIES

Smart contracts are generally designed to hold, approve, and transfer tokens. This makes them very tempting attack targets. A successful external attack may allow the external attacker to directly exploit. A successful centralization-related exploit may allow the privileged role to directly exploit. All risks which are identified in the audit report are categorized here for the reader to review:

Risk Type	Definition
Critical 	These risks could be exploited easily and can lead to asset loss, data loss, asset, or data manipulation. They should be fixed right away.
Major 	These risks are hard to exploit but very important to fix, they carry an elevated risk of smart contract manipulation, which can lead to high-risk severity.
Medium 	These risks should be fixed, as they carry an inherent risk of future exploits, and hacks which may or may not impact the smart contract execution. Low-risk re-entrancy-related vulnerabilities should be fixed to deter exploits.
Minor 	These risks do not pose a considerable risk to the contract or those who interact with it. They are code-style violations and deviations from standard practices. They should be highlighted and fixed nonetheless.
Unknown 	These risks pose uncertain severity to the contract or those who interact with it. They should be fixed immediately to mitigate the risk uncertainty.

All statuses which are identified in the audit report are categorized here for the reader to review:

Status Type	Definition
Open	Risks are open.
Acknowledged	Risks are acknowledged, but not fixed.
Resolved	Risks are acknowledged and fixed.





## CENTRALIZED PRIVILEGES

Centralization risk is the most common cause of cryptography asset loss. When a smart contract has a privileged role, the risk related to centralization is elevated.

There are some well-intended reasons have privileged roles, such as:

- Privileged roles can be granted the power to pause( ) the contract in case of an external attack.
- Privileged roles can use functions like, `include()`, and `exclude()` to add or remove wallets from fees, swap checks, and transaction limits. This is useful to run a presale and to list on an exchange.

Authorizing privileged roles to externally-owned-account (EOA) is dangerous. Lately, centralization-related losses are increasing in frequency and magnitude.

- The client can lower centralization-related risks by implementing below mentioned practices:
- Privileged role's private key must be carefully secured to avoid any potential hack.
- Privileged role should be shared by multi-signature (multi-sig) wallets.
- Authorized privilege can be locked in a contract, user voting, or community DAO can be introduced to unlock the privilege.
- Renouncing the contract ownership, and privileged roles.
- Remove functions with elevated centralization risk.

 Understand the project's initial asset distribution. Assets in the liquidity pair should be locked. Assets outside the liquidity pair should be locked with a release schedule.



# AUTOMATED ANALYSIS

Symbol	Definition
	Function modifies state
	Function is payable
	Function is internal
	Function is private
	Function is important

```

| **BioKript** | Implementation | ERC20, Ownable, ReentrancyGuard ||| |
| L | <Constructor> | Public ! |  | ERC20 |
| L | setRouterAddress | External ! |  | onlyController |
| L | getAddresses | Public ! | |NO! |
| L | preventBots | External ! |  | onlyOwner |
| L | setBuyTax | External ! |  | onlyController |
| L | setSellTax | External ! |  | onlyController |
| L | setLiquidityFee | External ! |  | onlyController |
| L | burn | External ! |  | onlyController |
| L | excludeFromFees | Public ! |  | onlyController |
| L | calcTax | Internal  | | |
| L | _transfer | Internal  |  | | |
| L | setDistributor | External ! |  |NO! |
| L | setController | External ! |  |NO! |
| L | distributeInvestors | External ! |  |NO! |
| L | claimRewards | External ! |  | nonReentrant |
| L | claimableRewardAmount | Public ! | |NO! |

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```

|  L | withdraw | External ! | ● | onlyController |
|  L | addLiquidityPair | External ! | ● | onlyController |
|||||
| **IUniswapV2Router02** | Interface | IUniswapV2Router01 |||
|  L | removeLiquidityETHSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|  L | removeLiquidityETHWithPermitSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|  L | swapExactTokensForTokensSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|  L | swapExactETHForTokensSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|  L | swapExactTokensForETHSupportingFeeOnTransferTokens | External ! | ● | NO ! |
|||||
| **IUniswapV2Factory** | Interface | |||
|  L | feeTo | External ! | | NO ! |
|  L | feeToSetter | External ! | | NO ! |
|  L | getPair | External ! | | NO ! |
|  L | allPairs | External ! | | NO ! |
|  L | allPairsLength | External ! | | NO ! |
|  L | createPair | External ! | ● | NO ! |
|  L | setFeeTo | External ! | ● | NO ! |
|  L | setFeeToSetter | External ! | ● | NO ! |
|||||
| **IUniswapV2Pair** | Interface | |||
|  L | name | External ! | | NO ! |
|  L | symbol | External ! | | NO ! |
|  L | decimals | External ! | | NO ! |
|  L | totalSupply | External ! | | NO ! |
|  L | balanceOf | External ! | | NO ! |
|  L | allowance | External ! | | NO ! |
|  L | approve | External ! | ● | NO ! |

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```

|  L | transfer | External ! | 🔴 |NO! |
|  L | transferFrom | External ! | 🔴 |NO! |
|  L | DOMAIN_SEPARATOR | External ! | |NO! |
|  L | PERMIT_TYPEHASH | External ! | |NO! |
|  L | nonces | External ! | |NO! |
|  L | permit | External ! | 🔴 |NO! |
|  L | MINIMUM_LIQUIDITY | External ! | |NO! |
|  L | factory | External ! | |NO! |
|  L | token0 | External ! | |NO! |
|  L | token1 | External ! | |NO! |
|  L | getReserves | External ! | |NO! |
|  L | price0CumulativeLast | External ! | |NO! |
|  L | price1CumulativeLast | External ! | |NO! |
|  L | kLast | External ! | |NO! |
|  L | mint | External ! | 🔴 |NO! |
|  L | burn | External ! | 🔴 |NO! |
|  L | swap | External ! | 🔴 |NO! |
|  L | skim | External ! | 🔴 |NO! |
|  L | sync | External ! | 🔴 |NO! |
|  L | initialize | External ! | 🔴 |NO! |
|||||
|  **ReentrancyGuard** | Implementation | |||
|  L | <Constructor> | Public ! | 🔴 |NO! |
|  L | _nonReentrantBefore | Private 🗝️ | 🔴 | |
|  L | _nonReentrantAfter | Private 🗝️ | 🔴 | |
|  L | _reentrancyGuardEntered | Internal 🗝️ | | |
|||||
|  **SafeMath** | Library | |||

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```

| L | tryAdd | Internal 🔒 | | |
| L | trySub | Internal 🔒 | | |
| L | tryMul | Internal 🔒 | | |
| L | tryDiv | Internal 🔒 | | |
| L | tryMod | Internal 🔒 | | |
| L | add | Internal 🔒 | | |
| L | sub | Internal 🔒 | | |
| L | mul | Internal 🔒 | | |
| L | div | Internal 🔒 | | |
| L | mod | Internal 🔒 | | |
| L | sub | Internal 🔒 | | |
| L | div | Internal 🔒 | | |
| L | mod | Internal 🔒 | | |

```

```

|||||

```

```

| **Ownable** | Implementation | Context |||
| L | <Constructor> | Public ! | 🔴 | NO ! |
| L | owner | Public ! | | NO ! |
| L | _checkOwner | Internal 🔒 | | |
| L | renounceOwnership | Public ! | 🔴 | onlyOwner |
| L | transferOwnership | Public ! | 🔴 | onlyOwner |
| L | _transferOwnership | Internal 🔒 | 🔴 | |

```

```

|||||

```

```

| **ERC20** | Implementation | Context, IERC20, IERC20Metadata |||
| L | <Constructor> | Public ! | 🔴 | NO ! |
| L | name | Public ! | | NO ! |
| L | symbol | Public ! | | NO ! |
| L | decimals | Public ! | | NO ! |
| L | totalSupply | Public ! | | NO ! |

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```

|  L | balanceOf | Public ! |  NO ! | |
|  L | transfer | Public ! |  NO ! |
|  L | allowance | Public ! |  NO ! |
|  L | approve | Public ! |  NO ! |
|  L | transferFrom | Public ! |  NO ! |
|  L | increaseAllowance | Public ! |  NO ! |
|  L | decreaseAllowance | Public ! |  NO ! |
|  L | _transfer | Internal  |  | |
|  L | _mint | Internal  |  | |
|  L | _burn | Internal  |  | |
|  L | _approve | Internal  |  | |
|  L | _spendAllowance | Internal  |  | |
|  L | _beforeTokenTransfer | Internal  |  | |
|  L | _afterTokenTransfer | Internal  |  | |
|||||
|  **IUniswapV2Router01** | Interface |  |||
|  L | factory | External ! |  NO ! |
|  L | WETH | External ! |  NO ! |
|  L | addLiquidity | External ! |  NO ! |
|  L | addLiquidityETH | External ! |  NO ! |
|  L | removeLiquidity | External ! |  NO ! |
|  L | removeLiquidityETH | External ! |  NO ! |
|  L | removeLiquidityWithPermit | External ! |  NO ! |
|  L | removeLiquidityETHWithPermit | External ! |  NO ! |
|  L | swapExactTokensForTokens | External ! |  NO ! |
|  L | swapTokensForExactTokens | External ! |  NO ! |
|  L | swapExactETHForTokens | External ! |  NO ! |
|  L | swapTokensForExactETH | External ! |  NO ! |

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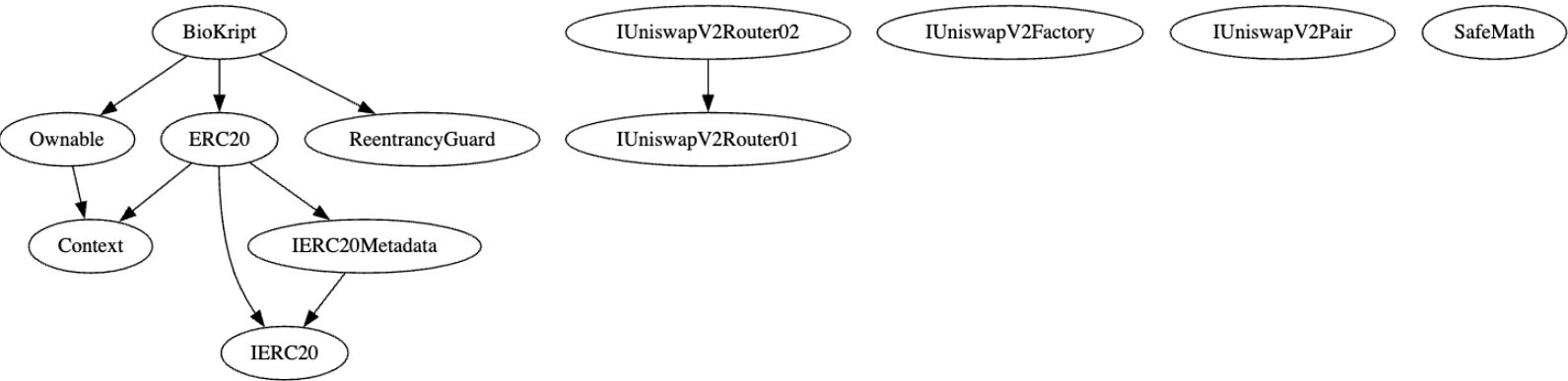


```

|  L | swapExactTokensForETH | External ! | 🚫 | NO ! |
|  L | swapETHForExactTokens | External ! | 🚫 | NO ! |
|  L | quote | External ! | | NO ! |
|  L | getAmountOut | External ! | | NO ! |
|  L | getAmountIn | External ! | | NO ! |
|  L | getAmountsOut | External ! | | NO ! |
|  L | getAmountsIn | External ! | | NO ! |
|||||
| **Context** | Implementation | |||
|  L | _msgSender | Internal 🚫 | | |
|  L | _msgData | Internal 🚫 | | |
|||||
| **IERC20Metadata** | Interface | IERC20 |||
|  L | name | External ! | | NO ! |
|  L | symbol | External ! | | NO ! |
|  L | decimals | External ! | | NO ! |
|||||
| **IERC20** | Interface | |||
|  L | totalSupply | External ! | | NO ! |
|  L | balanceOf | External ! | | NO ! |
|  L | transfer | External ! | 🚫 | NO ! |
|  L | allowance | External ! | | NO ! |
|  L | approve | External ! | 🚫 | NO ! |
|  L | transferFrom | External ! | 🚫 | NO ! |

```

# INHERITANCE GRAPH



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## MANUAL REVIEW

Identifier	Definition	Severity
CEN-01	Centralized privileges	Major 🟡
CEN-03	Privileged roles blacklist EOAs from transferring tokens	
BIO-01	Privileged roles withdraw contract balance through <code>withdraw()</code>	
CEN-06	Privileged roles update current liquidity pair	
CEN-07	Authorizations and access controls	

`onlyController` centralized privileges are listed below:

```

setRouterAddress()
preventBots()
setBuyTax()
setSellTax()
setLiquidityFee()
burn()
excludeFromFees()
withdraw()
addLiquidityPair()

```

`onlyOwner` centralized privileges are listed below:

```

transferOwnership()

```

`msg.sender == distributor` and `msg.sender == controller` access controls are provided to:

```

setDistributor()
setController()

```

`msg.sender == distributor` access control is provided to:

```

distributeInvestors()

```



## RECOMMENDATION

Deployers, contract owners, controllers, distributors, access controlled, and all other privileged roles' private-keys/access-keys/admin-keys should be secured carefully. These entities can have a single point of failure that compromises the security of the project. Manage centralized and privileged roles carefully, review PAGE 09 for more information.

The current trading pair, e.g., Pancakeswap or Uniswap pair should not be removed from automated market makers. Functions like blacklist elevates centralization risk significantly.

## RESOLUTION

BioKript team acknowledged to secure deployers, contract owners, controllers, distributors, access controlled, and all other privileged roles' private keys carefully. BioKript team uses multi-signature validation approach to manage centralization roles – 3 signatures are required to access privileged roles.



Identifier	Definition	Severity
CEN-02	Initial asset distribution	Minor 

All of the initially minted assets are sent to the project owner when deploying the contract. This can be an issue as the project owner can distribute tokens without consulting the community.

```
_mint(owner(), 500000000 * 10**18);
emit Transfer(address(0), msg.sender, totalSupply());
```

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## RECOMMENDATION

Project must communicate with stakeholders and obtain the community consensus while distributing assets.

## ACKNOWLEDGEMENT

BioKript team will distribute tokens as per their pre-determined tokenomics.



Identifier	Definition	Severity
LOG-01	Lack of appropriate arbitrary boundaries	Medium 🟡
LOG-05	High transaction tax	

Below mentioned functions are set with high arbitrary boundaries.

```

setBuyTax()
setSellTax()
setLiquidityFee()

```

Smart contract sets 90% buy and sell tax in constructor arguments.

```

buyTax = 90
sellTax = 90

```

## RECOMMENDATION

These functions should be provided appropriate upper input boundaries. For example, maximum fee charged in a transaction should not exceed 20%.

## PARTIAL RESOLUTION\*

BioKript team has lowered taxes to the following:

```

buyTax = 3
(https://bscscan.com/tx/0x66077efca1033522f3c9c2d81ff1d51c014bb1e2fbc1d7f592945eef92d06fbb)

sellTax = 5
(https://bscscan.com/tx/0x1c44fe70e9a4d1e91602fbd13d8c30a87f71cb2e6b34b6a0cce3c92b0879dd74)

```

\* BioKript team can set taxes to 99% at any time, potentially making contract a honeypot.



Identifier	Definition	Severity
LOG-02	Potential front-running	Minor ●

Potential front-running happens when an attacker observes a transaction swapping tokens or adding liquidity without setting restrictions on slippage or minimum output amount. The attacker can manipulate the exchange rate by front-running a transaction to purchase assets and make profits by back-running a transaction to sell assets.

```
distributeInvestors()
```

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## RECOMMENDATION

Asset transfer functions should be provided reasonable minimum output amounts, instead of zero.



Identifier	Definition	
LOG-03	Re-entrancy	

Below mentioned functions are used with re-entrancy guard:

`claimRewards()`

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Identifier	Definition	Severity
LOG-04	Unsafe transfer method	Medium 🟡

`super._transfer()` is used directly in several places which may lead to unexpected behavior as it bypasses logic in overridden `_transfer()` function.

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## RECOMMENDATION

Consider replacing `super._transfer()` with a new internal function that wraps it, e.g., `super.transfer()`

## RESOLUTION

BioKript team has removed `super._transfer()`.



Identifier	Definition	Severity
LOG-06	Missing important checks	Major 🟡

`claimRewards()` – Users may buy more tokens before distribution and selling them immediately after distribution. Consider implementing a holding period after claiming rewards or other measures to incentivize holding the token.

`claimableRewardAmount()` – Formula  $(\text{distributeTokens} * (\text{potential} - 1))$  might yield unexpected results if `potential` is less or equal to 1. Check to ensure potential is greater than 1.

`_transferWithFees()` – If `from` or `to` is in the `_isExcludedFromFees`, their `previousBalance` will not be updated. This means that `previousBalance[from]` and `previousBalance[to]` will remain 0 even if they have a balance. Make sure `_isExcludedFromFees` addresses are checked for `previousBalance`. `allowance` check for `transfer` or `transferFrom` functions should be performed in `_transferWithFees()`.

## ACKNOWLEDGEMENT

BioKript team has recognized this finding. Their development team has decided to maintain the current codebase unchanged.





Identifier	Definition	Severity
COD-02	Timestamp manipulation via <code>block.timestamp</code>	Minor 

Be aware that the timestamp of the block can be manipulated by a miner. When the contract uses the timestamp to seed a random number, the miner can actually post a timestamp within 15 seconds of the block being validated, effectively allowing the miner to precompute an option more favorable to their chances.

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## RECOMMENDATION

To maintain block integrity, follow 15 seconds rule, and scale time dependent events accordingly.



Identifier	Definition	Severity
COD-06	Unknown externally owned account	Minor <span style="color: green;">●</span>
BIO-02	Hardcoded addresses in constructor	

An externally owned account (EOA) has no code, and one can send messages from an externally owned account by creating and signing a transaction.

Please note, hardcoded addresses cannot be changed after contract deployment.

```

distributor = 0x5d135b21EcC60000B0ecDE932617105f04F71EFB;
controller = 0x6a07bB46D93c4BF298E1aCf67bDBd163e7B793c6;
companyWallet = 0x62537084Ad89F5137bad17135cb98D88b971EcbF;
burnWallet = 0x24C6D745f762be4ad8f165d4a3E0E7c35E443E6E;
safetyFunds = 0x0DC0ed454b001680B239c55b1bec76F8f93C609D;
reserves = 0xF41D58658fA316CEEfA20F781424661c1Db5CfBf;
liquidityReceiver = 0xe1a2967DeAb90287cbE1c57768a0d347ccd8f530;
feeReceiver = 0x4ed2D84a05DB7212039B4290507762Da79D4Ceb7;

```

## RECOMMENDATION

Private keys of externally owned accounts must be secured carefully.



Identifier	Definition	Severity
COD-08	Lack of fallback function	

Fallback functions are usually executed in one of the following cases: If a function identifier doesn't match any of the available functions in a smart contract. If there was no data supplied along with the function call.

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## RECOMMENDATION

Use fallback function with empty data, and mark it external, and payable.



Identifier	Definition	Severity
COD-10	Third Party Dependencies	Unknown 🟤

Smart contract is interacting with third party protocols e.g., Market Makers, Reward Contract, Front-end Centralized and Decentralized Applications, Open Zeppelin tools. The scope of the audit treats third party entities as black boxes and assumes their functional correctness. However, in the real world, third parties can be compromised, and exploited. Moreover, upgrades in third parties can create severe impacts, e.g., increased transactional fees, deprecation of previous routers, etc.

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## RECOMMENDATION

Inspect third party dependencies regularly, and mitigate severe impacts whenever necessary.

## ACKNOWLEDGEMENT

BioKript team will inspect third party dependencies regularly.



Identifier	Definition	Severity
COD-12	Lack of event-driven architecture	Minor 

Smart contract uses function calls to update state, which can make it difficult to track and analyze changes to the contract over time.

## RECOMMENDATION

Use events to track state changes. Events improve transparency and provide a more granular view of contract activity.

## ACKNOWLEDGEMENT

BioKript team has acknowledged this finding and agreed to keep the code as-is.



## DISCLAIMERS

InterFi Network provides the easy-to-understand audit of solidity source codes (commonly known as smart contracts).

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## ABOUT INTERFI NETWORK

InterFi Network provides intelligent blockchain solutions. We provide solidity development, testing, and auditing services. We have developed 150+ solidity codes, audited 1000+ smart contracts, and analyzed 500,000+ code lines. We have worked on major public blockchains e.g., Ethereum, Binance, Cronos, Doge, Polygon, Avalanche, Metis, Fantom, Bitcoin Cash, Velas, Oasis, etc.

InterFi Network is built by engineers, developers, UI experts, and blockchain enthusiasts. Our team currently consists of 4 core members, and 6+ casual contributors.

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