



**DEFIMOON**  
be secure

# Smart Contract Audit Report

July, 2023



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DEFIMOON PROJECT

Audit and  
Development

## CONTACTS

defimoon.org  
audit@defimoon.org  
🐦 defimoon\_org  
📧 defimoonorg  
🌐 defimoon  
🔗 defimoonorg

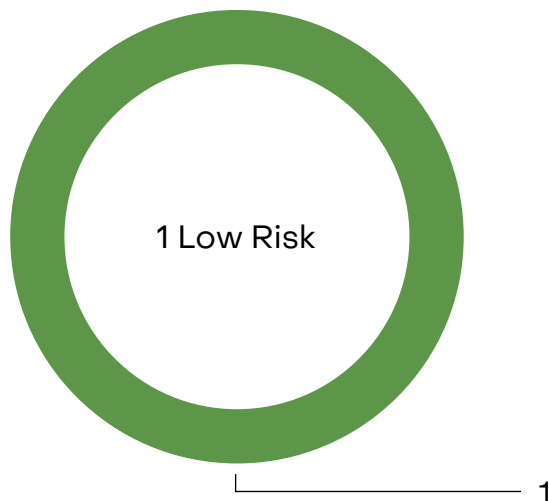


9 July 2023

This audit report was prepared by DefiMoon for Horizon-Dex.

### Audit information

Description	Dynamic market maker using a curve
Audited by	Ilya Vaganov
Approved by	Artur Makhnach, Kirill Minyaev
Languages	Solidity
Methods	Architecture Review, Unit Testing, Functional Testing, Manual Review
Source code	<a href="https://github.com/Horizon-Dex/contracts/tree/888c8d2d6cb37e7b2e79eb2f5ce51551098d439a">https://github.com/Horizon-Dex/contracts/tree/888c8d2d6cb37e7b2e79eb2f5ce51551098d439a</a>
Site	<a href="https://horizondex.io">https://horizondex.io</a>
Network	Linea
Status	Passed



	High Risk	A fatal vulnerability that can cause the loss of all Tokens / Funds.
	Medium Risk	A vulnerability that can cause the loss of some Tokens / Funds.
	Low Risk	A vulnerability which can cause the loss of protocol functionality.
	Informational	Non-security issues such as functionality, style, and convention.

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## **Audit Information**

Defimoon utilizes both manual and automated auditing approach to cover the most ground possible. We begin with generic static analysis automated tools to quickly assess the overall state of the contract. We then move to a comprehensive manual code analysis, which enables us to find security flaws that automated tools would miss. Finally, we conduct an extensive unit testing to make sure contract behaves as expected under stress conditions.

In our decision making process we rely on finding located via the manual code inspection and testing. If an automated tool raises a possible vulnerability, we always investigate it further manually to make a final verdict. All our tests are run in a special test environment which matches the "real world" situations and we utilize exact copies of the published or provided contracts.

While conducting the audit, the Defimoon security team uses best practices to ensure that the reviewed contracts are thoroughly examined against all angles of attack. This is done by evaluating the codebase and whether it gives rise to significant risks. During the audit, Defimoon assesses the risks and assigns a risk level to each section together with an explanatory comment.

# Audit overview

## **No major vulnerabilities found.**

Horizon-Dex is a noncustodial protocol that implements a dynamic market maker. It offers liquidity providers the ability to concentrate liquidity within specific price ranges, similar to the Uniswap V3 protocol. This enhances liquidity utilization for providers. Additionally, the protocol's reinvestment curve automatically reinvests fees back into the pool, compounding the interest for LP positions.

The Horizon-Dex protocol consists of several key contracts, including the Factory, Pool, Router, AntiSnipAttackPositionManager, and PoolOracle.

The Horizon-Dex protocol is audited to ensure its reliability and security. It implements an Automated Market Maker (AMM) that enables liquidity providers to concentrate liquidity within a specified price range. This concentration, along with the automatic reinvestment of fees in the second constant product curve, enhances liquidity utilization for providers. Additionally, Horizon-Dex incorporates an anti-sniping mechanism and an oracle for each pool to address issues related to real-time liquidity provision.

The audit primarily focuses on three critical aspects: functional correctness, access control, and accuracy of arithmetic operations. High levels of security are maintained for these subjects. Furthermore, the audit covers general areas like code complexity, trustworthiness, gas efficiency, and documentation, all of which are deemed highly secure.

In conclusion, the audit confirms that the Horizon-Dex codebase provides a satisfactory level of security.

Summary of findings

ID	Description	Severity
<u>DFM-1</u>	Using the static DOMAIN_SEPARATOR	Low Risk

## Application security checklist

Compiler errors	Passed
Possible delays in data delivery	Passed
Timestamp dependence	Passed
Integer Overflow and Underflow	Passed
Race Conditions and Reentrancy	Passed
DoS with Revert	Passed
DoS with block gas limit	Passed
Methods execution permissions	Passed
Private user data leaks	Passed
Malicious Events Log	Passed
Scoping and Declarations	Passed
Uninitialized storage pointers	Passed
Arithmetic accuracy	Passed
Design Logic	Passed
Cross-function race conditions	Passed

## Detailed Audit Information

### Contract Programming

Solidity version not specified	Passed
Solidity version too old	Passed
Integer overflow/underflow	Passed
Function input parameters lack of check	Passed
Function input parameters check bypass	Passed
Function access control lacks management	Passed
Critical operation lacks event log	Passed
Human/contract checks bypass	Passed
Random number generation/use vulnerability	Passed
Fallback function misuse	Passed
Race condition	Passed
Logical vulnerability	Passed
Other programming issues	Passed

### Code Specification

Visibility not explicitly declared	Passed
Variable storage location not explicitly declared	Passed
Use keywords/functions to be deprecated	Passed
Other code specification issues	Passed

### Gas Optimization

Assert () misuse	Passed
High consumption 'for/while' loop	Passed
High consumption 'storage' storage	Passed
"Out of Gas" Attack	Passed

## Findings

### DFM-1 «Using the static DOMAIN\_SEPARATOR»

**Severity:** Low Risk

**Description:** The `ERC712Permit.DOMAIN_SEPARATOR` is `immutable`, meaning that it will not be altered if the blockchain undergoes a fork. While this may seem beneficial, it can generate issues in cases where there is a fork, such as a Proof-of-Work (PoW) fork in the Ethereum network. In such situations, the `chainId` will be modified, but the `BasePositionManager` on the forked chain will still accept permits from the old `chainId`. This vulnerability creates a potential for cross-chain replay attacks, wherein a signature from one domain is utilized on another domain.

**Recommendation:** The best solution would be to use `DOMAIN_SEPARATOR` as a function that will calculate the domain hash dynamically.



## Automated Analyses

### **Slither**

Slither's automatic analysis not found vulnerabilities, or these false positives results .

# Methodology

## Manual Code Review

We prefer to work with a transparent process and make our reviews a collaborative effort. The goal of our security audits is to improve the quality of systems we review and aim for sufficient remediation to help protect users. The following is the methodology we use in our security audit process.

## Vulnerability Analysis

Our audit techniques include manual code analysis, user interface interaction, and whitebox penetration testing. We look at the project's web site to get a high-level understanding of what functionality the software under review provides. We then meet with the developers to gain an appreciation of their vision of the software. We install and use the relevant software, exploring the user interactions and roles. While we do this, we brainstorm threat models and attack surfaces. We read design documentation, review other audit results, search for similar projects, examine source code dependencies, review open issue tickets, and investigate details other than the implementation.

## Documenting Results

We follow a conservative, transparent process for analyzing potential security vulnerabilities and seeing them through successful remediation. Whenever a potential issue is discovered, we immediately create an Issue entry for it in this document, even though we have not yet verified the feasibility and impact of the issue. This process is conservative because we document our suspicions early even if they are later shown to not represent exploitable vulnerabilities. We follow a process of first documenting the suspicion with unresolved questions, then confirming the issue through code analysis, live experimentation, or automated tests. Code analysis is the most tentative, and we strive to provide test code, log captures, or screenshots demonstrating our confirmation. After this we analyze the feasibility of an attack in a live system to make a final decision.

## Suggested Solutions

We search for immediate mitigations that live deployments can take, and finally we suggest the requirements for remediation engineering for future releases. The mitigation and remediation recommendations should be scrutinized by the developers and deployment engineers, and successful mitigation and remediation is an ongoing collaborative process after we deliver our report, and before the details are made public.

Appendix A — Finding Statuses

Resolved	Contracts were modified to permanently resolve the finding
Mitigated	The finding was resolved by other methods such as revoking contract ownership or updating the code to minimize the effect of the finding
Acknowledged	Project team is made aware of the finding
Open	The finding was not addressed