



H-X

# **Report on Security Assessment of DX25 Smart Contract for Tacans**

Version 1.0



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## Revision History

Contributor	Date	Version	Comment
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# 1. Executive Summary

## 1.1 Introduction

By request of Tacans (Customer, Company), and according to Purchase Order dated 08 June 2023, H-X Technologies (H-X, Provider or auditors) has delivered the professional information security services, namely, security assessment of the Customer's smart contract (target object).

After reviewing the implementation of DX25's smart contract, this audit report has been prepared to discover potential issues and vulnerabilities of their source code. We have outlined our approach to evaluate the potential security risks. Advice on how to improve the security and performance has also been given in the report.

DX25 is a decentralized exchange (DEX) that operates on the MultiversX which is a highly scalable, secure and decentralized blockchain network. It is designed to provide an advanced trading experience that combines the best features of traditional centralized exchanges (TradeFi) and decentralized exchanges (DeFi).

As a single-sided liquidity DEX, DX25 allows traders to provide liquidity to the exchange using a single token. This means that traders can easily add liquidity to the platform without having to provide both tokens in a trading pair.

DX25 is built on the MultiversX, which is a blockchain platform designed to provide a scalable and secure infrastructure for decentralized applications. Within the MultiversX ecosystem, DX25 is poised to emerge as the preeminent DeFi protocol, boasting a comprehensive suite of services, revolutionary innovations, and the ability to harness trading functionalities effectively.

The platform also incorporates advanced features such as adaptable exchange pools with smart routing, concentrated liquidity and dynamic fee levels guarantee the best swap price for traders. This provides traders with greater control over their trades and helps to mitigate risks.

Overall, DX25 aims to provide a user-friendly and seamless trading experience that combines the best aspects of both TradeFi and DeFi. By doing so, it hopes to become a leading platform for decentralized trading on the MultiversX.

Smart contracts are self-executing programs that are designed to enforce the terms of an agreement between two parties on the blockchain network. They automate the process of verifying, enforcing, and executing the terms of the agreement, without the need for intermediaries.

Security is a critical aspect of smart contracts, as they execute financial transactions and store valuable information on the blockchain. Any vulnerabilities or flaws in the smart contract code can result in severe financial losses or exploitation of the network. Therefore, it is essential to ensure that smart contracts are secure and free from any vulnerabilities.

A security risk assessment was conducted based on the results of the smart contract audit. The audit adhered to the best practices outlined in the smart contract Style Guide and the Smart Contract Security Best Practices. Both automated and manual techniques were employed to evaluate and verify the security of the target object.



## 1.2 Short description of the project

**Project goal.** Assessment of overall level of security of the target object.

**Project scope.** The audit of a smart contract involved a comprehensive review and evaluation of its code and associated processes to identify any vulnerabilities or weaknesses that could potentially compromise the security, functionality, or performance of the contract.

**Project resources** included the dedicated security team, hardware, and software tools. The project team included these roles:

- Team Lead – Vladimir Buldyzhov.
- Security Analyst – Alex Kucher.
- Quality assurance – Matskovska Daria.
- Quality assurance – Chechyk Maryna.

## 1.3 Summary of findings

During our assessment of the smart contract, we identified three minor security issues and one informational issue. We're happy to note that the developers have been proactive and have implemented measures to enhance the security of the protocol. Additionally, we provided recommendations for improving certain mechanics of the project, which the developers have taken into account. Overall, we are satisfied with the level of collaboration and commitment demonstrated by the development team in addressing the identified issues, and we believe that the security level of the smart contract has been significantly enhanced.

Overall, DX25 smart contract was found to be of high quality and meets industry standards and best practices. Its design and implementation demonstrate a strong commitment to security and reliability, and the audit results provide confidence in the contract's ability to operate as intended.

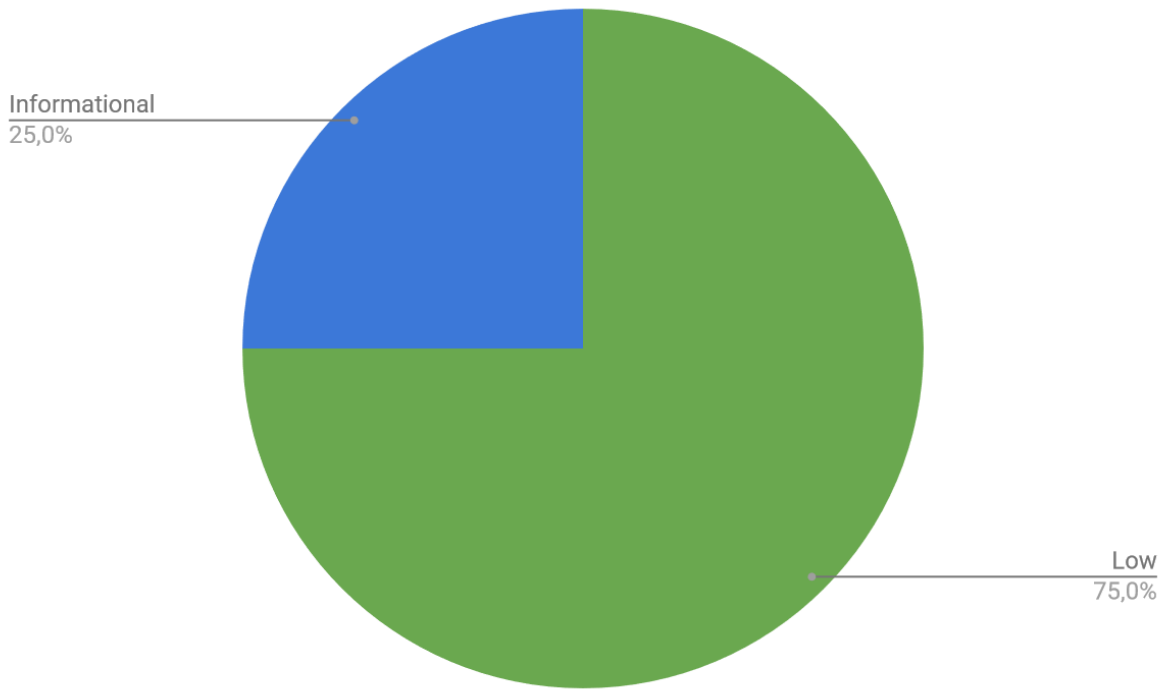
### Diagram and table of the findings

In the table below, the findings from the audit are presented, with each severity level having its own column.

Critical	High	Medium	Low	Informational
0	0	0	3	1



The results are clearly illustrated in the chart below.



ID	Findings	Risk level	Status
F-1	<a href="#">Potential lack of check</a>	Low	Noted
F-2	<a href="#">Unnecessary double check</a>	Low	Noted
F-3	<a href="#">Unnecessary argument passing</a>	Low	Noted
F-4	<a href="#">Missing cargo overflow checks</a>	Informational	Fixed

### 1.4 Disclaimer

This audit report is solely intended to assess the security and functionality of the smart contract for the decentralized exchange project on the MultiversX blockchain. It is not intended to provide investment advice or personal recommendations, nor does it take into account any potential economic implications of tokens, token sales, or other assets. Under no circumstances should any entity rely on this report to make investment decisions, buy or sell any tokens, products, services, or other assets.

It should be noted that this audit report does not endorse any particular project or team, nor does it guarantee the security of the project. The evaluation result does not ensure the absence of any further security issues, as a single audit cannot be comprehensive. Therefore, it is highly recommended that the project undergoes additional independent audits and a public bug bounty program to ensure the security of smart contracts.



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Furthermore, this audit report is subject to certain limitations, including but not limited to the fact that the evaluation is based on the information provided by the project team, and no independent verification of the information was conducted. Additionally, the audit is limited to the specific smart contract codebase reviewed and does not cover any associated web or mobile applications or third-party integrations. Any changes to the smart contract codebase after the completion of the audit are not covered by this report. Finally, this audit report does not provide any warranties regarding the discovery of all security issues of the smart contract.



## 2. Project Approach

### 2.1 Smart contract security audit methodology

The security audit was done using a combination of manual and automated tools and techniques to identify vulnerabilities within the target environment and exploit them.

#### Phase 1 – Getting familiar with the code and application

To evaluate the potential vulnerabilities or issues, we go through a checklist of well-known smart contract-related security issues, using automatic verification tools and manual review. We test some discovered issues on our local network to reproduce the issue and prove our findings.

In this audit, we considered the following important features of the code.

#### Common issues:

- Behavior flow management
  - Evaluation of possible scenarios of unexpected or undesirable behavior.
    - *front running*
    - *reentrancy*
    - *cross contract calls*
      - *exploitable state between the call and the callback*
      - *rollback any changes to the state in the callback if the external call failed*
      - *refund*
    - *transactions or events order dependencies*
    - *assert violation*
    - *unnecessary checks*
    - *unexpected ballance*
- Access control
  - Presence of an access control check for privileged actions.
    - *public methods or variables that should be private*
    - *unencrypted private data on-chain*
    - *make sure it's the call made by a user*
    - *overview of administrative roles and trust model*
- Improper initialization of the smart contract
  - *no validation of passed arguments*
- Denial of service
  - *insufficient balance to withdraw or transfer tokens*
- Unused code
  - *code with no effects*
  - *unused variables*
  - *unused functions*
- Typographical issues
  - *misspelling*
- Requirement violation
- Arithmetic issues
- Cryptographic issues
- Weak randomness
- Shadowing variables





- Centralization related issues
- Secure oracles usage

**Additional:**

- Issues that caused by the token smart contracts and their operators themselves
  - *fee on transfer tokens*
  - *changing the balance of tokens (Token Supply manipulation)*

However, these issues can interfere with the proper operation of a DEX.

- Check the correct operation of the tokens stored by the smart contract that belong to users
- Possibility of obtaining more tokens than expected
- Incorrect commission (fee) calculation
- Ability to drain/steal funds from the pool
- Arithmetic

Carefully checking the implementation to make sure that functions/methods return correct/expected results or report an error/return if incorrect.

- *correctness*
- *rounding*
- *type-safe casts*
- *swap math*
- *liquidity math*
- *fee math*

**Cargo issues:**

- *vulnerable dependencies*
- *dependency versions*
- *profile settings*
  - *overflow-checks*
  - *optimization*



## 2.2 Simple method of risk evaluation and treatment

Auditors rate each finding in this document according to its business impact and each recommendation in terms of the effort required in correcting the problem. The following table describes the different levels of vulnerabilities.

Severity	Description
<b>Critical</b>	Issues that could result in an unlimited loss of funds or completely disrupt the contract's workflow. Malicious code (including malicious modification of libraries) is also considered a critical issue.
<b>High</b>	Issues that may lead to limited loss of funds, breach of user experience or other contracts under certain conditions. In addition, smart contract issues that allow a privileged account to steal or block other users' funds.
<b>Medium</b>	Issues that do not lead to the loss of funds directly, but violate the logic of the contract. May lead in contract failure or denial of service.
<b>Low</b>	Issues that are not optimal coding, such as gas optimization hints, unused variables, etc.
<b>Informational</b>	Issues that do not affect the operation of the contract. Information severity issues are usually related to code best practices, e.g. style guide.



### 3. Findings of the Audit

#### 3.1 Scope clarification

According to the assessment, the Customer's smart contract is well protected. The following is an overview of the project, containing the scope of the security review. It then provides an overall summary of the audit findings, followed by a detailed review of the vulnerabilities found, with each vulnerability given a severity rating (**critical/high/medium/low**) and a possible solution. Conclusions that are not directly related to security are marked as informational. Based on the findings, we recommend resolving all low findings, and further reviewing the information level findings. This will help ensure confidentiality, integrity, and availability.

During the audit process, each vulnerability is also assigned a status:

- **Open:** *the issue has not been presented to the project development team;*
- **Fixed:** *the issue has been fixed;*
- **Noted:** *the issue has been acknowledged by the project team, but no further action has been taken because a compelling case has been made.*

The scope of the project is a smart contract for a decentralized exchange written in the Rust programming language for the MultiversX blockchain. The project allows users to trade, provide liquidity, and earn rewards.

Here is an overview of the features available to different actors:

Function	User Role	Tested
metadata	User	True
get_deposits	User	True
get_deposit	User	True
get_verified_tokens	User	True
get_user_tokens	User	True
get_pool_info	User	True
get_liquidity_fee_level_distribution	User	True
get_owner	User	True
get_version	User	True
execute_actions	User	True
get_position_info	User	True
get_positions_info	User	True
deposit	User	True



Function	User Role	Tested
withdraw	User	True
init_wegld	Owner	True
extend_verified_tokens	Owner	True
remove_verified_tokens	Owner	True
set_protocol_fee_fraction	Owner	True
add_guard_accounts	Owner	True
remove_guard_accounts	Owner	True
suspend_payable_api	Owner, Guard	True
resume_payable_api	Owner, Guard	True
open_position	Liquidity Provider	True
withdraw_fee	Liquidity Provider	True
close_position	Liquidity Provider	True
swap_exact_in	Trader	True
swap_exact_out	Trader	True
swap_to_price	Trader	True

**DEPRECATED:**

- *register\_tokens*
- *unregister\_tokens*
- *token\_register\_of*
- *register\_account*
- *unregister\_account*

Please take note that the audit report only covers certain modules in the repository and not all of them. Specifically, the audit report only includes the contract located in the **DX25/dex/src** folder. To be more specific, the audit report focuses on the following files:

**./**

<b>File</b>	<b>keccak256</b>
lib.rs	bd49e017bafb5e2b03f7007dd72849d5e1f192b9ec1fb370f7114815180397c9

**./bin**

<b>File</b>	<b>keccak256</b>
-------------	------------------



describe-error-code .rs	67286f756fbfc49013012d4670f8c6fa0a21066bb51011fb89716eb196005048
----------------------------	--

**./chain**

File	keccak256
mod.rs	bc1ed46710cbf3d9f93639b3e3e54a846ff29cfd748775e1c92d666e5e078a1a
error.rs	44dfc87fadf9e9992930e65c42a40cbe066378426d44a58f318b428c4285b484
test_utils.rs	10b728fe6e9208911f5705697353bfe099b679bc0773579994079d51c95aa135

**./chain/dex\_types**

File	keccak256
mod.rs	a8b8fe6a13b9dc482b1eda75dd7d45a106b40eca930e7957d010e90c8dd1ce4e
collections.rs	bb0f26f0ba69f7f969b730257acfc42d3bdc1400e4e89616ad9704fe9dfcaaf2
float.rs	1011eec08d946f54ce24923fe2093e673b123394653cfbd1c754f543673ea534
ordered_map.rs	11f4211641bc751d6415f2040863c288b326a39c22065b3383b3078b97f0e3fe
token_id.rs	e733b691b3a9660810e7f0a72aa114a5dd151a51e96264d6016688d153a2fefa

**./chain/wasm**

File	keccak256
mod.rs	a6a9f8de0659e8e421381873cf082225f2ae81bdf656f19537ac7cc342ca2b9a
api_types.rs	2ee74333668edb18e809cf0ccc8120ab9cd427776de36d637d03a8b8ab0d9320
contract.rs	d0cc6b6ff0968ebbae8b8a8a09eaa8149b2481d558c5e110169a9c5865d90e5e
dex_state.rs	c7acc195b80a6e6971df306a96c9cc395c7cc84fa3f5d9d55726d12dc42124d9
dex_wrapper.rs	b4233118bd4db63bf9fb5277311ee2654116d8fb30a45a5035639e2e84d04581
events.rs	bac3d5fc64e37be5f84e5f7126b0eb7425d7ff634721dd630cac295f17b9836b
item_factory.rs	378dad710ca3c99c32ca0846d717013cd5932cc6990c0700059a2606e297a7d8
send_batch.rs	846ff07a363f5654d672eb218d98acc4282e646558fb9b2d601e4f7913d58f81



**./dex**

File	keccak256
mod.rs	d7f0c3214c55bccca69752ed9a1dc69eed1b6e70717c7dcc5d6095028d4dd3c96
array_custom_try_map.rs	699a9e35d3c6ec6a9404edeeb47100d701ca7d5a4581c12b075995c90cb1ec04
collection_helpers.rs	15176019ab03fcf6d0fdd452be79dfafd36b7cec62e90e0dac657619b82a89c2
dex_tests_swap.rs	e37d1a6fe302b4432a74670fbbca4c0f41c57e9f6f2e3aa86d38c334ef08406f
errors.rs	3b2ec75ff6fec560f52b265e1ded12e922f24626a64dca7b2f2848ea61f7123a
map_with_context.rs	5c2d2f7795375b588588225b15a03bb174c8a43e733ccace92fa84f1470e891b
primitives.rs	aceb8d4cf1f7b0e2f8e6ee3147dec6a739d6a8ac373cf21840c73861859f516b
rational_fraction.rs	e85da03f9fa4585e588a4b92cfd2674021357869b2acbc2fc3f06696cb961ae7
state_types.rs	63bee2fe7cdd11d389041d2c9015746cee278a51f9f7e531e6433ee027f1839e
tick.rs	d17851cc41add9b5c78860e9adfe2d64e82389fb64fd707661f4ec3dd3e822c0
tick_state_ex.rs	ce6e9de00524e73f8431225684cf80abc09ed063f7767a8f5b8984a258a96cd0
traits.rs	ae2d629721c04ebf85b7ee0b4133d310f64ccc994a6313a9f9b86bb35058c020
util_types.rs	275480998643ecc5fcbd7dcedcd43f46e503483397e5de8d4b9d3a32d8f5ec59
utils.rs	90e9332057588c2ac9b8a385ef3b130db68a7d58f16535b9039563bd4d00ae0c
withdraw_trackers.rs	a140a2a35b30fcdab85322d42af1b9582d10f3b8ead4a5c4e6751161a0ab6df0

**./dex/dex\_impl**

File	keccak256
mod.rs	3410e6efeb1328f02c6a7e4a9fd27e57185d7cef616c0c9e41fa2fe961bbde4d

**./dex/v0**

File	keccak256
mod.rs	da6bc517418cf731412933ae1f50e3893a0cf5c43bd1fd8b751906ad89ac0e7b



account_state_ex.rs	2b07ff9b3fd77e922c120a6c2791819121efca35052746fca4ed41e37fb26297
pool_state_ex.rs	7bf22a702fb55a03a14650765f17ea5e9c6ad3f35e2743271d45bd0d7147c64c
pool_tests.rs	4239c6ba009e4d6c725191fa02e786e56ce3edbb939622e7d95d1255a70bc781
position_state_ex.rs	3c9b1a8a1c5110498b1f726ca7641a582353c2723c99d3482b2bb8909cf19553
util_types.rs	7a935bb688d664782f21186b58ddc173b2b68d6e206e6c2c2011e4084a45469d

**./fp**

File	keccak256
mod.rs	6babe9a6c66a6af93691d63ca971947f3817e7316d69e26464cb7b98d768617d
display.rs	1f03f34f2526620613921d4dc3175e04ea931765de55dbadec37a395f218d7c3
error.rs	eac11376e0b8fecfb7592a222df1336640a316d6ae40b7b9f6a23eaf5af12ab
i128x128.rs	14f9e79e86aee184dc9fae2e3c45548ca7145f548ccc7021c2fc44a4d81a4174
i192x64.rs	3acabfd2e809084c8a41a23b3e802e09afb76cd195dd662767843ff8c0eac562
i192x192.rs	d1aa06e0c49a88d17abec944b76bdf3fea1a3f80d1234f058a2d385956f5dc08
i256x128.rs	1bec02f19ce8cb06ccae30e10996b1db9098b3157eb433e2e4e0f3bbfdb24b33
i256x256.rs	356286fd0cd761761d4cb6784bf5a442152943a3430da5991fe70c0646b2cc97
i256x320.rs	e924463a8984f64976423b16d034c272cad48c53405b19cf3ef286580899d622
i320x64.rs	0a77ea8e1c1929abf96f4bbc927678c042f438d69ac1e431ee9a466d810792ed
signed.rs	12330cd3b87c6db979e87317bacc1e4cef24d0d6d2632416a259af70a9cc7468
traits.rs	d02bb85571123584c3935822e07d79eafb99c570abdd1e7b9e063264fce2a665
try_float_to_ufp.rs	a4a5e8b5ebd467e9b1cf9efc24ad5b7ab1a551a6b915b33f6a01619ace87da3f
types.rs	6c415ee6cf72237e9130b945085158fed0ad216d50412a76b6d5d5f327d110b1
u128x128.rs	c030211eeb72832db020e8effc2a7483a1eeae3fef9760c5638b1802f58be5e2
u192x64.rs	b6011d582e5f9a2f4655c0d1ef026ecf6a8d86bda1be3800b9b256092a90a1d2
u192x192.rs	57c89dd2d3a823d6d48533c3b8ade07df432915486e0b3d5d8284e745bf6cc46
u256x128.rs	6e2266388e9090cc7b6648147123d452e02ffba61b7810ef9585b723fba6944
u256x256.rs	ffe78977df180aa24c8807fb60be20549307547ee06b784b750fd6ea7f0505d



u256x320.rs	e34732618cce3ea439c549975bb35086baf69790f1350240464a28afd6fdfe9
u320x64.rs	ec91ae97fcf250581536c501565d287ec7102b187802b94b40af9c9899f68658
u320x128.rs	2a5f8d5a3aa289a5b6d399086ea05764e0080a5229dc51d4260312ad2faa1a3d
u320x192.rs	319e740ccf39c26e97bf316a0aa94fe5a570335bb6509e523f503f9118b5dbb5
u320x320.rs	c623d3d56c8084263d479ff584c7cf7db787f1fbc2b1279ba728879b46fed2d7
ufp_to_float.rs	b959daa6ee3ea30898593a795cb6bbf47f4cf5f670a36ab3f16adf44bde280aa
unsigned_symmetric.rs	a76223240f3d74921cf9364fa296ef0783912ec68644e34ad7fa50a120080844

### Used dependencies

- bitvec = "1.0.1"
- multiversx-sc = { version = "0.41.1", features = ["alloc"] }
- multiversx-sc-codec = "\*\*"
- itertools = "0.10.5"
- num-traits = "0.2.15"
- paste = "1.0.9"
- thiserror = "1.0.31"
- typed-index-collections = "3.1.0"
- uint = { version = "0.9.3", default-features = false }
- strum = "0.24.1"
- static\_assertions = "1.1.0"
- strum\_macros = "0.24.3"
- rug = "1.18.0"
- multiversx-sc-wasm-adapter = "0.41.1"





## 4. Audit details

### 4.1 Results from Manual analysis

#### 4.1.1 F-1 Potential lack of check

**Commit:** *a73135c98*

**Branch:** *main*

**Description:**

The *init\_wegld* method does not contain the *ensure\_payable\_api\_resumed* check, which may cause unwanted behavior.

**Risk:** **Low**

**Location:**

- *./src/chain/wasm/contract.rs* :**126-156**

**Code section:**

```
#[multiversx_sc::contract]
pub trait DX25Contract {
    ...
    #[endpoint]
    fn init_wegld(&self, network_wegld_wrappers: ApiVec<ManagedAddress>) {
        let mut dex = self.as_dex_mut();
        let caller = dex.get_caller_id();
        let contract = dex.contract_mut().latest();

        if caller != contract.owner_id
        && caller != self.blockchain().get_owner_address().to_byte_array().into()
        {
            self.fail(error_here!(dex::ErrorKind::PermissionDenied));
        }

        let wegld = &mut contract.extra.wegld;

        if wegld.is_some() {
            self.fail(error_here!(chain::Error::WegldAlreadyInitialized));
        }

        let wegld_address = self.get_wegld_address(network_wegld_wrappers.0);

        let wegld_token_id: TokenIdentifier = self
            .wegld_swap_proxy(wegld_address.clone())
            .wrapped_egld_token_id()
            .execute_on_dest_context();

        *wegld = Some((
            wegld_address.to_byte_array().into(),
            TokenId::from_bytes(wegld_token_id.to_boxed_bytes()),
        ));

        self.extend_verified_tokens(vec![into_token_id(&wegld_token_id)].into());
    }
    ...
}
```

**Recommendation on Improvement:**

Add an ***ensure\_payable\_api\_resumed*** check to the ***init\_wegld*** method, if needed.

**Status:** *Noted*

**Comment** (developers): The ***init\_wegld*** method can only be called once anyway and is designed to be called immediately after the contract is deployed. The scenario when ***init\_wegld*** will be called with suspended payable API is practically impossible. The ***init\_wegld*** method doesn't affect any token balances or pools' states, so it is questionable if it should be considered a part of payable API.

#### 4.1.2 F-2 Unnecessary double check

**Commit:** *a73135c98*

**Branch:** *main*

**Description:**

The ***init\_wegld*** method includes a validation that restricts the ability to invoke the method solely to the owner of the smart contract. However, subsequent calls to the ***extend\_verified\_tokens*** and then ***add\_verified\_tokens*** methods also include a verification step ensuring that these methods can only be called by the owner of the smart contract ***ensure\_caller\_is\_owner***.

**Risk:** **Low**

**Location:**

- *./src/chain/wasm/contract.rs :126-156*

**Code section:**

```
#[multiversx_sc::contract]
pub trait DX25Contract {
    ...
#[endpoint]
    fn init_wegld(&self, network_wegld_wrappers: ApiVec<ManagedAddress>) {
        let mut dex = self.as_dex_mut();
        let caller = dex.get_caller_id();
        let contract = dex.contract_mut().latest();

        if caller != contract.owner_id
        && caller != self.blockchain().get_owner_address().to_byte_array().into()
        {
            self.fail(error_here!(dex::ErrorKind::PermissionDenied));
        }

        ...
        self.extend_verified_tokens(vec![into_token_id(&wegld_token_id)].into());
    }
    ...
}
```

**Recommendation on Improvement:**

Consider removing the step of adding the address to the list of verified tokens during the invocation of the ***init\_wegld*** method. Instead, you can add it separately by making a distinct call to the



**extend\_verified\_tokens** method. Alternatively, you might consider implementing an additional lower-level method specifically designed for adding verified tokens.

**Status:** *Noted*

**Comment** (developers): While a double-check may be unnecessary, it is also undesirable and risky to have a method that will perform these actions without those checks. Also as the MultiversX blockchain constraints the maximum size of the WASM build that can be deployed, reusing `extend_verified_tokens` and `add_verified_tokens` methods allows for optimizing WASM build size.

#### 4.1.3 F-3 Unnecessary argument passing

**Commit:** `a73135c98`

**Branch:** `main`

##### **Description:**

When initializing a smart contract, the **owner\_id**, **protocol\_fee\_fraction**, **fee\_rates** arguments are passed. These arguments will then be passed to the **new\_contract** method. However, the **new\_contract** method contains a strict check that completely eliminates the variance of the **fee\_rates** argument.

**Risk:** **Low**

##### **Location:**

- `./src/dex/traits.rs` :299-327

##### **Code section:**

```
pub trait StateMut<T: Types + ?Sized>: State<T> {
    ...
    fn new_contract(
        &mut self,
        owner_id: AccountId,
        protocol_fee_fraction: BasisPoints,
        fee_rates: latest::RawFeeLevelsArray<BasisPoints>,
    ) -> Result<Contract<T>> {
        ensure_here!(
            fee_rates == [1, 2, 4, 8, 16, 32, 64, 128],
            ErrorKind::InvalidParams
        );
        ...
    }
    ...
}
```

##### **Recommendation on Improvement:**

In this situation, there is no need to pass the **fee\_rates** argument, it can be replaced by a constant expression.

**Status:** *Noted*



**Comment** (developers): The current implementation of pools is designed, optimized and tested to work only with these specific **fee\_rates** values, however, we have these as a parameter for forward compatibility in case we make a more generalized implementation in the future.

#### 4.1.4 F-4 Missing cargo overflow checks

**Commit:** `a73135c98`

**Branch:** `main`

**Description:**

Cargo.toml does not include the **overflow-checks=true** option. When optimized release builds are compiled, overflow checks are automatically disabled. Consequently, if an overflow occurs in release builds, it will be suppressed, resulting in unforeseen application behavior.

**Risk:** **Informational**

**Location:**

- `./DX25/dex/Cargo.toml`

**11.4.1 Recommendation on Improvement:**

Adding **overflow-checks=true** under the release profile in Cargo.toml is strongly advised.

**Status:** *Fixed*

**Comment** (developers): Makes sense to add **overflow-checks=true**, will enable this with the next version.

## 4.2 Results from Semi-Automatic Scans

### 4.2.1 RustSec: cargo audit

RustSec is a project focused on improving the security of Rust software. One of its tools is cargo-audit, a command-line tool that scans Rust dependencies for vulnerabilities reported to the National Vulnerability Database (NVD) and the RustSec Advisory Database.

Crate	Version	Warning	Title	Date	ID	URL
wee_alloc	0.4.5	unmaintained	wee_alloc is Unmaintained	2022-05-11	RUSTSEC-2022-0054	<a href="#">link</a>
atty	0.2.14	unsound	Potential unaligned read	2021-07-04	RUSTSEC-2021-0145	<a href="#">link</a>
hermit-abi	0.3.1	yanked	N/A	N/A	N/A	N/A

The static code analyzer and dependency analysis scans were completed successfully, and the identified errors, bugs, and vulnerabilities were carefully reviewed. In the tested version, we did not discover any significant security concerns in the codebase.



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## 5. Recommendations

### 5.1 Recommendation for vulnerability mitigation

The auditors conducted a thorough security audit on the Client's smart contract to determine if there were any vulnerabilities that could be exploited by attackers. The main objective of the audit was to ensure the smart contract's protection against external threats.

Based on the audit findings, that within the analyzed conditions, the smart contract cannot be misused. However, the audit did identify three low-level issues and one informational issue that need to be addressed in order to enhance the overall security of the smart contract.

To mitigate these issues, we strongly recommend that the Customer takes immediate action to resolve the identified issues, particularly focusing on the absence of contract suspension checks, failure at set protocol fee fraction, and missing cargo overflow checks, which were classified as low-level issues. Additionally, it is important to implement comprehensive documentation and conduct thorough unit and functional tests for the smart contract. These measures will not only prevent future issues but also ensure the overall security of the smart contract.

After becoming acquainted with the identified and analyzed concerns, the customer has exhibited a profound comprehension of these issues and has taken the requisite measures to rectify them. The customer's proactive stance in recognizing potential problems and executing corrective measures has further elevated the project's already exceptional security standards.

### 5.2 Recommendation for continuous improvement

Auditors recommend mitigating all the vulnerabilities described in this report. The nature of information threats involves the uncertainty of compromise paths that may be used by an attacker. In addition, the set of known technical vulnerabilities in libraries, components, and hosting environments is constantly increasing. Therefore, the results of this audit cannot guarantee uncovering all possible security problems or misuses, and only show the weakest points in the security of the target object.

Besides smart contract audits, to enhance Customer's security effectively and to reduce Customer's business risks, other appropriate security management processes and security solutions should be designed and implemented. These security measures include but are not limited to: secure development lifecycle, regular security audits by an independent party, security event monitoring, incident response.

Using internationally recognized standards and best practices such as ISO 27000, PCI DSS, NIST is recommended. We can help in the implementation of these processes and solutions.



## 6. Appendix. Test functions

Based on a comprehensive examination of the provided test table, it can be concluded that all tests have successfully passed without encountering any problems.

It is crucial to treat these findings with due seriousness and conduct further investigations. While low-level issues may not pose an immediate threat, it is important to address them to mitigate potential future complications. Informational issues, although not necessarily related to security, can offer valuable insights into areas of the system that could benefit from improvement.

On the whole, the absence of critical and high-level issues is a highly positive outcome. It is essential to maintain vigilant monitoring of the system to promptly identify and resolve any potential issues, thereby ensuring its ongoing security and stability.

Test Description	Test Result
chain::dex_types::float::tests::test_f64_pow_2	ok
chain::dex_types::float::tests::test_f64_to_aligned_words	ok
chain::dex_types::ordered_map::tests::test_debug	ok
chain::dex_types::ordered_map::tests::test_empty	ok
chain::dex_types::ordered_map::tests::test_ceil_key	ok
chain::dex_types::ordered_map::tests::test_balance_regression_1	ok
chain::dex_types::ordered_map::tests::test_floor_key	ok
chain::dex_types::ordered_map::tests::test_insert_2_remove_2_regression	ok
chain::dex_types::ordered_map::tests::test_insert_3_rotate_l_l	ok
chain::dex_types::ordered_map::tests::test_higher	ok
chain::dex_types::ordered_map::tests::test_insert_3_rotate_r_r	ok
chain::dex_types::ordered_map::tests::test_balance_regression_2	ok
chain::dex_types::ordered_map::tests::test_insert_8_remove_4_regression	ok
chain::dex_types::ordered_map::tests::insert_n_random	ok
chain::dex_types::ordered_map::tests::test_insert_one	ok
chain::dex_types::ordered_map::tests::test_iter	ok
chain::dex_types::ordered_map::tests::test_iter_empty	ok
chain::dex_types::ordered_map::tests::test_insert_2n_remove_n_random	ok
chain::dex_types::ordered_map::tests::test_iter_from_empty	ok
chain::dex_types::ordered_map::tests::test_iter_rev	ok
chain::dex_types::ordered_map::tests::test_iter_rev_empty	ok
chain::dex_types::ordered_map::tests::test_insert_lookup_n_asc	ok
chain::dex_types::ordered_map::tests::test_insert_lookup_n_desc	ok
chain::dex_types::ordered_map::tests::test_iter_from	ok
chain::dex_types::ordered_map::tests::test_lower	ok
chain::dex_types::ordered_map::tests::test_iter_rev_from_empty	ok
chain::dex_types::ordered_map::tests::test_iter_rev_from	ok
chain::dex_types::ordered_map::tests::test_range	ok
chain::dex_types::ordered_map::tests::test_range_panics_non_overlap_excl_excl	ok



Test Description	Test Result
chain::dex_types::ordered_map::tests::test_range_panics_non_overlap_excl_incl	ok
chain::dex_types::ordered_map::tests::test_range_panics_non_overlap_incl_exlc	ok
chain::dex_types::ordered_map::tests::test_range_panics_non_overlap_incl_incl	ok
chain::dex_types::ordered_map::tests::test_remove_1	ok
chain::dex_types::ordered_map::tests::test_range_panics_same_excluded	ok
chain::dex_types::ordered_map::tests::test_insert_n_duplicates	ok
chain::dex_types::ordered_map::tests::test_max	ok
chain::dex_types::ordered_map::tests::test_min	ok
chain::dex_types::ordered_map::tests::test_remove_3	ok
chain::dex_types::ordered_map::tests::test_remove_3_desc	ok
chain::dex_types::ordered_map::tests::test_remove_3_asc	ok
chain::dex_types::ordered_map::tests::test_remove_7_regression_1	ok
chain::dex_types::ordered_map::tests::test_remove_empty	ok
chain::dex_types::ordered_map::tests::test_remove_7_regression	ok
chain::dex_types::ordered_map::tests::test_remove_7_regression_2	ok
chain::dex_types::ordered_map::tests::test_to_vec	ok
chain::dex_types::ordered_map::tests::test_to_vec_empty	ok
chain::dex_types::token_id::tests::test_token_id_tree	ok
dex::array_custom_try_map::test::custom_try_map::empty_array	ok
dex::array_custom_try_map::test::custom_try_map::fail_fast	ok
dex::array_custom_try_map::test::custom_try_map::failing_case	ok
dex::array_custom_try_map::test::custom_try_map::normal_case	ok
dex::dex_impl::tests::base::add_remove_guards	ok
dex::dex_impl::tests::base::create_instance	ok
dex::dex_impl::tests::base::deposit_other_account_successful	ok
chain::dex_types::ordered_map::tests::test_remove_9_regression	ok
dex::dex_impl::tests::base::deposit_successful	ok
chain::dex_types::ordered_map::tests::test_remove_root_3	ok
dex::dex_impl::tests::base::open_first_position_signle_sided_succeeds	ok
dex::dex_impl::tests::base::get_positions_infos	ok
dex::dex_impl::tests::base::open_non_first_position_signle_sided_fails	ok
dex::dex_impl::tests::base::success_withdraw_zero_amount_zero_balance	ok
dex::dex_impl::tests::base::open_close_position	ok
dex::dex_impl::tests::base::open_two_positions	ok
dex::dex_impl::tests::base::swap_exact_in_failure	ok
dex::dex_impl::tests::base::swap_exact_in_success	ok
dex::dex_impl::tests::base::swap_exact_out_success	ok
chain::dex_types::ordered_map::tests::test_remove_20_regression_1	ok



Test Description	Test Result
dex::dex_impl::tests::base::swap_exact_out_failure	ok
dex::dex_impl::tests::base::test_reserves_consistency	ignored
dex::dex_impl::tests::base::test_liquidity_fee_level_distribution	ok
dex::dex_impl::tests::base::test_open_position	ok
dex::dex_impl::tests::base::test_withdraw_fee::case_2	ok
dex::dex_impl::tests::base::test_withdraw_fee::case_1	ok
dex::dex_impl::tests::base::test_withdraw_fee::case_3	ok
chain::dex_types::ordered_map::tests::test_remove_n	ok
dex::dex_impl::tests::base::version	ignored,
dex::dex_impl::tests::base::withdraw_failure_not_enough_tokens	ok
dex::dex_impl::tests::base::withdraw_failure_token_not_registered	ok
dex::dex_impl::tests::base::withdraw_failure_account_not_registered	ok
dex::dex_impl::tests::base::test_withdraw_fee::case_4	ok
dex::dex_impl::tests::base::withdraw_success_whole_balance	ok
dex::dex_impl::tests::deposit_execute_actions::fail_caller_not_initiator	ok
dex::dex_impl::tests::deposit_execute_actions::fail_mutable_api_stopped	ok
dex::dex_impl::tests::deposit_execute_actions::success_just_deposit	ok
dex::dex_impl::tests::execute_actions::empty	ok
dex::dex_impl::tests::execute_actions::fail_mutable_api_stopped	ok
dex::dex_impl::tests::base::test_withdraw_fee::case_5	ok
dex::dex_impl::tests::execute_actions::success_two_swap_ins_chain::amount_1_200	ok
dex::dex_impl::tests::execute_actions::success_two_swap_ins_chain::amount_2_1_000	ok
dex::dex_impl::tests::execute_actions::success_two_swap_ins_chain::amount_3_5_000	ok
dex::dex_impl::tests::base::withdraw_success_arbitrary	ok
dex::dex_impl::tests::execute_actions::success_two_swap_outs_chain::amount_2_1_000	ok
dex::dex_impl::tests::execute_actions::success_two_swap_outs_chain::amount_3_5_000	ok
dex::dex_impl::tests::execute_actions::success_two_swap_outs_chain::amount_1_200	ok
dex::dex_impl::tests::execute_actions_impl::fail_deposit_action_no_data	ok
dex::dex_impl::tests::execute_actions_impl::fail_close_position	ok
dex::dex_impl::tests::execute_actions_impl::fail_deposit_data_no_action	ok
dex::dex_impl::tests::execute_actions_impl::fail_open_position	ok
dex::dex_impl::tests::execute_actions_impl::fail_deposit_twice	ok
dex::dex_impl::tests::execute_actions_impl::fail_no_start_amount	ok
dex::dex_impl::tests::execute_actions_impl::fail_withdraw_fee	ok
dex::dex_impl::tests::execute_actions_impl::fail_withdraw	ok
dex::dex_impl::tests::execute_actions_impl::fail_register_account_callback_fails	ok
dex::dex_impl::tests::execute_actions_impl::fail_register_account_not_first	ok
dex::dex_impl::tests::execute_actions_impl::success_base_open_position	ok





Test Description	Test Result
dex::dex_impl::tests::execute_actions_impl::success_base_withdraw_fee	ok
dex::dex_impl::tests::execute_actions_impl::success_base_scenario_out	ok
dex::dex_impl::tests::execute_actions_impl::success_base_scenario_in	ok
dex::dex_impl::tests::execute_actions_impl::success_multiple_deposit	ok
dex::dex_impl::tests::execute_actions_impl::success_just_deposit	ok
dex::dex_impl::tests::execute_actions_impl::success_base_close_position	ok
dex::dex_impl::tests::execute_actions_impl::success_single_swap_in::amount_2_1_000	ok
dex::dex_impl::tests::execute_actions_impl::success_no_deposit_empty_batch	ok
dex::dex_impl::tests::execute_actions_impl::success_single_swap_in::amount_1_200	ok
dex::dex_impl::tests::execute_actions_impl::success_single_swap_in::amount_3_5_000	ok
dex::dex_impl::tests::execute_actions_impl::success_single_swap_out::amount_1_200	ok
dex::dex_impl::tests::execute_actions_impl::success_single_swap_out::amount_2_1_000	ok
dex::dex_impl::tests::execute_actions_impl::success_single_swap_out::amount_3_5_000	ok
dex::dex_impl::tests::execute_actions_impl::success_register_account	ok
dex::dex_impl::tests::execute_actions_impl::success_two_swap_ins_chain::amount_1_200	ok
dex::dex_impl::tests::execute_actions_impl::success_two_swap_ins_chain::amount_2_1_000	ok
dex::dex_impl::tests::execute_actions_impl::success_two_swap_ins_chain::amount_3_5_000	ok
dex::dex_impl::tests::execute_actions_impl::success_two_swap_outs_chain::amount_1_200	ok
dex::dex_impl::tests::execute_actions_impl::success_two_swap_outs_chain::amount_2_1_000	ok
dex::dex_impl::tests::execute_swap_action::fail_duplicate_tokens::exact_1_SwapKind__ExactIn	ok
dex::dex_impl::tests::execute_actions_impl::success_two_swap_outs_chain::amount_3_5_000	ok
dex::dex_impl::tests::execute_actions_impl::success_zero_withdraw	ok
dex::dex_impl::tests::execute_swap_action::fail_duplicate_tokens::exact_2_SwapKind__ExactOut	ok
dex::dex_impl::tests::execute_swap_action::fail_prev_swap_result::exact_1_SwapKind__ExactIn	ok
dex::dex_impl::tests::execute_swap_action::fail_pool_not_registered	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_1_false::exact_1_SwapKind__ExactIn::amount_1_200	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_1_false::exact_1_SwapKind__ExactIn::amount_3_5_000	ok
dex::dex_impl::tests::execute_swap_action::fail_prev_swap_result::exact_2_SwapKind__ExactOut	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_1_false::exact_2_SwapKind__ExactOut::amount_1_200	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_1_false::exact_2_SwapKind__ExactOut::amount_2_1_000	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_1_false::exact_1_SwapKind__ExactIn::amount_2_1_000	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_2_true::exact_1_SwapKind__ExactIn::amount_1_200	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_1_false::exact_2_SwapKind__ExactOut::amount_3_5_000	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_2_true::exact_1_SwapKind__ExactIn::amount_2_1_000	ok



Test Description	Test Result
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_2_true::exact_1_SwapKind__ExactIn::amount_3_5_000	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_2_true::exact_2_SwapKind__ExactOut::amount_2_1_000	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_2_true::exact_2_SwapKind__ExactOut::amount_3_5_000	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_1__None::exact_1_SwapKind__ExactIn::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_slippage::use_prev_result_2_true::exact_2_SwapKind__ExactOut::amount_1_200	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_1__None::exact_1_SwapKind__ExactIn::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_1__None::exact_2_SwapKind__ExactOut::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_1__None::exact_2_SwapKind__ExactOut::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_2__Some_new_token_id__SwapKind__ExactIn_new_amount_10__::exact_1_SwapKind__ExactIn::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_2__Some_new_token_id__SwapKind__ExactIn_new_amount_10__::exact_2_SwapKind__ExactOut::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_2__Some_new_token_id__SwapKind__ExactIn_new_amount_10__::exact_2_SwapKind__ExactOut::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_2__Some_new_token_id__SwapKind__ExactIn_new_amount_10__::exact_1_SwapKind__ExactIn::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_3__Some_new_token_id__SwapKind__ExactOut_new_amount_10__::exact_1_SwapKind__ExactIn::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_3__Some_new_token_id__SwapKind__ExactOut_new_amount_10__::exact_2_SwapKind__ExactOut::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_3__Some_new_token_id__SwapKind__ExactOut_new_amount_10__::exact_2_SwapKind__ExactOut::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_in_not_registered::prev_swap_result_3__Some_new_token_id__SwapKind__ExactOut_new_amount_10__::exact_1_SwapKind__ExactIn::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_1__None::exact_1_SwapKind__ExactIn::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_1__None::exact_2_SwapKind__ExactOut::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_1__None::exact_1_SwapKind__ExactIn::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_1__None::exact_2_SwapKind__ExactOut::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_2__Some_new_token_id__SwapKind__ExactIn_new_amount_10__::exact_1_SwapKind__ExactIn::am	ok



Test Description	Test Result
ount_1_None	
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_2_Some__new_token_id__SwapKind__ExactIn_new_amount_10____::exact_1_SwapKind__ExactIn::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_3_Some__new_token_id__SwapKind__ExactOut_new_amount_10____::exact_1_SwapKind__ExactIn::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_3_Some__new_token_id__SwapKind__ExactOut_new_amount_10____::exact_1_SwapKind__ExactIn::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_3_Some__new_token_id__SwapKind__ExactOut_new_amount_10____::exact_2_SwapKind__ExactOut::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_2_Some__new_token_id__SwapKind__ExactIn_new_amount_10____::exact_2_SwapKind__ExactOut::amount_1_None	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_2_Some__new_token_id__SwapKind__ExactIn_new_amount_10____::exact_2_SwapKind__ExactOut::amount_2_Some_1_000_	ok
dex::dex_impl::tests::base::test_log_positions_ticks	ok
dex::dex_impl::tests::execute_swap_action::fail_token_out_not_registered::prev_swap_result_3_Some__new_token_id__SwapKind__ExactOut_new_amount_10____::exact_2_SwapKind__ExactOut::amount_2_Some_1_000_	ok
dex::dex_impl::tests::execute_swap_action::success::exact_1_SwapKind__ExactIn::amount_2_1_000	ok
dex::dex_impl::tests::execute_swap_action::success::exact_1_SwapKind__ExactIn::amount_1_200	ok
dex::dex_impl::tests::execute_swap_action::success::exact_2_SwapKind__ExactOut::amount_1_200	ok
dex::dex_impl::tests::execute_swap_action::success::exact_1_SwapKind__ExactIn::amount_3_5_000	ok
dex::dex_impl::tests::execute_swap_action::success_to_price::direction_1_true::amount_2_10_000	ok
dex::dex_impl::tests::execute_swap_action::success::exact_2_SwapKind__ExactOut::amount_3_5_000	ok
dex::dex_impl::tests::execute_swap_action::success::exact_2_SwapKind__ExactOut::amount_2_1_000	ok
dex::dex_impl::tests::execute_swap_action::success_to_price::direction_1_true::amount_1_200	ok
dex::dex_impl::tests::execute_swap_action::success_to_price::direction_1_true::amount_3_500_000	ok
dex::dex_impl::tests::execute_swap_action::success_to_price::direction_2_false::amount_1_200	ok
dex::dex_tests_swap::swap_exact_out_failure	ok
dex::dex_impl::tests::execute_swap_action::success_to_price::direction_2_false::amount_2_10_000	ok
dex::dex_impl::tests::execute_swap_action::success_to_price::direction_2_false::amount_3_500_000	ok
dex::dex_tests_swap::swap_exact_in_failure	ok
dex::dex_tests_swap::test_swap_simple	ok
dex::dex_tests_swap::test_swap_almost_to_position_end_success	ok
dex::dex_tests_swap::test_swap_beyond_position_end_fails	ok
dex::dex_tests_swap::test_swap_to_price_too_low	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_01____15000__12000_::swap_side_1_Side__Left	ok



Test Description	Test Result
dex::dex_tests_swap::test_swap_to_price_all	ok
dex::dex_tests_swap::test_swap_to_price_limit	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_02___15000__10000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_02___15000__10000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_03___15000__8000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_01___15000__12000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_03___15000__8000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_04___15000__0__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_05___15000__2000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_04___15000__0__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_05___15000__2000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_06___15000__10000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_06___15000__10000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_07___15000__14000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_08___5000__3000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_08___5000__3000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_09___5000__0__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_07___15000__14000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_10___5000__3000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_11___5000__10000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_09___5000__0__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_11___5000__10000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_12___5000__12000__::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_10___5000__3000__::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_13___0__5000__::swap_side_1_Side__Left	ok



Test Description	Test Result
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_12__5000_12000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_13__0_5000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_14__0_10000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_15__0_12000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_14__0_10000::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_16__2000_4000::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_15__0_12000::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_16__2000_4000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_17__2000_10000::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_18__2000_16000::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_17__2000_10000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_overlapping_positions	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_19__10000_16000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_18__2000_16000::swap_side_2_Side__Right	ok
dex::dex_tests_swap::test_swap_two_cl_positions::pos1_range_19__10000_16000::swap_side_1_Side__Left	ok
dex::dex_tests_swap::test_swap_with_tick_crossing	ok
dex::tick::tests::create_tick_with_limited_range_of_value::case_1_success_zero	ok
dex::errors::tests::error_desc_roundtrip	ok
dex::tick::tests::create_tick_with_limited_range_of_value::case_2_success_min	ok
dex::tick::tests::create_tick_with_limited_range_of_value::case_3_success_max	ok
dex::tick::tests::eff_sqrtprices_on_different_levels_match::case_1	ok
dex::tick::tests::create_tick_with_limited_range_of_value::case_4_failed_less_than_min	ok
dex::tick::tests::create_tick_with_limited_range_of_value::case_5_failed_more_than_max	ok
dex::dex_tests_swap::test_swap_within_inactive_region_fail_wrong_direction	ok
dex::tick::tests::eff_sqrtprices_on_different_levels_match::case_2	ok
dex::tick::tests::eff_sqrtprices_on_different_levels_match::case_3	ok
dex::tick::tests::eff_sqrtprices_on_different_levels_match::case_4	ok
dex::tick::tests::eff_sqrtprices_on_different_levels_match::case_5	ok
dex::tick::tests::eff_sqrtprices_on_different_levels_match::case_7	ok
dex::tick::tests::max_bit_index_for_price_tick	ok



Test Description	Test Result
dex::tick::tests::scale_back_and_forth::case_1	ok
dex::tick::tests::scale_back_and_forth::case_3	ok
dex::tick::tests::scale_back_and_forth::case_4	ok
dex::tick::tests::scale_back_and_forth::case_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_eff_ticks_succeed::eff_tick_index_1_MIN_EFF_TICK	ok
dex::tick::tests::scale_back_and_forth::case_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_eff_ticks_succeed::eff_tick_index_2_MIN_EFF_TICK_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_eff_ticks_succeed::eff_tick_index_4_MAX_EFF_TICK	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_1_0	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_2_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_3_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_4_3	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_eff_ticks_succeed::eff_tick_index_3_MAX_EFF_TICK_1	ok
dex::tick::tests::eff_sqrtprices_on_different_levels_match::case_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_1_0	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_2_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_3_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_4_3	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_2_Side__Right::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_1_MIN_TICK::side_1_Side__Left::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side__Left::fee_level_2_1	ok



Test Description	Test Result
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_3_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_1_0	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_2_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_3_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_4_3	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_4_3	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_1_0	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_1_0	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_2_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_3_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_4_3	ok
dex::dex_tests_swap::test_swap_within_inactive_region_success	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_2_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_6_5	ok



Test Description	Test Result
de_Right::fee_level_3_2	
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_4_3	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_1_Side_Left::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_1_0	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_2_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_3_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_4_3	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_1_Side_Left::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_1_0	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_2_1	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_3_2	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_4_3	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_5_4	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_7_6	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_4_MAX_TICK::side_2_Side_Right::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_3_2	ok





Test Description	Test Result
e_Left::fee_level_3_2	
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_1_Side_Left::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_1_MIN_TICK::side_2_Side_Right::fee_level_8_7	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_6_5	ok
dex::tick::tests::test_eff_sqrtprice_for_extreme_ticks_succeed::tick_index_3_MAX_TICK_1::side_2_Side_Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side_Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_1_Side_Left::fee_level_8_7	ok



Test Description	Test Result
Side__Left::fee_level_3_2	
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side__Right::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side__Right::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side__Right::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side__Right::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side__Right::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side__Right::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_2_MIN_TICK_1::side_2_Side__Right::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_1_Side__Left::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_1_0	ok



Test Description	Test Result
ee_level_3_2	
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_3_MIN_TICK_7::side_2_Side__Right::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_1_Side__Left::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_4_0::side_2_Side__Right::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_1_0	ok



Test Description	Test Result
Side__Right::fee_level_2_1	
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_1_Side__Left::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_5_MAX_TICK_7::side_2_Side__Right::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_1_Side__Left::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_6_MAX_TICK_1::side_2_Side__Right::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Si	ok



Test Description	Test Result
de__Left::fee_level_1_0	
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Side__Left::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Side__Left::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Side__Left::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Side__Left::fee_level_8_7	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Side__Left::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Side__Left::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_1_Side__Left::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_1_0	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_2_1	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_3_2	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_4_3	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_5_4	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_6_5	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_7_6	ok
dex::tick::tests::test_eff_tick_from_tick_and_opposite_succeeds::tick_index_7_MAX_TICK::side_2_Side__Right::fee_level_8_7	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_1_0::side_2_Side__Right	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_3_2::side_1_Side__Left	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_2_1::side_2_Side__Right	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_2_1::side_1_Side__Left	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_1_0::side_1_Side__Left	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_4_3::side_1_Side__Left	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_3_2::side_2_Side__Right	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_4_3::side_2_Side__Right	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_5_4::side_2_Side__Right	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_5_4::side_1_Side__Left	ok
chain::dex_types::ordered_map::tests::prop_avl_vs_rb_simple	ok
chain::dex_types::ordered_map::tests::prop_avl_height	ok
chain::dex_types::ordered_map::tests::prop_avl_vs_rb_range_incl_excl	ok



Test Description	Test Result
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_1_0::side_1_Side__Left	ignored
chain::dex_types::ordered_map::tests::prop_avl_vs_rb_range_incl_incl	ok
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_1_0::side_2_Side__Right	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_2_1::side_1_Side__Left	ignored
chain::dex_types::ordered_map::tests::prop_avl_vs_rb_range_excl_incl	ok
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_2_1::side_2_Side__Right	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_3_2::side_1_Side__Left	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_3_2::side_2_Side__Right	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_4_3::side_1_Side__Left	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_4_3::side_2_Side__Right	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_5_4::side_1_Side__Left	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_5_4::side_2_Side__Right	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_6_5::side_1_Side__Left	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_6_5::side_2_Side__Right	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_7_6::side_1_Side__Left	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_7_6::side_2_Side__Right	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_8_7::side_1_Side__Left	ignored
dex::tick::tests::test_ordering_holds_for_opposite_side_exhaustive::level_8_7::side_2_Side__Right	ignored
dex::tick::tests::test_precalculate_ticks_bit_repr	ok
dex::tick::tests::test_spot_sqrtprice::case_02_all_ones	ok
dex::tick::tests::test_spot_sqrtprice::case_04_large_pos2	ok
dex::tick::tests::test_precalculated_ticks	ok
dex::tick::tests::test_spot_sqrtprice::case_03_large_pos1	ok
dex::tick::tests::test_spot_sqrtprice::case_07_neg_one	ok
dex::tick::tests::test_spot_sqrtprice::case_08_large_neg1	ok
dex::tick::tests::test_spot_sqrtprice::case_09_large_neg2	ok
dex::tick::tests::test_spot_sqrtprice::case_10_min_tick	ok
dex::v0::pool_state_ex::conversion_one_minus_one_over_one_minus_fee_rate_to_fee_liquidity_ufp_never_fails_and_within_64_fract_bits	ok
dex::v0::pool_state_ex::conversion_one_over_one_minus_fee_rate_to_gross_liquidity_ufp_never_fails_and_within_64_fract_bits	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_2_1	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_4_3	ok
dex::tick::tests::test_spot_sqrtprice::case_01_max_tick	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_6_5	ok
dex::tick::tests::test_spot_sqrtprice::case_05_one	ok



Test Description	Test Result
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_1_Side__Left::fee_level_7_6	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_4_3	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_2_1	ok
dex::tick::tests::test_spot_sqrtprice::case_06_zero	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_6_5	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_7_6	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_1_0::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_2_1::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_3_2::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_change_protocol_fee_fraction::side_2_Side__Right::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_4_3::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_5_4::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_6_5::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_8_7::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_1_0::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_1_Side__Left::fee_level_7_6::protocol_fee_fraction_1_1235	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_6_5::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_3_2::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_4_3::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_2_1::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_close_position_for_non_existed_position	ok
dex::v0::pool_tests::tests::test_close_position_right_after_open_position::side_1_Side__Left::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_close_position_right_after_open_position::side_2_Side__Right::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_5_4::protocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_1_0::side_1_Side__Left	ok



Test Description	Test Result
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_7_6::p rotocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_1_0::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_8_7::p rotocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_2_1::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_2_1::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_3_2::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_4_3::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_3_2::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_4_3::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_6_5::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_5_4::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_5_4::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_7_6::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_7_6::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_close_position_after_one_swap::side_2_Side__Right::fee_level_6_5::p rotocol_fee_fraction_1_1235	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_6_5::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_get_position_info_for_non_existed_position	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_8_7::side_1_Side__Left	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_2_1	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_4_3	ok
dex::v0::pool_tests::tests::test_get_position_info_for_existed_position::fee_level_8_7::side_2_Side__Right	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_6_5	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_open_position_in_empty_pool::fee_level_7_6	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio	ok





Test Description	Test Result
n_range::fee_level_1_0	
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio n_range::fee_level_2_1	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio n_range::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio n_range::fee_level_6_5	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio n_range::fee_level_4_3	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio n_range::fee_level_7_6	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio n_range::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_above_positio n_range::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_4_3	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_2_1	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_6_5	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_below_positio n_range::fee_level_7_6	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_positio n_range::fee_level_2_1	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_positio n_range::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_positio n_range::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_positio n_range::fee_level_4_3	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_positio n_range::fee_level_7_6	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_positio n_range::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_le vel_1_0	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_positio n_range::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_le	ok



Test Description	Test Result
vel_4_3	
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_level_7_6	ok
dex::v0::pool_tests::tests::test_open_position_in_pool_with_liquidity_when_spot_price_within_position_range::fee_level_6_5	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_level_6_5	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_1_0	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_2_1	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_4_3	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_3_2	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_1_Side__Left::fee_level_2_1	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_6_5	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_8_7	ok
dex::v0::pool_tests::tests::test_price_is_zero_at_all_levels_in_empty_pool::side_2_Side__Right::fee_level_7_6	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_2_1	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_4_3	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_5_4	ok
dex::v0::pool_tests::tests::test_withdraw_fee_with_non_existed_position_id	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_1_0	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_3_2	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_6_5	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_8_7	ok
dex::v0::position_state_ex::tests::test_cast_one_over_sqrt_one_minus_fee_rate_from_float_to_liquidity_is_always_successful::fee_level_7_6	ok



Test Description	Test Result
fp::i192x64::test::test_i192x64_to_f64	ok
fp::i192x64::test::test_div	ok
dex::v0::position_state_ex::tests::test_gross_liquidity	ok
fp::i192x64::test::test_mul_large	ok
fp::i192x64::test::test_mul	ok
fp::i192x64::test::test_sum	ok
fp::i192x64::test::test_sub	ok
fp::i192x64::test::test_try_f64_to_i192x64_large	ok
fp::i192x64::test::test_try_f64_to_i192x64_overflow	ok
fp::i192x64::test::test_try_f64_to_i192x64_prec_loss	ok
fp::i192x64::test::test_try_f64_to_i192x64_tiny	ok
fp::try_float_to_ufp::test::test_try_f64_to_u128x128_from_leading_and_trailing_parts	ok
fp::try_float_to_ufp::test::test_try_f64_to_u128x128_overflow	ok
fp::try_float_to_ufp::test::test_try_f64_to_u128x128_tiny	ok
fp::try_float_to_ufp::test::test_try_f64_to_u128x128_prec_loss	ok
fp::try_float_to_ufp::test::test_try_f64_to_u128x128_zero	ok
fp::try_float_to_ufp::test::test_try_f64_to_u192x192	ok
fp::try_float_to_ufp::test::test_try_f64_to_u192x192_zero	ok
fp::u128x128::test::test_div	ok
fp::try_float_to_ufp::test::test_try_f64_to_u128x128_negative	ok
fp::u128x128::test::test_floor	ok
fp::u128x128::test::test_fract	ok
fp::u128x128::test::test_integer_sqrt	ok
fp::u128x128::test::test_mul	ok
fp::u128x128::test::test_sub	ok
fp::try_float_to_ufp::test::test_try_f64_to_u128x128_large	ok
fp::u128x128::test::test_mul_large	ok
fp::u192x192::test::test_div	ok
fp::u128x128::test::test_u128x128_to_f64	ok
fp::u128x128::test::test_sum	ok
fp::u192x192::test::test_ceil	ok
fp::u192x192::test::test_mul	ok
fp::u192x192::test::test_fract	ok
fp::u192x192::test::test_sub	ok
fp::u192x192::test::test_floor	ok
fp::u192x192::test::test_mul_moderate_integers	ok
fp::u192x192::test::test_integer_sqrt	ok
fp::u192x192::test::test_try_into_u128_successful	ok



Test Description	Test Result
fp::u192x192::test::test_try_into_u128_overflow	ok
fp::u192x192::test::test_sum	ok
fp::u192x192::test::test_integer_cbrt	ok
fp::u192x192::test::test_try_into_u128_zero	ok
fp::u192x192::test::test_u192x192_to_f64	ok
fp::u192x64::test::test_div	ok
fp::u192x64::test::test_mul	ok
fp::u192x64::test::test_mul_large	ok
fp::u192x64::test::test_sub	ok
fp::u192x64::test::test_try_f64_to_u192x64_negative	ok
fp::u192x64::test::test_fract	ok
fp::u192x64::test::test_try_f64_to_u192x64_large	ok
fp::u192x64::test::test_sum	ok
fp::u192x64::test::test_floor	ok
fp::u192x64::test::test_try_into_u128_overflow	ok
fp::u192x64::test::test_try_into_u128_successful	ok
fp::u192x64::test::test_try_f64_to_u192x64_prec_loss	ok
fp::u192x64::test::test_try_f64_to_u192x64_overflow	ok
fp::u192x64::test::test_u192x64_to_f64	ok
fp::u256x256::test::test_ceil	ok
fp::u192x64::test::test_try_f64_to_u192x64_tiny	ok
fp::u256x256::test::test_mul	ok
fp::u256x256::test::test_fract	ok
fp::u256x256::test::test_div	ok
fp::u256x256::test::test_sum	ok
fp::u256x256::test::test_sub	ok
fp::u256x320::test::test_ceil	ok
fp::u256x320::test::test_div	ok
fp::u256x256::test::test_floor	ok
fp::u256x256::test::test_integer_sqrt	ok
fp::u256x320::test::test_mul	ok
fp::u256x320::test::test_fract	ok
fp::u256x320::test::test_mul_large	ok
fp::u256x320::test::test_sub	ok
fp::u256x320::test::test_sum	ok
fp::u320x128::test::test_320_debug	ok
fp::u320x128::test::test_320_div	ok
fp::u320x128::test::test_320_mul_large	ok



Test Description	Test Result
fp::u320x192::test::test_ceil	ok
fp::u320x192::test::test_div	ok
fp::u320x128::test::test_320_mul	ok
fp::u320x192::test::test_floor	ok
fp::u256x320::test::test_floor	ok
fp::u320x192::test::test_fract	ok
fp::u256x320::test::test_integer_sqrt	ok
fp::u320x192::test::test_mul	ok
fp::u320x192::test::test_integer_cbrt	ok
fp::u320x192::test::test_mul_moderate_integers	ok
fp::u320x192::test::test_mul_overflow	ok
fp::u320x192::test::test_sub	ok
fp::u320x192::test::test_sum	ok
fp::u320x320::test::test_320_debug	ok
fp::u320x320::test::test_320_div	ok
fp::u256x256::test::test_mul_large	ok
fp::u320x320::test::test_320_mul	ok
fp::u320x192::test::test_integer_sqrt	ok
fp::u320x320::test::test_320_mul_large	ok
fp::u320x64::test::test_320_div	ok
fp::u320x64::test::test_256_conversion	ok
fp::u320x64::test::test_320_mul	ok
fp::u320x64::test::test_320_mul_large	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_6_5::side_2_Side__Right	ok
fp::unsigned_symmetric::test::test_floor	ok
fp::unsigned_symmetric::test::test_div	ok
fp::u320x64::test::test_invalid_256x256_conversion	ok
fp::unsigned_symmetric::test::test_integer_sqrt	ok
fp::unsigned_symmetric::test::test_mul	ok
fp::u320x64::test::test_256x256_conversion	ok
fp::unsigned_symmetric::test::test_mul_large	ok
fp::unsigned_symmetric::test::test_sub	ok
fp::unsigned_symmetric::test::test_sum	ok
fp::unsigned_symmetric::test::test_fract	ok
fp::unsigned_symmetric::test::test_integer_sqrt_u192x192	ok
fp::u320x64::test::test_320_debug	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_7_6::side_1_Side__Left	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_7_6::side_2_Side__Right	ok



Test Description	Test Result
dex::tick::tests::test_ordering_holds_for_opposite_side::level_8_7::side_1_Side__Left	ok
chain::dex_types::ordered_map::tests::prop_avl_vs_rb_range_excl_excl	ok
dex::tick::tests::test_ordering_holds_for_opposite_side::level_8_7::side_2_Side__Right	ok
chain::dex_types::ordered_map::tests::prop_avl_balance	ok
success_deposit_withdraw_egld	ok
success_open_swap_fee_close_batch_egld	ok
success_deposit_batch_open_position	ok
success_deposit_batch_swap_in	ok
success_batch_withdraw_fee	ok
success_batch_close_position	ok
test_multiple_deposits	ok
test_deposit_withdraw	ok
gen_mandos	ignored
test_init	ok
test_liquidity_fee_level_distribution	ok
test_positions	ok
test_sc_withdraw	ok
test_suspension	ok
test_actions	ok
test_invalid_swap_in	ok
test_swaps	ok
test_swaps_egld	ok
test_verified_tokens	ok