INFORMATION PAPER

PRE-TRADE RISK MANAGEMENT (PTRM) SYSTEM IN DERIVATIVES MARKET

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Hong Kong Exchanges and Clearing Limited
香 港 交 易 及 結 算 所 有 公 司

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SECTION I: INTRODUCTION

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1. The increasing use of automated electronic trading has introduced new risks to markets. Consequently, Pre-Trade Risk Management (PTRM) has become a focus of regulators and industry bodies.

2. Although the responsibility for PTRM lies with the Participants, Hong Kong Exchanges and Clearing Limited (HKEx) is committed to promoting and supporting stability in Hong Kong's markets. HKEx intends therefore to introduce a new PTRM system, Genium INET PRM ("the PTRM system"), as an integral part of the Hong Kong Futures Automated Trading System (HKATS) for its derivatives market tentatively by the second quarter of 2016.

3. The PTRM system is a tool for use by Participants. It is intended to be complementary to other in-house tools provided by Participants themselves in fulfilling responsibilities for pre-trade risk management.   The PTRM will be mandatorily applied to all HKATS orders.

4. The key characteristics are listed below:

   (a) Risk limits are required to be applied to all entities and/ or business units trading on HKATS (subsequently referred to as "Trading Units").   Risk limits are required to be a reasonable reflection of the risk inherent in the trading activity of the Trading Unit.

   (b) Responsibility for setting risk limits is as follows:

      (i) In the case of a Non-Clearing Participant (NCP), it is the responsibility of its General Clearing Participants (GCP) to set the limits on the Trading Units of the NCP.

      (ii) In the case of a self-clearing Exchange Participants (EP), the responsibility of setting limits on the Trading Units rests with the appropriate function(s) of the EP (e.g. Compliance, Risk or Responsible Officer).

5. This information paper generically uses the term "Risk Limit Manager[1] " to refer to the entities or functions setting limits in both of the above cases.

6. Risk Limit Managers are required to agree the limits set with their corresponding Trading Units.

    (a) In general, Risk Limit Managers can carry out the following actions through the PTRM GUI:

        -   Set up Pre-Trade Limit Groups (PTLG[2]s) for their Trading Units

        -   Set Maximum Order Size Limits

        -   Set Maximum Order Rate Limits

        -   Set Maximum Intraday Exposure Limits.

        -   Execute unblock on the order flow of a PTLG

    (b) Both Risk Limit Managers and Trading Units can carry out the following actions:

        -   Execute block on the order flow of a PTLG

        -   Execute Mass Order Cancellation

        -   Execute a "Kill Switch" (combination of block and mass order cancellation).

7. Risk checks of PTRM are at PTLG level but not at the account level.

8. This information paper presents an overview of the new PTRM system for the derivatives market and its implementation.   More details will be covered before the rollout through the following activities arranged by HKEx for all Participants:

        -   the release of HKATS OMNet Application Programming Interface (OAPI) specifications regarding PTRM

        -   the provision of training for the PTRM GUI

        -   the provision of user manual for the PTRM GUI

        -   Market Rehearsals.

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[1] The Risk Limit Manager is a person being assigned or authorized by the Participant to define, maintain and monitor the PTLGs and their corresponding risk limits.   The Risk Limit Manager can also execute emergency PTRM functions (e.g. block/ unblock of a PTLG, mass order cancellation and Kill Switch) during the day. For details of the Risk Limit Manager's PTRM GUI, please refer to Figure 5.

[2] A PTLG is comprised of a group of HKATS usernames with the same EP mnemonic, subject to the risk limits set by the corresponding Risk Limit Managers. This is further explained in paragraph 11.

9. In addition, HKEx has established an enhanced Drop Copy service to GCPs on a request basis. This optional service is already implemented and is available for subscription. The enhanced Drop Copy service is an extension of the existing trade feed available at DCASS for GCPs to conduct risk management on the trading activities performed by their associated Non-Clearing Participants (NCPs). With this service, GCPs will receive order information of their associated NCPs through GCPs' DCASS OAPI programs through a single OAPI connection.

SECTION II: FUNCTIONAL FEATURES

PTRM as a complementary risk control system to Participants

The purpose of PTRM is to provide an additional backstop risk management tool to Participants. The PTRM functions provided by HKEx should not be regarded as a layer of precise controls for addressing trading and counterparty risks arising from Participants' pre- and post-trade activities. They are not intended to replace other risk management tools or procedures that should have been put in place by Participants.

PTRM GUI for Risk Limit Managers to set risk limits upon their Trading Units

10. The PTRM GUI allows viewing of intraday risk limits and risk consumptions in real-time. Risk Limit Managers are allowed to edit the risk limits of each PTLG created for their Trading Units. The PTRM GUI also displays related notifications and warnings of breach events that occur on such PTLGs.

Base Pre-Trade Limit Group (Base PTLG) and Pre-Trade Limit Groups (PTLGs)

11. When the system is initially launched, by default, all HKATS usernames of the same Participant with order placement functions will be grouped under a default group called the "Base PTLG" by their EP mnemonic (s), and risk limits will be set at their maximum allowable values. Risk Limit Managers can set risk limits directly upon this Base PTLG (i.e. at the Participant level) or the Participant 's usernames can be divided into groups according to their activities and risk profile, and assigned to a new PTLG with its own risk limits. The creation of these additional PTLGs and the assignment of usernames can be done through the PTRM GUI. The following example illustrates the creation of PTLG1 and PTLG2 for Exchange Participant ABC with 3 HKATS usernames by its corresponding Risk Limit Manager:
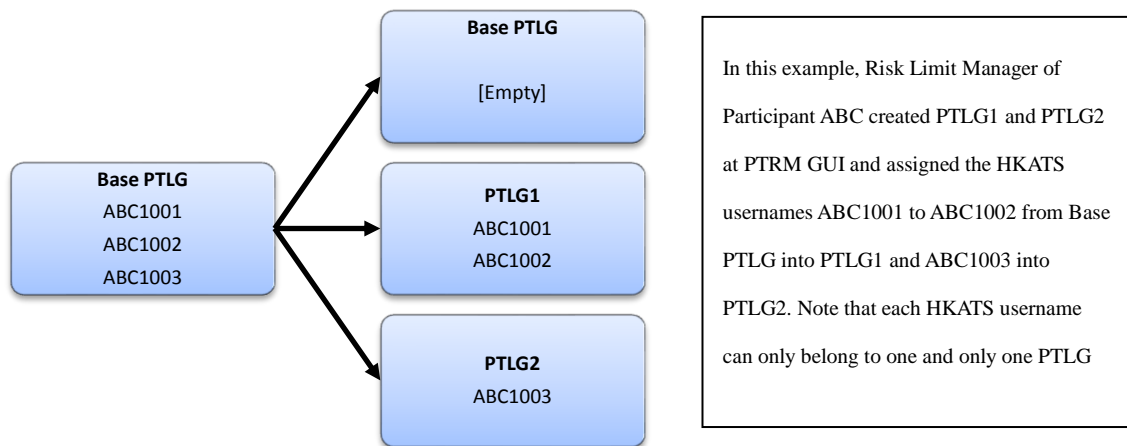
Figure 1

In this example, Risk Limit Manager of Participant ABC created PTLG1 and PTLG2 at PTRM GUI and assigned the HKATS usernames ABC1001 to ABC1002 from Base PTLG into PTLG1 and ABC1003 into PTLG2. Note that each HKATS username can only belong to one and only one PTLG

12. Risk Limit Managers will be allowed to create a limited number of PTLGs for their corresponding Trading Units.

Risk Limits

Maximum Order Size Limit:

13. Risk Limit Managers can set limits on the order size by product type or class level for the PTLGs of their Trading Units through the PTRM GUI. Note that order size limits are not applied to standard combinations (e.g. calendar spreads) and Tailor-Made Combinations (TMCs). A Trading Unit entering an order with a size that is larger than the corresponding limit will be rejected directly by the PTRM system without entering the central order book.

14. The existing Central Order Size Limits (COSLs) will still be in effect alongside with the PTRM settings. If an order passes the Maximum Order Size check, the order size will still be checked against the corresponding COSL. Order sizes of standard combinations and TMCs will still be checked against the COSLs.

15. The Maximum Order Size check is pre-trade and non-accumulative – Order size checks are performed and, where failing, rejections are made on each individual order before it enters the central order book. A breach on Maximum Order Size Limit will not render a block on the particular PTLG.
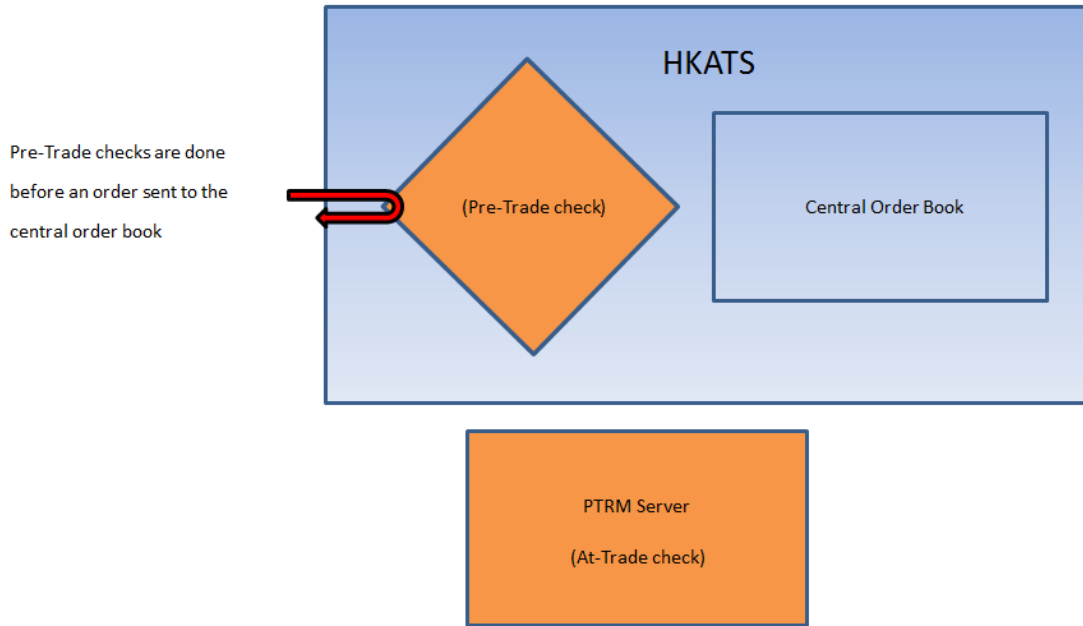
Figure 2 – Rejection by pre-trade checks

Maximum Order Rate Limit:

16. Risk Limit Managers can set an Order Rate Limit per PTLG to restrict the number of new orders allowed per time interval, where the time interval can be set between 1 to 300 seconds. Orders sent by the HKATS usernames within the same PTLG will be aggregated and counted as a whole.

17. Transaction types of single-sided order (MO31) and double-sided quote (MO37) will only be included in counting the number of orders. Each double-sided quote (MO37) will be counted as two orders.

18. The Maximum Order Rate check is "at trade", meaning that the check is performed after orders have been submitted to the order book. If the number of orders submitted in the prescribed time interval exceeds the limit set, then the PTLG will be blocked and subsequent orders and block trades of the PTLG will be rejected before entering the central order book. Order cancellations can still be performed.
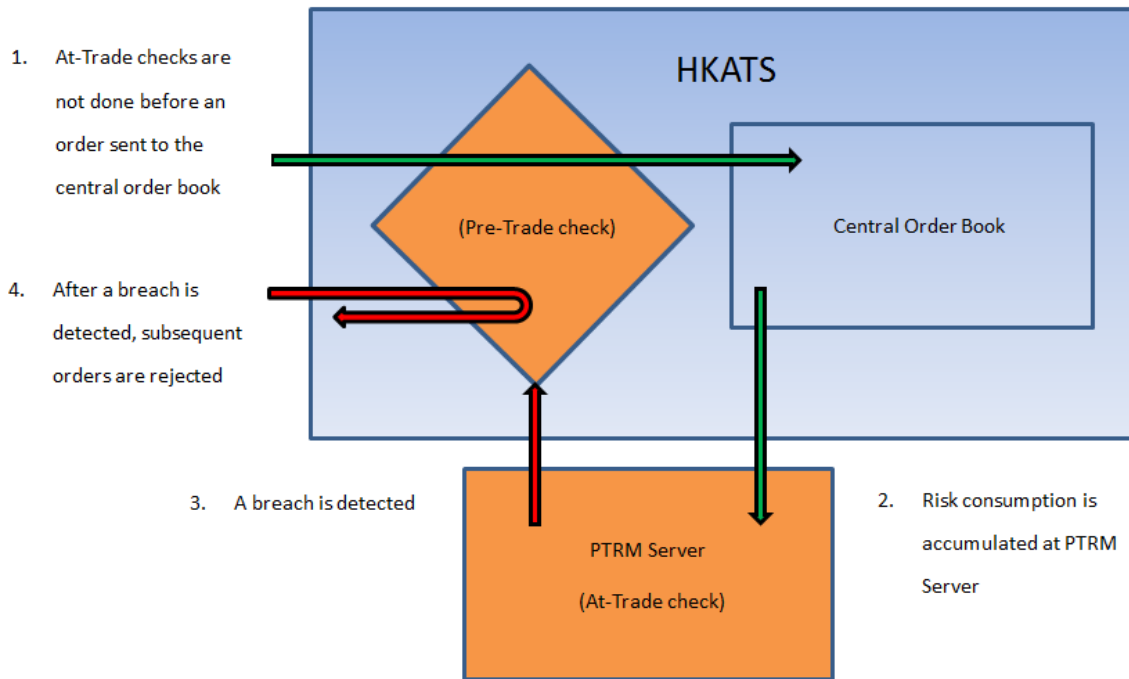
1. At-Trade checks are not done before an order sent to the central order book

4. After a breach is detected, subsequent orders are rejected

3. A breach is detected

2. Risk consumption is accumulated at PTRM Server

Figure 3 – Rejection by an at-trade check

19. A PTLG can be unblocked by the associated Risk Limit Managers (see paragraph 29).

Intraday Exposure Limit:

20. The value of risk exposure of each order will be approximated by multiplying the order quantity by a Unit Margin Rate fixed by HKEx for each instrument. This can be further multiplied by a coefficient which is set by the Risk Limit Managers for each PTLG to approximate the percentage of orders that may be expected to subsequently trade. Separate coefficients can be set for futures and options.

21. The exposure values of each order will be accumulated per PTLG and monitored against four risk counters set by the Risk Limit Managers:

a) Net Futures Long/ Short Limit

b) Gross Futures Long/ Short Limit

c) Net Options Long/ Short Limit

d) Gross Options Long/ Short Limit

The limits are symmetrical, i.e. a single limit value is specified for each of the four measures, which is then applied to both the Long and Short sides.

(Please refer to **APPENDIX A: COMPONENTS OF INTRADAY EXPOSURE LIMITS** for details.)

22. The Unit Margin Rates are provided at the start of day by HKEx. They are the margin requirements (in HKD equivalent) for each futures and options series based on their previous day's closing prices and the latest margin levels determined by HKEx as a proxy exposure calculation.

23. All four risk counters will be reset to zero after the daily day-end batch. Outstanding good-till-cancel (GTC) orders which are reloaded at start of day will contribute to the risk consumption every day.

24. The Risk Limit Managers can set upper bounds to each of these four limits for each PTLG as a control of its intraday risk exposure. The exposure checks are At-Trade, meaning that an order that breaches any of these four limits will be accepted to the central order book but the PTLG will then be blocked and subsequent orders will be rejected. The block will apply to new orders and also block trades of the PTLG, but order cancellations can still be carried out. The block will not impact other PTLGs of the same Participant unless it is the Base PTLG (see paragraph 26).

25. Risk Limit Managers can choose to be notified by the notification and warning levels before an Intraday Exposure Limit is breached (see paragraph 32 and 33).

26. All block trades of a Participant, irrespective of the entering HKATS username and associated PTLG, will be counted into the Intraday Exposure Limit risk counters of the Participant's Base PTLG only. If a limit set on the Base PTLG is breached, it will be blocked on its own. Other PTLGs of the same Participant can still enter orders normally except block trades. Block trades of the Participant cannot be accepted until the Risk Limit Manager unblocks the Base PTLG.

27. A PTLG can be unblocked by the associated Risk Limit Managers (see paragraph 29).

Summary of the 3 Risk Limits:

Risk Limit	Feature
Max Order Size	• Pre-trade • Order will not enter the central order book at breach • Breach will not trigger a 'Block' on the PTLG
Max Order Rate	• At-Trade • Breaching order will be accepted into the central order book
Max Intraday Exposure	• Breach will trigger a 'Block' on the PTLG. Subsequent orders and block trades will be rejected.

Figure 4

Emergency Actions

Block / Unblock a PTLG:

28. In addition to blocks being triggered by a breach of the Maximum Order Rate or the Intraday Exposure Limit, Risk Limit Managers can impose blocks on PTLGs through the PTRM GUI whenever circumstances require.

29. Risk Limit Managers can unblock a blocked PTLG through the PTRM GUI (Trading Units cannot perform an unblock operation).   Where the block is the result of a breach in the Intraday Exposure Limit, Risk Limit Manager will need to first increase the relevant risk limit on the PTLG before unblock.

Mass Order Cancellation:

30. Risk Limit Managers and Trading Units can execute Mass Order Cancellation through the PTRM GUI on a selected PTLG.   All outstanding orders and quotes including GTC orders by the HKATS usernames of that PTLG will be cancelled.

Kill Switch:

31. Risk Limit Managers and Trading Units can apply a Kill Switch function to first block a PTLG and then perform a mass order cancellation on all of its outstanding orders in a single action.

Other PTRM functions

Notifications:

32. Notification of events including blocks, warnings and breaches will be given through the PTRM GUI and, where configured, by email.

33. A list of email addresses can be set for each PTLG and a notification email will be sent to the addresses upon the triggering of specific PTRM events.

34. Order rejections due to PTRM events will be notified by the associated OAPI return codes sent to the OAPI programs of Participants.

Risk Limit File Upload:

35. In order to facilitate bulk maintenance of Participant Risk Limits, Risk Limits can be uploaded through the PTRM GUI in a csv file format or in other formats specified by HKEx.

PTRM Reports:

36. The following reports will be provided at the DCASS terminal of Participants on the next business day for their reference:
    a) Daily Audit Report – event logs of specific PTRM GUI activities.
    b) Daily Maximum Limit Utilization Report – the maximum utilization rates of At-Trade Risk Limits (e.g., Maximum Order Rate Limit and Maximum Intraday Exposure Limits).

PTRM GUIs for Trading Units

37. A PTRM GUI will be granted to a Participant appointed Trading Unit on demand. These Participant appointed Trading Units can execute emergency actions such as blocking a PTLG from placing new orders, performing Mass Order Cancellation and executing the Kill Switch through the PTRM GUI for its own PTLGs. These actions are strictly for emergency use only and associated notifications will be sent to HKEx for reference. Trading Units will not be able to manage their own risk limits, unblock their own PTLGs, or **create, delete their own PTLGs (these functions would be managed by the corresponding Risk Limit Managers**).

PTRM GUI	Define PTLG	Set Risk Limit	Emergency Button
Risk Limit Managers	√	√	√
Trading Units	x	x	√*

Figure 5 – Summary of PTRM GUI functions

X -- PTLG defining and Risk Limit setting for Trading Units are done by their corresponding Risk Limit Managers

√*--PTRM GUI of Trading Units cannot execute unblock for themselves. The unblock will be done by their associated Risk Limit Managers

SECTION III: INFRASTRUCTURAL FEATURES

PTRM GUI

38. The PTRM GUI is a Java web-based Graphical User Interface for Participants to access the HKEx PTRM system through the PTRM Gateway such that they can manage their PTLGs and also set up or review their risk limits.
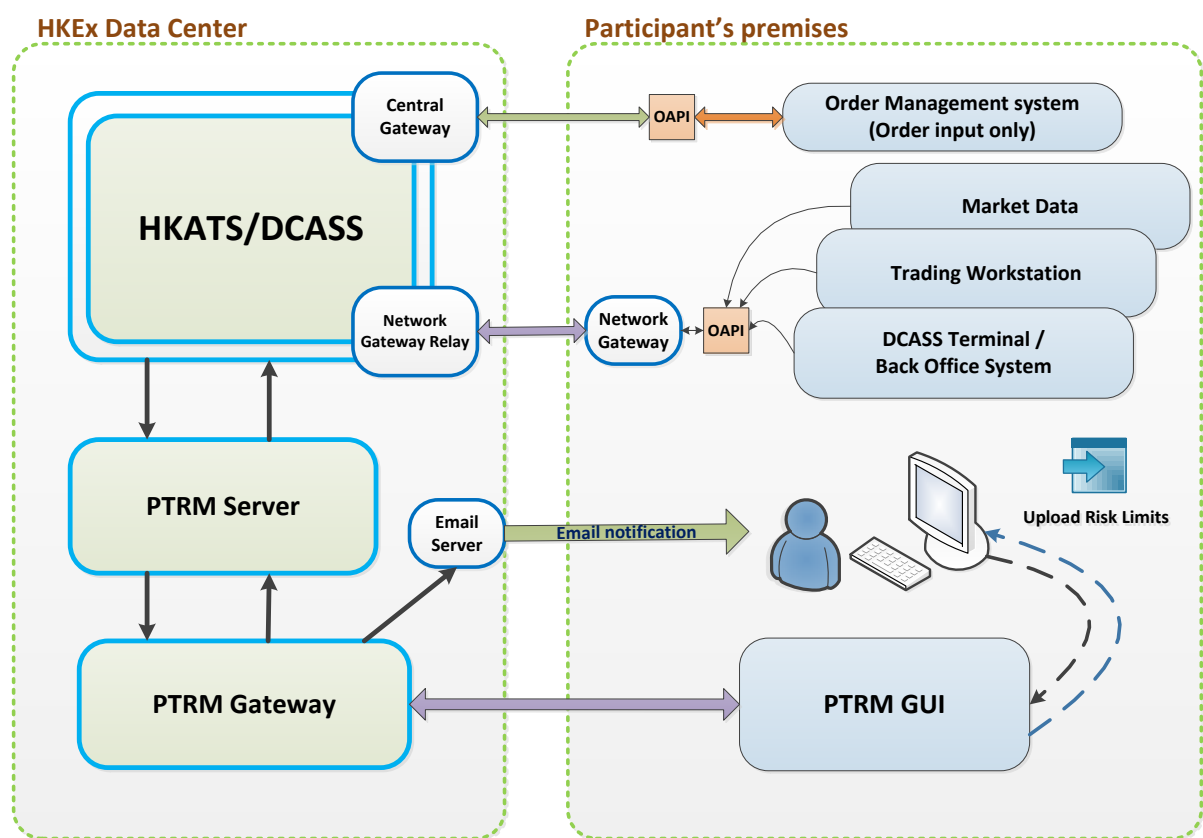

Figure 6

Email Server

39. Specific PTRM events will be notified by email through an Email Server. Participants are reminded that email notifications are sent through the internet which is not managed by HKEx. Participants should also refer to the PTRM GUI for those notifications.

Hardware and Software Configuration Requirements for Participants Devices

40. To connect the PTRM GUI, Participants are recommended to follow the software and hardware specifications in the table below. HKEx will notify Participants in due course if a revised specification is required.

PTRM GUI Specifications (Minimum PC Requirement)	
Processor	Intel Core i3-550 3.2GHz or higher
RAM	4GB
Storage	10GB
Network adapter	100Mbps full-duplex
Monitor	1280 x 1024 resolution
OS	Microsoft Windows 7 (64 bit)
Layered software	JAVA 1.6 or Higher See Java System Requirements: http://java.com/en/download/help/sysreq.xml
	Anti-virus software
Supporting Browser	Windows Internet Explorer (IE) 8
Bandwidth Usage	Consume less than 1Mbps of existing SDNET/2 or HKEx Service Network circuits

Figure 7

PTRM GUI Connectivity:

SDNET/2 Circuit

41. An SDNET/2 circuit can be used to connect PTRM GUI to the PTRM system for reliable connectivity. Existing SDNET/2 circuits can be shared with the PTRM GUI connection. Bandwidth consumption per PTRM GUI connection is estimated to be less than 1Mbps.

HKEx Service Network (HSN)

42. For Participants using HSN, existing HSN circuits can be shared with the PTRM GUI connection. Bandwidth consumption per PTRM GUI connection is estimated to be less than 1Mbps. In addition, reliable link(s) between Participant's premises and the Hosting Data Centre is required to connect their PTRM GUI through HSN.

Contingency Arrangement

43. The PTRM system has built-in resiliency and disaster recovery capability. In the event of hardware failure or data-centre site failure, the PTRM system can fail over to its backup site.

44. All connected PTRM GUI would be logged out and have to re-login manually to the backup system in case of PTRM failure.

SECTION IV: IMPLEMENTATION

The implementation of PTRM requires preparations by all Participants.   Participants should take note of the following:

Hardware and Software Procurement

45. Participants should review and upgrade (if applicable) hardware and software for the PTRM GUI terminal in accordance with the minimum hardware and software requirements specified in **Figure 7 of SECTION III**.

Preparation for Setting Up PTRM Risk Limits

46. The PTRM risk checks by HKEx are mandatory to all Participants.   Risk Limit Managers are recommended to review their Trading Units' trading activities for setting limits at rollout. Participants are advised to start gathering trade information and engaging with their Trading Units to establish initial risk limits.

PTRM Contact Persons, Risk Limit Managers and Trading Units

47. Participants are required to nominate 2 Contact Persons (recommended to be 1 from business and 1 from IT) for the PTRM initiative by June 2015.   They will be the main contacts with HKEx regarding matters related to the PTRM project implementation during which HKEx will have regular communication with them.

48. Participants should nominate relevant personnel to be their Risk Limit Managers and Trading Units. Risk Limit Manager and Trading Units, as mentioned in the previous sections, can use the login ids and passwords provided by HKEx and login to the PTRM system according to Figure 6.   Participants are advised to discuss internally regarding the nomination.

OAPI³ Verification and Certification Test

49. There will be 4 new OAPI return codes introduced (see Figure 8 below).   Participants are advised to assess and ensure they have necessary technical support and reserve sufficient resources to develop or modify, if necessary, their OAPI programs.

(-850002) **User is in a blocked Pre Trade Risk state**	• **User is in a blocked Pre-Trade Risk State and is currently not allowed to trade** • **Triggered by the block function**
(-850004) **User has breached Max. Order Rate limit**	• **User has breached Max. Order Rate Limit and the transaction is rejected.**
(-850006) **User has breached a Max. Intraday Exposure limit**	• **User has breached a Max. Intraday Exposure limit and the transaction is rejected.**
(-850008) **User has exceeded Max. Order Size limit**	• **User has exceeded Max. Order Size limit and the transaction is rejected.**

Figure 8

50. An OAPI verification session will be conducted tentatively in the third quarter of 2015 for Participants to verify and ensure their OAPI program(s) is/ are able to handle the newly introduced OAPI return codes.   Participants are required to re-certify their OAPI programs if they need to make any change due to the new PTRM system.   Both the verification and certification tests (if applicable) will be required to be completed before Participants taking part in the Market Rehearsals scheduled tentatively in the first quarter of 2016 (see paragraph 57).

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³ OAPI herein represents HKATS OAPI program developed by Participants or vendors

PTRM GUI Training Session

51. HKEx will provide training sessions on PTRM GUI to all Participants nominated Risk Limit Managers and Trading Units tentatively in the fourth quarter of 2015.

Production Preparations & Market Rehearsals

52. HKEx plans to conduct production readiness tests for the market in the 4th Quarter of 2015.

53. As the final preparation and verification of readiness before production rollout, Market Rehearsals will be conducted over weekends in the first quarter of 2016.   All Participants will be required to participate in the Market Rehearsals to confirm and declare their readiness.

Risk Limit Review by HKEx

54. HKEx will conduct regular reviews on the reasonableness of risk limits set by Participants.

PTRM GUI Connections

55. Basic PTRM GUI connection will be provided to each Participant free of charge.

Basic PTRM GUI Connection for Risk Limit Managers	• 1st connection free of charge • 2nd connection on demand free of charge
Basic PTRM GUI Connection for Trading Units	• 1st connection on demand free of charge

Figure 9

56. Additional PTRM GUI connections other than the basic number of connection prescribed in Figure 9 may be requested and shall be chargeable. Details will be announced in due course.

Tentative Implementation Schedule

57. Participants are advised to make reference to the following tentative implementation schedule for necessary preparations regarding the PTRM initiatives.
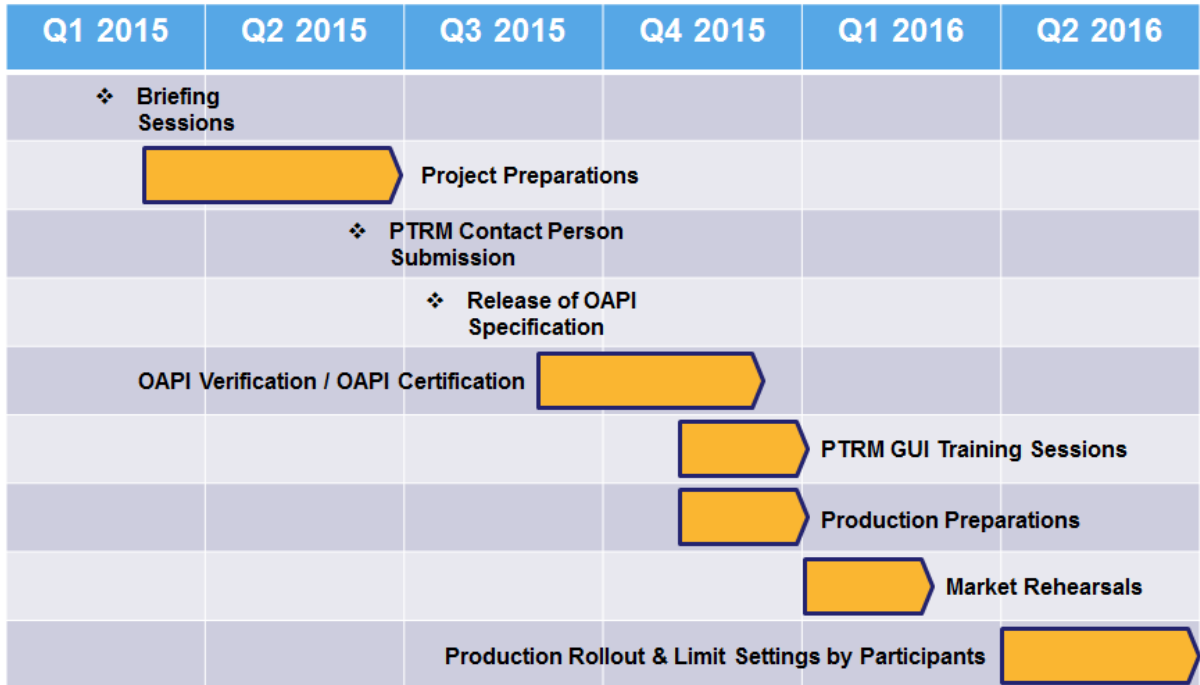
Q1 2015	Q2 2015	Q3 2015	Q4 2015	Q1 2016	Q2 2016
❖ Briefing Sessions					
Project Preparations					
	❖ PTRM Contact Person Submission				
		❖ Release of OAPI Specification			
OAPI Verification / OAPI Certification					
			PTRM GUI Training Sessions		
			Production Preparations		
			Market Rehearsals		
		Production Rollout & Limit Settings by Participants			

Figure 10

SECTION V: ENQUIRIES

For enquiries and further clarification on the PTRM for derivatives markets, please write to:

Hong Kong Exchange and Clearing Limited
12/F One International Finance Centre
1 Harbour View Street
Central
Hong Kong

Re: Information Paper on Pre-Trade Risk Management (PTRM) System in Derivatives Markets

Alternatively, please contact us by email to ClickSupport@hkex.com.hk and dcassoapi@hkex.com.hk or call our hotlines:

(+852) 2211 6360 (Trading)
(+852) 2979 7222 (Clearing)

A dedicated webpage has been set up at the HKEx website to host all information about the PTRM project. Participants should refer to the webpage for most up-to-date information:

http://www.hkex.com.hk/ptrm
http://www.hkex.com.hk/ptrm_c

APPENDIX A: COMPONENTS OF INTRADAY EXPOSURE LIMITS

Gross Futures Long/ Short Limits

Gross Futures Long	The risk counter includes: • Long futures open orders • Long futures trades
Gross Futures Short	The risk counter includes: • Short futures open orders • Short futures trades

Net Futures Long/ Short Limits

Net Futures Long	The risk counter includes: • Long futures open orders • Long futures trades minus Short futures trades
Net Futures Short	The risk counter includes: • Short futures open orders • Short futures trades minus Long futures trades

Gross Options Long/ Short Limits

Gross Options Long	The risk counter includes: • Buy call options and sell put options open orders • Buy call options and sell put options trades
Gross Options Short	The risk counter includes: • Sell call options and buy put options open orders • Sell call options and buy put options trades

Net Options Long/ Short Limits

Net Options Long	The risk counter includes: • Buy call options and sell put options open orders • (Buy call options and sell put options trades) minus (Sell call options and buy put options trades)
Net Options Short	The risk counter includes: • Sell call options and buy put options open orders • (Sell call options and buy put options trades) minus (Buy call options and sell put options trades)

Remarks:

a) Order quantity of each order will be multiplied by its **Unit Margin Rate** in HKD before being accumulated in to the risk counters.

b) A **Futures Order Coefficient (FC)** and an **Options Order Coefficient (OC)** will be applied in the calculation of exposure. They are adjustable from 0% to 100% by the Risk Limit Managers and govern the percentage of the value of open orders to be included in the Intraday Exposure Risk check.