

VIRTU MATCHIT EXECUTION PROTOCOLS

Virtu MatchIt (“MatchIt” or “the ATS”) is a registered alternative trading system operating a crossing network with multiple crossing sessions that provides subscribers with anonymous access to a pool of liquidity comprised of orders submitted to Virtu Americas LLC (“VAL”), by its customers and other broker-dealers. MatchIt does not display orders on its order book to any subscriber.¹ All executions occur within, and at prices, derived from the NBBO.² This document pertains to MatchIt. References in this document to other of VAL’s operations are made to provide context around the manner of operation of MatchIt.

MatchIt will operate two crossing sessions, designated as the *VAL Crossing Session* and the *Main Crossing Session*. The VAL Crossing Session will be open to VAL only. The Main Crossing Session will be open to all subscribers of the ATS. MatchIt will match orders between the hours of 9:30 a.m. and 4:00 p.m.

MatchIt will create one or more liquidity profiles for each subscriber using one or more quantitative measurements, which include execution performance relative to the market over different time horizons when removing liquidity from MatchIt. MatchIt may assign a liquidity profile to previously uncategorized subscribers. MatchIt will allow subscribers to limit their interaction with other subscribers that have a specific liquidity profile.³

Any VAL business unit or trading desk and any VAL affiliate that is a broker dealer (“VAL Affiliate”) may submit orders to the MatchIt Main Crossing Session, either for their own account or on behalf of clients. VAL and VAL Affiliates will utilize the order types available to other Subscribers when submitting orders to the MatchIt Main Crossing Session.

VAL’s client facing electronic market making unit (“VCMM”), also referred to as its “wholesale market maker” accepts client orders from other broker-dealers for execution (“retail orders”). VCMM may submit orders for its own account to any MatchIt crossing session in order to fill its retail orders (“a Linked Order”). When the VCMM receives an execution for a Linked Order in MatchIt, it will contemporaneously execute the retail order at the same or an improved price.⁴ VCMM may transmit orders to any MatchIt crossing session when seeking liquidity to fill retail orders; when seeking liquidity other than to fill retail orders VCMM may transmit orders to the MatchIt Main Crossing Session.

VAL also provides algorithmic trading strategies and smart order routing services to clients and internal VAL trading desks (“Virtu Electronic Trading”). Virtu Electronic Trading may transmit orders to the MatchIt VAL Crossing Session on behalf of clients including institutional customers, affiliates of VAL and VAL Trading Desks.

Other business units and trading desks of VAL and VAL Affiliates may transmit orders directly to the MatchIt Main Crossing Session. When transmitting orders directly to MatchIt for VAL’s or a VAL

¹ Virtu personnel including service desk personnel, technology personnel, legal and compliance, and management personnel may at times have access to view orders submitted to the ATS and resulting executions.

² MatchIt uses a proprietary market data system to calculate the NBBO.

³ Upon request, MatchIt will disclose general profile information concerning the subscriber pool to MatchIt subscribers, and will also inform each subscriber of their own profile information. Subscriber identities will remain confidential.

⁴ The market maker may improve on the execution price of a Linked Order to enhance execution quality for retail orders. Under normal conditions executions of Linked Orders will result in contemporaneous executions of related retail orders. On occasion, for a variety of reasons, it is possible that a Linked Order that is executed in MatchIt does not result in a contemporaneous execution for a retail order.

Affiliate's own account these orders will be transmitted with a principal capacity ("Virtu Proprietary Orders").

VAL (e.g. Virtu Electronic Trading) may submit instructions on an order that prevent potential interactions with Virtu Proprietary Orders. This limitation will not prevent interactions with Linked Orders transmitted to fill retail orders and principal capacity algorithmic orders transmitted by Virtu Electronic Trading. This limitation is not available to external subscribers.

MatchIt reserves the right to review any transaction based upon the request of a subscriber or on its own motion and declare any transaction executed by MatchIt null and void in the event that the transaction occurred at a price that was within the numerical guidelines for erroneous transactions of any exchange or was the result of a significant systems disruption. In reviewing transactions resulting from significant systems disruptions, in addition to the price of the transactions, MatchIt may also take into account the volume of transactions as compared to the normal volume of transactions for the relevant security as executed by MatchIt.

Below is a summary of MatchIt's crossing sessions, order types and execution protocols.

MAIN CROSSING SESSION

The Main Session is open to all MatchIt subscribers. MatchIt will execute Peg Orders against eligible contra-side IOC and Peg Orders.

Peg Orders: Peg Orders are entered as "day orders" and remain in MatchIt until canceled by the Subscriber or fully executed against eligible contra-side Peg or IOC orders. All outstanding orders that have not been canceled or executed expire at the end of a particular session's operating hours and will be canceled by MatchIt. Peg Orders may be entered with Peg Market, Peg Mid-Point or Peg Primary instructions that peg their execution to prices related to the NBBO.⁵ Peg Orders may also be entered with a limit price that designates a floor or ceiling above or below which the order will not be eligible for execution.

IOC Orders: IOC Orders must have a designated size, side (e.g., buy, sell long or sell short), symbol and limit price (if applicable). IOC Orders are submitted as immediate-or-cancel and are executed against contra-side Peg Orders that are eligible for such execution or immediately canceled. IOC Orders may be entered with Market or Mid-Point instructions.⁶ IOC Orders may also be entered with a limit price that designates a floor or ceiling above or below which the order will not be eligible for execution.

Minimum Execution Quantity: Both Peg and IOC Orders may be designated with minimum execution quantities ("MEQ"). MEQ permits a Subscriber to designate a minimum number of shares that must be available on the contra-side in order for the Subscriber's order to be eligible for execution. For example, if a contra-side order meets the Subscriber's limit price but does not satisfy the Subscriber's MEQ instruction, an execution will not occur. All executions will occur either at the national best bid, offer or prices within the best bid and offer.

⁵ Peg Market instructions indicate that the Peg order can pay the spread, for example a buy order could execute at the national best offer. Peg Primary instructions indicate that the order should not pay the spread, for example a buy order would execute at the national best bid.

⁶ IOC Market orders are eligible to pay the spread.

Locked Market Instruction: Unless instructed otherwise by Subscribers, MatchIt will execute eligible orders while the NBBO is locked. Subscribers may, on a per order basis for both Peg and IOC Orders, instruct MatchIt not to execute an order if the NBBO is locked. When an IOC Order is entered with a locked market instruction, it will be rejected if the NBBO is locked. When a Peg Order is entered with a locked market instruction, it will be accepted and will remain open in the system – but ineligible for execution – until the NBBO is no longer locked.

Peg Order Add-Only Liquidity Instruction (“Add Only”): Subscribers may, on a per order basis, instruct MatchIt to only permit execution of their Peg order if upon entry the order is adding liquidity to MatchIt. Peg Orders that would remove liquidity from MatchIt will be accepted by MatchIt and remain open in the system – but ineligible for execution – unless and until such a time that the order would be adding liquidity to MatchIt.⁷

Virtu Proprietary Transaction Opt Out: VAL (e.g. Virtu Electronic Trading) may submit instructions on orders that prevent potential interactions with Virtu Proprietary Orders. This limitation will not prevent interactions with Linked Orders transmitted to fill retail orders and principal capacity algorithmic orders transmitted by Virtu Electronic Trading. This instruction is not available to external subscribers.

Virtu 28(e) Proprietary Transaction Opt Out: This instruction may be placed on orders for which soft dollar credits accrue. This instruction will only allow riskless principal or agency crossing.⁸

Long/Short Sales – Orders to sell shall only be entered as long sales if the shares are owned and will be delivered to VAL no later than settlement date. All short sale or short sale exempt orders must be properly identified as such.

Hours of Operations – Orders are accepted by MatchIt any time after 7:00 a.m. EST. MatchIt operates and executes orders for the Main Session from 9:30 a.m. to 4:00 p.m. Any order not executed in full by the end of the period for which the order was entered will be canceled.

Market Data - MatchIt utilizes a Virtu proprietary market data system that combines direct market data feeds and the SIP for the Main Session. MatchIt will make information about which feeds are being used available to subscribers via the Virtu website. In the event the VIRTU proprietary market data system experiences an issue or a delay in processing one or more direct market center feeds, MatchIt has the ability to use SIP data in lieu of the impacted direct market center data on a market center by market center basis.

Locked Markets and Limit Up/Limit Down

While the NBBO is locked, the ATS will execute a subscriber’s eligible orders at the locked price unless a subscriber requests that their order not execute during locked market conditions. MatchIt will not execute orders if the NBBO is crossed, if the security is halted, if the NBB is below the Limit Up-Limit Down Lower Limit Price Band (“Lower Band”), if the NBO is above the Limit Up-Limit Down Upper

⁷ Peg orders that existed on the book at the time the Peg Order containing the Add Only instruction was entered will never interact with the Peg Add Only order.

⁸ This opt out is provided to assist in ensuring the executions conforms to the Section 28(e) Safe Harbor. This limitation will limit interaction with orders transmitted for VAL’s or a VAL Affiliate’s own account. Linked Orders will remain eligible for execution. However, in these circumstances, MatchIt will execute the Linked Order and pass information on the execution message so that the market maker’s systems transact with its underlying client according to FINRA’s definition of “riskless principal”, i.e., at the same price, as the execution received in MatchIt.

Limit Price Band (“Upper Band”) or if the security is in a Limit Up-Limit Down Trading Pause (“Trading Pause”).⁹

Self-Trade Prevention

MatchIt supports self-trade prevention. Please contact a MatchIt representative for additional details.

Tick Pilot Securities: The U.S. Securities and Exchange Commission has approved a Tick Size Pilot Program which will begin on October 3, 2016¹⁰. Upon commencement of the Tick Size Pilot Program, MatchIt will operate in compliance within the Trading and Quoting limitations stipulated by FINRA Rule 6191 for securities that are part of the Tick Size Pilot Program (“Pilot Securities”).

For Pilot Securities in Test Group One, Test Group Two or Test Group Three, MatchIt will only accept market orders or limit orders with limit prices sent in \$0.05 increments. Limit orders sent at any other price increment will be rejected. Pilot Securities in the Control Group will not be impacted by these limitations.

For Pilot Securities in Test Group Two, MatchIt does not accept Market Peg sell short orders; these orders will be handled as Mid-Point Peg sell short orders.

MatchIt will only accept IOC orders with Mid-Point instructions and Peg-Mid-Point orders for Test Group 3 securities. MatchIt will reject all IOC Market orders and all Peg Market and Peg Primary orders in Test Group 3 securities. MatchIt will not execute Test Group 3 orders when the NBBO is locked or crossed.

MatchIt will use the same execution protocols and price improvement logic for Pilot Securities as for securities that are not part of the Tick Size Pilot Program.

⁹ For details please see SEC Release No. 34-67091, the Order Approving, on a Pilot Basis, the National Market System Plan to Address Extraordinary Market Volatility, or “Limit Up-Limit Down”.

¹⁰ Additional information about the Tick Size Pilot Program is available at <http://www.finra.org/industry/tick-size-pilot-program>.

Execution Priority and Price Protocol:

For Peg orders, priority is determined on a price, time basis¹¹. For IOC orders priority is based on a first in time basis. Removers receive price improvement. In the case of an IOC order, the IOC order is the removing order. In the case of two passive orders, the second in time is the removing order. Peg Orders may be entered with the following instructions, Peg Primary, Peg Mid-Point, Peg Market.

The following charts generally describes the interaction absent instructions like MEQ, Add Only, etc.:

		Sell						
		Incoming/Removing						
		Peg Primary IOC	Peg Mid IOC	Peg Market IOC	Peg Primary DAY	Peg Mid DAY	Peg Market DAY	
Buy	Resting / Providing	Peg Primary DAY	No Cross	No Cross	Bid	No Cross	No Cross	Bid
		Peg Mid DAY	No Cross	Mid	Mid	No Cross	Mid	Mid
		Peg Market DAY	Offer	Offer	Offer	Offer	Offer	Offer

¹¹ Subscriber order modifications will generally result in a new order time for matching purposes (i.e. the order will lose queue spot). An exception is a modification which reduces an order's quantity without changing other order instructions.

Price Improvement Example:

NBBO	\$10.00/\$10.02										
Resting Orders	<table border="1"> <thead> <tr> <th>Time</th> <th>Side</th> <th>Size</th> <th>Price</th> <th>Broker</th> </tr> </thead> <tbody> <tr> <td>11:00 AM</td> <td>B</td> <td>10,000</td> <td>\$10.01</td> <td>1</td> </tr> </tbody> </table>	Time	Side	Size	Price	Broker	11:00 AM	B	10,000	\$10.01	1
Time	Side	Size	Price	Broker							
11:00 AM	B	10,000	\$10.01	1							
Incoming Order	<table border="1"> <thead> <tr> <th>Time</th> <th>Side</th> <th>Size</th> <th>Price</th> <th>Broker</th> </tr> </thead> <tbody> <tr> <td>11:10 AM</td> <td>S</td> <td>10,000</td> <td>\$10.00</td> <td>2</td> </tr> </tbody> </table> <p>There is a \$.01 overlap in price.</p>	Time	Side	Size	Price	Broker	11:10 AM	S	10,000	\$10.00	2
Time	Side	Size	Price	Broker							
11:10 AM	S	10,000	\$10.00	2							
Price Improvement Logic	100% to taker; Broker# 2										
Resulting Executions	<p>@11:10am</p> <table border="1"> <tr> <td>10,000</td> <td>\$10.01</td> </tr> </table>	10,000	\$10.01								
10,000	\$10.01										

Price Improvement Example (Short Sell Market Peg Order w/ Reg SHO restriction):

NBBO	\$10.00/\$10.02										
Resting Orders	<table border="1"> <thead> <tr> <th>Time</th> <th>Side</th> <th>Size</th> <th>Price</th> <th>Broker</th> </tr> </thead> <tbody> <tr> <td>11:00 AM</td> <td>SS*</td> <td>10,000</td> <td>\$10.00</td> <td>1</td> </tr> </tbody> </table> <p>*Order is a Market Peg Order</p>	Time	Side	Size	Price	Broker	11:00 AM	SS*	10,000	\$10.00	1
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Time	Side	Size	Price	Broker							
11:10 AM	B	10,000	\$10.01	2							
Price Improvement Logic	100% of Reg SHO compliant price improvement to taker; Broker# 2										
Resulting Executions	<p>@11:10am</p> <table border="1"> <tr> <td>10,000</td> <td>\$10.0001</td> </tr> </table>	10,000	\$10.0001								
10,000	\$10.0001										

Price/Time Example

NBBO:\$10.00 Bid/\$10.02 Offer

Resting Orders:

Time	Side	Size	Price	Broker
11:00 a.m.	B	400	\$10.00	1
11:01 a.m.	B	500	\$10.00	2
11:02 a.m.	B	100	\$10.00	3
11:03 a.m.	B	600	\$10.00	4

Incoming Order:

Time	Side	Size	Price	Broker
11:10 a.m.	S	1,000	\$10.00	5

Resulting Trades:

Time	Side	Size	Price	Broker
11:10 a.m.	B	400	\$10.00	1
11:10 a.m.	B	500	\$10.00	2
11:10 a.m.	B	100	\$10.00	3
11:10 a.m.	S	400	\$10.00	5
11:10 a.m.	S	500	\$10.00	5
11:10 a.m.	S	100	\$10.00	5

Trading Disclosure

In its normal course of business, VAL will engage in trading in the securities available for trading in MatchIt for VAL's proprietary accounts and on behalf of accounts under VAL's management while MatchIt has an executable order and at terms better or worse than the prices received on executions for such order. VAL and its affiliates may enter orders into MatchIt on a principal and/or agency basis. Only VAL personnel with responsibilities for the operation of the ATS have access to order information. VAL's activity could affect the value or terms of executions received on an order in MatchIt.

Terms and Conditions

Use of MatchIt is governed by the terms and conditions set forth in your MatchIt agreement.