

# AIS Developer Studio

*Release Version 1.0*

*ITU-R M.1371-5 Technology*

Operational And Technical Manual

Baseline MODULE  
VDO / VDM generator MODULE

## NOTICE

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### **Objective**

The objective for the use of the AIS Developer Studio is to create a general VDL environment using a PC and optional hardware / external RF signal generator / power pad. Where the choice of the base-band VDL / VDO and VDM data is easily analyzed and defined. As an AID to AIS

This product should only be used for the purposes intended by its developers and then only according to acceptable reference standards and operating procedures.

Any deviation from this may well be in conflict with competent regional authorities in your area.

**The AIS Developer Studio and or Interface/s should not be used to alter the operational status of any AIS unit unless authorized by a competent authority.**

**Under no circumstances should the AIS Developer Studio and or Interface/s be used to create any signal content outside the scope of this document using any procedure or method offered by the AIS Developer Studio Interface.**

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**AISTE.ST** formerly Sine Qua Non would like to take this opportunity to congratulate you on the purchase of one of the AIS Developer Studio suite of products. We want to assure you that this product range is designed using over 22 Years of AIS experience and thoroughly tested to ensure your complete satisfaction.

A demonstration program is provided free of charge. AISTE.ST requires that the user download the demo program and documentation from [www.aiste.st](http://www.aiste.st) and validate it for their respective use prior to placing an order for the un-encumbered licensed version.

### **Limited Warranty.**

Where software discrepancies are identified and or module operational bugs are found. These should immediately be brought to the attention of AISTE.ST. The limited warranty is limited to the rectification of the discrepancy or bug by software upgrade, and should not exceed the original operational and technical specification as defined by AISTE.ST in the respective AIS Developer Studio module.

If you have any questions, queries or customisation requests related to this product, please do not hesitate to contact us by email:

Physical Address:  
28 Mustang Ave  
Pierre Van Ryneveld  
Centurion  
Gauteng  
South Africa

Postal Address:  
28 Mustang Ave  
Pierre Van Ryneveld  
Centurion  
Gauteng  
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Website: [www.aiste.st](http://www.aiste.st)  
[www.sinequanonth.co.za](http://www.sinequanonth.co.za)

Telephone: +27 0722253467

Thanking you,

**AISTE.ST**



### Installation

The installation of AIS Developer Studio is as follows.

Obtain the latest version of AisDeveloperStudioDemo.exe for your requirement from [info@aiste.st](mailto:info@aiste.st).

Create a new folder. Save the downloaded files in the folder. Run the application. This will allow the unit to run in demo mode.

Certain aspects of the application will not run in demo mode.

**AIS Developer Studio is not freeware.**

Once you have evaluated it for your purpose please purchase your license file from [www.aiste.st](http://www.aiste.st). Save your purchased file's in the above-mentioned folder.

The license file will provide full user login details.

This will allow the application to run in full un-unencumbered mode.

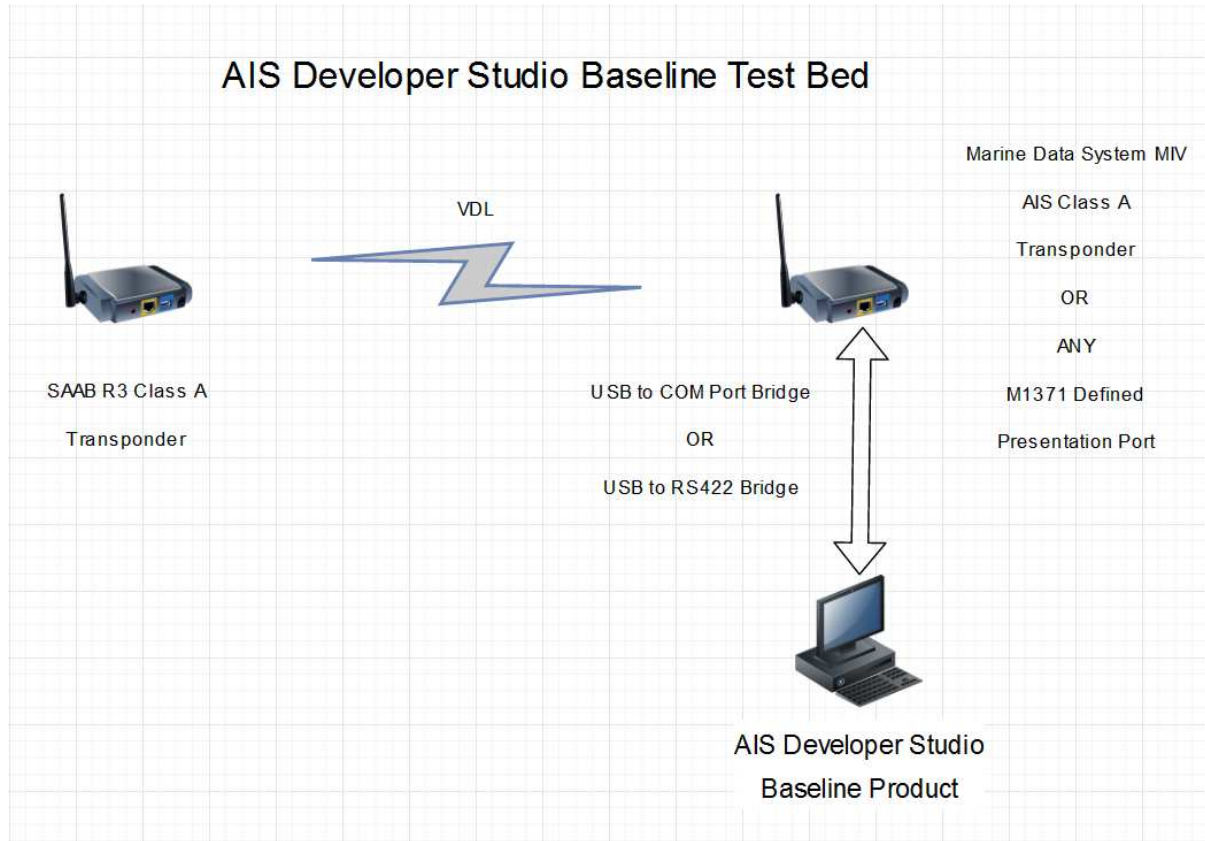
Registered users will receive support if any problems with AIS Developer Studio arise.

ALL requests for support should be addressed to [support@aiste.st](mailto:support@aiste.st) explaining any bug or discrepancy as well as a screenshot.

It is the intention of AISTE.ST through the current and further development of the AIS Developer Studio suite of components to continue to supply a cost effective method for development, production, integration and verification of protocols as used by AIS, ASM and VDE.

It is the intention of AISTE.ST to supply upgrades to the AIS Developer suite user group if and when they become available.

Users may subscribe to this upgrade service.



**Method:**

Set-up your test / development bed as above or according to your target requirement.



## Hardware Set-up Procedure

Connect EUT / DEVELOPMENT or M1371 / IEC61162 VDO/VDM presentation port to USB to RS232 / RS422 cable bridge. We make exclusive use of commercial FTDI Windows's compatible devices.



Using PUTTY or similar Communications Program verify reception of EUT / DEVELOPMENT or M1371 / IEC61162 !AIVDO / !AIVDM \$AIALR / \$AITXT strings.

```
COM1 - PuTTY
$PMDSSN,0054,9,4,4,4,3,1*70
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
!AIVDO,1,1,,B,1000F;QP?w<tSF014Q@>4?v01PS7,0*40
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
!AIVDO,1,1,,A,1000F;QP?w<tSF014Q@>4?v01pIN,0*00
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
!AIVDO,1,1,,B,1000F;QP?w<tSF014Q@>4?v01PS7,0*40
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
$AIALR,165341.00,006,V,A,AIS: general failure*07
!AIVDM,1,1,,B,121P7E0P?w<tSF014Q@>4?wvqd01,0*19
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
!AIVDO,1,1,,A,1000F;QP?w<tSF014Q@>4?v01pKp,0*3C
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
$AITXT,01,01,90,MODE aut RR030 SyncM V MMSI000005678 NRships001 RB N*11
$AITXT,01,01,91,VDL1 TX161975000hz .50 RX161975000hz .50 2W M G B 25kHz*42
$AITXT,01,01,91,VDL2 TX162025000hz .50 RX162025000hz .50 2W M G B 25kHz*41
$AITXT,01,01,91,VDL3 TX156525000hz .50 RX156525000hz .50 12W M F B 25kHz*50
$AITXT,01,01,92,FP 329 RP 7 PAT 394*3B
!AIVDO,1,1,,B,1000F;QP?w<tSF014Q@>4?v01d01,0*11
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
!AIVDO,1,1,,1000F;QP?w<tSF014Q@>4?v01P00,0*66
```

You have now verified that your hardware presentation port, wiring and PC setup is functional.

You have now concluded Hardware Setup Procedure.  
This will now be referred to as the AIS Developer Studio EUT Presentation Comport





## Run AIS Developer Studio Application

It can be run from the folder where it has been saved. It is a stand alone compiled exe. It does not require installation.

## Login

login

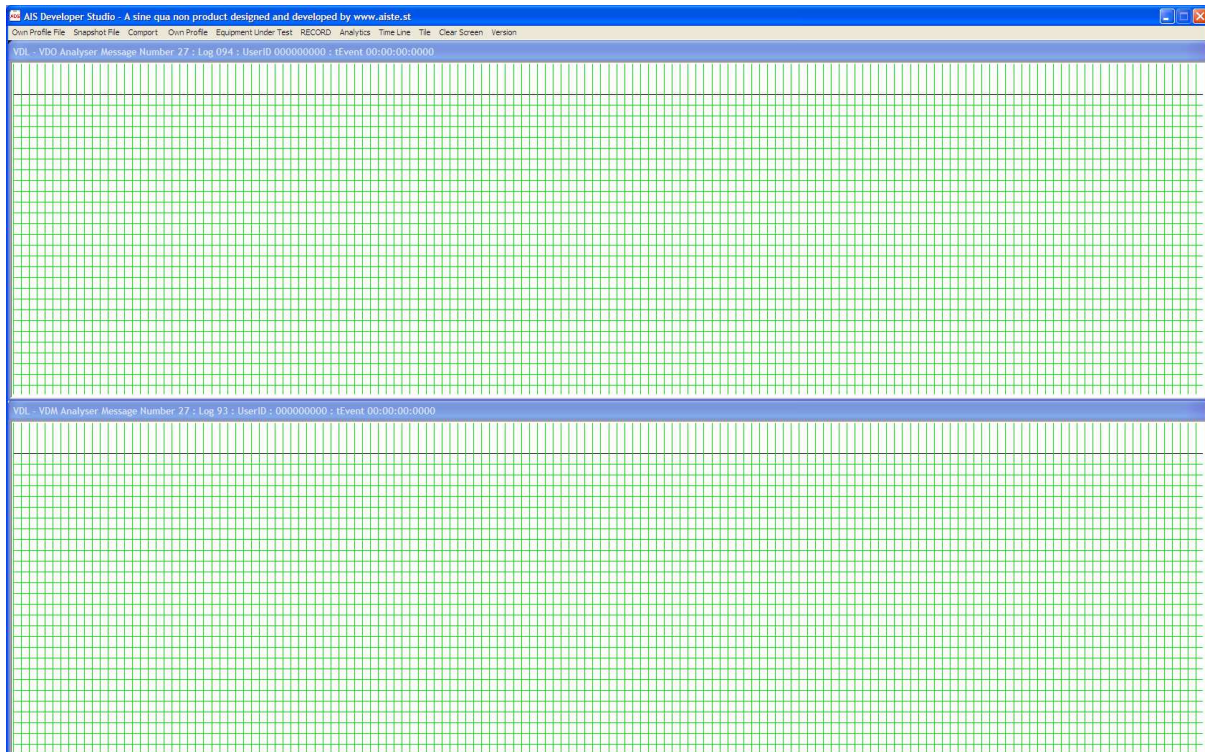
name DEMO

email DEMO

company DEMO

Enter the details that were supplied to you in your license.txt file.

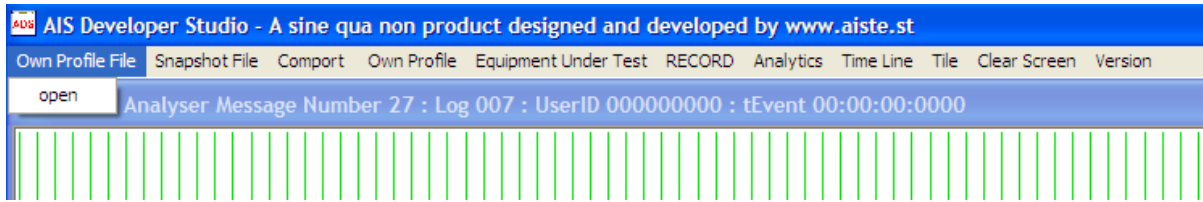
**Store your license.txt file in a safe place.**



The application main window will be displayed.



## Open Own Profile File



It consists of all the default values used in AIS Developer Studio Own Profile Dialog.

It is a text only - markup language file.

Make a copy and edit your copy with your default values.

Keep the original for comparison purposes.

This file can be edited using any text editor.







### **Important User ID'S**

`<ProductMmsi>990001234</ProductMmsi>`

This is the user ID for AIS Developer Studio.

If you have the VDO / VDM Generator MODULE option and want to make use of the context menu VDO / VDM generator, it will use the "Own Profile" values to create the various AIS Messages.

`<VdoMmsi>5678</VdoMmsi>`

This is the Equipment Under Test user ID or the targeted incoming VDO stream ID from a presentation port interface.

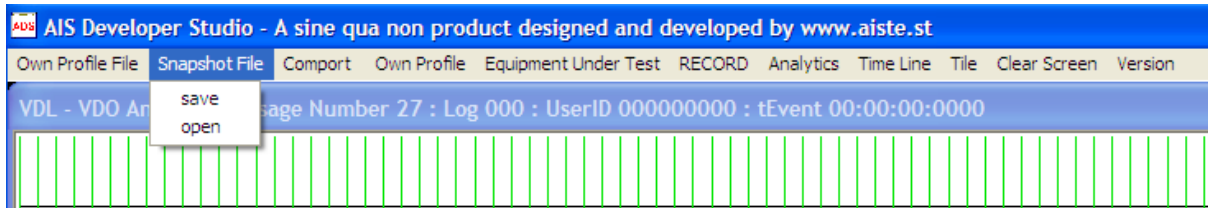
`<VdmMmsi>135792468</VdmMmsi>`

This is the Equipment Under Test user ID or the targeted incoming VDM stream ID from a presentation port interface.

These three values must be correct in order for the RECORD and ANALYSIS process to function correctly.



### SNAPSHOT FILE



#### SAVE:

A snapshot of the AIS Developer Studio visual dual time line and recorded analysis data object can be saved at any time.

Make sure that you choose a different file name for each save.

#### OPEN:

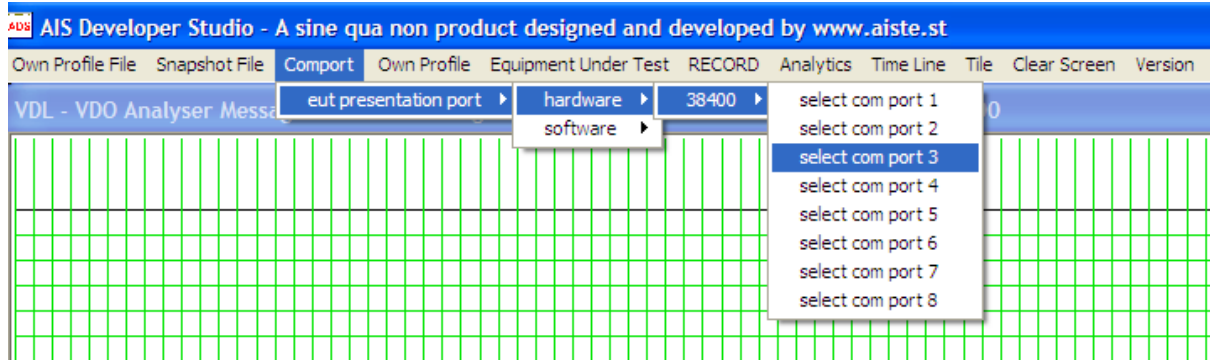
A snapshot of the AIS Developer Studio dual time line and recorded analysis data object can be opened at any time.

It will contain the current visual main window dual time line events as well as any recorded analysis data.

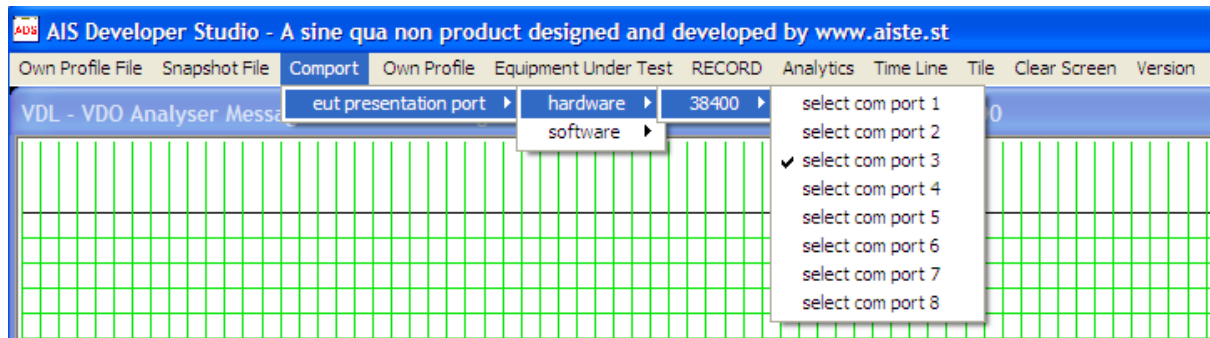


## Comport Set-up

Select the comport number you verified in Hardware Set-up Procedure above.



If the comport exists in the PC and was correctly opened a check mark will appear next to the comport menu item.

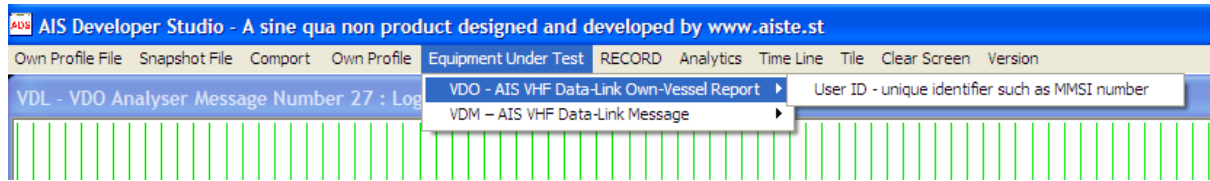


If you wish to close the comport, re-select the menu item and the application will close the comport.

The check mark will no longer be visible.



## Equipment Under Test



Using this menu option you can verify or LOCALLY modify the EUT VDO and or VDM MMSI.

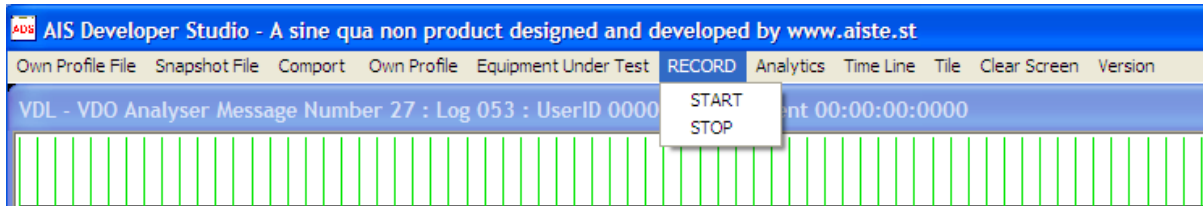
This is handy if you are in a multi transponder environment and you want to start a new recording of a different transponder unit not in your profile file.

They can be modified or verified *locally* using the Equipment Under Test Menu Item.





### RECORD Set –up



In order to have valid analysis data you need to RECORD a file.

Analysis can only take place once you have stopped the recording process.

The RECORD data object will store a maximum of 600 events.

This is based on a maximum of 2 second updates for 20 minutes.

The incoming VDO and VDM streams for the targeted EUT MMSI are recorded.

NO recording will take place if you have not entered a EUT presentation port MMSI contained in the incoming comport stream.

**START:**

Truncates and starts the RECORD data object from the beginning.

**STOP:**

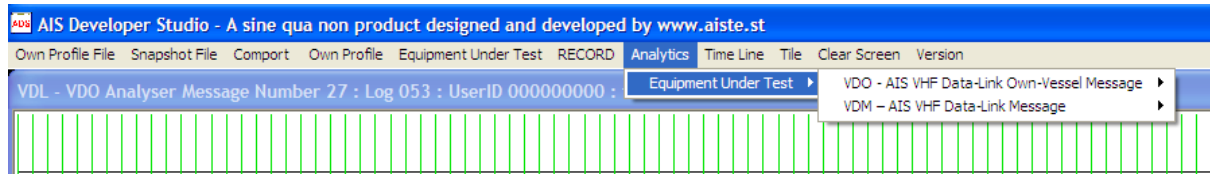
Stops the RECORD process. This does not save the file.

**NOTE:**

If you want to save a snapshot, this would be a good time.

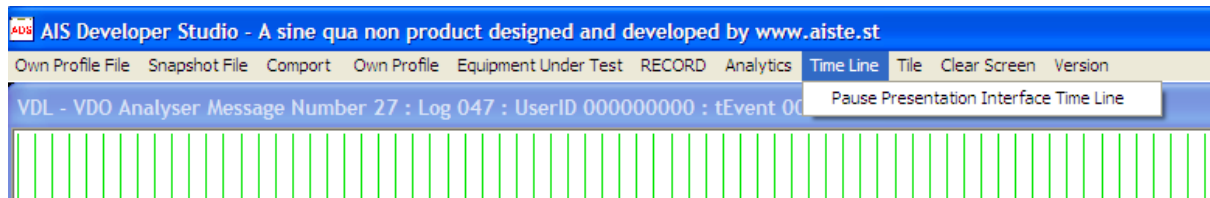


## ANALYTICS



Select which of the incoming VDO /VDM data objects to send for graphical representation.

## TIME LINE



You can pause the updating of the dual TIME LINES as well as recording process.

This can be handy if you want to record the current screen as a snapshot of events.

## TILE

Tiles Time Line Windows

## CLEAR SCREEN

Clears Time Line Data Objects

## VERSION

Application compilation number. This number is unique for every user.



### Baseline MODULE

The AIS Developer Studio Baseline MODULE consists of the following:

*A method of visualizing the VDL output from an AIS Presentation Port in the form of !AIVDO, !AIVDM, \$AIALR and \$AITXT strings using a dual time line display.*

In order to evaluate we are going to do a real time analysis of network entry of the two transponders indicated in the above hardware set-up using the AIS Developer Studio Baseline MODULE.

The SAAB R3 transponder used is the first Class A type approved transponder and was acquired in the first years of 2000.

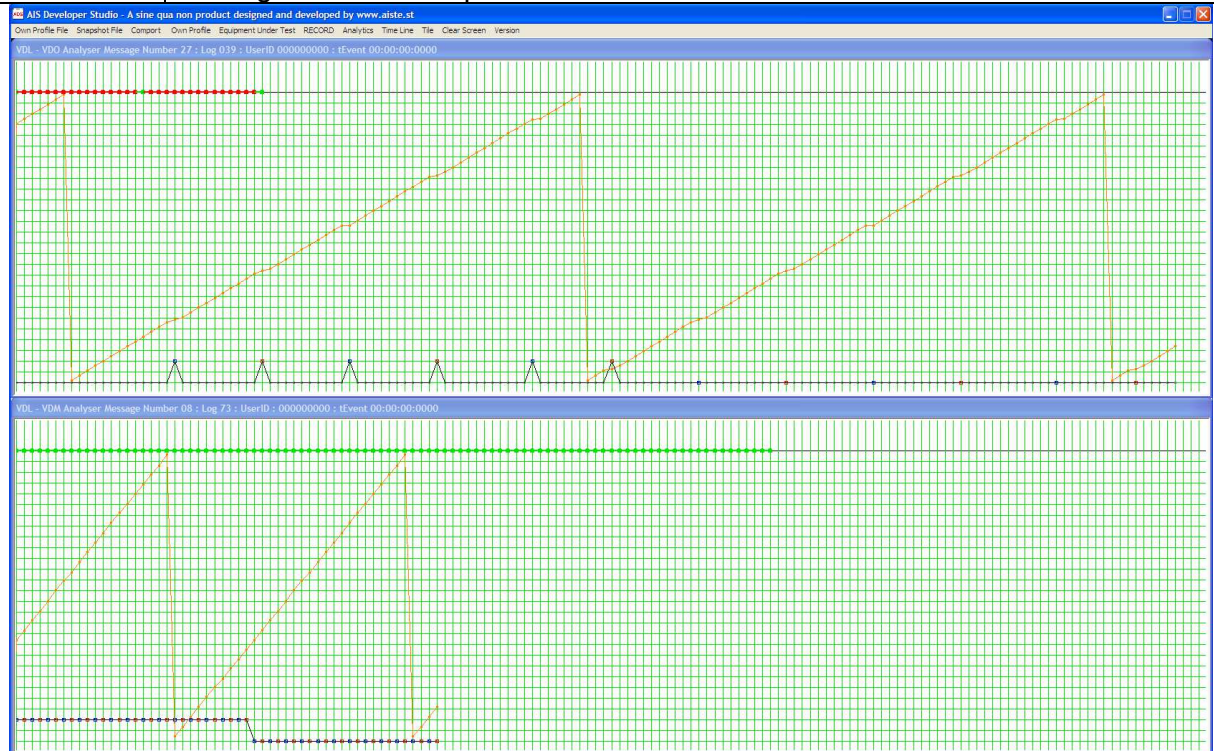
The MDS MIV Class A type approval was a few years later according to M 1371-1, pre - dating 2004.

Method	
1	Set-up test bed as per "AIS Developer Studio Baseline Test Bed above".
2	Set-up hardware comport interface as per "Hardware Setup Procedure above".
3	Run AIS Developer Studio Application.
4	Login
5	Select Own Profile File Menu Item and open profile as per "Open Own Profile File" above.
6	Select Comport Menu Item and select comport as per "Comport Set-up above".
7	Using Equipment Under Test Menu - verify EUT MMSI used in test bed. MDS MIV(000005678) = !AIVDO...
8	Using Equipment Under Test Menu - verify EUT MMSI used in test bed. SAAB R3(135792468) = !AIVDM...
9	Select RECORD Menu Item and select as per RECORD Set-up
10	Switch power on to both transponders used in the test bed at the same time.



**!AIVDO  
MDS MIV**

6 Alternating transmission's of Msg 3 over 1 minute period, then steady state  
Msg 1.  
Average time interval per transmission = 10 seconds



**!AIVDM  
SAAB R3**

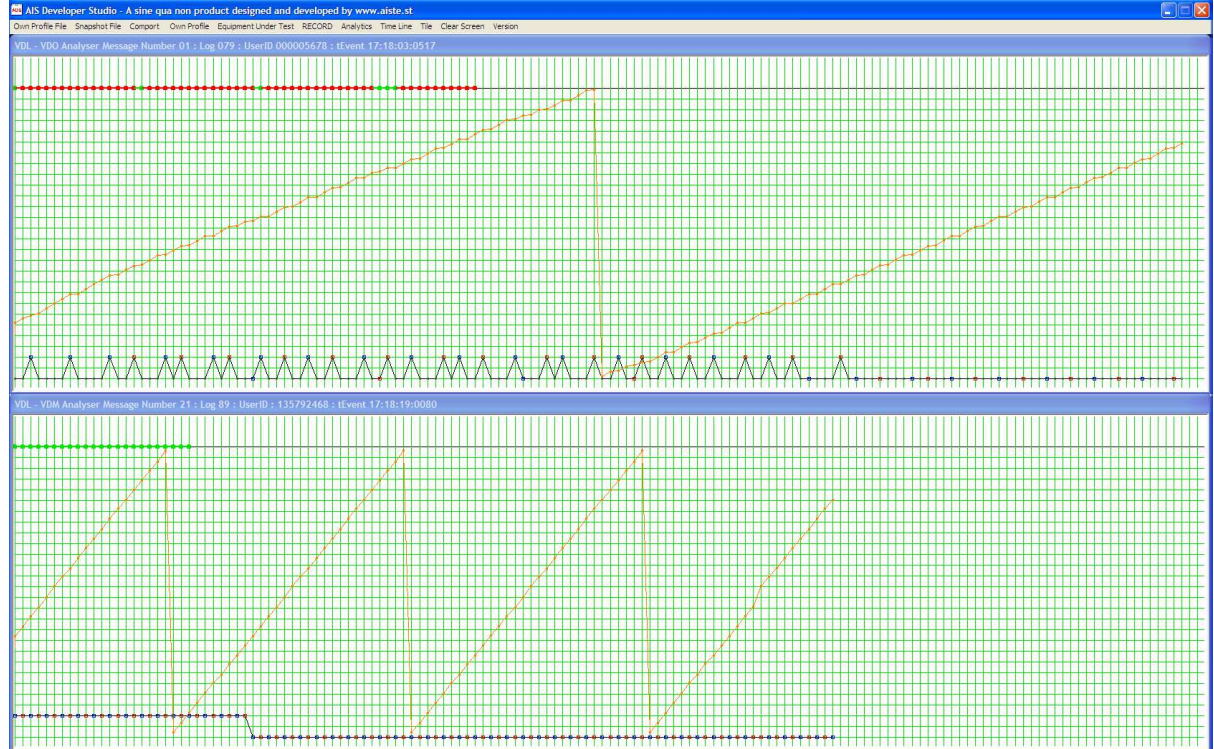
Multiple alternating transmissions over 1 minute period.  
Average time interval per transmission = 2 seconds





**!AIVDO  
MDS MIV**

**Alternating Msg 3 change of state announcement changing update rate  
Then steady state Msg 1**



**!AIVDM  
SAAB R3**

**Steady state alternating Msg 1 transmissions**

**!AIVDO  
MDS MIV**

**Single Msg 5 transmitted nominally 6 minutes after network entry**



**!AIVDM  
SAAB R3**

**Steady state alternating Msg 1 transmissions**





!AIVDO  
MDS MIV

Steady state alternating Msg 1 transmissions

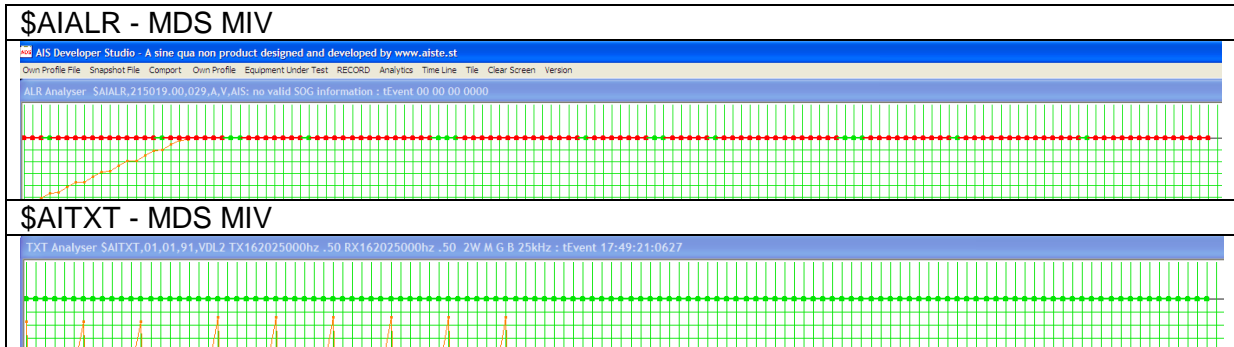


!AIVDM  
SAAB R3

Alternating Msg 5 transmitted nominally 6 minutes after network entry followed by two Msg 3 change of state transmissions on same channel.



*A method of visualizing the EUT output from an AIS Presentation Port in the form of \$AIALR and \$AITXT strings using a dual time line display.*



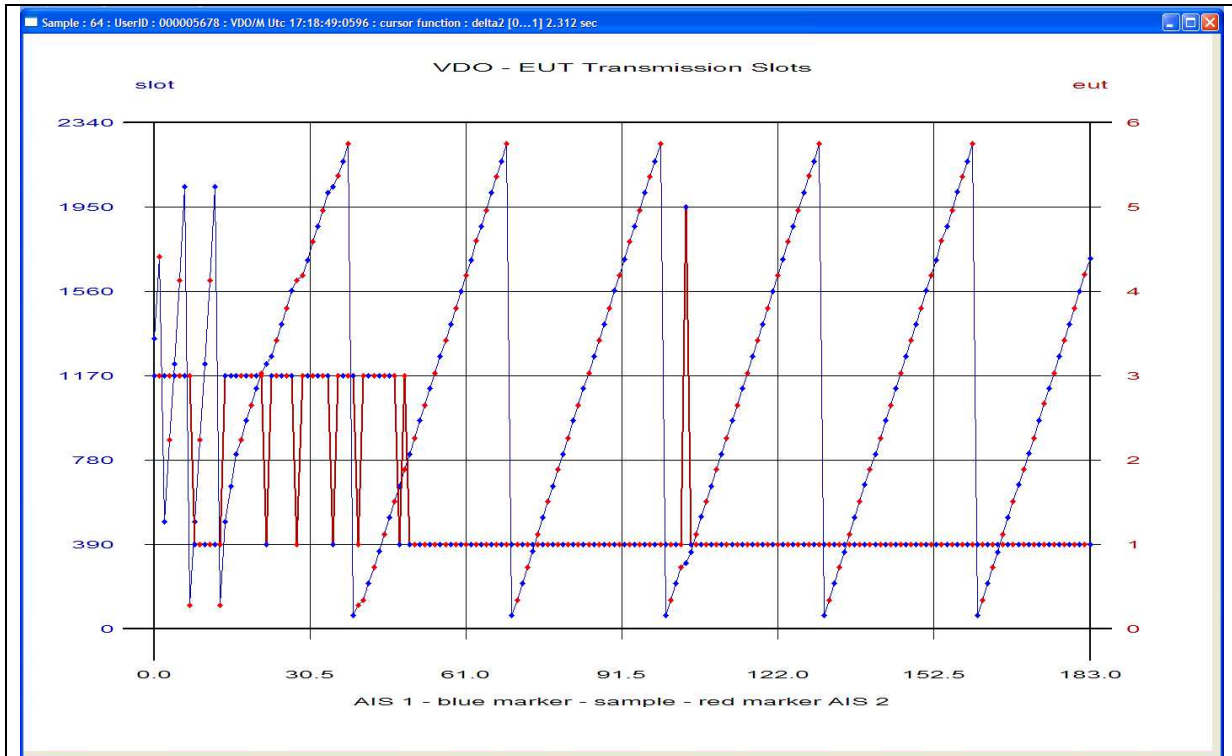
Place mouse cursor over ALR or TXT timeline. If data is recorded it will display in the respective window as formatted text.



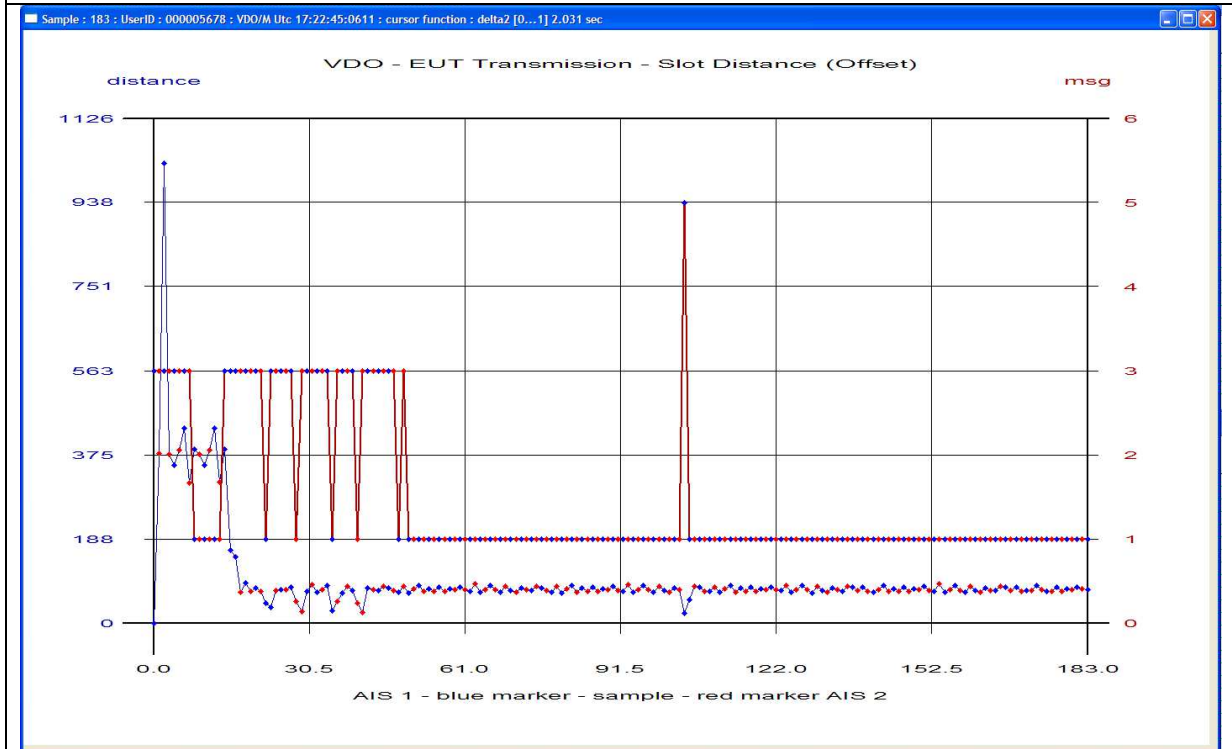
A method of recording the VDL output from an AIS Presentation Port in the form of !AIVDO and !AIVDM strings.

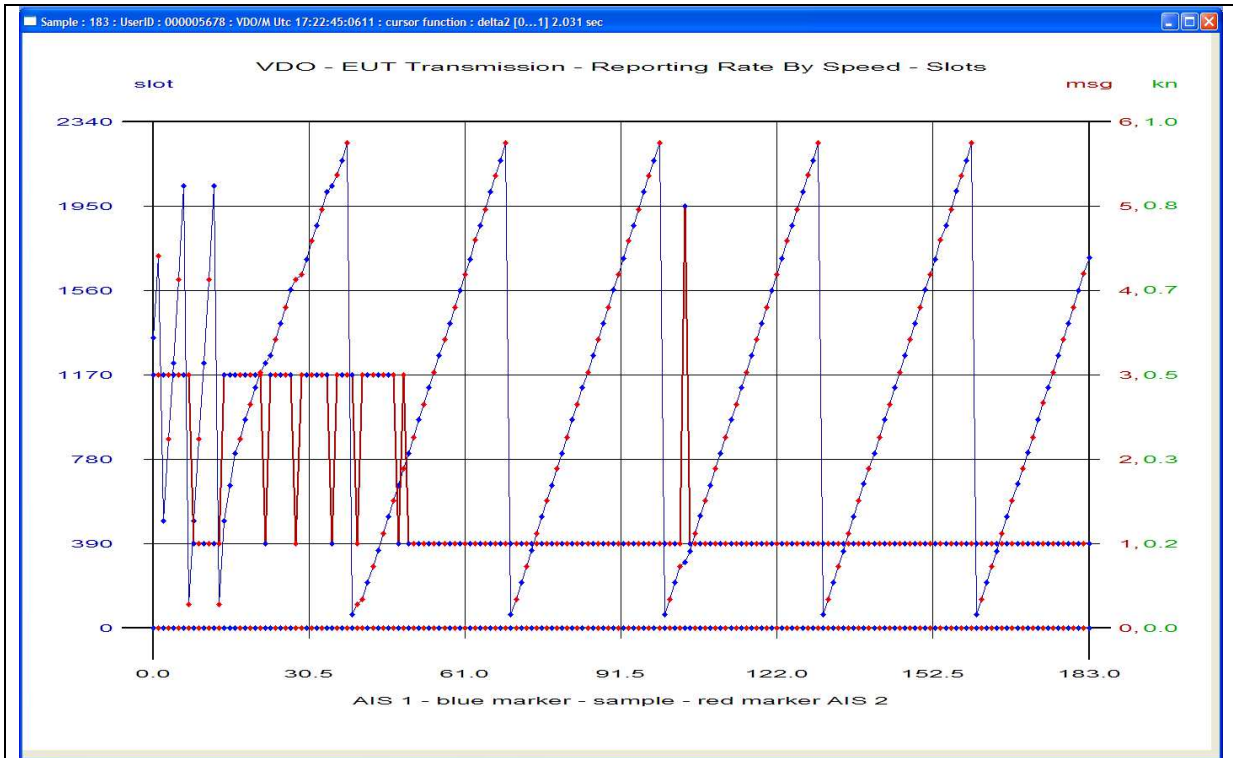
Time Stamping each event with the WINxx clock that should be network locked to a UTC time base. (external network lock).

A method of analysing the nominal slot, slot offset, message, speed, heading and packet data using analysis graphs.

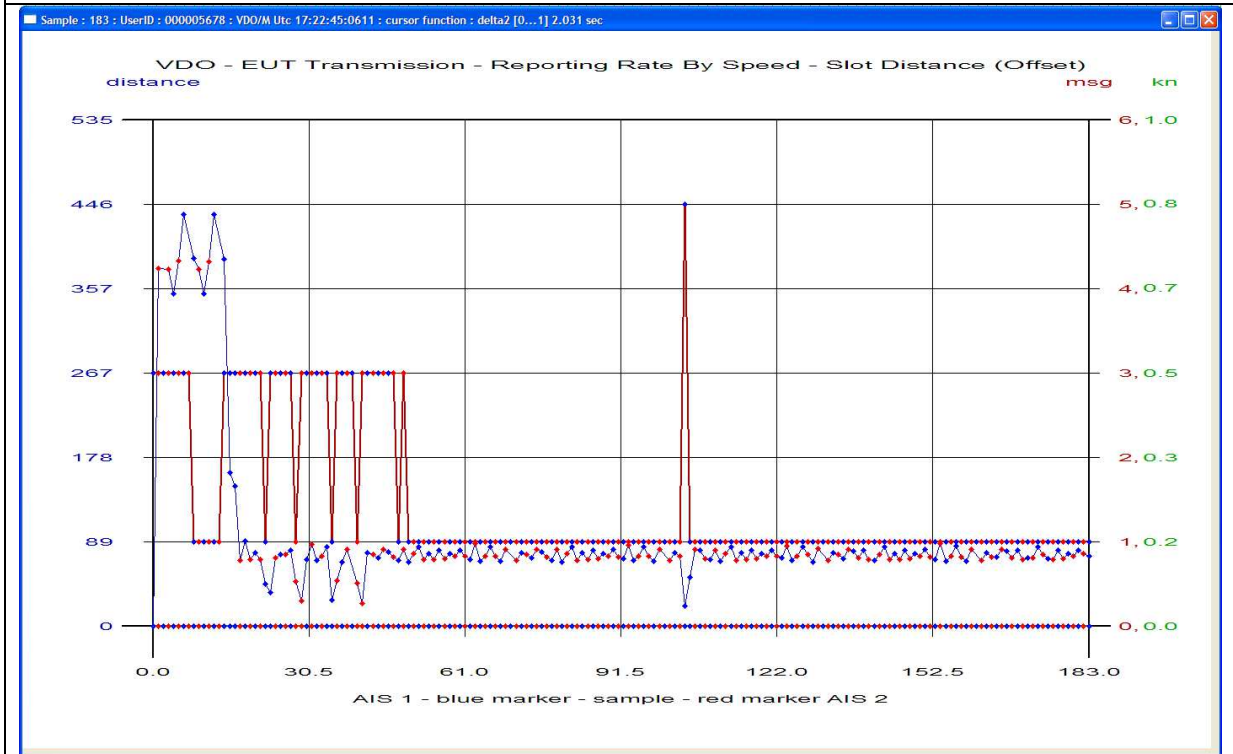


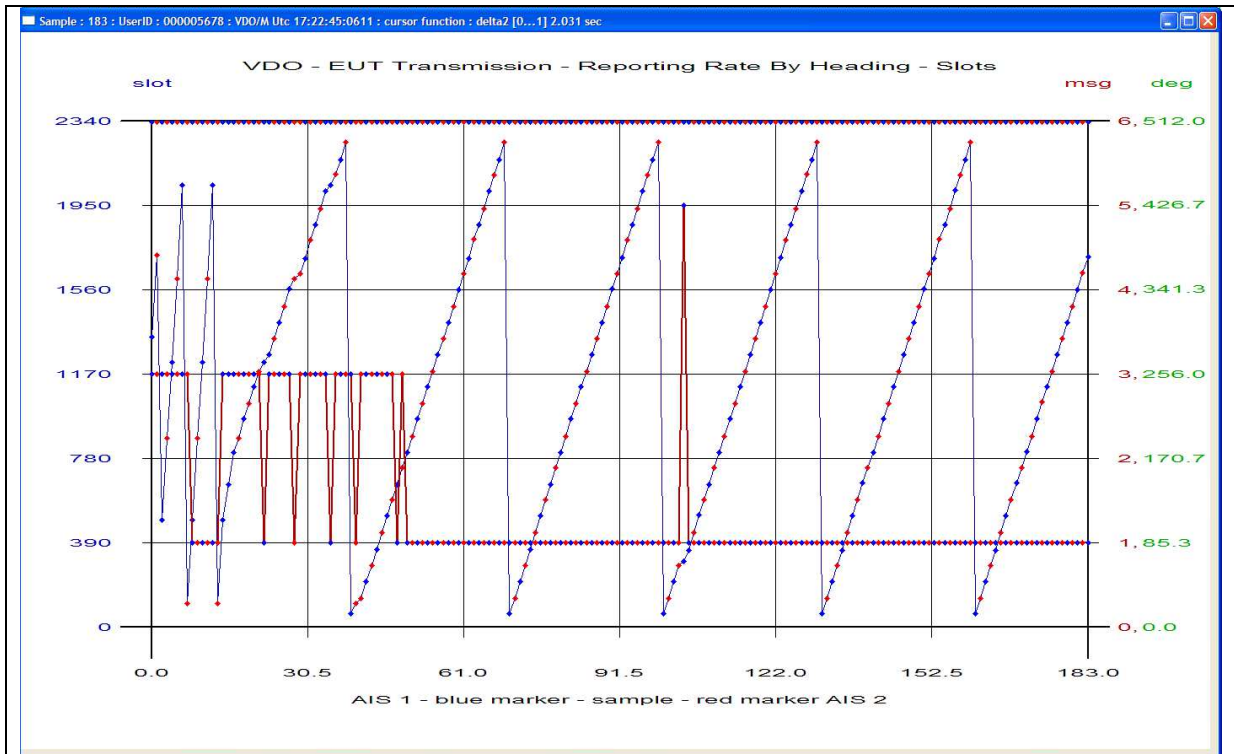
## MDS MIV - Transmission



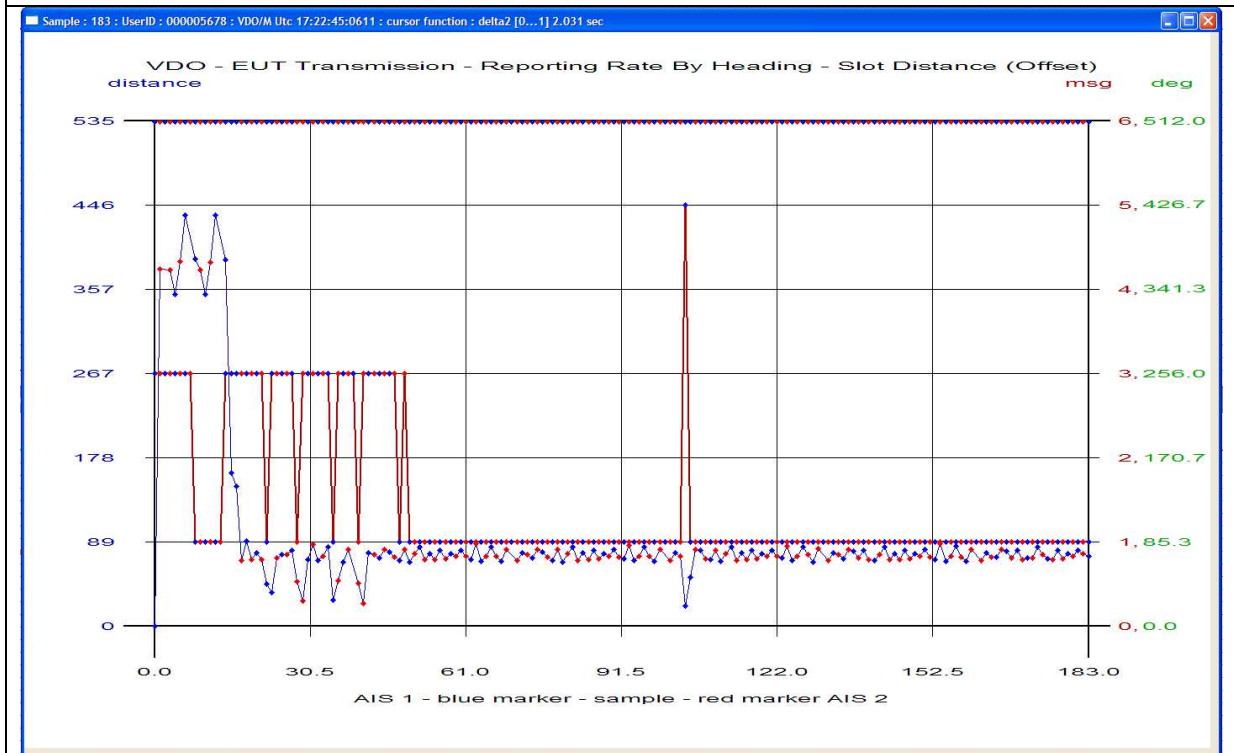


MDS MIV - Transmission

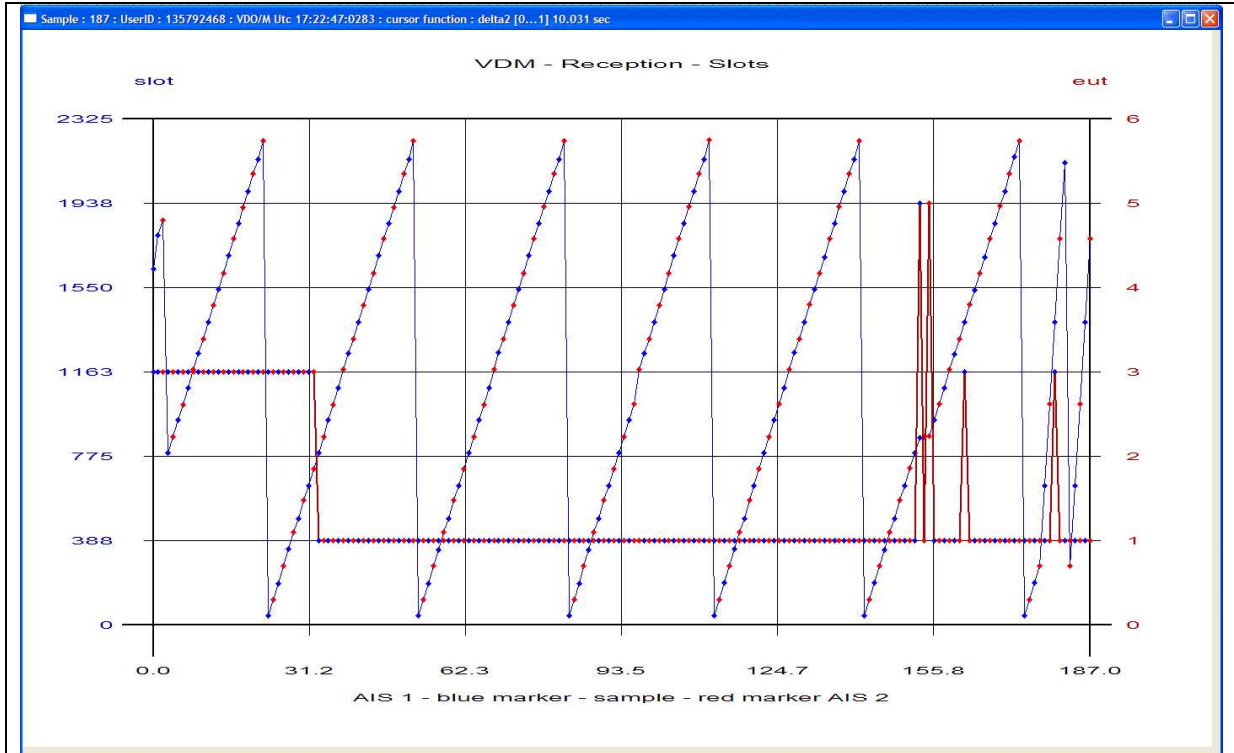




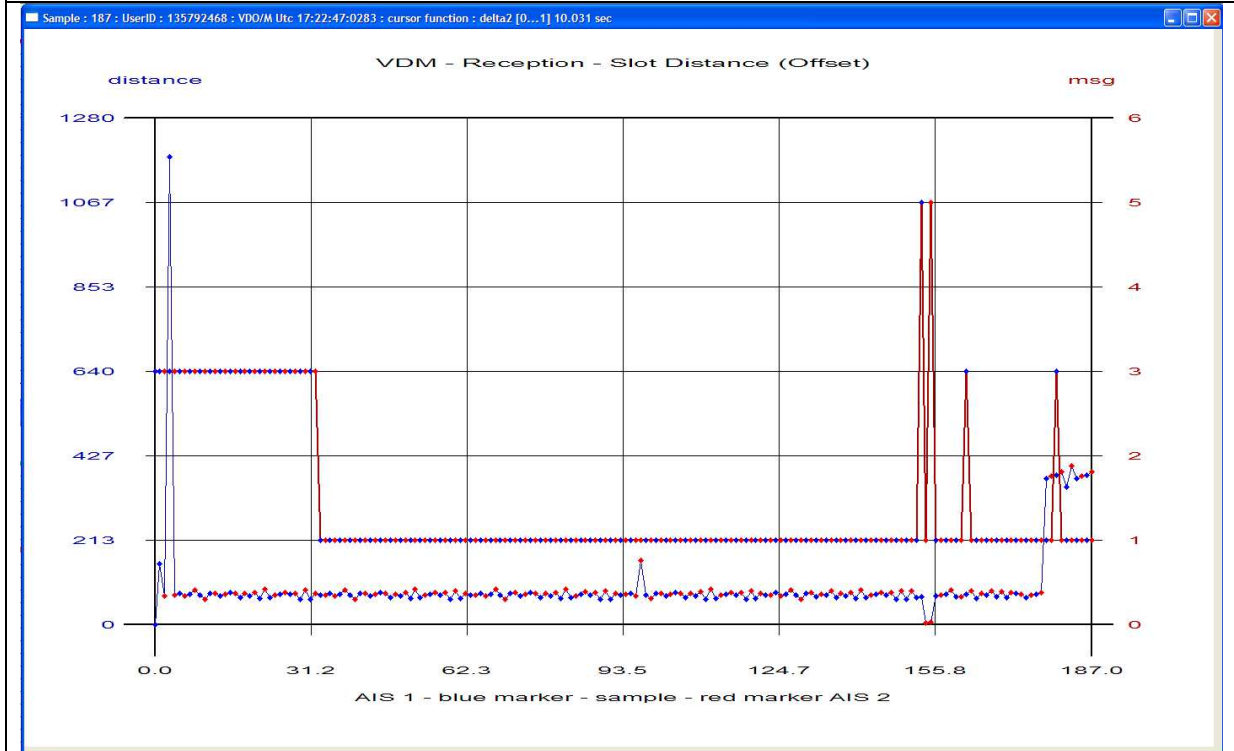
## MDS MIV - Transmission

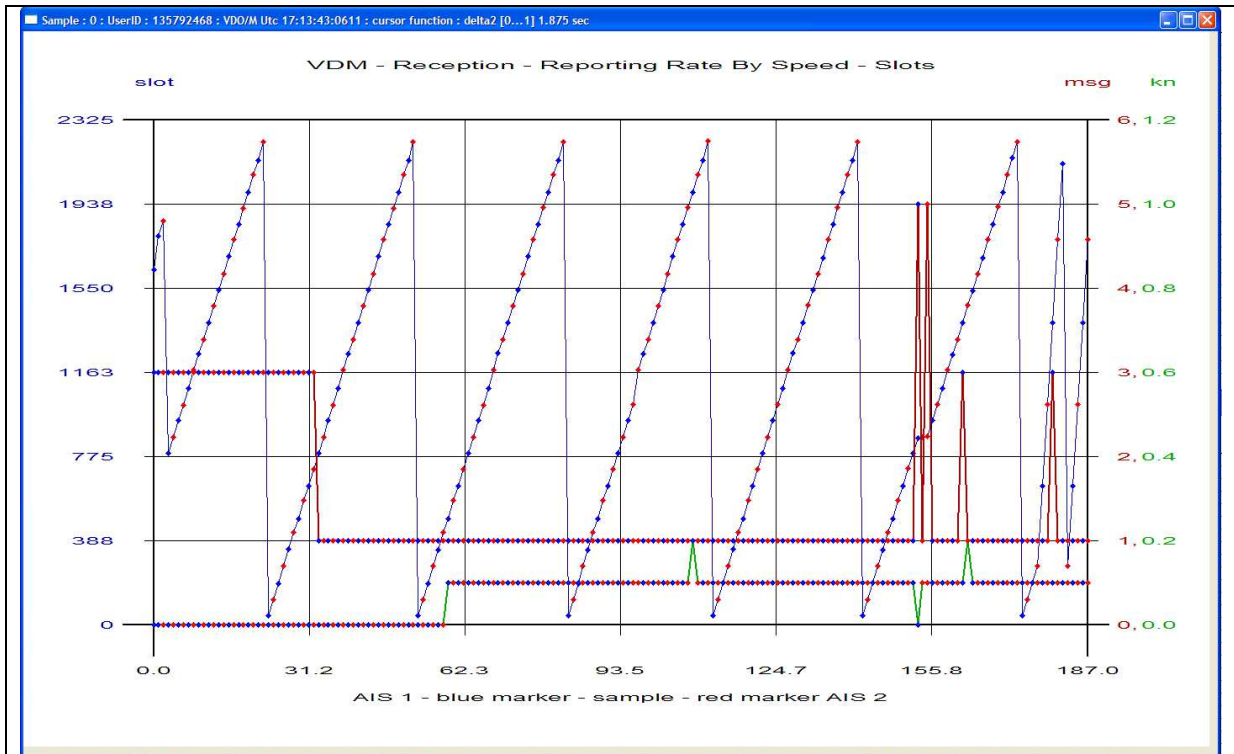




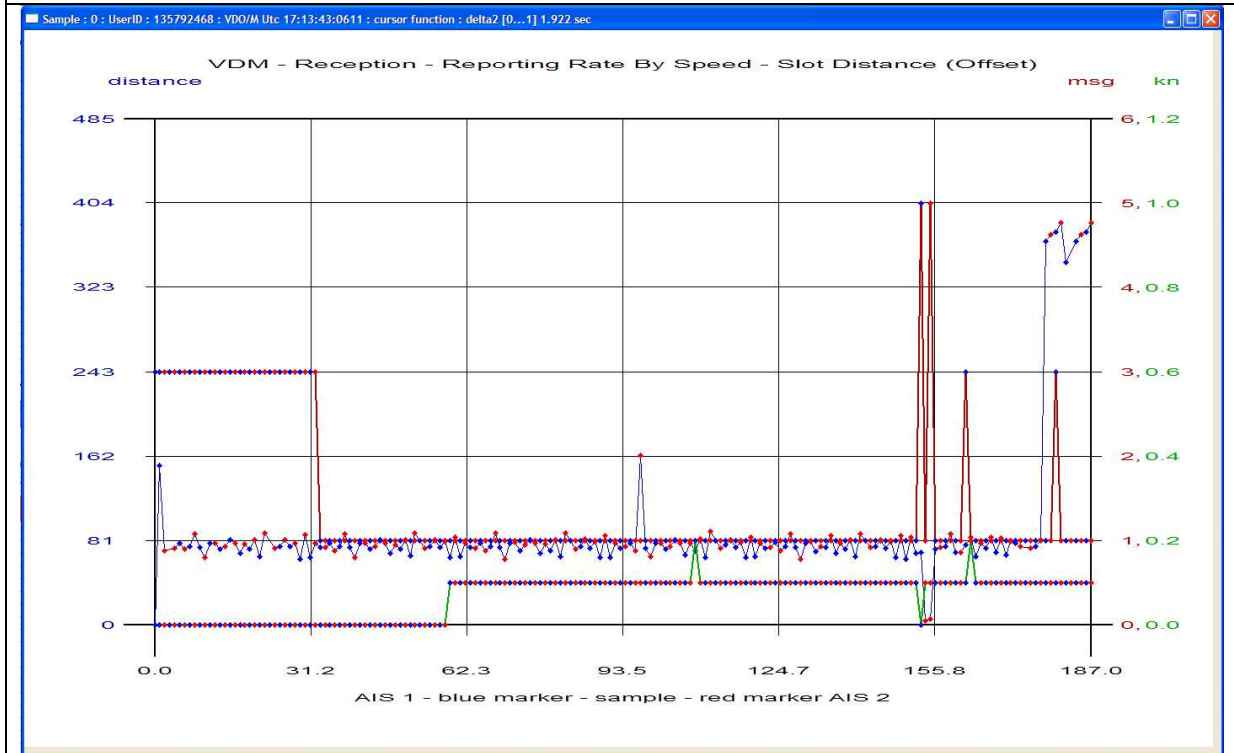


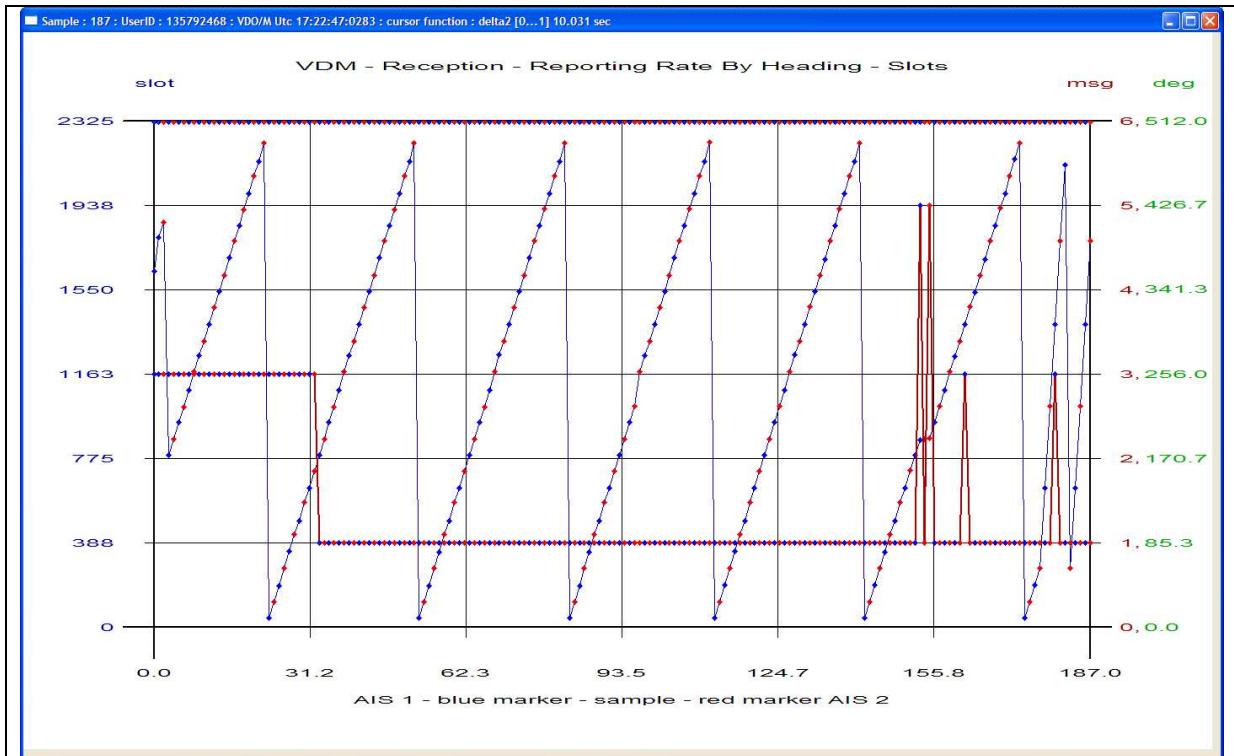
SAAB R3 VDL Transmission -> MDS MIV VDL Receiver



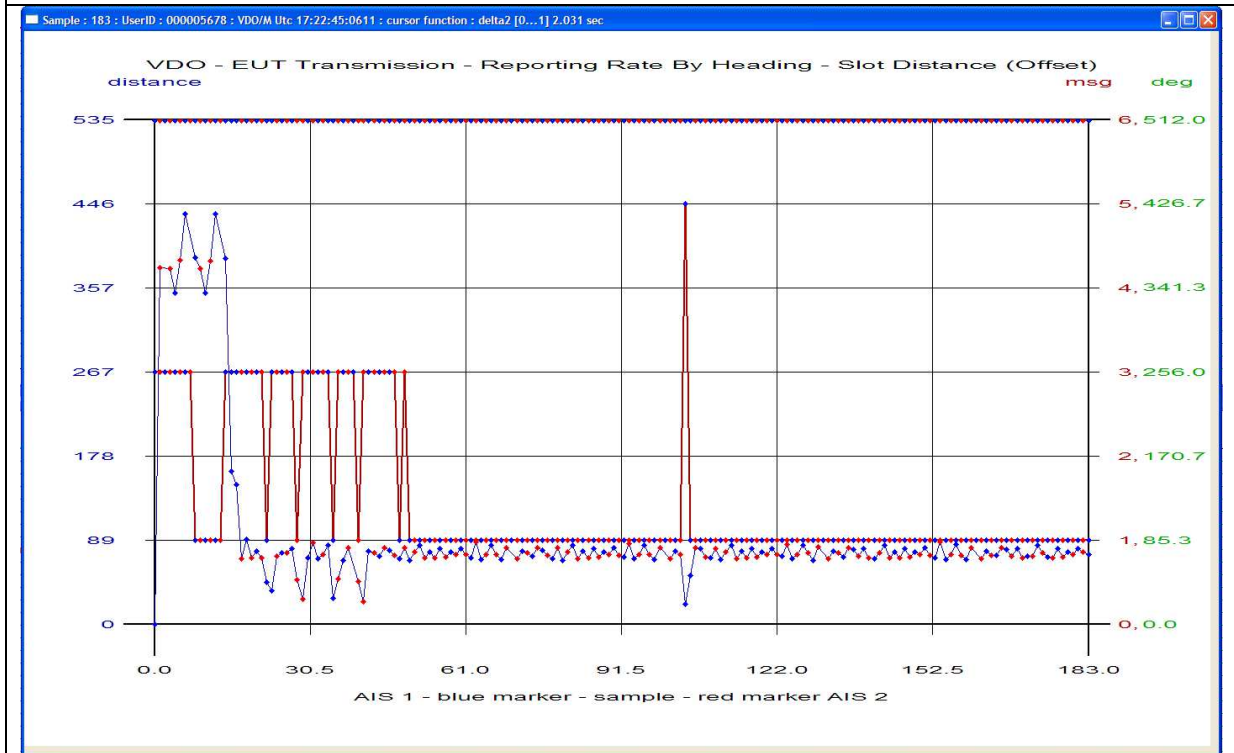


SAAB R3 VDL Transmission -> MDS MIV VDL Receiver





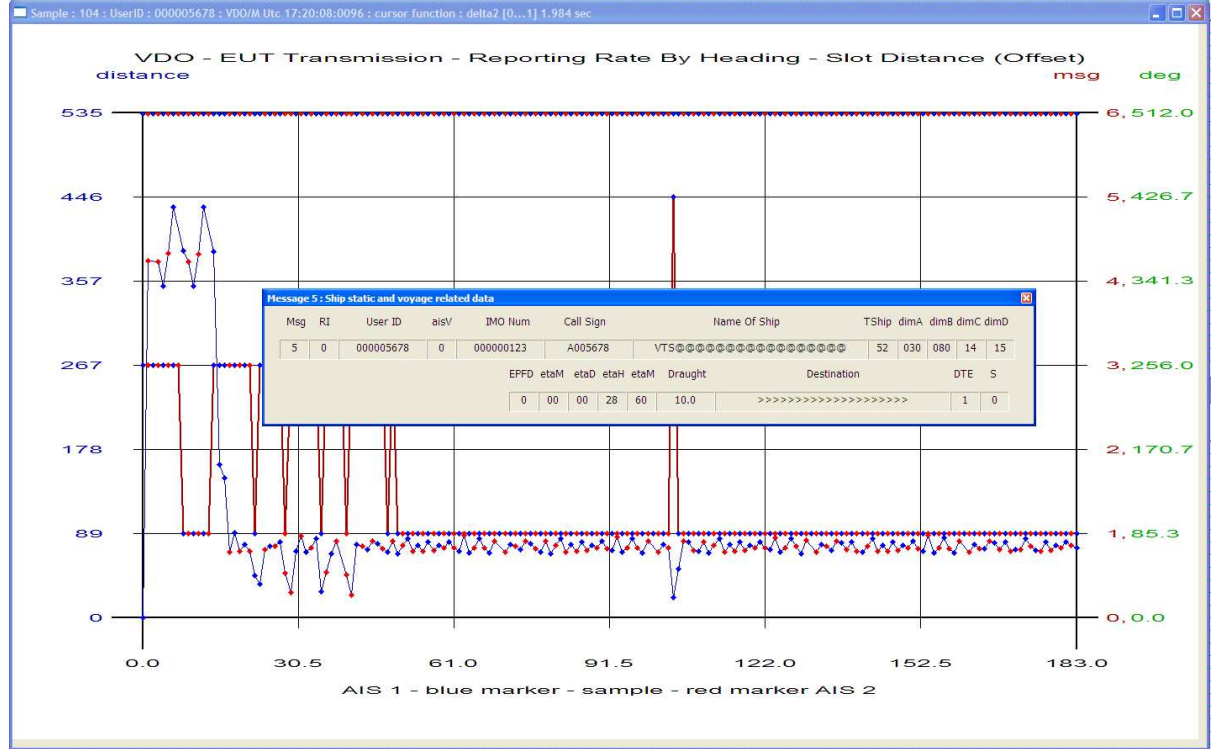
SAAB R3 VDL Transmission -> MDS MIV VDL Receiver



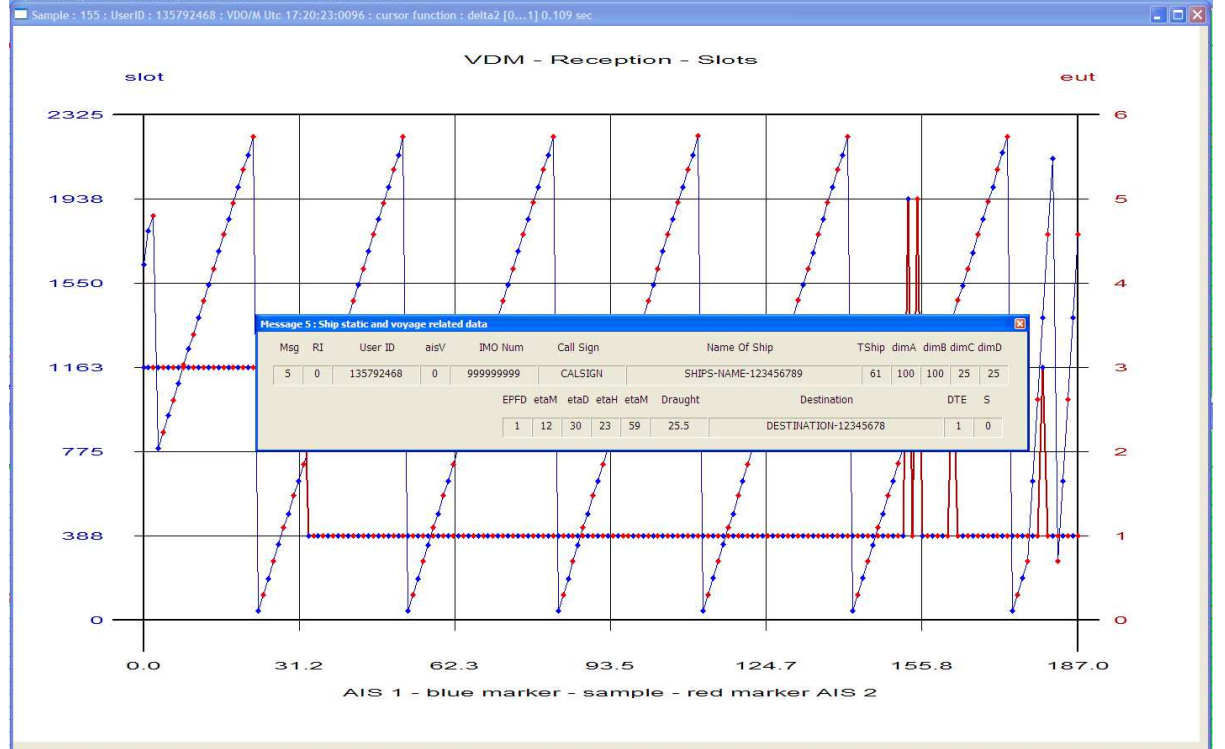


# AIS Developer Studio V2

## MDS MIV VDO Message Filter – UserID 000005678



## SAAB R3 VDM Message Filter – UserID 135792468





*A method of saving a snapshot of current events.*

See SNAPSHOT FILE

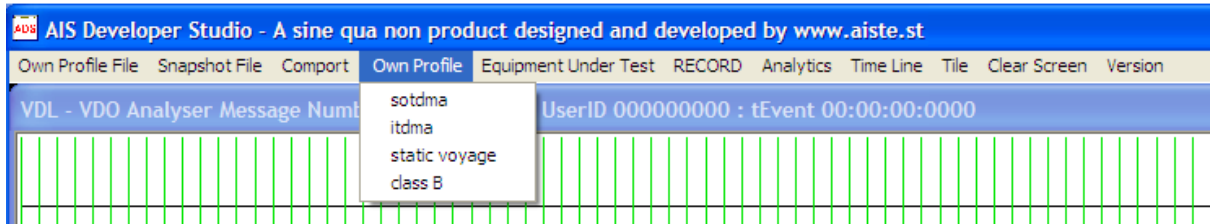
*A method of loading a snapshot for later analysis.*

See SNAPSHOT FILE

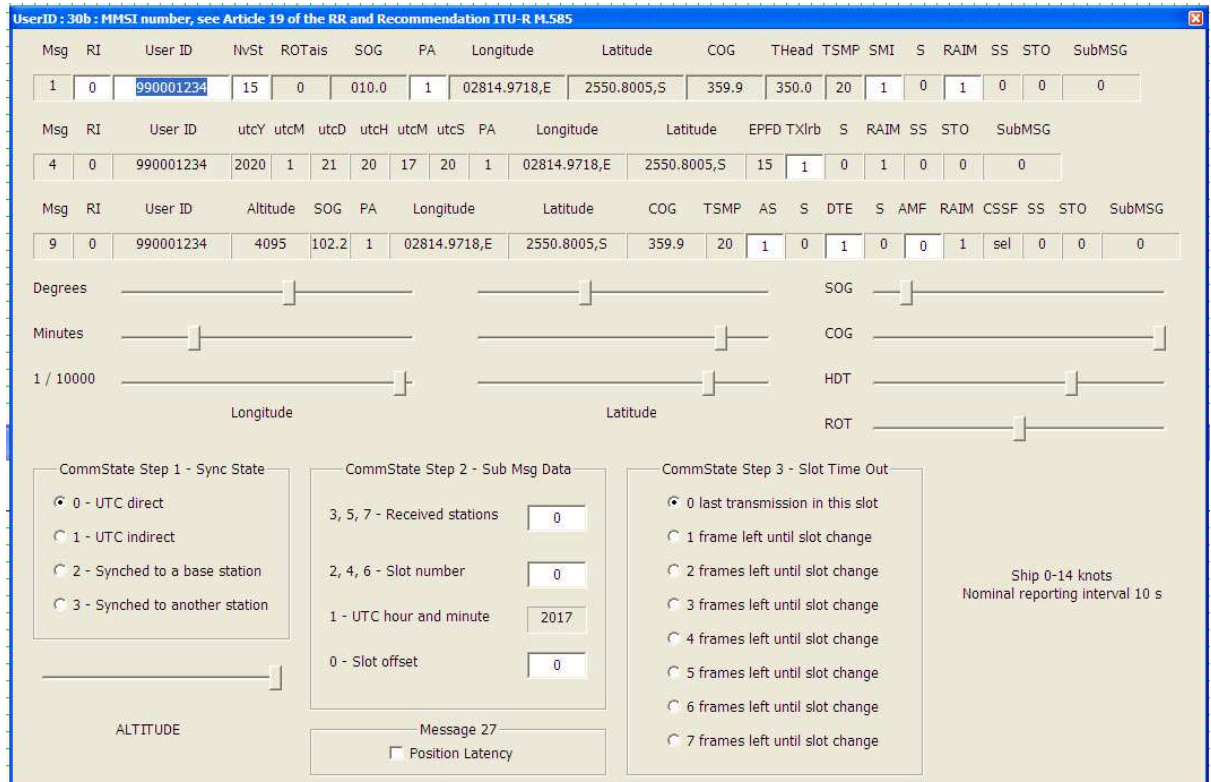




## VDO / VDM Generator MODULE



The Own Profile is used as a static data base for AIS encapsulated message creation. SENSOR, SOTDMA and ITDMA states as well as Class B and AtoN message formats can be created and manipulated easily.





**UserID : 30b : MMSI number, see Article 19 of the RR and Recommendation ITU-R M.585**

Msg	RI	User ID	NvSt	ROTAis	SOG	PA	Longitude	Latitude	COG	THead	TSMP	SMI	S	RAIM	SS	slotI	Nslot	KPF
3	0	990001234	15	0	010.0	1	02814.9718,E	2550.8005,S	359.9	350.0	21	1	0	1	0	0	0	0

Msg	RI	User ID	utcY	utcM	utcD	utcH	utcM	utcS	PA	Longitude	Latitude	EPFD	TXIrb	S	RAIM	SS	slotI	Nslot	KPF
4	0	990001234	2020	1	21	20	19	21	1	02814.9718,E	2550.8005,S	15	1	0	1	0	0	0	0

Msg	RI	User ID	Altitude	SOG	PA	Longitude	Latitude	COG	TSMP	AS	S	DTE	S	AMF	RAIM	CSSF	SS	slotI	Nslot	KPF
9	0	990001234	4095	102.2	1	02814.9718,E	2550.8005,S	359.9	21	1	0	1	0	0	1	sel	0	0	0	0

Degrees

Minutes

1 / 10000

Longitude

Latitude

SOG

COG

HDT

ROT

ALTITUDE

CommState Step 1 - Sync State

- 0 - UTC direct
- 1 - UTC indirect
- 2 - Synchronized to a base station
- 3 - Synchronized to another station

Slot increment

Keep Flag

Number of slots to allocate

- 0 = 1 slot
- 1 = 2 slots
- 2 = 3 slots
- 3 = 4 slots
- 4 = 5 slots
- 5 = 1 slot; offset = slotincrement + 8 19z
- 6 = 2 slots; offset = slot increment + 8 1!
- 7 = 3 slot; offset = slot increment + 8 19

Ship 0-14 knots  
Nominal reporting interval 10 s

**Reference point for reported position and overall dimensions of ship : A : 9b : Bit 21-Bit 29 : 0 - 511 = 511 m or greater**

Msg	RI	User ID	aisV	imoN	Call Sign	Name Of Ship	TShip	dimA	dimB	dimC	dimD
5	0	990001234	2	0	A001234	PORT TUG@@@@@@@@@@@@@@@@	52	25	25	5	5

EPFD	etaM	etaD	etaH	etaM	Sdraft	Destination	DTE	S
15	0	0	0	0	10	CAPE TOWN@@@@@@@@@@@@@@@@	1	0

**Class B unit flag : 1b : 0 = Class B SOTDMA unit**

Msg	RI	User ID	S	SOG	PA	Longitude	Latitude	COG	THead	TSMP	S	Unit	MKD	DSC	Band	ms22	Mode	RAIM	CSSF
18	0	990001234	0	010.0	1	02814.9718,E	2550.8005,S	359.9	350.0	36	0	0	0	0	0	0	0	1	0

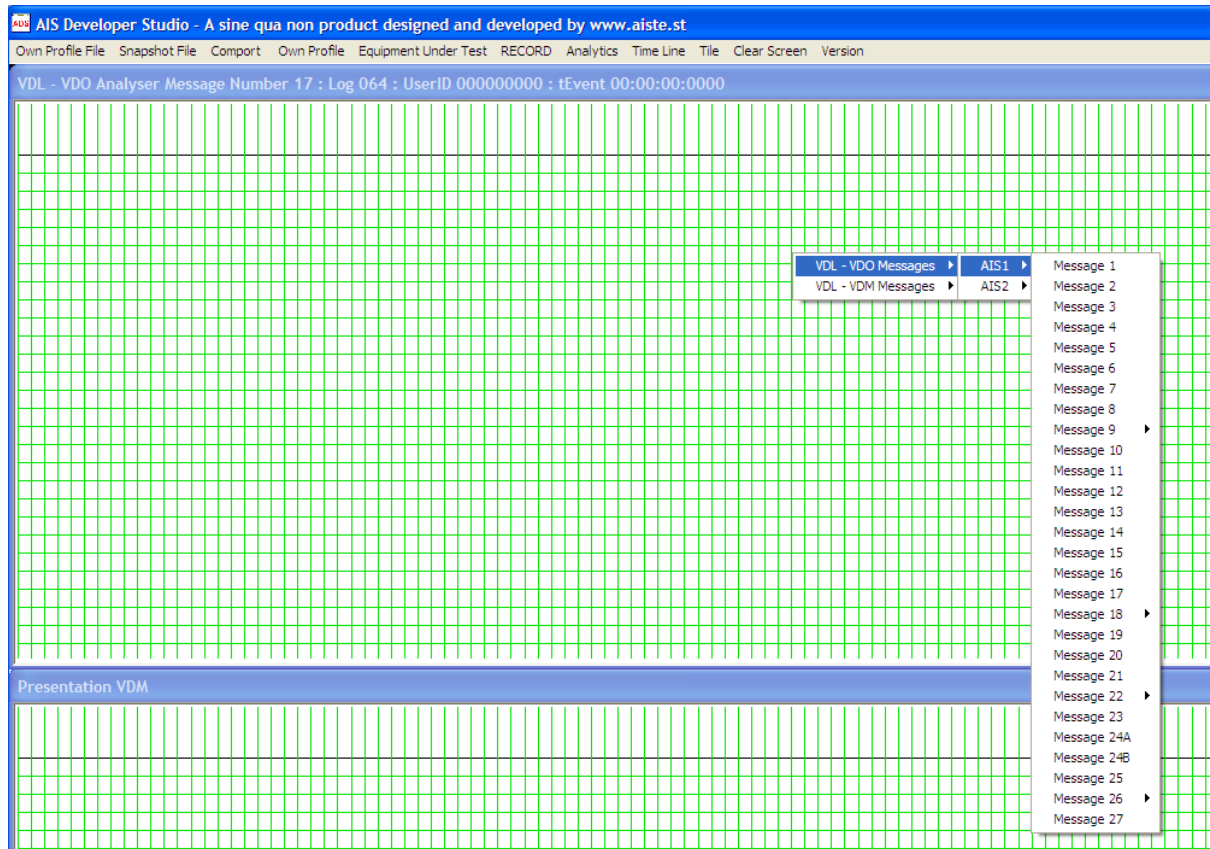
Msg	RI	User ID	PN	Name Of Ship
24	0	990001234	0	PORT TUG@@@@@@@@@@@@@@@@

Msg	RI	User ID	PN	TShip	Vender ID	Call Sign	dimA	dimB	dimC	dimD	EPFD	S	
24	0	990001234	1	52	0	0	A001234	25	25	5	5	15	0

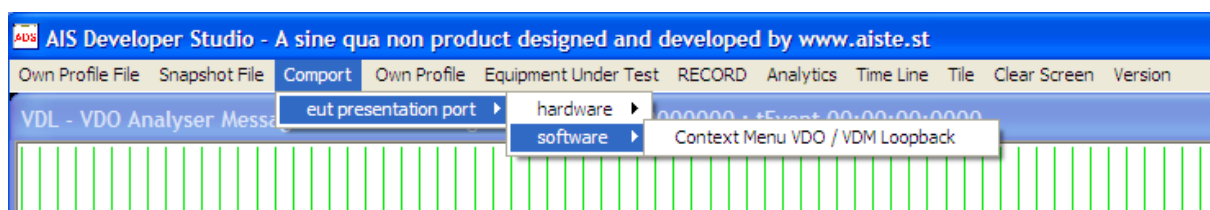


By placing the mouse cursor in the VDO time line and right clicking the mouse, a context menu will be displayed. The user can then select either VDO or VDM message creation.



The VDO / VDM generator module is used to create on the fly AIS encapsulated message's. All 27 M.1371 – 5 messages are supported.

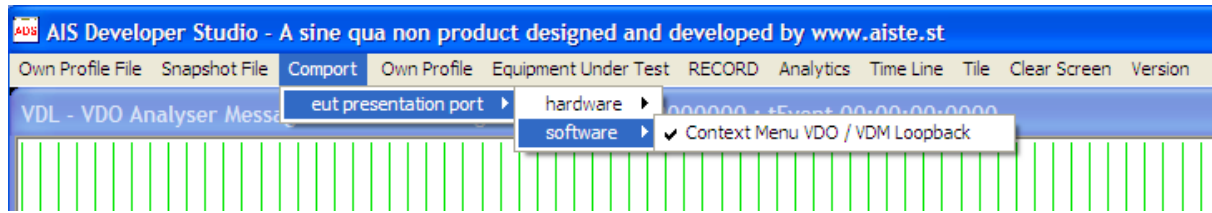
The messages are output on the AIS Developer Studio EUT Presentation comport.



By selecting the software loop back facility, the respective VDO and VDM message will be displayed in the main window dual timeline displays as well as being output on the AIS Developer Studio EUT Presentation comport.



Once selection is made a check mark will appear next to the menu item.



This facilitates easy AIS VDO / VDM message creation that can be ported to a multitude of AIS compatible devices such as chart plotters, marine traffic and navigation displays etc. Any external device which can process an IEC 61162 and or M 1371 AIS VDO / VDM string should be compatible.



### Abbreviations

The following is a list of abbreviations used in the AIS Developer Studio Suite

1pps	1 pulse per second
ACK	Acknowledge
AIS	Automatic Identification System
AIS1	Automatic Identification System channel 1 (161.975 MHz)
AIS2	Automatic Identification System channel 2 (162.025 MHz)
ANT	Antenna
BER	Bit Error Rate
BIT	Built In Self Test
BS	Base Station
BT	Bandwidth Time product
COG	Course over Ground
DBR	Differential Beacon Receiver
DSC	Digital Selective-Calling
DTE	Data Terminal Equipment
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EPFS/D	Electronic Position Fixing System/Device
ETA	Estimated Time of Arrival
GPS	Global Positioning System
HDLC	High-level Data Link Control
IEC	International Electro-technical Commission
IO	Input-Output
ITU	International Telecommunication Union
KDU	Keyboard Display Unit
LR	Long Range
MMSI	Maritime Mobile Service Identities
NU	Not Used
PA	Power Amplifier
PC	Personal Computer
PER	Packet Error Rate
PI	Presentation Interface
RF	Radio Frequency
ROT	Rate of Turn
RX	Receive
SOG	Speed over Ground
TDMA	Time Division Multiple Access
TX	Transmit
UTC	Coordinated Universal Time
VDL	VHF Data Link
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
ADS	AIS Developer Studio V2
NTP	Network Time Protocol
ADS	AIS Developer Studio
SNAPSHOT	EUT VDO + VDL VDM recording session
SNTP	Simple Network Time Protocol





**Reference Documents**

**List of standards and specifications**

Document Number	Title
IEC 61162-1	Maritime Navigation and Radio Communication Equipment and Systems - Digital Interfaces: Part 1 - Single Talker and Multiple Listeners.
IEC 61162-2	Maritime Navigation and Radio Communication Equipment and Systems - Digital Interfaces: Part 2 - Single Talker and Multiple Listeners High Speed Transmission.
IEC 61993-2 IEC 62287 IEC 62320	Universal Shipborne Automatic Identification System (AIS).
ITU-R M.1084-2	Interim solutions for improved efficiency in the use of Band 156-174Mhz by stations in the Maritime Mobile Service.
ITU-R M.1371-5	Technical characteristics for a universal ship-borne automatic identification system using time division multiple access in the maritime mobile band.
ITU-R M.493	Digital Selective Calling (DSC) system for use in the Maritime Mobile Service.
ITU-R M.823-2	Technical characteristics of differential transmissions for global navigation satellite systems from maritime radio beacons in the frequency band 283.5 - 315 kHz in region 1 and 285-325 kHz in regions 2 and 3.
ITU-R M.825-3	Characteristics of a transponder system using DSC techniques for use with vessel traffic services and ship-to-ship identification.
ITU Manual	ITU Manual for use by the Maritime mobile and Maritime Mobile-Satellite Services.
IEC 61108-1	Global navigation satellite systems (GNSS) - Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results.
IEC/EN 60945	Maritime Navigation and Radio communication equipment and systems – General requirements-methods of testing and required results
PuTTY	PuTTY is copyright 1997-2020 Simon Tatham

**List of Related Software and Manuals**

Module	Description	Part number
AIS Developer Studio Software for Windows. Verified to run on WINXP and WIN10	A Windows based application for configuring and testing various AIS products. Various levels of user access available dependent on licence.	Stand alone compiled exe.



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