

## USING MODERNIZED-GPS NOISE MODELS

MODERNIZED-GPS NOISE encapsulates - within Tapestry - RF "noise-like" models designed for the Modernized User Equipment (MUE) operational field environment testing. Specifically to this task, the NAVLABS DS400 Modernized GPS Constellation Simulator provides;

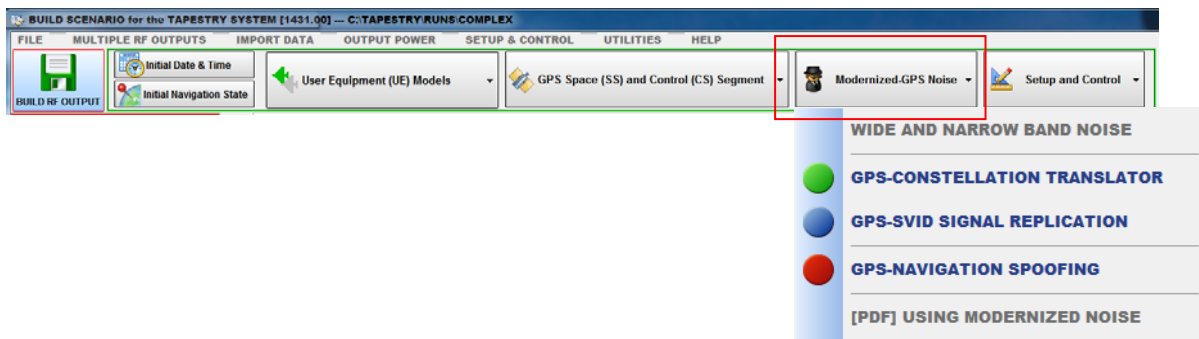
### **64 / 58 $L_1$ C/A P $L_2$ C P / $L_1$ C/A P M $L_2$ C P M CHANNELS.**

- All Channels can be assigned to Modernized Noise Output
- Channels are separable into 2 Outputs providing a relative J/S = 100

The provided models are;

- **WIDE & NARROW BAND NOISE**  
50 MHz WBGN and NB Noise programmable J/S.
- **GPS SIGNAL REPLICATION**  
Simulating an external process that measures-and-processes a subset of the composite GPS Satellite signals-set and then rebroadcasts them.
- **GPS SIGNAL TRANSLATOR**  
Simulating an external process that measures a complete GPS-Satellite signal-set and rebroadcasts it.
- **NAVIGATION SPOOFING**  
Simulating an external process that broadcasts a complete GPS constellation signal-set that if tracked by the UE causes erroneous PVT.

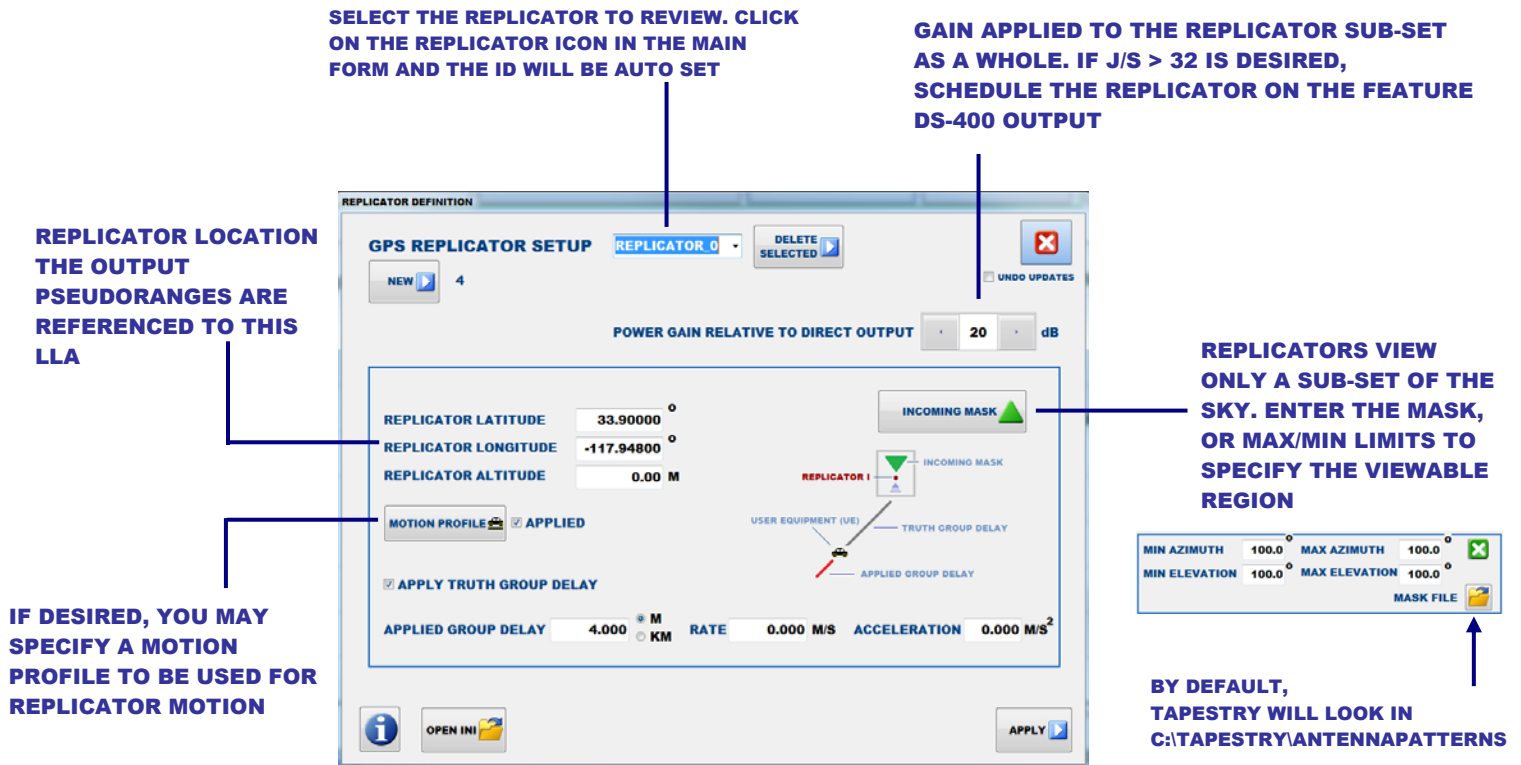
The use of each model is discussed subsequently.



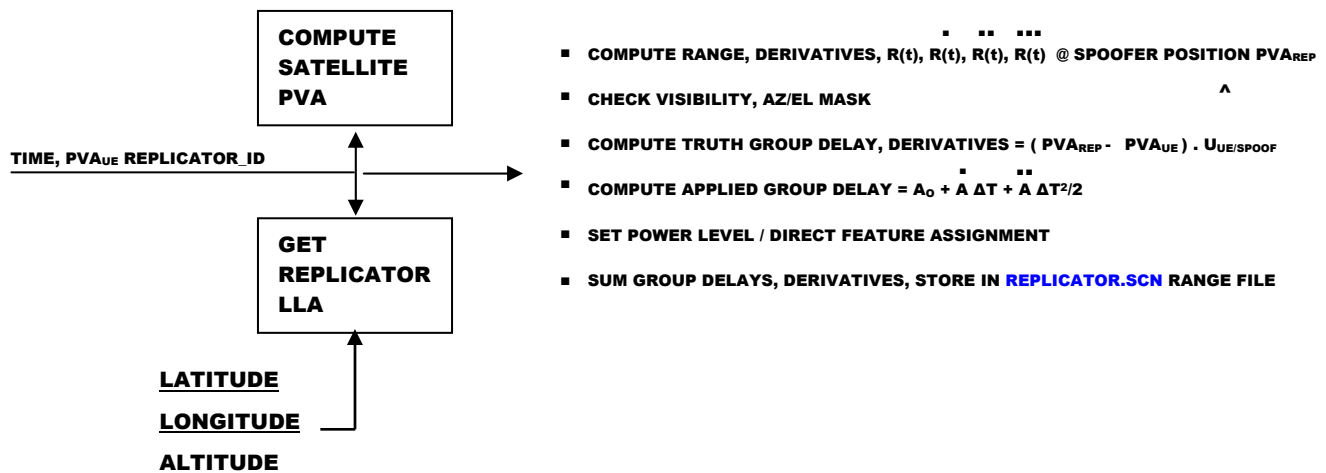
## GPS-SVID SIGNAL REPLICATION

As illustrated, a GPS Signal Replicator is not a bent pipe. Instead, the Replicator gathers a partial set of the visible GPS signals and rebroadcasts the partial set elsewhere. Within Tapestry, *elsewhere* is located at the User Equipment UE; Vehicle I.

For the Replicated GPS Signal Set, the RF output at the UE; Vehicle I, is computed as follows;

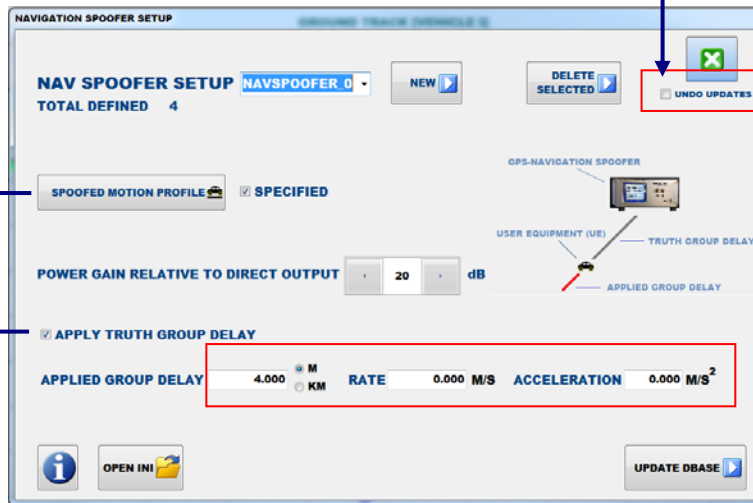


For the Replicated GPS Signal Set, the RF output at the UE; Vehicle I, is computed as follows;



## GPS-NAVIGATION SPOOFING

THE NAVIGATION SPOOFER  
REQUIRES A "SPOOFING"  
FILE. THIS IS THE  
NAVIGATION PROFILE THE  
SPOOFER BROADCASTS TO  
THE UE

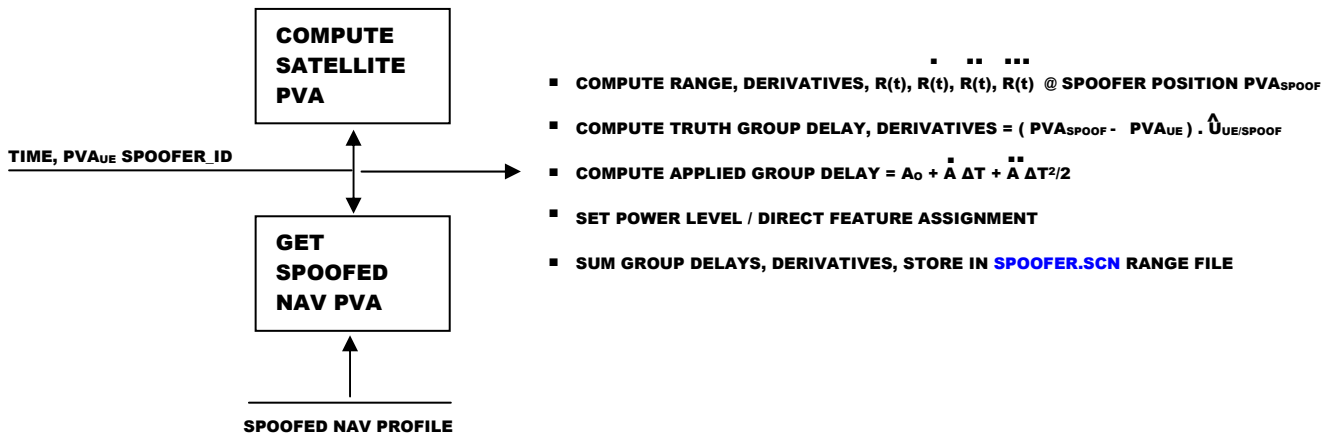


IF YOU WANT TO QUIT, NOT SAVING THE  
CHANGES MADE TO THE DBASE, SET THIS  
CHECKBOX AND THE ORIGINAL INI FILE  
WILL BE RETAINED.

ADDITIONAL ( TO GEOMETRIC  
TRUTH) GROUP DELAY APPLIED  
TO THE PSEUDORANGE SET  
PRODUCED BY THE SPOOFER

THE (INSTANTANEOUS)  
RANGE BETWEEN THE  
SPOOFING FILE AND THE UE  
IS COMPUTED  
AUTOMATICALLY AND  
APPLIED

For the GPS Navigation Spoofer, the RF output at the UE; Vehicle I, is computed as follows;



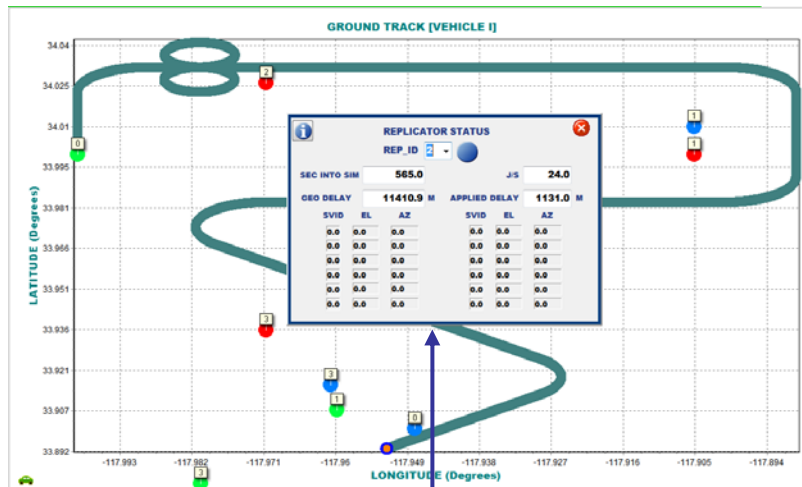
## GPS-CONSTELLATION TRANSLATOR

As illustrated, a GPS Translator acts somewhat like a bent pipe. It measures the composite GPS signal-set from all visible SVIDS, and sends or directs it elsewhere. Within Tapestry, *elsewhere* is located at the User Equipment UE; Vehicle I.

The screenshot shows the 'GPS TRANSLATOR DEFINITION' window. At the top, it says 'GPS TRANSLATOR SETUP' and 'TRANSLATOR 1'. There are buttons for 'NEW', 'DELETE SELECTED', and 'APPLY'. Below this, it says 'NUMBER DEFINED 4'. A section for 'POWER GAIN RELATIVE TO DIRECT OUTPUT' has a value of '20 dB'. The main area contains fields for 'TRANSLATOR LATITUDE' (34.00000), 'TRANSLATOR LONGITUDE' (-118.00000), and 'TRANSLATOR ALTITUDE' (10.00 M). There is a 'MOTION PROFILE' button and an 'APPLIED' checkbox. A diagram shows 'GPS CONSTELLATION SIGNALS' being received by a 'TRANSLATOR' and then sent to 'USER EQUIPMENT (UE)'. Labels indicate 'TRUTH GROUP DELAY' and 'APPLIED GROUP DELAY'. At the bottom, there are fields for 'APPLIED GROUP DELAY' (-900.000 M/KM), 'RATE' (-900.000 M/S), and 'ACCELERATION' (45.000 M/S<sup>2</sup>). An 'APPLY' button is at the bottom right.

Parameter	Value
Translator Latitude	34.00000
Translator Longitude	-118.00000
Translator Altitude	10.00 M
Power Gain	20 dB
Applied Group Delay	-900.000 M/KM
Rate	-900.000 M/S
Acceleration	45.000 M/S <sup>2</sup>

For the Translator GPS Signal Set, the RF output at the UE; Vehicle I, is computed as follows;



(EXAMPLE) THERE ARE 4 SPOOFERS, 4 REPLICATORS, 4 TRANSLATORS. THEY ARE OVERLAID ON THE MAIN PLOT. CLICKING ON ONE OF THE ICONS PRESENTS THE POP-UP SHOWN.

