# orolia



## Skydel GSG-8: Running a basic scenario

GSG-8 is the newest positioning, navigation, and timing test solution offered through Orolia's GSG family of simulators, and powered by Skydel Simulation Engine. It was developed to deliver the highest standard of Global Navigation Satellite System (GNSS) signal testing and sensor simulation performance in an easy to use, upgradable and scalable platform.

This document explains how to start a first basic simulation with a GSG-8.

### 1.1. Start SKYDEL and Create a New Configuration

The GSG-8 hardware model that can be used to run this simulation are:

GSG-821	GSG-831	GSG-842/Broadsim
2 RF Outputs	3 RF outputs	4 RF outputs
1 GPU/2 SDR	1GPU/3 SDR	2 GPU/4 SDR

To launch Skydel on a Linux system, simply type Skydel-sdx in the terminal.

In Windows, locate Orolia's Skydel in the start menu and click on it.



Click "Continue", and then Select "New Configuration".



#### 1.2. Add an output

To add an output, navigate to Settings – Output.

		Click Setting	gs Tab			
M			Skydel - Untitle	ed (Not Saved)		
6	Start Arm		00:00:00			
<b>**</b>	Settings					
Settings	Output		<b>Click</b> Output			
	Start Time					
9	Global	•				
Receiver	GPS	Þ				
	GLONASS	Þ				
1	GALILEO	•				
	BEIDOU					

Select the **DTA-2115B** in the dropdown list and click the **Add** button twice.

	Anechoic Chamber	
	DTA-21158	
	File	
	N310	
	None	
	NoneRT	
	Wavefront Controller	
	X300	
Select output type and click Add.		
DTA-2115B - Add	Clear Reference Power	Test GPU Speed



### 1.3. Add signals

Click on Edit in the Radio setting to set your radio configuration.

Output DTA-2115B	Radio 1 DTA-2115B number 0 EXT. Q.K Edit Delete	RF A	Signal Selection No Signal	Sampling Rate Central Frequency GPU # Gain	12.500 MSps 0.0000 MHz 0 50 dB	Edit
	Radio 2 DTA-21158 number 1 EXT. CLK Edit Delete	RF A	Signal Selection No Signal	Sampling Rate Central Frequency GPU # Gain	12.500 MSps 0.0000 MHz 0 50 dB	Edit

Click on Signal selection Edit to select your signal. GPS: L1 C/A, L1C, L2C

- GLONASS: G1, G2
- Galileo: E1
- BeiDou: B1

		Signal Selection	8
	Output Type Output Type Output L-Band Output L-	Signal ✓ GPS L1 C/A ✓ GPS L1C GPS L1 P-Code ✓ GLONASS G1 ✓ Galileo E1 QZSS L1C ✓ Gaussian Noise	<ul> <li>Galileo E1 PRS</li> <li>✓ BeiDou B1</li> <li>BeiDou B1C</li> <li>SBAS L1</li> <li>QZSS L1 C/A</li> <li>QZSS L1S</li> </ul>
Add Clear Reference Power	GPU # 0 🗘		
on Spectrums Status Log	Gain 50 dB 💠		
			¥ <u>C</u> ancel <b>√</b> <u>O</u> K

For this study case we will select GPSL1 CA in GNSS, Upper L-Band and GPS L2C in GNSS, Lower L-Band with the sampling rate of 50 MSps.

Output DTA-2115B	Radio 1     RF A       DTA-2115B number 0     Edit		Signal Selection GPS L1 C/A Gaussian Noise GPS L1C GLONASS G1 Galileo E1 BeiDou B1	Sempling Rate Central Frequency GPU # Gain	60.000 MSps Edit 1582.0000 MHz 0 50 d8
	Radio 2 DTA-2115B number 1 Edit Delete	RF A	Signal Selection GPS L2C GLONASS G2 Gaussian Noise	Sampling Rate Central Frequency GPU # Gain	50.000 MSps Edit 1235.0000 MHz 0 50 d8



### 1.4. Set vehicle position

Next, we will configure our vehicle on a circular position.

Go to Settings -> Vehicle -> Body to set your vehicle position

For this case we use this position:



Click on Ok to save your configuration.



#### 1.5. Connection to a receiver

We then connect a U-Blox receiver to the computer.



Go to menu Receiver and start by clicking the Connect button and choosing your receiver from the list of available ports.

Choose Receiver Serial Port 🛛 🛞									
Ports	Description	u-blox GNSS receiver							
ttyACM1         ttyUSB0         ttyACM0         ttyS0         ttyS1         ttyS2	Manufacturer Product ID Vendor ID	u-blox AG - www.u-blox.com 424 5446							
	ls Busy	No							
	Baud Rate	9600 👻							
	Data Bits	8 bits							
n georgeonethethethethethethethethethethethethethe	Parity	None 👻							
	Stop Bits	● 1 bit ○ 2 bits							
······maerowsokinawa <sup>1</sup> ·····maerowsokinawa <sup>1</sup> ·····maerowsokinawa	Flow Control	None 👻							
Skydel can parse specific NMEA 0183	v4.1 sentences. Clic	k Help for more details.							
Help	Refresh List ID	D Range X <u>C</u> ancel <u>√</u> OK							



#### 1.6. Run the simulation

Click on start to run your simulation.



The simulator state will change to Initializing for approximately 2-3 seconds and if the hardware setup is properly done, the state will then change to Streaming RF. Now the simulation is running.





Then click on cold start on the receiver tab.

	UTC Position Altitude (MSL) Altitude (Ellipsoid HDOP 0.86 VDOP 1.32 u-blox commands	2020-03-31 00:08:33 48.858371°, 2.2944825° -43.6m 2.6m PDOP 1.57 Fix 3D
		Cold start
En fris F & & & Dezybedow W & Men for downer & Fris & Frisher W & Construct (		
(2019년 4년 19년 19년 19년 19년 19년 19년 19년 19년 19년 19		Warm start
SGNVTG,T,M,0.047,N,0.086,K,4730		Hot start
\$GNGN5,000833,00,4851,50228,N,00217,66895,E,ANNN,11,0.86,-43,6,462,2,\*02		
\$GNGCA,000833.00,4851.50228,N,00277.60895,E,1,11,0.80,-43.0,M,40.2,M,45D \$GNGSA & 3.01.03.04.09.17.111.91.422.23.31.1.57.0.861.32.1*0B		
\$GNGSA,A,3,		
\$GNGSA,A,3,,,,,,,,,,157,0.86,1.32,3*0E		
\$GPGSV.3,1,11,01,47,126,45,03,81,030,47,04,48,179,45,09,19,202,40,0*68		
\$UPUSY,5,2,11,11,14,149,50,14,10,43,40,17,46,274,45,19,50,501,44,0°02		
SGLSSV.21.0646464636.0*7F		
\$GLGSV,2,2,06,,,,46,,,,42,0*7B		
\$GAGSV,1,1,02,12,,,40,33,,,43,0*76		
\$GNGLL,4851,50228,N,00217.66895,E,000833.00,A,A*7A		
\$GNGR5,000833.00,1,0.2,0.1,-0.4;0.2,0.2,0.0,0.1,0.1,0.0,0.1,-0.3,,1,0*72		
SGNGRS 000835.001 3 30*58		
\$GNG\$T,000833.00,4.5,1,7.1,5,3.0*6F		
\$GNZDA,000833.00,31,03,2020,00,00*71		
\$GNGBS,000833.00,1.7,1.5,3.0,,,,,,*56		
· · · · · · · · · · · · · · · · · · ·	ttyACM0 9	600/8N1 Disconnect

Go to the spectrums tab, and you see this view:



Check **Show receiver** on the constellation tab and go to the **Map** view:





PRN

SV ID +





#### Go to the Deviation tab:





You can also connect the receiver to a Windows computer and load the U-center application to observe the signals.

After a few minutes, we can see that the receiver is tracking the signals well and the position of the vehicle is clearly visible in the window.

Longitude		2.29448033 °
Latitude		48.85837133 °
Altitude		2.900 m
Altitude (msl)		-43.300 m
TTFF		334581.640 s
Fix Mode		3D
3D Acc. [m]		
2D Acc. [m]		
PDOP	0 1.1	5
HDOP	0 0.6	5
Satellites		



## 1.7. Log files (raw data)

The logging settings allow the user to control how Skydel logs data during a simulation.

Check **raw logging** and **Rinex Logging** to log simulation data such as satellite trajectories, receiver trajectories, and signal power levels. You may also specify the desired update rate at which data are logged.

<u>F</u> ile <u>E</u> dit <u>W</u> ir	ndow <u>T</u> ools <u>H</u> elp			
<u>O</u>		tatus Incomplete	00:00:00	
Cottingo	In version 21.3, SV ID replaces PRN	to identify a satellite.	Details	
Settings	<u>Settings</u> → Global			
0	Atmosphere 🕨 🕨		_	
	Earth Orientation	Raw Logging (csv)	$\checkmark$	10 Hz 👻
Receiver	Logging	NMEA Logging		1 Hz 💌
	Signal Level	Downlink Logging	None 💌	
	Synchronize Simulators			
Мар		RINEX Logging	$\checkmark$	
		HIL Input Logging		
{}		Logging Folder	C:/llcorc/loan-CracoO	1/2i/Documents/Claydol-SDY/Output/Untitled
U		Logging Folder	C./ USEIS/Jean-GraceOt	alar bocuments, skyder sbx, output, ontitled
Automate				

This is what the csv file you get looks like:

Elapsed Time (m	is) 💌 ECEF X (m)	<ul> <li>ECEFY (m)</li> </ul>	CCUF2 (m)	<ul> <li>ECEF Error X (m)</li> </ul>	<ul> <li>ECEF Error Y (m)</li> </ul>	<ul> <li>ECEF Error Z (m)</li> </ul>	<ul> <li>Body Azimuth (rad)</li> </ul>	Body Elevation (rad)	Range (m) 🔹	PSR (m)	- ADR	Clock Correction (s)	<ul> <li>Clock Noise (m)</li> </ul>	Delta Af0 (s)	•
	500 -4452024.556	474 24619445.7540	8 34161233.322	1	0	0	0 0.7788636641861	0.4486354078049	39191436.90394	39059874.82910	62 203394988.172	8 0.0004388723180124		0	0
	600 -4452149.101	639 24619467.7361	3 34161199.148	14	0	0	0 0.7788627952094	0.4486321666479	39191452.56089	39059890.48528	68 203395069.698	6 0.0004388723207486		0	0
	700 -4452273.646	487 24619489.7200	3 34161164.971	17	0	0	0 0.7788619262917	0.448628925454	39191468.21806	39059906.141691	11 203395151.225	4 0.0004388723234848		0	0
	800 -4452398.191	017 24619511.7057	5 34161130.793	22	0	0	0 0.7788610574332	0.4486256842231	39191483.87546	39059921.79831	91 203395232.753	5 0.000438872326221		0	Q
	900 -4452522.735	23 24619533.6933	1 34161096.614	07	0	0	0 0.7788601886338	0.4486224429553	39191499.53309	39059937.45517	05 203395314.282	7 0.0004388723289571		0	0
	1000 -4452647.279	125 24619555.6827	34161062.432	12	0	0	0 0.7788593198935	0.4486192016506	39191515.19093	39059953.11224	55 203395395.813	1 0.0004388723316933		0	0
	1100 -4452771.822	702 24619577.6739	2 34161028.248	19	0	0	0 0.7788584512123	0.4486159603091	39191530.849	39059968.76954	19 203395477.344	6 0.0004388723344295		0	0
	1200 -4452896.365	961 24619599.6669	8 34160994.063	76	0	0	0 0.7788575825903	0.4486127189306	39191546.5073	39059984.42706	57 203395558.877	4 0.0004388723371657		0	0
	1300 -4453020.908	903 24619621.6618	7 34160959.876	73	0	0	0 0.7788567140274	0.4486094775152	39191562.16581	39060000.08481	07 203395640.411	2 0.0004388723399018		0	0
	1400 -4453145.451	527 24619643.6585	9 34160925.687	91	0	0	0 0.7788558455236	0.448606236063	39191577.82455	39060015.74277	89 203395721.946	3 0.000438872342638		0	0
	1500 -4453269.993	833 24619665.6571	5 34160891.497	1	0	0	0 0.778854977079	0.448602994574	39191593.48352	39060031.400970	03 203395803.482	5 0.0004388723453742		0	0
	1600 -4453394.535	821 24619687.6575	3 34160857.304	×	0	0	0 0.7788541086935	0.4485997530481	39191609.1427	39060047.059384	47 203395885.019	8 0.0004388723481103		0	0
	1700 -4453519.077	491 24619709.6597	5 34160823.110	7	0	0	0 0.7788532403672	0.4485965114854	39191624.80211	39060062.718022	22 203395966.558	3 0.0004388723508465		0	0
	1800 -4453643.618	844 24619731.6638	1 34160788.914	71	0	0	0 0.7788523721001	0.4485932698858	39191640.46174	39060078.376882	26 203396048.098	0.0004388723535827		0	Ó
	1900 -4453768.159	878 24619753.6697	34160754.716	12	0	0	0 0.7788515038921	0.4485900282495	39191656.1216	39060094.03596	58 203396129.638	8 0.0004388723563188		0	0
	2000 -4453892.700	595 24619775.6774	2 34160720.517	14	0	0	0 0.7788506357434	0.4485867865765	39191671.78168	39060109.695271	19 203396211.180	8 0.000438872359055		0	0
	2100 -4454017.240	993 24619797.6869	7 34160686.315	7	0	0	0 0.7788497676538	0.4485835448666	39191687,44198	39060125.354800	07 203396292.724	0.0004388723617912		0	0
	2200 -4454141.781	074 24619819.6983	5 34160652.112	8	0	0	0 0.7788488996234	0.44858030312	39191703.1025	39060141.014552	22 203396374.268	3 0.0004388723645273		0	0
	2300 -4454266.320	837 24619841.7115	7 34160617.907	34	0	0	0 0.7788480316522	0.4485770613366	39191718.76324	39060156.67452	63 203396455.813	8 0.0004388723672635		0	0
	2400 -4454390.860	281 24619863.7266	3 34160583.701	99	0	0	0 0.7788471637403	0.4485738195165	39191734.42421	39060172.334722	28 203396537.360	4 0.0004388723699996		0	0
	2500 -4454515.399	407 24619885.7435	1 34160549.492	14	0	0	0 0.7788462958875	0.4485705776597	39191750.0854	39060187.99514	19 203396618.908	2 0.0004388723727358		0	0
	2600 -4454639.938	216 24619907.7622	3 34160515.282	2	0	0	0 0.778845428094	0.4485673357662	39191765.74682	39060203.65578	13 203396700.457	2 0.000438872375472		0	0
	2700 -4454764.476	706 24619929.7827	8 34160481.070	6	0	0	0 0.7788445603598	0.448564093836	39191781.40845	39060219.31664	71 203396782.007	3 0.0004388723782081		0	0
	2002 445 4000 014	THE RECEIPTER PARTY.					a a second second second		and a second second	and the second				-	-

#### Conclusion:

The GSG-8 is a powerful GNSS simulator which allows the user to simulate simple simulations as presented in this document to the most complex including spoofers, jammers or HIL systems.

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