

---

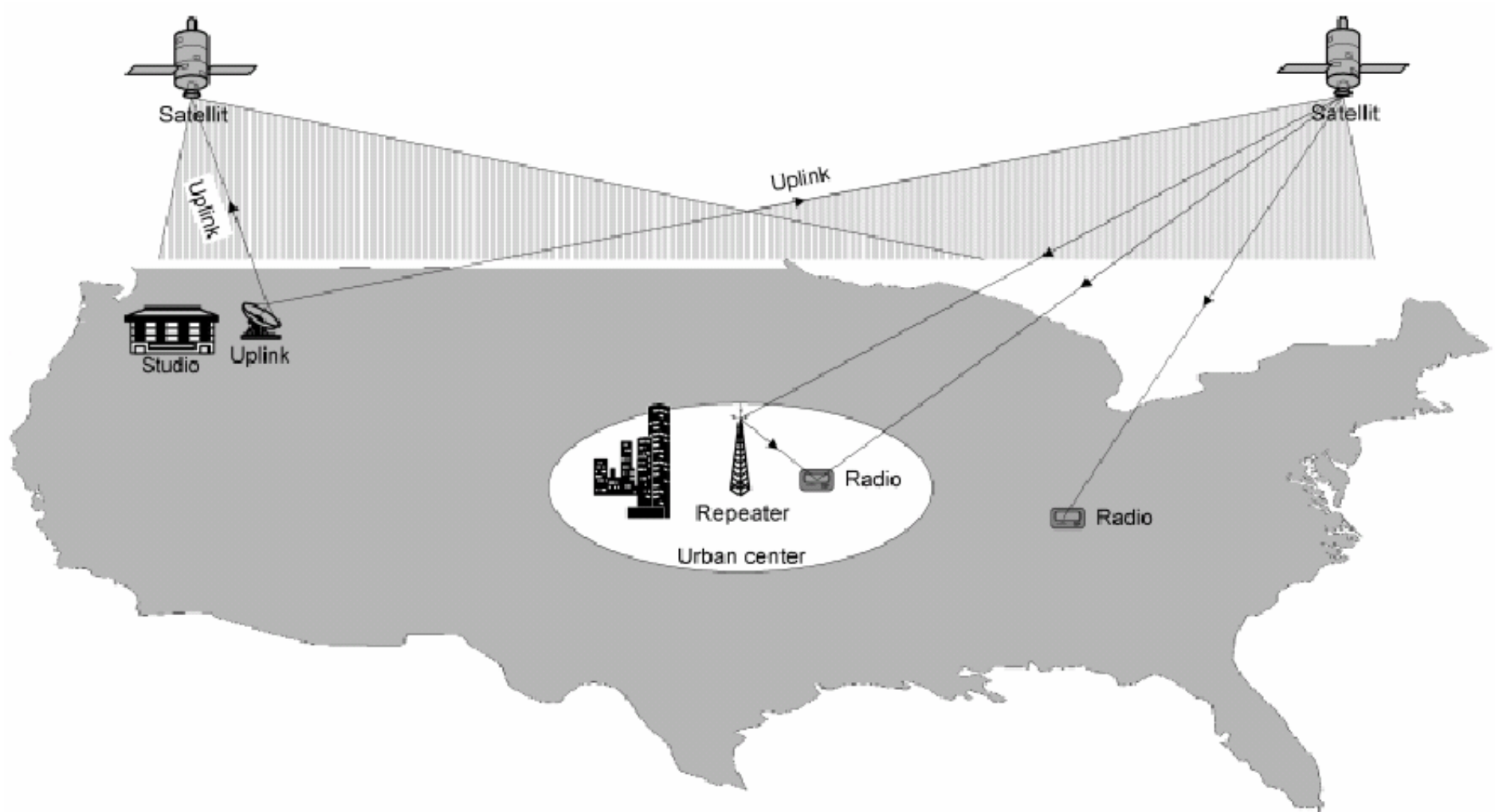
# IZT DSG2000

Signal Simulator for Sirius Satellite Radio and  
XM Satellite Radio



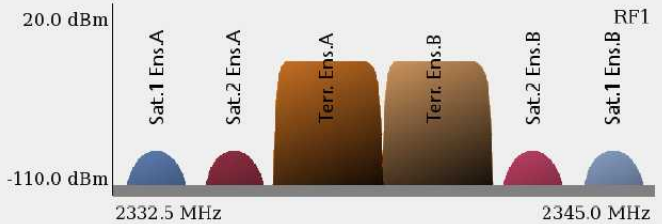
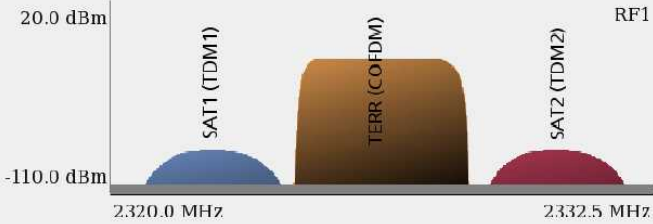


  
**IZT Pacific Co., Ltd.** Speedy decision and action for our customers!  
アイジーティーパシフィック株式会社

# ・デジタル衛星ラジオ



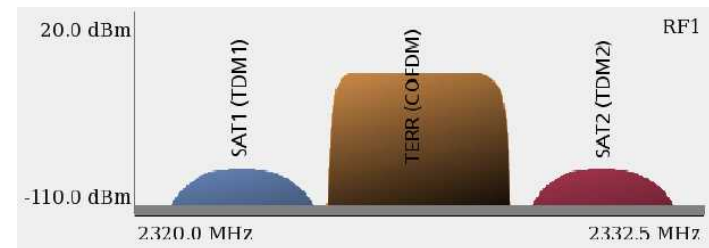
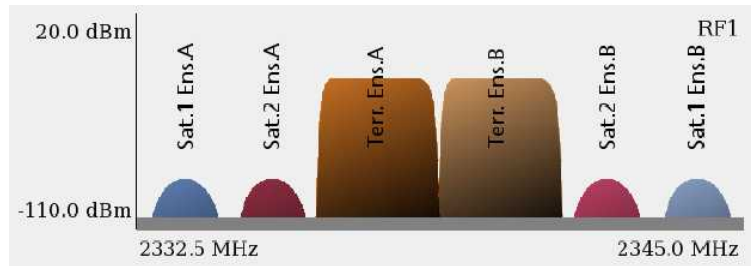
# ・ XM/SIRIUS

		
放送開始	2001年9月	2002年2月
衛星	静止衛星 (2衛星)	楕円軌道衛星 (3衛星)
サービス料金(1ヶ月)	12ドル99セント	12ドル95セント
番組	約150CH 音楽、ニュース、トーク、スポーツ メジャーリーグ中心	約150CH 音楽、ニュース、トーク、スポーツ アメリカンフットボール中心
周波数	2332.5 ~ 2345.0 MHz	2320.0 ~ 2332.5 MHz
変調方式	衛星: QPSK変調 地上: MCM変調 衛星: 4波 地上2波	衛星: QPSK変調 地上: COFDM変調 衛星: 2波 地上1波
	 <p>20.0 dBm -110.0 dBm Sat.1 Ens.A, Sat.2 Ens.A, Terr. Ens.A, Terr. Ens.B, Sat.2 Ens.B, Sat.1 Ens.B, RF1 2332.5 MHz, 2345.0 MHz</p>	 <p>20.0 dBm -110.0 dBm SAT1 (TDM1), TERR (COFDM), SAT2 (TDM2), RF1 2320.0 MHz, 2332.5 MHz</p>

# ・商品コンセプト

## ・1台(ユニット)で衛星波/地上波を出力可能

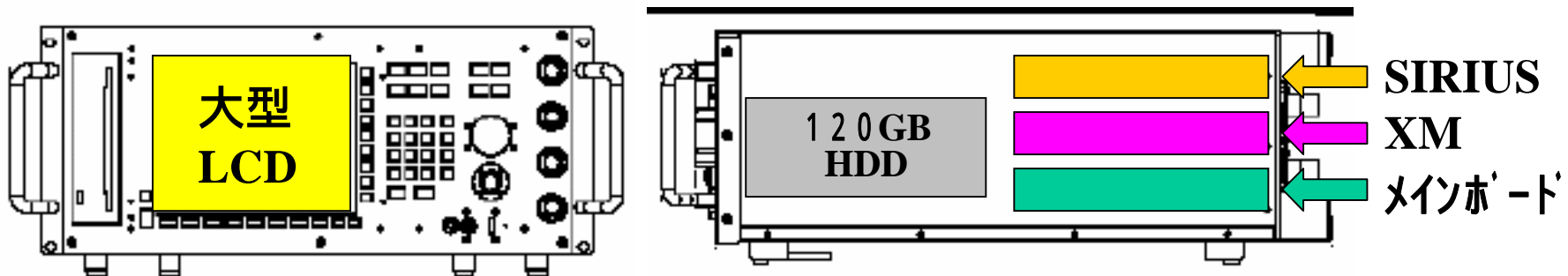
SGを複数用意する必要なく1台でXM(衛星4、地上2)SIRIUS(衛星2、地上1)を出力



## ・2種類の衛星放送SGを1つのユニットに

XM/SIRIUSの信号発生器を1台に集約 コストとスペースの低減

Linuxシステム+RFユニットの構成



# 商品コンセプト

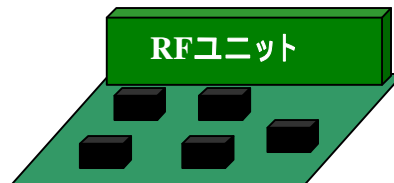
## Manufacturing System (工程用) をベースに拡張可能 オプション追加でDevelopment SystemへVer. up

- DSG2000へ入
- SIRIUS用 SG(仕様1)
- XM用 SG(仕様2)



### SIRIUS/XM SG追加

Upgrade full SIRIUS/XM signal



Card with Spectral Representation of SIRIUS/XM signal requires 1/2

### For Development System Option

#### Performance Testing Package

#### SIRIUS/XM

- Cannel Simulator
- Profiles
- 20dBm Out Put
- Output Filter Simulation
- Nonlinearty Simulation

#### SIRIUS Overlay

#### External Filter SIRIUS/XM

### AWG

Wideband-Synthesizer  
SIRIUS/XM

### 2nd RF Option

RFユニット

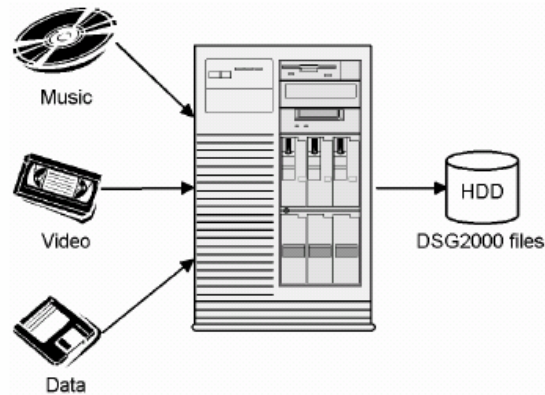
### GP-IB I/F

GP-IB

Programming  
Option

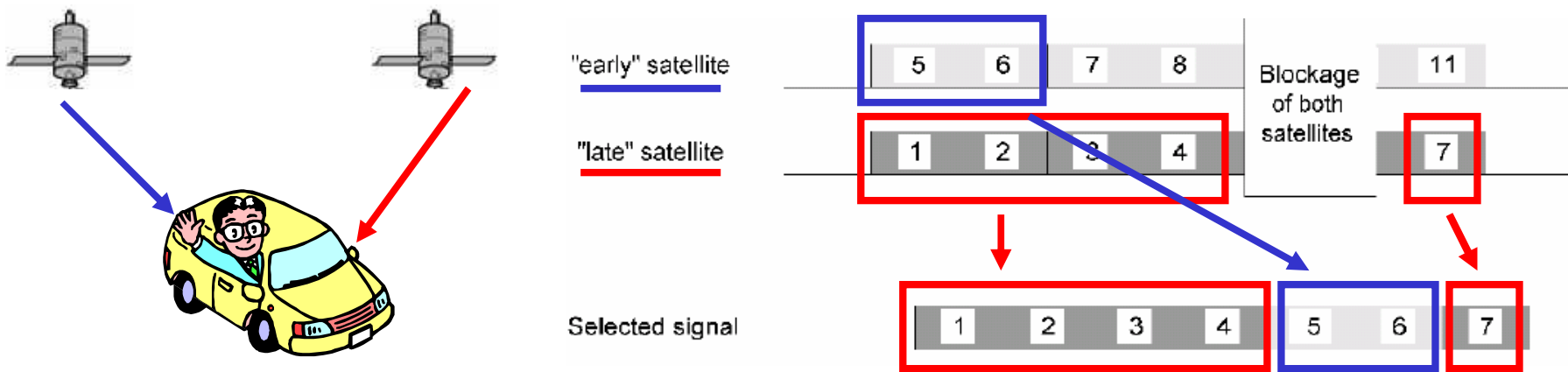
# ・DSG2000標準機能

## SIRIUS/XM TS データ



- ・SIRIUS/XM用テストTSをインストール  
(SIRIUS/XMとの基本契約が必要です)
- ・120GB HDD搭載
- ・SIRIUS/ XM社より供給されるTSに対応

## Delay



# ・DSG2000標準機能

## SIRIUS/XM SG パラメータ

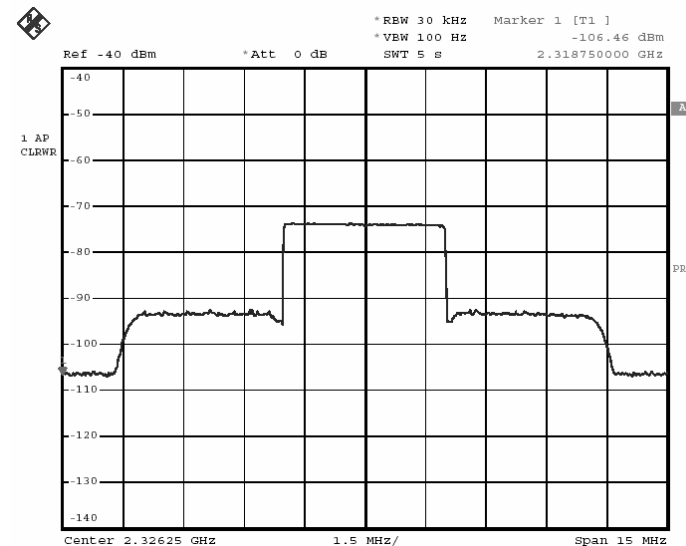


Sirius signal - 2 QPSK, 1 COFDM

The default frequencies for SIRIUS are:

- 2322.293 MHz for satellite 1
- 2326.250 MHz for terrestrial
- 2330.207 MHz for satellite 2

XM:Sat.1EnsA/B Terr.EnsAB Sat.2EnsA/B  
SIRIUS:SAT1 TERR SAT2  
各信号波で周波数/出力のコントロールが可能



XM default frequencies reside at

- 2333.460 MHz for satellite 1 ensemble A
- 2335.300 MHz for satellite 2 ensemble A
- 2337.485 MHz for terrestrial ensemble A
- 2340.015 MHz for terrestrial ensemble B
- 2342.200 MHz for satellite 2 ensemble B
- 2344.040 MHz for satellite 1 ensemble B

# ・DSG2000 標準機能

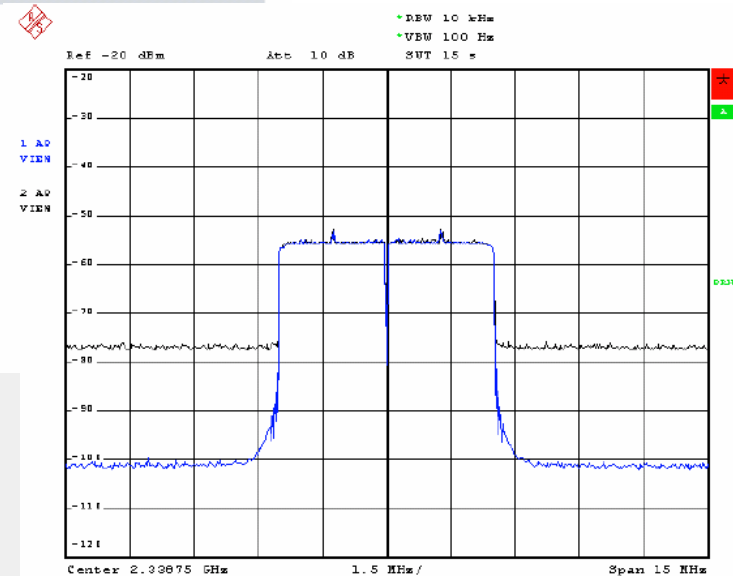
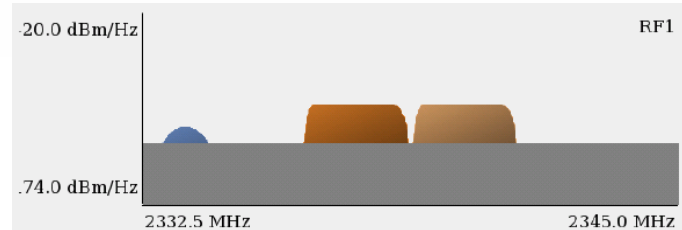
## CN付加/シミュレート機能

XM/SIRIUS 1st/2nd(option)個別にノイズ  
付加が可能  
更にレベル/幅が設定可能

				RF1			RF2		
	Lin	Filter	Sim	Pow [dBm]	C/No [dBHz]	C/N [dB]	Pow [dBm]	C/No [dBHz]	C/N [dB]
SAT1	OFF	OFF	OFF	-110.0	64.0	-1.8	-110.0	64.0	-1.8
TERR	OFF	OFF	OFF	-110.0	64.0	-2.0	-110.0	64.0	-2.0
SAT2	OFF	OFF	OFF	-110.0	64.0	-1.8	-110.0	64.0	-1.8
NOISE [dBm/Hz]				-174.0 *			-174.0 *		

AWGN settings of the DSG2000

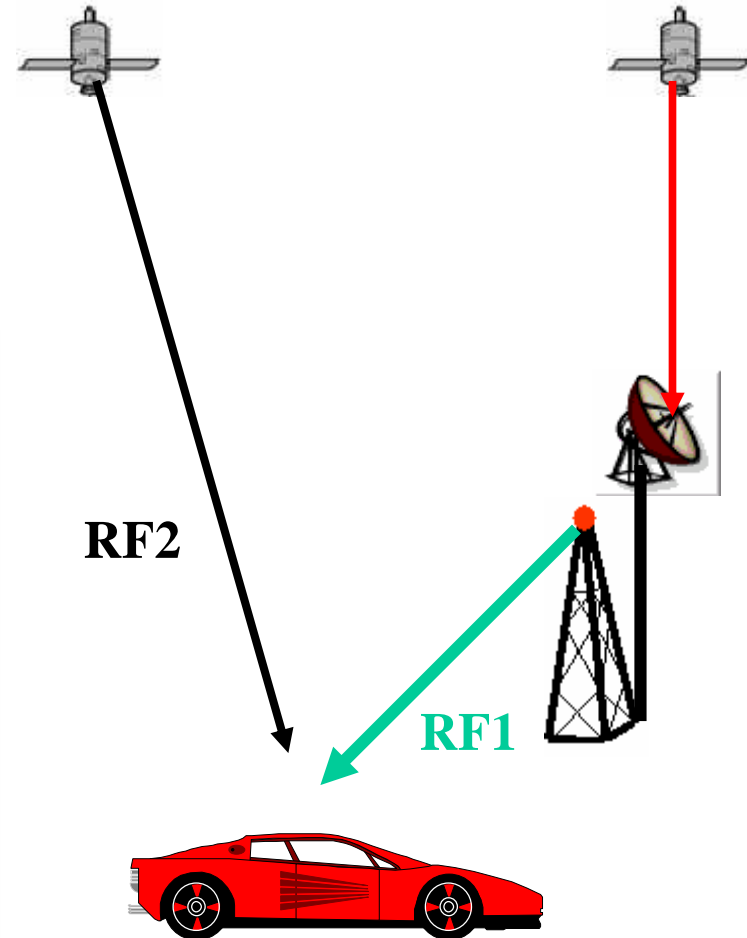
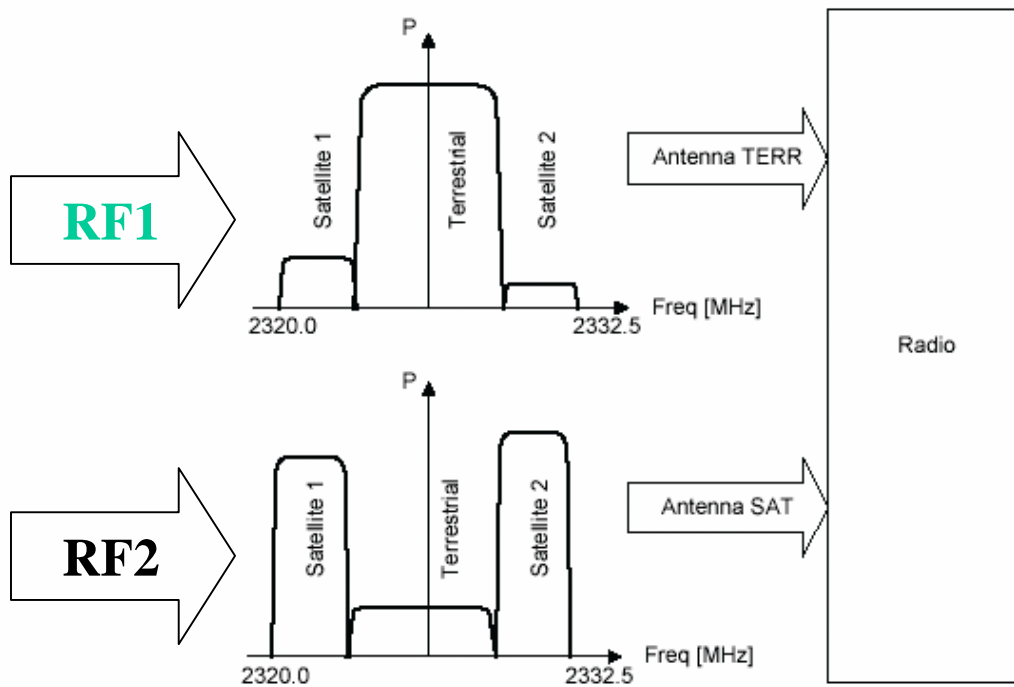
- [1] Power level of the carriers
- [2] Noise density of the RF output
- [3] C/No of the carriers
- [4] C/N of the carriers
- [5] LOCK indicator



# ・DSG2000 オプション

## 2<sup>nd</sup> RF Option

1<sup>st</sup>,2<sup>nd</sup>各RF独立制御が可能

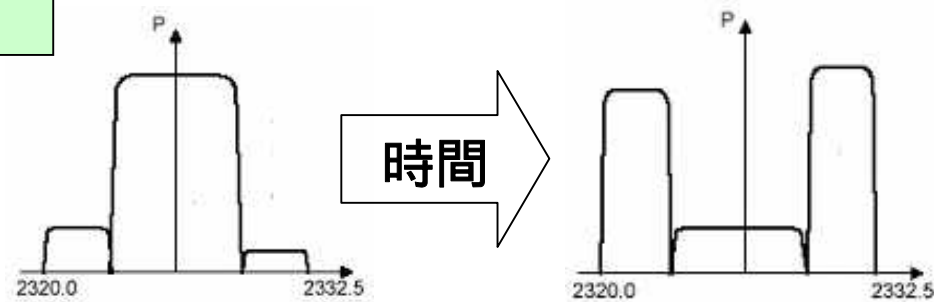


# ・DSG2000 オプション

## Profiles

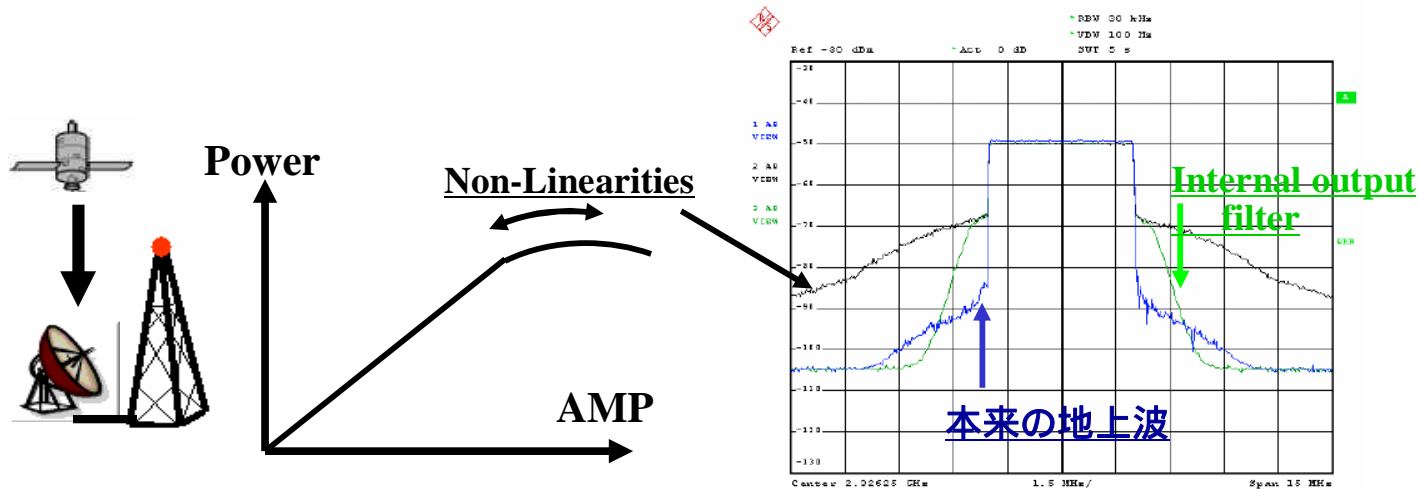
```
channel sirius_attenuation_sat1_rf1
{
  stay      0.0  10ms
  ramp     -25.0 1000ms
  ramp     -10.0 1000ms
  ramp      0.0  50ms
}

channel sirius_attenuation_terr_rf1
{
  stay      0.0  10ms
  stay     -30.0  10ms
  stay      0.0 3000ms
}
```



各信号のパラメーターコントロールが可能

## Internal output Filter /Non-Linearities Simulation External output Filter



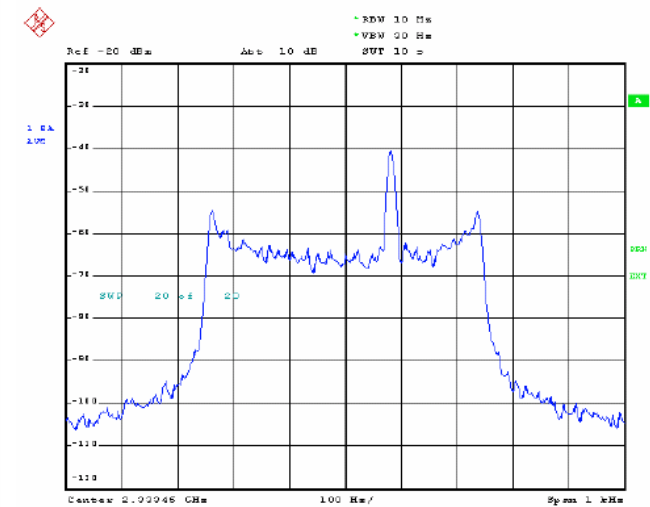
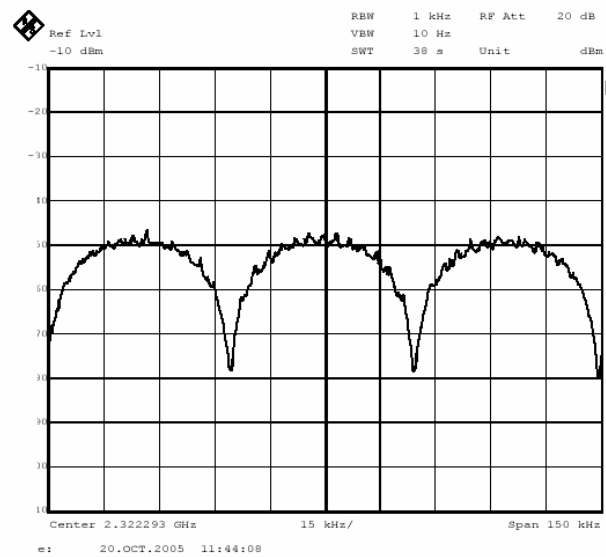
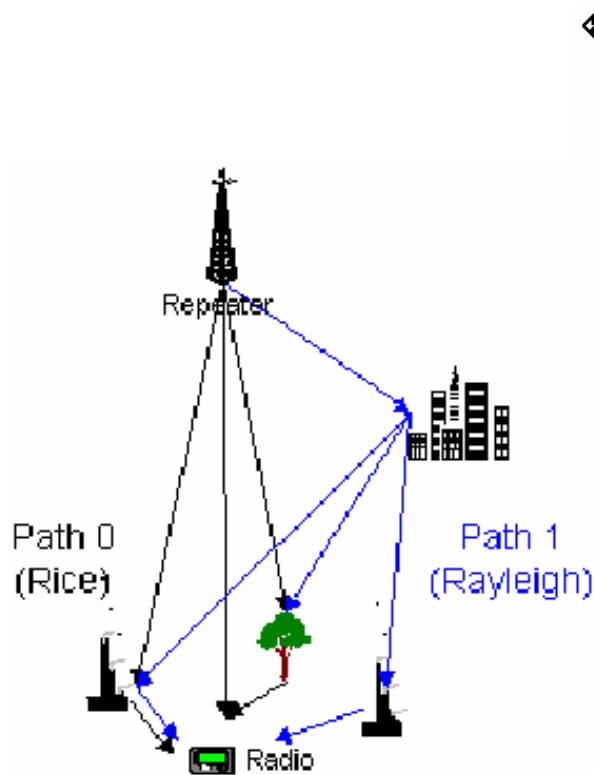
## External Output Filter

Internal Filterでは効果が少なく、また他の衛星ラジオの影響を確認する為に使用する

# ・DSG2000 オプション

## チャンネルシミュレータ

## フェージングシミュレート機能

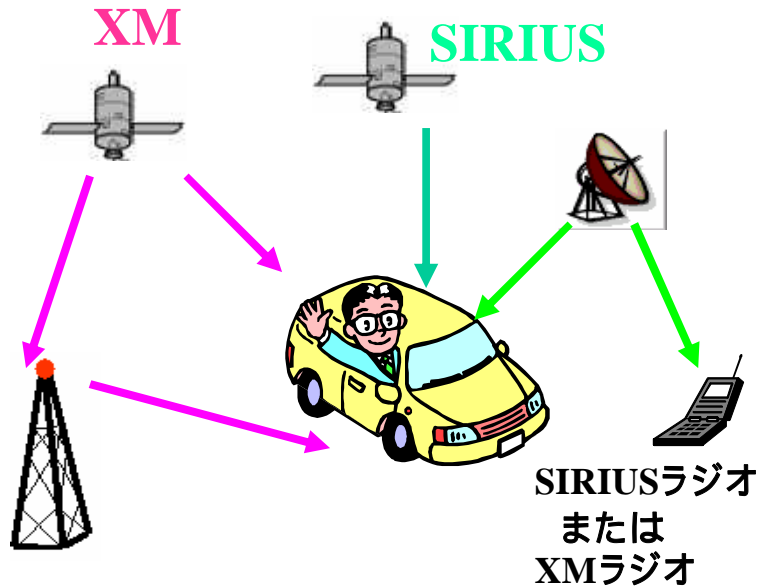


Parameter	Unit	Min	Default	Max
Delay	$\mu$ s	0	0	80
Doppler	Hz	0	10	3000
Loss	linear	-1	1 and 0	1
Rice K	value	0	0	10
Rice Angle	degree	-180	0	180
State	enum	OFF	ON	JAKES

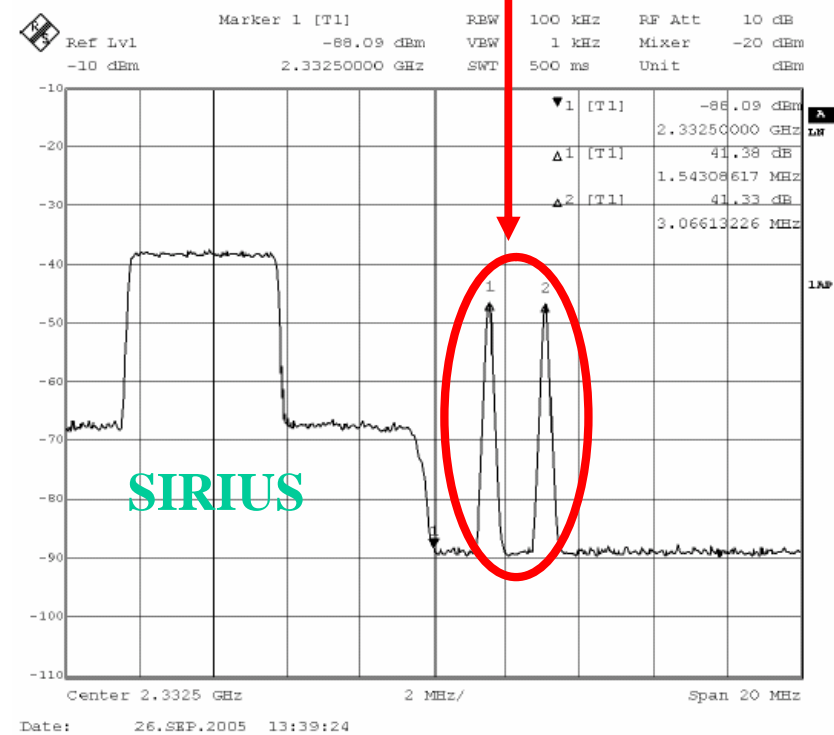
# ・DSG2000 オプション

## Arbitrary waveform generator (AWG)

他のWide Bandの妨害波(キャリア信号のみ)を  
出力する事が出来る



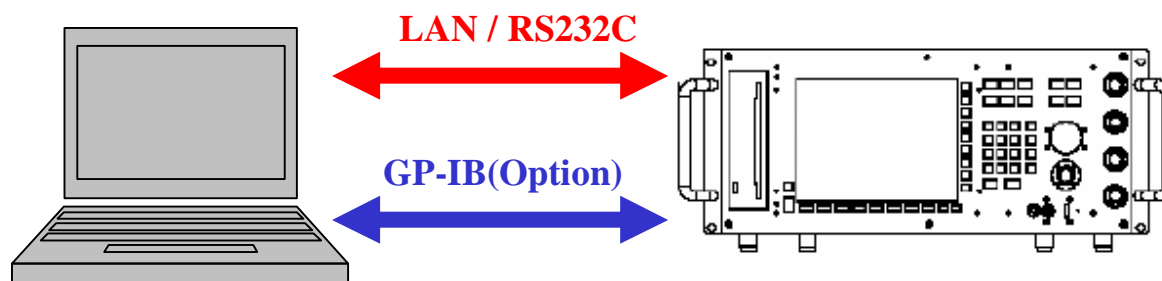
## 妨害波(他のWide Band キャリア)



# ・DSG2000 オプション

## Programming Option

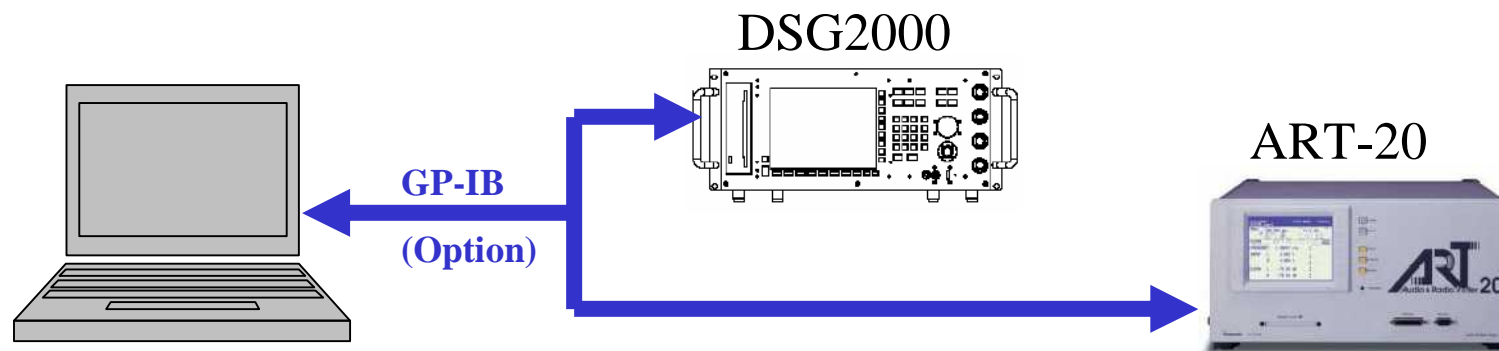
PCよりDSG2000の制御が可能 自動計測対応



- ・Visual C++
- ・HT Basic
- ・Labview (推奨)  
(Programming Opに添付)

## GP-IB

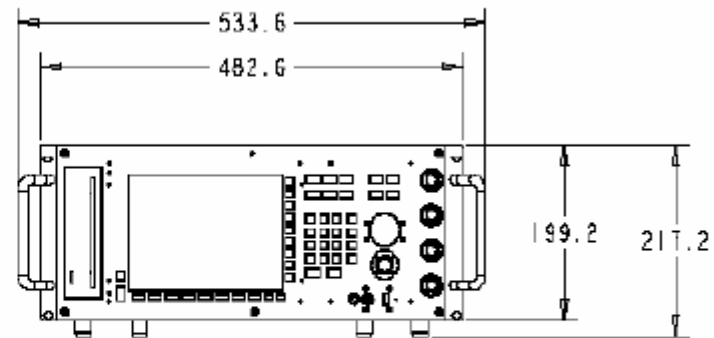
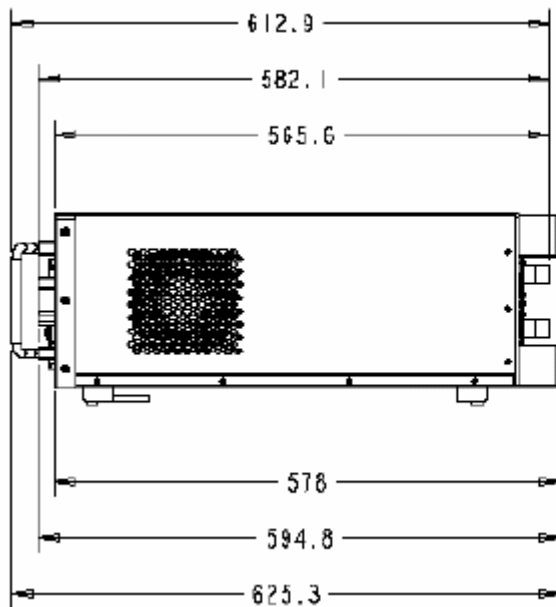
GP-IBインターフェースをDSG2000に追加、他の測定器との自動計測も可能



# ・DSG2000 仕様

## 本体部分 (メイン)

Harddisk	120 GB
Power requirements	90 to 264 Vac, 47 to 63 Hz, 400 W maximum
Temperature range	0 to 40 °C
Weight	depending on equipment; approx. 25 kg



# ・ D S G 2 0 0 0 仕様

## SIRIUS用 基本性能1

<b>Signal</b>	<i>2xQPSK</i>	2322.293 MHz / 2330.207 MHz
	<i>COFDM</i>	2326.25 MHz
	<i>Frequency</i>	Nominal frequencies +/-45kHz, stepsize 1 Hz
	<i>Delay</i>	SAT1: 228 to 322 ms TERR: fixed SAT2: 4397 to 4490ms
	<i>Stability</i>	$5 \times 10^{-8}$ (OCXO)
<b>Impairments</b>	<i>AWGN</i>	Assignable in C/N, C/No and No
<b>I/Q baseband output</b>	<i>Channels</i>	2 (I and Q)
	<i>Level</i>	-6 dBm max
	<i>Attenuation</i>	0 to -96.0 dB, stepsize 0.1 dB
<b>S-band output</b>	<i>Output power</i>	-110 to 10 dBm, stepsize 0.1 dB
	<i>Level uncertainty</i>	Absolute $< \pm 0.5$ dB
	<i>Auto-calibration</i>	User initiated auto-calibration
	<i>QPSK/COFDM</i>	Maximum output power difference between QPSK and COFDM: 35 dB
	<i>QPSK/QPSK</i>	Maximum difference between QPSK signals: 35 dB
<b>Front panel connectors</b>	<i>RF output</i>	One N-type output, impedance 50 Ohms

# ・DSG2000 仕様

## SIRIUS用 基本性能2

Rear panel connectors	<i>SAT 1 outputs, SAT 2 outputs, TERR outputs</i>	I and Q outputs Analog, BNC, impedance 50 Ohms
	<i>1 PPS input</i>	Accepts an 1 PPS reference (timebase) input; SMB, impedance 50 Ohms, TTL
	<i>10 MHz input/output</i>	Accepts an external reference (timebase) input; BNC, impedance 50 Ohms, $100\text{ mV}_{\text{PP}} - 5\text{ V}_{\text{PP}}$  Outputs int. or ext. reference signal. BNC, impedance 50 Ohms, $1\text{ V}_{\text{PP}}$
	<i>GPS input</i>	GPS-Time information to synchronize timebase to GPS (RS232)
	<i>Event output (1,2)</i>	Outputs a pattern for triggering external equipment during large scale fading SMB, impedance 50 Ohms, $1\text{ V}_{\text{PP}}$
Remote access	<i>Remote programming</i>	Via LAN or RS-232

# ・DSG2000 仕様

## XM用 基本性能1

<b>Signal</b>	<i>4xQPSK</i>	2333.465 MHz / 2335.305 MHz / 2342.205 MHz / 2344.045 MHz
	<i>2xMCM</i>	2337.490 MHz / 2340.020 MHz
	<i>Frequency</i>	Nominal frequencies +/-45kHz, stepsize of 1Hz
	<i>Delay</i>	SAT1,2: ±6 ms TERR: 10 to 30 ms processing delay
	<i>Stability</i>	$5 \times 10^{-8}$ (OCXO)
<b>Impairments</b>	<i>AWGN</i>	Assignable in C/N, C/No and No
<b>I/Q baseband output</b>	<i>Channels</i>	2 (I and Q)
	<i>Level</i>	-6 dBm max
	<i>Attenuation</i>	0 to -96.0 dB, stepsize 0.1 dB
<b>S-band output</b>	<i>Output power</i>	-110 to 10 dBm, stepsize 0.1 dB
	<i>Level uncertainty</i>	Absolute < ± 0.5 dB
	<i>Calibration</i>	User initiated autocalibration
	<i>QPSK/MCM</i>	Maximum output power difference between QPSK and MCM: 35 dB
	<i>QPSK/QPSK</i>	Maximum difference between QPSK signals: 35 dB
<b>Front panel connectors</b>	<i>RF output</i>	One N-type, impedance 50 Ohms

# ・DSG2000 仕様

## XM用 基本性能2

Rear panel connectors	<i>SAT I output</i>	Outputs the "I" part of the satellites Analog, BNC, impedance 50 Ohms
	<i>SAT Q output</i>	Outputs the "Q" part of the satellites Analog, BNC, impedance 50 Ohms
	<i>TERR I output</i>	Outputs the "I" part of the terr. signal Analog, BNC, impedance 50 Ohms
	<i>TERR Q output</i>	Outputs the "Q" part of the terr. signal Analog, BNC, impedance 50 Ohms
	<i>1 PPS input</i>	Accepts an 1 PPS reference (timebase) input; SMB, impedance 50 Ohms, TTL
	<i>10 MHz input/output</i>	Accepts an external reference (timebase) input; BNC, impedance 50 Ohms, 100 mV <sub>pp</sub> - 5 V <sub>pp</sub>  Outputs int. or ext. reference signal BNC, impedance 50 Ohms, 1 V <sub>pp</sub>
	<i>GPS input</i>	GPS-Time information to synchronize timebase to GPS (RS232)
	<i>Event output (1,2)</i>	Outputs a pattern for triggering external equipment during large scale fading SMB, impedance 50 Ohms, 1 VPP
Remote access	Remote programming	Via LAN or RS-232

# ・DSG2000 仕様

## オプション関連1

### Option DSG2000-001A: 2nd RF Sirius

for i.e. antenna diversity testing; requires option DSG2000-001 or DSG2000-002H

RF output with power levels adjustable independently from first RF output for satellite and terrestrial signals

### Option DSG2000-002A: 2nd RF XM

for i.e. antenna diversity testing; requires option DSG2000-002 or DSG2000-001H

RF output with power levels adjustable independently from first RF output for satellite and terrestrial signals

### Option DSG2000-001G: Performance Testing Package Sirius

requires option DSG2000-001 or DSG2000-002H

#### Improved performance

*Power level*

-110 to 20 dBm

*Frequency*

2320.0 to 2332.5 MHz

#### Impairments

*Satellite non-linearity*

Memoryless distorter (Output back-off, non-linearity)

*Terrestrial non-linearity*

Memoryless distorter (Output back-off, non-linearity)

*Terrestrial filter simulation*

Digital filter to simulate output filter

*Satellite channel simulator*

Simulation with 2 paths

*Terrestrial channel simulator*

Simulation with 8 paths

#### Profiles

*Level*

2 msec steps, individually settable for both RF outputs

*Delay + frequency*

2 msec steps

*Variable AWGN*

2 msec steps

# ・ D S G 2 0 0 0 仕様

## オプション関連2

### Option DSG2000-002G: Performance Testing Package XM

requires option DSG2000-002 or option DSG2000-001H

<b>Improved performance</b>	<i>Power level</i>	-110 to 20 dBm
	<i>Frequency</i>	2332.5.0 to 2345.0 MHz
<b>Impairments</b>	<i>Satellite non-linearity</i>	Memoryless distorter (Output back-off, non-linearity)
	<i>Terrestrial non-linearity</i>	Memoryless distorter (Output back-off, non-linearity)
	<i>Terrestrial filter simulation</i>	Digital filter to simulate output filter
	<i>Satellite channel simulator</i>	
	<i>Terrestrial channel simulator</i>	
<b>Profiles</b>	<i>Level</i>	2 msec steps, individually settable for both RF outputs
	<i>Variable AWGN</i>	2 msec steps

# ・DSG2000 仕様

## オプション関連3

**Option DSG2000-001H: Spectral Representation of the XM signal**

for interference testing; requires option DSG2000-001

---

**Option DSG2000-002H: Spectral Representation of the Sirius signal**

for interference testing; requires option DSG2000-002

---

**Option DSG2000-001J: External output filter XM**

for interference testing; requires options DSG2000-001 + DSG2000-001H or  
DSG2000-002 + DSG2000-002H + DSG2000-002L

---

**Option DSG2000-002J: External output filter Sirius**

for interference testing; requires options DSG2000-002 + DSG2000-002H or  
DSG2000-001+ DSG2000-001H + DSG2000-001L;

---

**Option DSG2000-001K: Wideband Synthesizer, AWG for Sirius interference**

information on necessary hardware options on request

---

**Option DSG2000-002K: Wideband Synthesizer, AWG for XM interference**

information on necessary hardware options on request

---

**Option DSG2000-001L: Upgrade to real XM signal**

requires option DSG2000-001H

---

**Option DSG2000-002L: Upgrade to real Sirius signal**

requires option DSG2000-002H

---

# ・ D S G 2 0 0 0 仕様

## オプション関連4

---

Option DSG2000-002N: Sirius Overlay

requires option DSG2000-001 or options DSG2000-002H + DSG2000-002L

---

Option DSG2000-003: Programming option

requires option DSG2000-001 or DSG2000-001

Step through scenario file, applying saved settings (local);  
Labview Driver

---

Option DSG2000-004: GPIB

Remote access

  
**Innovationszentrum** Telekommunikations-  
technik GmbH

  
**IZT Pacific Co., Ltd.** Speedy decision and action for our customers!  
アイジーティーパシフィック株式会社