

Satellite Testing

SPECTRUM ANALYSIS SOLUTIONS FOR WIDEBAND SATELLITE COMMUNICATIONS

Alexander Nähring, Product Manager Signal, Spectrum & Phase Noise Analysis

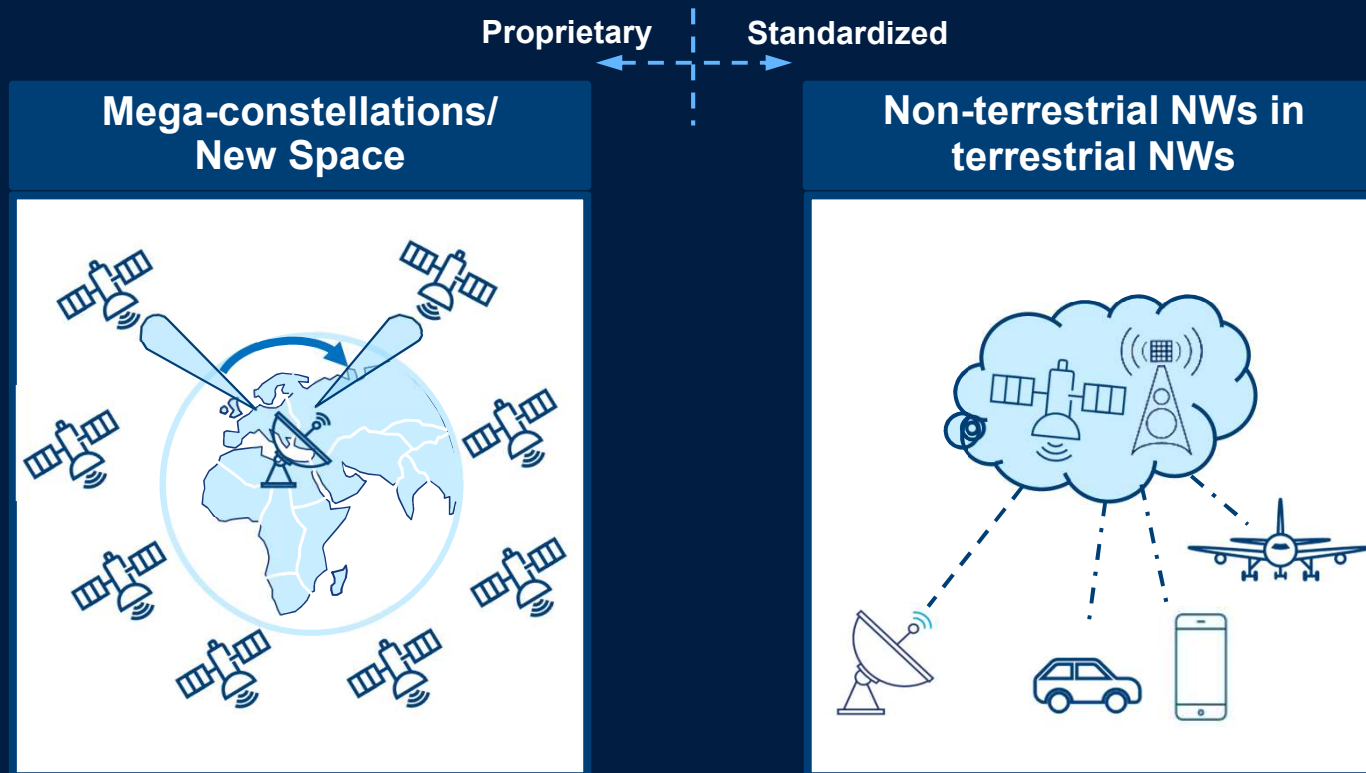
Yvonne Weitsch, Market Segment Manager Aerospace & Defense

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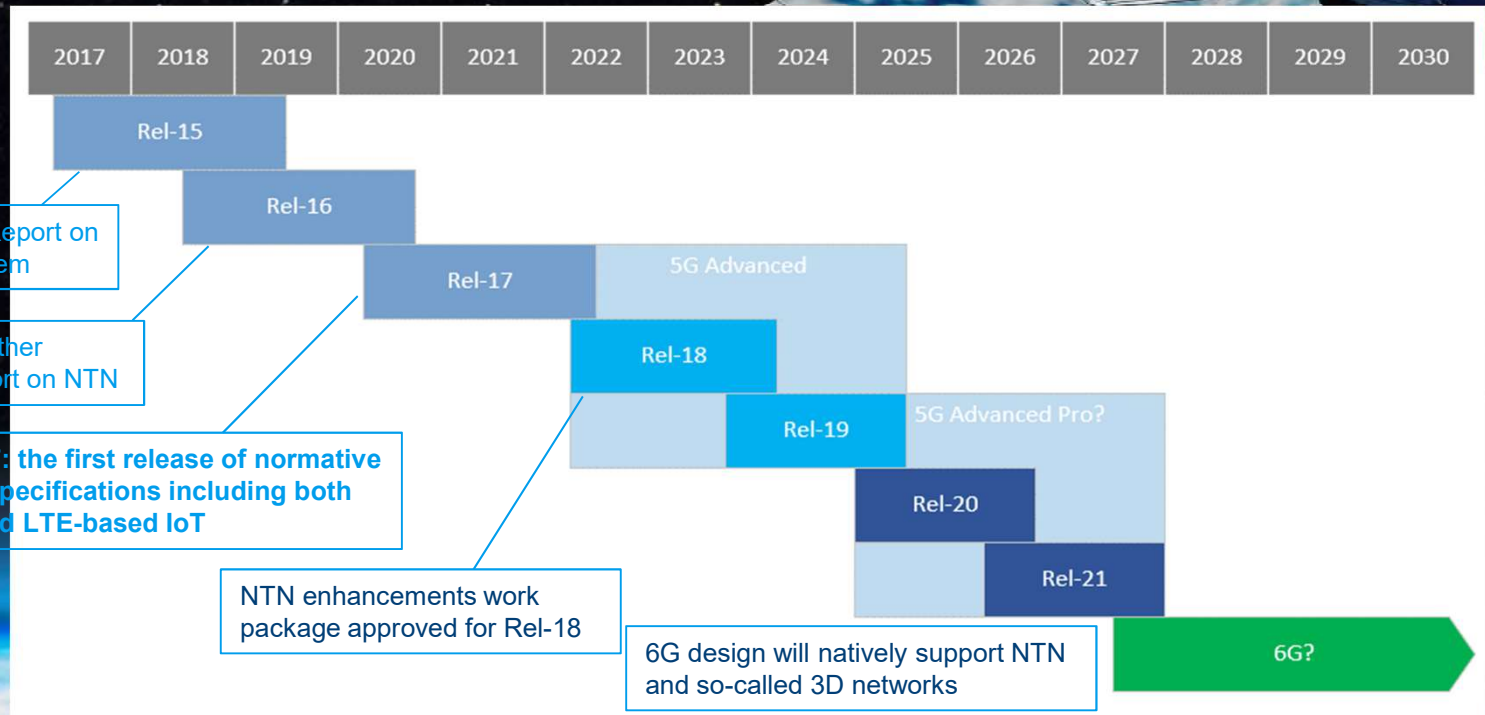
Make ideas real




Current evolution in the satellite industry and in terrestrial mobile communications



THE ROADMAP OF NTN IN 3GPP



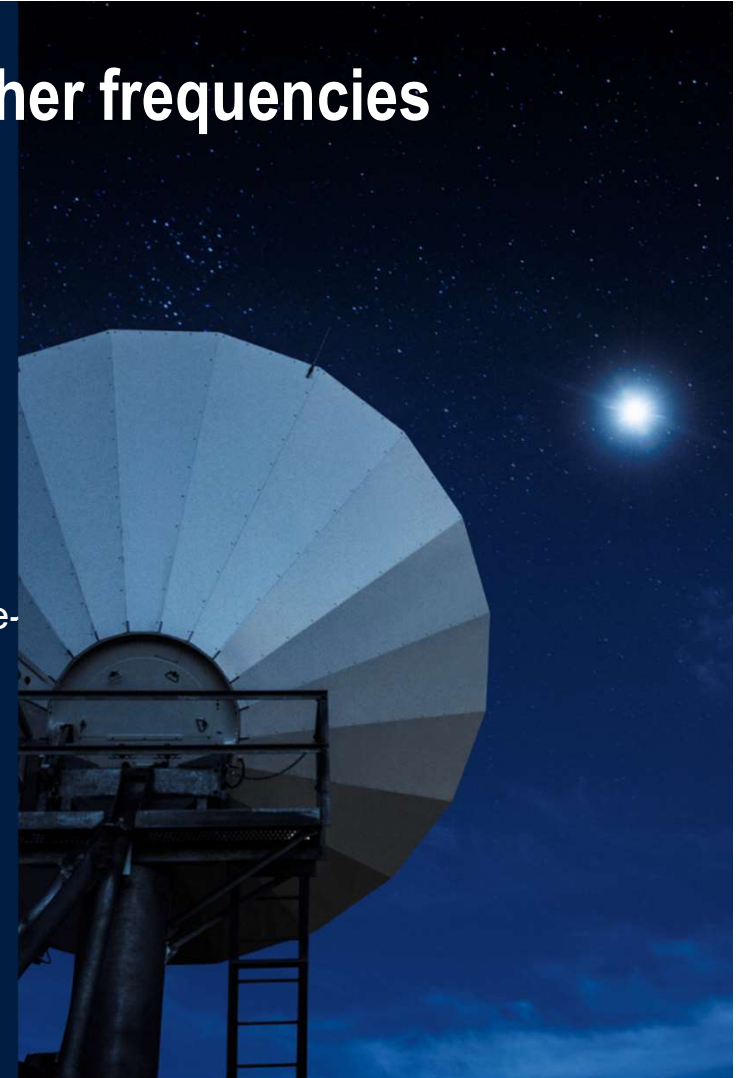
NTN frequency bands

Frequency band	Range (GHz)	3GPP NR NTN bands	Duplex Mode	Max Bandwidth
L	1 - 2	n255 1.525 – 1.559 (DL) 1.6265 – 1.6605 (UL)	FDD	20 MHz
S	2 - 4	n256 1.98 – 2.01 (UL) 2.17 – 2.2 (DL)	FDD	20 MHz
C	4 - 8	 Rel-18 evaluating beyond 10 GHz (VSAT only)		
X	8 - 12			
Ku	12 - 18			
K	18 - 27			
Ka	26.5 - 40		2-3 GHz	
Q/V	33 - 75		5 GHz	

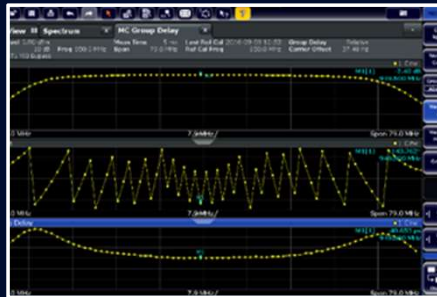
Challenges of broadband signals at higher frequencies

$$\text{PSD (dBm/Hz)} = \text{Noise power (dBm)} - 10\text{Log (BW/Hz)}$$

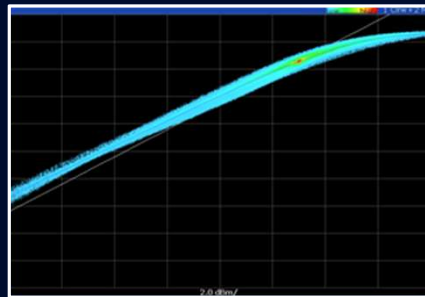
- ▶ Very wideband frequency spans lead to more spurs.
- ▶ A limit in the SNR limits the notch depth with regard to Noise-Power-Ratio measurements.



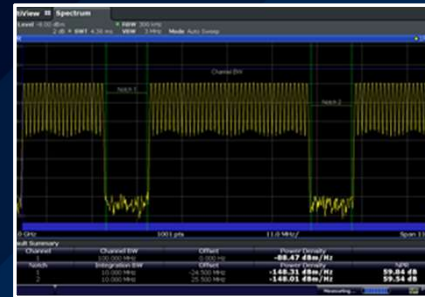
Signal Generators & Spectrum Analyzers Measurement Applications



Group Delay



Gain Transfer



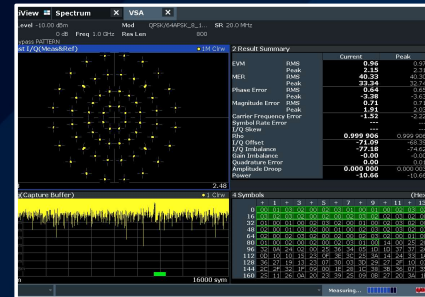
Noise Power Ratio



Spurious



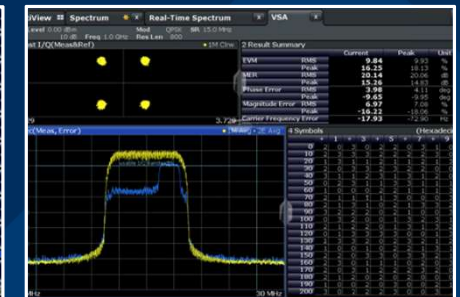
Phase Noise



S2/S2X - Wideband



Bit Error Rate



Interference

Vector Signal Generation

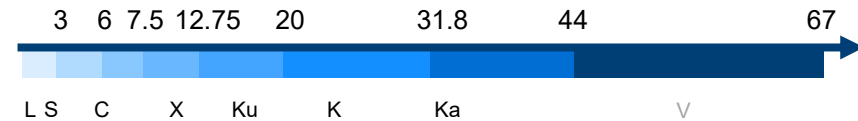
R&S®SMW200A

HIGH END VECTOR SIGNAL GENERATION

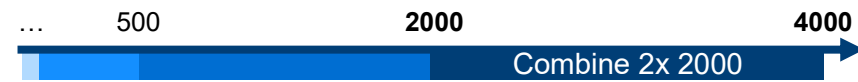


Up to 2 internal basebands and 2 RF paths

RF Frequency [GHz]



Baseband Generation Bandwidth [MHz]



Support for signal standards,
custom modulation and arbitrary waveforms

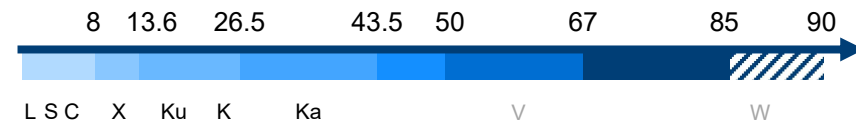
Signal & Spectrum Analyzer

R&S®FSW

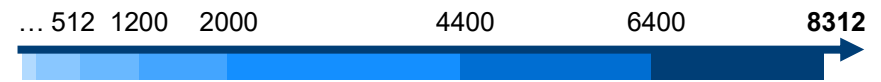
HIGH FREQUENCY, HIGH BANDWIDTH, *HIGH END*



RF Frequency [GHz]



Signal Analysis Bandwidth [MHz]



**Demodulation and analysis of standards,
Custom modulations (single carrier, OFDM, ...)
and more**

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CUSTOM OFDM GENERATION AND ANALYSIS

BASIC PARAMETERS

- Baseband
- OFDM Standards
- EUTRA/LTE/loT ...
- 5G NR/Sidelink ...
- V5GTF ...
- OFDM Signal Generation ...**

Generation

Total Number of Subcarriers	4 096	Occupied Number of Subcarriers	3 300
Subcarrier Spacing	120.000 0 kHz	Sequence Length	128 Symbols
Cyclic Prefix Length	256 Samples	CP No. Symbols	1 Symbols
Alt. Cyclic Prefix Length	128 Samples	Alt. CP No. Symbols	31 Symbols
DFT-S (skip non-data)	0		

Analysis

OFDM VSA

Symbol Characteristics

FFT Size Samples

Cyclic Prefix Length Samples

Preamble Symbol Characteristics

Block Length Samples

Frame Start Offset Samples

Advanced Cyclic Prefix Configuration

Conventional Mode
(All symbols have the same cyclic prefix length)

Two Different Cyclic Prefix Lengths

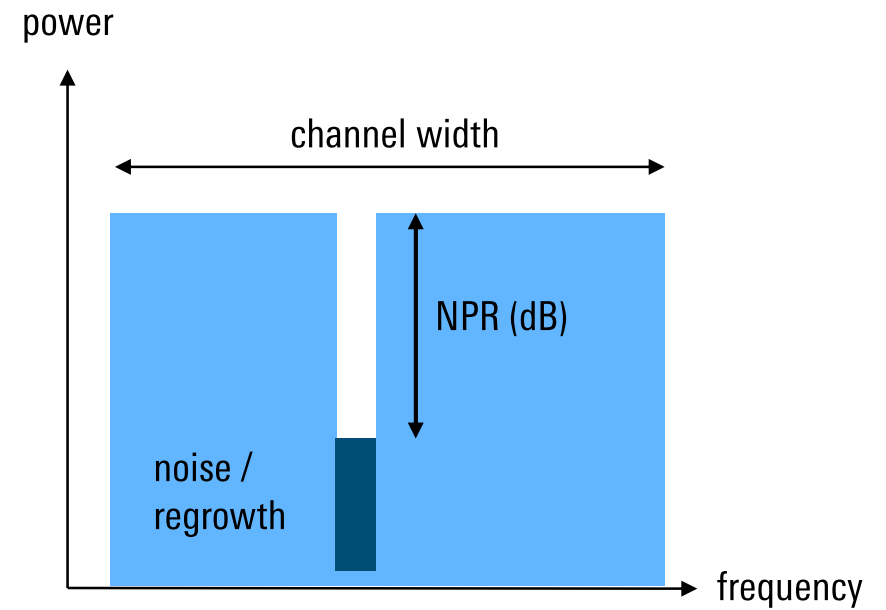
Periodic: Repeat Range 1 and Range 2

Non-Periodic:
Extend Range 2 to the End of Frame

	Symbols	Samples
Range 1	<input type="text" value="1"/>	<input type="text" value="256"/>
Range 2	<input type="text" value="31"/>	<input type="text" value="128"/>

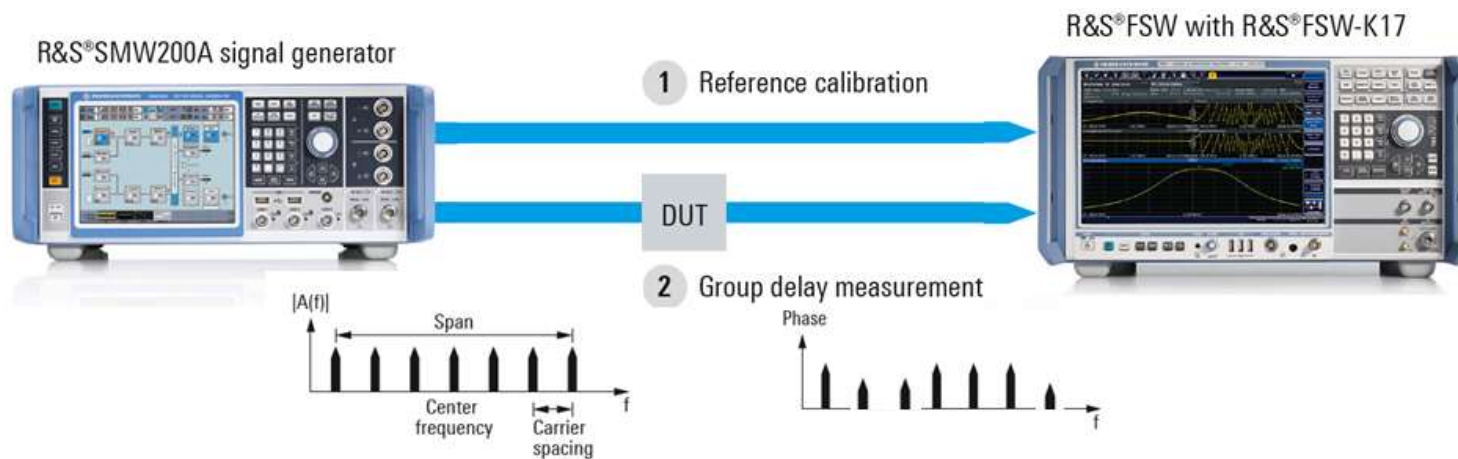
NOISE POWER RATIO

- ▶ Notched signal input to DUT
- ▶ Regrows caused by intermodulation
- ▶ NPR: ratio between carrier and notch power



GROUP DELAY MEASUREMENT

- ▶ Measure propagation time of a signal through a device
- ▶ Quantify signal degradations during in-orbit testing
- ▶ MCCW signals for wideband measurement



Find out more

www.rohde-schwarz.com/shortURL

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