Early 6G Sub THz Wide Bandwidth Measurement with Band Stitching Technology

Use UXA Signal Analyzer and Down-Converter

6G Challenges

The next generation of cellular technology will make huge improvements in bandwidth utilization and frequency coverage. The potential 6G signal single component carrier can be above 2 GHz and whole signal bandwidth can be over 8 GHz. 6G signal frequency band can go up to sub THz as D-band (110-170 GHz) or even H-band (220-330 GHz). Typically, high-performance signal analyzer itself on market can only analyze the signal up to 4 GHz and frequency to 50 GHz. Then how can we achieve high dynamic range in measurement over such wide signal bandwidth (either single carrier or OFDM)? And how can we maximize the signal analyzer for more test cases coverage (either power measurement or demodulation analysis)?

Band Stitching Technology

The wide band signal can be split into N sub-band acquisitions. Then each sub band can be processed using a new technique called DSIS (Digital Separation of Image and Spurious). It's based on the fact that the real signal and its image respond differently to the phase changes of the LO signal. This characteristic makes it possible to digitally distinguish and extract real signal and its image separately. DIS (Digital Image Separation) can be further generalized from signals with different phase responses to LO, and as a result, spurious signals can also be separated. We call this generalization Digital Separation of Image and Spurious (DSIS).

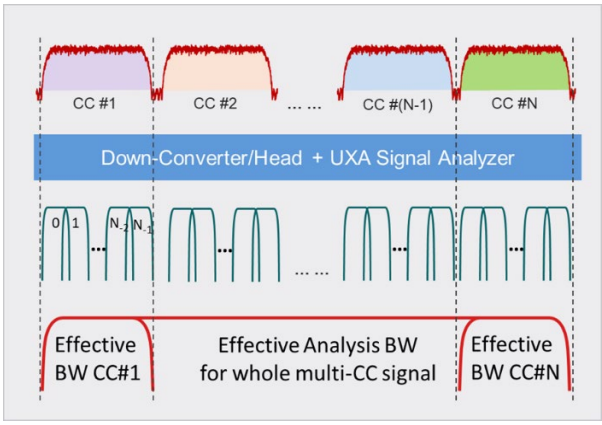

Figure 1. 6G Signal Analysis with Band Stitching

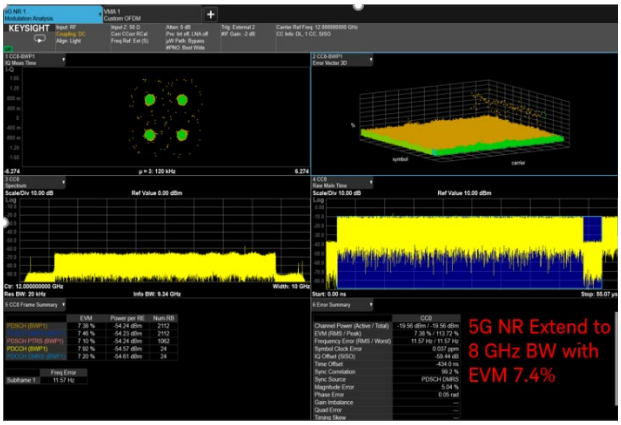

Figure 2. 5G NR Extension to 8 GHz with EVM 7.4%

KEYSIGHT

Keysight 6G Sub THz Signal Generation and Analysis

Keysight's 6G sub-terahertz (THz) solution features an arbitrary waveform generator (AWG) that generates a wideband intermediate frequency (IF), which is upconverted to D-band (110-170 GHz). The signal is then down-converted to an IF and digitized with a UXA high performance signal analyzer, then demodulated and analyzed using X-Series measurement application. Band stitching technology is used to analyze 6G wide bandwidth signal with only 2 GHz or 4 GHz analysis bandwidth option.

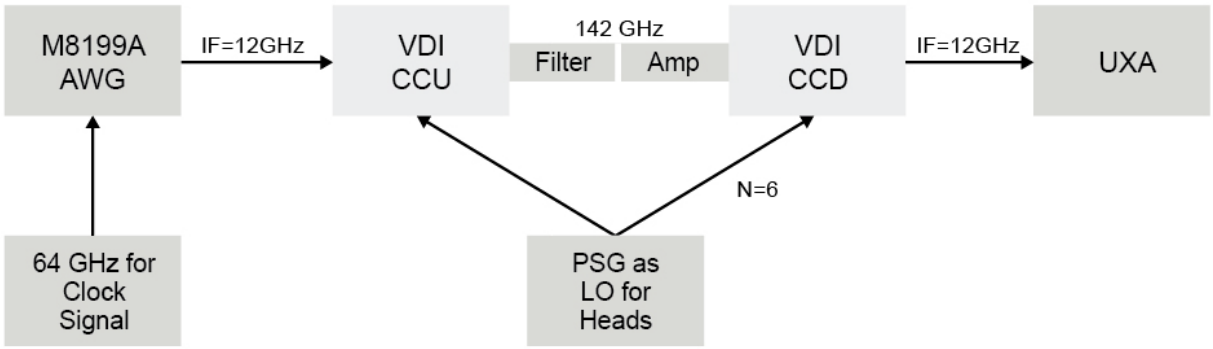

Figure 3. 6G Sub THz Example @ 142 GHz using UXA and Down Converter with Band Stitching Technology

Configuration Guide for 6G Sub THz

Model	Description

PXA or UXA	• N9032B-508/513/526, frequency range up to 26.5 GHz
	• N9042B-526/544/550 frequency range up to 50.0 GHz
	  ○ R20 analysis bandwidth, 2 GHz
	  ○ R40 analysis bandwidth, 4 GHz
	• X-Series Measurement Applications Version A.32.03 or later.

E8267D PSG	PSG Signal Generator as LO for up and down converter
N9029ACST	CCU and CCD Compact frequency up and down converter from VDI
M8199A AWG	Arbitrary waveform creator, 128/256 GSa/s
M8195A AWG	Arbitrary waveform creator, 65 GSa/s
N9085EM0E	5G NR Measurement Application
N9054EM0E	VMA Digital Demod Meas Application (Single Carrier measurement)
N9054EM1E	VMA Custom OFDM Meas Application
N90EMBWSB	Software Based IQ Bandwidth Expansion (Band Stitching)
N7631EMBC	5G NR Signal Generation

Band stitching technology from Keysight using N9032B or N9042B signal analyzer can support the very wide 6G signal analysis with repetitive signals. It applies Keysight unique measurement science with delicate hardware/LO control and can analyze the 5G NR extension, single carrier or custom OFDM signal for early 6G research.