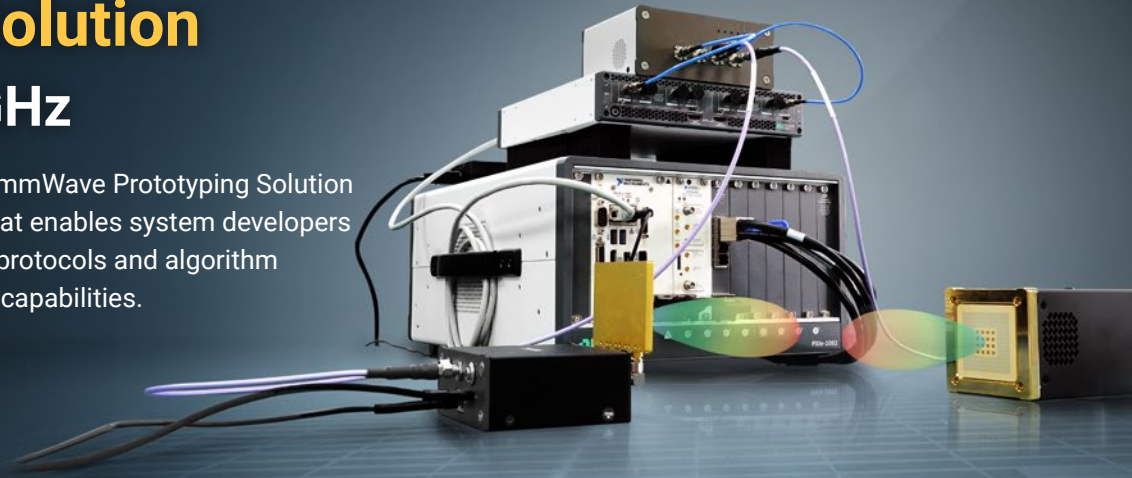


# mmW-SDR Solution

## Go Beyond 7 GHz

Presenting the TMYTEK Rapid mmWave Prototyping Solution with the NI Ettus USRP X410 that enables system developers to realize and experiment with protocols and algorithm innovations, with full mmWave capabilities.



### TMYTEK mmWave extension platform with excellent EVM performance

The solution includes the UD Box 5G, an up-and-down converter between Sub-6 GHz and 5G mmWave bands without sacrificing EVM quality; and the BBox 5G series mmWave beamformers integrating PA, LNA, Tx/Rx switch, and phase shift into one box with a choice of 4x4 or 1x4 array antenna kit. The solution also comes with an intuitive GUI for beamforming experiments.

The NI Ettus USRP X410 capability is fully upgraded by the TMYTEK solution. It has been intensively tested for system compatibility and performance. Engineers can use the beamformer to fine-tune the gain and phase of multiple RF channels, and the UD Box 5G to expand the SDR spectrum to 5G FR2 mmWave bands while maintaining excellent EVM performances.

- Ready-to-use mmWave multi-channel frontend
- Excellent EVM RF performance
- Integrated and validated with baseband instruments
- 140 ns Beam Switch @100MHz SPI
- Intruitive GUI and open API



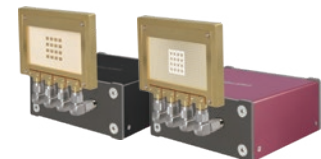
#### UD Box 5G - Single & Dual Channel

**RF:** 24 - 44 GHz  
**IF:** 0.01 - 14 GHz  
**Tunable LO:** 24 - 44 GHz  
**Conversion Loss:** 13 dB (typ.)  
 10 MHz output and 100 MHz input/output  
 Synchronization



#### BBox One 5G

**RF:** 24.25 - 27.5 GHz; 26.5 - 29.5 GHz; 37-40 GHz  
**Band:** n258, n257, n260  
**RF Channels:** 16  
 Tx/Rx Half Duplex  
 Individual Gain and Phase Control  
**Beam control interface:** SPI  
**API:** LabVIEW, MATLAB, Python, C#, C++



#### BBox Lite 5G

**RF:** 26.5 - 29.5 GHz; 37 - 40 GHz  
**Band:** n257, n260  
**RF Channels:** 4  
 Tx/Rx Half Duplex  
 Individual Gain and Phase Control  
**Beam control interface:** SPI  
**API:** LabVIEW, MATLAB, Python, C#, C++

## Fully-integrated 5G FR2 waveform and beam management

### Transmit and analyze 5G NR mmWave

The Sub-6 GHz signals of NI Ettus USRP X410 can be converted to 28 GHz by TMYTEK UD Box and BBox, which allows for transmitting and analyzing the 5G NR FR2 waveform in true mmWave bands. The EVM quality of 400 MHz bandwidth/256 QAM is outstanding, substantially greater than the 3GPP specification of 3.5 % (-40 dB) @256QAM.

- 5G FR2 standard waveform supported
- Real-time analysis, rapid prototyping

### Beam Steering

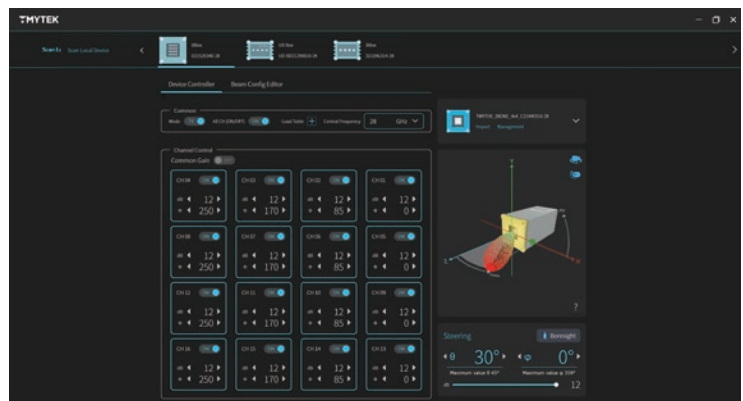
Beamforming technology is essential for mmWave applications. To experiment with beamforming behavior, TMYTEK delivers a ready-to-use beam management platform. It's simple to change the beam angles to restore signal quality using the in-house designed interface GUI - TMXLAB Kit (TLK). This beamforming testbed is also the ideal platform for developing beam management algorithms. The beamforming experiments can be observed as below.

- The channel, gain, and phase can be controlled individually
- Boresight setting
- Beam misaligned
- Beam steering

## Intuitive software integrated - TMXLAB Kit (TLK)

TMYTEK's in-house designed GUI, TMXLAB Kit (TLK), connects to the beamformer via the LAN port to control the phase and amplitude of each RF port to form the beams. An API is included and it is compatible with LabVIEW, MATLAB, Python, C#, C++, and other programming languages.

- Individual channel control
- Beam steering control
- Customized antenna setting



TMXLAB Kit (TLK)

## Discover more use cases

The function of RF signal recording and playback are included in the solution, as well as a wireless communication prototype, allowing for advanced experiments on 5G/B5G and 6G leading research topics such as MIMO, radar, communication and sensing, channel sounding, wireless AI, mmWave beamforming, Reflective Intelligent Surface (RIS), and more.

Learn More ▾



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