Software Control Interface

The BBox™ Lite software interface offers both UI and API control which are completely designed in house by our software team. Our patented software algorithm offers better accuracy and easier control on the beam angles. The module can be controlled by RJ-45 ethernet cable. Both the UI and API are available for our customers to access and download from the Web. The user interface is included in our TMXLAB Kit software tool which is also used to control BBox One and UD Box. The BBox Lite interface shows the 4-channel phase and amplitude control block diagram as depicted below. To control the parameters, users can drag the Common Gain, dB, or Φ slide bars on the desired channel to make the changes. The right hand portion of the interface shows the beam steering angle as well as the total module gain. This function can be used together with our standard antenna kit to control the steering angle.

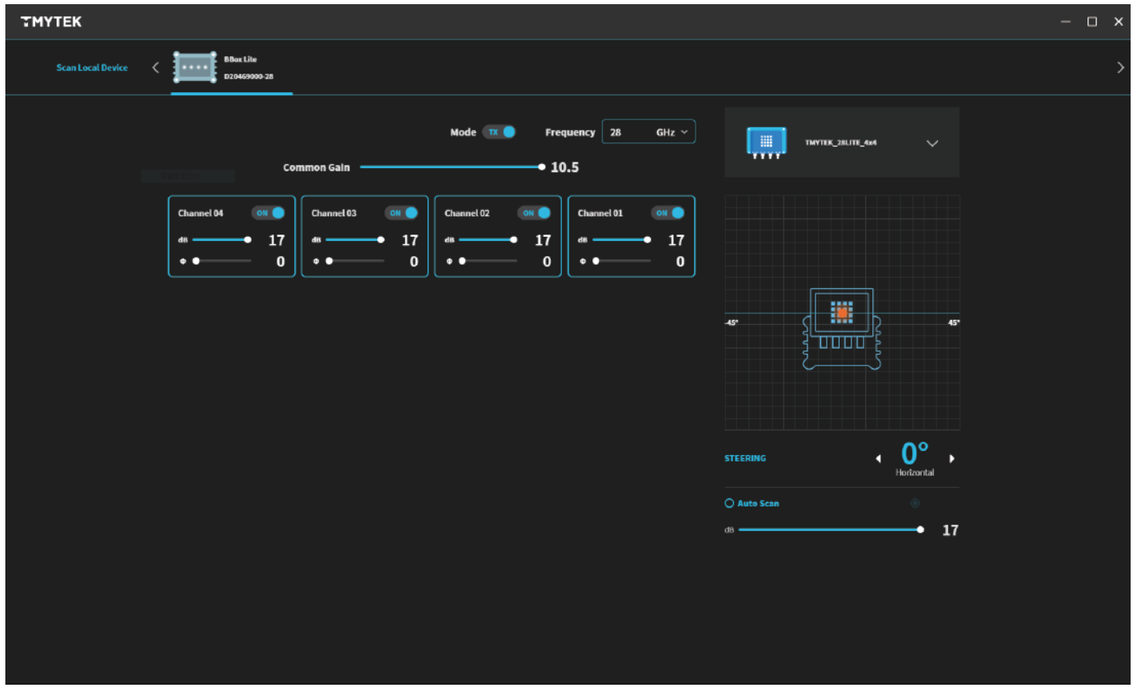

Figure 5. BBox™ Lite User Interface

BBox™ Lite

5G NR mmWave Beamforming Development Kit

www.tmytek.com

BBox™

Build for All 5G Developers

Massive deployment is expected in 2021 worldwide. IMT-2020 defines eMBB, URLLC and mMTC which are keys to successful 5G communications. TMYTEK has developed a small and compact development tool to help our customers in moving onto 5G beamforming developments and tests with ease. We call it the BBox™ Lite. Our BBox™ Lite is the lighter version of our BBox™ series. It consists of 4 channel RF control, standard antenna kit and API software

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/TMY technology

Version: 2021-01

BBox™ Lite 28 GHz BB-LITE-BP-28-04

Features

- Operating Frequency: 26.5 to 29.5 GHz
- Designed for 5G n257 band (including n261 band)
- Up to 4 controllable RF channels with series patch antenna
- Each channel provides:
  - › 360˚ phase shifter coverage with 5˚ per step
  - › RMS phase error: 4˚ (typical)
  - › 15 dB attenuation range with 0.5 dB per step
  - › RMS attenuation error: 0.3 dB (typical)
  - › Input / Output matching: -10 dB (typical)
- T/R half duplex operation
- 5 ms T/R mode switching time (typical)
- 5 ms beamsteering time (typical) *1
- PC software control via RJ-45 Ethernet interface

*1Beamsteering time is the time it takes for all 4 channels' gain and phase to change to reflect the new beamforming angle. The time here is dependent on the CPU speed of the PC in which the control interface (UI or API) is running on.

System RF Specifications

Parameter	Conditions	Unit	Min.	Typ.	Max.
Operating Frequency Range	With AA-Kit, compliant with n257 and n261 band	GHz	26.5	28	29.5
Number of Controllable Channels			---	4	---
Antenna Array Gain		dB	14	15	16
Transmitter Maximum Gain		dB	33.5	35.5	37.5
Transmitter EIRP		dBm	27	29	31
Maximum Input Power	Tx Mode	dBm	---	---	-8
Receiver Maximum Gain		dB	30	32	34
Beamsteering Range	Horizontal	deg	-45	---	+45
	Vertical	deg	---	Fixed	---
3dB Beamwidth	Broadside	deg	-13.0	---	+13.0

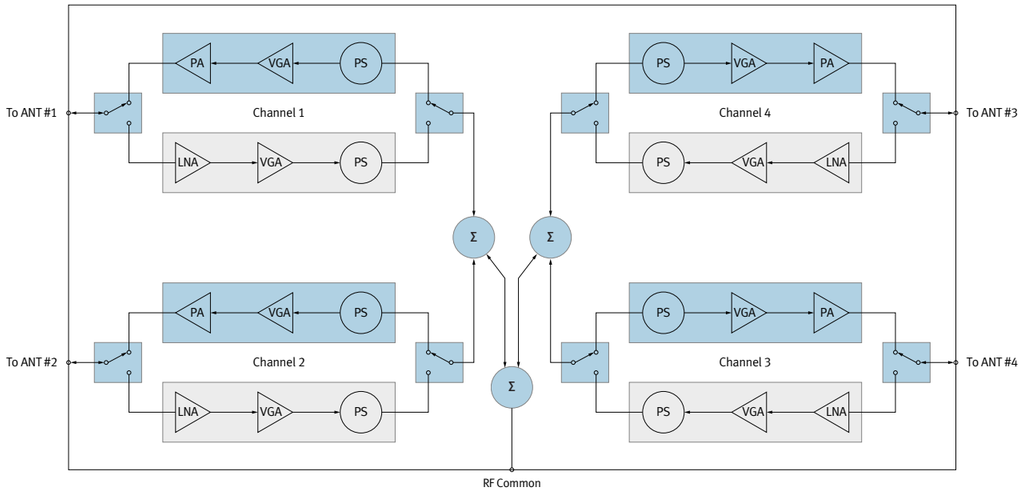

Figure 1. 5G Beamformer System Diagram (4 channels)

Connector Specifications

Parameter	Location	Type and Function
RF1, RF2, RF3, RF4	Front Panel	4 channel RF ports with K-type connectors
RJ-45 Ethernet	Back Panel	Control port (including UI and API control)
DC IN	Back Panel	3-pin DC input (5V max. 1A adapter included)
RF COM	Back Panel	RF common port with SSMA connector
Switch Button	Back Panel	ON/OFF Switch

DC Specifications

Parameter	Conditions	Unit	Min.	Typ.	Max.
Power Consumption		W	---	---	2.5
Supply Voltage		Vdc	---	5	---
T/R Switching Time	Between Tx and Rx modes	ms	---	5	---
Beamsteering Time*1	Dependent on CPU speed	ms	---	5	---

AC Specifications

Parameter	Conditions	Unit	Min.	Typ.	Max.
Adapter Input Voltage		Vac	100	---	240
Adapter Input Current Consumption		A			1

Single Channel RF Specifications

Tested conditions: 4 channels, f_{RF} = 28 GHz, Z_S = ZL = 50 Ω and T_{AMB} = 25˚C

Parameter	Conditions	Unit	Min.	Typ.	Max.
Operating Frequency Range	Without antenna	GHz	26.5	28	29.5
Maximum Gain	Tx Mode	dB	13	15	17
	Rx Mode	dB	10	12	14
Noise Figure	Rx Mode	dB	---	10.5	12
OP1dB	Tx Mode	dBm	4	5	6
IP1dB	Rx Mode	dBm	-21	-20	-19
Phase Shifting Range		deg	---	360	---
Phase Shifting Step		deg	---	5	---
RMS Phase Error		deg	---	4	---
Attenuator Range	Tx Mode	dB	13	15	17
	Rx Mode	dB	13	15	17
Attenuator Step		dB	---	0.5	---
RMS Attenuation Error		dB	---	0.3	---
Return Loss	Antenna Port (Tx)	dB	---	10	---
	Antenna Port (Rx)	dB	---	10	---
	COM Port	dB	---	7	---
Channel-to-Channel Isolation	Maximum gain setting-Tx	dB	---	25	---
	Maximum gain setting-Rx	dB	---	30	---

Package

TMYTEK's compact connectorized packaging:

Parameter	Conditions	Unit	Min.	Typ.	Max.
Dimension	With AA-Kit	mm	124.3	102.0	103.7
Weight	Aluminum	g	---	510	---

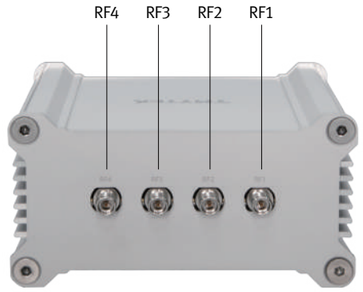

Figure 2. BBox™ Lite Front Panel

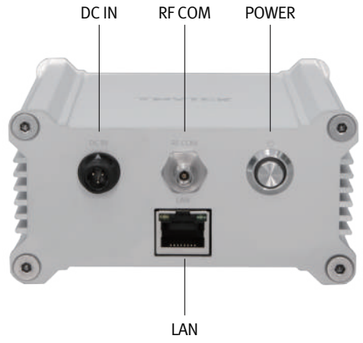

Figure 3. BBox™ Lite Back Panel

Figure 4. BBox™ Lite Antenna (4 channels)

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