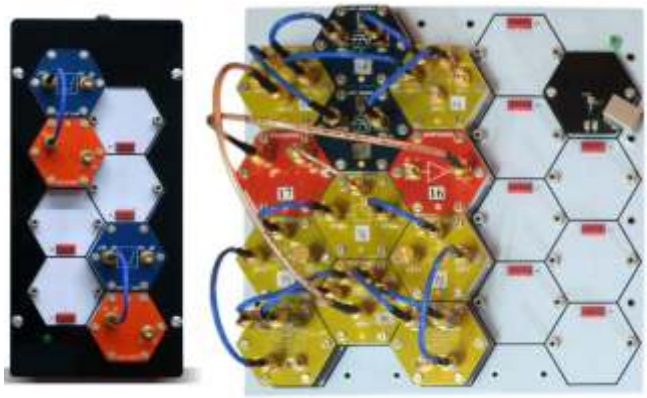
BeeWave is platform for teaching and prototyping RF systems with a fast and easy Plug & Play approach that is ideal for education and research. Building complex RF circuits on PCB is a tedious task; The user has to carefully route RF tracks, prepare RF layouts and simulations, carefully calculate bias and DC power requirements for different components, design power and control/clock distribution networks... etc. Then wait for PCB fabrication and testing times only to repeat the entire process again with every design iteration. This has made RF design a slow and costly process especially for universities and research centers, startups and small to medium businesses who don't have access to their own RF PCB manufacturing and testing facilities.
BeeWave opens the door to innovation in the RF Field by allowing students, researchers and designers to build complete RF systems simply by connecting readymade modules using standard cables, accelerating the early stages of RF Circuit design and prototyping and minimizing error and uncertainty. BeeWave Modules represent common RF circuit components (Filters, Mixers...etc.) with both active and passive modules to support designing virtually every type of system.
For teachers and educators, BeeWave comes with teaching modules, experiments and lab exercises built around BeeWave to take the student through the different aspects of RF circuit design engineering and RF concepts

Features

- Readymade Plug & Play modules for typical RF functions up to 6 Ghz
- Connect modules & build complete RF circuits in a matter of minutes
- Ideal for Hands-on education of RF & Microwave concepts
- The fastest way to prototype, test &validate RF circuit designs
- Build any RF & Microwave circuit without the need for complex RF PCB design and fabrication
- Improve your design over multiple design iterations withoutthe cost or delay of PCB re-fabrication
- Readymade configurationsforeducation and classroom training
- PC controlled modules, compatible with Matlab

BeeHive

A backplane with hexagon shapes. It holds the modules and easily provides power and control data communications



Application Module

Fixed gain amplifier optimized for applications requiring high & wide bandwidth gain blocks.

- Frequency Range: 10 MHz to 6000 MHZ
- Gain: 14 dB
- P1dB Output Power:15 dBm
- Input Return Loss (S11): -20 dB
- Output Return Loss (S22): -9 dB
- Reverse Isolation: 25 dB
- Max. DC Voltage at input or output: 25V
- Max RF input power: 20 dBm

Variable gain amplifier

- Frequency Range: 10 -6000 MHZ
- Gain Setting: -19.75 to 12 dB
- Gain Resolution: 0.25 dB (Typical)
- P1dB Output Power: 15 dBm
- Input Return Loss (S11): -15 dB
- Output Return Loss (522): -10 dB
- Reverse Isolation: 23 dB
- Max. DC Voltage at input or output: 25V
- Max. RF input power: 20 dBm

- Frequency Range: 50 -1000 MHZ
- Gain Setting: -1125 to 19.5 dB
- Gain Resolution: 0.25 dB (Typical)
- Input Return Loss (511): -15 dB
- Output Return Loss (522): -15 dB
- Reverse isolation: 25 dB
- Max. DC Voltage at input or output: 25 V
- Max. RF input power: 20 dBm
- Wideband low noise amplifier
- Frequency Range: 700-2700 MHZ
- Saturated Output Power: 18 dBm
- 1 dB Output Compression Point: 15 dBm
- Noise Figure: 2dB
- Small Signal Gain (S21): 16dB
- Input Return Loss (S11): -18 dB

Note: Specifications are subject to change.

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- Output Return Loss (S22): -17 dB
- DCVoltage (RF in, RF out): 25 Vdc
- Max. RF input power: +20 dBm
- LNA2700

Band Pass Filter based on ceramic filters technology.

- Bandwidth: 100-1020 MHZ
- Center Frequency: 2450 -5500 MHZ
- Return Loss: -22 dB
- Pass Band Insertion Loss: -5 dB
- Stop Band Attenuation: -40 dB
- Max. RF input power: 20 dBm

Band Pass Filter based on SAW (Surface Acoustic Wave) technology.

- Bandwidth:2 - 80 MHz
- Center Frequency: 315 - 2440 MHZ
- Return Loss: -20 dB
- Pass Band Insertion Loss: -2 dB
- Stop Band Attenuation: -40 dB
- Max. RF input power: 20 dBm

Band Pass Filter

- Bandwidth:40 -72 MHz
- Center Frequency: 1900 -2436 MHZ
- Return Loss: --17.5 dB
- Pass Band Insertion Loss: -1 dB
- Stop Band Attenuation: -35 dB
- Max. RF input power: 20dBm

Ceramic Low pass filter module.

- Cutoff Frequency: 150- 6000 MHZ
- Return Loss: -20 dB
- Pass Band Insertion Loss: -3 dB
- Stop Band Attenuation: -50 dB
- Max. RF input power: 20 dBm

High performance, Wide band Microwave double balanced passive mixer (can be used for frequency up-conversion or downconversion)

- Frequency Range
- RF : 2-14 Ghz
- LO : 1-12 Ghz
- IF :10-6000 MHZ
- Return Loss:
- RF :-25 TO -9 dB
- LO : -25 TO -5 dB
- IF :17TO -5 dB
- Conversion loss :8 dB @ 6 Ghz
- LO to RF Leakage: -25 dBm
- LO to IF Leakage: -25 dBm
- RF to IF Isolation: 40 dB
- SSB Noise Figure @ 6 GHz: 8 dB
- IIP3 @ 6 GHz: 24 dBm
- Max. DC Voltage at input or output: 25 V
- RFand IF input power: 20 dBm
- LO input power: 10 dBm

Ultra-wideband phaselocked loop (P11) with integrated voltage control oscillators (VCOs) with good phase noise and spurious performance.

- Frequency Range: 23.5-6000 MHZ
- Output Power @iGHz
- - Power Setting 0: -8 dBm
- - Power Setting 1: -5 dBm
- - Power Setting 2: -2 dBm
- - Power Setting 3:1 dBm
- Frequency Resolution
- - 3000 to 6000 MHz : 100KHz
- -1500 to 3000 MHZ: 50khz
- 750 to 150❑ MHZ: 25khz
- - 375 to 750 MHZ: 12.5khz
- -187.5 to 375 MHz: 6.25khz
- Phase Noise @ 1GHz & 10 Khz
- offset: -104 dBc/Hz
- 2nd Harmonic: -20 dBc
- 3rd Harmonic: -7 dBc
- DC Voltage on RF output or REF in: 50Vdc

10 MHz clock reference source used to provide reference clock inputs to local oscillators.

- Number of Outputs: 4
- Output Frequency: 10 MHZ
- Output Power: 11 dBm
- Frequency Stability: 2.5 ppm

SPDT absorptive RF switch

- Frequency Range: 10 - 6000 MHZ
- Insertion Loss: 1.5 dB (Typical)
- RFC Return Loss: -15 dB
- Active Port Return Loss: -15 dB
- Terminated Port Return Loss: -15 dB
- RF Input Power Handling (Active): 36 dBm
- RF Input Power Handling (Terminated): 26 dBm
- Input IP2 2 GHz: 120 dBm
- Input IP3 @ 2 GHz: 65 dBm
- Max. RF input power:40 dBm
- Max. DC Voltage at input or output: 50 Vdc
- Isolation 2GHz : 50dB

SPDT absorptive RF switch

- Frequency Range: 30 -5000 MHZ
- Insertion Loss: 1.5 dB (Typical)
- RFC Return Loss: -20 dB
- Active Port Return Loss: -15 dB
- Terminated Port Return Loss: -17dB
- RF Input Power Handling (Active): 33 dBm
- RF Input Power Handling (Terminated): 24 dBm
- Input IP2 @ 2 GHz: 97 dBm
- Input IP3 @ 2 GHz: 58 dBm
- Max. RF input power:35 dBm
- Max. DC Voltage at input or output: 50 Vdc

Wideband variable attenuator

- Frequency Range: 10 -6000 MHZ
- Insertion Loss: 2.5dB (ty)

Note: Specifications are subject to change.

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- Attenuation Setting: -31.75 dB (min)
- Attenuation Resolution: 0.25dB (ty)
- Return Loss: -15dB (ty)
- RF Input Power :23dBm (max)
- Input IP3: 55dBm
- Max DC Voltage at input or output: 25 Volt

Power Supply module providing DC supply to all other Beewave modules through the backplane

- Input Voltage: 12 Vdc (typical)
- Output Voltage: 3.3 Vdc and 5 Vdc
- Maximum output power: 30 Watt
- Efficiency: up to 89%
- Universal Input Range: 90-305VAC
- Input voltage reverse Protection
- Output Short Circuit and overload Protection
- 4 Additional Outputs (5V and 3.3V)

Possible Experiment Setup

Mapping Down-Converter block diagram to relevant BeeWave Modules,

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