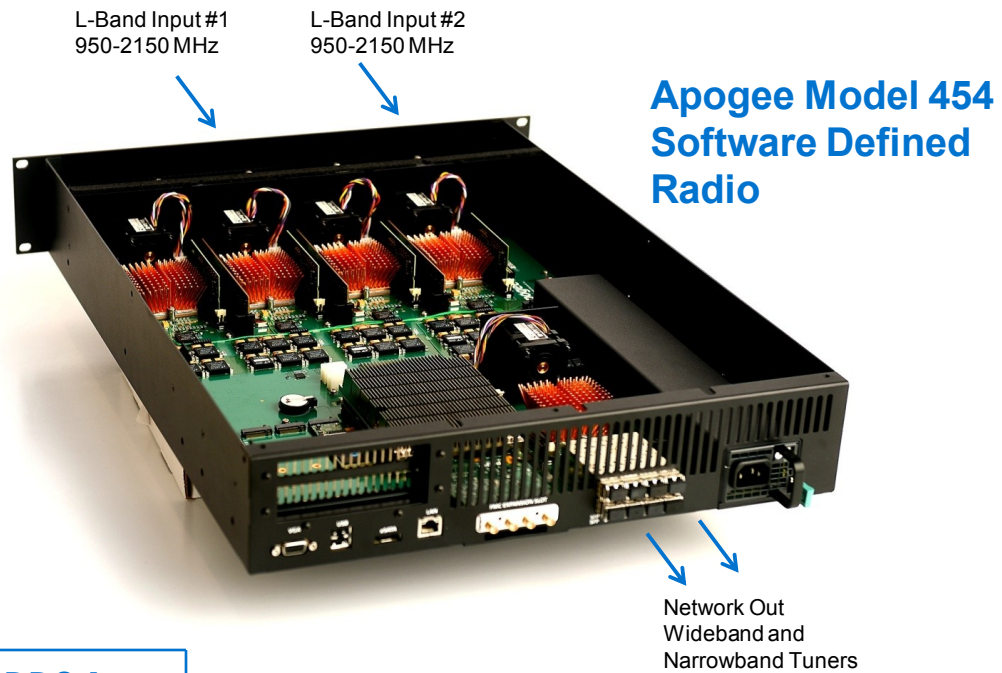# Apogee
Applied Research, Inc.

Model 454
RF-Digital Down Converter Application (RF-DDC)

- **SATCOM**
- **Search and Survey**
- **Spectrum Monitoring**
- **L-Band to Network**
- **L-Band to VITA-49A**

RF to Digital Down Converter Application

The RF-DDC Application utilizes the Model 454 and Apogees internally developed FMC RF Transceiver Modules (part number FMC-XCVR-2). The application digitizes up to two L-Band inputs (950 MHz to 2150 MHz, 1200 MHz BW per input) and provides high channel count digital tuners to the customers 10 GbE Network for further processing. Tuner bandwidths up to 160 MHz. A snapshot mode facilitates full bandwidth spectral monitoring.

L-Band Input #1
950-2150 MHz

L-Band Input #2
950-2150 MHz

**Apogee Model 454
Software Defined
Radio**

Network Out
Wideband and
Narrowband Tuners

Key Features—RF-DDC App

L-Band Inputs..	Up to two L-Band Inputs, 950-2150 MHz Frequency Range
Input Power Range...	-87 dBm to 0 dBm (Typ)
ADC Converters..	12-bit, 1.6 GSPS, 1200 MHz BW,
Clocks..	10 MHz and 1PPS required, Apogee Timing Module (FMC-T00) Required in timing FMC slot
Wideband Snapshot	Snapshot the 1200 MHz input bandwidths, over 1 seconds length at full rate
Other ADC..	Histogram, % in Clip Metrics Monitoring, Spectral Inversion
Narrowband Tuners..	192 tuners per L-Band Input, decimations of 128 to 131,072 in steps of 32 for each tuner
Wideband Tuners...	24 tuners per L-Band input, decimations of 8,16,32, and 64
Tuners..	All independent CF, BW, adjustable output filters, and tune anywhere across the L-Band
Output..	Separate Digital IF multicast for each tuner output via the units eight 10 GbE ports
Output Format..	VITA-49A or SDDS
Form Factor/Environmental...............................	19" 2U rack mount, 0-35C Operation Range, less than 500 Watts power

Key Specifications– RF-DDC App

L-Band Inputs	SMA Connector, 50 Ohm, Analog L-Band, 950-2150 MHz Frequency Range
Input VSWR	≤ 1.3:1 (950-2150 MHz)
Input Power Range	-87 dBm to 0 dBm (Typ)
Input Max Power	+10 dB without damage
Amplitude Flatness	Uncorrected amplitude ripple over any 80 MHz segment less than ± 0.5 dB
	Uncorrected amplitude ripple over any 40 MHz segment less than ± 0.3 dB
Out of Band Rejection	Minimum of 50 dB rejection between 0-900 MHz.
	Minimum of 50 dB rejection between 2200 -3200 MHz.
Gain	Up to 28 dB, 14 dB selectable, 14dB fixed
Attenuation	Adjustable 0.5 to 31.5 dB in increments of 1 dB steps
System Spurious Performance	-55 dBc Typical, IMD3 of -57 dBFS Typical
Noise Figure	Typical Noise Figure 10 dB for input paths routed via the internal LNA
	Typical Noise Figure 27 dB for selected inputs that bypass the internal gain stages.
Phase Noise	-78 dBc at 100 Hz.
	-82 dBC/Hz at 1 kHz.
	-89 dBC/Hz at 10kHz.
	-103 dBC/Hz at 100 kHz.
	-115 dBC/Hz at 1 MHz.
Time Stamping	Input 1PPS, 10 MHz Ref, NTP time, time stamp each tuner output to 1nsec accuracy
Spectrum Inversion	User configurable to invert or not invert in the input spectrum pre-processing
Wideband Snapshot of Input Data	User selectable in number of snapshot samples, and delta samples between snapshots
Output Packet Formatting	SDDS, Optional VITA 49 with the Spectrum Survey Profile version 1.1 (VITA 49A)
	Output via the units eight 10 GbE SFP+ ports
External Reference	10 MHz, AC Coupled, 50 Ohm, 4 to 13 dBm, female SMA port
	1 PPS, AC Coupled, 50 Ohm, 7 to 13 dBm, female SMA port
Digital Tuners	192 Narrowband tuners per RF input, decimation range of 128 to 131,072 in steps of 32
	24 Wideband Tuners per RF input, decimation range of 8, 16, 32, or 64
	Can be tuned anywhere between 950—2150 MHz, Independent BW and CF per Tuner
	100 uHz Tuning resolution per Tuner
	Adjustable Output Filter per Tuner, 5% to 80% in steps of 1.125%
	Independent Multicast stream for each tuner, selectable data output, Real or Complex
	Tuner allocation resource management provided by Apogee software
Performance Monitoring	Histogram provided for ADC loading, Percent Time in Clip Metrics, ADC overload indicator
User Interface	HTTPS Post command software for user control via a 100/1000 RJ45 Command control port
SATA Port	One external SATA port provided to storage outside the chassis
Form Factor / Environmental	19" rack mount, 2U form factor, 0-35C operating, humidity 30 to 70% non condensing