Spectrum Analyzer Range Extender

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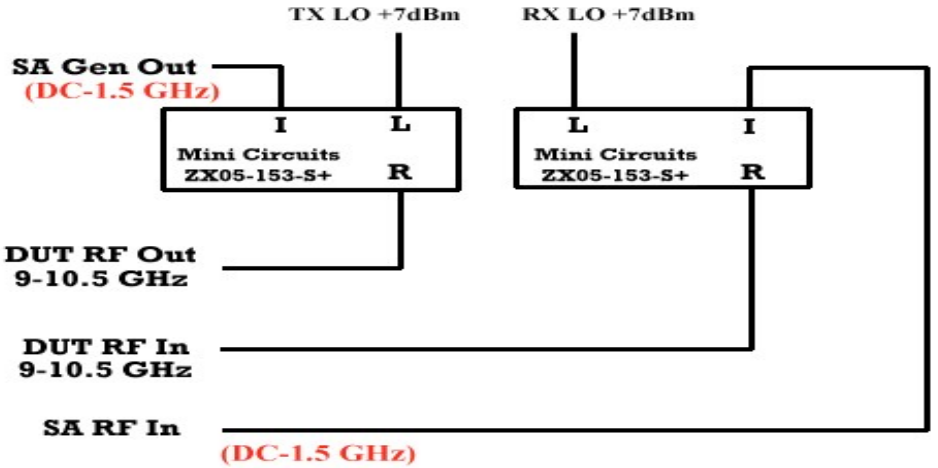
N0EDV


2 to 6 GHz LO IN
2-7.5 GHz Range
DigiLO
OUT
1 GHz LO IN
9-10.5 GHz Range
Ext. 10 MHz
SA
GEN
OUT
SA
RF
IN
DUT
RF
OUT
DUT
RF
IN
Power
2 to 7.5 GHz
9 to 10.5 GHz
Galaxy A42 5G

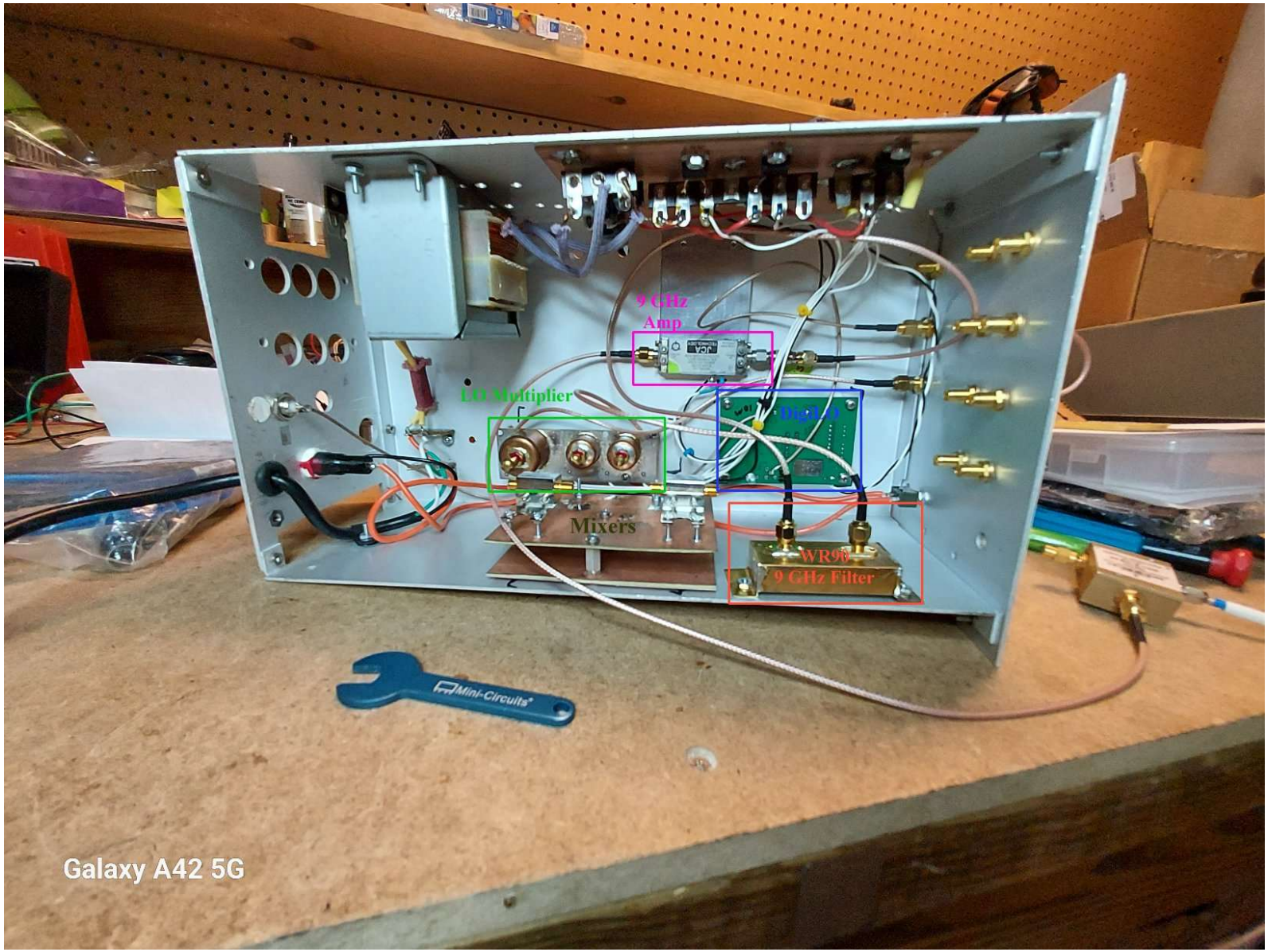
Overview.

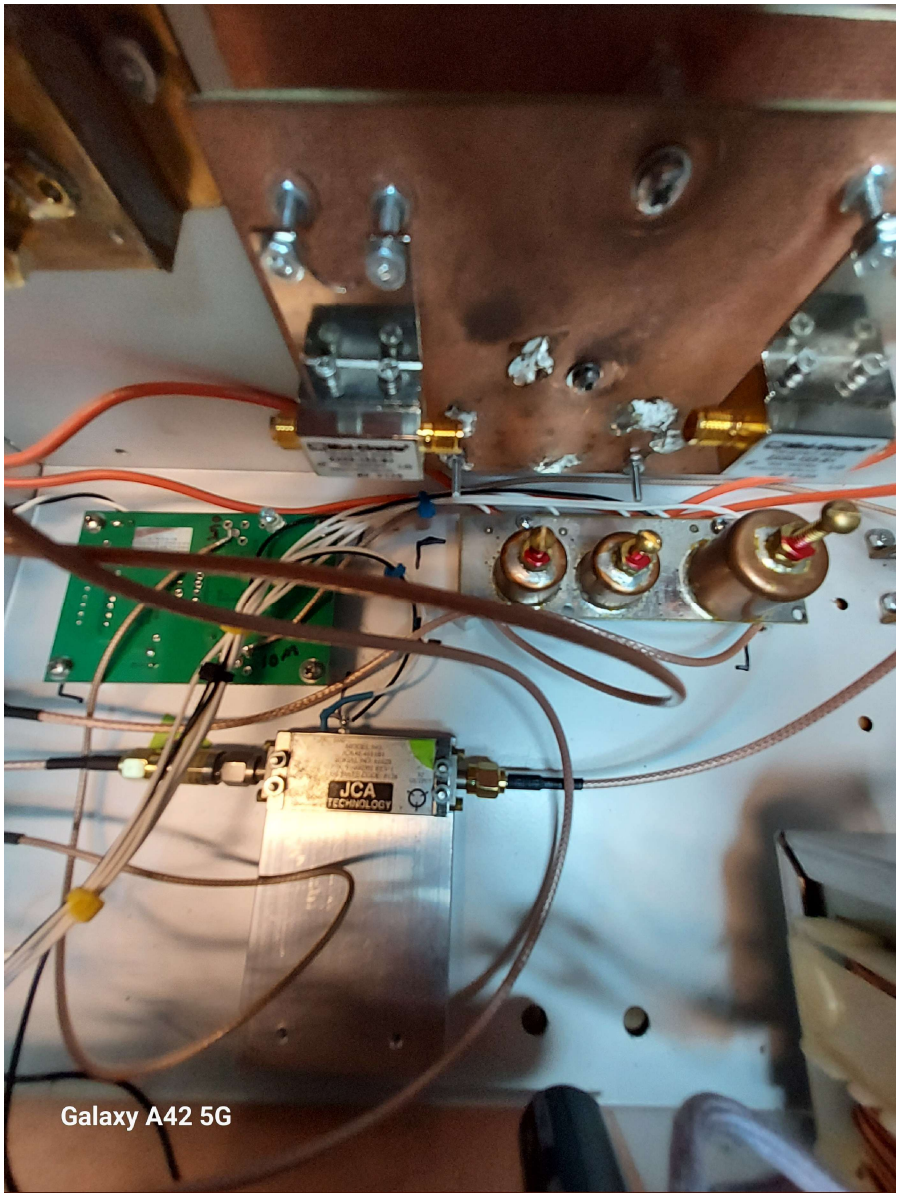
The spectrum analyzer range extender is used to extend the frequency range of the base spectrum analyzer. The unit accomplishes this by the use of mixers that up-convert the tracking generator output from the spectrum analyzer to desired frequency ranges and down-convert desired frequency ranges to the base frequency range of the spectrum analyzer.



9-10.5 GHz Converter Section

SA=Spectrum Analyzer
DUT=Device Under Test
LO=9000 MHz (for SA range 9.0-10.5 GHz)


9 GHz
Amp
LO Multiplier
DigLO
Mixers
WR90
9 GHz Filter
Mini-Circuits
Galaxy A42 5G


JCA
TECHNOLOGY
Galaxy A42 5G

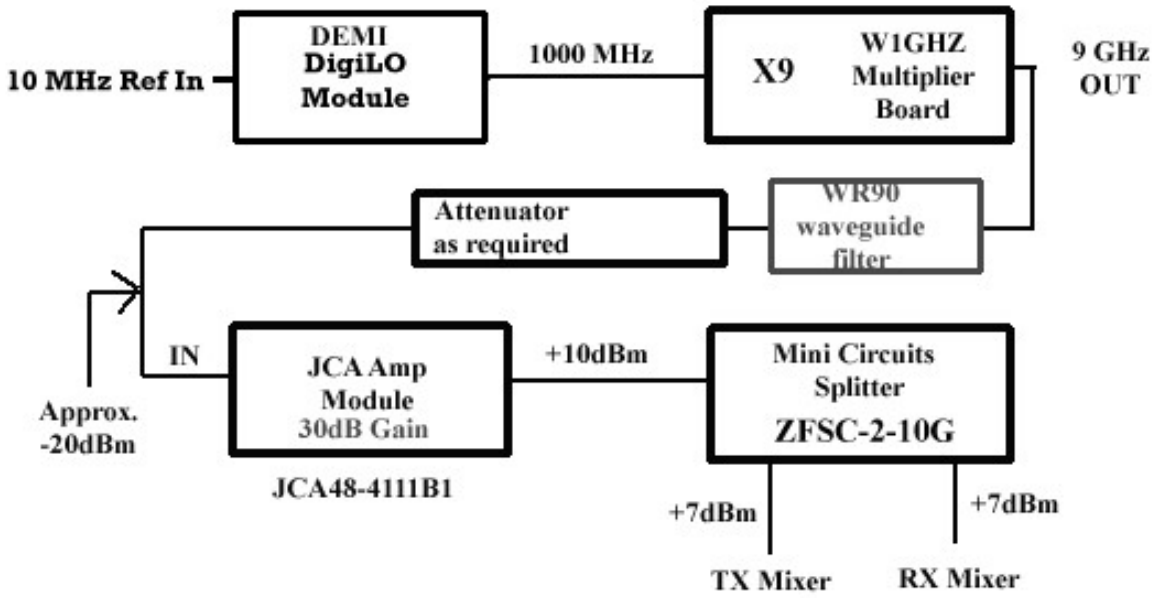
Theory of Operation (9-10.5 GHz)

- In principle, the unit is quite simple. It is basically a transverter system. It utilizes a DigiLO PLL synthesizer board to supply a signal at 1000 MHz (one of the standard frequencies programmed into it) at approximately the 0 dBm level. This signal drives a W1GHZ 10 GHz Personal Beacon Board, which triples it to 3000 MHz and finally triples it again to supply a 9000 MHz signal at +5 to +10 dBm. This is the perfect level to drive the mixers I used (Minicircuits ZX05-153-S+). My output from the W1GHz board was considerably less, so I ended up adding a small JCA amplifier from eBay to get it up to just under +10 dBm.


5342A MICROWAVE FREQUENCY COUNTER
HEWLETT • PACKARD
9 000
GHz
MHz
KHz
9.4
Hz
dBm
SAMPLE RATE
GATE
REMOTE
HOLD
RESOLUTION
10KHz
100KHz
1MHz
1KHz
100Hz
10Hz
1Hz
FREQ
AUTO
MAN(MHz)
RESET
SET
RECALL
AMPL
OFS dB
OFS MHz
CHS
CHECK
ENTER
LINE
STBY
ON
50Ω
1MΩ
10Hz-500MHz
500MHz-18GHz
Galaxy A42 5G

The LO Section

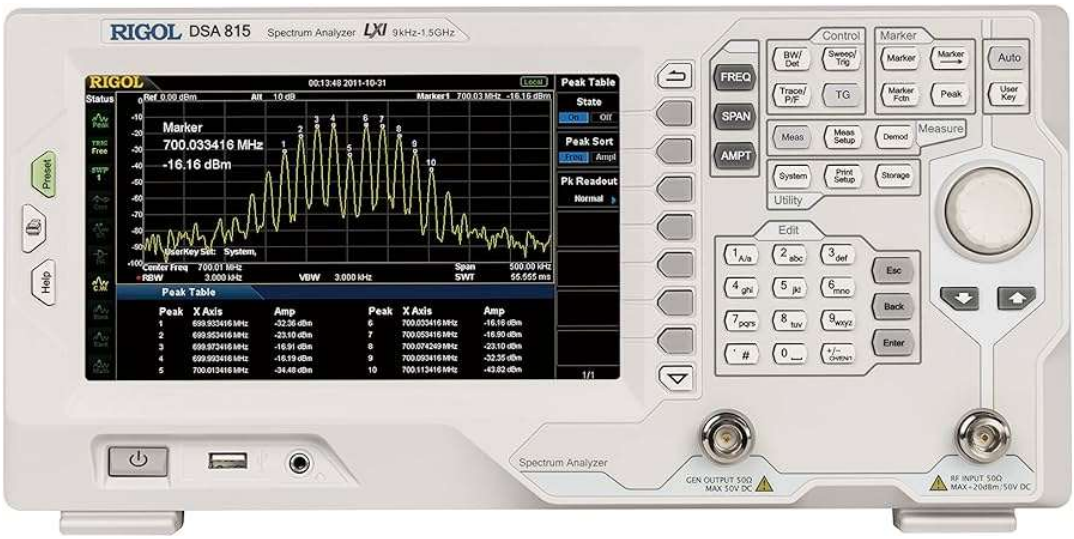
The 9 GHz LO signal from the W1GHZ board is passed through a homebrew high pass filter made with a short section of WR90 waveguide with SMA connectors soldered at each end and the ends shorted with pieces of brass sheet. The signal out of the filter is connected to the JCA amp and then to the LO port of the mixers via a splitter. There are two mixers used. One up converts the Tracking Generator output of the spectrum analyzer up from its base range (0-1500 MHz) to 9-10.5 GHz. The other mixer down converts signals in the 9-10.5 GHz range to the base range of the spectrum analyzer.



9 GHz LO SECTION

Rigol Spectrum Analyzer

I have a Rigol DSA-815 with the tracking generator option. I bought it brand new from a seller on eBay for $999. Cheap at half the price! Wait, is that right? No…cheap at TWICE the price! Anyway, it's a great starter spectrum analyzer that is easy to use and offers some nice features. One is that you can manually set a "Frequency Offset" which mathematically calculates the frequencies displayed to a more useful value. In this project , I set this offset to 9000 MHz (LO Frequency) so that I can enter or display frequencies directly.



Questions?

The End