Fast Multi-Harmonic Kickers

Electrodynamic, DOE SBIR DE-SC0020566 SBIR Phase II, year 1.

PI: Brock F. Roberts, PhD

DOE Phase II SBIR Topic: 33c, Nuclear Physics Accelerator Technology, Particle Beam Sources and Techniques.

Collaborators: The Thomas Jefferson National Laboratory's (JLAB) Superconducting Radio Frequency Research and Development Group (SRF R&D) and Center for Injectors and Sources (CIS).

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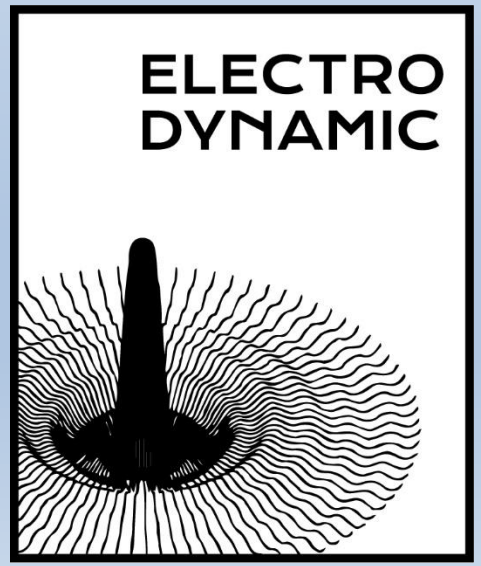

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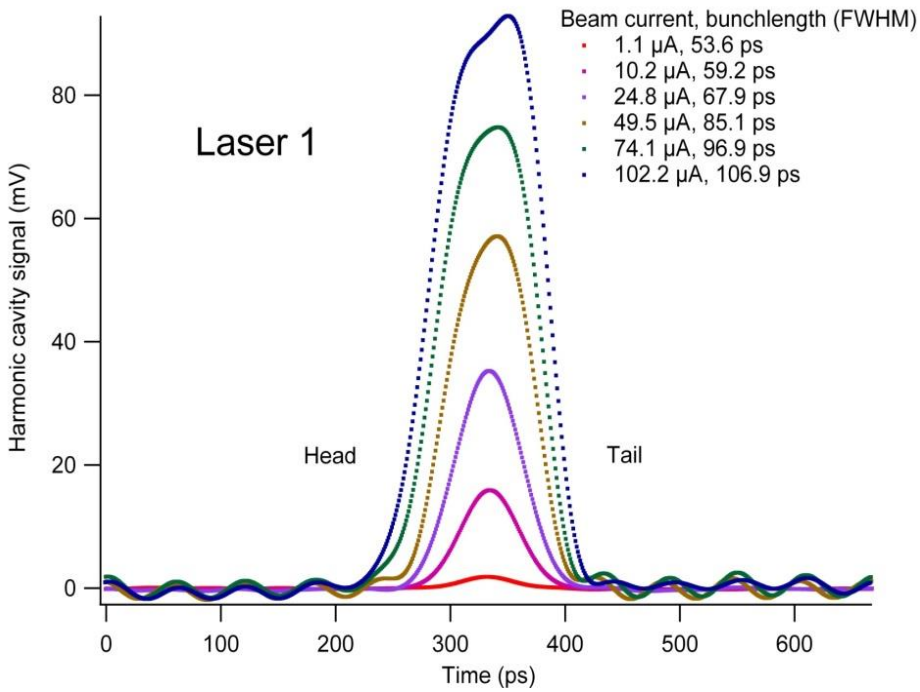
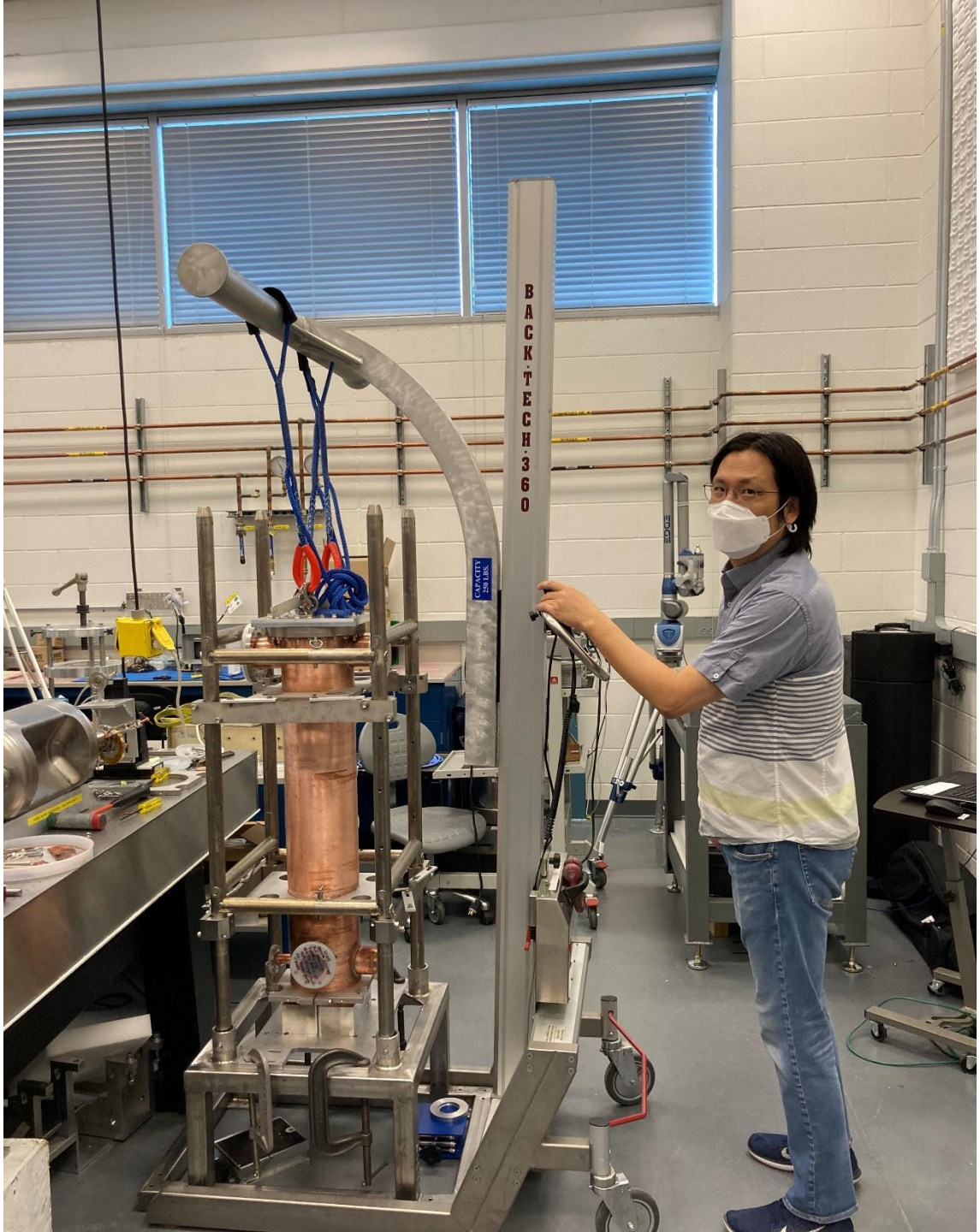
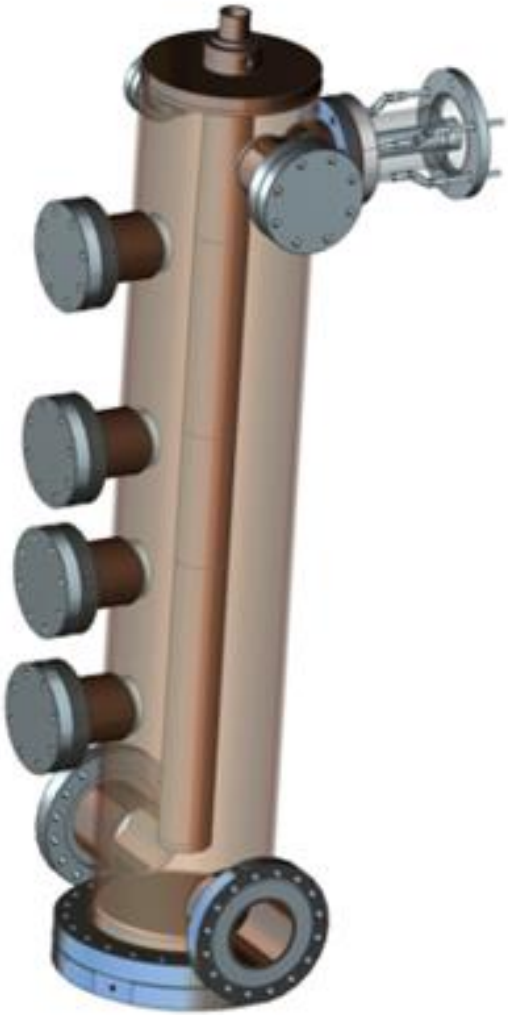
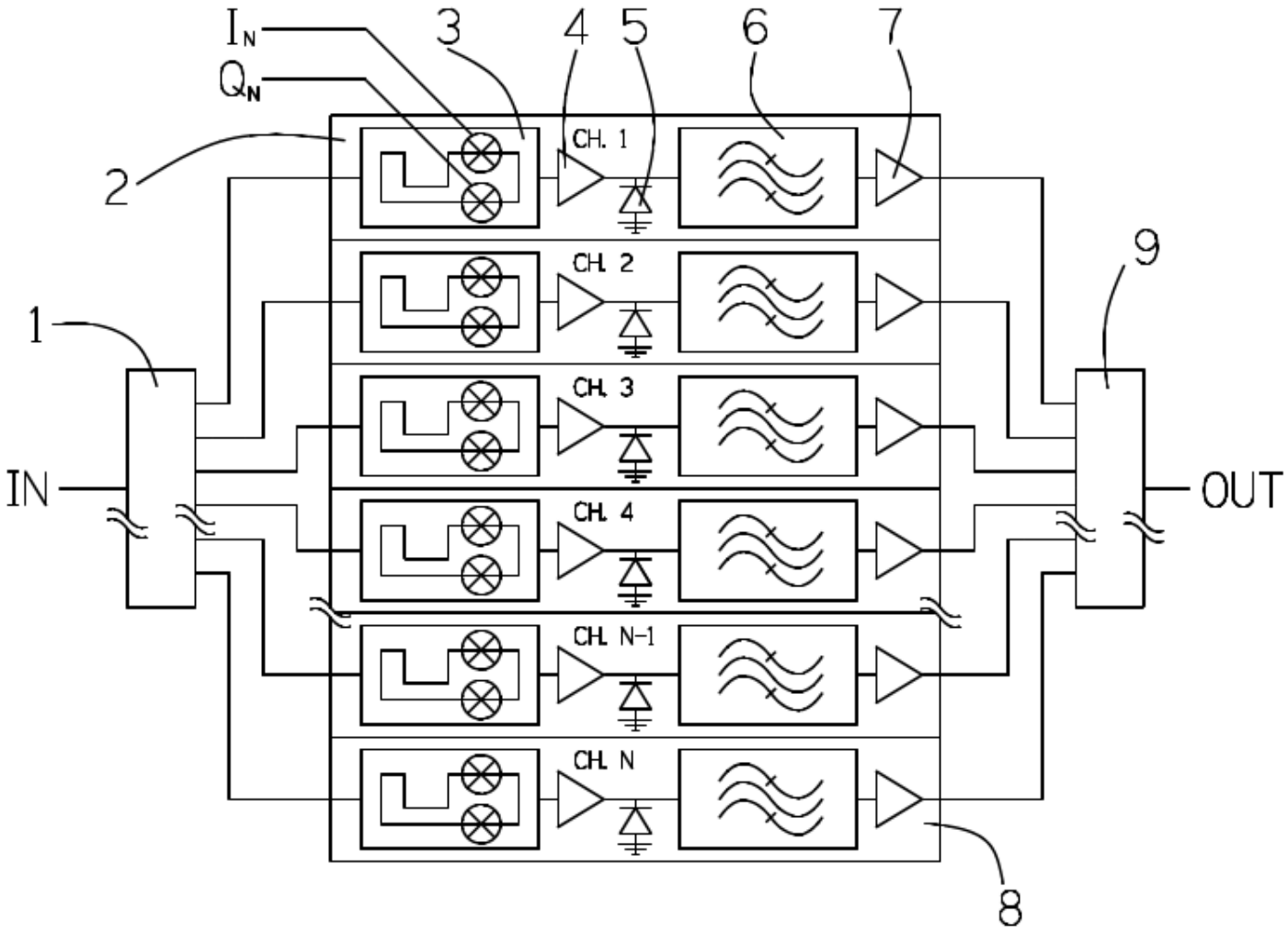



BACK-TECH-360
CAPACITY
250 LBS.

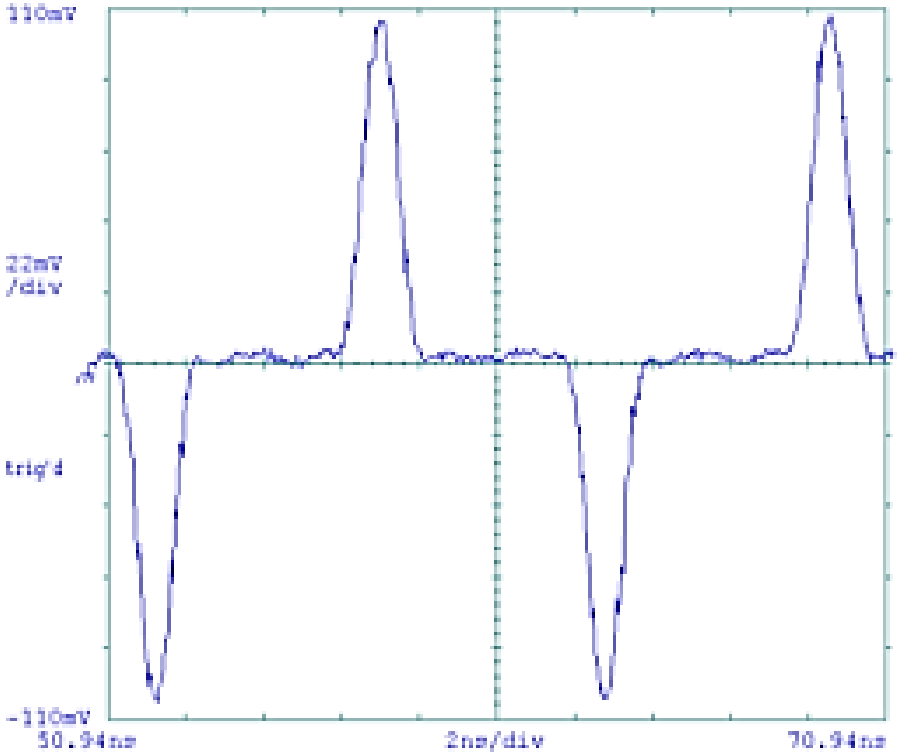


The HAWG

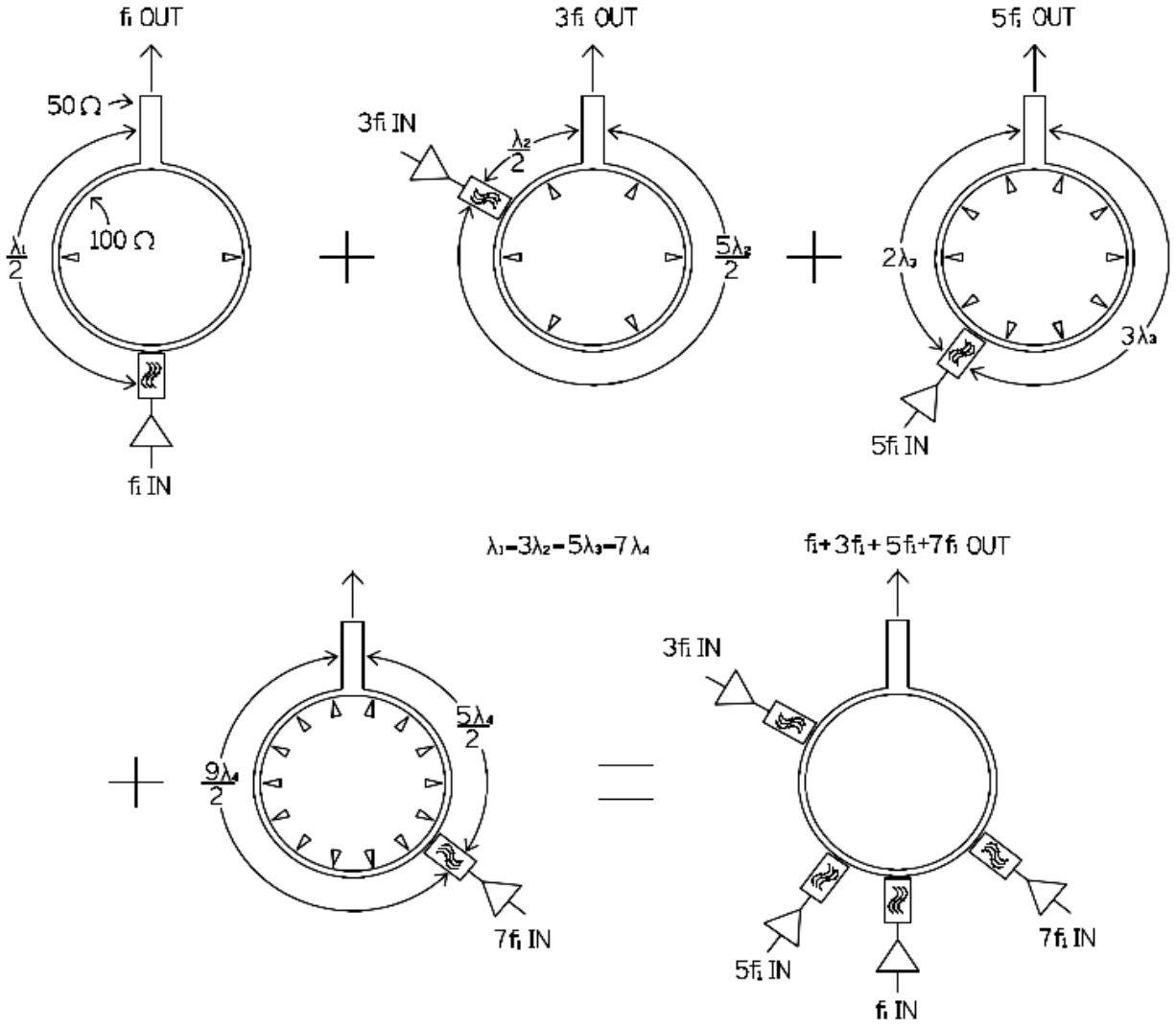


86.6 MHz HAWG

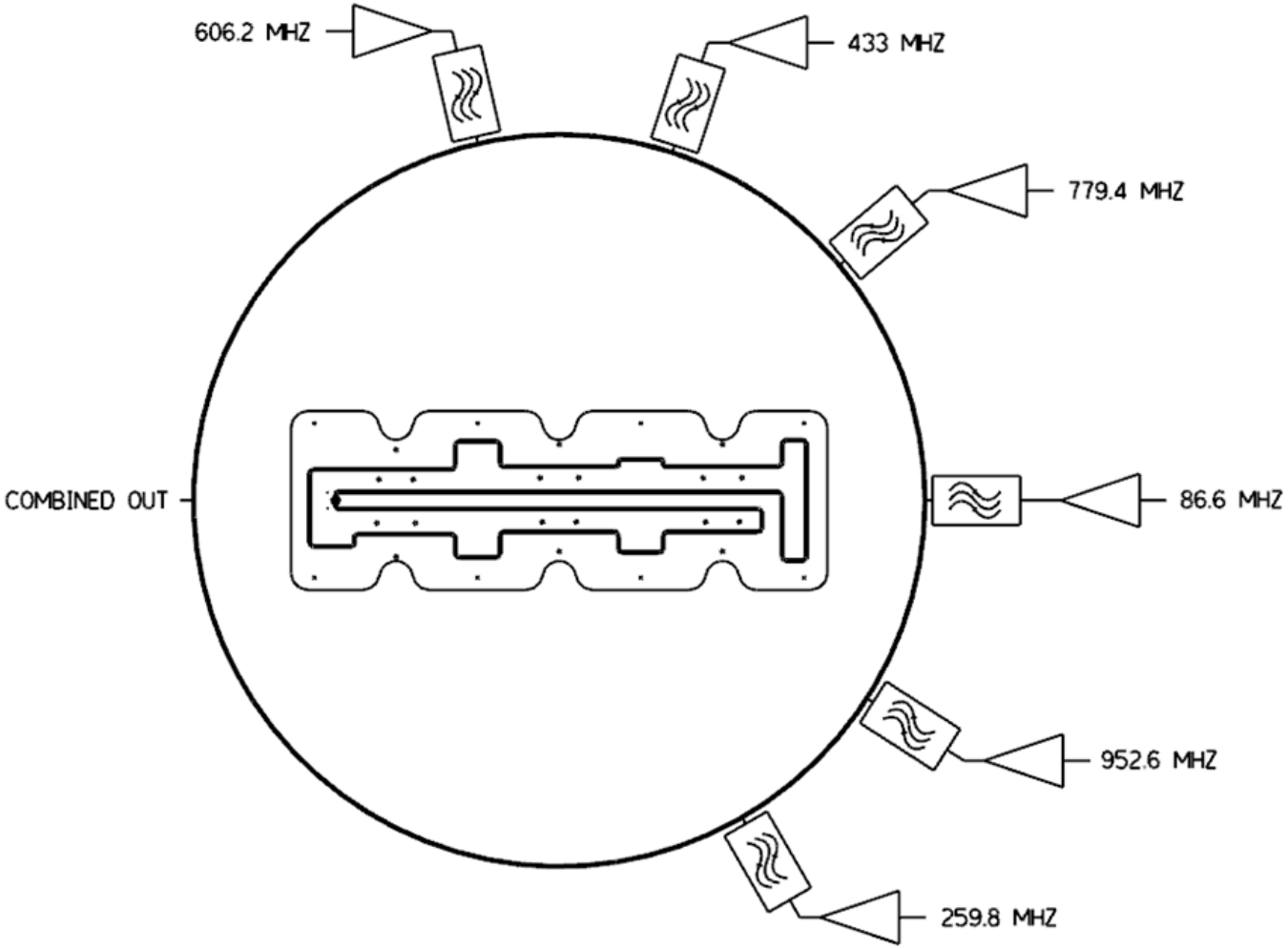
Harmonic Arbitrary Waveform Generator (HAWG)



The Harmonic Amplifier and Waveform Combiner (HAWC)



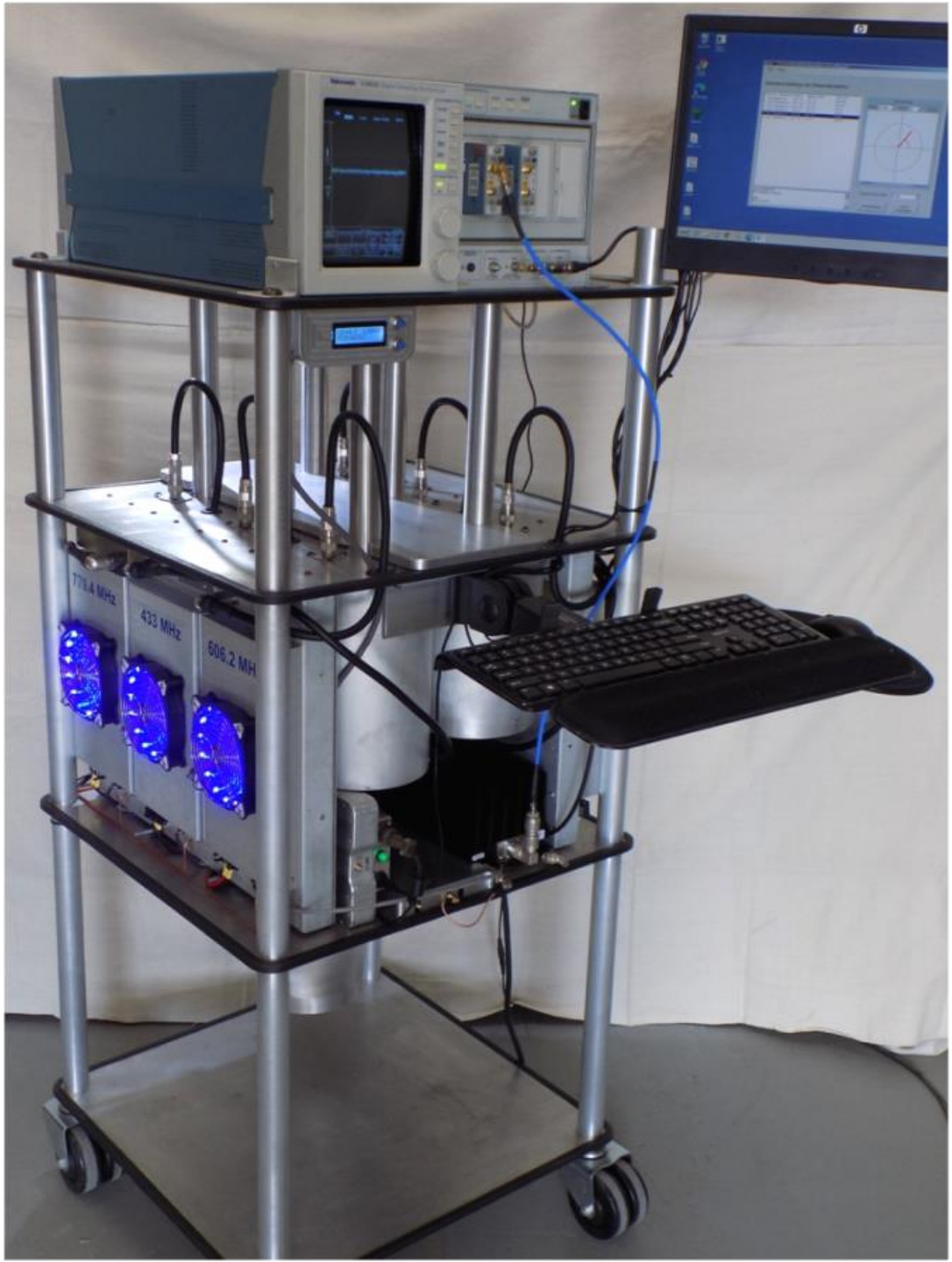
86.6 MHz Harmonic Amplifier and Waveform combiner (HAWC)



The

HAWG

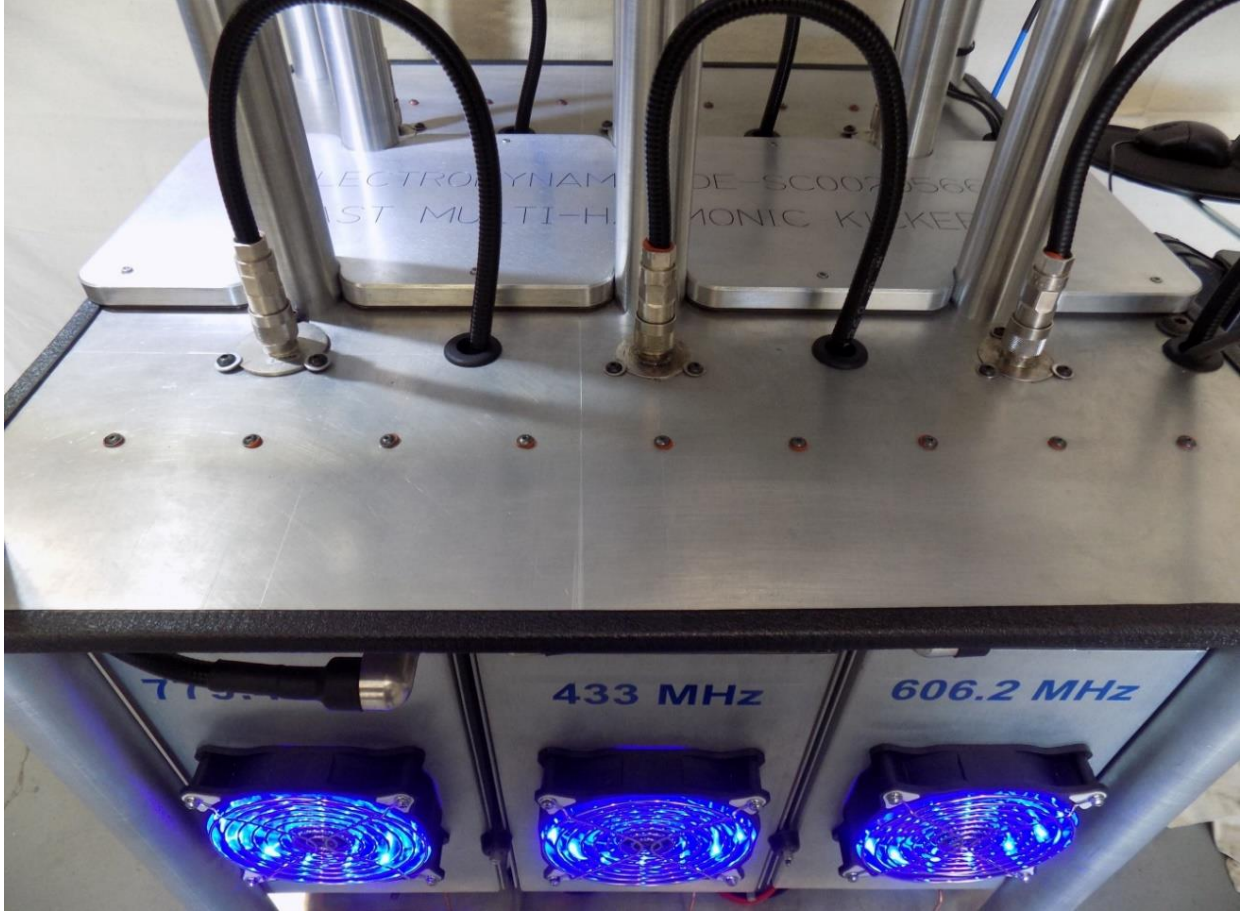
and

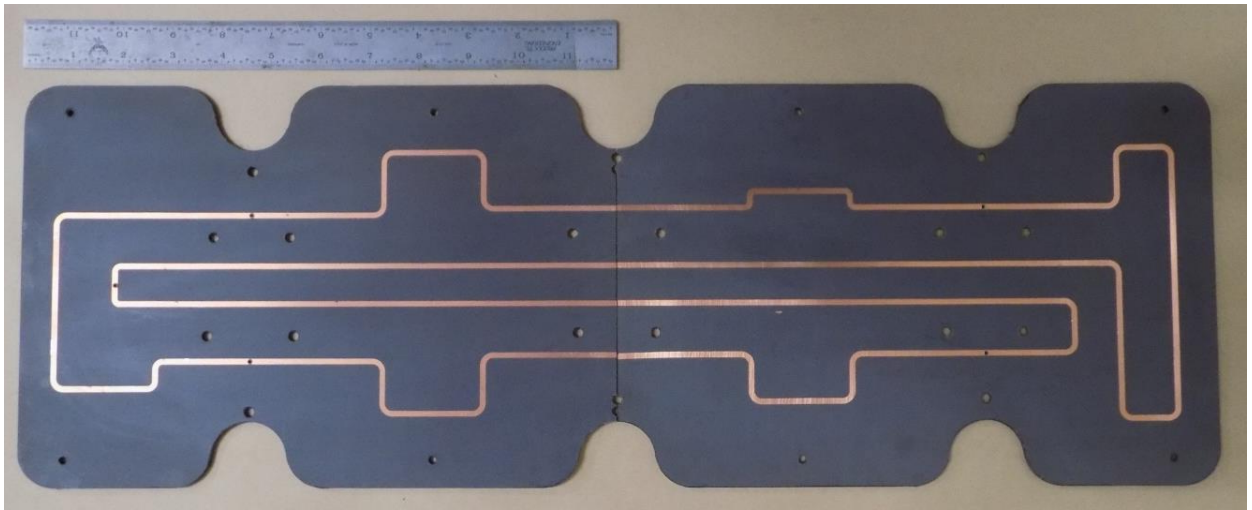


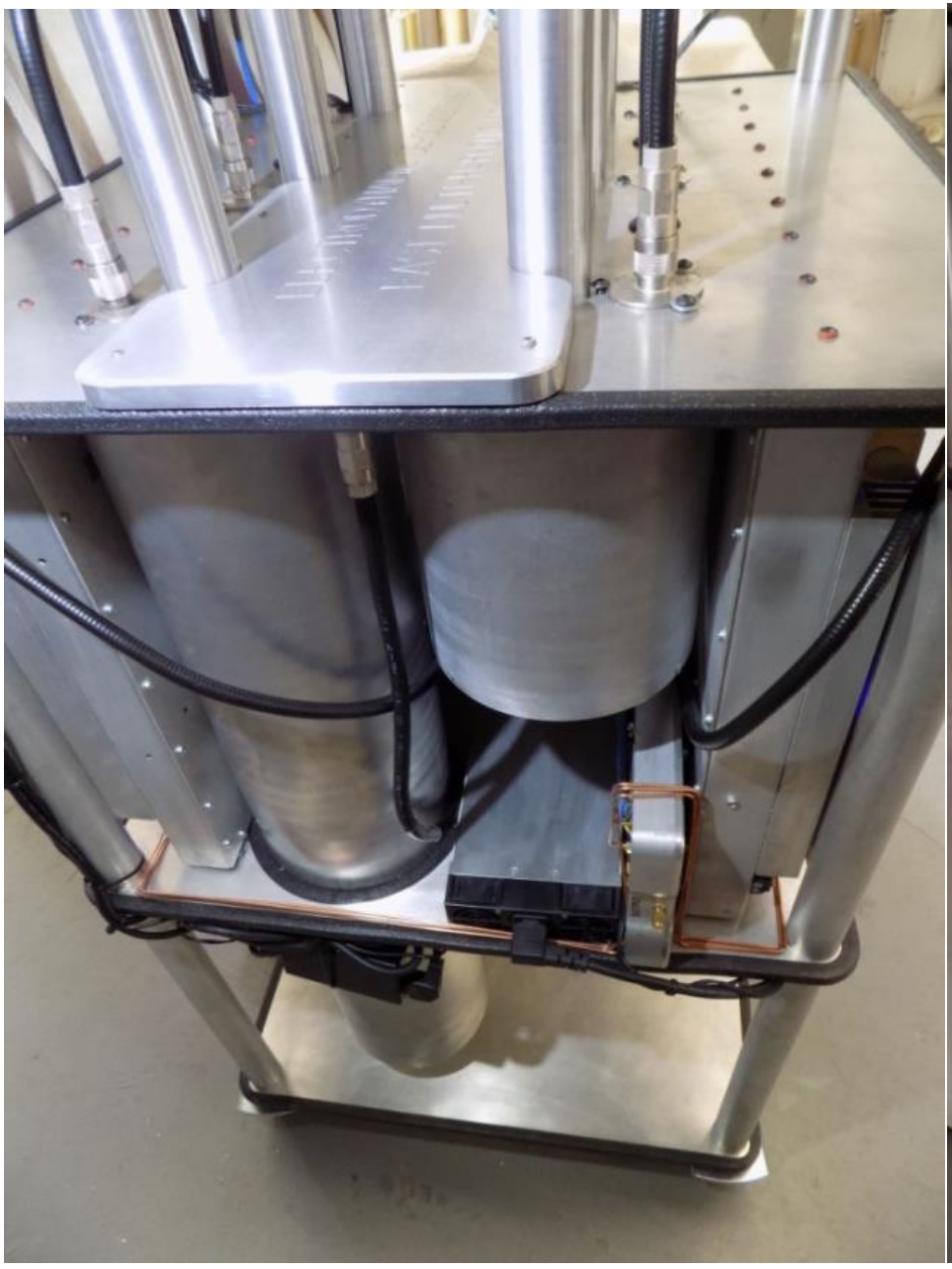
the

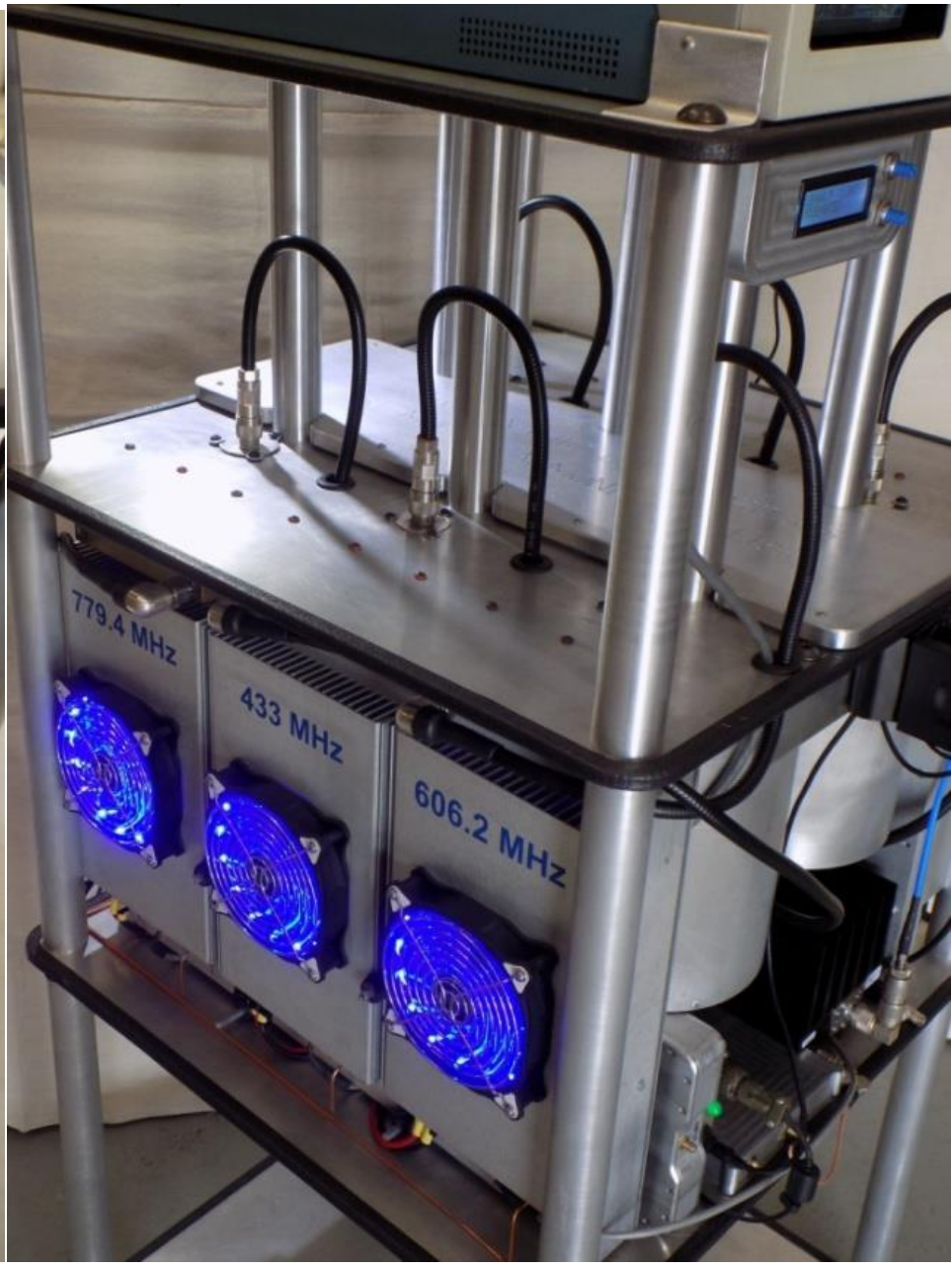
HAWC

!

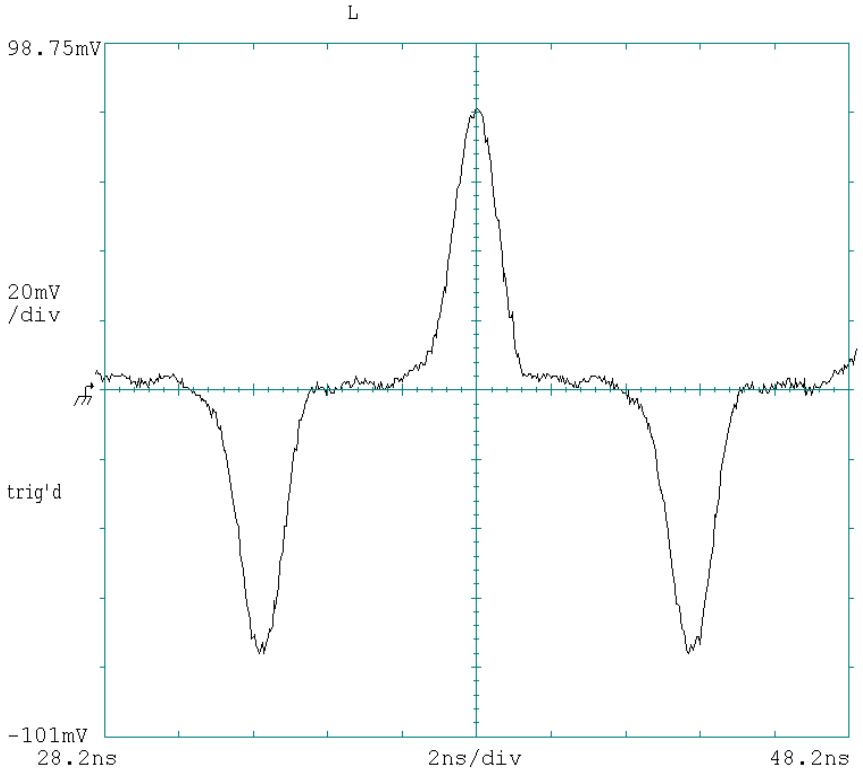

433 MHz
606.2 MHz





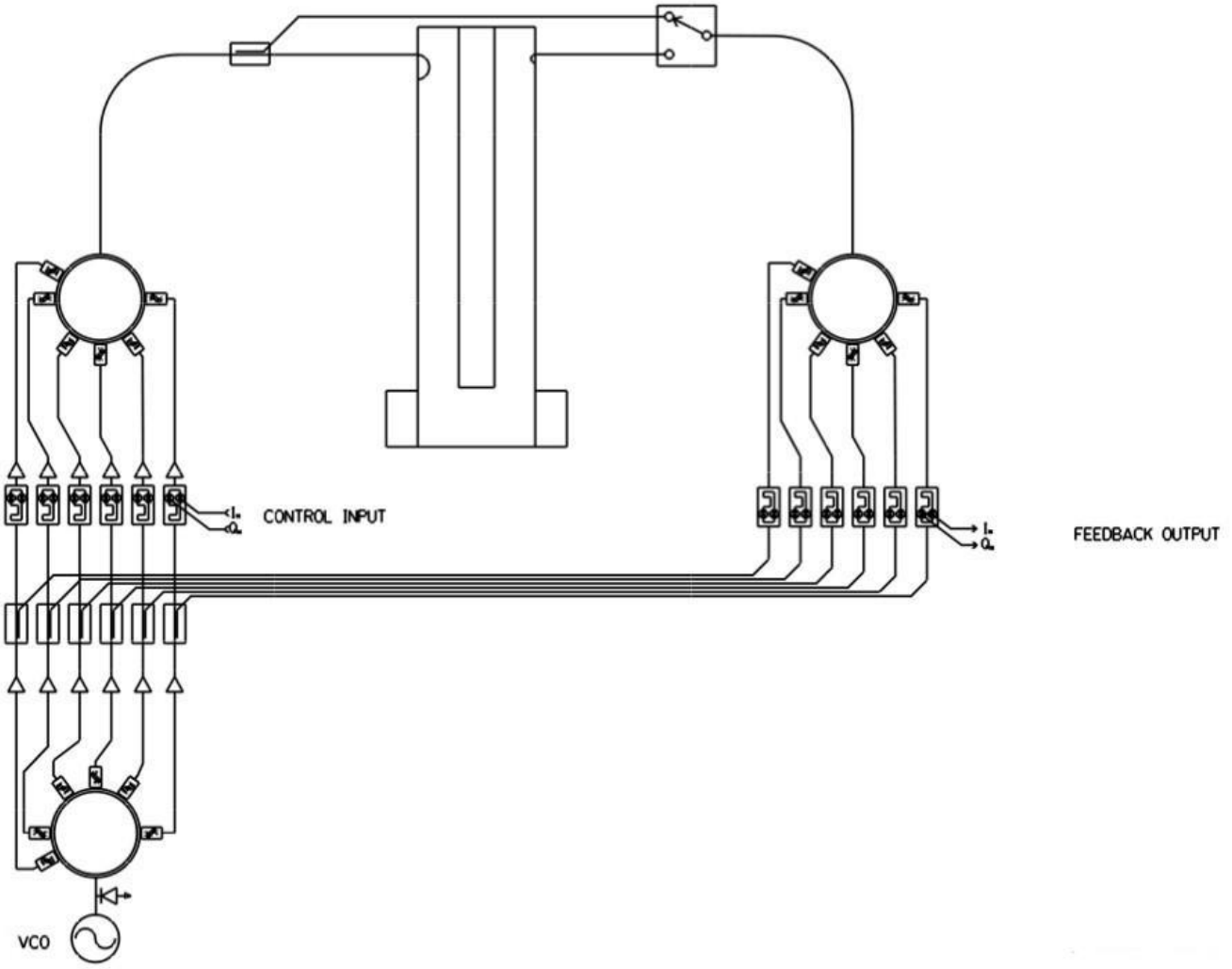

779.4 MHz
433 MHz
606.2 MHz

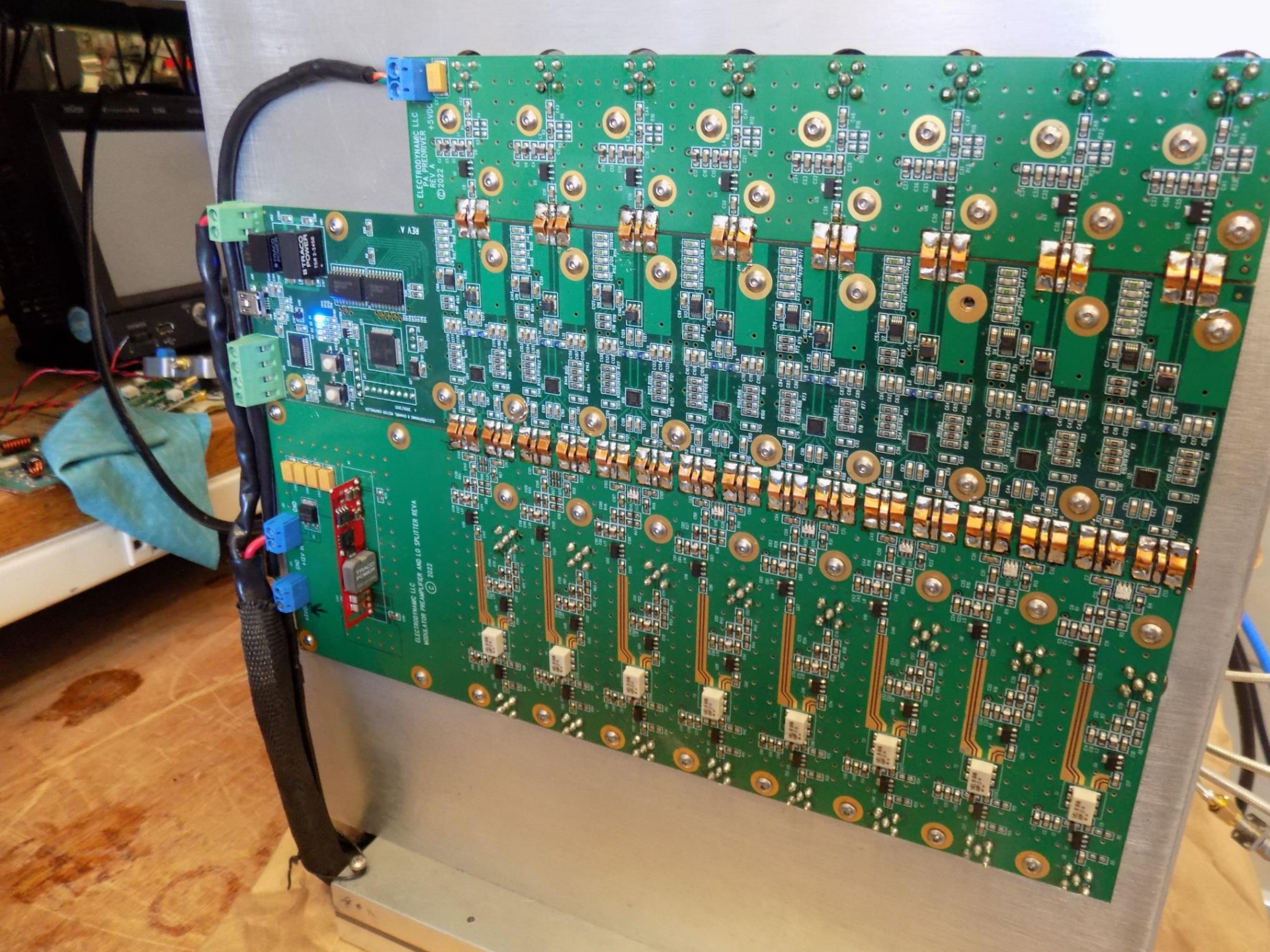
400 V peak to peak waveforms on 50 Ohm transmission line.



Frequency MHz	Port 1 to 0	Port 2 to 0	Port 3 to 0	Port 4 to 0	Port 5 to 0	Port 6 to 0
86.6	-.93	-60	-67	-67	-56	-70
259.8	-36	-.98	-54	-52	-70	-72
433.0	-34	-70	-1.0	-65	-49	-60
606.2	-41	-64	-56	-1.1	-49	-62
779.4	-40	-65	-51	-38	-1.9	-58
952.6	-45	-23	-62	-42	-35	-1.7

HAWG and HAWC with feedback for automatic control.




ELECTRODYNAMIC LLC
LO DRIVER +5VDC
REV A
©2022
REV A
TRACO POWER
ELECTRODYNAMIC LLC
RECEIVER PREAMPLIFIER AND LO SPLITTER REVA
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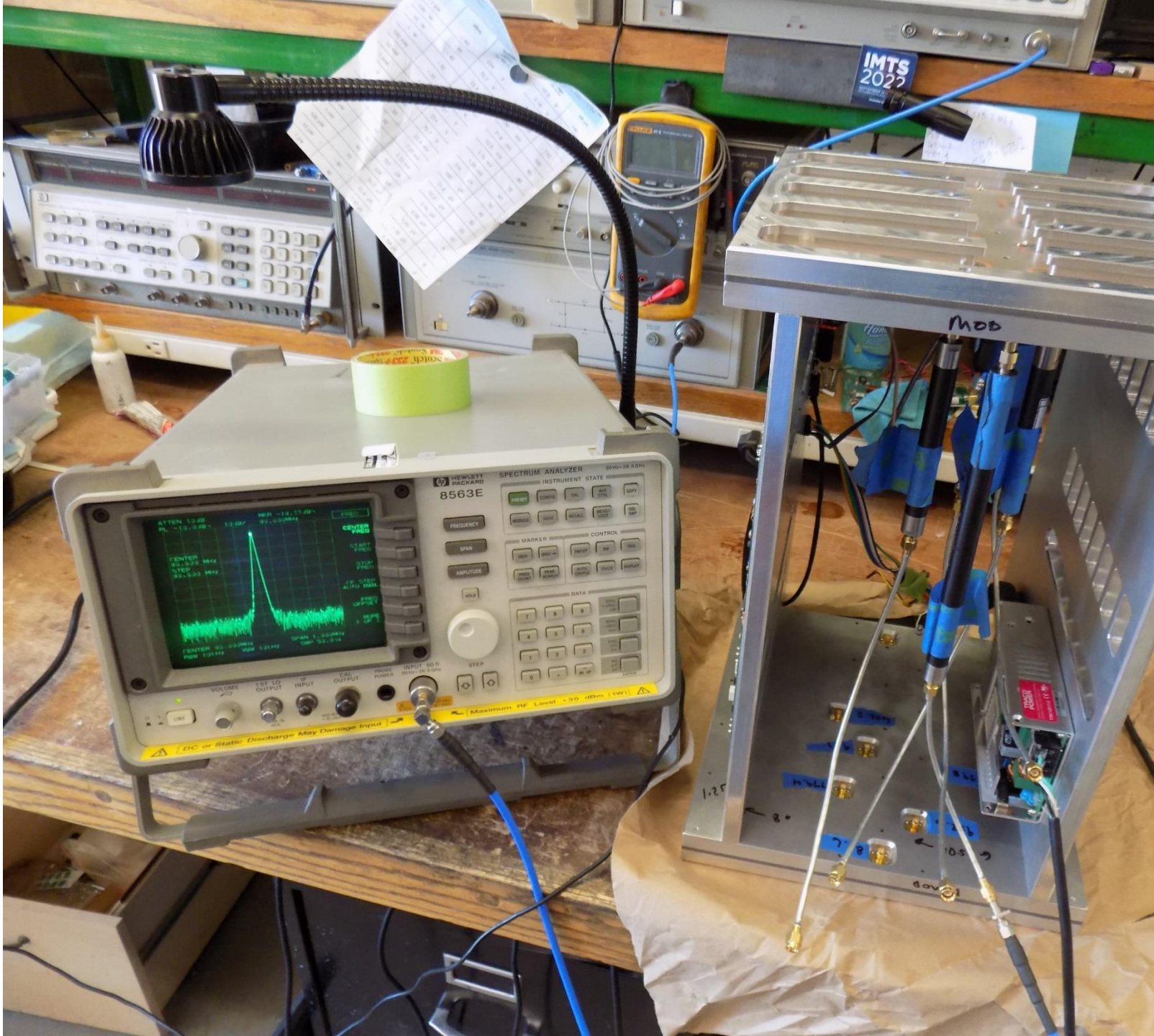
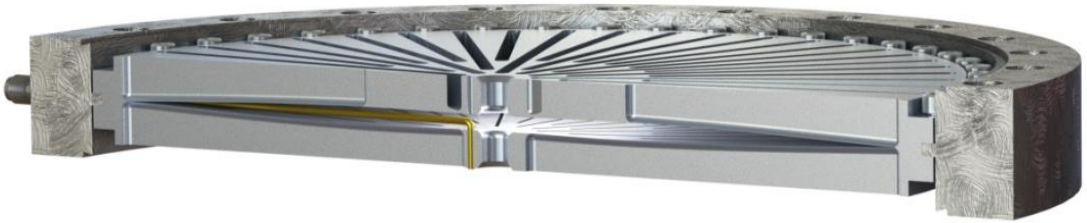
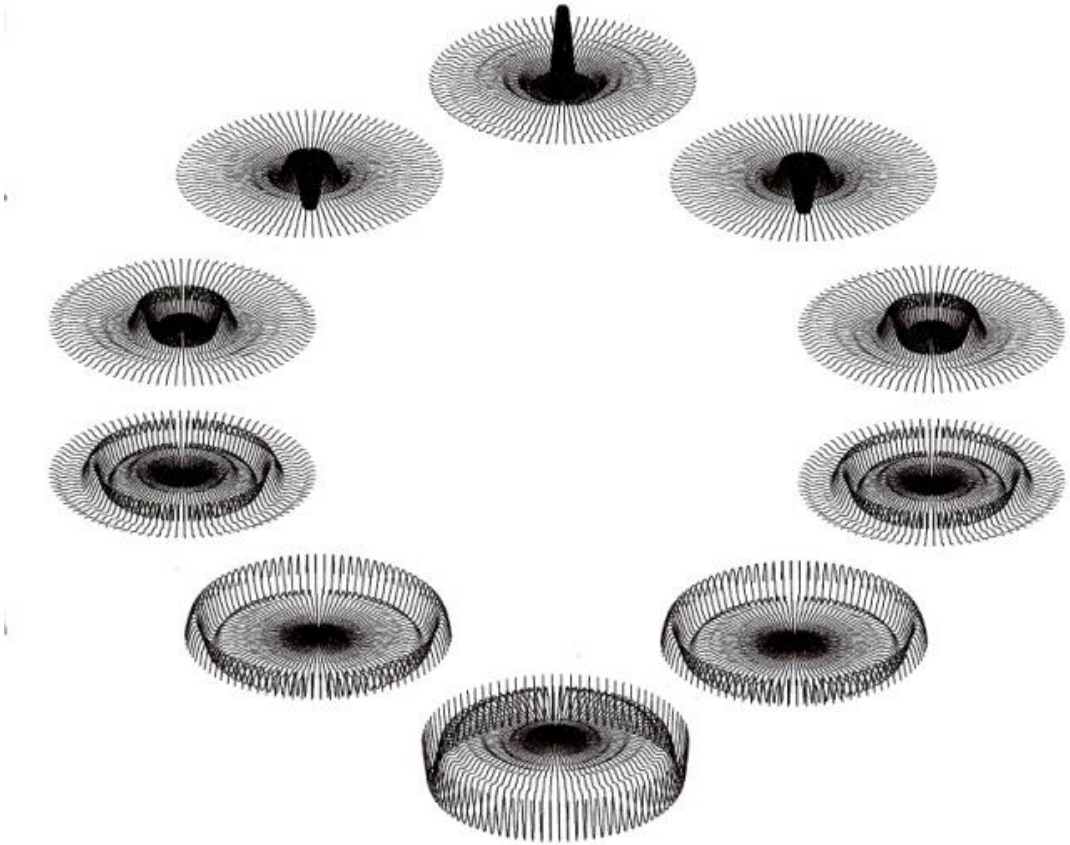
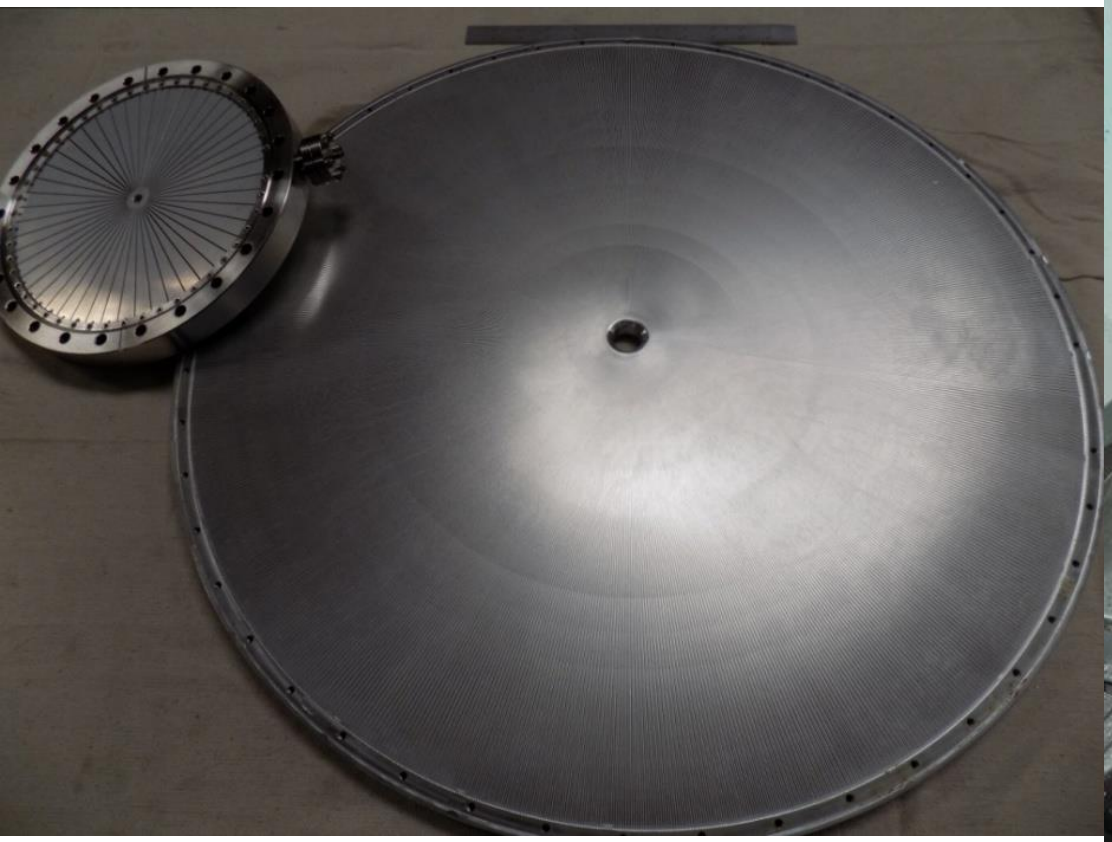
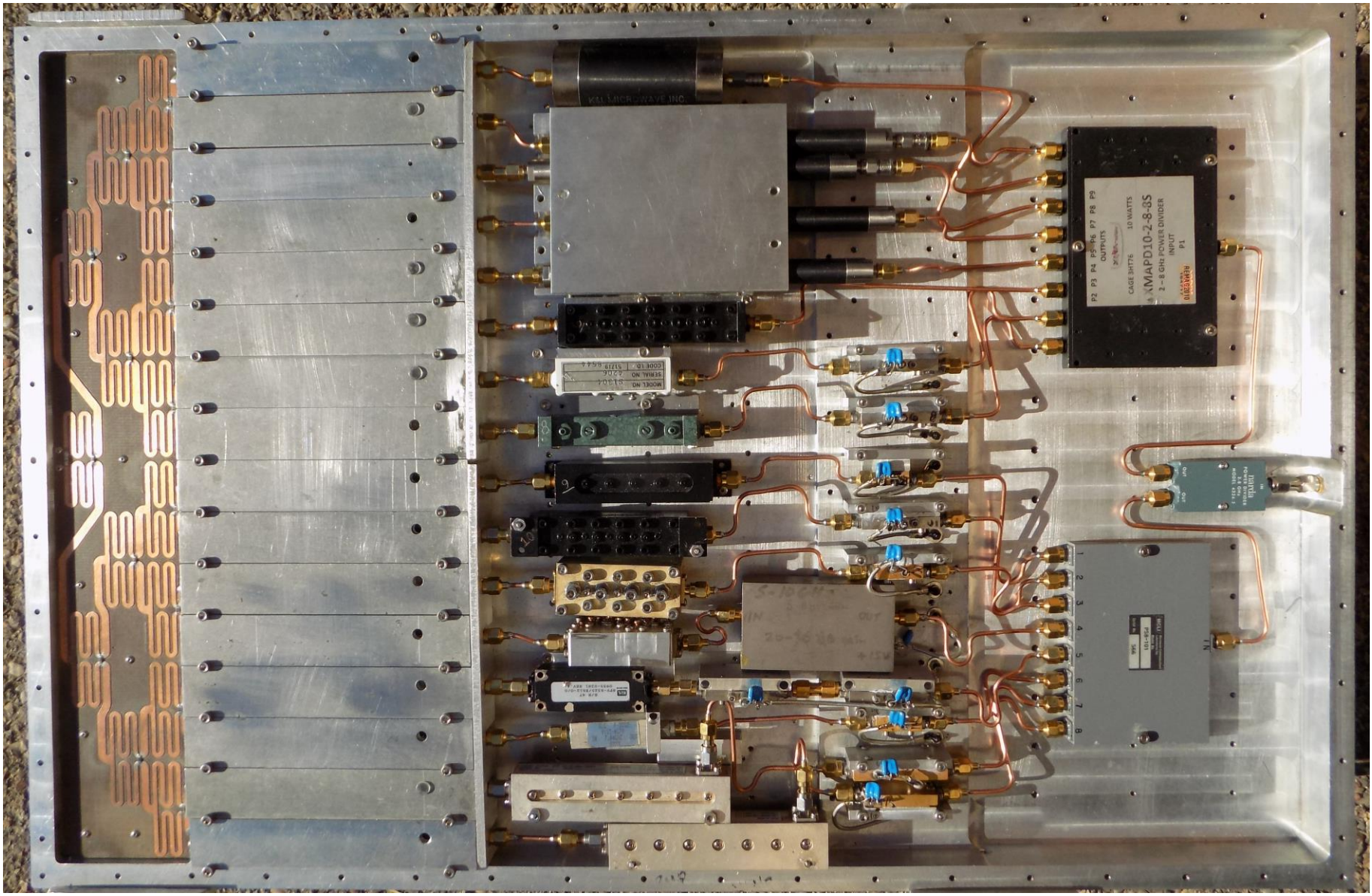

IMTS 2022
HEWLETT PACKARD
8563E
SPECTRUM ANALYZER
INSTRUMENT STATE
FREQUENCY
SPAN
AMPLITUDE
MARKER
CONTROL
DATA
STEP
Maximum RF Level +30 dBm (1W)
DC or Static Discharge May Damage Input
MOD





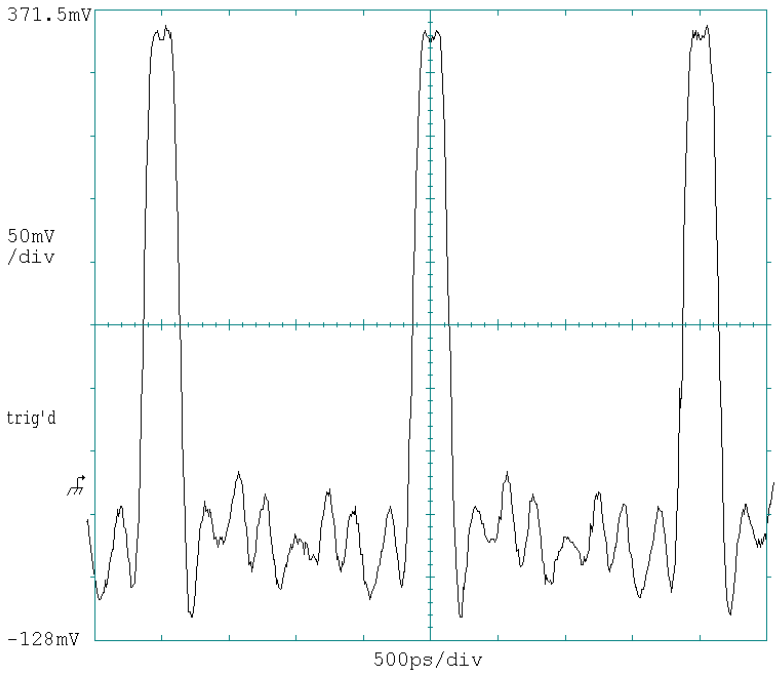


499 MHz HAWG


MAPD10-2-8-8S
2 - 8 GHz POWER DIVIDER
10 WATTS
CAGE 3HT76
OUTPUTS
INPUT

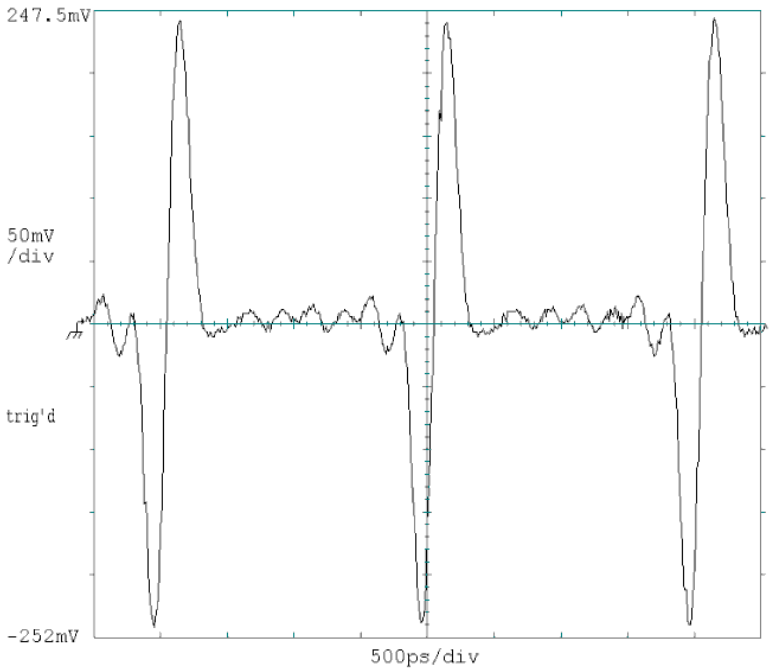
Rectangular Drive Pulses

Channel #	Amplitude	Phase
1	1	0
2	.89	0
3	.78	0
4	.62	0
5	.46	0
6	.29	0
7	.13	0
8	0	0
9	.29	180
10	.16	180
11	.18	180
12	.17	180



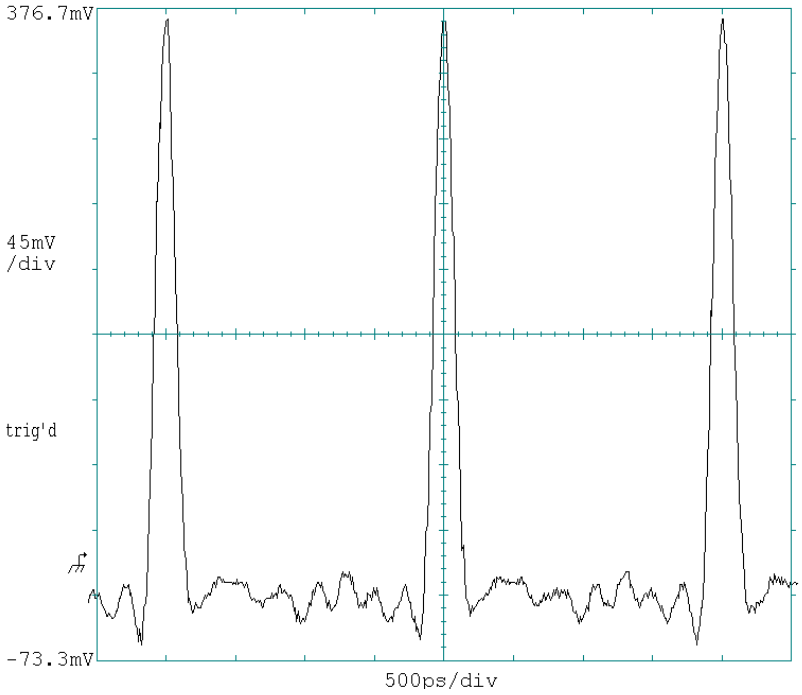
Bipolar Drive Pulses

Channel #	Amplitude	Phase
1	.37	0
2	.69	0
3	.9	0
4	1	0
5	.96	0
6	.81	0
7	.61	0
8	.38	0
9	.16	0
10	0	0
11	0	0
12	0	0



Gaussian Drive Pulses

Channel #	Amplitude	Phase
1	1	0
2	.96	180
3	.91	0
4	.84	180
5	.72	0
6	.57	180
7	.44	0
8	.31	180
9	.21	0
10	.14	180
11	.1	0
12	0	180



Thank you for supporting the SBIR Program

- Beamline installation and testing of JLAB's harmonic kicker cavity is scheduled for October 22.
- Next year we will report on the development of a 499 HAWC and driven harmonic TM_{0N0} cavities.
- Multi-Harmonic Drivers; HAWG +HAWC could be used for stripline kickers.
- Got bunch length monitors? Electrodynamic can provide non-invasive bunch length monitors, fast high power waveform generators, machining, RF electronics etc. Please send me an e-mail, Brock.electro@outlook.com or give me a call: 505-225-9279.