

**Next Meeting:**  
 Tuesday, September 16, 2025  
 7:00pm  
 Garden City Presbyterian Church  
 1841 Middlebelt Road  
 Garden City, MI 48135

**Remember,  
 There is no meeting this month.  
 Our next meeting is in September.**

***Even though there is no business meeting this month, we hope you'll join us this Saturday for Breakfast!***  
 Every Saturday mornings at 9:00 am  
 At the Big Boy Restaurant  
 28340 Ford Road, at Harrison  
 Garden City  
 Everyone is welcome!



The Garden City Presbyterian Church is hosting a car show September 13, 2005. The church has been very good to our club over the years, providing us with meeting and storage space at no charge. They are asking for our help in providing parking and communications assistance for this event. Please contact Scott, WT8S to volunteer.

**GCPC Car Show**  
 September 13, 2025 8A-2P  
 (rain day 9/20/2025)  
 \$20 per car entry  
 All Proceeds to benefit Fisher House

Be sure to visit and use our repeater:  
 KK8GC  
 146.860 MHz  
 -600Hz offset (input on 146.260)



Photo courtesy K6KT

© Kenneth Ray Seals

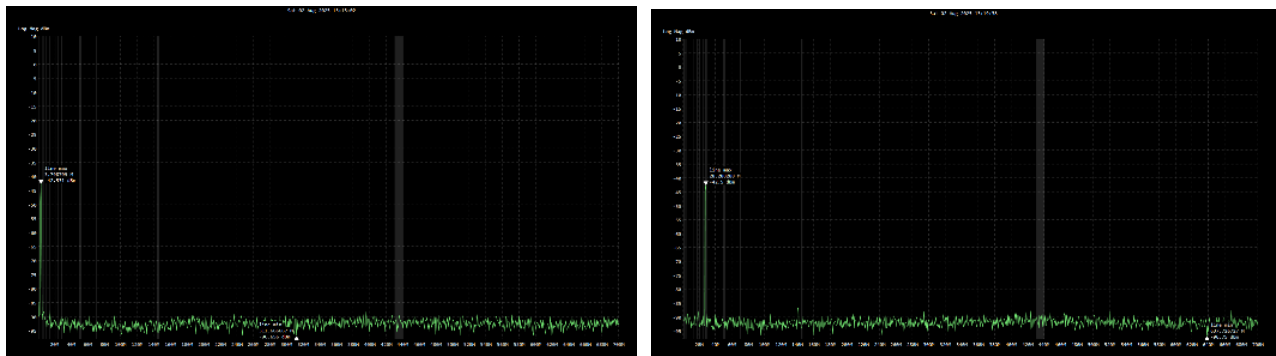
# Mat-Matics #121: Henry Amplifier Conducted Emissions Reductions

-Mat Breton, N8TW

My daughter has been complaining that when am using my linear amplifier strange things are happening in her room: her “smart” room light/fan is erratic, her PC is behaving strangely, etc. When operating at > 400W PEP I personally noticed the washing machine lock-up (needs to be unplugged to reset) and the furnace will stop working. Since the common element of all the devices is their connection to the 120Vac house wiring, I decided to investigate conducted emissions (RF emissions coming out of the conductors attached to the unit) ... specifically the 240Vac connection.

When my Henry Radio 2K-Classic Amplifier was designed in the 1970’s the conducted emissions standards were not very strict, and there was not a lot of sensitive equipment that would be affected as there are nowadays. As a result, AC lines filtering was not as common except on things like laboratory instruments. My Henry Radio amplifier (circa 1983) has no line filtering to reduce EMI conducted emissions.

To be sure that I wasn’t seeing effects from spurious radiated emissions I took output measurements into a 1KW attenuator using a spectrum analyzer (my tinySA-Ultra). The output across all bands was very clean and spurious emissions were well below the FCC limit of 40dB for this vintage amplifier. The results below show the output of the Henry operating at about 600W after 170dB of attenuation.



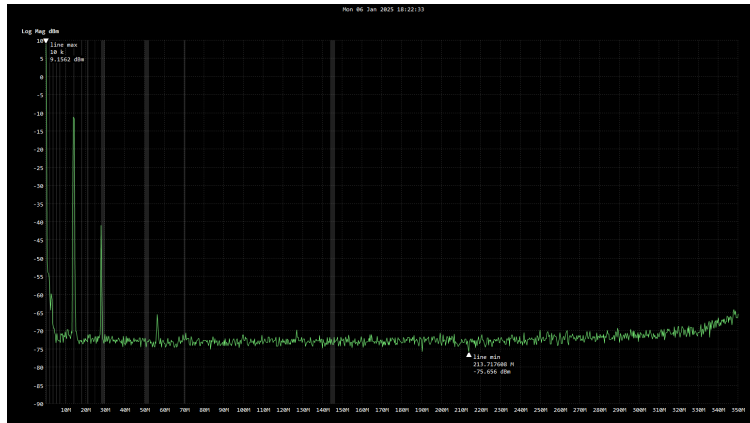
Linear emissions at 80M (left), 10M (right)

Having narrowed it down to likely conducted emissions, I decided to take some baseline measurements of the conducted emissions coming out of the Henry Amplifier. To do this I borrowed a LISN (Line Impedance Stabilization Network) from a friend. A LISN functions a bit like an impedance match at the feedpoint of an antenna: it takes the very low impedance present on the line and changes it to 50 Ohms across a large frequency range (wideband). It also isolates the noise in one direction so that external noise is not coupled in. This particular unit covers about 30kHz to 30Mhz. You can use the LISN to either “listen” or to inject noise: in this case I wanted to listen to noise being emitted from the amplifier AC mains. Failure to use a LISN or equivalent matching circuit when using a 50-Ohm impedance instrument means that the measurements are likely going to be very weak, and what you see may not even be coming from the Device Under Test.



LISN on the left, tinySA-Ultra on the right

I plugged the output of the LISN into my tinySA (a small hobby-level spectrum analyzer that can be purchased for very little money). This allowed me to inspect the emissions coming out of the Henry amplifier. The results confirmed my theory: the noise coming out of the 240Vac lines was excessive. Even at relatively low power levels (300 to 400W output power) the measured signal on the power line was large.



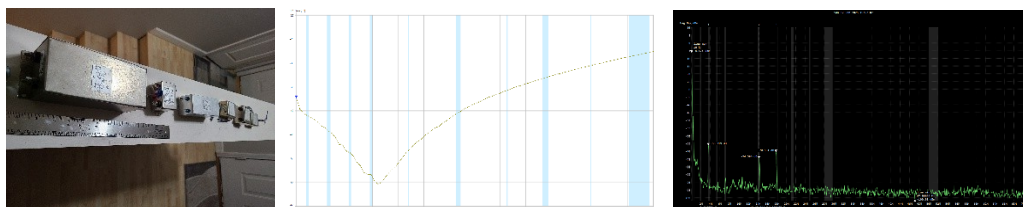
20M Conducted Emissions at 400W w 10dB Attenuation

Line/Mains Isolation: The most obvious solution was to add a mains/line filter onto the amplifier to prevent the internally generated noise from being injected into the rest of the house AC wiring. These devices are used to choke common mode noise and absorb differential noise. The alternative was to go inside the Henry and try to figure out where the leakage was occurring and redesign that portion ... a lot of work with no guarantee of success. Commercial mains filters can be purchased cheaply or recovered from junked equipment. My requirements for this one included that it needed to have a low DCR (DC resistance) to handle the 8-10Amps of current at 240Vac, and the effective attenuation range was between 80M and 10M (3.5MHz to 30MHz). Commercially available filters typically consist of a combination of X-Caps (between neutral and hot), Y-Caps (between ground and neutral/hot), and common-mode chokes. Most come in either single or dual-stage configurations.



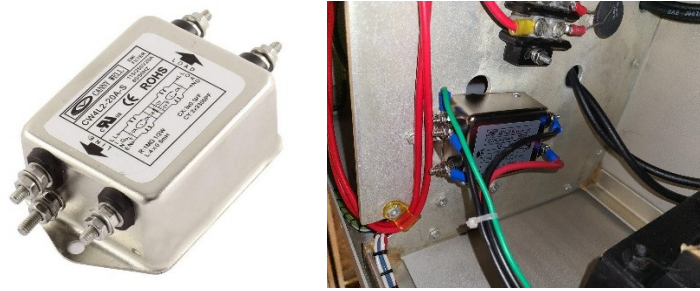
Single-Stage EMI Filter (left), Example (middle), Dual-Stage (right)

Measuring various filters: I measured the filters I had in my junkbox ... all single-stage. I used my nanoVNA to measure the S21 passthrough loss across frequencies of interest. While a couple of filters did show improvements, the best was still not good enough. Most showed significant reduction at 80M as measured with a nanoVNA in an ideal environment (see below), but far less at 10M. I ended up purchasing a dual-stage EMI filter which measured a better attenuation across the entirety of the range.



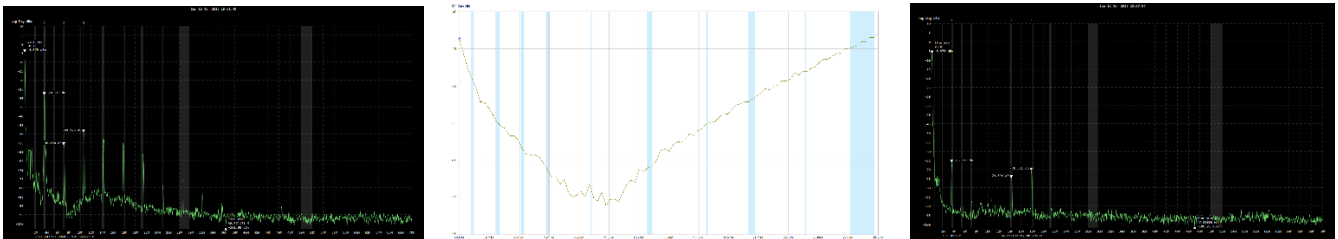
Junk Drawer Filters (left), sample S21 (middle), Results (Right)

Installation: Because both the X and Y Capacitors in the filter waste a small amount of power (acting as a 60Hz bypass) I elected to put the filter after the power switch/breaker (when switched off there is no wasted energy). There was room inside the pedestal on the underside of the deck. Installation only took a few minutes.



Commercial filter (left), Installed (right)

Results: The conducted emissions when operating at 80M was significantly attenuated (~38dB) with effective attenuation falling as the frequency rose (possibly indicating a secondary leakage path ... perhaps through the ground connections) with about 14dB attenuation on 10M.



80M Results Before (left), filter S21 attenuation (center), After (right)

The real proof was in the fact that my appliances no longer behave erratically when I'm operating high-power ... and that makes this effort worth it.

Lesson learned: During measurement of the signals, I was pugging and unplugging the mains line from the amplifier multiple times. One time I forgot to first unplug the tinySA unit from the LISN ... inadvertently making a "hot plug" condition that I believe overstressed the tinySA and destroyed the front-end attenuator. That slowed down testing while I borrowed another unit. I eventually ordered a new TinySA-Ultra unit.

Summary: For less than \$15 (\$13.69 for the filter) I was able to reduce the conducted emissions to the point where all the devices in the house now function properly even at maximum power.



Photo courtesy Hank, W8CZK



An enormous, 515-mile-long flash of lightning that crossed at least three states has been named the longest in recorded history in the world.

The 2017 “megaflash” stretched from eastern Texas to near Kansas City — a distance that would take at least eight hours by car or 90 minutes by commercial plane, according to the World Meteorological Organization. In comparison, the average bolt of lightning usually measures less than 10 miles, according to the National Weather Service.

The WMO, an agency within the United Nations, announced Thursday that it certified the megaflash as the [longest lightning flash](#) on record. It struck Oct. 22, 2017, during a severe storm that hit much of the Great Plains.

A megaflash is a giant bolt of lightning that travels huge distances from its origin point, said Randall Cerveny, a professor of geographical sciences at Arizona State University and a member of the WMO committee that confirmed the new record.

“It’s an incredibly strange phenomenon,” he said. “We only discovered them 10 years ago, when we could use a particular set of technologies to detect the start and end locations of the of lightning events.”

Megaflashes are not altogether uncommon, but they typically only occur in parts of the world where specific geographical and atmospheric conditions can produce the most [severe thunderstorms](#), Cerveny said. In the Great Plains and across the Midwest, for instance, warm and humid air from the Gulf of Mexico collides with drier, colder air from the north, creating strong atmospheric instability.

When these conditions mix and produce severe storms, megaflashes of lightning can occur. These extra-long bolts of lightning have been observed before in the United States, Argentina and southern France, and scientists think they can also occur in parts of China and Australia, according to Cerveny.

The 2017 megaflash was produced by an immense storm that blanketed a huge swath of the U.S., from Texas up into Iowa and Missouri. Though megaflashes can extend across multiple states, they form high up in the atmosphere and so rarely cause damage on the ground, Cerveny said.

“They are upwards of 10,000 to 18,000 feet high, in the upper to middle layers of a thunderstorm,” he said.

The 515-mile-long lightning bolt was described in a study published Thursday in the [Bulletin of the American Meteorological Society](#).

“These new findings highlight important [public safety concerns about electrified clouds](#) which can produce flashes which travel extremely large distances and have a major impact on the aviation sector and [can spark wildfires](#),” WMO Secretary-General Celeste Saulo [said in an accompanying statement](#).

The extreme conditions that spawn them are a reminder of how [powerful and dangerous lightning storms can be](#). In the U.S., lightning kills roughly 20 people each year and injures hundreds more, [according to the weather service](#).

With the classification Thursday, the 2017 lightning flash now surpasses the previous world record set five years ago by about 38 miles, according to the WMO. That bolt of lightning was unleashed April 29, 2020, and spanned 477.2 miles across parts of the southern U.S.

The 2017 megaflash was identified after scientists re-examined archival measurements taken when the storm occurred.

“When the original studies were done, we didn’t have the technology that we have today,” Cerveny said. “Now we have this instrument on a weather satellite that very accurately detects lightning and can precisely pinpoint where, how far and how long a lightning flash event takes place.”

Experts said it’s likely there will be even longer megaflashes found in the coming years, particularly as satellite technologies improve the ability to detect them.

“Over time, as the data record continues to expand, we will be able to observe even the rarest types of extreme lightning on Earth and investigate the broad impacts of lightning on society,” study lead author Michael Peterson, an atmospheric scientist in the Severe Storms Research Center at the Georgia Institute of Technology, said in a statement.

The WMO’s Committee on Weather and Climate Extremes keeps official records of global, hemispheric and regional extremes, including for temperature, rainfall, wind, hail, lightning, tornadoes and tropical cyclones.

*-article by Denise Chow, NBC Meteorologist,*

*courtesy NBC News*

*(Thanks to Rich, AC3FJ for this article.)*

# 2025 Grand Rapids Hamfest

*Grand Rapids Amateur Radio Association*

Saturday, September 6 ~ 8 AM to 12 Noon

**Saturday, Sept. 6 ~ 8AM-Noon**

Tickets \$8 ~ 12 & Under Free

Spacious Indoor & Trunk Sales

Food & Drinks Available

Inside Tables \$10, Trunk Sales Free



**Home School Building**

5625 Burlingame Ave. SW,

Wyoming, MI

**FREE PARKING!**

**MULTIPLE DOOR PRIZES!!**

**SATURDAY 10AM ~ FREE VE Testing by GRARA**

**Table Reservations**

Send table requests to:

GRARA Hamfest  
PO Box 3282  
Grand Rapids, MI 49501



Talk-in on the GRARA  
147.26 repeater.

Or

Email [hamfest@w8dc.org](mailto:hamfest@w8dc.org)

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 Phone: (\_\_\_\_) \_\_\_\_\_-\_\_\_\_ Email: \_\_\_\_\_

_____ Tables	@	\$10.00	=	\$ _____
_____ Tickets	@	\$ 8.00	=	\$ _____
_____ Outside Trunk Space	@	FREE	=	-0-
		Donation	\$	_____
		<b>TOTAL</b>	\$	_____

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