CQ CHATTER

DECEMBER 2021 **VOLUME B21 •ISSUE 10**

WOOD COUNTY AMATEUR RADIO CLUB

President	**KG8FH/W8PSK**	**Jeff Halsey/Loren Phillips**
Vice President	**KE8CVA**	**Terry Halliwill**
Secretary	**N1RB**	**Bob Boughton**
Treasurer	**KD8NJW**	**Jim Barnhouse**
Board Member	**WB8NQW**	**Bob Willman**

Time for a Kick-off

The Club's traditional Kick-off Banquet is scheduled for Monday, January 10th, at 6:00 pm. The location has been reserved, and is once again the Country Farmhouse restaurant at 117 E. Main St. in Wayne. As before, Club members will be able to order off of a limited menu, and will be billed individually. Family and friends are invited.

Please make reservations at least one week ahead of time with Bob-WB8NQW:

blcksmth@reagan.com

This is a one-of-a-kind annual get together for the Club, and provides us all with the chance to meet ops who we may only know from their voice over the air, plus XYLs and other family members. ■

Club Courthouse Tour

On Saturday, October 30, a tour of the Wood County Courthouse was enjoyed by members of the Club. Representing a covid-delayed event to celebrate the bicentennial of Wood County last year, a series of tours of the facility were conducted by County Officials. Through the auspices of Bob-WB8NQW, one of the tour slots was reserved for WCARC members and friends.

The tour was led by Judge Matthew Reger, who serves in the Common Pleas Court. Judge Reger did an admirable job of showing the group around the Courthouse, from the basement up to the attic. The most recent restoration of the facility occurred from 1979 to 1981.

continued on p. 6

Net Check Ins-I

Nov 2		*Traffic: 0*
	NM8W	*(NCS)*
	KE8QGV	
	KE8CVA	
	KG8FH	
	KC8EKT	
	W8PSK	
	WB8NQW	
	KD8RNO	
	N8VNT	
	N1RB	
	KA8VNG	*(11)*
Nov 9		*Traffic: 0*
	WB8NQW	
	WE8TOM	
	KA8VNG	
	WD8LEI	
	KD8RNO	
	WD8JWJ	
	W8PSK	
	KD8NJW	
	N1RB	
	KE8CVA/M	
	KG8FH	
	KD8VWU	*(12)*
Nov 16		*Traffic: 0*
	N1RB	*(NCS)*
	WE8TOM	
	WD8JWJ	
	KC8EKT	
	KD8RNO	
	WB8NQW	
	KD8NJW	
	WD8LEI	

Brain Teasers

1. If a frequency display shows a reading of 2425 MHz, what frequency is that in GHz??

a.) 0.002425 GHz
b.) 24.25 GHz
c.) 2.425 GHz
d.) 2425 GHz

2. What type of amateur station simultaneously retransmits the signal of another amateur station on a different channel?

a.) beacon station
b.) Earth station
c.) repeater station
d.) message forwarding station

3. Which of the following is accurately represented in electrical schematics ?

a.) wire lengths
b.) physical appearance of components
c.) the way components are interconnected
d.) all of the above

December Contests

The contest lineup for the month of December is given below. Please note that the WARC bands (60, 30, 17 and 12 m) are never open to contesting.

Dec 11-12	*0000 to 2359 Z*	10 m
ARRL 10 m 'test		**CW/SSB**
Dec 18	*0000 to 2359 Z*	160 m to 10 m
RAC (Canada) Winter 'test		**CW/SSB**
Dec 18-19	*1400 to 1400 Z*	160 m to 10 m
Croatian (9A) DX 'test		**CW**
Dec 19	*1800 to 2359 Z*	80 m to 10 m
ARRL Rookie Roundup		**CW**
Dec 30	*1200 to 2359 Z*	80 m to 10 m
YOTA (Youth On The Air)		**CW/SSB**

WB8VUL - SK

William G. "Hoot" Gibson became a silent key on November 13, 2021. A 20-year veteran of the USAF and BGSU grad, Hoot was a long-standing member of the Club and served as the editor of CQ Chatter for many years. As Director of the Wood County Airport, he made the facility available to the Club for meetings. He was always willing to lend a hand to help promote the WCARC and was an active participant in Club activities, including Field Day and Hamarama.

IT'S TIME TO RENEW YOUR MEMBERSHIP

Dues Payable to:

WCARC

P. O. Box 534

Bowling Green, OH 43402

Sen/Stu: $10

Reg: $15

Fam: $20

Net Check Ins-II

Nov 16 *continued*
KE8CVA
KG8FH
KC8NKC *(11)*
Nov 23 *Traffic: 0*
KG8FH *(NCS)*
KD8RNO
KE8CVA
KC8EKT
WD8ICP
WD8LEI
KB8QEW
KE8QGV
WB8NQW
KA8VNG
WE8TOM
N1RB
N8VNT *(13)*
Nov 30 *Traffic: 0*
KD8NJW *(NCS)*
WD8JWJ
KD8RNO
KE8CVA
KC8EKT
KG8FH
KE8NEC
WB8NQW
KA8VNG
WE8TOM
N8VNT
N1RB
KD8VWU *(13)*

Brain Teaser answers: (T) 1-c, 2-c, 3-c

Near Field Communication (NFC) Cards

by Jenny List, Hackaday

NFC (Near Field Communication) tags are a frequent target for experimentation, whether simply by using an app on a mobile phone to interrogate or write to tags, by incorporating them in projects by means of an off-the-shelf module, or by designing a project using them from scratch. Yet they're not always easy to get right, and can often give disappointing results. This article will attempt to demystify what is probably the most likely avenue for an NFC project to have poor performance, the pickup coil antenna in the reader itself.

A selection of the NFC tags on my desk

The tags contain chips that are energized through the RF field that provides enough power for them to

continued on p. 6

WCARC Weekly Net

Tuesdays at *2100* all year

147.18 MHz 67 Hz PL

Net Control Roster

Dec	*7*	*NM8W*
Dec	*14*	*WB8NQW*
Dec	*21*	*N1RB*
Dec	*28*	*KG8FH*
Jan	*4*	*KD8NJW*
Jan	*11*	*NM8W*

NEXT MEETING

Business Meeting

Monday

December 13

TIME: 7:30PM/7:00EB

PLACE:

Sheriff's Training Room
E. Gypsy Lane Rd. &
S. Dunbridge Rd.
Bowling Green, OH

10 meter Net

informal group meets

Sunday

@ 20:30 Z

on 28.335 MHz

Fusion Net

Thursday

@ 19:30 Z

on 442.125 MHz

67 Hz PL on analog

Informal net

courthouse—from p. 1

The idea was to try to retain as much of the original architecture as possible, which meant restoring floor tiles, marble floors, walls and pillars, retouching painted murals in the foyer and in the courtrooms, and where possible reconditioning many of the original metal fittings, railings and sculptures. It is an understatement to say that an excellent job was done, as evidenced by the degree of preservation that the building exhibits.

For many years, the WCARC occupied a clubroom/station in the basement of the Courthouse so as to be near the County Emergency Operations Center, which was also housed there. Unfortunately, after the Oklahoma City bombing, heightened security necessitated that the Club move out. A couple of us old-timers were challenged to figure out exactly where the club station had been located because the extensive renovation of the basement tended to be disorienting. At any rate, the tour served to illustrate that Wood County does indeed have a beautiful and functional Courthouse. ■

NFC—from p. 4

start up, at which point they can communicate with a host computer for whatever their purpose is.

"NFC" stands for "Near Field Communication", in which data can be exchanged between physically proximate devices without their being physically connected. Both reader and tag achieve this through an antenna, which takes the form of a flat coil and a capacitor that together make a resonant tuned circuit. The reader sends out pulses of RF which is maintained once an answer is received from a card, and thus communication can be established until the card is out of the reader's range.

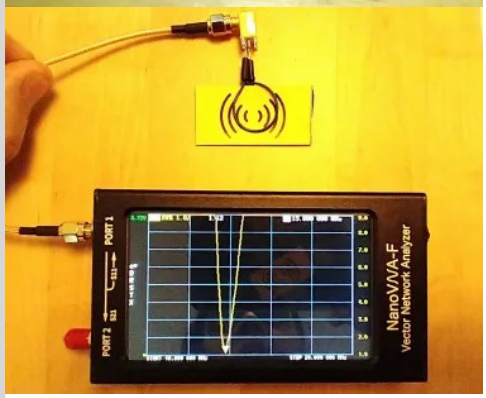
Very Few NFC Tags And Readers Are On The Same Frequency

For the majority of tags likely to be experimented by Hackaday readers the RF frequency is 13.56 MHz, and the RF emissions are supposed to be in the magnetic field plane rather than the electric field. There's nothing complex about the antennas, indeed it's easy enough to make one yourself by winding a suitable coil and tuning it with a small variable capacitor. The RF properties of the antenna can be explored with instruments as simple as a signal generator and an oscilloscope, or if you're a radio amateur old enough to have picked one up, a dip meter. For the purposes of this article I'm using a NanoVNA because of its extreme convenience, and I've set it to measure SWR on port 1 with a sweep between 10 MHz and 20 MHz. I'm loosely coupling it to the NFC antennas I'm testing by means of an RF pickup coil, one turn of wire about 10mm diameter soldered to a coaxial connector and secured with a bit of glue. When I place the pickup coil over

continued on p. 7

NFC—from p. 6

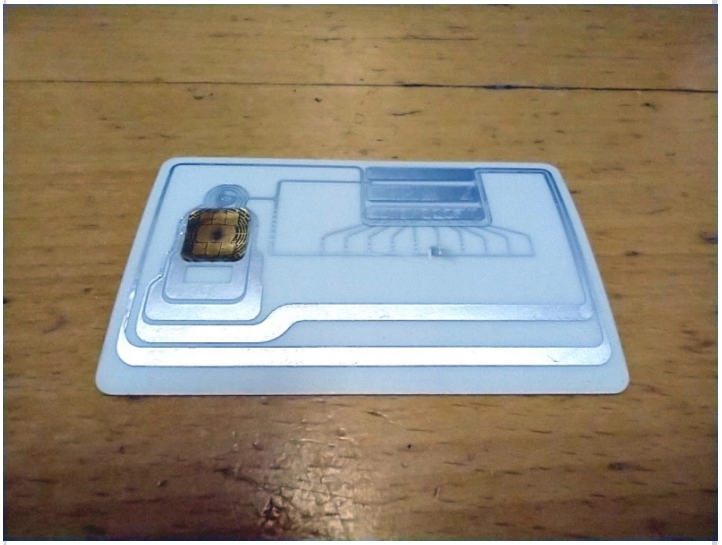
an NFC tag, I'm rewarded with a sharp peak on the VNA from infinity down to near 1:1 SWR. This works well with most reader coils and with lower power NFC tags that simply contain a memory chip, but my VNA doesn't provide enough energy to measure those tags with higher power integrated circuits such as bank cards, a public transport card, or passport. In writing this article I found that both cards and readers appear to resonate anywhere between 13.5 and 15 MHz, with the majority being measured at about 14 MHz. In practice most readers provide more than enough energy so the tag can still be energized despite the resulting inefficiency, but for any NFC tag system to work at maximum efficiency it should have both reader and tag adjusted to resonate at the 13.56 MHz frequency of communication.



Immediately, the VNA pinpoints one of the problems inherent to mass-produced NFCs, that the resonant frequency is rarely exactly on 13.56 MHz

Most tags, and the cheapest reader modules, have very little effort put in to tuning them to resonance, but one of the more interesting tags I examined for this piece, a bank card subjected to a teardown by a friend, shows a very clever approach to automated tuning.

A bank card is a standard chip card made from two laminated layers of plastic, with the chip contacts appearing in the front face. Upon dismantling it can be seen that the chip and its contacts are on a small piece of plastic about 10 mm by 10 mm that can be lifted clear of the card.



Here's what's going on inside your bank card. The variable capacitor is shown at top centrer, and the chip is sitting in its pick-up coil on the left.

This module can be read by a card reader, but only when it is placed directly on the antenna rather than with any part

continued on p. 8

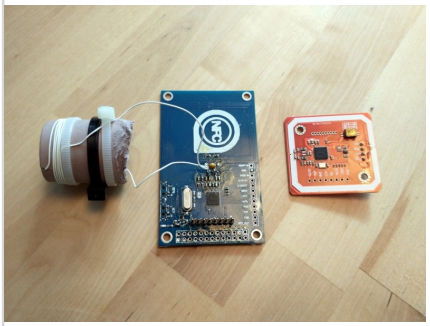
NRC—from p. 7

of the whole card in proximity to the reader as would happen in a store. To ensure the small chip module can be energized by a reader over the whole surface of the card, the rear half of the card is a printed circuit board that is simply a tuned circuit with a large coil and an ingenious variable capacitor made from a row of small PCB plates. The coil is half-and-half around the edge of the card and closely around the chip, allowing it to pick up the field over a large area and couple the resulting energy closely into the chip. It's tuned during manufacture by cutting a trace connecting the capacitors, at a guess this will be an automated process. Measuring its resonance, it turns out to be a little higher than 13.56 MHz, but since that measurement was made on a dismantled card with no chip in place it's likely that the resonant point will have been moved upwards.

Tuning An NFC Reader For Maximum Smoke

Turning to the readers, the more expensive devices have a built-in variable capacitor and will have been factory-tuned to 13.56 MHz, while the cheap modules normally have a fixed capacitor and resonate at a higher frequency.

Experience with these cheaper modules suggests that they will usually interact with the simpler cards such as the ubiquitous MiFare Classic, but that they are unable to provide enough energy to power the smarter cards such as the MiFare DESfire tags. Adjusting the antenna on the module for resonance at 13.56 MHz improves the efficiency to the extent that the higher-power tags can be read, for example in the picture is a cheap reader module prepared by a friend. He used an RF pickup coil and an oscilloscope to measure the amplitude of the 13.56 MHz carrier, and adjusted the tuned circuit until a point of maximum amplitude had been reached. In this case he wound his own coil and removed wire from it turn by turn to find the maximum, but the same result could just as easily be done with the PCB coil and a small trimmer capacitor. This cheap reader now works with DESfire cards that previously required a far more expensive module, making the process well worth the effort.



A pair of cheap NFC reader modules. The one on the left has been modified to provide resonance at 13.56 MHz.

So while much of the technological magic in an NFC tag lies in its digital electronic package it's worth remembering that making it all work is still a firmly analog antenna. A bit of old-fashioned RF tweaking work with your 'scope and a signal generator can transform their performance for the better. ■

WCARC Field Day Results

Below are the composite and raw scores, respectively, detailing the Club's effort for Field Day 2021, as they appeared in QST. The raw score (on the right) is the total obtained from the actual operations that took place at the operating site (Wood County Historical Museum) under the K8TIH call. The Club operated in Class 6A.

The composite score (left) includes the contributions of other operators who operated under their own calls, but who directed their scores to be added to the Club score (special pandemic rules). Many thanks to those who took the time to help set up and operate at the museum site, but also to those who opted to contribute their own individual scores to the Club's total—ed.

White Rock ARC	168	1
White Rock Lake ARC	1,848	3
Whitewater Valley ARC	1,466	1
Whitley Co. ARC	4,594	1
Whitman ARC	2,834	1
Whitman Co. ARES/RACES	90	1
Wichita ARS	1,046	1
Wilderness Road ARC	1,488	2
Willamette Valley DX Club	2,358	3
Williamsburg Area ARC	9,146	3
Williamson Co. ARC	142	1
Williamson Co. ARES	826	1
Wilson ARC	3,498	2
Wilsons Wonders	5,210	1
Windmill Amateur Radio Grp	2,400	1
Winnipeg ARC	734	1
Winona ARC	4,904	2
Wireless Assn. of South Hills ARC	4,464	2
Wireless Operators of Winsted/CQ RC	408	1
Wireless Soc. of Lorain Co.	1,335	1
Wireless Soc. of S. Maine	7,710	2
Wisconsin ARC	3,554	7
Wisconsin River Gang	6,520	1
Wisconsin Valley RA	1,324	1
Wistaria Wireless Soc.	1,608	1
Wood Co. ARC	2,568	3
Wood Co. ARES/RACES	2,848	1
Wood Co. Emergency Comm.	3,108	1
Woodbridge Wireless	24,092	4
Woodchuck ARC	1,214	1
Woodford Co. ARC	768	2
Workshop88	2,895	1
WPA FIELD DAY Assn.	3,266	2
WRAET	626	2
WVØH FD Group	2,058	1
WVARC-AZ	804	6
XRX & Monroe Co. ARES RC	4,114	1
XWARN/DARA	3,868	2
Yadkin Valley ARC	1,152	1
Yankee Clipper Contest Club	7,416	3
Yavapai ARC	1,236	1
Yellow Thunder ARC	1,510	1
Yellowknife ARS	1,422	1
Yellowstone RC	1,272	3
YoloARS/MTVACA/SACARC/ Yolo CO ARES/UCDARC	1,754	1
Yonkers ARC	2,288	1
Yooper Dupers	3,574	1
York ARC	1,360	1
York Co. Radio Soc.	630	1
York Co. (SC) ARS	8,320	2
York RC	7,763	5
York Region ARC	9,588	15
Young Co. ARC	602	1
Yuba-Sutter ARC	2,816	6
Yukon ARA	790	1
Zephyrhills Area ARC	1,348	1
Zuni Loop MEF	6,470	7

Penn Wireless Assn.					
W3SK	600	2	27	3,624	EPA
Vero Beach ARC					
W4OT	583	2	46	3,452	SFL
Hood Co. ARC					
W5HCT	527	2	8	2,974	NTX
Stones River ARC					
K4FUN (+W4OPS)	536	2	47	2,912	TN
Bridgerland ARC					
W7IVM	292	2	72	2,394	ID
Fort Venango Mike and Key Club					
W3ZIC	320	2	32	2,212	WPA
GVARC/SBCARA					
W6GGF	175	2	14	2,192	SCV
San Fernando Valley ARC					
W6S	236	2	20	2,150	LAX
Santa Rosa Co. ARES					
K4SRC	219	2	12	2,130	NFL
N. New England Field AR Operators					
NE1FO (+N1SFT)	242	2	12	1,936	NH
West Alabama ARC					
KC4UG	178	2	20	1,856	AL
TCARES					
K6TUO	257	2	12	1,684	SJV
Twin State RC					
W1FN	351	2	25	1,576	NH
Northern Berkshire ARC					
N1WM	209	2	6	1,352	WMA
Wood Co. ARC					
K8TIH	91	2	10	1,332	OH
Kent ARS					
K3ARS	97	2	7	1,082	MDC
Salem ARC					
W7SAA (+K7DSG)	48	2	19	1,052	OR
Tompkins Co. ARA					
AF2A	151	2	11	956	WNY

6A — Battery

NASA Ames Research Center ARC					
NA6MF (+NA6MF)	24	5	4	870	SCV

7A

WOOD COUNTY ARC
P.O.BOX 534
BOWLING GREEN, OH
43402