

Observations On FM Contesting: Preparing to win, Lessons Learned From Losing.

Abstract:

This paper is intended to assist new FM category entrants through setting realistic goals for performance by analyzing historic scores and then looking at three case studies of winning stations to pick up on their commonalities, unique advantages and identifying the strategies they use that will improve performance. An example dual band station is used throughout the paper to identify how, with a little planning and preparation a dual band station can have an excellent chance at a top three national finish. The paper begins by analyzing QSO's, multipliers and the score needed for a top 3 finish. It then moves on to the selection of an operating location and the all important, for FM, pre-contest coordination. Three nationally winning stations are then evaluated to uncover their strategies and common themes for success. The paper wraps up with a list of Lessons Learned From Losing and a few operating tips.

Introduction

The FM category in VHF/UHF contesting is available to every new Technician as soon as they get their first radio. FM is the easiest category to do well in and has the lowest bar for entry yet it consistently has only around 20 entrants nationally. FM is relaxed, unlike HF no one is going to be upset if your procedures are not perfect. In FM we operate regionally due to a limited range of 300 miles or less, but compete against each other nationally. The goal of this paper is to get helpful information into the hands of amateur radio operators who have never taken part in a VHF/UHF contest to enable them to prepare smartly, do well and above all else have fun. This paper will attempt to do that by looking at four topics:

Setting contest goals for QSO's, QSO points, Multipliers & Score.

Analyzing winning stations

Using the information presented to create a winning strategy

Avoiding mistakes that prevent you from reaching your goal.

It is more fun and motivating to take part in any competition when you have a chance of doing well. FM most certainly gives you that chance. Once the fun of VHF/UHF contesting is experienced it is likely that you will want to take part in the next FM contest to improve your skills or even "move up" to other categories. If you are an experienced VHF/UHF operator please pass this paper along to new Technicians or those who show an interest in VHF/UHF contesting.

Setting Contest Goals.

A little time studying the scores of other competitors provides a lot of insight into what your scoring goals "need" to be. The discussion will focus on what it takes to get a top three national score. While a first place national score *may* be out of reach for a first time entrant, a top three national score is often achievable with just a little effort. At the regional and divisional level almost any log submitted will get you a top three finish if not an outright divisional or regional first place. Once you set your goals, the station, station location and bands needed will be apparent and you will have good idea of how much pre-contest coordination (assistance) you will need to reach those goals. In the following discussion the example station used will be a dual band FM rig typically found in base and mobile stations with 50 watts on 2m with a 3dBi whip antenna, 25 watts on 70cm with a 6dBi whip antenna, a combination found on most mobile rigs. Scores are made up of two components, QSO points and Multipliers. We will start the assessment of goals by looking at the number of contacts or Q's and QSO points that are needed by our example station.

QSO Point Goals.

QSO points are awarded for each contact made. A single QSO in FM can be worth either one or two points (QSO points). There are four bands available in the FM category, 6m, 2m, 1.25m and 70cm. The National Calling Frequencies (NCFs) are typically used for most contacts. Note that contesting is secondary on the NCFs and you should move to other frequencies when non-contesters want to use them. Contacts in the two lower bands (6m and 2m) are worth one point each, and contacts in the higher bands (1.25m and 70cm) are worth two points each. Ninety-five percent of contacts begin on 2 meters at the NCF (146.520MHz) and then move (QSY) to 70cm and the other bands. Your 2 meter contacts will outnumber those on other bands by about 2 to 1 so it pays to have a decent 2 meter set up and call CQ on 2m almost exclusively. Every amateur has 2m and 70cm FM simplex capability so you might think the airwaves would be crowded, but they are not. Any evening you can spend an hour on the air calling CQ on the FM simplex NCFs and get only one or two responses. Very few Hams use the national calling frequencies daily, fewer know when there is a contest going on and almost no one knows that FM contesting exists. You will need to make an effort to get people up on FM simplex during the contest. Turning go Figure 1, Analysis of Q's you will notice that there is usually a wide disparity in the number of Q's or contacts made between the first place station and all others. This is because most contests have one "big dog" and then everyone else. The median number of contacts on all bands since 2016 for second place has been 51 and 41 for third. This is an almost absurdly low bar for doing well. Making only 30 contacts on 2 meters (30 points) with half of them successfully being QSY'd to the 2 points per QSO 70cm band (another 30 points) would give you a total of 45 Q's (45 contacts across the two bands) for 60 QSO points.

Analysis of Q's (40-60)

Contacts for a Top 3 in FM

Average Q's: 1st 117, 2nd 61, 3rd 45

Median since 2016 is 1st 144, 2nd 51, 3rd 41

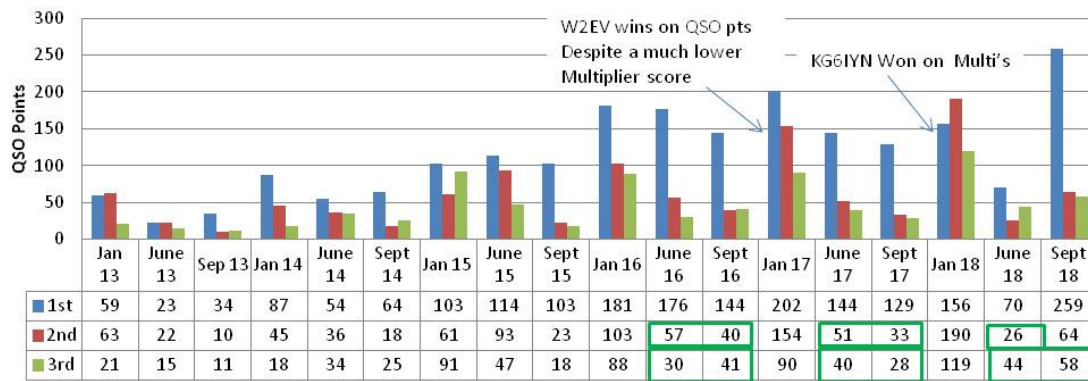


Figure 1: Q's Analysis

If you happen to have either of the other two bands (6m or 1.25m) you could easily increase the QSO points score to 80 or 100 with just 10 to 20 contacts on those bands. Once you make a contact on 2 meters it is essential that you ask the other station if they have any of the other bands available to you.

Based on the above assessment for a second or third place national finish, we will set the QSO point goal at 60 points with 30 stations contacted. Contacting 30 stations is not hard. You might think you need to live near a major population center with 30,000 Hams to achieve this. You don't, you just need 30 Hams within a 30 to 50 mile radius to get on the air. Since you are allowed "assistance" in VHF/UHF contesting you can arrange in advance to meet people on the air during the contest. How many members are in your local club? Coordinate with them. Most clubs are HF centric but all of the members will have FM simplex and many of them will get on the air for you if you just ask. Many daily and weekly repeater nets in your local area have 10 to 30 participants; remind them of the contest and request they get on the air for a QSO.

A powerful tool for scoring are mobile stations called rovers in VHF/UHF contests. Each time you make contact them after they enter a new grid square you can talk to them AGAIN and count them as new points. A single two-band FM mobile (Rover) circling around a grid corner near you can provide 12 points, one point from each grid on 2 meters (four points) and two points from each grid on 70cm (8 points). If you can get a pair of rovers out there you will be well on your way to achieving your QSO point total. If you get six or eight Rovers to grid circle at one or more grid corners you will have what the Rochester VHF/UHF club call a "Rover Blitz," a club tactic they use to generate very high scores in all categories including FM.

Working near grid corners is a big part of what goes into developing your contesting strategy, particularly for FM which tends to be range limited.

Multiplier Goals.

As the name implies, your QSO point score is multiplied by the number of multipliers you achieve. You receive a multiplier for each four digit (ex: FM08) Maidenhead grid square you make a contact with for the first time on a given band. A two-band station that makes contacts only in the grid that it is located in will get two multipliers, one for each of its two bands. A two band station near a grid corner should easily be able to get four multipliers on 2 meters and four more on 70cm for a total of eight. Turning to Figure 2, Multiplier Analysis, you will see that since 2016 the median number of multipliers for second place has been 15 and for third place 10. Working near a grid corner will get you eight of the minimum ten multipliers you need. So how do you get the rest?

Analysis of Multipliers (10-15)

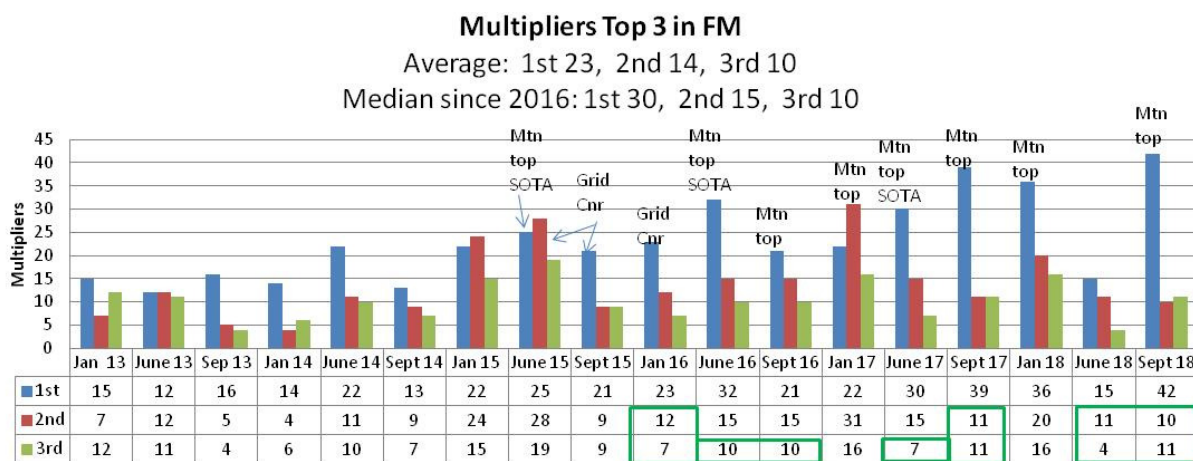


Figure 2: Multiplier Analysis

To get the multiplier count up to 10 or 15 a bit of portable/mobile station location planning or QTH luck is required. The grids are roughly 60 miles North-South and 120 miles East-West. While you may think this a long reach for FM simplex, it is not hard. With line-of-sight you can work a five watt HT at 50 or 75 miles. One of the best places to set up a station is 20 to 30 miles north or south of a grid corner with a clear line of sight to that first grid corner as well as to a second grid corner 30 to 40 miles away in the opposite direction. Since FM gear is highly mobile or portable you can move your station anywhere you want if your QTH (like mine) is in a compromised location. However, don't think for a minute that you must be on a mountain top to do well. A 30 mile line of sight requires only 300 feet of elevation difference between the stations and, in practice, frequently a lot less. W2EV, a regular winner who lives in

flat land, has just such a North-South grid line set up with grid corners at 10 and 50 miles. The key thing to do is to set up close to a North-South grid line with line of sight to TWO grid corners. It's not essential, but it is exceptionally helpful, if you do some line of sight and link margin estimates for your station location. Google Earth and the Pasternack link budget calculators make this very easy to do.

Looking at Figure 3 you will see that KK4OSG (now WG4I) sets up on a N-S grid boundary about 15 miles south of a grid corner, similar to W2EV who is north of his grid corner by 10 miles. This map was plotted on Google Earth with the grid lines overlaid. KK4OSG has a line of sight to three grid corners at 15 miles, 45 miles and 75 miles all on a North or South heading

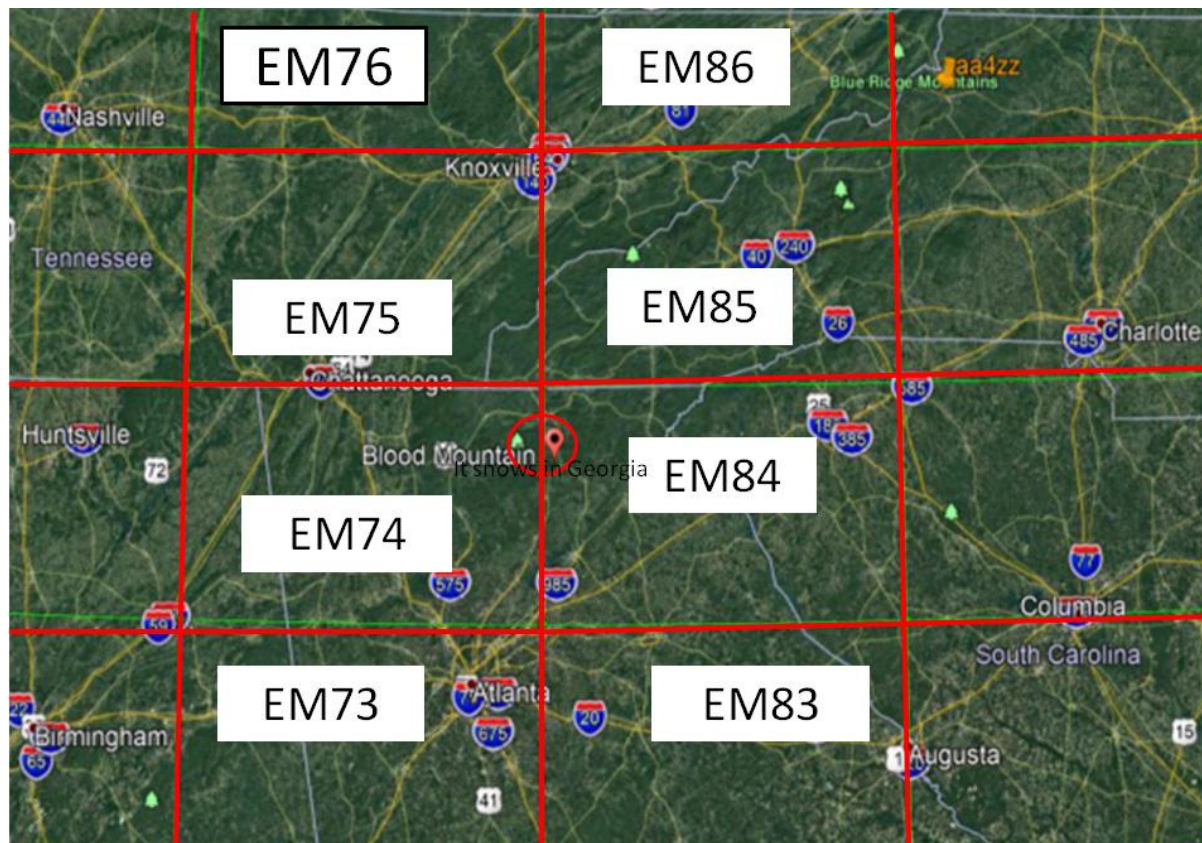
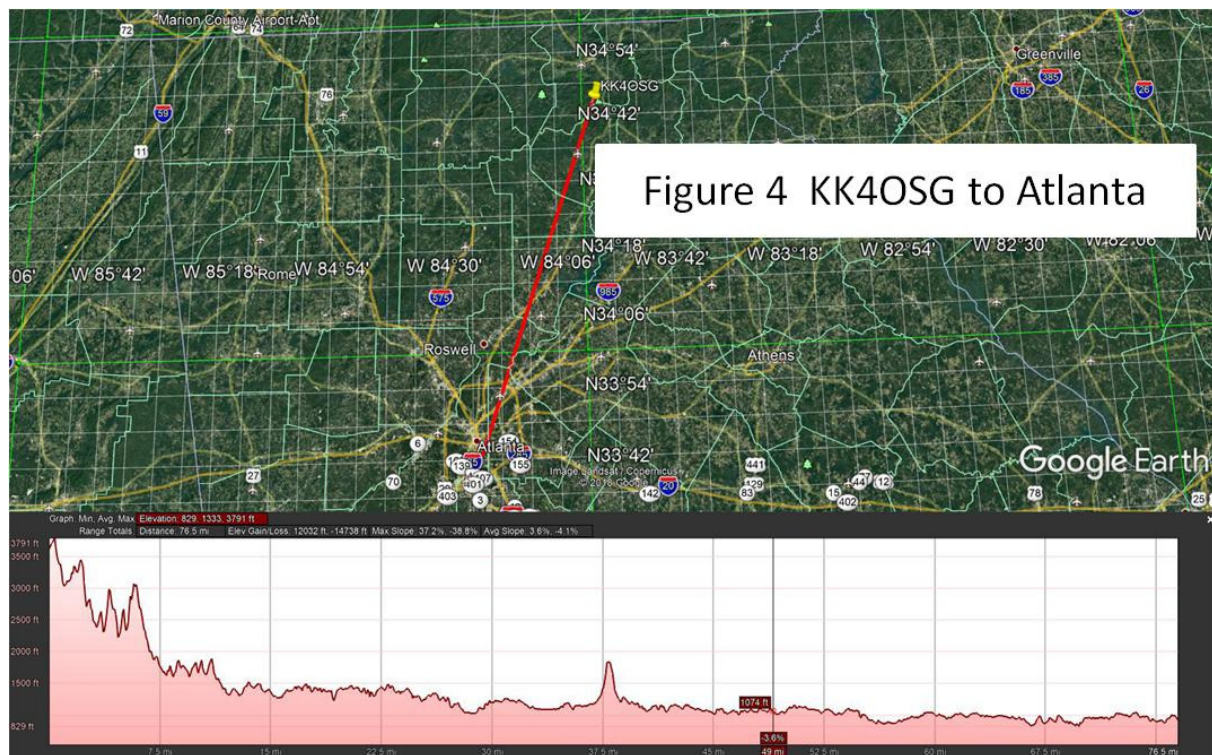


Figure 3: KK4OSG Station Location

with line of sight to the large population center of Atlanta at 60 miles. As shown in Figure 4, you can use the "ruler" tab on Google Earth to draw a line between your proposed location, nearby grid corners, or population centers. If you right click that line you will get an elevation profile like that shown at the bottom of Figure 4 where KK4OSG's line of sight to Atlanta is plotted. Be aware that Google Earth assumes a FLAT EARTH in the elevation profiles so you will want to do a radio line of sight calculation between the two locations using the local elevation of the two stations to make sure Earth's curvature does not get in the way.



To find out if you can reach grid corners or population centers take the distances measured on Google Earth and use the online Pasternack Link Budget Calculator. Be conservative on the capabilities of the "other station" and be realistic about your own. Most Hams only use FM for repeaters so its normal to see cheap lossy cable and connectors being used. I never assume less than 3dB loss or more than 3dBi gain (2m) or 6dBi gain (70cm) for the other station. The link margin calculation will provide the signal strength that the far end of the QSO. You want to see at least 20 micro-volts or -80dBm at the other side for your maximum reliable range. You will likely go a lot further at -80dBm but it pays to be conservative.

The result of the predictions described can be seen in Figure 5, Flagpole Knob Multiplier Estimates, which I calculated for my first contest site working a two band station. The yellow pins show a range of site studied. The red circles are the predicted 70 mile (70cm) and 120 mile (2m) ranges from my chosen operating site. From the center of FM08 at Flagpole Knob I expected, with high confidence, five grids on 70cm and eleven grids on 2m. Due to terrain, the EM Grids were denied, but over the course of two contests I was able to reach all of grids as predicted.

Analysis of FM Contesting: Multiplier Goals 2 Bands



Flagpole Knob 70cm Grids

Five at High Confidence
FM 07,08,09,18,19

Four at Low Confidence
EM99,98,97 & FM 17

Flagpole Knob 2 Meter Grids

Eleven at High Confidence
FM 06,07,08,09,17,18,19
EM 97,98,99, FN00

Four at Low Confidence
FM16, FN10, EN90, EM96

Assume a 3dB omni, 25W &
3dB losses for the other station.

Figure 5: Flagpole Knob Multiplier Estimates

Keep in mind that Multipliers are irrelevant if your QSO count is near zero. A strong effort at getting Hams up on the air can, and often has, made up for a multiplier disadvantage. Advance planning to get stations on the air is the foundation of a good score with the multipliers being vital but not the sole determining factor. It is not unusual to see stations with the highest multiplier totals lose to stations with more QSO points, this happens about 25% of the time.

Scoring Goals.

Figure 6 shows the scores in FM over the last 18 contests. As was seen in the QSO and Multiplier data, the first place stations tend to run away with the top score (Jan 17 and June 15 being the exceptions). The second and third place scores are much lower and often very close. The median scores since 2016 have been 462 for 3rd place and 1125 for 2nd place but it's not unusual to see scores as low as 400 or 500 points take 2nd place.

Analysis of Scores

Scores Top 3

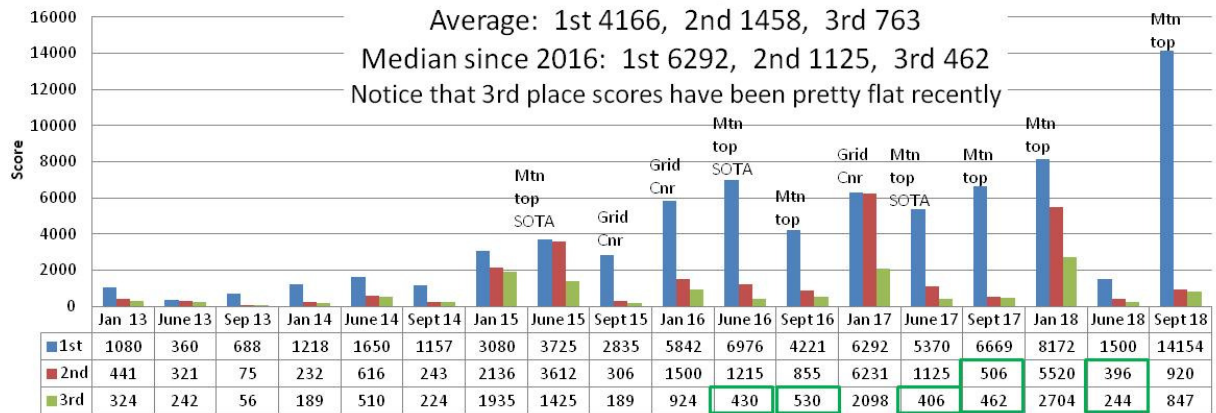


Figure 6 Analysis of Scores

Our example, a two band station located 15 to 30 miles from a grid corner, is expected to achieve a minimum 60 QSO points and eight to eleven multipliers for a total score of between 480 and 660 points. This station is easily in the running for a 3rd place national finish and has a shot at 2nd. Adding a third band, (I like 1.25m/223.5Mhz NCF) would almost guarantee a second place finish. If you look at the seasonal scores you will notice that the June contest tends to have the lowest FM scores for second and third place. This is because almost all of the experienced VHF/UHF testers are over on SSB where there is the highest annual activity level and best annual propagation is. This leaves the door wide open in June for the new guy to step up. If you are trying to decide which contest to take part in for the first time on FM I would strongly recommend June.

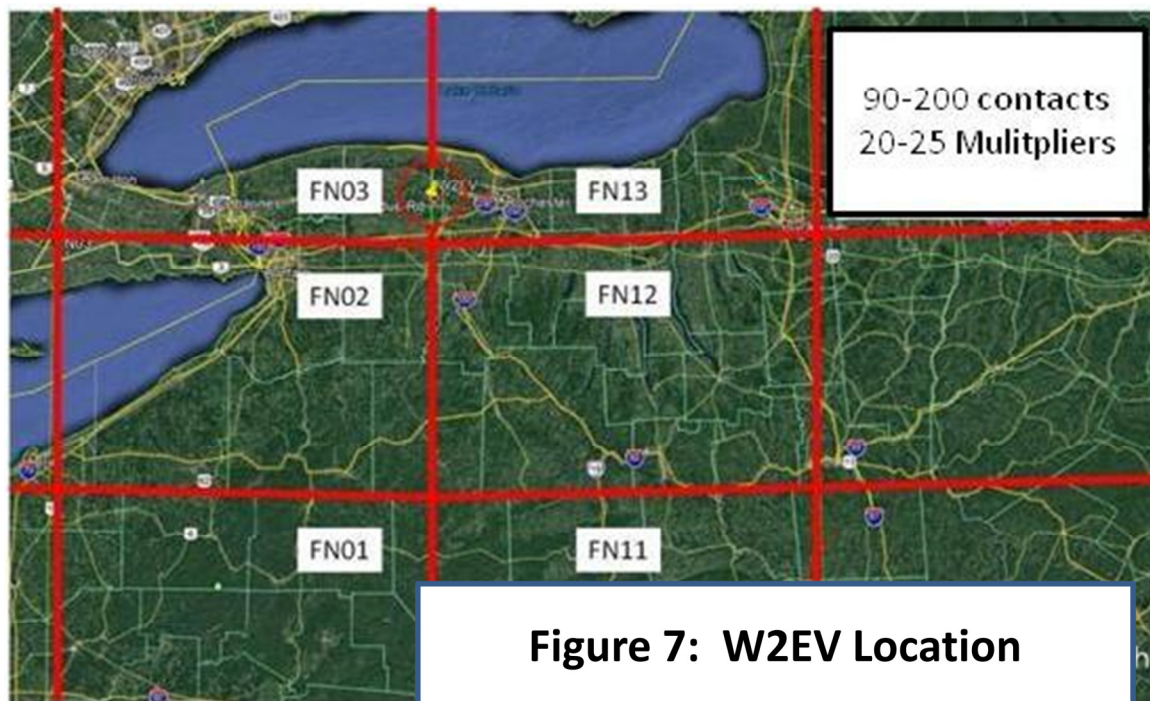
Case Studies of Three Winning Stations.

W2EV: The Consistent Winner.

The first station we will look at is W2EV near Rochester NY. W2EV has dominated the FM category since its inception with seven first place wins and three second place wins. Any time his station comes up on the air it is a contender for first place. Figure 7 shows his location relative to nearby grids. W2EV works from his QTH using omni antennas on all four bands. His station is 10 miles from a grid corner, is sited on a North-South grid line at 650 feet ASL with a nearly clear line of sight to the grid corners on all four side of him. The land is FLAT. You don't need big beams, high power or high altitude to win. The key to W2EV's success is coordination, reliability and consistency.

W2EV, besides being skilled and experienced, has one nearly overwhelming advantage, he is a member of a very active VHF UHF club in Rochester NY. The club coordinates between

its members for each VHF/UHF contest to maximize points and it sponsors a Rover Blitz of between eight and ten Rovers who circle the grid corner ten miles from W2EV's station. The club passes out HT's to new Hams to work hill tops and, most impressively, it often pre-runs the contest a couple weeks in advance to shake out the bugs and work out any line of sight issues for member stations. The Pacific North West VHF Society does a good job coordinating for FM as well and they are worth studying as well but the Rochester Club really sets the standard when it comes to including FM in their club contest plans.



If you make a historic study of W2EV's scores (or those who use his station) you will find that he very consistently scores 4,000 to 6,000 points with a high QSO count. He always gets between 20 to 25 multipliers, four from each of the four nearby grids for a total of 16 and the rest from grids that are 50 to 120 miles away. W2EV's consistency always puts him in a position to enable his competitors snatch defeat from the jaws of victory if they make any number of mistakes or encounter bad weather (want to guess how I know this?)

KK4OSG: The Iron Ham

KK4OSG (now WG4I) is an avid SOTA activator. He does things a little different. For FM contests he backpacks his station up to a site on Blood Mountain at 4,660 feet over a two mile trail with 2,000 feet of vertical elevation change. Batteries are heavy so he usually works at five watts until near the end of the contest when he uses up the last of his batteries going to a higher power. Being in the humid southeast, he occasionally gets that rarest of animals, ducting, strong enough to support FM well beyond normal line of sight which has enabled him to reach as far north as Boston and consistently down into Florida.

KK4OSG's station is in the tent shown in Figure 8 and consists of an FT-8900 for 6m, 2m, and 70cm along with a borrowed rig for 1.25m.

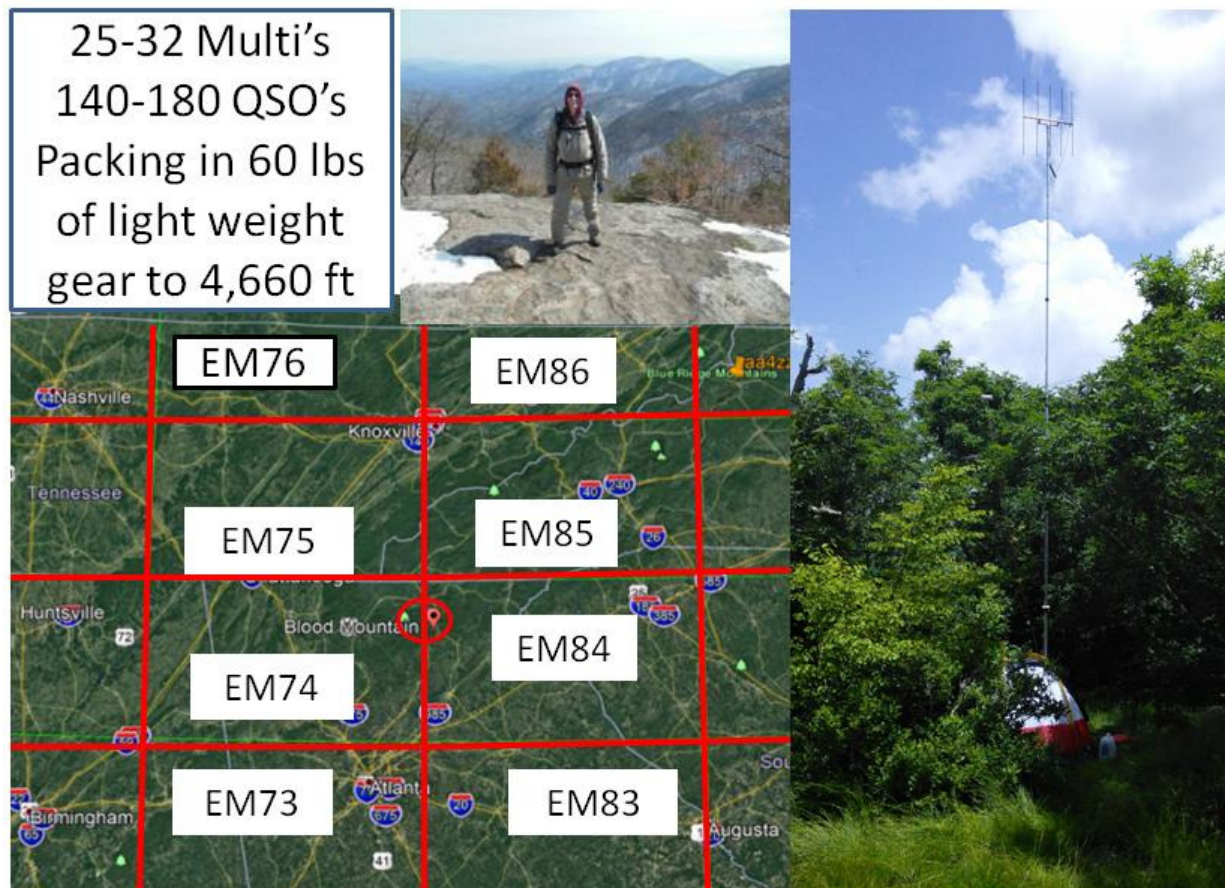


Figure 8: KK4OSG The Iron Ham

For antennas he uses a roll-up ladder line J-Pole for 1.25m, a dual band Elk Yagi-Uda for 2m/70cm and a wire dipole hung from the trees for 6m. A push-up mast is used to get the Elk and J-Pole clear of the trees. His excellent station location at high altitude with line of sight to FIVE grid corners and Atlanta allow him to gather between 25 and 32 multipliers with 140 to 180 Q's. He has won first place three times and held the record high score of 6,976 points (with a perfect log, no errors) from June 2016 until January 2018.

Of the three stations reviewed, I believe that KK4OSG does the least amount of pre-contest coordination. His location is the best of the three stations evaluated which enables his four band station, despite being on low power for most of the contest, to achieve an impressive number of multipliers and a very high QSO score.

KM4KMU: The Grid Chasing Shrimp Boat

I set up a temporary four band fixed site station on a mountain top. I usually work from Reddish Knob at 4,400 feet on the Va-WVa border in the center of FM08. My station is mounted in a modified Jeep with a fold over mast and outriggers for guy lines that are reminiscent of a shrimp boat - as seen in Figure 10.



Figure 10: KM4KMU, a grid chaser at the center of FM08 at 4,400 ft in the NRQZ

For coordination I email every person I have made contact with in previous contests on FM. This list has about 300 hams on it and gets longer every contest. I also set up my station at a local Ham Fest a month before the contest to pass out roughly 100 flyers requesting QSO's. Besides operating from a grid center, which is unusual, I am located deep inside the National Radio Quiet Zone (with permission) which is a double-edged sword. While the noise levels are very low there is no phone, text or internet connection making any sort of assistance during the contest nearly impossible (contesting assistance or emergency assistance).

I generally get from 30 to 40 multipliers with 140 to 150 contacts being made. In September of 2018 I got extremely lucky and was sitting on top of a "leaky" surface based duct with clear skies above me and heavy clouds with rain beneath me. This allowed me to achieve a record total of 42 multipliers but more importantly, it supported strong propagation out to 200 miles so I was able to reach "weaker" onmi stations at long ranges, not just stations on stacked beams. The duct was just "leaky enough" to let me reach all the normal close in stations. These conditions allowed me to generate a record 259 contacts to go along with a record number of multipliers providing a score of 14,154. This sort of makes up for my annual disaster in January where I either make a lot of stupid mistakes (lessons learned from losing) or have terrible weather and end up in a compromised location. For the June contest I support the W4IY VH/UHF multi-op station and get a week of mountain top Elmering.

Commonalities of Top Performing Stations

W2EV and KK4OSG set up near a grid corner AND on a North-South grid line putting two or more grid corners easily within reach. KM4KMU being the exception who makes up for that with beams and mast mounted pre-amps.

KK4OSG and KM4KMU set up at high altitudes to maximize range. W2EV is the exception who makes up for that with amazingly strong pre-contest coordination including a Rover Blitz and a good line of sight to four grid corners on relatively flat land.

W2EV and KM4KMU conduct good to strong pre-contest coordination. The exception being KK4OSG (at lower power) who makes up for that with a clear line of sight to five grid corners and Atlanta.

There are five common characteristics between the majority of these winning stations:

- Good to excellent pre-contest coordination, two of three
- Set up 10-30 miles from a grid corner, two of three.
- Set up on a North-South grid line, two of three
- Line of sight to 3 or more grid corners all three.
- High altitude to maximize range, two of three.

Of the five common characteristics the most important is pre-contest coordination followed by setting up near a grid corner. This would be especially valuable for our example dual band station which is limited in power, antenna gain and range. If you can add altitude and line of sight to three grid corners all the better but it is not essential. A dual band station that can reach two grid corners and generate a good turn out through pre-contest coordination is almost guaranteed a second or third place finish.

Lessons Learned from Losing:

The following is compilation of mistakes, errors and lessons learned. Most of these have been driven home by losing badly in January or barely missing first place, also in my cursed month of January.

1) Log all your contacts. Even if they don't submit logs they will count in your log. I got 11th instead of 4th place in my first contest, Jan. 2016 because I thought only stations that logged counted. I talked to about 100 hams but only logged 11 of them. Doom on the newbie.

2) If you are hand logging don't lose a log sheet, use a pad not separate sheets. I lost to W2EV in January of 2017 by about one percent after losing log sheet.

3) If you are hand logging write clearly. Despite losing that log sheet in January of 2017 I could have won if my lousy hand writing hadn't cost me a dozen or so contacts. Study your Log Checking Reports to find out what you can do to improve.

4) Another lesson from January of 2017. Stay on the air, Butt In Chair (BIC). I abandoned my mountain top site when ice started forming. I wanted a hotel room instead of a tent. I was on the air for only 16hrs over two days and lost to W2EV by just 61 points. 10 more minutes on the air would probably have given me first place.

5) If you are using a logging program check what you type in before entering it. In September of 2017 I touch typed "OH" for "ZERO" eight times. The other station said "OH" instead of ZERO and the fingers typed it, I heard but was not LISTENING. That hurt my score but I still got first place since none of the other high scoring stations showed up to make me pay the price of that error.

6) Recon your operating site well in advance. For the January 2018 contest I went to a ski resort in Central PA which is very popular with Rovers in June and September. Due to LED flood lights, lift motors and car ignitions in the parking lot I experienced S-7 noise on FM that is not present in September or June. Dozens of Hams heard me 20 over S-9. I heard almost no one and went QRT after 9 hours.

7) Mark a road atlas with grid squares going out 300 miles in every direction. On FM most of your contacts won't know what grid square they are in. You can have them look it up on QRZ but its faster if you give it to them and then HAVE THEM REPEAT IT BACK so it's a legitimate exchange.

8) If you are setting up a remote site (KK4OSG, KM4KMU) KISS, Keep It Simple Stupid. Practice setting up you station and tearing it down in both daylight and darkness. You never know when lightning or bad weather (ice, wind etc) will show up. Minimize nuts, bolts, tools and set up time.

9) Know how to tell Yeasu owners how to turn off wires. Wires puts a tone over the first part of each call making it unintelligible. If you know how to turn off wires on an FT-8800, FT-8900 or FT-60 it will save you a few QSO points in every FM contest.

10) When you QSY always have the other station meet you back on the frequency you could hear each other on if you fail to make contact after the QSY, a common problem on 70cm. They may have other bands that you can work or they may have ARS turned on (next).

11) Make sure you know how turn off your Automatic Repeater Shift (ARS). Sometimes other stations that are very close will hear you on the QSY but you will not hear them. When they come back to the "good frequency" after a failed QSY ask them if they have their automatic repeater shift turned off. Many hams and many radio don't automatically turn ARS off when working simplex. FM is for repeaters only, isn't it?

12) Always bring omni antennas when working a populated grid corner. In January of 2019 heavy snow and ice kept me off my preferred mountain top so I tried to emulate W2EV's set up by working a populated grid corner, but I brought beams not omnis. Dozens of people heard me call CQ all around the compass on my "sloppy" 2m beam. When I QSY'd the group to 70cm and switched over to my razor sharp M2 70cm beam I heard only a couple stations on each bearing and it took almost half an hour to work around the compass. Most of the stations I QSY'd just gave up waiting for me and never came back.

13) Always bring omnis when ice threatens. In January of 2019 I knew to expect ice during the contest and thought I was ready for it. I liberally coated my antennas with Silicon spray a day before the contest and minutes before I raised the mast. The ice storm was so bad that 2 hours into the contest my driven elements had shorted out to the boom due to ice and the VSWR went sky high, see Figure 11.

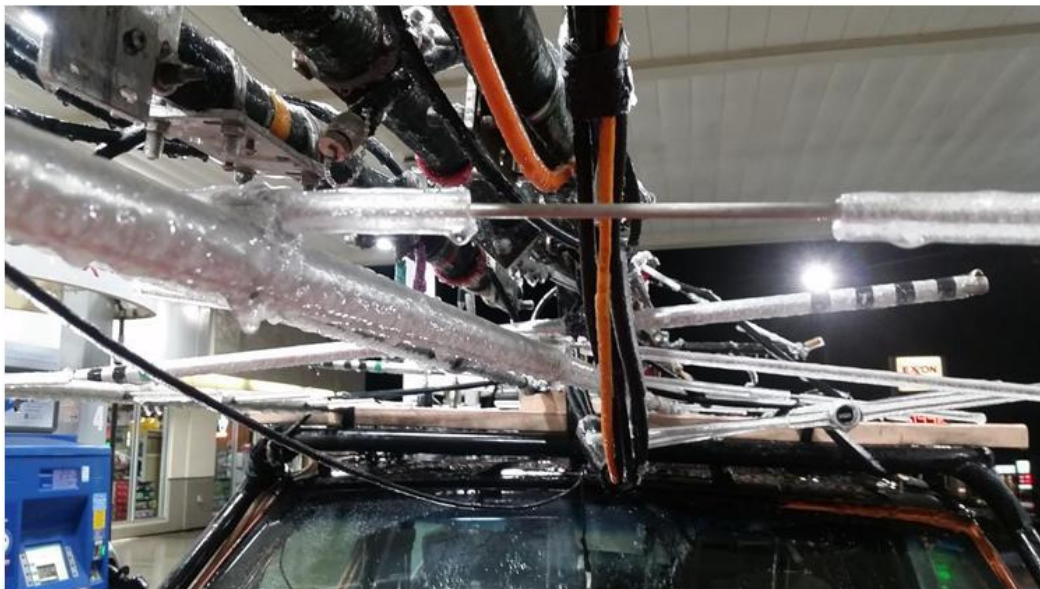


Figure 11: Always Bring Omnis When Ice Threatens

I dropped the mast, cleared the ice as much as possible and went back to work. In about an hour the ice built back up, VSWR shot up again and I went QRT after 3 hours on the air. If I had brought my omnis or even simple mag mount whips I could have cleaned them in minutes, stayed on the air for most of the contest and been better able to handle the grid corner pile ups discussed in 12 above. January did me in again.

Operating Tips

To wrap things up I will pass along a few operating tips. FM is more "genteel" and slower paced than SSB contesting. There are few if any contesters on FM. You will need to patiently explain the contest exchange and give people their grid squares regularly. If you beat the calling frequency to death calling CQ contest every 15 seconds you will scare people off who have no idea what you are doing and possibly anger those who do. Always give up the calling frequency to those who need it. You are on their turf, disrupting their routines. A surprising number of informal nets operate on the calling frequency because it is so rarely used (especially Sunday mornings on the way to Church). Be polite, be interesting, relax, laugh a little and create a pile up. What you are doing is rare and unique. People will be interested. Take time to talk with them and make it fun. Don't be afraid to go a couple rounds. If people like you (especially on simplex nets) they will happily make a contest exchange with you. On FM simplex any activity, if it's interesting will draw in more stations. There will be a lot of people listening and they will call you back if you make it fun. It is not unusual for other Hams to dust off old 6m and 1.25m rigs to make a contact. They will call up friends to get them on the air, they will jump into mobile rigs and drive to hill tops to give you bands they couldn't do from home to give you additional multipliers. Some will even drive to new grids for you. The key is to make it fun for them to take part in the contest.

Conclusion

Set some realistic goals. Position and configure your station to achieve those goals. Do everything possible to get people on the air, otherwise FM simplex can be a real desert. Don't make the same mistakes I have. Above all have fun and spend time on the air either making new contacts or having brief rag chews. If you are interesting those short rag chews will draw more people in which will feed on itself and drive up your score.

Good Luck and Above All Have Fun.

73,

John Young

KM4KMU