APRS QSY from 145.79 to 144.39

Greg Jones, WD5IVD
President, TAPR

Frank Bauer, KA3HDO
Vice President of AMSAT Manned Space Operations

Stan Horzepa, WA1LOU
TAPR APRS SIG Chair

Steve Dimse, K4HG
APRS QSY Proposal Liaison

Abstract

This little adventure began over a year ago when Frank Bauer, KA3HDO, Vice President of AMSAT Manned Space Operations approached the community with the issue of potential interference to the future of amateur radio operations aboard the International Space Station. Much discussion took place before the final proposal was put forth at the 1997 ARRL and TAPR Digital Communications Conference. At the conference, Frank presented his paper "Amateur Radio on Manned Space Vehicles: Improving Amateur Radio's Future Through Enhanced Space Frequencies." [Bauer, 1997] This paper discusses the basic issues of the proposal. What we have a year later is a nearly complete process of a large section of the amateur radio community voluntarily changing frequency. It wasn't easy or without debate, but the process showed that with adequate communications and lots of time discussing and educating people on the reality of the situation, that change can happen in the amateur radio service in a cooperative manner. This paper will discuss history leading up to the QSY, the APRS QSY proposal, major events in the process, results of the APRS QSY survey, current status of the QSY, who received money from the QSY fund, and finally what lessons were learned along the way.

History of 145.79

As was posted in a message by Tom Clark, W3IWI, [Clark, 1997] the reason APRS started on 145.79 dates back to the 1990 era of packet radio in the local Maryland and Washington DC areas. Several hams in the area including Tom Clark, W3IWI, decided to open up the 145.50 - 145.80 segment to packet activity. They felt that the five slots in the 145.01-145.09 segment were inadequate for all the PBBS, linking, DX Cluster, simplex rag chewing, etc that was happening on packet radio. The local packeteers prevailed on the local FM folks to quadruple the available space which the packet community would administer. They elected to follow the local pattern of 20 kHz channelizing, using the odd tens kHz slots (300 kHz of spectrum yielding 15 available channels). Tom at that time, being very involved in AMSAT, understood the band-edge problems with regard to the satellite sub-band and thus placed 145.79 as a "reserved for experimentation." The plan was for this frequency to be used for new technologies, especially modems.

At about this time, Bob Bruninga, WB4APR, began testing a <UI> frame (unconnected datagrams) protocol and asked about getting a frequency to test what he saw as a way for low-powered mobiles to transmit information to nearby stations working like the cellular

telephone network with limited coverage. Tom suggested he use 145.79 with the implied reality that it was adjacent to the satellite band, that it was subject to occasional QRM, and that the concept was experimental.

As we all know, Bob's modest request a few years later became APRS, and 145.79 became APRS's national home.

The crux of our story begins when the post-Challenger shuttle program resumed and AMSAT Manner Space Operations resurrected the idea of SAREX carrying amateur packet hardware (the SAREX TNC/ROBOT). AMSAT tried very hard to find a suitable frequency for the SAREX ROBOT. Since it involved both up- and down-links, and since most radios were built for 600 kHz splits, they tried pairing frequencies like 144.950 with 145.550. This choice was not very well received by some packet radio communities. The reason being that in the late 1980's the 145.01-09 packet frequencies had been added to with the addition of 144.91-99. When SAREX began operations on 144.950, there were a lot of individuals who had packet radio systems running on 144.950 who were very unhappy about the intrusion.

This was one of the first cases of how do you fit into differing world wide bandplans operating frequencies for space missions that do not interfer with anyone else. The real problem here is that in Region 1, the 2M band is only 2 MHz wide (144-146 MHz). The situation is made even more difficult, since the band plan has to be agreed to by 50+ countries. For reasons that have to do with International governmental treaties negotiated at the WARCs, the amateur satellite service is restricted to the universal international parts of the bands, so any spacecraft using 2M must operate between 144 & 146 MHz -- no choice! In that context, the satellite community has convinced the entire, world-wide amateur community (thru the IARU) that 10% of the worldwide 2M band -- 145.80-146.00 -- must be reserved for space activities. Thus SAREX's usage of 145.55 was not well received by the Europeans either!

Now let's add MIR into the mix. The suggestion for the use of 145.20/145.80 for MIR came from an IARU Region 1 conference (Tel Aviv), and after the idea was announced to the rest of the world, it became obvious that it was not a good GLOBAL choice since 145.20 was heavily used elsewhere (in Europe, 145.20/.80 was a repeater pair which was being phased out -- which is why the idea made some sense in Region 1). The problem in the US is that APRS is/was on 145.79. Although the proposal made since in Region 1, it didn't necessarily fit into Region 2.

As Tom points out in his e-mail [Clark, 1997], "The real underlying problem is that the 2M band is crowded, especially in Europe. 2M links for MIR/SAREX/ISS are desirable since EVERYBODY already has the necessary radios. The problems are compounded because the 2M band has, in general, been treated as a local coverage resource with emphasis on terrestrial repeaters -- except for the bottom-end "DX" and the top-end satellite chunks, the people who dole out frequency slots wear a "100 km radius" (i.e. 60 miles) localized set of blinders. The local repeater operator/coordinator has virtually no interest in what happens 1000 km away! Witness the fact that different parts of the USA adhere to 15 & 20 kHz channel spacings as a local option!"

Historically, we find ourselves here in the US using 145.79 because APRS at the time was considered a local experiment when it began. Add to this the reemergence of amateur radio activities aboard manned space missions that have very limited operating frequency constraints and the potential problem of interference between the two groups is very high.

The Proposal

The proposal to QSY APRS presented at the 1997 ARRL and TAPR Digital Communications Conference wasn't the first such suggestion. There had been several discussions and proposals before this one that looked at the issue of APRS being on 145.79 and 145.80 being used for space based operations. What made this proposal different was that all the elements were in place for a successful proposal. There was a clear outstanding need to reduce near band interference before the International Space Station began amateur radio operations. The facts already showed that orbiting crews endured significant frequency interference issues to achieve success that many simply turned off the radio. Thus, these frequency problems have limited the growth and success of this communication medium. The real downside to the interference issue was that the full potential of this facet of amateur radio to infuse new blood into the hobby through educational opportunities for students and its positive experience to the community has been somewhat stunted due to these frequency problems.The potential amateur radio promotion for successful amateur operations on the ISS is not disputed by anyone. How can anyone argue against the fact that communicating with astronauts and cosmonauts is an exciting and challenging facet of amateur radio. The APRS community was operating one two main frequencies. 145.79 and 144.39. The proposal to move everyone to one single frequency to help with creating a true national / international agreement (with Canada) was a seen benefit to the now rapidly growing APRS community that is seeking increased coverage and ease of use between areas of operation. After much education on the subject, most could see the problem with the location of a frequency on board MIR and the ISS due to international limits for frequency selection.

In addition, several new items that past proposals didn't have were added. These included that each of the three major organizations (TAPR, AMSAT, and the ARRL) would donate money towards a QSY fund to help with the relocation. After all the discussion and debate, only $1500 was spent towards helping QSY. Most sites simply changed frequency or paid for the cost locally. All three major groups (TAPR, AMSAT, ARRL) showed support by passing a motion on the issue at their board of directors meeting. A committee was formed to help coordinate the efforts of the QSY and open debate then began. The committee consisted of: Stan Horzepa, WA1LOU, TAPR APRS SIG Chair, Steve Dimse, K4HG, APRS QSY Proposal Liaison, Greg Jones, WD5IVD, President, TAPR, and Frank Bauer, KA3HDO, Vice President of AMSAT Manned Space Operations.

TAPR, AMSAT, ARRL

Once the three major organizations involved passed a motion at their board of directors meeting, the APRS QSY committee felt we had a chance to make this proposal work. Without the support from each of these groups, the proposal would have lost a lot of its positive energy. With the passing of each motion, the proposal gained strength that this was finally the right mix to solve the problem for everyone.

TAPR Board of Directors Positions Statement

1) TAPR, in support of its APRS SIG and the organizations of many APRS users, recognizes that APRS is a vital and exciting facet of amateur radio.
2) TAPR supports the experimentation of APRS through various amateur radio satellites and the International Space Station.
3) TAPR endorses the concept of an APRS-QSY Fund and will help set up and administer such a fund when the time becomes necessary to facilitate the potential QSY of APRS U.S. infrastructure.
4) TAPR approves a donation of $500 to support the QSY initiatives when the fund is established.

AMSAT Board of Directors Position Statement

The AMSAT- also agreed (in cooperation with the Tucson Amateur Packet Radio (TAPR) organization) to help an ongoing effort aimed at minimizing the impact of moving a large number of current Automatic Packet Reporting Systems (APRS) users off of 145.79 MHz. The Board agreed to donate up to $500 to a fund to help defray needed expenses of various fixed frequency APRS node operators in finding another "home" for their APRS operations in the USA. If the shift to another frequency eventually proves acceptable to the APRS community, it would help resolve one of the last remaining issues in clearing 145.80MHz for worldwide use by MIR, SAREX, and ISS.

ARRL Board position statement on QSY [ARRL, 1998]

Whereas, the ARRL recognizes that APRS and SAREX / ARISS are vital and exciting facets of Amateur Radio, and Whereas, the ARRL recognizes the unique needs of APRS and SAREX / ARISS for nationwide frequencies, and Whereas, the ARRL supports the experimentation of APRS through various Amateur Radio satellites and the International Space Station, and Whereas, TAPR and AMSAT-NA have endorsed the APRS / Manned Space alliance and the "APRS QSY Activity" and have each pledged up to $500 to the "APRS QSY Donation Pool," Be it resolved that the ARRL endorses the concept of an APRS / Manned Space compromise as a mechanism to share frequencies in the crowded two-meter band to minimize interference. Moreover, the ARRL pledges a donation of up to $500 to support the APRS QSY initiatives once the fund is established.

TAPR APRS SIG QSY Information Collection Questionnaire Survey

One of the first things started by the committee was a survey. The purpose of the survey was twofold. The first being a straw poll of the sentiment behind this issue. The second being the collection of information on who wanted to receive money from the QSY fund.

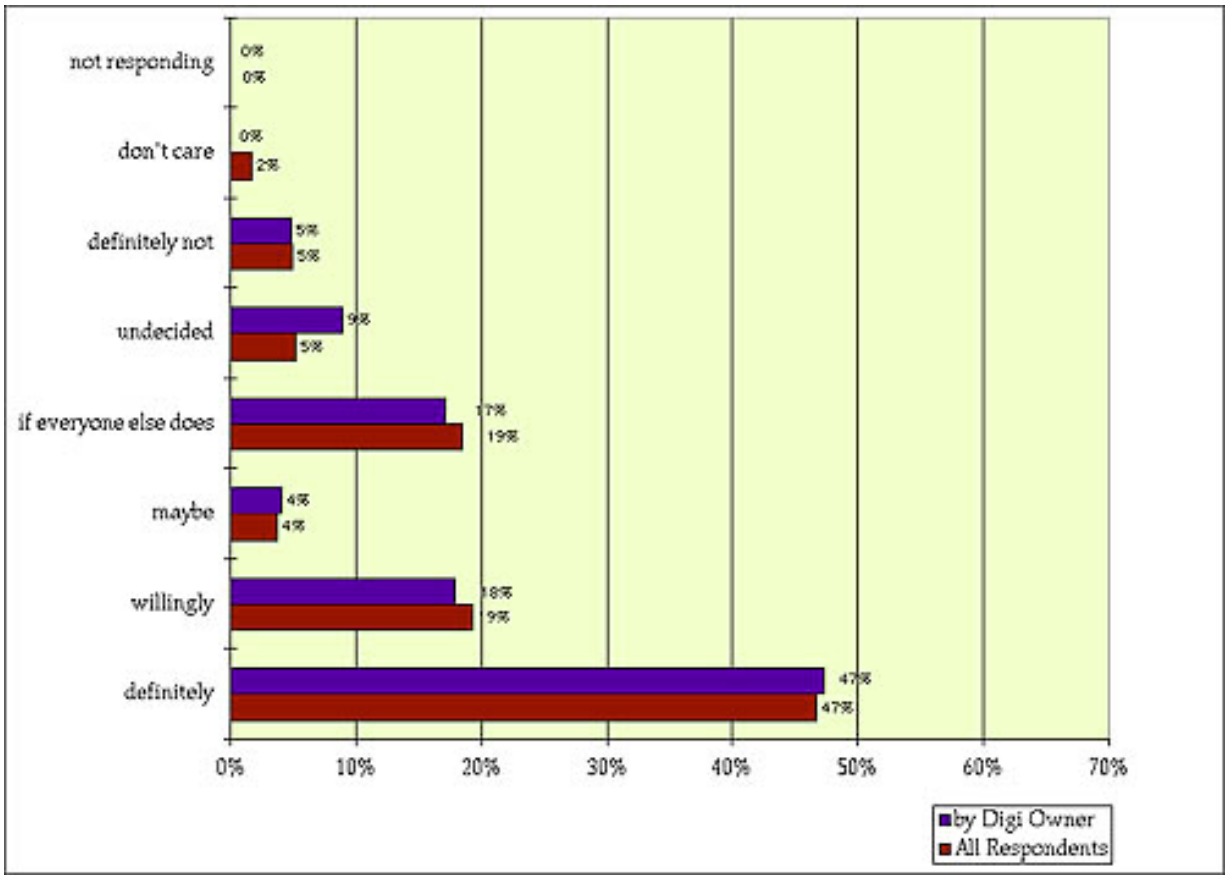
The survey was run from November 1st, 1997 until June 30th, 1998, at which time it was determined that saturation of the survey had resulted. Saturation being defined in this case as no significant change in the percentages (less than 2% over 3 months) shown in the survey results. The survey generated 486 entries of which 146 (30%) indicated digiowners, 253 (52%) indicated end-users, and 87 (18%) made no indication of status. The committee had hoped to reach over 150 wide digiowners with the survey and consider the 146 as a successfully reached goal.

All Respondents (486) - rank order		
definitely	227	47%
willingly	94	19%
if everyone else does	90	19%
undecided	25	5%
definitely not	24	5%
maybe	18	4%
don't care	8	2%
not responding	0	0%

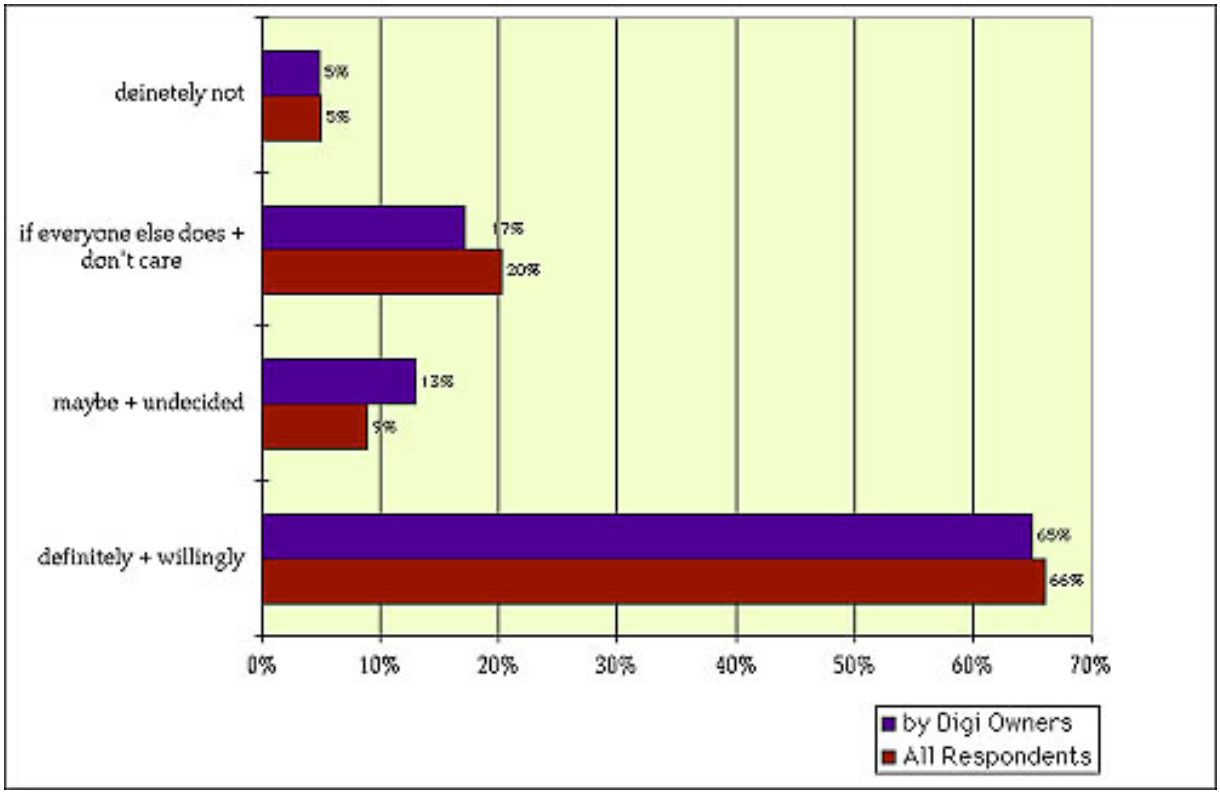
All Respondents combination (486) - rank order		
definitely + willingly	321	66%
if everyone else does + don't care	98	20%
maybe + undecided	43	9%
definitely not	24	5%

Just looking at Wide Digi Owners (146) - rank order		
definitely	69	47%
willingly	26	18%
if everyone else does	25	17%
undecided	13	9%
definitely not	7	5%
maybe	6	4%
don't care	0	0%
not responding	0	0%

Just looking at Wide Digi Owners combination (146) - rank order		
definitely + willingly	95	65%
if everyone else does + don't care	25	17%
maybe + undecided	19	13%
definitely not	7	5%



Graph showing the percentage of all respondents as compared to just Digipeater Owner responses to the survey. The information submitted by the total group and digipeater owner sub-group are nearly identical.

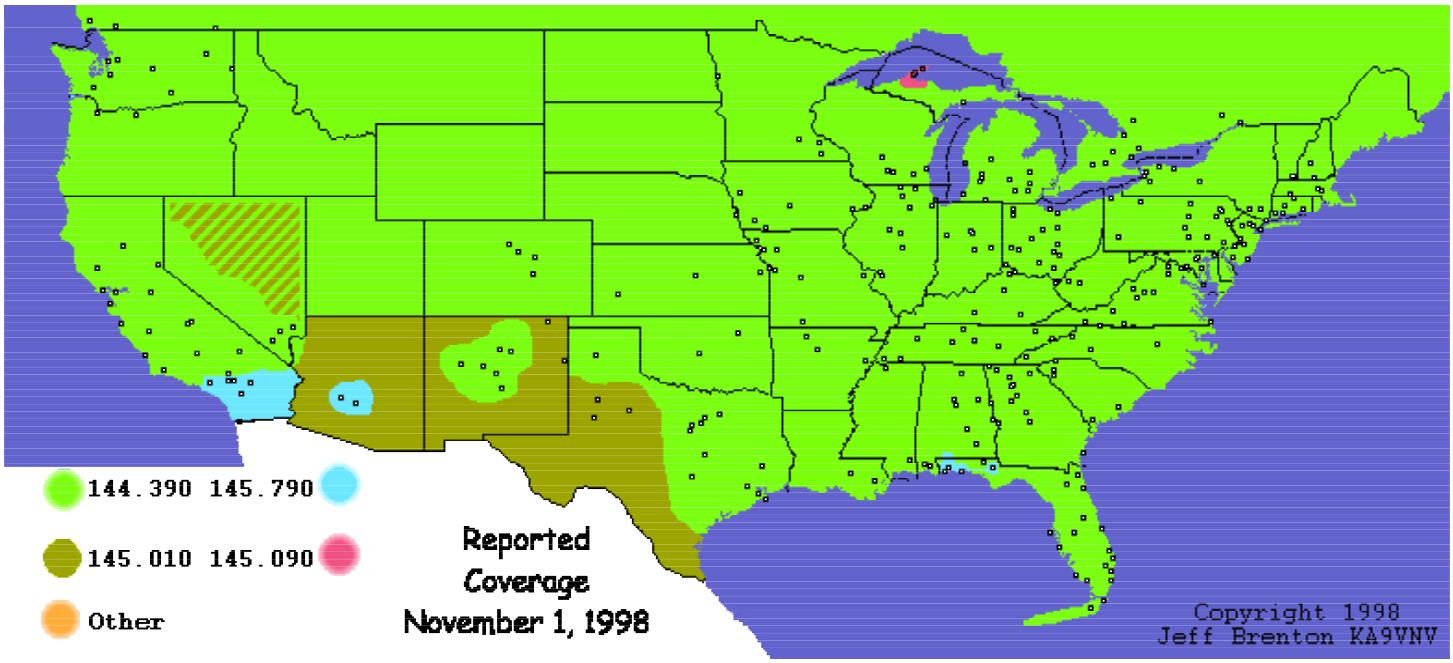


This graph shows the combination of like feelings about the potential QSY.

Current Status of APRS QSY

The position of the organizations involved (TAPR, AMSAT, ARRL) has always been that it is the choice of the individual ham whether or not to QSY, and this decision needs to be made on a local basis. It is not appropriate for one group of hams to tell another that they have to move, or when they should move. This applies just as much to one group of APRSers telling another, as it does to AMSAT telling APRS it has to move. Some areas have a tougher problem and need more time. Please be considerate of this, and try to help these situations.

Jeff Brenton, KA9VNV, has maintained a web page tracking the actual success of the APRS QSY. The following information and map is from his web page. Thanks to Jeff for allowing us to use some of his content in this article. (http://www.dididahdahdidit.com/APRSFreq.htm).



APRS QSY Frequencies as of June, 1998

The map lists the reported frequencies for various areas of the United States which will be in effect by November, 1998. Some areas are in the process of switching to 144.390; others have switched already.

QSY Fund

In March of 1998 a message was sent to 19 individuals that had requested funding via the APRS QSY survey instrument. These 19 individuals represented only 3.9% of the 486 people submitting information to the survey. It seems that the vast majority of the APRS QSY has been self funded by groups and individuals.

The following 10 people requested $1265 worth of the $1500 collected from TAPR, AMSAT, and the ARRL. The remaining $235 is on hold to an 11th group, until the QSY change has been made.

N9QGS, Ron Malinowski, $30 for crystals.
N7ZEV, Frank Kostelac, $80 for crystals 2 digis in Las Vegas area
K7GPS, David Dobbins, $75 for recrystalling / tuning a digi in WA state
K5QQ, Jim Baremore, $70 xtals / tuning an NM digi.
WB0WNX, Dave Kaplan, $50 xtals / tuning Iowa digi
W3NRI, Greg Harbough, $50 xtals for two trackers
W9JBL, John Leonard, $90 DCI filter for Chicago wide
N4VDE, Ricky Davis, $25 for crystals for SC digi
KU0G, Jim Duncan, $300 for 10 radios.
KE4DGH, Tommy Ellison $495.00 for new radio and notch filter for co-site voice repeater

Conclusion

We should not underestimate the significance of the task accomplished by the amateur radio service and APRS community since the 1997 ARRL and TAPR Digital Communications Conference. In completing a QSY of this magnitude from the initial proposal to a shift of frequency on a national level which is widely accepted and implemented in such a short period of time is an event few have been successful in achieving in the history of the amateur radio service. While there are still areas of change to occur, progress in these geographical areas continues and we hope will eventually QSY over time.

The amateur radio service as a whole and the APRS community itself can congratulate itself for making the QSY happen and leaving the future frequency for ISS operations much less occupied and interference free for future astronaut communications to other amateur radio operators.

References

1. Frank Bauer, KA3HDO. 1997 ARRL and TAPR Digital Communications Conference. Web Page: http: / / www.tapr.org / aprsqsy / bauer / bauer.htm

2. Tom Clark, W3IWI. Tue, 14 Oct 1997. aprssig@tapr.org. Subject: Re: ***Important: APRS and AMSAT-Please Read

3. Full information on the Board meeting can be found at arrl.org. Refer to ARRL Bulletin 8 ARLB008 From ARRL Headquarters Newington CT January 20, 1998.