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Federal Communications Commission
Office of the Secretary
Room TW - A325
445 12th Street S.W.
Washington, D.C. 20554

Gentlemen:

Please find attached a rulemaking petition dealing with the 160M (1.8MHz) Amateur Service band which has been jointly prepared by Mr. William R. Tippett, W4ZV, and myself, Jeffrey T. Briggs, K1ZM. We ask that it be carefully considered and, hopefully, started along a path within the Commission by which it might ultimately become communication law. It is our belief that such action by the Commission is essential to supplement the newly-revised American Radio Relay League 160M bandplan which we believe will prove ***ineffective*** in maintaining a separation of wideband and narrowband modes below 1.843 MHz on 160M. Stated another way, the existence of the ARRL voluntary bandplan is a wonderful thing - but it just does not go far enough, in our opinion and has already proven unenforceable as some amateurs simply choose to ignore it. It is our belief that only action by the Commission as proposed can serve to effect what a voluntary bandplan can never achieve, eg: ***results*** on a sustained basis.

By way of background, Mr. Tippett and I are long-tenured users of the 160M band with over 50 years of practical experience on 1.8MHz. Mr Tippett, for example, has confirmed 306 entities on 160M and I myself have confirmed 304 under the ARRL DXCC program. Additionally, I have authored an ARRL published reference text on 160M entitled ***"Dx'ing On the Edge.....The Thrill of 160M"*** a copy of which is enclosed for your review. Among other things, it describes how the 160M amateur band is utilized today which may prove useful in evaluating our rulemaking proposal. Both Mr. Tippett and I are frequent participants in ARRL and CQ Magazine sponsored operating events (contests) and have placed at or near the top many times over the past 15 years.

It should be noted that both Mr. Tippett and I served on the ARRL 160M bandplan review committee which was appointed by ARRL President Jim Haynie this past Spring. We on the bandplan committee recently completed our work which culminated in the new bandplan's adoption by the ARRL Board of Directors this past July. During our deliberations, there was considerable discussion on the committee regarding the need for FCC action to secure wideband and narrowmode separation in fact on 160M following adoption of the bandplan. It was agreed that a request for FCC rulemaking, if filed, should be effected ***outside*** the committee's formal work product to the ARRL Board as such action was not a part of the bandplan committee's original mandate from the ARRL Board. These then are the circumstances giving rise to this

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formal petition at this time. Let me hasten to add, however, that we are ***not*** asking the Commission to endorse the ARRL 160M bandplan per se. Rather, we are asking that the Commission simply help the amateur fraternity of users of 160M achieve (through communication law) the one thing that a voluntary bandplan cannot achieve, eg: a true separation of narrowband and wideband modes on the low end of 160M.

Thank you in advance for your consideration. It is hoped that adoption of this request may reduce the FCC's burden of attempting to enforce gentlemen's agreements and informal bandplans.

Very truly yours,

Jeff T. Briggs, K1ZM 9/10/01

Jeffrey T. Briggs, K1ZM

Copies to: Mr. Herbert W. Zeiler, WTB
Mr. William Cross, WTB
Mr. Riley Hollingsworth, Enforcement

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September 10, 2001

Before the

Federal Communications Commission

Washington, DC 20554

Petition for Rulemaking

Request to change Part 97.305c	)
Of the Commission's Rules to restrict	)
Certain types of transmission	)
On prescribed portions of the	)
Amateur 160 Meter (160 m) band	)

Petition Submitted by

Jeffrey T. Briggs, K1ZM and William R. Tippett II, W4ZV

Executive Summary

Purpose: This is a petition for proposed FCC rulemaking regarding the 160 m Amateur Radio Service band.

What is Being Requested: It is respectfully requested that the FCC adopt rulemaking creating a sub-band for wideband modes (SSB, AM, SSTV) within the 160 m amateur band from 1.843-2.000 MHz inclusive. Narrowband modes, as defined within Part 97 regulations, should continue to be authorized across the entire band from 1.800 - 2.000 MHz. The intent of this action is to separate wideband and narrowband modes in the region from 1.800 - 1.843 MHz.

Specifically, we request that only *Frequencies* for *Phone, image* in Part 97.305c be changed from *Entire band* to ***1.843-2.000 MHz*** as indicated below in the regulation:

Band	Frequencies	Emission types authorized	Standards Part 97.307(f), Paragraph
160 m	***1.843-2.000 MHz***	Phone, image	(1), (2)

Principal Rationale for Request: Operating activity on the 160 m Amateur Band has grown to a level where separation by the Commission of wideband modes (such as SSB, AM and SSTV) and narrowband modes (such as CW and digital) is both necessary and desirable. A simple "line of demarcation" by the Commission is sufficient to address this need. The Amateur Service, under the provisions of the revised ARRL Bandplan for 160 m, is well-equipped thereafter to ***self-manage*** the specific operating activities within these two broadly-defined FCC-articulated segments.

<u>What this Petition Includes:</u> This petition is composed of the following sections:

1) An historical overview of the 160 m band (Post WWII- present)
   a) A synopsis of post-war ***Loran-based*** FCC actions and their lingering effects on 160 m today
2) A review of current operating practices on 160 m
   a) How the band is utilized today
   b) The impact of unique propagation anomalies on 1.8 MHz and why continuous wave (CW) mode operation deserves special consideration by the Commission for future 160 m users
   c) Technical issues supporting this proposal
3) Arguments ***for*** the proposal including benefits
   a) Rationale supporting the separation of narrowband and wideband modes
   b) Provision for newer digital modes (as addressed within the revised ARRL 160 m Bandplan)
   c) Consistency with current Commission thinking which requires amateur ***consensus*** and ***limited self-regulation*** as a policy objective
   d) Why this action is needed now and some resulting benefits

<u>Appendices</u>: 1) Revised ARRL 160 m Bandplan ***as adopted*** by ARRL's BOD, July 2001
2) Supporting Data Evidencing Efficacy of CW mode versus SSB mode
3) Supporting Data Evidencing Growth in Utilization of 160 m

Respectfully submitted,

Jeff T. Briggs 9/10/01

Jeffrey T. Briggs, K1ZM

William R. Tippett 9/10/01

William R. Tippett II, W4ZV

copies: W. Cross, R. Hollingsworth, H. Zeiler

1. An Historical Overview of the 160 Meter Band - Post WWII to Present

The return of 160 Meters (160 m) to the Amateur Service following WWII by the Commission was unique in a number of respects and can be summarized as follows:

o The ***Loran*** radionavigation service was a ***Commission priority***

o The Amateur Service was granted limited usage of the band on a ***non-interference*** basis with Loran

o The process of the return of the band to US amateurs commenced in the late 1940's and was finally completed (at full-power 1.5kW levels) at the start of the 1980's following the shutdown of Canadian Loran

o Amateur sub-bands were ***assigned regionally*** by the Commission during this period with no provision for sub-band assignment ***by mode*** within the various regional segments

o When the various regional segments throughout the US were finally reassembled by the Commission as Loran began to shut down, no provision was ever made to address a separation of narrow and wideband modes within the reconstructed 160 m band

These last two points, while seemingly insignificant, have major bearing on this rulemaking request now before the Commission because they are underlying causal factors which have led to the lack of segmentation by mode on 160 m that continues to exist today.

When US amateurs were again allowed ***common access*** to 1.8 MHz across the full swath of the Continental US, for whatever reason, the Commission never elected to grant

the familiar CW (and narrowband) segments and Voice (and wideband) segments as presently exist on 3.5 MHz through 144 MHz.

As noted elsewhere within this request, this sharing of space by mixed mode amateur users of 1.8 MHz (as a practical matter) has served the Amateur community pretty well through the years, but only because activity levels on 160 m were relatively low. Given the fact that there has been a resurgence of interest in this band, especially during solar minima, action by the Commission to separate wideband and narrowband modes now as requested would provide welcome relief to the Amateur Service.

2. <u>A Review of Current Operating Practices on 160 m</u>

A. How the 160 m Band is Utilized Today

As we enter the new millenium, the 160 m band now serves a variety of interests including:

o Local ragchewing interests (both voice and CW)

o AM and "vintage equipment/restoration" enthusiasts

o CW enthusiasts (growing as the band is newly-discovered - especially during solar minima)

o Weak signal DX/Intercontinental communication enthusiasts, principally on CW (experiencing sizable growth, especially during solar minima)

o Some emerging PSK 31 and digital interests (small but growing)

o Experimental and beacon interests (nascent and emerging)

o Contesting Interests (episodic competitive operating events sponsored by the ARRL, CQ Magazine and others) - principally on CW and SSB mode

o There is almost no utilization of SSTV and RTTY on 160 m at present

Most of these activities usually coexist quite well (in accordance with the existing ARRL bandplan). However, given the ***voluntary*** nature of the ARRL bandplan, the lines of demarcation between CW weak signal work especially, contesting in particular and wideband SSB users often become "blurred". This is especially troublesome in the region from about 1.820-1.843 MHz because this area overlaps with International overseas administration allocations which exist from about 1.810-1.850 MHz generally. This coalescence of wideband and narrowband modes in this region causes unnecessary friction among users, especially when the usual "fences" guiding generally-accepted voluntary segmentation (under the bandplan) are ignored. Separation of wideband and narrowband modes through Commission rulemaking would serve to augment the existing benefits of the ***revised*** ARRL bandplan (see Appendix 1) by clearly delineating where the fences are ***as a matter of communication law***. It should be clearly understood that this request for proposed rulemaking does not seek Commission endorsement of the revised ARRL Bandplan for 160 Meters per se.

B. The Impact of Propagation Anomalies on 1.8 MHz and Why Continuous Wave Mode (CW) Deserves Special Consideration by the Commission for Future 160 m Users

1.8 MHz is unique among the various MF and HF Amateur Bands due to the special propagation anomalies which exist. While in some respects 1.8 MHz behaves similarly to 3.5 MHz, ionospheric absorption is a material factor on 1.8 MHz giving rise to generally ***weak incoming signal levels***. Additionally, there exists deep, ***slow fading*** (QSB) on signals most of the time which often occurs in ***cycles of minutes duration***

rather than seconds. There is also the presence much of the time of relatively high ***atmospheric noise levels*** (static) which can propagate over great geographic distances on 1.8 MHz. These impediments, which do not exist with the same intensity on any other MF or HF amateur band, provide a "mystique" of sorts which attracts a very special kind of amateur user to 1.8 MHz. 160 m offers great challenges to ***any*** amateur and ***especially*** to those hardy souls who enjoy attempting long distance Intercontinental communication during the hours of darkness.

While SSB and AM voice modes offer convenience to the amateur and the newer digital modes offer the promise of future possibilities involving the integration of radio waves and computer technology, the realities of propagation on 1.8 MHz have proven repeatedly over time that ***continuous wave (CW mode) operation is a principal mode of choice***. This is especially true for reliable communication over even moderate distances and is nearly paramount when amateurs are attempting sunrise and sunset propagation over great distances around the world.

Thus, even in a time wherein we are seeing a predicted atrophying of interest in CW among nation states and regulatory agencies with respect to amateur licensing requirements, continuous wave operation will continue to remain a popular mode of choice among amateur users globally on 160 m for many years to come. ***Simply stated, CW mode gets through. No other mode overcomes the natural propagation impediments which exist on 160 as well***. (See Appendix 2 for supporting data.)

Given this reality, CW warrants special consideration by the Commission to ensure its continued viability in a world seemingly moving in other directions. Weak signal work especially on 160 m would cease to be possible without the provision of a haven for CW

by the Commission that is afforded some meaningful protection from wideband voice modes such as AM, SSB and SSTV.

C. Technical Issues Supporting this Proposal

The case for narrowband and wideband mode separation on 160 m becomes clearer when one considers the bandwidths involved. CW signals occupy a bandwidth of mere hundreds of cycles depending on keying shaping and speed. SSB and AM signals occupy bandwidths of from 2-6 kHz (or more) respectively. The FCC has long recognized the fact that narrow occupied bandwidth modes can easily be removed from wide occupied bandwidth modes, while the inverse cannot.

When one considers a confluence of ***differing*** bandwidth signals in a very confined band segment (1.800 - 1.843 MHz), the dimensions of the problem come into clear focus. One can tune out a relatively close CW signal when operating CW mode on an adjacent channel by means of narrow bandwidth filtering. However, an offending SSB signal on Lower Sideband on 160 m can essentially disrupt multiple casual CW "rag chews" on adjacent channels. The same offending SSB signal will render weak-signal Intercontinental CW communication on many adjacent channels all but impossible.

Dynamic range is another technical issue worthy of mention. Groundwave and one-hop signals on 160 m can be extremely strong (-25 to -35 dBm), so strong in fact that they can overcome the dynamic range of even the best modern transceivers available today. On a quiet winter night, weak CW signals can be at or below the noise floor (-130 to -140 dBm) of modern transceivers. Even if all spurious emissions of local LSB signals are down -40dB from the carrier as specified by FCC regulations, the resulting interference is still about 60 dB above a weak CW signal several kHz away from the

passband of a LSB signal. In these cases, the offending wideband signals just cannot be avoided and multiple narrowband contacts on adjacent channels are degraded or rendered impossible. Of course, this situation is even worse if a weak CW signal is within the 3 kHz passband of a local LSB signal.

Relatively low activity levels on 1.8 MHz have stood the amateur community in good stead over the post-war years thus mitigating the effects of this issue. However, recent converts to the band and the arrival shortly of the next solar minima suggest that the provision of a clear line of demarcation between wideband and narrowband modes by the Commission would be timely now and offer most welcome relief.

3. <u>Supporting Arguments for the Proposal Including Benefits</u>

A. Rationale Supporting the Separation of Wideband and Narrowband Modes

The most compelling argument in favor of Commission rulemaking is that the action requested was among the four predominant themes expressed in the comments received by the ARRL 160 m Bandplanning Committee during its recent deliberations. While US amateurs strongly prefer ***less Commission regulation*** in their lives generally, there also appears a willingness to support targeted and focused actions by the Commission, where necessary, to promote the general welfare of most amateurs. This is especially true in areas where self-regulation has demonstrated an inability over time to achieve reliable, effective results.

The second argument in favor of Commission rulemaking is that amateur activity levels on 160 m have grown substantially within the past 20 years (see Appendix 3 for supporting data). While 1.8 MHz is still called the "Gentleman's Band" in honor of its legendary patron Stew Perry, W1BB, the reality of current usage patterns suggests the

methodology by which the band has been administered historically needs fine-tuning. The legacy of Loran, offering no separation between wide and narrowband modes by segments, is no longer effective and needs to be replaced.

The third argument in favor of Commission rulemaking is one of ***consistency***. The Commission has wisely adopted a framework of separation by mode of all other amateur service bands from 3.5 - 144 MHz. Experience over the years has demonstrated that such a methodology maintains relative balance and order on the amateur bands. Logically, its adoption will achieve similar results on 160 m. Even as the ARRL works with the Commission to "refarm" the other US amateur bands, some separation of wideband and narrowband modes will logically continue. It is of course recognized that some ***realignment of allocations*** will likely be made within the various bands but the ***general methodology*** of separation that exists today would be expected to prevail.

The fourth argument in favor of Commission rulemaking is a restatement of the ***technical issues*** cited earlier. Wideband and narrowband modes just do not coexist very well within the same narrowly confined space, in this case the region from 1.800 - 1.843 MHz. Given the rulemaking requested, the revised ARRL bandplan can effectively manage the narrowband operations that will remain from 1.800 - 1.843 MHz by recommending generally accepted segments wherein such narrowband activities are to take place. A digital sub-band has been provided within the revised ARRL 160 m bandplan from 1.800 - 1.810 MHz, for example, which will steer such activity out of the CW rag chew and CW weak-signal areas of the band which are slotted from 1.810 - 1.843 MHz.

The fifth argument in favor of Commission rulemaking is a corollary to the fourth above. The utilization of CW mode on 160 m remains popular and is ***growing*** today because it is the singular mode of choice for reliable communications over medium and long distances on 1.8 MHz. The unique propagation anomalies which exist on 160 m, especially with respect to weak-signal intercontinental communications, have established continuous wave operation as the principal mode of choice for such activity. Weak-signal CW work especially is severely impaired by the existence of adjacent channel wideband LSB operations and the rulemaking requested will provide meaningful relief if adopted.

B. Provision for New and Digital Modes within the Revised 160 m Bandplan

It should be noted that this request for Commission rulemaking does ***not*** seek endorsement of the ARRL 160 m Bandplan per se. It only seeks a separation of wideband and narrowband modes by an act of communications law which is something a voluntary bandplan cannot effect. It is known that recent comments by the Commission in public forums (including the recent Dayton Hamvention) indicate a desire for amateurs to plan for the future space requirements of digital and newer modes that are emerging today. The revised ARRL 160 m Bandplan which appears in the Appendices is thoroughly consistent with Commission thinking in this area and has provided space for digital communications from 1.800 - 1.810 MHz. It also provides space for experimental modes from 1.995 - 2.000 MHz and earmarks the region 1.999 - 2.000 MHz for beacons. This request for rulemaking is thus thoroughly consistent and in lock-step with the provisions of the revised voluntary bandplan which itself has been designed to be consistent with Commission thinking.

C. Consistency with Current Commission Policy Objectives

The rulemaking requested is consistent with current Commission thinking which requires amateur ***consensus*** and ***limited self-regulation*** as policy objectives. While we have achieved reasonable consensus and have attempted self-regulation to the maximum extent possible, Commission assistance is desirable in this one specific area. Rulemaking will establish the necessary "fences" that are needed and amateurs thereafter should be well-equipped to manage what remains.

D. Why This Action Now and Some Resulting Benefits

Favorable action by the Commission at this time will provide relief in an area where it is needed. The legacy of Loran-based bandplanning on 160 m has outgrown its utility and some fine-tuning by the Commission is warranted. Providing regulatory direction in an area where it is required may also avoid the need for future "spot enforcement" by the Commission as activity levels continue to grow on 160 m.

Favorable acceptance of this petition now will allow for a comments period, subsequent review and possible action by the Commission prior to the approaching solar minima which is a time of uniquely favorable propagation on the 1.8 MHz amateur band. During solar minima, the amateur fraternity migrates downward to the 160 m, 80 m and 40 m bands out of necessity during darkness periods and 160 m has of late provided somewhat of an "escape valve" for 80/75 m during periods of heavy congestion.

Favorable action by the Commission to resolve a somewhat unique dilemma on 160 m is also an opportunity to establish a model framework for the subsequent actions that are likely to follow on the higher HF bands. The amateur service gains a betterment

by expeditious action on this matter and it would seem as if the Commission gains little by deferment.

Favorable action by the Commission at this time seems a "win-win" for the various parties and certainly for the amateur 160 m fraternity.

Appendices

1) Revised ARRL 160 Meter Bandplan (As approved by the ARRL Board of Directors July 20-21, 2001 - September 2001 QST Magazine page 65):

1.800 - 1.810	Digital Modes
1.810	CW QRP
1.800 - 2.000	CW
1.843 - 2.000	SSB, SSTV and other wideband modes
1.910	SSB QRP
1.995 - 2.000	Experimental
1.999 - 2.000	Beacons

Note: While it is suggested under the ARRL bandplan that normal CW operations take place from 1.800 - 1.843 MHz, it is recognized that CW mode operation continues to be legal under Commission law throughout the entire 160 m Amateur Band and may be used in emergencies and during periods of extremely heavy utilization of the band, (e.g.: during domestic and International contests, for example.)

2) Supporting Data Evidencing Efficacy of CW mode versus SSB mode

The CQ 160 CW and SSB Contests are sponsored annually by CQ Magazine. These contests offer a very good comparison between modes since they follow identical rules, have similar activity levels (December 2000 CQ Magazine listed 4606 unique calls for SSB and 4512 for CW in the 2000 contest) and similar propagation (contests separated by 30 days...CW last weekend in January and SSB last weekend in February). Since the CQ 160 scoring system highly weights inter-continental QSO's, results can demonstrate the efficacy of CW versus SSB for making inter-continental contacts. The following data is from all-time CQ 160 CW and SSB records at:

http://members.aol.com/k3bu/W160Records.htm

Average all-time record CQ 160 scores for CW versus SSB:

Area/Category:	% CW score exceeds SSB
Africa	+585
Asia	+44
Europe	+123
North America	+68
USA	+30
Oceania	+57
South America	+212
Multi-operator	+31
Low Power (<100W)	+63

QRP (<5W)	+98

AVERAGE MARGIN: +128%

All-time record scores for 160 meters in the CQ WW DX Contest tell a similar story. These contests follow identical rules, with similar participation and similar propagation (SSB contest the last weekend in October and CW the last weekend in November). The following data is from all-time CQ WW CW and SSB single operator records at:

http://members.aol.com/k3bu/WWRecords.htm

Average all-time CQ WW record scores for single-operator CW versus SSB:

Area/Category:	% CW score exceeds SSB
Africa	-67
Asia	+2
Europe	+133
N. America	+65
Oceania	+52
S. America	+152
USA	+157

AVERAGE MARGIN: +71%

Note the similarity in margins for both contests in favor of the CW mode. CW has clearly been demonstrated to be nearly twice as effective as SSB for long distance communications work on 160 meters.

3) Supporting Data Evidencing Growth in Utilization of 160 m

Long-time, experienced users of 160 m know well that activity levels have increased within the past 20 years on the band. If one compares activity levels of today with those of around 1970, especially during the Winter months in the Northern hemisphere, there is greatly increased competition during contest periods and when a rare DXCC entity appears on the band. 160 m even begins to sound like 40 m CW during periods of solar minima in the Northern hemisphere! More importantly, there exists ample ***hard data*** to support the anecdotal evidence.

<u>Availability of Equipment for 160 m</u>

Prior to 1970, if one wished to purchase commercially manufactured equipment for 160 m, there were essentially two choices available. The R.L. Drake Company and the E.F. Johnson Company were two of the most widely known manufacturers of ***transmitters***

covering 1.8 MHz. There were any number of receiver manufacturers around including Hammarlund, the National Radio Company, Hallicrafters and the Collins Radio Company.

One of the first SSB transceivers available commercially was the British KW Electronics model which advertised itself as "the transceiver with 160 m" in its heyday. Much of the early equipment remained homebrew even during this period although some managed to get on the band using converters and transverters. This essentially was the "state of the art" until the early 1970's.

From about 1973 onward, more and more commercial transceiver equipment began appearing with 160 m on its front panel. Japanese equipment manufacturers were among the first with models such as the Kenwood TS520S, the TS180S and later the TS830S. Others quickly followed suit including familiar names such as Yaesu, Icom and others.

Today, nearly all amateur band transceivers cover 160 m as do their matching linear amplifiers. Thus equipment is readily available for amateurs all over the world to acquire with ease and ***one of the early barriers to growth has been fully removed***. We can see clear evidence of this growth in a number of key indicators which are discussed below:

Rate of Growth in the Single Band 160 m ARRL DXCC Award Program

The single-band 160 m ARRL DXCC Award program was introduced in October of 1976. The following matrix indicates a remarkable rate of growth in recent years.

1976 - 1976 Certificate numbers 1 - 3 awarded
1977 - 1984 (June) Certificate numbers 4 - 58 awarded
1984 - 2001 (June) Certificate numbers 59-900 awarded

Source: ARRL DXCC Desk

Rate of Growth In Participation During the ARRL's Single Band 160 m Contest

The list below indicates the number logs submitted during the ARRL 160 m Contest from 1985 through 2000. Peak growth exceeds 90% with some reduction during solar maxima periods.

Year	Number of Logs Submitted
1985	407
1986	405 Cycle Minimum September 1986
1987	422
1988	418
1989	308 Cycle 22 Maximum June 1989

1990	428
1991	524
1992	595
1993	647
1994	714
1995	714
1996	777 Cycle Minimum May 1996
1997	735
1998	767
1999	604
2000	690 Cycle 23 Maximum April 2000

Source: ARRL Contest Desk

Rate of Growth in Contact Totals Made by US Stations During the CQ 160 m Contests

The list below indicates the highest contact total made by a US station during the CQ Magazine single band 160 m contests from 1985 - 2000. Growth at its peak exceeds 80% on CW mode and 60% on SSB mode with some reduction during solar maxima periods.

Year	CW Mode	SSB Mode
1985	823	1053
1986	998	1171 Cycle Minimum September 1986
1987	913	1216
1988	925	1189
1989	778	1063 Cycle 22 Maximum June 1989
1990	880	1073
1991	875	1013
1992	1111	1209
1993	1152	1256
1994	1348	1277
1995	1430	1655
1996	1514	1643 Cycle Minimum May 1996
1997	1391	1728
1998	1430	1354
1999	1304	1005
2000	1084	1122 Cycle 23 Maximum April 2000

Source: CQ Magazine 1985 - 2000

Comparison of 160 m Contact Levels by US Multi-Multi Contest Entrants Over Time

The matrix appearing below represents the aggregation of 160 m contact totals of the 5 top-scoring USA multi-multi entrants during 48 hours in the CQWW CW DX Contests from 1975 - 2000. A definite trendline of increasing contact totals can be seen as well as variations caused by solar cycle maxima and minima. Solar maxima present somewhat unfavorable conditions on 1.8 MHz due to increased levels of signal absorption. Solar minima offer favorable conditions for 160 m enthusiasts due to decreased absorption. The matrix indicates increasing activity levels on 160 m throughout the period with short periods of reduced activity around solar maxima.

Year	Contacts (Sum of Top 5 USA Multi-Multi QSO's on 160 m in CQ CW DX Tests)	
1975	214	
1976	300	Cycle Minimum June 1976
1977	295	
1978	229	
1979	235	Cycle 21 Maximum December 1979
1980	215	
1981	298	
1982	230	
1983	407	
1984	502	
1985	647	
1986	546	Cycle Minimum September 1986
1987	495	
1988	391	
1989	392	Cycle 22 Maximum June 1989
1990	523	
1991	381	
1992	433	
1993	890	
1994	781	
1995	1299	
1996	1474	Cycle Minimum May 1996
1997	704	
1998	898	
1999	996	
2000	1092	Cycle 23 Maximum April 2000

Sampling of 160 m Contacts by Top Multi-Multi Contest Entrants in CQ WW CW Contests:

1978 San Andres Island - HK0COP	121
1980 Puerto Rico - NP4A	506
1983 Aland Islands - OH0W	585
1985 Lithuania - UP7A	929
1999 Morocco - CN8WW	1720
2000 Morocco - CN8WW	1594

Source: CQ Magazine 1975 - 2000

Sampling of 160 m Contacts by Top Multi-Multi Contest Entrants in CQ WW SSB Contests:

1979 St. Kitts Island - VP2KC	506
1999 Morocco - CN8WW	1049
2000 Morocco - CN8WW	951

Source: CQ Magazine 1975 - 2000

160 m Contact Totals Made by Overseas Dxpeditions to Rare DXCC Entities

Dxpeditions to rare DXCC entities indicate increasing 160 m contact totals of late, especially when compared to 160 m performances of 15 years ago. Especially note the operations by FO0XX and FO0AAA from the same location near the USA but separated in time by 15 years.

Year/Dxpedition Location and Callsign	160 m Contacts Made
1985 Clipperton Island - FO0XX	650
1987 Revillagigedo Is. - XF4DX	627
1988 Kingman Reef - K9AJ/KH5	681
1988 Palmyra Island - W0RLX/KH5	504
1992 MV Island - 4J1FS	1174
1997 Heard Island - VK0IR	1241
1998 Spratly Islands - 9M0C	1149
1999 Palestine - E44/HA1AG	1579
1999 U.A.E - A61AJ	1666
2000 Clipperton Island - FO0AAA	2000
2000 Myanmar Rep. - XZ0A	2385
2001 Rep. Of Comoros - D68C	1395

Source: Mega DX Peditions Honor Roll Spreadsheet, W6BSY and Internet.

Attachment A

DOCUMENT OFF-LINE

This page has been substituted for one of the following:

o An oversize page or document (such as a map) which was too large to be scanned into the ECFS system.

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o Other materials which, for one reason or another, could not be scanned into the ECFS system.

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One book of 15 chapters