Supplemental 2015 White Paper on Proposed Contest Rule Changes

Change History
30-08-2015 Issue 1

This document gives details of two further proposed rule changes for V/UHF contests in 2016. Comments on these proposals are invited.

These two rule change suggestions in this document are taken from the President's Review of Contesting Workshop held in July 2015 and the responses from the 2015 White Paper that concluded on 7th August 2015.

Please submit your views via the web survey form at http://www.rsgbcc.org/cgi-bin/survey.pl?for=swp15 no later than 23.59 hours on 25th September 2015. All comments will be reviewed by the RSGB Contest Committee. The revised rules for all RSGB contests will be published as soon as possible after the review. All rule changes will take effect on 1st January 2016.

Please note that the collective response to this White Paper is only one of the inputs that the RSGB Contest Committee considers when setting the rules for RSGB contests in 2016.

Please note that in this document, 'UK' is used as an abbreviation for 'UK & Crown Dependences'.

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Proposal 1. Replace the M7 scoring system in the UKAC with a Bonus points scoring system (details below)

Introduction

The scoring system for the UKAC has generated a great deal of controversy over the past few years. One of the recommendations of the President's Review of Contesting was that the Contest Committee should attempt to create a scoring system that resulted in a level playing field across the UK. During the President's Review Workshop, an alternative scheme using bonus points for working large locator squares (JO01, IO65 etc.) rather than the present multiplier schemes was proposed by Martin GM8IEM. In order to assess the impact of the proposed scheme, a model was created to analyse the effects of different scoring schemes. Details of this model are contained in Annex 1. Details of the results of the analysis conducted on various different scoring schemes are given in Annex 2.

The outcome of the analysis indicated that the scheme that gives the most level playing field is 'Bonus 1' (see Annex 2 for details). This scoring scheme combines the existing points per km distance score with the use of an additive bonus rather than a multiplier for working a new square. The bonus points awarded for working a new square has been determined (at a macroscopic level) by the inverse of the population density.

Figure 1 gives the proposed bonus points for working each new square in the UKAC. Note that non-UK squares all receive a bonus of 500. Please refer to Annex 3 for the treatment of squares that contain UK and non-UK territory.

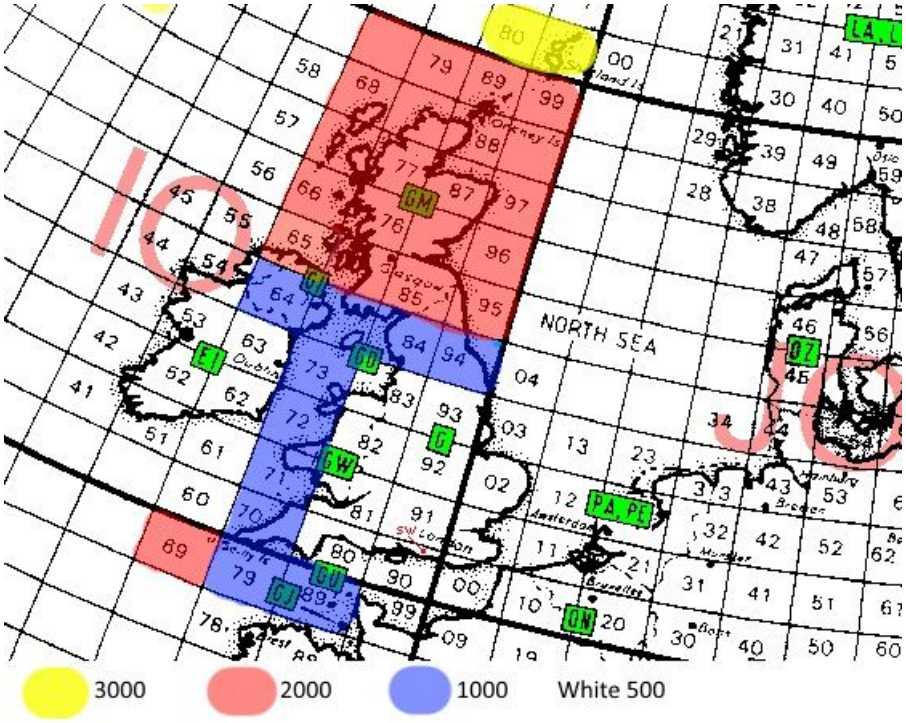

Figure 1. Map of bonus points per square for Bonus 1 scheme

The analysis, determining which list each square goes in, and the bonus points for each list is complex (see Annex 1 & 2), but it should not be difficult for entrants to calculate their bonus points if they wish to do so (until the logging software catches up – this will be implemented in MINOS by the start of 2016). If entrants

don't wish to calculate their score, this will be done automatically during contest adjudication.

The 'nuts and bolts' of this new scheme is: the amateur radio population has been estimated in each square and each square has been classified as: 'high', 'medium', 'low' and 'sparse'. The first time a 'high' square is worked the entrant gets 500 points, the first time a 'medium' square is worked the entrant gets 1000 points, the first time a 'low' square is worked the entrant gets 2000 points and the first time a 'sparse' square is worked the entrant gets 3000 points. Finally, the bonus points for the squares worked are added together then added to (not multiplied by) the total points per km score (calculated from the stations locators). The addition of the two figures (bonus points and points per km) gives the overall score.

See Annex 3 for the classification and points for each square including the treatment of squares that contain UK and non-UK territory (see also Figure 1).

The proposal is to adopt the scoring schemed know in this document as 'Bonus 1'. The alternative is to retain the current scoring scheme (M7).

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Proposal 2. Permit the use of MGM in all multi-mode sections in all V/UHF RSGB Contests

Introduction

The 2015 White Paper contained a proposal (3.1) to "Add MGM (Machine Generated Modes) sections to all VHF/UHF/SHF contests (Open-MGM and Single Op-MGM) to allow experimentation with these modes during contests. These new sections will permit the use of conventional modes (CW/Phone) as well as MGM".

The majority of the respondents to the 2015 White Paper who replied to Proposal 3.1 (84% of the 63 responses) agreed that the use of MGM should be permitted. Furthermore, several of the respondents argued that the use of MGM should not be restricted to its own section but should be permitted in all multi-mode sections.

The rationale for this view is based on the premise that MGM QSOs take considerably more time to complete (between 6 minutes and 60 minutes according to experienced users of these modes) than conventional phone or CW QSOs. Hence, in the time a station makes one MGM QSO, another station might make 6 to 8 conventional QSOs. Assuming an average points per QSO of 200, this equates to the 'conventional' station scoring 1200 to 1600 points in these 6 minutes. A single MGM QSO might score this amount of points but equally it might be only 600 to 800 points. Any bonus points for working new squares will be in addition to these points.

The President's Review of Contesting Workshop also recommended that MGM be permitted in all sections rather than be restricted to its own, dedicated sections for the reasons given above.

Rule change proposal:

In order to enact this change, it is proposed that the use of MGM is permitted in all sections of all multi-mode RSGB V/UHF contests except for the IARU Region 1 coordinated contests (e.g. 144MHz Trophy and October 432MHz-248GHz and associated contests). The rules for the IARU 50MHz contest do permit the use of MGM but only in the SINGLE with MGM and MULTI with MGM sections. Hence, the 50MHz Trophy contest will also permit the use of MGM in separate sections only. Please note that if the IARU Region 1 contest rules change with respect to the use of MGM, the RSGB rules will also change for the coordinated contest(s).

The alternative offered to permit the use of MGM in all UKAC sections but only in separate all mode sections in other RSGB V/UHF contests (except for IARU R1 coordinated contests where the use of MGM is not permitted at all).

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Annex 1

Model to Assess the Fairness across the UK of Contest Scoring Schemes at VHF/UHF

This model was developed by Martin GM8IEM following discussions during the Presidential Review to understand better the effect of different scoring schemes on contestants living in different regions, with particular reference to the UK Activity Contest rules.

The first stage of the model examines the number of land-based locator squares and the population density[1] of each locator square within a 400 km radius of London, Manchester and Edinburgh; these are considered representative of their surrounding regions[2]. A comparison of available data sets confirms that there is a high degree of correlation across the UK between population density and density of amateur stations[3]. The population data for each land-based square within the 400 km radius is aggregated and normalised to produce a figure showing the relative probability of making a contact.

The second stage of the model considers the effect of the contest scoring rules, assuming all the locator squares within the 400 km radius of each city are worked, and the result is then normalised and factored by the results of the first stage of the model. The final result is a measure of the relative competitive advantage for each of the 3 cities under the rule-set being considered.

Of course the model is imperfect: not all locator squares within 400km will be worked, it doesn't take account of band overcrowding in the densely populated areas, nor the effect of mountainous terrain on propagation in the sparsely populated areas; aircraft movements are such that in the south-east many contacts are made by aircraft scatter, even though the contestants may be unaware of the propagation mode, whereas away from normal flight-paths each individual aircraft is seen as an opportunity for a QSO. Nevertheless, the model is believed to give a broad-brush overview of the effect of different scoring schemes in different parts of the UK.

The results of the modelling are given in Annex 2.

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Annex 2

Analysis of alternative scoring schemes for the UKAC

Eight different scoring schemes have been analysed for scoring potential. The analysis was performed by Martin GM8IEM and Ian G0FCT and is based on the population density in each large Maidenhead Locator square (JO01, IO65 etc.). The analysis method is based on the work of Martin GM8IEM (see Annex 1).

The scoring schemes analysed were:

a. Multiplier Schemes

M5 multiplier: overall points total is the number of different UK squares worked multiplied by the total distance of all stations worked (1 point/km)

M7 multiplier: overall points total is the number of UK squares multiplied by 2 plus the number of non-UK squares worked multiplied by the total distance of all stations worked (1 point/km)

b. Bonus Schemes

The total points in a Bonus Scheme is the sum of the points for the different squares worked (only the first contact with square counts for bonus points) plus total distance worked at 1 point/km. E.g. the first station you work in IO95 nets you X points plus 1 point for every km that separates the two stations. If the distance is 450 km, you get 450+X points.

Bonus A (Southern UK squares score 1000 points, Northern and Western UK squares score 1500 points and non-UK squares score 500 points)

Bonus B (Southern UK squares score 1000 points, Northern and Western UK squares score 1500 points and non-UK squares score zero points)

Bonus C (Southern UK squares score 1000 points, nearer Northern and Western UK squares score 1500 points, far Northern and Western UK squares score 2000 points and non-UK squares score 500 points)

Bonus D (Southern UK squares score 1000 points, nearer Northern and all Western UK squares and all EI squares score 1500 points, far Northern squares score 2000 points, very far Northern squares score 3000 points and non-UK squares score 500 points)

Bonus E (Southern UK squares score 1000 points, nearer Northern and all Western UK squares and all EI squares score 1500 points, far Northern squares score 2000 points, very far Northern squares score 3000 points and non-UK squares score 1000 points)

Bonus F (Southern UK squares score 500 points, nearer Northern and all Western UK squares score 1000 points, far Northern squares score 2000 points, very far Northern squares score 3000 points and non-UK squares score 500 points)

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Results of the Analysis

The analysis results of the various schemes is given in Table 1.

Table 1 Scheme Analysis Results

Scheme	London	Manchester	Edinburgh
Total available squares within 400 km radius	27.5	24.0	21.4
... of which Eu/RoI squares	9.6	1.7	0.6
Population density totalled per square within 400km	3.8	2.6	1.0
Factored by M5 multiplier*	3.5	2.8	1.0
Factored by M7 multiplier	4.3	2.9	1.0
Factored by Bonus A	3.3	2.5	1.0
Factored by Bonus B	2.8	2.4	1.0
Factored by Bonus C	2.7	2.2	1.0
Factored by Bonus D	2.6	2.3	1.0
Factored by Bonus E	3.1	2.3	1.0
Factored by Bonus F (Bonus 1)	1.9	1.8	1.0

* i.e. stations in the London area have a 3.5:1 competitive advantage over stations in Edinburgh

Notes:

1. Population data for each locator square derived from detailed 0.5 degree data available from NASA Earth Observations - see http://neo.sci.gsfc.nasa.gov/analysis/configure.php

2. A visual inspection of population density maps shows that if the calculations were centred within 50 km of each of the representative cities there would be little impact on the results.

3. Amateur population by locator square (UK only) as supplied by Peter Burden G3UBX; strong positive correlation of 0.9 between amateur population and general population per square, giving confidence that the model using population density rather than amateur headcount is giving valid results for all squares.

Conclusion

Bonus F (henceforth renamed as 'Bonus 1') provides a readily visible relationship between bonus points and population density. It also does not discriminate against our continental friends but still gives a much more level playing field. It gives a good incentive for stations in most of the UK & CD not just to beam in one favoured direction but to spend time seeking out more distant contacts to maximise the bonus points total. Figure 1 shows a map of the points per square for Bonus 1.

Comparison of M7 & Bonus Scheme 1

A further 'sanity' check was conducted using the submitted logs from the 6m, 2m and 23cm 2014 UKAC. The adjudication software used by the Contest Committee was configured to enable these logs to be rescored using the M7 and Bonus 1.

The results of the rescoring are shown in Tables 2, 3, 4 & 5. Only the top few places are shown in each table. As can be seen, there is no wild geographical distortion introduced by Bonus 1. However, the tactics needed to succeed in the UKAC may be different under Bonus 1 when compared with those under M7!

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Table 2. 6m M7 & Bonus 1 - single month result

6m													
Section AL	M7	M7	M7	M7	M7	M7	Section AL	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	M3BRV/P	IO81QT	56	5247	16	83952	1	M3BRV/P	IO81QT	56	5247	4000	9247
2	M0RKX/P	IO92BA	41	4107	18	73926	2	M0RKX/P	IO92BA	41	4107	4500	8607
3	G4HGI	IO83PL	43	3383	18	60894	3	G4HGI	IO83PL	43	3383	5000	8383
4	M0ICK/P	IO83RO	54	3727	16	59632	4	M0ICK/P	IO83RO	54	3727	4500	8227
5	M1EYP/P	IO83WE	56	3666	14	51324	5	M1EYP/P	IO83WE	56	3666	4000	7666
6	M0VAA	IO83WK	39	2510	14	35140	6	M0VAA	IO83WK	39	2510	4000	6510
Section AO	M7	M7	M7	M7	M7	M7	Section AO	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	M0WLF	IO81QJ	68	9314	20	186280	1	G4NOK	IO93FR	71	7675	8000	15675
2	G4NOK	IO93FR	71	7675	22	168850	2	M0WLF	IO81QJ	68	9314	6000	15314
3	G4ELJ	IO91PH	70	7470	20	149400	3	G4ELJ	IO91PH	70	7470	5500	12970
4	G6UW	JO02AF	44	5178	20	103560	4	G6UW	JO02AF	44	5178	5500	10678
5	G3TCT	IO81QC	37	4579	22	100738	5	G3TCT	IO81QC	37	4579	6000	10579
6	G3PHO	IO93GG	51	4253	22	93566	6	G3PHO	IO93GG	51	4253	6000	10253
Section AR	M7	M7	M7	M7	M7	M7	Section AR	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	M1MHZ	IO92WV	100	13860	30	415800	1	M1MHZ	IO92WV	100	13860	11000	24860
2	G3PYE/P	JO02CE	79	11011	30	330330	2	G3PYE/P	JO02CE	79	11011	10500	21511
3	M0XII/P	IO91MP	86	9101	26	236626	3	M0XII/P	IO91MP	86	9101	8000	17101
4	M0COP/P	IO82NN	72	8587	22	188914	4	M0COP/P	IO82NN	72	8587	6500	15087
5	M0BUL/P	IO82LF	64	8157	22	179454	5	M0BUL/P	IO82LF	64	8157	6000	14157
6	G8AXZ/P	IO93EC	82	7870	20	157400	6	G8AXZ/P	IO93EC	82	7870	5500	13370
Section AX	M7	M7	M7	M7	M7	M7	Section AX	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	G7DWY	IO93BR	63	5486	24	131664	1	G7DWY	IO93BR	63	5486	9000	14486
2	GM4JR	IO85FB	19	3960	20	79200	2	GM4JR	IO85FB	19	3960	10500	14460
3	G4FJK	IO80HV	21	4011	16	64176	3	G4FJK	IO80HV	21	4011	4500	8511
4	GW0IRW	IO72XD	10	1698	12	20376	4	GM4VVX	IO78TA	4	2413	5000	7413
5	GM4VVX	IO78TA	4	2413	6	14478	5	GW0IRW	IO72XD	10	1698	3000	4698

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Table 3. 2m M7 & Bonus 1 - single month result

2m													
Section AL	M7	M7	M7	M7	M7	M7	Section AL	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	M0ICK/P	IO83RO	75	9122	30	273660	1	M0ICK/P	IO83RO	75	9122	14000	23122
2	G4HGI	IO83PL	84	8809	30	264270	2	G4HGI	IO83PL	84	8809	14000	22809
3	G4NBS	JO02AF	46	7757	30	232710	3	G4NBS	JO02AF	46	7757	15000	22757
4	M0VXX/P	IO82RJ	91	11002	21	231042	4	G4ODA	IO92WS	26	5555	16000	21555
5	G0HEL/P	IO81WG	76	9550	24	229200	5	M0VXX/P	IO82RJ	91	11002	7500	18502
6	G4ODA	IO92WS	26	5555	35	194425	6	G0HEL/P	IO81WG	76	9550	8000	17550
Section AO	M7	M7	M7	M7	M7	M7	Section AO	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	G4FZN/P	IO94JF	133	27411	46	1260906	1	GM4AFF	IO86TS	81	32860	20000	52860
2	GM4AFF	IO86TS	81	32860	38	1248680	2	G4FZN/P	IO94JF	133	27411	21000	48411
3	GD8EXI	IO74PC	118	33409	32	1069088	3	GD8EXI	IO74PC	118	33409	11000	44409
4	G4CLA	IO92JL	136	19580	44	861520	4	G4CLA	IO92JL	136	19580	20000	39580
5	G0VVE	IO91SG	126	21913	38	832694	5	G0VVE	IO91SG	126	21913	16500	38413
6	GM6JNJ	IO75SO	54	15746	26	409396	6	GM6JNJ	IO75SO	54	15746	11000	26746
Section AR	M7	M7	M7	M7	M7	M7	Section AR	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	M0BUL/P	IO82OI	154	27152	51	1384752	1	M0BUL/P	IO82OI	154	27152	25500	52652
2	M1MHZ	IO92WV	124	21339	46	981594	2	M1MHZ	IO92WV	124	21339	23000	44339
3	G3PYE/P	JO02CE	112	18997	41	778877	3	G3PYE/P	JO02CE	112	18997	19500	38497
4	M0BRA	IO91PK	107	17383	42	730086	4	M0BRA	IO91PK	107	17383	19500	36883
5	G4IRC	JO02OD	79	16766	39	653874	5	G4IRC	JO02OD	79	16766	18000	34766
6	G0XDI	IO91RQ	104	15180	40	607200	6	GW8ASD	IO83LB	86	13040	21500	34540
7	G8CUL	IO91JO	102	14968	36	538848	7	G0XDI	IO91RQ	104	15180	16500	31680
8	GW8ASD	IO83LB	86	13040	40	521600	8	G8CUL	IO91JO	102	14968	16000	30968
Section AX	M7	M7	M7	M7	M7	M7	Section AX	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Multiplier	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	GM4JR	IO85FB	74	18829	38	715502	1	GM4JR	IO85FB	74	18829	22500	41329
2	GW0IRW	IO72XD	18	3946	25	98650	2	GW0IRW	IO72XD	18	3946	9000	12946
3	GM4VVX	IO78TA	4	736	8	5888	3	GM4VVX	IO78TA	4	736	8000	8736

Table 4. 23cm M7 & Bonus 1 - single month result

23cm													
Section AL	M7	M7	M7	M7	M7	M7	Section AL	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Mult	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	M1MHZ	IO92WV	31	4241	24	101784	1	G4YHF/A	IO92UU	18	3381	10500	13881
2	GW8ASD	IO83LB	30	4362	22	95964	2	G4ODA	IO92WS	25	3753	10000	13753
3	G4ODA	IO92WS	25	3753	20	75060	3	M1MHZ	IO92WV	31	4241	9500	13741
4	G4YHF/A	IO92UU	18	3381	22	74382	4	GW8ASD	IO83LB	30	4362	9000	13362
5	G4HGI	IO83PL	29	3165	18	56970	5	G4HGI	IO83PL	29	3165	6500	9665
6	G4CLA	IO92JL	27	2627	18	47286	6	G4CLA	IO92JL	27	2627	5000	7627
Section AO	M7	M7	M7	M7	M7	M7	Section AO	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Mult	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	G8OHM	IO92AJ	69	10923	34	371382	1	G8OHM	IO92AJ	69	10923	16500	27423
2	G4BRK	IO91HP	53	9187	29	266423	2	G4BRK	IO91HP	53	9187	13000	22187
3	G4KUX	IO94BP	31	8023	28	224644	3	G4KUX	IO94BP	31	8023	14000	22023
4	G4KCT	IO93LW	37	6918	28	193704	4	G4KCT	IO93LW	37	6918	13000	19918
5	G3TCU	IO91QE	28	4653	22	102366	5	G8PNN	IO95EF	20	3969	12500	16469
6	G8PNN	IO95EF	20	3969	22	87318	6	G3TCU	IO91QE	28	4653	8500	13153
Section AR	M7	M7	M7	M7	M7	M7	Section AR	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1	Bonus 1
Pos	Callsign	Locator	QSOs	Score	Mult	Total	Pos	Callsign	Locator	QSOs	Score	Bonus	Total
1	G8CUL	IO91JO	48	8322	31	257982	1	G8CUL	IO91JO	48	8322	14000	22322
2	G4NBS	JO02AF	46	7585	29	219965	2	G4NBS	JO02AF	46	7585	13000	20585
3	GM4JR	IO85FB	25	6624	22	145728	3	GM4JR	IO85FB	25	6624	11000	17624
4	M0GHZ	IO81VK	29	5377	22	118294	4	G8XVJ	IO83QK	35	4582	9500	14082
5	G8XVJ	IO83QK	35	4582	22	100804	5	M0GHZ	IO81VK	29	5377	8000	13377
6	G3UVR	IO83KH	37	4344	20	86880	6	G0MJW	IO91IO	25	3641	8500	12141

Table 5. 2m Club M7 & Bonus 1 - full year result

144MHz UKAC 2014					
Club Scores					
M7 Pos	M7 Club	M7 Total	Bonus 1 Pos	Bonus 1 Club	Bonus 1 Total
1	Travelling Wave CG	133,395	1	Travelling Wave CG	133,843
2	Bolton Wireless Club	90,556	2	Bolton Wireless Club	92,503
3	Trowbridge & DARC	73,305	3	Trowbridge & DARC	69,405
4	Sheffield & DWS	64,598	4	Sheffield & DWS	67,717
5	Spalding & DARS	60,390	5	Spalding & DARS	61,633
6	Sheffield ARC	47,496	6	Sheffield ARC	48,088
7	RAF Waddington ARC	42,857	7	RAF Waddington ARC	43,870
8	Tall Trees CG	40,638	8	Tall Trees CG	41,047
9	Harwell ARS	38,528	9	Ossett ARO	38,531
10	Camb-Hams	36,317	10	Harwell ARS	37,031
11	Ossett ARO	35,180	11	Camb-Hams	36,171
12	Wirral & DARC	32,299	12	Wirral & DARC	35,174
13	Milton Keynes ARS	28,910	13	Grimsby ARS	27,686
14	RS of Harrow	28,406	14	Milton Keynes ARS	27,440
15	Grimsby ARS	26,969	15	Worksop ARS	27,383
16	Northern Fells CG	25,788	16	RS of Harrow	27,353
17	Worksop ARS	25,468	17	Northern Fells CG	26,182
18	Cray Valley RS	25,297	18	Cray Valley RS	23,674
19	Swindon & DARC	22,534	19	Swindon & DARC	20,706
20	Bracknell ARC	18,144	20	Bracknell ARC	17,527

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Annex 3

Bonus 1 Locator Square classification

Column 1	Column 2	Column 3	Column 4
3000 point squares	**2000 point squares**	**1000 point squares**	**500 point squares**
IP80	IN69	IN79	All other locator squares not listed in columns 1, 2 or 3 and all non-UK stations in listed squares
IP90	IO65 (UK only)	IN89	
	IO66	IO54 (UK only)	
	IO67	IO64 (UK only)	
	IO68	IO70	
	IO69	IO71	
	IO75	IO72	
	IO76	IO73	
	IO77	IO74	
	IO78	IO84	
	IO79	IO94	
	IO85		
	IO86		
	IO87		
	IO88		
	IO89		
	IO95		
	IO96		
	IO97		
	IO98		
	IO99		